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A BIBLIOGRAPHY ON METHODS OF ATMOSPHERIC VISIBILITY MEASUREMENTS RELEVANT TO AIR TRAFFIC CONTROL AND RELATED SUBJECTS

Hector C. Ingrao

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FINAL REPORT

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FEDERAL AVIATION ADMINISTRATION
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16. Abstract

This bibliographical survey provides reference information and background material to assist in the selection of principles and measuring techniques which may be used in the development of future systems to measure Runway Visual Range (RVR), Slant Visual Range (SVR), Approach Light Contact High (ALCH), Taxi Visual Range (TVR), or any other parameter to be defined which will describe the photometric conditions of runways and/or taxiways under actual operational and atmospheric visibility conditions.

This survey gives much of the literature which has been published on the subject of visibility, the factors inherent to the target background, atmospheric optics, visibility-measuring instrumentation, photometric properties of the eye, visibility data-processing, landing, takeoff and taxiing problems which are imposed by reduced visibility. References on anatomy and physiology of the eye, pathological effects on vision, optometrical testing and visibility statistics of airports have been excluded with the exception of a few selected references.

The raw references and abstracts of this survey have been selected from automated information searches conducted by the National Aeronautics and Space Administration, The Defense Documentation Center, and the National Technical Information Service at the request of TSC as well as from existing bibliographies on visibility and manual searches conducted by the Transportation Systems Center.

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PREFACE

This bibliographical survey is a final report which fulfills an agreement between the Federal Aviation Agency and the Transportation Systems Center (TSC) both under the Department of Transportation.

OBJECTIVE

To provide reference information and background material to assist in the selection of principles and measuring techniques that may be used in the development of future systems to measure Runway Visual Range (RVR), Slant Visual Range (SVR), Approach Light Contact High (ALCH), Taxi Visual Range (TVR), or any other parameter to be defined which will describe the photometric conditions of a runway and/or taxiways under actual operational and atmospheric visibility conditions.

SCOPE

A survey has been conducted for references which may have, directly or indirectly, relevance to the analysis and design of systems which are indicated in the objective. This bibliography gives much of the literature which has been published on the subject of visibility, the factors inherent to the target background, atmospheric optics, measuring instrumentation, photometric properties of the eye, visibility data-processing, landing, takeoff and taxiing problems which are imposed by reduced visibility. Such materials on anatomy and physiology of the eye, pathological effects on vision, optometrical testing and visibility statistics of airports have been excluded with the exception of a very few references which are considered to have some degree of relevance to the objective. The search which totals approximately 1100 bibliographical references does not cover a given period, the oldest is dated 1901 and the latest 1973.

SOURCES SEARCHED

The raw references and abstracts of this survey have been selected by Mr. Hector C. Ingrao from automated information searches conducted by the National Aeronautics and Space Administration (NASA), the Defense Documentation Center, (DDC), and the National Technical Information Service (NTIS) at the request of TSC as well as from existing bibliographies on visibility and manual searches conducted by TSC.

The automated NASA searches include:

Optical Scattering Properties of Fog Banks, 23 December 1970

Night Vision, Dark Adaptation, and Low Visibility Perception, 23 September 1970

Atmospheric Visibility Measurements, 23 May 1973

The automated DDC searches include:

Optical Scattering of Coastal Fog Banks, 23 December 1970

Visibility Measurements, 17 May 1973

The automated NTIS search is:

Atmospheric Visibility Measurements and Applications, 5 June 1970

Relevant elements of the following existing bibliographical surveys have been used:

An Annotated Bibliography on Methods of Visibility Measurement 1950-1969, by Annie E. Grimes, ESSA, Office of the Administration and Technical Services, Atmospheric Sciences Library, Rocksville, MD.

Visibility, by M. Leiking and J. Weiner, The Library of Congress, Reference Department, Technical Information Division, July 1952.

Selected Annotated Bibliography on Visibility, Part II, by Nikolay T. Zikeev, Meteorological Abstracts, 3,942 (1952).

A manual bibliographical search has been carried out at MIT by Ms. Alice Hall, Cambridge MA, on 31 May 1973, as *Atmospheric Visibility, Measurements and Applications.*

Another manual reference and abstract search has been conducted by Mr. Hector C. Ingrao.

FORMAT OF THE REFERENCES

The references in this bibliography have been grouped into three major categories:

1. Reports
2. Journal articles
3. Books, proceedings, conference papers, brochures and monographs.

The entry to references of the first category is by corporate source, and the other two categories by author.

The abbreviations for corporate sources are taken from the Corporate Author Headings, March 1970, COSATI 70-7, Committee on Scientific and Technology, Washington DC. The abbreviations for periodicals and journals follow those in the World List of Scientific Periodicals 1900-1960 and its annual updates 1964-68*; the quarterly updates of this 1969-72 publication have also been searched. The foreign titles, as far as possible, appear in the original language with the English translation following. In some instances, references are made to the English translation of the foreign publication, without reference to the original title.

Each reference is preceded by an accession letter and a four-digit number. The letter R is used for the reports series, J for the journal articles and B for books, proceedings, papers, or monographs. As far as possible, references are supplied with a corresponding abstract.

In many references, there is an accession number at the bottom left-hand side of the abstract or reference; these numbers are retrieval numbers for the NASA Scientific and Technical Aerospace Reports (STAR), the International Aerospace Abstracts (IAA), and the Defense Documentation Center (DDC), the Foreign Technology Division (FTD) Wright Patterson USAFB, the NASA Office of Scientific & Technical Information and the Government Reports Announcements.

A typical STAR accession number is:

N68-35595 #

where N indicates the STAR system, 68 the year 1968, 35595 the serial number of the reference, and # indicates that the reference is available in microfiche.

A typical IAA accession number is:

A66-33209* #

where A indicates the IAA system, 66 the year 1966, 33209 the serial number of the reference, * indicates NASA sponsorship of the work reported and = that the reference is available in microfiche.

A typical DDC accession number is:

AD 672072

where AD indicates the DDC system, and 672072 the serial number of the reference.

*The name of this publication has changed (in 1969) to that of the British Union Catalog of Periodicals.

CLASSIFICATION

Within each category, the references are arranged in the report section, alphabetically by corporate source and in the other two sections alphabetically by author. A name index, by corporate source and personal author, and a subject index are provided.

ACKNOWLEDGMENTS

The generous assistance given by the staff of the Technical Information Center, Ms. Lucille T. Perodeau, Ms. Regina K. Clifton, and Ms. Diane Wurzel is acknowledged. They were responsible for eliminating duplicate references which appeared in different independent searches, editing and complying with the established reference formats. Their contributions included the painstaking work of preparation of the material for the printer. To Dr. Jack R. Lifsitz, who searched for abstracts for several references, to Mr. Walter M. Ingrao, who devoted his own time to trace primary reference sources at different MIT libraries, acknowledgment is also made.

CONTENTS

R0005
Advisory Group for Aeronautical Research and Development, Paris (France).
FLIGHT TEST METHOD FOR THE EVALUATION OF APPROACH AND RUNWAY LIGHTING EFFECTIVENESS.
T. Van Oosterom 1963.
Rept. 431

R0010
Aeronautical Icing Research Labs., Arcata, CA.
FOG STUDIES AT ARCATA, CALIFORNIA, UNDER "OPERATION PEA SOUP", 1960-1962. Final Report 15 Feb. **1960 through 31 Aug. 1962.**
G.P. Ettenheim, Jr., J.B. Howe, and H.L. Webster. Sept. 1962 22 p.
Tech. Note 572 AFCRL-62-897

The use of the multicylinder method at Arcata has provided measurements of fog parameters which could have been obtained by no other presently available field technique. The study described in this report is claimed to define the accuracy limitations more precisely than has been done before. In evaluating the warm-fog multicylinder technique, these limitations need to be considered together with the disadvantages and advantages of the technique included in the report. (Author)
N62-16394#

R0020
Aerospace Corp., El Segundo, CA. Lab Operations.
RADAR METEOROLOGY AT MILLIMETER WAVELENGTHS. SEPT. 1965–JUNE 1966.
R.L. Mitchell June 1966 30 p.
Rept. TR-669 (6230-46)-9

The theoretical scattering and absorption properties of rain, fog, cloud particles, and atmospheric aerosols are given for millimeter wavelengths. Two methods of evaluating the performance of meteorological radars are suggested. A comparison is made for centimeter, millimeter, and optical wavelengths under various meteorological conditions. Radar meteorology is an important application of millimeter waves, especially for cloud studies. Particle backscatter cross sections are much higher at millimeter wavelengths than at longer wavelengths, and yet the penetration through clouds and fog is much greater than at optical wavelengths. In addition, high resolution is possible at millimeter wavelengths with modest size antennas. Small meteorological particles, such as cloud and fog droplets (and possibly giant aerosols around 50 microns in size), could be detected at millimeter wavelengths. (Author)
AD-488085

R0030
Aerospace Corp., El Segundo, CA. Systems Engineering Operations.
CEILING/VISIBILITY RECURRENCE AND DIURNAL VARIATION.
Cyrus R. McAllister July 1969 30 p.
Rept. TR-0066(5520-05)-1

Estimators of conditional probabilities of recurrence of combined ceiling/visibility conditions associated with 8000 feet and 5 miles, respectively, are presented and tested against samples of data representative of semitropical climatological regimes. The estimators are shown to be reasonably efficient in the sense that about 95% of the achieved estimates fall within plus or minus 0.03 of observed values of the conditional probabilities. The results are contrasted with the higher degree of efficiency arising through application of similar methodology to cloud-cover amounts, where the comparable level was found to be 95% within plus or minus 0.02 for a large sample of northern hemispheric data. (Author)
AD-695017

R0035
Aerospace Corp., Los Angeles, CA.
STUDY TO DEMONSTRATE THE FEASIBILITY OF AND DETERMINE THE OPTIMUM METHOD OF REMOTE HAZE MONITORING BY SATELLITE.
E.H. Rogers July 1972 1 p.
Progress Rept. 1 June–July 1972

Optimum method of detecting and monitoring haze using ERTS-1 remote sensing.
N72-31360#

R0036
Air Force Avionics Lab., Wright-Patterson AFB, OH. Research and Technical Division.
GROUND-BASED MEASUREMENTS OF EARTH-TO-SPACE BEAM TRANSMITTANCE, PATH RADIANCE, AND CONTRAST TRANSMITTANCE.
Seibert Q. Duntley
Tech. Doc. No. AL-TDR-64-245

R0037
Air Force Cambridge Research Center, Bedford, MA.
EVALUATION OF VISUAL DISTANCE COMPUTER CP-384/GMQ (XD-1).
Philip I. Hershberg Apr. 1960 31 p.
Instrumentation for Geophysics and Astrophysics No. 13

This report discusses the operation of the Visual Distance Computer which was designed to automatically provide accurate information regarding range and height at which a pilot can expect to see runway approach lights. A list of the tests performed during the evaluation of the Computer is given, including test results and recommendations. The tests indicated that the equipment is accurate and reliable; and when recommended modifications are completed, the Computer should be suitable for field use. Also presented and discussed are basic equations used in solving visual distance problems, initial approximations to existing conditions for each equation solution, and revised equations together with a need for a computer solution of these equations. Two appendices discuss the computer design and details of the evaluation testing program. (Author)

R0037A
Air Force Cambridge Research Center, MA. Geophysics Research Directorate.
VARIATIONS OF ATMOSPHERIC TRANSMISSIVITY AND CLOUD HEIGHT AT NEWARK.
William C. Morton III and Thomas O. Haig Jan. 1958 32 p.
Air Force Surveys in Geophysics No. 91

Data derived from ceilometer-transmissometers have been examined to determine the feasibility of using a centrally located instrument to approximate conditions in the approach zone. Data were gathered simultaneously from two sites, each equipped with Cloud Height Set, AN/GMQ-13, and Transmissometer, AN/GMQ-10. The sites were located near the middle marker (Cloud Height Set) and End-of-Runway (Transmissometer), and approximately one mile away in the middle of Newark Airport, Newark, New Jersey. It is concluded that the instruments should be located as near as possible to the region in space where the measurement is of operational importance. (Author)

R0038
Air Force Cambridge Research Labs., L.G. Hanscom Field, MA.
CLEAR LINES-OF-SIGHT FROM AIRCRAFT.
Eugene A. Bertoni Aug. 1967 188 p.
Air Force Surveys in Geophysics No. 196
AFCRL-67-0435

An in-flight observation program to collect observations of the presence, or absence, of clear lines-of-sight at several angles in the vertical plane has been completed. Approximately 72,000 observations were collected over a period of about 15 months. Observations were taken by flight crews of the Air Force, Navy, and Pan American Airways. Data were obtained over most of the Northern Hemisphere, except the area from 30E to 110E. All observations taken within a 10 deg latitude-longitude sector were grouped together by altitude and season. The relative frequency of a clear line-of-sight is plotted in the appropriate area on maps for various lines-of-sight. The number of observations on which the relative frequency is based is shown in parentheses. The relative frequencies are intended to serve as estimates of the probabilities of clear lines-of-sight. These estimates should be considered as a first approximation since, (a) the observations were taken in a very subjective manner, (b) the estimates are based only on about one season of data, and (c) cloud variability may be quite large within some 10 degree sectors. (Author)
N67-39625#

R0039
Air Force Cambridge Research Labs., L.G. Hanscom Field, MA.
FIELD TEST OF A FORWARD SCATTER VISIBILITY METER.
Wayne S. Hering, H. Stuart Muench, and H. Albert Brown May 1971 21 p.
Rept. AFCRL-71-0315 AFCRL-ERP-356

Field tests of a forward scatter visibility instrument were carried out in August 1970 at Cutler, Maine. The performance characteristics of the new instrument were examined through comparisons of simultaneous measurements of atmospheric extinction coefficient with a conventional transmissometer and through comparisons with human observations of visibility, during periods of dense coastal advection fog, which restricted visibility to less than one mile, the correlations coefficient between forward scatter and transmissometer measurements was about 0.91 with a standard error of estimate of 26 percent. The disparities between simultaneous measurements were caused primarily by high frequency fluctuations in fog density that were detected by the small volume measurements with the forward scatter instrument, but were smoothed out by the measurements of transmittance over a baseline of 500 ft. Additional comparisons of forward scatter measurements and transmittance measurements in winter snow situations gave results similar to those obtained in fog conditions. (Author)
AD-726995

R0040
Air Force Cambridge Research Labs., L.G. Hanscom Field, MA.
METHODS FOR ESTIMATING THE PROBABILITY OF CLEAR LINES-OF-SIGHT, OR SUNSHINE, THROUGH THE ATMOSPHERE.
Iver A. Lund May 1966 10 p.
Rept. AFCRL-ERP-246, AFCRL-66-838

Five methods for using standard cloud observations to estimate the probability of a clear line-of-sight, or sunshine, through the atmosphere are described and compared. The root-mean-square errors of the probability estimates (expressed in units of per cent) are less than 10 for four of the five methods. (Author)
AD-648441

R0043
Air Force Cambridge Research Labs., L.G. Hanscom Field, MA.
AN OPERATIONAL SYSTEM TO MEASURE, COMPUTE AND PRESENT APPROACH VISIBILITY INFORMATION.
T.O. Haig and W.O. Morton III June 1958 139 p.
Air Force Surveys in Geophysics No. 102
Rept. AFCRC-TN-58-417

The publication briefly reviews the history and major efforts of the Approach Visibility Project; discusses in detail the development of a simplified system to determine visual contact height; discusses the use of this information in military and civil air operations; and presents instructions for implementing the system on an interim basis. (Author)
AD-152584

R0044
Air Force Cambridge Research Labs., L.G. Hanscom Field, MA.
VERTICAL-ATTENUATION MODEL WITH EIGHT SURFACE METEOROLOGICAL RANGES 2 TO 13 KILOMETERS.
Louis Elterman Mar. 1970 66 p.
Rept. AFCRL-70-0200, AFCRL-ERP-318

An examination of the haze regime shows that: (1) the aerosol properties of a surface meteorological range generally affect a mixing layer to 5 km altitude, and (2) the lower and upper visibility limits of a haze regime are defined by meterological ranges 1.2 km and 15 km respectively. Within these limits eight meteorological ranges are selected for developing uv, visible, and ir aerosol attenuation coefficients. An aerosol scale height is derived for each meteorological range. Finally, the computed aerosol attenuation coefficients are presented as tabulations which include previously published attenuation parameters (aerosols, molecules and ozone) to 50 km altitude. (Author)
AD-707488

R0047
Air Proving Ground Center, Eglin AFB, FL.
OCCURRENCE OF FOG, LIMITED VISIBILITY AND CLOUDINESS AT SELECTED CITIES IN THE UNITED STATES.
Denis A. Whittaker Oct. 1960 17 p.
APGC-TR-60-44

The frequency of occurrence of fog, limited visibility, and cloudiness is presented. Monthly data are given in both tabular and graphic form for 19 major United States cities. Fog and limited visibility occur, on the average, least often in summer (3 or 4% of the time) and most often in winter (about 10%). Peak values, for all 19 cities, never exceeded 20%. 60% cloudiness within 5000 ft thick altitude layers has an average occurrence of 14% at the lowest level (5000 to 10,000 ft); and decreases almost linearly with altitude to zero percent of 50,000 ft. Maximum occurrence is about two and a half times larger than the average values. (Author)

R0048
Air Weather Service, Scott AFB, IL.
ENVIRONMENTAL-MEASURING EQUIPMENT USED BY AIR WEATHER SERVICE IN SUPPORT OF AIR FORCE AND ARMY OPERATIONS.
Nov. 10, 1967 145 p.
AWS Pamphlet No. 105-3

This pamphlet presents information on Visibility-Measuring Equipment (AN/GMQ-10( ), Transmissometer Set and AN/GVN-1, Visibility-Measuring Set, Night) and Visibility-Measuring Auxiliary Equipment (AN/FMN-1, Computing Set, Runway Visual Range) on pages 9-11.

R0050
Air Weather Service, Scott AFB, IL.
ESTIMATING METEOROLOGICAL EFFECTS ON RADAR PROPAGATION. VOLUME I.
W.B. Moreland Jan. 1965 198 p.
Rept. TR183-Vol. 1
AD-459466

R0055
Air Weather Service, Washington, DC.
AN OBJECTIVE METHOD FOR FORECASTING VISIBILITY LESS THAN ONE HALF MILE AT RAF SCULTHORPE, ENGLAND, NOV. THRU FEB.
Lelyn W. Nybo Jan. 1961 6 p.

The report presents the results of an attempt to produce an objective forecast method to make a short range forecast of one weather element. Application of this element in forecasting is briefly outlined also with consideration of surface parameters (sky condition, surface wind speed and direction, visibility, temperature, dew point spread, etc.). Procedures are described in detail, with tables and diagrams.

R0060
American Bosch Arma Corp., Philadelphia, PA. Tele-Dynamics Div.
STATION SELECTION AND EQUIPMENT ALLOCATIONS FOR TEST NETWORK. WEATHER OBSERVING AND FORECASTING SYSTEM 433L.
July 1, 1960
WSC-E-12-2

Section 3 on system equipment description and utilization includes brief descriptions of the Transmissometer Set, AN/GMQ-10, and Transmissometer WB-N161.

R0070
American Bosch Arma Corp., Philadelphia, PA. Tele-Dynamics Div.
TECHNICAL BULLETIN OF 433L EQUIPMENT FOR THE TEST NETWORK OF THE WEATHER OBSERVING AND FORECASTING SYSTEM 433L.
June 10, 1960
WSC-M-4

This bulletin presents brief technical descriptions, technical characteristics, logistical data, operational data and installation considerations pertinent to the transmissometer, either AN/GMQ-10 or N161C on pages 41-43 and for the visual distance computer CP-384/GMQ on pages 52-53.

R0080
Army Aeromedical Research Unit, Fort Rucker, AL.
TINTED WINDSCREENS IN U.S. ARMY AIRCRAFT.
John K. Crosley Mar. 1968 18 p.
USAARU-68-7

A spectrophotometric analysis was performed on the tinted windscreen of the U.S. Army AH-1G helicopter. The results of this test, considered in conjunction with the conclusions of other researchers working with both aircraft and automobile tinted windshields, have led to the recommendation that no tinted media should be positioned between the pilot and his normal field of view during heavy overcast days, at twilight, or at night. (Author)
N68-26445# AD-667960

R0090
Army Electronics Command, Fort Belvoir, VA. Night Vision Lab.
ATMOSPHERIC OPTICAL ENVIRONMENT.
Mishri L. Vatsia Sept. 1972 123 p.

A knowledge of the fundamental optical properties of the terrestrial atmospheric environment is essential for solving various problems in the multidisciplinary field of Visionics including the areas of vision, psychology, atmospheric physics, infrared physics, simulation, astrogeophysics, and electro-optical technology. The aim of the report is to generalize the recent work of the author and summarize the data from other worldwide sources published by the first quarter of the year 1972. The report included a treatment of the atmospheric radiation, the atmospheric transmission, and the transfer of contrast by the atmosphere. The fundamental characteristics of the daytime and nighttime radiation including some important recent measurements of the solar, twilight, and nightglow radiation spectra are presented. An extensive chapter on atmospheric transmission includes the fundamental properties of the terrestrial atmosphere and basic principles of atmospheric absorption and scattering. A fairly complete collection of the most important data on atmospheric transmittance in the 0.4 micrometer to 15 micrometers spectral region is presented. The effects of atmospheric turbulence on the propagation of imagery are described. A detailed analysis of the transfer of contrast by the atmosphere is presented, and its significance on the performance of electro-optical devices is emphasized. (Author)
AD-750610

R0100
Army Electronics Labs., Fort Monmouth, NJ.
CORRELATION BETWEEN ATMOSPHERIC BACKSCATTERING AND METEOROLOGICAL VISUAL RANGE.
Robert W. Fenn June 1964 26 p.
TR2481

On the basis of present knowledge of the distribution of natural haze particles in the atmosphere, the relation between the backscatter intensity and the visual range on the extinction coefficient has been analyzed. It can be shown that the various processes which cause the changes in visibility (increasing haze-particle number, change in haze particle-size distribution, etc.) result in rather different backscatter conditions. Therefore, it cannot be expected that a unique relation between visibility and backscatter signal can be found. A relation, visibility = F (backscatter signal), with useful accuracy can be established only for specific atmospheric conditions; this relation, however, may be characteristic for certain geographical areas. These conclusions, derived from natural aerosol distributions and processes, are found to be in agreement with some published empirical data on scattering and visibility correlation. (Author)
AD-604255 N64-29795

R0110
Army Electronics Labs., Fort Monmouth, NJ.
PROPAGATION OF LASER BEAMS IN THE ATMOSPHERE: A LITERATURE SEARCH.
William F. Rapp, John J. Newman, Jr. and Douglas H. Shedd Sept. 1964 17 p.
AD-451941

R0120
Army Missile Command, Redstone Arsenal, AL. Physical Sciences Lab.
SOME CLIMATIC INFORMATION ON SURFACE VISIBILITY.
Helmut P. Dudel Apr. 1967 97 p.
Rept. RR-TR-67-5

After a brief discussion of the definitions, practices of observing, coding, and statistical evaluation of meteorological visibility, frequencies of occurrence of visibilities in individual climatic zones are surveyed with emphasis on visibilities of less than three miles. Tables and graphs are presented to show annual and diurnal variation and the frequency of other visibility thresholds for selected stations. Zone medians with visibilities of less than three miles are found to range from practically zero in desert, semiarid and (during summer) mediterranean type climates to more than 35 percent in marine-temperate climate of Western Europe during winter. By weighing the annual zone median values according to land area coverage, an approximate world-wide mean of seven percent is computed for occurrence of visibilities of less than three miles. (Author)
AD-816612

R0130
Army Natick Labs., MA. Earth Sciences Div.
VISIBILITY MEASUREMENT IN FORESTED AREAS. SPECIAL REPORT.
Robert L. Anstey Nov. 1964 36 p.
Rept. SR-S-4

This report summarizes and evaluates results of visibility studies conducted in a tropical deciduous forest, mediterranean-type forests, mid-latitude mixed forests, and a high-latitude coniferous forest, together with an evaluation of the measurement techniques employed in these studies. Based on this evaluation, it is recommended that a secchi disk (a flat, dull-white surface), mounted on a tripod of local materials, be used as a standard visibility measuring method for forested areas. By using this standard system, comparable visibility data will be obtained from representative stands of vegetation under various environmental conditions.
AD-648230

R0140
Army Test and Evaluation Command, Aberdeen Proving Ground, MD.
METEOROLOGICAL EQUIPMENT METEOROLOGICAL STATIONS, MANUAL, OR AUTOMATIC: MATERIEL TEST PROCEDURE.
June 1968 16 p.
Rept. MTP-6-2-186

The scope of this MTP is limited to the engineering test of meteorological station groupings of essential components for information gathering and recording (or reporting). These components consist of state-of-the-art devices designed to sense and display ambient data on temperature, dew point (humidity), wind direction and speed, barometric pressure, cloud height (sky condition), visibility, rainfall, and snow depth in the environment of the station. Components of the system which have been standardized will not be retested except as they influence the system. (Author)
AD-718646

R0150
Army Test and Evaluation Command, Aberdeen Proving Ground, MD.
METEOROLOGICAL STATIONS, MANUAL OR AUTOMATIC: MATERIEL TEST PROCEDURE.
Aug. 1968 16 p.
Rept. MTP-6-3-186

The objective of this test procedure is to describe the methods used to determine the degree that meteorological stations, manual or automatic, and associated tools and test equipment perform the mission as described in the Qualitative Materiel Requirements, Small Development Requirements and Technical Characteristics, and the suitability of the systems and the maintenance packages for use by the Army. (Author)
AD-718583

R0160

Ateliers de Constructions Electriques de Charleroi (Belgium).

TESTS ON ACEC VIDEOMETER IN FOG CHAMBER AT UNIVERSITY OF CALIFORNIA, BERKELEY, CALIFORNIA, U.S.A., FINAL REPORT.

R.A. Brousmiche, I.L. Dujardin, M.E. Etienne, et al. July 1967 22 p. Sponsored by FAA Prepared in cooperation with the Belg. Airports and Airways Agency.

FAA-RD-67-32

This report deals with a videometer for measuring visibility along airport runways. Fog chamber tests were conducted with a manual and an automatic version of the equipment to verify values obtained during operations at the Brussels National Airport, Belgium. The equipment consists of the videometer and a television screen display device. The present report describes test conditions and gives the results obtained with the manual and the automatic videometers. Measurements made simultaneously with both versions of the equipment and by human observers are compared.

N68-15999#

R0165

Atmospheric Sciences Lab., White Sands Missile Range, NM.

IMPROVEMENT OF VISIBILITY OVER AIRPORT RUNWAYS DURING FOGGY WEATHER. PART I. STUDY OF FOG AND ITS EFFECT ON AIR TRAFFIC PROCEDURES OF IMPROVING VISIBILITY.

M.R. Fabre Feb. 1968 55 p.

Discusses the formation of fog; determination of visual depth in fog; conditions and methods of improving visibility over airports; study of fog dissipation carried out abroad.

AD-892215

R0170

Avco Everett Research Lab., Everett, MA.

CARRIER AIRCRAFT APPROACH SLOPE VISIBILITY TRANSMISSOMETER USING LASER RAMAN BACKSCATTERING. FINAL REPORT ON PHASE 1 AND 2.

Jan. 1972 28 p.

A laser Raman transmissometer was fabricated and experimental field tests were conducted which verified the feasibility of the method. A pulsed nitrogen laser at 3371 A was used as the laser source. Transmissions as low as 2% over a 1/4-mile range were measured by Raman scattering and compared with a reference double-ended standard transmissometer. (Author)

AD-892215

R0180

Ballistic Research Labs., Aberdeen Proving Ground, MD.

ATMOSPHERIC TRANSMISSION OF LIGHT FOR CLEAR AIR AND FOG IN THE SPECTRAL REGION 0.35 TO 1.10 MICRONS.

Alan R. Downs Apr. 1964 45 p.

Rept. BRL-MR-1561

Methods are described for estimating the transmission of light by a clear atmosphere for humidities ranging from 0.1 x 10 to the minus 6 power to 100 x 10 g/cubic AMT, and temperatures between -40 C and +60 C for path lengths between 1000 and 5000 meters. Also, transmissions are given for varying amounts of fog for path lengths up to 200 meters. The paths used are horizontal and near sea level and wavelength intervals of 0.05 micron are used between wavelengths of 0.35 and 1.10 microns. (Author)

AD-444333

R0190

Ballistic Research Labs., Aberdeen Proving Ground, MD.

AN EVALUATION OF METHODS TO MEASURE ATMOSPHERIC VISIBILITY.

Alan R. Downs April 1969 51 p.

Rept. BRL-MR-1973

The 'visibility' is defined and its importance to BRL projects is discussed. Equations are derived relating the 'visibility' to other atmospheric parameters and relevant properties of the human eye. The concept of the atmospheric attenuation coefficient is developed and related to the 'visibility.' Four possible methods of measuring the attenuation coefficient are described. Results of error analysis on the four methods are given as well as the results of field measurements made under a variety of conditions. The major sources of error in each method are described as well as ways to minimize their effect. (Author)

AD-854035

R0200
Bege (J.R.M.) Co., Arlington, MA.
LASER BEAM ATTENUATION IN THE LOWER ATMOSPHERE. PART II.
R.M. Langer June 1964 70 p.
Rept. 6431

The material on laser beam attenuation presented in Part 1 is reviewed and aligned with observational experience of atmospheric turbulence and aerosol scattering. Haze, fog, and cloud models of Junge, Eldridge and Deirmendjian are examined with respect to particle size distribution, suspended water content, absorption and wave length scattering dependence. Numerical data are summarized in terms of the nepier path R(N) which is the path required to attenuate a collimated beam by a factor of E. The combined attenuation by aerosols and molecular absorption is such as to favor the use of laser beams in the relatively transparent windows in the atmosphere. A table is outlined tentatively, listing known gas laser wave lengths, strengths and nepier paths for a clear standard atmosphere. The table will be filled in Part III. (Author)
AD-454990

R0210
Boeing Scientific Research Labs., Seattle, WA. Flight Sciences Lab.
A STUDY OF FOG CLEARING USING A CARBON DIOXIDE LASER.
G.J. Mullaney, W.H. Christiansen, and D.A. Russell Apr 1969 27 p.
D1-82-0848

It has been suggested that haze and fog may be dissipated by using a 10.6 micron laser beam. This radiation is strongly absorbed by liquid water but only weakly absorbed by water vapor. Thus, the laser selectively deposits its energy in the water droplet, ultimately evaporating it. In this paper, the physics of fog removal by a CO2 laser is explored and the possibility of clearing airport runways is evaluated. While initial estimates of the power required to clear a runway are large for present-day laser devices, they may not be excessive requirements for future systems. (Author)
N69-39784# AD-691057

R0220
Bollay (E.) Associates, Inc., Goleta, CA.
INSTRUMENTATION FOR THE DIRECT MEASUREMENT OF FOG DROPLET GROWTH.
Robert A. Begun Aug. 1964 135 p.
RD-64-136

An instrument is in operation that directly measures water droplet growth as a precursor of developmental fog formation. Water droplet sizes of interest range from 0.1μ to 1.0μ, prior to the particles becoming visible to the human eye. Using optical techniques, the instrument measures the transmission of two discrete wavelengths of ultraviolet light over a path length of 125 ft. The atmosphere is not disturbed. As the absolute value of the transmission is not quantitatively measured, the alignment of the unit is not critical. Several cases of development fog were successfully indicated by the instrument several hours before visibility was affected. (Author)
N65-22937#

R0230
Bolt Beranek and Newman, Inc., Cambridge, MA.
ATMOSPHERIC HAZE: A REVIEW. FINAL REPORT.
O.A. Germogenova, J.P. Friend and A.M. Sacco Mar. 31, 1970 184 p.
Rept. BBN-1821
Prepared in cooperation with Coordinating Research Council, Inc. N.Y.

General description of haze components; Mechanisms of haze formation; Distribution and dynamics of atmospheric aerosol; Quantitative analysis of turbulent diffusion; Optical properties of air pollutants; Instrumentation techniques for measuring hazes.
PB-192102

R0231
California State Div. of Highways.
REDUCED VISIBILITY (FOG) STUDY.
Mar. 1967 132 p.

Summarizes research conducted by the Calif. Transportation Agency to find or develop various means of giving advance warning to motorists of the need for greater alertness and caution when driving in reduced visibility conditions produced by fog. Discussion of fog accidents on California highways includes statistical data on multiple fog accidents per year over a 3-yr period, on the number of accidents (1964) by weather conditions and by number of vehicles involved, and on the role of fog in multivehicle accidents, a graph giving the hourly distribution of accidents by weather conditions. Contents also include the following: effect of fog and signs on speed and on headways, comparison of regulatory with advisory speed signs, stimulation of fog in the Driving Simulation Lab., etc.

R0232
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
EFFECT OF BACKSCATTER FROM AIRCRAFT BEACON LIGHTS ON TARGET VISIBILITY IN FOG.
D.M. Finch, E.C. Curwen, and L.E. King Nov. 1966 42 p.
FAA-RD-66-57

Tests were performed in the fog chamber to determine how the backscatter from aircraft beacon lights (collision-avoidance lights) in a fog of 0.21 per mile transmittance affects an observer's ability to see a set of target lights at a fixed distance equal to the corresponding visual range of 3 miles (approximately 16,000 ft). The tests investigated three white and three red beacon lights, both steady-burning and flashing, with peak intensities from 1200 to 200,000 cp in white and 1200 to 25,000 cp in red, results from a total of over 10,000 observations, made by 34 observers, show that use of the beacon lights produced no appreciable reduction in target-light visibility except with the highest white-light intensity, there was no apparent difference between the steady-burning and flashing modes of the beacons insofar as target visibility is concerned. (Author)
AD-648611

R0233
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
EFFECT OF LANDING-LIGHT BACKSCATTER ON TARGET VISIBILITY IN FOG.
D.M. Finch, E.C. Curwen, and L.E. King Sept. 1966 36 p.
FAA-RD-66-60

Tests were conducted in the FAA fog chamber to determine if backscatter from aircraft landing lights in visual ranges of 3 mi, 2600 ft, and 1200 ft would interfere with an observer's ability to see a set of amber target lights at the runway threshold. Results from a total of 518 test observations, made by 14 observers, indicate substantially no reduction in target-light visibility in visual ranges of 3 mi and 2600 ft, in the 1200-ft visual range, the visibility of the target lights was reduced by an appreciable amount.
AD-646843

R0234
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
EVALUATION OF CENTERLINE-LIGHTING INDICATIONS FOR RUNWAY-DISTANCE REMAINING AND TAXI-WAY EXITS. FINAL REPORT.
D.M. Finch, R. Horonjeff, and K. Mellander Jun. 1967 36 p.
SRDS-RD-67-10

Tests were conducted to determine the effectiveness of colored centerline lights for indicating runway-distance remaining and for marking high-speed taxiway exits (large-radius turn-offs) under daytime and nighttime visibility conditions down to 700 ft of visual range. The tests consisted of observations by pilots of various lighting patterns under simulated rollout conditions. The results indicate that red centerline lights can be effectively used either in combination with white lights or alone if the intensity of the red lights is high enough to provide adequate guidance under reduced visibility. Results also indicate that under conditions of 700 ft visual range, adequate identification and guidance for large-radius taxiway turnoffs can be provided by steady-burning, green lights along the taxiway centerlines, with a pattern having an equivalent intensity at least that of 1000 cp lights at 12.5 ft spacing in daytime and 500 cp at 12.5 ft at night. Steady-burning taxiway lights were preferred by the pilots over flashing lights. Taxiway centerline lights having a much wider beam than that specified by the FAA were visible from a point on the runway centerline farther beyond the beginning of the taxiway turnoff than were the specified narrower-beam lights. (Author)
N67-36000#

R0235
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
EVALUATION OF ICAO VISUAL AID PANEL APPROACH LIGHTING PATTERNS, FINAL REPORT.
D.M. Finch, R. Horonjeff, and H.G. Paula Feb. 1966 35 p.
SRDS-RD-65-104

Nine different patterns for the last 1000 feet of approach lights before runway threshold, including two European and seven U.S. configurations, were evaluated on a reduced scale in the Fog Chamber by tests in daytime and nighttime fog (1200-foot visual range). The tests, consisting of observations by pilots, showed none of the patterns to be clearly outstanding. Two of the patterns judged fairly effective (one from the United Kingdom and one from the U.S.) also exhibited a serious shortcoming. Among the most acceptable of the patterns tested were two modified versions of the current U.S. standard and the one proposed by The Netherlands. (Author)
N66-28654#

R0236
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
EVALUATION OF RUNWAY LIGHTING SYSTEMS FOR EFFECTIVENESS IN DENSE FOG, FINAL REPORT.
D.M. Finch, R. Horonjeff, and H.G. Paula Jan. 1966 264 p.
RD-65-68

Tests of runway lighting systems in dense fog show that an intensity of 200 to 300 cp, now in general use for centerline lights at U.S. airports, is not high enough for effective guidance in a fog density of 1200-ft visual range, day or night. These tests also indicate that in daytime, with a 1200-ft visual range, runway marking is considerably useful to pilots as a supplement to runway lighting. In addition, on the basis of pilots' reactions, the present U.S. standard pattern (3:3:3) for touchdown-zone and centerline lights was found to be more effective than either of two other patterns (3:2:1 and 7:3:1) evaluated. Pilots also preferred a modified version of the present U.S. standard approach-light system. The tests were performed in a specially designed facility using artificially produced fog and a linear scale reduction factor of 1/10. Evaluations were made from pilot observations, as well as photometric measurement and photographic techniques. The test facilities and methods are described, the test results are presented, and some of the influencing factors, such as background brightness and cockpit cutoff angle, are discussed. In addition, a number of recommendations are made with regard to intensities and photometric distributions for runway lights, and with respect to changes in the present U.S. standard approach light systems. (Author)
N66-19724#

R0237
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
AN INVESTIGATION OF INTENSITIES FOR THE U.S. NATIONAL STANDARD RUNWAY TOUCHDOWN ZONE AND CENTERLINE LIGHTING (IN A VISUAL RANGE OF 1200 FEET).
D.M. Finch, R. Horonjeff, H.G. Paula, et al. Jan. 1964

R0238
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
PHOTOMETER DETECTION CONTRAST AND VISIRILITY OF RUNWAY LIGHTING IN DENSE FOG. FINAL REPORT.
D.M. Finch, R. Horonjeff, H.G. Paula June 1967 66 p.
SRDS-RD-67-33

Using a specially developed photometric method, the visibility of a runway lighting system was studied under various conditions of visual range and background brightness. The method is based on measurement of a defined quantity. C sub d. called photometer detection contrast, and depends on the correlation of this quantity with subjective visibility. All tests were performed in the FAA Fog Chamber at 1/10 scale. Photometric data for the runway lights were obtained in daytime and nighttime visual ranges of 1200, 900, and 700 ft. and maximum visibility distances for various portions of the lighting system were then determined on the basis of an assumed value of .06 for the minimum usable C sub d. Based on the number of lighting elements that would be visible to a pilot under the various test conditions studied, it was concluded that the lighting system would become but marginally effective for visual guidance in a daytime fog of 900-ft visual range and background brightness of about 50-600 fL. The same would hold true for a nighttime fog of 700-ft visual range. In a daytime visual range of 700 ft. the system would no longer provide effective visual guidance. (Author)
N68-15788#   AD-662279

R0239
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
PHOTOMETRIC DETECTION CONTRAST OF AIRPORT LIGHTING IN DECREASING VISIBILITY.
D.M. Finch, R. Horonjeff, and H.G. Paula Aug. 1966 26 p.
SRDS-RD-66-47

A photometric method is described for determining the visibility of airport runway lights under various conditions of visual range and background brightness. The method is based on measurement of a defined quantity, C1, called photometer detection contrast, and depends on the correlation of this quantity with subjective visibility. Use of the photometric method is illustrated by tests conducted in various fog conditions. An automatic scanner mechanism used with a telephotometer for the efficient acquisition of the luminance data is also described. (Author)
N67-22732   AD-645116

R0239A
California Univ., Berkeley, CA. Inst. of Transportation and Traffic Engineering.
A PRELIMINARY EVALUATION OF EFFECTIVENESS OF RUNWAY MARKING IN FOG WITH BRIGHT SUNSHINE OVERHEAD.
D.M. Finch and R. Horonjeff Aug. 1963 14 p.
Interim Rept. 4

"All-weather runway marking", required on all instrument runways was painted in the fog chamber, and observations by a small number of pilots were made in daytime fog with bright sunshine overhead. Each pilot was asked to evaluate the guidance in formation provided by (1) the marking alone, and (2) the marking together with the runway lights in 1,200 ft RVR visibility for landing and 700 ft RVR visibility for take-off. The questions asked of each pilot and the answers provided by them are shown in the attachments to this report. When evaluating only the marking for landing, the approach lights, threshold lights, and runway edge lights were set at step 5. This conforms with present practice. For evaluating the marking together with touchdown zone and centerline lights for landing, the approach lights, the threshold lights, and the runway edge lights were set at step 5, with the touchdown zone lights at 7,500 cp at 100 ft, and the runway centerline lights at 200 cp at 25 ft. FKE-off, only the runway edge lights and the runway centerline lights were in operation. (Author)
AD-418201L

R0239B
Chain Lakes Research Corp., Detroit, MI.
PROBLEMS ENCOUNTERED IN THE DESIGN OF A PORTABLE TRANSMISSOMETER CALIBRATOR. FINAL REPORT.
Roger A. Keller Oct. 1972
Rept. FAA-RD-73-7
AD-757282

R0240
Coast Guard, Washington, DC.
AUTOMATIC FOG DETECTION BY MEASUREMENT OF BACK SCATTERED LIGHT.
Sept. 1960
Rept. 712
AD-242101

R0250
Coast Guard, Washington, DC.
EXPERIMENTAL EVALUATION OF ATTENUATION AND STRAYFIELD OF INFRARED RADIATION IN NATURAL FOG.
W.H. Schonfeld and H. Wehmeier Sept. 1960
Rept. 5119
AD-242058

R0260
Coast Guard, Washington, DC.
SIDESCATTER FOG DETECTOR.
P.O. Chapman Mar. 1963
Rept. 326
AD-298856L

R0270
Cold Regions Research and Engineering Lab., Hanover, NH.
THE ATTENUATION AND BACKSCATTERING OF INFRARED RADIATION BY ICE FOG AND WATER FOG.
Motoi Kumai and Jack Russell Apr. 1969 14 p.
CRREL-RR-264

Ice-fog crystals consisting of many spherical particles, and some hexagonal plates and columns, were observed at ambient temperatures of about -40C in the Fairbanks, Alaska, area during mid-winter. The concentrations and the size distributions of the ice-fog crystals were measured. The attenuation and back-scattering of infrared radiation by ice-fog crystals were computed for optical wavelengths of 2.2 microns, 2.7 microns, 4.5 microns, 5.75 microns, 9.7 microns and 10.9 microns using the Mie theory. The minimum attenuation coefficients and backscattering functions of ice fog were found to be at 9.7 microns wavelength in the observed wavelengths. Optical attenuation coefficients and volume backscattering functions of water fogs were also computed using the Mie theory. The minimum attenuation coefficients and backscattering functions of water fog were found to be at 10.9 microns wavelength in the region of 2.2 microns, 2.7 microns, 4.5 microns, 5.75 microns, 9.7 microns and 10.9 microns. Both the attenuation coefficients and backscattering functions of ice fog are within the same order of magnitude as water fog for equivalent fog concentrations and wavelengths. (Author)
N69-37933# AD-689447

R0280
Cold Regions Research and Engineering Lab., Hanover, NH.
ATTENUATION OF VISIBLE LIGHT BY FALLING SNOW. RESEARCH REPORT.
Harold W. O'Brien June 1969 35 p.
Rept. CRREL-RR-242

The attenuation of visible light by falling snow was studied by making simultaneous attenuation measurements and snow concentration measurements. The attenuation coefficient was calculated from photometric measurements and from visual observations. Snow concentration in the air was evaluated by two methods: from Formvar replicas collected during the snowfall, and by mass accumulation of snow in collecting pans. The snowflakes were arbitrarily classified by crystal types according to their estimated fall velocity. It was found that the correlation between extinction coefficient (attenuation) and snow concentration was generally much higher by types than when all snowflakes were considered together regardless of crystal components and degree of riming. Two types, apparently improperly classified, displayed lower correlations than the overall group. When no fog is present during the snowfall, the experimental results coincide well with attenuation theory if a reasonable correction is applied to the values obtained in the measurement of snowflake diameters. Measurements of mass flux indicate that for a given intensity the attenuation caused by snow is an order of magnitude greater than that caused by the same mass flux of rain. (Author)
AD-702905

R0290
Cold Regions Research and Engineering Lab., Hanover, NH.
THE EFFECT OF LOW VISIBILITY ON THE PERFORMANCE OF VEHICLE OPERATORS. TECHNICAL REPORT.
Ronald Liston Aug. 1972 17 p.
Rept. CRREL-TR-237

An experimental program to identify the relationship between visibility conditions and operator performance is discussed. Average speed in negotiating a controlled course is taken as the measure of operator performance. The method to measure visibility is discussed. It is shown that despite use of a contrived test course and artificially reduced visibility, the results appear valid. It is also shown that the relationship between visibility conditions and average speed can be represented with a simple, second order equation. (Author)
AD-749248

R0300
Cold Regions Research and Engineering Lab., Hanover, NH.
FOG DROP MEASUREMENTS AT BARROW, ALASKA. SPECIAL REPORT.
Motoi Kumai and R.F. Glienna Mar. 1972 21 p.
Rept. CRREL-SR-166

Arctic fog droplets were sampled on chloride-sensitive gelatin-coated glass slides at Point Barrow, Alaska, in the summer of 1971. The collection efficiency of the fog droplets was determined. About 20,000 fog drop radii were measured. The results of analysis of the concentration and the size distribution of fog drops are presented in the form of tables and photomicrographs. It is shown that the concentration and the size distribution changed rapidly with time and space; the drop radii ranged widely between 3.3 and 65 micrometers; the mean radius was 10 micrometers; the maximum concentration was 24 drops/cc and the liquid water content was 0.09 g/cubic meter at a visibility of 250 m. Calculations were made of the attenuation by fog at wavelengths of 0.571 and 1.06 micrometers for the observed size distributions and concentrations of fog drops. (Author)
AD-752129

R0310
Cold Regions Research and Engineering Lab., Hanover, NH.
HORIZONTAL VISUAL RANGE IN POLAR WHITEOUT.
Fritz Kasten May 1962 5 p.
Special Rept. 54

A theory on the horizontal visual range of objects of any color under overcast sky and over homogeneous ground is briefly outlined. The theory takes into account the influence of the visual ground albedo on the illumination of the object and the dependence of the contrast threshold of the human eye on the visual angle subtended by the object viewed. The object always appears darker than the horizon. The visual range of a black object is greater than that of any brighter object and is independent of the visual ground albedo. The visual range of objects of low or medium visual albedo is also almost independent of the visual ground albedo so that they may be considered red as equivalent to black objects. But the visual range of white objects strongly depends on the visual ground albedo; it tends to zero when the visual ground albedo is greater than 0.94 even in clear air. The effect of the visual angle and hence of the diameter of the object on its visual range becomes marked only for visual angles smaller than 0.2°. The results explain the optical conditions encountered in polar whiteout. Measurements made in whiteouts in North Greenland proved the validity of the theory. (Author)

R0320
Cold Regions Research and Engineering Lab., Hanover, NH.
IMPROVING VISIBILITY DURING PERIODS OF SUPERCOOLED FOG.
J.R. Hicks Dec. 1966.
Technical Rept. 181

Six tests of dispersal systems using propane were conducted in Hanover, N.H. during winter 1964-65 and a like number in Greenland during summer 1965 mainly on supercooled fogs and in a few instances when air temperatures were within the lower 2 m at or slightly above freezing. Propane was introduced into the fog as a liquid aerosol to induce spontaneous nucleation either by cooling or by clathrate reaction which may be important in fog modification. The tests show that liquid propane will improve visibility in fogs, is safe to use, and no standby time is needed. The system may be permanently installed with either radio or manually controlled valve units, and is inexpensive, a cost of $20/hr estimated to keep an airport approach zone clear of fog. Details of the individual tests conducted are given. The dispensing apparatus, propane flammability tests, and the theory of formation, growth, and precipitation of ice crystals, thermal reaction, and the clathrate concept are discussed. (Author)

R0330
Cold Regions Research and Engineering Lab., Hanover, NH.
LIGHT SCATTERING AND PARTICLE AGGREGATION IN SNOWSTORMS.
M. Mellor Feb. 1966 23 p.
CRREL-RR-193

Light scattering and visible radiation determined by brightness contrast of topographic features and sky during snowstorm.
AD-633539 N66-34291#

R0335
Cold Regions Research and Engineering Lab., Hanover, NH.
MEASUREMENTS OF LASER EXTINCTION IN ICE FOG FOR DESIGN OF SEV PILOTAGE SYSTEM.
R. Munis and A. Delaney Aug. 1972 23 p.
CRREL-RR-302

Laser extinction measurements of visibility during ice fog for aiding in SEV pilot system design.
N73-15537#

R0337

Cold Regions Research and Engineering Lab., Hanover, NH.

VISUAL RESOLUTION AND OPTICAL SCINTILLATION OVER SNOW, ICE AND FROZEN GROUND. PT. 2.

Donald J. Portman, Edward Ryznar, and Floyd C. Elder Oct. 1965 44 p.

Research Rept. 111

The effects of turbulent fluctuations of atmospheric density are seen as rapid changes in the brightness of a distant light source (scintillation) and in the apparent position, size, and shape of distant objects (shimmer). An investigation of these effects in horizontal optical paths was conducted by measuring visual resolution, optical scintillation intensity and frequency, and wind and temperature profiles over snow, ice and ground surfaces. The data obtained over the various surfaces were analyzed to determine relationships between (1) visual resolution and meteorological conditions and (2) scintillation (intensity and frequency) and meteorological and surface conditions. Principal results of the analysis of the resolution data obtained over snow and frozen ground showed that, for turbulent flow in stable stratification, visual resolution (1) deteriorated systematically as the vertical temperature gradient increased, (2) deteriorated with clear skies as the wind speed increased up to about 5 mph and then improved at higher wind speeds, and (3) was optimum and nearly independent of wind speed during low overcast cloudiness. Over snow-free ice surface and with air temperatures below freezing, only minor scintillation was observed. Resolution conditions were excellent during wind speed and sky conditions normally conducive to higher scintillation intensity and poorer resolution over ground or snow-covered ground. As the snow depth on the ice increased, the behavior of scintillation intensity approached that observed over ground and snow-covered ground. The scintillation data obtained over ice are interpreted with regard to wind and temperature structure above the ice and to the heat conducted upward through the ice. A photographic method to measure resolution is described and some results are presented. Power spectra of scintillation over different surfaces are shown and discussed in relation to various meteorological parameters. These and other relationships are discussed and equipment and measurement procedures are described. (Author)

R0338

Consiglio Nazionale delle Richerche, Rome (Italy). Istituto di Fisica dell 'Atmosfera.

BIBLIOGRAFIA VISIBILITA [1958-1970] (BIBLIOGRAPHY ON VISIBILITY [1958-1970])

M. Gazzi, G. Simonini, and V. Vicentini Jan. 1972 59 p.

Rept. IFA-STR-17

A bibliography from 1958 up to 1970 is presented on visibility problems relating to air navigation, runway visual fields, and visual field of objects in the atmosphere. Problems such as psychophysical effects of luminous intensity and color on the human eye and effect of low visibility conditions on the pilot's landing maneuver are also included.
N72-31125

R0340

Cornell Aeronautical Lab. Inc., Buffalo, NY.

A FIELD INVESTIGATION AND NUMERICAL SIMULATION OF COASTAL FOG.

E.J. Mack, W.J. Eadie, C.W. Rogers, et al. Aug. 1972

Technical Rept. CAL No. CJ-5055-M1

R0350

Cornell Aeronautical Lab. Inc., Buffalo, NY.

INVESTIGATION OF WARM FOG PROPERTIES AND FOG MODIFICATION CONCEPTS, VOL. III. Annual Summary Report.

R.J. Pilie and W.C. Kocmond Feb. 1967 55 p.

NASA-CR-675 ASR-3

Surface measurements of drop size distribution and liquid water content made in advection fogs are shown to agree with characteristics of the fog model presented in earlier work. Comparisons are made of cloud and fog nucleus concentrations measured in Buffalo, Hawaii and Central Pennsylvania. Analytical and experimental data show that the basic concept for minimizing visibility degradation in radiation fog by preseeding with small concentrations of large hygroscopic nuclei is sound. Visibility improvements greater than a factor of two over unseeded fogs have been produced in the laboratory. The concept appears to have applicability only for radiation fog situations. Analytic and experimental investigations show that it is impractical to attempt to suppress fog at an airport by placing electric charge on fog droplets. Electrical forces that can be established by this means when practical droplet charging equipment is used are far too small to have significant influence on fog dissipation rate. (Author)
N67-17359#*

R0355
Cornell Aeronautical Lab., Inc., Buffalo, NY.
PROJECT FOG DROPS, PART I INVESTIGATIONS OF WARM FOG PROPERTIES.
R.J. Pilie, W. Eadie, E.J. Mack, et al. Aug. 1972 151 p.

Micrometeorological and microphysical properties of warm valley fogs and mathematical model of fog life-cycle.
N72-30554#

R0360
Defence Research Telecommunications Establishment, Ottawa, (Ontario). Electronics Lab.
THE FEASIBILITY OF DETECTING FOG BY MEANS OF A LASER.
A. Watanabe Dec. 1966 9 p.
DRTE 1177

The purpose of this report is to present suggestions for the detection of sea fog by means of a laser. Other possibilities are also considered briefly. One of the methods discussed is to make use of the scattered radiation due to multiple reflection and refraction from the small droplets of water in the approaching fog. Another possibility is to use the extinction properties of fog when it moves into the direct path of a transmitted beam of radiation, laser or non-coherent. In considering the several possible methods, the interfering effects of scattered sunlight, the amount of laser radiation back-scattered by the atmosphere, the detection of backscatter with a range-gated system, the detection possibilities of a narrow-band amplifier at the pulse repetition frequency and the signal-to-noise properties of range-gated systems are discussed. (Author)
AD-807378

R0363
Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
DIE BESTIMMUNG DER HORIZONTALEN NORMSICHT DURCH KONTRAST MESSUNGEN AN NATUERLICHEN SICHTZIELEN (THE DETERMINATION OF THE HORIZONTAL STANDARD VISIBILITY BY CONTRAST MEASUREMENTS OF NATURAL OBJECT).
H.E. Hoffman Feb. 1967 27 p.
Rept. DLR-FB-67-11

Three different methods of contrast determination are treated. Any one of these methods may be used to determine the horizontal standard visibility. Contrast "C", as used here, is the visible contrast between natural objects (forests) and the sky above, when observed from a finite distance. The test performed to determine the value of the constant C_0 (i.e., the contrast observed at zero distance) showed that there is a difference in C_0 for coniferous and deciduous type forests and that C_0 is dependent on the type of object illumination. Differences of contrast were not evaluated for variations in foliage due to seasonal changes, and snow covered objects were not tested. Considering the mean square error values of C_0 and the inaccuracies of the C values which were obtained by using the herein described methods, the percent relative error of the horizontal standard visibility was smallest when photoelectric measuring methods were used. In evaluations under conditions of 30 km standard visibility, the error values obtained in the photoelectric method were always less than 15% for a measuring distance of 4 km (i.e., 4 km between measuring instrument and observed natural object.) (Author)
N67-28675#

R0365
Deutsche Forschungs- und Versuchanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
UEBER EINIGE ERFAHRUNGEN BEI DER BESTIMMUNG DER HORIZONTALEN NORMSICHT DURCH KONTRASTMESSUNGEN AN NATUERLICHEN SICHTZIELEN (EXPERIENCE GAINED IN DETERMINING HORIZONTAL STANDARD VISIBILITY).
H. Hoffman Mar. 1971 48 p.
Rept. DLR-FB-71-22

The horizontal standard determined by contrast measurements on natural objects. The differences between the measured and the observed ranges of sight can be explained by an insufficient value for the contrast threshold of the human eye, which was used for the calculation of the horizontal standard visibility. Two conditions make possible the use of a mean value for the inherent contrast of natural objects instead of specific values. These conditions are: The distance to the natural objects must be large, and the horizontal standard visibility should be smaller than 40 km. (Author)
N73-12118 AD-887970

R0370
Deutsche Versuchsanstalt fur Luft- und Raumfahrt Mulheim an der Ruhr (W. Germany).
LABORATORIUMS-MASSIGE HERSTELLUNG KUNSTLICHER NEBEL UND ENTNEBELUNGSVERSUCHE UNTER VERWENDUNG ELEKTRISCHER FELDER. TEIL II. (LABORATORY PRODUCTION OF ARTIFICIAL FOG AND FOG DISPERSAL EQUIPMENT USING ELECTRIC FIELDS. PART II).
U. Schmieschek Apr. 1963 49 p.
DVL-206

A laboratory installation was constructed for the production of steady and flowing fog so that the mechanics of fog formation could be investigated. This installation operates on the principle of a cold air and water vapor mixture. Testing of the installation showed that, at all times, reproducible fog of excellent stability in regard to density, flow velocity, and temperature can be produced. Investigations of the fog produced indicate that the average droplet radius is of the same order of magnitude as the average droplet radius of natural fog. The quantitative density of various fogs was determined by an absorption method. A fog dispersion installation was equipped with an electro-optical apparatus and a visibility metering device for the purpose of rapid determination of the prevailing fog density. Fog dispersal investigations were carried out with the aid of steady and alternating electric fields. In each investigation, the degree of fog dispersal was quantitatively determined. In these investigations, the dependency of the degree of fog dispersal upon the characteristics and the position of the electric fields was determined. In addition, the degree of fog dispersal as a function of the prevailing strength of the electric field, the fog density, and the flow velocity was investigated. Results of this investigation indicate that the use of a steady electric field for fog dispersal is practically useless. On the other hand, the use of an alternating electric field produces excellent fog dispersal effects; a fog dispersal of 75 percent was obtained.
N63-16193

R0380
Direction de la Meteorologie Nationale, Paris (France).
FREQUENCES DES PLAFONDS BAS DES NUAGES, DES MAUVAISES VISIBILITES ET DES CONDITIONS NON OPERATIONELLES A ORLY ET AU BOURGET POUR PLUSIEURS SEUILS DIFFERENTS; ETUDE SUR LE DEGAGEMENT DE CES AERODOMES (FREQUENCY OF LOW CLOUD CEILING, POOR VISIBILITY, AND NON-OPERATIONAL CONDITIONS AT ORLY AND LE BOURGET FOR SEVERAL DIFFERENT THRESHOLDS; STUDY OF THE RELIEVING OF THESE AIRPORTS).
R. Bubeck, P. Charli, and A. Tasson 85 p.
Rept. 26
N68-86317

R0390
Duntley (S.Q.), LaJolla, CA.
DIRECTIONAL REFLECTANCE OF ATMOSPHERIC PATHS OF SIGHT.
May 1969 19 p.
Rept. -69-1

The contrast reducing properties of any path of sight inclined downward through the atmosphere can be specified by a single dimensionless number analogous to a reflectance and called the directional reflectance of the path of sight R. The contrast transmittance of the path depends solely upon the ratio of the directional path reflectance to the inherent directional reflectance of the background. Previously published optical atmospheric data derived from in-flight measurements have been used to produce tables of R* for two clear-weather conditions. A simple nomograph and numerical examples are included.*
N69-36714 AD-688265

R0400
Elcon Lab., Inc., Salem, MA.
MEASUREMENT OF ATMOSPHERIC EXTINCTION AND LIGHT SCATTERING FUNCTION. PART I. POLAR NEPHELOMETER AND POWER SUPPLY. FINAL REPORT May 1963–May 1966.
Griffith Resor, III July 1966 105 p.
Rept. R-3-66-2

An ultraviolet polar nephelometer which is used to measure the differential scatter function of air is described. The instrument covers the range from pure air to dense haze conditions. The report gives a comprehensive discussion of the design of the instrument, detailed description of the optical and electrical components, installation procedures and maintenance guide. The nephelometer has a useful, dynamic range of 60 dB, adjusted so that adequate signal is obtained for pure air. Detailed specifications are listed. (Author)
AD-637795

R0410
Elcon Lab., Inc., Salem, MA.
MEASUREMENT OF ATMOSPHERIC EXTINCTION AND LIGHT SCATTERING FUNCTION. PART II. APPARATUS FOR MEASUREMENT OF ATMOSPHERIC EXTINCTION. FINAL REPORT MAY 1963-MAY 1966.
Edwin Langberg July 1966 85 p.
Rept. R-5-66-1

The extinction meter is capable of automatically measuring the extinction coefficient of air at one wavelength for conditions ranging from pure air to dense haze conditions. The meter is self-calibrating so that only a minimum of periodical calibrating is necessary.
AD-637796

R0412
Environmental Science Services Administration, Rockville, MD.
AN ANNOTATED BIBLIOGRAPHY ON METHODS OF VISIBILITY MEASUREMENT, 1950-1969.
Annie E. Grimes Sept. 1969 68 p.
ESSA-ATSTM-LIB-2

The bibliography on the methods of visibility measurement has been compiled from sources in the Atmospheric Sciences Library. (Author)
N70-26053# PB188652

R0418
Federal Aviation Administration, Washington, DC.
ANALYSIS OF VFR CLOUD CLEARANCE AND VISIBILITY STANDARD.
George E. Rowland and C.T. Reichwein Sept. 1971 122 p.
FAA-RD-70-48

R0420
Federal Aviation Administration, Washington, DC. Systems Research and Development Service.
TABLES OF RUNWAY VISUAL RANGE VALUES AS A FUNCTION OF TRANSMITTANCE AND VARIOUS VALUES OF PILOT'S ILLUMINANCE THRESHOLD AND LIGHT TARGETS. FINAL REPORT.
Alcott J. Larsson, John K. Marut and Robert L. Northedge Aug. 1970 62 p.
Rept. FAA-RD-70-58

Values of runway visual range (RVR) were developed for various atmospheric transmittances utilizing Allard's Law and Koschmieder's Law. Commonly employed constant's of pilot's contrast threshold and visual illuminance threshold are utilized in the appropriate RVR equations. Computations are based on a 250 foot baseline transmissometer with light target intensities of 10,000, 2,000 and 400 candela, values which are presently used in the United States. Information is presented in tabular form showing transmittances corresponding to runway visual range readings from 600 feet to 7000 feet in 50 foot increments. Each table includes data for each of the three light target intensities. A total of eight tables is provided. The computer program which was utilized to develop each set of data is included with each table. (Author)
AD-713495

R0430
Federal Aviation Agency, Atlantic City, NJ. Systems Research and Development Service.
AN ANALYSIS OF RUNWAY VISUAL RANGE.
Dec. 1966
Rept. RD 66-100

R0440
Federal Aviation Agency, Washington, DC. Bureau of Research and Development.
APPROACH VISIBILITY STUDIES AT NEWARK. FINAL REPORT.
William E. Eggert Sept. 1960 112 p.
AMB Project D-1-902

The Federal Aviation Agency, Bureau of Research and Development and predecessor agencies, the Airways Modernization Board and Air Navigation Development Board have sponsored a series of developmental tasks under project agreements with the Air Force Cambridge Research Center and the U.S. Weather Bureau leading toward the development of equipment and techniques for determining a pilot's slant visual range in the approach zone under instrument landing conditions. Resulting from these studies is a method of determining and expressing in the form of probabilities slant visibility in terms of height on the glide slope at which a pilot on an instrument approach would first establish visual contact with the approach light system. This is called the Approach Light Contact Height (ALCH). This report presents a detailed analysis of 2375 instrument approaches carried out during the 23 months of evaluation conducted at Newark between May 1, 1957 and March 31, 1959. Only conventional type aircraft were used to participate during the project. During this period data from pilot reports of establishing contact during an instrument approach were based upon his sighting of centerline "Configuration A" high intensity approach lights in contrast to earlier studies in which sighting of runway threshold lights of lower effective intensities were used. Based upon this later data, earlier empirical relationships between the measured meteorological quantities and the approach light contact height have been redefined and simplified. New constants have been derived. A complete description of the basis of the method is presented together with an evaluation of the operational applications of the information as pilot advisory data as a basis for legal landing minimums, and as a missed approach probability indicator. Recommendations are included for the work required to extend and fully establish the validity of the statistically determined constants for use at other locations than Newark under differing climatic conditions, varied aircraft types and different glide slope angles. Revised general specifications for a combined ALCH/RVR automatic computer are also given in the Appendix. (Author)

R0450
Federal Aviation Agency, Washington, DC. Systems Research and Development Service.
FOG CHAMBER LIGHTING TESTS, INTERIM MEMORANDUM REPORT.
L.C. Vipond Nov. 1962 17 p.

A fog chamber simulating a 4,000-ft. stretch of runway is developed to aid in the study of airport runway lighting. Using the fog chamber, charts and tables can be prepared and verified for candlepower versus distance seen under almost any controlled fog condition or atmospheric transmissivity. The fog chamber will permit a realistic study of the effects of backscatter of lights, both high and low candlepower units. Photometric distribution requirements can be studied under different low visibility conditions. N63-10620

R0460
Garbell Research Foundation, San Francisco, CA.
RECENT DEVELOPMENTS IN VISUAL LOW-APPROACH AND LANDING AIDS FOR AIRCRAFT.
Maurice A. Garbell 1951 19 p.
Garbell Aeronautical Series No. 1

A section of this report (p. 16-19) deals with the development of automatic instrumentation for measuring and reporting ceiling, visibility and slant visibility for terminal airways, weather reports, especially for planes making visual low-approach landings. The brightness meter/transmissometer, located in the touchdown zone of the runway, gives much needed information. It has been tested experimentally during 1949-1950. A series of six vertical ceiling lights and one beam at a 45° angle is suggested for more accurate instantaneous ceiling height measurements at night. Tests were made at Arcata.

R0470
Garbell Research Foundation, San Francisco, CA.
THE VISUAL RANGE IN DAYLIGHT, DARKNESS, AND TWILIGHT.
Maurice A. Garbell 1952 38 p.
Garbell Aeronautical Series No. 6

This study presents references, formulas and charts necessary for the computation of visual range in daylight, darkness and twilight, for any given combination of optical extinction coefficients and brightness conditions.

R0480
General Dynamics/Convair, San Diego, CA.
MEASUREMENT OF CLOUD REFLECTANCE PROPERTIES AND THE ATMOSPHERIC ATTENUATION OF SOLAR AND INFRARED ENERGY. FINAL REPORT. Sept. 1965-Dec. 1967
M. Griggs and W.A. Marggrat Dec. 1967 165 p.

The results of measurements made with an instrumented DC-3 aircraft are presented and discussed. In the infrared 8 to 14 microns 'window' region, both the integrated and spectral radiances of different surfaces were measured as a function of altitude to 18,000 feet, and compared with a theoretical model. Surface temperature measurements were made in order to determine the mean emissivity of stratus clouds, the ocean, the desert, and snow, in the 'window' region. In the visible region, the albedos of the above surfaces, plus forest and grass surfaces, were determined from measurements of the total down and total up fluxes of solar radiation. The total down flux measurements are compared with a theoretical model. The directional reflectivity and polarization of stratus clouds, the ocean, and snow, were determined as a function of wavelength in the visible region. These optical properties of clouds are related to cloud properties such as thickness, liquid water content, and droplet size distribution. Stratus cloud radiances determined with an aerial camera on a U2 at altitudes up to 65,000 feet are analyzed. (Author)
AD-666936

R0490
General Electric Co., Philadelphia, PA. Space Div.
DESIGN, CONSTRUCTION, AND EVALUATION OF A MOBILE LIDAR SYSTEM FOR THE REMOTE MEASUREMENT OF SMOKE PLUME OPACITY. FINAL REPORT. 24 Dec. 1969-21 Dec. 1971.
C.S. Cook and G.W. Bethke Dec. 1971 100 p.

A mobile (truck mounted) ruby laser lidar system has been designed, constructed and evaluated for the remote measurement of smoke plume opacity (or transmittance). The system has been tested at ranges of 211 and 319 meters using synthetic targets of known laboratory measured transmittance. The targets used were made of bright and black anodized aluminum screen, glass, plexiglass, white painted plywood and black felt. These tests indicated an error which increased as target reflectance increased. In general, the lidar and telephotometer determined transmittance values agreed within the accuracy expected for a given plume transmittance as indicated by the synthetic target test results. Plume-to-sky contrast (plume visibility) was found to have no correlation with plume transmittance because of the variability of ambient illumination of the plume.
PB-210672

R0494
General Electric Co., Valley Forge, PA. Valley Forge Space Technology Center, Missile and Space Div.
DETERMINATION OF ATMOSPHERIC TRANSMISSIVITY FROM LASER BACKSCATTER MEASUREMENTS.
H.W. Halsey and E.L. Gray
Technical Information Document R66SD44

R0500
Harry Diamond Labs., Washington, DC.
A BACKSCATTER NEPHELOMETER.
Donald J. Mary Feb. 1965 27 p.
Rept. TM-65-11

A device to measure the backscatter of optical radiation by fog is described. The integrated scattering coefficient can be measured over the range 178 < PHI < 179.3 deg in the spectral region of 0.64 to 1.07 microns. Equations relating the integrated scattering coefficient and the system parameters are presented. (Author)
AD-614829

R0510
Harry Diamond Labs., Washington, DC.
CONCEALMENT OF TARGETS BY FOG.
Charles Ravitsky
AD-283354

R0520
Human Sciences Research, Inc., Arlington, VA.
LABORATORY STUDIES OF THE ABILITY OF OBSERVERS TO PERFORM THREE VISUAL TASKS REQUIRED OF PILOTS IN APPROACH AND LANDING.
W.S. Vaughn, Jr., Wallace F. Rollins, and Terrence S. Luce Apr. 1963 111 p.
HSR-RR-63/7-MK-X
N64-10444

R0522
Human Sciences, Inc., Arlington, VA.
AIRPORT MARKING AND LIGHTING SYSTEMS: A SUMMARY OF OPERATIONAL TESTS AND HUMAN FACTORS. Final Report.
Lybrand, W.A., W.S. Vaughan, Jr. and J.P. Robinson.
May 1959 230p.
PB-161750-1

Contents:
Chap. 1. Introduction
Chap. 2. Operational test results from Arcata to Dow
Chap. 3. Flight mode analysis of AML functions
Chap. 4. Outline of recommended research and development
Technical note 1. AML as system design and research and development problems
Technical note 2. The nature of the pilot's task
Technical note 3. Information requirements derived from analysis of the pilot's task
Technical note 4. The information required for the visual control of aircraft landings
Technical note 5. Implications of accident and pilot reaction time data for AML design
Technical note 6. Determinants of intensity and positioning of approach and runway lighting

R0524
Human Sciences Research, Inc., Arlington, VA.
AIRPORT MARKING AND LIGHTING SYSTEMS: A SURVEY OF OPERATIONAL TESTS AND HUMAN FACTORS, Final Report Appendix.
Lybrand, W.A., W.S. Vaughan, Jr., and J.P. Robinson.
May 1959 415p.
PB-161750-2

This volume contains summaries and references of published reports on airport marking and lighting and related topics. It can be used as a catalog of information about airport marking and lighting to aid airport design engineers and FAA research personnel in identifying and locating reports.

R0526
Human Sciences Research, Inc., Arlington, VA.
AIRPORT MARKING AND LIGHTING SYSTEMS; A SUMMARY OF OPERATIONAL TESTS AND HUMAN FACTORS, Condensed Report.
Lybrand, W.A., W.S. Vaughan, Jr., and J.P. Robinson.
May 1959 31p.
PB-161750-3

This report is a condensed version of PB 161 750-1X. It is intended for non-technical readers in management or supervisory positions in the aviation industry, and in pertinent government agencies and departments. It describes, within a few minutes reading time, what is known now and what needs to b learned and cevel

R0528
Human Sciences Research, Inc., Arlington, VA.
AIRPORT MARKING AND LIGHTING SYSTEMS: A SURVEY OF OPERATIONAL TESTS AND HUMAN FACTORS, 1959-1961.
Vaughan, Jr., W.S., T.S. Luce, and R.G. Kassebaum.
May 1962
AD-284787

HSR-RR-59/1-Mk, May 1959, summarized operational test results from the 1946 Arcata work on approach lighting to the 1958 tests of narrow guage runway lighting at Dow Air Force Base. This present report is a supplement to the first and contains operational test results and human factors information generated during 1959-1961. Operational tests of airport marking and lighting since 1969 have been concentrated in three areas: beacon systems, approach and runway combined systems, and angle of approach indicators. Test results in these areas are summarized and individual reports are annotated. Human factors work during 1959-1961 is presented in five categories: pattern recognition, luminance and visual acuity, dynamic visual acuity and motion preception, size-distance judgments, and response latency to visual stimuli. (Author)

R0530
Instrument Pilot Instructor School, Randolph AFB, TX.
CREW DUTIES, MODE AND FUNCTION STUDY.
Donald L. Carmack Oct. 1971 28 p.
Rept. IPIS-TN-71-4

Some of the basic problems associated with low visibility approaches can be traced to doubts concerning piloting roles when operating to lower minimums. Somewhat dependent on piloting procedures are the avionics and mode selection configurations which will not only integrate man and automatics, but provide the apparatus for control/monitoring and decision making. It is quite correct that an autopilot is an extremely important systems component. However, an autopilot in itself will not fulfill piloting requirements. What if the autopilot fails or softens in an axis. The crew must be prepared to take over the failed or softened component. This will only be possible if an adequate man/machine interface has been accomplished. (Author)
AD-740502

R0540
Instrument Pilot Instructor School, Randolph AFB, TX.
RUNWAY MARKINGS IMPROVEMENT STUDY. FINAL REPORT.
D.L. Carmack May 1971 21 p.
Rept. IPSIS-TN-71-2

The study was based on requirements established during actual approaches in visibilities below current Air Force minimums down to zero-zero. The runway markings proposed in this study are a result of the established criteria. (Author)
AD-884902

R0550
Intermountain Weather, Inc., Salt Lake City, UT.
COMPUTATION OF VISUAL RANGE IN FOG AND LOW CLOUDS.
Don R. Dickson and J. Vern Hales Dec. 1961 21 p.
Rept. 3

Visual ranges were computed for various values of extinction coefficient, for five sets of conditions appropriate to fog and low clouds. The computations involve basic theories of visual range as developed by Allard (1876) and Koschmieder (1924). The four values of the threshold of illumination (E_t) which Haig and Morton (1958) determined were used in the Allard theory computations. (Author)

R0560
Intermountain Weather, Inc., Salt Lake City, UT.
A STUDY OF THE PHYSICAL, THERMODYNAMICAL, AND DYNAMICAL CAUSES OF LOW CEILINGS AND VISIBILITIES. FINAL REPORT.
J. Vern Hales, Wilford Zdunkowski, and Donald Henderson June 1963 95 p.
AFCRL-63-865

Advective rates of change in meteorological quantities are estimated using a numerical technique for calculating gradients of the advected properties. An approximate method is presented to determine the time and height at which the air is cooled sufficiently to reach the dew point profile—presumably the time and height of the onset of fog formation. The solution is based on Brooks (1950), whose infrared radiation tables have been extended, and Jaeger's analytical solutions of the diffusion equations. The solution requires the Whittaker function, for which properties and routine evaluation are discussed. Three computer programs are given. (Author)
N64-11446 AD-423535

R0570
Intermountain Weather, Inc., Salt Lake City, UT.
VISUAL RANGE AS A FUNCTION OF FOG DROPLET DISTRIBUTION. FINAL REPORT.
Don R. Dickson and Franklin S. Harris, Jr. Aug. 1964 74 p.

A complete review of published information on droplet formation and growth, droplet distribution in fog, and the cloud thermodynamic processes is reported. Radiative cooling was investigated, and a paper titled "Flux Divergence in a Multiple Nonscattering Atmosphere" is included. An analysis of factors in the growth of cloud or fog droplets was made following an equation that indicated that the droplet growth rate is a function of curvature, the latent heat which must be transferred from the surface of the droplet, surface tension, and salinity. It is shown that for certain ranges of radius r, the growth rate dr/dt is much less dependent on the relative humidity than had been thought. The development of a generating function by which fog droplet distributions can be approximated is reported.
N65-11388# AD-605718

R0574
International Impulsphysics Association, Hamburg (West Germany).
THE MEASUREMENT OF RUNWAY VISUAL RANGE.
G.J.W. Oddie

Brief reference is first made to the use of visibility as an indication of visual guidance for take-off and landing operations and to the early "human observer" method of assessing runway visual range (RVR). Fully automatic systems for the measurement and display of RVR are then described and the method of deriving RVR from measurements of atmospheric transparency, taking into account the characteristics of the runway lights and the effect of ambient illumination on the sensitivity of the pilot's eyes, is explained. Finally, subjects for further study are identified.

R0580
Koninklijk Nederlands Meteorologisch Instituut, The Hague.
CLIMATOLOGY OF AMSTERDAM AIRPORT (SCHIPHOL).
Staatsdrukkerij 1966 145 p.
Rept. 87

Aeronautical data concerning the climatology in the vicinity of the Schiphol airport at Amsterdam are presented in a series of tables based on hourly observations made between January 1, 1949, and December 31, 1963. Basic data are provided on horizontal visibility and cloud base height, duration of fog, surface wind, temperature and pressure, relative humidity, and precipitation. Additional data are presented on visibility and wind condition data prior to January 1, 1949.
N68-19772#

R0590
Landing Aids Experiment Station, Arcata, CA.
FLIGHT OPERATION, METEOROLOGY, ELECTRONICS, AIRFIELD LIGHTING, FOG DISPERSAL. FINAL REPORTS.
1949 243 p.

A comprehensive study on the program of testing and evaluating visual landing aids during low visibility. Parts entitled "Meteorology" and "Airfield lighting" contain material on visibility and its determination. For visibility observations, special visibility targets were installed at various distances up to 3000 ft. Instrumental measurements of vision range were carried out by means of transmissometer of the Bureau of Standards. At the request of the U.S. Weather Bureau, the visibility meter constructed by Massachusetts Institute of Technology was tested. In conclusion, the author states that this meter, in its present form, cannot be used as a reliable aid in estimating visibility range. Numerous photographs and diagrams illustrate the installation used for observations of visibility. Monthly frequency of visibility range groups by day and night for 1949 and annual distribution of visibility are given in graphs.

R0600
Landing Aids Experiment Station, Arcata, CA.
METEOROLOGY, FINAL REPORT.
Jan. 31, 1947 71 p.
Rept. 9

A study related to the problem of safety in landing of aircraft during periods of low visibility. Fog as well as other chief factors in limited visibility were under intensive investigation. The first section reviews known information and speculations on the nature of fog, transmission of light through fog. In addition, different methods of dispersing fog artificially are discussed. Method of thermal dispersion of fog and problem of instrumentation for ceiling, visibility, wind and temperature measurements are considered in detail. On p. 53-57, entitled "Visibility," a special description of visibility meters (National Bureau of Standard transmissometers) and visual observations of horizontal and slant visibility are given.

R0605
Landing Aids Experiment Station, Arcata, CA.
METEOROLOGY, FINAL REPORT, 1947 TEST SEASON.
45 p.

An intensive study of fog occurrence at Arcata. The investigators classify fog (advection fog, radiation fog and frontal fogs), determine the factors including fog formation (California current, winds, inversion) and describe meteorological observations and research which were made by flight tests during poor visibility. The descriptions of visibility markers, threshold lights and transmissometers used for visibility measurement are given in detail. The constant for the equation (presented by DOUGLAS and YOUNG) for the relationship of atmospheric transmissivity to visibility was derived from 279 observations.

R0610
Library of Congress, Washington, DC. Aerospace Technology Div.
SURVEYS OF FOREIGN SCIENTIFIC AND TECHNICAL LITERATURE, COMMUNIST-BLOCK METEOROLOGICAL SYSTEMS AND SENSORS.
Lee Boylan June 18, 1969 124 p.
Rept. ATD-69-118

The present compilation of abstracts is devoted to the study of Soviet-block weather systems and sensors. The report is divided into three major parts. Part I deals with the status and future development of some aspects of the Soviet Hydrometeorological Service. Part II reviews the computer processing of weather data. In Part III, the material is limited strictly to instruments and sensor systems. These are arranged in functional groupings and include instruments for measuring the following: pressure, temperature, wind, humidity, precipitation, dew, cloud height, ozone, radiation, visibility, and waves. (Author)
AD-689396

R0614
Library of Congress, Washington, DC. Technical Information Division.
VISIBILITY, A BIBLIOGRAPHY.
Jack Wiener and M.C. Leikind July 1952 90 p.

R0620
Mainz Univ. (West Germany). Inst. fuer Meteorologie.
RESEARCH ON ATMOSPHERIC OPTICAL RADIATION TRANSMISSION. FINAL REPORT. 1 Dec. 1967-30 Nov. 1968.
K. Bullrich, R. Eiden, G. Eschelbach, et al. Jan. 1969 155 p.

Contents: Elliptical polarization of the skylight and the atmospheric aerosol; Measurement of light absorption by aerosol particles with an integrating sphere; The extinction coefficient of a particle population as a function of the relative humidity; Preliminary results of computations of the aerosol scattering functions obtained from populations following power law particle size distributions; The jet impactor, a device for measuring relative values of the number and size of atmospheric aerosol particles; Computation of multiple scattering in the turbid atmosphere; The triple scattering and the influence of the angular dependent reflected radiation in the turbid atmosphere; Evaluation of the aerosol particle size distribution from measurements of the volume scattering function; and Measurements of polarization during twilight at Davos.
AD-690114

R0626
Mainz Univ. (West Germany). Meteorologisch-Geophysikalisches Inst.
ADVANCED INVESTIGATIONS OF THE VISUAL RANGE UNDER OVERCAST SKY: VISUAL RANGE AND ALBEDO ESPECIALLY IN POLAR REGIONS. FINAL REPORT.
Fritz Kasten and Fritz Moller 1960 154 p.

The theory of horizontal visual range of a not self-luminous object of diameter D and own visual albedo A' depends on albedo A' of ground and on the visual extinction coefficient o of the air. The instruments and methods of measurement of quantities occurring in the theory are described. The instruments are photometers and albedometers. With one exception these instruments were recently constructed.

R0630
Mainz Univ., (West Germany). Meteorologisch-Geophysikalisches Inst.
RESEARCH ON ATMOSPHERIC OPTICAL RADIATION TRANSMISSION.
Reiner Eiden, Guenter Eschelbach, Gottfried Haenel, et al. Jan. 1971 91 p.
Scientific Rept. 1

The report discusses the following items: A direct method for the integration of the equation of radiative transfer in a turbid atmosphere; Determination of the complex index of refraction of spherical aerosol particles optimal information is obtained of the light scattered by analysing the degree of polarization, the ellipticity and the angle of orientation of the ellipse of the field vector; New results on visual range as function of relative humidity have indicated that there exists a simple relation between the change in visual range and change of particle radius; and, Calculations of the spectral extinction coefficient of atmospheric aerosol particles with different complex refractive indices. (Author)
AD-690114

R0632
Mainz Univ. (West Germany). Meteorologisch-Geophysikalisches Inst.
THEORETICAL INVESTIGATION OF THE VISIBILITY UNDER SPECIAL ATMOSPHERIC CONDITIONS (THE HORIZONTAL VISUAL RANGE OF NOT SELF-LUMINOUS OBJECTS UNDER OVERCAST SKY). FINAL REPORT.
Fritz Kasten and Fritz Moller 1959 51 p.

After a brief review on the definitions of brightness contrast, contrast threshold of the human eye, and visual range, the dependence of contrast threshold on the visual angle presented by a graph of H.R. Blackwell, is expressed analytically. Suitable substitution delivers a connection between visual range, extinction coefficient of the air, and luminance of both the object and the horizon. The luminance distribution of overcast sky is investigated by means of values of former authors and of our own measurements at Mainz, Germany. The results lead to the statement that the luminance distribution of overcast sky depends on the visual albedo of the underlying surface. Because of this important influence of albedo on the luminance distribution of sky, the exact definitions of total and visual albedo are given, and calculated and measured values of them are presented. The formula of S. Fritz on the relationship between luminance distribution of overcast sky and visual albedo of ground is compared with the measurements. A "visual range function" is derived connecting the visual range with the extinction coefficient of air, the albedo of ground, and the object albedo. It is found that the visual range of a black object only depends on the extinction coefficient of air, independent of ground albedo, and that the visual range of a white object on white ground is zero, independent on the extinction coefficient of air. Next, the visual range function is described by means of several graphs showing the visual range plotted over the object albedo with ground albedo as parameter for different extinction coefficients, and vice versa. Its behavior for small visual ranges is considered. The theory is applied on visibility in polar regions. A brief description of the "polar white-out" is given, and the optical phenomena of whiteout are explained on the basis of our visual range theory. Finally some remarks are made with regard to future improvement and extension of the theory. Particularly it is referred to the comparison of the theory with measurements conducted on this special purpose by one of us (F.K.). The measurements were carried out in summer 1959 on the North Greenland Ice Cap. They were supported by The European Research Office, U.S. Department of the Army; the U.S. Army Snow Ice and Permafrost Research Establishment; the U.S. Army Polar Research & Development Center, and the U.S. Army Engineering Research & Development Detachment. (Author)

R0640
Massachusetts Inst. of Tech., Cambridge, MA. Flight Transportation Lab.
WEATHER CONDITIONS AFFECTING VTOL AIRBUS OPERATIONS IN THE NORTHEAST CORRIDOR.
Robert W. Simpson Dec. 1966 44 p.
TR-FT-66-4

A detailed study of hourly weather observations in the Northeast Corridor during the periods 0600-2400 for a ten year period 1944-1958 was made to study the implications of weather affecting the operations of a VSTOL Airbus transportation system. As a result, specifications for an automatic approach to a hover ending at 75 feet above ground, and within 350 feet visibility were determined to achieve weather reliable operations of over 99.5% throughout the year. Examination of high temperatures indicated that a criterion of operation at 95°F at 1000 feet elevation should be used to ensure 99.5% reliability through the summer months over the corridor. The frequency of high winds indicated that a step gust of 30 mph could be used for specifying the aircraft's displacement from a hover position while under an inertially stabilized automatic control system. The study indicates that Category II all weather operations occur about 0.9% of the time, and Category III about 1.3% of the time in the Northeast Corridor. (Author)
N68-11922# PB-174915

R0645
Massachusetts Inst. of Technology, Lexington, MA. Lincoln Labs.
SCATTERING AND ATTENUATION BY PRECIPITATION PARTICLES.
Carol A. Boudreau and Melvin L. Stone Aug. 1965 72 p.
Ref. Bibliography 26

This bibliography is offered to encourage the further application of radar meteorological techniques and data in connection with the study of the effects of hydrometeors, precipitation, clouds and fog on microwave propagation. It combines material developed in regard to weather radar research with the more conventional works on attenuation. In addition to the weather radar material, the bibliography includes references on thermal radiation from precipitation, cloud physics, and dielectric and scattering properties of hydrometeors. Some of the references are pertinent to the study of propagation at optical wavelengths and are useful in evaluating the performance of laser communications systems. The 494 references included are from the literature published between January 1950 and October 1964.
AD-628200

R0650
McGill Univ., Montreal (Quebec). Stormy Weather Group.
ATTENUATION OF A PARALLEL BEAM OF LIGHT, PARTICULARLY BY SNOW.
Olav Lillesalter Apr. 1965 16 p.
Sc. Rept. MW-43

R0660
Miami Univ., Coral Gables, FL. Inst. of Marine Science.
STUDY OF LIGHT ATTENUATION UNDER SUBTROPICAL CLIMATIC CONDITIONS
H.W. Hiser, R.W. Robert, and C.L. Courtwright Dec. 1966 326 p.

Light propagation data from the 4 seasons of the year taken in the Florida Everglades at night during 1964 and 1965 are presented and analyzed. These show the attenuation of blue, green, red, and IR light under tropical and subtropical conditions. Graphs are presented for: total transmittance versus range, direct transmittance versus range, and the ratio of indirect to direct light intensity versus the optical path length. A portion of the report describes the field site, equipment used, and method of data collection. Several auxiliary graphs give results of concurrent polar nephelometer measurements of the light scattered from particles in a small volume of air as a function of the angle of incidence and reflection. (Author)

R0670
Miami Univ., Coral Gables, FL. Radar Meteorological Lab.
STUDY OF LIGHT ATTENUATION UNDER SUBTROPICAL CLIMATIC CONDITIONS, 1 July 1963–30 Nov. 1965.
H.W. Hiser, P.E. Normal, and J.D. Hirth Dec. 1965 97 p.
Rept. 1

This report contains an analyzed sample of attenuation measurements of blue, green, red and infrared light made in the Florida Everglades in the summer quarter of 1964. Data for the other three seasons will be included in the final report. Graphs are presented for: total transmittance versus range, direct transmittance versus range, and the ratio of indirect light intensity versus the direct extinction coefficient times range. A portion of the report describes the field site, equipment used, and methods of data collection. Several auxiliary graphs give results of Polar Nephelometer measurements of the light scattered from particles in a small volume of air as a function of the angle of incidence and reflection. (Author)
N66-19417# AD-626198

R0680
Michigan Univ., Ann Arbor. Inst. of Science and Technology.
TRANSMISSOMETER AND ATMOSPHERIC-TRANSMISSION STUDIES. FINAL REPORT.
D.F. Fisher, E.C. Hall, G.H. Lindquist et al. Mar. 1963 77 p.

A transmissometer capable of measuring the spectral transmission of the atmosphere in the 0.5-15-micron region is described. The major components, which include two interferometer spectrometers, a visual photometer, and two 60-inch searchlights are described in detail. The operation of the system is discussed first component by component, and then as a complete unit. A data-reduction system is described, and also a technique for using the transmissometer data to correct missile-radiation measurements, Engineering drawings, D measurements, and design calculations are in separate appendixes. (Author)*

R0682
Michigan Univ., Ann Arbor. Willow Run Labs.
SCINTILLATION AND VISUAL RESOLUTION OVER THE GROUND.
F.R. Bellaire and F.C. Elder 1960.

R0690
Motorola Inc., Riverside, CA. Systems Research Lab.
THE DETERMINATION OF ATMOSPHERIC TRANSMISSIVITY BY BACKSCATTER FROM A PULSED LIGHT SEPARATED SYSTEM.
Melvin H. Horman Oct. 1958 80 p.
Rept. RL-3838-2

As an aircraft approaches a runway, the pilot must recognize the runway lights while sufficient altitude remains to permit course correction. The prediction as to when the lights will be seen must be made from the ground, preferably by measuring the transmission loss along the actual approach path. The feasibility of determining visual range along the slant path by observing the light scattered by the atmosphere from a pulsed beam of light utilizing noncoaxial transmitter and receiver optics was investigated experimentally and theoretically using two 60-inch diameter glass searchlight mirrors.

The experimental equipment was employed with mirror separations of 65 feet and 230 feet. Returns were obtained at night from a maximum distance of approximately 25,000 feet on one extremely clear night with the larger separation. The maximum range from which returns can be obtained is a function of the transmissivity of the air, always being only a fraction of the visual range, with fraction increasing as the visual range decreases.

Data from useful ranges were not obtainable in the daytime because of poor mirror quality. Ambient light flux, with its accompanying noise, was obtained from the entire mirror, while the signal was derived from only a small part of the mirror. Measurements and computations were made to determine the effective mirror area.

The theory indicates that returns from a single range are sufficient to determine the transmission loss to that range. These data can be used to extrapolate the visual range, using a much longer baseline than the 500 feet used in most transmissometer systems. The system has the further advantage of obtaining its data from along the actual flight path. Computations based on single returns were in approximate agreement with estimates of visual range made from the site of the measurements, although such estimates are known to be quite unreliable.

The equipment may be used to sample data at several ranges along the path and hence to give a profile of the changes along the path indicating where haze or smog exists. The theory shows how smog and haze differ in their returns, and how they may be distinguished from one another by collecting and evaluating the data carefully.

The data obtained appear to confirm the theory, although the mass scattering distribution is a relatively unknown factor which may reduce the effectiveness of the equipment. The influence of this parameter must be determined by comparing the results of measurements with this equipment with actual reports of pilots at a landing field. (Author)

R0692
Motorola Corp., Riverside, CA. Systems Research Lab.
THE DETERMINATION OF ATMOSPHERIC TRANSMISSIVITY BY BACKSCATTER FROM A PULSED-LIGHT SYSTEM.
Norman B. Stevens, Melving H. Horman, and Edward E. Dodd July 1957 131 p.
Rept. 1

When an aircraft approaches a runway the pilot must recognize the runway lights while sufficient altitude remains to permit course correction. The prediction as to when the lights will be seen must be made from the ground, preferably by measuring the transmission loss in the approach path. The feasibility of determining visual range along the slant path by observing the light scattered by the atmosphere from a pulsed beam of transmitted light scattered was investigated experimentally and theoretically. Three configurations were considered, in which the receiver and transmitter were coaxial, separated laterally, and separated in range. The experimental equipment produced useful signals at night from ranges of 1000 to 2000 feet. Although this range is not adequate, extrapolations of the data indicate the advisability of assembling a larger system as a means of securing larger ranges. (Author)

R0700
Motorola, Inc., Riverside, CA. Systems Research Lab.
MEASUREMENT OF ATMOSPHERIC TRANSMISSION USING BACKSCATTER FROM A PULSED LIGHT SEPARATED SYSTEM. FINAL REPORT. PART 1.
Melvin H. Horman June 1959 104 p.
Rept. RLF-3828-3

A pulsed light transmissometer has been tested by comparing its measurements with those of a telephotometer and with visual range taken from an aircraft. The results indicate that the pulsed light transmissometer is a useful instrument for determining the transmission loss up a slant path, such as the glide path at an airport. This measurement can be made without affecting landing aircraft.

A logarithmic amplifier, discussed in a separate report, was developed to simplify and decrease the time of the data reducing technique.

The theory of the separated pulsed light transmissometer has been further developed and a nomogram drawn to facilitate data reduction.

The processes of data reduction have been simplified to the point at which automatic computation is feasible.

System limitations, secondary scatter, and ambient light level are discussed.

A method for simpler data reduction is discussed. (Author)

R0710
National Aviation Facilities Experimental Center, Atlantic City, NJ.
EVALUATION OF UNITED STATES AIR FORCE PORTABLE AIRFIELD LIGHTING SYSTEM, FINAL REPORT.
Robert F. Gates Aug. 1969 43 p.
NA-6933

An evaluation of a prototype portable airfield lighting system was conducted. Comparative tests were conducted using precision approach radar (PAR) in weather conditions of approximately 1/2-mile visibility. Motion picture film was taken of the segment ahead of the aircraft and the PAR scope was photographed three times a second to obtain data on approach light system effectiveness. The very limited weather data obtained in the six-week test period indicated that both systems would provide minimum acceptable visual guidance in 3/4-mile visibility conditions with the alternate approach light system preferred in 1/2-mile visibility conditions primarily due to the additional length of 900 feet. The runway edge lighting used in the portable approach light system provided adequate straight-in guidance, but circling guidance was inadequate for both day and night conditions. Several recommendations were made concerning the design of the brightness control. interlocking of systems through the console, and the method of supporting the approach and runway edge lighting fixtures. (Author)
N69-34825#

R0720
National Aviation Facilities Experimental Center, Atlantic City, NJ.
TEST AND EVALUATION OF A DAYTIME COCKPIT FOG SIMULATOR. FINAL REPORT Apr. 1969–May 1971.
Morris Ritter Nov. 1971 35 p.
FAA-NA-71-44; FAA-RD-71-82

An evaluation was conducted to determine the suitability of a daytime cockpit fog simulator to accurately and realistically simulate Category II and Category III weather conditions to the pilot during flight approaches. Thirteen pilots, using a DC-7 aircraft, participated in the program. The fog simulator was evaluated during atmospheric meteorological visibilities ranging from 1.5 to 12 miles. Technical data, as well as completed pilot questionnaires, comprised the data analyzed. Although the simulator shows merit insofar as projecting realism, a redesign of the unit is necessary to correct deficiencies in various optical electronic, and mechanical areas. (Author)
N72-10233#

R0721
National Bureau of Standards, Washington, DC.
DESIGN AND CALIBRATION OF A REMOTE-INDICATING PHOTOELECTRIC BRIGHTNESS METER.
C.A. Douglas and I. Nimeroff Nov. 29, 1955 9 p.
Rept. 4421

R0722
National Bureau of Standards, Washington, DC.
DEVELOPMENT OF A TRANSMISSOMETER FOR DETERMINING VISUAL RANGE.
C.A. Douglas and L.L. Young Feb. 1945
Technical Development Rept. 47

R0723
National Bureau of Standards, Washington, DC.
DEVELOPMENT, TESTING, AND EVALUATION OF VISUAL LANDING AIDS, JULY 1 TO SEPT. 30, 1963.
1963
Rept. 8146

R0724
National Bureau of Standards, Washington, DC.
DEVELOPMENT, TESTING, AND EVALUATION OF VISUAL LANDING AIDS.
May 1969
Rept. 10046

R0725
National Bureau of Standards, Washington, DC.
INSTRUCTION BOOK FOR TRANSMISSOMETER SET AN/GMQ-10.
June 23, 1953
Rept. 2588

This report describes the installation, operation, maintenance, and repair of Transmissometer Set AN/GMQ-10.

R0726
National Bureau of Standards, Washington, DC.
METHODS OF MODIFYING THE TRANSMISSOMETER SYSTEM TO PERMIT ITS USE DURING PERIODS OF VERY LOW RUNWAY VISUAL RANGE.
C.A. Douglas
Rept. 8188

R0727
National Bureau of Standards, Washington, DC.
OPERATIONAL TESTS OF DUAL BASELINE TRANSMISSOMETER SYSTEMS.
J.C. Wilderson, J.W. Simeroth, and James E. Davis Sept. 15, 1970 14 p.
NBS-10339

A Skopograph Duplex dual-baseline transmissometer system was installed and operated for four months to determine operational performance of the system. A system of standard transmissometers with similar baselines was placed beside the test system to provide data for comparison. The output data from both systems were recorded photographically by a special photo-pack. The Skopograph equipment operated through the test period with no failures. The most important maintenance requirement was the need for cleaning the windows of the field units approximately twice each week. Several features of the performance and records that could require special treatment in processing the data and evaluating the performance are discussed. (Author)
N71-22455#

R0728
National Bureau of Standards, Washington, DC.
SOME FACTORS AFFECTING THE RELATION BETWEEN REPORTED VISIBILITY AND VISIBILITY FROM AIRCRAFT.
C.A. Douglas 1953
Rept. 2715

This report presents an analysis of some of the factors which affect the accuracy of the prediction of visual guidance received by a pilot landing an aircraft. Consideration is given to factors such as variability of atmospheric transmittance with time and location, cockpit cutoff, search time, effects of terrestrial backgrounds and the intensity distribution of the lights used when predicting the guidance which the pilot will obtain. Examples of cumulative effects of these factors are given.

R0730
National Weather Service, Washington, DC.
DISCUSSION OF SENSOR EQUIVALENT VISIBILITY.
July 1971 35 p.
Tech. Memo NOAA-TM-NWS T&EL 11

R0740
Naval Air Test Center, Patuxent River, MD.
MEASUREMENT OF CARRIER AIRCRAFT COCKPIT VISIBILITY DURING CARRIER APPROACHES AND LANDINGS (F4G/B AND RF-4B) AIRPLANES.
K.H. Dickerson Feb. 1966 13 p.
Rept. ST-2R-66

The limitations to downward vision from the cockpit of an F-4G airplane in a carrier approach attitude were measured to assist in maintaining compatibility between visual landing aid systems and current carrier-based airplanes. The vertical angles from the horizontal plane at which downward vision is restricted around 180 deg. of forward ARC are presented. Also included is information pertaining to prominent visual obstructions, visibility through the windshields during rain, and the effectiveness of the windshield defrosting system. (Author)
AD-478343

R0750
Naval Ammunition Depot, Crane, IN.
SLANT VISUAL RANGE/APPROACH LIGHT CONTACT HEIGHT MEASUREMENT SYSTEM. MATHEMATICAL SIMULATION TO AID IN SELECTING SVR/ALCH MEASUREMENT EQUIPMENT.
G. Lohkamp, G. Bradley, R. Chipman, et al. Apr. 26, 1972 161 p.

Mathematical simulation was used to compare candidate systems for Slant Visual Range/Approach Light Contact Height measuring equipment. Inputs to the simulation include response of the human visual system, typical atmospheric data, atmospheric scattering data, and characteristics of each candidate system. The candidate systems modeled were the transmissometerceilometer, Videograph B, two backscatter lidar systems, and a forward scatter laser system. Other systems were studied but eliminated for various reasons before simulation. (Author)
AD-742964

R0755
Naval Ammunition Depot, Crane, ID
SLANT VISUAL RANGE/APPROACH LIGHT CONTACT HEIGHT MEASUREMENT SYSTEM. MEASUREMENT OF FOG STRATIFICATION AND SYSTEM EVALUATION. FINAL REPORT. PHASE II.
G. Bradley, R. Chipman, C. Lohkamp, et al. Sept. 1973.

R0760
Naval Ammunition Depot, Crane, IN.
VISIBILITY MODEL.
Gerald Bradley Nov. 1969 63 p.
Rept. NAD-CR-RDTR-151

A discussion of the factors which influence the ability of an aerial observer to see and identify a ground target is provided. On this foundation there has been constructed a mathematical model which predicts the probability of detection of a ground target under varying conditions of atmospheric clarity, flare location and intensity and the pertinent characteristics of target background. (Author)
AD-698286

R0770
Naval Electronics Lab., San Diego, CA. Center for Command Control and Communications.
SIMULTANEOUS FM-CW RADAR AND LIDAR PROBING OF THE ATMOSPHERE.
V.R. Noonkester, D.R. Jensen, and J.H. Richter Nov. 1, 1972 147 p.
Rept. NELC-TR-1849

Two new remote sensors, the NELC-developed FM-CW radar and Stanford Research Institute's laser radar, were operated simultaneously from 30 Nov 1971 to 14 January 1972 to establish their capabilities and limitations. Nine days of data were obtained by recording techniques which produced records having the same time and height scales. (Author)
AD-753813

R0780
Naval Medical Research Inst., Bethesda, MD.
THE VISIBILITY OF AIRPORT RUNWAYS.
N.L. Barr, et al. Nov. 1954

R0790
Naval Postgraduate School, Monterey, CA.
ANALYSIS AND PREDICTION OF VISIBILITY AT SEA.
William George Schramm May 1966 54 p.

This paper is concerned with the problem of visibility at sea and fog over the sea. Restrictions to visibility in general are discussed and suspended moisture is related to low visibilities at sea. Fleet numerical weather facility at Monterey produces a field of the difference between the vapor pressures of the sea and air. This field is used as a humidity index to determine the moisture in the air and is related to visibility. A total of 1100 data points from the North Atlantic were analyzed and an attempt was made to produce a linear regression equation. The regression equation proved to be most inaccurate in the area of low visibilities. A scattergram of visibility as a function of air temperature and the vapor pressure difference revealed a significant relationship. Using this relationship it is possible to forecast visibility and fog probability.

R0793
Naval Postgraduate School, Monterey, CA. Environmental Prediction Resources Facility.
VISIBILITY CALCULATIONS FOR MICROPHYSICAL COMPUTER MODELS.
June 1973 23 p.
Technical Note 5-72

R0797
Naval Research Lab., Washington, DC.
ATMOSPHERIC TRANSMISSION IN THE INFRARED.
J.H. Taylor and H.W. Yates July 2, 1956 16 p.
Rept. 4759

Infrared atmospheric transmission from 0.5μ to 15μ is shown as measured over three horizontal paths of 1000 feet, 3.4 statute miles and 10.1 statute miles. The intense source — a 60-inch carbon-arc searchlight — permits a resolution throughout of about 10 wave numbers. Work is continuing in an effort to obtain data taken under a wide range of atmospheric and meteorological conditions. The data presented here represent an average relatively-clear winter day, a moderately dense fog, and a snowstorm. (Author)

R0800
Naval Research Lab., Washington, DC.
DAYTIME MEASUREMENT OF ATMOSPHERIC TRANSMISSION OF LIGHT.
C.A. Pearson July 10, 1952 12 p.
Rept. 3993

The atmospheric transmission of light was determined in the daytime over a 17-mile inclined path in an arid region where the average elevation of the light path was about 5200 feet, by measuring at two locations the apparent brightness of two adjacent areas on a mountainside; one a light, sandy area and the other a dark area. Two photoelectric brightness meters were used. One was a 6-foot focal length refracting telescope with an RCA 5819 multiplier phototube set up as a brightness meter at a distance of about 21.5 miles from the mountain, and the other was a recording transmissometer modified to record the brightness of one of the areas on the mountainside at a distance of about 4.5 miles. The photoelectric brightness meters were calibrated in the field by comparing them with visual brightness measurements made with a Luckiesh-Taylor brightness meter. Transmission was also determined on cloudless days by visual measurements of the brightness of the horizon sky and the apparent brightness of a dark bluff at a distance of about 21.5 miles. The results obtained by the two methods are in good agreement and correspond to the high visual ranges observed in the area. (Author)

R0805
Naval Research Lab, Washington, DC
EVALUATION OF THE USE OF ATMOSPHERIC–ELECTRICITY RECORDINGS IN FOG FORECASTING.
R.V. Anderson and Eva Mae Trent. Oct. 7, 1966 17 p.
Rept. 6426

Atmospheric electric and meteorological data from 4 stations have been analyzed to determine the accuracy of fog forecasts made using atmospheric electrical recordings. A tabulation indicating the successes and failures in forecasting both fog and no-fog conditions shows success percentages ranging from 86-92%. These success percentages illustrate the assertion that the use of electrical recording will effect a material improvement in the accuracy of forecasting. A theoretical discussion leads to the development of a possible physical mechanism for the phenomenon which is consistent with available information. Consideration of human and instrumental factors leads to a decision that a total-conductivity meter using a vibrating-capacitor electrometer and with suppressed-zero checks is the instrument most usable in regular forecasting use. (Author)

R0810
Naval Research Lab., Washington, DC.
FURTHER STUDIES ON THE CORRELATION OF BACKSCATTERING WITH ATMOSPHERIC TRANSMISSION.
J.A. Curcio, G.L. Knestrick and T.H. Cosden June 11, 1958 19 p.
Rept. 5143

Atmospheric transmission was measured and recorded by a Douglas transmissometer through heavy fog. Transmission in clear air was determined by measuring the apparent source temperature with a disappearing-filament optical pyrometer filtered to an effective wavelength of 6650 A. This study shows a good correlation between meteorological range and backscattered light in air free of industrial contaminants.

R0820
Naval Research Lab., Washington, DC.
INFRARED TRANSMISSION OF THE ATMOSPHERE.
H.W. Yates and J.H. Taylor June 8, 1960 46 p.
Rept. 5453

Atmospheric transmission has been studied in the infrared over three sea-level horizontal paths at the Chesapeake Bay Annex of the U.S. Naval Research Laboratory near North Beach, Maryland. A fourth path lay between the mountains of Mauna Loa and Mauna Kea on the Island of Hawaii. Two transmissometers were used at North Beach, Maryland and a calibrated lamp with a visual telephotometer was used in Hawaii.

R0830
Naval Research Lab., Washington, DC.
THE MEASUREMENT OF SLANT VISIBILITY.
H.S. Stewart, L.F. Drummeter, and C.A. Pearson
Rept. N-3484 12 p.

A description of a new method of slant visibility measurement. Atmospheric transmission was determined by means of a 36-inch searchlight as source and two modified Luckiesh-Taylor photometers. Authors present equations showing mathematical relationships of this problem and results of the method for testing on the night of April 14, 1949 at the Chesapeake Bay Annex.

R0840
Naval Research Lab., Washington, DC.
A RECORDING ATMOSPHERIC TRANSMISSOMETER.
C.A. Pearson March 7, 1952 13 p.
Rept. 3949

A photoelectric telephotometer, which measures the illumination produced at a known distance from a calibrated light source, was developed to record directly the total atmospheric transmission at night over a two-mile path in the visible region of the spectrum. The photoelectric telephotometer is battery operated, and all parts are placed in one box 60 x 9 x 9 inches which can be transported and set up easily for field use. A Variac, an ammeter, a 1000-watt voltage regulator, and 115-volt ac power are used with a 1000-watt projection-type lamp as the light source. The recording transmissometer was calibrated (a) with a 2360 k standardized lamp, and (b) by comparing it with a visual telephotometer. Eleven transmission measurements from 20% to 80% total transmission over a two-mile path gave an average deviation of ±5% from one-to-one correspondence between the photoelectric and the visual methods. Accurate measurements outside these limits of transmission would require a shorter path for lower transmission and a longer path for higher transmission of the atmosphere. (Author)

R0850
Naval Research Lab., Washington, DC.
RECORDING HORIZONTAL ATMOSPHERIC TRANSMISSION OF LIGHT BY DAY AND NIGHT.
T.H. Cosden July 8, 1955 11 p.
Rept. 4570

A transmissometer which uses a modulated source and a tuned photoelectric detector has been constructed and tested. The device will operate over long (10 mi) or short paths and has proven reliable, stable, and accurate for long periods. One transmissometer has been operated continuously for 1400 hr with no difficulty. The transmission readings are good to ±2 percent over a 700-hr period.

The device is a relative monitoring system and must be calibrated to give absolute visual transmission. Calibration is carried out by means of visual photometry. (Author)

R0860
Naval Research Lab., Washington, DC.
VISUAL MEASUREMENTS OF ATMOSPHERIC TRANSMISSION OF LIGHT AT NIGHT.
C.A. Pearson, M.J. Koomen, and R. Tousey Feb. 23, 1951 13 p.
Rept. 3810

The transparency of the atmosphere at night in the visible range of the spectrum, was measured on 120 nights over a 9 mile course across Chesapeake Bay by using a series of calibrated light sources 1/2 to 1 mile apart. Effects of elevation also investigated. Night observations agreed fairly well with those before sunset and after dawn. Equipment described and illustrated, precision of measurements 2% for normal values. No apparent correlation between transmission values and relative humidity, pressure, temperature, wind speed or direction.

R0865
New York Univ. Coll. of Engineering.
POLARIZATION TECHNIQUES FOR SEEING THROUGH FOGS WITH ACTIVE OPTICAL SYSTEMS. FINAL REPORT.
Alan M. Nathan June 1957 77 p.
TR 362 01

R0870
Ohio State Univ., Columbus. ElectroScience Lab.
EXTINCTION AND BACKSCATTER OF VISIBLE AND INFRARED LASER RADIATION BY ATMOSPHERIC AERO-SOLS.
David B. Rensch Apr. 1969 140 p.
Rept. 2476-3

Theoretical calculations of the atmospheric extinction and backscatter coefficients for continental maritime fog and precipitation aerosol models are given. Experimental measurements of aerosol extinction and backscatter coefficients at 0.6328 microns are shown, along with simultaneous measurements of the aerosol extinction coefficient at 10.59 microns. The aerosol particle attenuation contribution at 10.59 microns was made identifiable and separable from the total measured attenuation because an accurate empirical relation had been found for water vapor and carbon dioxide absorption. From the investigation it was apparent that aerosol attenuation cannot be neglected in atmospheric applications of visible and infrared lasers. The dominant loss in the visible region is aerosol scattering while in the infrared regions it may or may not be the predominant loss because molecular absorption can cause considerable attenuation at certain infrared wavelengths. Losses caused by turbulence, multiple scattering and nonlinearities have not been considered. (Author)
AD-850891

R0880
Pennsylvania State Univ., University Park. Dept. of Meteorology.
FOG PREDICTION USING CONDENSATION NUCLEI AND POTENTIAL GRADIENT.
Hans Neuberger and Carl D. Thormeyer July 31, 1966

This paper briefly describes the installation of a transmissometer loaned by the U.S. Weather Bureau to facilitate visibility measurements.

R0890
Princeton Univ., NJ.
ON THE VISUAL DETECTION OF ACCELERATED MOTION (PH.D. THESIS).
Ross D.L. Filion Sept. 1963 84 p.
AFOSR-64-0189

The absolute threshold for acceleration in the motion of a seen object was investigated. Subjects were presented with constant velocity or positively accelerated motions of the CRT (cathode ray tube) beam on an oscilloscope screen; their task was to judge whether the pip achieved a final velocity greater than or equal to its initial velocity. The main conclusions drawn were: (1) Subjects' judgments concerning the presence or absence of acceleration in a stimulus motion are based on information deriving from within the motion itself and not on external aspects. (2) Subjects apparently detect acceleration by some procedure of estimating and comparing earlier and later average velocities in the motion display. (3) Effects analogous to the velocity transposition phenomenon occur in the detection of acceleration when viewing field dimensions are changed and when spatial or temporal size of the motion path is changed. (4) The human organism's performance in dealing with the second-time derivatives of visual stimulus magnitudes is not as good as performance in dealing with first-time derivatives of the same stimulus magnitudes.
N64-21381 AD-433109

R0900

Radiation Research Associates, Inc., Fort Worth, TX.

CONTRAST TRANSMISSION DATA FOR CLEAR AND HAZY MODEL TROPICAL ATMOSPHERES.

Michael B. Wells, Dave G. Collins and Francis A. Hopper Dec. 1968 38 p.

Rept. RRA-T92-VOL-1, Scientific 6-Vol-1.

Monte Carlo data on the scattering of light in both clear and haze model tropical atmospheres with ground level meteorological ranges of 25 km and 3 km, respectively, were used to compute atmospheric contrast transmission data. The calculated contrast transmission data show the image attenuation effects of the atmosphere between ground level and an airborne observer. Data were computed for both plane parallel and plane isotropic monochromatic light sources incident to the top of each of the model atmospheres. These data can be used to compute contrast reduction by the atmosphere for atmosphere illuminated by sunlight, moonlight, and night light. The atmospheric contrast transmission function for each model atmosphere was computed for seven values of the source zenith angle, seven values of the incident wavelength, six receiver altitudes, four values of the background albedo, and 48 different combinations of the receiver nadir angle and azimuthal angle. Data are presented that show the variation of the atmospheric contrast transmission function with the source zenith angle, source wavelength, receiver altitude, receiver direction, and background albedo. (Author)

AD-848288

R0910

Radiation Research Associates, Inc., Fort Worth, TX.

MONTE CARLO STUDIES OF LIGHT TRANSPORT THROUGH NATURAL ATMOSPHERES. FINAL REPORT 1 Feb, 1970–31 Dec. 1972.

Wolfram Blattner and Michael B. Wells. Jan. 31, 1973 105 p.

Rept. RRA-T7304

The report describes work performed on six major work areas: Modification to the FLASH procedure and its application to solar almucantar, horizon brightness, and twilight scattering studies; Development of the BRITE procedure for treating light scattering in a plane parallel atmosphere with the backward Monte Carlo method. Application of the FLARE procedure to evaluate the effect of multiple scattering on the angular intensity reaching a receiver from a point isotropic source; Modifications of the LITE-IV procedure for use in path radiance and path reflectance calculations; Applications of the TPART-I procedure to studies of radiation transport in foggy atmospheres for use in determining the effects of scattering on visibility measurements made with optical transmission instruments; and, Modifications to the MIE2 procedure and development of the MIE3, MIE4, and MIE5 procedures for calculating scattering cross sections and phase function data for homogeneous spherical particles and for particles having a spherical shell of different materials, and the application of these programs to calculations of scattering data for visible and infrared light.

AD-757494

R0920

Radiation Research Associates, Inc., Fort Worth, TX.

SCATTERING AND REFLECTANCE OF LIGHT FROM AIRBORNE LASER SYSTEMS.

Dave G. Collins and Michael B. Wells, June 15, 1968 77 p.

Rept. SCIENTIFIC-4, RRA-T88

The LITE-I Monte Carlo program was used to predict the ground reflected and atmospheric scattered components of the scattered light from airborne laser systems received at collimated receivers located at the same altitude as the laser system and focused on the ground area illuminated by the direct radiation from the laser system. Lasers emitting light with wavelengths of 0.5145, 1.06, 3.507 and 10.6 microns were considered at different altitudes in two model atmospheres. The first atmosphere was a clear atmosphere having a ground level meteorological range of 25 km. The second atmosphere was identical to the first above 1.5 km but below 1.5 km the aerosol content was increased to reduce the ground level meteorological range to 5 km. The ground reflected component of the scattered light entering the receiver for all four wavelengths was taken to be the sum of the direct radiation incident on the ground and reflected to the receiver plus the single scattered radiation incident upon the ground area illuminated by the direct radiation and then reflected to the receiver. For the 3.507 and 10.6 micron lasers the atmospheric scattered component at the receiver in both atmospheres is composed almost entirely of single scattered light, but for the 0.5145 and 1.06 micron lasers the single scattered irradiance seriously underpredicts the atmospheric scattered component for lookangles greater than just a few degrees. (Author)

AD-681145

R0930
Rand Corp., Santa Monica, CA.
CLOUD FREE LINE-OF-SIGHT CALCULATIONS.
R.R. Rapp and C. Schutz. Sept. 1972 28 p.
P4883

Synoptic cloud cover observations for computing probability of clear lines of sight through atmosphere to ground.
N73-13620#

R0935
Robert A. Taft Sanitary Engineering Center, Cincinnati, OH.
SOME EFFECTS OF AIR POLLUTION ON VISIBILITY IN AND NEAR CITIES.
George C. Holworth. 1962 p. 69-88
Tech. Rept. A62-5

R0940
Royal Aircraft Establishment (England).
A SIMULATOR INVESTIGATION OF THE PROBLEMS OF VISUAL TAXI-GUIDANCE IN LOW VISIBILITIES.
A.D. Brown. Aug. 1967
RAE TR 67170

R0950
Royal Aircraft Establishment (England).
VISIBILITY DATA.
D.A. Batemen and D.E. Killick. Aug. 1970
RAE TM RAD 938

R0960
Royal Armament Research and Development Establishment, Fort Halstead (England).
THE R.A.R.D.E. PORTABLE VISIBILITY RECORDER.
B. Bestley, G.H. Crockett, and E. Parry. May 1969 18 p.
Rept. RARDE-MEMO-17/69

This memorandum describes portable equipment developed to record variations in visibility when conducting field trials of night vision aids. The variation in the atmospheric transmission is measured by recording the apparent brightness of an incandescent filament lamp viewed over ranges which may be varied to suit the particular trial. The equipment has been used successfully out to a maximum range of 1000 metres. (Author)
AD-691588

R0970
Ryan Electronic and Space Systems, San Diego, CA.
TECHNIQUES OF CLOUD AND FOG BACKSCATTERING INTERFERENCE REDUCTION AND TARGET DISCRIMINATION IN IR FUZING APPLICATIONS. INTERIM REPORT.
D. Zak. May 1969 35 p.
Rept. 29063-75

Ever since optical fuzing became recognized as a practical reality (generally in the last five years) the question of false firing on clouds, fog, rain, snow, smoke, haze and general aerosols has been an active question of considerable concern to both user and developer for all systems, except those limited to clear weather operation. A number of approaches to a solution have been suggested, but no proven system has evolved at the present time. These techniques have involved such things as geometrically crossing the transmitter and receiver beams and short pulse transmitters combined with narrow receiving gates to limit the volume of backscattering being observed, polarization discrimination between specular (water droplets) and diffuse (target) return. Alternatively the 'soft' nature of a spatially dispersed return could be recognized by suitable modulation and detection techniques to generate an inhibit signal to prevent firing on such a return. This report is an attempt to analyze the theoretical aspects and define a path toward a useful solution to this problem.

R0973
Scripps Institution of Oceanography, La Jolla, CA.
THE REDUCTION OF CONTRAST BY ATMOSPHERIC BOIL.
Seibert Q. Duntley, William H. Culver, Frances Richey, et al. July 1, 1958 31 p.
SIO-REF-58-35
N68-80520 AD-268121

R0975
Scripps Institution of Oceanography, La Jolla, CA.
VISUAL CONTRAST THRESHOLDS FOR LARGE TARGETS, PT. 1. THE CASE OF LOW ADAPTING LUMINANCES.
J.H. Taylor 1960
Rept. SIO 60-25

R0977
Scripps Institution of Oceanography, La Jolla, CA.
VISUAL CONTRAST THRESHOLDS FOR LARGE TARGETS, PT. 2. THE CASE OF HIGH ADAPTING LUMINANCES.
J.H. Taylor 1960
Rept. SIO 60-31

R0980
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
AIRBORNE MEASUREMENTS OF OPTICAL ATMOSPHERIC PROPERTIES, SUMMARY AND REVIEW. FINAL REPORT 1 November 1969-31 August 1972.
Seibert Q. Duntley, Richard W. Johnson and Jacqueline I. Gordon. Nov. 1972 82 p.
Rept. SIO-Ref-72-82

The report summarizes a 3-year period of collecting optical atmospheric data in the daytime chiefly with airborne instruments. Nine field expeditions were made between November 1969 and August 1972 in various places in the United States and Europe, primarily during the spring and fall. Measurements were made in five spectral regions, as follows: three narrow band optical filters with mean wavelengths of 478, 664, and 765 nanometers, and two broad band sensitivities, one representing the S-20 multiplier phototube incorporating an ultraviolet rejection filter with a mean wavelength of 532 nanometers, the other representing the photopic response with a mean wavelength of 557 nanometers. Optical measurements included total scattering coefficient and sky and terrain radiance. These data were used to calculate natural irradiance on a horizontal plane surface, directional reflectance of terrain, atmospheric beam transmittance, path radiance, and directional path reflectance. The methods of data collection and data processing are reviewed, the resultant data bank described, and initial comparisons made between several of the field expeditions. (Author)
AD-754-898

R0990
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
COMPUTERIZED VISIBILITY CALCULATIONS MAXIMUM SIGHTING RANGE PROGRAM.
I.H. Barkdoll, III July 1967 125 p.
NASA-CR-129731; SIO-REF-67-23

R1000
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
MEASUREMENT OF THE ABSORPTION COEFFICIENT OF HYDROSOLS.
John E. Tyler and Wayne H. Wilson Nov. 1968 18 p.
Rept. SIO-REF-68-32

A theoretical method is described for the measurement of the optical volume absorption coefficient of natural bodies of water using the divergence of the vector irradiance field. Laboratory equipment has been constructed for the evaluation of the feasibility of using the method. The laboratory equipment is described and preliminary data is shown. (Author)
AD-677932

R1010
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
PROVISIONAL INSTRUCTIONS OPERATION OF SUBMARINE VISIBILITY EQUIPMENT.
Roswell W. Austin July 1966 64 p.
Rept. SIO-REF-66-21

Equipment has been devised which may be used by submarines when submerged for determining their visual detectability from surface vessels or low-flying aircraft. The theory behind the measurements, and the calculational procedure for determining this visibility are described, as is the method for operating and maintaining the equipment. A system of photoelectric sensors, indicators, recorders, and analog computers is described which provides the submariner with real time optical information. (Author)
AD-510315

R1020
Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.
A STUDY OF THE FACTORS AFFECTING THE SIGHTING OF SURFACE VESSELS FROM AIRCRAFT.
William Richardson June 1962 120 p.
Rept. SIO-R-62-13

A collection of 3,465 detailed reports of sightings of surface vessels from aircraft of the U.S. Coast Guard are analyzed by profit analysis to determine visual thresholds and measures of variance of the thresholds. Each of 17 conditions affecting the sighting range is studied separately to determine its effect. In each case, tables of profit results and graphs are included. A table of factors for each condition is included to allow forecasting of sighting thresholds and explanation of use for any probability level. A random selection of sightings is made in order to supply conditions for use of these factor tables as a demonstration of forecasting and as a test of the reliability of the data and of the forecasting method. (Author).
AD-281809

R1030
Serendipity Associates, Chatsworth, CA.
THE LANDING TASK AND PILOT ACCEPTANCE OF DISPLAYS FOR LANDING IN REDUCED WEATHER MINIMUMS.
R.A. Behan and F.A. Siciliani Dec. 1964 120 p.

An analytical and empirical study is presented of the information requirements and the nature of a display for landing in reduced weather minima. The VFR landing task is analyzed to determine information requirements and to determine the manner in which information is used. It was found useful to construe the information available to the pilot as analogous to a compensatory display. An acceptance study was made to determine pilot preferences for information display. The results indicate that pilots prefer a windscreen display which presents a pictorial representation of the landing situation and the relationship between the aircraft and the glide slope and localizer. A display concept is presented which conforms to these information requirements and is based on the pilot preferences determined. (Author)
N69-21829#

R1040
Signal Corps Engineering Labs., Fort Monmouth, N.J.
TRANSMISSOMETER COMPONENTS: TEST REPORT.
Eugene E. Sartor Sept. 24, 1954 15 p.
Rept. T-1345

An automatically transmitting (by Morse code) transmissometer designed for use with automatic meteorological station AN/GMT-2 ( ) as a modification of Bureau of Standards prototype is described in great detail. All parts, including projector, receiver and transmitter illustrated test made to determine performance with 6 pulses per sec over a baseline of 1000 ft. and is sensitive to variations in dust, smoke, rain or fog content of atmosphere. It can operate for about a year except under severe icing conditions.

R1050
Simco Co., Burlington, MA.
RESEARCH STUDIES AND INVESTIGATION OF METEOROLOGICAL PHENOMENA.
Calvin Y. Sing, et al. Jan. 1968
AFCRL 68-0082

R1060

Sperry Gyroscope Co., Great Neck, NY.

A FLIGHT INVESTIGATION OF THE PERFORMANCE OF LOW CEILING/VISIBILITY METEOROLOGICAL EQUIPMENT.

Dec. 1954 114 p.

Rept. 5245-4059

The objective of this program is to evaluate the ceilometer-transmissometer system of measuring low ceiling/visibility weather in relation to the operational requirements of the instrument approach. (Author)

R1070

Sperry Gyroscope Co., Great Neck, NY.

AN OPERATIONAL FLIGHT EVALUATION OF AN APPROACH ZONE SLANT VISIBILITY MEASURING SYSTEM, SUMMARY REPORT.

May 1957

Rept. 3245-4080

The performance of the approach zone slant visibility measuring system development during the Sperry-ANDB program at MacArthur Field has been evaluated operationally in an accelerated service test at Newark Airport. The system for determining slant visibility involves meteorological measurements by ceilometer and transmissometer, photometric measurements by terrain illuminometer and horizon photometer, and relationships combining these measurements with visual data for the human pilot based on flight observations. (Author)

R1080

Sperry Rand Research Center, Sudbury, MA.

BACKSCATTER SIGNATURE STUDIES FOR HORIZONTAL AND SLANT RANGE VISIBILITY. FINAL REPORT.

Richard T. Brown, Jr. May 1967 213 p.

Analytical and experimental results of a study of a backscatter signature system for measurements indicative of horizontal and slant visual range are presented. The physics of the concept, including the relationships between characteristics of a time display of backscattered laser energy and the extinction coefficient of the visibility restricting scattering medium, also is discussed. Data obtained simultaneously from the backscatter signature system and conventional transmissometers were used to investigate the effectiveness of the measuring technique and the changes in the operating characteristics obtained by varying the system configuration. The backscatter signature measurements, converted to atmospheric transmittance, compare well with those of the transmissometer, considering certain incompatibilities between the measuring systems. The optimum system configuration and design parameters are discussed with respect to the design of a backscatter signature system. (Author)
AD-659469

R1090

Stanford Research Inst., Menlo Park, CA.

ANALYTIC AND EXPERIMENTAL INVESTIGATIONS OF LIDAR FOR METEOROLOGICAL APPLICATION.

F.G. Fernald, J. Oblanas, M.G.H. Ligda et al. Sept. 1967 83 p.

Project SRI-5044

An experimental and theoretical study was made of ways in which lidar observations could aid in such operational meteorological problems at the Pacific Missile Range as the measurement of slant visibility and the prediction of the formation of stratus cloud, techniques are presented for measuring the height of the atmospheric inversion and predicting the levels at which the stratus clouds will form. On two different occasions, experiments were conducted that did provide advanced warning of the onset of stratus even before they were visible to the unaided eye. Experiments were conducted to verify techniques developed for measuring slant visibility by application of lidar backscatter data. In addition, limited experiments indicated that the crosspolarized component on signals backscattered from ice crystals is measurably stronger, compared to that in the plane transmitted, than is the case with spherical scatterers such as water droplets. Basic lidar return signals from the atmosphere of amplitude versus range were transformed analytically to an expression called the spatial backscatter function (SBF) which contains only the backscattering properties of the scattering volume centered at range R and the extinction properties of the atmosphere integrated.
AD-829082

R1100
Stanford Research Inst., Menlo Park, CA.
COMPUTER MODEL FOR INVESTIGATING THE STRATEGY OF AUTOMATICALLY ESTIMATING PREVAILING VISIBILITY. FINAL REPORT.
R.R. Mancuso and E.E. Uthe Sept. 1972 97 p.
Rept. SRI 1336-FR

Means of automatically measuring prevailing visibility are investigated by computer simulation. The effects of instrument type, numbers, locations, and sampling intervals on the accuracy of the measurements are estimated. However, due to uncertainties associated with the parameters used in the visibility model, the usefulness in studying sampling strategy is limited. A field study to evaluate the technique developed under this study and the parameters used in the visibility model is recommended. It is concluded that lidar may be the most appropriate instrument for automatically measuring prevailing visibilities. (Author)
COM-72-11491

R1110
Stanford Research Inst., Menlo Park, CA.
SLANT RANGE VISIBILITY MEASUREMENT FOR AIRCRAFT LANDING OPERATIONS. FINAL REPORT 1 Apr. 1971-30 Apr. 1972.
William Viezee, John Oblanas, and Ronald T.H. Collis Feb. 1972 94 p.

A method of determining 'slant visibility' by lidar observations from the ground during various degrees of fog and low cloud conditions was investigated in an experimental program at a coastal site. The emphasis of the study was on the operational aspects of landing aircraft in Categories I and II conditions, and the first concern was to ascertain whether a pilot might be expected to obtain visual reference from the critical heights of 200 ft and 100 ft respectively. This depends primarily upon the transmittance along the slant path from the cockpit to the ground. The air of the lidar observations was to determine the conditions of atmospheric transmittance aloft, with special reference to whether the appropriate minimum values are exceeded. (Author)
AD-742359

R1120
Stanford Research Inst., Menlo Park, CA.
VISIBILITY MEASUREMENT FOR AIRCRAFT LANDING OPERATIONS. FINAL REPORT. 26 September 1969-30 September 1970.
Ronald T.H. Collis, William Viezee, Edward E. Uthe, et al. 30 Sept. 1970 149 p.
AFCRL-70-0598

An experimental pulsed neodymium lidar system was modified and calibrated to obtain accurate data on atmospheric extinction properties in fog and low cloud conditions. The objective was to establish the theoretical and practical basis of a system for measuring slant visibility conditions for aircraft landing operations. To operate in conditions of fog and low cloud the lidar systems dynamic range was extended to 50 DB by using a two-stage receiver system. In addition, the transmitter and receiver beams were made coaxial to make close-range observations. (Author)
N71-28217# AD-716483

R1130
Systems Technology, Inc., Hawthorne, CA.
INVESTIGATION OF MEASURING SYSTEM REQUIREMENTS FOR INSTRUMENT LOW VISIBILITY APPROACH. FINAL REPORT. July 1969—June 1970.
Dunstan Graham, Warren E. Clement, and Lee Gregor Hofmann Feb. 1971 220 p.
AFFDL-TR-70-102

A practical method of determining measuring system requirements for instrument low visibility approach is presented. The method is made to depend on system analysis of the airplane, its control system, and the guidance system, as well as on atmospheric turbulence inputs and radio guidance system fluctuation noise. Requirements on the system are set in terms of a low value of the accident exposure multiplier which is related to the probability of a missed approach in the assumed environment. The application of the method is demonstrated in connection with two examples, manual-flight director approach in the A-7D attack airplane, and automatically coupled approach with an advanced windproof flight control system in the DC-8 transport aircraft. The results, including particularly the implied requirements on scan rate for a scanning beam instrument low visibility approach system demonstrate the interconnections between scanning rate, flight control, and overall system performance. (Author)
N71-30173# AD-722773

R1140
Technical Operations, Inc., Arlington, MA.
EXPERIMENTAL MEASUREMENTS OF DIFFUSE TRANSMITTANCE IN REAL ATMOSPHERES. FINAL REPORT.
Ralph G. Eldridge and John C. Johnson Dec. 1, 1956 60 p.
Rept. TOI 56-30

A report covering quite thoroughly (by means of curves of intensity vs range) the effects of haze, mist, fog, rain, snow, clouds, etc. of various intensities, types or thicknesses on visibility of transmittance of pulsed light, from an isotropic source using 12 ECA photoswitch Division Visibility Photometers. Theory, data from a large number of tests presented statistically and in graphical form, and photographs showing equipment and operation in launching tethered balloons carrying light source are included. Some light sources were in free balloons or were dropped from airplanes with parachutes. Studies were also made of diffuse transmittance above a snow cover (with albedo 0.7-0.8) over Sebago Lake, Maine (11 flights). Meteorological observations were taken for each test.

R1150
Technical Operations, Inc., Burlington, MA.
LASER FOG DISDROMETER SYSTEM. FINAL REPORT 16 Sept. 1963–30 Apr. 1967.
John Ward June 1967 68 p.
Rept. TO-B-67-32

Instrumentation to record and size naturally occurring fog droplets in the 5 microns to 100 microns diameter size range has been constructed and used in the field. The system is based on a two-step imaging technique using Fraunhofer holograms. A q-switched ruby laser illuminates the sample volume and forms the holograms on aerial film. The short time pulse of the laser stops the motion of the droplets and provides 'instantaneous' sampling periodically over the history of a fog. The Fraunhofer hologram technique allows both sufficient resolution as well as considerably depth of field to record the data. A readout instrument was also fabricated; this instrument counts and sizes the fog data by reconstructing, from the hologram frames recorded in the field, real images of the sample volume. (Author)
AD-656487

R1160
Technical Operations, Inc., Burlington, MA.
PERFORMANCE TESTING OF THE GROUND BASED AND SNOWFLAKE DISDROMETER SYSTEM.
John Boardman March 1971 71 p.
Rept. TO-B-714

R1170
Technische Hochschule, Munich (West Germany). Fakultaet fuer Machinenwesen und Elektrotechnick.
EIN NEUES VERFAREN ZUR BESTIMMUNG DER SICHTWEITE IN DER ATMOSPHERE (A NEW INVESTIGATION FOR DETERMINING THE VISUAL RANGE IN THE ATMOSPHERE).
M. Lang 1971 19 p.

Backscattering of a light impulse propagating through the atmosphere is used to determine the optical extinction coefficient and thus the visibility factor. This method provides information for a visual field of 50 to 1500 m on the position of inhomogeneities, visual range before, in, and after the inhomogeneity, and the medium visual range at certain intervals through the shape of the extinction coefficient curve.
N71-36738

R1180
Transportations Systems Center, Cambridge, MA.
CHARACTERISTICS OF A SIGNAL DATA CONVERTER FOR A MULTI-RUNWAY VISIBILITY MEASURING SYSTEM.
Hector C. Ingrao and J.R. Lifsitz Oct. 1971 35 p.
Rept. DOT-TSC-FAA-72-1

The report summarizes the results of a task to define characteristics for a signal data converter for computing visibility values from inputs from several transmissometers with reference to several kinds of target lights (e.g. centerline lights, approach lights, edge lights, taxiing lights).
AD-744873

R1185
Transportation Systems Center, Cambridge, MA
THE MEASUREMENT OF ATMOSPHERIC VISIBILITY WITH LIDAR: TSC FIELD TEST RESULTS.
J.R. Lifsitz. 1973
DOT-TSC-FAA-73-27

This report represents a technical feasibility study of the use of lidar for determining the atmospheric extinction coefficient (τ) in low visibility. The work, sponsored by the FAA, is part of a program aimed at providing an airport system for measuring and reporting slant visual range. Measurements were made using three different laser sources: 1) a ruby laser (λ=6943A, P_g=10 Mw insingle Q-switched pulses); 2) a gallium aluminum arsenide diode laser array (λ=8250Å, P-250W (peak), prf=100-550pps); and 3) a 3mw cw helium neon laser, intensity modulated at radio frequencies (1-10MHz). Details of the apparatus are given. The importance of treating the finite laser pulse width explicity is shown and a computational method for so doing is presented and used in the data reduction. The relative merits of instantaneous versus time-averaged signatures is discussed with regard to the useful representation of atmospheric conditions.

Results of lidar measurements made both in natural coastal fog and in fog produced in the Richmond (CA) Fog Chamber are analyzed. Extinction coefficients ($.01<\sigma<07m^{-1}$) are obtained, for the pulsed systems, from the backscatter signature using both the 'slope' and 'ratio' methods of analysis. In most cases the pulsed lidar values agree well with independent assessments of extinction. For the modulated lidar, the predicted visibility-dependence of the relative phase (phase of reflected radiation relative to outgoing phase) was not observed, apparently due to insufficient overall system sensitivity. (Author)

R1190
Transportations Systems Center, Cambridge, MA
PROPOSED CONTROL TOWER AND COCKPIT VISIBILITY READOUTS BASED ON AN AIRPORT-AIRCRAFT INFORMATION FLOW SYSTEM.
HectorC. Ingrao and J.R. Lifsitz July 1971 48 p.
Rept. TSC-FAA-71-18

The problem of displaying visibility information to both controller and pilot is discussed in the context of visibility information flow in the airport-aircraft system. The optimum amount of visibility information, as well as its rate of flow and display, depends both on the needs of the pilot during landing and on the air traffic control philosophy (tactical or strategic) chosen. A rationale is provided to assist in the selection of flow rates and readouts. The relationship of visibility information to the magnitude of terminal information handled by the pilot is discussed. Several display formats are proposed, including one for the traffic controller and three different options for the pilot. (Author)
AD-744718

R1200
Transportation Systems Center, Cambridge, MA.
VISIBILITY CONCEPTS AND MEASUREMENT TECHNIQUES FOR AVIATION PURPOSES.
G.T. Schappert July 1971 110 p.
DOT-TSC-FAA-71-25

The report reviews present techniques for measuring atmospheric transmittance and its conversion to runway visual range. The response of the pilot to visual cues used in determining the visibility is discussed as a function of his cockpit environment. The lights used by the FAA as targets for visibility determinations are discussed and used in the computations. New techniques for visibility measurements and new concepts and definitions are discussed and analyzed. The emphasis is on techniques for measuring slant visual range by means of optical remote sensing devices. Various problems relating to atmospheric modeling, signal processing, and eye safety aspects are discussed. (Author)
N72-20998 AD-744688

R1205
Travelers Research Center, Inc., Hartford, CT.
CORRELATION OF RADAR SIGNAL INTENSITY WITH CEILING AND VISIBILITY.
J.A. Russo, Jr. 1960
Technical Memorandum 2

R1210
Travelers Research Center, Inc., Hartford, CT.
FURTHER STUDIES OF SPACE AND TIME VARIATIONS IN ATMOSPHERIC TRANSMISSION ALONG AIRPORT RUNWAYS.
Keith D. Hage and Herbert D. Entrekin Mar. 1965 37 p.
Rept. TR-3, 7468-143

Space and time variations of transmission of visible light in the atmosphere during fog and precipitation are examined in detail as a preliminary step in the development of suitable short-period prediction techniques to be used at aviation terminals. This study is based primarily on data from three transmissometers along runways at John F. Kennedy International Airport, New York. The relative space scales of various classes of obstructions-to-vision are estimated and compared with similar estimates based on data from the National Aviation Facilities Experimental Center at Atlantic City, N.J. The apparent movement of the transmission field is derived and is related, insofar as possible, to advective and warm frontal movements. The potential predictability of linear translation of the transmission field is evaluated for periods of 5 to 25 minutes. Conditional frequencies of runway visual range for selected space and time lags are presented and compared with those found for Atlantic City Airport. (Author)
AD-617774

R1220
Travelers Research Center, Inc., Hartford, CT.
RESEARCH ON THE PREDICTION OF RARE EVENTS TO IMPROVE FORECASTS OF LOW CEILING AND VISIBILITY. FINAL REPORT.
Joseph G. Bryan, John A. Russo and Guy T. Merriman Sept. 1967 145p.

Research on the improvement of the probability forecasts of rare weather events, specifically low ceiling and low visibility, has been conducted under USWB sponsorship as a continuation of previous work in this area of vital importance to safe air travel. The prediction of rare weather events poses a difficult problem because the physical mechanisms are so little understood and perhaps not well defined by existing data. Central ideas of the present approach are: 1) the identification of physical conditions that tend to exclude the possibility of the rare event and 2) for the remaining sample with such inhibiting conditions absent, the construction of mathematical functions, called synthetic predictors, designed to represent the combined effects of many variables and reflect joint terms as well as additive ones. Results so far obtained are noteworthy in signaling changes from high to low ceiling; the correct forecasting of deterioration is difficult to achieve.

R1230
Travelers Research Center, Inc., Hartford, CT.
SPACE AND TIME VARIATIONS IN ATMOSPHERIC TRANSMISSION AT A RUNWAY. INTERIM REPORT.
Keith D. Hage, Herbert D. Entrekin and Albert E. Boyer June 1963 52 p.
Technical Pub. 28

The spacetime variations in atmospheric transmission during fog, rain, snow, and blowing snow are examined in detail as a preliminary step in the development of suitable short-range prediction techniques of operational parameters for use at aviation terminals. The study is based primarily on selected samples of continuous data from four transmissometers alongside one runway at the Federal Aviation Agency, National Aviation Facilities Experimental Center at Atlantic City, N.J. Because of the limitations of station spacing and the 1-dimensional nature of the net work, the results of the study are far from comprehensive. However, the data serve as a test for analysis techniques and as a starting point for the more complete investigations that will be made possible by the Mesonetwork installation in the Atlantic City Region. Within the limits noted, information is presented on characteristic space scales, local effects on the transmission field, and the movement and linear predictability of the transmission field. Some of the characteristic variability properties are interpreted in terms of concurrent hourly observations of wind, cloud cover, time of day, and precipitation. (Author)
AD-413339

R1235
Tufts Univ., Medford, MA. Inst. for Applied Experimental Psychology.
VISION IN MILITARY AVIATION.
Wulfeck, J.W., Alexander Weisz, and Margaret W. Raben
Nov. 1958 394p.
AD-207780 PB-151658

The requirements of vision in military aviation are analyzed in the light of the human observer. Practical problems of perception encountered in many phases of flying are analyzed and discussed. A comprehensive bibliography is included in each section of the report for those who are interested in a more detailed approach to a particular subject.

R1240
United Aircraft Corporate Systems Center, Farmington, CT. Weather System Center.
ANALYSIS OF AIRPORT AND IN-FLIGHT AIRCRAFT WEATHER INSTRUMENTATION TECHNIQUES.
June 30, 1963
WSC TM 5

Part C presents a description of the proposed instruments, a backscattering photometer for measuring atmospheric transmissivity along an actual aircraft glide path for the purpose of determining an approaching pilot's slant visual range. The experimental program is described and preliminary results are recorded.

R1250
United Aircraft Corporate Systems Center, Farmington, CT. Weather System Center.
CATEGORY I AND II TEST REPORT FOR RUNWAY VISUAL RANGE COMPUTING SETS, AN/FMN-1.
February 26, 1963
WSC E-28

The results of Category I and II tests performed on the Aeronca and Olympic Runway Visual Range Computing Sets, AN/FMN-1, are provided in the text of the report. A discussion of the advantages and disadvantages of each model concept is included, as well as the results of each test specified in the Test Plan. Included also are the human factors engineering review, the reliability and maintain-ability study of the test operations and test results. Recommendations are made for improvement in the AN/FMN-1 method of operation. (Author)

R1260
United Aircraft Corporate Systems Center, Farmington, CT. Weather System Center.
PRELIMINARY STUDY, NATIONAL METEOROLOGICAL SERVICE SYSTEM. VOLUME II. SURVEY OF OTHER METEOROLOGICAL SYSTEM PROGRAMS.
June 1963 49 p.
WSC SCR 152-2

The equipment of the weather observing subsystem for System 433L includes a Visual Range Computing Set AN/FMN-1. The purpose or goal, the functional description, planned procurement, location and estimated cost of this unit are presented on page 6.

R-1270
United Aircraft Corporate Systems Center, Farmington, CT. Weather System Center.
SECOND ANNUAL PROGRESS REPORT FOR THE PERIOD 1 April 1962 THROUGH 31 MARCH 1963.
April 22, 1963 55 p.
WSC E-18-8

The engineering, test and evaluation, reliability, and technical data of the AN/FMN-1 Visual Range Computing Set are briefly discussed.

R1280
United Engineers, Boston, MA.
STUDY OF VISUAL AIDS FOR ARCTIC AIRSTRIPS.
A.J. Greenberg and H.B. Watson, Jr. Apr. 1962
Rept. TR61 509

A world-wide study was made into the state-of-the-art of visual aids for arctic airstrips. Emphasis was placed on finding better visual aids for use during the meteorological phenomenon referred to as "white-out". Based on the subjective questioning of operational pilot personnel and the objective testing, various recommendations for the improvement of existing visual aids are advanced. Many additional and promising areas for study and testing were suggested. (Author)
AD-284616

R1290
Weapons Research Establishment, Salisbury (Australia).
MEASUREMENT OF VISUAL RANGE.
B.W. Koerber and P. Crosby Sept. 15, 1960 17 p.
Technical Note OID

This report describes work being carried out at Salisbury and Woomera into the scattering or attenuating properties of the atmosphere which reduce the contrast of distant objects observed through the atmosphere. These attenuating properties are described in terms of the visual range through the atmosphere. Description is given of four photoelectric nephelometers designed and constructed at Salisbury for the measurement of visual range. These instruments separately calibrated, show agreement in the measurements of visual range to within 10%. Preliminary measurements of visual range have been obtained at ground level and up to heights of 10,000 ft. at Salisbury and Woomera.

R1291
Weapons Research Establishment, Salisbury (Australia).
THE WRE VISIBILITY METER.
P. Crosby, B.W. Koerber, and D.T. Lloyd Mar. 1969 26 p.
Rept. WRE-TM-PAD-265

A portable field instrument was developed for the measurement of meteorological range, or visibility. The instrument is a compact, rugged, low cost version of earlier integrating nephelometers. Measurements of meteorological range are obtained in a small local sample of the atmosphere. Accuracy is at least 10 percent in dry weather, over the range of visibilities between 25 and 50 miles. The instrument was developed originally to provide data required for the assessment of optical tracking performance in missile flight tests. Various other applications are discussed, together with the results of tests of the instrument in ground installations, and in a Cessna 210 aircraft. (Author)
N69-32474

R1292
Weather Bureau, Asheville, NC.
CLIMATIC STUDIES FOR PROPOSED LANDING SYSTEM FOR INTERNATIONAL AIRPORT (DORVAL) MONTREAL, QUEBEC. FINAL REPORT.
June 1964 82 p.

R1293
Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.
ANALYSIS OF DESIGN CHARACTERISTICS OF METEOROLOGICAL TOWER FACILITY. FINAL REPORT.
Frederick C. Hochreiter Jan. 1968 100 p.

An analysis of design characteristics for an aviation oriented meteorological tower facility is discussed. The feasibility of converting an existing 160 ft. Air Height Surveillance Radar Tower is investigated. The study also incorporates an analysis of the instrumentation required to adequately describe the desired parameters, as well as sensor characteristics, spacing, orientation, and configuration, and the cost of such instrumentation. The feasibility of using the laser and aerosol measuring devices in the tower facility is discussed. Conclusions support the establishment of the Meteorological Tower test bed with a capability for measuring all parameters of interest to aviation terminal operations. The mass of the Tower gives it the stability necessary to affix components of transmissometer systems that will aid in slant visibility studies. (Author)
AD-684864

R1293A
Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.
AN ANALYSIS OF MODIFICATIONS TO RUNWAY VISUAL RANGE EQUIPMENT FOR LOW RVR RANGE VALUES. FINAL REPORT.
Matthew Lefkowitz and Ernest E. Schatter Dec. 1966 122 p.
FAA-RD-66-9

Several transmissometer configurations using 250-foot baselines have been compared to develop a system with capability of measuring very low values of runway visual range. Tests were conducted at Atlantic City, N.J., and Arcata, California. The existing 'standard' 500-foot baseline system was used as the comparison reference. The end-to-end dual system was considered most representative of the present standard. A single transmissometer system was judged to be less representative, primarily due to sampling differences. (Author)
AD-654557

R1293B

Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.

AN ANALYSIS OF RUNWAY VISUAL RANGE. FINAL REPORT.

Matthew Lefkowitz and Ernest E. Schatter Dec. 1966 122 p.

Rept. RD-66-100

The results of a controlled observational program have been used to validate the credibility of the current runway visual range system, and to provide a basis whereby future visual range system and lighting methods can be compared.

A mobile laboratory was positioned on an airfield runway during low visibility conditions. Observers were stationed on top of the vehicle to make RVR observations. The high intensity runway edge lights, and other visual range targets, were observed under various weather conditions, target light intensities, and illumination conditions. Simultaneous measurements were made of atmospheric transmittance.

It was found that the current runway visual range system concept is generally credible although certain areas were noted to be considered for modification.

Runway visual range for day is conservative in that most static observers could see farther than the current system predicts. The static observer's visual range of runway lights by day does not conform to Allard's law when the visual illuminance threshold value is fixed.

Night runway visual range, as predicted by the current system, approximates the average visual range of the static observations and generally conforms to Allard's Law.

The fact was established that runway visual range represents a probability of sighting light targets, and as such should be recognized by the user as not being an exact absolute value.

A benchmark system is proposed whereby other visual range systems and lighting techniques can be compared.

A complete review is presented of the evolution of runway visual range from conception to the current system. (Author)

AD-658537

R1293C

Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.

AN ANALYSIS OF RUNWAY VISUAL RANGE. INTERIM REPORT.

Ernest E. Schlatter Mar. 1966 28 p.

Rept. RD-66-24

The results of a controlled observational program have been compared to Runway Visual Range values. A mobile laboratory was positioned on the touchdown point of an instrument runway during low visibility conditions. Observers were stationed on top of the vehicle to make RVR observations. The high intensity runway edge lights were counted under various light intensity settings and illumination conditions. Simultaneous measurements of atmospheric transmittance provided RVR values.

Interim results are based on observations made at NAFEC airports only. They indicate that day RVR values are conservative and night RVR values are representative of static observations made of the high intensity runway edge light. (Author)

R1293D

Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.

DEVELOPMENT OF TRANSMISSOMETER CALIBRATION TECHNIQUES AND DEVICES. PHASE I. INTERIM REPORT.

Frederick C. Hochreiter Feb. 1968 61 p.

Two side-by-side 250-ft. baseline transmissometers are used to isolate calibration techniques that may be useful under all visibility conditions. Current calibration procedures are limited to application in visibilities of 5 miles or more. A review of these procedures is presented. Testing anticipates extending some calibration techniques to visibilities less than 5 miles. Preventive maintenance procedures are discussed which may be utilized to minimize transmissometer outages. Inspection of Weather Bureau Electronic and Maintenance Summaries shows that timely replacement of the projector lamps will reduce lamp failures to near zero. Interim results of testing show that the practice of aging CE-75 phototubes should not be overlooked. The Appendix presents detailed transmissometer alignment and calibration procedures reflecting current techniques. (Author)

AD-673263

R1293E

Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.

EVALUATION OF MULTI-TRANSMISSOMETER SYSTEMS. FINAL REPORT.

Ernest E. Schlatter and Matthew Lefkowitz Aug. 1968 208 p.

Rept. RD-68-49

A test program was conducted to evaluate multi-transmissometer systems. These consisted primarily of instruments at touchdown, midpoint, and roll-out locations on a runway at five airfields distributed across the U.S. continent in differing climatic regimes. The airfields were located at Atlantic City, N.J., New York, N.Y., Chicago, Ill., Denver, Colo., and Los Angeles, Calif. The data acquisition program is described as is the analyses of data.

Primary objective of the program was to determine if a need exists for three transmissometer systems per runway under a variety of weather categories. The conclusions were affirmative due primarily to the fact that differences in runway visual range as large as 2000 feet or greater do occur during low visual range conditions. These large variations might go undetected without a midpoint RVR measurement. (Author)

AD-681877

R1293F

Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.

EVALUATION OF SEVERAL MULTI-TRANSMISSOMETER SYSTEMS. INTERIM REPORT.

Ernest E. Schlatter Dec. 1967 98 p.

Rept. RD-67-72

A test program has been developed and implemented to evaluate multi-transmissometer systems. These consist primarily of instruments at touchdown, midpoint, and roll-out locations at five airfields distributed across the continent in differing climatic regimes. The airfields are located at Atlantic City, N.J., New York City, N.Y., Chicago, Ill., Denver, Colo., and Los Angeles, Calif. The data acquisition technique and program are described.

Further data processing is scheduled. Partial analysis of available data indicates that no single transmissometer will always be most representative of lowest visibility conditions at any airport and even with three systems along the runway unreported variations in RVR will still occur.

Analysis of 55-, 45-, and 15-second sampling intervals for RVR computation shows little difference between 55- and 45-second sampling. The number and magnitude of differences increase when RVR from a 15-second sampling is compared to RVR from a 55-second sampling especially during rapid changes in transmittance. (Author)

N68-22228# AD-668990

R1293G

Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.

EVALUATION OF SEVERAL MULTI-TRANSMISSOMETER SYSTEMS. INTERIM REPORT.

Matthew Lefkowitz and Ernest E. Schlatter July 1966 42 p.

Rept. RD-66-45

A test program has been developed and implemented to evaluate multi-transmissometer systems. These consist primarily of instruments at touchdown, midpoint, and roll-out locations of five airfields distributed across the continent in differing climatic regimes. The airfields are located at Atlantic City, N.J., New York City, N.Y., Chicago, Ill., Denver, Colo., and Los Angeles, Calif. The data acquisition technique and program are described. Preliminary analysis of the small data sample thus far indicates that while large differences may exist between instrument locations, they tend to diminish as visibility decreases. (Author)

R1293H
Weather Bureau, Atlantic City, NJ. Test and Evaluation Lab.
STUDIES IN THE FIELD OF APPROACH VISIBILITY MEASUREMENT AND INSTRUMENTATION. FINAL REPORT.
Matthew Lefkowitz and Aviation Weather Research Project Personnel Apr 1962 137 p.

A series of studies have been conducted and developmental work performed in the field of approach visibility measurements, instrumentation and application to aircraft instrument landing operations, at the National Aviation Facilities Experimental Center, Atlantic City, New Jersey.

Flight tests were conducted in a comprehensive program designed to refine the approach light contact height (ALCH) techniques developed empirically at Newark and confirm their more general applicability to other locations, types of aircraft and operational conditions. It was determined that ALCH for low clouds was substantially the same at Atlantic City as at Newark. Limited data for ALCH, HF category (fog, smoke, and haze), permitted the general appraisal that this category also showed marked similarity.

Studies indicated that automatic control of runway and approach lights is feasible, and a design was developed for optimum intensity of these lights with regard to varying weather conditions. This design was based on the concepts of runway visual range (RVR) and ALCH to provide a means of immediate and practical application.

Four simultaneously operating transmissometers were installed along runway 13-31 to measure variations of transmittance with time and space. Statistical studies were made of the data. It was revealed that a measurement made by a transmissometer cannot be relied on to be more representative than the immediate area sampled; hence, it is not always representative of conditions encountered by the pilot as he moves along the runway during landing and takeoff operations. (Author)

R1294
Weather Bureau, Silver Spring, MD.
ANALYSIS AND MODIFICATION OF RVR EQUIPMENT FOR RVR VALUES 500 FEET AND ABOVE, FINAL REPORT.
Richard H. Waters and Richard R. Reynolds May 1966
Rept. RD-66-34

A rationale of the design criteria and choices of the present RVR system, reportings based on atmospheric transmittance measured over a 500 foot path, is presented. Modifications to existing equipment for low RVR reporting on three different schedules are described. Each of the three reporting modes are based on transmittance measurements over a 250 foot path. Reportings are from 600 feet in 200 and 500 foot increments, from 500 feet in 100 and 200 foot increments and from 500 feet in 100, 200 and 500 foot increments. Cost reductions that could be effected in the purchase of new equipment as a result of eliminating one or two light settings, LS3 and LS4, are revealed. RVR computer modifications are discussed for an end-to-end transmissometer configuration. An operational analysis of the RVR computer system reveals three areas requiring improvement: additional circuitry is required to provide more reliable operation of the Receiver-Decoder over noisy signal lines; a design change is needed to eliminate the possibility of serious damage to the computer by erroneous insertion of interconnecting cables, and improved fabrication methods should be applied to the etched circuit relay board of the Signal Data Converter. Various modes of system operation enhancement are discussed; oral RVR reporting, data communication methods, and RVR testing capability expansion. (Author)

R1294A
Weather Bureau, Silver Spring, MD.
FEDERAL METEOROLOGICAL HANDBOOK NO. 1: SURFACE OBSERVATIONS.
Jan. 1, 1971 209 p.

This handbook prescribes uniform instructions for standard weather observing and reporting techniques. It is intended to provide a framework within which the observer can find a system for identifying meteorological phenomena and reporting their occurrence in an understandable format. Agreements with the World Meteorological Organization, international and domestic aviation interests, and civil and military weather services provide the basis for which standards are developed. (Author)
AD-720106

R1294B

Weather Bureau, Silver Spring, MD. Techniques Development Lab.

OBJECTIVE VISIBILITY FORECASTING TECHNIQUES BASED ON SURFACE AND TOWER OBSERVATIONS.

Donald M. Gales Oct. 1968 32 p.

WBTM-TDL-16

Three objective techniques are presented for forecasting the morning minimum visibility at Washington National Airport in the fall season. Excluded from forecasts are dates with precipitation or a frontal passage before 1200Z. The basic technique makes use of the 0400Z wind speed and dew-point depression at Washington; the wind speed, wind direction, and wind gustiness recorded on a 300-ft tower; and a simple yes-or-no forecast for any clouds below 7500 ft before 1200Z. Gustiness is measured by the wind direction variability occurring in five classes. Three years of data provide the developmental sample. Verification statistics from an independent two-year sample show 66 percent of the forecasts in the correct class and a skill score of 40, slightly exceeding the skill of the official forecast. An alternate second technique uses only surface data from which tower data are objectively estimated; an alternate third technique employs only wind speed and dew-point depression to forecast visibility from isopleths. (Author)
N69-10805#

R1294C

Weather Bureau, Silver Spring, MD. Techniques Development Lab.

OPERATIONAL EVALUATION OF A CEILING AND VISIBILITY PREDICTION TECHNIQUE. FINAL REPORT.

Roger A. Allen Dec. 1969 25 p.

FAA-RD-70-17

Statistical forecasts of ceiling and visibility were computed in real time for eight major terminals and transmitted for the information of the forecasters preparing the official forecasts. Verification of subjective forecasts made before and after examination of the statistical forecasts provided an estimate (in terms of an arbitrary score) of the usefulness of the statistical forecasts as guidance. The experiment demonstrated the feasibility of distributing such forecasts from a central computer, and provided information on the stability or statistical forecast equations when derived from a large data sample and applied to a much later period. The equations were strongest in forecasting visibility seven hours in advance. Their greatest weakness was in the prediction of short period changes in low ceilings and low visibilities. (Author)
AD-709470 N70-33805#

R1294D

Weather Bureau, Silver Spring, MD. Techniques Development Lab.

PREDICTING CEILING AND VISIBILITY WITH BOOLEAN PREDICTORS. INTERIM REPORT.

Roger A. Allen May 1970 42 p.

FAA-RD-70-37

Predictors were developed for Seattle 3-hour ceiling and visibility prediction which were Boolean combinations of the simple weather elements observed at a network of stations. These Boolean predictors were intended to provide a more complete formulation of the conditions which precede specified categories of ceiling and visibility than was possible with the simple predictors used in previous experiments. Better definition of the antecedent conditions should lead to improved probability forecasts of terminal weather. A test of one set of Boolean predictors was completed, and the verification results were examined. The forecasts made with these predictors were not as good as forecasts based on simple predictors. For reasons discussed in the report, the results of this test should not be considered as final; however, it does appear that the development and application of Boolean predictors of this type for a large number of terminals would be much more costly than the use of simple predictors. (Author)
AD-712732

R1295

Weather Bureau, Sterling, VA. Test and Evaluation Lab.

THE AMOS V OBSERVER AND TEST: PART II. FINAL REPORT.

Elbert W. Atkins and Walter E. Hoehne Mar. 1969 72 p.

Rept. WBTM-T/EL-8

The report discusses a test conducted to determine if the AMOS V and associated sensors could help an airport weather observer by automatically making weather observations, and by alerting the observer to significant changes in the weather. A separate section is devoted to each set of parameters. Each of these sections contains the following: (1) A comparison of methods by which the observers and the AMOS system obtain the values reported; (2) The results of a comparison of AMOS versus observer values; (3) A discussion of the problems encountered in the automation of weather observations.
PB-183810

R1295A
Weather Bureau, Sterling, VA. Test and Evaluation Lab.
ANALYSIS OF VISIBILITY OBSERVATION METHODS.
Frederick C. Hochreiter Oct. 1969 47 p.
WBTM-T/EL-9

The report concludes the first phase of the objective visibility observation task. It was primarily a literature search of state-of-the-art in visibility observations and measurements. Most visibility observations today are largely subjective appraisals made by humans, usually referred to as sensory observations. State-of-the-art instruments that produce visibility indications as a function of extinction or scattering are available. The objective of future phases of this task is to determine the principle of measurement, or type of sensor best suited to meeting requirements for this type of data. (Author)
PB-188327

R1295B
Weather Bureau, Sterling, VA. Test and Evaluation Lab.
EVALUATION OF A LASER FOR USE AS A TRANSMISSOMETER CALIBRATOR. FINAL REPORT.
David H. George and Robert J. McCann Jan. 1970 96 p.
FAA-RD-70-1

A laser transmissometer was evaluated for use in providing an objective method of calibrating the NBS-type transmissometer to the light transmission characteristics of the atmosphere in all weather and visibility conditions. The laser transmissiometer was tested by using it to calibrate an NBS-type transmissometer. Visibility measurements from the laser (objectively) calibrated NBS-type system were compared with measurements from an identical system calibrated by the normal (subjective) method. Results indicate that the laser method tends to calibrate the NBS-type transmissometer to yield higher runway visual range values than does the normal method of calibration. Deficiencies in the laser system made rigorous testing of the laser device impracticable. An appendix details performance specifications for an improved laser calibrator system. (Author)
AD-706356

R1295C
Weather Bureau, Sterling, VA. Test and Evaluation Lab.
TRANSMISSOMETER CALIBRATION TECHNIQUES, FINAL REPORT.
Frederick C. Hochreiter and Robert J. McCann Sept. 1968 116 p.
FAA-RD-68-51

This report is devoted to the investigation, analysis and specification of transmissometer procedures and techniques which may be accomplished without the need of specialized calibration devices.

Two sides-by-side, 250-ft. baseline transmissometers are used to isolate calibration techniques that may be useful under all visibility conditions. Past calibration procedures were limited to application in visibility of 5 miles or more. This report shows that these calibration procedures can be successfully applied when the visibility is as low as 2 miles.

Preventive maintenance procedures which may be used to minimize transmissometer outages are discussed. Results show that projector lamp failures will be rare if the lamp is charged after 2500 hours of operation. It is also shown that it is feasible to replace the projector lamp during low visibility conditions.

The results of a transmissometer maintenance survey are presented. This survey gave a better understanding of transmissometers maintenance problems from the field electronic technicians' point of view. It also allowed this project to use the past experience of others as a source of basic information on which to base studies.

Other results show that it is not possible to calibrate a transmissometer by using data from a nearby system(s) on an airfield. (Author)
N69-21145#

R1296A
Weather Bureau, Washington, D C.
FINAL APPROACH VISIBILITY STUDIES. FINAL REPORT.
Apr. 1955 103 p.

Chapters 4-7 present a description of the transmissometer, the objectives of the project for research and development work on methods of determining visibility factors which affect the operation and control of aircraft during approach and landing, observational techniques, comparisons between observed visual ranges and transmissometer data, nighttime transmissometer calibration, daytime calibration of transmissometer, and twilight transmissometer calibration.

R1296B
Weather Bureau, Washington, D.C.
FINAL APPROACH VISIBILITY STUDIES, FISCAL YEAR 1952. PROGRESS REPORT, PART I.
June 30, 1952 43 p.

This report outlines the initial phase of work accomplished by the Weather Bureau. Descriptions of the instruments for measuring ceiling and visibility with some discussion of their limitations are included. The transmissometer is described on pages 9 and 10.

R1296C
Weather Bureau, Washington, D.C.
FINAL APPROACH VISIBILITY STUDIES. FISCAL YEAR 1952. PROGRESS REPORT, PART II.
Mar. 1953 53 p.

The purposes of the visibility phase of this study are to undertake a field calibration of the transmissometer developed by Douglas and to compare visibility reported by an observer at end of the runway with visibility determined by a nearby transmissometer. The maintenance of the equipment is discussed.

R1296D
Weather Bureau, Washington, D.C.
FINAL APPROACH VISIBILITY STUDIES. FISCAL YEAR 1953. PROGRESS REPORT.
Nov. 1953 52 p.

The visibility phase of this report deals with the (1) luminance threshold, day calibration of transmissometer; (2) illuminance threshold, night calibration of transmissometer, (3) comparison between observed visual ranges and transmissometer data; (4) visibility meter in control tower at Washington National Airport.

R1296E
Weather Bureau, Washington, D.C.
PROGRESS REPORT, INSTRUMENT DIVISION.
June 28, 1961 7 p.

This report includes a brief description of the transmissometers which were installed in the approach area of the instrument runway at Washington National Airport.

R1296F
Weather Bureau, Washington, D.C.
PROGRESS REPORTS FOR SECOND HALF FISCAL YEAR 1962 OF RESEARCH AND DEVELOPMENT PROJECTS WITH AVIATION BENEFITS.
July 1962 87 p.

On pages 43-44 the description of the progress of the AMOS III-61 project which provides for transmission of manual input of prevailing visibility and automatic transmission of runway visibility is given. The source also presents a progress report of end-of-runway equipment which requires a change in design of the transmissometer to make it more serviceable.

R1296G
Weather Bureau, Washington, D.C.
RUNWAY OBSERVATION PROJECT AT WASHINGTON NATIONAL AIRPORT, WASHINGTON, D.C.; REPORT FOR PERIOD AUGUST 24, 1949–MARCH 8, 1950.
Apr. 1950 49 p.

The operational aspects, staffing problems, deficiencies and recommendations for the runway observation project at Washington National Airport are presented.

R1296H
Weather Bureau, Washington, D.C.
RUNWAY VISUAL RANGE.
May 1962 8 p.

This study deals with runway visibility, runway visual range, transmissometer, high intensity runway lights, RVR instrumental system, and coding of RVR for teletypewriter transmission.

R1296l
Weather Bureau, Washington, D.C.
TRANSMISSOMETER; A TIRELESS WEATHER OBSERVING SENTINEL IN THE SERVICE OF THE FLYING PUBLIC. REVISED.
Nov. 1961 1 p.

This article describes the transmissometer, the projector, the receiver and the indicator recorder. Further applications of system, where the transmissometer is installed and the basis for determination of visibility by transmissometer are briefly discussed.

R1297
Weather Squadron (12th), Detachment 14, Selfridge AFB, MI.
MORNING VISIBILITY STUDY FOR SELFRIDGE AFB, MICHIGAN.
Stephen T. Hemenway Nov. 1967 12 p.

The study was initiated to develop an objective method of forecasting IFR morning visibility (less than three miles) occurrences at Selfridge AFB, Michigan. Several weather parameters were examined in a search for possible predictors. Some correlation with the later occurrence of IFR visibility was noted between the following parameters, each recorded three hours before sunrise: temperature-dew point spread, wind speed, visibility, and geostrophic wind direction. Two diagrams are provided which are useful in objectively forecasting morning visibility (Author)
N68-23952# AD-667215

R1298
Weather Squadron (28th), NY.
VISIBILITY IMPROVEMENT GRAPHS.
R.O. Sabin 1968

R1299
Weather Wing (4th), Ent AFB, CO. Aerospace Sciences Div.
AN OBJECTIVE TECHNIQUE FOR FORECASTING CONDITIONS BELOW VFR IN STRATUS AND FOG AT PETERSON FIELD, COLORADO SPRINGS, COLORADO.
Kenneth B. Knechtel June 1968 40 p.

The paper describes a partially automated investigation, using an IBM 7090 computer, to develop objective forecast techniques for forecasting ceiling/visibility conditions less than 1500 feet and/or 3 miles at Colorado Springs, Colorado. Six forecast techniques (three seasonal periods and two forecast periods) complete with forecast checklists and the selected scatter diagrams are presented as a final result of the investigation. (Author)
N68-35077# AD-672270

R1300
Wright Air Development Center, Wright-Patterson AFB, OH.
A HAZE-METER.
Myron H. Yang Feb. 1960 19 p.
WADC TN 59-319

The possibility of constructing a haze-meter as a useful indicator to the inexperienced observer for daytime astronomical recordings is investigated. Theories involving Rayleigh Scattering form the basis for investigation of more accurate measurements in sky colour by instrument, and an analysis of the nature of scattering particles and the number of processes taking place in the spectrum of scattered light contribute to more definite determinations of the amount of haze.

An experimental haze-meter was built by using a dichromatic mirror to split the scattered sunlight. The ratio in intensity of red to blue light which is determined by the haze was detected by special photo-cells with proper filters in a Wheatstone bridge circuit. After correction of certain calibration difficulties, suitable transitorized amplifiers evolved and were tested for amplification.

Schematics showing the wiring, housing, mounting, and details of the dichromatic mirror are included. Also, included are spectral response curves and tabulations for Kodak 1241, RCA 6694A photo-conductive cells and circuit diagrams for the two- and three-stage direct coupled amplifiers. (Author)

R1310
Wright Air Development Center, Wright-Patterson AFB, OH.
MEASUREMENT OF INFRARED TRANSMISSION THROUGH CLOUDS ON MT. WASHINGTON USING RECEIVING SET AN-AAR-6.
Alexander Sadowski April 1952 53 p.
WADC TR 52-174

J0010
Adamy, Laszlo.
A KISUGARZASI KOD FOLOSZLASANAK ELOREJELZESE (FORECASTING THE TIME FOR CLEARANCE OF RADIATION FOGS)..
Indojaras Vol. 71, No. 3, May/June 1967, p. 144-149

The basis of the Jefferson-Kennington method for forecasting the time of clearance of radiation fog is the knowledge of the amount of radiation energy which eventually heats the atmosphere near the ground. Starting with the experimental determination of this amount of energy for radiation fogs observed at Ferihegy Airport, the amount of energy which is needed to clear these fogs is compared with the amount of solar energy received to the time of fog clearance. On this basis the method is used on a set of diagrams, on which the time of the clearance of radiation fog may be determined by constructions, taking into account the minimum temperature, the temperature increment which is necessary to clear the fog, and the depth of the fog on a given day. With the use of the described method for 87 cases selected from a 10 yr observational period the departure of the forecast time of the fog clearance from the actual one was ±1 hr or less in 62 cases (71%). From these 10 yrs, 8 have served to construct the curves, while the statistically independent fog cases taken from the years 1963-65 have served to control the given method. For these years a departure equal ±1 hour or less is obtained in the 70% of these cases. (Author)

J0020
Adamy, Laszlo.
A NEDVESSEG ES LATASTAVOLSAG KOXOTTI STATISZTIKI KAPCSOLAT FERIHEGY REPULOTEREN (STATISTICAL RELATIONSHIP BETWEEN HUMIDITY AND VISIBILITY ON FERIHEGY AIRPORT).
Orszagos Meteorologiai Intezet, Hivatalos Kiadvanyai, Budapest Vol. 29, No. 1, 1966, p. 114-119.

On the basis of hourly observations made under different weather conditions at the meteorological station at the Ferihegy Airport the statistical connection between humidity and visibility was investigated. On the basis of data it is proved that the change of the method of humidity measurements carried out in 1961 (instead of psychrometers, a distant meteorological station was used), caused a change in the statistical relationship between humidity and visibility. In the opinion of the author the new method of measurement will furnish less useful data to the investigation and consequently the forecasting of fog. Therefore parallel measurements seem to be required as soon as possible in order to give a detailed analysis of the difference between the 2 methods of measurement. (Author)

J0030
Adamy, Laszlo.
METHODS FOR FORECASTING LOW CLOUDS, FOGS, HORIZONTAL AND OBLIQUE VISIBILITY AND WIND CONDITIONS OF THE 12 KM. DEEP LAYER.
Orszagos Meteorologiai Intezet, Hivatalos Kiadvanyai, Budapest Vol. 33, 1967, p. 234-245.

Data from radio ascent at the Aerological Observatory (Budapest) during 1951-1964 were used to prepare Climatological tables. Parameters: Wind speed frequencies along the isobaric surfaces for different wind directions; frequencies of temperature and geopotential values on the standard isobaric surfaces; vertical variations of wind speed between standard isobaric surfaces; frequencies of temperature values in tropopause expressed as a function of pressure and geopotential, etc. In the formation of radiation fogs the highest correlation was found between dew point depression in the lowest 50 mb layer. Radiation fogs do not form if this parameter $>12^\circ C$.

Temperature and humidity contrasts in evening and night hours between the lowest 50 mb and ground have a low correlation with fog frequencies. (Author)

J0040
Adrian, W.
A METHOD FOR SOLVING THE EQUATION FOR THE CARRYING DISTANCE OF LIGHT SIGNALS MONOGRAPHICALLY.
Lichttechnik, Berl. Vol. 13, No. 3, 1961, p. 100-102.

The carrying distance t is given in nautical miles by the expression $t^2 = \frac{I}{E_{min}} d^t$ when I is the power of the signal (in cd), E_{min} is the threshold power of illumination at observer's eye, a is the degree of visibility in the atmosphere (in naut. miles). A nomograph is given which allows t to be determined. It can be applied to all relations which are derived from the equation above. Three examples are included.

J0050

Ahlquist, Norman C. and Robert J. Charlson

A NEW INSTRUMENT FOR EVALUATING THE VISUAL QUALITY OF AIR.

J. Air Pollut. Control Ass. Vol. 17, No. 7, July 1967, p. 467-469.

Any device for assessing the visual quality of air must necessarily have an extremely high sensitivity since, at times, the Rayleight scattering of air molecules is the determining factor. The integrating nephelometer of Brewer and Beuttell has been adapted for air quality measurement. It records the volume scattering coefficient and was reliable in over a month of continuous operation. The results may be interpreted in terms of visual range; if so the inherent noise in the system corresponds to more than 500 miles visual range with a 100-second response time. The low cost, simplicity, and sensitivity of the device make it appear useful for rapid evaluation of visual air quality. The design of the instrument will be presented, including both the optical and electronic components. The results of operation of the instrument in Seattle during days of moderate air pollution will be used to illustrate the utility of the device. (Author)

J0060

Aleksaniants, S.M. Iu. G. Konovalov, and V.I. Chnukov.

OPREDELENIE DAL'NOSTI VIDIMOSTI OGNEI VYSOKOI INTENSIVNOSTI (DETERMINATION OF THE RANGE OF VISIBILITY OF HIGH INTENSITY LIGHTS).

Met. gidrol. No. 8, Aug. 1967, p. 76-81.

Under present regulation, 1 of the parameters used for specifying minimum weather conditions for landing or taking off at airports is the meteorological visibility. Many airfields are now equipped with high intensity lights and, under many conditions, these are visible to the pilot long before he is within the distance given by the meteorological visibility. This paper considers the possibility of using the visible range of the high intensity lights as an alternative parameter in specifying landing or take-off minima. The visible range visibility of the high intensity lights can be determined in two ways. It can be observed directly by counting the number of lights visible from the runway threshold or it can be calculated theoretically from the formula $E_c = I/L^2 \epsilon L/Sm$, *where L is the visual range, I is the intensity of the lights,* E_c *is the threshold of visual sensitivity to light,* ϵ *is the visual contrast threshold, and Sm is the meteorological visibility. It is not easy to obtain observations from a suitable position or to correct for differences in background lighting with observations taken elsewhere. It is therefore more practical to determine the required values from the formula. To do this directly would be difficult, but this paper shows how the calculations can be simplified by the use of a series of nomograms. A comparison of computed and observed visibilities of high intensity lights indicates that the computed values coincide with the observed values within a mean square error of 12%. A special computing device for finding the visual range of high intensity lights with the formula has been developed.*

N68-35511

J0064

Ambartsumian, V.A.

DIFFUSE REFLECTION OF LIGHT BY A FOGGY MEDIUM.

Dokl. Akad. Nauk SSSR, n.s. Vol. 38, Mar. 20, 1943, p. 229-232.

J0066

Ambartsumian, V.A.

DIFFUSION OF LIGHT THROUGH SCATTERING MEDIUM OF LARGE OPTICAL THICKNESS.

Dokl. Akad. Nauk SSSR, n.s., Vol. 43, April 30, 1944, p. 102-106.

J0070

Antarkar, V.N.

A NOTE ON VERTICAL VISIBILITY.

Indian J. Met. Geophys. Vol. 11, No. 2, 1960, p. 204-205.

It is often observed that under certain conditions horizontal visibility shows improvement while the vertical visibility deteriorates. As is well known, these conditions are—(1) Marked atmospheric pollution, (2) Temperature inversion aloft, but not on the ground, (3) Turbulence at the ground due to strengthening of surface winds and (4) Illumination of the top of the dust cover. The last factor is important particularly from the point of view of an aircraft flying above the dust cover.

The conditions over Jodhpur on the night of 26-27 May 1959, serve as a typical illustration of all these four factors. (Author)

J0080

Antipov, B.A., V.E. Zuev, and V.A. Sapozhnikova.

EKSPERIMENTAL'NOE ISSLEDOVANIE POGLOSHCHENIIA IZLUCHENIIA GAZOVYKH LAZEROV S DLINAMI VOLN 3,39 I 3,51 MKM V ATMOSFERE (EXPERIMENTAL INVESTIGATION OF THE ABSORPTION OF THE RADIATION OF GAS LASERS WITH WAVELENGTHS OF 3.39 AND 3.51 MU IN THE ATMOSPHERE).

Izv. vyssh. ucheb. Zaved. Fiz. Vol. 10, No. 7, 1967, p. 142-144. Trans. into English in Soviet Physics Journal Vol. 10, No. 7, 1967.

Experimental investigation of the atmospheric absorption of gas-laser radiation at wavelengths of 3.39 and 3.51 μ. The experiments involved measurements of radiation intensity in relation to the degree of gas pressure in the beam's path. Air at pressures from 1 mm Hg to atmospheric pressure was used together with various partial pressures of methane. Results are given for the dependence of absorption at both wavelengths on the gas pressure and the amount of methane.
A67-37668 #

J0090

Anyz, Fvantisek.

IZMERENIIA VODNOSTI TUMANOV V PROMYSHLENNYKH RAIONAKH (MEASUREMENT OF WATER CONTENT IN FOGS IN INDUSTRIAL REGIONS).

Studia geophys. geod. Vol. 8, No. 4, 1964, p. 395-404.

Water content measurement of fog in industrial regions using filtration method.

J0100

Appleman, H.

A NOTE ON THE EFFECT OF AIRCRAFT EXHAUST ON AIRPORT VISIBILITY.

Bull. Am. met. Soc. Vol. 37, No. 1, Jan. 1956, p. 19.

On several occasions reports have been received by Headquarters Air Weather Service of deteriorating weather conditions at an air base apparently caused by the landing of a number of jet aircraft. Such an occasion occurred at Goose Bay, Laborador in December, 1954. A detailed analysis has been made of this case and the probable cause of the phenomenon given. (Author)

J0110

Appleman, H.S.

VISIBILITY DETERIORATION CAUSED BY SUCCESSIVE TAKEOFFS OF JET AIRCRAFT.

Arch. Met. Vol. 13, No. 1, 1963, p. 108-113.

A problem of growing concern is the deterioration in runway visibility that occasionally occurs when a number of jet aircraft take off in rapid succession particularly when water injection is used to increase engine thrust. The following study investigates whether the visibility restriction is due to fog resulting from saturation of the air by water vapor in the aircraft exhaust (i.e. surface condensation trails) or to a smoke-type contamination. It is shown that at the temperatures where water injection is used, condensation trails cannot form, so the restriction must be due to contamination. A review is then made of the meteorological parameters likely to be related to the problem of contamination visibility deterioration, including the results of a preliminary objective forecast study using certain of these predictors.

J0120

Arnulf, A. and J. Bricard.

REPORT ON THE LATEST INVESTIGATIONS ON LIGHT TRANSMITTENCY OF FOG AND MIST AND OF ITS CHARACTER, WHICH WERE CONDUCTED IN THE OPTICAL INSTITUTE IN PARIS.

Beitr. Phys. Atmos. Vol. 33, Nos. 1-2, 1960, p. 9-27.

Simultaneous measurements were made in atmospheric mist and fog of the transmittancy and of the drop spectrum. The transmittancy was calculated from the measured drop spectrum values, then compared with the measured transmittancy values, which lay between 0.3μ and 13μ. The agreement suffered in places, because the measurement of the drop spectrum for small radii was too small.

The transmittancy was measured with various transmissometers, all based on a compensation process. Their spectral range was determined either with a color filter or with a Doppelmanochromator.

The drop size spectrum was determined by one of two methods. In the first, suggested by Dessene, the drops were collected on threads of spider's web, and photographed in a microscope. In the other method the drops were micro photographed in the free air stream. A photo-electric method was described which made it possible to determine the drop spectrum in the free air stream for drops of diameter down to 0.1μ.

J0130
Arnulf, A. and J. Bricard.
TRANSMISSION BY HAZE AND FOG IN THE SPECTRAL REGION 0.35 TO 10 MICRONS.
J. Opt. Soc. Am. Vol. 47, No. 6, June 1957.

Two independent methods were used: direct spectrophotometry through the transparent windows of the atmospheric gases, and measurement of the number and diameter of the water droplets, followed by a Mietheory calculation of the spectral transmittance. Results from the two methods are in good agreement when the media are sufficiently homogeneous, as for a quiet haze or fog and artificial smoke.

The following kinds of atmospheres were considered: hazes (optical density per km in the visible spectrum is less than 2); a small number of small-drop fogs (optical density per km less than 10); evolving fogs (which have changing distributions of drop-diameters); nonevolving, slightly selective fogs; artificial smokes. In addition, some information is given on the statistical distribution of drop-diameters.

It was found that the transmission of haze increased markedly with increasing wavelength, from the visible to 10 microns, but this marked increase was not found for fogs. (Author)

J0140
Arnulf, A.J., J. Bricard, E. Cure, et al.
RESEARCH ON THE TRANSMISSION OF LIGHT BY HAZE AND FOG.
Revue Opt. Theor. Instrum. Vol. 38, No. 3, 1959, p. 105-133.

An optical determination of transmission factors in haze and fog for various wavelengths is intended and their calculation through the simultaneous specification of atmospheric constitution is reported.

The first part describes the spectrometer associated with a receiver consisting of a thermopile designed for the range 0.3 to 13μ and giving the transmission factor in direct value. In addition two visual photometers allowing similar measurements in the visible region are presented. Data from the various methods are discussed.

The second part describes the methods used to get an absolute granulometric measurement of scattering particles in suspension. Optical measurements are explained by means of such granulometric processes on the basis of theoretical considerations. (Author)

J0150
Atkins, J.E.
CHANGES IN THE VISIBILITY CHARACTERISTICS AT MANCHESTER/RINGWAY AIRPORT.
Met. Mag., Lond. Vol. 97, No. 1151, June 1968, p. 172-174.

Forecasters at Manchester/Ringway Airport consider that the characteristics of visibility there have been changing as a result of smoke control in and around Manchester since ~1960. This note presents data which, although not derived specifically to test this opinion, do suggest a tendency for poor visibility to be realized less often with light winds during recent years than in previous years.

J0160
Atlas, David.
OPTICAL EXTINCTION BY RAINFALL.
J. Met. Vol. 10, No. 6, Dec. 1953, p. 486-488.

The optical extinction coefficient due to scattering by spherical particles large with respect to the wavelength is

$$\sigma = 2\pi \Sigma N_i r_i^2,$$

where N_i is the number of particles per unit volume of radius r_i. This demonstrates that the quantity $\Sigma N r_i^2$ for rain, and therefore extinction by rainfall, is quantitatively related to rain intensity. The implications of such a relationship with regard to visual range, and its use in studying raindrop size-distributions, are also discussed. (Author)

J0170
Atlas, David and S. Bartnoff.
CLOUD VISIBILITY, RADAR REFLECTIVITY, AND DROP-SIZE DISTRIBUTION.
J. Met. Vol. 10, No. 2, April 1953, p. 143-148.

The coefficient C in Trabert's visibility equation, $V = (Cpr)/W$, where r is linear mean radius, p density, and W is liquid-water content, is shown to be a function of the breadth of the drop-size distribution but has preferred values in natural clouds ranging from 3.3 for fair-weather cumulus to 4.8 for nimbostratus. The frequently quoted value of 2.6 pertains only to a perfectly monodisperse distribution, and is inappropriate in nature. A more useful equation is found to be $V = (Kpd_0)/W$, in which d_0 is the median volume diameter and the coefficient K is found to be very nearly independent of the breadth of the drop-size spectrum over the range which occurs in natural clouds. $K = 1.2$ is shown to be an excellent value for 65 observations by Diem. Similarly, the coefficient G in the radar-reflectivity equation, $Z = (6/\pi)Gd_0^3\ (W/p) \times 10^{-6}$ has a preferred value of 1.35. The implication is that nature has a preference for a particular type of drop-size spectrum. (Author)

J0190
Avaste, O. Kh. Moldau, and K.S. Shifrin.
SPEKTRAL 'NOYE RASPREDELENIYE PRYAMOY I RASSEYANNOY RADIATSII (SPECTRAL DISTRIBUTION OF DIRECT AND DIFFUSE SOLAR RADIATION).
Issled. Fiz. Atmos. Vol. 3, 1962, p. 23-70.
Trans. into English NASA-TT-F-9142.

The results of the calculations of the spectral distribution of direct and scattered solar radiation under various degrees of atmospheric clarity are given with consideration for the absorption of body water vapor, carbon dioxide, and ozone. The calculations for the standard radiation model of the atmosphere coincide quite well with the mean experimental data. An approximation formula is proposed for determining of albedo effect on the descending scattered radiation flux for the cases of real absorption. It also shows that the real observation of the elongation of the atmospheric indicatrix of scattering with the increase in the wavelength directly follows the scheme of K. 'S. Shifrin and I. N. Minin. (Author)
N65-11694#

J0200
Bachurina, A.A.
INVESTIGATION OF HORIZONTAL VISIBILITY NEAR THE EARTH'S SURFACE DURING SNOW STORMS
Trudy tsent. Inst. Prognozov No. 77, 1958, p. 15-41. In Russian.

J0210
Bakhtiyarov, V.G.
THE POSSIBILITY OF USING THE TRANSPARENCY METHOD TO DETERMINE THE MICROSTRUCTURE OF AN ATMOSPHERIC AEROSOL.
Vysokogornyi Geofizicheskii Institut, Trudy No. 8, 1968, p. 41-48.
Trans. into English FTD-HT-23-97-70.

A discussion is presented on the application of the visibility method in calculating the spectra of the particles in a dispersed system in the free atmosphere, i.e., to determine the size spectra of atmospheric aerosols. The first section of the paper deals with the difficulties encountered in using the method, i.e., determination of the polydispersed scattering coefficient for the significant IR and short wavelengths, in an atmosphere in which radiation is attenuated by absorption by gaseous components and by scattering, and along both off-vertical and horizontal paths. Results obtained by both American and Soviet specialists are compared. The second section deals with problems encountered in making actual horizontal measurements of atmospheric aerosol visibility in the visible, near UV, and IR ranges over paths 5-10 km above the earth. A procedure is presented for determining visibility. The flux of radiation from a source located in the focus of the first mirror passes through the atmospheric layer. (Author)
N70-32624# AD-704755

J0220
Baldit, Albert.
PROCEDES DE MESURE DE LA VISIBILITE VERTICALE ET OBLIQUE (TECHNIQUE OF MEASURING VERTICAL AND SLANT VISIBILITY).
Meteorologie Vol. 7, 1931, p. 362-367.

Describes methods of measuring visibility with and without instruments.

J0230
Baldit, Albert
LA VISIBILITE ET LE BROUILLARD AU POINT DE VUE DE LA SECURITE AERONAUTIQUE (VISIBILITY AND FOG FROM THE POINT OF VIEW OF SAFETY IN AIR NAVIGATION).
Meteorologie Vol. 7, 1931, p. 354-361.

The author describes technique of visibility measurement (horizontal, slant, vertical and night visibility) and studies problems of fog formation, fog forecasting and fog dissipation.

J0240
Barteneva, O.D.
O RASCHETE DAL 'NOSTI VIDIMOSTI OB 'EKTOV, PROEKTIR UIUSHCHIKHSIA NA RAZLICHNYE FONY V SUMERKIINOCH 'IU (CALCULATION OF THE VISIBILITY RANGE OF OBJECTS PROJECTED AGAINST VARIOUS BACKGROUNDS AT NIGHT AND TWILIGHT).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 5-10.

Discussion of the calculation of the visibility range of celestial bodies projected against the background of any Earth formation. The data required for these calculations are presented in tabular form.
A65-18566 #

J0250
Barteneva, O.D.
USTANOVKA I METODIKA ISSLEDOVANIIA TOCHNOSTI IZMERITELEI VIDIMOSTI (EQUIPMENT AND METHODS FOR THE INVESTIGATION OF THE ACCURACY OF VISIBILITY METERS).
Trudy glav. geofiz, Obs., Len. No. 68, 1957, p. 76-87.

From the equations for measuring meteorological distance of visibility from the contrast of distant objects, it follows that the accuracy of any method for measuring the distance of visibility is determined by the accuracy of the measured contrast. On the basis of this principle, the author compares the accuracy of different methods, namely extinction and photometric comparision for measuring distance of visibility. With the aid of a diagram, the author describes a photometric arrangement for measuring contrasts with an accuracy of ±2% and the methods of extinction and photometric comparision for measuring the accuracy of a visibility meter. The magnitude of relative error in measuring contrast with instruments based on the method of extinction does not depend upon the construction of the instrument but is determined by the properties of the dye-stability of its threshold of sensitivity. The error of measurement of contrast by the method of photometric comparison depends greatly upon the extent to which the size, form, color of the comparison standard in the instrument soil similar to the object whose contrast is being measured. The results of measurements are presented and the theoretical accuracy of measurement of meteorological distance of visibility is discussed.

J0260
Barteneva, O.D. and G. Ia. Bashilov.
O NEFELOMETRICHESKOM METODA IZMERENIIA PROZRACHNOSTI ATMOSFERY (A NEPHELOMETRIC METHOD FOR MEASURING THE TRANSPARENCY OF THE ATMOSPHERE).
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 4, April 1961, p. 613-619.
Trans. into English in Bulletin of the Academy of Sciences, USSR, Geophysics Series No. 4, Apr. 1961.

By means of the nephelometric method it is possible to determine indirectly the coefficient of transparency of the atmosphere according to the brightness of scattered light. The results of various measurements to determine whether a simple relationship exists between scattered light in a definite direction and the integral index of scattering are presented and it is shown that the principle of measurement of atmospheric transparency on the basis of light scattering close to an angle of 45° by means of a nephelometer with a constant angle of observation is valid. The possiblity of measuring atmospheric transparency on the basis of scattering for angles differing from 45° is examined. Graphs showing the dependence of the coefficient of scattering p(a), upon atmospheric transparency for different angles are presented. The value of p(a) was found to increase for all values of a with diminution in transparency, but a practically unique dependence between atmospheric transparency and the scattering coefficient p(a), for the entire range of variation of scattering in the atmospheric layer near the ground, exists only for an angle close to 45°. The localized nature of the nephelometric method, i.e., the necessity of extending the results of measurement in a small volume to a large expanse is examined and it is shown that the good agreement in the measurements of meteorological visibility in the entire range of atmospheric transparency not distorted by the localized character of the method.

J0270
Barteneva, O.D. and A.N. Boiarova.
BRIGHTNESS OF TWILIGHT AND OF THE NIGHT SKY.
Trudy glav. geofiz. Obs., Len. No. 100, 1960, p. 133-140. In Russian.

J0280
Barteneva, O.D., N.G. Boldyryov and A.A. Butylev.
DETERMINATION OF ATMOSPHERIC TRANSMISSIVITY AND POWER OF REMOTE LIGHTS BY MEANS OF A STELLAR PHOTOMETER.
Trudy glav. geofiz. Obs., Len. No. 42, 1953. In Russian.

J0290

Barteneva, O.D., and A. A. Butylev.

VIDIMOST' TSVETNYKH OGNEI V POLEVYKH USLOVIIAKH (VISIBILITY OF COLORED LIGHTS UNDER FIELD CONDITIONS).

Trudy glav. geofiz. Obs., Len. No. 80, 1959, p. 39-44.

The results of studies on the sensitivity of the eye to white, green and red lights under field conditions during a naturally variable sky brightness at the horizon, at twilight and at night are presented and analyzed. The distance of visibility of a distant light is determined by the magnitude of illumination E produced at the pupil of the observer. The illumination corresponding to the moment of observation of light on a white colorless point is termed the achromatic threshold E_0. The illumination corresponding to the moment of discrimination of the color of a light is termed the color threshold E_{th}. The magnitude of the achromatic interval is determined usually as the ratio E_{th}/E_0, it depends upon the color of the light and brightness of the background against which the light is observed. The illumination of E_0 and E_{th} at the pupil of the observer is calculated by the formula:

$$E = \frac{I}{(i_1 + l_2)^2} \, p c \tau w \tau f$$

where l_1 and l_2 = distance from the glass and to the source of the light, and to the observer, I = intensity of illumination, p_c = coefficient of reflection of the glass, τ_w = coefficient of transmission of the photometric wedge and τ_f = total coefficient of transmission of light filter in front of the diaphragm. The experimental picture and set up are described. For white light the illuminating threshold at the pupil of the observer under field condition does not fall below 10^{-8} lux. When the brightness of the background varies a hundred-fold (from 0.1 to 0.001 asb) the threshold of illumination varies only two-fold reaching at the limit values of 4×10^{-8} lux during uncovering and 2×10^{-8} lux when the visibility of the light disappears. In the case of a red light the threshold of illumination remains constant for all background brightness beginning from 0.1 asb and lower. For green light the achromatic threshold coincides with that of white light. The ratio E_{th}/E_0 varies from 1.5 to 3.2 for a background brightness from 30 to 7.10^{-4} asb. In calculating the distance of visibility of colored signal lights at sea, the magnitude of the illumination threshold should be 3×10^{-7} lux for a red light and 6×10^{-7} lux for a green light.

J0300

Barteneva, O.D. and E.A. Poliakova.

STUDY OF ATTENUATION AND SCATTERING OF LIGHT IN NATURAL FOG DUE TO ITS MICROPHYSICAL PROPERTIES.

Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 1, No. 2, 1965, p. 193-207.

Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 1, No. 2, 1965.

The correlation dependence between transparency and water contents in fogs is obtained from data of simultaneous optical and microphysical measurements. The possibility of calculations of fog microstructure parameters using these two integral characteristics is shown. Scattering indicatrices for fogs and thick hazes are obtained. The classification of indicatrix forms is connected with fog microphysical properties and with the classification proposed earlier for all values of the transparency.

J0310

Bartishvili, I.T.

METEOROLOGICHESKAIA DAL'NOST' VIDIMOSTI V ZONE DOZHDIA (METEOROLOGICAL VISIBILITY RANGE IN A RAIN ZONE).

Trudy, Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Tiflis. No. 5, 1959, p. 115-123.

An analysis of observations on meteorological distance of visibility in a rain zone carried out during 1956-1957 in the Batum district showed that during shower rain a correlation exists between atmospheric transparency (meteorological visibility distance) and intensity of rain. An analogous relationship exists between these elements also in the case of continuous rain; in the former the correlation is better than in the latter. In Batum during continuous rain whose intensity attains 20 mm/hr during the observation period the meteorological visibility distance falls to 1.5—2 km. During heavy shower rain whose intensity reaches 77 mm/hr during the observation period the meteorological visibility distance may attain 1 to 0.5 km and less. The correlation between intensity of rain of any type (I in mm/hr) and the coefficient of attenuation α in 1/km) is for southern Georgia expressed by the formula $\alpha = 0.16\ I^{0.69}$. The dependence or visibility distance (S_M in km) upon intensity is expressed by $S_M = 18.8\ I^{-0.69}$. Since the differences between the observational results in different geographical conditions (Leningrad, Makhindzhauri, Chakvi) are small a table with mean data on the relationship between meteorological visibility distance and rain intensity is presented.

J0315
Beattie, E.M.
INVESTIGATION OF VISUAL THRESHOLD VALUES.
Proc. R. Soc. Edinb. Vol. 59 (I), 1938-1939, p. 55-61.

J0320
Beck, R.H.
A PILOT LOOKS AT VISIBILITY.
Air Line Pilot Vol. 37, Oct. 1968, p. 12-16.

J0330
Beebe, R.G.
CHANGES IN VISIBILITY RESTRICTIONS OVER A 20 YEAR PERIOD.
Bull. Am. met. Soc. Vol. 48, No. 5, 1967, p. 348.

It is well known that there is more air pollution today than many years ago. This is a serious problem for many reasons but it also raises the question as to how this has affected ground visibility in connection with aircraft operations. A brief study of several airport stations that have had ground visibility problems in the past indicates that the incidence of low visibilities at the ground has decreased markedly over the past 20 years. (Author)

J0340
Belogorodskii, S.L.
MINIMA FUER DIE LANDUNG VON LUFTFAHRZEUGEN (MINIMA FOR THE LANDING OF AIRCRAFT).
Grazhd. Aviats. No. 10, 1971.
Trans. Into German in *Technisch-olonomische Informationen der zivilen Luftfahrt* Vol. 8, No. 1, 1972 p. 23, 24, 29-31.

The operational flight regulations of civil aviation of the USSR contain new rules regarding the minima for the takeoff and landing of aircraft. Minimum values with regard to the altitude of the lower cloud limit for the landing of aircraft and helicopters are considered together with the minimum range of horizontal visibility which guarantees the safe landing of an aircraft. The magnitude of the minimum values for an aircraft type depends on its aerodynamic characteristics and its equipment. Airport characteristics and the professional qualifications of the pilot are also significant. A new definition for the decision height is also considered.
A72-30820#

J0345
Bennett, M.G.
ATMOSPHERIC POLLUTION AS AFFECTING VISIBILITY.
J. natn. Smoke Abat. Soc. Vol. I, Autumn 1930, p. 123-124+.

J0350
Bennett, M.G.
FURTHER CONCLUSIONS CONCERNING VISIBILITY BY DAY AND NIGHT.
Q. Jl. R. Met. Soc. Vol. 61, No. 259, April 1935, p. 179-186.

Some experiments were carried out at Kew and Farnborough for verification of the theories of visibility presented by KOSCHMIEDER and the author. Analysis of these observations showed that Koschmieder's formula is not quite correct quantitatively. The threshold ϵ in Koschmieder's equation is also not constant. It is impossible to disregard scattering light from the object (which was considered in author's theory). (MGA)

J0360
Bennett, M.G.
THE PHYSICAL CONDITIONS CONTROLLING VISIBILITY THROUGH THE ATMOSPHERE.
Q. Jl. R. Met. Soc. Vol. 56, No. 233, Jan. 1930, p. 1-29.
Physical-theoretical study, analyzing in detail the basis for visibility determination.

J0370
Bennett, M.G.
A VISIBILITY METER.
J. scient. Instrum. Vol. 8, No. 4, April 1931, p. 122-126.

A meter is described which measures the degree of clearness with which any particular object can be seen. Very slightly ground glass which is just sufficient to obscure the object observed is the measure of its visibility. Various precautions are adopted which obviate the sources of error found in other instruments of this type. Applications to meteorology and illuminating engineering are described.

J0380
Bennett, M.G.
THE VISUAL RANGE OF LIGHTS AT NIGHT, AND ITS RELATION TO THE VISUAL RANGE OF ORDINARY OBJECTS BY DAY.
Q. Jl. R. Met. Soc. Vol. 58, No. 245, July 1932, p. 259-267.

Theoretical considerations and experimental observations, carried out by the author, made it possible to determine the effect of the intensity of light on visual range, the effect of background brightness and relation between the visual range or ordinary objects by day and of lights at night.

J0390
Benson, Carl S.
ICE FOG.
Weather Lond. Vol. 25, No. 1, Jan. 1970, p. 10-18.

Ice fog becomes increasingly serious as air temperature goes below—35°C. Ice fog is produced when water vapor output from urban environments meets an air mass which is too cool to dissolve it, and cold enough to crystallize the condensed vapor into tiny (5-10μ) ice crystals. In Fairbanks it usually has a vertical thickness of ~10 meters, rarely exceeds 30 meters. Street level visibility can be reduced to less than 10 meters.

J0400
Berliand, M.E. et al.
ON THE THEORY OF ATMOSPHERIC DIFFUSION IN FOG CONDITIONS.
Trudy glav. geofiz., Len. No. 207, 1968, p. 3-13.
Trans. into English AFCRL-71-0268; AFCRL-TRANS-91.

Study of cases of intense air pollution shows that a part of them is related to periods of extended fogs. The harmful effect of smoke and gaseous admixtures is revealed more sharply in fog than in other weather conditions: an unpleasant feeling from them is increased, the presence of admixtures in fogs furthermore decreases the visibility, etc. One notes a reverse effect when the presence of smoke contributes to the condensation of the atmospheric moisture. In this manner, a mutually increasing effect of smokes and fogs occurs. The report presents the estimates of the influence of river fogs (the theory of which is developed by Berliand and Onikul, on the distribution of gaseous admixtures. (Author)
N71-32976# AD-724104

J0410
Bertolotti, M., L. Muzii, and D. Sette.
ON THE POSSIBILITY OF MEASURING OPTICAL VISIBILITY BY USING A RUBY LASER.
Appl. Optics Vol. 8, Jan. 1969, p. 117-120.

Investigation of the effects of the atmosphere on the attenuation of a laser beam. The possibility of using the backscattered radiation from a ruby laser to probe optical visibility is examined. Some experiment results supporting the possibility of measuring the visual range with a Q-switched ruby laser are reported.
A69-21089

J0420
Beryozkin, V.A.
BASIC PROPOSITIONS OF THE THEORY OF VISIBILITY.
Trudy glav. geofiz, Obs., Len. No. 1, 1948. In Russian.

J0430
Beryoskin, V.A.
MEASUREMENT OF ATMOSPHERIC TRANSMISSIVITY FROM LUMINANCE OF ATMOSPHERIC HAZE.
Trudy glav. geofiz. Obs., Len. No. 11, 1948. In Russian.

J0440
Beutell, R. and A. Brewer.
INSTRUMENTS FOR THE MEASUREMENT OF THE VISUAL RANGE.
J. scient. Instrum. Vol. 26, 1949.

J0450
Bibby, J.R.
FOG DENSITY INDICATOR.
Met. Mag., Lond. Vol. 86, No. 1018, Apr. 1957, p. 117-119.

J0460
Bibby, J.B.
GOLD VISIBILITY METER MK. 2.
Met. Mag., Lond., Vol. 76, No. 900, June 1947, p. 130-133.

The author describes a visibility meter constructed by E. Gold. Method of using the meter and relation between meter reading and equivalent daylight visibility are discussed.

J0465
Bielich, F.H.
INFLUENCE OF THE HAZE IN LARGE CITIES ON VISIBILITY AND SOLAR RADIATION.
Veroff. geophys. Inst. Univ. Lpz. Vol. 6 (2), 1933, p. 69-119.

J0470
Blackwell, H.R.
CONTRAST THRESHOLDS OF THE HUMAN EYE.
J. opt. Soc. Am. Vol. 36, No. 11, 1946, p. 624-643.

J0480
Blaise, Pierre and Paul Petry.
LUMINOUS INTENSITY AND RANGE OF LIGHTS.
J. Inst. Nav. Vol. 21, No. 3, July 1968, p. 285-296.

In this paper, Blaise (Chairman of a committee of the Intl. Assn. of Lighthouse Authorities) and Petry (General Secretary of the Assn.) comment on certain changes impending in the notation of luminous intensity and the range of marine lights. They conclude that the changes will be of benefit to navigators at sea and engineers. (Author)

J0490
Blaise, Pierre and Paul Petry.
LUMINOUS INTENSITY AND RANGE OF LIGHTS: GEOGRAPHICAL RANGE.
Intl. hydrog. Rev. Vol. 45, No. 2, July 1968, p. 161-173.

Discussed are the amendments of the Light Lists and charts by the Hydrographic Offices of various countries following the Recommendation for the Notation of Luminous Intensity, adopted by the International Association of Lighthouse Authorities (IALA) in 1966. This paper comprises the following: luminous intensity and luminous range including the intensity of a light, luminous range of light, luminous range of light, meteorological visibility, nominal range and the use of these data; investigations of luminous range in either average or relatively dull weather; and geographical range. In the discussion on meteorological visibility, the Koschmieder and Allard formulas are given. Other relevant equations, nomograms for determining luminous range the time proportion, during which a light at intensity I has a luminous range greater or equal to the nominal range, etc., are presented.

J0500
Boileau, Almerian R.
DETERMINATION OF PATH RADIANCE FOR DOWNWARD PATH OF SIGHT FROM GROUND-BASED OR LOW-ALTITUDE MEASUREMENT.
J. opt. Soc. Am. Vol. 58, No. 4, Apr. 1968, p. 586-587.

This paper describes a method of obtaining the path radiance for a downward path of sight by the ground-based measurements of the path radiance of the reciprocal upward path of sight and the two corresponding sterisents. (Author)
AD-677115

J0510
Boldyrev, N.G.
DAL'NOST' VIDIMOSTI REAL'NYKH OB'EKTOV (RANGE OF VISIBILITY OF ACTUAL OBJECTS).
Trudy glav. geofiz. Obs., Len. Vol. 19, No. 81, 1950, p. 14-24.

The author analyzes the conditions of visibility of actual objects, as determined basically by the transparency of the atmosphere (meteorological visibility) and the condition of perceptibility of objects against their background, depending upon the contrast in their brightness and the distance from the observer. The article contains formulas for computation of both kinds of visibility and of their interrelation, and a nomogram of the range of daylight visibility, constructed by the author in 1946.

J0520
Boldyrev, N.G.
TOCHNOST' IZMERITELEI VIDIMOSTI (ACCURANCY OF VISIBILITY METERS).
Akademiia Nauk SSSR, Otdelenie Technicheskikh Nauk, Izvestiia No. 12, Dec. 1951, p. 1786-1791.

An analysis of conditions determining good results of visibility measurement. The contrast sensitivity of the observer's eyes is the most important factor for accuracy of measurement. The author gives a mathematical analysis of probable errors and concludes that to get correct visibility measurements thorough training of observers is needed.

J0530
Boldyrev, N.G. and O.D. Barteneva.
DAL'NOST' VIDIMOSTI REAL'NYKH OB'EKTOV V SUMERKI I NOCH'IU (VISIBILITY RANGE FOR TANGIBLE OBJECTS DURING TWILIGHT AND NIGHT).
Trudy glav. geofiz. Obs., Len. No. 118, 1961, p. 3-17.

The theory and method of computing the distance of visibility of objects during the dark hours of the day are investigated with the aid of the following formulas:

$$K = \frac{K_0}{1 + 1/b(\epsilon^{\alpha L} - 1)}, \quad (K - \epsilon)\gamma^2 = (1 - \epsilon)\delta^2$$

and

$$(K - \epsilon)\frac{Q}{L^2} = (1 - \epsilon)\frac{1}{V^2},$$

where K_0 = true contrast of an object with the background, b = coefficient of luminosity of the background; $b = B_f/C$ if $B_f > B_0$ or $b = B_0/C$ if $B_0 > B_f$ where B_0 = brightness of an object and B_f = brightness of the background, C = coefficient of the light atmosphere equation; α = coefficient of attenuation of light; K = threshold contrast for distinguishing an object of angular dimensions γ; ϵ = threshold of contrast sensitivity for an object of large angular dimensions; δ = least resolvable angle, L = true distance of visibility of an object; $V = 1/\delta$ = sharpness of visibility; $\gamma = Q/L^2$ (where Q = area of visible silhouette of an object). The experimental results of the investigation of the threshold of brightness, of contrasts of sensitivity and of the sharpness of vision during small levels of brightness and of the brightness of sky and illumination of a horizontal surface during twilight and at night are presented and the equation for determining the coefficient of light atmosphere is derived, namely:

$$C = \sum_0^{\pi}\Delta A \sum_0^{\pi} B\rho(\gamma)\sin\varphi\Delta\varphi,$$

where $\rho(\gamma)$ = standardized index of light scattering, angle φ = position of a part of the sky on the celestial sphere. Tables of parameters determining the distance of visibility of objects in twilight and at night are presented. It is demonstrated that the distance of visibility of objects observed against the background of sunset may be greater than the meteorological distance of visibility. (Author)

J0540

Boldyrev, N.G. and O.D. Barteneva.

METODIKA IZMERENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI PO KONTRASTAM UDALENNYKH OB'EKTOV (THE METHODOLOGY OF MEASURING THE METEOROLOGICAL VISIBILITY RANGE ON THE BASIS OF CONTRASTS OF DISTANT OBJECTS).

Met. gidrol. No. 10, Oct. 1958, p. 50-53.

J0550

Boldyrev, N.G. and O.D. Barteneva.

VISUAL'NAIA METODIKA OPREDELENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI I EE ISPYTANIE NA SETI GIDROMETEOSTANTSII (VISUAL METHOD OF DETERMINATION OF METEOROLOGICAL VISIBILITY AND ITS TESTING IN THE HYDROMETEOROLOGICAL STATION NETWORK).

Trudy glav. geofiz. Obs., Len. No. 80, 1959, p. 3-10.

In Russian.

The method employed in the Main Geophysical Observatory measuring the visibility of objects at meteorological stations presupposes the possibility of determining visibility on the basis of the intensity of atmospheric haze enveloping individual objects. The formula for determining visibility is

$$S = \frac{\ln 1/\mathcal{E}}{\ln K_0 - \ln K}\, l$$

where K_0 = *true contrast of an object with the background of the sky at the horizon,* K = *contrast altered by the atmospheric haze,* l = *distance between observer and object,* $\mathcal{E}$ = *threshold of contrast sensitivity of the eye. The mean value of meteorological visibility is given by* $\overline{S} = \frac{\Sigma l}{\Sigma P}$ *where* $P = \frac{\ln K_0 - \ln K}{\ln 1/\mathcal{E}}$ = *the weight of each individual measurement. The accuracy of determination of meteorological visibility by the method of forks that is based upon the fact that true distance S is greater than the distance* l, *to the most distant visible object but is less than* l_2, *the distance to the nearest invisible object, i.e.,* $l_1 < S < l_2$. *The correctness of this method is established and its accuracy is determined by the method of least squares.*

J0560

Bozhevikov, N.S.

NEKOTORYE VOPROSY PRAKTIKI INSTRUMENTAL'NYKH IZMERENII GRANITSY OBLABOV (SOME OPERATIONAL PROBLEMS OF INSTRUMENTAL MEASUREMENT OF CLOUD BASE HEIGHT).

Met. gidrol. No. 5, May 1965, p. 56-58.

Cloud base measurements made by 5 different methods are compared. Of the instruments used 2 relied on instrumental measurements of the light reflected from the cloud base, the other methods were the visual observation of the searchlight spot, aircraft reports and pilot balloons. All measurements gave varying readings. No one is considered sufficiently reliable to be used as a standard. The relative errors of the different methods and explanations of them are discussed. It is pointed out that there is, as yet, no commonly agreed definition as to what constitutes a cloud base. Part of the variations in readings could be accounted for by the rapid variations in cloud base both in time and in space. At aviation stations, in difficult weather conditions, continuous measurements of cloud base should be made and the range of fluctuation should be reported.

J0565

Bozhevikov, N.S.

THE RELATIONSHIP BETWEEN THE HEIGHT OF CLOUD BASES AND VISUAL RANGE AT THE GROUND.

Trudy glav. geofiz. Obs. (Leningrad) No. 153, 1964, p. 1-9.

Trans. into English FTD-TT-65-551/1.

The relationship is examined between the height of cloud bases measured by triangulation with a Bozhevikov cloud-height indicator and horizontal visibility determined on the basis of prominent dark objects against the sky at the horizon. A tendency toward reduced horizontal visibility is noted with a drop in the height of the cloud bases. (Author)

J0570
Bozhevikov, N.S.
O SVIAZI VYSOTY NIZHNEI GRANITSY OBLAKOV S DAL'NOST'IU VIDIMOSTI U ZEMLIJ (RELATION BETWEEN THE HEIGHT OF THE LOWER BOUNDARY OF CLOUDS AND THE VISIBILITY RANGE FROM THE EARTH).
Trudy glav. geofiz. Obs. Len. No. 153, 1965, p. 11-17.

Analysis of available experimental information in order to establish a relation between the height of the lower cloud boundary, visibility, and relative humidity at the Earth surface. It is found that for St., Frst, and Frnb type clouds, a functional relation between the height of the lower cloud boundary and the horizontal visibility range can be observed up to a height of ~ 500 m. The most probable value for the visibility lies within 2 and 4 km. For Sc-type clouds, a correlation between cloud height and visibility can be observed up to 1000 m. For stratocumuli, the most probable visibility value lies between 4 and 10 km.

J0580
Bozhevikov, N.S.
RELATIONSHIP BETWEEN CEILING HEIGHT AND HORIZONTAL METEOROLOGICAL VISIBILITY ON THE GROUND.
Trudy nauchno-issled. Inst. gidromet, Proborost. No. 12, 1964, p. 78-83.

J0590
Bradbury, N.E. and E.M. Fryer.
A PHOTOELECTRIC STUDY OF AN ATMOSPHERIC CONDENSATION NUCLEI AND HAZE.
Bull. Am. met. Soc. Vol. 21, No. 10, Dec. 1940.

A method is described whereby the opacity of the atmosphere is determined by the extinction of a beam. of light. By the use of a chopped light beam, photocell, and a.c. amplifier the apparatus may be made independent of any amount of stray light and hence can Punction during both the daylight and night hours. Continuous records have been made of atmospheric opacity over a period of several weeks and the results compared with the extinction to be expected as the result of Rayleigh scattering by atmospheric condensation nuclei. The results show a maximum of scattering and hence greatest opacity in the hours near sunrise when the relative humidity is highest and the nuclei largest. During other hours of the day, the opacity is a function of the density of condensation nuclei, their size (as determined by the relative humidity), and the amount of non-nucleic matter (largely dust) in the atmosphere. (Author)

J0600
Brady, Frank B.
ALL-WEATHER AIRCRAFT LANDING.
Scient. Am. Vol. 210, No. 3, Mar. 1964, p. 25-35.

A comprehensive survey of all-weather aircraft landing befinning with James H. Doolittle's landing on Sept. 24, 1929 and covering the interval up to the present. A comparison is made between that landing and those made by jet aircraft at the present time. Information is given on the Instrument Landing System (ILS) currently in use. Some of the automatic approach systems are described and various problems on approach and landing are considered. There remains the problem of whether or not the ILS system can be improved enough, without changing its worldwide standard characteristics, to meet the needs of today's jets and tomorrow's supersonic craft. Some potentials for future application are pointed out such as the British "Autoland" now being installed in the new generation of airline and military aircraft.

J0605
Brandis, S.A.
ALTERATIONS OF THE VISUAL FUNCTIONS IN DIFFERENT TYPES OF WORK. III. ALTERATIONS OF LIGHT SENSITIVITY OF THE EYE IN CONNECTION WITH VARIOUS TYPES OF WORK PERFORMED BY MAN.
Fiziol. Zh. Vol. 29, 1940, p. 424-433.

J0610
'Bravo-Zhivotovskiy, D.M., L.S. Doln, A.G. Luchinin et al.
SOME PROBLEMS OF THE THEORY OF VISIBILITY IN TURBID MEDIA.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 5, No. 1, 1969, p. 672-684.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 5, No. 7, 1969, p. 388-393.

J0615
Breckenridge, F.C. and C.A. Douglas.
DEVELOPMENT OF APPROACH-AND CONTACT-LIGHT SYSTEMS.
Illum. Engng. Vol. 40, Nov. 1945, p. 785-829.

J0620
Brewer, A.W. and F.J. Scrase.
I. METEOROLOGICAL MEASUREMENTS.
Q. Jl. R. Met. Soc. Vol. 77, No. 331, Jan. 1951, p. 3-32.

On pages 6-8 the authors describe briefly some visibility instruments. They are various visibility meters, Lohle's meter, Beuttell's instrument, Gold visibility meter, Waldram's photometer and a ship's visibility meter under the code name "Loofah".

J0625
Bricard, J.
ON THE VISIBILITY OF DISTANT OBJECTS THROUGH FOG.
C. r. hebd. Seanc. Acad. Sci., Paris. Vol. 216, May 10, 1943, p. 644-646.

J0630
Bricard, J.
TRANSPARENCY OF THE LOWER ATMOSPHERE.
Recherche aeronaut. Sept.-Oct. 1949.

J0640
Briggs, J.
VISIBILITY VARIATIONS AT LONDON/HEATHROW AIRPORT.
Met. Mag., Lond. Vol. 98, May, 1969, p. 135-138.

Tabulated frequencies of visibility changes in fog at London/Heathrow Airport in periods between four minutes and one hour. The analysis is based on transmissometer records on occasions when visibility was in the range 100-1300 m for periods of three hours or more during June 1965 to September 1966. (Author)
A69-35266

J0650
Brown, Richard T., Jr.
A NEW LIDAR FOR METEOROLOGICAL APPLICATION.
Jnl. appl. Met. Vol. 12, 1973, p. 698-708.

A new lidar has been demonstrated to be potentially useful as a meteorological tool. This lidar is the result of applying a new technology, gallium arsenide fiber coupling. By coupling optical fibers to each of an array of gallium arsenide diode lasers, a narrow, well collimated, relatively high flux density laser beam is attainable from a small package. This, in conjunction with pulse repetition rates in the kilohertz region, permits the construction of a practical lidar with a good signal-to-noise ratio and peak power within the limits of eye safety. Examples of signals from some hydrometeors (rain, fog, and clouds) using a 250-watt peak-power lidar are presented. Cloud height measurement to 4000 feet has been attained. The possibility of measuring cloud extinction coefficients using such signals is demonstrated. The potential of measuring extinction coefficient profiles (thus visibility profiles) through fog is also demonstrated. (Author)

J0654
Brown, Richard T., Jr.
A SINGLE-ENDED LASER DEVICE FOR THE REMOTE DETERMINATION OF ATMOSPHERIC TRANSMITTANCE OVER HORIZONTAL AND SLANT PATHS.
Paper presented at the Institute for Electrical and Electronics Engineers, Aerospace and Electronic Systems Technical Convention, Washington, D.C., Oct. 16-18, 1967.
In: *IEE Transactions on Aerospace and Electronic Systems, Supplement* Vol. AES-3, Nov. 1967, p. 276-286.

Consideration of a concept pointing toward a device which has the potential for solving some of the problems associated with the determination of horizontal and slant visibility along an aircraft glide path in bad weather. The technique makes use of unique signatures of energy backscattered from a transmitted pulse by the particles restricting the visibility. The concept was instrumented and field-tested with the cooperation and support of the Federal Aviation Agency. Although still in the experimental stage, a single backscatter-signature device can provide a measure of the cloud ceiling, the range to a fog bank, and the visual range over a horizontal or slant path.

J0660
Brown, Richard T., Jr.
WEATHER INSTRUMENTATION.
Sperry Rand Engineering Review Vol. 24, No. 3, 1971, p. 11-17.

Weather-its certainties and uncertainties-is a vital link in the air transportation system. While meteorological measuring devices have existed for many years and become highly refined and accurate, the needs of modern aircraft and airports dictate even greater precision and further development of specializing equipment. Some of these new instruments take advantage of the accuracy and flexibility afforded by later technology and digital presentations. All-weather landing and take-off will especially hasten the refinement and installation of new meterological instruments to arm a pilot with the information he needs—at the instant he has to make a critical judgment. (Author)
A72-21522

J0665
Bruce, H.D.
OBSERVATIONS ON THE VISIBILITY OF A SMALL SMOKE.
J. For. Vol. 42, June 1944, p. 426-434.

J0670
Dullrich, Karl
DIFFUSION OF LIGHT IN TURBID AIR.
Optik, Stuttg. Vol. 2, 1947, p. 304-325.

J0680
Bullrich, Karl
MEASUREMENT OF DIFFUSED LIGHT IN HAZE AND CLOUD.
Met. Rdsch. No. 13, 1960, p. 89.

During the winter period 1958-1959, numerous measurements of light scattering in haze and fog were carried out at Mainz University. These measurements aimed at determining the intensity of scattered light as a function of scattering angle, the intensity of both polarization components i_1 and i_2 of the scattered light as a function of the scattering angle and the excitation of the beam. The measurements were made with an artificial unpolarized beam of light in the wavelengths of 420, 555, and 670 mμ. The special scattering function in strong haze shows a decrease of intensities between the scattering angle 20 and 110 degrees of about 1.5 powers of ten. All the results are quite similar. Hence a Junge aerosol function may be assumed in almost all the cases. Spectral differences are small. In fog spectral scattering shows a decrease of intensities between 20 and 110 degrees of more than 2 powers of ten. A secondary maximum exists at 145°; it belongs to the first fogbow. A spectral dependence couldn't be established.

The results of measurements of the polarization function in fog shows negative polarization at small scattering angles. Measurements and theoretical considerations show that the polarization function is a much more sensitive criterion for the distribution of aerosol size and fog droplets size than the extinction of the scattering function.

J0690
Buma, T.J.
A STATISTICAL STUDY OF THE RELATIONSHIP BETWEEN VISIBILITY AND RELATIVE HUMIDITY AT LEEUWARDEN.
Bull. Am. met. Soc. Vol. 41, No. 7, July 1960, p. 356-360.

From statistical data, it is found that very marked differences in visibility at a given relative humidity may occur at a station if the surface wind direction is taken into account. At Leeuwarden, the visibility is much lower for wind from land than for wind from the sea at the same relative humidity. It is shown that this is due to the condensation nuclei which may be more numerous and more hygroscopic in continental air than in maritime air; this result differs somewhat from that published by Junge. Comparison of our results with those of Appleman concerning Frankfurt shows good agreement of Frankfurt and Leeuwarden for maritime air, which was not to be expected. (Author)

J0700
Burkhart, K.
CONTRIBUTION TO THE THEORY OF OBLIQUE VISION.
Z. Met. Vol. 2, 1948.

J0705
Burkhart, K.
HORIZONTAL AND OBLIQUE VISIBILITY.
Z. angew. Met. Vol. 59, February 1942, p. 44-45.

J0710
Burlow, G.N.
METHOD OF DIRECT DETERMINATION OF METEOROLOGICAL VISIBILITY DISTANCE ON THE BASIS OF THE SIGNAL OF BACK-SCATTERING.
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 25, 1971, p. 30-40. In Russian.

J0720
Burt, E.W.
STUDY OF THE RELATION OF VISIBILITY TO AIR POLLUTION.
Am. ind. Hyg. Ass. J. Vol. 22, No. 2, 1961, p. 102-108.

J0730
Bylov, M.V.
O NABLIUDENIIAKH S KLINOVYM IZMERITELEM VIDIMOSTI (ON OBSERVATIONS WITH THE WEDGE VISIBILITY METER).
Zap. gidrogr. Vol. 54, 1928, p. 201-210.

Experimental investigations with Wigand's wedge visibility meter and its accuracy is determining the range of vision under different weather conditions.

J0733
Byram, G.M.
A PHOTOELECTRIC METHOD OF MEASURING THE TRANSPARENCY OF THE LOWER ATMOSPHERE.
J. opt. Soc. Am. Vol. 25, December 1935, p. 393-395.

The photoelectric method of measuring the transparency of the lower atmosphere described in this paper was used by the research branch of the U.S. Forest Service while conducting investigations of the transmission of light through the lower atmosphere in order to develop a practical field method of measuring atmospheric clearness. Foresters have a particular interest in means to measure the transparency of the atmosphere because of the importance of this factor in determining the radius of vision of fire lookouts stationed on high peaks or towers. The purpose of these lookouts is to discover fires while they are small and relatively easy to control, hence a knowledge of atmospheric conditions and changes is needed in order that a given territory may have the proper lookout protection. The photoelectric apparatus proved to be a valuable method for measuring atmospheric transparency and was an important link in the development of simpler devices for making similar measurements. (Author)

J0735
Byram, G.M.
VISIBILITY PHOTOMETERS FOR MEASURING ATMOSPHERIC TRANSPARENCY.
J. opt. Soc. Am. Vol. 25, Dec. 1935, p. 388-392.

Most determinations of the transmission factor of an absorbing medium are made from measurements taken on the initial and terminal intensities of a light beam traveling a given distance through the medium; this method gives a direct means of measuring the transmission factor.

The theory of the air transparency measurements made by the visibility photometers described in this paper differs from the theory of the previous method in that the determinations of the transmission factor are made from measurements on haze brightness or on the intensity of light scattered and reflected by particles in the air. It is shown that this is a direct method of measuring the amount of light absorbed in a given distance rather than the amount transmitted. (Author)

J0740
Calvert, E.S.
VISUAL AIDS FOR LOW VISIBILITY CONDITIONS, A DISCUSSION OF THE FUNDAMENTAL REQUIREMENTS WITH A BRIEF ACCOUNT OF SOME RESULTS OBTAINED ON A R.A.E. SIMULATION.
Jl. R. aeronaut. Soc. Vol. 52, No. 45, July 1948, p. 439-476.

J0745
Cauvet-Duhamel, P.
STUDY OF A METHOD FOR MEASURING HORIZONTAL VISIBILITY.
Annls Phys. Globe Fr. outre mer Vol. 2, Oct. 1935, p. 132-135.

J0750
Cena, Giuseppe
SULLA MISURE DELLA VISIBILITA CON SPECIALE RIGUARDO A QUELLA NOTTURNA (ON MEASUREMENT OF VISIBILITY WITH SPECIAL REGARD TO NIGHT OBSERVATIONS).
Riv. met. aeronaut. Vol. 9, No. 2, Apr./June 1949, p. 48-53.

Discussion of theory of visibility with nomograms for calculating relationships under varying nocturnal conditions (complete darkness, moonlight or twilight) and tables for determining visibility at night by observing the distance a 50 or 200 candle-power electric lamp could be seen under varying illumination conditions.

J0760
Cena, Giuseppe
LA VISIBILITA METEOROLOGICA: MISURE A VISTA E STRUMENTALI (VISIBILITY: VISUAL AND INSTRUMEN– MEASUREMENTS).
Riv. met. aeronaut. Vol. 10, No. 3, July-Sept. 1960, p. 14-17.

J0770
Charlson, R.J.
ATMOSPHERIC VISIBILITY RELATED TO AEROSOL MASS CONCENTRATION: A REVIEW.
Environ. Sci. & Technol. Vol. 3, No. 10, 1969, p. 913-918.

The presence of particles in the atmosphere reduces visibility. This phenomenon is dramatically evident in polluted air, where the visual range often falls below a few kilometers. This amount of degradation is frequently objectionable and hazardous. The paper summarizes the present and recently acquired knowledge of the relationship between mass concentration of aerosol and visual range. Five topics covered: significance of self-preserving or constant shape size distribution; integrating nephelometer for measuring atmospheric visibility degradation; light scatter and extinction related to aerosol characteristics; and the relationship between mass concentration and visual range; and application of this result.

J0780
Charlson, R.J.
AN INTEGRATING NEPHELOMETER FOR STUDIES OF AIR POLLUTION AEROSOLS.
J. Air Pollut. Control Ass. Vol. 17, No. 9, Sept. 1967, p. 585.

Tests in Seattle of the integrating nephelometer of Brewer and Beuttell adapted for air quality measurement will be used to illustrate the utility of this device.

J0785
Charlson, R.J., N.C. Ahlquist, H. Selvidge, et al.
MONITORING OF ATMOSPHERIC AEROSOL PARAMETERS WITH THE INTEGRATING NEPHELOMETER.
J. Air Pollut. Control Ass. Vol. 19, No. 12, Dec. 1969.

J0790
Charlson, Robert J., Helmuth Horvath, and Rudolf F. Pueschel.
THE DIRECT MEASUREMENT OF ATMOSPHERIC LIGHT SCATTERING COEFFICIENT FOR STUDIES OF VISIBILITY AND POLLUTION.
Atmos. environ. Vol. 1, 1967, p. 469-478.

The integrating nephelometer of Beuttell and Brewer has been modified for studies of air pollution. The instrument, which is simple, stable, and inexpensive to construct, has been operated continuously for several months. Interpretation of the data is simplified by use of a theoretical approach which indicates that the measured light scattering coefficient is proportional to the mass of suspended particulates for well-aged atmospheric aerosols. (Author)

J0800

Clayton, George D. and Paul M. Giever.

INSTRUMENTAL MEASUREMENTS OF A VISIBILITY IN AIR POLLUTION STUDIES.

Analyt. Chem. Vol. 27, No. 5, May 1955, p. 708-713.

An instrument which measures transmittance (transmissometer) was found to be a useful tool, in air pollution studies, for measuring visibility in an urban atmosphere. It was relatively free of operating difficulties, required little attention, and was sufficiently sensitive to measure instantaneous variations in visibility. In a study of the relationship among data obtained with the instrument, the soiling power of the atmosphere, and the mass weight of air-borne particulates, it was found that there was no correlation among these three different methods of measuring aerosols. Visibility measurement therefore cannot be used as an index of the soiling power of the atmosphere or the mass weight of the air-borne particulates. Rain removed from the atmosphere some aerosols which cause discoloration, while snow had no such effect.

J0805

Coleman, H.S., and H.E. Rosenberger.

A COMPARISON OF VISUAL AND PHOTOELECTRIC MEASUREMENTS OF THE ATTENUATION OF BRIGHTNESS CONTRAST BY THE ATMOSPHERE.

J. opt. Soc. Am. Vol. 40, June 1950, p. 371-372.

A comparison has been made of visual and photoelectric measurements of the attenuation of brightness contrast by the atmosphere. The comparison is being made to attempt to gain an insight into the reasons for the apparently great scatter of atmospheric attenuation data obtained by early investigators in this field. In particular it is of interest to determine whether or not the lack of consistency of the early attenuation data may be attributed to unusual atmospheric conditions or to poor experimental design. The results of the comparison indicate excellent agreement between the atmospheric data obtained by the two methods mentioned. It is concluded that if proper experimental techniques are followed, there is no reason to expect visual photometry to lead to different atmospheric attenuation data than those obtained by photographic and by photoelectric processes. (Author)

J0810

Coleman, Howard S., Fred J. Morris, Harold E. Rosenberger, et al.

A PHOTOELECTRIC METHOD OF MEASURING THE ATMOSPHERIC ATTENUATION OF BRIGHTNESS CONTRAST ALONG A HORIZONTAL PATH FOR THE VISIBLE REGION OF THE SPECTRUM.

J. opt. Soc. Am. Vol. 39, No. 7, July 1949, p. 515-521.

A satisfactory method has been developed for measuring the attenuation of brightness contrast by the atmosphere along horizontal paths for the visible region of the spectrum. The method consists of the measurement of the apparent brightness of "black" and "white" test objects (referred to hereafter as targets) located at different distances from a photoelectric telephotometer. The method is being used in an ONR sponsored research program at the University of Texas. In this program seven pairs of "black" and "white" targets are being used. These are rectangular in shape and subtend practically the same angle with respect to the telephotometer. The targets range in size from 0.65 X 1.30 ft to 33 X 66 ft. These are located approximately along a horizontal line running nearly due East starting at a point located about eight miles east of Austin, Texas, and cover a range of nearly 9 miles in the vicinity of the Colorado River. This location of the target range provides a means of making atmospheric attenuation measurements for different azimuth angles between the path of observation and the position of the sun. In addition, the location is such that fogs and dust haze occur fairly frequently as well as a highly clear atmosphere. The data obtained during the first year of operation indicate that, for "white light," the brightness contrast is exponentially attenuated and that the attenuation coefficient is surprisingly insensitive to the naturally occurring local variations in illumination along the observation path. (Author)

J0820

Coleman, Howard S. and Harold E. Rosenberger.

SPECTRAL DEPENDENCE OF THE ATTENUATION OF BRIGHTNESS CONTRAST BY THE ATMOSPHERE.

J. Met. Vol. 7, No. 4, Aug. 1950, p. 259-262.

The effect of wave length on the attenuation of brightness contrast by the atmosphere was studied by means of apparatus and procedure based upon a law derived by Koschmieder. The attenuation coefficient was expressed in terms of meteorological range and measurements were made by means of which the dependence of meteorological range upon wave length was found to be a linear rather than a fourth power function, and the linear relationship was valid for white and black objects over a wide range of atmospheric transparencies. It is concluded that molecular scattering is not the predominant factor in the atmospheric attenuation of brightness contrast.

J0825
Collier, L.J., and W.G.A. Taylor.
A TELEPHOTOMETER EMPLOYING THE MAXWELLIAN VIEW PRINCIPLE AND ITS USE IN MEASURING ATMOSPHERIC TRANSMISSION.
J. Scient. Instrum. Vol. 15, Jan. 1938, p. 5-17.

The paper describes a "Maxwellian View" type of telephotometer designed for measurements of atmospheric transmission. The accuracy of measurements obtained with this instrument compares favourably with that given by other methods of measurement. Over distances up to 8000 ft. the instrument does not require the use of light sources of great intensity. The telephotometer and its accessory apparatus are readily transportable.

In using the instrument care must be taken to avoid error due to the Stiles-Crawford effect; but provided this and other sources of systematic error are avoided, the error in determining atmospheric transmission should not, under favourable conditions, exceed 5 percent. (Author)

J0830
Collis, R.T.H.
LIDAR
Sci. Jnl. Vol. 4, No. 2, Feb. 1968, p. 72-77.

The use of lidar to measure and monitor visibility has been considered. Lidar shows promise of being able to accomplish this.

J0840
Collis, R.T.H.
LIDAR FOR ROUTINE METEOROLOGICAL OBSERVATIONS.
Bull. Am. met. Soc. Vol. 50, Sept. 1969, p. 688-694.

Discussion of difficulties and problems involved in applying the lidar technique in operational meteorology. Lidar, using pulsed lasers as energy sources, applies the radar principle at wavelengths in and near the visual spectrum to probe the atmosphere. It can detect particulate matter of much smaller dimensions and sparser concentration than is possible with meteorological radar. Lidar may be used to measure cloud base heights although difficulties arise with diffuse clouds, especially in foggy conditions. Inhomogeneities in turbidity that occur at the heights of temperature inversions in the relatively clear atmosphere are also revealed by lidar. Examples of work in progress that shows promise of providing a measurement of visibility are presented. It is concluded that lidar can already contribute usefully in routine meteorological service, but that its full potential in ceilometry and visibility measurement awaits further developments. For routine unattended use, high pulse-rate, low peak-power lidars are advocated on safety grounds.
A70-10081 #

J0844
Conner, J.P., and R.E. Ganoung.
AN EXPERIMENTAL DETERMINATION OF THE VISUAL THRESHOLDS AT LOW VALUES OF ILLUMINATION.
J. opt. Soc. Am. Vol. 25, Sept. 1935, p. 287-294.

The present paper gives the results of an investigation performed by the authors on the mutual relations among visual acuity, background luminosity and contrast. The range of luminosities was from 0.0001 to 1.0 lumen per square foot, and the range of contrast was from 1.77 to 92.9 percent. The work was done in the Illuminating Engineering Laboratories of the Massachusetts Institute of Technology.

An important feature of this investigation is the determination of the relation between visual acuity and background luminosity for foveal vision alone and also for parafoveal vision alone. The use of a fixation point allowed the parafoveal curves for visual acuity vs. luminosity to be extended from 0.0001 to 1.0 lumen per square foot, and these curves were found to be practically straight lines of small slope. Similarly, the curves for foveal vision were found to remain straight and to descent sharply to zero as the luminosity was reduced. It is believed that the present work constitutes the first such separation to be made, and it is hoped that this information will be of value in the further development of theories of vision. (Author)

J0845
Conference on Atmospheric Limitations to Optical Propagation, Boulder, CO, Mar. 18-19, 1965.
SUMMARY OF PAPERS.
Radio Science Vol. 1, No. 3, Mar. 1966, p. 405-410.

A brief summary of all papers presented at the Conference. The 43 presentations covered topics ranging from a theoretical deduction of the phase structure function to a description of laser absorption measurements by acoustic waves to the use of glass spheres for simulating and optical turbulence. CRPL has established a program concerned with the analysis and utilization of optical radiation for purposes of telecommunication and with the limitations imposed on such uses by the atmosphere.

J0850
Cottrell, C.I.
THE MEASUREMENT OF VISIBILITY.
Illum. Engr. Vol. 46, 1951.

J0860
Coulman, C.E.
OPTICAL IMAGE QUALITY IN A TURBULENT ATMOSPHERE.
J. opt. Soc. Am. Vol. 55, No. 7, July 1965, p. 806-812.

Description of some experiments conducted to determine the relationships between daytime atmospheric seeing quality and relevant meteorological parameters. Measurements of the time-averaging modulation transfer function of an optical system comprising an objective and a horizontal air path correlate with a parameter which characterizes the magnitude of temperature fluctuations in the lower layers of the atmosphere. Evidence is produced to support an exponential relationship between the transfer function and the atmospheric temperature-structure function. The transfer function fluctuates rapidly about a mean; visual estimates of resolution limit agree more closely with the maxima than with the mean. The significance of these results is discussed in relation to the choice of conditions for good terrestrial and astronomical seeing. (Author)
A65-26884

J0870
Coulman, C.E. and D.N.B. Hall.
OPTICAL EFFECTS OF THE THERMAL STRUCTURE IN THE LOWER ATMOSPHERE.
Appl. Optics Vol. 6, No. 3, 1967, p. 497-503.

Ascending convective plumes of inhomogeneous warm air interspersed with regions of air that are remarkably free from temperature fluctuations are sometimes observed in the lower layers of the atmosphere. A close correlation is demonstrated between intervals of good optical seeing along an upward-slanting path 20 m long and such periods of below average, air-temperature fluctuation. This correlation is sensitive to the azimuthal angle between wind direction and the vertical plane containing the optical path. The occurrence of temperature-quiescent periods at a given height is also shown to require the horizontal wind speed to be less than a critical value, and there is evidence that the thermal structure tends to be elongated in the direction of the wind. The range of amplitudes of image dancing observed in these experiments is comparable with that encountered in solar observations. The atmospheric temperature structure coefficients calculated from these optical experiments compare favorable with independent direct measurements. (Author)

J0875
Counsell, W.D.
NIGHT VISION AND AVIATION.
Trans. ophthal. Soc. Aust. Vol. 3, 1941, p. 126-129.

J0880
Crosby, Peter
MEASUREMENT OF VISUAL RANGE.
Nature, Lond. Vol. 185, No. 4711, Feb. 13, 1960 p. 438-439.

This paper presents descriptive information on two photoelectric instruments constructed at the Weapons Research Establishment, Salisbury, South Australia. These instruments are polar nephelometer and integrating nephelometer.

J0890
Crosby, Peter and Brian W. Koerber.
SCATTERING OF LIGHT IN THE LOWER ATMOSPHERE.
J. opt. Soc. Am. Vol. 53, No. 53, No. 3, Mar. 1963, p. 358-361.

The optical scattering coefficient has been measured at Woomera at ground level, and at altitudes up to 14,000 ft, using two integrating nephelometers. The principle and the construction of a nephelometer are described. Results obtained over a period of 12 months are given. (Author)

J0895
Crozier, W.J.
THE THEORY OF THE VISUAL THRESHOLD. I. TIME AND INTENSITY.
Proc. natn. Acad. Sci. U.S.A. Vol. 26, Jan. 1940, p. 54-60.

J0900
Curcio, J.A., L.F. Drummeter, C.C. Petty, et al.
AN EXPERIMENTAL STUDY OF ATMOSPHERIC TRANSMISSION.
J. opt. Soc. Am. Vol. 43, No. 2, Feb. 1953, p. 97-102.

An experimental investigation was made to determine the general characteristics of the spectral transmission of the atmosphere in the vicinity of Washington, D.C. on the Chesapeake Bay, in the Gulf of Mexico, and in the Central Pacific. Transmission measurements were made at the wavelengths of approximately 15 of the Hg discharge lines in the interval 2500A to 6000A. Values of the spectral atmospheric attenuation coefficients (km^{-1}) have been computed. For all observations made, these values increase toward shorter wavelengths and this is most pronounced for wavelengths below 3200A, where true absorption as well as scattering contributes to the attenuation. (Author)

J0910
Curcio, J.A. and G.L. Knestrick.
CORRELATION OF ATMOSPHERIC TRANSMISSION WITH BACKSCATTERING.
J. opt. Soc. Am. Vol. 48, No. 10, Oct. 1958, p. 686-689.

This is a report of experimental work performed during the period of September 1956 to June 1957 on the correlation of backscattering with atmospheric transmission, measurements were made for a variety of conditions where the meteorological range varied from less than 0.10 mile to more than 40 miles in atmospheres which were free of industrial pollution. Analysis of the data shows the following relationships:

$$V=C/S^{1.5},$$

where V = meteorological range, C = constant, and S = backscattered signal. The point spread about the curve indicates that meteorological range can be determined from the backscattered signal with an accuracy of 20% for all visibilities in the ranges studied. (Author)

J0920
Cuth, S.
VISIBILITY.
Gen. Electr. Rev. No. 3, 1952.

J0930
Dashkevitch, L.L.
NEPHELOMETRIC BACK-SCATTER APPARATUS.
Trudy nauchno-issled. Inst. gidromet. Proborost. Issue 13, 1963.

J0940
Dashkevich, L.L.
VISIBILITY GAGES AND THEIR USE.
Svetotekhnika No. 1, 1957.

J0950
Dashkevitch, L.L., M.A. Golberg, and A.M. Mikhailova.
NEFELOMETRICHESKAIA USTANOVKA OBRATNOGO RASSEIANIIA M-71 DLIA IZMERENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI V TEMNOE VREMIA SUTOK (M-71 BACK-SCATTERING NEPHELOMETER FOR MEASURING METEOROLOGICAL VISIBILITY DURING THE DARK PERIOD OF THE DAY).
Trudy nauchno-issled. Inst. gidromet. Proborost. No. 13, 1965, p. 2-17.

Principles of the operation and installation of a back-scattering nephelometric device intended for measuring meteorological visibility during the nighttime by means of the M-53 polarizing visibility meter are presented. The basic operational and technical characteristics of this instrument are given.

J0960

Dashkevich, L.L. and V.A. Markelov.

IZMERENIE METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI PO STEPENI DEPOLIARIZATSII PRIAMOGO SVETOGO POTOKA (MEASUREMENT OF THE METEOROLOGICAL VISIBILITY RANGE FROM THE DEGREE OF DEPOLARIZATION OF DIRECT LIGHT).

Trudy nauchno-issled. Inst. gidromet. Priborost. No. 23, 1970, p. 71-78.

The degree of polarization of scattered light depends on the turbidity of the atmosphere and several other parameters. The polarization decreases with increasing turbidity. A reliable correlation between the polarization of scattered light and the transparency of the atmosphere has not been established previously. In the present article, an attempt is made to use the effect of depolarization for measuring the atmospheric transparency based on experiments made at the Minsk Hydrometeorological Observatory in 1968. Some assemblies for measuring the transparency are discussed. In the experiments, a light source transmits a ray through a polarization filter in a flat polarized vertical plane. After passage through the atmospheric layer, the polarization of the light ray is diminished because of multiple scattering. A filter is placed in front of one photoelectric receiver with a polarization plane perpendicular to that of the light source filter; in front of a second receiver, a filter is placed that has a plane of polarization identical with that of the source. The ratio of the light fluxes received by the two receivers are related to the transparency by a given function. The use of the ratio of the two light fluxes from a single source involves compensation of the effect of changes in the light flux and decreases in the sensitivity of the receivers so that the method can be used for the design of a photoelectric recorder of atmospheric transparency. (Author)

J0970

Dashkevich, L.L. and V.A. Markelov.

K VOPROSU OB IZMERENII NAKLONNOI PROZRACHNOSTI ATMOSFERY S RAZLICHNYKH VYSOT (MEASURING SLANT ATMOSPHERIC TRANSPARENCY FROM DIFFERENT HEIGHTS).

Trudy nauchno-issled. Inst. gidromet. Priborost. No. 18, 1968, p. 51-55.

Procedures of measurement by the method of equal angles from different heights proposed in the U.S.S.R. and abroad are described. The known method of determining slant transparency from various heights by slanting the plane in which lie the optical axes to the axis of the projector beam makes it possible to obtain information on the distribution of transparency with height in one vertical plane. The authors have, therefore, considered other solutions which are possible in obtaining the information from the height in the landing plane. The selection of one of the proposed variants is determined by operational-technical requirements with local conditions taken into account but they are distinguished by the fact that the measurement is made in the vertical plane along the glide. (Author)

J0980

Dashkevich, L.L. and V.A. Markelov.

ONEKOTORYKH PUTIAK OSOVERSHENSTVOVANI IA OPTICHESKOI SKHEMY USTANOVOK DLIA IZMERENIIA MDV PO OBRATNOMU SVETORASSEIANIIU (SOME WAYS OF IMPROVING THE OPTICAL ARRANGEMENT OF DEVICES FOR MEASURING THE METEOROLOGICAL VISIBILITY RANGE, BASED ON INVERSE LIGHT DISPERSION).

Trudy nauchno-issled. Inst. gidromet. Priborost. No. 20, 1968, p. 32-35.

To reduce the light flux issuing from the daytime sky, that is, to increase the signal-to-noise ratio, a black screen is set up (at some distance from the light source) fully obscuring the field of vision of the photoelectric receiver; but it should illuminate the screen. For increasing the effectiveness of the measurement base at a given distance to the screen, gratings may be used. These gratings, although they lower somewhat the level of the receiver signal, increase considerably the length of the sector of effectively used luminous volumes within the boundaries between the photoelectric receiver and the screen. In reducing the angle between the optical axis of the photoelectric receiver and the light source, i.e., in the case of maximum approximation to the measurement of inverse scattering, the gain from the grating increases.

J0990

Dashkevich, L.L. and V.A. Markelov.

SPOSOB OPREDELENIIA NAKLONNOI PROZRACHNOSTI ATMOSFERY PRI POMOSHCHI DVUKH ISTOCHNIKOV SVETA (METHOD OF DETERMINING THE SLANT ATMOSPHERIC VISIBILITY BY MEANS OF TWO LIGHT SOURCES).

Trudy nauchno-issled. Inst. gidromet. Priborost. No. 18, 1968, p. 56-60.

The known method of determining slant atmospheric transparency from the ratio of levels of signals of the photoelectric receivers oriented on the same point of the intermediate ray at an assigned height above ground level has a number of shortcomings. To eliminate these shortcomings and to increase the volume of information, the authors proposed a new method of determining transparency with 2 light sources. With successive emanation, the ratio of relative intensity of scattered signals characterizes the transparency of the entire layer of the atmosphere up to the secondary light source. Information on transparency at the height of the secondary light source is obtained from the known tidal transparency and the intensity of the scattered signal of one of the sources. (Author)

J1000
DeBacker, M.C.C.
VIDEOMETRY AND AIR TRANSPORT SAFETY.
Flight Saf. Vol. 3, Feb. 1970, p. 23-35.

Measurement of runway visual range (RVR) by means of a television camera with a highly sensitive lens. The process consists of beaconing by groups of three lights, the lights being placed 50 m apart up to a distance of 500 m, and thereafter 100 m apart up to 1200 m. The three lights in each group come on simultaneously. If the last light in a group is not visible on the television screen, i.e., if the observer cannot see more than two lights, an exact measurement of the RVR is obtained. The line of lights runs parallel to the runway and 75 m away from it. The system has been tried out with a Caravelle aircraft and in a fog tunnel, and results were highly satisfactory.
A70-24507

J1010
de Boer, J.B. and D. Vermeulen.
ON MEASURING THE VISIBILITY WITH MOTORCAR HEADLIGHTING.
Appl. sci. res. Vol. B2, No. 1, 1951, p. 1-32.

A special comparative investigation on visibility by motor-car headlights with American and European types of equipment. Numerous observations give interesting experimental characteristics of conditions of night visibility and physiological properties of the human eye. The influence of glare on visibility also was investigated with measurement of illumination (in luxes) of the observer's eyes. The results of experiments (containing numerous graphs) are important for meteorologists studying the problem of night visibility.

J1020
Descamps, V. J.
RUNWAY VISUAL RANGE, HOW IT WORKS.
Aerospace Science Review Vol. 69, No. 1, Apr. 1969, p. 11-13.

J1025
Dessens, H.
THE RELATION BETWEEN ABSORPTION BY THE ATMOSPHERE AND VISIBILITY.
C. r. hebd. Seanc. Acad. Sci., Paris, Vol. 218, Apr. 24, 1944, p. 685-687.

J1030
Dickson, Don R., et al.
COMPUTATION OF VISUAL RANGE IN FOG AND LOW CLOUDS.
Jnl. appl. Met. Vol. 2, No. 2, Apr. 1963, p. 281-285.

J1035
Dobson, G.M.B.
INTRODUCTORY PAPER. PART I. (B). THE GENERAL PROPERTIES AND BEHAVIOR OF DISPERSE SYSTEMS CONSISTING OF AQUEOUS AND OTHER VOLATILE PARTICLES, I.E., MIST, CLOUD, HYGROSCOPIC NUCLEI, TOWN AND COUNTRY FOGS.
Trans. Faraday Soc. Vol. 32, Aug. 1936, p. 1149-1152.

J1036
Dolezalek, Hans.
ATMOSPHERIC ELECTRIC FOG EFFECT.
Rev. Geophys. Vol. 1, No. 2, May 1963, p. 231-282.

Atmospheric electric parameters show significant variations in a period of hours before formation of fog becomes visible. The same is true for the dissipation of fog. Apparently the recording of the electric parameters yields a sensitive measure for condensation and evaporation processes in nature. In addition, the electric variations indicate the existence of processes in the transition time between clear weather and fog that are not yet understood. Thus an investigation of this atmospheric electric fog effect promises to increase our knowledge of the formation and dissipation of natural fogs. Of course, it also indicates a method for short range forecasting of these events. This review describes the discovery of the effect and the present experimental knowledge. Some attempted explanations are discussed, and are found to be insufficient. The fundamental possibilities for the explanation are treated in some detail, and material for further investigations is provided. (Author)

J1040
Dolukhanov, M. P.
O SOOTNOSHENII MEZHDU DAL'NOST'IU VIDIMOSTI I POGLOSHCHENIEM V TROPOSFERE (THE RELATION BETWEEN THE VISIBILITY RANGE AND ABSORPTION IN THE TROPOSPHERE).
Radiotekhnika, Kiev Vol. 8, May-June 1965, p. 363-366. In Russian.
Trans. into English in *Soviet Radio Engineering* Vol. 8, May-June 1965, p. 254-256.

Determination of the relation between the visibility range of a 100-watt incandescent lamp and the absorption coefficient in a fog. The visibility range is determined for various values of the absorption coefficient from an equation involving the known values of the radiated power of the lamp and the threshold illuminance required for visual perception by the human eye. The relation between the visibility range and the absorption coefficient is then obtained graphically.
A66-10223 #

J1050
Donati, S. and A. Sona.
OPTICAL RANGE GATING TO EXTEND VISIBILITY IN THE FOG.
Alta Freq. (Eng. ed.) Vol. 39, Feb. 1970, p. 202, 203.

Description of preliminary results of tests of the effectiveness of an optical range gating system. Optical range gating consists of a pulsed light source used in connection with a gated observation device, which can be switched on with a suitable delay in order to cut down the back-scattering of the first layers of fog. Photographs illustrate the improvement in visibility achievable with the range gating system.
A70-26719 #

J1060
Donchenko, V.A., M.V. Kabanov, B.A. Saveley, et al.
OB OBRATNOM RASSEIANII IZLUCHENIIA OKG V TUMANAKH I DYMAKH (BACKSCATTERING OF LASER RADIATION IN FOGS AND HAZES).
Izv. vyssh. ucheb. Zaved. Fiz. Vol. 1, No. 1, 1968, p. 158-159.
Trans. into English in *Soviet Physics Journal* Vol. 11, No. 1, 1968.

Laboratory investigation of the intensity of laser radiation reflected from two scattering media under conditions resembling those encountered in practice. Cloud-chamber results indicate that the intensity of radiation reflected from a fog layer is 1.4 times less than that of radiation reflected from a smoke layer, when the optical thickness of the scattering layer (τ) is 4.5, and is half the intensity of the radiation reflected from a smoke layer for τ = 5.5.
A68-22328#

J1070
Douglas, C.
VISIBILITY MEASUREMENT BY TRANSMISSOMETER.
Electronics Vol. 20, No. 2, 1947, p. 106-109.

J1075
Douglas, C.K.M.
SMOKE AND VISIBILITY
Q. Jl. R. Met. Soc. Vol. 58, Jan. 1932, p. 16.

J1080
Dovgiallo, E. N.
CONNECTION BETWEEN RANGE OF VISIBILITY AND METEOROLOGICAL CONDITIONS.
Trudy glav. geofiz. Obs., Len. No. 109, 1961. In Russian.

J1084
Dovgiallo, E. N.
DAL'NOST' VIDIMOSTI PRI RAZLICHNYKH METEOROLOGICHESKIKH IAVLENIIAKH (VISIBILITY RANGE IN THE PRESENCE OF VARIOUS METEOROLOGICAL PHENOMENA).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p.93-101.

Application of a local statistical study of atmospheric transparency to the determination of the recurrence interval of various gradations in the meteorological visibility range in conditions of fog, haze, snowfall, snow storms, rain, and drizzle. It is found that the visibility is impaired most by fog, snow storms, and rainfall, in this order.
A65-18576 #

J1086
Dovgiallo, E.N.
IZMENCHIVOST' PROZRACHNOSTI ATMOSFERY PRI OBRAZOVANII I RASSEIANII TUMANA (VARIABILITY OF ATMOSPHERIC TRANSPARENCY DURING THE FORMATION AND DISPERSION OF FOG).
Trudy glav. geofiz. Obs., Len. No. 184, 1966, p. 41-43.

Results of a study of fogs recorded at Voeikovo during Dec. 1956 to April 1962 are shown in a set of curves for slow and rapid formation and dissipation of fog, all of which can be expressed analytically by

$$b_s(\tau) = a\tau^{\alpha},$$

where

$$b_s(\tau) = [b_s(\tau + t) - b_s(\tau)]^2$$

is the time structural function of visibility. The values of a, α and σ^2 are tabulated for rapid and slow formation and dissipation. It is concluded that change in transparency both during formation and dissipation of fog strictly follows the stated power law.
(MGA)

J1090
Dovgiallo, E. N.
O SUTOCHNOM KHODE METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI (DIURNAL VARIATION OF METEOROLOGICAL VISIBILITY).
Trudy glav. geofiz. Obs., Len. No. 169, 1965, p. 22-30.

The daily variation of the meteorological distance of visibility is investigated on the basis of experimental material obtained in connection with the operation of M-37 transparency recorder at the Kizpole Poligon meteorological station. With the aid of graphs, the author discovers the variation of meteorological distance of visibility with various weather conditions, with relative humidity, with haze, etc. The characteristic features of the daily variation of the probability of low degrees of meteorological visibility distance are presented. The total probability of low visibility has the same daily variations as relative humidity. A high probability of low degree of visibility during overcast weather is not associated with cloud cover but with increased humidity on such days.

J1094
Dovgiallo, E. N.
PROZRACHNOST' ATMOSFERY V GORIZONTAL'NOM I VERTIKAL'NOM NAPRAVLENIIAKH (ATMOSPHERIC TRANSPARENCY HORIZONTALLY AND VERTICALLY).
Trudy glav. geofiz. Obs., Len. No. 169, 1965, p. 31-35.

Vertical and horizontal coefficients of attenuation of light in Voeikovo obtained from data of simultaneous observations are compared. It is demonstrated that the transparency of the entire atmosphere and the transparency of the horizontal layer near the surface of the Earth possess an opposite daily and annual variation. The transparency of the entire atmosphere has an annual and daily variation that is opposite to that of the absolute humidity; the horizontal transparency is more sensitive to variations of relative humidity. The annual and daily variation of transparency of the atmospheric layer near the surface of the Earth is opposite to the variation of relative humidity. (Author)

J1096
Dovgiallo, E. N.
SUTOCHNYI I GODOVOI KHOD METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI (DIURNAL AND ANNUAL VARIATIONS OF METEOROLOGICAL VISIBILITY).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 80-88.

Presentation of the results of statistical processing of tapes made by an atmospheric-transparency recorder in continuous operation over a period of 10 years. The obtained annual and diurnal probability variations of various gradations in visibility are presented in the form of diagrams.
A65-18574 #

J1100
Dovgiallo, E. N.
SUTOCHNYI I GODOVOI KHOD VEROIATNOSTI DAL'NOSTI VIDIMOSTI MEN'SHE 10 KM (DIURNAL AND ANNUAL VARIATION OF THE PROBABILITY OF A VISIBILITY RANGE OF LESS THAN 10 KM).
Trudy glav. geofiz. Obs., Len. No. 184, 1966, p. 44-47.
Trans. into English. FTD-HT-23-269-68

Horizontal visibility of the atmospheric layer near the ground is subject to daily and yearly fluctuations. The author utilized visibility data from geographic points with widely differing climatic conditions: Alma-Ata, Kiev, Batumi, Karadag, Tashkent, Sverdlovsk, Murmansk, Vladivostok, Petropavlovsk-Kamchatskiy, and Yuzhno-Kuril'sk. The fluctuations of visibility in all the locations were similar, the highest visibility being in the summer months. The relative humidity curves show the same trend. Daily visibility varied in a similar manner, the highest visibility being in the morning.
AD-679805

J1105
Dovgiallo, E.N.
VLIIANIE TERMICHESKOI KONVEKTSII NA KONTRAST ESTESTVENNYKH OB'EKTOV (EFFECT OF THERMAL CONVECTION ON THE CONTRAST OF NATURAL OBJECTS).
Trudy glav. geofiz. Obs., Len. No. 125, 1962, p. 88-91.

The author analyzes the results of observations on the visible contrast of natural objects observed during strongly developed thermal convection carried out in July—Aug. 1959 on Cape Pitsunde which extends far into the sea. The distance of visibility was determined by the formula $S_m = \frac{1.5L}{lgK_0 - logK}$, *where* S_m = *meteorological distance of visibility;* L = *distance to the object on which observations were made;* K_0 *and* K = *contrasts of the object with and without haze, respectively. It was found that the contrast of natural objects decreased with an increase in atmospheric inhomogeneity produced by thermal convection in the atmospheric layer near the ground. The variation in contrast was greater, the greater was the atmospheric layer with disorderly fluctuations of the coefficient of refraction between the observer and the object. Increase in wind velocity favored an increase in optical inhomogeneity of the layer and a weakening of the initial contrast. When natural objects were used as an orientation for determining meteorological distance of visibility, it was necessary to consider the possibility of distortion of contrast by a layer with increased turbulence.*
(MGA)

J1120
Dovgiallo, E. N. and N.M. Gorb.
K VOPROSU O SVIAZI VIDIMOSTI S NIZHNEI GRANITSEI OBLAKOV (THE RELATION BETWEEN THE VISIBILITY AND THE LOWER CLOUD BOUNDARY).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 89-92.

Investigation of the interrelation between the height of the lower cloud boundary (up to 1000 m), the horizontal meteorological visibility range, and the relative humidity near the Earth. The data used in the investigation are taken from pilot-balloon soundings and ground measurements of atmospheric transparency, obtained during the period 1956-1962. The results indicate that, except for a slight tendency of visibility to decrease with low cloud cover, there is essentially no correlation between the factors under investigation.
A65-18575#

J1124
Dow, J.S.
VISIBILITY BY WHITE AND COLORED LIGHT.
Light Ltg. Vol. 34, May 1941, p. 71.

J1126
Dow, J.S.
VISIBILITY BY WHITE AND COLORED LIGHT.
Trans. illum. Engng Soc., Lond. Vol. 6, Oct. 1941, p. 121-128.

J1128
Draper, G.H., and R.F. Haupt.
RANGE OF VISION.
Aero Dig. Vol. 43, July 1943, p. 473.

J1130
Driving, A. Ia.
THE STUDY OF OPTICAL AND PHYSICAL PROPERTIES OF NATURAL FOGS.
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Vol. 7, No. 2, 1943.
Trans. into English Army Biological Labs., Fort Detrick, Md. Trans-416.
N69-73569 AD-682907

J1140
Driving, A. Ia., N.V. Zolotavina, M.N. Polozova, et al.
STRATIFIKATSIIA ATMOSFERY I OBRAZOVANIE PRODUKTOV KONDENSATSII PO DANNYM PROZHEKTORNOGO ZONDIROVANIIA (ATMOSPHERIC STRATIFICATION AND THE FORMATION OF CONDENSATION PRODUCTS ACCORDING TO DATA FROM SEARCHLIGHT SOUNDINGS).
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 5, 1958, p. 613-624.
Trans. into English in *Bulletin of the Academy of Sciences USSR, Geophysics Series* No. 5, 1958.

Searchlight soundings of the atmosphere in polarized light carried out in the Moscow Oblast are compared with aerological data and weather maps. The results of the optical soundings indicate the following: when the maps of baric topography show in the region of sounding, the presence of a marked center of high pressure with a rather intense cyclone to the north or southeast of it and when the thermoisopleths show vertical cooling over the point of observation, the soundings reveal the presence of aerosol in the troposphere and stratosphere. When these meteorological conditions are absent the thermoisopleths are different; they do not show cooling vertically and sounding does not disclose either strongly scattering haze or aerosol layers. In such cases the intensity of light scattering gradually diminishes and is the result of diffusion by aerosol with a radius less than 0.1μ, as well as by molecules. When the presence of aerosol in the stratosphere at the moment of sounding is well correlated with vertical cooling in the entire layer the aerosol is primarily a product of condensation. The condensation products in the stratosphere at heights of 14 to 23 km in these cases consist of water droplets with the predominant size of 1.5μ regardless of the latitude of the place of observation.

J1145
Duclaux, J.
TRANSMISSION OF LIGHT THROUGH THE ATMOSPHERE.
J. Phys. Radium, Paris S.7 Vol. 6, Feb. 1935, p. 49-51.

J1150
Dunbar, C.
FUNDAMENTAL PRINCIPLES OF METERS USED TO MEASURE VISIBILITY.
Illuminating Engineering Society of London, Transactions Vol. 5, 1940.

J1152
Duntley, S.Q.
CONTRAST REDUCTION BY THE ATMOSPHERE ALONG INCLINED PATHS OF SIGHT (Abstract).
J. opt. Soc. Am. Vol. 36, Dec. 1946, p. 713.

In an earlier paper it was shown that the apparent contrast of an object viewed against the horizon sky varies exponentially with distance. The same law can be shown to hold in the case of an object viewed along an inclined path of sight, provided distance is measured in terms of the equivalent optical path in a homogeneous atmosphere and contrast is properly defined. A method has been evolved for dealing with an atmosphere comprised of dissimilar strata. The nomographic visibility charts described in an earlier paper can be used for problems involving inclined paths of sight. (Author)

J1154
Duntley, S.Q.
THE MEASUREMENT OF METEOROLOGICAL RANGE.
J. opt. Soc. Am. Vol. 37, Dec. 1947, p. 994-995.

Nomographic charts for predicting the visibility of distant objects were described by the author in an earlier paper. Each of these charts contains a scale of meteorological range, a measure of the limitation on visibility imposed by the atmosphere. Meteorological range has been defined as that horizontal distance within an optically homogeneous atmosphere for which the contrast transmittance is two percent. The determination of meteorological range can be accomplished either from visual observations or from photometric measurements. For example, the commonly used method for estimating "visibility" in terms of the most distant dark object visible against the horizon sky can, by means of the nomographic charts, be used to determine the meteorological range. A photometric measurement of the apparent contrast of any distant dark object also enables the meteorological range to be calculated. In general, observational methods yield low precision and are sometimes impracticable while photometric procedures, visual or photoelectric, offer higher precision but may suffer from sampling errors. Automatic recording of the meteorological range by photoelectric photometers may sometimes minimize the sampling errors by enabling a time average to be made by inspection. Time averaging indicators may also be used for this purpose. Methods for the photometric measurement of meteorological range include: (1) the measurement of apparent contrast, (2) the measurement of apparent luminance difference, and (3) the measurement of space light. A survey of the advantages, the disadvantages, and the precision requirements of these three types of photometric procedures has been made. (Author)

J1155
Duntley, S.Q.
THE MEASUREMENT OF METEOROLOGICAL RANGE IN WATER
J. opt. Soc. Am. Vol. 39, July 1949, p. 630.

Experimental studies of the reduction of apparent contrast by water have suggested that the vision-restricting properties of water can usefully be described in terms of meteorological range, i.e., in terms of that horizontal distance through optically homogeneous water for which the contrast transmittance is two percent. The measurement of meteorological range in water involves problems closely analogous to those encountered in measuring the meteorological range in air. A new technique for measuring meteorological range by the space-light method has been devised. Both visual and photoelectric instruments of the new type have been built and used in air, and the requirements for similar devices for use under water have been explored. This work has been supported by the ONR. (Author)

J1160
Duntley, S. Q.
THE REDUCTION OF APPARENT CONTRAST BY THE ATMOSPHERE.
J. opt. Soc. Am. Vol. 38, No. 2, Feb. 1948, p. 179-191.

A comprehensive, theoretical study. Special values were derived for the cases of visibility upward visibility downward and horizontal visibility. On the basis of these conclusions, experimental observations under different sky and ground conditions were also carried out.

J1162
Duntley, S. Q.
THE VISIBILITY OF DISTANT OBJECTS.
J. opt. Soc. Am. Vol. 38, Mar. 1948, p. 237-249.

For thousands of years, thousands of mariners have sighted thousands of ships, and have made appropriate entries in their logs. Even so, this mass of miscellaneous information is of little use in predicting the range at which a specified object will be just visible under a new set of circumstances. The purpose of this paper is to identify the principal factors involved in the visibility of an object, to indicate how each factor affects the range of visibility, and to supply charts which, by combining these factors, enable the limiting range to be found under any set of prevailing conditions. (This paragraph has been lifted, almost verbatim, from some material prepared during the war by Professor Arthur C. Hardy, then Chief of the Camouflage Section (16.3) of the NDRC.)

J1163
Duntley, S. Q.
THE VISIBILITY OF OBJECTS SEEN THROUGH THE ATMOSPHERE (Abstract).
J. opt. Soc. Am. Vol. 36, June 1946, p. 359.

The limiting range at which a uniformly bright (or dark) object is visible depends upon the apparent contrast between the object and its background, the angular size of the object, its shape, and the perceptual capacity of the observer at the level of brightness to which his eyes are adapted. Both the apparent contrast and the angular size of any object depend upon its distance from the observer, but in accordance with different laws. Because the perceptual capacity of a human observer depends simultaneously upon both of these quantities, any calculation intended to determine the range at which an object can just be sighted has hitherto required a series of successive approximations. A simple nomograph chart has been devised which provides, for the first time, a practical means for combining laboratory data on the perceptual capacity of the human eye with physical data on the optical properties of the atmosphere in such a manner that the limiting range of the object can be readily predicted. The use of nomographic charts in this connection was first suggested by Professor Arthur C. Hardy, and the ultimate form was worked out with the assistance of Professor Raymond D. Douglas. This work was done under the auspices of the Camouflage Section of the N.D.R.C. (Author)

J1170
Duntley, Seibert Q., et al.
VISIBILITY
Appl. Optics Vol. 3, No. 5, May 1964, p. 549-598.

This article provides samples of the data needed for visibility calculations and illustrates their use. Topics included are: Optical Properties of Objects and Backgrounds; Use of Visual Performance Data in Visibility Prediction; Ocular Behavior in Visual Search; Atmospheric Properties; Water Properties; Techniques of Measurement; Object Classification; Visual Search.

J1180
Duntley, S.Q., H. Culver, F. Richey, et al.
REDUCTION OF CONTRAST BY ATMOSPHERIC BOIL.
J. opt. Soc. Am. Vol. 53, No. 3, March 1963, p. 351-358.

It is shown that the probability of receiving light from an object viewed through a turbulent atmosphere follows a normal Gaussian distribution. Furthermore the root-mean-square angular deflection of the points of any object will be proportional to the square root of the object-to-observer distance. From relations of the type described in the examples it is possible to predict the apparent contrast throughout a scene, provided the inherent contrast distribution, the optical air state, and the range of the target are known. The optical air state for a given condition of atmosphere can be measured by using a telephotometer and a series of long thin black bars of varying widths. (Author)

J1190
Durisic, R.
RANGE OF LIGHTS, ITS DETERMINING AND INSERTION ON CHARTS.
Hidrogr. Godisn. 1967, p. 79-97. In Russian.

J1200
Eggleton, A.E.J.
THE CHEMICAL COMPOSITION OF ATMOSPHERIC AEROSOLS ON TEES-SIDE AND ITS RELATION TO VISIBILITY.
Atmos. environ. Vol. 3, No. 3, 1969, p. 355-372.

J1210
Eldridge, Ralph G.
CLIMATIC VISIBILITIES OF THE UNITED STATES.
Jnl. appl. Met. Vol. 5, No. 3, 1966, p. 277-282.

Climatological visibility data for 53 sites is used to evolve seasonal visibility maps of the U.S. The analysis is presented in the form of cumulative visibility frequency distribution maps. A brief discussion of their use and limitations to describe atmospheric opacity is included. (Author)

J1220
Eldridge, Ralph G.
COMPARISON OF COMPUTED AND EXPERIMENTAL SPECTRAL TRANSMISSION THROUGH HAZE.
Appl. Optics Vol. 6, No. 5, 1967, p. 929-933.

Spectral transmissions through haze are computed using meteorological observations to specify aerosol scattering and water vapor, carbon dioxide, and ozone absorption. The computed spectral transmissions are compared with the appropriate experimental transmissions to evaluate the degree to which a natural spectral transmission can be simulated by a computed spectral transmission. The comparison indicates that the dominant atmospheric attenuating parameter is the absolute distribution of aerosols. (Author)

J1230
Eldridge, Ralph G.
MIST, THE TRANSITION FROM HAZE TO FOG.
Bull. Am. met. Soc. Vol. 50, No. 6, June 1969, p. 422-426.

The transition from haze to fog is manifest by the occurrence of dissimilar optical phenomena which are a consequence of a change in the aerosol distribution of the scattering medium. Based on these effects, visibilities between 0.5 and 1 Km are properly called mist. Visibilities in excess of 1 Km are, generally, characteristicsof haze; whereas, fog is limited to visibilities less than 0.5 Km. (Author)

J1240
Eldridge, Ralph G.
THE RELATIONSHIP BETWEEN VISIBILITY AND LIQUID WATER CONTENT IN FOG.
Jrnl Atmos. Sci. Vol. 28, Oct. 1971, p. 1183-1186.

An analytical technique employing a fog drop-size distribution model is used to demonstrate the importance of the width of measured drop-size distributions when evolving a visibility-liquid water content relationship. Consistency is achieved between two apparently different visibility-liquid water content curves generated from two sets of fog drop-size distributions by considering the difference in the size range of the droplets in the distributions.
A72-11281#

J1250
Eldridge, Ralph G. and J. C. Johnson.
DIFFUSE TRANSMISSION THROUGH REAL ATMOSPHERE.
J. opt. Soc. Am. Vol. 47, No. 7, July 1958, p. 463-468.

Diffuse transmissions through atmospheres of haze and clouds were measured over slant ranges from 0.5 to 9.0 kilometers. The modification of the transmissions when the source was near a diffusely reflecting surface was also measured. The transmissions are presented as curves representing the least squares fit to the experimental data for general weather conditions. (Author)

J1260
Elterman, L.
RELATIONSHIP BETWEEN VERTICAL ATTENUATION AND SURFACE METEOROLOGICAL RANGE.
Appl. Optics Vol. 9, No. 8, Aug. 1970, p. 1804-10.

An examination of the haze regime, used in the sense of diminished surface meteorological range, shows that the lower and upper limits can be defined by meteorological ranges 1.2 km and 15 km, respectively. In order to develop relationships between surface haze and vertical attenuation, eight meteorological ranges are selected from within these limits; then, vertical aerosol attenuation parameters are computed by deriving an aerosol scale height for each meteorological range. A sample tabulation for one of twenty wavelengths in the uv, visible, and ir is presented and combined with previously published attenuation parameters (aerosols, molecules, and ozone) to the 50-km altitude. (Author)

J1270
Essenwanger, Oskar.
CORRELATION OF WIND DIRECTION OBSERVATIONS AND OTHER SURFACE ELEMENTS.
Geofis. pura appl. Vol. 51, Jan./Apr. 1962, p. 251-290.

Many tabulations of climatological data present the distribution of specified elements with wind direction. It is shown that statistical characteristics expressing the relationship between cloud cover or visibility and wind direction can be computed with meaningful meteorological interpretation. The U.S. Navy Summaries of Monthly Aerological Records (SMAR) are used. Several distribution characteristics are suggested and the method of computing is discussed with samples given. The linear correlation coefficient r_{yx} *between cloud cover or visibility classes and wind directions seems to be a fairly good characteristic but because of the nonlinearity of the relationship, the correlation* n_{yx} *is more efficient. Climatological features may also be studied by the linear correlation coefficient* R_{yx}*, which expresses the unweighted relation between cloud cover (visibility) classes and wind direction. The mathematical formulation of the relationship by polynomials indicates that higher order terms affect the functional connection. (Author).*

J1280
Ettinger, J. and George W. Royer.
VISIBILITY AND MASS CONCENTRATION IN A NON-URBAN ENVIRONMENT.
J. Air Pollut, Control Ass. Vol. 22, No. 2, Feb. 1972, p. 108-111.

J1290
Evans, E., C.J.M. Aanensen and T. E. Williams.
DETERIORATION OF VISIBILITY IN RADIATION FOG.
Met. Mag., Lond. Vol. 87, No. 1028, p. 33-35.

J1295
Evans, T.P.
VISIBILITY AT SEA.
Q. Jl. R. Met. Soc.. Vol. 59, July 1933, p. 237.

J1300
Evans, W.E. and R.T.H. Collis.
METEOROLOGICAL APPLICATIONS OF LIDAR.
SPIE Journal Vol. 8, Jan. 1970, p. 38-45.

Conventional microwave radar is used extensively by meteorologists in locating and tracking percipitating storms, and to some extent, by cloud physicists in determining physical characteristics of dense cloud. The more recent availability of highly collimated, nearly monochromatic, short-pulse light beams from laser sources makes it possible to use the radar technique for remote detection and measurement of minute concentrations of very small particles, down to those having dimensions on the order of the wavelength of light. This paper discusses the capabilities and limitations of the lidar technique, describes a sampling of the variety of meteorological applications that have been investigated experimentally to date, and attempts some conjecture on the probable direction of future research and application. Subjects covered include measurements of upper-atmosphere molecular density, structure and screening effects of tenuous cirrus clouds, tracking of atmospheric pollutants, single-ended measurements of visibility, remote measurement of smoke-plume opacity, and investigation of turbulence phenomena. The extremely high data rates resulting from the excellent spatial and temporal resolution capabilities of the lidar give rise to interesting problems in data storage and display, not all of which have been solved satisfactorily. These instrumentation aspects will be emphasized. (Author)

A70-23066

J1310
Fass, V.A.
INVESTIGATION OF VISIBILITY IN ATMOSPHERE HAVING HIGH TURBIDITY.
Met. gidrol. No. 6, 1941.

J1320
Fasso, Guy and Guy Leclere.
ESSAIS A LA PLUIE DANS LA GRANDE SOUFFLERIE DE MODANE (RAIN-TESTING IN THE LARGE WIND-TUNNEL OF THE O.N.E.R.A. TEST-CENTER OF MODANE).
Rech. aerospat. July-Aug. 1965, p. 15-23.

Description of the working principle, the construction and the calibration of a system supplying artificial rain. To study the effect of rain on the visibility through the windshield of an aircraft, a system supplying artificial rain has been designed and built. Its domain of application is defined: study on the full-scale model of the forward part of an aircraft, including its windshield and its accessories, of the effect of various types of rain and of the efficiency of different rain removal devices or wipers in an airstream reaching 150 m/sec and at various angles-of-attack (up to 15°) and of sideslip (up to 10°). Observations (by an experimenter seated and equipped like the pilot) on the visibility of various reference marks placed in the wind-tunnel are noted, recorded and completed by several physical measurements and by cinematographic recording. (Author).
A66-11204

J1330
Fenn, Robert W.
CORRELATION BETWEEN ATMOSPHERIC BACKSCATTERING AND METEOROLOGICAL VISUAL RANGE.
Appl. Optics Vol. 5, No. 2, Feb. 1966, p. 293-295.

On the basis of our present knowledge of the distribution of natural haze particles in the atmosphere, the relation between backscatter intensity and the visual range, or the extinction coefficient, has been analyzed. It can be shown that the various processes which cause the changes in visibility (increasing particle number, changes in particle size distribution, etc.) result in rather different backscatter conditions. Only by a combination of such processes is it possible to explain a relation between backscatter and extinction coefficient as it can be derived from experimental data. It therefore becomes clear that such a relation cannot be a unique one and that it will change from one situation to another. (Author)

J1340
Fesenkov, V.G.
K VOPROSU O GORIZONTALNOI VIDIMOSTI (CONTRIBUTION TO THE PROBLEM OF HORIZONTAL VISIBILITY).
Astr. Zh. Vol. 23, No. 2, 1946, p. 111-122.
A theoretical investigation in which the author describes the methods used to measure visibility in the air layer near the ground. These methods are based on observation of brightness of a single screen and sky near horizon or of two identical screens, but at different distances from the observer.

J1345
Fesenkov, G.V.
ON THE CONDITIONS OF VISIBILITY OF NOCTILUCENT CLOUDS.
Meteorologicheskie Issledovaniia 1966, p. 26-29. In Russian.

The trajectories of light rays in polar coordinates as well as the corresponding indices of refraction and refraction angles are calculated with the help of electronic machines according to the author's formulas. The results are given in the tables presenting light trajectories within the whole interval of altitudes of the closest approach, namely from 10 to 60 km every 2 km. One can consider that the atmospheric layers within the altitude of 10 km, that is in the region of the troposphere, are in fact opaque to the passing horizontal rays; on the other hand, the rays passing at the altitude of more than 40-50 km do not experience a noticeable refraction or absorption. (Author)
N67-28024#

J1350
Fesenkov, V.G.
OPYT ISSLEDOVANIIA OPTICHESKIKH SVOISTV VOZDUKHA FOTOMETRICHESKIM PUTEM (AN ATTEMPT AT A PHOTOMETRIC INVESTIGATION OF THE OPTICAL PROPERTIES OF THE AIR).
Zh. Geofiz. Vol. 4, No. 2, 1934, p. 143-164.

A special surface photometer was constructed to measure the scattering capacity of the optical properties of the air. The author develops the theory and methods of observation and presents a general formula for calculating atmospheric visibility.

J1360
Fett, W.
VISUAL RANGE AND ATMOSPHERIC AEROSOLS IN BERLIN-DAHLEM.
Beitr. Phys. Atmos. Vol. 40, No. 4, 1967, p. 262-278.

J1370
Fimpel, H.P., H.G. Muller, and G.H. Ruppersberg.
MESSUNGEN DER NORMSICHTWEITE MIT EINEM STREULICHTSCHREIBER WAEHREND DER ATLANTISCHEN EXPEDITION 1965 "METEOR" (MEASUREMENTS OF STANDARD VISIBILITY USING A SCATTERED LIGHT RECORDER DURING THE "METEOR" ATLANTIC EXPEDITION 1965).
Meteor. forsch. ergebn., B. No. 2, 1968, p. 35-36.

During the "Meteor" Atlantic Expedition, 1965, the standard visibility was measured aboard with an AEG/FFM-Scattered Light Recorder. The working principle, technique, and accuracy of this instrument are described. Some empirical results are discussed, e.g., the errors from the disturbing influences of the ship and those caused by contamination of the lenses. The measured values are compared to estimated values of visibility by eye-observation. For certain periods with uniform atmospheric conditions, hourly mean values of visibility were correlated with air temperature, humidity, and wind. The visibility shows a rather weak daily period for pure oceanic aerosol, whereas about 100 mi off the African coast, the period appeared more pronounced. Interesting differences were found in the relative changes of visibility for different origins of the aerosol. This results in a dependence of visibility on the wavelength of scattered radiation. (Author)

J1380
Fisher, G.H.
SIZES OF RETINAL IMAGES FORMED BY DISTANT OBJECTS.
Nature, Lond. Vol. 221, 1969, p. 584-586.

In popular discussion the analogy is frequently drawn between the structure of the human eye and the mechanism of a camera. These two optical systems bear a superficial resemblance because, in each case, light rays reflected from distant objects enter an iris-diaphragm before actuating a photo-sensitive surface. Important examples of the many cues available for recognizing features of the immediate environment indicate variation in the sizes of objects in accordance with their locations in depth. Thus when considering the ability of human beings to perceive stimuli present in the field of vision, it is necessary to determine the sizes of the images formed on the retina of the eye. The author suggests here that the assumptions involved in conventional methods for determining the sizes of retinal images are not entirely satisfactory. (Author)

J1390
Foitzik, Leonhard.
BESTIMMUNG DER SCHRAEGSICHT NACH EINER KOMPONENTENMETHODE (DETERMINATION OF SLANT VISIBILITY ACCORDING TO A COMPONENT METHOD).
Beitr. Phys. Atmos. Vol. 33, Nos. 1-2, 1960, p. 28-35.

The slant visual range near the ground which is of interest to a landing airplane can be derived from the normal visual range at the ground and from its vertical gradient if idealized conditions are assumed. An equation is developed for the landing-visual-range and its dependence on altitude. Further, it is investigated how conclusions concerning the slant visual range can be drawn from transmissometer records along an inclined line. It can be shown that the visual range recorded by the inclined transmissometer is identical with the landing-normal-visual-range for the height above the ground at which the opposite station (triple mirrors array) of the transmissometer is situated. For other values of the altitude a nomogram can be used. (Author)

J1400
Foitzik, Leonhard.
CONCERNING MEASUREMENT AND RECORDING OF NORMAL METEOROLOGICAL RANGE OF VISIBILITY.
Feingeraete-Tech. No. 1, 1955.

J1410
Foitzik, Leonhard.
DIE METEOROLOGISCHE SICHTWEITE, IHRE MESSUNG UND IHRE REGISTRIERUNG (METEOROLOGICAL VISIBILITY, ITS MEASUREMENT AND RECORDING).
Wiss. Annln. dt. Akad. Wiss. Berl. Vol. 2, No. 7, July 1953, p. 418-425.

A review of objective visibility meters used in West and East Germany, the British Commonwealth, United States and the U.S.S.R. The main deficiency of visibility meters (working with artificial light) is that the influence of daylight cannot be completely eliminated. The author developed a high precision recording visibility meter working with modulated light. The photometric comparison is made by one photo cell. The basic principles are explained, a photo of the mechanical parts is given and registration curves are presented.

J1420
Foitzik, Leonhard.
EIN NEUER SICHTMESSER (A NEW VISIBILITY METER).
Met. Z. Vol. 50, No. 12, Dec. 1933, p. 473-474.

Description of a visibility meter constructed by Zeiss and based on a principle advanced by Koschmieder. Turbidity and visibility are determined by photometric measurements of the brightness of objects located at a distance from 100 m to 1000 m.

J1425
Foitzik, Leonhard.
ON THE SPECTRAL TRANSPARENCY OF NATURAL FOG.
Met. Z. Vol. 52, 1936, p. 458-460.

J1430
Foitzik, Leonhard.
PROBLEMS AND RESULTS OF VISIBILITY RESEARCH.
Z. Met. Vol. 12, No. 4/6, Apr./June 1958, p. 154-157.

In the general treatment of the visibility problem, the condition $K=\epsilon$ (where K=brightness contrast and ϵ=contrast threshold of the eye) gives rise to two fundamental research problems. One is concerned with the brightness contrast, K, between visibility target and surroundings and the other with the contrast threshold of the eye and its dependence upon different factors. A third task is the fulfillment of $K=\epsilon$ in such a way as to render it practically applicable. The apparent contrast K—referred to the locus of the observer is a function of target distance l and inherent target contrast K_0—referred to the locus of the target. The functional dependence $K=K(l,K_0)$ is dependent upon extinction and scattering coefficient of light in the atmosphere. The treatment of visibility in haze and fog has led to the study of spectral light transmission and spectral light extinction coefficients of the atmosphere. Experimentally determined anomalies were interpreted by Stratton and Houghton according to a theory of light extinction based upon Mie's theory of light scattering by dielectric spheres of radius ρ as a function of wave length λ. Studies on the dependence of the scattering function σ upon scattering angle γ in haze and fog led to numerical evaluations on the basis of Mie's theory, etc. New systematic laboratory investigations of $\epsilon(\zeta,\beta)$ where ζ=target angle and β= diminishing light density have been carried out. Data are available on the $\epsilon(\zeta,\beta)$ function for circular targets in the uniformly bright background and ϵ—values for targets of other shape can be reduced to these for circular targets by equating their surfaces. In connection with practical aspects of visibility, mention is made of visibility observations under nonideal conditions during twilight and at night; normal visibility values for particular application to special visibility distances, visibility of radiated or nonradiated atmospheric targets, etc. Other studies of the various aspects of visibility are mentioned briefly.

J1440
Foitzik, Leonhard
DIE REICHWETTE VON SCHEINWERFEN UNTER BERUECKSICHTIGUNG DER ATMOSPHAERISCHEN, OPTIS- UND PHYSIOLOGISCHEN EINFLUESE (RANGE OF SEARCHLIGHTS WITH REGARD TO ATMOSPHERIC, OPTICAL AND PHYSIOLOGICAL INFLUENCES).
Meteorologischer und Hydrologischer Dienst, Abhandlungen Vol. 2, No. 9, 1952, p. 1-77.

In this detailed study, the brightness of an illuminated object is divided into light reflected from the object and scattered light of beam. From brightness of the object and background the contrast is calculated and compared with threshold contrast of the eye for the same angle. The distance at which contrast and threshold are equal is the range. Intensity of light source is found to be less important than distance of observer from it. The range in a stratified hazy atmosphere is calculated, including a graphical determination of oblique vision. Finally, oblique vision of black objects by day and illuminated objects by night are compared. (Author)

J1450
Foitzik, Leonhard.
SICHTBEOBACHTUNG-SICHTMESSUNG (VISIBILITY OBSERVATION-MEASUREMENT).
Z. Met. Vol. 5, No. 1, Jan. 1951, p. 1-14.

Describes an experiment in determining visibility by day to an accuracy of at least 10% using about 50 objects classified into 8 sectors, 10 logarithmic intervals of distance, and 5 degrees of visibility. Visibility in km. is given by (distance of object) x (visibility factor). Selection of objects during 2 hours after sunset is examined (moonlit, moonless, cloudy). The meaning of visibility is considered with reference to 4 types of visibility meters but the use of natural objects is considered preferable except for limited horizons. At night photometry of lights is preferred. For continuous day and night work author advocates light-transmission apparatus over a few hundred meters. He gives examples of autographic 24-hour records on 4 selected days.

J1460
Foitzik, Leonard.
SICHTMESSGERAETE (APPARATUS FOR MEASURING VISIBILITY).
Annln Met., Hamburg Vol. 5, Nos. 7-12, 1952, p. 215-222.

Standard visibility is defined as the distance at which, in an atmosphere of uniform turbidity, the contrast between a black object of 1° angle with a cloudless sky is 2%. A meter for continuously recording this is described; it includes a beam of light which can be regulated, a reflector 250 m distant, a standard beam, a light-sensitive receiver and a recorder. Speciman records are shown; agreement with observed visibility is good by day, poor by night.

J1470
Foitzik, Leonhard.
THEORIE DER SCHRAEGSICHT (THEORY OF SLANT VISIBILITY).
Z. Met. Vol. 1, No. 6, 1947, p. 161-175.

An exhaustive study on dependence of visibility determination on physical (transparency of the air, reflective properties of object, brightness background) and physiological (state of observer, contrast threshold of the human eye, form of object, etc.) conditions. Numerous graphs, nomograms, equations and data of special observations illustrate this study.

J1480
Foitzik, Leonhard.
TRANSMISSION OF LIGHT IN THE VISIBLE SPECTRUM THROUGH A VERY TURBID ATMOSPHERE.
Wiss. Abh. Reichsamt WettDienst Vol. 4, No. 5, 1938. In German.

J1490
Foitzik, Leonhard.
UEBER DIE KONTRASTSCHWELLE DES AUGES IN BEZUG AUF DAS LICHTPROBLEM BEITRAEGE ZUR DEFINIERTEN BESTIMMUNG DER TAGESSICHTWEITE (THE CONTRAST THRESHOLD OF THE EYE IN RESPECT TO THE VISIBILITY PROBLEM: CONTRIBUTIONS TO THE ACCURATE DETERMINATION OF DAY-TIME VISIBILITY).
Meteorologischer Dienst, Abhandlungen Vol. 1, No. 8, 1951.

The author, who has been publishing valuable contributions to the knowledge of visibility factors since 1932, has in this monograph provided the most comprehensive treatment of the subject since Middleton's famous text (2nd ed. 1941) appeared. The present work is based on a multitude of observations made of the visibility of numerous specific dark colored objects such as church spires, towers, triangulation points or chimneys which make an angle of <1° with the eye. The objectives are grouped according to direction from observation point (Lindenberg) using 8 sectors of the compass, to distance (<100 m. to >50 km) and to whether the background is infinite, >2X distance of objective, or <2X distance of objective. In addition to the "Nadelziele", or pin point objectives, tabulated in the above fashion, there were numerous "Grossziele" or large objectives which could be seen with the eye and measured with a light meter. Observations were also tabulated according to time of day (08, 10, 12, 14, etc.) and according to observer (no significant difference in mean values of 4 observers). The relation between visibility s/N and the contrast threshold V and between the visibility of large and small objectives [plotted according to size (mean angle) vs. contrast threshold] is worked out in detail and discussed. The latter relationship is shown in comparison with curves made from data of Siedentopf, Schonwald and Scharonow. Dependence of contrast limit on illumination (light intensity) is investigated by means of an illumination meter and the results tested in the laboratory. The contrast limits of trees (forest objectives) are next determined by means of numerous observations under different solar angles, cloudiness conditions and colors of objectives. Many other relationships are studied, the last being the contrast threshold of the eye for various shapes of objects as determined in the laboratory. The conclusion is that for isolated objects, it makes no difference what the shape is (only the size or area of the surface is significant), but for objects resting on a base the contrast threshold is greater if a large base is used than for a small base, and in any case is greater than for free objects. Actual details of observations, made at 4 times of the day during Aug.-Nov. 1947, are given in the appendix.

J1500
Foitzik, Leonhard.
ZUR METEOROLOGISCHEN OPTIK VON DUNST UND NEBEL. TEIL II. (ON THE METEOROLOGICAL OPTICS OF HAZE AND FOG II).
Z. Met. Vol. 4, No. 11, Nov. 1950, p. 321-329.

In Pt. II the distribution of drop size is considered. In natural fogs the range of drop radius is very variable but all can be expressed by the normal survey=e—A(log p/r)^2, where y=relative frequency, p=radius, r most frequent radius and A in North Sea varies from 15 to 50, mean 27. The inference is that all nuclei are not equally effective and this is confirmed by experiments with a cloud chamber with different degrees of dilatation. The Stratton-Houghton function for loss of light with drops of equal radius (Pt. I) is recalculated for the drop size distribution.

J1510
Foitzik, Leonhard and Helmut Zschaeck.
MESSUNGEN DER SPEKTRALEN ZERSTREUUNGSFUNKTIEN BODENNAHER LUFT BEI GUTER SICHT, DUNST UND NEBEL (MEASUREMENTS OF THE SPECTRAL SCATTERING FUNCTION OF THE AIR NEAR THE GROUND BY GOOD VISIBILITY, SMOKE AND FOG).
Z. Met. Vol. 7, No. 1, Jan. 1953, p. 1-19.

Measurements of the scattering function made by means of a 150 cm parabolic mirror and a mercury high pressure lamp for three spectral intervals at different turbidities show a good correlation with visibility. The scattering function can be characterized by means of the "direction ratio" between the forward and back scattering. Mean scattering function given for green and yellow, as well as data for the dependence of the direction ratio and the extinction exponent dependent on temperature, relative humidity, wind and air mass.

J1520
Foskarino, T.G.
MICROPHYSICS OF MARITIME FOGS.
Met. gidrol. No. 4, 1969, p. 44-48. In Russian.

J1530
Fox, Robert J.
NEW WEATHER SENSOR? LIGHT AMPLIFICATION STIMULATED EMISSION RADIATION.
The MAC Flyer Vol. 15, No. 11, Nov. 1968, p. 24-26.

The author presents his views on the possible uses of laser radar (lidar) to improve the weather service. The two basic ways to solve visibility problems are based on (1) reflected returns from smoke or fog and (2) the use of a standard set of reflectors positioned at various distances along the runway. Lidar is being evaluated as a visibility measurement system.

J1540
Frankenberger, Ernst.
BEZIEHUNGEN ZWISCHEN DER NORMSICHTWEITE UND DER RELATIVEN FEUCHTE NACH MESSUNGEN IN QUICKBORN (RELATIONSHIPS BETWEEN STANDARD VISIBILITY AND RELATIVE HUMIDITY ACCORDING TO MEASUREMENTS IN QUICKBORN).
Beitr. Phys. Atmos. Vol. 37, Nos. 3-4, 1964, p. 183-196.

The visibility is dependent on the size and the nature of the aerosol particles and on their quantity. In meteorological conditions with subadiabatic temperature stratification and low wind velocity the quantity of the particles per ccm. variates only very slowly and the variations of visibility are mainly caused by the variations of the particle size, which occur if the relative humidity grows or diminishes. Therefore the rates of the relative visibility variation per percent relative humidity are more useful for the visibility prognosis than the mean relations between the relative humidity and the visibility. This publication reports on the instruments, which have been used, on the statistical derivation of the rates mentioned before and on the visibility at Quickborn during December 1963 and January 1964. (Author)

J1550
Fraser, Robert S.
APPARENT CONTRAST OF OBJECTS ON THE EARTH'S SURFACE AS SEEN FROM ABOVE THE EARTH'S ATMOSPHERE.
J. opt. Soc. Am. Vol. 54, No. 3, Mar. 1964, p. 289-300.

The apparent contrast of objects lying on the surface of the earth, when observed in the visible spectrum from above the earth's atmosphere, is calculated for three model atmospheres. The earth is illuminated by sunlight, and light is reflected from the earth's surface according to Lambert's law. The apparent contrast increases with increasing wavelength. The apparent contrast is lower when aerosols are in the atmosphere, than when the atmosphere is free of aerosols. The apparent contrast can be enhanced significantly, if the albedo of the object space is low, when an analyzer, such as a piece of Polaroid, is used in the optical system of the receiver. (Author)

J1555
Freeman, G. A.
KRYPTON LAMP FOR ALL-WEATHER LANDINGS.
Westinghouse Engr. Vol. 8, May 1948, p. 90-91.

J1560
Freeman, M.H.
STATISTICALLY BASED GRAPHICAL TECHNIQUE OF OBJECTIVE FORECASTING.
The Statistician Vol. 15, No. 2, 1965, p. 157-165.

The described method, which was developed using rigorous statistical methods, the computations being done on a Ferranti Mercury computer, was derived from that used by Thompson and described by Glahn (1965). The difficulty encountered with Thompson's technique was overcome by rearranging the material in an ingenious way to produce a composite diagram. This diagram is shown and its use is described and demonstrated. The problem chosen for investigation during the development of the technique was visibility at London Airport. The statistical techniques employed in the investigation are described. Tabulated standard errors and correlation coefficients between observed and predicted visibilities show that London Airport's subjective forecast for 0900 GMT was better than the objective forecast. For the other hours, and particularly 2100 GMT, the objective forecasts were better. The objective forecasting diagrams remained in use at London Airport as an aid to the forecaster. Further applications of the technique are briefly referred to and in conclusion the author states that this graphical technique of objective prediction is suited to a great variety of applications, and its usefulness is not confined to meteorology.

J1570
Fremming, Ornulf.
AN INVESTIGATION OF THE HORIZONTAL VISIBILITY UNDER LOW CLOUDS IN ORDER TO OBTAIN RESULTS THAT CAN BE OF PRACTICAL USE IN THE AIR TRAFFIC.
Metr. Annr, Oslo Vol. 4, No. 15, 1959, p. 401-430.

J1580
Frungel, Frank
AUTOMATIC FOG WARNING EQUIPMENT USING SUB-MICROSECOND LIGHT PULSES.
Bull. Am. met. Soc. Vol. 45, No. 9, Sept. 1964, p. 597-600.

To overcome the shortcomings of the transmissometers Fog Detectors II and III have been developed. These instruments are described and schematic diagrams of each system are presented.

J1590
Frungel, Frank.
EIN IMPULSOPTISCHES TRANSMISSOMETER FUER REGISTRIERUNG DER NORMSICHTWEITE ZWISCHEN ETWA 40 M UND UNENDLICHE ZAHL (VIDEOGRAPH) (OPTICAL PULSE TRANSMISSOMETER FOR RECORDING STANDARD VISIBILITY FROM ABOUT 40M TO INFINITY (VIDEOGRAPH).
Arch. Met. Geophys. Vioklim. Ser. B Vol. 10, No. 2, 1960, p. 252-263.

A transmission-measuring apparatus was constructed on the principle of transmitting impulse-optic signals by means of spark light as transmitter and a photo-electric cell as impulse receiver. The transmitter shows no disturbing variations of intensity if the spark gap is operated under the critical value. The measuring range of extinction amounts to 1: 105 corresponding to a normal range of visibility from about 40 m to infinity. The apparatus is designed for airports. A simple telephone cable serves as connection with the recording system. (Author)

J1600
Frungel, Frank.
LIGHT DENSITY OF INTENSE LIGHTING DISCHARGES.
Optik, Stuttg. No. 3, 1948, p. 128.

J1610
Frungel, Frank.
METHODEN DER TRANSMISSIONS- UND STREULICHTMESSUNG AN GROSSEN LUFTVOLUMINA MITTELS IMPULSLICHT, NEBELWARN- UND SICHTWEITMESSGERAETE MIT SEHR GROSSER MESSBASIS (METHODS OF MEASURING TRANSMISSION AND SCATTERED LIGHT IN LARGE VOLUMES OF AIR BY MEANS OF PULSED LIGHT, FOG WARNING DEVICES AND VISIBILITY INSTRUMENTS WITH VERY LONG BASES).
Ber. dt. Wetterd. Vol. 12, No. 91, 1963, p. 159-163.

Several measuring methods for scattered light and transmission on aerosol particles are known. Due to the sensitivity of the electro-optical instruments, difficulties arise from the daylight influence. This influence can be eliminated in nearly all cases by using impulse light. The axial peak-intensities of spark light sources reaching $10^9 ... 10^{11}$ *cd also allow to measure the extinction of visible light over large distances.*
Fog warning and visibility instruments for base lengths to 15 km were constructed. (Author)

J1620
Frungel, Frank.
DER "SKOPOGRAPH," EIN FLUGPLATZ-TRANSMISSOMETER MIT IMPULSLICHT (THE "SKOPOGRAPH," AN AIRFIELD TRANSMISSOMETER WITH IMPULSE LIGHT).
Beitr. Phys. Atmos. Vol. 33, Nos. 1-2, 1960, p. 36-52.

The paper describes a transmissometer (visibility meter gauged in standard visibility) where projector and receiver face each other at distance of 150 m.
One succeeded in designing as projector a light-pulse generator, the special characteristic of which is that the light output peak, averaged over approximately 30 pulses, remains constant over a period of 1 to 2 years. Thus no compensation of lamp aging is necessary. The receiver is equipped with a novel honeycomb filter to prevent entering of stray light. A laminar current of air is blown through this filter against the direction of the incoming light. A honeycomb filter system permits passage of a light beam of appx. 1° *only, so that no stray light can reach the quartz lens. The quartz lens together with an adjustment diaphragm finally shades off appx. 10 ang. minutes. Despite the narrow receiving angle one succeeded in making the instrument insensitive to side winds by designing a very short and compact form of construction, so that the instrument needs no wire bracing once it is finally screwed onto a concrete base. Due to the high amplitude of the spark light pulses a considerable electric pulse amplitude is available at the photocell of the receiver. The measuring range between the white noise of the tube and the pulse peak which can be utilized amounts to* $1: 10^5$ *in clear air.*
The described impulse-optical transmissometer is therefore capable of measuring with a logarithmic scale visibility range from appx. 40 m to infinity. The amplifier uses long life tubes with practically negligible aging effects and as the cathode of the phototube carries a very small load only, no inaccuracy due to aging effects could be observed within one year. Mathematical calculations relating to the equipment are also given. Test runs are carried out by two of such transmissometers operating side by side with parallel beams operating onto a common double system recorder. This system of double tracing immediately shows up indicating errors.
The instrument gives off a DC current-output variable between 0 and 1 mA which can be carried over practically any length of telephone cable connections. This type of construction has meanwhile stood its test on numerous airports for more than 3 years and can therefore be regarded as a fully developed and mature design. Though the system is comparatively expensive it is still regarded as good value for money because of the accuracy of measuring results which under similar conditions, are exactly reproducible and because of the fact that the equipment is practically service-free. (Author)

J1630
Frungel, Frank.
DER VIDEOGRAPH, EIN MESSGERAET FUER ATMOSPHAERISCHE TRUEBUNG UND SICHTWEITEN (THE VIDEOGRAPH, A MEASURING DEVICE FOR ATMOSPHERIC TURBIDITY AND VISIBILITY).
Arch. tech. Messen Jan. 1969, p. 1-6. In German.

Description of a special type of visibility measuring instrument, employing backscattering of light at particles. In contrast to the conventional transmissivity meter, in which the projector and receiver are separated by about 100 m, requiring extremely accurate alignment, the backscattering principle makes it possible for the instrument to function as a single unit, requiring no alignment whatever. It can thus be installed as a portable unit and finds its primary uses on shipboard, in coast guard service, in large cities and in weather stations.
A69-20376

J1631
Frungel, Frank.
THE "VIDEOGRAPH" BACKSCATTER FOG DETECTOR AND VISIBILITY METER.
Association Internationale de Signalisation Maritime, Bulletin No. 40, Apr. 1969. In English.

J1640
Frungel, Frank and G. Hands.
SIGNAL TRANSMISSION THROUGH LIGHT IMPULSES.
Arch. elekt. Ubertr. No. 13, 1959.

J1650
Fry, Glenn A.
THE RELATION OF THE CONFIGURATION OF BRIGHTNESS CONTRAST BORDER TO ITS VISIBILITY.
J. opt. Soc. Am. Vol. 37, No. 3, Mar. 1947, p. 166-175.

A special investigation on the methods of visibility measurement as related to physiological effects.

J1655
Gassovskii, L.N., et al.
VISIBILITY OF OBJECTS AT LOW ILLUMINATIONS.
Problemy fiziol. Opt. Vol. 3, 1946, p. 40-49.

J1660
Gavrilov, V.A.
MODERNIZATSIIA IZMERITELIA VIDIMOSTI PRIMENITEL'NO K IZMERENIIAM PO METODU OTNOSITEL'NOI IARKOSTI (MODERNIZING A VISIBILITY METER FOR MEASUREMENTS BY A BRIGHTNESS METHOD).
Trudy glav. geofiz. Obs., Len No. 153, 1964, p. 24-27.

Describes a modernized visibility meter whose optical photometrical scheme contains an assembly forming a representation of a black mark in the principal focal phase of the optical system. In the modernized apparatus there is used an optical system especially designed and adopted to the method of relative brightness. The focusing range of the representation from 0.5m to infinity enables the instrument to be used for solving a diversity of problems under field and laboratory conditions both by eliminating the contour line and by the method of relative brightness. A diagram of the optical and mechanical construction of the visibility meter and a photograph of its appearance are presented.

J1670
Gavrilov, V.A.
A NEW METHOD FOR MEASURING THE METEOROLOGICAL RANGE OF VISIBILITY-THE RELATIVE LUMINANCE METHOD.
Met. gidrol. No. 11, 1959. In Russian.

The author presents a new method for measuring the transparency of the atmosphere based on the principle of relative brightness allowing the determination of meteorological visibility of Z=100-120 or even 150 times. It is assumed that two absolutely black objects are situated at different distances along on visual line. The dimensions of the objects are so chosen that the nearer is projected on the background of the farther. For high atmospheric transmissivity when the eye does not perceive a haze the nearer fuses with the farther and is not visible. In the presence of the smallest trace of haze the farther object becomes as it were and brighter the nearer black object becomes visible. The principle assumption of related brightness is that for any atmospheric turbidity of for and brightness value of the haze on the more distant object the closer object will always be black, i.e., its brightness may be regarded as zero. Apparatus and operation is presented. Theory is developed and results of measurements given.

J1680
Gavrilov, V.A.
NOTES ON DIAPHANOSCOPES ON THE V.V. SHARONOV SYSTEM.
Met. gidrol. No. 3, 1948. In Russian.

J1690
Gavrilov, V.A.
NOVYI METOD OPREDELENIIA GORIZONTAL'NOI PROZRACHNOSTI ATMOSFERY (A NEW METHOD OF DETERMINING THE HORIZONTAL TRANSPARENCY OF THE ATMOSPHERE).
Met. gidrol. No. 11, Nov. 1959, p. 53-57.

J1700
Gavrilov, V.A.
NOVYI PRIBOR DM-7 DLIA OPREDELENIIA DAL'NOSTI VIDIMOSTI OB'EKTOV I OGNEI (NEW DEVICE DM-7 FOR DETERMINATION OF RANGE OF VISIBILITY OF ACTUAL OBJECTS AND LIGHTS).
Trudy glav. geofiz. Obs., Len. No. 19, 1950, p. 66-78.

A new photometric device is described and illustrated and the theoretical considerations presented for determining contrast of objects, atmospheric transparency and actual meteorological visibility at dusk. History of the development of method (since 1926) is given.

J1710
Gavrilov, V.A.
O DIAF ANOSKOPICHESKOM METODE OPREDELENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI NA GIDROMETEOROLOGICHESKIKH STANTSIIAKH (DIAPHANOSCOPIC METHOD OF DETERMINING METEOROLOGICAL VISIBILITY DISTANCE FOR HYDROMETEOROLOGICAL STATIONS).
Met. gidrol. No. 9, Sept. 1956, p. 45-48.
Directorate of Scientific Intelligence, Defence Research Board, Ottawa, Canada, Translation No. 24, Translated by A. Nurklik.

The essence of the diaphanoscopic method for determining distance of meteorological visibility consists of looking at an ocular scale of an instrument with a series of gray marks of different contrast and finding a mark, the brightness of which corresponds to the greatest degree with the brightness of objects visible simultaneously at a weather station. The accuracy of this procedure, developed by V.V. Sharonov, is discussed. This technique was modified by the author so that the observer has to choose not an equally contrasted object but rather the closest, perceptibly brighter object than the mark. The apparatusused by the author in his experiemtns is described and illustrated, the sources of errors and needed corrections are discussed and the results are presented in a table. Improved accuracy in measuring visibility by the modified technique is obtained.

J1720
Gavrilov, V.A.
O NEKOTORYKH AKTUAL'NYKH VOPROSAKH UCHENIIA O VIDIMOSTI (SOME ACTUAL PROBELMS OF THE STUDY OF VISIBILITY).
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 6, 1953, p. 546-560.

On the basis of experimental studies of the visual perception of objects of a landscape, the author discusses the effect of the outlines of objects of a landscape upon their contrast with the background, general rules of the perception of distant objects, the numerical evaluations of the visual perceptionof objects, instrumental determination of the distance of visibility including photometric measurement of visibility, nephelometric apparatus, and visual photometric measurement of visibility and formulates the concept of distance of visibility.

J1730
Gavrilov, V.A.
O VELICHINE POROGA KONTRASTNOI CHUVSTVITEL'NOSTI GLAZA V VYRAZHENII DLIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI (THRESHOLD VALUE OF VISUAL CONTRAST SENSITIVITY IN THE TERM FOR METEOROLOGICAL VISIBILITY RANGE).
Trudy glav. geofiz. Obs., Len. No. 125, 1962, p. 11-19.

The results of experimental investigations of the truest value of the contrast threshold which enters into the expression for meteorological distance of visibility are presented. The magnitude of the latter was calculated for three threshold values (2,3, and 5%) and was compared with precise limits of visibility according to a visually fixed fork, "visible-invisible" according to natural and artificial objects. Out of 261 observations the best agreement was obtained for the 3% threshold. (Author)

J1740
Gavrilov, V.A.
THE POSSIBILITY OF PRECISE MEASUREMENTS WITH A VISIBILITY GAGE.
Svetotekhnika No. 5, 1960.

J1750
Gavrilov, V.A.
REGARDING INSTRUMENTAL DETERMINATION OF THE VISIBILITY RANGE PARAMETERS OF REAL OBJECTS.
Trudy glav. geofiz. Obs., Len. No. 42, 1953. In Russian.

J1760
Gavrilov, V.A.
USOVERSHENSTVOVANNYI VARIANT METODE OTNOSITEL'NOI IARKOSTI (METHOD DVUKH CHERNYKH TEL) (PERFECTED VERSION OF THE RELATIVE BRIGHTNESS METHOD (TWO-BLACK BODY METHOD)).
Trudy glav. geofiz. Obs., Len. No. 125, 1962, p. 3-10.

The author outlines the method of relative brightness developed earlier by him in order to apply visibility meters to determinations of contrasts of objects and meteorological visibility distance and points out the defects of this method. In this paper the author presents principles of measuring meteorological visibility distance by observations on two similar black bodies one of which is 2-3 m from the point of observation and the other is 250-300 m. These principles enable simultaneous measurement both of the true contrast of a black body and that distorted by haze and measurement of the distance of visibility independently of the influence of atmospheric scattering indices and other distorting factors. The theory of the method of two black bodies and the equation for contrast, K, and for transition from contrast to the coefficient of visibility are presented.

J1770
Gavrilov, V.A. and V.E. Goryshin.
OB OPREDELENII POSADOCHNOI VIDIMOSTI NA AERODROMAHK (DETERMINATION OF LANDING VISIBILITY AT AIRPORTS).
Trudy glav. geofiz. Obs. Len. No. 153, 1964, p. 18-23.

Discussion of the various aspects of the problem of switching from the meteorological visibility range, currently used in aircraft landing, to the visibility range which the pilot actually has during the approach to landing. The advantages of the new approach to the visibility problem are demonstrated by a system of runway markings proposed for this purpose.
A65-18568#

J1780
Gavrilov, V.A. and V.A. Kovalyov.
APPLICATION OF THE PRINCIPLE OF LIGHT BACK-SCATTER FOR MEASUREMENT OF HORIZONTAL AND NON-HORIZONTAL TRANSMISSIVITY OF THE ATMOSPHERE.
Trudy glav. geofiz. Obs., Len. No. 153, 1964.

J1790
Garland, J.A.
CONDENSATION ON AMMONIUM SULPHATE PARTICLES AND ITS EFFECT ON VISIBILITY.
Atmos. environ. Vol. 3, No. 3, May 1969, p. 347-354.

J1800
George, D.A. and R. Hill.
GLACIATION OF WATER FOG AND A TEMPORARY IMPROVEMENT IN VISIBILITY AT SHAWBURY.
Met. Mag., Lond. Vol. 95, No. 1125, Apr. 1966, p. 121-123.

At Shawbury at 0915 GMT on Feb. 3, 1965, tiny round opaque ice crystals were observed to be falling when the visibility was 50 yds. The crystals grew in size with time becoming ice needles 1 to 2 mm long by 0928 GMT. The visibility meanwhile increased but fell quickly again after the precipitation ceased at 0935 GMT. The general synoptic conditions at the time are described. It is concluded that the precipitation fell from the fog itself, which was initially supercooled, and the process is likened to that which produces fallstreak holes.

J1805
George, David H.
ESTIMATES OF FOG ELEMENT LENGTH.
Jnl appl. Met. Vol. 11, No. 5, Aug. 1972, p. 384-876.

The size of horizontal transmittance discontinuities must be known in order to optimize time and spatial representativeness of automated transmittance measurements. Results of computations using observed parameters are presented in a table of fog element sizes. Most fog elements embedded in a larger fog volume ranged in size from about 50 to 100 ft in length. This information is useful to researchers interested in time and spatial representativeness of atmospheric transmittance data. (Author)
COM-72-11456

J1810
Georgiyevskiy, Iu. S.
SPECTRAL TRAMSPARENCY OF HAZE IN THE SPECTRAL REGION FROM 0.37 TO 1.0 MICRONS.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 5, No. 4, 1969, p. 388-394. Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 5, No. 4, 1969, p. 214-218.

J1820
Goes, O.W.
REGISTRIERUNG DER DURCHLAESSIGKEIT IN VERSCHIEDEN SPEKTRAL-BEREICHEN IN DER ATMOSPHAERE, 2 TEIL (RECORDING ATMOSPHERIC TRANSPARENCY IN VARIOUS SPECTRAL RANGES, PT. 2).
Beitr. Phys. Atmos. Vol. 37, No. 2, 1964, p. 119-131.

From Jan. through July 1961 the optical transparency of the atmosphere near the ground has been measured on 158 days at the Rhein/Main airport. The measurements were taken simultaneously with 2 transmissometers after Foitzik in the visible spectral region λ_{max}=0.55μ and in the near infrared. The present paper reports on the continuation of the measurements which have been discussed in the first part. On the average one finds for standard visual ranges Vn=600 m in the region 1.2μ somewhat smaller extinction X than in the visible part of the spectrum. Above Vn=600 m the ratio first increases discontinuously up to the value 3.3. Contrary to the behavior of the atmosphere when λ=0.85μ, the ratio $Xs/X_{1.2}$ decreases again with increasing standard visual range and reaches a minimum, Xs/X1.2=1.2 when Vn=10 km. This result is at first surprising. However, results of other authors are similar. But the measurements do not comprise the whole turbidity range from 0.1—40 km standard visual range. The present paper fills this gap. It is possible to interpret the result qualitatively by the assumption of a suitable droplet distribution for the atmospheric aerosol and with the aid of the Mie theory. One finds that a power law distribution can be assumed for the radii of the droplets on which a distribution with radii around 2μ with small concentrations is superimposed. (Author)

J1830
Goes, O.W.
REGISTRIERUNG DER SICHTWEITE AUF EINEM FLUGHAFEN (RECORDINGS OF VISIBILITY AT AN AIRPORT).
Beitr. Phys. Atmos. Vol. 33, Nos. 1-2, 1960, p. 57-67.

During the winter season 1958/59 two transmissometers after Foitzik were tried out at the Frankfurt airport. A few optical and electronic improvements were necessary to achieve a satisfactory agreement between both instruments. The recorded normal visual range during the daytime agreed quite well with the estimates of an observer. A remarkable fine structure of the normal visual range showed up in the recordings. Especially before the start of fog a slow decrease of the visual range with particularly strong short-period variations occurred frequently which was missed by the subjective observation. (Author)

J1840
Gogoleva, E.I.
STATISTICAL INVESTIGATION OF SLANT VISIBILITY IN PRESENCE OF LOW CLOUD.
Trudy glav. geofiz. Obs., Len. No. 153, 1964. In Russian.

J1850
Goldberg, Bernice.
ON THE DETERMINATION OF SLANT VISUAL RANGE (Abstract).
Bull. Am. met. Soc. Vol. 34, No. 2, Feb. 1953, p. 82.

The effects of Rayleigh scattering and large particle scattering on the slant visual range are considered for the following cases: a standard ordinary clear atmosphere (Hulbert's Atmosphere), an optically uniform atmosphere, an atmosphere consisting of a fog layer adjacent to the ground and a layer of normal good visibility above, and an atmosphere in which a dust layer is embedded between two layers of good visibility. (Author)

J1860
Golberg, M.A.
ERRORS IN THE MEASUREMENT OF SLANT RANGE OF VISIBILITY BY THE EQUAL ANGLES METHOD.
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 15, 1966, p. 32-39.

J1870
Golberg, M.A.
OSNOVNYE REZUL'TATY SDATOCHNYKH ISPYTANII NEFELOMETRICHESKOI USTANOVKI OBRATNOGO RASSEIANIIA M-71 (MAIN RESULTS OF TEST RUNS OF THE M-71 BACK-SCATTERING NEPHELOMETER).
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 13, 1965, p. 32-36.

Data from test runs of back-scattering nephelometer are generalized. On the basis of test results it is established that the mean square error of visibility measurement with the instrument in the middle part of the measured range constitutes 20%, but associated with haze, fog and high transparency constitutes 25-30%. Observations with this instrument can be conducted after the Sun dips $\measuredangle 8^\circ$ beyond the horizon.

J1880
Golberg, M.A.
SOME PROBLEMS IN THE OPERATION OF A METER OF SLANT TRANSPARENCY.
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 17, 1967, p. 61-70.

J1890
Golberg, M.A.
TEORIIA NEFELOMETRICHESKOI USTANOVKI OBRATNOGO RASSEIANIIA (THEORY OF A BACK-SCATTERING NEPHELOMETER).
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 13, 1965, p. 18-31.

Several theoretical problems related with the operation of a back-scattering nephelometer are examined. A working formula is obtained for determining meteorological visibility from photometer readings if a M-53 polarizing visibility meter is used as the photometer. A calibration curve is constructed, one of the possible schemes of instrument calibration is proven, and recommendations are given based on the optimal values of the basic parameters.

J1900
Golberg, M.A.
THEORY OF THE METHOD OF VISUAL MEASURING METEOROLOGICAL VISIBILITY DISTANCE ON THE BASIS OF LIGHT SCATTERING AT ANGLES CLOSE TO 180 DEGREES.
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 25, 1971, p. 26-29. In Russian.

J1910
Golberg, M.A. and Z.I. Grishchenko.
IMAGE BLURRING IN OBSERVATIONS OF DISTANT OBJECTS.
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 12, Dec. 1964, p. 1889-1896.
Trans. into English in *Bulletin of the Academy of Sciences, USSR, Geophysics Series* No. 12, Dec. 1964, p. 1144-1147.

Reports that work aimed at evaluating the influence of meteorological factors and local conditions on distant observation has been in progress at the Karodag Actinometric Obs. and the Minsk Hydromet. Obs. In this paper the subject is treated in terms of the blurring angle as a function of the heights of the observation and the object, distance objective diameter and meteorological conditions. It was found that as a rule, the blurring angle increases as the objective diameter increases.

J1920
Golikova, O.I.
KIUVETA DLIA NEFELOMETRICHESKIKH IZMERENII S VYSOKIM UGLOVYM RAZRESHENIEM V OBLASTI UGLOV 5-175° (CUVETTE FOR NEPHELOMETRIC MEASUREMENTS WITH HIGH ANGULAR RESOLUTION IN THE REGION 5 TO 175°).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 176-185.
Trans. into English NASA-TT-F-327.

An evaluation is made of the errors in nephelometric measurements when rectangular and cylindrical cuvettes are used. On the basis of these investigations, a double cylindrical cuvette is proposed for nephelometric measurements with high angular resolution in the range of 5-175°, in particular for investigating the scattering of light by prototypes of cloud droplets. (Author)

J1925
Goltseva, E.M.
EXPERIMENTAL COMPARISON OF VARIOUS METHODS FOR DETERMINING HORIZONTAL RANGE OF VISIBILITY BY DAY.
Kazakhskiy Politekhnicheskiy Institut, Alma Alta, Studies, No. 21, 1960.

J1927
Goncalves, P.
NIGHT VISION OF COMBATANTS.
Illustracao medica, Vol. 10, May-Sept. 1944, p. 20-27

J1930
Gordon, Jacqueline I., and Peggy V. Church.
OVERCAST SKY LUMINANCES AND DIRECTIONAL LUMINOUS REFLECTANCES OF OBJECTS AND BACKGROUNDS UNDER OVERCAST SKIES.
Appl. Optics Vol. 5, June 1966, p. 919-923.

Discussion of sky luminance data and directional luminous reflectance of objects and backgrounds. Two sky luminance distributions are given for overcast sky above snow-covered terrain, and directional luminous reflectance data which were obtained under these skies are presented. Luminous reflectances computed from Krinov spectral reflectance data for a variety of natural terrains measured under overcast are also indicated.
A66-32612.

J1935
Gordov, A.N.
THE VISIBILITY OF HORIZONTAL OBJECTS IN THE FOG.
Zh. Geofiz. Met. Vol. 7, No. 5, 1937, p. 328-337. In Russian.

J1940
Goryshin, V.I.
APPARATUS FOR MEASURING AND RECORDING ATMOSPHERIC TRANSMISSIVITY.
Trudy glav. geofiz. Obs., Len. No. 100, 1960. In Russian.

J1947
Goryshin, V.I.
KOMPENSATSIONNYI FOTOMETR DLIA TOCHNYKH IZMERENII REGISTRATSII PROZRACHNOSTI ATMOSFERY (COMPENSATING PHOTOMETER FOR EXACT MEASUREMENTS AND RECORDING OF ATMOSPHERIC TRANSPARENCY).
Trudy glav. geofiz. Obs., Len. No. 118, 1961.

The operation of compensating photometers for measuring and recording the transparency of the atmosphere and the principal sources of error are examined. The compensating photometer for accurate measurements of atmospheric transparency using a new method of modulation of light beams and the construction of a linear measuring diaphragm are described with the aid of diagrams and a photograph. Some results of its experimental use are presented. (Author)

J1950
Goryshin, V.I.
NEKOTORYE REZUL'TATY LABORATORNYKH I POLEVYKH ISPYTANII AVTOMATICHESKOGO FOTOMETRA DLIA IZMERENIIA I REGISTRATSII PROZRACHNOSTI ATMOSFERY (RDV-1) (SOME RESULTS OF LABORATORY AND FIELD INVESTIGATIONS OF AN AUTOMATIC PHOTOMETER FOR MEASURING AND RECORDING ATMOSPHERIC TRANSPARENCY (RDV-1).
Trudy glav. geofiz. Obs., Len. No. 213, 1969, p. 56-69.

An evaluation of the errors in taking photometric measurements has been made mainly as the result of laboratory (chamber) experiments. A check of the linear scale of the transmissivity photometer indicated that the graduation of the scale was effected by the quality of the glass bulb of the lamp. With a bulb of good unblemished glass, the graduation is linear, with errors of $<1\%$. The calibration was checked for four OP-8-100 lamps. To evaluate the calibration stability, calibration checks were made after 500 hours of working of the photometer. Under laboratory conditions, the threshold sensitivity of the photometer was estimated, the stability of the readings with extended working was checked, the agreement between the readings recorded and the actual measurements of the instrument was examined, the relationship of the readings and oscillations within the current circuit was checked, the stability of the readings when certain spare parts were substituted for the original parts was studied, and so on. To evaluate the possible effects of climatic conditions, trials were made of the photometer's response in hot and cold conditions and with different humidities. The data presented in this paper shows that the photometer is suitable for operating with temperatures from -50° to $+50^\circ C$ and with humidities up to 100%. To evaluate the quality of the measurements of meteorological visibility, field trials were carried out in the period from Dec. 1963 to March 1964 in the visibility range from 200 to 6000 m.

J1960
Goryshin, V.I.
RASCHET OSNOVNYKH PARAMETROV FOTOELEKTRICHESKOGO FOTOMETRA DLIA IZMERENIIA PROZRACHNOSTI ATMOSFERY (CALCULATION OF THE MAIN PARAMETERS OF A PHOTOELECTRICAL PHOTOMETER FOR MEASURING ATMOSPHERIC TRANSPARENCY).
Trudy glav. geofiz. Obs., Len. No. 237, 1969, p. 55-61.

Methods for calculating the light characteristics and geometry of the optical system of photoelectric photometers based on the principle of direct measurement of the relative attenuation of the atmospheric light flux are presented. Basic formulas are given for calculating the magnitude of the working light beam and the parasite beam generated by the background on which the light source is projected. The error in photometric determinations, caused by the effect of daylight, depends only on the ratio of the background brightness to the apparent brightness of the light source and on the square of the ratio of the diameter of the diaphragm opening to the diameter of the image of the source in the diaphragm plane. Formulas are given and calculation results are presented for the magnitude of the permissible angular displacement of the optical system and the required minimal values of light source brightness. The required amplification coefficients for the current and the voltage of the photometer amplifier were determined. (Author)

J1970
Goryshin, V.I.
SERIINYI OBRAZETS AVTOMATICHESKOGO FOTOMETRA DLIA IZMERENIIA I REGISTRATSII PROZRACHNOSTI ATMOSFERY (RDV-1) (SERIAL MODEL OF AN AUTOMATIC PHOTOMETER FOR MEASURING AND RECORDING ATMOSPHERIC TRANSPARENCY (RDV-1).
Trudy glav. geofiz. Obs., Len. No. 213, 1968, p. 48-58.

A description of the principles and the construction of a serial type automatic compensating photometer is given. The photometer consists of a photographic and an electrical system. The components of the optical system are a light source (an incandescent lamp of the OP—8—100 type), an optical configuration which forms a measuring ray with an angular spread of 2° and a uniform zone of about 40 min, and a reflecting system. A prismatic reflector ensures complete stability of the photometer readings within an interval of 4°. The photoelement, with optical element corrections, has a resultant curve of spectral sensitivity to the lamp radiation close to that of the eye. The optical arrangement provides a second ray of light for comparison and is provided with a linear scale for atmospheric transmissivity. The optical system contains an optical sight for pointing the ray at the reflector, a device for controlling the focus, etc. The electrical system of the photometer provides for the complete automatization of the processes of measuring and recording atmospheric transmissivity. Among its components are a basic electronic amplifier, an actuating device with magnetic damping, a motor-generator, a power amplifier for the basic current, remote systems for recording the readings and controlling the instrument, and a system of electricity supply. A brief description of the construction of the photometer is included. (Author)

J1980
Gotz, Friedrich Wilhelm Paul.
EINE GELEGENTLICHE UNTERSUCHUNGSMETHODE DER SICHT (A CONVENIENT METHOD OF VISIBILITY INVESTIGATION).
Jber. naturf. Ges. Graubundens Vol. 64, 1925/1926, p. 277-284.

The brightness measurement of snow and shadow squares can be used for visibility measurement. The author made photographs of snow-covered and snow-free squares and determined the differences of brightness by means of a microphotometer.

J1985
Granath, L.P. and E.O. Hulburt.
THE ABSORPTION OF LIGHT BY FOG.
Phys. Rev. Vol. 34, July 1, 1929.

Measurements between two stations 0.4 km apart with a thermocouple and galvanometer and with spectograms, properly calibrated, of the absorption of light by fog for wave-lengths from 0.4 to 3μ showed that the absorption increased slightly with decrease in wave-length, but hardly enough to indicate that red light is appreciably better than blue light for the purpose of penetrating fog. For a fairly dense fog, such that in daylight dark colored objects at about 0.6 km could barely be seen, the distances necessary to reduce the light to 10^{-2} of its original value were about 710, 843, 910, 970, 980 and 980 meters for wave-lengths 0.4, 0.5, 0.6, 1.0, 2.0 and 3.0μ, respectively. (Author)

J1990
Grant, Peter.
VIEWING DISTANT MOUNTAIN PEAKS.
Mt. Wash. Obs. News Bull. Vol. 10, No. 1, Mar. 1969, p. 6-7.

Discusses refraction of the atmosphere, at which, at sunset, bends the Sun's rays more than 0.5 deg and the Earth's apparent visual radius (r) for which surveyors use 5000 mi and microwave radio engineers use 5280 mi, and which for the lapse rate of a standard atmosphere is about 5000 mi. The author states that on exceptionally clear days (2—3/yr), Mt. Marcy (131 mi away in New York State) can be seen from Mt. Washington. A method is presented of predicting visibility in which two graphs are drawn: one for which r=5280 and the other for r=6000 mi and the distance x is obtained from the equation $x^2=2ra+a^2$ *where a is the altitude in feet.*

J1995
Grieger, H.
VERTICAL CONDUCTIVE CURRENT, VISIBILITY, RELATIVE HUMIDITY, AND MASS EXCHANGE.
Beitr. Geophys. Vol. 51, No. 4, 1937, p. 325-334.

J2000
Grushin, S.I.
ONE POSSIBILITY ON LOWERING THE ERROR IN MEASURING SYSTEMS.
Trudy glav. geofiz. Obs., Len. No. 240, 1969, p. 8-10. In Russian.

The conditions are analyzed under which the effect of the error in transforming an analog into a digital quantity on the overall measurement error can be minimized. As an example, the determination of the meteorological visual range is given.

J2010
Guidelli Guidi, Guido, N.
MISURA DELLA PORTATA VISUALE DI PISTA (MEASUREMENT OF THE RUNWAY VISUAL RANGE).
Riv. met. aeronaut. Vol. 29, No. 1, Jan./Mar. 1969, p. 17-24.

The theoretical principle and practical development are described of an instrument (the transmissometer) measuring the runway visual, range. The theoretical development is based on water droplet sizes such as in fog being measurements that are not affected by changes in the light wavelength. The system of an optical measuring bridge fitted with two photoelements and the digital output is noted. (Author)

J2012
Guilford, J.P.
FLUCTUATIONS OF ATTENTION WITH WEAK VISUAL STIMULI.
Amer. J. Psychol. Vol. 38, Oct. 1927, p. 534-583.

J2013
Guillery, P. and G. Kapp.
A NEW APPARATUS FOR THE MEASUREMENT OF THE TRANSPARENCY OF THE ATMOSPHERE.
Licht Vol. 10, May 20, 1940, p. 100-101.

J2014
Gulnitski, L.V.
DETERMINATION OF RANGE OF VISIBILITY FROM INTENSIVITY OF DIRECT SOLAR RADIATION.
Kazakhskiy Politekhnicheskiy Institut, Alma Alta, Studies No. 21, 1960.

J2015
Gulnitski, L.V.
ON THE PROBLEM OF IMPROVING THE METHOD FOR DETERMINING RANGE OF VISIBILITY.
Kazakhskiy Politekhnicheskiy Institut, Alma Alta, Studies No. 21, 1960. In Russian.

J2017
Gulnitski, L.V.
A UNIVERSAL VISIBILITY GAGE.
Akademiia Nuak Kazakhstoi SSSR. Seriia Astronomii i Fiziki, Izvestiia No. 3, 1961. In Russian.

J2020
Gulnitski, L.V. and V.K. Anisimov.
NOVYI IZMERITEL VIDIMOSTI (NEW VISIBILITY METER).
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Vol. 6, No. 3, 1942, p. 110-115.

Description of the construction and operation of a new instrument constructed at the geophysical observatory at Minsk. The authors developed 3 photoelectric and one contrasting method of visibility measurement.

J2030
Hall, F.F., Jr.
LASER MEASUREMENTS OF TURBIDITY IN THE ATMOSPHERE.
Optical Spectra Vol. 4, 1970, p. 67-70.

J2040
Hampton, W.M.
THE VISIBILITY OF OBJECTS IN A SEARCHLIGHT BEAM.
Physical Society of London, Proceedings Vol. 45, June 2, 1933, p. 663-671.

Calculation of visibility of objects of different sizes illuminated by a projector and with different reflecting powers.

J2045
Hand, I.F.
EFFECT OF LOCAL SMOKE ON VISIBILITY AND SOLAR RADIATION INTENSITIES.
Mon. Weather. Rev. Wash. Vol. 53, Apr. 1952, p. 147-148.

J2050
Hanel, Gottfried.
NEW RESULTS CONCERNING THE DEPENDENCE OF VISIBILITY ON RELATIVE HUMIDITY AND THEIR SIGNIFICANCE IN A MODEL FOR VISIBILITY FORECASTING.
Beitr. Phys. Atmos. Vol. 44, Nos. 2-3, 1971, p. 137-167. In German.

J2060
Harris, A.
VISIBILITY ON THE ROAD.
Illuminating Engineering Society of London, Transactions Vol. 22, 1957.

J2070
Harrison, Louis P.
FIELD EXPERIMENTS WITH A REMOTE TELEVISION PICK UP CAMERA FOR DETERMINATION OF VISIBILITY AT AN AIRPORT (abstract).
Bull. Am. met. Soc. Vol. 34, No. 2, Feb. 1953, p. 81-82.

Under sponsorship of the Air Navigation Development Board, the Allen B. Du Mont Laboratories, contracted with the U.S. Weather Bureau to supply television services at Washington National Airport to permit the conduct of certain investigations. On seven occasions, each of six hours' duration, a television pick-up camera was installed at the south end of the instrument landing runway (No. 36), and the video signals were transmitted by microwave a distance of 2,900 feet to the Administration Building. Here a receiver was mounted in the Weather Bureau Airport Observatory to display the television picture as picked up by the camera. Objective was to compare (Vr), visual range as judged by an end-of-runway observer, looking in the direction the nearby camera was focused, with (V0), visual range as judged by an observer scrutinizing the sufficient increment of general illumination incident on the camera lens. Nearby lights acted as glare sources which produced serious disturbing influences because of "blooming" (lights appearing as enlarged luminous discs) when the image orthicon pick-up tube was used. However, when use was made of a RCA Vidicon commercial television pick-up tube camera, the "blooming" effect was comparatively negligible. A discussion is presented of the psychophysical and physical factors involved in the problem of calibrating a television system for remote visibility observational purposes. (Author)

J2080
Hartower, T.N.S.
RUNWAY VISUAL RANGE, SLANT VISUAL RANGE AND METEOROLOGICAL VISIBILITY.
Met. Mag. Lond. Vol. 92, Jan. 1963, p. 26-34.

Transformation of the comparisons between horizontal visibility, obtained by Hodkinson at Cardington, into Runway Visual Range (RVR) and Slant Visual Range (SVR) in relation to a particular runway at Gatwick Airport (London) and the associated runway and approach light patterns. The transformation of horizontal visibility to RVR is based on curves obtained from field experiments on the runway, and the transformation of slant visibility to SVR is based on a conservative estimate of 50,000 candelas as the intensity of the approach lights. Scatter diagrams obtained for glide-path heights of 300 and 200 ft, with both the runway and approach lights at full brilliance, are presented and discussed. Six radiation fogs chosen at random for the Heathrow and Gatwick Airports (London) and the Manchester Airport are examined. The meteorological visibility throughout the history of each fog is plotted against time. The RVR "operational zone for landing" from 400 to 1,200 yd is indicated.

J2083
Hartridge, H.
VISIBILITY OF BLUE AND YELLOW.
Nature Lond. Vol. 153, June 24, 1944, p. 775-776.

If a pattern consisting of blue and yellow areas be viewed at a sufficient distance by an observer, then, in certain circumstances, the blue is seen as black and the yellow is seen as white, so that the pattern appears to be a black and white one. Factors of importance in determining whether the pattern is seen as blue and yellow or as black and white have been found to be (1) the size of the pattern, (2) the intensity of illumination, (3) the size of the pupil, (4) the exact colours of the yellow and the blue pigments used in the design, (5) the adaptation of the retina, (6) spectral content of illuminant. It is suspected that factors of importance would also be (7) absorption of the eye media, and (8) absorption by the macula lutea. Some quantitative measurements have been made in respect of factors 1, 2 and 3 (size, intensity and pupil diameter). (Author)

J2090
Haynes, B.
FINAL APPROACH VISIBILITY STUDIES AT AIRPORTS IN THE USA.
Aerospace Engineering Review No. 3, 1953.

J2100
Hecht, Selig.
VISUAL THRESHOLDS OF STEADY POINT SOURCES OF LIGHT IN FIELDS OF BRIGHTNESS FROM DARK TO DAYLIGHT.
J. opt. Soc. Am. Vol. 37, No. 1, Jan. 1947.

In a paper with the above title, Knoll, Tousey, and Hulburt, present measurements of the brightness of a tiny spot of light when it first becomes visible against a background whose brightness is varied between dark and daylight.

The data of Knoll, Tousey, and Hulburt are of interest because they show that even for a point source, brightness discrimination follows its usual pattern in visual function. The measurements agree with previous data and theory. (Author)

J2110
Hecht, Selig, Sherman Ross, and Conrad G. Mueller.
THE VISIBILITY OF LINES AND SQUARES OF LIGHT AT HIGH BRIGHTNESS.
J. opt. Soc. Am. Vol. 37, No. 6, June 1947.

Field experiments show that a wire may be seen against a sky of high brightness when its diameter subtends only half a second of visual angle. For this the wire must be at least one degree long. Shorter wires must be thicker. Silhouetted squares may be seen at angles of only 18 seconds. Considering length and width, squares are more efficient visual targets than fine lines by about a factor of 3. (Author)

J2115
Heinsius, E.
ON NIGHT VISION.
Dte. Militararzt Vol. 8, Aug. 1943, p. 451-457.

J2120
Hicks, J.R.
IMPROVING VISIBILITY NEAR AIRPORTS DURING PERIODS OF FOG.
Jnl. appl. Met. Vol. 6, No. 1, Feb. 1967, p. 39-42.

Liquefied propane, released from ground-based dispensers, was used to seed twelve fogs during the period from Oct. 6, 1964 to July 24, 1965. Six of these tests were conducted at Camp Century, Greenland. Five were successful - i.e., glaciation of the super-cooled droplets and subsequent precipitation occurred. The sixth test was made on an ice fog which was not amenable to this type of modification. The remaining six tests were made in the Hanover-Lebanon, N.H. area. Five of these tests were successful. The sixth experiment, conducted under a low stratus cloud, yielded no reaction. It is concluded that propane is safe and economical to use as a fog dispersing agent when used as described. (Author)
A67-22814

J2125
Hightman, H.M.
CEILING AND VISIBILITY IN THE UNITED STATES.
Mon. Weath. Rev. Wash. Vol. 58, May 1930, p. 202.

J2130
Hodkinson, J.
SOME OBSERVATIONS OF SLANT VISIBILITY IN FOG.
Met. Mag., Lond. Vol. 92, No. 1086, Jan. 1963, p. 15-26.

During the winters of 1957-58, 1958-59 and 1959-60 a series of visual observations during fog were made at Cardington. These were supplemented during the winter of 1960-61 by data obtained by photoelectric methods. The visual observations were made by observing objects, or lights, attached to the flying cable of a captive kite balloon which was flown at about 500 ft. The objects, or lights, were attached at 5, 50, 100, 150, 200, 300, 400 and 500 ft above the ground. Observations by day were made by observing the distance away from which they were just visible. At night Gold visibility meter readings were taken from a fixed base line. Errors were considered to be 15-20% during the day and 25-30% at night. No readings were taken in the twilight period. The ratio of the slant visibilities at various heights, with height are computed and the data presented in the form of histograms. Plots of slant visibility against horizontal visibility are then made for various heights. It is shown that within most water fogs the slant visibilities are less than the horizontal visibilities at ground level and that the slant visibility usually decreases with height. In deep and mature fogs the slant visibility is reduced to a greater extent than in the shallower fogs and in these more mature fogs the relationship between slant visibility and horizontal visibility may be more clearly defined. In shallow fog the change in slant visibility with height showed a discontinuity at the fog top.
A63-14622

J2140
Hoffmann, H.E.
THE VISIBILITY RANGE WHEN OBSERVING AN AIRCRAFT WITH AND WITHOUT FIELD-GLASSES.
Optica Acta Vol. 19, May 1972, p. 463-466.

A72-40750

J2150
Hohn, D.H.
SCATTERING BY ATMOSPHERIC AEROSOL IN THE VISIBLE AND NEAR INFRARED RANGE.
Pure and Applied Geophysics Vol. 59, 1964, p. 172-184. In German.

The scattering by the atmospheric aerosol of radiation in the region $0.5 \leq \lambda \leq 2.1\ \mu m$ *and* $4^\circ \leq \varphi \leq 40^\circ$ *is investigated experimentally. The features in the IR can be characterized by that in the visible, but the scattering dispersion is found to be different from that expected. At scattering types near A (or 1) in the visible there is almost no scattering dispersion for* $\lambda \leq 1.1 \mu m$. *At types near B (or 2) in the visible a high scattering dispersion in the region between* $0.8 \mu m$ *and* $1.3 \mu m$, *was observed. For the whole region of wavelengths including the IR a classification similar to that used in the visible is suggested.*

J2153
Holmes, J.G.
SEEING THROUGH FOG.
Light Ltg Vol. 36, Feb. 1943, p. 23-26, 28, 30.

Discusses the factors which determine the range at which objects can be seen in a foggy or misty atmosphere by day. At night when an attempt is made to render an object visible by artificial light, the the range of visibility of (a) a light in a night fog, (b) a light in a day fog, (c) an illuminated object in a night fog.

J2155
Holmes, F. M. E. and B. O'Brien.
TRANSMISSION OF LIGHT BY FOG AND HAZE [Abstract].
J. opt. Soc. Am. Vol. 22, Jan. 1932, p. 9.

The transmission of a horizontal light path 1.3 km long has been determined under various atmospheric conditions thruout the visible spectrum. Light from an incandescent lamp, collimated by a telescope mirror, is projected to a glass triple mirror 0.65 km distant, and returned adjacent to but not coinciding with the outgoing beam. A comparison beam is provided by two reflecting prisms with a stop between, and the two beams are received by an objective prism spectrograph. The comparison beam is adjusted to intensity match with the beam from the distant mirror by a variable sector disc rotated at a speed such that photographic reciprocity and intermittency defects compensate.[1]

Reference wave lengths are obtained by an absorption cell of didymium nitrate solution placed between the light source and the collimating mirror. The two adjacent spectra of nearly equal density are compared with a densitometer. On apparently clear nights the scattering is approximately proportional to $1/\lambda^4$, *but is greater than that computed from the Rayleigh formula for the equivalent air path. For a fog of quite uniform droplets averaging 50 microns diameter, and having an optical density of 1.20 per kilometer, the variation in transmission with wave length was only that computed from the Rayleigh formula for the air in the path, the scattering due to the fog being nonselective, although 80 times that due to the air present. Under certain conditions in a clearing fog, and also in faint haze, Rayleigh scattering has been observed four or more times that due to air. The light path thus far used is too short to permit accurate study of very light haze, but within the accuracy of measurement it appears possible to represent the scattering by a term proportional to* $1/\lambda^4$ *plus a nonselective term. (Author)*

J2160
Hood, John M., Jr.
ENVIRONMENTAL PHOTOMETRY IN THE ANTARCTIC.
J. Geophys. Res. Vol. 65, No. 5, May 1960, p. 1527-1534.

Measurements of the meteorological range were made by two different techniques. The first involved the use of a very sensitive small field photometer. The second technique required simple photographic materials and equipment.

J2170
Hood, John M., Jr.
A TWO-CAVITY LONG-BASE MODE METEOROLOGICAL RANGE METER.
Appl. Optics Vol. 3, No. 5, May 1964, p. 603-608.

A meteorological range measuring device in use at Barrow, Alaska, utilizing two dark cavities is described and sample data is presented. From the two values of range which can be computed from the equation, $v = x \ln 50/\ln[B_h/(B_h - B_x)]$, *an approximate relation is developed for a corrected range having the form* $1/v_c = K_1/v_1 - K_2/v_2$. *A concept of measuring error as instrumental scattering of horizon and background light by a constant factor,* ϵ, *is developed and is shown to be determinable from* v_1 *and* v_2 *by a relation of the form,* $\epsilon = a_1K_2(1/v_1 - 1/v_2)$. *The statistical properties of* ϵ *are examined from actual data and the possibilities of a single cavity system with a known* ϵ *are discussed. (Author)*

J2175
Hoppe, F. and H. Siedentopf.
THE DEPENDENCE OF THE VISUAL CONTRAST THRESHOLD ON THE BACKGROUND BRIGHTNESS AND THE OBJECT SIZE.
Astr. Nachr. Vol. 264, 1937, p. 217-222.

J2180
Horman, M. H.
MEASUREMENT OF ATMOSPHERIC TRANSMISSIVITY USING BACK-SCATTERED LIGHT FROM A PULSED LIGHT BEAM.
J. opt. Soc. Am. Vol. 51, No. 6, June 1961, p. 681-691.

This paper concerns the use of pulsed light sources of extreme luminance and short duration in measuring the transmissivity of the air along a slant path; the glide approach path to an airport runway is of particular interest. The fundamental pulsed-light-transmissometer technique is described for an idealized atmosphere and an idealized single-ended transmissometer (confocal transmitter and receiver). Complications arising for real conditions are avoided by the following modified technique: a transmitter on the ground projects a series of light pulses up the glide path, during which time a receiving system separated to side collects light scattered from the transmitter beam at each of a sequence of predetermined ranges and plots the scattered light flux received against time. These return plots are graphically super-imposed on a single time base and an envelope of the return peaks is drawn. Equations representing individual returns indicate that their peak envelope can be used to determine the transmissivity over a given path.

Signal variations due to clouds and absorbing media are discussed, and the use of the technique in a ceilometer is mentioned. Path length limitations due to equipment features and secondary scatter under low-transmissivity conditions are discussed. Measurements obtained with an experimental pulsed-light transmissometer are given and compared with measurements by two other systems. (Author).

J2185
Horvath, Helmuth and Kenneth E. Noll.
THE RELATIONSHIP BETWEEN ATMOSPHERIC LIGHT SCATTERING COEFFICIENT AND VISIBILITY.
Atmos. environ. Vol. 3, 1969, p. 543-550.

Koschmieder's formula relating visibility to the extinction coefficient has been verified by comparing simultaneous measurements of both variables at one site. These data suggest that the meteorological range, determined from a point measurement of the scattering coefficient with an integrating nephelometer, is approximately equal to the prevailing visibility determined by an observer looking at prominent dark objects. The quantitative relationship between visibility, total atmospheric scattering coefficient, and aerosol mass concentration is presented and compared with the classical theoretical relationship. (Author). A70-18923

J2190
Houghton, H.
ON THE RELATION BETWEEN VISIBILITY AND THE CONSTITUTION OF CLOUDS AND FOG.
J. aeronaut. Sci. No. 6, 1939.

J2200
Houghton, H.
THE TRANSMISSION OF LIGHT IN THE ATMOSPHERE WITH APPLICATIONS TO AVIATION.
J. aeronaut. Sci. Vol. 9, 1942, p. 103-107.

J2210
Houghton, H. G. and W. R. Chalker.
THE SCATTERING CROSS SECTION OF WATER DROPS IN AIR FOR VISIBLE LIGHT.
J. opt. Soc. Am. Vol. 39, No. 11, Nov. 1949.

Additional values of the scattering cross section of water drops in air have been computed from the theory of Mie. The water drops are assumed to be dielectric spheres of index of refraction 4/3. Values of the scattering area coefficient have been computed for 50 values of $\alpha=2\pi r/\lambda$*, ranging from 7 to 24. The curve of the scattering area coefficient versus* α *has three major maxima and two minima in this range, with indications that the curve continues to oscillate with decreasing amplitude for increasing* α*. Numerous minor oscillations were found in the vicinity of the major maxima and minima. (Author).*

J2220
Horvath, Helmuth and Kenneth E. Noll.
THE RELATIONSHIP BETWEEN ATMOSPHERIC LIGHT SCATTERING COEFFICIENT AND VISIBILITY.
Atmos. environ. Vol. 3, 1969, p. 543-550.).

Koschmieder's formula relating visibility to the extinction coefficient has been verified by comparing simultaneous measurements of both variables at one site. These data suggest that the meteorological range, determined from a point measurement of the scattering coefficient with an integrating nephelometer, is approximately equal to the prevailing visibility determined by an observer looking at prominent dark objects. The quantitative relationship between visibility, total atmospheric scattering coefficient, and aerosol mass concentration is presented and compared with the classical theoretical relationship. (Author). A70-18923

J2225
Hovland, C. I. and D. A. Bradshaw.
VISUAL REACTION TIME AS A FUNCTION OF STIMULUS BACKGROUND CONTRAST.
Psychol. Forsch. Vol. 21, 1935, p. 50-55.

J2230
Hulbert, Edward Olson.
OPTICS OF ATMOSPHERIC HAZE.
J. opt. Soc. Am. Vol. 31, No. 7, July 1941, p. 467-476.

By means of a telescopic photometer, measurements were made in daylight of b, the brightness of a large approximately black body at a distance d=3.2 km, and of h, the brightness of the sky just above the black body. For visual ranges v from 3.2 to 15 km the measurements agreed with the theoretical relations $v=(1/\beta) \log 1/\eta$ *and* $\beta=(1/d) \log (1/(1-b/h)$ *where* β *is the atmospheric attenuation coefficient, and* η *is the threshold of brightness contrast, being 0.02 for the usual intensities of daylight illumination. It allowed that the ratio of* β *to the attenuation of optically pure air was 227, 55.4, 27.7, 13.8, 5.54 and .77 for v 1, 5, 10, 20, 50 and 100 km, respectively. The angular distribution of light scattered by haze was determined in two ways: 1) by measuring the brightness at various angles of a searchlight beam at night, and 2) by measuring the brightness of the horizon sky at various azimuths for a moderately low sun and a cloudless sky. The distribution was much the same for haze ranging from thin to thick. It showed pronounced forward scattering, over three-fourths of the light being scattered in a forward direction and less than one-fourth in a backward direction. Such a scattering distribution would occur from haze particles of various sizes, most of them being of dimensions greater than the wave-length of white light. (Author).*

J2235
Hurst, G. W.
VISIBILITY IN METEOROLOGY; THE THEORY AND PRACTICE OF THE MEASUREMENT OF THE VISUAL RANGE. [Review]
Mt. Mag., Lond. Vol. 71, May 1936, p. 94-95.

J2240
Huss, Ed.
BEITRAEG ZUR KENNTNIS DER SICHT IN WOLKEN DER FREIEN ATMOSPHAERE (CONTRIBUTION TO THE KNOWLEDGE OF VISIBILITY IN CLOUDS IN THE FREE ATMOSPHERE).
Wiss. Abh. dt. met. Dienst franz. BesatzGeb. Vol. 2, 1950, p. 3-20.

Pilot balloon and captive balloon observations of visibility in clouds made during 1929-1933 are discussed. Methods of measurement are described. Data are presented on visibility in clouds and fog as a function of observation angle, cloud type and form, temperature, altitude, wind speed, gustiness, vertical temperature gradient and thermal stability, vapor pressure, water content and drop size and distribution.

J2245
Illuminating Engineering Society. Committee on Instruments and Measurements.
ANNUAL REPORT OF COMMITTEE ON INSTRUMENTS AND MEASUREMENTS. PART I. EQUIPMENT AND PROCEDURE FOR PHOTOMETRIC MEASUREMENTS OF BLACKOUT AND DIMOUT LUMINAIRES. PART II. DESCRIPTION OF METHOD FOR MEASURING ATMOSPHERIC TRANSMISSION.
Illum. Engng. Vol. 38, Nov. 1943, p. 509-517.

J2250
Iaroslavtsev, I.N.
NABLIUDENIIA NAD VIDIMOST'IU KLINOVYM IZMERITELEM VIGANDA (VISIBILITY OBSERVATIONS WITH WIGAND'S WEDGE METER).
Zh. Geofiz. Vol. 3, No. 2, 1933, p. 212-221.

Report on visibility observations made during day-Oct. 1929 at Krasnodar. The author notes the defects of Wigand's visibility meter and presents results of observations. Monthly mean visibility data, diurnal variations and frequency of visual range (for 5 km intervals) are given.

J2260
Israel, Hans and Fritz Kasten.
VISIBILITY IN FOG AND POSSIBILITIES OF ARTIFICIALLY INFLUENCING IT.
ForschBer. Wirt.-und VerkMinist. NRhein-Westf. No. 640, 1959. In German.

J2265
Ivanoff, A.
ON THE DISCRIMINATION OF THE INTENSITY OF A POINT SOURCE.
Rev. Opt. Theor. instrum. Vol. 25, Jan.-Mar. and Apr.-June 1946, p. 3-35 and 82-113.

J2270
Ivanov, I.P. and G.K. Ilich.
O KOEFFITSIENTE PROPUSKANIIA SVETA RASSEIVAIUSHCHIMI SLOIAMA BOL'SHOI TOLSHCHINY (COEFFICIENT OF TRANSMISSION OF LIGHT THROUGH THICK SCATTERING LAYERS).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 3, No. 6, June 1967, p. 662-666.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 3, No. 6, 1967, p. 379-382.

The thickness index of attenuation and of integral (according to the angles) transmission coefficients of optically thick layers of light scattering systems is investigated by the formula for the transmission coefficient of such a layer for the case of a large probability of survival of a light quantum. This formula is

$$T = \frac{g(\eta_0) sh 4q\mu/\epsilon}{sh\ \frac{\mu}{\epsilon}\tau + 4q\frac{\mu}{\epsilon}},$$

where $\epsilon = a + \sigma$ = index of extinction (a and σ = index of extinction and of scattering of an elementary volume of the medium, resp.), μ = thickness index of attenuation of critically scattered light, η_0 = cosine of the angle of incidence of light upon the medium, q = parameter depending upon the form of the index of scattering of an elementary volume, $q(\eta_0)$ = ratio of the brightness coefficient to the integral of the transmission coefficient of a layer of sufficiently large thickness, η_0 = cosine of the angle of incidence of light upon the medium. The parameter q is expressed by

$$q \approx \frac{1 - \Lambda}{\Lambda(\mu/\epsilon)^2},$$

where Λ = probability of survival of a light quantum. The dependence of g and q upon the scattering index is investigated experimentally. It is shown that the formula presented describes the transmission of light by layers of large optical thickness. If the straight lines $lgT = f(\tau)$ are extrapolated to $\tau = 0$ they cut off sections on the ordinate axis whose size depends upon $g(\eta_0)$. This indicates that with increase in the thickness of a layer for different scattering indices and illumination conditions, the illumination may decrease more rapidly in the case of small values of τ than in case of large values of τ, since from physical considerations it is evident that for $\tau = 0$ all the curves should issue from $T = 1$.

J2280
Jack, Valerie D.
FURTHER WORK ON OBJECTIVE FORECASTING OF VISIBILITY.
Met. Mag., Lond. Vol. 95, No. 1125, Apr. 1966, p. 114-121.

Objective methods of forecasting are methods which do not involve personal judgment; they have been considered in the Meteorological Office for a number of years but ideas involving rigorous statistical methods were not practicable until the advent of the electronic computer. Diagrams based on the Freeman objective method were produced in 1958 for predicting visibility at London (Heathrow) Airport. These were issued to Heathrow for testing during the months of November, December and January of the winters 1958/59 and 1959/60. Similar diagrams for Manchester Airport were issued in 1959 to be tested during the winter of 1959/60. The results of these tests were encouraging and it was decided that further diagrams should be computed for, in the first instance, Heathrow and that they should be based on a larger amount of data to provide three-hour and six-hour forecasts from each of the eight synoptic hours. (Author)

J2290
Jackson, C.C.
MINIMA AND MANOEUVRABILITY, PT. 1.
Flight Vol. 83, No. 2817, 1963, p. 329.

The difficulties of landing a heavy passenger jet aircraft in minimum approach conditions of 200 ft. cloud base and/or half mile runway visibility are stressed. Caution is sounded against airline management's efforts to lower the weather minima still further in order to achieve better time table regularity.

J2300
Jackson, C.C.
MINIMA AND MANOEUVRABILITY, PT. 2.
Flight Vol. 83, No. 2821, 1963, p. 460.

J2310
Jacobs, K.
THE PLANNING OF RUNWAY LAYOUTS AS AFFECTED BY THE WEATHER.
J. Inst. Nav. Vol 15, No. 3, July 1961, p. 295-307.

A method is presented for quick calculation of the frequency of cross-wind components which limit the landing of aircraft on runway layouts at aerodromes and for deriving the best runway layouts for a site with a known or deducible wind distribution. The method depends on some initial study of the relevant wind rose but an exact solution is obtained by the application of an empirically derived formula involving the percentage of time that a wind exceeds a given velocity. The formula was originally verified only for the British Isles but later it has been found to be valid elsewhere where there is a wide range of wind speeds. Allowance can be made in the calculations for bad weather, eg. dense smoke or low cloud approaching the aerodrome from certain directions, for the use of one end only of a runway and for a permissible tail wind component. The method has been modified from that described in an earlier (1944) draft of the paper mainly to allow for the use of the meteor computer. (MGA).

J2320
Jacobson, R.C.
A VERTICAL VISIBILITY SCALE.
Bull. Am. met. Soc. Vol. 16, No. 10, Oct. 1935, p. 239-241.

Gives six degree (0-5) scale of visibility which depends on the appearance of a ground object when viewed vertically downwards.

J2325
Jake, V.
CEILING AND VISIBILITY IN THE UNITED STATES; CENTRAL STATES.
Mon. Weath. Rev. Wash. Vol. 58, May 1930, p. 201-202.

J2330
Jason, A.C.
A RECORDING SMOKEMETER.
Instrum. Pract. Vol. 10, No. 2, Feb. 1950, p. 133-134.

Smoke is measured in terms of optical density per unit length. Light which passes through smoke is also absorbed by an annular optical wedge, the position of which is adjusted automatically as smoke varies by servo-motor which is also coupled to a pen arm.

J2340
Jiusto, J.E., R.J. Pilie, and W.C. Kocmond.
FOG MODIFICATION WITH GIANT HYGROSCOPIC NUCLEI.
Jnl. appl. Met. Vol. 7, Oct. 1968, p. 860-869.

Analytic and experimental investigations were conducted to examine the concept of modifying fog with hygroscopic material. An approximate equation was derived that is useful in estimating the feasibility of such applied problems. The combined results show that it is possible to improve visibility in warm fog by seeding with micron-size salt particles (NaCl). The visibility in laboratory fog produced in a 600-m^3 chamber was increased by factors of 3 to 10, with as little as 1.7 mg/m^3 of NaCl being effective. Only a modest reduction (<1%) in ambient relative humidity by the giant salt particles is necessary to cause substantial evaporation of the fog droplets. Extrapolation of these results suggests that clearing a suitable landing zone for aircraft should not involve prohibitive amounts of properly sized seeding material. (Author)
A69-10696#

J2345
Johnson, E. A., et al.
THE MEASUREMENT OF LIGHT SCATTERED BY THE UPPER ATMOSPHERE FROM A SEARCH-LIGHT BEAM.
J. opt. Soc. Am. Vol. 29, Dec. 1939, p. 512-517.

Rayleigh scattering from atmospheric gases in the path of an intense search-light beam has been measured up to heights of 34 km. It is found that above a limit of haze, which varies on different days from four to ten km, the scattering agrees with that calculated upon the assumption of the usual atmosphere. Clouds have been occasionally observed at heights of 12 km. It is shown that the method can be extended to allow measurements up to heights of 70 to 90 km and to determine the distribution of ozone at low altitudes, as well as the study of other atmospheric problems. (Author)

J2350
Johnson, Russell H.
NEW AIR FORCE WEATHER EQUIPMENT.
Weatherwise Vol. 7, No. 4, Aug. 1954, p. 82-85, 102-103.

This article presents a description of the Transmissometer Set AN/GMQ-10 and gives some advantages in the application of this Transmissometer.

J2360
Johnston, D.R. and D.E. Burch.
ATTENUATION BY ARTIFICIAL FOGS IN THE VISIBLE NEAR INFRARED, AND FAR INFRARED.
Appl. Optics Vol. 6, No. 9, 1967, p. 1497-1501.

The attenuation coefficient ratio ($a\lambda/a_{0.546}$) for artificial fogs has been measured at 345 μ. The attenuation coefficient ratios at 0.436 μ, 1.01 μ, 3.5 μ, 10 μ, and 13.5 μ were also measured so that a comparison between artificial fogs and natural fogs could be made. By comparing our results with others on natural fogs and with the theoretical work of others in the visible and near ir, we have concluded that our artificial fogs closely resemble natural fogs. We conclude, therefore, that $a_{345}/a_{0.546}$ is representative of real fogs. Artificial fogs are generated and allowed to dissipate during which time attenuation of light at several wavelengths is recorded. The green line of the mercury arc at 0.546 μ was used as the standard of comparison. For radiation at 345 μ, $a_{345}/a_{0.546} = 0.014 \pm 0.009$ during the generation time of the fog and 0.021 ± 0.006 during the time the fog is allowed to dissipate. (Author)

J2370
Jones, Lloyd A.
A METHOD AND INSTRUMENT FOR THE MEASUREMENT OF THE VISIBILITY OF OBJECTS.
Phil. Mag. 6th Ser., Vol. 39, No. 229, Jan. 1920, p. 96-134.

One of the earliest comprehensive investigations of the visibility problem and its instrumental measurement. Theoretical analysis of visibility conditions, physiological factors affecting visibility, etc. are emphasized. The natural causes of lowered visibility are also investigated. The author presents a detailed description of his visibility meter and the results obtained with it. The visibility meter is constructed on the photometric principle.

J2380
Kabanov, M.V. and I.V. Samokhvalov.
EKSPERIMENTAL'NOE ISSLEDOVANIE OTRAZHENIIA KOROTKIKH IMPUL'SOV OPTICHESKOGO IZLUCHENIIA TUMANAMI I DYMAMI (EXPERIMENTAL STUDY OF THE REFLECTION OF SHORT PULSES OF OPTICAL RADIATION FROM FOG AND SMOKE).
Izv. vyssh. uchen. Zaved. Fiz. Vol. 12, No. 3, 1969, p. 80-84.
Trans. into English in *Soviet Physics Journal* Vol. 12, No. 3, 1969.

Investigation of short light pulse scattering in artificial fog and smoke. A pulsed semiconductor laser beam is led through a collimator into a chamber filled with artificial fog or wood smoke of variable optical density. The pulse duration is 8 nsec and the Mie scattering parameters are 42 ± 20 and 5 ± 3 for the fog and smoke, respectively. The attenuation coefficient of reflected light is determined photometrically at a wavelength of 0.63 μ, and a photomultiplier and an oscillator are used for recording the reflected light. It is found that the phase and duration of reflected pulses strongly depend on the attenuation coefficient and other optical properties of the reflecting medium when their density is low. However, this dependence is not observed when the attenuation coefficient is above 0.4 m^{-1}.
A69-30077#

J2390
Kabanov, M.V., I.V. Samokhvalov, and B.A. Savelev.
POLARIZATION OF LASER EMISSION SCATTERED BY FOG AND SMOKE.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 4, No. 10, 1968, p. 1116-1119.
Trans. into English FSTC-HT-23-635-69.

The results of experimental investigations of the degree of polarization of scattered forward and reflected light are discussed, including laser-emission in artificial fog and smoke. Results obtained show that during dispersion of narrow laser beams the theory of momentary scattering describes not only the dependence of scattered light intensity on optical thickness, but also the polarizing ability of scattered forward light. (Author)
A69-28783

J2400
Kabanov, M.V. and B.A. Savelev.
EKSPERIMENTAL'NYE ISSLEDOVANIIA IARKOSTI MNOGOKRATNO RASSEIANNOGO VPERED SVETA PRI RASPROSTRANENII UZKIKH KOLLIMIROVANNYKH PUCHKOV (EXPERIMENTAL STUDIES OF THE BRIGHTNESS OF MULTIPLY SCATTERED LIGHT FOR THE CASE OF THE SPREADING OF NARROW COLLIMATED BEAMS).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 4, Sept. 1968, p. 960-967.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 4, Sept. 1968, p. 550-554.

Investigation of the brightness of multiply scattered light in milk, lycody, and artificial fog and smoke as a function of the optical diameter Δ of the light beam and the receiver. When the optical diameter is sufficiently small, the brightness of the forward light is found to be described by the expression for single scattering (in fog and smoke for optical densities up to $\tau = 16$ with $\Delta \leqslant 0.09$). The structure of the light beam is studied for different optical densities and scattering media.
A68-44039#

J2404
Kalitin, N. N.
ON THE TRANSPARENCY OF THE ATMOSPHERE AND ITS VARIATIONS.
Bull. Obs. Lyon Vol. 11, July 1929, p. 151-160.

J2406
Kalitin, N. N.
SMALL VARIATIONS OF ATMOSPHERIC TRANSPARENCY.
Beitr. Geophys. Vol. 46 (3), 1936, p. 283-290.

J2410
Kampe, H.J.
VISIBILITY AND LIQUID WATER CONTENT IN CLOUDS IN THE FREE ATMOSPHERE.
J. Met. Vol. 7, No. 1, Feb. 1950, p. 54-57.

This paper briefly describes a method of determining the visibility in clouds by Koschmieder's formula. This requires the measuring of the scattering coefficient which is accomplished by means of a transmissometer.

J2420
Kahler, K.
DIE ATMOSPHAERISCHE SICHT UND IHRE MESSUNG (ATMOSPHERIC VISIBILITY AND ITS MEASUREMENT).
Naturwissenschaften Vol. 23, No. 16, April 19, 1935, p. 253-256.

A theoretical study with critical review of the methods for calculation and apparatus used to measure the visual range.

J2430
Kariakin, N.A. and V.V. Kuznetsov.
K VOPROSU O RASCHETE I OTSENKE SVETOVYKH VRASHCHAIUSHCHIKHSIA MAIAKOV (ON THE PROBLEM OF CALCULATION AND ESTIMATION OF OPTICAL PROPERTIES OF ROTATING LIGHTHOUSE BEAMS).
Svetotekhnika No. 10, Oct. 1935, p. 2-8.

Analysis of technical conditions and light properties of different types of lighthouse beacons and study of the physiological factors in visibility (contrast threshold of the human eye depending on brightness and duration of light). The relation between white sources of light and visibility is shown in a table for different grades of air transparency.

J2440
Kasatkina, O.I. and L.B. Krasilshchikov.
AVTOMATICHESKAIA SMENA FIL'TROV PRI REGISTRATSII SIL'NO MENIAIUSHCHIKHSIA SVETOVYKH POTOKOV (AUTOMATIC SWITCHING OF FILTERS IN THE RECORDING OF ABRUPTLY CHANGING LUMINOUS FLUXES).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 75-77.

Discussion of a lens nephelometer developed by the authors for measuring light scattering indices, in which light scattered by cloud droplets is received by a photomultiplier, and the signals from the latter are recorded by an electron potentiometer. Since the ratio of the luminous fluxes that correspond to the maximum and minimum light scattering by water droplets of 5 to 50 μ can reach values in the order of 10^4, it is necessary to eliminate large changes in the illumination level at the cathode by introducing several light filters. A diagram for the automatic switching of these light filters is presented.
A65-18572#

J2450
Kasatkina, O.I. and L.B. Krasilshchikov.
ISKLIUCHENIE VLIIANIIA NEPOSTOIANSTVA ISTOCHNIKA SVETA PRI OB'EKTIVNYKH FOTOMETRICHESKIKH IZMERENIIAKH S POMOSHCH'IU ELEKTRONNOGO POTENTSIOMETRA (ELIMINATION OF THE EFFECT OF LIGHT-SOURCE INSTABILITY IN LENS-PHOTOMETRIC MEASUREMENTS USING AN ELECTRON POTENTIOMETER).
Trudy glav. geofiz. Obs. Len. No. 153, 1964, p. 78, 79.

Discussion of a device for use with an electron potentiometer that records the characteristic curves of light scattering by water droplets. The instrument serves to eliminate the effect of variations in a mercury-vapor-tube flux on the photometric measurements of scattered beams.
A65-18573#

J2460
Kasten, Fritz.
DISKUSSIONSBEITRAG ZUR FRAGE DER SICHT IN WOLKEN (DISCUSSION OF THE PROBLEM OF VISIBILITY IN CLOUDS).
Arch. Met. Geophys. Bioklim. Ser. A. Vol. 13, No. 1, Feb. 1962, p. 117-121.

The discrepancy between measured (or estimated) visual range (V_g) and the one calculated from the drop size distribution (V_b) stated by Trappenberger on the basis of the measurements of Rittenberger, are discussed. It is assumed that in the measurement of the drop size distribution the small droplets are discriminated. If the distributions are extrapolated to drop diameters of 2 or 1 μ, V_b turns out to be in agreement with V_g. (Author)

J2470
Kasten, Fritz.
DER EINFLUSS DER AEROSOL-GROESSENVERTEILUNG UND IHRER AENDERUNG MIT DER RELATIVEN FEUCHTE AUF DIE SICHTWEITE (EFFECT OF AEROSOL SIZE DISTRIBUTION AND ITS VARIATION WITH RELATIVE HUMIDITY ON THE VISUAL RANGE).
Beitr. Phys. Atmos. Vol. 41, No. 1, 1968, p. 33-51.

Analytical study of the relation between aerosol size distribution and visual range. From aerosol distribution given by Junge (1952), spectral standard visual ranges are calculated and compared with records of a transmissometer and a scattering recorder as well as with visual estimates of visibility by Frankenberger (1964). It is found that for visual ranges <10 km, the computations agree well with the measurements as far as the following is taken into consideration: (1) for visual estimates of visibility by means of sight markers of visual field angle of more than 100', the contrast threshold of the eye is set at $|\epsilon| = 5.27 \times 10^{-3}$ instead of $|\epsilon| = 0.02$ as usually, so that the corresponding standard visual ranges become $V_n = 5.25\ \sigma^{-1}$, instead of $V_n = 3.912\ \sigma^{-1}$; and (2) the readings of the scattering recorder depend on the steepness of the aerosol size distribution. Possible causes for the deviations of the measurements from the values theoretically expected in the region of visual ranges ≥10 km are proposed. An analytical description of the variation of visual range in the phase of precondensation by soaking of the aerosol particles is included.
A69-12760

J2480
Kasten, Fritz.
REGARDING RANGE OF VISIBILITY IN POLAR WHITE-OUT.
Polarforschung Nos. 1-2, 1960.

J2490
Kasten, Fritz.
VISIBILITY AND ALBEDO, ESPECIALLY IN THE POLAR REGIONS, PT. 1, THEORY OF HORIZONTAL VISIBILITY OF NON SELF-LUMINOUS OBJECTS UNDER AN OVERCAST SKY.
Beitr. Phys. Atmos. Vol. 34, Nos. 3-4, 1961, p. 234-258.

J2500
Kasten, Fritz.
VISIBILITY FORECAST IN THE PHASE OF PRE-CONDENSATION.
Tellus Vol. 21, No. 5, 1969, p. 631-635.

Study of the effect on visibility of the swelling of aerosol particles due to increasing humidity. Aspects of the swelling of aerosol particles due to rising humidity are examined and the variation of visibility with varying humidity is discussed. The visibility is considered as function of humidity.
A70-21921#

J2510
Kasten, Fritz.
VISIBILITY RANGE CHANGES DUE TO HUMIDITY SWELLING OF AEROSOLS.
Annln Met., Hamburg No. 4, 1969, p. 148-151.

J2512
Kekcheev, K., N. Derzhavin and S. Pilipchuk.
PROBLEM OF NIGHT VISION.
War. Med., Chicago Vol. 3, Feb. 1943, p. 171-173.

J2520
Kelly, T.
THICK AND DENSE FOG AT LONDON/HEATHROW AIRPORT AND KINGSWAY/HOLBORN DURING THE TWO DECADES 1950-1959 AND 1960-1969.
Met. Mag., Lond. Vol. 100, Sept. 1971, p. 257-267.

All occasions of semipersistent thick fog during the 20 years under consideration are listed. Another table shows all occasions of semipersistent dense fog. 'Semipersistent fog' is defined as fog lasting for 12 hours or more, while 'persistent fog' is fog lasting for 24 hours or more. A visibility of less than 50 meters was defined as dense fog and a visibility of less than 200 meters as thick fog, the latter including the former. The information discussed might help forecasters to decide whether, in any given situation, thick or dense fog is climatologically likely to occur in the London area and at Heathrow in particular.
A71-43890

J2525
Kevern, G. M.
APPROACH AND RUNWAY LIGHTING FOR ADVERSE WEATHER CONDITIONS.
Illum. Engng Vol. 41, June 1946, p. 455-473.

J2530
Khvostikov, I.A.
ON INVESTIGATING THE ATMOSPHERE WITH HELP OF A PROJECTOR BEAM.
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Issues 5-6, 1945.

J2540
Knestrick, G.L., T.H. Cosden, and J.A. Curcio.
ATMOSPHERIC SCATTERING COEFFICIENTS IN THE VISIBLE AND INFRARED REGIONS.
J. opt. Soc. Am. Vol. 52, No. 9, Sept. 1962, p. 1010-1016.

Atmospheric spectral attenuation coefficients have been measured in ten narrow wavelength bands between 0.4 and 2.3 μ for a variety of weather conditions for two overwater, sea-level paths of 5.5 and 16.3 km. The wavelength bands were chosen so as to avoid molecular absorption and were isolated by interference filters. A 60-in.-diameter high-intensity source and a 24-in.-diameter narrow-field receiver were combined to yield relative scattering attenuation coefficients (σ) as a function of wavelength λ. These were then scaled using values obtained at one wavelength with a visual telephotometer. Logσ vs logλ curves show a wide range of slopes and shapes, with a tendency toward less slope in the infrared (indicating that σ is becoming independent of λ in the infrared). Some correlation with relative humidity was found for relative humidities greater than 70%. An anomalous slope reversal between 1.68 and 2.27 μ is discussed, and a possible explanation for the reversal is given as selective scattering by the aerosol at these wavelengths. (Author)

J2545

Knoll, H. A., R. Tousey and E. O. Hulburt.

VISUAL THRESHOLDS OF STEADY POINT SOURCES OF LIGHT IN FIELDS OF BRIGHTNESS FROM DARK TO DAYLIGHT.

J. opt. Soc. Am. Vol. 36, Aug. 1946, p. 480-482.

The threshold illumination at the eye from a steady source of light of 1'angular diameter in a field of brightness b was measured for b ranging from zero to about 1500 candles per square foot. The data were obtained by five young experienced observers using both eyes unaided and with natural pupil. A bend in the i, b curve at about b=1000 mμL occurred at the transition from foveal to extra-foveal vision. The relation $i=10^{-10}(1+b)^{1/2}$, where i is in footcandles and b is in millimicrolamberts, expressed the experimental data within a factor of 3 over the entire range. (Author).

J2547

Kobayasi, A. and D. Nukiyama.

ON THE TRANSMISSIBILITY OF VISIBLE LIGHT THROUGH A CLOUD OF PARTICLES.

Proc. phys. - math. Soc. Japan Vol. 15, Feb. 1933, p. 59-72.

In English

J2550

Kolenkova, S.I. and I.V. Litvinov.

KHARAKTERISTIKA NEKOTORYKH PARAMETROV ATMOSFERY V POGRANICHNOM SLOE PRI TUMANAKH (CHARACTERISTIC OF SOME ATMOSPHERIC PARAMETERS IN THE BOUNDARY LAYER IN THE PRESENCE OF FOG).

Met. gidrol. July 1971, p. 20-27.

The wind velocities and directions, the air temperature, and the visibility range in the 300-m layer are analyzed for fog conditions on the basis of data obtained from the meteorological tower at Obninsk. It is found that vertical temperature gradients are subject to pronounced variations, in particular, in the lower layer (0 to 49 m), due to the influence of the underlying surface.

A71-42846#

J2560

Kolosov, M.A., A.V. Sokolov, L.V. Fedorova, et al.

SVIAZ' ABSOLIUTNOGO KOEFFITSIENTA OSLABLENIIA INTENSIVNOSTI LAZERNOGO IZLUCHENIIA V VODNYKH TUMANAKH S KONTSENTRATSIEI KAPEL' (RELATION BETWEEN THE ABSOLUTE ATTENUATION COEFFICIENT OF LASER RADIATION IN WATER FOG AND THE DROPLET CONCENTRATION).

Dokl. Akad. Nauk SSSR Vol. 188, Oct. 21, 1969, p. 1277-1280. In Russian.

Study of laser radiation attenuation in artificial fogs obtained by adiabatic expansion of air in a pressure chamber. An electronic droplet-size analyzer is used for determining the proportions of water particles of different sizes in a fog. The device is capable of recording a total of 7 particle fractions with radii measuring from 0.5 to 14 μ in a single continuous process. A representative curve showing the relation between the radiation attenuation coefficient and the water particle concentration is plotted. The results suggest that there is only single scattering of laser radiation in fogs with optical thicknesses less than 7.

A70-18725#

J2570

Konovalov, Iu.G.

GENERALIZED MATHEMATICAL DESCRIPTION OF THRESHOLD OPTIC EYE FUNCTIONS AND DETERMINATION OF THE VISUAL RANGE OF LUMINOUS OBJECTS.

Met. gidrol. No. 9, 1968, p. 38-44. In Russian.

Empirical dependences of light and contrast sensibility thresholds upon background brightness and angular size of the object by mathematical processing of experimental data are obtained simultaneously. These dependences generalizing the well known regularities of threshold susceptibility make it possible to calculate the visual range of luminous objects at any values of background brightness and angular sizes under the conditions of transparent and opaque atmosphere. The research data enable to increase the accuracy of determining the visual range of luminous objects compared with the existing methods. (Author)

J2575
Koschmieder, H.
ATMOSPHERIC LIGHT AND VISIBILITY.
Naturwissenschaften Vol. 26, Aug. 12, 1938, p. 521-528.

J2576
Koschmieder, H.
THEORY OF THE HORIZONTAL VISUAL RANGE.
Met. Z. Vol. 43, Nov. 1926, p. 418-420.

J2577
Koschmieder, H.
THEORY OF THE HORIZONTAL VISUAL RANGE. I.
Beitr. Phys. frei. Atmos. Vol. 12, Feb. 10, 1925, p. 33-35.

J2578
Koschmieder, H.
THEORY OF THE HORIZONTAL VISUAL RANGE. II. CONTRAST AND VISIBILITY.
Beitr. Phys. frei. Atmos. Vol. 12, Oct. 25, 1925, p. 171-181.

J2579
Koschmieder, H.
VISIBILITY MEASUREMENTS OR VISIBILITY OBSERVATIONS?
Met. Z. Vol. 58, June 1941, p. 221-223.

J2580
Koschmieder, Harald Hans and H. Ruhle.
DANTZIGER SICHTMESSUNGEN (VISIBILITY MEASUREMENTS IN DANZIG).
ForschArb. st. Obs. Danzig Nos. 2 and 3, 1930.

Report on experimental investigations made during 1927-1929, using different instruments. Special black and white screens were also used for visibility observation. The authors present remarks and some corrections to the visibility theory and discuss the sources of error caused by physical and physiological factors and weather conditions.

J2590
Koshelenko, I.V.
NEKOTORYE RADIATSIONNYE KHARAKTERISTIKI V TUMANE (SOME CHARACTERISTICS OF RADIATION IN FOG).
Kiev. Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Trudy No. 47, 1965, p. 22-29.
Trans. into English by American Meteorological Society, Boston, Mass. T-R-552.

Data are presented on the radiation balance and total radiation in fog at ground level, at the top of the fog layer, and within the fog. The mean attenuation factors of long-wave and short-wave radiation in a fog layer are calculated on the basis of these data. (Author)
N68-23899 AD-667406

J2600
Koshelev. B.P.
K VOPROSU O SVIAZI OPTICHESKIKH I MIKROFIZICHESKIKH KHARAKTERISTIK TUMANOV (PROBLEM OF THE RELATION BETWEEN OPTICAL AND MICROPHYSICAL CHARACTERISTICS OF FOG).
Izv. vyssh. ucheb. Zaved. Fiz. Vol. 9, No. 3, 1966, p. 126-129.
Trans. into English in *Soviet Physics Journal* Vol. 9, No. 3, 1966.

Study of the causes of the disagreement between photometric values of the fog transmittance attenuation factor and values of the factor calculated from microstructural observations with a flow trap. From a large number of experiments, it is found that the disagreement arises because the absolute values given for droplet concentration by a flow trap are too low. The droplet-size distribution functions are determined fairly accurately with such traps.
A66-38917#

J2610
Kovetz, A.
AN ANALYTICAL SOLUTION FOR THE CHANGE OF CLOUD AND FOG DROPLET SPECTRA DUE TO CONDENSATION.
Jrnl atmos. Sci. Vol. 26, Mar. 1969, p. 302-304.

Description of the process of droplet growth by condensation of water vapor on condensation nuclei. A partial differential equation for the droplet spectrum is used in the description. Solutions of this equation are given for a few simple cases which are of interest in connection with clouds and fogs.
A69-26017#

J2620
Kozharin, V.S.
O STRUKTURE NIZHNEI KROMKI NIZKIKH OBLAKOV SLOISTYKH FORM (STRUCTURE OF THE LOWER EDGE OF LOW STRATUS CLOUDS).
Trudy glav. geofiz. Obs., Len. No. 186, 1966, p. 95-103.

The dependence of the structure of the lower boundary of low stratus upon the hygrothermal state of the lower layer of the atmosphere and the relationship between the water content of the lower boundary of clouds and horizontal and slant visibility are examined. Equations are derived for calculating the fluctuations of the lower boundary of clouds, the height of the lower boundary of the precloud haze and its vertical extension, and the slant visibility within a layer beneath a cloud. (Author)

J2630
Krasilshchikov, L.B.
ON THE PROBLEM OF SIGHTING WITH OBJECTIVE COLLECTORS THROUGH A TURBIDIZED ATMOSPHERE.
Trudy glav. geofiz. Obs., Len. No. 100, 1956. In Russian.

J2635
Krat, V. A.
SOME PROBLEMS IN THE THEORY OF VISIBILITY OF TERRESTRIAL OBJECTS FROM AN AIRPLANE.
Glavnaia astronomicheskaia observatoriia, Leningrad, Doklady Vol. 17, No. 135, 1946.

J2640
Kraus, A.
NOTE OF FOG AND ATMOSPHERIC POLLUTION.
Q. Jl. R. Met. Soc. No. 73, 1947.

J2650
Kruglov, R.A.
BESKONTAKNYE FUNKTSIONAL'NYE PREOBRAZOVATELI V KACHESTVE IZMERITEL'NYKH USTROIST AVTOMATICHESKIKH FOTOMETROV (CONTACTLESS FUNCTIONAL TRANSFORMERS AS MEASURING ATTACHMENTS ON AUTOMATIC PHOTOMETERS).
Trudy glav. geofiz. Obs., Len. No. 199, 1966, p. 33-39.

The solution of the equation for meteorological distance of visibility in a photometer is discussed. There is described the construction and operation of an electromechanical functional transformer for a photometer with electrical compensation and with a single photoelectric element for solving this equation. (MGA)

J2660
Kruglov, R.A.
IMPUL'SNYI FOTOMETR S ELEKTRONNYM FUNKTISIONAL'NYM PREOFRAZOVATELEM (AN IMPULSE PHOTOMETER WITH AN ELECTRONIC CONVERTER).
Trudy glav. geofiz. Obs., Len. No. 240, 1969, p. 95-102.

Methods are considered for reducing the errors of objective measurements of the transparency of the atmosphere. Errors caused by the remote transmission of measurement data were also considered. A block diagram of one of the possible variants of a photometer is described that gives the accuracy of remote measurements of meteorological visual ranges required for aviation purposes. (Author)

J2670
Krylov, Nikolai K.
ISSLEDOVANIIA PO GORIZONTAL'NOI I VERTIKAL'NOI VIDIMOSTI ROSTOVSKOI GEOFIZICHESKOI OBSERVATORII (INVESTIGATIONS OF THE ROSTOV GEOPHYSICAL OBSERVATORY ON HORIZONTAL AND VERTICAL VISIBILITY).
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Vol. 6, No. 3, 1942, p. 90-92.

Report on experiments made during 1940 in Rostov on Don. More than 1000 series of observations were carried out to determine visibility. The relation between visibility and size of black objects, and the variations in contrast sensitivity of the human eye were studied. Some observations on visibility of white and black platforms (200 square meters each) were made from airplanes, when the observer marked the altitude on which the differences of brightness between white and black platforms faded away. A short description of an instrument for measuring the brightness of black objects is also given.

J2680
Kubota, K.
ON THE VISIBILITY FOR AERONAUTICAL METEOROLOGICAL OBSERVATIONS.
J. Met. Res., Tokyo Vol. 17, No. 11, 1965, p. 727-739.

J2690
Kulb, W.
DIE SCHWACHUNG SICHTBARER UND ULTRAROTER STRAHLUNG DURCH KUNSTLICHE NEBEL UND IHRE WIRKUNG AUF DIE SICHT (THE ATTENUATION OF VISIBLE AND INFRARED RADIATION BY ARTIFICIAL AEROSOLS AND THEIR EFFECT UPON VISIBILITY).
Annln Phys. Vol. 5, No. 11, 1931, p. 679-726.
Trans. into English Rept. No. FSTC-HT-23-097-71.

Spectral transmission by a number of artificial aerosols (mist from fuming sulfuric acid, mists of SICL4 and NH3 and of TICL4, zinc chloride aerosol, carbon aerosol, potassium sucrate smoke) was measured for wavelengths from 0.4 to 4.0 micrometers. A study was made of the relative contributions of scattering and absorption to total attenuation. General ideas regarding visibility conditions in turbid media are developed and means of improvement are discussed. (Author)

J2695
Kuhl, A.
DIFFERENTIAL THRESHOLDS AT CONSTANT ADAPTATION READINESS.
Z. InstrumKde Vol. 63, Dec. 1943, p. 405-416.

J2700
Kulikova, G.I., E.G. Palagin, E.A. Poliakova, et. al.
K VOPROSU O VOZMOSHNOSTI RADIOLOKATSIONNOGO OPREDELENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI V TUMANAKH (POSSIBILITY OF RADAR DETERMINATION OF VISIBILITY IN FOGS).
Trudy glav. geofiz., Len. No. 173, 1965, p. 71-75.
Trans. into English by American Meteorological Society, Boston, Mass. T-R-534.

The feasibility of radar determination of visibility in fogs is examined. The fundamental possibility of detection of fogs at short ranges is demonstrated. Correlations are established between optical and radar characteristics of fogs. Approaches to the development of a radar method are pointed out. (Author)
N66-27844#   AD-630554   A66-11272

J2710
Kusano, K.
VARIATIONS OF TRANSMISSIVITY AND RUNWAY VISUAL RANGE AT THE TOKYO INTERNATIONAL AIRPORT.
J. Met. Res., Tokyo Vol. 20, No. 6, June 1968, p. 319-328. In Japanese.

Statistical investigation has been made to study variations of transmissivity and runway visual range (RVR) at the Tokyo Intl. Airport, based on the data obtained from 2 sets of transmissometers. Results are as follows: 1) annual and diurnal variations of transmissivity and RVR are similar to those of visibility, 2) low values of both transmissivity and RVR persist for at least 10 to 15 min and variations with periods of 100 min and 150 min are clearly recognized in case of poor visibility, 3) a rather high value of RVR persists for only 2 min, and variations with periods of 9 min and 40 min prevail in case of good visibility, 4) when lower values of transmissivity and RVR persist for the longer period, the lower extreme value becomes small, and 5) variation in space of transmissivity and RVR largely depends on environmental meteorological conditions, especially on surface wind. These results are useful for qualitative forecast of RVR. (Author)

J2720
Kutz, Gerhard.
MESSUNG DER SICHT VOM FUEHERSITZ VERSCHIEDENER FLUGZEUGMUSTER (MEASUREMENT OF VISIBILITY FROM THE PILOT'S COCKPIT OF DIFFERENT AIRPLANE TYPES).
Z. Flugtech. Motorluftschiff. Vol. 22, March 28, 1931, p. 167-176.
Trans. into English in NACA, TM646, Nov. 1931.

An experimental work. Special visibility meters were constructed for observation. Visibility measurements made from six different types of airplanes and from automobiles were compared. Minimum visibility requirements and some numerical coefficients are given.

J2730
Kuznetsov, E.S.
THEORY OF NON-HORIZONTAL VISIBILITY.
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Vol. 7, No. 5, 1943, p. 247-336. In Russian.

A comprehensive study of visibility conditions for cases when the observer and object are situated at different horizontal levels. The author revises the theory of horizontal visibility and investigates the distribution of the coefficient of absorption and scattering with height, the form of the index of scattering, the boundary conditions and the albedo of the earth's surface. The author proposes a new theory for determination of visibility of black and non-black objects. The physical basis of the theory is the equation for the transfer of radiation. The calculation of visibility range is given for two cases, i.e., a case when observer is situated above the object and when he is below the object.

J2740
Lamar, Edward S., Selig Hecht and Charles D. Henley.
SIZE, SHAPE AND CONTRAST IN DETECTION OF TARGETS BY DAYLIGHT VISION.
J. opt. Soc. Am. Vol. 37, No. 7, July 1947, p. 531-545.

The influence of size and symmetry has been studied on the contrast required for the recognition of rectangular targets against background brightnesses of 2950 and 17.5 footlamberts. Targets less than 2 minutes in diameter require the addition of a constant total light flux to the background. Larger targets require less contrast but more total flux as the area increases, until beyond 200 square minutes when the required contrast becomes independent of area. For areas below 100 square minutes, square targets are most efficient for their area; the greater the ratio of length to width the greater the contrast required. All the measurements can be unified on the supposition that the visually critical region of a target is a ribbon just inside its perimeter and about 1 minute wide. Evidently, contrast is not judged over the area of a target, but across its boundary. (Author)

J2750
Lamar, Edward S., Selig Hecht, Charles D. Henley, et al.
SIZE, SHAPE AND CONTRAST IN DETECTION OF TARGETS BY DAYLIGHT VISION. II. FREQUENCY OF SEEING AND THE QUANTUM THEORY OF CONE VISION.
J. opt. Soc. Am. Vol. 38, No. 9, Sept. 1948.

Frequency-of-seeing curves have been obtained for targets having various image perimeters at background brightnesses of 2950 and 17.5 foot-lamberts, respectively. A description of the data has been obtained on the basis of the assumption that the absorption of a light quantum by a foveal cone is a random event which is subject to the laws of chance. On this basis the data indicate that the detection of a target takes place across the image boundary; that in order to detect the target, at least one of the cones along the boundary must absorb at least 4 quanta, and that this critical number of quanta is the same for each of the two background brightnesses investigated. At the higher brightnesses, this critical number of quanta absorbed from the target is about equal to the random fluctuation to be expected in the number absorbed from the background during the critical time of one exposure. (Author)

J2760
Lamp, R.
THE FREQUENCY OF LOW VISUAL RANGES AND CEILINGS AT GERMAN CIVIL AIRPORTS.
Met. Rdsch. Vol. 23, 1970, p. 102-104. In German.

Runway low visibility and ceilings frequency and duration at German airports, using 1949-1967 statistical data.
A70-37925

J2770
Lamp, R.
THE REAPPEARANCE OF FOG LAYERS.
Met. Rdsch. Vol. 23, 1970, p. 141-144. In German.

Airport fog layers repetition frequency after low visibility periods.
A70-43246

J2780
Landi, A. and C. Giallombardo.
LA DETERMINAZIONE DELLA VISIBILITA E DELLA ALTEZZA DELLA BASE DELLE NUBI SUGLI AEROPORTI (DETERMINATION OF THE VISIBILITY AND THE HEIGHT OF THE BASE OF CLOUDS OVER AIRPORTS).
Riv. met. aeronaut. Vol. 11, No. 2, Apr./June 1951, p. 13-18.

Methods used in Italy for official measurements of ceiling height and visibility at airports are reviewed. The cloud height is determined by estimation or by ceiling or pilot balloons in the daytime, and is measured with a projector at night. The effect of ragged bases during nimbus is discussed. Day and night visibilities are defined, choice of visibility marks and lights discussed and IMO (1949 code) specifications set forth.

J2785
Langer, R. M.
ATMOSPHERIC ABSORPTION AND TRANSMISSION IN SEARCHLIGHT PRACTICE.
J. opt. Soc. Am. Vol. 12, Apr. 1926, p. 359-373.

J2787
Langmuir, I. and W.F. Westendorp.
A STUDY OF LIGHT SIGNALS IN AVIATION AND NAVIGATION.
Physics Vol. 1, No. 5, Nov. 1931.

Visibility of point sources.—Laboratory experiments have been devised to make measurements of the visibility of light signals under conditions essentially similar to those encountered by the aviator or the navigator. Data have been collected on the direct visibility of flashing point sources of light of different colors flash lengths and intervals, against different backgrounds; the time it takes to locate a visible beacon was studied as a function of the beacon intensity and frequency of flashing. The threshold candle power C required for visibility of a point source at distance D (cm) against a background of brightness H (candles X cm^{-2}*) is given by the empirical equation* $C/D^2=3.5 \times 10^{-9} H^{1/2}$*. Colored point sources were not found to be useful except in the case of red lights with background intensities above moonlight. For an airplane approaching a beacon it is advantageous to use frequencies of flashing as high as 12 to 30 per minute, although with exceptionally clear atmosphere, lower frequencies may be better.*

Visibility of diffuse light.—In a study of the visibility of flashes of diffuse light superimposed on a steady white background, white light flashes gave the best results. The sensitivity of the eye to light from point sources is from 10,000 to 170,000 times as great as from diffuse sources, this range corresponding to an increase in background brightness from 0.1 starlight up to moonlight. A selective differential photoelectric receiver is described which detects signals of modulated diffuse light of an intensity of only 4×10^{-11} *candles X cm*$^{-2}$*. This sensitivity is independent of the steady background brightness up to 100 times moonlight, and is from 6 to 13,000 times as great as that of the eye in the range of background intensity from darkness up to moonlight.*

Diffusion of light in fog.—The greatest difficulty in transmission of light signals through fog lies in the loss of advantages of the point source. Dense fog may increase the distances at which diffuse light signals may be detected. The range depends to a considerable extent on the reflectivity of the ground. A theoretical treatment of the diffusion of light through fog, based on the scattering of the light rays by fog particles, indicates that airplanes can be guided through fog at distances of several miles by means of diffuse modulated light acting on a differential photoelectric receiver. (Author)

J2790
Langrock, Erwin.
PROBLEME UND ASPEKTE DER ERARBEITUNG VON WETTERMINDEST BEDINGUNGEN FUER DIE LUFTFAHRZEUGTYPEN DER INTERFLUG (PROBLEMS AND ASPECTS OF ELABORATION OF WEATHER MINIMUM CONDITIONS FOR INTERFLUG AIRCRAFT).
Technisch-okonomische Informationen der zivilen Luftfahrt Vol. 7, No. 2, 1971, p. 76-87.

The methodology necessary for determining weather minima is discussed. Factors affecting this determination are reviewed and qualitatively estimated. Requirements are presented which must be included in the methodology. Finally, possible approaches to the methodology preparation are examined.

J2795
Langstoth, G. O. et al.
A LABORATORY STUDY OF VISIBILITY THROUGH CLOUDS.
Can. J. Res. Vol. 25A, Jan. 1947, p. 49-57.

J2796
Lash, J. D. and G. F. Prideaux.
VISIBILITY OF SIGNAL LIGHTS.
Illum. Engng. Vol. 38, Nov. 1943, p. 481-492.

J2800
Lavrishchev, D.N.
EXPERIENCE IN REFINING THE FORECASTING OF LOW CLOUDINESS, POOR VISIBILITY, AND FOG.
Met. gidrol. No. 5, 1963.
Trans. into English by Joint Publications Research Service in *Translations from Meteorologiia i gidrologiia* No. 5, July 12, 1963, p. 62-71

Three graphs are presented as aids in the forecasting of low cloudiness, poor visibility, and fog. Graph 1 shows the relationship of the height of low cloudiness to the air temperature (T) and the vapor tension (e) in millibars at the surface of the earth. This graph shows that a change in the height of unbroken low cloudiness has the same appearance as a change in the maximum vapor tension at the surface of the earth. Graph 2 shows the relationship of the height of low cloudiness (H) and horizontal visibility (V) to the dew-point deficit ($- T_d$) at the surface of the earth. This graph is used mainly to forecast possible minimum values of the height of cloudiness and the horizontal visibility at a given airport. Graph 3 shows the occurrence of fog (radiation and advection) in relationship to the temperature (T) and vapor tension (e). This graph makes it possible to determine fog formation and the time of the formation. Criteria for the construction of the graphs and an analysis for usage of the graphs are included.
N64-12791

J2810
Lefkowitz, Matthew.
SOME EFFORTS TOWARDS UPGRADING TERMINAL WEATHER OBSERVATIONS.
J. Air Traff. Control Vol. 10, No. 5, Mar. 1968, p. 20-23.

Research programs, funded by FAA, are conducted by Weather Bureau personnel in an effort to upgrade terminal weather observations. Runway visual range (RVR) is a program which relates directly to instrument approach and landing operations. The transmissometer is the RVR instrument.

J2820
Levin, I.M.
O NABLIUDENII OB'EKTOV, OSVESHCHENNYKH UZKIM SVETOVYM PUCHKOM, V RASSEIVAIIUSHCHEI SREDE (OBSERVATION OF OBJECTS ILLUMINATED BY A NARROW LIGHT BEAM IN A SCATTERING MEDIUM).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 5, Jan. 1969, p. 62-76.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 5, Jan. 1969, p. 32-39.

Discussion of a scheme for observing objects illuminated by narrow light beams in scattering media. Relations for an integral light flux incident on the receiver plane at various angles, and also an equation for determining the visibility range are derived. The results of measurements of the light field characteristics figuring in these relations are given. These characteristics are used in brightness calculations for media with various ratios between the absorption and scattering coefficients.
A69-23971#

J2830
Linke, F.
CRITICAL DISCUSSION OF RECENT ENGLISH WORKS ON THE PROBLEM OF VISIBILITY.
Met. Z. Vol. 58, 1941.

J2840
Linke, F.
NOTES ON THE RESULTS OF LIGHT EXTINCTION MEASUREMENTS BY GUTH, V. AND LINKE, F.
Met. Z. Vol. 60, 1943, p. 140-141.

J2850
Linke, F., L. Nevzil, and I. Zacharov.
ON THE IMPORTANCE OF INCREASED DIFFUSION DURING TWILIGHT.
Studia geophys. geod. Vol. 8, No. 3, 1964, p. 274-286. In French.
Trans. into English John Crerar Library TT-65-13287.

J2860
Litchford, George B.
LOW-VISIBILITY LANDING, PT. 1: 1200 RVR.
Astronaut.+Aeronaut. Vol. 6, No. 11, Nov. 1968, p. 26-38.

The potential rewards or losses entailed in the some 50-billion dollars to be invested in airline jets by the end of the 1970s will hinge in part on the ability to operate them at increasingly lowered visibilities and in dense air-traffic environments. The impact of one electronic element—the landing system—on the safety and regularity of such service, much less on the air-traffic capacity of our congested terminal areas, has yet to be fully recognized. Electronic guidance and landing controls definitely lag other advances in the field of aeronautics. This situation should cause national concern. But even many people in the field do not appreciate its problems in depth. This article and its companion next month attempt to explain the reasons for the present situation and why a new, "total-system" approach to the low-visibility instrument landing problem will be essential to the future of aviation. (Author)

J2865
Litchford, George B.
LOW VISIBILITY LANDING, PART II: THE SYSTEMS CHALLENGE.
Astronaut.+Aeronaut. Vol. 6, No. 12, Dec. 1968, p. 44-56.

Discussion of a "total system approach" to the problem of low-visibility aircraft landing, emphasizing modern electronic developments. It is believed that integration of a high-capacity (Category-II and -III) landing system with any CAS (Collision Avoidance System) is mandatory, since the functions are so interrelated in terminal-area low visibility. Close spacing commensurate with high-density operations must be measured and displayed to pilots. Tighter safety standards (reduced errors) must be developed that are reflected in each element of the over-all system; this includes vertical and horizontal landing guidance, and radar monitoring of approach, landing, roll-out, and surface movement.
A69-13853#

J2867
Little, D. M.
CEILING AND VISIBILITY IN THE UNITED STATES; PACIFIC COAST STATES.
Mon. Weath. Rev. Wash. Vol. 58, May 1930, p. 203-204.

J2870
Lohle, Friedrich.
UEBER DIE SCHAETZUNG DER SICHTWEITE (EVALUATION OF VISIBILITY).
Met. Z. Vol. 55, No. 2, Feb. 1938, p. 54-61.

A study of conditions important to visibility measurement. Author emphasizes the dependence of accurate measurement on contrast sensibility of the human eye and the size and color of observed objects. A special comparison of various scales used for visibility observations (international, English, German and others) is presented.

J2874
Lohle, Friedrich.
ON INSTRUCTIONS FOR VISIBILITY ESTIMATION.
Z. angew. Met. Vol. 57, 1940, p. 37-49.

J2880
Lohle, Friedrich.
UEBER DIE SCHRAEGSICHT (ON SLANT VISIBILITY).
Met. Z. Vol. 52, No. 11, Nov. 1935, p. 435-438.

Mathematical analysis of the results of visibility observations from Rosskopf (766 m) to the Rhine Valley (250 m).

J2882
Lohle, Friedrich.
ON THE WIGAND HORIZON VISIBILITY.
Phys. Z. Vol. 37, Jan. 1936, p. 22-27.

J2883
Lohle, Friedrich.
ON VISUAL RANGE.
Annln Hydrogr. Berl. Vol. 68, June 15, 1940, p. 194-200.

J2884
Lohle, Friedrich.
VISIBILITY AND FLIGHT SAFETY.
Dtsch. Luftfahrtforsch. Vol. 13, Mar. 20, 1936, p. 100-102.

J2885
Luckiesh, Matthew and Frank K. Moss.
THE ABILITY TO SEE LOW CONTRASTS AT NIGHT.
J. aeronaut. Sci. Vol. 9, May 1942, p. 261-263.

J2886
Luckiesh, Matthew and Frank K. Moss.
CONTRAST SENSITIVITY AS A CRITERION OF VISUAL EFFICIENCY AT LOW BRIGHTNESS-LEVELS.
Amer. J. Ophthal. Vol. 22, Mar. 1939, p. 274-276.

J2887
Luckiesh, Matthew and Frank K. Moss.
THE MEASUREMENT OF VISIBILITY.
J. aeronaut. Sci. Vol. 9, Jan. 1942, p. 100-102.

J2888
Luckiesh, Matthew and Frank K. Moss.
SEEING LOW CONTRASTS AT NIGHT.
Light Ltg Vol. 32, Aug. 1939, p. 165-166.

J2889
Luckiesh, Matthew and Frank K. Moss.
SUPRA-THRESHOLD VISIBILITY.
J. opt. Soc. Am. Vol. 30, Feb. 1940, p. 62-69.

J2890
Luckiesh, Matthew and Frank K. Moss.
VISIBILITY: ITS MEASUREMENT AND SIGNIFICANCE IN SEEING.
J. Franklin Inst. Vol. 220, No. 4, Oct. 1935, p. 431-466.

Fundamental consideration of the physical and physiological bases of visibility. Several visibility meters are described.

J2895
Mackworth, N. H.
THE BREAKDOWN OF VIGILANCE DURING PROLONGED VISUAL SEARCH.
Q. Jl exp. Psychol. Vol. 1, Apr. 1948, p. 6-21.

J2900
Maczynski, Stanislaw.
AUTOMATICALLY RECORDING INSTRUMENT FOR MEASURING HORIZONTAL LIGHT EXTINCTION IN THE GROUND AIR LAYERS.
Acta geophys. pol. Vol. 11, No. 4, 1963, p. 239-246.

Describes an automatic recording instrument designed to measure horizontal light extinction near the ground. It was designed at the Belsk Obs. and provides continuous measurements in the whole range of the visible spectrum. The optical system is shown in sketches and its operation explained.

J2910
Makhotkin, L.G.
VIDIMOST', RAZMERY POMUTNIAIUSHCHIKH CHASTITS I FORMULA TRABERTA (VISIBILITY, DIMENSIONS OF VISIBILITY-BLURRING PARTICLES, AND TRABERT'S FORMULA).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 102-110.

Analysis of available observational data, leading to the conclusion that the character of particle distribution with respect to size can be determined from Trabert's formula if a certain correction factor is introduced in the theoretical value of the coefficient C in this formula. It is shown that electric-conductivity measurements in the atmosphere, in conjunction with visibility measurements, constitute an efficient means of investigating haze particles.
A65-18577#

J2920
Manzhula, A.P. and S.A. Kolonitskii.
O SKOROSTI OSAZHDENIIA CHASTITS IZ ATMOSFERY (RATE OF ATMOSPHERIC PARTICLE FALLOUT).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 1, Sept. 1965, p. 994, 995.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 1, Sept. 1965.

Derivation of a formula expressing the average rate of atmospheric particle fallout in terms of height-averaged values of the density and viscosity of the atmosphere. A table of average rates of particle fallout, calculated with the aid of the formula derived, is given, making it possible to determine the average rate of fallout from the particle radius and the fallout height.
A66-10760#

J2930
Markelov, V.A.
IZMERITEL' NAKLONNOI PROZRACHNOSTI S KVANTOVYM OPTICHESKIM GENERATOROM (SLANT TRANSPARENCY METER WITH A LASER).
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 18, 1968, p. 87-106.
Trans. into English Rept. No. FTD-HT-23-337-69.

Considers the possibility of achieving a slant transparency meter utilizing a laser and a narrow band light filter, and the advantages of such a meter. The paper gives a numerical comparison of the ratios signal/background when a laser is used and when a projector with a lamp giving emanation in a wide spectrum is used. Computations show that, in the first case, the ratio is 360 times greater. It is shown that the use of a ruby laser giving a monochromatic light beam, a narrow-band light filter, and a slot diaphragm of the field of view, reduces considerably the level of illumination of the day sky and increases the signal/background ratio. This makes it possible to build a slant transparency meter operating in the daytime with considerably higher accuracy and dependability. (Author)
AD-704033

J2940
Markelov, V.A.
RASCHETNYI ANALIZ NEKOTORYKH PARAMETROV IZMERITELIA NAKLONNOI PROZRACHNOSTI (COMPUTATIONAL ANALYSIS OF SOME PARAMETERS OF A SLANT TRANSPARENCY METER).
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 18, 1968, p. 81-86.
Trans. into English Rept. No. FSTC-HT-23-707-69.

Considers the problem of selecting the parameters of the slant transparency meter: the height of the secondary light source and the angle between the optical axes of the receivers and of the laser in relation to 1) the range of measurement of slant visibility and the attendant errors and 2) conditions of use of an installation operating by the equal angle method. Curves are given of the relation of luminescence of receivers to the height of the secondary light source and to the angle between the optical axes of the receivers and the laser. Considering the limitations of the height of the secondary light source by the level of the signal and the height of cloudiness, and the practical requirements of aviation, it is concluded that 60 m is the optimum and 150 m is the maximum height and that the angles between the optical axes must be between 30 and 36°. On the premise that it is possible to measure the ratio of levels of electrical signals with an accuracy of 2% in the range between 0.2 to 4 km, a formula is given with which an approximate value of the relative error of measurement of the visibility range can be determined. (Author)
AD-698078

J2950
Martynov, D. Ia.
OB INSTRUMENTAL'NOM OPREDELENII DAL'NOSTI VIDIMOSTI V GORIZONTAL'NOM ZAPRAVLENII (ON INSTRUMENTAL DETERMINATION OF VISIBILITY IN A HORIZONTAL DIRECTION).
Uchen. Zap. kazan. gos. Univ., Astron. Vol. 103, No. 5, 1943, p. 53-65.

The author derives several equations for computation of horizontal visibility and describes his own special instrument constructed for observations of visibility. This meter has photometer with selenium cell and mirror galvanometer (sensitivity 0.9 x 10)$^{-9}$. The horizontal visibility is determined by photometric measurement of brightness of white and black shields.

J2960
Martz, E.P., Jr.
VISIBILITY: DETECTION AND RECORDING OF OBJECTS AGAINST A SKY BACKGROUND.
J. Soc. Motion Pict. Telev. Engnrs Vol. 67, No. 4, 1958, p. 228-241.

J2970
Masaki, H.
APPARENT COLORS OF NATURAL OBJECTS (PT. 2).
Sci. Lt, Tokyo Vol. 9, 1960, p. 39-54.

J2980
McDonald, Jaime E.
AIRLIGHT SIMULATION EXPERIMENTS.
J. astronaut. Sci. Vol. 19, No. 1, 1962, p. 114-116.

J2990
McDonald, Jaime E.
VISIBILITY REDUCTION DUE TO JET EXHAUST CARBON PARTICLES.
Jnl. appl. Met. Vol. 1, No. 3, Sept. 1962, p. 391-398.

J2995
McEachern, D., B.D.B. Layton and E. G. Burr.
CANADIAN ARMY NIGHT VISION TRAINING AND TESTING UNIT.
War Med., Chicago Vol. 5, May 1944, p. 283-291.

J3000
McNulty, R.P.
THE EFFECT OF AIR POLLUTANTS ON VISIBILITY IN FOG AND HAZE AT N.Y.C.
Atmos. environ. Vol. 2, No. 6, Nov. 1968, p. 625-628.

J3005
Mecke, R.
CONTRIBUTIONS TO THE MEASUREMENT OF VISIBILITY.
Met. Z. Vol. 56, Oct. 1939, p. 369-372.

J3010
Mellor, Malcolm.
LIGHT SCATTERING AND PARTICLE AGGREGATION IN SNOW STORMS.
J. Glaciol. Vol. 6, No. 44, June 1966, p. 237-248.

J3020
Memma, N.
GLI AIUTI VISUALI AEROPORTUALI DAI PRIMI VOLI NOTTURNI AI PIU MODERNI ORIENTAMENTI POR IL VOLO IN CONDIZIONI DI BASSA VISIBILITA.
Riv. aeronaut. astronaut. missil. No. 2, 1966.

J3030
Meteorological Office, Great Britain.
SLANT VISIBILITY.
Met. Mag., Lond. Vol. 86, No. 1017, Mar. 1957, p. 84-89.

J3040
Meteorological Office, Great Britain.
SYMPOSIUM ON THE MEASUREMENT OF VISIBILITY (METEOROLOGICAL OFFICE DISCUSSION).
Met. Mag., Lond. Vol. 79, No. 934, Apr. 1950, p. 112-118.

Koschmieder's theory of daylight visibility is accepted, giving $V = 3.91/o$, o = extinction coefficient of atmosphere. Visibility meters are described as: measuring air-light; measuring σ directly by attenuation of artificial light; measuring scattering coefficient. Brewer-Beuttell meter is illustrated. Discussion, opened by G.J.W. Oddie, centered largely on Gold meter.

J3050
Meuriers, Joseph.
VISIBILITY INVESTIGATIONS AT THE LINDENBERG AERONAUTICAL OBSERVATORY.
Ber. dt. Wetterd, U.S. Zone No. 13, 1950. In German.

J3060
Mezin, Maurice.
PERFECTIONNEMENT DES MESURES DE LA VISIBILITE HORIZONTALE (IMPROVEMENT OF HORIZONTAL VISIBILITY MEASUREMENTS).
Meteorologie Vol. 7, 1931, p. 368-372.

The author discusses the problem of visibility measurement at present, comments on instrumental techniques and describes the nephelometer constructed by Gamba.

J3070
Mezin, Maurice.
PROCEDES DE MESURE DE LA VISIBILITE PENDANT LA NUIT (TECHNIQUE OF VISIBILITY MEASUREMENT AT NIGHT).
Meteorologie Vol. 7, 1931, p. 373-375.

Some remarks on improvement of methods of night visibility observation (more accurate measurement of power and distance of light sources; application of light-filters, etc.).

J3080
Middleton, W.F. Knowles.
THE ATTENUATION OF CONTRAST BY THE ATMOSPHERE.
Photogramm. Engng Dec. 1950, p. 663-672.

This is a review paper dealing with the reduction in contrast or attenuation of the differences in brightness between various objects caused by the atmosphere. The author presents the derivation of Bouguet's law which holds for the transmissivity of monochromatic light and the equation of Duntley for determining attenuation of contrast. He also discusses the dependence of the extinction coefficient upon wave length, observations on the aerosol to determine the size of haze and fog droplet, and the effect of the atmosphere on the color of objects.

J3089
Middleton, W. E. Knowles.
THE COLORS OF DISTANT OBJECTS.
J. opt. Soc. Am. Vol. 40, June 1950, p. 373-376.

A general expression is developed for the apparent color of an object of any intrinsic color, seen through a given thickness of an atmosphere of any specified optical properties. In deriving this expression, the author has made use of modern theories of the alteration of contrast by the atmosphere. Some examples of the application of this theory are given, and in conclusion it is shown that the visual range of colored objects differs little from that of achromatic objects of the same luminance factor. (Author)

J3090
Middleton, W.E. Knowles.
EXPERIMENTS WITH A TELEPHOTOMETER. THE DEPENDENCE OF EXTINCTION COEFFICIENT UPON WAVE-LENGTH.
Beitrage. Geophys. Vol. 44, No. 4, 1935, p. 358-375.

An instrument was constructed which measures directly the brightness ratio between two objects nearly in the line of collimation. The experimental observations show an increasing dependence of the extinction coefficient upon wave length as the air becomes clearer. (Author)

J3100
Middleton, W.E. Knowles.
THE MEASUREMENT OF VISIBILITY AT NIGHT.
Royal Society of Canada, Transactions 3rd Ser., Vol. 25, Sec. 3, 1931, p. 39-48.

Theory and analysis of visibility measurement at night.

J3102
Middleton, W. E. Knowles.
MEASUREMENT OF VISIBILITY AT NIGHT.
Trans. R. Soc. Can. Vol. 26 III, May 1932, p. 25-33.

J3104
Middleton, W. E. Knowles.
NOTE ON THE VISUAL RANGE OF WHITE AND GREY OBJECTS.
Q. Jl. R. Met. Soc. Vol. 73, July-Oct. 1947, p. 456-459.

J3105
Middleton, W. E. Knowles.
ON THE THEORY OF THE CEILING PROJECTOR.
J. opt. Soc. Am. Vol. 29, Aug. 1939, p. 340-349.

The ceiling projector is a small searchlight used to measure cloud heights at night. The elementary geometry of the measurement is stated, and expressions are developed for the apparent brightness of the spot of light under various atmospheric conditions, and for the total flux density from the spot at the observing station. Some remarks on the visibility of the spot are appended. (Author).

J3107
Middleton, W. E. Knowles.
THE PRINCIPLES UNDERLYING THE CHOICE OF VISIBILITY MARKS.
Mon. Weath. Rev. Wash. Vol. 63, Jan. 1935, p. 17-19.

J3110
Middleton, W.E. Knowles.
SICHTWEITE BEI MONDLICHT, STERNLICHT UND DAEMMERUNG (VISIBILITY DURING MOONLIGHT, STAR-LIGHT AND TWILIGHT).
Met. Z. Vol. 51, No. 11, Nov. 1934, p. 425-427.

The oscillations of the contrast threshold of the human eye were experimentally investigated during twilight and night brightness. The variations of sensibility were determined for different ranges of visibility (day ranges of visibility varied from 5 km up to 20 km).

J3120

Middleton, W.E. Knowles and A.G. Mungall.

ON THE PSYCHOPHYSICAL BASIS OF METEOROLOGICAL ESTIMATES OF VISIBILITY.

American Geophysical Union, Transactions Vol. 33, No. 4, Aug. 1952, p. 507-512.

Before the results of telephotometry or of measurements of atmospheric scattering can be used to calculate the visual range in daylight, we must know the least contrast between a "visibility mark" and its surroundings which will lead the observer to report the mark as visible. A knowledge of the dispersion of this quantity is also of importance if the reliability of estimates of "visibility" has to be calculated. This paper reports direct measurements of the contrast, made by pointing a photoelectric telephotometer alternately at a mark and at the sky just adjacent to it, the mark having been chosen by a trained meteorological observer as being just at the visual range. The results of 1000 observations show a range of values of about 20:1. It is concluded that the present instructions for the estimation of "visibility" are chiefly to blame for this state of affairs, and that a criterion of detection should be substituted for the present one of recognition. (Author)

J3130

Milashina, T.A.

SVIAZ' UKHUDSHENNOI VIDIMOSTI S RAZLICHNYMI METEOROLOGICHESKIMI ELEMENTAMI (RELATIONSHIP BETWEEN POOR VISIBILITY AND VARIOUS METEOROLOGICAL ELEMENTS).

Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev, Trudy No. 43, 1964, p. 164-167.

The results of calculations of the frequency of deterioration of visibility (less than 2 km) as a function of different meteorological phenomena (temperature, moisture and wind) based upon observations made during the cold seasons of Oct.-March 1956-1960 in Kiev are presented. The variation of visibility does not depend directly upon atmospheric temperature but the phenomena reducing visibility depend upon temperature. Between the range of 4°C to -4°C lie 76% of the cases reducing visibility. Visibility is reduced most sharply during large variations in moisture. Visibility less than 200 m occurs at a relative humidity of 95-100%. During the cold half of the year the visibility in Kiev deteriorates because of moist turbidity. Visibility less than 1000 m is observed often during calm and wind speeds less than 1-3 m/sec.

J3140

Miler, M. and M. Chomat.

THE EFFECT OF ATMOSPHERIC SCATTERING ON OPTICAL BEAM INTENSITY AT LOW VISIBILITY.

Jemna Mech. Opt. No. 12, 1967, p. 382-384.

Trans. into English Rept. No. FTD-HT-23-598-68.

Atmospheric attenuation of an optical beam caused by scattering in fog was measured using an incoherent gas diode emitter in the 900-MH infrared band. The beam was concentrated to about 10 angular minutes by a 1-kHz moderator. The receiving photomultiplier and interference filter were placed at a distance of 600 m (through thick fog) across an artificial lake. Three forms of light scattering are described and a formula is presented for visibility based on the attenuation coefficient and wavelength for Rayleigh scattering. A formula for attenuation is given, and other experimental findings, such as the effect of size of moisture droplets, of nonhomogeneous waves of thick fog, and of homogeneous fog cover, are given. In homogeneous fog, minimum visibility was 300 m and the maximum attenuation 20 dB/km; in extremely dense fog visibility was 50 m and attenuation 180 dB/km, which indicates why optical navigation signals are not reliable under such conditions. (Author)

AD-850030

J3145

Miles, W. R.

NIGHT VISION; FLYING DEMANDS LIGHT SENSITIVITY AND FORM ACUITY.

Yale scient. Mag. Vol. 18, Oct. 1943, p. 10-11+;

J3147

Miller, J. E. and H. T. Mantis.

AN OBJECTIVE METHOD OF FORECASTING VISIBILITY.

Bull. Am. met. Soc. Vol. 19, May 1948, p. 237-250.

J3150
Minafra, Nicola and S. Fanchiotti.
LIMITI OPERATIVI DELLA VISIBILITA SUGLI AEROPORTI DI MILANO-LINATE E MALPENSA (OPERATIONAL LIMITS OF MEAN VISIBILITY AT MILAN-LINATE AND MALPENSA AIRPORTS).
Riv. met. aeronaut. Vol. 29, No. 2, Apr./June 1969, p. 32-46.

Graphs and tables showing the variations of the mean visibility on Linate and Malpensa Airports during the cold half of the year are given and illustrated. Visibility has been deduced from elaboration of observations relating to a 5-yr period. A comparison is first made of visibilities during different months, the fog behavior being examined during the day. The distribution of frequency maxima and minima during the 24-hr period are studied, and the operational conditions of the two airports are then compared. For a possible resorting to plants for fog dissipation the chronological distribution of determinate critical visibilities is finally examined. (Author)

J3160
Miurk, Kh.
O NOVOI FORMULE INTENSIVNOSTI IZLUCHENIIA O NOVYKH KHARAKTERISTIKAKH PROZRACHNOSTI ATMOSFER (NEW FORMULA FOR RADIATION INTENSITY AND NEW CHARACTERISTICS OF THE TRANSPARENCY OF THE ATMOSPHERE).
EEsti NSV Teaduste Akadeemia. Fuusika ja Astronoomia Instituut, Uurimusi Atmosfaarifuusikast No. 1, 1959, p. 7-14.

On the suppositions that 1) the atmosphere consists of homogeneous layers with respect to the amount of the substance causing the extinction of radiation, 2) the amount of the above-mentioned substance does not change during the time under consideration, and 3) the decrease of the coefficient of extinction is proportional to the relative increase of air-mass: dm/m the author has derived a formula (7) for the i-th layer and a formula (8) for the whole atmosphere. Taking into consideration the formulae (2) and (4) the author has obtained a formula (11) where a_1 *is defined by the formula (10). Comparing the formula (11) with the formula (14) a new formula of intensity (16) has been obtained. This formula has been checked with the tables of the intensity of direct radiation of S.I. Sivkov and Sh.M. Chkhaidze; the results are given in Tables 1 and 2. Figures in the tables show difference in intensity (cal/cm*^{2} *min) between the intensity determined after the formula (16) on the one hand and after the tables by Sivkov (Table 1) and by Chkhaize (Table 2) on the other hand. The author concludes that the formula (16) is in accordance with reality and its application can be recommended. To facilitate calculations a nomogram has been constructed on the basis of the formula (16). (Author)*

J3165
Morikofer, W.
ON THE TURBIDITY OF THE ATMOSPHERE DUE TO DESERT DUST AND SNOW DRIFTS.
Helv. phys. Acta Vol. 14, 1941, p. 537-548.

J3170
Morita, K. and F. Yoshida.
LIGHT WAVE ATTENUATION IN PROPAGATION THROUGH THE ATMOSPHERE.
Electl Commun. Lab. Rev. Vol. 19, p. 714-725.

Light wave attenuation in fog, mist, rainfall and snowfall during propagation through atmosphere, deriving semiempirical formulas for attenuation rate relationship to visibility.
A71-42523

J3180
Moskalenko, N.I.
THE EXPERIMENTAL INVESTIGATION OF SPECTRAL TRANSPARENCY OF H_2O, CO_2, CH_4, N_2O, CO VAPORS UNDER CONDITIONS OF AN ARTIFICIAL ATMOSPHERE.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 5, No. 9, Sept. 1969, p. 962-966.
Trans. into English in *Academy of Sciences, USSR, Atmospheric and Oceanic Physics* Vol. 5, No. 9, Sept. 1969.

J3190
Mosetti, Ferruccio.
SU UNA POSSIBILITA D'IMPIEGO DEL NEFELOMETRO (ON A POSSIBLE APPLICATION OF NEPHELOMETERS).
Annali, Geofis. Vol. 5, No. 4, Oct. 1952, p. 591-595.

A diagram showing the empirical law between polarized light diffused by the atmosphere and the percent humidity is presented. It is further shown how, by using this diagram, one can obtain information about the non-uniform distribution of humidity with altitude.

J3195
Mrose, H.
THE DEPENDENCE OF VISIBILITY UPON LANDSCAPE AND WEATHER CONDITIONS.
Z. angew. Met. Vol. 51, Aug. 1934, p. 267-271.

J3200
Mucket, Gunter.
EIN GERAET ZUR MESSUNG DER METEOROLOGISCHEN SICHTWEITE NACH DEM STREULICHTVERFAHREN (A DEVICE FOR MEASURING METEOROLOGICAL VISIBILITY ACCORDING TO THE SCATTERED LIGHT METHOD).
Meteorologischer Dienst, Veroffentlichungen No. 20, 1964.

The contents of this paper include the following: a brief discussion of the measurements of the scattering function of the atmosphere at different conditions of turbidity carried out by Bullrich and Möller; Reeger and Siedentopf; Foitzik and Zschaeck; the theoretical principles underlying the measurement of the scattering function and the derivation of an equation enabling the development of an instrument which permits determination of an equation. The construction of the instrument is described with the aid of a diagram and a photograph and the results of its use are presented.

J3210
Mucket, Gunter.
UEBER EINEN HEUEN REGISTRIERENDEN SICHTMESSER (A NEW RECORDING VISIBILITY METER).
Meteorologischer und Hydrologischer Deinst, Abhandlungen Vol. 5, No. 39, 1956.

A new recording photoelectric visibility meter developed in 1953-4 at Lindenberg is described in theory and its construction, actual operation calibration, accuracy, and results of some measurements set forth at some length and illustrated with photographs, wiring diagrams, recorder records, etc. The principle of extinction of a light source applied over an optical path of varying length up to 700 m (tests were made at Lindenberg and comparison made with a Foitzik recording meter in 1954) is illustrated.

J3215
Mueller, Eleonore.
VERSUCH EINER ABSCHAETZUNG DER VERTEILUNG DER LUFTVERUNREINIGUNG IN DEUTSCHLAND AUS SICHTWEITENBEOBACHTUNGEN (AIR POLLUTION DISTRIBUTION OVER GERMANY ESTIMATED FROM VISIBILITY OBSERVATIONS).
Met. Abh. Vol. 89, No. 2, 1970.

Visibility is used as a measurement factor correlated to air pollution by dust and aerosols, including observations under foggy conditions. Since the dust content of the air is inversely proportional to visibility it is considered that the degree of air pollution in Germany could be determined from estimates of horizontal visibility, except in fog conditions. The influence of disturbing factors, such as atmospheric moisture and lateral incidence of sunlight, is discussed.
N71-29377#

J3220
Mueller, Peter K., and Robert G. Givens.
DYNAMIC CALIBRATION AND DATA INTERPRETATION OF A LIGHT-SCATTERING INSTRUMENT.
J. Air Pollut. Control Ass. Vol. 11, No. 12, Dec. 1961, p. 576-580, 584.

The Monitron light scattering photometer is described. This paper gives the methods and results of studies concerning performance and response calibration.

J3230
Mullaney, G.J., W.H. Christiansen, and D.A. Russell.
FOG DISSIPATION USING CO_2 LASER
Applied Physics Letters Vol. 13, Aug. 15, 1968, p. 145-147.

Laboratory measurements have been made of the evaporation rate of fog when subjected to an intensity of 5 to 50 W/cm^2 of 10.6-μ radiation. The measurements agree with calculations and show that most of the absorbed laser energy goes into heating the air by conduction from the droplet-surface. This heated air induces a motion which prevents the laser from completely clearing the fog. A correlation is found which describes the visibility improvement as the fog and power density are varied. (Author)
A69-12622

J3240
Mullaney, G.J., W.H. Christiansen, and D.A. Russell.
A STUDY OF FOG CLEARING USING A CO_2 LASER.
Jnl Aircr. Vol. 8, 1971, p. 108-113, AIAA Paper 69-670.

Fog removal by high power carbon dioxide lasers, evaluating possibility of clearing airport runways. A71-20308#

J3250
Murphy, Joseph S.
GOOD NEWS FOR PILOTS: INSTRUMENT-APPROACH AIDS INSTALLED.
Am. Aviat. Vol. 18, No. 5, Aug. 1954, p. 38.

A brief description of the transmissometer, a National Bureau of Standards invention, is described.

J3260
Nasibov, G.M.
A PORTABLE INSTRUMENT FOR MEASURING VISIBILITY.
Gig. Sanit. Vol. 3, Mar. 1953, p. 54-55. In Russian.

J3265
National Bureau of Standards (United States).
TRANSMISSOMETER FOR VISIBILITY MEASUREMENTS.
Tech. News Bull. natn. Bur. Stand. Vol. 31, Sept. 1947, p. 102-104.

J3270
Nechaev, I.N.
USOVERSHENSTVOVANIE VIZUAL'NOGO METODA OPREDELENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI (IMPROVING THE VISUAL METHOD FOR DETERMINING THE METEOROLOGICAL VISIBILITY RANGE).
Trudy glav. geofiz. Obs., Len. No. 129, 1962, p. 134-145.

Inaccuracies in the visual determination of the meteorological visibility limit by various methods were discussed. The improving of these methods by means of preparing tables of standard contrasts was indicated and a combined "visible not visible" method together with the evaluation of visible contrasts was devised. Preliminary methods of computing auxiliary tables for simplifying the procedure of visibility determination of objects by taking into account their virtual contrasts, illumination conditions and angular sizes were suggested.

J3280
Noll, Kenneth E. et al.
VISIBILITY AND AEROSOL CONCENTRATION IN URBAN AREAS.
Atmos. environ. Vol. 2, Sept. 1968, p. 465–475.

J3290
Nomoto, S. and K. Enoshima.
A STATISTICAL STUDY ON VISIBILITY FORECASTING, PT. 1
J. Met. Res., Tokyo Vol. 20, No. 12, Dec. 1968, p. 631-646. In Japanese.

Investigates objective forecasting of airport visibility by means of statistics and correlation analysis. For this purpose, 74 predictors are chosen in consideration of visibility, and 302 correlation coefficients are calculated for minimum visibility in the evening and averaged on days with or without rainfall. Among them, some useful predictors with high correlation coefficient, such as mesoscale pressure pattern, atmospheric stability and wind velocity in the lower atmosphere, are selected. By combining them, some forecasting diagrams are constructed. Forecasting method by these diagrams is verified to be fairly useful, and minimum visibility in the morning and evening can, in general, be predicted within an error of 1.5 mi. (Author)

J3300
Nomoto, S., et al.
A STATISTICAL STUDY ON THE VISIBILITY FORECASTING, PT. 2, PREPARATION AND VERIFICATION OF THE MULTIPLE REGRESSION EQUATION FOR VISIBILITY FORECASTING.
J. Met. Res., Tokyo Vol. 21, No. 1, Jan. 1969, p. 9-17. In Japanese

Multiple regression equations for visibility forecasting were constructed by using the HITAC 5020 computer. In these equations, predictands are the averaged visibilities in the afternoon and the minimum visibilities after sunset, and predictors are 35 meteorological elements observed in the morning. The visibilities forecasted by multiple regression equations are close to the observed ones; for instance, the correlation coefficient is 0.637. From the relation of multiple correlation coefficients to the number of predictors in 6 multiple regression equations, it follows that accuracy of the method increases rapidly as the number of employed predictors increases to 4 or 5, but then increases slowly with increased predictors. A regression equation was prepared for each N (N = 1, 2, . . .,20) of selected predictors out of 35 predictors, and accuracy of the methods based on 5, 10, and 20 predictors is verified; the most accurate method is the one based on 10 predictors, then the 5, and 20 predictors follow. In order to improve the accuracy, the following considerations are necessary: a) with respect to the space and time scale, predictors must be selected to be equivalent to the predictands; b) both predictors and predictands must be in the normal distribution; c) several predictors having a large sample correlation coefficient should be selected for regression equations; d) predictors with great physical significance should not be ignored, even if the corresponding simple correlation coefficients are small; e) multiple regression equations with as many predictors as possible must be prepared. (Author)

J3310
Nomoto, S.
STATISTICAL STUDY ON VISIBILITY FORECASTING, PT. 3, CORRELATION-SYNOPTIC ANALYSES FOR EVALUATION OF PREDICTORS IN 1- TO 4- HOUR FORECASTING.
J. Met. Res., Tokyo Vol 21, No. 7, July 1969, p. 395-406. In Japanese.

To obtain regression equations for 1- to 4-hr forecasting of rapidly changing prevailing visibility at Tokyo International Airport (Haneda), predictors are statistically selected with emphasis on their physical meanings in relation to the predictand, and extent of their spacetime distributions in view of the predictand. Considerations on the selected predictors indicate that 1) visibility change within 1-4 hr has large correlations with predictors having space-time distributions with the same extent as that of the predictand; 2) among dew-point depression, temperature, pressure, and wind at Haneda, the first and the second have, in that order, largest correlations with prevailing visibility at the station; and 3) wind and temperature changes are simultaneous with visibility change. Dew-point depression change, however, precedes visibility change 30 to 90 min. (Author)

J3320
Nomoto, S.
STATISTICAL STUDY ON VISIBILITY FORECASTING, PT. 4, MULTIPLE REGRESSION EQUATIONS FOR SHORT-HOUR FORECAST.
J. Met. Res., Tokyo Vol. 21, No. 8, Aug. 1969, p. 487-495. In Japanese.

For 1- to 4-hr forecast of prevailing visibility at Tokyo International Airport (Haneda), appropriate predictors are selected by screening procedures from tentatively chosen 94 predictors. Validity tests on 5-predictor forecast equations thus obtained reveal the following. 1) Tests on 54 cases in an independent period indicate that the mean errors are in the range from 1.5 to 2.3 km, and correlation coefficients between observed and computed visibilities are in the range from 0.98 to 0.75. 2) The influence of the persistency of the initial visibility is more than 60% of the total change within 2 hr after the initial hour, but decreases to about 40% 3 hr after the initial hour. 3) Visibility change within a short period (1-4 hr) from the initial hour is much influenced by the tendency of weather change in the neighborhood at the initial hour, and the characteristics of visibility change at Haneda in the relevant season of the year. The predictors that contribute significantly, after the above two, to visibility at Haneda in various time ranges are (at the end of 1-, 2-, and 3- to 4-hr periods following the initial hour) the initial-hour dew-point depression at Haneda, horizontal wind shear within 40 km of Haneda and advection within 100 km of Haneda. 4) The space-time distributions of a predictor that gives good results for the visibility in a specific time range have an extent equivalent to the length of the relevant time range. (Author)

J3330
Nomoto S., and Yuso Takigawa.
STATISTICAL STUDY ON VISIBILITY FORECASTING, PT. 5, HALF-DAY FORECASTING BY MULTIPLE REGRESSION EQUATION.
J. Met. Res., Tokyo Vol. 22, No. 2, Feb. 1970, p. 51-59. In Japanese.

With screening procedures, equations for forecasting mean visibility at 3-hr intervals for 12 hr were obtained. Predictors obtained from a mesoscale observation network were selected according to the following criteria: physical or theoretical correlation with the predictand; statistical correlation with the predictand; empirically used by forecasters as a good guide for visibility forecasting. From verifications on an independent period, the equations gave correlation coefficients as 0.39-0.66 and standard errors of 1.9-2.9 km. Good predictors are low-level wind direction and speed, vertical wind speed, static stability, and variation in water vapor. The results indicate that visibility is affected mainly by air mass in the ground inversion layer containing floating pollutant and water droplets. (Author)

J3340
Novoseltsev, E.P.
SRAVNITEL'NYI ANALIZ USLOVII VIZIROVANIIA PRI OBLACHNOM I BEZOBLACHNOM NEBE (COMPARATIVE ANALYSIS OF CONDITIONS FOR SEEING WITH CLOUDY AND CLEAR SKIES).
Trudy glav. geofiz. Obs., Len. No. 100, 1960, p. 41-44.

This analysis is based on the theory of Shifrin and Minin. To evaluate changes in the conditions of sighting in the course of a day, it is necessary to know the daily rate of contrast between the object and the background, for both cloudless and cloudy skies. Expression for the contrast for cloudless sky is analyzed and the terms involved therein are defined. This formula was used to compute the contrast in object-background at different angles of sighting and the altitudes of Sun for the two pairs; a brick on the background of three branches and a highway with the background of black soil. The results of computation are tabulated. It is explained that with cloudless sky, the daily rate of contrast is significant. The contrast and its rate for cloudy sky is also analyzed and the results indicate that the absence of the rate depend only on the angle of sight and optical properties of atmospheric layer. The sudden appearance of the clouds is also investigated. Comparison table of contrasts at cloudless and cloudy skies is given. It is noted that in case of the objects with non-Lambert index of reflection, the daily rate of contrast and the relation of contrasts at cloudless and cloudy skies may be quite different.

J3342
Nukiyama, D.
ON THE TRANSMISSIBILITY OF THE VISIBLE LIGHT THROUGH A CLOUD OF PARTICLES. PART III.
Rep. aeronaut. Res. Inst. Tokyo Vol. 8, Dec. 1933, p. 61-100.

J3343
Nukiyama, D. and A. Kobayasi.
ON THE TRANSMISSIBILITY OF VISIBLE LIGHT THROUGH A CLOUD OF PARTICLES. PARTS I AND II.
Rep. aeronaut. Res. Inst. Tokyo Vol. 7, Aug. 1932 and Feb. 1933, p. 1-18 and 307-338.

J3344
O'Brien, B. and F. M. E. Holmes.
TRANSMISSION OF LIGHT BY FOG AND HAZE
J. opt. Soc. Am. Vol. 22, Jan. 1932, p. 9.

An optical glass with a pronounced absorption band in the blue (B. & L. Kalichrome) was crushed and sized into groups of particles whose effective diameters ranged by steps of $\sqrt{2}$ *per group from 8 to 720 microns, and the diffuse reflecting power of the loosely packed powder measured with a spectrophotometer thruout the visible spectrum. Using extinction coefficients determined for the glass before crushing the variation of reflection factor with size of particle was found to be closely represented by the expression given by Stokes for reflection from semitransparent plates, providing the effective diameter of the particles multiplied by a constant factor was substituted for the thickness of plates. This factor was independent of the size of particle but varied with particle shape, being greater for the elongated fragments crushed by impact than for more rounded forms produced by attrition, although both types showed characteristic conchoidal fracture. The factor increased slightly with increase in absorbed moisture, apparently due to effect on packing of the grains. When the product of effective diameter and extinction coefficient was kept constant the reflection factor was found constant within the accuracy of measurement, providing the shape of the particles was independent of size. (Author).*

J3350
O'Brien, Harold W.
VISIBILITY AND LIGHT ATTENUATION IN FALLING SNOW.
Jnl. Appl. Met. Vol. 9, No. 4, Aug. 1970, p. 671-683.

J3355
Oddie, G. J. W.
MEASUREMENT OF VISIBILITY.
Met. Mag., Lond. Vol. 79, Apr. 1950, p. 112-118.

J3360
Oddie, G.J.W.
THE TRANSMISSOMETER.
Weather, Lond. Vol. 23, No. 11, Nov. 1968, p. 446-455.

The transmissometer, as instrument for measuring the transmissivity of the atmosphere for light, is being increasingly used for observations of visibility and runway visual range (RVR). The background theory to the subject is simple enough but there are many technological difficulties involved in the production of an adequate instrument. The obvious way of measuring the attenuation of a light beam along a baseline is to measure the flux at the two ends using two photosensitive receivers. A major difficulty arises from the need to have an extremely stable light source and stable receivers. General difficulties associated with the design of all types of transmissometers, are considered: Stray light reaching the receiver from daylight from the sky behind the projector, from daylight scattered by aerosols, or from other light sources. (Means to combat this are noted.) Narrow angle scattering along the beam may also give rise to errors. The alignment of the source and receiver becomes important since relatively small displacements can lead to the shielding of some part of the light from the source. Observations need to be in the optical range of the spectrum; it is important that the source contain as little radiation from outside the optical range as possible.

J3370
Ohtake, Takeshi and Paul Huffman.
VISUAL RANGE IN ICEFOG.
Jnl. appl. Met. Vol. 8, No. 4, Aug. 1969, p. 499-501.

J3380
Olbers, Werner.
UBER DIE BEZIEHUNGEN ZWISCHEN MESSUNGEN DER NORMSICHTWEITE UND LANDEBAHNSICHT RVR (RELATIONSHIPS BETWEEN MEASUREMENTS OF STANDARD VISUAL RANGE AND RUNWAY VISUAL RANGE).
Annln Met., Offenbach No. 3, 1967, p. 110-115.

In this paper the connections between meteorological visibility as well as standard visual range (as indicated by an instrument for measuring visibility) and RVR are explained. Especially some reasons for different estimates of observers and pilots are stated, above all their different observation angles in relation to the optical axis of illumination according to the observed targets and the respective inherent surrounding luminance. Reported are finally some values found out at foreign weather services concerning determination of RVR out of observed meteorological visibility or measured standard visual range, surrounding luminance and eventually luminious intensity of runway lights. (Author)

J3390
Olivier, J.
A STUDY ON LANDING AIDS FOR POOR VISIBILITY; THE CALCULATION OF LINES OF APPROACH.
Meteorologie Special no. 33, Jan./Mar. 1954, p. 19-74. In French.

J3400
O'Neil, John H.
RUNWAY VISIBILITY
Aerospace Saf. Vol. 19, No. 5, May 1963, p. 8-9.

Explains the new definition of runway visibility which appears in AFR60-16. Runway visibility is defined as "instrumentally or visually derived value that best represents the horizontal distance a pilot can see down the active runway in the direction of takeoff or landing. When the high intensity runway lights are operative, runway visibility observations will take this into account and the reported visibility will be the maximum possible with the lights on." A short explanation is given on how meteorological visibility is instrumentally determined.

J3410
Onishchenko, S.M.
VISIBILITY OBSERVATION.
Met. Gidrol. No. 7, 1959, p. 40-41. In Russian.

J3420
Pahor, S. and M. Gros.
OPTICAL PROPERTIES OF THICK FOG LAYERS.
Tellus Vol. 22, No. 3, 1970, p. 321-327. In Swedish.

J3425
Paszynski, Janusz.
TRANSPARENCY OF THE ATMOSPHERE AS AN ELEMENT OF LOCAL CLIMATE IN INDUSTRIAL REGIONS.
Przeglad Geograficzry, Warsaw Vol. 32, Supplement, 1960, p. 103-107. In Polish and French.

J3430
Pchelko, I.G., ed.
ANALIZ I PROGNOZ METEOROLOGICHESKIKH USLOVII DLIA AVIATSII (ANALYSIS AND FORECASTING OF METEOROLOGICAL CONDITIONS FOR AVIATION).
Gidrometeorologicheskii Nauchno-Issledovatel'skii Tsentr SSSR, Trudy No. 70, 1970.

Problems connected with improving the meteorological information available to aircraft flying both in the troposphere and in the stratosphere up to heights of 20 to 25 km. Wind prediction in the lower layers of the troposphere (in particular, the prediction of vertical wind shears), and prediction of the vertical development of convective clouds, of atmospheric turbulence causing aircraft buffeting in the stratosphere, of the horizontal range of visibility of runway lights, and of the height of the lower cloud boundary are discussed.
A71-31358

J3440
Pearson, C.A.
RECORDING HORIZONTAL ATMOSPHERIC TRANSMISSION OF LIGHT AT NIGHT.
Bull. Am. met. Soc. Vol. 35, No. 1, Jan. 1954, p. 33-39.

A photoelectric telephotometer, which measured the illumination produced at a fixed distance from a light source of known candle power, was developed to record directly the total horizontal atmospheric transmission of light at night over a two sea-mile path. The apparatus consisted of a multiplier phototube, a DC amplifier, batteries for operation, and a one-milliampere recorder. It can be set up easily for field use. A 1000-watt projection-type lamp was used as a light source. By means of a standard lamp, the photoelectric telephotometer was calibrated in a laboratory light tunnel to record illumination in sea-mile candles. In the field the photoelectric telephotometer was compared with a visual telephotometer. Transmission measurements showed good agreement between photoelectric and the visual methods. (Author)

J3450
Pearson, Carl A. and E. Boettner.
HORIZONTAL ATMOSPHERIC TRANSMITTANCE MEASUREMENTS WITH A THALLOUS SULFIDE CELL TRANSMISSOMETER.
J. Opt. Soc. Am. Vol. 46, No. 1, Jan. 1956, p. 54-59.

Measurements of horizontal atmospheric transmittance were made over 1.24- and 4.07-sea-mile paths with an automatically recording near-infrared transmissometer. The transmissometer comprised a tungsten source, modulated at 60 cps, and a thallous sulfide cell receiver. The visual transmittance was simultaneously recorded with a photomultiplier-tube receiver using the same source. New results of total transmissivity per sea mile in the 0.7- to 1.1-micron region of the spectrum are presented and compared with results of the Naval Research Laboratory and the Admiralty Research Laboratory in the visual and infrared regions of the spectrum. A graph of transmissivity versus wavelength from 0.3 to 12 microns was made. This graph is useful in finding the transmissivity in the "windows" of the infrared spectrum when the transmissivity has been determined at a particular wavelength or for a small band of wavelengths. (Author)

J3460
Pearson, Carl A., M.J. Koomen, and R. Tousey.
VISUAL MEASUREMENTS OF ATMOSPHERIC TRANSMISSION OF LIGHT AT NIGHT.
Bull. Am. met. Soc. Vol. 33, No. 3, Mar. 1952, p. 117-121.

Measurements of the visual transmission of the atmosphere were made at night across Chesapeake Bay over a period of two years. A visual telephotometer was used to measure the illumination produced at a distance of 8.77 sea miles by a series of calibrated light sources. With this range it was possible to measure atmospheric transmission values between 0.4 and 0.9 per sea mile corresponding to daylight visual ranges from 4 to 40 sea miles with an accuracy of ±2 percent. Under stable atmospheric conditions the data obtained at night were in good agreement with direct observations of the daylight visual range made before sunset and after the following dawn. (Author)

J3465
Pearson, H. J. C.
VISUAL LANDING AIDS FOR USE IN RESTRICTED VISIBILITY.
Illus. Engng Vol. 43, July 1948, p. 736-742.

J3470
Penkov. A.P.
K VOPROSU O RASCHETE OBESPECHENNOSTI PERIODOV RAZLICHNOI NEPRERYVNOI PRODOLZHITEL-'NOSTI GOLOLEDA NA AERODROME (CALCULATING THE PROBABILITY OF CONTINUOUS PERIODS OF VARIOUS DURATION OF GLAZED FROST IN AIRPORTS).
Trudy nauchno-issled. Inst. Aeroklim., Len. No. 27, 1968, p. 64-67.

On the basis of earlier statistical processing of material of hourly observations of glaze during 1960-1964, at Sheremet'evo airport, a correlation was obtained between integral frequencies of glaze formation periods of various continuous duration and their average values. A nomogram was constructed that allows the calculation of continuous duration of glaze formation periods with given probabilities from their monthly mean values.

J3480
Perlat, A.
VISIBILITE ET HAUTEUR DE LA BASE DES NUAGES; PROBLEMES DE MESURES RESOLUS OU A RESOUDRE SUR LES AERODROMES (VISIBILITY AND HEIGHT OF CLOUD BASES; PROBLEMS RESOLVED OR TO BE SOLVED AT AIRPORTS).
Meteorologie Special no. 33, Jan./Mar. 1954, p. 9-18.

After having pointed out some information on the visibility claimed by the navigators at the moment of landing, the author indicates the particulars which can presently be obtained with the instruments or the methods in use, and gives a few indications on the current research on the problems. (Author)

J3490
Peterson, Axel H.
MEASUREMENT OF THE VISIBILITY ASPECT OF AIR POLLUTION BY MEANS OF LIGHT SCATTERINGS.
J. Air Pollut. Control Ass. Vol. 5, No. 4, Feb. 1956, p. 212, 247.

The author discusses the light scattering instrument which he is engaged in developing for air pollution studies.

J3500
Petit, M. and R. Tasseel.
APPAREIL POUR LA MESURE DE LA VISIBILITE (AN INSTRUMENT FOR VISIBILITY MEASUREMENT).
Meteorologie Special no. 33, Jan./Mar. 1954, p. 75-97.

The authors describe a device for the measurement of the coefficient of extinction of the turbid air, and the relations existing between this data and the visibility. The results are compared with the estimation of the observers and the conclusions brought forth on precision of the estimates and visibility measurements. (Author)

J3510
Petrenko, N.V.
NEKOTORYE USOVERSHENSTVOVANIIA METODIKI PROGNOZA RADIATSIONNOGO TUMANA I VIDIMOSTI (SOME IMPROVEMENTS IN THE METHOD OF FORECASTING RADIATIVE FOG AND VISIBILITY).
Trudy tsent. Inst. Prognozov No. 157, 1966, p. 12-24.

A graph for forecasting the temperature of formation of radiation fog on the basis of the initial dew point and its vertical gradient and the accuracy of the graphical method for determining the time of onset and dissipation of radiation fog is improved. The dependence of minimum visibility in a radiation fog upon minimum temperature and duration of fog is examined. Nomograms for determining the possible minimum visibility in a fog on the basis of the initial value of the dew point and its drop during the night and also for computing the increase in the dew point as a function of the amount of water vapor entering into the atmosphere as a result of burning fuel within cities are presented. (Author)

J3515
Petronio, G.
THE LIGHT-PERCEPTION THRESHOLD AND THE FIELD OF VISION IN FATIGUED SUBJECTS.
Archo Ottal. Vol. 47, Feb. 1940, p. 19.

J3518
Piaskovskaia, E. V.
THE BRIGHTNESS OF THE DIURNAL SKY AND THE COEFFICIENT OF ATMOSPHERIC TRANSPARENCY.
Astr. Zh. Vol. 20, No. 2, 1943, p. 34-41.

J3520
Piatovskaia, N.P.
SRAVNENIE INSTRUMENTAL'NOGO I VIZUAL'NOGO METODOV OPREDELENIIA DAL'NOSTI VIDIMOSTI (COMPARISON OF INSTRUMENTAL AND VISUAL METHODS OF DETERMINING VISIBILITY).
Met. gidrol. No. 11, 1958, p. 50-52.

The results of determinations of visibility distance, S_M, by means of a visibility meter, developed by V.A. Gavrilov, and by means of a visual method, which uses a 5 ball scale intensity of atmospheric haze over objects, are presented. Six objects projected against the sky were used; they included a near and far tower, groups of trees and different types of forests. In case of the visual method S_M was obtained as a weighted mean of all observations for the different objects for a given time of observation, when the instrument was used S_M was obtained for each object separately and the arithmetic mean S_M was computed for all objects for a given time. When snow or extensive atmospheric haze covered the objects the results of both agreed in practically all cases. Also on days with very clear atmosphere these methods did not give contradictory results.

J3522
Piaskovskaia, E. V.
A NEW METHOD OF DETERMINING THE COEFFICIENT OF ATMOSPHERIC TRANSPARENCY.
Astr. Zh. Vol. 24, Mar.-Apr. 1947, p. 119-128. In Russian.
Summary in English.

J3525
Pick, W. H.
VISIBILITY AT SEA.
Q. Jl. R. Met. Soc. Vol. 58, July 1932, p. 251-257.

J3530
Pile, A.F.
NON-INSTRUMENTAL OBSERVATIONS, PT. 3. NON-UNIFORM VISIBILITY.
Mariners' Weath. Log Vol. 7, No. 1, 1963, p. 15-16.

States that frequently visibility is not reduced around the horizon circle in a uniform manner; fog banks (showers) or haze may reduce visibility in only a portion of the circle. The prevailing visibility or visibility index is defined. Fog which obscures 1/2 the horizon circle and various weather phenomena obscuring horizon are shown in diagrams and are discussed.

J3540
Pinegin, N.I., N.G. Boldyrev, and O.C. Barteneva.
RASCHET DAL' NOSTI VIDIMOSTI (CALCULATION OF THE VISUAL RANGE)
Dokl. Akad. Nauk SSSR Vol. 84, No. 3, May 1952, p. 483-486.

A formula for calculating the visibility distance of objects against a background of the sky on the horizon is given.

J3550
Piotrowski, Stefan.
ON THE BRIGHTNESS OF CLOUDS.
Acta geophys. pol. Vol. 4, No. 3, 1956, p. 139-144. In Polish.

J3560
Piskun, V.F.
NOVYI METOD OPREDELENIIA DAL'NOSTI VIDIMOSTI I KOEFFITSIENTA EKSTINKTSII SVETA PRIZEMNON SLOE ATMOSFERY (A NEW METHOD OF DETERMINING THE RANGE OF VISIBILITY AND THE EXTINCTION COEFFICIENT IN THE AIR LAYER NEAR THE GROUND).
Met. gidrol. Vol. 4, No. 4, April 1931, p. 21-32.

Description of three methods of visibility determination used by the author. Data used were taken from observations of screens composed of black and white rectangles, located at different distances from the point of investigation. Visibility conditions and the influence of haze, mist and brightness of the air on visual range are analyzed mathematically.

J3580
Platt, C.M.R.
TRANSMISSION OF SUBMILLIMETER WAVES THROUGH WATER CLOUDS AND FOGS.
Jrnl atmos. Sci. Vol. 27, May 1970, p. 421-425.

Computation of submillimeter wave extinction in clouds and fogs using recent spectrometric results of the optical properties of water. At wavelengths greater than 1000 microns, an approximate formula is adequate in which extinction is proportional to cloud water content. At 2000 and 1000 microns the extinction is 6.5 and 15.2 dB/km per gm/cu m, respectively. Between 200 and 1000 microns additional extinction occurs due to large droplets of diameters greater than 20 microns. Extinction for a typical fog distribution is computed and is found to be 41.1 dB/km per gm/cu m at 337 microns and 92.8 dB/km per gm/cu m at 200 microns. Comparison with experimental data at 1200 and 337 microns show qualitative agreement, but insufficient data on the composition of the clouds and fogs investigated precludes accurate comparison. (Author)
A71-23375#

J3590
Polevitskii, K.K. and E.N. Shadrina.
AVTOMATICHESKII NEFELOMETR (AN AUTOMATIC NEPHELOMETER).
Trudy glav. feofiz. Obs., Len. No: 240, 1969, p. 85-94.

A new automatic nephelometer is described that was developed by the Observatory. A theoretical explanation, a diagram of the electrical function, and the design features of the instrument are given. The instrument measures the transparency of the atmosphere in an unlimited measurement range in open space and at an arbitrary time of the day. It does not require a large measuring base and construction of major supports for the installation of the instrument also is not necessary. (Author)

J3600
Poliakova, E.A.
DAL'NOST' VIDIMOSTI V ZONE DOZHDIA (RANGE OF VISIBILITY IN AN AREA OF RAIN).
Met. gidrol. No. 8, Aug. 1956, p. 23-26.

This paper is concerned with determining the transparency of the atmosphere during rain and forecasting visibility during rain. The author examines the possibility of determining the transparency of air within a rainfall area from a given rain intensity and develops equations expressing the relationship. An expression is developed for determining the distance of visibility in a rain zone in terms of points on a scale.

J3610
Poliakova, E.A.
INVESTIGATION OF METEOROLOGICAL VISIBILITY DURING RAIN.
Trudy glav. geofiz. Obs., Len. No. 100, 1960, p. 45-52. In Russian.

J3620
Poliakova, E.A.
THEORETICAL BASES OF INSTRUMENTS FOR MEASUREMENT OF RANGE OF VISIBILITY.
Trudy glav. geofiz. Obs., Len. No. 11, 1948. In Russian.

J3630
Poliakova, E.A. and V.D. Tretiakov.
ISSLEDOVANIE METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI PRI SNEGOPADAKH (INVESTIGATION OF METEOROLOGICAL VISIBILITY DURING SNOWFALL).
Trudy glav. geofiz. Obs., Len. No. 100, 1960, p. 53-57.

For practical purposes an investigation during snowstorms is more significant than one during rain because snowfalls and snowstorms reduce the visibility much more. This is proved by visual observations, but up-to-date no quantitative expression has been derived. In 1950-51 E.N. Dovgiallo processed the data obtained with recorder of transparencies and preciptograph during snowfalls and storms in Leningrad area. The description of the transparency recorder and Tretiakov preciptograph are given together with the method and their use.

J3640
Popkov, S.L.
VYCHISLITEL'NOE USTROISTVO DLIA OPREDELENIIA DAL'NOSTI VIDIMOSTI AERODROMNYKH OGNEI VYSOKOI INTENSIVNOSTI (A COMPUTER SYSTEM FOR DETERMINING THE VISIBILITY OF HIGH INTENSITY AIRPORT LIGHTS).
Trudy glav. geofiz. Obs., Len. No. 240, 1969, p. 103-108.

Based on Allard's formula, a relationship is derived that correlates the maximum visual range of lights by the human eye with the light intensity of a source and establishing the condition (transparency of the atmosphere) under which the light should be put in operation. The formula determining the visibility of light is reduced to a suitable form for schematic treatment. The structure of the computer solution is described. (Author)

J3650
Popov, O.I.
PHOTOELECTRICAL APPARATUS FOR MEASUREMENT OF AIR TRANSMISSIVITY.
Svetotekhnika No. 1, 1957.

J3655
Posternak, J.
VISUAL ADAPTATION TO DARKNESS AND THE VISUAL FIELD AT HIGH ALTITUDE.
Helv. physiol. pharmac. Acta Vol. 4, June 1946, C52.

J3660
Prikhotko, G.F.
CORRELATION OF LOW CLOUDINESS WITH METEOROLOGICAL PHENOMENA.
Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev, Trudy No. 12, 1958, p. 3-15.

J3670
Pritchard, B.S. and W.G. Elliott.
TWO INSTRUMENTS FOR ATMOSPHERIC OPTICS MEASUREMENTS.
J. Opt. Soc. Am. Vol. 50, No. 3, Mar. 1960, p. 191-202.

A description is given of the design and construction of two instruments for studying atmospheric optics. One device, the Recording Polar Nephelometer measures the volume scattering index of light passing through a sample of natural atmosphere, with scattering angle, polarization, and wavelength as variables. A new calibration procedure has been developed which employs a diffusing screen of known reflectance and transmittance as the standard. The second device, the Portable Transmissometer, measures the extinction coefficient with an accuracy of 5% under all conditions. These instruments are transported by a specially-equipped station wagon to form a mobile research unit. Samples of results obtained in fog and clear air are included. (Author)

J3680
Probald, Ferenc.
URBAN EFFECTS ON VISIBILITY IN BUDAPEST.
Idojaras Vol. 69, No. 6, Nov./Dec. 1965, p. 370-374. In Hungarian.

J3685
Przybyllock, E.
BRIGHTNESS AND SHARPNESS OF VISION AT TWILIGHT.
Annln Hydrogr. Berl. Vol. 60, July 1932, p. 287-291.

J3690
Pueschel, Rudolf and Kenneth Noll.
VISIBILITY AND AEROSOL SIZE FREQUENCY DISTRIBUTION.
Jnl. appl. Met. Vol. 6, No. 6, Dec. 1967, p. 1045-1052.

J3700
Quenzel, R.
INFLUENCES IN THE ATMOSPHERE IN THE ACCURATE MEASURE OF THE LIGHT SCATTERING LAYER.
Beitrage. Geophys. Vol. 78, No. 3, 1969, p. 251-263.

J3707
Rabinovich, Iu. I, and L.N. Guseva.
EKSPERIMENTAL'NYE ISSLEDOVANIIA SPEKTRAL'NO PROZRACHNOSTI ATMOSFERY (EXPERIMENTAL INVESTIGATIONS OF SPECTRAL TRANSPARENCY OF THE ATMOSPHERE).
Trudy glav. geofiz. Obs., Len. No. 118, 1961, p. 69-76.

The authors describe investigations of the spectral transmissivity of the atmosphere carried out in order to obtain more accurate mean values of the coefficient of atmospheric transmission in the visible range of the spectrum in different geographic regions for different seasons and in order to establish correlations between the spectral coefficient of transmissivity and the general actinometric coefficient of transmissivity from data of standard actinometric measurements. The apparatus including actinometers, light filters, photomultipliers, etc., are described with the aid of diagrams. The formula for optical thickness of the atmosphere is:

$$\tau_\lambda = \frac{1}{m} \ln \frac{I_\odot}{I_\lambda} ,$$

where τ_λ *= optical thickness, m = mass of the atmosphere,* $I_\odot, I_\lambda$ *= intensity of direct radiation at the upper boundary of the atmosphere and at the surface of the earth respectively. The coefficient of transmissivity is given by:*

$$p = e^{-\tau_\lambda} .$$

The diurnal variation of transmissivity does not exceed ±20-25%; it is associated with the development of atmospheric turbulence relative to the point of observation and with the azimuthal heterogeneity of the atmosphere. The seasonal fluctuations of the coefficient of transmissivity are slight. The mean coefficients of transmissivity can be recommended as standard for different climatic calculations relative to conditions of stable clear weather. The relationship between mean coefficients of transmissivity and wavelength has a linear character. The correlation between spectral and general optical atmospheric thickness is given by the linear equation

$$\tau_\lambda = A + B_{t_0} ,$$

where τ_λ *and* t_0 *= spectral and general optical thickness, respectively. The coefficient of correlation for wavelengths from 400-700 mmc ranged from +0.68 to +0.79.*

J3710
Rabinovich, Iu. I.
IZMENENIE SPEKTRAL'NYKH KONTRASTOV S VYSOTOI V SVOBODNOI ATMOSFERE (VARIATION OF SPECTRAL CONTRASTS WITH HEIGHT IN THE FREE ATMOSPHERE).
Trudy glav. geofiz. Obs., Len. No. 118, 1961, p. 62-68.

Airplane measurements of the vertical variation of the spectral contrasts of objects of an aerial landscape were carried out at elevations of 200 to 6000 m in a spectral range of 390 to 1000mμ. Data are presented showing that the contrast varies with altitude when the angle of vision increases, since with large optical thicknesses ($\theta = 75^\circ$) the variation is more abrupt and the actual contrasts values are considerably less. An empirical relationship describing approximately the variation of spectral contrast with altitude for different conditions of sighting is derived, namely:

$$K(\lambda,z) = K(\lambda,0)e^{-\gamma(\lambda)z}.$$

The procedure for comparing theoretical and computed values of contrasts is outlined and the results are presented. An analysis shows that for mean values of contrasts there is a satisfactory agreement between the calculated and measured values. (MGA)

J3720
Ratsimor, M.Ia.
METODIKA RASCHETA PROZRACHNOSTI I DAL'NOSTI VIDIMOSTI OGNEI V NAKLONNOM NAPRAVLENII (METHOD OF CALCULATING TRANSPARENCY AND SLANT VISIBILITY OF LIGHTS).
Met. gidrol. No. 1, Jan. 1967, p. 28-33.

The author derives equations for calculating transparency and slant visibility distance of lights. The formula for slant visibility corresponding to a height (h), at which the computed value of the contrast during observations at an angle φ to the horizon is equal to a constant value $K(h) = \epsilon$ is

$$S_{pk} = \frac{h}{\sin\varphi} = \frac{2C(e^{\sqrt{B^2-4AC}\,\sin\varphi} - 1}{(B+\sqrt{B^2-4AC}) - (B-\sqrt{B^2-4AC})\,e^{\sqrt{B^2-4AC}\,\sin\varphi}}.$$

The distribution of horizontal meteorological visibility under clouds at a height below 150 m is determined experimentally and is given by the equation

$$S(h) = \frac{2S_H + 0.28S_0}{H^2}h^2 - \frac{S_H + 1.28S_0}{H}h + S_0.$$

The formula for calculating visibility of lights at an angle φ to the horizon under low cloud cover is

$$E_0 = I\left(\frac{\sin\varphi}{h}\right)^2 e^{-\left[\frac{-\ln\epsilon}{h}\,\frac{1}{\sqrt{B^2-4AC}}\,\ln\frac{h(B+\sqrt{B^2-4AC})+2C}{h(B-\sqrt{B^2-4AC})+2C}\right]\frac{h}{\sin\varphi}}.$$

By solving this equation with respect to I, intensity of the lights, there is obtained the formula

$$I = E_0\left(\frac{h}{\sin\varphi}\right)^2 e^{\left[\frac{-\ln\epsilon}{\sin\varphi}\,\frac{1}{\sqrt{B^2-4AC}}\,\ln\frac{h(B+\sqrt{B^2-4AC})+2C}{h(B-\sqrt{B^2-4AC})+2C}\right]}$$

The formula for calculating the visibility distance of lights for a linear variation with height is

$$E_0 = I\left(\frac{\sin\varphi}{h}\right)^2 e^{-\left[\frac{-\ln\epsilon}{S_0-S_H}\,\frac{H}{h}\,\ln\frac{S_0H}{S_0H(S_H-S_0)h}\right]\frac{h}{\sin\varphi}},$$

and the formula for I is

$$I = E_0\left(\frac{h}{\sin\varphi}\right)^2 e^{\left[\frac{-\ln\epsilon}{S_0-S_H}\,\frac{H}{\sin\varphi}\,\ln\frac{S_0H}{S_0H+(S_H-S_0)h}\right]}.$$

(MGA)

J3730

Ratsimor, M. Ia.

NAKLONNAIA I VERTIKAL'NAIA VIDIMOST' ADVEKTIVNYK TUMANAKH (SLANT AND VERTICAL VISIBILITY IN ADVECTIVE FOGS).

Gidrometeorologicheskii Nauchno-Issledovatel'skii Tsentr SSSR, Trudy No. 45, 1969, p. 14-24.

Formulas for calculating slant visibility below the lower cloud boundary, the lower boundary of the dense part of a cloud at which visibility is less than 100 m (involving the use of the "Oblako" device for measuring the reflection from the lower cloud boundary), the attenuation of a light beam in the atmospheric layer near the ground, the transparency of a fog, etc., are presented. Equations for calculating transparency and the slant visibility of flares are presented. Nomograms are presented for calculating the slant visibility distance for detecting landing flares from a gliding descent ($\gamma = 2^{\circ}40'$) during advective fog, for determining the necessary combination of the values of the height of the lower cloud boundary, and meteorological visibility distance necessary for detecting flares of approximately constant illumination of different intensity from a height of 66 m above the nearest transmitting radio beacon. The formula describing the variation of slant meteorological visibility distance beneath the cloud layer can be used operationally.

J3740

Ratsimor, M. Ia.

TRANSPARENCY AND THE SLANT VISUAL RANGE OF LIGHTS DURING SNOWFALL.

Met. gidrol. No. 7, 1968, p. 58-64. In Russian.

J3750

Ratsimor, M. Ia.

VERTIKAL'NOE RASPREDELENIE GORIZONTAL'NOI VIDIMOSTI POD OBLAKAMI I V OBLAKAKH (VERTICAL DISTRIBUTION OF HORIZONTAL VISIBILITY UNDER CLOUDS AND WITHIN CLOUDS).

Trudy tsent. Inst. Prognozov No. 157, 1966, p. 57-70.

Presents the results of measurements of horizontal meteorological visibility (atmospheric transparency) made during airplane flights below clouds and within clouds of the lower half of the troposphere during twilight. The measurements were made with the aid of an M-71 inverse scattering nephelometer. Under St clouds at a height of 150 m and lower, the horizontal visibility decreases continuously from the surface to the cloud base. This deterioration in visibility is observed under St clouds at a relative humidity of 90% and higher at the surface of the Earth, in the presence of a temperature inversion above the clouds accompanied by an increase in specific humidity and weak turbulence beneath the clouds. Such conditions are observed frequently in the westerly and northerly sectors of anticyclones. Beneath St clouds higher than 150 m, the probability of continuous deterioration of visibility with height is considerably less. Beneath Sc clouds with a lower boundary higher than 200-300 m, the horizontal visibility in the lower part of the layer beneath the cloud generally does not decrease with height. (Author)

J3760

Reshikova, A.A. and Z.V. Tonkova.

CONNECTION BETWEEN THE LOWER LIMIT OF CLOUDS AND RANGE VISIBILITY.

Trudy tsent. aerol Obs. No. 7, 1952.

The authors examine the relationship between the height of the cloud base and the horizontal visibility for stratus clouds up to 150 m. It was found that for stratus clouds, no relationship exists between the height of the lower cloud boundary and horizontal visibility; these clouds always permit good visibility. On the case of Ns-Frnb clouds the relationships between cloud height and horizontal visibility is very slight being expressed only at moderate heights, but only in the case of Frnb clouds. The data on cloud heights and visibility are presented in tables.

J3770

Riissanen, J., and T. Lumme.

ON THE MEASUREMENT OF RVR AT HELSINKI AIRPORT.

Ilmatieteen Laitos, Toimitukaia No. 73, 1969.

The possibility of automatic measurement of runway visual range (RVR) is being studied at Helsinki airport. For this purpose, special instrumentation consisting of a transmissometer, analog-digital computer, and background brightness measuring device was installed there. This instrumentation continuously measures the atmospheric transmittance and background brightness, computes the visibility on the runway according to Alland's law and continuously presents this visibility in digital form.

J3775
Riley, J. A.
CEILING AND VISIBILITY IN THE UNITED STATES; SOUTHEASTERN STATES.
Mon. Weath. Rev. Wash. Vol. 58, May 1930, p. 199-201.

J3777
Robertson, C. J.
EFFECT OF FATIGUE ON THE ADJUSTMENT OF THE EYE TO NEAR AND FAR VISION.
Arch. Ophthal., N.Y. Vol. 17, May 1937, p. 859-876.

J3778
Roff, M. F.
PERCEPTION AND VISIBILITY THROUGH FOG.
J. gen. Psychol. Vol. 15, Oct. 1936, p. 269-291.

J3780
Rogers, C.D.
VARIATION OF ATMOSPHERIC "SEEING" BLUR WITH OBJECT-TO-OBSERVER DISTANCE.
J. opt. Soc. Am. Vol. 55, No. 9, Sept. 1965, p. 1151-1153.

A study has been made of the image blurring introduced by a thermally turbulent atmosphere under poor "seeing" conditions for horizontal sight lines. The root-mean-square radius of the blue circle is shown to increase approximately as the square root of the range up to the maximum range considered, using optical transfer techniques. This is in good agreement with a recent theoretical model of light transmission through a turbulent optical medium. (Author)

J3790
Romanov, N. N. and S. G. Chanysheva, eds.
VOPROSY AVIATSIONNOI I SINOPTICHESKOI METEOROLOGII (PROBLEMS OF AVIATION AND SYNOPTIC METEOROLOGY).
Sredneaziatskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Trudy No. 49, 1970.

Topics examined are: vertical motions near cold fronts, distribution of meteorological elements in frontal zones, the latitude effect of cloud development, analysis of cloud fields, influence of the configuration of the underlying surface on the temperature conditions above mountain ranges, effects impairing visibility, relative motion and equilibrium distribution of aerosols, problems associated with the application of pilot-balloons to the determination of wind structures, meteorological observations during solar eclipses, and the synoptic analysis of fogs.
A71-26557

J3792
Roper, V. J. and E. A. Howard.
SEEING WITH MOTOR CAR HEADLAMPS.
Trans. Illum. Engng Soc. Vol. 33, May 1938, p. 417-438.

J3794
Roper, V. J. and K. D. Scott.
SEEING WITH POLARIZED HEADLAMPS.
Illum. Engng. Vol. 36, Dec. 1941, p. 1205-1213.

J3796
Roper, V. J. and K. D. Scott.
SILHOUETTE SEEING WITH MOTOR CAR HEADLAMPS.
Trans. Illum. Engng Soc., N.Y. Vol. 34, Nov. 1939, p. 1073-1083.

J3800
Roshchina, I. M.
OSOBENNOSTI RASPREDELENIIA PLOKHOI VIDIMOSTI PO TERRITORII ZAPADNOI EVROPY (CHARACTERISTICS OF POOR VISIBILITY DISTRIBUTION IN WESTERN EUROPE).
Trudy nauchno-issled. Inst. Aeroklim., Len. No. 43, 1967, p. 104-107.

The work is based on literature data and data provided by several meteorological stations. The total data on visibility from 106 western European stations were analyzed only for the most probable seasonal values of visibility ≤1 km because of differences in observation times and the grading of the visibility distance. The indicated visibility, however, is the quantitative criterion for cloud determination. Based on the results of this analysis, charts were constructed which delineate the regions with lowest visibility and some common regularities. The charts do not, however, cover detailed visibility distributions over the West-European territory, namely in mountain areas, because data of stations located above 300 m a.s.l. were not used. The paper lists factors and atmospheric phenomena reducing visibility. Best visibility for western Europe is encountered in summer, and the poorest in winter. Good visibility throughout all seasons prevails in the area of the Mediterranean. (Author)

J3810
Rossler, J.
TRANSMISSIONSMESSUNGEN MIT LASERLICHT (6328 A) AM METEOROLOGISCHEN OBSERVATORIUM AACHEN (TRANSMISSION MEASUREMENTS WITH A LASER BEAM (6328 A) AT THE AACHEN METEOROLOGICAL OBSERVATORY).
Met. Rdsch. Vol. 21, No. 1, Jan./Feb. 1968, p. 26-28.

A description of a He-Ne-Laser-Transmissometer is given and the particular feasibilities and difficulties are discussed.

J3820
Rouch, Jules Alfred Pierre.
MESURE DE LA VISIBILITE AU DESSUS DE LA MER (VISIBILITY MEASUREMENT AT SEA).
Geofiz. pura appl. Vol. 21, 1952, p. 41-42.

The measurement of the distance of the clearly visible horizon is a good method of estimating the visibility at sea.

J3830
Roussel, M. R. and J. C. Roussel.
ALTERATION OF VISIBILITY BY WATER VAPOR.
Journal de Recherches Atmospheriques Vol. 2, 1969, p. 85-91.

The article describes the determination by a spectrophotometric method of water vapor influence over the contrast between a natural target and the bordering sky. For targets not so dark as the horizon sky (snow-covered mountain), the apparent contrast is increased by added absorption of water vapor (advent of moister air). This increase is produced in pure absorption bands of water.

J3840
Rozenberg, G. V.
O GORIZONTAL'NOI DAL'NOSTI NABLIUDAEMOSTI V POLIARIZOVANNOM SVETE (HORIZONTAL RANGE OF VISIBILITY IN POLARIZED LIGHT).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 5, Apr. 1969, p. 430-432.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 5, Apr. 1969.

Generalization of the classical theory of horizontal visibility to the case of photometric observation of a remote polarized-light source on a background of polarized light scattered horizontally by the atmosphere. Relationships are derived which can be used for calculating the influence of design parameters and the optical state of the atmosphere on the effectiveness of laser communications systems.
A69-30655#

J3850
Rubinshtein, M. V. and G. D. Reshetov
ANALYSIS AND FORECASTING OF CLOUDINESS, FOG, WIND, AND TURBULENCE FOR AVIATION (SELECTED ARTICLES).
Tsentral.nyi Institut Prognozov, Moscow, Trudy No. 157, 1966, p. 71-86.
Trans. into English FTD-MT-24-121-68.

A comparison of altitudes of the lower cloud boundaries determined by an instrument and from an aircraft; Frontal cloud systems as observed from aircraft.
N69-20573# AD-681272

J3860
Ruhnke, Lothar H.
VISIBILITY AND SMALL-ION DENSITY.
J. Geophys. Res. Vol. 71, No. 18, Sept. 15, 1966, p. 4235-4241.

The similarity of the light scattering process to the process of ion attachment on airborne scatterers is examined. Under the assumption that particle concentration and size are the main factors influencing visibility and ion-density fluctuation in the lower atmosphere, it is shown by analysis that a correlation exists between electrical and optical properties of a turbid atmosphere. Experiments led to the derivation of an empirical formula. Correlation coefficients in the visibility range of 2 km to 100 km and over periods up to 8 hrs were in the range of 0.90 to 0.95. Deviations occurred when triboelectric charges were being generated by strong winds and during the dissipation of fog. It appears that the rate of production for negative small ions is increased by at least a factor of 2 during fog dissipation. (Author)

J3870
Runge, I.
DIE UNTERSCHIEDSSCHWELLE DES AUGES BEI KLEINEM SEHWINDEL (CONTRAST THRESHOLD WITH A SMALL ANGLE OF VISION).
Phys. Z. Vol. 30, No. 3, Feb. 1929, p. 76-77.

Report on experimental work carried out in the laboratory of the Osram Society in Berlin. Relation between vision range, brightness and vision angle were investigated.

J3880
Ruppersberg, Gerhard H.
DIE AENDERUNG DES MARITIMEN DUNSTSTREUKOEFFIZIENTEN MIT DER RELATIVEN FEUCHTE (CHANGES IN THE SCATTERING COEFFICIENT OF MARITIME HAZE WITH HUMIDITY).
Meteor. forsch. ergebn., B. June 1971, p. 37-60.

Calculation of the equilibrium radii of maritime aerosol particles for the purpose of describing quantitatively the changes in the standard visibility or in the scattering coefficient due to changes in the humidity. No assumptions are made with regard to particular particle size distributions. Changes in the density and in the refractive index of the aerosol droplets and insoluble ingredients are admitted. The results are illustrated with an aqueous NaCl aerosol and are compared with the measurements of other authors. A close mathematical relationship is found to exist between the wavelength dependence of the scattering coefficient for haze and its changes with humidity. It is concluded that a deformation of the oceanic particle size distributions in the range below 1 micron radius occurs and that above 98% humidity characteristic changes in the size distributions of any aerosol occur.
A71-34084

J3890
Ruppersberg, Gerhard H.
REGISTRIERUNG DER SICHTWEITE MIT DEM STREULICHTSCHREIBER (RECORDING OF VISIBILITY WITH A DIFFUSED LIGHT RECORDER).
Beitr. Phys. Atmos. Vol. 37, Nos. 3-4, 1964, p. 252-263.

The scattered-light meter is a device which automatically gives the standard visibility by means of the atmospheric scattering coefficient recording it by means of a teletransmitter.

This type of measurement is quite propitious for continuous record in the open air. It offers appropriate accuracy in a wide range with almost no claim to maintenance. Three scattered light meters have been tested for several years in the inland as well as on the German coast of the North Sea. They were compared with each other, with estimations of visibility, and other visibility records. After a certain period of development the instruments operated all right both in technical as well as in physical respect. In general there is also a good accordance with the estimations of visibility; characteristic deviations which occur in practical use are discussed. The device that now is manufactured by industry effectively supports the estimations of visibility and reduces routine work such as documentation and fog warnings by observers.

J3900

Ruppersberg, Gerhard H.

DIE SICHTWEITENREGISTRIERUNG IM LUFTVERKEHR (RECORDING VISIBILITY IN AVIATION).

Umschau Vol. 61, No. 21, Nov. 1, 1961, p. 667-668.

The problem of visibility recording, in particular the visibility conditions in an atmospheric area of 4-5 km long and 60 m high, required by jet planes, is discussed. A visibility distance meter is described with the aid of a diagram. It is based upon the principle that the light transmissivity of a free, fairly clear atmosphere is determined primarily by light scattering. The instrument measures by means of electronically regulated optical compensation, the scattered light which an impulse source produces in a fixed scattering volume. The standard visibility distance is reported by means of a teletransmitter to a centrally located recording device. The normal visibility distance is that based upon Koschmieder's theory of visibility distance. The visibility of runway searchlights, depending upon light intensity, field brightness and standard distance, can be 4 times greater than the standard visibility. Accordingly, a landing visibility meter, provided with the adaptivity dependent stimulus threshold of the human eye and capable of observing the number of landing lights that is visible from the beginning of the landing strip, is being developed.

J3910

Ryznar, E.

VISUAL RESOLUTION AND OPTICAL SCINTILLATION IN STABLE STRATIFICATION OVER SNOW.

Jnl. appl. Met. Vol. 2, No. 4, 1963, p. 526-530.

The effects of turbulent fluctuations of atmospheric density are seen as rapid changes in the brightness of a distant light source (scintillation) and in the position and size of distant objects (shimmer). The results of investigation of the effects in a horizontal optical path 543 m long and 1.5 m high over a uniform snow surface are described.

It was found that deterioration in visual resolution caused by shimmer was most pronounced when atmosphere was clear, a time when the detection and recognition of distant objects were otherwise unimpeded. Visual resolution deteriorated and scintillation intensity increased systematically with increasing inversion magnitude in turbulent flow. Resolution was best in windy and cloudy conditions and poorest on clear nights with light wind speeds.

J3920

Sachkov, N.K.

METEOROLOGICAL CONDITIONS OF AIRCRAFT LANDING.

Trudy tsent. aerol. Obs. No. 68, 1965, p. 3-24.

Trans. into English FTD-MT-24-322-67.

A procedure is given for determining the occurrence of minimum visibility and ceiling. The procedure is based on the relationship between the minimum height of the cloud bottoms and the landing (inclined) visibility. The bad weather was analyzed in several regions: the visibility of less than 2000 m and/or a ceiling of less than 200 m. The reproducibility of bad weather follows a definite path with the maximum occurring in the cold time of the year. The number of bad weather hours decreases from west to east. An attempt was made to relate the occurrence of bad weather to some synoptic-aerological factors such as fronts, anti-cyclones and sporadic winds. The proposed method of a climate approach to the occurrence of combined visibility and cloud height furnishes an average as well as the extreme number of hours of minimum weather at the given station. In turn, such data permit calculation of the probable working time of the airport per month, season, or year. The number of stand-by airports needed for the times of bad weather can also be determined. (Author)

N69-10951# AD-674891

J3930

Savikovskii, I. A.

OTKLONENIIA OT SVETOVOZDUSHNOGO URAVENENIIA I IKH VLIIANIE NA IZMERENIE GORIZONTAL'NOI PROZRACHNOSTI (DEVIATIONS FROM THE LIGHT-AIR EQUATION AND THEIR EFFECT ON THE MEASUREMENT OF HORIZONTAL TRANSPARENCY).

Trudy glav. geofiz. Obs., Len. No. 240, 1969, 168-181. In Russian.

An analysis was made of the measuring errors in the transmission coefficient T, and the meteorological visual range, S_M determined from the contrast between distant objects and the sky, which are caused by inhomogeneities of fogginess or illumination along the sighting line. Two models of inhomogeneity are considered: a local and a periodical. The errors of T and S_M are calculated for the local inhomogeneity at different sizes of the inhomogeneous section and its location relative to the observation object for various altitudes and Sun azimuths. Calculated were the errors caused by the periodical inhomogeneity at different ratios of periods, distances from the object and visual ranges. Under specifically unfavorable conditions, the error can amount to 50-100% for the local and periodical inhomogeneity. Based on the theoretical model developed by K. S. Shifrin and I. N. Minin, the light coefficient of a cloudy sky close to the horizon was calculated together with the error S_M caused by the inequality between the brightness of the sky close to the horizon and light air coefficient. Under most unfavorable conditions this error can amount to 10% for an angular altitude of the sighting line up to 0.5° and to 25% for an altitude up to 5°. (Author)

J3940
Savikovskii, I. A.
RESULTS OF FIELD TESTS OF POLARIZATION VISIBILITY GAGE.
Trudy nauchno-issled. Inst. gidromet. Priborost. Issue 10, 1961.

J3950
Savikovskii, I. A.
THEORY AND ERROR OF VISIBILITY GAGES, WITH SUPERPOSITION OF OBJECT AND SKY.
Trudy nauchno-issled. Inst. gidromet. Priborost. Issue 9, 1960.

J3960
Savikovskii, I. A.
VLIIANIE POLIARIZATSII SVETA NA IZMERENIIA DAL'NOSTI VIDIMOSTI DNEM POLIARIZATSIONNYM IZMERITELEM VIDIMOSTI (EFFECT OF LIGHT POLARIZATION ON DAYTIME VISIBILITY MEASUREMENTS USING A POLARIZING VISIBILITY METER).
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 13, 1965, p. 37-46.

In the M-53 visibility meter of L.L. Dashkevich's system, light fluxes of observed objects pass through a polaroid and a double-refracting prism and are polarized. On the other hand, these light fluxes themselves are partially polarized since they are caused by reflection and dispersion. The present article examines the problem of how partial polarization of light fluxes coming into the instrument influences the results of measurements and what errors it causes.
(MGA)

J3970
Schappert, G. T.
TECHNIQUE FOR MEASURING VISIBILITY.
Appl. Optics Vol. 10, Oct. 1971, p. 2325-2328.

A technique for measuring atmospheric extinction of light, or visibility, from the backscattered signal of a modulated cw laser is presented. The extinction coefficient is contained in the amplitude and phase of the return signal and can be extracted in several ways from certain amplitude and/or phase measurements. No assumption about a relationship between the extinction coefficient and backscattering coefficient need be made. (Author)
A71-42565#

J3975
Schonwald, B. and T. Muller.
DAS SICHTREGISTRIERGERAET JUNINGER (THE JUNINGER VISIBILITY RECORDING DEVICE).
Z. tech. Phys. No. 23, 1942, p. 30.

J3980
Schonwiese, Christian-Dietrich.
ZUR SYSTEMATIK DER NEBELERSCHEINUNGEN (ON THE SYSTEMATICS OF FOG PHENOMENA).
Wett. Leben Vol. 22, Nos. 9-10, 1970, p. 185-190. In German.

Description of an attempt to give a physically founded classification of the various modifications of fog, using abbreviations corresponding to those generally used in the climatic or air-mass classification. The classification presented is subdivided into a physical classification according to substrate and a physical classification according to function. Nonphysical effects on fog and fog variations are also briefly mentioned.
A71-12371

J3990
Schroder, W.
EINE UNTERSUCHUNG ZUR RICHTUNGSABHAENGIGKEIT DER SICHT (STUDY OF THE DEPENDENCE OF VISIBILITY ON DIRECTION).
Z. Met. Vol. 17, No. 7/8, 1964, p. 209-212.

Estimates of visibility made in several directions over an urban area and its surroundings are investigated as to frequencies of differences between the various directions and related to selected meteorological conditions. (Author)

J4000
Sebastian, H.
SICHT UND SICHTBESTIMMUNG (VISIBILITY AND VISIBILITY MEASUREMENT).
Beitrage. Geophys. Vol. 45, No. 1-2, 1935, p. 35-62.

Excellent review of the visibility problem up to date. Author considers physical and physiological factors influencing visibility measurements and gives the history of the development of measurement methods.

J4010
Sebeck, O.
LANDING OF AIRCRAFT DURING POOR VISIBILITY OR IN FOG.
Met. Zpr. Vol. 11, No. 2, 1958, p. 36-39. In Czech.

J4020
Sekihara, K., K. Murai, M. Kano, et al.
MEASUREMENTS OF ULTRAVIOLET, VISIBILE AND INFRARED SOLAR AND SKY RADIATION TO METEOROLOGICAL CONDITIONS.
J. Met. Res., Tokyo Vol. 13, No. 10, 1961, p. 771-777.

An instrument for measuring solar and sky radiation on a horizontal surface in a selected range of wavelength is designed. The spectral sensitivity, angular sensitivity, and the temperature effects are determined experimentally. The change of effective sensitivity due to the variation of solar altitude is discussed using theoretical results of global radiation. The intensities of UV, visible and IR radiation of half day integration, are given on the basis of the observation from Dec. 1957 to Aug. 1958. As to the meteorological influence, the effect of visibility and cloudiness is examined by taking into account the ratio of the observed value to the maximum theoretical one. It is concluded that the influence of the change of visibility is most effective in the UV data of Tokyo while the visible and IR data are principally controlled by the cloudiness. The importance of the extinction of UV radiation due to city smog is pointed out.

J4030
Semenov, G. A.
LINEIKA DLIA OPREDELENIIA UGLOVYKH RAZMEROV (RULER FOR MEASURING ANGLES).
Met. gidrol. No. 2, Feb. 1956, p. 48.

A description with the aid of diagrams of the construction of a ruler for measuring angles of objects in the determination of visibility. The ruler is based principally upon the relationship of a degree of curvature to a centimeter when the radius of curvature is equal to 565.5 mm; one degree of curvature being equal to 1 cm, and 1 mm to 6 min. The ruler is made of celluloid and is subdivided with centimeters and millimeters. The measurement procedure is described in detail.

J4031
Semenovskaia, E. N.
FURTHER RESEARCH CONCERNING THE INCREASE OF SENSITIVITY TO LIGHT IN TWILIGHT VISION BY MEANS OF PRIOR LIGHT STIMULI.
Albrecht v. Graefes Arch. Opthal. Vol. 133, Nov. 1934, p. 115-120.

J4032
Shallenberger, G. D. and E. M. Little.
VISIBILITY THROUGH HAZE AND SMOKE AND A VISIBILITY METER.
J. opt. Soc. Am. Vol. 30, Apr. 1940, p. 168-176.

Air clarity (c) is defined as the distance from an observer to a black ridge, or dark building, or some similar object when it is just barely visible against the horizon sky. The expression is derived for visual range (v) in miles of a small smoke, such as a Forest Service lookout would be expected to detect. Visual range depends upon direction with respect to the sun, clarity, height of smoke layer, binocular power, and Fechner's constant for the observer. The expression cannot be solved explicitly for v but families of curves are plotted. One interesting result is that under certain conditions, adding smoke to all the air increases the visual range of a small smoke. A visibility meter was constructed to determine clarity (general visibility). The form of meter finally adopted is to be slipped over one objective of a binocular. It consists essentially of a small-angle prism (0.5 diopter) that is moved past a small aperture before the objective. When covering part of the aperture there are two images in the field of view, the added one being due to the prism. As the prism covers more and more of the aperture, the original image grows weaker and the new one grows stronger. When the original image becomes so weak that the boundary line between the object (e.g., ridge or dark building) and the horizon haze just disappears, the distance the observer would have to be from the object for it to be just barely visible may be calculated from the position of the prism and the actual distance of the object. This is c. Curves are drawn to save calculations by the operator. The meter is adapted for use at Forest Service fire lookouts, airports, etc. (Author)

J4033
Serbu, G.P. and Eva Mae Trent.
STUDY OF THE USE OF ATMOSPHERIC-ELECTRIC MEASUREMENTS IN FOG FORECASTING.
American Geophysical Union, Transactions Vol. 39, No. 6, Dec. 1958, p. 1034-1042.

A statistical study of atmospheric-electric and pertinent meteorological data collected in Argentia, Newfoundland, from January through September, 1955, shows that fogs produce a decrease in the electrical conductivity with a concurrent increase in potential gradient. A quantitative analysis of the data shows that during fog (horizontal visibility less than ½ mi, ceiling less that 200 ft) the average conductivity was less than 0.65 times the monthly mean 92% of the time and the average potential gradient was more than 2.0 times the monthly mean 87% of the time. From one to two hours preceding the onset of fog the conductivity decreased and the potential gradient increased in about 70% of the events. One hour prior to dissipation of fog conductivity increased and potential gradient decreased in 75% of the events. Similar studies should be made in additional areas to determine whether the Newfoundland results are unique or may be encountered more generally. (Author)

J4035
Shapaev, V. M.
VLIIANIE VETRA NE KOLEBANIIA VIDIMOSTI I VYSOTY OBLACHNOSTI (INFLUENCE OF WIND ON FLUCTUATIONS OF CEILING AND VISIBILITY).
Trudy glav. geofiz. Obs., Len. No. 163, 1964, p. 104-121.

The observations of the Leningrad AMSG Station for the 10-yr period 1950-1959 are utilized. An analysis was carried out of the changes of horizontal visibility and of the height of the lower ceiling of cloudiness as a function of the direction and speed of the wind for Jan., the most typical month. Synchronous changes of the indicated meteorological complex were not noted in all cases. When changes occurred in wind only the structure of air currents under conditions of strong and weak advection was shown. Combined changes in visibility and in the height of the ceiling and of wind speed are discussed for shifting of the wind to the right and to the left and for its unchanging direction which reflect the effect of different synoptic processes. The effect of the diurnal course of wind velocity on the rate of change of visibility and partly on the height of the ceiling was determined for July. (Author)

J4040
Sharonov, V. V.
CALCULATING RANGE OF VISIBILITY UNDER GIVEN CONDITIONS OF OBSERVATION.
Nauch. Byull. leningr. gos. Univ. No. 9, 1947.

J4050
Sharonov, V. V.
THE DIAPHANOSCOPE, ITS THEORY, STUDY, AND USE.
Trudy glav. geofiz. Obs., Len. No. 11, 1948. In Russian.

J4060
Sharonov, V. V.
METODY I PRIBORY DLIA IZMERENIIA PROZRACHNOSTI ATMOSFERY (METHODS AND INSTRUMENTS FOR MEASURING ATMOSPHERIC TRANSPARENCY AND VISIBILITY).
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Vol. 6, No. 3, 1942, p. 65-80.

A critical review of the problem. The author discusses in detail the theory and practice of visibility calculation and measurement. Night, vertical and slant visibility are also considered.

J4070
Sharonov, V. V.
PRAKTIKA PRIMENENIIA IZMERITELEI VIDIMOSTI (MANNER OF USING VISIBILITY METERS).
Izv. Akad. Nauk SSSR. Ser. Geogr. Geofiz. Vol. 6, No. 3, 1942, p. 104-109.

An analysis of the physical and physiological principles of instruments used for measuring visibility. Detailed description of the new visibility meter, "dymometer" (haze meter), constructed by the author.

J4080
Sharonov, V. V.
SKHEMY NABLIUDENII DIAFONOSKOPOM PRI OPREDELENII PROZRACHNOSTI ATMOSFERY I DAL'NOSTI VIDIMOSTI ("DIAFONOSKOP" OBSERVATIONS FOR DEFINITIONS OF AIR TRANSPARENCY AND VISIBILITY).
Nauch. Byull. leningr. gos. Univ. No. 18, 1947, p. 7-8.

Theoretical analysis of 4 methods of visibility determination and a short review of the possible errors in these observations.

J4090
Sharonov, V. V.
USPEKHI SOVETSKOI VISIBILIMETRII (PROGRESS OF VISIBILITY MEASUREMENT IN THE USSR).
Priroda, Mosk. Vol. 34, No. 6, June 1945, p. 15-21.

A review of work done in the U.S.S.R. in construction of apparatus for visibility measurement.

J4100
Shek, M. P.
DECREASE IN THE VISUAL FACULTY UNDER CERTAIN CONDITIONS OF FATIGUE.
Voprosy Psikhologii No. 1, June 10, 1963, p. 17-20.
Trans. into English JPRS-19615.

The effect of auditory fatigue on the visual capability of human subjects was determined, using correction charts consisting of rings with breaks in their circumference. Preliminary studies indicated that general fatigue, induced by comparatively light laboratory work, leads to an increase in auditory and visual capabilities toward the end of a working day as compared to morning data. Isolated fatigue of the auditory and, especially, the visual faculty against a background of ordinary laboratory work, however, was accompanied by a marked decrease in visual perception at the end of a working day. A loss of sensory capability was also noted in subjects placed for a long time in an area having reduced air circulation.
N64-12506

J4110
Shevchenko, F. N.
K VOPROSU O POGRESHNOSTI IZMERENIIA NAKLONNOI DAL'NOSTI VIDIMOSTI SPOSOBOM RAVNYKH UGLOV (ERRORS IN MEASURING THE SLANT VISIBILITY RANGE BY MEANS OF EQUAL ANGLES).
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 18, 1968, p. 70-76.
Trans. into English Rept. No. FSTC-HT-23-708-69.

Considers a variant of application of the equal angle method in the measurement of the slant visibility range for angles $\varphi = 35°$. The application of this method involves a number of technical difficulties which are due also to the use of 2 receivers employed to measure weak signals and to transmit them over a considerable distance. To determine the feasibility of creating a measuring installation employing this method, the author considers one of the possible electrical systems in which discrete transformers of ordinary and logarithmic amplifiers are used. A method of determining the errors of the units comprising the system is shown. The errors of individual units of the electrical system are determined for $\varphi = 35°$. The dependence of the errors of measurement of slant visibility range on the errors of individual units is shown. (Author)
AD-697526

J4120
Shibita, Y.
THE THEORETICAL INVESTIGATION ON THE OPTICAL NATURE OF PARTICLES OF HAZE AND SOME RESULTS OF VISIBILITY OBSERVATIONS TAKEN IN FOG.
Geophisica Magazine, Tokyo Vol. 23, No. 1, Dec. 1951, p. 73-102.

J4130
Shifrin, K. S. and G. M. Aivazian.
UCHET INDIKATRISY RASSEIANIIA PRI IZMERENIIAKH PROZRACHNOSTI (CONSIDERATION OF THE DISPERSION COEFFICIENT IN TRANSPARENCY MEASUREMENTS).
Trudy glav. geofiz. Obs., Len. No. 153, 1964, p. 132-153.

Calculation of the value of the flux (scattered at small angles) entering the receiving system in atmospheric-transparency measurements. Numerical results obtained for (1) a parallel beam, (2) a point source, and (3) a projector are tabulated for a range of aerosol particle sizes and wavelengths. A method is proposed for minimizing the errors which occur in the directly measured attenuation-factor values in the various cases considered.
A65-18581#

J4140
Shifrin, K. S. and E. A. Chayanova.
THEORY OF A NEPHELOMETRIC METHOD OF MEASURING THE TRANSPARENCY AND STRUCTURE OF AN ATMOSPHERIC AEROSOL.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 3, No. 3, 1967, p. 274-283.
Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 3, No. 3, 1967, p. 156-161.

The form of relative scattering pattern (scattering pattern related to scattering coefficient) is given for typical aerosol models. It is shown that relative scattering is constant at 30-45° in wide range of atmospheric conditions and that it can be used for measuring the visual range. The variability of the number of aerosol particles and sizes is studied for typical states of the atmosphere. It is shown that the scattering pattern crossing angle is ~57° for the average (on the vertical) aerosol which agrees with observational data. (Author)

J4150
Shifrin, K. S. and V. I. Golikov.
IZMERENIYA MIKROSTRUKTURY METODOM MALYKH UGLOV (MEASUREMENT OF THE MICROSTRUCTURE OF SMALL ANGLES).
Trudy glav. geofiz. Obs., Len. No. 152, 1964, p. 3-15.
Trans. into English NASA-TT-F-317

The article discusses the results of testing a prototype of a field device for measuring the microstructure of fogs by the method of small angles. (Author)
N65-20986#

J4160
Shifrin, K. S. and I. N. Minin.
NON-HORIZONTAL VISIBILITY IN PRESENCE OF UNBROKEN CLOUD COVER.
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 1, 1959.
Trans. into English in *Bulletin of the Academy of Sciences, USSR, Geophysics Series* No. 1, 1959.

In order to develop a theory of non-horizontal visibility, the authors constructed a closed optical system of an actual (cloud-free) atmosphere so that any atmospheric properties can be derived from specifically measured optical conditions of the atmosphere. The data upon which the theory of horizontal visibility is based are those on the aerosol structure of a cloud-free atmosphere. (PENNDORF) spectral transparency of atmospheric aerosol (Schmolinsky, F., Met. Zeit. 61 (6), 1944) and scattering indices in the atmosphere (Foitzik, L. et al., Zeit.fuer Met., 7 (1) 1953.)

J4170
Shifrin, K. S. and I. N. Minin.
THEORY OF NON-HORIZONTAL VISIBILITY.
Trudy glav. geofiz. Obs., Len. No. 68, 1957, p. 5-75. In Russian.

J4180
Shifrin, K. S., A. Ya. Perelman, and L. K. Potekhina.
TABLITSY DLYA RASCHETA SPEKTRA CHASTITS DISPERSNOY SISTEMY PO YEYE PROZRACHNOSTI (TABLES FOR COMPUTING THE SPECTRUM OF THE PARTICLES OF A DISPERSED SYSTEM FROM ITS TRANSPARENCY).
Trudy glav. geofiz. Obs., Len. No. 152, 1964, p. 192-211.
Trans. into English NASA-TT-F-329

Equations are presented for calculating the spectrum of the particles of a dispersed system from data on its transparency, together with detailed tables for the special functions used in the problem. (Author)
N65-20989#

J4190
Shifrin, K. S. and G. L. Shubova.
STATISTICAL CHARACTERISTICS OF VERTICAL ATMOSPHERIC TRANSPARENCY.
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 2, Feb. 1964, p. 279-284.
Trans. into English in *Bulletin of the Academy of Sciences, USSR, Geophysics Series* No. 2, Feb. 1964.

J4200
Siedentopf, H.
CONCERNING TWILIGHT VISIBILITY, DETAIL VISIBILITY, AND FLIGHT VISIBILITY.
Z. Met. Vol. 2, 1948.

J4210
Siedentopf, H.
ON THE OPTICS OF ATMOSPHERIC HAZE.
Z. Met. Vol. 1, 1947.

J4215
Siedentopf, H.
ON VISIBILITY LIMITS. (VISUAL ACUITY CONTRAST THRESHOLD.)
Forschn Fortschr. Vol. 17, May 1-10, 1941, p. 153-155.

J4218
Siedentopf, H.
STUDIES ON PHYSIOLOGICAL OPTICS. I. ON THE VISIBILITY OF A ROW OF BRIGHT SPOTS.
Optik, Stuttg. Vol. 1, Oct. 1946, p. 324-326.

J4220
Siedentopf, H.
REMARKS ON VISIBILITY THEORY.
Z. Met. Vol. 2, 1948.

J4230
Silverman, Sam M. and J. B. Taylor.
NIGHT VISIBILITY - SOME ASPECTS OF NIGHT VISIBILITY USEFUL FOR AIR FORCE OPERATION.
Res. Rev. Vol. 6, No. 9, Sept. 1967, p. 15-16.

J4235
Simpson, G. C.
VISIBILITY AND THE OPTICAL PROPERTIES OF THE ATMOSPHERE.
Great Britain Meteorological Office Professional Notes Vol. 6, No. 94, 1948.

J4237
Slootmacker, P.
EMPLOYMENT OF INDUSTRIAL T.V. IN AERONAUTICAL METEOROLOGY.
Regie des Voies Aeriennes Service Meteorologique, Bulletin Trimestrielle (Belgium) immediately after Trimestrielle; Mar./May 1959, p. 1-7.

J4240
Smith, D. P.
RUNWAY VISUAL RANGE AT UNITED KINGDOM AIRPORTS.
Met. Mag., Lond. Vol. 97, Feb. 1968, p. 51-55.

Discussion of arrangements for runway visual range (RVR) measurement in the UK, and description of various systems in use. RVR experiments are discussed in which a transmissometer is used to measure the transmissivity of the atmosphere and to compute RVR by choosing appropriate values for the sensitivity of the pilot's eyes (visual threshold), background brightness, and intensity of the runway lights.
A68-22092

J4245
Smith, N. H.
SMOKE AND VISIBILITY.
Q. Jl. R. Met. Soc. Vol. 58, Apr. 1932, p. 113-114.

J4250
Sobolev, V. V.
DIFFUSE REFLECTION AND TRANSMISSION OF LIGHT BY THE ATMOSPHERE WITH THE ARBITRARY SCATTERING INDICATRIX.
Astr. Zh. Vol. 46, No. 6, 1969, p. 1137-1148.

J4255
Spencer, Domina Eberle.
SCATTERING FUNCTION FOR FOGS.
J. opt. Soc. Am. Vol. 50, No. 6, June 1960, p. 584-585.

The paper summarizes recent experimental data on fogs. It is shown that a wide range of conditions from very light to very dense fogs can be represented by a single shape of scattering function. The scattering function F (θ) is defined graphically and by a table of values. Given this scattering function, the scattering coefficient of a fog can be defined in terms of the attenuation coefficient.

J4270
Staats, Wayne F.
FIELD EXPERIMENTS WITH A TRANSMISSOMETER FOR MEASURING HORIZONTAL VISIBILITY AND WITH A RAPID SAMPLING CEILOMETER FOR MEASURING CLOUD HEIGHT (ABSTRACT).
Bull. Am. met. Soc. Vol. 34, No. 2, Feb. 1953, p. 81.

In connection with a research and development project sponsored by the Air Navigation Development Board, the U. S. Weather Bureau is conducting investigations designed to improve techniques of observing low-ceiling and low-visibility conditions pertinent to the final approach of aircraft. The experiments are being conducted at the Washington National Airport and at the Weather Bureau's experimental observatory at Silver Hill, Md. When visibility was less than one and one half miles and with fog the restricting phenomenon, instrumental indications of horizontal visibility by the transmissometer showed reasonably good agreement with visibility estimated by an observer stationed near the instrument. Cloud-base heights measured with a new type of instrument known as the rotating-beam ceilometer developed by L. W. Foskett and R. H. Guenthner of the Weather Bureau were found to be compatible with heights measured by the conventional fixed-beam ceilometer. Measurements with the new ceilometer, yielding an indication every twenty-four seconds, demonstrated that short-period fluctuations in a low cloud base height can be large, a change of such as three hundred feet in twenty-four seconds having been observed. (Author)

J4280
Stalenhoef, A. H. C.
VISIBILITY VARIATIONS AT SCHIPOL-AIRPORT, AMSTERDAM.
Pure and Applied Geophysics Vol. 98, No. 6, 1972, p. 213-226.
A72-42886

J4290
Stange, Rudolf.
MESSUNGEN MIT DEM BERGMANNSCHEN SICHTMESSER (MEASUREMENTS WITH BERGMANN'S VISIBILITY METER).
Veroff. geophys. Inst. Univ. Lpz. 2nd. Ser., Vol. 8, No. 5, 1937, p. 287-345.

Description of the visibility meter and analysis of numerous experimental observations made under different degrees of transparency, of atmospheric brightness, etc. Relation between visibility and turbidity is also discussed.

J4295
Starkiewicz, W.
THE INFLUENCE OF FATIGUE ON THE VISUAL ACUITY OF AVIATION PERSONNEL.
Polski Przegl. Med. lotn. Vol. 8, Jan.-Mar. 1939, p. 56-64.

J4300
Stauffert, Fritz.
SCHRAEGSICHTMESSUNG MIT EINER FERNSEHANLAGE (SLANT VISIBILITY MEASUREMENT WITH A TELEVISION APPARATUS).
Beitr. Phys. Atmos. Vol. 33, Nos. 1-2, 1960, p. 53-56.

An attempt was made at the Hannover airport to measure the visual range in the sector of aircraft approach by means of a television apparatus. The purpose was to determine whether objects just perceptible to the eye are reproduced on the television screen so that they can still be seen.

Color contrasts are thereby only approximately correctly transformed into the corresponding gray scales. This is confusing when observing step values. The step value for the illumination intensity is higher, and the contrast sensitivity is less. Thus, objects which are just visible with the eye can no longer be recognized on the screen.

A determination of the visual range with television is not yet possible unless luminous objects are employed as visibility marks. However, if very strong searchlights with adjustable light intensity are used, it is in principle possible to use a television installation to measure visibility. (Author)

J4310
Stedman, D. F.
SAFETY IN THE RAIN: A NEW APPROACH TO VISIBILITY IN RAIN FLIGHT.
Shell Aviat. News, No. 343, 1967, p. 2-5.

J4320
Steel, J.
RELATIONSHIP BETWEEN VISIBILITY AND VARIOUS PHYSICAL PARAMETERS.
Met. Zpr. Vol. 21, No. 1, 1968, p. 5-10.

J4330
Steinhauser, H.
DISTANT VISIBILITY AND FLIGHT VISIBILITY.
Naturw. Rdsch., Stuttg. Vol. 6, No. 4, 1953.

A summary is given of the physics and physiology of visibility, with applications to visibility from mountains and from an aircraft.

J4335
Steinhausser, H.
HORIZONTAL VISIBILITY IN LOCAL VARIABLE TURBIDITY AND ILLUMINATION.
Z. Geophys. Vol. 10, No. 1, 1934, p. 59-65.

J4340
Stewart, Harold S. and Joseph A. Curcio.
THE INFLUENCE OF FIELD OF VIEW ON MEASUREMENTS OF ATMOSPHERIC TRANSMISSION.
J. opt. Soc. Am. Vol. 42, No. 1, Nov. 1952, p. 801-805.

The purpose of this investigation was to learn the relationship between the diffuse transmission of the atmosphere and its transmission of collimated light as functions of distance between source and receiver, and wavelength for clear nonfoggy atmospheres. All measurements were made at the Chesapeake Bay Annex of the Naval Research Laboratory. The atmospheric transmission for collimated visible light was measured with a visual telephotometer.

J4350
Stewart, K. H.
METEOROLOGICAL OFFICE DISCUSSION; FOG INVESTIGATIONS.
Met. Mag., Lond. Vol. 82, No. 973, July 1953, p. 213-216.

The four methods of measuring slant visibility are listed; however, these methods are not described. They are (1) balloon-borne light (2) pyrotechnic flare, (3) balloon-borne photo-electric fog density indicator, and (4) inclined searchlight beams.

J4360
Stratton, J. A. and H. G. Houghton.
A THEORETICAL INVESTIGATION OF THE TRANSMISSION OF LIGHT THROUGH FOG.
Phys. Rev. Vol. 38, July 1, 1931, p. 159-165.

This theoretical investigation was undertaken in an attempt to explain some unexpected experimental results which are described in detail in another paper. The fog droplets are assumed to be dielectric spheres with an index of refraction of 1.33 and the development is based on the work of Mie and Debye on the pressure of light and the colors of colloidal solutions. The results show that the particle size of the fog is a controlling factor in the transmission characteristics of the fog. By assuming the appropriate particle size a theoretical transmission curve is obtained which closely corresponds to the experimental data. In conclusion, it is pointed out that the King formula is not applicable to the scattering of light by particles as large as fog drops. (Author)

J4365
Streltsov, V. [V.]
THE FUNCTION OF THE EYE IN AVIATION.
Amer. Rev. SOV. Med. Vol. 2, Dec. 1944, p. 126-133.

J4370
Stuchtey, Karl.
UEBER DIE VERSCHIEDENE HELLIGKEIT DER EINZELNEN TEILE DES DUNSTHORIZONS (ON VARIOUS DEGREES OF BRIGHTNESS OF DIFFERENT PARTS OF A MISTY HORIZON).
Met. Z. Vol. 31, No. 7, July 1914, p. 351-354.

A report on a series of experimental observations with pilot balloon soundings. Brightness of horizon as an important factor to range of vision was determined for air with different percentage of humidity. The dependence of brightness of horizon on azimuth of the sun was investigated.

J4380
Sultanbaev, S. A.
UKHUDSHENIE VIDIMOSTI IZ-ZA PROMYSHLENNOGO DYMA VO FRUNZE (REDUCTION OF VISIBILITY DUE TO INDUSTRIAL SMOKE IN FRUNZE).
Trudy sred.-aziat. nauchno-issled. gidromet. Inst.
Vol. 31, No. 46, 1967, p. 102-106.

Conditions of impairment of visibility by industrial smoke in foothill region are investigated. It is shown that the maximum imparment of visibility occurs during change in direction of local winds. (Author)

J4390
Summersby, W. D.
DISTRIBUTION OF PRECIPITATION AND THE VARIATION OF VISIBILITY IN PRECIPITATION.
Met. Mag., Lond. Vol. 98, No. 1165, Aug. 1969, p. 252-259.

The area considered extends from the eastern and northern extremities of the Baltic across the British Isles to include the ocean weather stations (OWS) 'I' and 'J'. A selection of observations for 13 stations spanning this region are examined to show how precipitation varies in type and intensity across it and, using the observations nearest midday, how visibility varies in precipitation. Interest is confined to coastal and sea areas rather than to inland stations. (Author)

J4400
Suzuki, Yoshio.
RELATION BETWEEN VISIBILITY AND AIR POLLUTION, ESPECIALLY FLOATING DUST AT TOKYO INTERNATIONAL AIRPORT.
J. Met. Res., Tokyo Vol. 23, No. 8, Aug. 1971, p. 283-319.

J4410
Sytinskaia, N. N.
SOME PARAMETERS OF VISIBILITY FUNCTIONS.
Izv. Akad. Nauk SSSR. Ser. Geofiz. No. 1, 1954, p. 83-86. In Russian.

J4420
Szucs, Zsigmond.
TRANZMISSZOMETER (TRANSMISSOMETER).
Orszagos Meteorologiai Intezet, Hivatalos Kiadvanyai, Budapest Vol. 29, No. 2, 1966, p. 208-211.

The visibility recorder called "Scopograph" operates on the principle of a transmissometer, i.e. a light impulse transmitter and receiver operate at the two ends of the base line. The light impulse emitted by the transmitter weakens overpassing the base line, depending on the pollen and this is measured by a sensor. The sensor produces a continuous voltage depending on the visibility, which operates a recorder instrument.

J4430
Tasseel, R.
CONTRIBUTION TO THE DEFINITION AND TO THE MEASUREMENT OF LANDING CONDITIONS.
Meteorologie Special no. 33, Jan./Mar. 1954.

During landing the pilot needs to know the heights (H) at which he begins to see the ground and the distance at each moment of the landing field beacons (V). The formulas for calculating H and V are presented. The determination of the ceiling height of the pilot and of the pilot visibility depends upon a knowledge of N — threshold of illumination of the eye of the observer and S the surface. The determination of these parameters and the application of the proposed methods is illustrated.

J4450
Tasseel, R.
SUR LA VISIBILITE DES SOURCES LUMINEUSES DE BALISAGE (ON THE VISIBILITY OF BOUNDARY LIGHTS).
J. scient. Met. Vol. 3, Nos. 9/11, Jan.-Mar./July-Sept. 1951, p. 16-25, 77-85.

The relation between visibility of boundary lights or beacons and mutual meteorological visibility is worked out by Koschmieder formula. Experimental data obtained during the winter of 1950-51 are analyzed and given in tables and on scatter diagrams, and the accuracy of observations clearly indicated. Both point sources and non-point sources are tested, and the coefficients established for each. The variation of brightness and contrast in fog data function of the attenuation is also shown.

J4460
Taylor, John H. and Justin J. Rennilson.
A COMPRESSED-SCALE SYSTEM OF PORTABLE VISIBILITY LIGHTS FOR NIGHTTIME USE.
Jnl. appl. Met. Vol. 1, No. 2, June 1962, p. 184-191.

A system of visibility lights for nighttime use at advanced or tactical air bases has been designed by the Visibility Laboratory of the Scripps Institution of Oceanography, La Jolla, Calif. This system enables a more precise estimate of nighttime to be made than has heretofore been attainable by conventional observation procedures. Although the system is able to yield visibility estimates to 5 mi or more, it requires less than a 2 mi path for its installation. The accuracy of the system is achieved by control of the observer's adaption level, as well as by use of a calibrated incandescent (searchlight) source in conjunction with highly efficient retrodirective reflectors. Portability is attained by compact design and packaging and by the use of battery power. The principles and design considerations of the system are also discussed. (Author)

J4470
Teneva, M.
MUSZER A VIZSZINTES LATASTAVOLSAG MEGHATAROZASARA (INSTRUMENT FOR THE DETERMINATION OF HORIZONTAL VISIBILITY).
Idojaras Vol. 61, No. 1, Jan./Feb. 1957, p. 9-14.

The paper acquaints us with an instrument based on simple physical principles and constructed by the author for the measuring of horizontal visibility. By the aid of this instrument the visibility becomes reliably measurable within the tolerable margin of errors even in the case, e.g., only 4-5 clearly visible objects, are to be found within the distances of 0,1-1,5-20.0 kilometres. (Author)

J4480
Tetens, Otto.
DIE SICHTBEOBACHTUNGEN DES AERONAUTISCHEN OBSERVATORIUMS LINDENBERG (VISIBILITY OBSERVATIONS AT THE LINDENBERG AERO NAUTICAL OBSERVATORY).
Met. Z. Vol. 37, No. 12, Dec. 1920, p. 348-349.

A report on a preliminary investigation of visibility made at the observatory in the preceding year without visibility meters.

J4485
Thomas, M. J.
THE VISIBILITY OF COLOURED TAILS IN PILOT BALLOON ASCENTS.
Met. Mag., Lond. Vol. 62, Sept. 1927, p. 179-182.

J4487
Titov, V. I.
NEKOTORYE KLIMATICHESKIE KHARAKTERICHESKI DAL'NOSTI GORIZONTAL'NOI VIDIMOSTI MENEE 1 KM (CERTAIN CLIMATIC CHARACTERISTICS OF THE HORIZONTAL VISIBILITY RANGE LESS THAN 1 KM).
Trudy nauchno-issled. Inst. Aeroklim. No. 38, 1967, p. 85-95. In Russian.

Demonstration of the recurrence of horizontal visibility less than 1 km as a function of air temperature, dew-point deficit, and barometric effects. The continuous duration of visibility lower than 1 km is also characterized on the basis of data obtained at 18 points over the European territory of the USSR. Three distinct regions of differing (in the annual variation and in degree) stability of visibility lower than 1 km are determined within the considered territory. The stability of the poor visibility initially depends on the stability of fog formation, and the specific role of fogs is described for each of the considered regions.
A68-17427 #

J4490
Torpova, T. P.
ON MEASURING THE POLARIZATION OF LIGHT IN FOG.
Trudy astrofiz. Inst., Alma-Alta 1962, p. 144-148.
Trans. into Eng. Library of Congress, Aerospace Technology Div. Rept. T63 102.

J4500
Tousey, R., M. Koomen, and L. Dunkelman.
A VISUAL PHOTOMETER FOR MEASURING THE BRIGHTNESS OF THE NIGHT SKY.
American Geophysical Union, Transactions Vol. 31, No. 4, Aug. 1950, p. 547-548.

The instrument described is suitable for night operation in high altitudes. It has no electrical circuits or lamps, and has a lower brightness limit of about .010 μL. A phosphor button serves as the comparison source.

J4510
Trabert, Wilhelm.
DIE EXTINKTION DES LICHTES IN EINEM TRUEBEN MEDIUM (SEHWEITE IN WOLKEN) (EXTINCTION OF LIGHT IN A TURBIN MEDIUM (VISION RANGE IN CLOUDS)).
Met. Z. Vol. 18, No. 11, Nov. 1901, p. 518-524.

Theoretical study of the dependence of visibility in clouds on water content and size of water drops.

J4520
Tschirske, Hilmar.
BEDEUTUNG ENTFERNTER WOLKEN FUR DIE BEURTEILUNG DER SICHT (THE IMPORTANCE OF DISTANT CLOUDS FOR ESTIMATING VISIBILITY)).
Met. Rdsch. Vol. 2, Nos. 1-2, Jan.-Feb. 1949, p. 26-29.

Assuming the height of cloud from its form, the author gives tables for determining its distance by the angle of elevation taking account of the height of the observer and the curvature of the earth.

J4525
TSirlin, V. A. and N.A. Vishnevskii.
THE FUNCTION OF THE EYE UNDER CONDITIONS OF NIGHT FLYING.
Vest. vozd. Flota Vol. 16, Sept. 1933, p. 32-33. *In Russian.*

J4530
Twomey, S. and H.B. Howell.
THE RELATIVE MERIT OF WHITE AND MONOCHROMATIC LIGHT FOR THE DETERMINATION OF VISIBILITY BY BACK-SCATTERING MEASUREMENTS.
Appl. Optics Vol. 4, No. 4, 1965, p. 501-506.

The response of a simulated single-ended transmissometer, based on the Mie theory of the scattering of light, has been computed for monochromatic light similar to that of a ruby laser (λ=0.7μ) and for white light (0.4μ≤λ≤0.7μ) for many fog and haze models. The results for white light are compared with data obtained from actual field measurements. The strong dependence of backscatter on the size distribution of the scatterers and on the spectral energy distribution of the source is illustrated, and the limitations of the single-ended transmissometer as a device for determining the visibility in haze and fog are discussed. A table of Mie extinction efficiency (or scattering coefficient) and intensity function (for the backscatter direction) is presented for integral values of size parameter up to 100. (Author)

J4535
van Heel, G. L.
THE ILLUMINATION AND BEACONING OF AERODROMES.
Philips tech. Rev. Vol. 4, Apr. 1939, p. 93-99.

J4540
Varaksin, V. P.
CHARACTERISTICS OF THE SPECTRAL PROPERTIES OF A VISIBLE DISTANCE METER WITH AN OPTICAL QUANTUM GENERATOR.
Trudy nauchno-issled. Inst. gidromet. Priborost. No. 25, 1971, p. 41-47. In Russian.

J4545
Vassy, A. and E. Vassy.
EXPERIMENTAL METHOD FOR THE ABSORPTION OF LIGHT BY THE LOWER ATMOSPHERE AND BY THE WHOLE ATMOSPHERE.
C. r. hebd. Seanc. Acad. Sci., Paris Vol. 206, June 20, 1938, p. 1893-1895.

J4547
Vassy, A. and E. Vassy.
STUDIES ON ATMOSPHERIC ABSORPTION.
J. Phys. Radium, Paris S.7, Vol. 10, Feb., Sept. and Nov. 1939, p. 75-81, 403-412, and 459-464.

J4550
Vassy, E.
UNE NOUVELLE METHODE POUR LA MESURE DE LA VISIBILITE HORIZONTALE (A NEW METHOD FOR MEASUREMENT OF HORIZONTAL VISIBILITY).
Meteorologie Special no. 33, Jan./Mar. 1954, p. 99-102.

It is suggested to determine directly the visual bearing from the formula which defines it. A few settings likely to be realized with this object in view are presented. It appears preferable to try the direct measurement of the horizontal visual range with the aid of the proposed "vibalmetre" and to transmit the value obtained to the pilot.

J4560
Veitser, V. J.
O PRILOZHIMOSTI NEFELOMETRICHESKOGO METODA K OPREDELENIIU DAL'NOSTI VIDIMOSTI KOEFITSIENTA OSLABLENIIA SVETA V GUSTYKH DYMAKH I TUMANAKH (ON THE APPLICATION OF THE NEPHELOMETRIC METHOD TO DETERMINE VISIBILITY AND EXTINCTION COEFFICIENT IN THICK SMOKE AND FOG).
Zh. tekh. Fiz. Vol. 17, No. 4, 1947, p. 469-474.

Nephelometric method of determining transparency of the atmosphere is not recommended for investigating dense mists, dusty atmosphere and artificial smoke clouds.

J4570
Ventura, Eduard.
AZ INVERZIOK ES A LATASTAVOLSAG KAPCSOLATA (RELATIONSHIP BETWEEN INVERSION AND VISIBILITY).
Idojaras Vol. 70, No. 6, Nov./Dec. 1966, p. 369-373.

The inversions in the lower atmosphere which occurred in Budapest in 1960-1964 are compared with simultaneous visibility observations made at the Ferihegy airport. During the period of investigation a good relationship was established between inversion frequency and monthly means of visibility distance. A good agreement between these parameters was also found on the basis of data for 1961-1963. It was established that good visibility values were significantly more frequent during weather without inversion and that poor visibility was more frequent during inversion weather. Inversions are thus essential but not determining prerequisites for a deterioration of visibility; but they have decisive significance in the formation of radiation fog. (Author)

J4580
Viaut, A.
CONDITIONS METEOROLOGIQUES AUX HAUTES ALTITUDES ET ASSISTANCE METEOROLOGIQUE AUX AERONEFS A HAUTES PERFORMANCES (METEOROLOGICAL CONDITIONS AT HIGH ALTITUDES AND METEOROLOGICAL ASSISTANCE TO HIGH-SPEED AIRCRAFT).
Ciel Terre Vol. 73, Nos. 5/6, May/June 1957, p. 237-256.

J4590
Victor, C. and A. Burnes.
VISION AT HIGH SPEED AND ALTITUDE.
Aerospace Engineering Review Apr. 1953.

J4600
Viezee, W., E. E. Uthe, and R. T. H. Collis.
LIDAR OBSERVATIONS OF AIRFIELD APPROACH CONDITIONS: AN EXPLORATORY STUDY.
Jnl. appl. Met. Vol. 8, No. 2, Apr. 1969, p. 274-283.

Lidar (laser radar) data obtained at Hamilton AFB, Calif. under conditions of low ceiling and visibility, are analyzed by hand and by electronic computer to explore the operational utility of lidar in determining cloud ceiling and visibility for aircraft landing operations. Hand analyses of the data show the ability of the lidar to describe the spatial configuration of the low-cloud structure in the direction of the landing-approach path. The problems inherent in evaluating lidar observations are discussed, and initial approaches to quantitative solutions by computer are presented. It is demonstrated that operationally useful information on the ceiling conditions contained in the hand analyses can be represented by digitizing the lidar data and subjecting these data to computer analysis. (Author)

J4610
Vittori, Ottavio and Riccardo Pesaresi.
RICHERCHE SULLA RIVELAZIONE E SUL CAMPIONAMENTO DI PARTICELLE ATMOSFERICHE (INVESTIGATIONS OF THE DETECTION AND SAMPLING OF ATMOSPHERIC PARTICLES).
Riv. met. aeronaut. Vol. 27, Oct.-Dec. 1967, p. 29-36.

Description of a series of investigations of the detection and sampling of atmospheric particles. The sensitive reaction for the detection of chloride particles, modified to obtain a homogeneous set of sampling slides, was applied to the calibration of an impactor. The capture efficiency was determined by counting NaCl particles collected on two identical impingers in series. A combination of three sampling velocities, three nozzle diameters, and four distances between the nozzle and the slide surface was used. The first results of tests at the low relative humidity of 35% showed that a process which leads to the breaking of the particles takes place inside the instrument, appreciably increasing the concentration of the smallest particles. The results obtained from tests at 98% relative humidity are also described.
A68-13749#

J4620
Vogt, Hasso.
VISIBILITY MEASUREMENT USING BACKSCATTERED LIGHT.
Jrnl atmos. Sci. Vol. 25, No. 5, Sept. 1968, p. 912-918.

The suitability of backscattered light for the measurement of visibility is discussed on the basis of previous practical and theoretical investigations and of 2 1/2 years' tests in routine meteorological work at the Meteorological Institute of the University of Berlin. Tests have demonstrated that backscatter devices indicate visibility equally as well as other types of visibility meters with an accuracy of about ±20%, provided that no completely abnormal distribution of aerosol particles occurs. (Author)

J4630
Vogt, Hasso.
DIE HORIZONTALE SICHTWEITE, IHRE SCHAETZUNG UND MESSUNG (HORIZONTAL VISIBILITY, ITS ESTIMATION AND MEASUREMENT).
Met. Abh. Vol. 69, No. 4, 1966.

With some theoretical investigations it is shown that the observed horizontal visual range (visibility) can be identified as atmospheric turbidity itself. It depends on the peculiarities of the human eye, on the properties of the objects used for estimating visual range, on the brightness and finally on the visual ground albedo. On the other hand the base of visual range measurements is given by the determination of atmospheric scattering. These measurements have the advantage of showing atmospheric turbidity clearly and can be registered during the day and the night at nearly the same conditions. Starting with the horizontal development of the "visibility-meters" some newer types of those instruments are described. Special interest has been given to a backscatter instrument. The measurements of this instrument are compared with estimated visual range. Some examples of the connection of visual range to other meteorological elements as relative humidity, amount of solid particles in the air, air-masses, and rain intensity underline the usefulness of "visibility-meters." Finally it can be shown that the departure of the estimated to measured visual range has nearly the same quantity as the differences amongst the observations of some persons estimating visual range. (Author)

J4640
Volkovitskii, O. A. and L. N. Pavlova.
IZMERENIE PROZRACHNOSTI TUMANOV, SOZDAVAEMYKH V EKSPERIMENTAL' NYKH USTANOVKAKH (TRANSPARENCY MEASUREMENT IN EXPERIMENTALLY PRODUCED FOGS).
Trudy Inst. prikl. Geofiz. No. 7, 1967, p. 21-27.

Construction and operation of a 2-channel photometer with electrical compensation for measuring the transparency of fogs under experimental conditions are described with the aid of a circuit diagram. Results of calibration are given in a curve. Equations for the relative errors of measurements of visibility distance, and for the measurement of transparency, are given.

J4650
Volz, F.
THE OPTICS AND METEOROLOGY OF ATMOSPHERIC TURBIDITY.
Ber. dt. Wetterd. Vol. 2, No. 13, 1954.

After a brief review of some studies on atmospheric turbidity and the principles of the optics of haze, the author presents an analysis of measurements and observations on haze scattered light carried out at Arosa, Frankfurt and Mainz. Three types of turbidity are described: Bishop ring - turbidity type C, B and A. The brightness distribution of the various types, the characteristic particle size distribution and the associated meteorological characteristics, such as cloud, air masses, etc., are discussed.

J4660
von Bezold, Wolfgang.
EINE OBJEKTIVE VORHERSAGEMETHODE FUER GERINGE SICHTWEITEN AUF STATISTISCHER GRUNDLAGE (A STATISTICAL OBJECTIVE METHOD FOR POOR VISIBILITY FORECASTS).
Met. Rdsch. Vol. 12, No. 3, May/June 1959, p. 100-103.

Using the method of objective forecasting the author attempts to forecast for the air field, Erding, from observational data of one day (1800 GMT) whether the horizontal visibility will be greater or less than one mile on the following day between 0600 GMT and 1900 GMT. The duration of this visibility was not to be predicted but only its occurrence. The study is based upon observations for the period 1949-1957, and included visibility data at 0600.

J4665
Wagner, H. G., I.C. Blasdel and J.R. Poppen.
STUDIES TO IMPROVE VISIBILITY OF AIRCRAFT BY USE OF SUITABLE EXTERIOR PAINT SCHEMES.
J. Aviat. Med. Vol. 20, Apr. 1949, p. 102-113.

J4667
Wald, G.
AREA AND VISUAL THRESHOLD.
J. gen. Physiol. Vol. 21, Jan. 20, 1938, p. 269-287.

J4670
Waldram, J. M.
MEASUREMENT OF THE PHOTOMETRIC PROPERTIES OF THE UPPER ATMOSPHERE.
Illuminating Engineering Society of London, Transactions Vol. 10, 1945, p. 125-130, 147-187.

Report on special investigations of visibility conditions using aircraft and special telephotometric instruments. The observations were carried out at different heights under various weather conditions and in clean and dusty air.

J4675
Walls, G. L.
THE BASIS OF NIGHT VISION.
Illum. Engng Vol. 39, Feb. 1944, p. 93-111.

J4680
Wasserman, S. E. and D. J. Monte.
A RELATIONSHIP BETWEEN SNOW ACCUMULATION AND SNOW INTENSITY AS DETERMINED FROM VISIBILITY.
Jnl. appl. Met. Vol. 11, Mar. 1972, p. 385-388.

A procedure is presented for estimating hourly snow accumulation from observations of snow intensity or visibility, with the procedure being tested for La Guardia Field, New York City. The relationship between reported snow intensity and estimated snowfall is shown on independent data to be reliable. Results should aid in forecasting additional snow accumulation and in estimating previous snowfall when this information is not available from direct measurements. (Author)
A72-26085#

J4690
Webb, E. K. and C. E. Coulman
DAYTIME SEEING AND THERMAL STRUCTURE IN THE LOWER ATMOSPHERE.
Nature, Lond. Vol. 212, Oct. 1, 1966, p. 58-59.

Results of a pilot experiment in which the fluctuations of optical image position over a 25-m slant path, the atmospheric temperature fluctuations, and the wind direction were recorded simultaneously. The purpose was to determine whether good seeing conditions occur when the optical path lies above the Obukhov height and has a slope roughly parallel with ascending warm convection plumes interspersed with sinking environmental air that is devoid of temperature fluctuations. It appears that intervals of good seeing along a slant path are likely to be encountered under sunny conditions, with sufficiently light wind at a suitable direction.
A67-10250

J4700
Weickmann, Helmut and Karl Bullrich.
EIN BEITRAG ZUR BESTIMMUNG DER SICHTWEITE BEI NACHT (A CONTRIBUTION TO MEASUREMENT OF VISIBILITY AT NIGHT).
Met. Rdsch. Vol. 2, Nos. 9-10, Sept.-Oct. 1949, p. 289-290.

Authors propose to direct cloud searchlight horizontally and measure intensity in lux at 500 or preferably 1000 m with a photometer. Conversion scales to visibility in km given.

J4705
Weinberg, V.B.
ABOUT THE VISIBILITY DISTANCE FOR DIFFERENT OBJECTS.
Problemy fiziol. Opt. Vol. 3, 1946, p. 50-58.

J4710
Werner, C.
THE PROJECT "HAVEN VIEW" AS AN EXAMPLE FOR AN INTERNATIONAL VISIBILITY MEASUREMENT PROGRAM.
Deutsche Forschungs- und Versuchanstalt fuer Luft- und Raumfahrt, Nachrichten Mar. 1973, p. 393-395. In German.

Haven View project for atmospheric visibility and radiation measurements, describing airborne and ground based instrumentation and measurement results.

J4718
Wigand, A.
THE DETERMINATION OF VISIBILITY WITH THE VISIBILITY METER.
Z. InstrumKde Vol. 45, Sept. 1925, p. 411-416.

J4720
Wigand, Albert.
EINE METHODE ZUR MESSUNG DER SICHT (A METHOD OF VISIBILITY MEASUREMENT).
Phys. Z. Vol. 20, No. 7, April 1, 1919, p. 151-160.

A short review of the development of visibility measurement. The first meter was constructed by De Saussure (1787), the next by Schlagintwelt (1848) and by Beer (1854). The author analyzes the technique of visibility measurement, remarks on the theory of range of vision and describes in detail the newly constructed visibility meter which is known at present as Wigand's wedge visibility meter. The results of experimental observations are presented and discussed.

J4730
Wigand, Albert.
EIN NEUER SICHTMESSER (THE NEW VISIBILITY METER).
Phys. Z. Vol. 22, No. 17, Sept. 1, 1921, p. 484-487.

An analysis of theoretical principles of the author's wedge visibility meter. This meter can determine quantitatively the visual range by day and night.

J4732
Wigand, Albert and K. Genthe.
ON THE MEASUREMENT OF VERTICAL VISIBILITY.
Phys. Z. Vol. 25, June 1, 1924, p. 263-270.

J4740
Williams, C. H. and J. R. Radley.
HINTS ON OBSERVING. 4. JUDGING VISIBILITY.
Mar. Obsr Vol. 24, No. 164, Apr. 1954, p. 103-106.

This paper gives hints on estimating the visibility at sea. These include (1) estimating visibility on ocean-going ships by observing some objects on deck at a range of 500 yards or less from navigating bridge and (2) radar. There are also brief descriptions of means visibility which may be observed ashore. They are Gold visibility meter and photo-electric visibility meter.

J4750
Williams, D. C. R.
QUANTITATIVE ASSESSMENT OF TARGET VISIBILITY.
Bendix Tech. J. Vol. 2, Summer 1969, p. 77-81.

Description of a method of quantitatively assessing a system in which visual information is relayed to a human operator who is subsequently required to perform some task. Target visibility is specified by a single factor related to the liminal level of detectability as derived from Tiffany data. Called the K factor, it takes into account visibility dependence on target size and constrast, background luminance level, level of glare, the scattering properties of the atmosphere, and the parameters of the optical sight through which the target is observed. Psychophysical experimental evidence is presented which uniquely relates task performance with the visibility factor of the target stimulus. K-factor analysis is valid for eye performance both under normal photopic daytime conditions and under mesopic or scotopic conditions, where contrast-ratio detectability is changing with luminance level. It is used to advantage for optimizing optical sight systems with respect to magnification and transmission under varying conditions of atmosphere and illumination. (Author)
A70-10420#

J4754
Witcombe, S.F.
HUMIDITY AND THE AGE OF FOG.
Q. Jl. R. Met. Soc. Vol. 59, Jan. 1933, p. 44-46.

J4756
Witcombe, S.F.
RELATIVE HUMIDITY AND VISIBILITY.
Q. Jl. R. Met. Soc. Vol. 58, July 1932, p. 250.

J4758
Wolff, M.
NEW INVESTIGATIONS ON LIGHT TRANSMISSION THROUGH FOG.
Elektrotech. Z. Vol. 56, Mar. 14, 1935, p. 319-320.

J4760
Wright, W. B. and J. A. Weinman.
MEASUREMENT OF THE CLEARANCE OF A RADIATION FOG.
Beitr. Phys. Atmos. Vol. 40, No. 3, 1967, p. 226-263. In German.

J4770
Zabrodskii, G. M., V. G. Morachevskii, and David Kraus.
STUDY OF THE TRANSPARENCY OF CLOUDS AND FOGS.
Trudy arkt. antarkt. nauchno-issled. Inst. Vol. 228, No. 1, 1959, p. 68-86.
Trans. into English JPRS 10330
Trans. into English American Meteorological Society, Boston, MA. Rept. TR 364.
AD-287216

J4780
Zak, E. G. and O. V. Marfenko.
STRUCTURE OF THE LOWER BORDER OF CLOUD COVER.
Trudy tsent. aerol Obs. No. 7, 1952.

The methodological and conceptual difficulties encountered in determining the height of cloud cover, in particular that of the lower boundary, are reviewed briefly as well as the need for studying the physical and synoptic characteristics of the lower cloud boundary, including its thickness, nature of visibility changes, etc. Stratus clouds with a lower boundary height up to 500 M were investigated during the fall-winter period with the aid of pilot and captive balloons. The contents include fluctuations of measurements of cloud height as measured by pilot balloons and fluctuations of the loss of horizon and of the loss of vertical visibility; the comparative height of the different levels of loss of visibility in clouds, variation of the lower margin of clouds, schematic structure of the lower cloud extension of a low cloud layer.

J4790
Zelmanovich, I. L., L. M. Lobkova, and E. R. Milyutin.
CALCULATION OF THE ATTENUATION COEFFICIENTS OF 0.6-14 MICROMETER WAVES PASSING THROUGH FOG.
Vysokogornyi Geofizicheskii Institut, Trudy No. 8, 1968, p. 83-90.
Trans. into English FTD-HT-23-595-70.

Precise and approximate equations are derived for use in determining the coefficient of attenuation alpha 1/KM of electromagnetic waves in mists and fogs. The simplified equations are given in unabsorbed polydispersed aerosols and absorbed polydispersed aerosols, comparative calculations were made for several laser wavelengths in the spectral windows of atmospheric transparency. The optical properties of the water drops used as sols, droplet sizes used, and the mean droplet radii were given. Results obtained in a given calculation using a M-20 electronic computer and those obtained in using given equations are tabulated. They indicate that the use of these approximate equations results in errors which are only about 18 percent larger than those derived from precise and tedious equations. Electromagnetic waves in the 10-12μ spectra passed through fogs with minimal attenuation. In heavy, optically dense fogs (for short wavelengths) the coefficient of attenuation was not selective. (Author)
AD-714786.

J4800
Ziegler, Roland.
LASERTECHNIK ZUR BESTIMMUNG DER METEOROLOGISCHEN SICHT AUF FLUGPLAETZEN (LASER TECHNIQUE FOR DETERMINING THE METEOROLOGICAL VISIBILITY RANGE AT AIRPORTS).
Flugrevue/Flugwelt International Oct. 1971, p. 45, 46.

Methods and equipments currently used at airports to determine the runway visibility range (RVR), the slant visibility range (SVR), the lower cloud boundary, and the atmospheric damping coefficient are reviewed. The advantages of using lasers as light sources and using lidars for determing the relationship between reflected light and the state of the atmosphere are outlined.
A71-43889

J4810
Zikeev, Nikolay T.
O PRIMENENII METODOV FOTOGRAFICHESKOI FOTOMETRII DLIA OPREDELENIIA VIDIMOSTI (APPLICATION OF METHODS OF PHOTOGRAPHIC PHOTOMETRY FOR VISIBILITY DETERMINATION).
Glavnaia Geofizicheskaia Observatoriia, Leningrad, Postoniannaia Aktinometricheskaia Komissiia, Biuleten Vol. 3, No. 26, 1933.

Report before the meeting of the Permanent Actionmetric Commission on the Central Geophysical Observatory on special experimental investigation made by the author at Voronezh University during 1932-1933. The half black and half white screens, located under analogous conditions of illumination but at different distances from observers were photographed simultaneously with a neutral glass wedge. Colored glass filters (yellow, green and red) were also used for experiments. The most effective results were obtained in cases of dissipating radiation fog.

J4820
Zuev, V. E.
RASPROSTRANENIE IZLUCHENII OPTICHESKIKH KVANTOVYKH GENERATOROV V ATMOSFERE (PROPAGATION OF LASER RADIATION IN THE ATMOSPHERE).
Izv. vyssh. ucheb. Zaved. Fiz. Vol. 10, 1967, p. 53-65.
Trans. into English in *Soviet Physics Journal* Vol. 10, No. 10, 1967.

Survey of experimental and theoretical studies concerning the features of the propagation of laser radiation in the atmosphere. Theoretical methods of determining the monochromatic absorption coefficients on the basis of values for the intensity, half-width, and position of the center of the absorption line of atmospheric gases are described. Results of direct experimental measurements of the absorption coefficients of atmospheric gases in the near-earth layer are given for the 1.15-μ radiation wavelength. Attenuation of laser radiation due to scattering on atmospheric aerosols is analyzed by comparison of theory and experimental measurements. The structure of the light field arising during the propagation of laser radiation in scattering media is studied. The applicability limits of the Bouguer law in describing the attenuation of a narrow collimated beam in a scattering medium are discussed, together with the nature of the scattering in the vicinity of the beam and in clouds and smoke.
A68-13367#

J4830
Zuev, V. E., M. V. Kabanov, and Iu. A. Pkhalagov.
EXPERIMENTAL INVESTIGATION OF ATTENUATION OF INFRARED RADIATION IN THE TRANSPARENCY WINDOWS OF THE ATMOSPHERE IN THE 1-2.5 MU REGION.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 4, July, 1968, P. 780-783.
Trans. into English in *Academy of Sciences, USSR, Izvestiya. Atmospheric and Oceanic Physics* Vol. 4, July 1968, p. 447-449.

Investigation of the attenuation of IR radiation in the atmosphere at wavelengths from 0.6 to 2.4μ. Searchlights were used in the tests as radiation sources. They were located at various distances from the receiving station (1.2, 3.5, and 9.86 km). The radiation was received by a telespectrometer, a combination of horizontal telescope and a spectrometer. Measurements were made under various meteorological conditions. Spectral transparency obtained during good visibility is shown in a graph for the region from 0.6 to 1.8μ. Another graph compares results obtained during good visibility with those obtained at snow fall (0.9 to 2.4μ).
A69-16695#

J4840
Zuev, V. E., M. V. Kabanov, and B. A. Savelev.
EKSPERIMENTAL'NOE ISSLEDOVANIE GRANITS PRIMENIMOSTI ZAKONA BUGERA DLIA OPISANIIA OSLABLENIIA UZKIKH KOLLIMIROVANNYKH SVETOVYKH PUCHKOV V RASSEIVAIUSHCHIKH SREDAKH (EXPERIMENTAL INVESTIGATION OF THE RANGE OF APPLICABILITY OF THE BOUGER LAW FOR DESCRIBING THE ATTENUATION OF NARROW COLLIMATED LIGHT BEAMS IN SCATTERING MEDIA).
Dokl. Akad. Nauk SSSR Vol. 175, July 11, 1967, p. 327-330.

Experimental investigation of the applicability of the Bouger law for describing the attenuation of narrow collimated light beams in various scattering media. Tests involved the measurement of beam attenuation in wood smoke composed of particles 1 to 2μ in diameter and water vapor with droplets from 8 to 15μ in diameter. The intensities of the original and the dispersed radiation were measured with a direct passage of the beam through the media and with a beam deflected from its original path. Results are given in terms of the dependence of the background illumination in the media on the optical thickness. The results indicate that the Bouger law is sufficiently accurate for describing the attenuation of a narrow collimated light beam within media with an optical thickness up to $\tau \cong 22$.
A67-37666#

J4850
Zuev, V. E., M. V. Kabanov, and B. A. Savelev.
THE LIMITS OF APPLICABILITY OF THE BOUGUER LAW IN SCATTERING MEDIA FOR COLLIMATED LIGHT BEAMS.
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 3, July 1967, p. 724-732.
Trans. into English in *Academy of Sciences, USSR Izvestiya, Atmospheric and Oceanic Physics* Vol. 3, July 1967, p. 414-418.

Results of experimental investigations of the passage of a collimated light beam in scattering media are given for thermal sources and lasers. On the basis of data obtained in a cloud chamber, it is shown that the exponential attenuation law can be used for collimated light beams (the divergence of the beam and the aperture of the radiation receiver are 6 to 10 min of arc) over a wide range of optical thicknesses (for smoke up to $\tau \leqslant 30$*). Under the conditions realized in the experiments, the limits of applicability of the exponential law in the model media do not agree with those for artificial fogs or smokes. (Author)*
A68-22503#

J4860
Zuev, V. E., M. V. Kabanov, and B. A. Savelev.
PROPAGATION OF LASER BEAMS IN A SCATTERING MEDIA.
Appl. Optics Vol. 8, Jan. 1969, p. 137-141.

Results of experimental investigations of some aspects of the propagation of He-Ne laser radiation at 0.63μ for different scattering media (artificial water fogs, wood smokes, model media). It is shown that the attenuation coefficients practically coincide when coherent and incoherent radiation is scattered. The applicability limits of Bouguer-Beer's law for describing the attenuation of radiation in scattering media are investigated, and the intensity of multiple forward-scattered light is measured for different geometrical parameters of the source and radiation receiver. The applicability of single scattering theory formulas for describing forward-scattered light intensity are discussed. (Author)
A69-21092

J4870
Zuev, V. E., B. P. Koshelev, S. D. Tvorogov, et al.
OSLABLENIE VIDIMOI I INFRAKRASNOI RADIATSII VODNYMI ISKUSSTVENNYMI TUMANAMI (ATTENUATION OF VISIBLE AND INFRARED RADIATION BY ARTIFICIAL WATER FOGS).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 1, May 1965, p. 509-516.
Trans. into English *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 1, May 1965.

Results of a theoretical and experimental study of the optical and microphysical properties of artificial aqueous fogs as attenuating factors for visible and IR radiation. An approximate method for determining attenuation factors is proposed and assessed. The method used in studying fog microstructure and translucence is described. In the visible spectral band, the attenuation factor is found to be practically independent of the wavelength. Fog attenuation factor variations across the 1- to 14-μ spectral band strongly depend on fog droplets microstructure, increasing with droplet-distribution half-width and the reciprocal of the radius of the most probable distribution of droplet size. Theoretical and experimental results are compared. (Author)
A65-27616#

J4880
Zuev, V. E., B. P. Koshelev, S. D. Tvorogov, et al.
SPEKTRAL'NAIA PROZRACHNOST' I MIKROSTRUKTURE ISKUSSTVENNYKH TUMANOV. III - SRAVNENIE RASCHETNYKHI EKSPERIMENTAL'NYKH DANNYKH (SPECTRAL TRANSMITTANCE AND MICROSTRUCTURE OF ARTIFICIAL FOG III - A COMPARISON OF ANALYTICAL AND EXPERIMENTAL RESULTS).
Izv. vyssh. ucheb. Zaved. Fiz. Vol. 9, No. 3, 1966, p. 121-125.
Trans. into English in *Soviet Physics Journal* Vol. 9, No. 3, 1966.

Concluding part of a study of the spectral transmittance of artificial fog, giving a comparison of calculated and experimental values for the attenuation factor of the aerosol transmittance component of fog and clouds. Good agreement is obtained for the relative attenuation factor; the substantial disagreement between calculated and experimental values for the absolute attenuation factor is linked to systematically inaccurate measurements of the droplet concentration with the use of a flow trap. (Author)
A66-38916#

J4890
Zuev, V. E., V. V. Pokasov, Iu. A. Pkhalagov, et al.
PROZRACHNOST' PRIZEMNOGO SLOIA ATMOSFERY DLIA IZUCHENII NEKOTORYKH OKG (TRANSMITTANCE OF THE GROUND LAYER OF THE ATMOSPHERE FOR CERTAIN LASER EMISSIONS).
Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 4, Jan. 1968, p. 63-68.

Description of the apparatus, technique, and results of measurements of the attenuation, in the ground layer, of laser emissions at the 0.63, 0.69, 0.84, 1.06, and 1.15μ wavelengths. The measurements were conducted over ranges of 200, 500, 1200, and 3500 m. An apparatus for reforming the laser beam was placed at the end of each range, together with the receiving equipment. The lasers used in the experiments consisted of He-Ne gas-mixture lasers, a ruby laser, a GaAs semiconductor laser, and a neodymium-glass laser. All measurements were accompanied by measurements of air temperature and humidity, using standard meteorological devices. The attenuation of the laser beam is divided into component causes associated with molecular absorption and aerosol scattering. The results obtained are presented in tabular form.
A68-22024#

J4900

Zuev, V. E., V. V. Sokolov, and S. D. Tvorogov.

AEROZOL'NAIA SOSTAVLIAIUSHCHALA SPEKTRAL'NOI PROZRACHNOSTI ATMOSFERNOI DYMKI V DIAPAZONE DLIN VOLN 0,15-14 MK (SPECTRAL-TRANSMITTANCE AEROSOL COMPONENT FOR ATMOSPHERIC HAZE IN THE RANGE 0.5 TO 14 μ).

Izv. vyssh. ucheb. Zaved. Fiz. Vol. 9, No. 3, 1966, p. 7-13.

Trans. into English in *Soviet Physics Journal* Vol. 9, No. 3, 1966.

Calculation of the aerosol component of spectral transmittance for atmospheric haze in the wavelength range from 0.5 to 14μ. The complexity of the refractive index and the polydispersity of the spherical water particles forming a haze are taken into account. The cases of horizontal and inclined propagation of radiation in a haze are considered. (Author)

A66-38910#

J4910

Zuev, V. E., V. V. Sokolov, and S. D. Tvorogov.

RASCHET OB'EMNYKH KOEFFITSIENTOV OSLABLENIIA IZLUCHENIIA DYMKAMI V DIAPAZONE DLIN VOLN 0,3-25 MKM (CALCULATION OF THE VOLUME COEFFICIENTS OF THE HAZE-INDUCED ATTENUATION OF RADIATION IN THE WAVELENGTH RANGE FROM 0.3 TO 25 μ).

Izv. vyssh. ucheb. Zaved. Fiz. Vol. 12, No. 1, 1969, p. 107-111.

Trans. into English in *Soviet Physics Journal* Vol. 12, No. 1, 1969.

Discussion of the attenuation of radiation in hazy lower layers of the atmosphere. The radiation attenuation coefficients of atmospheric hazes are calculated for a total of 83 wavelengths ranging from 0.3 to 25.31. Refractive index and absorption coefficient values obtained by Zuev et al. (1967) are used in the process. A spherical model of haze particles and an empirical formula are applied to approximate the spectra of the haze particle sizes. The aerosol component of the spectral transmittance of hazes is taken into account. The most probable values of the parameters of the haze particle microstructure are given. (Author)

A69-25571#

J4920

Zuev, V. E., A. V. Sosnin, and S. S. Khmelevtsov.

PROZRACHNOST' PRIZEMNOGO SLOIA ATMOSFERY DLIA ILZUCHENII NEKOTORYKH OKG V INFRAKRASNOI OBLASTI SPEKTRA (TRANSPARENCY OF THE ATMOSPHERIC BOUNDARY LAYER TO LASER EMISSIONS IN THE INFRARED REGION OF THE SPECTRUM).

Izv. Akad. Nauk SSSR. Fiz. Atmos. i Okeana Vol. 5, Feb. 1969, p. 201-2031.

Trans. into English in *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics* Vol. 5, Feb. 1969.

Experimental investigation of the attenuation of gas-laser emission at wavelengths of 3.39, 3.51, and 10.6μ, over distances of 200, 500, and 1200 m from December 1965 to December 1967. The experimental equipment and procedure employed are described. The absence of a dependence of the attenuation factor on humidity and range visibility at the 3.39μ wavelength is attributed to the fact that for this wavelength attenuation is primarily due to methane.

A69-25957#

J4930

Zuev, V. E. and S. D. Tvorogov.

VLIIANIE PARAMETROV MIKROSTRUKTURY ZHIDKOKAPEL'NYKH OBLAKOV I TUMANOV NA IKH SPEKTRAL'NUIU PROZRACHNOST' V DIAPAZONE DLIN VOLN 0.5-14 MK (EFFECT OF THE MICROSTRUCTURE PARAMETERS OF LIQUID PARTICLE CLOUDS AND FOGS ON THEIR SPECTRAL TRANSPARENCY IN THE 0.5-14 μ WAVELENGTH RANGE).

Izv. vyssh. ucheb. Zaved. Fiz. Vol. 9, No. 2, 1966, p. 143-150.

Trans. into English in *Soviet Physics Journal* Vol. 9, No. 2, 1966.

Values of the averaged factor of the effectiveness of radiation attenuation by liquid particle clouds and fogs, taking into account their real polydispersibility and the complexity of the refractive index of particles, are calculated and results analyzed. The results of calculations of the aerosol attenuation factor of liquid particle clouds and fogs are examined. It is concluded that the spectral transparency of clouds and fogs does not depend on wavelength. In the 10.5-12.2μ spectral region, transparency is always higher than than the same in the visible region. In the 5.0-10.5 and 12.2-14.0μ region, transparency can be both greater and less than the same in the visible region depending on the values of the microstructure parameters.

B0010
AGA Aktiebolog, Lidingo (Sweden).
ELECTRO-OPTIC FOG DETECTOR.
Product leaflet 3-SG2e

B0020
Allgemeine Elektricitats-Gesellschaft, AEG Telefunken, Hamburg.
MEASURING DEVICE FOR STANDARD VISUAL RANGE AEG/FFM SCATTERED LIGHT RECORDER TYPE STR-22-56-MS 04.
Product leaflet.

B0030
Armstrong, B. D. and G. Musker.
TRAINING FOR LOW VISIBILITY LANDINGS.
In: ROYAL AERONAUTICAL SOCIETY, TWO–DAY SYMPOSIUM ON FLIGHT TRAINING SIMULATORS FOR THE '70S, LONDON, OCT. 14-15, 1970, PROCEEDINGS.
London, Royal Aeronautical Society, 1970, p. K1-K16.

Discussion of some of the principles and practice of training for low visibility landings taking into consideration training in a ground-based simulator of comparatively modest dimensions. It is shown that worthwhile training can be imparted in such a simulator provided considerable care is taken with the visual attachment. The most important objectives of training for low visibility operations are believed to be to impress pilots with an understanding of the extreme variability of fog; to establish fully effective crew procedures; and to help pilots to acquire a grasp of the detailed meaning of the runway lighting patterns.
A71-10022

B0040
Ashley, A.
CAN INFRARED IMPROVE VISIBILITY THROUGH FOG?
Paper presented at the Illuminating Engineering Society, National Technical Conference, New York, NY, Aug. 29-Sept.2, 1965.
In: TOPICS IN ELECTRONICS, Vol. 6.
Deer Park, NY, Cutler-Hammer, Inc., 1966, 20p.

The fundamental system parameters - atmospheric attenuation, detector sensitivity, radiant intensity of source, and effects of background - are examined to determine whether the use of infrared sources and detectors, instead of visible sources and the eye, for marking airport runways and taxiways offer sufficient potential to warrant further consideration of their use as airport marker lights. The evaluation is based on theory and previous experimental work covering the several different aspects of the problem that are available for application to the specific problem. Analysis shows that at present there are no advantages in the use of infrared sources and detectors over the current visible sources and detectors and that further consideration is not warranted at this time. This analysis collects and collates existing knowledge from several disciplines and applies them in a theoretical analysis of the problem of improving visibility. Use of the results of this analysis should save time and money, which would otherwise be spent in "cut-and-try" methods of attacking the problem. (Author)
A66-30088#

B0050
Austin, J. M.
CEILING AND VISIBILITY CHANGES RELATED TO RADAR SIGNAL INTENSITIES.
In: AMERICAN METEOROLOGICAL SOCIETY, WEATHER RADAR CONFERENCE, 8TH, SAN FRANCISCO, APRIL 11-14, 1960, PROCEEDINGS, p. 9-14.

B0060
Avaste, O. A.
ACCURACY OF AN APPROXIMATE METHOD OF CALCULATING THE BRIGHTNESS OF ATMOSPHERIC HAZE.
In: MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I ATMOSFERNOI OPTIKE, 2ND, LENINGRAD, 1959, AKTINOMETRIIA I ATMOSFERNAIA OPTIKA, TRUDY.
Leningrad, Gidometeoizdat, 1961, p. 270-282.

B0070

Barteneva, O. D.

ISSLEDOVANIE INDIKATRIS RASSEIANIIA SVETA V PRIZEMNOM SLOE ATMOSFERY (INVESTIGATION OF LIGHT SCATTERING INDICES IN THE ATMOSPHERIC LAYER NEAR THE GROUND).

In: MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I ATMOSFERNOI OPTIKE, 2ND, LENINGRAD, 1959, AKTINOMETRIIA I ATMOSFERNAIA OPTIKA [TRUDY SOVESCHANIIA].

Leningrad, Gidrometeoizdat, 1961, p. 187-206.

The author investigates experimental determination of the indices of light scattering in the atmospheric layer near the ground and describes the use of the nephelometer with variable angle of observation for measuring the transparency of the atmosphere and the computation of the index of scattering ρ or the attenuation index of light a from the expression:

$$\rho = a\ 2\pi \int_0^{\pi} \rho(\varphi) \sin\varphi \, d\varphi.$$

With the aid of data presented in tables and graphs, the author discusses the results of measurements of the index of scattering of the light by the atmosphere, the coefficient of asymmetry of the light flux and the use of the nephelometric method to measure atmospheric transparency. The results are as follows: 10 classes of light scattering indices corresponding to different values of the coefficient of asymmetry of light flux K and to different observations in the layer near the ground were obtained. Within each class, for $K > 3.5$, the indices fell into two types of curves—a flattened one represented by the Rayleigh index and a sharp one represented by a prolate index with a sharp maximum at $\varphi = 90°$ and a pronounced minimum at $\varphi = 110$-$120°$. A single valued relationship between the form of the index and transparency of the atmosphere was not observed. With decrease in transparency the indices were stretched anteriorly passing from a Rayleigh to an extremely stretched form. At S meteorological distance of visibility = 220 km an index of scattering very close to a Rayleigh index was obtained. In fogs there were obtained indices of scattering with a maximum near $\varphi = 140°$ corresponding to the region of the first arc and produced by the presence of large water particles in the fog. A correlation was established between the form of the index characterized by the parameter K and S. The correlation coefficient between K and S amounted for $10 \leqslant S \leqslant 220$ km $R = 0.77 \pm 0.02$ and for $1 \leqslant S \leqslant 10$ km $R = 0.6 \pm 0.04$.

B0080

Barteneva, O. D.

VISIBILITY RANGE IN THE ATMOSPHERE.

In: VSESOIUZNOE NAUCHNOE METEOROLOGICHESKOE SOVESCHANIE, 1ST, LENINGRAD, JUNE 1961, TRUDY.

Leningrad, Gidrometeoizdat, 1963, Vol. 6, p. 253-260.

B0090

Barteneva, O. D. and N. G. Boldyrev.

VISIBILITY IN THE ATMOSPHERE.

In: VSESOIUZNOE NAUCHNOE METEOROLOGICHESKOE SOVESCHANIE, May 25, 1967, TRUDY.

Vol. 6, p. 311-321.

N68-87878

B0100

Beck, Richard H.

THE HOSTILE ENVIRONMENT OF LOW VISIBILITY.

Paper presented at the Air Line Pilots' Association, Air Safety Forum, 15th, Seattle, WA, July 9-11, 1968.

Examination of various facets of flying in reduced visibility, with an attempt to tie them together so that an appreciation may be gained of the total problem involved. A pilot must understand what he may or may not see at his decision height, and how a reduction of visual cues could possibly affect his judgment. He should know something about the nature of reduced visibility structures with which he may be involved. It is emphasized that he must be given adequate tools to do the job, and be properly trained to use them. It must be recognized that there will always be the existence of a "window problem" and a pilot will always look out of this window when he is close to the ground, whether he sees anything or not. A supplementary section covers visibility in general, and runway visual range (RVR) and its problems in particular. Also included is a sketch of the characteristics of some of the various degraded visibilities.

A68-43822#

B0110
Becker, M. E.
PISTES D'ENVOL- DENEBULATION- BALISAGE LUMINEUX (RUNWAYS- THE FIGHT AGAINST FOG- GROUND LIGHTS).
Paper presented at the Association Francaise des Ingenieurs et Techniciens de l'Aeronautique et de l'Espace, Congres International Aeronautique, 8th, Paris, May 29-31, 1967.

Discussion of the various factors involved in the construction and maintenance of runways, the development of methods for dissipating fog, and the setting up of adequate ground lights. With regard to runways, subjects discussed include the choice of the length and width of the runway, the setting up of stopping obstacles, the organization of the rate of arrivals, the spacing between aircraft, the coating of runways with bituminous or prestressed concrete, and the reduction of the duration of service. Two methods of attacking the fog problem are discussed - penetrating the fog by increasing the intensity of the runway lights or using chemicals to either freeze or evaporate fog droplets. Reference is made to the Turboclair procedure (heating the air by means of jet engines). It is pointed out that ground-lights should provide the pilot with information about direction, distance, and position. The arrangement and intensity of the lights are considered, and the adaptation of the ground-lights to weather conditions is discussed.
A68-38537#

B0120
Belov, V. F.
MEASUREMENT OF BASIC OPTICAL CHARACTERISTICS OF SURFACE LAYER OF AIR.
Leningrad, Gidrometeoizdat, 1956.

B0130
Beryozkin, V. A.
THE RANGE OF VISIBILITY AS AN OBJECT OF METEOROLOGICAL OBSERVATIONS.
Leningrad, Gidrometeoizdat, 1949.

B0140
Bettan, A.
CALCUL AUTOMATIQUE DE LA PORTEE VISUELLE DE PISTE SUR AERODROME (AUTOMATIC CALCULATION OF THE VISUAL RANGE OF AIRPORT RUNWAYS).
In: DIRECTION DE LA METEOROLOGIE NATIONALE (FRANCE), MONOGRAPHIE NO. 76, Aug., 1970, p. 31-51.

An operational system to measure, compute, and supply runway visual range data automatically is discussed. Data are taken for luminance atmospheric transmission and diffusion, and visibility range of the running track. The stability and performance of the system are also discussed.
N71-10120#

B0150
Bibby, J. R.
PHOTO-ELECTRIC VISIBILITY METER MK. II.
Great Britain, Meteorological Research Committee. Meteorological Research Papers, No. 1033, Jan. 18, 1957, 6p.

An instrument installed at London Airport in 1951 measures attenuation of a horizontal beam of light over 300 yds, using a selenium photocell recording on a Cambridge thread recorder. Set-up, operation and interpretation of results are described. Observations in 1954-55 are compared with visual observations for visibilities 3000-1000 yds and 1000-250 yds. Instrumental readings average too high by about 13%; large differences are probably due to atmospheric inhomogeneity.

B0160
Bibby, J. R.
REPORT ON FIELD TRIALS OF THE PHOTO-ELECTRIC VISIBILITY METER.
Great Britain, Meteorological Research Committee. Meteorological Research Papers, No. 2, 1945.

B0170
Blanchard, J. W.
CALCULATION OF WEATHER MINIMA, PT. 1, RVR MINIMS. (Selected Working Paper)
In: INTERNATIONAL CIVIL AVIATION ORGANIZATION. ALL-WEATHER OPERATIONS PANEL, 3RD MEETING, MONTREAL, APRIL 1967, PROCEEDINGS, VOL. 2.

B0180

Breitling, P. J. and S. Pilipowskyj.

COMPUTER SIMULATION OF OPTICAL CONTRAST REDUCTION CAUSED BY ATMOSPHERIC AEROSOLS.

Paper presented at the American Institute of Aeronautics and Astronautics, Space Sciences Meeting, New York, NY, Jan. 19-21, 1970.

AIAA Paper 70-194.

The results of the calculation of the primary and secondary scattering characteristics of four representative haze-model atmospheres are presented. One was a Rayleigh atmosphere, the other three had various vertical aerosol distributions with surface visibilities of 23, 12, and 3 km. Deirmendjian's phase functions for H, M, and L-model size distributions were used. Direct and diffuse radiation intensities reflected from a grey-black target in a vegetation background and escaping to space were computed for wavelengths from 0.40 to 0.90 micron for four solar zenith angles and three look angles. The study clearly illustrated the dependence of the optical contrast on the optical characteristics of the atmosphere and background. The results indicate that despite a number of assumptions, this model is capable of simulating the radiative processes of the atmosphere with good accuracy. (Author)

A70-18156#

B0190

Bressey, P. E.

THE PILOTS' VIEWPOINT ON ALL WEATHER OPERATIONS.

In: INTERNATIONAL FEDERATION OF AIRLINE PILOTS' ASSOCIATIONS, SYMPOSIUM ON ALL WEATHER OPERATIONS, HEAD UP DISPLAYS, LONG RANGE NAVIGATIONAL AIDS, ROTTERDAM, NETHERLANDS, OCT. 13-16, 1965, REPORT, VOL. I.

London International Federation of Airline Pilots' Associations, 1965.

Summary of the pilot's problems involved during the transition from instrument to visual flight in the last few seconds of the landing approach. It is emphasized that sound operational and technical reasons exist which justify pilots' interest in head-up displays and it is maintained that it will not be possible to operate down to the lower limits of Category II (100 feet and 100 meters) with adequate safety unless a reliable head-up display is provided. "Fringe" problems such as variations of RVR along the runway serviceability of ILS installations, accuracy of RVR reports when measured by Transmissometer and availability of fire and emergency service are also discussed. A special simulator for training pilots in low visibility approaches is strongly suggested.

A66-33204#

B0200

Bricard, J.

PROPAGATION OF VISIBLE AND IR RADIATIONS THROUGH FOG.

In: ROYAL METEOROLOGICAL SOCIETY, CENTENARY PROCEEDINGS, 1950.

London, London Society, 1950, p. 36-42.

A beam of wavelength λ passing through N water drops of radius R is scattered in ratio $2N\pi R^2 f(R/\lambda)$. The function $f(R/\lambda)$ is plotted against $2\pi R/\lambda$ and shows 2 maxima at 6 and 15. Frequency curves of drop sizes in fog and cloud differ appreciably. Absorption of light of different wavelengths in artificial fog studied experimentally was almost constant in all parts of the spectrum (0.5 - 5μ) and agreed with that calculated from the theoretical equation of coefficient of apparent absorption.

B0210

Brictson, C. A.

PILOT PERFORMANCE DURING DAY AND NIGHT CARRIER LANDING OPERATIONS.

In: AEROSPACE MEDICAL ASSOCIATION, 1967, ANNUAL SCIENTIFIC MEETING, WASHINGTON, DC, APRIL 10-13, 1967, PREPRINTS OF SCIENTIFIC PROGRAM.

Washington, DC, American Medical Association, 1967, p. 217-218.

Exploratory investigation of day and night pilot landing performance with reference to the significantly higher rate of night landing accidents. Measurements of altitude and lateral error were recorded as a function of range from touchdown for 21 experienced Navy pilots who were carrier-qualified in the F-4 Phantom aircraft. The main difference between day and night landings was the pilot's apparent inability to estimate his altitude position accurately.

A67-41618#

B0220

Briscoe, J.

THE AIRPORT AND ALL-WEATHER OPERATIONS.

Paper presented at the Royal Aeronautical Society and Canadian Aeronautics and Space Institute, Anglo-American Aeronautical Conference, 10th, Los Angeles, CA, Oct. 18-20, 1967.

AIAA Paper 67-756

A67-40989#

B0230

Brown, Richard T., Jr.

FINAL RESULTS OF LIDAR EXPERIMENTS FOR DETERMINATION OF ATMOSPHERIC TRANSMITTANCE OVER HORIZONTAL AND SLANT PATHS IN FOG.

In: RADAR METEOROLOGY CONFERENCE, 13TH, MC GILL UNIVERSITY, MONTREAL, CANADA, AUGUST 20-23, 1968, PROCEEDINGS.

Ed. by J. S. Marshall

Boston, American Meteorological Association, 1968, p. 524-529.

Investigation of the application of a laser backscatter technique for measuring the transmittance of visible light in natural fog. A short, high-energy, diverging pulse of light is transmitted through the scattering medium to be interrogated. The light scattered into the field of view of the receiver by each successive incremental scattering volume is detected by the receiver and identified as a function of range. Basic problems of transmissometry in the area of visibility determination at aircraft landing facilities are solved by this method.

A68-41072#

B0240

Bunakova, A. M. and L. S. Ivlev.

O VERTIKAL'NOM RASPREDELENII AEROZOLIA I AEROZOL'NYKH SLOIAKH V ATMOSFERE (VERTICAL AEROSOL DISTRIBUTION AND AEROSOL LAYERS IN THE ATMOSPHERE).

In: PROBLEMY FIZIKI ATMOSFERY, NUMBER 5 (PROBLEMS OF PHYSICS OF THE ATMOSPHERE, NUMBER 5).

Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1967, p. 206-214.

Review of Soveit and, in particular, U.S. data concerning the influence of atmospheric aerosols and water vapor, and the interaction and concentration of these components on the radiation conditions in the atmosphere. The application of a standard model atmosphere and experimental data concerning the attenuation of direct solar radiation to the determination of the part played by aerosols in this attenuation is examined, and the respective attenuation curves obtained by various authors are compared and analyzed.

A68-37963#

B0250

Canada Meteorological Branch.

REPORTING OF RUNWAY VISUAL RANGE.

Canada Meteorological Branch Circular 3635, 1962, 3p.

This circular contains instructions covering the observing, coding and transmission of RVR which becomes effective immediately and will be incorporated in MANOBS at an early date. The (transmissometer) and its operation are described. The international definition of RVR is given. Determinations of RVR are specified and the use of day and night conversion tables appended to the instruction is outlined. Two criteria for taking special observations are given.

B0260

Cane, A. P. W.

THE PRINCIPLES OF LOW WEATHER OPERATIONS.

In: INTERNATIONAL FEDERATION OF AIR LINE PILOTS' ASSOCIATIONS, SYMPOSIUM ON ALL WEATHER OPERATIONS, HEAD UP DISPLAYS, LONG RANGE NAVIGATIONAL AIDS, ROTTERDAM, NETHERLANDS, OCT. 13-16, 1965, REPORT, VOL. I.

London, International Federation of Air Line Pilot's Associations, 1965.

Discussion of the principles and problems associated with Category II operations. Requirements necessary to cover the final approach to land from coupling to the localizer and glide slope of the ILS, down to 30-m (100-ft) decision height with 400-m (1200-ft) visibility are dealt with. Problems are considered that arise in the transition to visual flight at this very low decision height, as well as those involved in making a successful landing or overshoot from 30 m.The role of the operating crew in Category II operations is evaluated. Low weather system requirements are assessed, and the means of achieving a Category II system are described. The existence of a considerable automatic human interface problem is identified as the biggest problem that has to be overcome before operations of the required repeatability and safety can be achieved.

A66-33209#

B0270

Checchini, M.

MESURE DE LA VISIBILITE SUR LES AERODROMES (THE MEASUREMENT OF VISIBILITY ON AERODROMES).
Paper presented at the Congres International Aeronautique, 8th, Paris, May 29-31, 1967.
Trans. into English by the Royal Aircraft Establishment, Farnborough (England).
RAE-LIB-TRANS-1295.

The note lists the various factors affecting the visual range of lights in fog and points out the variability of ranges measured by human observers. An alternative method of visual range estimation using transmissometers is explained and leads to a description of an apparatus which accepts transmissometer outputs, converts the signals to runway visual range and displays the reading to air traffic controllers on an airfield. (Author)
N68-29461#

B0280

Chaney, A. L.

A RECORDING VISIBILITY METER.
In: U.S. TECHNICAL CONFERENCE ON AIR POLLUTION, WASHINGTON, D.C., 1950, AIR POLLUTION, PROCEEDINGS.
P. 679-682.

The recording visibility meter described in this paper appears to be a practical method of recording visibilities on an automatic basis. The advantages of this instrument over the photographic technique from which it was derived are presented.

B0290

Chesters, A. K.

PREDICTION OF THE EFFECT OF ENGINE GEOMETRY ON AIRCRAFT SMOKE VISIBILITY.
Paper presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Washington, Nov. 28-Dec. 2, 1971.
Paper 71-WA/GT-10.

The visibility of aircraft exhaust smoke derives principally from light absorption and, hence, varies with smoke concentration and exhaust diameter. Because of complex exit aerodynamics and jet entrainment, however, effective exhaust diameters differ from actual. Entrainment rapidly transforms the exit profiles of smoke concentration to self-preserving Gaussian ones and causes slow decay of visibility. The initial visibility of the self-preserving jet is shown to depend on the mass emission rate of smoke times the square of ambient gas density and gross jet thrust. This expression also described, within about 10%, the actual exit visibility for current engine types. Quantitative criteria are also derived for the engine spacing, at which coalescence of parallel jets influences visibility, and for the magnitude of effect. (Author)
A72-15903#

B0300

Clodman, J.

SPECTRA OF TRANSMISSOMETER RECORDS AND THEIR IMPLICATION ON AIRCRAFT FLIGHT PLANNING.
In: AERONAUTICAL METEOROLOGY.
Geneva, World Meteorological Organization, 1969, p. 139-141.

B0310

Collis, R. T. H., W. Viezee, J. Oblanas, et al.

LIDAR MEASUREMENTS OF SLANT-RANGE VISIBILITY FOR AIRCRAFT LANDING OPERATIONS.
In: INTERNATIONAL CONFERENCE ON AEROSPACE AND AERONAUTICAL METEOROLOGY, 1ST, WASHINGTON, DC, MAY 22-26, 1972, PREPRINTS.
Boston, American Meteorological Society, 1972, p. 251-254.

Description of a lidar experiment designed to obtain observations of slant-path visibility under conditions of low clouds and fog at the coastal site of Pillar Point, California, in the summer of 1971. The results obtained indicate that the approach is valid and, when properly applied, has potential for use in a practical system.
A72-28847#

B0320

Cott, A. W.

A STUDY OF CEILING, VISIBILITY, AND WIND RELATIONSHIPS AT RCAF STATION COLD LAKE, ALBERTA.
Canada Meteorological Branch Circular 3379, 1960.

The relationship between ceilings and visibilities, the wind direction, wind speed, and the season at RCAF Station Cold Lake, Alberta, is determined. The data presented cover the period Aug. 1, 1954 to Aug. 31, 1959, and are for wind frequencies by various ceiling and visibility limits. All the data are tabulated and graphically presented.

B0330
Dietze, Gerhard.
EINFUEHRUNG IN DIE OPTIK DER ATMOSPHAERE (INTRODUCTION TO ATMOSPHERIC OPTICS).
Leipzig, Akademische Verlagsgesellschaft, 1957, 263 p.

B0340
Dimacopoulos, Georges.
SIMPLE METHOD OF DESCRIBING FLUCTUATIONS IN METEOROLOGY.
Paper presented at the World Meteorological Organization/International Union of Geodesy and Geophysics Symposium on Meteorological Data Processing, Brussels, July 1965, DATA PROCESSING IN METEOROLOGY.
In: *WORLD METEOROLOGICAL ORGANIZATION, TECHNICAL NOTE* No. 73, 1966, p. 117-118.

The author describes briefly a geometrical method of representation by vectorial quantities to describe the fluctuations of meteorological variables. As an illustration values of visibility corresponding to different directions are represented by vectors and the average is equivalent to replacing the real total by a circle. In order to simplify the mathematical description the vectorial fluctuations are represented by an ellipse or an ellipsoid (in the case of 3 dimensions).

B0350
Donati, S. and A. Sona
MIGLIORAMENTO DELLA VISIBILITA IN MEZZI DIFFONDENTI (IMPROVEMENT OF VISIBILITY IN SCATTERING MEDIA).
In: SYMPOSIUM ON RADIO AIDS TO MARITIME AND AERIAL NAVIGATION, TRIESTE, (ITALY), JUNE 24-26, 1971, PROCEEDINGS.
Trieste (Italy), Associazone Elettrotecnica ed Electtronica Italiana, 1971, 23p.

The problem of vision through scattering media, in which light absorption and scattering reduce the contrast and angular resolution of images, is analyzed in order to indicate methods for improving visibility. The results of theoretical evaluations and experimental measurements made with the technique of temporal selection of received light which have made it possible to improve the visibility distance in fog by a factor of 3.5-4 are given. The performance of systems using the mid and far IR is evaluated. The case of underwater vision is considered, and the possibility of using systems of temporal selection to improve visibility is examined.

B0360
Dovgiallo, E. N.
STATISTICAL REGULARITIES IN VISIBILITY VARIATIONS.
In: MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I OPTIKE ATMOSFERY, 5TH, MOSCOW, JUNE 1963, ACTINOMETRIIA I OPTIKA ATMOSFERY, TRUDY.
Moscow, 1964, p. 203-206.
FTD-HT-23-588-57

B0365
E G and G, Environmental Equipment Division, Waltham, MA
MODEL 207 FORWARD SCATTER METER
Specification bulletin 207 B1

B0370
Elterman, Louis and Robert B. Toolin.
ATMOSPHERIC OPTICS.
In: HANDBOOK OF GEOPHYSICS AND SPACE ENVIRONMENTS.
Bedford, MA, Air Force Cambridge Research Labs., 1965, Ch. 7.

A model of atmospheric attenuation is presented here based upon U.S. Standard Atmosphere 1962, supplemented with data on aerosol content up to 25 km height. Horizontal, vertical and slant-path transmissions from sea level, transmission between 2 altitudes and transmission to space in this atmosphere may be calculated from the included tables. Four attenuation coefficients are utilized for the model of a clear standard atmosphere, tabulated for various heights. The spectral reflectance of water, snow and soil are presented in graphs as function of wavelength and latitude and the cloud reflectance as function of cloud thickness at different solar zenith angles. Spectral distribution of the flux emerging from the model atmosphere is presented in graphs for different values of surface reflectance and with the Sun at the zenith. Rayleigh molecular scattering and polarization is given as a function of the optical thickness at different solar zenith angles. More realistic models which include aerosol distribution are developed for practical application.

B0380

Estelle, Earl W.

THE WEATHER BUREAU'S RUNWAY VISUAL RANGE PROGRAM.

Paper presented at the Illuminating Engineering Society Meeting, Washington, DC, May 4, 1961. 9p.

The transmissometer and visibility measurement are discussed.

B0390

Evans, W. E. and R. T. H. Collis.

METEOROLOGICAL APPLICATIONS OF LIDAR.

In: SOCIETY OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS, ANNUAL TECHNICAL SYMPOSIUM, 13TH, WASHINGTON, DC, AUGUST 19-23, 1968, PROCEEDINGS, VOL. I.

Redondo Beach, CA, Society of Photo-Optical Instrumentation Engineers, 1969, p. 325-336.

Discussion of the capabilities and limitations of the lidar (light detection and ranging) technique in meteorology, with description of a sampling of the variety of meteorological applications that have been investigated experimentally. Conjectures on the probable direction of future research and application are attempted. Subjects covered include measurements of upper-atmosphere molecular density, structure and screening effects of tenuous cirrus clouds, tracking of atmospheric pollutants, single-ended measurements of visibility, remote measurement of smoke-plume opacity, and investigation of turbulence phenomena. Emphasis is placed on instrumentation aspects of data storage and display.

A70-13673

B0400

Federal Aviation Administration.

RUNWAY VISUAL RANGE EQUIPMENT, PT. 1.

FAA Manual FC-198-1.

B0410

Ferrara, R. and G. Tonna.

STUDIO DELLO SCATTERING DI UN FASCIO LASER IN NEBBIA PRODATTA ARTIFICIALMENTE (STUDY OF THE SCATTERING OF A LASER BEAM IN ARTIFICIALLY PRODUCED FOG).

In: ASSOCIAZONE GEOFISICA ITALIANA, CONVEGNO ANNUALE, 17TH, ROME, MARCH 7-9, 1968, ATTI.

Rome Associazone Geofisica Italiana, 1969, 9p.

Determination of the angular distribution of a He-Ne laser beam scattered by an artiticial fog on the basis of data obtained with five light detection devices placed at angles of 30, 90, 130, 160, and 180 deg. The experimental arrangement is described, and the angular light distributions measured are presented. It is shown how the spectrum of the radii of the droplets in the fog can be derived from this distribution.

A69-43503

B0420

Ferrara, R. and G. Tonna.

VISIBILITA E CONDUCIBILITA POLARE IN NEBBIA (VISIBILITY AND POLAR CONDUCTIVITY IN FOG).

In: ASSOCIAZONE GEOFISICA ITALIANA, CONVEGNO ANNUALE, 17TH, ROME, ITALY, MARCH 7-9, 1968, ATTI.

Rome Associazone Geofisica Italiana, 1969, 9p.

Experimental study of the correlation between the electrical and optical properties of air in fog. Fundamental relations are presented which determine visibility and electrical conductivity in air. The distribution of droplets in fog with regard to their dimensions is discussed. It is found that this distribution can vary considerably depending on the type of fog and its state of development. A number of experiments is described which show the correlation between the electrical and optical properties in fog.

A69-43506

B0430

FF Impulphysics Corp., Cape Coral, FL.

THE IMPULSPHYSICS RUNWAY VISUAL RANGE SYSTEM.

Product leaflet.

B0440

Flaeten, J. O., S. Hoppestad, and J. Nordo.

OBJECTIVE AERODROME FORECASTS BY SYNOPTICAL PARAMETERS.

WORLD METEOROLOGICAL ORGANIZATION. TECHNICAL NOTE.

No. 71, 1966, p. 158-160.

This technical note deals with statistical analysis and prognosis in meteorology, multiregression equations, computer solutions. Correlation coefficients between predicted and observed visibility ~0.5 to 0.6 in most cases cited. (Same correlation coefficients are said to have been obtained by aerodrome forecasters).

B0450

Fleming, M. R.

PRELIMINARY REPORT ON INVESTIGATION OF VERTICAL VISIBILITIES IN SNOW.

CANADA METEOROLOGICAL DIVISION CIRCULAR 1962, June 8, 1951, 6p.

Based on data to estimate vertical visibility more accurately from the horizontal and slant visibility. Sources of error in eye, pilot balloon, pilot report on ceiling observation are discussed. Vertical visibility in snow is always less than horizontal—author believes this to be due to the manner snow flakes are oriented during their fall.

B0460

Foitzik, L.

DIE REICHWEITE VON ENGGEBUENDELTEN SCHEINWERFERSTRAHLEN (THE RANGE OF A NARROW BEAM SEARCHLIGHT).

Stuttgard (Germany), Optik.

The range of a searchlight beam depends on the strength of the light source, the size of the object and the turbidity of the atmosphere. Experiments using fixed balloon targets and airplanes to determine the range under various conditions show that a 5 fold increase in intensity of the light only increases the range 10%. Distance of observer from target had greater effect on visibility than increase of intensity of beam. Visual range with the use of telescopes of various magnifying powers gave indications that the effect of distance is not as great (with a telescope) as with the naked eye, since the field of vision is more limited and does not enlarge at the same rate as with the naked eye.

B0470

Freeman, M. H.

GRAPHICAL METHOD OF OBJECTIVE FORECASTING DERIVED BY STATISTICAL TECHNIQUES.

Paper presented at the World Meteorological Organization Inter-Regional Seminar on Statistical Analysis and Prognosis in Meteorology, Paris, Oct. 1962, STATISTICAL ANALYSIS AND PROGNOSIS IN METEOROLOGY: PROCEEDINGS OF THE SEMINAR.

In: *WORLD METEOROLOGICAL ORGANIZATION. TECHNICAL NOTE.* No. 71, 1966, p. 135-139.

A graphical method of objective forecasting by statistical technique for predicting visibility at London Airport is described. The isopleths in the diagram were obtained by fitting a curved surface to the data by the "least squares" method. A relation of the form

$$z = a + bx + cy + dx^2 + exy + fy^2 + \cdots$$

was found (z = predictand, and x and y = predictors). The computations were made on an electronic computer. A 2100 GMT visibility prediction (winter) for London Airport is presented. The 3 most useful predictors are wind speed, wind direction, and 1500 GMT visibility. A comparison of the normal subjective forecasts with the graphical objective technique is presented. The objective method accounted for all but 22% of the variance in the 3-hr forecasts and all but 32% for the 6-hr forecasts. For the subjective forecasts the figures were 24% and 45%, resp.

B0480

Gallagher, John E. and George B. Litchford.

REALISTIC LOW VISIBILITY LANDING CRITERIA FOR VSTOL AIRCRAFT.

Paper presented at the American Helicopter Society, Annual National Forum, 24th, Washington, DC, May 8-10, 1968.

Brief analysis of the V/STOL aircraft transition from instrument to visual flight at low approach-decision altitudes and slant-visibility range minimus, with suggested operational guidelines. It is noted that, even though there are several electronic concepts that are either being offered or developed, realistic operational V/STOL low-visibility instrument landing-systems criteria and associated electronic structures have yet to emerge. It is pointed out that the unique and precise slow-flying characteristics of V/STOL aircraft should enable a lower-visibility operation than the present fixed-wing jet-transport aircraft permits.

B0490

Gassovski, L. N., K. N. Bulanova, and Z. N. Enno.

VISIBILITY OF OBJECTS UNDER LOW ILLUMINATION CONDITIONS.

In: PROBLEMS OF PHYSIOLOGICAL OPTICS, Vol. 3.

Moscow, Izdatel'stvo Akademiia Nauk SSSR, 1946.

B0500

Gavrilov, V. A.

POLOZHENIE S IZMERENIEM METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI NA OSNOVOI SETI GIDROMETSTANTSII (STATUS OF METEOROLOGICAL VISIBILITY MEASUREMENT BY THE REGULAR HYDROMETEOROLOGICAL NETWORK).

Paper presented at the Vsesoiuznoe Nauchnoe Meteorologicheskoe Soveschanie, 1st, Leningrad, June 1961.

In: **MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I ATMOSFERNOI OPTIKE, 4TH, LENINGRAD, 1961,**

Leningrad, Gidrometeoizdat, 1963, Vol. 6, p. 260-269.

Standard measurements of atmospheric transparency were made by the Hydrometeorological Network at distances from 300 m to 5 km. Meteorological visibility is related to the contrast variations of the object due to haze by the formula:

$$SM = \frac{1.5L}{\log K_O - \log K'}$$

where L is the distance to the object and K_O the real contrast and K the contrast distorted by haze. The reliability of the methods applied - the extinction method, the comparison methods by photometers and the relative brightness method - was evaluated. Special equipment for measuring the visibility range at night is described.

B0510

Gavrilov, V. A.

PROZRACHNOST' ATMOSFERY I VIDIMOST' (TRANSPARENCY OF THE ATMOSPHERE AND VISIBILITY).

Leningrad, Gidrometeoizdat, 2nd ed., 1968, 166p.

A substantial pamphlet for wide use, not only among meteorologists, fliers and mariners, but for the general public integrated in technical subject such as this. The separate chapters deal with 1) contrast threshold and its relation to visibility; 2) physiological aspects; 3) causes of reduced visibility (haze, transparency, meteorological visibility); 4) visual range of actual objects under various meteorological, astronomical and conditions of ojbects themselves; 5) visibility of lights; 6) meteorological visibility of landing fields (runways). The text contains considerable data, illustrations of instruments and schemata of principles.

B0520

Gavrilov, V. A.

VIDOMOST' V ATMOSFERE (VISIBILITY IN THE ATMOSPHERE).

Leningrad, Gidrometeoizdat, 1966, 323p.

FSTC-HT-23-052-71

Presents results obtained in 20 yrs of the author's works on visibility, and experimental and theoretical elaborations applicable to the solution of practical problems. The 1st chapter acquaints the reader with the principal thesis of visibility, the 2nd and 3rd are devoted to descriptions of photometric instruments, the 4th-6th deal with theoretical experimental and instrumental phases connected with the determination of the visibility range of real objects and of signal lights. In ch. 7 the author discusses the new method of reverse light scattering for measuring horizontal and nonhorizontal transparency, describes an installation based on this principle and shows that with this method supplemented by shaded zones a number of problems in the optics of the ground layer can be solved. The last 2 chapters describe methods of measuring meteorological visibility in light and in darkness, the errors of measurements, and an evolution of the advantages of the various methods.

AD-719502

B0530

George, David H. and Matthew Lekowitz.

A NEW CONCEPT: SENSOR EQUIVALENT VISIBILITY.

In: **INTERNATIONAL CONFERENCE ON AEROSPACE AND AERONAUTICAL METEOROLOGY, 1ST, WASHINGTON, DC, MAY 22-26, 1972, PREPRINTS.**

Boston, American Meteorological Society, 1972, p. 243-250.

Discussion of some initial attempts to develop an automated, objective visibility measure to be used in lieu of the traditional prevailing visibility observation. The 'sensor equivalent visibility' (SEV) concept denoting any equivalent of human visibility derived from instrumental measurements is intended to render sensor measurements meaningful by relating them to human visibility. The representativeness of sensor data is analyzed, and a data processing strategy is devised. Results of tests of the contemplated procedures are summarized and improvements are proposed.

A72-28846#   COM 72-10759

B0540
Glezer, V. D. and I. M. Zuckermann.
INFORMATSIIA I ZRENIE (INFORMATION AND VISION).
Moscow, Isdatel'stvo Akademii Nauk, 1961.

B0550
Goetz, Alexander.
VISIBILITY RESTRICTION BY PHOTOCHEMICAL AEROSOL FORMATION.
Paper presented at the Air Pollution Research Conference on Effects of Motor Vehicle Emissions on Visibility and Vegetation, Dec. 6, 1961. 11p.

Photochemical aerosol formation is caused by the temporary accumulation of reaction products from certain atmospheric trace components upon nucleating particulates and results in their substantial size increase. These reactions require the coexistence of certain unsaturated hydrocarbon types (e.g., olefins), oxidizing gas traces, such as (NO, NO_2, O_3), and irradiation in the 320-400 mμ range of the sun spectrum. The presence of additional SO_2 traces can significantly enhance the aerosol formation. The final size of these aerosol particles depends on that of the nucleating particles present prior to photo-activation, on their concentration, and that of the reaction products. Such smog aerosols are predominantly in the diameter range between 0.3μ—1.0μ with a frequency about inversely proportional to the particle volume and of a concentration of 10^9—$10^{10}/m^3$. As this size range is practically not subject to fallout by gravity and also coincides with the optically visible wave-lengths, such aerosols are not effective (Mie-type) light scatterers and cause lasting, strong visibility restriction. The relation of the latter to the particle growth is discussed in some detail. (Author)

B0560
Golberg, M. A.
ISMERENIE DAL'NOSTI VIDIMOSTI V TEMNOE VREMIA SUTOK PO RASSEIANIIU NAZAD (VISIBILITY MEASUREMENT DURING THE DARK PART OF THE DAY BASED ON BACK SCATTERING).
In: MEZHEVDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I OPTIKE ATMOSFERY, 5TH, MOSCOW, JUNE 1963, AKTINOMETRIIA I OPTIKA ATMOSFERY, Moscow, 1964, p. 206-209.

Field tests have now been made of the NUOR, a nephelometric apparatus based on the backscattering principle, for determining the visibility range at night by the recording of scattering at an angle close to 180 degrees. The theory of the apparatus has been described by the author elsewhere (Trudy NIIGMP. 1963, No. 13). This paper describes the construction of calibration curves of the apparatus. It was formed that for the entire range of visibility measured in the network of hydrometeorological stations, the NUOR apparatus ensures an adequate degree of accuracy. The nephelometric backscattering apparatus can be used for determining the scattering coefficient at angles close to 180 degrees; the scattering index should be determined independently by some other method. Data are given on the values of the relative coefficient of scattering for angles of 175-180 degrees, averaged for the entire period of observation. The comparability of the NUOR and M-37 transparency recorder is shown.
FTD-HT-23-588-67 AD-676224

B0570
Golberg, M. A. and Z. I. Grishchenko.
RAZMYTOST' IZOBRAZHENIIA PRI NABLIUDENII NAZEMNYKH UDALENNYKH OK'EKTOV (IMAGE BLUR DURING OBSERVATION OF DISTANT TERRESTRIAL OBJECTS).
In: MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I OPTIKE ATMOSFERY, 5TH MOSCOW, JUNE 1963, AKTINOMETRIIA I OPTIKA ATMOSFERY, TRUDY.
Moscow, 1964, p. 209-211.

Observations of special signs spaced at 400, 800 and 1600 m on a plain, at 650 and 1200 m on a dissected area, and at 1900 and 8000 m over the sea were carried out over a number of years at the Karadag Actinomet. Obs. and at the Minsk Hydromet Obs. The signs consisted of black bands on a white background with the spaces between them equal to their widths which differed V2 times on the signs in each group. Telescopes with magnification 60× (objective dia. d = 160mm), 40× (d = 70 mm) and 15× (d = 30 mm) were used. On the plain area observations were made from heights of 0.5, 1.5 and 3.0 m. The temperatures of the soil surface and of the air at 0.5 and 2 m and wind velocity and direction at 1 m were measured at each sign. A coefficient of correlation of ~0.9 was found for the relationship $\Delta a = K(\Delta t)^{n}$ where Δa is the angle of blur of the image, K = a coefficient which depends on the diameter of the telescopes, the distance from the objective, and the height of the line of sight; Δt = difference in temperatures of the soil surface and of the air at 2 m; and n = 1.6 for the plain and 1.2 for the dissected area. For the plain area the dependence of Δa on the height of the line of sight (h) and on the distance l can be expressed by $\Delta a = ch^{-0.6}l^{0.8}$ where c depends on the diameter of the telescope and on meteorological conditions (mainly on the temperature gradient). The dependence of Δa on Δt for telescopes of large, medium and small magnification is shown in a graph. The observations on the dissected area showed that even a small spot of high turbulence near the observer substantially impairs conditions for photography and surveying.

B0580

Goodman, E. A. and L. Brown.

EXPERIMENTAL METHOD OF FORECASTING VISUAL SEQUENCES IN LOW VISIBILITY.

In: INTERNATIONAL CIVIL AVIATION ORGANIZATION, ALL-WEATHER OPERATIONS PANEL, 3RD MEETING, MONTREAL, APRIL 1967, SELECTED WORKING PAPERS,

Vol. 2, p. 113-154

B0590

Goryshin, V. I.

OB'EKTIVNYE IZMERENIIA METEOROLOGICHESKOI DAL'NOSTI VIDIMOSTI (OBJECTIVE MEASUREMENT OF METEOROLOGICAL VISIBILITY).

Paper presented at the Vsesoiuznoe Nauchnoe Meteorologicheskoe, 1st, Leningrade, June 1961.

In: MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I ATMOSFERNOI OPTIKE, 4TH, LENINGRAD, 1961, TRUDY SOVESCHANIIA.

Leningrad, Gidrometeoizdat, 1963, Vol. 6, p. 271

A new apparatus was recently designed for studies of horizontal and inclined transparency of the atmosphere in a nonsteady state. The design was based on the compensational zero method giving reliable and flexible results. The accuracy of the order of +1% was achieved by a new method of light beam modulation.

B0600

Great Britain. Meteorological Office.

HANDBOOK OF METEOROLOGICAL INSTRUMENTS. PART I. INSTRUMENTS FOR SURFACE OBSERVATIONS.

London, Her Majesty's Stationery Office, 1956, 488p.

Chapter 9 contains descriptive information on visibility instruments which fall into three classes. The instruments which are used to measure the extinction coefficient are the Gold visibility meter, the photo-electric visibility meter and the Bergmann visibility meter. The instruments which are used to measure the scatter coefficient are the "loofah" and the Beuttell visibility meters. Other instruments are the rangemeter of Waldrum and the visibility meter of Shallenberger and Little.

B0610

Gribanov, A. I.

METODY RASCHETA VIDIMOSTI PRI NAPRAVLENNOM' OSVESHCHENII (METHODS FOR CALCULATING VISIBILITY WITH DIRECTED ILLUMINATION).

Moscow, Gosenergoizdat, 1955.

B0620

Guidelli Guidi, G. N. and O. Vittori Antisari.

MISURA STRUMENTALE DELLA PORTATA VISUALE DI PISTA (INSTRUMENTAL MEASUREMENT OF THE VISUAL RANGE OF A RUNWAY).

In: ASSOCIAZONE GEOFISICA ITALIANA, CONVEGNO ANNUALE, 16TH, NAPLES, May 22-24, 1967, ATTI.

Rome, Associazone Geofisica Italiana, 1968, p. 53-63.

An instrument is described for measuring the transmission of light through the atmosphere to get runway visual range. It is composed of a projector and a receiver. Measurements are obtained by balancing the received light with the intensity checked at the projector output. The information transmitted in digital form, is displayed and recorded on a strip-chart recorder.

B0630

Hanel, G.

PHYSICAL PROPERTIES OF ATMOSPHERIC AEROSOL PARTICLES, EXTINCTION COEFFICIENT AND VISIBILITY AS FUNCTIONS OF THE RELATIVE HUMIDITY.

In: EFFECTS OF ATMOSPHERIC WATER ON ELECTROMAGNETIC WAVE PROPAGATION, NATO ADVANCED STUDY INSTITUTE, UNIVERSITY OF WESTERN ONTARIO, LONDON, CANADA, AUG. 29-Sept. 6, 1969, PROCEEDINGS.

Ed. by D. R. Hay.

London (Canada), University of Western Ontario, 1970.

B0640
Hewson, E. Wendell.
METEOROLOGICAL MEASUREMENTS.
In: AIR POLLUTION, Vol. II.
Ed. By Arthur Stern.
New York, Academic Press, 2nd. ed., 1968, p. 329-391.

B0650
Hilsenrod, A.
WEATHER INFORMATION FOR VERTICAL AND SHORT TAKEOFF AND LANDING/V-STOL/AIRCRAFT.
In: INTERNATIONAL CONFERENCE ON AEROSPACE AND AERONAUTICAL METEOROLOGY, 1ST, WASHINGTON, DC, MAY 22-26, 1972, PREPRINTS.
Boston, American Meteorological Society, 1972, p. 371-372.

B0654
Horne, E. Porter and Milton A. Whitcomb, eds.
VISION RESEARCH REPORTS.
Summaries of papers presented at the Armed Forces --National Research Council Committee on Vision, Annual Meetings, 36th, 37th, 39th, 1957, 1958, 1960. NRC Publication 835.

B0655
International Civil Aviation Organization, Montreal (Quebec).
RUNWAY VISUAL RANGE; OBSERVING AND REPORTING PRACTICES.
1973. ICAO Circular 113-AN/85.

The Meteorology and Operations Divisional Meeting (1964), held simultaneously with the Third Session of the Commission for Aeronautical Meteorology of the World Meteorological Organization, recommended that ICAO should secure from Contracting States up-to-date information on their runway visual range observing and reporting practices and that ICAO should consolidate, edit and publish this information for use by Contracting States and others concerned (Doc. 8411, MET/OPS (1964), Recommendation 3/4).

In accordance with the above recommendation, a summary of runway visual range observing and reporting practices was circulated by ICAO in 1967 and a second revised summary was circulated in 1971.

The interest generated among States by the circulation of the two summaries was such as to justify the issue of the additional and updated material received by the end of 1972 in an ICAO Circular. The Circular reflects current ICAO regulatory provisions and includes information on current practices which has been provided by a number of States. Also included is detailed technical and theoretical material on the observing and reporting of runway visual range and information on progress with slant visual range determination in view of the close relationship between the two concepts of runway and slant visual range.

B0660
Ito, H.
TIME AND SPACE VARIATION IN METEOROLOGICAL ELEMENTS ON THE AERODROME AND ITS VICINITY.
In: AERONAUTICAL METEOROLOGY.
Geneva, World Meteorological Organization, 1969, p. 142-157.
Local meteorological conditions have been studied at the Tokyo International Airport in connection with operational requirements in order to find out to what extent meteorological observations at one site on the aerodrome are representative for the entire area. Measurements were made of surface wind variations, vertical wind shear, temperature, runway visibility and cloud ceiling. Considerable variations in local values were found, and observations at several points in the airport area are advocated.

B0670
Jones, R. F.
TIME AND SPACE VARIATIONS OF VISIBILITY AND LOW CLOUD WITHIN THE APPROACH CONTROL AREA.
In: AERONAUTICAL METEOROLOGY.
Geneva, World Meteorological Organization, 1969, p. 97-101.
The possibility of measuring the cloud base height and horizontal visibility with sufficient accuracy within the approach control area of airports is discussed. It appears from the valuation of available data, that the cloud ceiling and visibility may change rapidly both in space and time so that a grid of observation points spaced at about 400 m and extending 15 km from the airport, along with computerized data processing would be required to meet valid standards. As this seems impracticable, new ways of data acquisition and presentation to the pilot are recommended.
N69-38916

B0680

Jedge, Michael E.

ATMOSPHERIC SCATTERING AT WAVELENGTHS OF 0.69 and 1.06 MICRON.

In: LASERS AND OPTO-ELECTRONICS; INSTITUTION OF ELECTRONIC AND RADIO ENGINEERS, JOINT CONFERENCE, UNIVERSITY OF SOUTHAMPTON, SOUTHAMPTON, ENGLAND, MAR. 25-28, 1969, PROCEEDINGS.

London, Institution of Electronic and Radio Engineers.

(IERE Conference Proceedings No. 14), 1969, p. 86-100.

Investigation of the scattering behavior of the atmosphere in conditions of reduced visibility at the two laser wavelengths of 0.69 and 1.06μ. The amount of scattering and the angular distribution of the scattered power have been determined for a range of visibilities from 200 m to 3 km. The effect of using a vertically and horizontally polarized transmitter on the shape of the scattering function has also been studied. The scattering of the two wavelengths of interest was related to the meteorological visibility, this information being obtained from observers stationed at a short distance from the trials site.

B0690

Kagan, V. K. and I. Ia. Kondratev.

OSNOVY INFORMATSIONNOI TEORII VIDIMOSTI V ATMOSFERE (ELEMENTS OF THE INFORMATION THEORY OF ATMOSPHERIC VISIBILITY).

Leningrad, Gidrometeoizdat, 1968.

Trans. into English by the Israel Program for Scientific Translations.

TT 70-50053

The text examines the contribution the information theory can make to the theory of visibility. By analyzing the threshold conditions of vision from the general standpoint of the theory of information, criteria can be derived to be satisfied by an optimum detector. In every particular case, the problem naturally falls into the successive stages of (1) determination of the radiation field and computation of the reduced fluxes from the elements of the sky, (2) derivation of the threshold conditions of detection for a detector with a particular functional scheme, and (3) comparison of the sky radiation with the total radiation of the object and the intervening haze, and the construction of a detector characteristic relating the signal power to the probability of detection and the false signal probability. The threshold conditions of vision, the eye as a radiation detector, and the field of short-wave radiation near the ground are discussed. Specimen calculations of radiation detector characteristics are described.

A72-26697

B0700

Kahl Scientific Instrument Corp., El Cajon, CA.

ENVIRONMENTAL HAZARDS ALARM SENSORS.

Product Bulletin 55M71

B0710

Kahl Scientific Instrument Corp., El Cajon, CA.

SKOPOGRAPH.

Product Bulletin 39AM14

B0720

Kahl Scientific Instrument Corp., El Cajon, CA.

SOME COMMENTS ON VISIBILITY MEASURING EQUIPMENT: TRANSMISSOMETER.

Product Leaflet.

B0730

Kahl Scientific Instrument Corp., El Cajon, CA.

THE VIDEOGRAPH FOG DETECTOR AND VISIBILITY METER.

Product Leaflet.

B0740

Klem, B. F.

ATMOSPHERIC EFFECTS OF THE REDUCTION OF CONTRAST BETWEEN AN OBJECTS AND ITS SKY BACKGROUND.

Paper presented at the Optical Society of America, Annual Meeting, Pittsburgh, PA, Oct. 9-11, 1968.

Study of the influence of the atmosphere on the reduction in the visibility of an airborne object. The contrast transmission function is calculated for a ground observer viewing an airborne object in a Rayleigh atmosphere, by solving the radiative transfer equation numerically. When the computations are compared with the results obtained from a simplified analytic model, it is found that agreement exists for moderate solar zenith angles and small values of optical thickness. When the sun approaches the horizon, or when the optical thickness increases, the analytic model underestimates the contrast transmission. Objects at 38,000 ft altitude have their contrast transmission reduced by as much as a factor of 5 when visually observed from the gound in this perfectly clear atmosphere.

A69-11100#

B0750

Koester, K. L. and L. H. Kosowsky.

ATTENUATION OF MILLIMETER WAVES IN FOG.

In: AMERICAN METEOROLOGICAL SOCIETY, RADAR METEOROLOGY CONFERENCE, 14TH, TUCSON, AZ, NOVEMBER 17-20, 1970, PROCEEDINGS.

Boston, American Meteorological Society, 1970, p. 231-236.

Determination of the attenuation coefficient of fog for 35, 70, and 94 GHz radiation, using Rayleigh scattering theory. The attenuation is shown to be highly temperature dependent, decreasing by approximately 250% as the temperature increases from 0 to 40 C. The attenuation due to fog at 70 GHz has been related to the apparent visibility in the two basic fog types - advection and radiation. The coefficients for a given visibility have been found to be significantly smaller than those predicted in the literature and comparable to the values observed during the experimental program conducted by Norden.

A71-10580#

B0760

Kohlrausch, A.

DAYLIGHT VISION, TWILIGHT VISION, ADAPTATION.

In: HANDBUCH DER NORMALEN UND PATHOLOGISCHEN PHYSIOLOGIE.

Vol. XII, 2nd half, Receptionsorgane II.

Ed. by A. Bethe et al.

Berlin, Julius Springer, 1931, p. 1499-1594.

B0770

Kondratev, K. Ia., ed.

PROBLEMY FIZIKI ATMOSFERY, NUMBER 5 (PROBLEMS OF PHYSICS OF THE ATMOSPHERE, NUMBER 5)

Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1967, 264 p.

A68-37946

B0780

Kondratev, K. Ia. and Iu. M. Timofeev.

NUMERICAL EXPERIMENT ON THE STUDY OF TRANSMISSION FUNCTIONS OF ATMOSPHERIC GASES.

In: MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I OPTIKE ATMOSFERY, 6TH, TARTU, JUNE 13-18, 1966, AKTINOMETRIIA I OPTIKA ATMOSFERY, TRUDY.

Tallin, Izdatvo Valgus, 1968, p. 131-137.

B0790

Lederer, J.

NASA SAFETY RESEARCH.

In: ANNUAL CORPORATE AIRCRAFT SAFETY SEMINAR, 17TH, WASHINGTON, DC, April 17-18, 1972, PROCEEDINGS.

Arlington, VA, Flight Safety Foundation, Inc., 1972, p. 8-12.

Review of several of the NASA R & D projects that affect safety, among which fire research is very prominent. Noncombustible and fire-resistant materials approved by NASA for use in space operations in a 100% oxygen environment are discussed. Another development now in the research stage is a system for detecting a fire long before conventional temperature probes would provide a warning. An outgassing technique is used. Methods of dealing with lightning and static are considered. Attention is given to problems of steep approaches, wakes, fog, and visibility.

A72-39742#

B0800
Linke, Franz.
SIGHT (VISIBILITY)
In: HANDBUCH DER GEOPHYSIK, Vol. VIII, PHYSIK DER ATMOSPHAERE I.
Ed. by Franz Linke and F. Moller.
Berlin, Borntraeger, 1943, Abschnitt III, p. 621-650.

B0810
Linke, Franz.
DIE THEORIE DER ZERSTREUUNG, EXTINKTION UND POLARISATION DER LICHTES IN DER ATMOSPHAERE (THE THEORY OF THE SCATTERING, EXTINCTION AND POLARIZATION OF LIGHT IN THE ATMOSPHERE).
In: HANDBUCH DER GEOPHYSIK, Vol. VII, PHYSIK DER ATMOSPHAERE I.
Ed. by Franz Linke and F. Moller.
Berlin, Borntraeger, 1943, Abschnitt II, p. 120-238.

B0820
Lohle, F.
SICHTBEOBACHTUNGEN VOM METEOROLOGISCHEN STANDPUNKT (VISIBILITY OBSERVATIONS FROM THE METEOROLOGICAL STANDPOINT).
Berlin, Julius Springer, 1941, 119p.

Fundamental study of the problem of visibility. The author studied the physical conditions of visibility in relation to various weather situations, local conditions and also to physiological state of the observer. Special attention is paid to visibility forecasting and to (visibility) as an important factor in aviation. The theory of visibility and conditions of visibility at night are discussed. The author describes the construction of the principal visibility meters constructed earlier and analyzes conditions of (visibility) in IR region of the spectrum.

B0830
McFarland, R. A.
VISION FROM THE COCKPIT AND DESIGN OF THE WINDSHIELD.
In: HUMAN FACTORS IN AIR TRANSPORT DESIGN.
By R. A. McFarland.
New York, McGraw-Hill, 1946, p. 433-486.

B0840
Mack, E. J., W. C. Kocmond, R. J. Pilie, et al.
SOME MICROPHYSICAL FEATURES OF COASTAL AND INLAND FOGS.
In: INTERNATIONAL CONFERENCE ON AEROSPACE AND AERONAUTICAL METEOROLOGY, 1ST, WASHINGTON, DC, MAY 22-26, 1972, PREPRINTS.
Boston, American Meteorological Society, 1972, p. 219-224.

Radiation fogs sampled at Los Angeles were found to possess low visibilities, high liquid water content (LWC), relatively small drops, narrow peaked drop-size distributions, and high concentrations of micron sized haze droplets. Typical characteristics of valley fogs observed at Elmira, NY, were low visibilities, moderately high LWC, low concentrations of haze droplets, and similar drop size distributions to those measured in Los Angeles. On the other hand, advection fogs observed in Vandenberg were characterized by less severe visibilities, low LWC, large drops in a broad drop-size distribution, and very low haze nucleus concentrations.
A72-28842#

B0850
Marconi Radar Systems Ltd., Leicester (England).
INSTRUMENTED RUNWAY VISUAL RANGE SYSTEM, TYPE IVR-1.
Marconi Radar Data Sheet J1 1970.

B0870
Meingard, P.N., O.I. Popov, and E.D. Sholokhova.
REGISTRIRUIUSHCHAIA FOTOELEKTRICHESKAIA USTANOVKA DLIA IZMERENIIA PROZRACHNOSTI VOZHDUKA V VIDIMOI OBLASTI SPEKTRA (RECORDING PHOTOELECTRIC DEVICE FOR MEASURING AIR TRANSPARENCY IN THE VISUAL REGION OF THE SPECTRUM).
In: **MEZHVEDOMSTVENNOE SOVESCHANIE PO AKTINOMETRII I ATMOSFERNOI OPTIKE, 2ND, LENINGRAD, 1959, AKTINOMETRIIA I ATMOSFERNAIA OPTIKA, TRUDY.**
Leningrad, Gidrometeoizdat, 1961, p. 152–159.

The authors describe the construction and operation of the recording photoelectric device for measuring atmospheric transparency in the visible region of the spectrum by measuring the brightness of a light beam from two distances. A block diagram of the device and a circuit diagram of the amplifying unit are presented. Its principle of operation and the accuracy of measurement are discussed with the aid of relevant equations and the results of field use of the FM-45 device are presented. The measurements of visibility distance compare favorably with those obtained by other methods.

B0880
Meteorology Research, Inc., Altadena, CA.
APPLICATION NOTES FOR MOBILE MRI INTEGRATING NEPHELOMETERS.
MRM Ca-70/30

Product Leaflet.

B0890
Meteorological Research, Inc., Altadena, CA.
A BRIEF SEMI-TECHNICAL DISCUSSION ABOUT THE MRI MODEL 1580 FOG VISIOMETER. January 11, 1971.
MRI 71M-954

B0900
Meteorology Research, Inc., Altadena, CA.
MECHANICAL WEATHER STATION.
MRM Ca-73/90

Product Leaflet.

B0910
Meteorology Research, Inc., Altadena, CA.
A SINGLE USEFUL INDEX OF AIR POLLUTION: THE INTEGRATING NEPHELOMETER.

Product Leaflet.

B0920
Middleton, W. E. Knowles.
VISIBILITY IN METEOROLOGY.
In: **COMPENDIUM OF METEOROLOGY.**
Boston, American Meteorological Society, 1951, p. 91–97.

After a brief review of the physics of scattering of light on particles of various sizes, the author considers the formulae (based on KOSCHMIEDER) which permit calculation of luminance and (according to DUNTLEY) optical slant range and then the theory of contrast threshold. Physiological factors which affect day and night observation by the unaided eye, the calculation of visual range (day and night), instruments for measuring visual range, reporting visibility in practice are considered. Finally, the author's recommendations for future study of physiological factors, creation of new instruments for general use in visibility observation and the need for a practical and accurate method of measuring transparency of the atmosphere as a function of height are considered.

B0930
Middleton, W. E. Knowles.
VISIBILITY IN METEOROLOGY. THE THEORY AND PRACTICE OF THE MEASUREMENT OF THE VISUAL RANGE.
Toronto, University of Toronto Press, 2nd ed., 1941, 165 p.

A remarkably complete and systematic treatment of the physical, optical and instrumental aspects of visibility and the measurement of visual range, including a discussion of the behavior of light in pure and polluted atmospheres, the extinction coefficient, contrast threshold brightness, influence of angular dimensions, threshold for point sources and diffuse illumination, day and night visibility of black, white, gray and colored objects in fog, and of light sources; vertical and slant visibility, dependence on time of day, season, humidity, wind, and mass, haze, and, finally, forecasting of fog. The appendix contains an unusually thorough chapter on the visual range of colored objects, with theory and nomograms on calculation of visibility in different spectral ranges, and a 17-page bibliography.

B0940

Middleton, W. E. Knowles.

VISION THROUGH THE ATMOSPHERE.

Toronto, University of Toronto Press, 1952, 250 p.

The elementary photometric theory, the extinction of light in the atmosphere, the alteration of contrast by the atmosphere, the relevant properties of the eye, the visual range of objects in natural light, and visual range of light sources and of objects illuminated by artificial light are discussed. The colors of distant objects, the visual range of colored objects, instruments for measuring visual range and related quantities, the special problems of the meteorologist, and the new visual science are discussed. The instruments described in Chapter 9 include telephotometers, visual telephotometers, photoelectric telephotometers, polar nephelometer, loofah, visibility meters and hazemeters.

B0950

Middleton, W. E. Knowles.

VISION THROUGH THE ATMOSPHERE.

In: HANDBUCH DER PHYSIK, Vol. 48.

Berling, Springer-Verlag, 1957, p. 254-287.

Section VIII on instrumentation presents classification of instruments to measure visual range. They are (1) those which measure the extinction coefficient, (2) those which measure the scattering function, (3) instruments which aid in the estimation of the visual range without directly measuring the optical properties of the atmosphere. The instruments discussed in this study include visual and photoelectric telephometers, transmissometer, polar diagram, visibility meters, searchlight directed over a photometer, meters using artificial haze, and disappearance range gauge.

B0954

Morris, Ailene and E. Porter Horne.

VISUAL SEARCH TECHNIQUES.

Papers presented at the Armed Forces--National Research Council Committee on Vision, Annual Meeting, 38th, April, 1959.
NRC Publication 712.

Contains the texts of twenty-three formal papers presented at a symposium held April 1959 by scientific and technical personnel selected as participants, as well as the prepared texts of ten invited discussants. The sessions covered: military doctrine, equipment, and practice; search strategies and probability functions; basic eye characteristics related to search; visual performance in the search situation; optimal visual search techniques.

B0960

Mullaney, G. J., W. H. Christiansen, and D. A. Russell.

A STUDY OF FOG CLEARING USING A CO_2 LASER.

Paper presented at the American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, San Francisco, CA, June 16-18, 1969.

AIAA Paper 69-670

Investigation of the physics of fog removal by a CO_2 laser and evaluation of the possibility of clearing airport runways. While initial estimates of the power required to clear a runway, 10^6 to 10^7 W, are large for present-day laser devices, they may not be excessive requirements for future systems. (Author)
A69-33449#

B0970

Neuberger, Hans.

INTRODUCTION TO PHYSICAL METEOROLOGY.

State College, PA, Pennsylvania State University, 1957.

In Chap. 2, entitled "Visibility in meteorology" the author gives a complete review of the visibility problem in its present state. The dependence of visibility on psychophysical and physiological factors, brightness variations under different conditions, effect of contrast, etc. are analyzed. Much attention is paid to objective measurements of visual range and to principles on which the most popular visibility meters were constructed. Under consideration also are the conditions of night visibility and its measurement.

B0980
Paulsen, W. H.
INDIRECT SENSING OF METEOROLOGICAL ELEMENTS IN THE TERMINAL AREA.
Paper presented at the Societe Meteorologique Francaise and the American Meteorological Society, Colloque sur la Meteorologie Aeronautique, Paris and Orly, France, May 24-26, 1971. 19 p.

A survey is made of current techniques of indirectly sensing meteorological elements that are of concern in the terminal area. The conventional weather radar and its range of capabilities are presented along with the additional meteorological information that can be obtained with the use of a vertically pointing cloud detecting radar. Other available indirect sensing techniques for determining ceiling heights and warning of approaching thunderstorms are discussed and new techniques that are being investigated and developed for measuring slant range visibility, low level winds and turbulence, and wind shear zones are presented.
A72-14692#

B0990
Pchelko, I.G.
PROGNOSIS OF VISIBILITY.
In: HANDBOOK FOR SHORT-TERM WEATHER FORECASTING, PART II.
Leningrad, Gidrometeoizdat, 1954.

B1000
Perrin de Brichambaut, C.
OBSERVATION ET MESURE DES VISIBILITES AU SOL (OBSERVATION AND MEASUREMENT OF GROUND VISIBILITY).
In: DIRECTION DE LA METEOROLOGIE NATIONALE (FRANCE), MONOGRAPHIE NO. 76, Aug. 1970, p. 1-29.
In French.

Definitions are given for night and day visibility. Measurements were made of the optical meteorological bearing and the runway visual range to determine the optical characteristics of the atmosphere. Measurements included transmission factors, extension of the mean coefficient in a column of air, and the diffusion of the luminary in a small volume of air. Calculation were made from the point of view of the pilot and an observer. Results of night and day meteorological visibility, and transmission factors are given in tables.
N71-10119#

B1010
Perrin de Brichambaut, C.
PROBLEMES RELATIFS A LA MESURE DE LA PORTEE VISUELLE DE PISTE (PVP) ET DE LA PORTEE VISUELLE OBLIQUE (PVO) (PROBLEMS IN THE MEASUREMENT OF RUNWAY VISUAL RANGE (RVR) AND SLANT VISUAL RANGE (SVR)).
In: AERONAUTICAL METEOROLOGY.
Geneva (Switzerland), World Meteorological Organization, 1969, p. 132-138.

The author discusses methods for studying runway visual range and slant visual range. Discussed are the definition and concepts of slant visibility and runway visual range (RVR); the physical laws used in investigating these parameters, including the equations for the maximum distance of a black object in the case of contrast meteorological visibility, the maximum visibility distance of pinhole beacons in the case of runway visibility, and the representation of the measurements; actual measurement methods of runway visibility including the observer at the station, the observer at the end of the runway, television at the end of the runway transmission meteor along the runway measuring the optical transmission of the atmosphere, and diffusion meters measuring the light diffused by the atmosphere behind and to deduce from it the transmissivity and the runway visibility range; use of measurements of optical transmission by the atmosphere including the measurement of the atmospheric parameter, σ, conversion of σ into runway visual range, the estimation of the mean luminous intensity of a beacon in the direction of the pilot and conversion of mean luminous intensity into runway visual range; the requirements of apparatus for measuring runway visual range and slant visual range at specified distances; the rules for using instrumental data; methods of observation and utilization of measurements; and the value of the CIMO/WMO.

B1020
Petrenko, N. V., A. A. Bachurina and N. N. Romanov.
PROGNOSIS OF VISIBILITY.
In: HANDBOOK OF METHODS INDICATIONS FOR AVIATION METEOROLOGY.
Leningrad, Gidrometeoizdat, 1959.

B1030
Pokrovskii, A. G.
METODIKA RASCHETA SPEKTRAL'NOGO POGLOSHCHENIIA INFRAKRASNOI RADIATSII V ATMOSFERE (METHOD FOR CALCULATING THE SPECTRAL ABSORPTION OF INFRARED RADIATION IN THE ATMOSPHERE).
In: PROBLEMY FIZIKI ATMOSFERY, NUMBER 5 (PROBLEMS OF PHYSICS OF THE ATMOSPHERE, NUMBER 5).
Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1967, p. 85–110.

Development of a method for calculating the atmospheric water-vapor absorption spectra for any concentration, temperature, and atmospheric pressure distributions. The method takes the line broadening due to the Doppler effect into account. The computational labor involved depends primarily on the number of spectral lines employed in the calculations and on the profiles of the atmospheric parameter distributions.
A68-37954#

B1040
Pritchard, B. S.
ATMOSPHERIC OPTICS MEASUREMENTS, COLORADO, SEPT. 17 TO 26, 1956.
In: Air Force Cambridge Research Labs., Geophysics Research Directorate, GRD RESEARCH NOTES, No. 46, 1960, p. 69-81.

B1050
Rabinovich, Iu. I.
EXPERIMENTAL PROOF OF I. N. MININ'S THEORY OF OBLIQUE VISUAL RANGE.
In: VSESOIUZNOE NAUCHNOE METEOROLOGICHESKOE SOVESCHANIE, May 25, 1967, TRUDY.
Vol. 6, p. 74–79.
N68-87857

B1060
Robinson, Elmer.
EFFECT OF AIR POLLUTION ON THE PHYSICAL PROPERTIES OF THE ATMOSPHERE.
In: AIR POLLUTION, Vol. I.
Ed. by Arthur Stern.
New York, Academic Press, 2nd. ed., 1968, p. 349–400.

B1070
Rozenberg, G. V.
POSSIBILITIES FOR DETERMINING EXPERIMENTALLY THE SPECTRA OF TRUE ABSORPTION FOR CLOUDS AND FOGS.
In: MEZHDUVEDOMSTVENNAYA KONFERENTSIYA PO VOPROSOV ISSLEDOVANIYA OBLAKOV, OSDAKOV I GROZOVOGO ELEKTRICHESTVA, 6TH, JUNE 1959, DOKLADY (INSTITUTE OF APPLIED GEOPHYSICS, INVESTIGATION OF CLOUDS, PRECIPITATION, AND THUNDERSTORM ELECTRICITY).
Moscow, 1961, p. 58–64. Trans. into English.
FTD-HT-23-1437-67

Radiational processes in the clouds and fogs are considered in the study of the volumetric factors of absorption and dispersion and their spectral relationships, everything discussed relates to that region of the spectrum where self-radiation of the dispersive substance or gaseous phase does not play a part. The aim of this report is to show that reliable methods of determining experimentally the true spectra of absorption and dispersion in and that their development requires special attention. (Author)
AD-682774#

B1080
Rozenberg, G. V.
PROBLEM OF FORECASTING VISIBILITY AND PROJECTOR SOUNDING OF THE ATMOSPHERE.
In: SYMPOSIUM ON THE PROJECTOR BEAM IN THE ATMOSPHERE.
Moscow, Izdatel'stvo Akademiia Nauk SSSR, 1960.

B1090

Rozenberg, G. V.

PROZHEKTORNYI LUCH V ATMOSFERE: ISSLEDOVANIIA PO ATMOSFERNOI OPTIKE (SEARCHLIGHT BEAMS IN THE ATMOSPHERE; RESEARCH ON ATMOSPHERIC OPTICS).

Moscow, Akademiia Nauk SSSR, 1960, 243 p.

Dispersion and absorption of light in the atmosphere are affected by the optical conditions of the atmosphere which vary with altitude and meteorological conditions. The character of light dispersion in the atmosphere can be used as the indicator of its optical conditions and of atmospheric processes which are responsible for these variations. Therefore, modification of characteristics of the searchlight beam can be used for the study and sounding of optical properties of the atmosphere at different altitudes and under different conditions. Theoretical and experimental investigations conducted by the authors in the Laboratory of Atmospheric Optics of the Institute of Atmospheric Physics of the Academy of Sciences of the U.S.S.R. are described with tabulated data, graphs, records, photographs and other illustrations. The work of these investigators is grouped under the following six major topics: (1) forecasting problems on visibility and sounding of atmosphere with the searchlight beam; (2) optical properties of atmosphere; (3) structure and characteristics of the searchlight beam; (4) approximate theory of visibility and theory of atmospheric sounding; (5) qualitative analysis of intensity of a dispersed light beam and (6) experimental verification of theory of atmospheric sounding.

B1100

Rozenberg, G. V., A. Ia. Driving and N. V. Zolotavina.

OPTICAL PROPERTIES OF THE ATMOSPHERE.

In: SYMPOSIUM ON THE PROJECTOR BEAM IN THE ATMOSPHERE.

Moscow, Isdatel'stvo Akademiia Nauk SSSR, 1960.

B1110

Savokovskii, I. A.

RESULTS OF TESTS ON THE PERFORMANCE OF POLARIZATION VISIBILITY METERS FROM MEASUREMENTS CARRIED OUT DURING THE DAY.

In: VESSOIUZNOE NAUCHNOE METEOROLOGICHESKOE SOVESCHANIE, TRUDY.

Leningrad, Gidrometeoizdat, 1963, Vol. 9, p. 247-253.

Trans. into English by the Israel Program for Scientific Translations, 1966.

Constant accuracy is the basic performance characteristic of any visibility meter. In the U.S.S.R. the meteorological visual range is measured with the polarization visibility meter, type M-53. The errors in measuring the visible contrast, fluctuations of true contrast, internal haze and errors in measuring the visual range are discussed.

B1120

Schweighofer, H. M.

INSTRUMENTS FOR CATEGORY II APPROACH AND TRANSITION.

In: INTERNATIONAL FEDERATION OF AIR LINE PILOTS' ASSOCIATIONS, SYMPOSIUM ON ALL WEATHER OPERATIONS, HEAD UP DISPLAYS, LONG RANGE NAVIGATIONAL AIDS, ROTTERDAM, NETHERLANDS, OCT. 13-16, 1965, REPORT, Vol. I.

London, International Federation of Air Line Pilots' Associations, 1965.

Description of a head-up display for use during the transition from instrument to visual contact in Category II and IIIa operations which is based on the sensitivity to movement and acuity of pilot peripheral vision. The FD-109 Flight Director is described and its major instruments illustrated, including the peripheral command indicator (PCI), flight director indicator, and course indicator. The PCI consists of two concentric glass cylinders, the outer one being transparent and the inner one having a translucent white background for integral lighting. Each cylinder carries a series of helical black lines, right-hand spirals on the outer cylinder and left-hand on the inner, thereby forming a white diamond pattern. Pitch and roll commands drive both cylinders such that the direction and magnitude of these commands are shown by a corresponding velocity of motion of the diamond pattern. Evaluation by pilots has led to several conclusions: (1) initiation of movement of the diamond pattern calls immediate attention to a flight path deviation, and (2) data are more readily perceived and acted upon, and (3) the PCI allows the pilot to direct his attention to other instruments.

A66-33210#

B1125
Serbu, G.P.
ATMOSPHERIC ELECTRICITY AND ADVECTION FOG FORECASTING.
In: Conference on Atmospheric Electricity, 2nd, Portsmouth, N.H., May, 1958, Proceedings. p. 239-240.

The report gives a brief summary of the results of a study conducted by the U.S. Naval Research Laboratory on atmospheric electricity and advection fog forecasting at Argentia, Newfoundland. The importance of including wind-speed and wind-direction data in short-term fog forecasting is noted.

B1130
Sharonov, V. V.
IZMERENIE I RASCHET VIDIMOSTI DALEKIKH PREDMETOV (MEASUREMENT AND CALCULATION OF VISIBILITY OF DISTANT OBJECTS).
Leningrad, 1947, 283 p.

One of latest comprehensive studies on visibility made by an authority in this field. The author analyzes physical and physiological factors important to measurement of visibility, describes principal methods and apparatus for visibility determination and makes some corrections to the theory of visibility.

B1140
Sharonov, V. V.
NABLIUDENIE I VIDIMOST' (OBSERVATION AND VISIBILITY).
Moscow, Isdatel'stvo Akademii Nauk, 1943. 76 p.

Discussion of the physical and physiological factors important for visibility and a description of the author's visibility meter. Visibility conditions in turbid air (haze, fog, smoke, etc.), slant visibility by airplane observation, night visibility and visibility during moonlight, starlight and twilight are considered.

B1150
Sharonov, V. V., ed.
TABLES FOR CALCULATION OF NATURAL LIGHTING AND VISIBILITY.
Moscow, Isdatel'stvo Akademii Nauk, 1945.

B1160
Sharonov, V. V.
VISIBILITY OF DISTANT OBJECTS AND LIGHTS.
Voyenmorizdat, 1944.

B1170
Shifrin, K. S.
SCATTERING OF LIGHT IN A TURBID MEDIUM.
Gostekhizdat, 1951, 288 p.

This small theoretical and practical text contains a wealth of applications to problems of optics important to meteorology and oceanography; especially those problems concerning cloud, fog or raindrop scattering, or scattering in a hazy atmosphere or turbid sea. Tables of data and graphs show quantitative relationships depending on particle size, wavelength of light, angle of incidence, etc. The several chapters deal successively with: (1) General aspects; (2) basic formulae; (3) refracted waves; (4) optics of small particles; (5) of large particles; (6) absorption and complete reflection of particles (small and large); (7) transparent particles of any size; (8) particles with electromagnetic properties differing slightly from those of surrounding media. Appendix contains tables for calculating indices for particles in medium (between small and large) size range.

B1180
Shifrin, K. S. and I. Golikov.
DETERMINING THE DROPLET SPECTRUM BY THE METHOD OF A SMALL ANGLE.
In: MEZHDUVEDOMSTVENNAYA KONFERENTSIYA PO VOPROSOV ISSLEDOVANIYA OBLAKOV, OSADKOV I GROZOVOGO ELEKTRICHESTVA, 6TH, JUNE 1959, DOKLADY.
Trans. into English by the American Meteorological Society, Feb. 1965.

B1190
Shifrin, K. S. and N. P. Pyatovskaya.
THE INCLINED VISIBILITY RANGE AND THE BRILLIANCE OF DAYTIME SKY.
Trans. of Table of Contents, annotation and selected pages of a Russian book.
Leningrad, Gidrometeoizdat, 1959, p. 1-19 and 126-134.
NASA-TT-F-14421

Results of computations pertaining to the brilliance of atmospheric haze and to the daytime sky are presented. A great range of physical parameters was investigated that determine investigated values, which embrace concrete atmospheric conditions, and various types of terrestrial surfaces. The work is considered to be of value to scientific workers and engineers employed in the fields of geophysics, aerial surveying, illumination engineering and allied sciences. Tables are presented in a useful form. (Author)
N73-10397#

B1200
SNECMA, Suresnes (France). ELECMA Electronic Div.
LYNX T.I.561 AUTOMATIC SYSTEM FOR MEASUREMENT, DISPLAY, COMPUTATION AND REMOTE TRANSMISSION OF VISIBILITY.
Product leaflet SCN 70-04-02

B1210
Sokolov, M. V.
REGARDING THE VISIBILITY OF LIGHT SIGNALS.
In: PROBLEMS OF PHYSIOLOGICAL OPTICS, Vol. 6.
Moscow, Izdatel'stvo Akademiia Nauk SSSR, 1948.

B1220
Spooner, A. H.
LOW VISIBILITY SIMULATION. (SELECTED WORKING PAPER).
In: INTERNATIONAL CIVIL AVIATION ORGANIZATION. ALL-WEATHER OPERATIONS PANEL, 3RD MEETING, MONTREAL, April 1967, PROCEEDINGS, Vol. II, p. 155-166.

B1230
Steffens, Carsten.
VISIBILITY AND AIR POLLUTION.
In: AIR POLLUTION HANDBOOK.
By Paul L. McGill et al.
New York, McGraw-Hill, 1956.

B1240
Steffens, Carsten and Rubin Sylvan.
VISIBILITY AND AIR POLLUTION.
In: NATIONAL AIR POLLUTION SYMPOSIUM, Nov. 10, 1949, PROCEEDINGS, p. 103-108.

B1250
Stewart, K. H.
AN APPROXIMATE RELATION BETWEEN SLANT VISIBILITY AND HORIZONTAL VISIBILITY AT GROUND LEVEL.
Great Britain. Meteorological Research Committee. Meteorological Research Papers, No. 1046, April 3, 1957, 5p.

An expression is developed for variation of slant visibility with height in a water fog, using values for Cardington and London airports. It was tested with a small lamp at Cardington, and small balloons at London airport. It gave a good representation on the average but large differences occurred on individual occasions.

B1260
Stewart, K. H.
A METHOD FOR ASSESSING THE FREQUENCY OF DANGEROUS VISIBILITY CONDITIONS.
Great Britain. Meteorological Research Committee. Meteorological Research Papers, No. 1047, April 3, 1957, 4p.

Variation of slant visibility in and above a fog layer is shown schematically for two different fogs. The curves can be estimated from temperature and humidity soundings and horizontal visibility. A diagram gives for a critical height of 200 ft. the line separating "safe" and dangerous conditions. At Cardington the latter occur for about 7 hours a year. Uncertainty in this estimate arises from uncertainty in the criteria for adequate visual guidance.

B1270

Stewart, K. H.

A SIMPLE METHOD FOR MEASURING ATMOSPHERIC ATTENUATION OF LIGHT ("METEOROLOGICAL OPTICAL RANGE" OR VISIBILITY) AT NIGHT.

Great Britain. Meteorological Research Committee. Meteorological Research Papers, No. 997, 1956.

An alternative to the Gold visibility meter is described, using two lights, one at a distance viewed directly, and the other carried on the observer's head and reflected in a small convex mirror on a stand. Observer varies his distance from the mirror until the two lights appear equally bright; the ratio of the two distances gives visibility. Tried out at Kew Observatory, it gave much smaller random errors and better agreement between different observers than the Gold meter.

B1280

Tatom, J. W., B. L. Hinson and A. E. Harris.

VTOL TRANSPORT DUST CLOUD/PILOT VISIBILITY MODEL STUDY.

In: ANNUAL NATIONAL CONFERENCE ON ENVIRONMENTAL EFFECTS ON AIRCRAFT AND PROPULSION SYSTEMS, 7TH, PRINCETON, NJ, Sept. 25-27, 1967, PROCEEDINGS.

Mount Prospect, IL, Institute of Environmental Sciences, 1967, p. 117-128.

A model study of the dust cloud/pilot visibility problem for helicopter, lift fan, and lift turbofan VTOL transport configurations has been conducted using takeoff thrust as a basis for comparison. The results indicate that while the high disk loading configurations do have a relatively greater visibility problem in the far field than rotorcraft, both have a problem. Simply reducing the lift unit disk loading does not solve the visibility/dust problem. It is shown that ground dust suppression using a jet dissipation system offers a promising means for eliminating the problem at its source. An erosion analysis describing dust pickup is presented with data which are shown to support the predictions. (Author)

A68-10652#

B1290

Thomas, D. C., T. W. Rowley and M. E. Judge.

FULLY AUTOMATIC ASSESSMENT OF RVR AND COMPARISON WITH OBSERVERS.

In: ELECTRONIQUE ET AVIATION CIVILE COLLOQUE INTERNATIONAL, PARIS, June 26-30, 1972.

Paris, Editions Chiron, 1972, Chpt. 3J.

B1300

Timofeev, Iu. M.

O FUNKTSIIAKH PROPUSKANIIA REAL'NOI ATMOSFERY (TRANSMISSION FUNCTIONS OF A REAL ATMOSPHERE).

In: PROBLEMY FIZIKI ATMOSFERY, NUMBER 5 (PROBLEMS OF PHYSICS OF THE ATMOSPHERE, NUMBER 5).

Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1967, p. 63-68.

Comparative analysis of several approximate methods for calculating the transmission functions for a real atmosphere, which are frequently used in theoretical calculations of thermal-radiation characteristics. It is shown that the error involved in approximate methods of accounting for atmospheric inhomogeneities is largest for atmospheric stratifications characterized by an increase in the absorbing gas mixture ratio with a drop in pressure. Using the effective-mass method, in which the absorption functions are represented in the form of functions of the product up^n*, it is necessary to choose the mean value of n for various values of u and p from measurements performed for uniform media. Particular attention should be given to an exact determination of n for ozone-type distributions.*

A68-37952#

B1310

Van Oosterom, T.

A FLIGHT TEST METHOD FOR THE EVALUATION OF APPROACH AND RUNWAY LIGHTING EFFECTIVENESS.

Presented at the Aircraft Take-Off and Landing Specialists Meeting, Sponsored by the AGARD Flight Mechanics Panel, Paris, 15-18 Jan. 1963. AGARD-431.

A flight operational method for evaluating the effectiveness of visual approach and landing aids is described. The method is based on a quantitative appraisal of the guidance obtained from a given configuration of lights by measuring the quality of the approach and landing and by determining the pilot's effort in carrying out these maneuvers. To this end, relevant flight technical and physiological measurements are made, and the test results are expressed in quality marks by a specially developed interpretation procedure. For simulating consistent and marginal weather conditions, a cockpit fog simulator has been developed consisting of a gyro- and altitude-controlled movable opaque screen mounted in front of the subject pilot. The safety pilot is not subjected to any restriction of visibility. The tests are performed on a statistical basis so that the real significance of the differences in effectiveness between light configurations as found from the trials can be determined. (Author)

N64-16291#

B1320
Veinberg, V. B.
ON THE VISIBILITY RANGE OF OBJECTS.
In: PROBLEMS OF PHYSIOLOGICAL OPTICS, Vol. 3.
Moscow, Izdatel'stvo Akademiia Nauk SSSR, 1946.

B1330
Walker, J.
VEHICLE MOVEMENT IN BAD VISIBILITY.
In: INTERNATIONAL FEDERATION OF AIR LINE PILOTS' ASSOCIATIONS, SYMPOSIUM ON ALL WEATHER OPERATIONS, HEAD UP DISPLAYS, LONG RANGE NAVIGATIONAL AIDS, ROTTERDAM, NETHERLANDS, Oct. 13-16, 1965, REPORT, Vol. I.

Description of the Sperry Navigator Mk II vehicle navigation system. The need in airport operation for equipment that will make possible vehicle (ground or air) movement in conditions of zero or near-zero visibility is noted. Factors influencing vehicle movement under these conditions are discussed, and the technical requirements of a suitable device are outlined. The prime factor influencing vehicle movement in bad visibility (also air or ground) is identified as the confidence of the driver or pilot in his ability to avoid external hazards. External hazards and aids are classified. Operational roles of the vehicle navigator are defined. Ten features of the Sperry system are enumerated, including small volume and light weight, cheapness, and no stringent service requirements.
A66-33207#

B1340
Wanta, R. C.
DIRECT USE OF ROTATING-BEAM CEILOMETER AND TRANSMISSOMETER IN THE REPORTING OF CEILING AND VISIBILITY.
New York, Institute of the Aeronautical Sciences, 1955. Preprint 534.

The development and characteristics of the rotating-beam ceilometer and the transmissometer are briefly described. Preliminary experiments with the new instruments by the Weather Bureau at Silver Hill, Maryland and at Washington National Airport are summarized.

Performance of the new equipment when the instrumental indications are translated directly into values of ceiling and visibility is described and discussed in terms of pilot observations at MacArthur Field. N.Y. (Author)

B1350
Weather Bureau, Washington, D.C.
INSTRUCTION MANUAL TRANSMISSOMETER SYSTEM.
Aug. 1966.

B1360
Wilson, D. and J. Hands.
FLIGHT SIMULATOR TECHNIQUES APPLIED TO ALL WEATHER LANDING PROBLEMS.
In: INTERNATIONAL FEDERATION OF AIR LINE PILOTS' ASSOCIATIONS, SYMPOSIUM ON ALL WEATHER OPERATIONS, HEAD UP DISPLAYS, LONG RANGE NAVIGATIONAL AIRS, ROTTERDAM, NETHERLANDS, OCT. 13-16, 1965 REPORT, VOL. I.
London, International Federation of Air Line Pilots' Associations, 1965.

Brief summary of the main features of simulator training equipment made by General Precision Systems, Ltd. The accurate simulation of actual flight conditions is emphasized. Five features are briefly discussed: color television on nearly all systems sold, which gives a brighter picture with better resolution than a previous monochrome system; compatibility with the flight simulator; airport landing systems that include strobe flash lighting and VASI lights; optics designed so that all rotational freedoms are related to glassware; and improvements in collimation, or virtual image of the picture.
A66-33205#

B1370
Wilson, James W.
USE OF RADAR IN SHORT-PERIOD TERMINAL WEATHER FORECASTING.
In: RADAR METEOROLOGY CONFERENCE, 13TH, McGILL UNIVERSITY, MONTREAL, CANADA, August 20-23, 1968, PROCEEDINGS.
Ed. by J. S. Marshall.
Boston, American Meteorological Society, 1968, p. 400-405, 407.

Demonstration of the important effect that precipitation can have on visibility, as part of an extensive program to increase the accuracy of aircraft terminal weather forecasts. It is shown that snow and heavy rain can reduce visibility significantly, while rain, through the accretion process, can thin dense fog. A technique was developed for forecasting visibility in snow, based on a visibility analysis prepared from a combination of mesonet and radar data and then an extrapolation of the analyzed field with the echo-motion vector. The program clearly showed that weather radar can play a significant role in short-period terminal weather forecasting.
A68-41057#

B1380
World Meteorological Organization.
AERONAUTICAL METEOROLOGY (Scientific and Technical Conference on Aeronautical Meteorology, London, Mar. 1968, Proceedings).
Geneva, 1969, 437p.

Symposium papers on aeronautical meteorology are presented.

B1390
World Meteorological Organization.
GUIDE TO METEOROLOGICAL INSTRUMENT AND OBSERVING PRACTICES.
Geneva, WMO, 2nd ed., 1961.
Publication No. 8.

Chapter VIII deals with the measurement of visibility. Brief notes are recorded on the estimation of visibility and visibility meters. The visibility meters include the telephotometer instruments, visual extinction meter, photoelectric transmission meter and scatter coefficient meters.

B1400
World Meteorological Organization.
INSTRUMENT DEVELOPMENT INQUIRY.
Geneva, WMO, 1968.
WMO 232.

The developments concerning instruments in Category 78, uni-directional meteorological visibility in France and the United States, are presented. These instruments include CAVIAR in France and the transmissivity sensor and temperature profile radiometer in the United States.

B1410
World Meteorological Organization.
WORLD CONGRESS, 5TH, GENEVA, APRIL 3-28, 1967, PROCEEDINGS.
Geneva, WMO, 1968, 191p.
WMO 214.RC.29.

Lists persons attending by member, state, name, and capacity; provides a table of representatives present, by country and organization; and records the minutes of the 16 plenary sessions held April 3-28, 1967. Major agenda items include the organization of the session; reports by the president and by presidents of regional associations, technical commissions, and the Secretary-General; general and legal questions, amendments, reviews of regulations, and other related topics; technical cooperation; the World Weather Watch; program and budget; technical questions, including various meteorological, hydrometeorological, and maritime meteorological subjects; administrative and financial affairs; elections and nominations; and miscellaneous topics. An extensive list of documents relevant to the session is appended.

B1420
Yingling, G. L.
AN EXAMINATION OF THE LOW VISIBILITY LANDING PROBLEM BELOW 200 FT AND THE FEDERAL REGULATIONS GOVERNING OPERATIONAL APPROVAL.
Paper presented at the American Institute of Aeronautics and Astronautics, Aircraft Design and Operations Meeting, 2nd, Los Angeles, CA, July 20-22, 1970.

Low visibility aircraft landing problem concerning pilot instrument and visual cue and Federal regulations governing operational approval.
A70-35845#

B1430
Zabrodskii, G. M.
RESULTS OF EXPERIMENTAL INVESTIGATIONS OF THE OPTICAL THICKNESS OF CLOUDS.
In: VSESOIUZNOE NAUCHNOE METEOROLOGICHESKOE SOVESCHANIIA, 1ST, LENINGRAD, June 1961, TRUDY.
Leningrad, Gidrometeoizdat, 1963, Vol. 6, p. 102-111.

Measurements of the meteorological visual range in clouds in summertime yielded information on the optical thickness of clouds and the attenuation of radiation. It was found that the thickness of stratified clouds increases with the height reaching a maximum at the upper boundary. Turbulent disturbances are likely to occur in stratified clouds. The upper cloud layer usually coincides with the inversion layer. Temperature pulsations with a 2° amplitude often occur in these upper layers.

B1440
Zuev, V. E.
PROZRACHNOST' ATMOSFERY DLIA VIDIMYKH I INFRAKRASNYKH LUCHEI (TRANSPARENCE OF THE ATMOSPHERE TO LIGHT AND INFRARED RADIATION).
Moscow, Isdatel'stvo Sovetskow Radio, 1966. 318 p.

Attempt to present the overall results of theoretical and experimental studies of the absorption, scattering, and attenuation of light and infrared radiation in the atmosphere. Research findings published prior to 1964, especially those made in the last eight to ten years and not included in the known monographs, are reviewed and analyzed. The quantitative data obtained by the author and his coworkers within narrow spectral ranges in regard to various geometrical schemes of the radiation source and receiver under all possible meteorological conditions are presented. The question of the absorption of infrared radiation which is propagated horizontally in the atmosphere is examined. Data on the distribution of absorptive gases in the atmosphere are given, and the specific absorption properties of the emissions from optical quantum generators in the atmosphere are considered. The absorption of infrared radiation propagating in an oblique direction is reviewed. The question of aerosol attenuation of light and infrared radiation by clouds, fog, rain, and mist is discussed. An analysis of the application of Bougeur's law to the description of experimental studies of aerosol scattering is included.
A66-41272#

B1445
Zuev, V.E.
RASPROSTRANENIE VIDIMYKH I INFRAKRASNYKH VOLN V ATMOSFERE (PROPAGATION OF VISIBLE AND INFRARED RADIATION IN THE ATMOSPHERE).
Moscow, Isdatel'stvo Sovetskow Radio, 1970. 496p.

PERSONAL AUTHOR INDEX

E

CORPORATE SOURCE INDEX

**WEATHER BUREAU, ATLANTIC CITY, NJ.
TEST AND EVALUATION LAB.**

WEATHER BUREAU, SILVER SPRING, MD.

**WEATHER BUREAU, SILVER SPRING, MD.
TECHNIQUES DEVELOPMENT LAB.**

**WEATHER BUREAU, STERLING, VA.
TEST AND EVALUATION LAB.**

WEATHER BUREAU, WASHINGTON, DC.

**WEATHER SQUADRON (12TH) DETACHMENT 14,
SELFRIDGE AFB, MI.**

WEATHER SQUADRON (28TH), NY.

**WEATHER WING (4TH), ENT AFB, CO.
AEROSPACE SCIENCES DIV.**

WORLD METEOROLOGICAL ORGANIZATION

**WRIGHT AIR DEVELOPMENT CENTER,
WRIGHT-PATTERSON AFB, OH.**

SUBJECT INDEX

H