

DOT-TSC-OST-71-17

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October 1971

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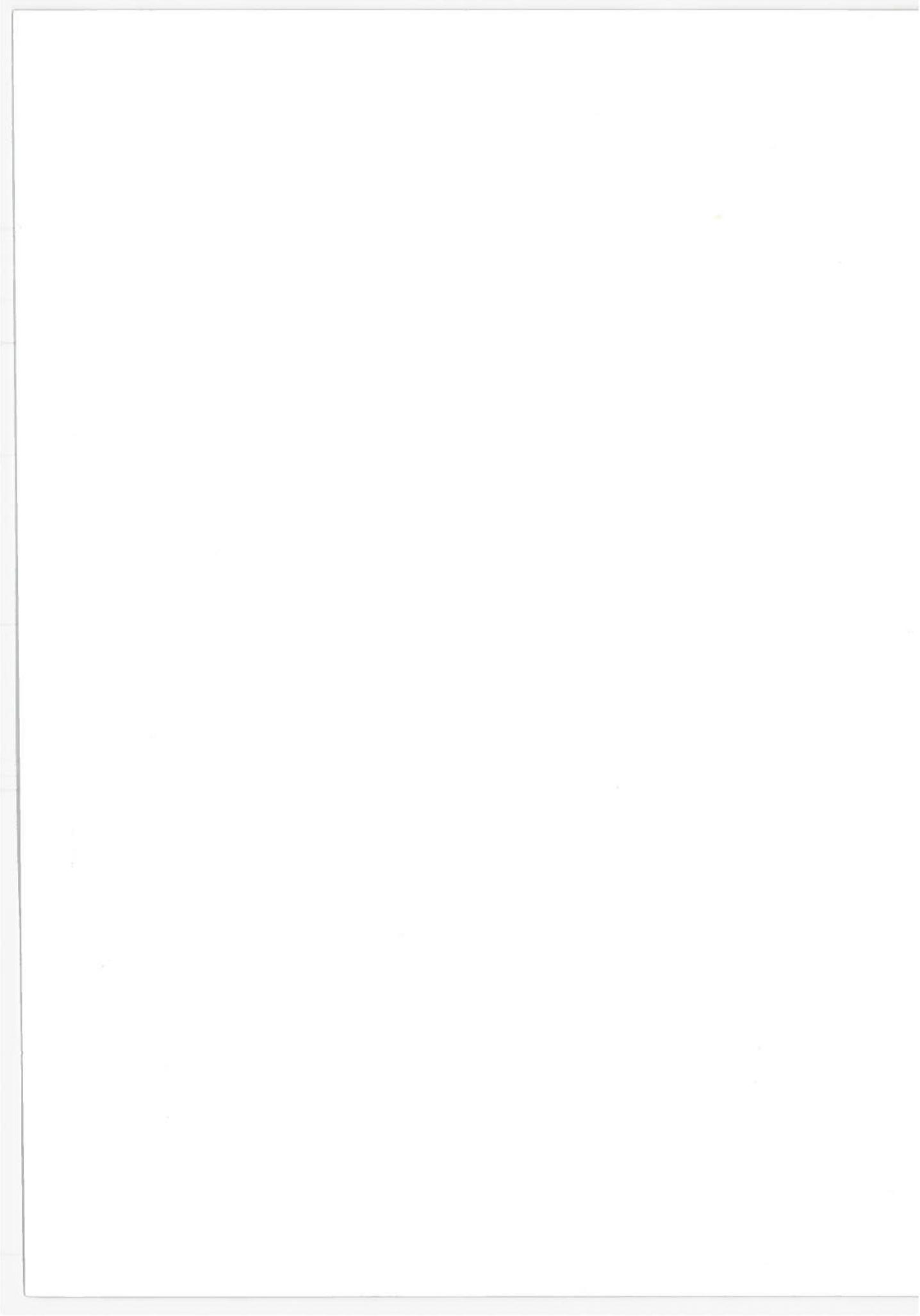


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16. Abstract This Reports Bibliography published at the Transportation Systems Center provides a substantive listing of Scientific Technical reports published from July 1970 through October 1971. Reports are arranged in 22 subject fields and are listed by Sponsoring Agency Name and Address. Abstracts of each Technical report are presented providing a brief overview of substantive information in each report. The abstracts are cross referenced by COSATI field and subject title.			
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**TRANSPORTATION SYSTEMS CENTER
REPORTS BIBLIOGRAPHY**

October 1971

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INTRODUCTION

TRANSPORTATION SYSTEMS CENTER REPORTS BIBLIOGRAPHY includes scientific and technical report literature. It is published by the Transportation Systems Center to simplify and improve access to Federal publications and data files.

This reports bibliography announces information released by technical directorates departments and branches within TSC. Announcements are arranged in 22 subject fields of the COSATI Subject Category list (AD-612-200). Reports covering more than one subject are announced in the primary field and cross-referenced in other fields.

An "Edge Index" on the back cover of this journal provides easy access to the subject fields within this journal.

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Two years after announcement, documents having 300 pages or less will have a service charge of \$3.00 added to the announcement price. No service charge will be added for documents over 300 pages.

Documents announced prior to January 1, 1969, have a service charge of \$3.00 added to the announcement price.

MICROFICHE

Microfiche reproduction of documents on a demand basis is priced at 95 cents per document.

Documents available on Standing Order through NTIS Selective Dissemination of Microfiche Service (SDM) are priced at 35 cents per document.

TYPICAL JOURNAL ENTRIES

subject field → **1. AERONAUTICS**

Includes the following Groups: Aerodynamics; Aeronautics, Aircraft; Aircraft Flight Control and Instrumentation. Air Facilities.

sponsoring agency name and address → **FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C. 20590**

**DOT-TSC-FAA-71-1 Transportation Systems Center
EN ROUTE TRAFFIC FLOW SIMULATION**

M. F. Medeiros, Jr., FA17, Technical Report, January 1971
For primary bibliographic entry, see Field 9.

performing organization report no. → **DOT/TSC-FAA-71-2 Transportation Systems Center
HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY
FOR DATA LINK *** ← performing organization name

Edwin H. Hilborn, FA16-0, Technical Memo. July 1970-
January 1971, 17 pp.

Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, and Display Problems. ← key words

abstract → Problems associated with the entry of air-ground-air messages via keyboard for transmission by Data Link are discussed. The ARINC proposal for a keyboard is presented, and an alternative method for coding keys is proposed for comparative evaluation. A sizable vocabulary of messages requiring a minimum of keying is developed and justified. An alternative layout for a keyboard is proposed and its rationale explained. Some display problems are noted. Plans for experimental evaluation of several keyboard codes and layouts are noted.

title and subtitle → **DOT-TSC-FAA-71-3 Transportation Systems Center.
CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM. THE BASIC, LEVEL 1 MODEL**

author(s) → **N. de Holland, S. Priver, FA06, Technical Report, April 1971, 44 pp.** ← type and date of report and No. of pages

Conceptual Transportation Systems Model, Flight Simulation, Input Package and Output Package.

For primary bibliographic entry, see Field 9.

**DOT-TSC-FAA-71-4 Transportations Systems Center.
A FUNCTIONAL DESCRIPTION OF AIR TRAFFIC CONTROL**

J. R. Coonan and P. Mpontsikaris, FA06, Technical Note,

work unit no. ↑

SUBJECT FIELD STRUCTURE

(Use Edge Index on back cover to locate subject field in the journal)

FIELD 1. AERONAUTICS. Includes the following Groups: Aerodynamics; Aeronautics; Aircraft; Aircraft Flight Control and Instrumentation; Air Facilities.

FIELD 2. AGRICULTURE. Includes the following Groups: Agricultural Chemistry; Agricultural Economics; Agricultural Engineering, Agronomy and Horticulture; Animal Husbandry; Forestry.

FIELD 3. ASTRONOMY AND ASTROPHYSICS. Includes the following Groups: Astronomy; Astrophysics; Celestial Mechanics.

FIELD 4. ATMOSPHERIC SCIENCES. Includes the following Groups: Atmospheric Physics; Meteorology.

FIELD 5. BEHAVIORAL AND SOCIAL SCIENCES. Includes the following Groups: Administration and Management; Documentation and Information Technology; Economics; History, Law, and Political Science; Human Factors Engineering, Humanities; Linguistics; Man-machine Relations; Personnel Selection, Training, and Evaluation; Psychology (Individual and Group Behavior); Sociology.

FIELD 6. BIOLOGICAL AND MEDICAL SCIENCES. Includes the following Groups: Biochemistry; Bioengineering; Biology; Bionics; Clinical Medicine; Environmental Biology; Escape, Rescue, and Survival; Food, Hygiene and Sanitation; Industrial (Occupational) Medicine; Life Support; Medical and Hospital Equipment; Microbiology; Personnel Selection and Maintenance (Medical); Pharmacology; Physiology; Protective Equipment; Radiobiology; Stress Physiology; Toxicology; Weapon Effects.

FIELD 7. CHEMISTRY. Includes the following Groups: Chemical Engineering, Inorganic Chemistry; Organic Chemistry; Physical Chemistry, Radio and Radiation Chemistry.

FIELD 8. EARTH SCIENCES AND OCEANOGRAPHY. Includes the following Groups: Biological Oceanography; Cartography; Dynamic Oceanography; Geochemistry; Geodesy; Geography; Geology and Mineralogy; Hydrology and Limnology; Mining Engineering; Physical Oceanography; Seismology; Snow, Ice, and Permafrost; Soil Mechanics; Terrestrial Magnetism.

FIELD 9. ELECTRONICS AND ELECTRICAL ENGINEERING. Includes the following Groups: Components; Computers; Electronic and Electrical Engineering; Information Theory; Subsystems; and Telemetry.

FIELD 10. ENERGY CONVERSION (Non-propulsive). Includes the following Groups: Conversion Techniques; Power Sources; Energy Storage.

FIELD 11. MATERIALS. Includes the following groups: Adhesives and Seals; Ceramics, Refractories, and Glasses; Coatings; Colorants, and Finishes; Composite Materials; Fibers and Textiles; Metallurgy and Metallography; Miscellaneous Materials; Oils; Lubricants, and Hydraulic Fluids; Plastics; Rubbers; Solvents, Cleaners, and Abrasives; Wood and Paper Products.

FIELD 12. MATHEMATICAL SCIENCES. Includes the following Groups: Mathematics and Statistics; Operations Research.

FIELD 13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING. Includes the following Groups: Air Conditioning, Heating, Lighting, and Ventilating; Civil Engineering; Construction Equipment, Materials, and Supplies; Containers and Packaging; Couplings, Fittings, Fasteners, and Joints; Ground Transportation Equipment; Hydraulic and Pneumatic Equipment; Industrial Processes; Machinery and Tools; Marine Engineering; Pumps, Filters, Pipes, Fittings, Tubing, and Valves; Safety Engineering; Structural Engineering.

FIELD 14. METHODS AND EQUIPMENT. Includes the following Groups: Cost Effectiveness; Laboratories, Test Facilities, and Test Equipment; Recording Devices; Reliability; Reprography.

FIELD 15. MILITARY SCIENCES. Includes the following Groups: Antisubmarine Warfare; Chemical, Biological, and Radiological Warfare; Defense; Intelligence; Logistics; Nuclear Warfare; Operations, Strategy, and Tactics.

FIELD 16. MISSILE TECHNOLOGY. Includes the following Groups: Missile Launching and Ground Support; Missile Trajectories; Missile Warheads and Fuses; Missiles.

FIELD 17. NAVIGATION, COMMUNICATIONS, DETECTION, AND COUNTERMEASURES. Includes the following Groups: Acoustic Detection; Communications; Direction Finding; Electromagnetic and Acoustic Countermeasures; Infrared and Ultraviolet Detection; Magnetic Detection; Navigation and Guidance; Optical Detection; Radar Detection; Seismic Detection.

SUBJECT FIELD STRUCTURE (Continued)

FIELD 18. NUCLEAR SCIENCE AND TECHNOLOGY. Includes the following Groups: Fusion Devices (Thermonuclear); isotopes; Nuclear Explosions; Nuclear Instrumentation; Nuclear Power Plants; Radiation Shielding and Protection; Radioactive Wastes and Fission Products; Radioactivity; Reactor Engineering and Operation; Reactor Materials; Reactor Physics; Reactors (Power); Reactors (Non-power); SNAP Technology.

FIELD 19. ORDNANCE. Includes the following groups: Ammunition, Explosives, and Pyrotechnics; Bombs; Combat Vehicles, Explosions, Ballistics, and Armor; Fire Control and Bombing Systems; Guns; Rockets; Underwater Ordnance.

FIELD 20. PHYSICS. Includes the following Groups: Acoustics, Crystallography; Electricity and Magnetism; Fluid Mechanics; Masers and Lasers; Optics; Particle Accelerators; Particle Physics; Plasma Physics; Quantum Theory, Solid Mechanics, Solid-state Physics; Thermodynamics; Wave Propagation.

FIELD 21. PROPULSION AND FUELS. Includes the following Groups: Air-breathing Engines; Combustion and Ignition; Electric Propulsion; Fuels; Jet and Gas Turbine Engines; Nuclear Propulsion; Reciprocating Engines; Rocket Motors and Engines; Rocket Propellants.

FIELD 22. SPACE TECHNOLOGY. Includes the following Groups: Astronautics; Spacecraft; Spacecraft Trajectories and Reentry; Spacecraft Launch Vehicles and Ground Support.

TRANSPORTATION SYSTEMS CENTER

SCIENTIFIC · TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to an existing knowledge.

TECHNICAL NOTES: Information less broad in scope, but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDA: Information initially receiving limited distribution because of preliminary data, security classification, or other reasons — now currently available for dissemination.

OPERATIONAL HANDBOOKS: Information providing operation and maintenance instructions for systems developed in connection with TSC projects sponsored by DOT operating administrations or other agencies.

CONTRACTOR REPORTS: Technical information generated in connection with a TSC contract or grant and released under TSC auspices.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit DOT distribution in English.

TECHNICAL REPRINTS: Information derived from TSC activities and initially published in the form of Journal Articles.

SPECIAL PUBLICATIONS: Information derived from or of value to TSC activities but not necessarily reporting the results of individual TSC-programmed scientific efforts. Publications, data compilations handbooks, sourcebooks, and special bibliographies.

PRELIMINARY MEMORANDUM: Scientific and technical information in which formal publication procedures have been waived in the interest of very rapid dissemination. They vary widely in scope and quality, are non-referencable, and limited in distribution. Preliminary memoranda are considered to be information communications or working papers.

JOURNAL ARTICLES:

PAPERS/ARTICLES — Detailed experimental or theoretical endeavors of interest to the scientific and engineering community.

COMMUNICATIONS/NOTES/CORRESPONDENCE — Short manuscripts without abstracts, but self-contained presentations.

LETTERS — Brief topics of interest with subject matter of timely and current importance.

ORAL PRESENTATIONS AT SOCIETY MEETINGS, CONFERENCES AND SYMPOSIA

Learned society or university (national and international) meetings, conferences, and symposia.

Government agency sponsored meetings, conferences and symposia (including DOT Headquarters and other DOT sponsored programs).



OCTOBER 1971

Transportation Systems Center Reports Bibliography

An Annual Announcement Journal of the U. S. Department of Transportation

1. AERONAUTICS

Includes the following Groups: Aerodynamics; Aeronautics, Aircraft; Aircraft Flight Control and Instrumentation. Air Facilities.

FEDERAL AVIATION ADMINISTRATION WASHINGTON, D.C. 20590

DOT-TSC-FAA-71-1 Transportation Systems Center **EN ROUTE TRAFFIC FLOW SIMULATION**

M. F. Medeiros, Jr., FA17, Technical Report, January 1971
For primary bibliographic entry, see Field 9.

DOT/TSC-FAA-71-2 Transportation Systems Center **HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**

Edwin H. Hilborn, FA16-0, Technical Memo. July 1970-
January 1971, 17 pp.

Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, and Display Problems.

Problems associated with the entry of air-ground-air messages via keyboard for transmission by Data Link are discussed. The ARINC proposal for a keyboard is presented, and an alternative method for coding keys is proposed for comparative evaluation. A sizable vocabulary of messages requiring a minimum of keying is developed and justified. An alternative layout for a keyboard is proposed and its rationale explained. Some display problems are noted. Plans for experimental evaluation of several keyboard codes and layouts are noted.

DOT-TSC-FAA-71-3 Transportation Systems Center. **CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM. THE BASIC, LEVEL 1 MODEL**

N. de Holland, S. Priver, FA06, Technical Report, April 1971, 44 pp.

Conceptual Transportation Systems Model, Flight Simulation, Input Package and Output Package.

For primary bibliographic entry, see Field 9.

DOT-TSC-FAA-71-4 Transportations Systems Center. **A FUNCTIONAL DESCRIPTION OF AIR TRAFFIC CONTROL**

J. R. Coonan and P. Mpontsikaris, FA06, Technical Note,

March 1971, 81 pp.

ATC Event Sequence and ATC Functions.

For primary bibliographic entry, see Field 17.

DOT-TSC-FAA-71-5 Transportation Systems Center **THE IMPACT OF INERTIAL NAVIGATION ON AIR SAFETY**

R. M. Hershkowitz, D. O'Mathuna and K. R. Britting, FA04, Technical Report, May 1971, 25pp.

Inertial navigation, Collision risk model, En route navigation statistics and Blunders.

For primary bibliographic entry, see Field 17.

DOT-TSC-FAA-71-6 Transportation Systems Center **COLLISION RISK MODEL FOR NAT REGION**

Ronald Hershkowitz, FA04, Technical Report, May 1971, 55 pp.

Collision Risk Model, Composite Problem, Vertical Separation and Lateral Separation.

For primary bibliographic entry, see Field 17.

DOT-TSC-FAA-71-7 Transportation Systems Center **EVALUATION OF AIR TRAFFIC CONTROL MODELS AND SIMULATIONS**

L. O. Higgins and P. Mpontsikaris, Service Technology Corporation, Cambridge, FA06, Technical Report, June 1971.

Air Traffic Control (ATC), Modeling and Simulation of ATC and Evaluation of ATC Models.

Approximately two hundred reports were identified as describing Air Traffic Control (ATC) modeling and simulation efforts. Of these, about ninety analytical and simulation models dealing with virtually all aspects of ATC were formally evaluated. The bibliography lists all the reports identified. There is an introduction to, and a summary of the evaluation efforts as of this publication. The summary also contains a preliminary indication of which models may be of value for ATC concept evaluation; specifically traffic flow, safety and system loading aspects of proposed concepts. The remainder of the document is a catalog of the written evaluation of the ATC models. The models are divided into seven categories: (A) Airport Surface Traffic, (B) Runway, Departure/Arrivals, (C) Terminal Area, (D) Enroute, (E) ATC Systems (and miscellaneous), (F) Cost-Effectiveness Models, and (G) Safety Related Models. The catalog will be updated periodically.

1. AERONAUTICS

**DOT-TSC-FAA-71-8 Transportation Systems Center
LINEARIZED MATHEMATICAL MODELS FOR DEHAVILLAND CANADA "BUFFALO & TWIN OTTER" STOL TRANSPORTS**

R. A. MacDonald, Mel Garelick and J. O'Grady, FA18, Technical Note.

Aircraft Math Models and STOL Aircraft Stability & Control.

Linearized six degree of freedom rigid body aircraft equations of motion are presented in a stability axes system. Values of stability derivatives are estimated for two representative STOL aircraft — the DeHavilland of Canada "Buffalo" and "Twin Otter." These estimates are based on analytical expressions included in the report. The combination of the equations of motion and the estimated stability derivatives provides an aircraft model which is useful for Navigation, Guidance and ATC Studies. Resulting transient responses to control inputs are presented.

**DOT-TSC-FAA-71-11 Transportation Systems Center
SIMULATION MODEL FOR THE PIPER PA-30 LIGHT MANEUVERABLE AIRCRAFT IN THE FINAL APPROACH**

Joseph S. Kozioł, Jr., FA07, Technical Memorandum, June 1971, 21 pp.

Light Maneuverable aircraft, autopilot model, final approach and simulation studies.

This report describes the Piper PA-30 "Twin Comanche" aircraft and a representative autopilot during the final approach configuration for simulation purposes. The aircraft is modeled by linearized six-degree-of-freedom perturbation equations referenced to the aircraft stability axis. Other equations are presented which derive the body axis rates, velocities and accelerations, and ground referenced velocities (translation equations). The autopilot is a representative system for automatic ILS approaches from initial localizer track down to decision height. The glideslope system is engaged by approaching the glidepath at constant altitude (usually in the altitude hold mode) on the localizer beam. The pilot must take over manually at the decision height since light aircraft are not normally equipped with automatic flare capability. The aircraft autopilot model described herein has been used extensively in simulation studies at TSC and exhibits the expected behavior.

**DOT-TSC-FAA-71-13 Transportation Systems Center
FINAL REPORT: OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 71**

Ronald M. Hershkowitz, FA04, Technical Report, June 1971.

Air Traffic Control, Collision Risk Model, Inertial Navigation and Separation Standards Surveillance.

For primary bibliographic entry, see Field 17.

**DOT-TSC-FAA-71-14 Transportation Systems Center
REAL-TIME SIMULATION PROGRAM FOR DE HAVILLAND (CANADA) "BUFFALO" AND "TWIN OTTER" STOL TRANSPORTS**

R. A. MacDonald, Mel Garelick and J. Haas, FA18, Technical Note, June 1971.

Aircraft Math Models, STOL Aircraft Stability and Control, and Aircraft Simulation.

Simulation models of two representative STOL aircraft — the DeHavilland (Canada) "Buffalo" and "Twin Otter" transports — have been generated. The aircraft are described by means of non-linear equations that will accommodate gross changes in angle of attack, pitch angle, flight path angle, velocity, and power setting. Aircraft motions in response to control inputs and external disturbances are related to Earth-fixed coordinates. The equations are programmed to run in "real time" so that they can be used in conjunction with a manned cockpit simulator. Provisions are made for pilot control inputs to the simulation, and conventional panel display parameters are generated. The report includes representative simulation results which demonstrate that the simulation is an adequate representation of the two STOL aircraft being modeled.

**DOT-TSC-FAA-71-15 Transportation Systems Center
LARGE SCALE SYSTEMS — A STUDY OF COMPUTED ORGANIZATIONS FOR AIR TRAFFIC CONTROL APPLICATIONS**

John Dumanian and David Clapp, FA03, Technical Report, June 1971, 152pp.

Computers, NAS Stage A Data Processing and ARTS III Data Processing.

For primary bibliographic entry, see Field 9.

**DOT-TSC-FAA-71-16 Transportation Systems Center
SYSTEM RELIABILITY AND RECOVERY**

Charles A. Dancy, III, FA03, Technical Report, June 1971, 61 pp.

Reliability, recovery, reconfiguration, multiprocessor architecture, failsafe/soft.

For primary bibliographic entry, see Field 9.

**DOT-TSC-FAA-71-17 Transportation Systems Center
TIME/FREQUENCY SYSTEMS**

E. H. Farr, L. A. Frasco, H. D. Goldfein and R. M. Snow, Technical Report, June 1971, 82 pp.

Time/Frequency, Multipath, ATC Systems and Coding.

For primary bibliographic entry, see Field 17.

**DOT-TSC-FAA-71-19 Transportation Systems Center
CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM**

George W. Wagner, G. G. Heroules and W. E. Brown, FA2 Annual Report FY71 July 1, 1970 — June 30, 1971, 47 p Radiometer.

For primary bibliographic entry, see Field 17.

**DOT-TSC-FAA-71-20 Transportation Systems Center
DISPERSED PROCESSING FOR ATC**

G. G. Paul & R. M. Snow, FA03, Interim Technical Report, June 1971, 16 pp.

Dispersed Processing, Air Traffic Control, Remote Tracking Data Link, Intermittent Positive Control, Discrete Addressing.

For primary bibliographic entry, see Field 9.

4. ATMOSPHERIC SCIENCES

DOT-TSC-FAA-71-23 Transportation Systems Center COMPUTER SYSTEMS PERFORMANCE MEASUREMENT TECHNIQUES

Judith Gertler, Herbert Glynn, Vivian Hobbs and Frederick Woolfall, FA03, Technical Report, June 1971, 71 pp.

Computer Measurements, ARTS III Data Processing, Executive Systems and Simulation.

For primary bibliographic entry, see Field 9.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON, D.C. 20590

DOT-TSC-NASA-71-5 Transportation Systems Center LABORATORY EVALUATION OF FECKER AND LORAL OPTICAL IR PWI SYSTEMS

Mark Gorstein, James N. Hallock, Maurice Houten and Igan G. McWilliams, Technical Report, February 1971, 81 pp.

Electro-Optical PWI, Flashing Xenon Strobe, Fault Correction, Calibrate in Azimuth and Elevation and Range.

For primary bibliographic entry, see Field 17.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D. C. 20590

DOT-TSC-OST-71-5 Transportation Systems Center AIRCRAFT EMISSIONS SURVEY

A. J. Broderick, W. F. Harriott, and R. A. Walter, OS10, Technical Memorandum, July 1, 1970 - March 31, 1971, Air Pollution, Gas Turbines, Emissions, Jet Engines, and Instrumentation.

This technical memorandum presents the preliminary results of a survey of transportation systems emissions monitoring requirements. Emissions of carbon monoxide, hydrocarbons, oxides of nitrogen and particulates from aircraft power plants, with emphasis on gas turbine engines, are considered. Measurement rationale for various types of aircraft is summarized. Instrumentation available for measuring these emissions is reviewed and a tabulation made of those techniques in current use. Instrumentation requiring further engineering development is briefly discussed.

DOT-TSC-OST-71-8 Transportation Systems Center A REVIEW OF AVAILABLE L-BAND AND VHF AIR- CRAFT ANTENNAS FOR AN AIRCRAFT-SATELLITE COMMUNICATIONS LINK

Telecommunications Division, OS08, Technical Report, May 1971, 93 pp.

L-Band Antenna, VHF Antenna, Slot-Dipole Antenna, and Boeing

For primary bibliographic entry, see Field 17.

DOT-TSC-OST-71-12 Transportation Systems Center AN AIRPORT AIRSIDE SYSTEM MODEL

Irwin Englander, OS04, Technical Report, June 1971

For primary bibliographic entry, see Field 9.

2. AGRICULTURE

No reports.

3. ASTRONOMY AND ASTROPHYSICS

Includes the following Groups: Astronomy; Astrophysics; Celestial Mechanics.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C. 20590

DOT-TSC-NASA-71-13 Transportation Systems Center MEASUREMENTS OF TRANS-ATMOSPHERIC ATTENUA- TION STATISTICS AT THE MICROWAVE FREQUEN- CIES: 15, 19, AND 34 GHz

G. G. Haroules, W. E. Brown, III, G. J. Bishop, Technical Report, June 1971

Earth-to-space paths, Electromagnetic Wave Propagation, and Atmospheric Attenuation.

Attenuation statistics resulting from a twelve month observation program are presented. The sun is used as a source of microwave radiation. The dynamic range of atmospheric attenuation measurement capability is in excess of 30 dB. Solar radiation characteristics with amplitude variations of a few percent are easily measured while at the same time provision is made to accommodate a 10 dB range above the quiet sun level if major solar flare activity occurs. The solar phenomenon was extracted from the data since it is not an objective of the measurement program. A discussion and analysis of the measurement technique is presented in support of the experimental data.

4. ATMOSPHERIC SCIENCES

Includes the following Groups: Atmospheric Physics; Meteorology.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C. 20590

DOT-TSC-NASA-71-6 Transportation Systems Center ATMOSPHERIC TRANSMISSION HANDBOOK: A SUR- VEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 kHz (100 km) - 3,000 THz (0.1 μ m).

W. I. Thompson, III, Technical Report, February 1971, 300 pp.

Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio Microwave, and Ultraviolet.

For primary bibliographic entry, see Field 17.

6. BIOLOGICAL AND MEDICAL SCIENCES

DOT-TSC-NASA-71-13 Transportation Systems Center **MEASUREMENTS OF TRANSATMOSPHERIC ATTENUATION STATISTICS AT THE MICROWAVE FREQUENCIES: 15, 19 and 34 GHz**

G. G. Haroules, W. E. Brown, III, G. J. Bishop, Technical Report, June 1971.

Earth-to-space paths, Electromagnetic Wave Propagation, and Atmospheric Attenuation

For primary bibliographic entry, see Field 3.

5. BEHAVIORAL AND SOCIAL SCIENCES

Includes the following Groups: Administration and Management, Documentation and Information Technology; Economics; History, Law, and Political Science; Human Factors Engineering; Humanities; Linguistics; Man-machine Relations; Personnel Selection, Training, and Evaluation; Psychology (Individual and Group Behavior); Sociology.

FEDERAL AVIATION ADMINISTRATION WASHINGTON, D.C. 20590

DOT-TSC-FAA-71-2 Transportation Systems Center **HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**

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Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, and Display Problems.

For primary bibliographic entry, see Field 1.

OFFICE OF THE SECRETARY OF TRANSPORTATION, WASHINGTON, D. C. 20590

DOT-TSC-OST-71-7 Transportation Systems Center **VEHICULAR TRAFFIC FLOW THEORY AND TUNNEL TRAFFIC FLOW MEASUREMENTS**

G. Chin, L. Jordan, D. Kahn, S. Morin, and P. Yoh, OS12, Technical Report, June 1971, 221 pp.

Traffic Flow, Tunnel Traffic, Congestion, and Airport Access.

For primary bibliographic entry, see Field 13.

DOT-TSC-OST-71-9 Transportation Systems Center **MODELING TRANSPORTATION SYSTEMS: AN OVERVIEW**

George Kovatch and George Zames, Service Technology Corp., Cambridge, OS12, Technical Report, June 1971.

Transportation Modeling and Transportation Planning

The purpose of this report is to outline the role of systems analysis and mathematical modeling in the planning of transportation systems. The planning process is divided into three sectors (demand, supply, and policy) reflecting the demand for transportation services by the public, the ability of the system to deliver these services, and the effects of

management policies on the equilibration between supply and demand. The composition of each sector is examined and illustrated by samples from recent major transportation studies and the modeling literature. Emphasis is placed on structure, dynamics, and feedback effects.

DOT-TSC-OST-71-11 Transportation Systems Center **PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST ANALYSIS**

George Kovatch and George Zames, Service Technology Corporation, Cambridge, OP01, Final Report: October 1970 - August 1971.

Transportation Systems Analysis, PRT Systems, and Urban Transportation.

In this report a preliminary systems analysis of the Personalized Rapid Transit System concept is given. It includes presentation of the significant advantages and disadvantages of the concept. Questions of system capacity, station capacity, urban grid design, and headway requirements are addressed. A review of current manufacturers' concepts is given with a functional classification of their major characteristics. Major component and system needs, which require further research and analysis, are described. A brief discussion of cost factors is also given.

DOT-TSC-DLM-71-1 Transportation Systems Center **AUTOMATED PATENT REPORTING SYSTEM**

H. E. Farmer & C. J. Caso, Technical Note, June 1970 - September 71, 45 pp.

Patent and Invention.

For primary bibliographic entry, see Field 9.

6. BIOLOGICAL AND MEDICAL SCIENCES

Includes the following Groups: Biochemistry; Bioengineering; Biology; Bionics; Clinical Medicine; Environmental Biology; Escape, Rescue, and Survival; Food, Hygiene and Sanitation; Industrial (Occupational) Medicine; Life Support; Medical and Hospital Equipment; Microbiology Personnel Selection and Maintenance (Medical); Pharmacology; Physiology; Protective Equipment; Radiobiology Stress Physiology; Toxicology; Weapon Effects.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D.C. 20590

DOT-TSC-OST-71-5 Transportation Systems Center **AIRCRAFT EMISSIONS SURVEY**

A. J. Broderick, W. F. Harriott, and R. A. Walter, OS10 Technical Memorandum, July 1, 1970 - March 31, 1971.

Air Pollution, Gas Turbines, Emissions, Jet Engines, and Instrumentation.

For primary bibliographic entry, see Field 1.

9. ELECTRONICS AND ELECTRICAL ENGINEERING

7. CHEMISTRY

Includes the following Groups: Chemical Engineering, Inorganic Chemistry; Organic Chemistry; Physical Chemistry, Radio and Radiation Chemistry

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C. 20590

DOT-TSC-NASA-71-6 Transportation Systems Center
ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 kHz (100 km) - 3,000 THz (0.1 μ m)

W. I. Thompson, III, NA10, Technical Report, February 1971, 300 pp.

Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, and Ultraviolet.

For primary bibliographic entry, see Field 17.

DOT-TSC-NASA-71-9 Transportation Systems Center
METALLIZATION FAILURES

Rosemary Beatty, NA08, Technical Report, May 1971, 116 pp.

Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, and Beam Lead Technology.

For primary bibliographic entry, see Field 9.

8. EARTH SCIENCES AND OCEANOGRAPHY

Includes the following Groups: Biological Oceanography; Cartography; Dynamic Oceanography; Geochemistry; Geodesy; Geography; Geology and Mineralogy; Hydrology and Limnology; Mining Engineering; Physical Oceanography; Seismology; Snow, Ice, and Permafrost; Soil Mechanics; Terrestrial Magnetism.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D.C. 20590

DOT-TSC-NASA-70-1 Transportation Systems Center
EARTH SURVEY BIBLIOGRAPHY: A KWIC INDEX OF REMOTE SENSING INFORMATION

W. I. Thompson, III, NA12, Technical Report, February 1971, 265 pp.

Earth Resources, Infrared, Radar, Visible, and Microwaves.

This bibliography represents a collection of 1650 bibliographic citations on remote sensing of the physical characteristics of the Earth. This bibliography is intended to be used as a source document leading to additional information.

DOT-TSC-NASA-71-6 Transportation Systems Center
ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 kHz (100 km) - 3,000 THz (0.1 μ m)

W. I. Thompson, III, NA10, Technical Report, February 1971, 300 pp.

Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, and Ultraviolet.

For primary bibliographic entry, see Field 17.

9. ELECTRONICS AND ELECTRICAL ENGINEERING

Includes the following Groups; Components; Computers; Electronic and Electrical Engineering; Information Theory; Subsystems; and Telemetry.

FEDERAL AVIATION ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-FAA-71-1 Transportation Systems Center
EN ROUTE AIR TRAFFIC FLOW SIMULATION

M. F. Medeiros, Jr., FA17, Technical Report, January 1971

This report covers the conception, design, development, and initial implementation of an advanced simulation technique applied to a study of national air traffic flow and its control by En Route Air Route Traffic Control Centers (ARTCC). The program was constructed at TSC under PPA FA17 (FY 70), and had also been submitted as a term project by the author. It is intended to be the first step in gaining an insight into the nature of the national flow control problem and into the utility and limitations of digital simulation for that end. A flexible digital computer implemented simulation has been developed which provides a family of model configurations and simulated environments for the U.S. air traffic system, restricted to positive controlled high altitude airspace. Exploitation, validation, and verification of this simulation model are just beginning. This report describes the purpose, design, development, and initial implementation of the simulation and presents future plans. Detailed information on the design and program structure is presented in the Appendices.

DOT-TSC-FAA-71-2 Transportation Systems Center
HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK

Edwin H. Hilborn, FA16, Technical Memo, July 1970 - January 1971, 18 pp.

9. ELECTRONICS AND ELECTRICAL ENGINEERING

Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, and Display Problems.

For primary bibliographic entry, see Field 1.

DOT-TSC-FAA-71-3 Transportation System Center **CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM. THE BASIC, LEVEL 1 MODEL**

A. N. de Hollan and A. S. Priver, FA06, Technical Report, April 1971, 44 pp.

Conceptual Transportation Systems Model, Flight Simulation, Input Package, and Output Package.

A basic conceptual model of the entire Air Transportation System is being developed to serve as an analytical tool for studying the interactions among the System elements. The model is being designed to function in an interactive computer graphics environment which permits rapid alteration of rules and parameters, as well as continuous real-time graphical monitoring of system operations. The model described here is the first member in an evolving hierarchy of increasingly complex models, progressing in the direction of closer approximation to the real-world Air Transportation System.

DOT-TSC-FAA-71-14 Transportation Systems Center **REAL-TIME SIMULATION PROGRAM FOR DE HAVILLAND (CANADA) "BUFFALO" AND "TWIN OTTER" STOL TRANSPORTS**

R. A. MacDonald, Mel Garelick, and J. Haas, FA18, Technical Note, June 1971.

Aircraft Math Models, STOL Aircraft Stability and Control, and Aircraft Simulation.

For primary bibliographic entry, see Field 1.

DOT-TSC-FAA-71-15 Transportation Systems Center **LARGE SCALE SYSTEMS - A STUDY OF COMPUTER ORGANIZATIONS FOR AIR TRAFFIC CONTROL APPLICATIONS**

J. Dumanian and D. Clapp, FA03, Technical Report, June 1971, 152 pp.

Computers, NAS Stage A Data Processing, and ARTS III Data Processing.

Based on current sizing estimates and tracking algorithms, some computer organizations applicable to future air traffic control computing systems are described and assessed. Hardware and software problem areas are defined and solutions are outlined. System evaluation criteria are presented.

Section 1: delineates the objectives and approach, and furnishes definitions of computer hardware and software;

Section 2: presents the ATC data processing requirements: the anticipated traffic, the computer processing rates, and the methods for analyzing computer performance;

Section 3: describes current computing systems with capabilities for usage in near future ATC applications;

Section 4: denotes the algorithms which are to be used in the projected ATC programs;

Section 5: sums up the future prospects in ATC data processing, assesses the risks and points out some future work efforts.

DOT-TSC-FAA-71-16 Transportation Systems Center **SYSTEM RELIABILITY AND RECOVERY**

C. A. Dancy, III, FA03, Technical Report, June 15, 1971, 61 pp.

Reliability, recovery, reconfiguration, multiprocessor, and failsafe/soft.

This study exhibits a variety of reliability techniques applicable to future ATC data processing systems. Presently envisioned schemes for error detection, error interrupt and error analysis are considered, along with methods of retry reconfiguration, task rescheduling and system restart. Reliability data are accumulated on present and planned ATC data processing systems and on certain commercial, military, and experimental computers having features applicable to future ATC tasks. Included as well are discussions of reliability concepts, methods of reliability determination and criteria for judging system reliability and capability for recovery. This work is connected with FA03-1, Large Scale Systems

DOT-TSC-FAA-71-20 Transportation Systems Center **DISPERSED PROCESSING FOR ATC**

G. G. Paul & R. M. Snow, FA03, Interim Technical Report June 1971, 16 pp.

Dispersed Processing, Air Traffic Control, Remote Tracking Data Link, Intermittent Positive Control, Discrete Addressing.

An analysis has been made of the potentialities and problems involved in assigning some computer processing and control functions to the remote sites in an upgraded third generation air traffic control system. Interrogator sites offer the most fruitful opportunities for remote processing. The minimal remote processing configuration consists of extraction, compaction, and encoding of locally derived data. With concurrent remote tracking, additional tasks may be added including roll call generation, data link management, ground communications management, and IPC service. Phased-array management is considered to be the function of a separate dedicated controller. Attention is directed to the need for a "orderwire" net to avoid problems of floating control.

DOT-TSC-FAA-71-23 Transportation Systems Center **COMPUTER SYSTEMS PERFORMANCE MEASUREMENT TECHNIQUES**

J. Gertler, H. Glynn, V. Hobbs, and F. Woolfall, FA03, Technical Report, June 1971, 71 pp.

Computer Measurements, ARTS III Data Processing, Executive Systems, and Simulation.

Computer system performance measurement techniques, tools, and approaches are presented as a foundation for future recommendations regarding the instrumentation of the ARTS ATC data processing subsystem for purposes of measurement and evaluation.

Section 1: Introduces the subject of computer system performance measurement and states objectives.

Section 2: Defines several computer system measurement approaches, describes the event-monitoring and statistical sampling software techniques, and discusses the various phases of a measurement process.

Appendix A: Defines the role of an Executive System in diverse computing environments and its effects.

fect on the design of a measurement package, discusses fundamental operational concepts of Executive Systems, and reviews ARTS III in terms of those concepts.

Appendix B: Surveys the state-of-the-art of available simulation languages and packages, summarizes their salient characteristics and provides guidelines for evaluation and selection of a simulation capability.

FEDERAL HIGHWAY ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-FHWA-71-1 Transportation Systems Center AUTOMATIC DATA REDUCTION FROM AERIAL PHOTOGRAPHS - PHASE I REPORT

J. G. Raudseps & D. S. Preraw, HW05, Technical Report, July 1970 - June 1971, 119 pp.

For primary bibliographic entry, see Field 13.

FEDERAL RAILROAD ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-FRA-71-1 Transportation Systems Center POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES

F. L. Raposa, RR05, Interim Technical Report, February 1971, 65 pp, Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, Wayside Electric Power Sources

For primary bibliographic entry, see Field 21.

DOT-TSC-FRA-71-1A Transportation Systems Center POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES

F. L. Raposa, RR05, Interim Technical Report, February 1971, 65 pp, Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, Wayside Electric Power Sources

For primary bibliographic entry, see Field 21.

DOT-TSC-FRA-71-2 Transportation Systems Center METROLINER AUXILIARY POWER ELECTRICAL SYSTEM RELIABILITY STUDY

J. D. Abbas and C. W. Watt, Jr., RR06, Interim Report, June 1971, 135 pp.

For primary bibliographic entry, see Field 21.

DOT-TSC-FRA-71-3 Transportation Systems Center TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS

J. B. Hopkins and M. E. Hazel, RR02, Technical Report, June 1971

Grade crossing protection, train detection, microwave telemetry, railroad signals

For primary bibliographic entry, see Field 13.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C. 20590

DOT-TSC-NASA-71-9 Transportation Systems Center METALLIZATION FAILURES

R. Beatty, NA08, Technical Report, May 1971, 116 pp.

Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, and Beam Lead Technology.

Metallization-related failure mechanisms are a major cause of integrated circuit failures under accelerated stress and field operations. Industry's approach has been, (1) a better understanding of the aluminum system, now the most widely used material, and (2) evaluation of alternative metal systems. The newer and more complex multilevel metallization systems require low temperature deposition techniques and critical etching-through methods due to smaller geometry and closer spacing. Aluminum metallization offers many advantages, but also has limitations. Alternative materials are being considered for large scale integrated arrays. This survey defines the merits and restrictions of metallization systems in current usage and those under development. Although no specific recommendations are made references can be drawn from the data presented. The advanced state of beam lead technology is apparent.

DOT-TSC-NASA-71-10 Transportation Systems Center EVALUATION OF NONDESTRUCTIVE TENSILE TESTING

J. J. Bowe and S. M. Polcari, NA08, Technical Report, May 1971

Semiconductor Devices, Nondestructive Testing, and Chip and Wire Bonding.

This report presents the results of a series of experiments performed in the evaluation of nondestructive tensile testing of chip and wire bonds. Semiconductor devices were subjected to time-temperature excursions, static-load life testing and multiple pre-stressing loads to determine the feasibility of a nondestructive tensile testing approach. The report emphasizes the importance of the breaking angle in determining the ultimate tensile strength of a wire bond, a factor not generally recognized nor implemented in such determinations.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, WASHINGTON, D. C. 20591

DOT-TSC-NHTSA-71-1 Transportation Systems Center OCCUPANT MOTION SENSORS

J. L. Horner, PH.D., HS05, Technical Report, July 1970 - January 1971, 54 pp.

Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, and Transducers.

For primary bibliographic entry, see Field 13.

DOT-TSC-NHTSA-71-4 Transportation Systems Center OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS

J. L. Horner, D. S. Ofsevit, G. R. Plank, and G. G. Lawrence, HS05, Technical Report, July 1971, 55 pp.

Bandwidth, Rotational Motion, Fourier Analysis, Sensor, Transducer, Acceleration, Angular Motion, and Digital Filtering.

For primary bibliographic entry, see Field 13.

9. ELECTRONICS AND ELECTRICAL ENGINEERING

OFFICE OF THE SECRETARY OF TRANSPORTATION, WASHINGTON, D. C. 20590

DOT-TSC-OST-71-2 Transportation Systems Center PROGRAMMER'S REFERENCE MANUAL FOR DYNAMIC DISPLAY SOFTWARE SYSTEM

OS03, Technical Report, January 1971

In 1968, the display systems group of the Systems Laboratory of the NASA/Electronics Research Center undertook a research task in the area of computer controlled flight information systems for aerospace application. The display laboratory of the Transportation Systems Division of the Transportation Systems Center for the Department of Transportation is the direct descendant of the above display laboratory. The vehicle for conducting this research consists of a Honeywell DDP-516 computer interfaced with a Sanders Associates ADDS/900 graphical display generator that controls various CRT devices. Input devices for indicating user response, including light pen, tablet, track ball and others can be interfaced with the computer and monitored by a simulation program.

With the Dynamic Display Software System, the user can interactively create the geometric characteristics of the desired display and specify dynamic linkages with a program to simulate the display environment. After the desired set of indicators is specified, the system serves as a simple real-time simulator to evaluate the usefulness of the displays. In addition, the system may run on-line with PDP-10, which allows display of conditions in a more complicated simulation environment. The user has the capability of making changes to previously created indicators to provide an evolutionary means of developing environment indicator systems. The system is described in this manual.

DOT-TSC-OST-71-3 Transportation Systems Center TRIP-THE TRANSPORTATION ROUTING AND INTER- MODAL PLANNING SYSTEM: AN AID FOR TODAY'S TRAVELER

George Kovatch and Jack Taub, Service Technology Corp., Cambridge, OS12, Technical Report, January 1971, 35 pp. TRIP, Computer Display Technology, and Comparative Cost and Time Data.

The Transportation Routing and Intermodal Planning (TRIP) System was conceived as an aid to today's traveler. It assumes a traveler wishes to choose from all available modes of transportation generally air, automobile, rail, and bus. It is based on the utilization of current computer display technology. The TRIP System accepts information from the traveler in real time while the traveler sits at an input terminal. The information described the individual travel needs and desires. The computer produces actual travel plans with comparative cost and time data for each mode. Results of a demonstration on existing TSC computer equipment are reported. (In this report, the concept is described and possibilities for future development and potential application are given.)

DOT-TSC-OST-71-6 Transportation Systems Center TRAFFIC CIRCLE MODEL

I. Englander, OS12, Preliminary Memorandum, May 1971, 14 pp.

Dynamic Model, Traffic Circle, and CRT Display Terminal.

This report describes a dynamic model of a traffic circle which has been implemented on a CRT display terminal.

The model includes sufficient parameters to allow changes in the structure of the traffic circle, the frequency of traffic introduced to the circle by each entering road, the model of entering the circle (right of way), the frequency of traffic leaving the circle by each road, and vehicular spacing toward the circle.

DOT-TSC-OST-71-11 Transportation Systems Center PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST ANALYSIS

George Kovatch and George Zames, Service Technology Corp., OP01, Final Report: October 1970 - August 71 Transportation Systems Analysis, PRT Systems, and Urban Transportation.

For primary bibliographic entry, see Field 5.

DOT-TSC-OST-71-12 Transportation Systems Center AN AIRPORT AIRSIDE SYSTEM MODEL

I. Englander, OS04, Technical Report, June 1971

This model of an airport airside system simulates aircraft operations and controller functions in the terminal area, both in the air and on the ground. The model encompasses all operations between the terminal gate and the point of handoff between the enroute controller and the terminal controller.

DOT-TSC-DLM-71-1 Transportation Systems Center AUTOMATED PATENT REPORTING SYSTEM

H. E. Farmer & C. J. Caso, Technical Note, July 1970 - September 71, 45 pp.

Patent and Invention.

This report represents complete documentation of the Automated Patent Reporting Systems (APRS) currently in operation at the Transportation Systems Center. The APRS was developed to satisfy TSC and DOT patent reporting needs. It has been designed to operate in a batch mode on an IBM-7094. Programming is in COBOL in order to simplify potential conversions to the maximum extent possible. The eleven reports generated by the APRS fall into three major groups: (1) docket information, (2) category information, and (3) summary reports. Samples of the reports generated are contained in Appendix A to this document.

The APRS works very well, and we are glad to share our system with others. Any Patent Counsel wishing to implement the Automated Patent Reporting System should forward this document to his data processing personnel for reference.

URBAN MASS TRANSPORTATION ADMINISTRATION, WASHINGTON, D. C. 20590

DOT-TSC-UMTA-71-3 Transportation Systems Center BIBLIOGRAPHY ON GROUND VEHICLE COMMUNICA- TION & CONTROL: A KWIC INDEX

W. I. Thompson, III, UM03, Annual Report; Vol. II, July 1971, 191 pp.

Bibliography.

For primary bibliographic entry, see Field 13.

13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

10. ENERGY CONVERSION (NON—PRO—PULSIVE)

No reports.

11. MATERIALS

Includes the following Groups: Adhesives and Seals; Ceramics, Refractories, and Glasses; Coatings, Colorants, and Finishes; Composite Materials; Fibers and Textiles; Metallurgy and Metallography; Miscellaneous Materials; Oils, Lubricants, and Hydraulic Fluid; Plastics; Rubbers; Solvents, Cleaners, and Abrasives; Wood and Paper Products.

UNITED STATES COAST GUARD WASHINGTON, D. C. 20591

DOT—TSC—USCG—71—7 Transportation Systems Center AN INVESTIGATION OF OIL FLUORESCENCE AS A TECHNIQUE FOR THE REMOTE SENSING OF OIL SPILLS

J. F. Fantasia, T. M. Hard and H. C. Ingrao, CG03, Technical Progress Report — July 1, 1970 — June 30, 1971

Oil Spills, Oil, Remote Sensing, Oil Fluorescence, and Laser
For primary bibliographic entry, see Field 17.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C. 20590

DOT—TSC—NASA—71—9 Transportation Systems Center METALLIZATION FAILURES

R. Beatty, Technical Report, May 1971

Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, and Beam Lead Technology.

For primary bibliographic entry, see Field 9.

DOT—TSC—NASA—71—10 Transportation Systems Center EVALUATION OF NONDESTRUCTIVE TENSILE TESTING

J. J. Bowe and S. M. Polcari, NA08, Technical Report, May 1971

Semiconductor Devices, Nondestructive Testing, and Chip and Wire Bonding.

For primary bibliographic entry, see Field 9.

12. MATHEMATICAL SCIENCES

No reports.

13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

Includes the following Groups: Air Conditioning, Heating, Lighting and Ventilating; Civil Engineering; Con-

struction Equipment, Materials, and Supplies; Containers and Packaging; Couplings, Fittings, Fasteners, and Joints; Ground Transportation Equipment; Hydraulic and Pneumatic Equipment; Industrial Processes; Machinery and Tools; Marine Engineering; Pumps, Filters, Pipes, Fittings, Tubing, and Valves; Safety Engineering; Structural Engineering.

UNITED STATES COAST GUARD WASHINGTON, D. C. 20591

DOT—TSC—CG—71—1 Transportation Systems Center SURVEY OF METEOROLOGICAL REMOTE SENSORS

A. E. Barrington, CG04, Technical Memorandum, July 1, 1970 — May 15, 1971

Meteorology, Remote Sensing, Data Buoy, and Instrumentation.

For primary bibliographic entry, see Field 17.

DOT—TSC—CG—71—3 Transportation Systems Center TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION

J. R. Lifszitz and H. C. Ingrao, CG02, Technical Report, June 1971

Fog Bank Detection, LIDAR, Aid-to-Navigation, and Radiometer.

For primary bibliographic entry, see Field 17.

FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D. C. 20590

DOT—TSC—FHWA—71—1 Transportation Systems Center AUTOMATIC DATA REDUCTION FROM AERIAL PHOTOGRAPHS — PHASE I REPORT

J. Raudseps & D. S. Prerau, HW05, Technical Report, July 1970 — June 1971, 119 pp.

Aerial photographs are useful in various studies of highway traffic behavior. From a timed sequence of aerial photographs of a fixed highway area, one can find for each vehicle crossing the area data on position, velocity, trajectory (i.e., entrancing, lane changing, and exiting) and type (i.e., car, truck, or bus). In this project, an interactive system consisting of a computer, a computer-controlled flying-spot scanner, and a graphics tablet is utilized to significantly automate the data reduction process. This report describes the current state-of-the-art of data reduction and the system being developed. The pertinent computer programs developed to date are documented in detail.

FEDERAL RAILROAD ADMINISTRATION WASHINGTON, D. C. 20590

DOT—TSC—FRA—71—1 Transportation Systems Center POWER CONDITIONING FOR HIGH—SPEED TRACKED VEHICLES

F. L. Raposa, RR05, Interim Technical Report, February 1971, 65 pp.

Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, and Wayside Electric Power Sources.

For primary bibliographic entry, see Field 21.

13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

DOT-TSC-FRA-71-1A Transportation Systems Center POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES

F. L. Raposa, RR05, Interim Technical Report, February 1971, 65 pp.

Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, and Wayside Electric Power Sources.

For primary bibliographic entry, see Field 21.

DOT-TSC-FRA-71-2 Transportation Systems Center METROLINER AUXILIARY POWER ELECTRICAL SYSTEM RELIABILITY STUDY

J. D. Abbas and C. W. Watt, Jr., RR06, Interim Report, June 1971, 135 pp.

For primary bibliographic entry, see Field 21.

DOT-TSC-FRA-71-3 Transportation Systems Center TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS

J. B. Hopkins and M. E. Hazel, RR02, Technical Report, June 1971

Grade crossing protection, train detection, microwave telemetry, and railroad signals

The constraints on innovative grade crossing protective systems are delineated and guidelines for development indicated. Inventory data have been arranged to permit an estimate of the classes of systems needed, the allowable costs, and contribution of various types of crossings to accidents. Many crossings warrant very limited expense and account for very few deaths. A number of approaches are possible for the intermediate cost classes, based on use of conventional signals with low-cost activation systems. Use of similar elements, singly or in combination, can also improve effectiveness of more expensive systems. The very high cost locations may well benefit from interconnection of train and vehicle detectors and small computers.

Extensive analysis and laboratory investigation has been carried out relating to a microwave telemetry alternative to conventional track circuits and possible crossing-located radar and impedance train detection systems.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C. 20590

DOT-TSC-NASA-71-9 Transportations Systems Center METALLIZATION FAILURES

R. Beatty, NA08, Technical Report, May 1971, 116 pp.

Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Material, Integrated Circuit Design, and Beam Lead Technology.

For primary bibliographic entry, see Field 9.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, WASHINGTON, D. C. 20591

DOT-TSC-NHTSA-71-1 Transportation Systems Center OCCUPANT MOTION SENSORS

J. L. Horner, Ph.D., HS05, Technical Report July 1970 - January 1971, 54 pp.

Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, and Transducers.

An analysis has been made of methods for measuring vehicle occupant motion during crash or impact conditions. The purpose of the measurements is to evaluate restraint system performance using human, anthropometric dummy, or animal occupants. A detailed Fourier frequency analysis is made of the sensor requirements. Potential candidate systems are evaluated, and five of these recommended for further development and field testing.

DOT-TSC-NHTSA-71-3 Transportation Systems Center DEVELOPMENT OF ANTICIPATORY AUTOMOBILE CRASH SENSORS

Hopkins, Holmstrom, Aprga, Hazel, White, and Newfell, HS04, Annual Report July 1, 1970 - June 30, 1971
Automobile Safety, Occupant Protection, Passive Restraint Activation, and Anticipatory Crash Sensing.

A comprehensive examination is carried out to determine the basic system constraints and required operational characteristics for anticipatory sensing of impending automobile crashes. This is followed by consideration of a wide variety of possible sensing techniques and selection of those deserving of further study. Two methods are chosen, microwave radar and ultrasonic sonar, and the advantages, weaknesses, and uncertain areas of both are delineated.

Realization of both sensors is described. The radar sensor comprising standard microwave components and solid state circuitry, has been installed on a test vehicle for characterization. Results are promising, but preliminary; the complexity of the sensing task and the reliability demands on the system require extensive analysis and testing before a conclusion can be drawn as to overall viability.

The sonar approach is a translation of the radar sensor into acoustic form. Transducers have been the subject of particular study and modification. Preliminary results suggest that environmental considerations and adequate target discrimination will be the major problem areas.

DOT-TSC-NHTSA-71-4 Transportation Systems Center OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS

J. L. Horner, D. S. Ofsevit, G. R. Plank, and G. G. Lawrence, HS05, Technical Report, July 1971, 55 pp.

Bandwidth, Rotational Motion, Fourier Analysis, Sensor Transducer, Acceleration, Angular Motion, and Digital Filtering.

A study has been made of methods for measuring occupant motion within a vehicle during crash or impact conditions. The purpose of the measurements is to evaluate restraint systems, using anthropometric dummy, animal, or human occupants. A list of general specifications for occupant motion sensors was drawn up. This was used to establish criteria for evaluation of proposed systems. From a study of various possible systems, five were selected for further development. These systems were built and prepared for field testing. In addition, computer methods for Fourier analysis of the data produced by these systems have been developed in theory and in programs for a digital computer.

**OFFICE OF THE SECRETARY
OF TRANSPORTATION,
WASHINGTON, D. C. 20590**

**DOT-TSC-OST-71-7 Transportation Systems Center
VEHICULAR TRAFFIC FLOW THEORY AND TUNNEL
TRAFFIC FLOW MEASUREMENTS**

G. Chin, L. Jordan, D. Kahn, S. Morin, and P. Yoh, OS12, Technical Report, June 1971, 221 pp.

Traffic Flow, Tunnel Traffic, Congestion, and Airport Access

Vehicular traffic flow has been investigated theoretically and experimentally in order that peak hour collective traffic flow dynamics be understood and that the peak hour flow through the Callahan Tunnel be improved by means of traffic flow control and modification. Two theoretical models are suggested, the finite reaction time model and the asymmetrical response model, as predictive of observed traffic density dynamics, wave growth and asymmetry. Experimentally, a traffic flow profile of capacities, vehicle speeds and traffic densities in the Callahan Tunnel has been obtained, and relationship between slowdown wave phenomena and traffic flow, determined. Based on these, it is suggested that traffic flow may be improved with traffic flow modification procedures.

**DOT-TSC-OST-71-9 Transportation Systems Center
MODELING TRANSPORTATION SYSTEMS: AN OVER-
VIEW**

George Kovatch and George Zames, Service Technology Corp., Cambridge, OS12, Technical Report, June 1971
Transportation Modeling and Transportation Planning.

For primary bibliographic entry, see Field 5.

**DOT-TSC-OST-71-10 Transportations Systems Center
TRANSPORTATION SYSTEMS TECHNOLOGY: A
TWENTY-YEAR OUTLOOK**

Service Technology Corp., Cambridge, G. Kovatch, J. B. Barber, R. F. Casey, and G. Zames, OP01, Final Report: October 1970 - August 1971

**Transportation Technology, Urban Transportation, and Inter-
urban Transportation.**

In this report an overall technology assessment of new and improved transportation systems is given. A broad survey has been made of new systems concepts for passenger and freight transportation in urban and interurban applications. Results of the findings are reported and projections of expected innovations and improvements are made along with discussion of some of the major limitations to wide scale applications over the next two decades. Recommendations for research and development emphasis in some of the more promising areas are given where possible although full analysis of cost factors and comparative analysis of competing systems were beyond the scope of this investigation.

**DOT-TSC-OST-71-11 Transportation Systems Center
PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST
ANALYSIS**

George Kovatch and George Zames, Service Technology Corp., Cambridge, OP01, Final Report: October 1970 - August 1971

Transportation Systems Analysis, PRT Systems, and Urban Transportation.

For primary bibliographic entry, see Field 5.

**URBAN MASS
TRANSPORTATION ADMINISTRATION,
WASHINGTON, D. C. 20590**

**DOT-TSC-UMTA-71-3 Transportation Systems Center
BIBLIOGRAPHY ON GROUND VEHICLE COMMUNICA-
TION & CONTROL: A KWIC INDEX**

W. I. Thompson, III, UM03, Annual Report; Vol. II, July 1971, 191 pp.

Bibliography.

This bibliography covers the subject of communication and control of ground vehicles. This covers the fields of land-mobile communication, computer aided traffic control, communication with high speed ground vehicles, and radio frequency noise. Emphasis is placed on the 150, 450 and 900 MHz frequency bands.

The bibliography has two indexes: a key word in context, KWIC index; and an author index. There are 1100 citations in the bibliography.

14. METHODS AND EQUIPMENT

Includes the following Groups: Cost Effectiveness; Laboratories, Test Facilities, and Test Equipment; Recording Devices; Reliability; Reprography.

**UNITED STATES COAST GUARD
WASHINGTON, D. C. 20591**

**TSC-USCG-71-7 Transportation Systems Center
AN INVESTIGATION OF OIL FLUORESCENCE AS A
TECHNIQUE FOR THE REMOTE SENSING OF OIL
SPILLS**

J. F. Fantasia, T. M. Hard, and H. C. Ingrao, CG03, Technical Progress Report - July 1, 1970 - June 30, 1971

Oil Spills, Oil, Remote Sensing, Oil Fluorescence, and Laser.

For primary bibliographic entry, see Field 17.

**FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D. C. 20590**

**DOT-TSC-FAA-71-7 Transportation Systems Center
EVALUATION OF AIR TRAFFIC CONTROL MODELS
AND SIMULATIONS**

L. O. Higgins and P. Mpontisikaris, Service Technology Corp., Cambridge, FA06, Technical Report, June 1971

Air Traffic Control (ATC), Modeling and Simulation of ATC, and Evaluation of ATC Models.

For primary bibliographic entry, see Field 1.

17. NAVIGATION, COMMUNICATIONS, DETECTION AND COUNTERMEASURE

**FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D. C. 20590**

**DOT-TSC-FRA-71-3 Transportation Systems Center
TECHNOLOGICAL INNOVATION IN GRADE CROSSING
PROTECTIVE SYSTEMS**

J. B. Hopkins and M. E. Hazel, RR02, Technical Report, June 1971

Grade crossing protection, train detection, microwave telemetry, and railroad signals.

For primary bibliographic entry, see Field 13.

**OFFICE OF THE SECRETARY
OF TRANSPORTATION
WASHINGTON, D. C. 20590**

**DOT-TSC-OST-71-3 Transportation Systems Center
TRIP-THE TRANSPORTATION ROUTING AND INTER-
MODAL PLANNING SYSTEM: AN AID FOR TODAY'S
TRAVELER**

G. Kovatch and J. Taub, OS12, Technical Report, January, 1971, 35 pp.

Computer Display Technology and Comparative Cost and Time Data.

For primary bibliographic entry, see Field 9.

**DOT-TSC-OST-71-11 Transportation Systems Center
PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST
ANALYSIS**

G. Kovatch and G. Zames, OP01, Final Report: October 1970 - August 1971

Transportation Systems Analysis, PRT Systems, and Urban Transportation.

For primary bibliographic entry, see Field 5.

15. MILITARY SCIENCES

No reports.

16. MISSILE TECHNOLOGY

No reports.

**17. NAVIGATION, COMMUNICATIONS,
DETECTION AND COUNTER-
MEASURES**

Includes the following Groups: Acoustic Detection; Communications; Direction Finding; Electromagnetic and Acoustic Countermeasures; Infrared and Ultraviolet Detection; Magnetic Detection; Navigation and Guidance; Optical Detection; Radar Detection; Seismic Detection.

**UNITED STATES COAST GUARD
WASHINGTON, D. C. 20591**

**DOT-TSC-CG-71-1 Transportation Systems Center
SURVEY OF METEOROLOGICAL REMOTE SENSORS**

A. E. Barrington, CG04, Technical Memorandum: July 1970 - May 1971

Meteorology, Remote Sensing, Data Buoy, and Instrumentation

The preliminary results of a survey are presented which identify techniques for determining meteorological data by remote sensing, applicable to automatic data buoy platforms. Both passive and active techniques are reviewed with emphasis on the former, in view of their more advanced development status. The principal references listed in the bibliography section of the memorandum indicate that experimental data to date have been obtained using only stable instrument platforms in a clean environment. Operation of unstable instrument platforms in the severe ocean environment requires further study.

**DOT-TSC-CG-71-3 Transportation Systems Center
TWO CANDIDATE SYSTEMS FOR UNMANNED FOG
BANK DETECTION**

J. R. Lifitz and H. C. Ingrao, Technical Report, June 1971
Fog Bank Detection, LIDAR, CG02, Aid-to-Navigation, and Radiometer.

The detection of coastal fog banks by remote sensing methods is discussed. The feasibility of laser backscattering (LIDAR) and infrared radiometry is explored in detail. These techniques are analyzed theoretically and experimental data are presented supporting the analysis. A design study is carried out for several laser systems, considering safety, reliability, cost, convenience, efficiency and maximum range. A fog bank detector utilizing a GaAs laser array is described which best satisfies these criteria. Before the prototype design is selected, a brief "in situ" test program is recommended, using apparatus designed at the Transportation Systems Center under Contract No. CG-02/99-712104 with the U. S. Coast Guard. In addition to clarifying several critical questions underlying the LIDAR design, the proposed test program would allow further evaluation of the infrared radiometric method. The latter technique, if its reliability can be verified, offers the advantages of being simpler and less expensive for fog bank detection than the LIDAR method.

**TSC-USCG-71-7 Transportation Systems Center
AN INVESTIGATION OF OIL FLUORESCENCE AS A
TECHNIQUE FOR THE REMOTE SENSING OF OIL
SPILLS**

J. F. Fantasia, T. M. Hard, and H. C. Ingrao, CG03, Technical Progress Report: July 1970 - June 1971

Oil Spills, Oil, Remote Sensing, Oil Fluorescence, and Laser

The feasibility of remote sensing of oil spills by laser excited oil fluorescence is investigated. The required parameters are measured in the laboratory; these parameters are fed into a physical model to predict signal and background level and the predictions are verified by field experiment. Airborne detection, identification, and quantification of oil spills at sea are shown to be feasible with existing equipment day or night.

17. NAVIGATION, COMMUNICATIONS, DETECTION AND COUNTERMEASURE

FEDERAL AVIATION ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-FAA-71-2 Transportation Systems Center **HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**

E. H. Hilborn, FA16, Technical Memo: July 1970 - January 1971, 18 pp.

Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, and Display Problems.

For primary bibliographic entry, see Field 1.

DOT-TSC-FAA-71-4 Transportation Systems Center **A FUNCTIONAL DESCRIPTION OF AIR TRAFFIC CONTROL**

J. R. Coonan and P. Mpontsikaris, FA06, Technical Note, March 1971, 81 pp.

ATC Event Sequence and ATC Functions.

This document contains a description of air traffic control in terms of generic operational functions. The functions are grouped by flight phase and by major system function (navigation, surveillance, control and communication). More detailed descriptions of these functions, and estimates of related parameters are contained in the appendix. A diagram is shown of the sequence of events for a typical IFR flight through the current ATC system. Also, certain aspects of ATC which cannot be described in terms of operational functions (e.g., legal responsibilities) are discussed.

DOT-TSC-FAA-71-5 Transportation Systems Center **THE IMPACT OF INERTIAL NAVIGATION ON AIR SAFETY**

R. M. Hershkowitz, D. O'Mathuna, and K. R. Britting, FA04, Technical Report, May 1971, 25 pp.

Inertial navigation, Collision risk model, En route navigation statistics, and Blunders.

An analysis of inertial navigation system performance data was carried out to assess the probable impact of inertial navigation on the aircraft collision risk in the North Atlantic region. These data were used to calculate the collision risk between two aircraft flying at the same nominal flight level on adjacent tracks. The inertial system's error sources are treated in a statistical sense to infer the en route error behavior from the terminal error data. Collision risk estimates are derived for easterly and westerly transatlantic flights. The results of this relatively conservative analysis shows that there is strong evidence to support the concept that the widespread use of inertial navigators will lead to reduced separation standards in the North Atlantic region while maintaining present safety standards.

DOT-TSC-FAA-71-6 Transportation Systems Center **COLLISION RISK MODEL FOR NAT REGION**

R. Hershkowitz, FA04, Technical Report, May 1971, 55 pp.

Collision Risk Model, Composite Problem, Vertical Separation, and Lateral Separation.

This paper reviews and summarizes the essential features of the collision risk model used to analyze the effects of separation standards on safety for the parallel tracking system employed in the North Atlantic. The derivation of the model is traced from a set of basic assumptions to formulation of various philosophies and a brief set of conclusions and recommendations for future work. Section VII contains a complete reference list.

DOT-TSC-FAA-71-7 Transportation Systems Center **EVALUATION OF AIR TRAFFIC CONTROL MODELS AND SIMULATIONS**

L. O. Higgins and P. Mpontsikaris, Service Technology Corp., Cambridge, FA06, Technical Report, June 1971

Air Traffic Control (ATC), Modeling and Simulation of ATC, and Evaluation of ATC Models.

For primary bibliographic entry, see Field 1.

DOT-TSC-FAA-71-13 Transportation Systems Center **FINAL REPORT: OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 71**

R. M. Hershkowitz, FA04, Technical Report, June 1971

Air Traffic Control, Collision Risk Model, Inertial Navigation, and Separation Standards Surveillance.

This report summarizes the oceanic surveillance and navigation analysis performed at Transportation Systems Center under PPA FA04 for FY 71. Three major efforts are reviewed and discussed herein: (1) a tutorial summary of the NAT/SPG collision risk model; (2) a study of the impact of inertial navigation on air safety; and (3) an investigation of the modeling techniques required to assess the effect of ATC satellite surveillance on separation standards in the North Atlantic region.

DOT-TSC-FAA-71-15 Transportation Systems Center **LARGE SCALE SYSTEMS - A STUDY OF COMPUTER ORGANIZATIONS FOR AIR TRAFFIC CONTROL APPLICATIONS**

J. Dumanian and D. Clapp, FA03, Technical Report, June 1971, 152 pp.

Computers, NAS Stage A Data Processing, and ARTS III Data Processing.

For primary bibliographic entry, see Field 9.

DOT-TSC-FAA-71-16 Transportation Systems Center **SYSTEM RELIABILITY AND RECOVERY**

C. A. Dancy, III, FA03, Technical Report, June 1971, 61 pp. Reliability, recovery, reconfiguration, multiprocessor, and failsafe/soft.

For primary bibliographic entry, see Field 9.

DOT-TSC-FAA-71-17 Transportation Systems Center **TIME/FREQUENCY SYSTEMS**

E. H. Farr, L. A. Frasco, H. D. Goldfein, and R. M. Snow, FA10, Technical Report, June 1971, 82 pp.

Time/Frequency, Multipath, ATC Systems, and Coding.

This report summarizes the work performed at DOT/TSC on the Time/Frequency ATC System study project. Principal emphasis in this report is given to the evaluation and analysis of the technological risk areas. A survey and description of proposed T/F system is included. The technical risk areas include the effects of multipath on signalling over radio links. Material is presented which bears on the comparative analysis of T/F with alternative technologies, including satellite and beacon-based system concepts. It is concluded that the most critical problems areas requiring further study are (a) multipath effects on T/F systems, and (b) systems operability under non-ideal conditions leading to graceful degradability.

17. NAVIGATION, COMMUNICATIONS, DETECTION AND COUNTERMEASURE

DOT-TSC-FAA-71-19 Transportation Systems Center CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM

G. W. Wagner, G. G. Heroules, and W. E. Brown, FA20, Annual Report FY-71: July 1970 — June 1971, 47 pp. Radiometer.

This report presents a review of accomplishments of the Clear Air Turbulence Detection Program. The objectives, instrumentation, supporting hardware and interfaces leading up to and including the test flights for the reporting period are given.

The ultimate goal of this program is the development of a remote method of detecting and thereby alerting high-altitude, high-speed aircraft in sufficient time to avoid the hazards associated with Clear Air Turbulence, CAT.

DOT-TSC-FAA-71-20 Transportation Systems Center DISPERSED PROCESSING FOR ATC

G. G. Paul & R. M. Snow, FA03, Interim Technical Report, June 1971, 16 pp.

Dispersed Processing, Air Traffic Control, Remote Tracking, Data Link, Intermittent Positive Control, Discrete Addressing.

For primary bibliographic entry, see Field 9.

DOT-TSC-FAA-71-23 Transportation Systems Center COMPUTER SYSTEMS PERFORMANCE MEASUREMENT TECHNIQUES

J. Gertler, H. Glynn, V. Hobbs, and F. Woolfall, FA03, Technical Report, June 1971, 71 pp.

Computer Measurement, ARTS III Data Processing, Executive Systems, and Simulation.

For primary bibliographic reference, see Field 9.

FEDERAL RAILROAD ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-FRA-71-3 Transportation Systems Center TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS

J. B. Hopkins and M. E. Hazel, RR02, Technical Report, June 1971

Grade crossing protection, train detection, microwave telemetry, and railroad signals.

For primary bibliographic entry, see Field 13.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-NASA-70-1 Transportation Systems Center EARTH SURVEY BIBLIOGRAPHY: A KWIC INDEX OF REMOTE SENSING INFORMATION

W. I. Thompson, III, NA01, Technical Report, February 1971, 265 pp.

Earth Resources, Infrared, Radar, Visible, and Microwaves.

For primary bibliographic entry, see Field 8.

DOT-TSC-NASA-71-5 Transportation Systems Center LABORATORY EVALUATION OF FECKER AND LORAL OPTICAL IR PWI SYSTEMS

M. Gorstein, J. N. Hallock, M. Houten, and I. G. McWilliams, NA06, Technical Report, February 1971, 81 pp.

Electro-Optical PWI, Flashing Xenon Strobe, Fault Correction, and Calibrate in Azimuth Elevation and Range.

Flight hardware and a flight test evaluation of the Electro-Optical Pilot Warning Indicators, using a flashing xenon strobe and silicon detectors as cooperative elements were prepared by the previous NASA group prior to the closure of ERC in June 1970. Several design deficiencies are pointed out. The present laboratory evaluation program which provides the ideal environment for performing the most detailed studies of the PWI system, has corrected the faults which prevented the equipment from operating, and has calibrated the sensitivity of both systems in azimuth elevation and range.

DOT-TSC-NASA-71-6 Transportation Systems Center ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 kHz (100 km) — 3,000 THz (0.1 μ m)

W. I. Thompson, III, NA10, Technical Report, February 1971, 300 pp.

Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, and Ultraviolet.

This handbook presents material on electromagnetic wave transmission in the earth's atmosphere with emphasis on earth-to-space paths up to January 1970. This type of information is needed in such varied fields as air pollution, astronomy, communications, earth resources, geodesy, meteorology, and navigation.

Part I presents basic background information dealing with transmission fundamentals, the properties of electromagnetic waves, the electromagnetic spectrum, and the earth's atmosphere.

Part II is a guide to information on the transmission properties of the earth's atmosphere to electromagnetic radiation. A major feature of Part II is the listing of table contents of several books and major articles on atmospheric transmission.

Part III contains selected transmission information on the following observable quantities: refraction, absorption, and scattering.

Part IV is a bibliography to be published in a separate volume entitled Atmospheric Transmission Bibliography 1960-1969: A KWIC Index of Electromagnetic Wave Transmission in the Earth's Atmosphere Over the Frequency (Wavelength) Range 3 kHz (100 km) — 3,000 THz (0.1 μ m). The bibliography covers the frequency regions: radio, microwave, infrared, visible, and ultraviolet. There is a listing of citations by local accession number, a key-word-in-content (KWIC) index or permuted title index, and an author index.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION WASHINGTON, D. C. 20591

DOT-TSC-NHTSA-71-3 Transportation Systems Center DEVELOPMENT OF ANTICIPATORY AUTOMOBILE CRASH SENSORS

Hopkins, Holmstrom, Appgar, Hazel, White, and Newfarmer. Annual Report: July 1970 — June 1971, HSO4.

Automobile Safety, Occupant Protection, Passive Restraint Activation, and Anticipatory Crash Sensing.

For primary bibliographic entry, see Field 13.

**OFFICE OF THE SECRETARY
OF TRANSPORTATION
WASHINGTON, D. C. 20590**

**DOT-TSC-OST-71-8 Transportation Systems Center
A REVIEW OF AVAILABLE L-BAND AND VHF AIR-
CRAFT ANTENNAS FOR AN AIRCRAFT-SATELLITE
COMMUNICATIONS LINK**

OS08, Technical Report, May 1971, 93 pp.

L-Band Antenna, VHF Antenna, Slot-Dipole Antenna, and Boeing.

One of the problems encountered in designing an aircraft to use a satellite system for communications (and for surveillance and navigation) is that of finding a suitable aircraft antenna. There is, at present, no antenna which will satisfy all requirements. The purpose of this paper is to briefly review the characteristics of some of the L-Band and VHF antennas which have been proposed for an aircraft-satellite link.

**DOT-TSC-OST-71-12 Transportation Systems Center
AN AIRPORT AIRSIDE SYSTEM MODEL**

I. Englander, OS04, Technical Report, June 1971

For primary bibliographic entry, see Field 9.

**18. NUCLEAR SCIENCE AND TECH-
NOLOGY**

No reports.

19. ORDNANCE

Includes the following Groups: Ammunition, Explosives, and Pyrotechnica; Bombs; Combat Vehicles; Explosions, Ballistics, and Armor; Fire Control and Bombing Systems; Guns; Rockets; Underwater Ordnance.

20. PHYSICS

Includes the following Groups: Acoustics; Crystallography; Electricity and Magnetism; Fluid Mechanics; Masers and Lasers; Optics; Particle Accelerators; Particle Physics; Plasma Physics; Quantum Theory, Solid Mechanics; Solid-state Physics, Thermodynamics; Wave Propagation.

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WASHINGTON, D. C. 20591**

**DOT-TSC-CG-71-3 Transportation Systems Center
TWO CANDIDATE SYSTEMS FOR UNMANNED FOG
BANK DETECTION**

J. R. Lifshitz and H. C. Ingrao, CG02, Technical Report, June 1971

Fog Bank Detection, LIDAR, Aid-to-Navigation, and Radiometer.

For primary bibliographic entry, see Field 17.

**NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
WASHINGTON, D. C. 20590**

**DOT-TSC-NASA-71-6 Transportation Systems Center
ATMOSPHERIC TRANSMISSION HANDBOOK: A SUR-
VEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN
THE EARTH'S ATMOSPHERE OVER THE FREQUENCY
(WAVELENGTH) RANGE 3 kHz (100 km) - 3,000 THz
(0.1 μ m)**

W. I. Thompson, III, NA10, Technical Report, February 1971, 300 pp.

Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, and Ultraviolet.

For primary bibliographic entry, see Field 17.

**DOT-TSC-NASA-71-7 Transportation Systems Center
MILLIMETER-WAVE GENERATION WITH SPIRALING
ELECTRON BEAMS**

Bernhard Kulke, NA10, Technical Report, February 1971, 98 pp.

Spiraling Electron Beam, Microwave Cavity, 9.4 and 94 GHz, and High-Power Millimeter Waves

An investigation has been carried out of the feasibility of using the interaction between a thin, solid, spiraling electron beam of 10-20kV energy and a microwave cavity to generate watts of CW millimeter-wave power. Experimental results are given for several prototype devices operating at 9.4 GHz and at 94 GHz. Power outputs of 5W, and electronic efficiencies near 3%, were obtained at X-band, and moderate gain was obtained at 94 GHz. The small-signal theory gives a good fit to the X-band data, and the device behavior at 94 GHz is as expected from the given beam characteristics. The performance is limited chiefly by the velocity spread in the spiraling electron beam, and once this can be brought under control, high-power generation of millimeter waves appears quite feasible with this type of device.

**DOT-TSC-NASA-71-10 Transportation Systems Center
EVALUATION OF NONDESTRUCTIVE TENSILE TEST-
ING**

J. J. Bowe and S. M. Polcari, NA08, Technical Report, May 1971

Semiconductor Devices, Nondestructive Testing, and Chip and Wire Bonding.

For primary bibliographic entry, see Field 9.

**NATIONAL HIGHWAY TRAFFIC AND
SAFETY ADMINISTRATION
WASHINGTON, D. C. 20591**

**DOT-TSC-NHTSA-71-1 Transportation Systems Center
OCCUPANT MOTION SENSORS**

J. L. Horner, Ph.D., HS05, Technical Report, July 1970 - January 1971, 54 pp.

Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, and Transducers.

For primary bibliographic entry, see Field 13.

22. SPACE TECHNOLOGY

DOT-TSC-NHTSA-71-4 Transportation Systems Center OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS

J. L. Horner, D. S. Ofsevit, G. R. Plank, and G. G. Lawrence, HS05, Technical Report, July 1971, 55 pp.

Bandwidth, Rotational Motion, Fourier Analysis, Sensor, Transducer, Acceleration, Angular Motion, and Digital Filtering.

For primary bibliographic entry, see Field 13.

URBAN MASS TRANSPORTATION ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-UMTA-71-3 Transportation Systems Center BIBLIOGRAPHY ON GROUND VEHICLE COMMUNICATION & CONTROL: A KWIC INDEX

W. I. Thompson, III, UM03, Annual Report; Vol. II, July 1971, 191 pp.

Bibliography.

For primary bibliographic entry, see Field 13.

21. PROPULSION AND FUELS

Includes the following Groups: Air-breathing Engines; Combustion and Ignition; Electric Propulsion; Fuels; Jet and Gas Turbine Engines; Nuclear Propulsion; Reciprocating Engines; Rocket Motors and Engines; Rocket Propellants.

FEDERAL RAILROAD ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-FRA-71-1A Transportation Systems Center POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES

F. L. Raposa, RR05, Interim Technical Report, February 1971, 65 pp.

Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, and Wayside Electric Power Sources.

The linear induction motor is to provide the propulsion of high-speed tracked vehicles and speed control of the motor is essential for vehicle operation. The purpose of power conditioning is to provide the matching interface between the available power and the desired power for driving the motor. As an integral part of the propulsion system the power conditioner provides the means for controlling both the thrust and the braking of the vehicle.

This interim technical report identifies and describes candidate power conditioners for driving linear induction motors in the variable frequency power mode. The power conditioners described include those for application with either on board electric power sources or with wayside electric power sources.

DOT-TSC-FRA-71-2 Transportation Systems Center METROLINER AUXILIARY POWER ELECTRICAL SYSTEM RELIABILITY STUDY

J. D. Abbas and C. W. Watt, Jr., RR06, Interim Report, June 1971, 135 pp.

The reliability of the electrical system of any vehicle is greatly affected by the way the system is configured. The propulsion and braking systems of a train must be unaffected by failures occurring in the nonessential power areas. With these criteria in mind the so-called "Auxiliary Power System" of the Metroliner car was analyzed. This auxiliary power system was found to be deficient in achieving these ends. Recommendations suggest methods of satisfying these criteria by segregating the essential from the nonessential elements, thereby enhancing the overall availability of the Metroliner car.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D. C. 20590

DOT-TSC-OST-71-5 Transportation Systems Center AIRCRAFT EMISSIONS SURVEY

A. J. Broderick, W. F. Harriott, and R. A. Walter, OS10 Technical Memorandum: July 1970 - March 1971

Air Pollution, Gas Turbines, Emissions, Jet Engines, an Instrumentation.

For primary bibliographic entry, see Field 1.

22. SPACE TECHNOLOGY

Includes the following Groups: Astronautics; Spacecraft; Spacecraft Trajectories and Reentry; Spacecraft Launch Vehicles and Ground Support.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON, D. C. 20590

DOT-TSC-NASA-70-1 Transportation Systems Center EARTH SURVEY BIBLIOGRAPHY: A KWIC INDEX OF REMOTE SENSING INFORMATION

W. I. Thompson, III, NA12, Technical Report, February 1971, 265 pp.

Earth Resources, Infrared, Radar, Visible, and Microwaves.

For primary bibliographic entry, see Field 8.

DOT-TSC-NASA-71-5 Transportation Systems Center LABORATORY EVALUATION OF FECKER AND LORAI OPTICAL IR PWI SYSTEMS

M. Gorstein, J. N. Hallock, M. Houten, and I. G. McWilliams NA06, Technical Report, February 1971, 81 pp.

Electro-Optical PWI, Flashing Xenon Strobe, Fault Correction, Calibrate in Azimuth, and Elevation and Range.

For primary bibliographic entry, see Field 17.

DOT-TSC-NASA-71-6 Transportation Systems Center
ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 kHz (100 km) - 3,000 THz (0.1 μ m)

W. I. Thompson, III, NA10, Technical Report, February 1971, 300 pp.

Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, and Ultraviolet.

For primary bibliographic entry, see Field 17.

DOT-TSC-NASA-71-7 Transportation Systems Center
MILLIMETER-WAVE GENERATION WITH SPIRALING ELECTRON BEAMS

B. Kulke, NA10, Technical Report, February 1971, 98 pp.
Spiraling Electron Beam, Microwave Cavity, 9.4 and 94 GHz, and High-Power Millimeter Waves.

For primary bibliographic entry, see Field 20.

DOT-TSC-NASA-71-9 Transportation Systems Center
METALLIZATION FAILURES

R. Beatty, NA08, Technical Report, May 1971, 116 pp.
Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Material, Integrated Circuit Design, and Beam Lead Technology.

For primary bibliographic entry, see Field 9.

DOT-TSC-NASA-71-10 Transportation Systems Center
EVALUATION OF NONDESTRUCTIVE TENSILE TESTING

J. J. Bowe and S. M. Polcari, NA08, Technical Report, May 1971

Semiconductor Devices, Nondestructive Testing, and Chip and Wire Bonding.

For primary bibliographic entry, see Field 9.

DOT-TSC-NASA-71-13 Transportation Systems Center
MEASUREMENTS OF TRANSATMOSPHERIC ATTENUATION STATISTICS AT THE MICROWAVE FREQUENCIES: 15, 19 and 34 GHz

G. G. Haroules, W. E. Brown, III, and G. J. Bishop, Technical Report, June 1971

Earth-to-space paths, Electromagnetic Wave Propagation, and Atmospheric Attenuation.

For primary bibliographic entry, see Field 3.

**OFFICE OF THE SECRETARY
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WASHINGTON, D. C. 20590**

DOT-TSC-OST-71-8 Transportation Systems Center
A REVIEW OF AVAILABLE L-BAND AND VHF AIRCRAFT ANTENNAS FOR AN AIRCRAFT-SATELLITE COMMUNICATIONS LINK

The Telecommunications Division, OS08, Technical Report, May 1971, 93 pp.

L-Band Antenna, VHF Antenna, Slot-Dipole Antenna, and Boeing.

For primary bibliographic entry, see Field 17.

