CIVIL AERONAUTICS BOARD
BUREAU OF SAFETY REGULATION
WASHINGTON, D. C.

April 1, 1952

CIVIL AIR REGULATIONS DRAFT RELEASE NO. 52-10

SUBJECT: Conversion of speed and distance provisions of the Civil Air Regulations to knots and nautical miles.

The Bureau of Safety Regulation has under consideration amendments to several Parts of the Civil Air Regulations with respect to the conversion of speed and distance requirements from miles per hour and statute miles to knots and nautical miles. The explanatory statement contained in the attached proposal sets forth the reasons therefor.

The proposal is being published in the Federal Register as a notice of proposed rule making concurrently with the issuance of this draft release.

The Bureau desires that all interested persons in the aviation industry who will be affected by the requirements of this proposal be fully informed as to the effect of the proposal upon their operations. To accomplish this objective the proposal is being circulated to the aviation industry in order to afford interested persons ample opportunity to submit to the Bureau such comments as they may desire. In order that such persons may have complete information readily available without the necessity of referring to other documents, we have attached an exact copy of the proposal being published in the Federal Register.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comment will be given careful consideration.

It should be noted that comments must be submitted in duplicate and in order to insure consideration should be received by the Bureau not later than May 15, 1952.

John M. Chamberlain

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Director, Bureau of Safety Regulation

CIVIL AERONAUTICS BOARD

[14 CFR, Parts 20, 26, 40, 41, 42, 43, 45, 48, 54, 60 and 61]

CONVERSION OF SPEED AND DISTANCE PROVISIONS OF THE CIVIL AIR REGULATIONS TO KNOTS AND NAUTICAL MILES

NOTICE OF PROPOSED RULE MAKING

Pursuant to authority delegated by the Civil Aeronautics Board to the Bureau of Safety Regulation, notice is hereby given that the Bureau will propose to the Board amendments to the Civil Air Regulations as hereinafter set forth.

Interested persons may participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should be submitted in duplicate to the Civil Aeronautics Board, attention Bureau of Safety Regulation, Washington 25, D. C. In order to insure their consideration by the Board before taking further action on the proposed rules, communications must be received by May 15, 1952. Copies of such communications will be available after May 20, 1952. for examination by interested persons at the Docket Section of the Board, Room 5412, Commerce Building, Washington, D. C.

On April 6, 1950, the Air Coordinating Committee (ACC) 1/ agreed on the following recommendations:

1. That there is a need for standardization of units used in speed and distance measurement,

2. That the single Military-Civil standard unit of measurement be nautical miles and knots, and

3. That these standardsbe placed into effect by a target date of 1954 with implementation to begin as soon as possible.

These recommendations concerning standardization of dimensional units were based on technical studies made during 1949 by subcommittees of the Air Coordinating Committee which had been initiated as the result of three significant developments in the operation of aircraft within the United States: (1) the requirement for a system of standard dimensional units in the implementation of the Common System of air traffic control and navigational aids, (2) the adoption by the

1/ See attached note.

military establishment of a standard system of dimensional units, and (3) the adoption by the International Civil Aviation Organization of international standards for dimensional units to be used in air-ground communications.

Standardization of Dimensional Units in the Military Establishment

Effective March 31, 1947, the Air Force adopted a policy of gradual conversion to the nautical mile and knot as the units of distance and speed measurement for Air Force aircraft operations. This decision stemmed from the action of the Joint Aeronautical Board, taken in 1946, which directed that all Air Force aircraft of a new type procured after 1946 would be equipped with airspeed indicators calibrated in knots. The Navy and Coast Guard have always used the nautical system for distance and speed measurement; however, due to the necessity for conformity with Civil Aviation practices in the United States, they have retained the statute mile for tower visibility reports. (Complete implementation by the military will be realized on July 1, 1952, when the Navy, Air Force, and Coast Guard make mandatory the use of the nautical system in aeronautical operations including all voice, teletype, and CW communications.)

Standardization of Dimensional Units in International Operations

The post war period saw the rapid extension of the operations of United States carriers to every area of the globe with the exception of the Iron Curtain countries. In addition to the carriers previously operating internationally, several of the domestic operators extended their routes beyond the continental limits of the United States. Concurrent with this development many foreign air carriers initiated operations into this country as the result of bilateral agreements between the United States and their respective governments.

The expansion of international air carrier operation during the post war period focused attention on the dissimilarity of dimensional units used by operators of the various countries of the world. Although international carriers variously used the nautical mile, the statute mile, and the kilometer as the basis for distance and speed measurements, the use of the nautical mile was predominant. Since considerable international traffic terminates or originates in the United States, it was of interest to the United States that some standardization in the field of dimensional units be sought. The International Civil Aviation Organization undertook to achieve such standardization in Annex 5 to the Chicago Convention (Dimensional Units to be Used in Air-Ground Communications). The Council of ICAO has recently approved a revision of Annex 5 which establishes the nautical mile as the basic unit of distance and speed measurement in

air/ground communications. It appears that international use of the nautical mile is gradually crystallizing into an accepted practice.

Need for Standardization of Dimensional Units in the Common System

The wartime stimulus given to the development of electronic navigation aids and traffic control facilities culminated in the development of a plan for the integration of air traffic control and navigation systems within the United States, which came to be known as the Common System. The outline for this plan was completed in 1948 and the detailed blueprint of the operational policies and facilities necessary for its ultimate implementation was completed in December 1950. The Common System will provide air traffic control and navigational services for all users of the airspace. It will meet the requirements of national defense, will improve safety in air operations, and will control the movement of air traffic more efficiently under all weather conditions.

However, one of the many technical problems that became apparent during the development of the Common System was that of standardization of units of distance measurement. In order that all existing and planned electronic facilities might be utilized most efficiently, it was realized that a single unit of speed and distance measurement was vital. With the marked increase in military use of the civil airways facilities in aircraft equipped with indicators calibrated in knots, the present traffic control system has already been heavily burdened, because traffic controllers must check and convert flight plan and en route speed estimates, in order to be sure that a single speed unit is being employed. This is necessary to establish minimum safe horizontal separation on the airways under IFR conditions. The problem of mixed traffic will become progressively more acute as the frequency of operations of military aircraft equipped with indicators calibrated in knots increases. It is obvious, that with Air Force aircraft converting to nautical units, and civil aircraft retaining statute units, a most undesirable and probably hazardous condition will ultimately exist on the airways. A standard air/ground dimensional unit would thus appreciably increase the efficiency of new navigational and traffic control devices and procedures, minimizing communications relative to dimensional units. In addition, equipment such as DME (Distance Measuring Equipment) can be manufactured most efficiently, if the manufacturer can be assured that a standard unit of measurement will be established, thus requiring the calibration of equipment in only one unit. Upon the installation of fully automatic traffic control equipment, the use of a single unit will become unavoidable, as movement data including time, reported speed and distance will be fed into these devices automatically. All federal agencies and non-governmental groups represented on ACC Subcommittees agreed that the adoption of a single standard unit was highly desirable

for the realization of the maximum efficiency of the Common System. The only two systems of measurement which the Air Coordinating Committee considered to be practicable of implementation were the English (statute) system, which is employed by domestic civil aviation and the nautical system, which is employed by the Military and the United States flag carriers in their international operations.

Standardization of Dimensional Units in the Civil Air Regulations

In general, non-governmental aviation interests consulted by the technical subcommittees of the Air Coordinating Committee in consideration of this dimensional problem, supported the retention of the statute mile as the basic unit and the Military supported the nautical mile. The Federal civil aviation agencies recognized, that as public service agencies, they have an obligation under the Civil Aeronautics Act of 1938, to foster and promote the development of an air transportation system best adapted to both civil and military needs and, therefore, while not actually promoting the nautical system, they were keenly aware that one standard unit of measurement was highly desirable for the orderly development and use of the growing electronic airways and traffic control system. Rather than perpetuate the continued use of two units in the Civil-Military aviation traffic control and navigation system, with the inefficiency and possibly hazardous confusion inherent in such a dual system, the Air Coordinating Committee considered that a progressive step would be taken if standardization on a common unit could be accomplished in a well-planned cooperative manner. Carrying out the recommendations of the Air Coordinating Committee, therefore, appears to be in the national interest.

Implementation of such a policy would necessarily involve conversion of statute values to nautical values in many aspects of civil aeronautical activities, and would require changes of dimensional units used, for example, in the Civil Air Regulations, Civil Aeronautics Manuals, Regulations of the Administrator, Airplane Flight Manuals, Flight Information Manuals, Coast and Geodetic Survey Charts, and Air Marking. Dimensional units employed in many of the above are based on pertinent provisions of the Civil Air Regulations, and as a result any detailed changes in the Civil Air Regulations affect the dimensional standards used in those various publications and activities.

The Civil Air Regulations and the various services provided by the aeronautical agencies of the Department of Commerce are so closely interrelated that any conversion of values in the Civil Air Regulations necessitated the closest coordination between the Department of Commerce (including the U. S. Weather Bureau) and the Civil Aeronautics Board. The methods of converting dimensional units used in the Civil

Air Regulations have been discussed with representative groups of aircraft users. No fundamental disagreement with the principles used in the conversions was apparent.

The policy upon which the proposed conversions was based was to insure simplicity and safety in each instance, each specific value in the regulations being considered on its own merits. The guiding principle in all proposed conversions was that, insofar as possible, no substantive change would be made in the requirements of the various regulations. Each of the conversions falls into one or more of the four categories listed below:

1. When appropriate, distance values would be converted to the nearest logical whole number.

2. In those cases in which distance values, not delineated on charts, had been originally established on an arbitrary basis and no hardship to operators or appreciable relaxation of safety standards would be involved, the same numerical value would be retained.

3. Visibility values below three nautical miles would be converted to values which could be observed by the U. S. Weather Bureau and Control Towers, and would retain very close approximates of the increments currently observed and reported.

4. In those cases where direct conversion was desirable or necessary, conversions would be made to the nearest 1/10 of a nautical mile (visibilities), or, in another category (performance limitations), to the nearest 1/100 of a nautical mile.

None of the amendments considered, with the exception of the three statute mile visibility requirement (60.16 (c), 60.31, etc.), involves a major substantive change in the regulations. Direct conversion of the three mile value is 2.6 nautical miles. It was agreed that this direct conversion would be cumbersome in voice procedures, and would imply an accuracy of observations in flight which could not be realized by pilots. In addition, the Board has under separate consideration the entire problem of visibility requirements and in particular is studying recommendations for higher visibility standards necessitated by the increase in the speed and congestion of aircraft operating in control zones and control areas. The Weather Bureau, which is obliged to measure and report visibility accurately in control zones, agreed that 2.6 nautical miles is an unrealistic refinement of visibility measurement and concurred in the use of three nautical miles. For these

reasons, therefore, the increase from three statute miles to three nautical miles for VFR visibilities was considered to be justifiable.

As a result of precise conversions used in groups 3 and 4, no change or re-evaluation of airways widths, route specifications, operational procedures, and minimum altitudes will be necessary, which would have been the case had the values been converted to the nearest whole number. All other conversions come under group 1 or 2 above, were in no way controversial, and were relatively easy to resolve.

In the airworthiness regulations, it is considered unnecessary to specify the use of knots in the design requirements at this time. The Bureau will propose in the 1953 Airworthiness Review that the nautical system of speed and distance measurement be employed in the airworthiness and other related regulations. However, it is felt desirable in the interest of safety of navigation and traffic control, to provide appropriate means for ready conversion by the pilots of statute units to nautical units. For those aircraft which are equipped with air-speed indicators calibrated in knots, all operating limitations and information in the Airplane Flight Manual and all placards which involve air speeds will be required to include the knot conversion values.

The problem of cockpit standardization in transport aircraft has been under active consideration by the Board, the Defense Department, and industry for some time. The question of mandatory replacement of air-speed indicators calibrated in statute miles with indicators calibrated in knots is intimately related to this larger problem of cockpit standardization, and therefore the Bureau is especially desirous of receiving comment on this aspect of the conversion project.

It is anticipated that owners will eventually choose to install air-speed indicators calibrated in knots as a matter of convenience. However, as long as adequate means of conversion are provided to ensure proper use of dimensional units under IFR conditions, there do not appear to be adequate grounds for requiring such indicators.

The rules governing the operations of air carriers contain certain en route operating limitations in which the term V_{S_0} (power-off true-indicated stalling speed in the landing configuration) is employed in various formulas. The constants and products of these formulas are predicated on the expression of V_{S_0} in statute miles per hour. As these formulas are closely related to certain performance requirements of the airworthiness regulations, which are expressed in statute units, and are used primarily for the development of

required performance charts, it is felt desirable to retain these formulas as currently expressed in statute miles per hour until such time as the related airworthiness regulations are expressed in nautical units. A note is proposed, therefore, to be appended to appropriate sections indicating that V_{S_0} will continue to be expressed in statute miles per hour where its reference is intended solely to establish operating weights of aircraft.

It is therefore proposed to amend the parts and sections of the Civil Air Regulations as indicated on the attachment marked "Conversion Amendments."

These amendments are proposed under the authority of Title VI of the Civil Aeronautics Act of 1938, as amended. The proposals may be changed in the light of comments received in response to this notice of proposed rule-making.

(Sec. 205 (a), 52 Stat. 984; 49 U.S.C. 425 (a). Interpret or apply secs. 601-610, 52 Stat. 1007-1012; 49 U.S.C. 551-560; 62 Stat. 1216)

Dated March 27, 1952 at Washington, D. C.

By the Bureau of Safety Regulation:

John M Chamberlain

John M. Chamberlain
Director

(SEAL)

NOTE

The Air Coordinating Committee (ACC) is a Federal interdepartmental committee established by interdepartmental agreement in 1945, and subsequently formalized by the President under Executive Order 9781, September 19, 1946, with responsibility for coordinating Federal policy in the field of aviation. The Committee is authorized to "examine aviation problems and developments affecting more than one participating agency; develop and recommend integrated policies to be carried out and actions to be taken by the participating agencies or by any other Government agency charged with responsibility in the aviation field; and, to the extent permitted by law, coordinate the aviation activities of such agencies except activities relating to the exercise of quasi-judicial functions." It coordinates interdepartmental views and recommends to the Department of State general policy directives and instructions for the guidance of the United States Representatives to the International Civil Aviation Organization (ICAO). The ACC is also responsible for making recommendations to the President concerning major aviation policy and for submitting to him for decision any disagreement on important aviation questions.

The ACC is concerned with all aspects of aviation policy, technical, economic, and legal, and in the past year has been especially active in providing a bridge between the military and civil agencies involved in mobilization of the nation's air power. Since recommendations of the ACC can be made only by unanimous agreement, its member agencies are assured of an opportunity for full discussion and consideration of all aviation matters affecting them. The means is thereby provided for the achievement of an integrated and coordinated Federal aviation policy.

Aviation policy matters may be submitted to the Air Coordinating Committee by individual Federal departments and agencies, States and other non-Federal jurisdictions, the aviation industry, and the U. S. Representative to the International Civil Aviation Organization. These matters are then referred to an ACC component or one of the member agencies for study and analysis and the preparation of a position which will be acceptable to the member agencies and carried out by them.

The Air Coordinating Committee membership at present includes the Departments of State, Navy, Air Force, Treasury, Post Office, Commerce, and the Civil Aeronautics Board, as voting members, and the Bureau of the Budget and the National Security Resources Board, as non-voting members. Federal agencies not members of the Committee are invited to participate on matters of interest to them with full voting privileges.

The Operational Policy Group of the Air Coordinating Committee's Air Traffic Control and Navigation Panel, which developed plans for

the Common System, was composed of operational and technical experts (civil and military), authorized and established as a full time group by the member agencies of the Air Coordinating Committee. They functioned with the following considerations in mind in developing the details of the safe, all weather air traffic control and navigation system (Common System):

(a) That integrated Civil-Military traffic control procedures were in the interest of national security;

(b) That the needs of non-tactical military operation must be considered.

(c) That the special problems of each class of user and method of use of the airspace (including the problems concerning aircraft only partially equipped with Common System equipment) must be taken into account, and

(d) That a complete study of all technical considerations affecting economy, time scale of accomplishment, and equipment development was necessary.

CONVERSION AMENDMENTS

1. Amend the distance and speed provisions of the Civil Air Regulations as follows:

GROUP I

CAR	CHANGE STATUTE MILES	TO NAUTICAL MILES
Sec. 20.35(a)(2)	350	300
Sec. 20.35(a)(2)	150	130
Sec. 41.13(b)	200	175
Sec. 41.30(d)	20	17
Sec. 41.128	100	85
Sec. 42.76	20	17
Sec. 42.82	20	17
Sec. 54.23(a)	70	60
Sec. 54.23(b)	120	105
Sec. 54.23(c)	120	105
Sec. 61.51	50	45
Sec. 61.52	50	45
Sec. 61.222	20	17

GROUP II

Sec. 20.25(a)(1)	25	25
Sec. 20.25(a)(1)	100	100
Sec. 26.7(c)	125	125
Sec. 26.8(a)(1)	200	200
Sec. 40.29	100	100
Sec. 41.21(a)(1)	25	25
Sec. 41.21(b)(1)	25	25
Sec. 41.22(a)	25	25
Sec. 42.21(b)	3	3
Sec. 42.23(a)(1)	25	25
Sec. 43.30(b)(4)	3	3
Sec. 48.2	5	5
Sec. 48.3(c)	3	3
Sec. 48.3(e)	5	5
Sec. 60.16(c)	3	3
Sec. 60.16(d) note	3	3

GROUP II (cont.)

CAR	CHANGE STATUTE MILES	TO NAUTICAL MILES
Sec. 60.31(a)	3	3
Sec. 60.31(b)	3	3
Sec. 60.31(c)	3	3
Sec. 60.31(c) note	3	3
Sec. 60.31(d) 5th line	1	1
Sec. 60.31(d) 8th line	1	1
Sec. 60.31(d) Note 6th line	3	3
Sec. 60.31(d) Note 11th line	3	3
Sec. 60.31(d) Note 20th line	1	1
Sec. 60.32(b)	3	3
Sec. 60.41(g)	miles per hour	knots
Sec. 61.43(b)	8	8
Sec. 61.252	25	25

GROUPS III and IV

Sec. 41.13(a)	2	1.7
Sec. 42.55(a)	1	0.9
Sec. 42.55(a)	2	1.7
Sec. 60.42(a)	1	0.9
Sec. 60.42(a)	1½	1.3
Sec. 60.42(a)	2	1.7
Sec. 60.42(b)	2	1.7
Sec. 61.200(b) 2nd line	1	0.9
Sec. 61.200(b) 4th line	½	0.4
Sec. 61.204(a)(1)	1	0.9
Sec. 61.204(a)(2)	1½	1.3
Sec. 61.204(a)(3)	2	1.7

GROUP IV

Sec. 41.30(a)	10	8.68
Sec. 41.30(b)	10	8.68
Sec. 41.30(c)	10	8.68
Sec. 41.30(d)	10	8.68
Sec. 41.30(d)	5	4.34
Sec. 41.114(b)	5	4.34
Sec. 42.53(b)	5	4.34
Sec. 42.73	10	8.68
Sec. 42.74.	10	8.68

GROUP IV (cont.)

CAR	CHANGE STATUTE MILES	TO NAUTICAL MILES
Sec. 42.75(b)	10	8.68
Sec. 42.76	10	8.68
Sec. 42.76	5	4.34
Sec. 42.82	10	8.68
Sec. 42.82	5	4.34
Sec. 60.17(d)	5	4.34
Sec. 61.219	10	8.68
Sec. 61.220	10	8.68
Sec. 61.221	10	8.68
Sec. 61.222	10	8.68
Sec. 61.222	5	4.34
Sec. 61.261(b)	5	4.34

2. Amend Sec. 43.10(b) by adding the following sentence at the end thereof:

> Air-speed limitations and related information contained in the Airplane Flight Manual, and pertinent placards shall be expressed in the same units as used on the air-speed indicator.

3. Amend Sec. 43.30(a)(1) by adding the following sentence thereto:

> Whenever the operation rules of this chapter require more than one air-speed indicator, all such instruments shall be calibrated to read air speed in the same units.

4. Amend Sec. 43.30(c) by adding a new subparagraph as follows:

> (c) Instrument flight rules.
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> * * * * * * *
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> (8) After July 1, 1952, if the aircraft is equipped with an air-speed indicator calibrated in statute miles per hour, a readily useable means shall be provided for the flight crew to convert statute miles per hour to knots.

5. Amend Secs. 41.30, 42.73, 42.74, 42.75, 61.219, 61.220 and 61.221 by adding the following note at the end of each section:

> Note: For the purposes of this section, V_{S_0} shall be expressed in statute miles per hour.