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FEDERAL AVIATION AGENCY
BUREAU OF FLIGHT STANDARDS
Washington 25, D. C.

May 24, 1961

CIVIL AIR REGULATIONS DRAFT RELEASE NO. 61-11

SUBJECT: Requirement for Airborne Distance Measuring Equipment

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The Bureau of Flight Standards of the Federal Aviation Agency has under consideration amendments to Parts 40, 41, 42, and 43 of the Civil Air Regulations. The reasons therefor are set forth in the explanatory statement of the attached proposal which was published today in the Federal Register as a notice of proposed rule making.

The Bureau of Flight Standards desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

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 should be submitted in duplicate to the Docket Section of the Federal Aviation Agency on or before August 1, 1961. Thereafter, such comments will be available in the Docket Section to all interested persons, and an additional period will be allowed for submission of further comments in response thereto. In order to insure consideration, such additional comments must be received on or before October 1, 1961.

Director,
Bureau of Flight Standards

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As published in the Federal Register on May 24, 1961 (26 F.R. 4455)

FEDERAL AVIATION AGENCY

[14 CFR Parts 40, 41, 42, 43]

[Reg. Docket No. 751; Draft Release No 61-11]

AIRBORNE DISTANCE MEASURING EQUIPMENT

Requirement

Pursuant to the authority delegated to me by the Administrator (14 CFR 405.27), notice is hereby given that there is under consideration a proposal to amend Parts 40, 41, 42, and 43 of 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 Docket Section of the Federal Aviation Agency, Room B-316, 1711 New York Avenue NW., Washington 25, D.C., on or before August 1, 1961. Thereafter, such comments will be available in the Docket Section to all interested persons. After examination of the original comments received, interested persons may submit such additional comments in response thereto as they may desire. Such additional comments must be submitted on or before October 1, 1961. (Photostatic copies of comments on file in the Docket Section may be obtained upon payment of the cost of such copies.) All original comments and additional comments in response thereto received by the dates specified for receipt thereof will be considered by the Administrator before taking action on the proposed rules. The proposals contained in this notice may be changed in the light of the comments received.

Distance measuring equipment (DME) is that portion of the standard internationally adopted short-range system of navigation which indicates to a pilot the distance an aircraft is from a ground station. The bearing, or azimuth, portion of this system is obtained by the use of very high frequency omnirange (VOR) equipment. VOR DME as used herein means airborne radio navigational equipment consisting of a VOR receiver and distance measuring equipment. The term VORTAC is used to describe a VOR facility at which a TACAN facility has been co-located and from which the airborne VOR DME receives bearing and distance information. The bearing and distance information received from the VORTAC facility furnishes the pilot with continuous information of the airplane's position with respect to that facility.

Military aircraft utilize a TACAN receiver which, when tuned to a ground military TACAN station or to a civil VORTAC station, furnishes the pilot with continuous bearing and distance information. Civil aircraft equipped with VOR DME may also obtain distance from military TACAN stations due to a system of pairing VOR frequencies with TACAN frequencies.

In the interest of expediting to the maximum the installation of distance measuring ground facilities, certain VOR facilities will be equipped for the time being with only the distance portion of a TACAN facility. This is necessary due to the shortage of certain equipment. When this equipment is available, these facilities, which will be known in the interim as VOR-DME facilities, will be fully converted to VORTACs. During this interim period, military aircraft which are equipped with TACAN will be able to receive distance information from these VOR-DME facilities.

The regulations presently require that civil aircraft must be VOR-equipped when they operate IFR on the existing VOR airways. Low frequency airways are rapidly being discontinued and replaced by VOR airways, so that in the not too distant future IFR flight along virtually all the airways or in other controlled airspace will require VOR equipment. There is, however, no regulation in effect today which requires distance measuring equipment on aircraft.

In 1957, the President's Air Coordinating Committee, with representation from all segments of the aviation industry, published ACC 58/11 (revised) outlining the minimum operational performance requirements for a VORTAC air traffic control system.

Some of the recommendations and conclusions stated in ACC 58/11 with regard to a VORTAC airway route structure and air traffic control service are:

1. Traffic volume, complexity of operations, safety requirements, efficient use of airspace, and the expeditious movement of air traffic dictate that maximum use of both the azimuth and distance measuring capabilities of VORTAC will be required in the navigation of aircraft subject to positive separation and in the performance of air traffic control service for such aircraft by at least 1965. At that time,

(a) The air traffic control system will have to be based on both the azimuth and distance capabilities of VORTAC;

(b) Aircraft to be operated under instrument flight rules will be required to have both distance measuring and azimuth capability and

(c) Aircraft to be operated under Visual Flight Rules and in such a manner that they will be subject to positive separation will be required to have both distance measuring and azimuth capability.

Since 1957, the Federal Aviation Agency, the military services, and certain civil aviation groups have proceeded on the assumption that the conclusions of ACC 58/11 would be effectuated by 1965. Major advances have been made by the military services and civil aviation with respect to the manufacture, programing, and installation of VOR/DME and TACAN equipment. However, the overall program does not appear to be progressing at a rate which will achieve the 1965 goal emphasized in the ACC conclusions. It is becoming increasingly apparent that some definite impetus to the program must be given by the Agency at this time.

Accordingly, on March 22, 1961, the Bureau of Flight Standards held an industry-wide conference in Washington, D.C., to discuss these matters. This was attended by representatives from a ments of aviation, including inte manufacturers of aviation equipn

The sense of the discussions a opinions expressed at the meeti dicated general acceptance of:

1. The validity of a complete DME and TACAN operational er ment for IFR flight.

2. The desirability of airborn tance information for both navig and air traffic control purposes.

3. The necessity of increasing th rent rate of progress, if the 196 is to be achieved.

4. The fact that increased p would necessitate:

(a) Widespread awareness in a ments of aviation as to the us benefits of the VORTAC syst navigation.

(b) Increased production of s equipment for both air carrier an eral aviation use.

(c) Accelerated installation pr for both airborne and ground equi

(d) Increased effort among all try and governmental groups to nate the production, installatio operational implementation of equipment.

(e) Accelerated development a plementation of air traffic control dures for the use of DME equipm achieve the maximum benefits widespread installation of DME.

It was evident that despite th mendable efforts on the part of m the aviation industry to equip th planes with DME, sufficient progr not and is not being made. It w evident that the Federal Aviation must at this time give new i direction, and guidance to the DM gram if the common short-range VORTAC, is to be a reality by 19

The Federal airways route st has been realigned on the thre basis as part of the entire progr visioned in ACC 58/11: Low altitu to 14,500 feet MSL), intermedia tude (14,500 to 24,000 feet MSL high altitude (24,000 feet and The order of installation and loca DME equipped facilities is being basically so as to serve first, th altitude route structure and the t areas serving these routes; ne intermediate; and finally, the lo tude route structures and their ass terminal areas.

Effective April 6, 1961, all l quency airways above 14,500 fe were discontinued so that the hi intermediate altitudes are now trolled airspace containing onl airways and jet routes, with the ex of a very few low frequency high jet routes. The FAA installati gram includes completion of all VORTAC facilities serving these tures by January 1, 1963, the maj which will be completed by July It is anticipated that by 1965 frequency airways route structur 14,500 feet MSL will have been tinued and replaced by VOR served by VORTAC facilities.

Air traffic control separation and procedures have been establi the use of DME. These procedu

esult in more efficient air traffic control f aircraft which are DME-equipped. The publication of arrival and departure rocedures, holding procedures, and in-trument approach procedures based on he use of VOR/DME and TACAN will e expedited by the Agency.

With respect to user installation and se of VOR/DME equipment, the Air ransport Association announced at the larch 22 conference that the scheduled ir carriers planned the full installation f VOR/DME equipment and use of the ORTAC system before 1965. Many of heir turbine-powered airplanes are cur-ently equipped with DME. Various lectronic manufacturers at the confer-nce assured those present that full-scale roduction of DME equipment, suitable or large airplanes, will be forthcoming n the very near future, and in sufficient uantity to meet the schedule being pro-osed in this notice. It was also indi-ated that the military services will have ll of their first line and tactical air-lanes TACAN-equipped by July 1961, nd will make every effort to equip the emainder of their airplanes as rapidly s possible thereafter.

The general aviation groups at the onference indicated a somewhat more autious approach to the subject of re-uired airborne DME equipment. Prin-ipally, they questioned the availability f lightweight, low cost, and reliable ME equipment suitable for use in small irplanes and the availability of test and ervice facilities. In this respect, it was tated by one manufacturer that light-veight DME, suitable for the greater umber of the smaller types of airplanes sed for IFR flying by general aviation, as been developed and will soon be vailable to the public. Other manu-acturers pointed out that they are also eveloping lightweight DME and stated hat they will have sets in production in he near future.

At the present time, only that radio avigational equipment which is used by ir carriers must meet the requirements f applicable Technical Standard Orders. ome thought has been given recently to mending Part 43 of the Civil Air Regu-ations to require that radio navigational quipment on all airplanes being oper-ted IFR in the air traffic control system neet applicable TSO requirements. No ecision on this matter has been made as et. If it is decided to effect such a re-uirement, it will not be made applicable o any radio navigational equipment, in-luding DME, constructed prior to the ffective date of such a requirement. However, whether or not it is decided to equire that all radio navigational equip-nent meet Technical Standard Order equirements, if it is found that any par-icular type of such equipment, including ME, is of such a nature that its opera-ion would be derogatory to the air traffic ontrol system, appropriate corrective ction will be taken.

It is recognized that a need will exist or providing test and servicing facilities hich are convenient and generally vailable. In this connection, the ground nd airborne check points presently vailable for checking VOR receiver per-ormance will be expanded to provide a check for airborne distance measuring equipment.

In connection with the benefits, needs, and uses of DME, it should be noted that the VORTAC system of navigation has always been premised on the fact that, for maximum safety and efficiency, distance information as received from the DME is just as important as the bearing information derived from the VOR. Together they make up the Rho Theta System of Short-range Navigation, adopted not only by the United States but also by all members of ICAO as the international standard until 1975.

As to its uses, it is emphasized that DME used together with VOR simplifies the pilot's work in the navigation of his aircraft, since it provides him with, in addition to bearing information, a continuous reading of the number of nautical miles to or from the facility to which the equipment is tuned. With the aid of DME, the pilot has the means of knowing his position at all times, and therefore the task of accurately estimating the time to the next fix is greatly simplified. Since it enhances the accuracy of pilot estimates, it therefore enhances the control of air traffic.

A further consideration rests in the capacity of DME to assist a pilot in staying within the limits of the airspace assigned him by his air traffic control clearance. It would be an invaluable tool particularly with respect to jet aircraft approaching terminal areas at high speeds. At such times the deceleration characteristics of these aircraft magnify the significance of error in estimating position and the proper time to begin a decleration.

DME also greatly facilitates the navigation of the airplane in the avoidance of severe weather and turbulence, in holding, and in rerouting by air traffic control. The fact that the pilot's job is simplified by the use of DME in itself increases the safety of the flight.

Instrument approach procedures cannot be approved at many airports due to the lack of a radio navigational aid located suitably close to such airports. Many such airports are located a distance from a VOR facility such that, while an approach predicated on VOR only may not be approved, the addition of DME equipment to that VOR facility will permit approval of an instrument approach procedure. As a result, airplanes equipped with VOR/DME will be able to operate into many more airports under instrument conditions than is now possible.

An early requirement for airborne DME raises the question of whether dual equipment should be mandatory for air carriers, under the concept presently incorporated in the regulations. An early requirement for dual distance measuring equipment for air carriers could, in light of the availability of equipment, result in a delay in equipping all users of the airspace. It appears, at this time, that greater safety advantages would accrue if all users of the airspace were equipped with a single DME rather than a smaller number with dual equipment. At an appropriate time, air carrier requirements for dual DME will be reevaluated.

The FAA recognizes the industry desire that users be allowed to determine whether the VOR and DME equipment controls should be located in one control head or whether separate tuning controls should be provided. It is requested that serious consideration be given to this matter and that comment be made thereon in view of the flexibility and the more complete navigational information which separate tuning would provide during the interim period until all VORTAC stations are commissioned.

In proposing any program which requires the installation of airborne distance measuring equipment, consideration must be given to the program being followed by this Agency in connection with implementing the airways route structure. Since first priority has been given to those VORTAC facilities required primarily to serve the high altitude route structure, followed by those facilities needed primarily for the intermediate altitude routes, and last, the low altitude routes, it is proposed that the airplanes normally using these routes be equipped in that order.

Further, safety considerations dictate installation of DME in the highest speed airplanes first. Inasmuch as the newer large airplanes, which are predominantly jet types, are already wired for DME, installation on such airplanes can be accomplished expeditiously. Relatively more reworking and rewiring is required on the older airplanes in order to install DME. Therefore, more time is required both to schedule and accomplish this work, and to plan for the phasing out of those airplanes which are not to be retained in service and are not, therefore, to be equipped with DME. Further, these types generally operate wholly in the low altitude strata. It is reasonable then, to require the installation of DME in those types at a later date. Consideration of cruising altitudes and speeds, and the type of IFR operations normally involved, indicates less urgency in installing DME in small, relatively slow, nonpressurized airplanes. In consideration thereof, and in view of the development and production of lightweight, low-cost DME, it is not proposed to require DME for small, nonpressurized, piston-powered airplanes at this time. At such time as suitable lightweight airborne DME is generally available, the need for additional regulatory action will be reevaluated in light of the progress being made in the programing and installation of DME in these types of airplanes.

The current rate of airborne DME installation, the anticipated increase in traffic volume, the increasing number of high-speed airplanes, and the resultant complexity of operations necessitate requiring a broad, long-term DME installation program. It is clearly evident that all air carrier and other large airplanes, and all airplanes which operate at high altitudes or at high speeds, must be equipped with DME by 1964, if operating IFR in the air traffic control systems.

In his remarks to the conference on DME on March 22, 1961, the Administrator indicated that the Agency would pre-

fer to seek reasonable compliance in matters of this nature. Although the program which the air carriers have voluntarily initiated is recognized and is in general accord with the considerations mentioned herein, it is believed that the DME installation schedule proposed herein is more appropriate considering the capabilities and needs of the industry and of the FAA.

In consideration of the foregoing, it is proposed to amend Parts 40, 41, 42, and 43 of the Civil Air Regulations to require the following civil aircraft of the United States, when operating under instrument flight rules in the controlled airspace of the United States, to be equipped on and after the date specified, with distance measuring equipment (DME), capable of receiving and indicating distance information from VORTAC facilities:

1. July 1, 1962, all turbojet airplanes.
2. January 1, 1963, all turboprop airplanes.
3. July 1, 1963, all pressurized airplanes.
4. January 1, 1964, all other airplanes having a maximum certificated takeoff weight of more than 12,500 pounds.

These amendments are proposed under the authority of sections 313(a), 601, 604, 605 of the Federal Aviation Act of 1958 (72 Stat. 752, 775, 778, 49 U.S.C. 1354(a), 1421, 1424, 1425).

Issued in Washington, D.C., on May 19, 1961.

OSCAR BAKKE,
Director, Bureau of Flight Standards.

MAY 19, 1961.

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