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VHF Air-Ground Communication Technology and Spectrum Utilization

RTCA DO-169
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F O R E W O R D

This Report was prepared by Special Committee 140 of the Radio Technical Commission for Aeronautics. It was approved by RTCA on July 20, 1979.

RTCA is an association of aeronautical organizations of the United States from both government and industry. Dedicated to the advancement of aeronautics, RTCA seeks sound technical solutions to problems involving the application of electronics and telecommunications to aeronautical operations. Its objective is the resolution of such problems by mutual agreement of its member and participating organizations.

The findings of RTCA are in the nature of recommendations to all organizations concerned. As RTCA is not an official agency of the Government of the United States, its recommendations may not be regarded as statements of official government policy unless so enunciated by the government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

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EXECUTIVE SUMMARY

One of the recommendations of the RTCA Aviation Service Working Group (ASWG), set up at the Federal Communications Commission's request to coordinate nongovernment participation in the U. S. preparatory work for the International Telecommunication Union 1979 General World Administrative Radio Conference, was that an additional 2 MHz of VHF spectrum contiguous to the currently allocated 118-136 MHz band be assigned to the Aeronautical Mobile Service to help meet the expected demand for additional channels towards the end of the century. Special Committee 140 was given the task of developing a plan for the most effective use of this additional spectrum. Its terms of reference included instructions to consider the impact of this plan upon use of the present spectrum, with the objective of encouraging further increases in the efficiency with which this safety service utilizes this valuable resource.

The Special Committee found the new spectrum will, in addition to more channels, facilitate the implementation of a further reduction of channel spacing in the present spectrum. After a careful study of the alternatives, SC-140 recommends that reduced channel spacing (possibly 12.5 kHz) be employed in the new spectrum, with continued use of amplitude modulation. Significant economic and operational penalties, with no corresponding spectrum use benefits, would result from the adoption of other modulation techniques. A further benefit of retaining amplitude modulation is the minimization of the technical problems of any subsequent transition to reduced channel spacing in the existing spectrum.

The Special Committee also recommends that care be taken to avoid premature implementation of reduced channel spacing in the present spectrum. Ground administrations have not yet fully implemented the channels made available through the recent adoption of 25 kHz spacing. Much airborne and virtually all ground VHF communications equipment designed for 25 kHz channel spacing is only in the early part of its life cycle. Also, at least one more generation of such airborne equipment is scheduled to enter service with new aircraft in the early 1980's. Thus, the introduction of a further reduction in channel spacing must allow adequate time to fully amortize the newly installed equipment and develop a suitable replacement for Climax networks used in many parts of the world if an orderly transition is to be achieved. Only in this way can the unique needs of this safety service be fully satisfied.

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I. INTRODUCTION

In preparing for U. S. participation in the 1979 General World Administrative Radio Conference (GWARC), the Federal Communications Commission (FCC) established Radio Service Working Groups for the various services under its jurisdiction. The FCC acknowledged that the Radio Technical Commission for Aeronautics (RTCA) was the focal point for nongovernment aviation participation in such preparatory work and requested that RTCA act as the Aviation Service Working Group. To this end RTCA established Special Committee 129 (SC-129) to respond to the various FCC Notices of Inquiry (NOI) relating to aviation interests.

In its comments on the FCC Fifth NOI, the ASWG provided further justification for additional spectrum for Aeronautical Operational Control. The thrust was to urge the FCC to provide an adequate amount of contiguous spectrum to permit satisfying the operational control communication requirement.

In its response to the FCC Eighth NOI, the ASWG stated:

> "It is apparent from the data provided by the FCC 8th NOI that the probability of an adequate allocation to serve all operational control requirements cannot likely be made in the 136-960 MHz band."

Consistent with the previous view that contiguous spectrum should be allocated to permit use of a single aircraft system to be used for several purposes (air traffic control and operational control), the FCC was urged to reconsider the possibility of sharing the 136-138 MHz band between the present users in various ITU Regions and the Aeronautical Mobile and any other service presently recognized. It should be explained by an appropriate footnote that services other than Aeronautical Mobile would be phased out on a long-term basis.

The ASWG Report (RTCA Paper No. 128-78/SC129-66) suggested that use of the 136-138 MHz band be predicated on a plan which RTCA would prepare showing how reduced channel width, or perhaps different modulation techniques, would be employed to make improved use of the new (136-138) spectrum.

If encouraged by FCC, as a result of some FCC action toward making spectrum in the band 136-138 available for Aeronautical Mobile, it was indicated that RTCA would:

- Establish a Special Committee to study means and methods of transitioning to the use of new modulation techniques, or any other method, that would improve spectrum utilization efficiency, beginning in the band 136-138 MHz as well as investigation of the best means of accommodating SST aircraft on such narrow-band channels;