REPORT 1181

MICROWAVE LANDING SYSTEM (MLS) SPECTRUM REQUIREMENTS AND SIGNAL PROTECTION CRITERIA

(Question 95/8)

(1990)

1. Introduction

1.1 WARC MOB-87 adopted Recommendation No. 607 which recommends that a future conference consider sharing a portion of the band 5 000 - 5 250 MHz which may not be required by the MLS and any other aeronautical radionavigation system. It also requested CCIR to study the spectrum requirement of MLS which led to the formulation of Question 95/8. The Recommendation also requested the cooperation of ICAO and other interested bodies.

1.2 The 1987 ITU World Administrative Radio Conference for the Mobile Services (WARC MOB-87) allocated, by footnote 797A, the band 5 150 - 5 216 MHz to the radiodetermination-satellite service on either a primary or a secondary basis and by footnote 797B, allocated the band 5 150 - 5 250 MHz in eighteen countries to the mobile service on a primary basis, subject to Article 14 coordination. The band 5 000 - 5 250 MHz had been previously allocated exclusively to aeronautical radionavigation, with footnote 796 indicating that the requirements of the MLS shall take precedence over other uses of the band.

2. ICAO activities

2.1 In conjunction with the overall planning for MLS implementation, ICAO has established a series of tasks to be accomplished by various ICAO bodies for development of all necessary criteria and procedures to support implementation and operational use of MLS. One of the tasks involves a review of MLS signal protection issues.

2.2 Two specific issues were identified:

a) minimum MLS spectrum requirements need to be justified taking into account system growth;

b) frequency management constraints have been encountered within Europe in making MLS frequency assignments. Development of suitable solutions will be necessary.

2.3 ICAO had previously determined that criteria based on absolute levels (rather than relative D/U levels) were necessary to preclude the acquisition of the DPSK preamble from undesired co-channel facilities. That is, the undesired co-channel must be suppressed below the desired receiver's noise level which requires separation of the undesired co-channel facility beyond the radio horizon.

2.4 A review of the co-channel DPSK interference mechanism based on current airborne receiver designs has confirmed that the current criteria of absolute signal level (separation to the radio horizon) in ICAO Annex 10 is proper and assures high integrity operations in all cases. Moreover, it was concluded that the variability of the D/U levels due to the combined fluctuations in transmitter power, propagation losses, airborne antenna gain and receiver sensitivities precluded the use of airborne receivers based on amplitude D/U criteria. Also, it was agreed that studies of other techniques will be undertaken in an effort to provide flexibility in alleviating the constraints imposed by the current criteria.

2.5 An initial assessment has been made of the European and United States assignment models and resulting plans. Further information will be exchanged to reach a better understanding of the different constraints in Europe and the United States. Both plans are considered acceptable for MLS implementation up to the year 2015 (the current MLS protection period). However, there is little margin in the two plans for future growth beyond the number of MLS facilities currently estimated for that period. In developing the MLS frequency plan for Europe, certain operational constraints were necessary due to the large number of MLS requirements in adjacent countries, and the MLS channels currently available. In the United States, it is expected that the same MLS frequency will have to be used for systems serving opposite ends of the same runway, again due to the limitation of currently available channels.

2.6 In view of these constraints and the need for some margin to accommodate long term growth, it was concluded that additional channels should be defined for implementation beyond the year 2015. Under Work Item 3, these additional channels will be defined for consideration by ICAO. It is expected that the band between 5 091 and 5 150 MHz will accommodate the new channels. Also, new DME/P channels will be defined from the available channels and pulse codes that are not paired to the existing 200 MLS channels.

2.7 An initial assessment has also been made of various services which are authorized to operate in the spectrum near to that allocated to the MLS. These include such systems as terminal weather radars, troposcatter communications systems, and satellite feeder links. In addition, particular attention was given to land mobile services which were authorized in the 5 150 - 5 250 MHz band (see 1.2 above). Preliminary conclusions are that the MLS can be protected by reasonable guardbands at the band edges to assure that the sidebands of the candidate system first channel have decayed to the spurious level. Also, for high powered candidate systems some distance separation may be needed as well, though this would be impracticable for mobile services. Further study is being conducted to define the specific criteria.