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Before the
FEDERAL COMMUNICATIONS COMMISSION
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In the Matter of	)	
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Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band and the 1.6/2.4 GHz Band	)	IB Docket No. 01-185
	)	
Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile Satellite Service	)	ET Docket No. 95-18

To: The Commission

COMMENTS OF THE AEROSPACE AND FLIGHT TEST RADIO COORDINATING COUNCIL

The Aerospace and Flight Test Radio Coordinating Council ("AFTRCC"), by its counsel, hereby submits its comments in response to the Commission's *Notice of Proposed Rule Making* in the above-captioned proceeding (the "*NPRM*"), FCC 01-225, released August 17, 2001.[1] In the *NPRM* the Commission seeks comment on proposals to authorize the terrestrial use of frequencies assigned to the mobile satellite service ("MSS").

AFTRCC focuses these comments on the Commission's proposal to authorize terrestrial operations in the 1525-1559 MHz band. This band is immediately adjacent to the primary flight test band, 1435-1525 MHz, which is used for aeronautical telemetry. These comments focus

[1] By *Order Extending Comment Period*, DA 01-2314, Released October 4, 2001, the Chief, Planning & Negotiations Division, International Bureau, extended the time for filing comments in this proceeding until October 19, 2001. By Public Notice, *FCC Announces Change in Filing Location for Paper Documents*, DA 01-2436, released October 17, 2001, the Commission announced that the filing date for all filings due on October 19, 2001, was extended to October 22, 2001.

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only on ensuring that any terrestrial use of the L-band frequencies which the Commission might consider does not cause adverse effects on flight test operations.

INTRODUCTION

AFTRCC is an association of aerospace companies engaged in the design, development, manufacture and testing of commercial and military aircraft, space vehicles, missiles and weapons systems. Members of AFTRCC include, in particular, the major U.S. manufacturers of military and commercial aircraft.[2] AFTRCC is the FCC-recognized advisory committee for coordination of flight test frequencies shared by Government and non-Government users. *See* 47 C.F.R. Section 87.305. AFTRCC works closely with its counterpart Government coordinators in order to ensure prompt, efficient coordination of the flight test frequencies.

AFTRCC has a long history of participating in spectrum policy issues. For example, AFTRCC initiated the private sector efforts which led to the allocation of radio spectrum for aeronautical telemetry, including its 1975 initiative which culminated with the allocation of the 1435-1525 MHz band for flight testing. Similarly, AFTRCC successfully petitioned for regulatory changes which eliminated potential regulatory handicaps to the global competitiveness of the U.S. commercial space launch industry. AFTRCC also has represented the interests of the aerospace industry in connection with proposals which contemplated reallocation of U.S. flight test spectrum to other, non-aviation uses -- such as the 1452-1492 MHz band for DARS. AFTRCC's experience makes it well qualified to comment on matters concerning the proposed terrestrial use of the 1525-1559 MHz L-band frequencies.

[2] AFTRCC's members are listed individually in Attachment 1.

Aeronautical telemetry is used to provide critical flight test, telemetry and telecommand operations data and communication between ground facilities and the aircraft, space vehicle, missile, or weapon system under test. Telemetry operations use facilities licensed by the Commission under 47 C.F.R. Part 87, Subpart J. Flight test operations occur in various areas of the country. They take place at altitudes which can exceed 60,000 feet and in an operational radius up to 200 miles (320 kilometers) from the associated ground station. Flight test, telemetry and telecommand operations are critical to the U.S. aerospace industry's ability to develop and deliver new and modified aircraft, space vehicles and military equipment. Real-time telemetry afforded by L-band frequencies is a major contributor to the productivity of the U.S. aerospace industry. Moreover, this real-time data link enables ground-based engineers to abort a test maneuver whenever a monitored condition indicates a possible threat to the aircraft or its crew, or to neighboring communities. Flight test operations are perhaps even more critical now that the United States is engaged in a long-term fight against international terrorism -- an effort that will require all of our technological and military resources and the development of new and improved aircraft and weapons systems.

As discussed below, L-band telemetry is susceptible to interference from terrestrial MSS operations in the 1525-1559 band. If the Commission authorizes terrestrial operations in this band, either as an auxiliary service for licensed MSS operators, or for others to provide a stand-alone terrestrial service, the Commission must include adequate safeguards to avoid interference to flight test operations.

DISCUSSION

Motient Services Inc. ("Motient") has proposed the use of the upper and lower L-band[3] for terrestrial base stations that would be used as part of its next generation mobile satellite system. In particular, Motient proposes that mobile MSS terminals be allowed to receive signals transmitted via terrestrial repeaters in the 1525-1559 MHz band. *NPRM* at para. 15, n. 41. The Commission alternately has suggested the possibility of allowing use of the MSS frequencies to provide terrestrial service, either in conjunction with a licensed MSS system, or as an alternative stand-alone mobile service. *See NPRM* at para. 37.

The Commission has noted that "permitting reuse of MSS spectrum for terrestrial services will require protection of adjacent channel and intraband operations, restrictions on tower heights and transmit powers, and frequency stability." *NPRM* at para. 34, *citing* 47 C.F.R. Section 24.200 *et seq*. Such protections and limitations are particularly critical to assure that no interference will occur to flight test operations.

Flight test telemetry involves safety of flight and is considered mission critical. Terrestrial use of the L-band MSS frequencies has significant potential to interfere with adjacent channel telemetry signals unless adequate safeguards are in place. Flight test operations are characterized by a combination of weak signals, wide bandwidths (5 MHz and potentially higher), and high-gain ground receiving antennas. Test aircraft use transmitters with output power levels of 20 watts and less, and operate at ranges up to 200 miles from the telemetry ground stations. Terrestrial transmitters could be located in close proximity to flight test operational areas and would pose a significant interference problem to ground receive stations.

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[3] The upper L-band includes the 1549.5-1558.5 MHz and 1651-1660 MHz bands allocated to MSS. The lower L-band includes the 1525-1544 MHz and 1626.5-1645.5 MHz bands allocated to MSS. *See NPRM* at paras. 12 and 14.

Moreover, terrestrial transmitters could have effective output levels orders of magnitude greater than aeronautical telemetry transmitters.

Terrestrial transmitter/flight test interference is not a simple issue, and involves two key effects. First, the out-of-band emissions from terrestrial transmitters can appear as in-band signals to flight test telemetry receivers. Second, in-band (1525-1559 MHz) signals from terrestrial transmitters could be sufficiently strong to overcome the telemetry receivers' out-of-band rejection capabilities.

There are several ways these effects can impact flight test telemetry equipment. For example, terrestrial transmitter emissions could saturate the wideband low noise amplifiers used as pre-amplifiers in almost all flight test ground stations. The key concerns are whether the tracking antenna of the flight test ground station happens to point at a terrestrial antenna, and whether the power received from the transmitter is sufficient to saturate the flight test preamp. This depends in part on the directive gain of the flight test telemetry receive antenna, which will vary among different flight test ground stations.

Even if saturation does not occur, flight test receive equipment will process these emissions which, in turn, will degrade the signal-to-noise level of the telemetry signal from the aircraft. This could reduce dramatically the distance from the ground station at which telemetry system reliability and performance is acceptable.

Similar issues arose in the context of the proposed terrestrial repeaters for digital audio radio (DARS).[4] However, in the DARS case there is 15 MHz of "guard band" between the proposed DARS repeater frequencies and the flight test operation frequencies.[5] Nonetheless, the

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[4] *See generally Establishment of Rules and Policies for the Digital Audio Radio Satellite Service in the 2310-2360 MHz Frequency Band*, 12 FCC Rcd 5754, 5810-5812 (1997).

[5] DARS repeaters occupy 2320-2345 MHz. *See Order and Authorization*, DA 01-2171, released

proposed repeaters presented a significant interference potential for flight test operations.[6] After extensive discussions, AFTRCC and the two authorized DARS service providers (XM Radio Inc. and Sirius Satellite Radio, Inc.) entered into Coordination Agreements whereby the parties agreed to coordinate the location of terrestrial DARS repeaters that would have line-of-sight to an AFTRCC facility, and the DARS operators agreed to limit the total out-of-band emissions of any DARS repeater within line of sight of an AFTRCC facility.[7]

The potential for interference to flight test operations from terrestrial transmitters in the L-band is significantly greater than the proposed DARS repeaters inasmuch as the 1525-1559 MHz MSS band is immediately adjacent to the 1435-1525 MHz flight test band. Moreover, the current out-of-band emission limits set forth in Section 24.238 of the Commission's Rules, which the Commission proposes to adopt for terrestrial transmitters are, standing alone, insufficient to prevent interference to flight test receive stations located in the vicinity of a terrestrial transmitter. Indeed, any protection standard for adjacent channel flight test operations necessarily must consider the effective radiated power of the terrestrial transmitter in the direction of the flight test center, the distance to the flight test site, the visibility of the test site as it relates to the transmitter's antenna height, the frequency distribution of the interference across

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September 17, 2001, and *Order and Authorization*, DA 01-2172, released September 17, 2001, (granting special temporary authority for the operation of terrestrial DARS repeaters). Flight test operations use the 2360-2390 MHz band. The intervening 15 MHz (2345-2360 MHz) is assigned to the Wireless Communications Service.

[6] *See* Reply Comments, filed March 8, 2000, by AFTRCC in IB Docket No. 95-91.

[7] *See* the September 11, 2000, Letter from Bruce Jacobs to Mr. Ronald Repasi, Federal Communications Commission, transmitting a copy of the Coordination Agreement between XM Radio and AFTRCC; and the October 12, 2000, Letter from Jennifer Hindin to the Commission transmitting a copy of the Coordination Agreement between Sirius Satellite Radio, Inc. and AFTRCC.

the band, and other relevant factors. The Commission's proposed adjacent channel protection standard includes none of these factors.

The protection levels generally required for flight testing vis-à-vis satellite operations are set forth in Recommendation ITU-R M.1459. But this is only a starting point for an analysis of the out-of-band problem, particularly in respect of terrestrial transmitters. Recommendation ITU-R M.1459 does not address situations in which the interfering transmitter is located within the area of flight test operations, as would occur with terrestrial transmit facilities. Further, it does not address the potential situation where the in-band power from a terrestrial transmitter overwhelms the out-of-band rejection capabilities of a telemetry receiver.

Another important element to ensure adequate interference protection to flight testing is advance coordination for any terrestrial facilities that will have line-of-sight to a flight test telemetry ground station. In the *NPRM* the Commission proposed coordination requirements but only as to co-frequency systems. *Ibid.* at para. 56. However, as demonstrated in AFTRCC's agreements with the two authorized DARS service providers, coordination can be accomplished for any affected terrestrial operator within line-of-sight of a flight test facility. Thus, the Commission should also include an adjacent channel coordination requirement in the event it should see fit to allow terrestrial transmitters in the 1525-1559 MHz band.

Conclusion

It is critical that the Commission consider adequate protection levels for flight test telemetry operations on frequencies adjacent to any terrestrial service in the 1525-1559 MHz band, MSS or otherwise. This necessarily will include a careful examination of the appropriate power level within the band, consideration of possible limits on terrestrial transmitter out-of-band emissions, and coordination of any proposed terrestrial transmitter before installation within line-of-sight of a flight test telemetry ground station.

Respectfully submitted,

AEROSPACE AND FLIGHT TEST RADIO COORDINATING COUNCIL

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ATTACHMENT 1

AFTRCC MEMBERS

Bell Helicopter Textron

The Boeing Company
- Commercial Airplanes
- Military Aircraft & Missile Systems

Cessna Aircraft Company

Honeywell Engines & Systems

ITT-Gilfillan

Lockheed Martin Corporation
- Aeronautics Company
- Enterprise Information Systems

Northrop-Grumman
- Integrated Systems

Raytheon Corporation
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- Raytheon Electronic Systems
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DOCKET NO. 95-18, 01-185

Attachment A

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1 Diskette see 95-18