Inmarsat Hawaii Inc.
FCC Form 312
Response to Question 42a

Description of Proposed Operations

By this application, Inmarsat Hawaii Inc. ("Inmarsat") seeks authority to modify the existing license for its gateway earth station located at Paumalu, Hawaii, Call Sign E080059 (the "Paumalu Gateway"), to enable it to *receive* certain Global Positioning System ("GPS")-related data as a part of the Federal Aviation Administration's ("FAA") Wide Area Augmentation System ("WAAS"). WAAS provides augmentation messages containing corrections for timing and errors in the GPS message from GPS satellites, allowing GPS system users to compute better positional accuracy than they could with standard GPS data alone.

More specifically, Inmarsat seeks to modify the Paumalu Gateway to receive WAAS data transmitted by the Inmarsat 4F3 ("I4F3") spacecraft over "L1" and "L5" GPS frequencies (1573.42-1577.42 MHz and 1166.45-1186.45 MHz, respectively). The I4F3 spacecraft will receive these data from: (i) the Paumalu Gateway, which would uplink over already authorized C-band frequencies and associated navigational carriers; and (ii) Vizada's uplink facility at Santa Paula, California, which would uplink using C-band frequencies and associated navigational carriers.[1]

Inmarsat's receive operations over the L1 and L5 frequencies at the Paumalu Gateway would be limited to configuration and testing activities in the near term. While WAAS data transmitted from the I4F3 spacecraft ultimately would be used by end users after Inmarsat's components of the WAAS system are fully implemented and tested, such implementation and testing would not be complete until at least January 2011. During this testing and implementation phase, WAAS data transmitted from the I4F3 spacecraft would be encoded with a "do not use" code directing GPS user terminals to ignore transmissions from the I4F3 spacecraft over the L1 and L5 frequencies.[2] Inmarsat would request that the FAA not alter this encoding until it has established that users have obtained requisite authority from the Commission.[3]

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1 *See* IBFS File No. SES-MFS-20100119-00089 (Vizada C-band uplink modification application). WAAS incorporates redundancy at many levels, and thus normally incorporates two gateway earth station facilities to service each WAAS satellite. Notably, Vizada's Santa Paula facility also would receive WAAS data from the I4F3 spacecraft, in a manner similar to the Paumalu Gateway. Inmarsat understands that those receive-only operations will be the subject of a separate application to be filed by Vizada.

2 WAAS data are generated by the FAA at its WAAS Master Station. Neither the I4F3 spacecraft nor the Paumalu Gateway would alter these data.

3 Inmarsat is planning to request that the Commission allow GPS users to receive signals from the I4F3 spacecraft without filing individual receive-only applications, likely through either a waiver request or petition for declaratory ruling.

Processing of the Instant Application

Because this application does not propose to utilize the L1 and L5 frequencies for MSS operations, and, moreover, does not propose to use an omni-directional antenna for communications, this application should be processed pursuant to the Commission's "first-come, first-served" procedures.[4] Nevertheless, Inmarsat acknowledges that WAAS users may use omni-directional antennas to receive signals from the I4F3 spacecraft in the future. As such, out of an abundance of caution, to the extent necessary, and consistent with Commission precedent, Inmarsat requests a waiver of Sections 25.157 and 25.158 of the Commission's rules to permit the Commission to process this application pursuant to "first-come, first-served" procedures.

The Commission may waive a rule for "good cause shown."[5] Notably, the Commission previously has concluded that there is "good cause" to waive its rules so as to process GPS/WAAS-related applications on a "first-come, first-served" basis. In particular, the Commission has recognized that because all users of the L1 and L5 frequencies must operate in conjunction with and be fully compatible with the U.S. GPS system, employing "first-come, first-served" licensing procedures would not preclude future licensees in these bands from also using this spectrum. Consequently, there is no need to segment available spectrum through a modified processing round approach that otherwise might apply.[6] Furthermore, the Commission has recognized that the presence of the U.S. GPS system, and ITU Resolution 609, constrain the Commission's ability to engage in such segmentation in these frequency bands.[7] Accordingly, there is good cause to waive the Commission's rules as requested.

Market Access for L1 and L5 Frequencies

The I4F3 spacecraft is licensed by the United Kingdom, and its use therefore is subject to the requirements of Section 25.137 of the Commission's rules.[8] The I4F3 spacecraft has been placed on the ISAT List, which constitutes a finding that this spacecraft "meet[s] the Commission's legal, technical, and policy requirements to access the U.S. market" specified in

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4 *See* 47 C.F.R. §§ 25.157 (specifying that processing round procedures apply with respect to NGSO satellite systems applications and GSO MSS satellite system applications in which satellites are designed to communicate with earth stations with omni-directional antennas), 25.158 (specifying that "first come, first served" procedures apply to all other applications). Inmarsat seeks authority to receive transmissions over the L1 and L5 frequencies in the RNSS, which is distinct from the MSS.

5 47 C.F.R. § 1.3.

6 *Lockheed Martin Corporation Application To Launch and Operate a Geostationary Orbit Space Station in the Radionavigation Satellite Service at 133° W.L.*, Order and Authorization, 20 FCC Rcd 11023, at ¶ 15 (2005) ("*Lockheed Order*");

7 *Id.*

8 *See* 47 C.F.R. § 25.137.

that section with respect to licensed L-band frequencies.[9] Moreover, the existing license for the Paumalu Gateway authorizes Inmarsat to serve the U.S. market using C- and extended C-band frequencies over the I4F3 spacecraft. Thus, Inmarsat has satisfied the requirements of Section 25.137 other than with respect to the L1 and L5 frequencies.

There is a more than adequate basis to grant market access with respect to the L1 and L5 frequencies—the only frequencies that are the subject of the instant application—because the I4F3 spacecraft remains licensed by the United Kingdom, a WTO member country, and would operate in a manner consistent with the Commission's technical and other requirements with respect to these frequencies.

As an initial matter, the nature of WAAS generally, and of the proposed WAAS operations over the I4F3 spacecraft specifically, mitigates any potential for harmful interference into other operations in the L1 and L5 bands. Critically, Inmarsat's operations would be fully coordinated with and integrated into the larger U.S. GPS system in order to ensure maximum compatibility with, and to avoid causing any harmful interference into, that system. Further, Inmarsat would utilize a signal structure and architecture similar to the U.S. GPS system, which uses Code Division Multiple Access ("CDMA") techniques and pseudo-random noise ("PRN") codes assigned by the GPS Wing of the U.S. Air Force to achieve maximum compatibility. The Commission has acknowledged that this architecture is sufficient to allow multiple users to share the L1 and L5 frequencies without causing harmful interference to each other.[10]

Consistent with Commission precedent, Inmarsat acknowledges its obligation to coordinate with operators of the U.S. GPS system, in order to ensure maximum compatibility and avoid causing harmful interference to its operations.[11] Based on Inmarsat's coordination efforts to date, Inmarsat does not expect that any harmful interference would occur in the L1 and L5 bands into the U.S. GPS system.

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9 *See Inmarsat, Inc. Request to Streamline Licensing of L-Band Mobile-Satellite Service Terminals Using Inmarsat Satellites as Points of Communication*, Order, 23 FCC Rcd 15268 (2008).

10 *Lockheed Martin Corporation Application To Launch and Operate a Geostationary Orbit Space Station in the Radionavigation-Satellite Service at 133° W.L.*, Order and Authorization, 20 FCC Rcd 11023, at ¶ 30 (2005) ("*Lockheed 133 Order*"); *Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands*, Report and Order, 9 FCC Rcd 5936, at ¶ 26 (1994).

11 *See Lockheed 133 Order* at ¶¶ 50 *et seq.; Lockheed Martin Corporation Application To Launch and Operate a Geostationary Orbit Space Station in the Radionavigation-Satellite Service at 107.3° W.L.*, Order and Authorization, 20 FCC Rcd 14558, at ¶¶ 38 *et seq.* (2005).

Inmarsat has completed frequency coordination with the Lockheed Martin RNSS systems that are authorized at 107.3 WL and 133 WL, LM-RPS-107.3W and LM-RPS-133W.[12] This coordination occurred at the US-UK frequency coordination meeting held in April 2008 in London. Through the U.K. administration, Inmarsat is progressing coordination of the INMARSAT-4 98W network in the L1 and L5 bands with MTSAT (Japan) and COMPASS / CHINASAT (China). Inmarsat does not expect that any harmful interference would occur in the L1 and L5 bands into those networks, and anticipates that these coordinations can be completed in the near future.

Moreover, Inmarsat has participated in the International Telecommunication Union ("ITU") consultation meetings to ensure that the I4F3 spacecraft operates in a manner consistent with ITU Resolution 609, which governs aeronautical radionavigation service ("ARNS") and radionavigation-satellite service ("RNSS") systems in the 1164-1215 MHz band. More specifically, at the last such meeting held in June 2009, it was agreed that the aggregate epfd from the operations of the I4F3 and other I4-class spacecraft in the L5 frequencies would be below the applicable limit.

The I4F3 spacecraft is described fully in a Technical Annex already on file with the Commission.[13] To ensure that the Commission has complete and accurate information with respect to the proposed WAAS operations over the I4F3 spacecraft, Inmarsat is submitting an amended and restated Schedule S with this application.[14] As compared to the most recent Schedule S for the I4F3 spacecraft, submitted in April 2008, the revised Schedule S:

- Expressly includes the L1 and L5 frequencies as operating frequencies in response to item S.2;
- Includes, in response to item S.13, two new link budgets based on the specific receive-only antenna that Inmarsat proposes to add to the Paumalu Gateway—"FLG Nav 20 MHz 1.8mRx.doc" and "FLG Nav 4 MHz 1.8mRx.doc."
- Updates the antenna gain specified in response to item S.13 to 58.5 dB, reflecting the transmit gain associated with the C-band antenna and its associated navigational carriers that are already licensed for the Paumalu Gateway; and
- Specifies the 97.65° W.L. orbital location in response to items S.3 and S.8—where the spacecraft is now being used to provide service pursuant to Commission

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12 *See generally id.*

13 *See* IBFS File No. SES-AFS-20080228-00207, at Exh. D.

14 Because Inmarsat has not previously sought authority from the Commission to access the U.S. market using the L1 and L5 frequencies, the Schedule S previously submitted for this spacecraft did not provide the full particulars of operation with respect to these frequencies. *See* IBFS File No. SES-AFS-20080410-00448.

authority—instead of the 98° W.L. orbital location originally proposed, and updates all beam diagrams to reflect this offset orbital location.

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The proposed modification would allow Inmarsat to provide the infrastructure needed to meet the FAA's goal of improving the performance and accuracy of its GPS network. Significantly, the proposed receive-only operations would cause no risk of harmful interference. Accordingly, grant of the instant application would serve the public interest.