

## Description of Amendment

Inmarsat Hawaii Inc. (“Inmarsat Hawaii,” and together with its affiliates, “Inmarsat”) submits this amendment to its application for authority to operate a gateway earth station that will communicate with the Inmarsat-5 F2 (“I5F2”) spacecraft.<sup>1</sup> The Application includes the market access information required pursuant to Section 25.137 of the Commission’s rules, including an orbital debris mitigation showing.<sup>2</sup> This amendment corrects the description of Inmarsat’s strategies to mitigate orbital debris contained in the Technical Annex included as Attachment A to the Application.<sup>3</sup> The following paragraphs replace the Accidental Explosion Assessment in Section A.17.2 of the Technical Annex:

The Boeing 702HP (Inmarsat I5F2) satellite is designed to minimize the potential for accidental explosions through propellant leakage and fuel and oxidizer mixing or other means. Propellant tanks and thrusters are isolated using redundant valves, and electrical power systems are shielded in accordance with standard industry practices. During the mission, batteries and various critical areas of the propulsion subsystem will be monitored to avoid conditions that could result in explosion. After the Boeing 702HP spacecraft reaches its final disposal orbit, all on-board sources of stored energy will be removed by depleting all propellant tanks, venting all (exception to helium as described below) pressurized systems, discharging batteries, and turning off all active units.

The Boeing 702HP spacecraft uses a bus that has a liquid propulsion system design consisting of two helium tanks plus two pairs of fuel and oxidizer tanks and uses a xenon ion propulsion system design consisting of two xenon tanks. Venting of the excess propellant in the fuel, oxidizer and xenon tanks is performed as part of the end-of-life shutdown operations. The helium tanks provide proper propellant tank pressurization for apogee engine firings during transfer orbit. Consistent with Boeing’s practice with respect to a number of its spacecraft buses, both helium tanks are isolated at the end of transfer orbit by firing pyro-valves. The spacecraft’s helium system will be sealed when tanks are isolated, resulting in a final pressure of ~230 psi, which is extremely low relative to the design burst pressure of 5250 psig (actual test performance at 6660 psig). Due to the low pressure at end-of-life in the helium tanks and their enclosure in the spacecraft body, an explosive event is extremely unlikely (even in the event of a tank rupture, *e.g.*, a meteorite strike), minimizing the potential of any release of orbital debris. The xenon tanks are vented by opening latch valves downstream of the tanks to allow cold flow through the xenon ion thrusters.

While applications seeking U.S. market access via non-U.S.-licensed space stations are required to submit information concerning orbital debris mitigation, the Commission has concluded that the orbital debris disclosure requirement can be satisfied by showing that the

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<sup>1</sup> See IBFS File No. SES-LIC-20120426-00397, Call Sign E120072 (the “Application”).

<sup>2</sup> See 47 C.F.R. §§ 25.114(d)(14), 25.137(b).

<sup>3</sup> Application, Attachment A at A.17.

satellite system's debris mitigation plans are subject to direct and effective regulatory oversight by the satellite system's national licensing authority.<sup>4</sup> The Commission has determined that this showing may be satisfied by submitting an English language version of the debris mitigation rules or regulations of the national licensing authority and to indicate the current status of the national licensing authority's review of its debris mitigation plans.<sup>5</sup>

The I5F2 satellite will be operated under the authority of the United Kingdom, and will be subject to the United Kingdom Outer Space Act 1986 ("Outer Space Act"). The Outer Space Act ensures compliance with the U.K.'s obligations under international treaties and principles covering the use of outer space and specifies that the U.K. licensing authority has the power to require licensees to conduct operations in such a manner as to "prevent the contamination of outer space," to "avoid any breach of the United Kingdom's international obligations," and to impose conditions "governing the disposal of the payload in outer space on the termination of operations under the license." In addition, the U.K. Space Agency, the U.K. agency charged with licensing activities in outer space, including the launch and operation of space objects, has issued published guidance on the Outer Space Act requirements, which requires applications for a space activities license to provide information regarding the plans for disposal of the space object at the end of life, including whether the propellant and pressurant tanks are vented. The UK Space Agency evaluates such applications pursuant to published standards, including the IADC Space Debris Mitigations Guidelines.

Inmarsat is in the process of preparing the application for launch and operating authority for filing with the UK Space Agency and expects to submit the application shortly. The application will describe the end-of-life plan for I5F2 as described above. Inmarsat submits that the foregoing demonstration of the U.K.'s authority over I5F2 provides direct and effective regulatory oversight regulation of the space activities of I5F2, and satisfies the disclosure requirements of Section 25.114(d)(14).

While, as the description above indicates, the I5F2 spacecraft does not comply with one aspect of Section 25.283(c) of the Commission's rules,<sup>6</sup> given the direct and effective oversight of the U.K. over the space operations of I5F2, Inmarsat submits that the orbital debris requirements of the Commission's rules are satisfied. In any event, given the *de minimis* low

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<sup>4</sup> *Mitigation of Orbital Debris*, Second Report and Order, 19 FCC Rcd 11567 ¶¶ 94, 95 (2004) ("*Orbital Debris Second Report and Order*").

<sup>5</sup> *Id.* at ¶ 95; *see also Globalstar Licensee LLC, GUSA Licensee LLC, GCL Licensee LLC*, Order, DA 11-520 ¶¶ 30-32 (rel. Mar. 18, 2011) (concluding that French Space Operations law and technical regulations provide for direct and effective regulation of debris mitigation measures by France, resulting in a finding that Globalstar satisfied its orbital debris mitigation showing).

<sup>6</sup> The debris mitigation provision reflected in Section 25.283(c) requires that a space station licensee "ensure, unless prevented by technical failures beyond its control, that all stored energy sources on board the satellite are discharged, by venting excess propellant, discharging batteries, relieving pressure vessels, and other appropriate measures." 47 C.F.R. §25.283(c).

pressure at end-of-life in the helium tanks and their enclosure in the spacecraft body, the potential for release of orbital debris is extremely unlikely.