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Subject Line: Kall Morris Inc (KMI) Response to NOAA CRSRA Request for Information: Private Remote Sensing Satellite Disposal and Debris Mitigation

During the ongoing proliferation of Low Earth Orbit (LEO) it is important to clarify and coordinate rules for maintaining safe access to space. As such, it is important to reinstate the requirement of subsection (b)(4) license requirement for a license specifying that the licensee shall, upon termination of operations under the license, make disposition of any satellites in space in a manner satisfactory to the President, including for both the responsible disposal of on-orbit systems at end of life and the mitigation of orbital debris and survivability of such upon reentry. By reinstating this requirement as a narrow rulemaking pertaining to the subsection (b)(4) license requirement that exists in all of its licenses, it further protects the space environment from where the FCC 5-year end-of-life deorbit rules leave off, preventing gaps in requirements and potential for loopholes.

As NOAA CRSRA indicates in their Request for Information, multinational organizations are able to receive Spectrum permission from other countries while still requesting NOAA permission for Earth imaging over the US. The justification for why the standards should still be followed, even for a multinational organization, is that their orbits intersect with the same orbits that are utilized by US satellites.

Response to Request for Comment

KMI is strongly in favor of NOAA reinstating rules that contribute to the long-term protection and safety of assets in LEO. We firmly believe that every satellite operator has a responsibility to be a good steward of the orbits in which they operate. Specific wide-acting requirements from NOAA help solidify these responsibilities as planned parts of missions. In some specific areas, KMI believes the action taken by NOAA could go further to protecting space without harming the ongoing economic activities, and those answers are expressed in the remainder of this response.

1. Articulate the benefits and drawbacks of CRSRA clarifying its supervision of remote sensing system disposal and orbital debris mitigation under its existing authority. Articulate how CRSRA's decision to undertake a narrow rulemaking pertaining to all remote sensing systems, a narrow rulemaking only pertaining to licensees not licensed by the FCC, or limited guidance to licensees not licensed by the FCC would impact these benefits and drawbacks.
 - a. The primary benefit of CRSRA clarifying its supervision and licensing requirements of remote sensing system disposal and orbital debris mitigation would be to prevent the proliferation of uncontrolled debris in LEO. The potential



bureaucratic burden of CRSRA and FCC having identical requirements is not anticipated to be substantial and can be managed by cross-agency collaboration to align the requirements and limit the repetition of identical work.

KMI proposes that the reinstated requirements could be expanded for greater coverage and orbital safety-keeping as the consideration to reinstate subsection (b)(4) license requirement is also an opportunity for NOAA to have a greater impact on protecting critical orbits. By implementing this license requirement, CRSRA could begin to reverse the growing congestion of active and debris space objects in this critical orbital region for Earth and US imaging.

2. Should CRSRA choose to exercise its existing authority for disposal and orbital debris mitigation, recommend which industry standards and best practices CRSRA should consider when developing the definitions, revised condition language, and disposal and orbital debris mitigation plan assessment.
 - a. As operators in the region that CRSRA has existing authority over could include entities both foreign and domestic to the United States, CRSRA could consider modeling requirements found in the FCC's adoption of the '5-Year Rule' [Docket No: 22-27118-313] for deorbiting satellites to address the growing risk of orbital debris. Industry standards around the definition of terms like "disposal" or "orbital debris" are underway at the international organization of CONFERS or the US organization of COSMIC. KMI is a contributing member of both of these organizations.

3. The current subsection (b)(4) license requirement states: "Upon termination of operations under the license, make disposition of any satellites in space in a manner satisfactory to the President." CRSRA defines termination of operations as (1) to irreversibly render the remote sensing system incapable of being operated; (2) to passivate the system such that it cannot be operated; or (3) to become incapable of operating the system due to its natural end-of-life or anomaly, and to cease attempts to communicate as a result thereof. Comment on whether this definition is complete or omits other means by which operations could terminate.
 - a. The above CRSRA definition of "termination of operations" is mostly complete, but may encounter a situation where an operator falsely claims they can maintain communication and control over a satellite without any method for verification.



4. Prior regulations required licensees to “obtain approval from the Assistant Administrator of all plans and procedures for the disposition of satellites as part of the application process” in order to “make disposition of a satellite in space.” Former 15 CFR 960.11(b)(12) (2006). Under this requirement, CRSRA approved disposal plans including atmospheric re-entry, maneuvering to a storage orbit, or direct retrieval. Comment if this list remains comprehensive or if additional means or methods of disposal should be considered.
 - a. The presented options for “end-of-service life” disposal plans, including atmospheric re-entry, maneuvering to a storage orbit, or direct retrieval, could be expanded to include a minimum altitude at which the satellite is considered to be in the process of re-entry, even if it will remain in orbit for several more months. KMI recommends setting an apogee, or highest point of the orbit, below 404km to avoid interaction with the ISS or other space stations, as this would balance the need to deorbit with the cost of lowering the altitude further when atmospheric drag will be sufficient. Additionally, the rules should make clear that contracting with an Active Debris Removal company for direct retrieval and disposal services satisfies the requirements, allowing the industry to specialize and form a secondary commercial market for mission disposal services.
5. Recommend the type and content of documentation regarding disposal and orbital debris mitigation plans CRSRA should require to be submitted should CRSRA choose to exercise its existing authority for disposal and orbital debris mitigation.
 - a. To avoid undue bureaucratic burden on operators the documentation requirements should closely match those required by the FCC. If it is necessary to define the documentation for CRSRA, it should include a primary disposal method with evidence of other tests or missions that successfully executed the method in the timeframe described. There should also be a requirement for a secondary method should the primary method fail, but this secondary method can include approaches with less direct evidence of success, to encourage the development of new and innovative techniques. In addition, each mitigation plan should include an analysis of the potential for collision and affected orbits after the mission has ended and potentially lost the ability to maneuver.
6. Describe if there are disposal and orbital debris mitigation considerations that are unique to remote sensing systems (meaning they may not exist for other types of space systems) or that are of higher importance or priority for remote sensing systems than other types of space systems.
 - a. The orbits most predominantly used for Earth imaging are sun-synchronous orbits, in which the proliferation of debris in the higher 700km to 1200km orbits has become so great that many operators consider these orbits off-limits. This issue is highlighted as the definition of debris or disposal has to have some consideration for what happens if the satellite is destroyed or damaged by another piece of debris or operational object. In that case, one satellite may be launched but may result in hundreds or thousands of trackable objects and many



more untrackable smaller fragments. In this situation, the question arises: should the launch company/operator be considered to no longer have a disposal requirement or should they still have a responsibility to, at the very least, bring down the largest fragments still detected? In this case, the largest fragments could represent at least half of the original mass or some other qualification.

7. Recommend methods by which CRSRA could verify compliance with the license requirement to make disposition of satellites.
 - a. CRSRA could contract a third party to conduct independent verification of compliance with deorbit requirements through direct removal of satellites or debris or a regular survey of an approved constellation to confirm compliance with license requirements. CRSRA could also set a definition that if an operator is warned of a dangerous impending conjunction and fails to perform a risk reduction maneuver they are considered to no longer be in full control of the mission and the timeline for disposal begins, even if the conjunction does not result in a collision.

Sincerely,

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