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Merissa Velez
Chief, Policy Branch
International Bureau
Federal Communications Commission
45 L Street, NE
Washington, DC 20554

RE: Response to FCC email
IBFS File No. SAT-MOD-20210114-00010

Dear Merissa:

HawkEye 360, Inc. ("HE360") hereby responds to your email dated March 16, 2021, requesting additional information regarding the above-referenced application.[1] For your convenience, the questions in the email are reproduced below in italics.

1. *Regarding requested changes in HE360's propulsion system:*

   a. *What is the propellant being used in the new propulsion system? If liquids are being used as part of the propulsion system, would such liquids have a chemical composition that is conducive to the formation of persistent droplets if released?*

      The propellant being used in the IFM Nano Thruster propulsion system is Indium. Our spacecraft have 220g of the Indium fuel onboard. Indium is solid at room temperature and remains in its solid state when contained inside the unpowered IFM Nano Thruster system. The field-emission electric propulsion (FEEP) ionizes the Indium propellant and accelerates it using a strong electric field along a micro-structure emitter tip. The resulting plasma is then expelled to produce thrust. This process does not release any persistent liquids. The propulsion system has been used extensively on orbit (at least 37 units as of early 2021) by several other spacecraft/operators between 2018 and 2020.

   b. *What is the standard course of action when a conjunction data message (CDM) is received? For example, please indicate if there are any risk thresholds that will be used in determining whether an action is required, the sequence of events from the time a CDM is received to the time a propulsive maneuver would be executed, etc.*

      CDMs from the 18 SPCS are re-assessed by HE360 using a hard body radius reflecting the actual size of our spacecraft (1m instead of 5.5m, which is used by 18 SPCS). For CDMs associated with an inactive or non-maneuverable object, HE360 considers a conjunction actionable if the Pc is greater than 1e-4 **or** the miss distance is less than 100m; planning for a collision avoidance maneuver is done for all actionable conjunctions. By default, the maneuver is scheduled to occur 24 hours prior to the time of closest approach ("TCA") and

[1] *See* email to Tony Lin, Counsel for HE360, DLA Piper, from Merissa Velez, Chief, Policy Branch, Satellite Division, International Bureau, FCC (March 16, 2021).

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is uploaded to the spacecraft approximately 36 hours prior to TCA. Maneuvers are planned such that, at TCA, Pc is less than 1e-6 **and** miss distance is greater than 150m.

If updated tracking information indicates the conjunction is no longer actionable (that is, Pc less than 1e-4 and miss distance greater than 100m), the maneuver will not be executed.

For CDMs associated with a maneuverable object, such as an operating satellite, HE360 will attempt to contact and coordinate with the relevant operator. If the operator does not respond before 36 hours to TCA, HE360 will treat the conjunction as if it were with a non-maneuverable object.

c. *Would the HE360 spacecraft be capable of performing a propulsive maneuver that would produce an 18 km trajectory change over 1 orbit revolution? If not, please provide an analysis, considering an array of typical conjunctions in the HE360 operational orbits, of whether high-risk events can be mitigated to a level one and a half orders of magnitude below the mitigation action threshold. If HE360 has not adopted such a threshold, please use a 1E-5 threshold?*

The HE360 spacecraft is not capable of producing an 18 km trajectory change over 1 orbit. The spacecraft is capable of mitigating conjunctions by over two orders of magnitude.

For example, the maneuvers designed for two previously received CDMs show the following results:

Scenario	Pc	Miss Distance
Original CDM, Case 1	2.132e-5	105 m
Case 1 with Mitigation	1.343e-7	523 m
Original CDM, Case 2	3.118e-4	105 m
Case 2 with Mitigation	4.632e-10	438 m

It should be noted that the designed maneuvers were not executed, as the conjunction was rated non-actionable based on updated CDMs; the original values in the table are based on the initially received CDM.

d. *Please confirm HE360 will provision the required amount of propellant to enable collision avoidance given the estimated number potential conjunction events in the HE360 operational orbits, as well as reserve sufficient propellant to conduct the planned end-of-life maneuvers for the system.*

The spacecraft has sufficient propellant to enable collision avoidance maneuvers, using an overly conservative estimate of 4 maneuvers per year. Sufficient propellant is also available to conduct end of life maneuvers.

2. *Regarding the requested antenna changes, please state whether the description of operations provided in the HE360 LOA application, Narrative at pages 4-5, is applicable for the RF frequencies that would be within range for the new antennas.*

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The description of operations provided in the HE360 LOA application, Narrative at pages 4-5, is applicable for the RF frequencies that would be within range for the new antennas.

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