

Omnispace LLC Responses to OET Follow-up Questions to Form 442
File No.: 0426-EX-CN-2022
Correspondence Reference Number: 71294
Date of email: 08/05/2022

Q1) Please provide the following information: (1) The iteration of DAS used for analysis (2.1.1) has been out of date for a number of years due to errors and updates. Please update to DAS 3.2.1 and perform the analysis again using the up-to-date software version.

Answer 1) The OMNI-L1 and OMNI-L2 satellite orbital debris analysis was updated by Thales/NanoAvionics using the NASA Debris Assessment Software (DAS 3.2.3) and a new version of the Omnispace Space Debris Mitigation Document report was created by NanoAvionics. The updated answers in the report to the orbital debris questions asked by the OET/FCC are provided below.

Q2) What is the targeted level of risk of collision reduction that the LEO1 operators are targeting? If no threshold level has been selected, please use a baseline level of risk of collision of $1e-5$, and a reduction of 1 and a half orders of magnitude.

Answer 2) Omnispace has registered the OMNI-L1 satellite with the USSF 18th Space Defense Squadron. OMNI-L1 has been assigned NORAD satellite catalog ID: 52157. Omnispace and its satellite operators Thales Alenia Space/NanoAvionics are registered to receive close approach/conjunction notification messages from the United States 18th Space Defense Squadron for assessment of space situational awareness and space traffic management. OMNI-L2 has been launched but has not reached its final orbit as of October 18, 2022.

Omnispace and its satellite manufacturers Thales Alenia Space/NanoAvionics assess the risks from the close approach/conjunction notification messages including the time of close approach, probability of collision and the miss distance range to take the necessary steps to mitigate collision risks.

Thales Alenia Space/NanoAvionics use a baseline threshold level of risk of collision of $1E-03$ (> 0.1% probability, 1/1000).

If the risk of collision is deemed high and if contacted by the other satellite operator, steps would include sharing ephemeris information, and conducting or delaying propulsion and attitude operations would be performed.

The probability of risk of on-orbit collision calculated using the NASA DAS 3.2.3 software is $6.84E-06$ (1 in 146,198). The probability of accidental collision with space objects larger than 10 cm in diameter is less than 0.001, as required.

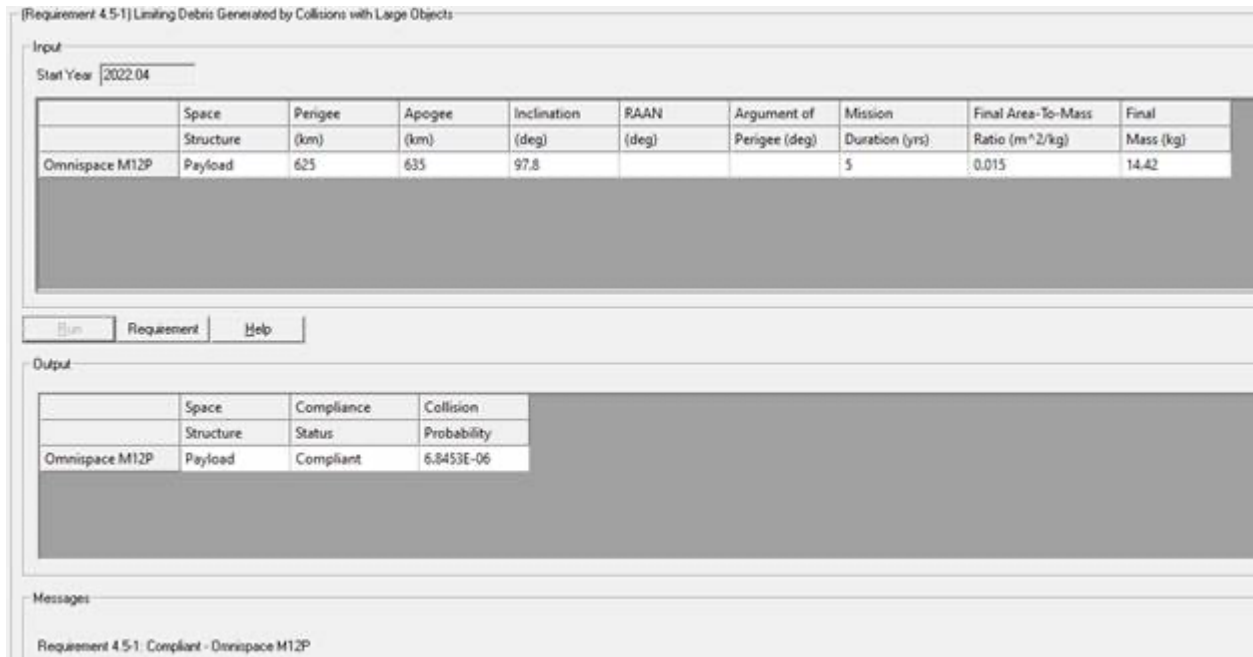


Figure 1: Probability of collision with large objects.

Q3) Please indicate if this level of risk reduction is achievable by the LEO1 and provide a detailed timeline of events from time of CDM notification to the time a collision avoidance maneuver decision is made by operators, and the duration of time to fully execute said maneuver.

Answer 3) Omnispace and its satellite manufacturers Thales Alenia Space/NanoAvionics receive timely CDM (conjunction data message) notifications from the US Space Force that notify of any close approach/conjunction events including the time of close approach, probability of collision and the miss distance range to take the necessary steps to mitigate collision risks.

Thales Alenia Space/Nanoavionics use a baseline threshold level of risk of collision of 1E-03 (> 0.1% probability, 1/1000). If the risk of collision is deemed greater than 1E-03 (> 0.1% probability, 1/1000), response steps include assessing the time of close approach, probability of collision and the miss distance range. No action is taken unless contacted by the other satellite operator involved in the warning, which then sharing ephemeris information, and conducting or delaying propulsion and attitude operations would be performed in coordination with the other satellite operator. The OMNI-L1 and OMNI-L2 satellites have view of the satellite ground station several times per day (3-4 times per day for telemetry and commanding) and any operational commands can be executed during those passes.

Q4) Please make sure to provide the following values in the updated version of DAS:

Q4a) The exact human casualty risk number from space system components surviving reentry as a result of post-mission disposal as reported by DAS

Answer 4a) The exact human casualty risk number from space system components surviving reentry as a result of post-mission disposal as reported by DAS is 0 for (full burn upon re-entry),

and 0 for (de-orbit and natural decay) for the satellite. (DAS human casualty risk is 0, see figure below)

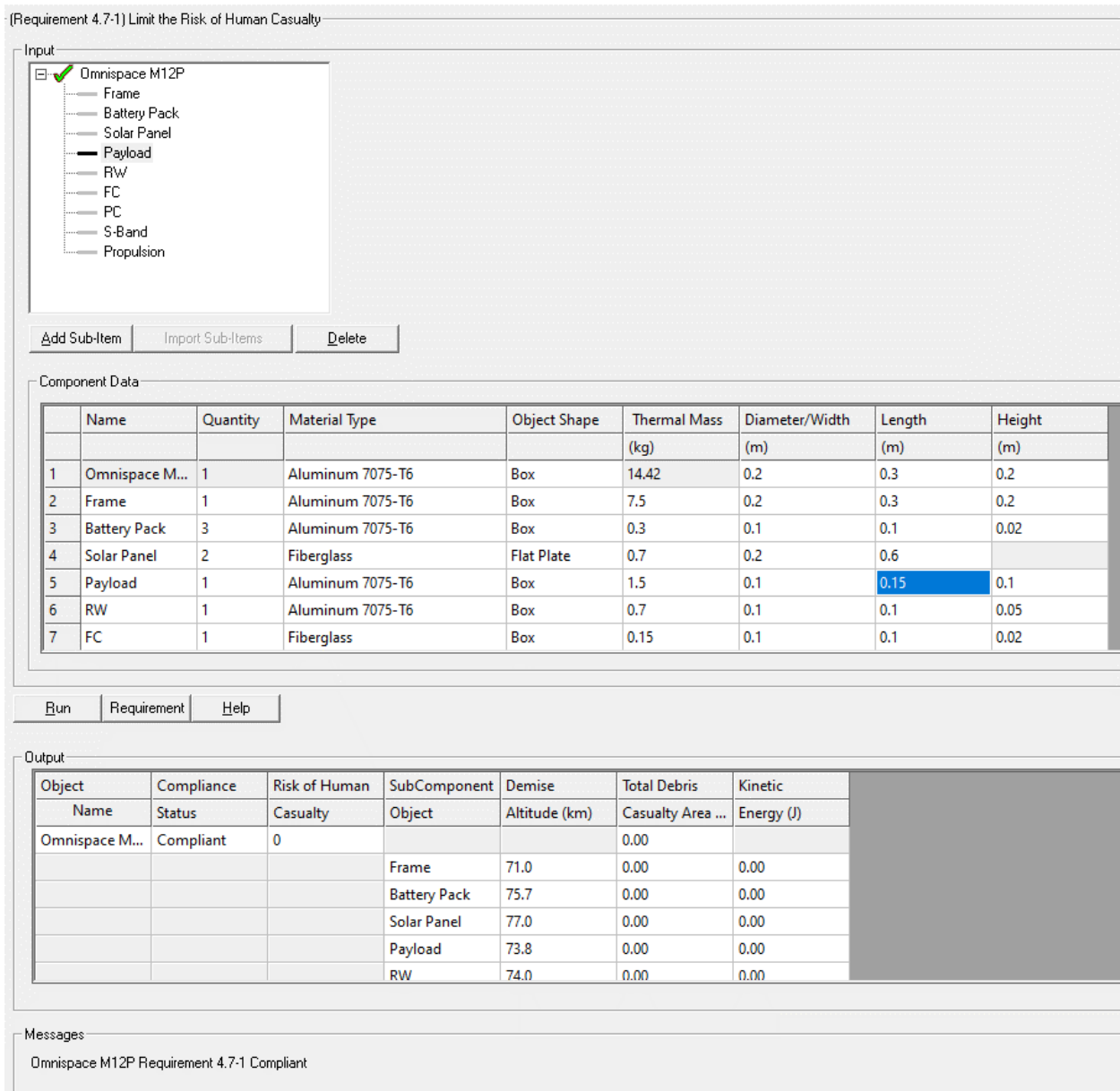


Figure 2: Risk of Human Casualty

Q4b) Large object collision risk, both if the satellite successfully conducts post-mission disposal operation, and in the event post-mission disposal is not successfully performed.

Answer 4b) Less than 0.001 for the satellite (DAS Collision Probability 6.8453E-06)
 NASA DAS software was used in order to assess on-orbit collision risk. For the LEO spacecraft, the program or project shall demonstrate that, during the orbital lifetime of each spacecraft and orbital stage, the probability of accidental collision with space objects larger than 10 cm in diameter is less than 0.001.

DAS software showed that for the Omnispace M12P satellite, this probability is less than 0.001. (DAS Collision Probability 6.8453E-06, see figure below)

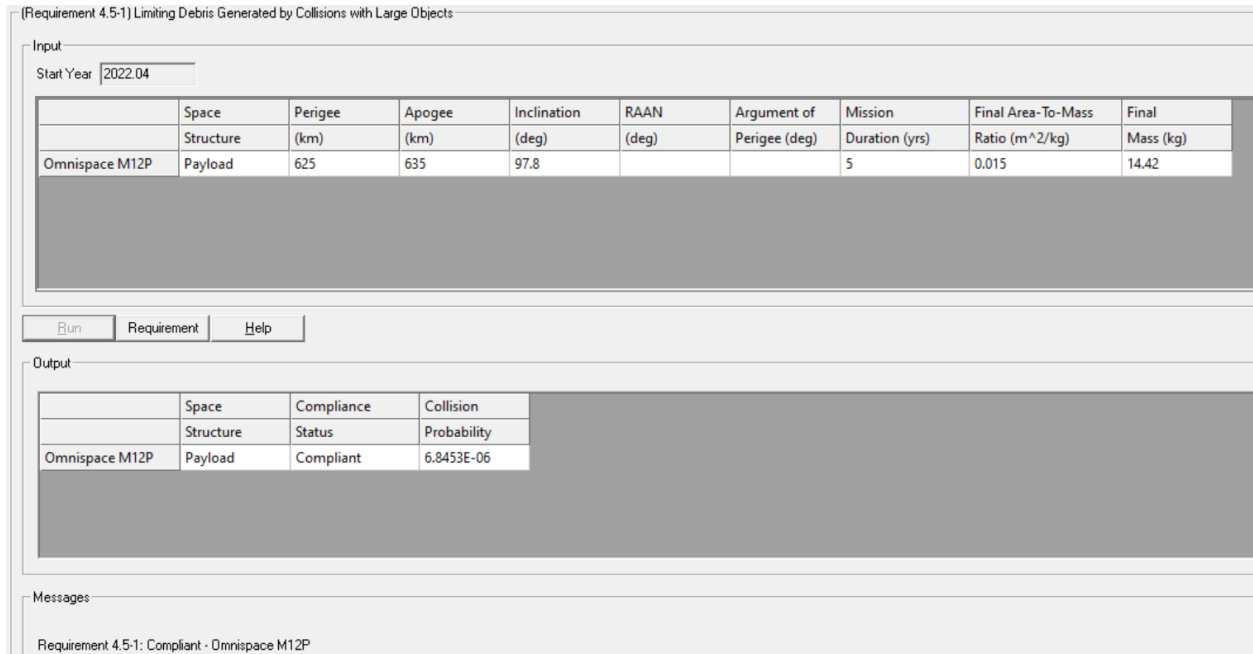


Figure 3: Limiting Debris Generated by Collisions with Large Objects

Q4c) Small object collision risk number.

Answer 4c) Less than 0.01 for the satellite (DAS Collision Probability 2.7809E-05)

Requirement: the probability of accidental collision with orbital debris and meteoroids sufficient to prevent compliance with the applicable post mission disposal requirements is less than 0.01.

NASA DAS software was used to assess on-orbit collision risk. It shall be demonstrated that, during the mission of the spacecraft, the probability of accidental collision with orbital debris and meteoroids sufficient to prevent compliance with the applicable post mission disposal requirements is less than 0.01.

There are no post-mission-disposal critical subsystems on the satellite, however the analysis has been performed for the entire satellite. DAS software showed that for the Omnispace M12P satellite, this probability is less than 0.01 (DAS Collision Probability 2.7809E-05, see figure below).

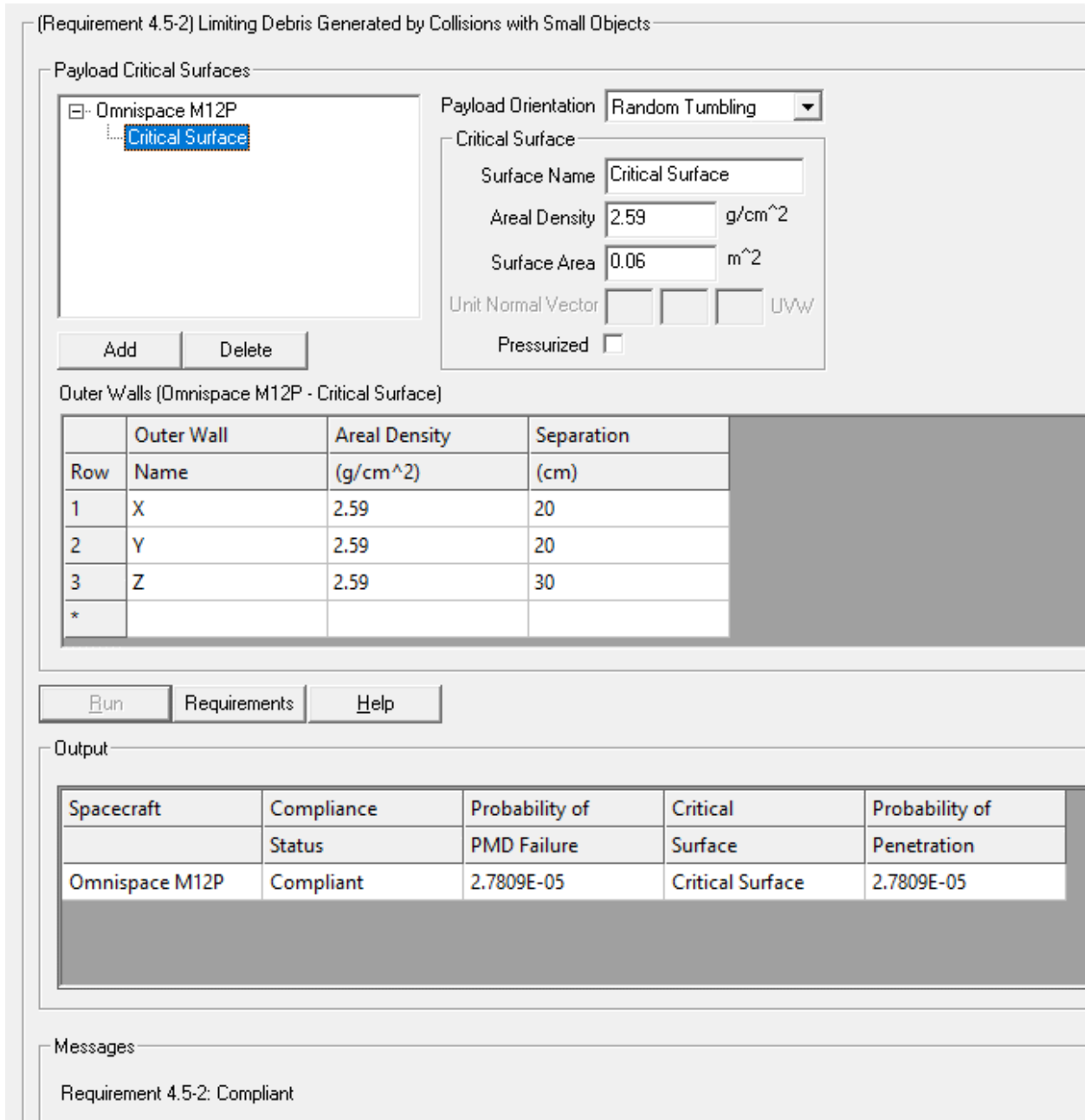


Figure 4: Limiting Debris Generated by Collisions with Small Objects