

ANNEX 11
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
AND AXIOM SPACE INC.
UNDER SPACE ACT UMBRELLA AGREEMENT
NO. SAA-RA-22-36162, DATED 4/6/2022
FOR
METEOROID AND ORBITAL DEBRIS RISK ASSESSMENTS FOR AXIOM
STATION.

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of NASA JSC to assess micrometeoroid and orbital debris (MMOD) risk based on hypervelocity impact test and analysis results for Axiom spacecraft.

The legal authority for this Annex, consistent with the Umbrella Agreement, is in accordance with the Space Act, Other Transactions Authority (OTA), 51 U.S.C. § 20113(e).

ARTICLE 2. RESPONSIBILITIES

NASA will use reasonable efforts to:

1. Provide MMOD probability-of-no-penetration (PNP) assessments for the Axiom Station with Bumper-code.
 - a. For purposes of costing this task, the following assumptions are made: four (4) Bumper assessments will be performed each year, four (4) reports provided each year documenting the results of these assessments via presentation charts, one (1) PNP analysis report will be provided each year documenting PNP assessment results for the Axiom Station and comparison to requirements, as well as ballistic limit equations, failure criteria and other parameters used in the assessments.
 - b. The assessments will support design iterations to reduce MMOD risk and/or mass, and to assess changes in the design or operations that affect MMOD risk.
 - c. The assessments will be used to support MMOD requirements compliance.

2. Perform hypervelocity impact tests as required by Axiom to support development and verification of ballistic limit equations used in the Bumper-code MMOD analyses.
 - a. For purposes of costing this task, the following assumptions are made: a block of 25 hypervelocity impact tests will be performed each year, consisting of 15 tests on the .50 cal launcher and 10 tests on the .17 cal launcher. If Axiom requires additional testing, an amendment to this agreement can be made to provide additional blocks of testing.
 - b. Provide test report with results of the testing for each block of testing.
 - c. Provide test fixtures and hardware required to perform the tests.

- d. Provide test plans and updates during course of testing.
- e. Support following reviews for each test series:
 - i. Test Readiness review (TRR)
 - ii. Post test data review (PTDR)
- 3. Participate in analysis reviews. Assume 1 analysis review per year.
 - a. Analysis cycle kickoff
 - b. Analysis report review
- 4. Provide MMOD Design Consultation.
- 5. Meet with Axiom on regular basis to status progress (every two weeks).
- 6. Communicate to Article 8 Points of Contact actual costs incurred monthly.

AXIOM will use reasonable efforts to:

- 1. Provide test articles and hardware required for test setups.
- 2. Provide CAD models and information required for MMOD analysis (materials of construction, thicknesses, gap distances, failure criteria).
- 3. Provide station configuration data necessary for each analysis cycle.

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

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| 1. Axiom will provide to NASA all information and data necessary to perform the required MMOD analysis. | 1 month after the start of the agreement. |
| 2. Axiom will provide materials for hypervelocity tests. | 1 month prior to test start. |
| 3. NASA will perform MMOD risk assessments and analysis result products. | As defined in Section A, item 1. |
| 4. NASA will provide a TRR. | 1-2 weeks prior to test start. |
| 5. NASA will provide a PTDR. | 2 weeks after tests end. |
| 6. NASA provides test report with results of testing. | 4 weeks after tests end. |

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| 7. NASA supports analysis reviews. | Within each year of the agreement (participate in review via 0.25 WYE for 4 months). |
| 8. NASA provides MMOD design consultation. | As required. |
| 9. NASA and Axiom support telecons/meetings to provide status on tasks. | Bi-weekly |

ARTICLE 4. FINANCIAL OBLIGATIONS

- A. Partner agrees to reimburse NASA an estimated cost of \$1,292,345.25 for NASA to carry out its responsibilities under this Annex. The Partner agrees to pay NASA JSC \$103,801.84 prior to initiation of work under this Agreement. Subsequent advance payments will be determined based on the testing and analysis requested and scheduled to ensure that funds are resident with NASA before Federal Obligations are incurred in support of this Annex. Each payment shall be marked with JSC Annex 11.
- B. NASA will not provide services or incur costs beyond the current funding received by NASA. Although NASA has made a good faith effort to accurately estimate its costs, it is understood that NASA provides no assurance that the proposed effort under this Annex will be accomplished for the estimated amount. Should the effort cost more than the estimate, Partner will be advised by NASA as soon as possible. Partner shall pay all costs incurred and have the option of canceling the remaining effort, or providing additional funding in order to continue the proposed effort under a modification to this Annex. Should this Annex be terminated, or the effort completed at a cost less than the agreed-to estimated cost, NASA shall account for any unspent funds within one year after completion of all effort under this Annex, and promptly thereafter, at Partner's option return any unspent funds to Partner or apply any such unspent funds to other activities under the Umbrella Agreement. Return of unspent funds will be processed via Electronic Funds Transfer (EFT) in accordance with 31 C.F.R. Part 208 and, upon request by NASA, Partner agrees to complete the Automated Clearing House (ACH) Vendor/Miscellaneous Payment Enrollment Form (SF 3881).

ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

- A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of two years.
- B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any

restrictive notice on the Data provided.

1. Background Data:

The Disclosing Party's Background Data, if any, will be identified in a separate technical document.

2. Third Party Proprietary Data:

The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.

3. Controlled Government Data:

The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.

4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement: None

ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or April 6th 2027, whichever comes first. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

Management Points of Contact

NASA Lyndon B. Johnson Space Center
Heather Cowardin
Branch Chief, Hypervelocity and Orbital
Debris Office
Mail Stop: XI5/9E
2101 NASA Parkway
Houston, Texas 77058
Phone: 281-483-2938
heather.cowardin@nasa.gov

AXIOM SPACE INC.
Ricky Villarreal
Executive Director of Station Strategic
Partnerships
1290 Hercules Ave,
Houston, TX 77058-2769
Phone: 281-793-7262
ricky@axiomspace.com

Technical Points of Contact

NASA Lyndon B. Johnson Space Center
Christopher Cline
Hypervelocity Impact Technology Office
Mail Suite: XI5/9E
2101 NASA Parkway
Houston, Texas 77058
Phone: 281-792-2844
christopher.j.cline@nasa.gov

AXIOM SPACE INC.
Aaron Tullos
Structures and Mechanisms Associate
Director
1290 Hercules Ave,
Houston, TX 77058-2769
aaron@axiomspace.com

ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE
CENTER

AXIOM SPACE INC.

BY: _____
Burt Laws
Director of Exploration Integration and
Science Directorate

BY: _____
Andrew Cooke
Director of Contracts

DATE: _____

DATE: 12 Sept 2024

AXIOM REF NO. REQ0015850