

**ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER
AND
INVERSION SPACE
UNDER SPACE ACT UMBRELLA AGREEMENT NO. 35782, DATED 2/25/2022
(ANNEX NUMBER 2)**

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of allowing the Partner to access NASA capabilities, facilities, and technical expertise in the areas of engineering analysis and testing, mission analysis, materials processing, and related support in the development of commercial space and Entry, Descent, and Landing (EDL) systems. This may include (but is not limited to) thermal protection system (TPS) development, analysis, materials processing, and TPS integration, high temperature seals Micro-Meteoroid Orbital Debris (MMOD) analysis as well as EDL trajectory and Guidance, Navigation, and Control (GN&C) design, analysis, and testing.

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

A. NASA ARC will use reasonable efforts to:

1. Provide Subject Matter Expert (SME) consultation of TPS selection for entire vehicle Outer Mold Line (OML or aeroshell), materials processing, coating and TPS integration, high temperature seals, MMOD analysis as well as EDL trajectory and GN&C design, analysis, and testing. for Partner-provided vehicle designs (Partner is responsible for final design).
2. Provide aerothermodynamics analyses of three axisymmetric cases at three points during re-entry.
3. Provide aerothermodynamics analyses of three fully 3-dimensional computational fluid dynamic (CFD) analyses at 3 points during re-entry to validate trajectory.
4. Provide access to the Fully Implicit Ablation and Thermal response (FIAT) restricted material model for various TPS Materials under consideration (i.e. Conformal PICA [CPICA], 3D Mid-Density Carbon Phenolic [3MDCP], Heatshield for Extreme Entry Environment Technology [HEEET], Carbon Phenolic [CP], Materials Engineered for Re-entry using Innovative Needling [MERINO]), Silicone Infused Refractory Ceramic Ablator (SIRCA) for the Partner to perform their own TPS sizing analysis.
5. Provide TPS Sizing verification for the estimated Partner-provided trajectory.
6. Provide design criteria for ground support equipment (GSE) to support TPS fabrication, Inversion vehicle assembly and integration, subsystem testing, and spacecraft assembly and integration and testing.
7. Provide support for anchoring of Partner's CFD computations related to TPS for

Reaction Control System (RCS) footprint heating and wake footprint in space and effect on control authority through use of:

8. NASA anchored database of previous test data; and
9. Expertise concerning best practices for selection of the most appropriate real data points for anchoring.
10. Provide lateral directional control, roll/yaw, split flap control derivatives using CBAERO and Cart3D.
11. Demonstrate how CBAERO's anchoring process (from NASA databases) can help yield Mid Fidelity CART3D-EQ, and High Fidelity CFD.
12. Provide Independent Verification and Validation (IV&V) of Partner's trajectory simulations.
13. Provide consultation on the fabrication of C-PICA, MERINO/HEEET TPS, 3D Woven TPS, Tile and Tile-based TPS and other NASA Intellectual Property (IP) related to TPS where relevant to Partner's design, including:
 - i. Review of Inversion Space lab design, bill of materials (BOM), equipment, tooling, and procedures for the selected TPS fabrication;
 - ii. NASA provides on-site technical guidance at both Inversion Space (if travel is approved) and NASA ARC for key material fabrication and testing activities for the selected TPS production; and
 - iii. Review of processing data and properties of Inversion Space produced TPS.
14. Fabricate C-PICA, MERINO, 3MDCP/HEEET billets and/or SIRCA for:
 - i. Vehicle's base; and
 - ii. Any other areas of the Vehicle where Partner elects to utilize C-PICA/MERINO/3MDCP/HEEET.
15. Support major Partner reviews and milestones virtual or in person, dependent upon approval of NASA travel to the Partner's location.
16. Travel in support of technical meetings and major milestones, fabrication support and technology transfer, as needed.

B. Partner will use reasonable efforts to:

1. Provide Vehicle OML design information, which shall include size and weight goals and/or requirements, shape geometry, mechanical and electrical interfaces, other requirements, and/or other related data to enable NASA to develop the appropriate TPS integration approach (assuming no penetrations/protrusions on the forebody).
2. Invite NASA SME personnel to participate at formal reviews related to TPS/aeroshell and overall flight readiness.
3. Provide relevant mission related requirements (anything that would impact vehicle design and subsequent TPS selection/sizing/integration).
4. Obtain patent license as necessary to use NASA-patented C-PICA, HEEET/3MDCP, MERINO technology and any other NASA-Patented technology to be used under this Annex, as covered per NASA Technology Transfer requirements.

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities"

Article are as follows:

Milestone	Estimated Completion Date
Support of Partner Engineering & CFD of Arc Forebody (NASA)	Sept 2025
IV&V of Trajectory Simulations for Arc (NASA)	Dec 2025
Delivery of CPICA TPS billets, if selected by Partner (NASA)	March 2026
Delivery of SIRCA TPS billets, if selected by Partner (NASA)	March 2026
Delivery of 3DWoven TPS billets, if selected by Partner (NASA)	April 2026
Support of Partner's Engineering & CFD of Arc Flaps and Aftbody (NASA)	Sept 2026
Arc OML Optimization (regarding TPS selection consultation and aerothermodynamics analyses) & Database Delivery (NASA)	Dec 2026
TPS Equipment Set up and Validation of Partner-Produced TPS in Support of Tech Transfer (NASA)	Feb 2027
Provide list of TPS Equipment technical criteria as well as a list of all vendors that may be able to meet those criteria, for Partner TPS selection (NASA)	Feb 2027

ARTICLE 4. FINANCIAL OBLIGATIONS

- A. Partner agrees to reimburse NASA an estimated cost of \$1,307,941.00 for NASA to carry out its responsibilities under this Annex. Each payment shall be marked with Ames Research Center, SAA2-403668-2.

	Task	Total
1	Subject Matter Expert Consulting 2025	\$ 32,650
2	Subject Matter Expert Consulting 2026	\$ 31,755
3	Subject Matter Expert Consulting 2027	\$ 33,058
4	Tech Transfer Equipment Setup	\$ 85,499
5	Tech Transfer Integration Support	\$ 78,370
6	Engineering Support & CFD Base Heatshield	\$ 71,535
7	Engineering & CFD for Flap/Base	\$ 94,719
8	Arc OML Optimization	\$ 72,568
9	ARC OML Database	\$ 91,776
10	CPICA TPS Fabrication	\$222,331
11	HEEET/3MDCP TPS Fabrication	\$185,160
12	SIRCA Fabrication	\$170,991
13	HEEET/3MDCP Nose Fabrication	\$137,529
Total		\$1,307,941.00

- B. NASA will not provide services or incur costs beyond the current funding. 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 the revised estimate. 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 one year.
- 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 February 25, 2027, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. 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. TERMINATION

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 Ames Research Center

Nahri Ahn

Agreement Manager

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Inversion Space

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Technical Points of Contact

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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
AMES RESEARCH CENTER**

INVERSION SPACE

BY: _____

Eugene Tu

Center Director

BY: _____

Justin Fiaschetti

Justin Fiaschetti

CEO

DATE: _____

DATE: 6/5/25