

**ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER
AND
BLUE ORIGIN, LLC
UNDER SPACE ACT UMBRELLA AGREEMENT NO. 40473 / SAA2-403808
(ANNEX NUMBER ONE)**

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of NASA ARC performing unique design support, analysis, consultation, and arc jet testing to enable Blue Origin’s development of commercial space transportation activities under an existing Reimbursable Space Act Umbrella Agreement (“Umbrella Agreement”) with Blue Origin (SAA2-403808)(PAM ID # 40473). Each capitalized term used in this Annex One, but not defined herein, shall have the meaning ascribed to it in the Umbrella Agreement. Blue Origin (“Partner”) and NASA ARC may be individually referred to as a “Party” and collectively referred to as the “Parties.”

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:

Design and System Engineering

1. Develop Independent risk assessments of Partner’s designed application regarding operational and system implementation utilizing experience from Adaptable Deployable Entry and Placement Technology (ADEPT).
2. Assess options for Guidance-Navigation-Control of application.
3. Collaborate with Partner with technical interchange meetings and information.

Aerothermal Environment Predictions

4. Perform aerothermal analysis of Partner’s application leveraging ADEPT developed toolsets to support Thermal Protection System (TPS) design (partner responsible for final design).
5. Provide CBAero (Configuration Based Aerodynamics) consultation support for Partner-provided designs and trajectories.
6. Provide aerothermal tool (FIAT) input files to Partner and review Partner’s analysis for accuracy.

ADEPT TPS material selection and design support

7. Provide updated sizing of ADEPT TPS including thickness and mass estimates.

8. Continue to provide ADEPT TPS material property database.
9. Provide ADEPT TPS architecture specifications.
10. Loan an ADEPT compatible carbon layer fabric to Partner in amount sufficient for the material property testing and material integration prototyping required to inform activities under this Annex.
11. Identify candidate TPS options and include assessment of manufacturability.
12. Assess application's concept of operations on TPS performance.

Structural Design support

13. Review Partner provided structural design, load cases, and mass estimates.
14. Consult with Partner on application of ADEPT lessons learned in areas of deployment, fabric behavior, stowage, and manufacturability.

Arcjet testing

15. Arcjet material screening test
 - Perform pre-test predictions of flow environments
 - Provide test preparation and execution support
 - Provide two arc jet facility occupancy days
 - Provide model holders for mounting of test samples
 - Provide instrumentation installation support
 - Provide post-test data package including temperature/time histories, images, and instrumentation data provided at the end of each test day with videos to follow one month later.

B. Partner will use reasonable efforts to:

1. Collaborate with NASA Ames with technical interchange meetings and information sharing.
2. Provide initial design information of vehicle configuration including outer mold line (OML), dimensions, mass, interface descriptions to support ADEPT TPS design support.
3. Provide nominal and off-nominal 3-degrees-of-freedom design trajectories for application.
4. Return the loaned fabric to ARC after testing, and provide any test results to ARC that are necessary for the Parties to complete responsibilities under this Annex.
5. Partner to follow research licensing requirements for NASA patented ADEPT (ARC-16621-1) design.
6. For arcjet testing:
 - Provide safety data sheets (SDS) and Hazard Analyses for materials brought onto ARC.
 - Participate in arcjet test readiness review and arcjet testing.
 - Comply with NASA safety regulations, policies, and guidelines for observing arcjet testing.

ARTICLE 3. SCHEDULE AND MILESTONES

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

Note that the "Authority to Proceed (ATP)" requires appropriate signatures on this Annex from both Parties and a transfer of funds from the Partner to NASA ARC.

Milestone Task (Responsible Party)	Completion
Provide material samples (as needed) and arcjet test ATP (Blue Origin)	ATP + 2 weeks
Application Design, Performance, Simulation Update #1 (NASA ARC)	ATP + 4 weeks
Provide updated Vehicle configuration and Design Trajectory (Blue Origin)	ATP + 6 weeks
Application Design, Performance, Simulation Update #2 (NASA ARC)	ATP + 8 weeks
Arcjet Material Screening Test Quick Look Report (NASA ARC)	Test completion (mid June) + 4 weeks
Application Design Update supporting downselect evaluation decision (NASA ARC)	ATP +12 weeks
Application Design inputs for Final Memo (NASA ARC)	ATP + 15 weeks

ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated cost of \$713,183 for NASA to carry out its responsibilities under this Annex. Each payment shall be marked with Ames Research Center, Annex One, SAA2-403808-1.

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 (1) 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. LIABILITY

For the responsibilities and activities conducted under this Annex, and any claims arising thereunder, the following sentence shall be added to the end of Paragraph C, Article 8 (titled "Liability") of the Umbrella Agreement: Partner's liability for such repair and restoration shall not exceed \$713,183.

ARTICLE 6. 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 three 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 7. 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 one (1) year from the Effective Date, 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 8. RIGHT TO TERMINATE

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

ARTICLE 9. 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
Matt Holtrust
Agreement Manager
Mail Stop: 223-3, Room 100
Moffett Field, CA 94035
Phone: 650-604-4069
matthew.j.holtrust@nasa.gov

Blue Origin, LLC
Candy Guerrero
Sr Manager - Supply Chain &
Logistics
21218 76th Ave S.
Kent, WA 98032
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Technical Points of Contact

NASA Ames Research Center
Antonella Alunni
Aerospace Engineer
Mail Stop: 269-1
Moffett Field, CA 94035
Phone: (650) 703-6435
antonella.i.alunni@nasa.gov

Blue Origin, LLC
Daniel Sokol
Design Lead
21218 76th Ave S.
Kent, WA 98032
Phone: (253) 437-9300 x19034
dsokol@blueorigin.com

ARTICLE 10. 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 11. 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** **BLUE ORIGIN, LLC**

BY: _____
Dr. Rupak Biswas
Director of Exploration Technology

BY: _____
Name: Candy Guerrero
Title: Sr. Manager, Subcontracts

DATE: _____

DATE: 24 May 2024 _____