

**ANNEX  
BETWEEN  
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
AMES RESEARCH CENTER  
AND  
BLUE ORIGIN, LLC  
UNDER SPACE ACT UMBRELLA AGREEMENT NO. 27616 / SAA2-403403  
(ANNEX NUMBER NINE)**

**ARTICLE 1. PURPOSE**

This Annex to the Reimbursable Space Act Umbrella Agreement SAA2-403403 (the “Umbrella Agreement”) between Blue Origin, LLC (“Blue Origin” or “Partner”) and NASA Ames Research Center (“NASA” or “NASA ARC”) shall be for the purpose of NASA ARC performing arc jet testing and data analysis of the arc jet data for Blue Origin to enable Blue Origin’s development of the New Glenn heavy launch vehicle.

The NASA Ames performing organization will be the Code TS Entry Systems and Technology Division.

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).

Each capitalized term used in this Annex Nine, but not defined herein, shall have the meaning ascribed to it in the Umbrella Agreement.

**ARTICLE 2. RESPONSIBILITIES**

A. NASA ARC will use reasonable efforts to:

**Tasks**

1. Series #1 Arc Jet Testing
  - Provide test preparation and execution support
  - Provide thirteen arc jet facility occupancy days
  - Provide wedge model holders for mounting of test samples
  - Provide spectrometer support
  - Provide catalycity analysis for stagnation articles (via Stewart’s method)
  - Standard 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
2. Provide wedge catalycity analysis via computational fluid dynamics (CFD) support for Series #1
3. Series #2 Arc Jet Testing
  - Provide test preparation and execution support

- Provide seven arc jet facility occupancy days
  - Provide spectrometer support
  - Standard 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
4. CFD support for Arc Jet Series #2
  5. TPS subject matter expert support

B. Partner will use reasonable efforts to:

1. Provide safety data sheets (“SDS”) and Hazard Analyses for materials brought onto ARC
2. Provide fully assembled test articles to NASA Ames at least two weeks before test window
3. Provide wedge article mechanical attachment design and related analysis to ARC for review and feedback. Provide attachment hardware for article assembly.
4. Provide stagnation test articles with custom holders
5. Provide relevant custom TPS holder geometry and thermal analysis details as needed by arc jet facility
6. Support arc jet article assembly, with Ames personnel, between test runs
7. Provide objectives for CFD analysis
8. Participate in arc jet test readiness review and arc jet testing
9. Submit sufficient and timely “Authority to Proceed.”
10. Comply with NASA safety regulations, policies, and guidelines for observing arc jet testing

### ARTICLE 3. SCHEDULE AND MILESTONES

Deliverables listed in this Article match the numbering system from the NASA Responsibilities Article and are also referred to as tasks. Note that a task may have multiple deliverable milestones associated with that task. Further note that the “Authority to Proceed” (ATP) requires appropriate signatures on this agreement from both Parties and a transfer of funds from the Partner to NASA ARC on a per task basis. Upon execution of this Annex, the Parties agree that NASA will initiate work on Task 1. Thereafter, Partner shall provide NASA the ATP and funding (see Article 4) for NASA to continue to perform work in furtherance of the remaining tasks. Should Partner provide ATP and funding out of sequential order, NASA reserves the right to revise the estimated due date. The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

<b>Task(Milestone)</b>	<b>Completion</b>
1(a). Arc jet test series #1 (13 days)	ATP + 1-4 months (facility availability)
1(b). Arc jet final report for Series #1	Test series completion + 3 months
1(c). Spectrometer data report for Series #1	Test series completion + 6 weeks
1(d). Stagnation test catalycity report, Series #1	ATP + 4 months
2. CFD-derived catalycity report for Series #1	Test series completion + 6 months

3(a). Arc jet test series #2 (7 days)	ATP + 1-4 months (facility availability)
3(b). Arc jet final report for Series #2	Test series completion + 3 months
3(c). Spectrometer data report for Series #2	Test series completion + 6 weeks
4. CFD report for Series #2	Test series completion + 3 months
5. TPS SME feedback/report	ATP + 6 months

#### ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA to carry out its responsibilities on a per task basis under this Agreement in accordance with the payment schedule below. In no event will NASA transfer any U.S. Government funds to Partner under this Agreement. Payment must be made by Partner in advance of initiation of NASA's efforts on any task (see Article 3) on behalf of the Partner. Upon initial funding of the Annex, Partner shall issue NASA a purchase order for \$2,284,000 USD (the estimated total cost for Task #1). Partner can selectively fund any or all of the Tasks #2-#5 listed in this Article, upon or after initial funding of Task 1. Tasks below correspond to the NASA Deliverables listed in the previous Article. Tasks estimated costs are:

##### **Tasks & Obligations**

<u>#.</u> <u>Description</u>	<u>Cost</u>
1. Series #1 Arc Jet Testing	\$2,284,000
2. CFD support for Series #1	\$180,000
3. Series #2 Arc Jet Testing	\$1,180,000
4. CFD support for Series #2	\$90,000
5. TPS subject matter expert support	\$190,000

Each payment shall be marked with Ames, Annex Nine.

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.

## 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 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 document.

### 2. Third Party Proprietary Data:

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

### 3. Controlled Government Data:

Arc jet 24-inch nozzle geometry data will be provided to Partner upon request for a period of up to two (2) years, not to exceed the duration of this Annex (expiration 4/13/2024); after which time, Partner shall certify to the Technical Point of Contact that it has destroyed or returned all copies.

Additional Disclosing Party's Controlled Government Data, if any, will be identified in a separate 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 13, 2024, 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. 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 Ames Research Center  
Matt Holtrust  
Agreement Manager  
Mail Stop: 202A-3  
Moffett Field, CA 94035  
Phone: (650) 604-4069  
matthew.j.holtrust@nasa.gov

Blue Origin, LLC  
Donna Elburn  
Director Supply Chain & Logistics  
21218 76th Avenue S  
Kent, WA 98032-2442  
Phone: (253) 437-9300 x18264  
Email: [delburn@blueorigin.com](mailto:delburn@blueorigin.com)

Technical Points of Contact

NASA Ames Research Center  
Jay Feldman  
Materials Engineer  
Mail Stop: 223-3  
Moffett Field, CA 94035  
Phone: (650) 604-0406  
jay.d.feldman@nasa.gov

Blue Origin, LLC  
Mathew Janda  
Engineer – Aerospace Systems  
21218 76th Avenue S  
Kent, WA 98032-2442  
Phone: (714) 661-0021  
Email: [MJanda@blueorigin.com](mailto:MJanda@blueorigin.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  
AMES RESEARCH CENTER**

**BLUE ORIGIN, LLC**

BY: \_\_\_\_\_  
Eugene L. Tu  
Center Director

BY:  \_\_\_\_\_ on behalf of Donna Elburn  
Donna Elburn  
Director Supply Chain & Logistics      Jessica Curry  
Manager, Subcontracts

DATE: \_\_\_\_\_

9/30/2022 | 2:55 PM PDT  
DATE: \_\_\_\_\_