

ANNEX NO. 6
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LANGLEY RESEARCH CENTER
AND
BLUE ORIGIN, LLC
UNDER
SPACE ACT UMBRELLA AGREEMENT SAA8-2235543
FOR
SCIFLI LOFTID IMAGING MISSION (SLIM)

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of conducting a flight campaign to perform imaging of the Low-Earth Orbit Flight Test of an Inflatable Decelerator (LOFTID) during reentry. The goal of the imaging mission is to provide calibrated temperature data from the LOFTID aeroshell and provide a time-resolved temperature profile of the thermal protection system (TPS) during reentry. NASA Langley Research Center (LaRC) will provide entry, descent, and landing (EDL) and remote sensing subject matter experts (SME), Scientifically Calibrated In-Flight Imagery (SCIFLI) services, and Langley Research Services Directorate (RSD) aircraft for in-flight data capture and analysis to support this mission.

NASA and Blue Origin have common interests relevant to the research and design of launch and space exploration vehicle technology. SCIFLI multispectral imaging, data acquisition, and analysis products are intended to contribute to the technology maturation of Blue Origin's reusable upper stage vehicle and are intended to inform engineering assumptions, assist in the development & verification aerodynamic and aero-heating databases, and support Blue Origin's planned testing of hypersonic inflatable aerodynamic decelerator (HIAD) and other hypersonic vehicle technologies.

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 LaRC will use reasonable efforts to:

1. Collaborate with Blue Origin on test planning and preparations.
2. Develop, integrate, and fly 4-axis gimbal pointing systems and imaging payloads in the cabin of a NASA compatible aircraft.
 - a. Determine optimal wavebands for collecting spatial and spectral data during the LOFTID reentry to allow for temperature extraction.

- b. Conduct all airworthiness, test readiness, and operational safety reviews necessary for the conduct of this mission in accordance with NASA Procedural Requirement (NPR) 7900.3, Aircraft Operations Management, Langley Procedural Requirement (LPR) 1710.18, Airworthiness Review Process, and Langley Management System Center Procedure 0960 (LMS-CP-0960), Conducting Flight Experiments Utilizing Research Services Directorate (RSD) Aircraft.
- c. Integrate 4-axis gimbal systems and imaging windows into the airborne platform.
- 3. Conduct flight campaign to collect aerothermal performance data during the LOFTID flight test reentry using radiometrically calibrated spectral and spatial imaging systems on aerial imaging platforms.
- 4. Conduct post-flight radiometric characterization and calibration on all imaging payloads.
- 5. Perform data reduction, radiometric transport calculations, and post-flight data analysis and provide to Blue Origin.

B. Partner will use reasonable efforts to:

- 1. Provide advance reimbursement to NASA LaRC, as outlined in the Financial Obligations Article.
- 2. Collaborate with NASA LaRC on test planning and preparations.
- 3. Participate in NASA Test Readiness Review (TRR).

ARTICLE 3. SCHEDULE AND MILESTONES

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

1. Blue Origin to provide advance reimbursement to NASA LaRC, as outlined in the Financial Obligations Article.	Upon Effective Date of Annex but NLT October 14, 2022
2. NASA LaRC and Blue Origin to collaborate on test planning and preparations.	As required during Annex period of performance
3. NASA LaRC to complete integration of imaging payloads onto NASA aircraft.	~ Ten (10) days (1.5 weeks) prior to Milestone 5
4. NASA LaRC and Blue Origin to participate in TRR.	~ One (1) week prior to Milestone 5
5. NASA LaRC to deploy mission operators to Kona, HI to support the imaging campaign.	~ Four (4) days prior to Milestone 6
6. NASA LaRC to conduct flight campaign to collect data during LOFTID flight test reentry.	LOFTID flight test currently scheduled for November 1, 2022.

7. NASA LaRC to complete post-flight calibration of imaging payloads.	Within two (2) weeks following Milestone 6
8. NASA LaRC to complete data reduction and analysis and provide to Blue Origin.	Within six (6) months following Milestone 7

ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated cost of \$1,489,739 for NASA to carry out its responsibilities under this Annex. **Each payment shall be marked with Langley Research Center SAA8-2235543, Annex 6.**

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 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. 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 four (4) years.

B. In accordance with 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, a period of one (1) year from the Effective Date, or expiration of the Umbrella Agreement, whichever comes first.

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	
<u>NASA Langley Research Center</u> Laurie Roberts Agreements Lead Space Technology and Exploration Directorate Mail Stop 104 Hampton, VA 23681 Phone: 757.864.5803 Email: laurie.d.roberts@nasa.gov	<u>Blue Origin, LLC</u> Dr. Christopher Schulz Senior Director, Advanced Development Programs 21218 76 th Avenue S Kent, WA 98032-2442 Phone: 903.232.4960 Email: cschulz@blueorigin.com
Technical Points of Contact	
<u>NASA Langley Research Center</u> Carey Scott SCIFLI Principal Investigator Mail Stop 204 Hampton, VA 23681 Phone: 757-690-3580 Email: carey.f.scott@nasa.gov	<u>Blue Origin, LLC</u> Dr. Christopher Schulz Senior Director, Advanced Development Programs 21218 76 th Avenue S Kent, WA 98032-2442 Phone: 903.232.4960 Email: cschulz@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
LANGLEY RESEARCH CENTER

BLUE ORIGIN, LLC

BY: _____
David A. Dress
Director, Space Technology and
Exploration Directorate

BY: _____
DocuSigned by:
Jessica Curry
B36BBAE87D4A4A9...
Jessica Curry
Sr. Manager, Subcontracts

DATE: _____

10/13/2022 | 12:31 PM PDT
DATE: _____