

ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER
AND
BLUE ORIGIN, LLC
UNDER
SPACE ACT UMBRELLA AGREEMENT
NO. SAA8-1931648, DATED 12/11/2019
SAA8-1931648.3

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of conducting scaled testing of three pump configurations in the Inducer Test Loop (ITL) in the Propulsion Cold Flow Test Complex to investigate the extreme environments of cavitation and assess mitigations.

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 MSFC will use reasonable efforts to:

1. Provide Test Requirement Document to Partner for review.
2. Assemble, instrument, and install each test article into the ITL.
3. Provide all instrumentation currently in MSFC stock. Pre- and post-test calibrations will be performed, and all sensors will undergo a pre-test in-situ end-to-end verification to ensure they are working and ready for test.
4. Conduct the experimental tests for three different test article builds and provide Partner quick-look data analysis after test of each test article build to include preliminary raw data.
5. Acquire, process, and archive all experimental data and report results to Partner in final data review.
6. Deliver final report of detailed test and data reports and all raw data.

BLUE ORIGIN will use reasonable efforts to:

1. Deliver all test article hardware, including any custom instrumentation, special tooling and commercial items (e.g., fasteners) needed to build the test rig.
2. Participate in quicklook data reviews after each test series and any test reviews.

ARTICLE 3. SCHEDULE AND MILESTONES

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

1. NASA MSFC to provide Test Requirement Document to Blue Origin, for review Effective Date + 1 week
2. Blue Origin to deliver all test article hardware, including any custom instrumentation, special tooling and commercial items (e.g., fasteners), needed to build the test rig Milestone 1 + 1 week
3. NASA MSFC to conduct the experimental tests for three different test article builds and provides partner quicklook data analysis after each test build to include preliminary raw data Milestone 2 + 3 months
4. Blue Origin to participate in quicklook data reviews after each test series and any test review As required
5. NASA MSFC to acquire, process, and archive all experimental data and reports results to Blue Origin in final data review Milestone 3 + 6 weeks
6. NASA MSFC to deliver final report of detailed test and data reports and all raw data to Blue Origin Milestone 5 + 2 weeks

ARTICLE 4. FINANCIAL OBLIGATIONS

A. Partner agrees to reimburse NASA an estimated cost of \$588,023 for NASA to carry out its responsibilities under this Annex.

Each payment shall be marked with NASA MSFC and SAA8-1931648.3.

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 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:

None

2. Third Party Proprietary Data:

None

3. Controlled Government Data:

None

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 one 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 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.

Technical Points of Contact

NASA George C. Marshall Space Flight
Center

BLUE ORIGIN, LLC
Scott Sargent

Lisa W. Griffin
Chief, Fluid Dynamics Branch
Mail Suite: ER42
Marshall Space Flight Center, AL 35812
Phone: 256-544-8972
lisa.w.griffin@nasa.gov

BE-3PM Turbomachinery Tech lead
21218 76th Avenue S
Kent , WA 98032-2442
Phone: 253-437-9300 x17472
ssargent@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
GEORGE C. MARSHALL SPACE
FLIGHT CENTER

BLUE ORIGIN, LLC

BY: _____
Mary E. Koelbl
Director Engineering Directorate

BY: _____
Candy Guerrero
Sr. Manager, Subcontracts

DATE: _____

DATE: _____