

ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GLENN RESEARCH CENTER
AND
LOCKHEED MARTIN CORPORATION
UNDER
SPACE ACT UMBRELLA AGREEMENT
NO. 37675, DATED 8/29/2023 (ANNEX NUMBER 2)

ARTICLE 1. PURPOSE

This Annex is being pursued on a non-reimbursable basis wherein the NASA Glenn Research Center (GRC) and Lockheed Martin Corporation (LM) will collaborate on long-distance power transmission on the lunar surface. This activity will be sponsored by the Space Technology Mission Directorate (STMD), Game Changing Development (GCD) Program, Microgrid Definition and Interface Converter for Planetary Surfaces (MIPS) Project.

The purpose of this agreement is to collaborate on lunar surface electrical power systems. Under this agreement, NASA GRC will provide Subject Matter Expertise (SME) in the areas of power management and distribution, communications, controls, hardware integration, and materials. GRC will also deliver a prototype 10 kWe Universal Modular Interface Converter (UMIC) that is being developed to enable long-distance power transmission, to enable the lunar surface electrical power grid. LM has been developing a Grid Power Node (GPN) element with the intention of using the UMIC as a key module with that design. LM will use their analytical tools and power system expertise to support trade studies to enhance the UMIC requirements and define the UMIC and GPN interfaces to enable a flight design. This agreement will include a study on the frequency of the long-distance Alternating Current (AC) lunar surface transmission, UMIC external interface definitions for thermal, power, and data transfer, identified differences between a flight-oriented interface definition and the delivered prototype UMIC, and integrated test plan development. This activity is beneficial to NASA and LM because _it will leverage industry expertise in an AC frequency trade study and allow collaboration on UMIC improvements. Further, NASA will provide Subject Matter Expertise in the areas of power management and distribution, communications, power integration, and materials; and temporarily supply a UMIC for LM to integrate in to their GPN project.

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 GRC will use reasonable efforts to:

1. Provide SME support to an AC frequency trade study.
2. Develop test plans to verify frequency trade study results.
3. Provide SME support, which may include generating analyses, and actively participating in the UMIC Functional Requirements, Operations, and Interface Definition for the GPN.
4. Capture differences between the delivered prototype and expected flight designs.
5. Deliver 10 kWe (assumed Technical Readiness Level [TRL-4]) UMIC to LM along with firmware code, schematics, operational procedures, test data, and Gerber files, and any other relevant materials or data to support integrated UMIC testing.
6. Provide SME support in discussion of integration requirements.
7. Evaluate LM's testing and Verification and Validation plans to verify frequency trade study results, help answer any remaining questions, and deliver documentation.
8. Collaborate with LM to support test integration scope performed by LM.

B. Partner will use reasonable efforts to:

1. Perform trade study to determine the impact of AC frequency, consistent with the scope identified.
2. Support test plan product development, to verify frequency trade study results.
3. Generate documentation and provide SME support, which may include generating analyses for the UMIC Functional Requirements, Operations, and Interface Definition for the GPN task.
4. Conduct analyses on integration requirements between UMIC and GPN.
5. Support feature prioritization discussions with GRC to provide feedback on interface definition and feature sets of disproportionate importance for the UMIC test article.
6. Generate test plan UMIC testing and integration scope.
7. Perform UMIC integration and testing.
8. Summarize all testing completed, including all major findings, and share with GRC.

ARTICLE 3. SCHEDULE AND MILESTONES

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

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| 1. Kick Off Meeting. | Approximately June 2024. |
| 2. LM delivers results of collaborative AC frequency trade study. | Approximately July 2024. |
| 3. GRC delivers UMIC Functional Requirements, Operations, and Interface Definition. | Approximately July 2024. |
| 4. GRC provides UMIC development details including initial firmware code, schematics, operational procedures, test data, and Gerber files, and any other relevant materials to LM to support integration testing. | Approximately July 2024. |

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| 5. LM completes integration test plan of the UMIC with the planned GPN breadboard scope. | Approximately August 2024. |
| 6. GRC delivers TRL-4 version of the UMIC to LM, along with final firmware code and any other updated data products. | Approximately August 2024. |
| 7. LM performs integration testing with the GPN breadboards and delivered UMIC. | Approximately December 2024. |
| 8. LM delivers test artifact to GRC. | Approximately December 2025. |

ARTICLE 4. FINANCIAL OBLIGATIONS

There will be no transfer of funds between the Parties under this Agreement and each Party will fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

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 (1) 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 two (2) years 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.

Management Points of Contact

NASA

Soravud (Joe) Piboontum
STMD Power Portfolio Project Manager
Mail Stop: 162-7
21000 Brookpark Road
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Lockheed Martin

Jessica (Jess) M. Allen, CFCM, MBA
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Technical Points of Contact

NASA

Jeffrey Csank
Electrical Engineer
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21000 Brookpark Road
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Lockheed Martin

Luis Carrio
Chief Architect, Lunar Exploration
Campaign
12257 South Wadsworth Blvd.
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Phone: 408-203-6819
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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
GLENN RESEARCH CENTER

LOCKHEED MARTIN

BY: _____
Michael J. Barrett
Director of Space Flight Systems

BY: _____
Jessica M. Allen
Contracts Management

DATE: _____

DATE: July 18, 2024