

Attachment A: Draft Space Act Agreement (SAA)

UNFUNDED SPACE ACT AGREEMENT
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AND
LOCKHEED MARTIN CORPORATION
IN-SPACE MANUFACTURING TECHNOLOGIES FOR THERMOLASTIC
COMPOSITES
UNDER THE SPACE TECHNOLOGY
ANNOUNCEMENT OF COLLABORATION OPPORTUNITY 2022

ARTICLE 1. AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113(e)), this Agreement is entered into by the National Aeronautics and Space Administration, located at 300 E Street SW, Washington, DC 20546 (hereinafter referred to as "NASA") and Lockheed Martin Corporation located at 12257 S Wadsworth Blvd, Littleton, CO 80125 (hereinafter referred to as "Partner" or "LM"). NASA and Partner may be individually referred to as a "Party" and collectively referred to as the "Parties."

ARTICLE 2. PURPOSE

This Agreement ("Agreement") shall be for the purpose of accelerating the development and testing of critical technologies for emerging space system capabilities consistent with the capabilities articulated in the STMD 2022 Announcement of Collaboration Opportunity (ACO). "The Parties' specific responsibilities, schedule, and milestones are described in one or more Responsibilities and Schedule Document, completed in coordination with a NASA Center, and incorporated fully by reference into this Agreement. This collaboration is intended to advance commercial space-related efforts by facilitating access by Partner to NASA's extensive resources including facilities, technical expertise, hardware, and software. Each Center Responsibilities and Schedule Document will detail the specific purpose of the proposed activity, responsibilities, schedule and milestones, and any personnel, property or facilities proposed to be made available to Partner.

ARTICLE 3. RESPONSIBILITIES

The Parties agree they will use reasonable efforts to fulfill the Responsibilities set forth in the Responsibilities and Schedule Document.

ARTICLE 4. SCHEDULE AND MILESTONES

The Parties agree they will use reasonable efforts to fulfill the Responsibilities set forth in the Responsibilities and Schedule Document.

ARTICLE 5. 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 6. PRIORITY OF USE

Any schedule or milestone in this Agreement is estimated based upon the Parties' current understanding of the projected availability of NASA goods, services, facilities, or equipment. In the event that NASA's projected availability changes, Partner shall be given reasonable notice of that change, so that the schedule and milestones may be adjusted accordingly. The Parties agree that NASA's use of the goods, services, facilities, or equipment shall have priority over the use planned in this Agreement. Should a conflict arise, NASA in its sole discretion shall determine whether to exercise that priority. Likewise, should a conflict arise as between two or more non-NASA Partners, NASA, in its sole discretion, shall determine the priority as between those Partners. This Agreement does not obligate NASA to seek alternative government property or services under the jurisdiction of NASA at other locations.

ARTICLE 7. NONEXCLUSIVITY

This Agreement is not exclusive; accordingly, NASA may enter into similar agreements for the same or similar purpose with other private or public entities.

ARTICLE 8. LIABILITY

A. Partner hereby waives any claims against NASA or one or more of its Related Entities for any injury to, or death of, Partner or one or more of its Related Entities, or for damage to, or loss of, Partner's property or the property of its Related Entities, arising from or related to activities conducted under this Agreement, whether such injury, death, damage, or loss arises through negligence or otherwise, except in the case of willful misconduct. For purposes of

this Agreement, "Related Entities" shall mean contractors and subcontractors of a Party at any tier; grantees, investigators, customers, and users of a Party at any tier and their contractors or subcontractor at any tier; or, employees of the Party or any of the foregoing.

B. Partner further agrees to extend this unilateral waiver to its related entities by requiring them, by contract or otherwise, to waive all claims against NASA and its Related Entities for injury, death, damage, or loss arising from or related to activities conducted under this Agreement. In the event the U.S. Government incurs any liability based upon Partner's failure to provide for the waiver by Partner's Related Entities set out above, Partner agrees to indemnify and hold the U.S. Government harmless against such liability, including costs and expenses incurred by the U.S. Government in defending against any suit or claim for liability by Partner's Related Entities.

C. In the event U.S. Government property is damaged as a result of activities conducted under this Agreement for the primary benefit of Partner, except in the case of gross negligence or willful misconduct by NASA, Partner shall be solely responsible for the repair and restoration of such property subject to NASA direction.

D. Notwithstanding the other provisions of this Article, the waiver of liability set forth in this section shall not be applicable to:

- i. Claims between Partner and its own Related Entity or between its own Related Entities;
- ii. Claims made by a natural person, his/her estate, survivors, or anyone claiming by or through him/her (except when such person or entity is a Party to this Agreement or is otherwise bound by the terms of this waiver) for bodily injury to, or other impairment of health of, or death of, such person;
- iii. Claims for damage caused by willful misconduct;
- iv. Intellectual property claims;
- v. Claims for damage resulting from a failure of Partner to extend the waiver of liability to its Related Entities, pursuant to paragraph B of this Article; or
- vi. Claims by Partner arising out of or relating to NASA's failure to perform its obligations under this Agreement.

ARTICLE 9. LIABILITY - PRODUCT LIABILITY

With respect to products or processes resulting from a Party's participation in an SAA, each Party that markets, distributes, or otherwise provides such product, or a product designed or produced by such a process, directly to the public will be solely responsible for the safety of the product or process.

ARTICLE 10. LIABILITY - PRODUCT LIABILITY INDEMNIFICATION

In the event the U.S. Government incurs any liability based upon Partner's, or Partner's Related Entity's, use or commercialization of products or processes resulting from a Party's participation under this Agreement, Partner agrees to indemnify and hold the U.S. Government harmless against such liability, including costs and expenses incurred by the U.S. Government in defending against any suit or claim for such liability.

ARTICLE 11. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. General

1. "Related Entity" as used in this Data Rights Article means a contractor, subcontractor, grantee, or other entity having a legal relationship with NASA or Partner that is assigned, tasked, or contracted to perform activities under this Agreement.
2. "Data" means recorded information, regardless of form, the media on which it is recorded, or the method of recording.
3. "Proprietary Data" means Data embodying trade secrets developed at private expense or commercial or financial information that is privileged or confidential, and that includes a restrictive notice, unless the Data is:
 - a. known or available from other sources without restriction;
 - b. known, possessed, or developed independently, and without reference to the Proprietary Data;
 - c. made available by the owners to others without restriction; or
 - d. required by law or court order to be disclosed.
4. Data exchanged under this Agreement is exchanged without restriction except as otherwise provided herein.
5. Notwithstanding any restrictions provided in this Article, the Parties are not restricted in the use, disclosure, or reproduction of Data provided under this Agreement that meets one of the exceptions in 3., above. If a Party believes that any exceptions apply, it shall notify the other Party before any unrestricted use, disclosure, or reproduction of the Data.
6. The Parties will not exchange preexisting Proprietary Data under this Agreement unless authorized herein or in writing by the owner.
7. If the Parties exchange Data having a notice that the Receiving Party deems is ambiguous or unauthorized, the Receiving Party shall tell the Providing Party. If the notice indicates a restriction, the Receiving Party shall protect the Data under this Article unless otherwise directed in writing by the Providing Party.
8. The Data rights herein apply to the employees and Related Entities of Partner. Partner shall ensure that its employees and Related Entity

- employees know about and are bound by the obligations under this Article.
9. Disclaimer of Liability: NASA is not restricted in, or liable for, the use, disclosure, or reproduction of Data without a restrictive notice or for Data Partner gives, or is required to give, the U.S. Government without restriction.
 10. Partner may use the following or a similar restrictive notice:

Proprietary Data Notice

The data herein include Proprietary Data and are restricted under the Data Rights provisions of Space Act Agreement [provide applicable identifying information].

Partner should also mark each page containing Proprietary Data with the following or a similar legend: **“Proprietary Data – Use And Disclose Only Under the Notice on the Title or Cover Page.”**

B. Data First Produced by Partner under this Agreement

If Data first produced by Partner or its Related Entities under this Agreement is given to NASA, and the Data is Proprietary Data, and it includes a restrictive notice, NASA will use reasonable efforts to protect it. The Data will be disclosed and used (under suitable protective conditions) only for U.S. Government purposes.

C. Data First Produced by NASA under this Agreement

If Partner requests that Data first produced by NASA under this Agreement be protected, and NASA determines it would be Proprietary Data if obtained from Partner, NASA will mark it with a restrictive notice and use reasonable efforts to protect it for five (5) years after its development. During this restricted period the Data may be disclosed and used (under suitable protective conditions) for U.S. Government purposes only, and thereafter for any purpose. Partner must not disclose the Data without NASA’s written approval during the restricted period. The restrictions placed on NASA do not apply to Data disclosing a NASA owned invention for which patent protection is being considered.

D. Publication of Results

The National Aeronautics and Space Act (51 U.S.C. § 20112) requires NASA to provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof. As such, NASA may publish unclassified and non-Proprietary Data resulting from work performed under this

Agreement. The Parties will coordinate publication of results allowing a reasonable time to review and comment.

E. Data Disclosing an Invention

If the Parties exchange Data disclosing an invention for which patent protection is being considered, and the furnishing Party identifies the Data as such when providing it to the Receiving Party, the Receiving Party shall withhold it from public disclosure for a reasonable time (one (1) year unless otherwise agreed or the Data is restricted for a longer period herein).

F. Copyright

Data exchanged with a copyright notice and with no restrictive notice is presumed to be published. The following royalty-free licenses apply:

1. If indicated on the Data that it was produced outside of this Agreement, it may be reproduced, distributed, and used to prepare derivative works only for carrying out the Receiving Party's responsibilities under this Agreement.
2. Data without the indication of F.1. is presumed to be first produced under this Agreement. Except as otherwise provided in paragraph E. of this Article, and in the Invention and Patent Rights Article of this Agreement for protection of reported inventions, the Data may be reproduced, distributed, and used to prepare derivative works for any purpose.

G. Data Subject to Export Control

Whether or not marked, technical data subject to the export laws and regulations of the United States provided to Partner under this Agreement must not be given to foreign persons or transmitted outside the United States without proper U.S. Government authorization.

H. Handling of Background, Third Party Proprietary, and Controlled Government Data

1. NASA or Partner (as Disclosing Party) may provide the other Party or its Related Entities (as Receiving Party):
 - a. Proprietary Data developed at Disclosing Party's expense outside of this Agreement (referred to as Background Data);

- b. Proprietary Data of third parties that Disclosing Party has agreed to protect or is required to protect under the Trade Secrets Act (18 U.S.C. § 1905) (referred to as Third Party Proprietary Data); and
 - c. U.S. Government Data, including software and related Data, Disclosing Party intends to control (referred to as Controlled Government Data).
2. All Background, Third Party Proprietary and Controlled Government Data provided by Disclosing Party to Receiving Party shall be marked by Disclosing Party with a restrictive notice and protected by Receiving Party in accordance with this Article.
3. 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.
- a. Background Data:
The Disclosing Party's Background Data, if any, will be identified in a separate technical document.
 - b. Third Party Proprietary Data:
The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.
 - c. Controlled Government Data:
The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.
 - d. Notwithstanding H.4., NASA software and related Data will be provided to Partner under a separate Software Usage Agreement (SUA). Partner shall use and protect the related Data in accordance with this Article. Unless the SUA authorizes retention, or Partner enters into a license under 37 C.F.R. Part 404, the related Data shall be disposed of as NASA directs:
[insert name and NASA Case No. of the software; if none, insert "None."]
4. For such Data identified with a restrictive notice pursuant to H.2. including such Data identified pursuant to this Article, Receiving Party shall:
- a. Use, disclose, or reproduce such Data only as necessary under this Agreement;
 - b. Safeguard such Data from unauthorized use and disclosure;
 - c. Allow access to such Data only to its employees and any Related Entity requiring access under this Agreement;
 - d. Except as otherwise indicated in 4.c., preclude disclosure outside Receiving Party's organization;
 - e. Notify its employees with access about their obligations under this Article and ensure their compliance, and notify any Related Entity with access about their obligations under this Article; and
 - f. Dispose of such Data as Disclosing Party directs.
- I. Oral and visual information

If Partner discloses Proprietary Data orally or visually, NASA will have no duty to restrict, or liability for disclosure or use, unless Partner:

1. Orally informs NASA before initial disclosure that the Data is Proprietary Data, and
2. Reduces the Data to tangible form with a restrictive and gives it to NASA within ten (10) calendar days after disclosure.

J. Classified Material

If classified material is used under this Agreement, Partner must provide a completed Contract Security Classification Specification (DD Form 254 or equivalent) to the NASA Point of Contact. Handling of classified material must be consistent with NASA and U.S Federal Government statutes, regulations, and policies.

ARTICLE 12. INTELLECTUAL PROPERTY RIGHTS – INVENTION AND PATENT RIGHTS

A. General

1. NASA has determined that 51 U.S.C. § 20135(b) does not apply to this Agreement. Therefore, title to inventions made (conceived or first actually reduced to practice) under this Agreement remain with the respective inventing party(ies). No invention or patent rights are exchanged or granted under this Agreement, except as provided herein.
2. “Related Entity” as used in this Invention and Patent Rights Article means a contractor, subcontractor, grantee, or other entity having a legal relationship with NASA or Partner assigned, tasked, or contracted with to perform activities under this Agreement.
3. The invention and patent rights herein apply to employees and Related Entities of Partner. Partner shall ensure that its employees and Related Entity employees know about and are bound by the obligations under this Article.

B. NASA Inventions

NASA will use reasonable efforts to report inventions made under this Agreement by its employees. Upon request, NASA will use reasonable efforts to grant Partner, under 37 C.F.R. Part 404, a negotiated license to any NASA invention made under this Agreement. This license is subject to paragraph E.1. of this Article.

C. NASA Related Entity Inventions

NASA will use reasonable efforts to report inventions made under this Agreement by its Related Entity employees, or jointly between NASA and Related Entity employees, where NASA has the right to acquire title. Upon request, NASA will use reasonable efforts to grant Partner, under 37 C.F.R. Part 404, a negotiated license to any of these inventions where NASA has acquired title. This license is subject to paragraph E.2. of this Article.

D. Joint Inventions With Partner

The Parties will use reasonable efforts to report, and cooperate in obtaining patent protection on, inventions made jointly between NASA employees, Partner employees, and employees of either Party's Related Entities. Upon timely request, NASA may, at its sole discretion and subject to paragraph E. of this Article:

1. refrain from exercising its undivided interest inconsistently with Partner's commercial business; or
2. use reasonable efforts to grant Partner, under 37 C.F.R. Part 404, an exclusive or partially exclusive negotiated license.

E. Rights to be Reserved in Partner's License

Any license granted Partner under paragraphs B., C., or D. of this Article is subject to the following:

1. For inventions made solely or jointly by NASA employees, NASA reserves the irrevocable, royalty-free right of the U.S. Government to practice the invention or have it practiced on behalf of the United States or on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.
2. For inventions made solely or jointly by employees of a NASA Related Entity, NASA reserves the rights in 1. above, and a revocable, nonexclusive, royalty-free license retained by the Related Entity under 14 C.F.R. § 1245.108 or 37 C.F.R. § 401.14 (e).

F. Protection of Reported Inventions

For inventions reported under this Article, the Receiving Party shall withhold all invention reports or disclosures from public access for a reasonable time (1 year unless otherwise agreed or unless restricted longer herein) to facilitate establishment of patent rights.

G. Patent Filing Responsibilities and Costs

1. The invention and patent rights herein apply to any patent application or patents covering an invention made under this Agreement. Each Party is responsible for its own costs of obtaining and maintaining patents covering sole inventions of its employees. The Parties may agree otherwise, upon the reporting of any invention (sole or joint) or in any license granted.
2. Partner shall include the following in patent applications for an invention made jointly between NASA employees, its Related Entity employees and Partner employees:

The invention described herein may be manufactured and used by or for the U.S. Government for U.S. Government purposes without the payment of royalties thereon or therefore.

NASA technology available for licensing can be located by visiting the following website address – <http://technology.nasa.gov>.

ARTICLE 13. USE OF NASA NAME AND NASA EMBLEMS

A. NASA Name and Initials

Partner shall not use “National Aeronautics and Space Administration” or “NASA” in a way that creates the impression that a product or service has the authorization, support, sponsorship, or endorsement of NASA, which does not, in fact, exist. Except for releases under the “Release of General Information to the Public and Media” Article, Partner must submit any proposed public use of the NASA name or initials (including press releases and all promotional and advertising use) to the NASA Associate Administrator for the Office of Communications or designee (“NASA Communications”) for review and approval. Approval by NASA Office of Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

B. NASA Emblems

Use of NASA emblems (*i.e.*, NASA Seal, NASA Insignia, NASA logotype, NASA Program Identifiers, and the NASA Flag) is governed by 14 C.F.R. Part 1221. Partner must submit any proposed use of the emblems to NASA Communications for review and approval.

ARTICLE 14. RELEASE OF GENERAL INFORMATION TO THE PUBLIC AND MEDIA

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NASA or Partner may, consistent with Federal law and this Agreement, release general information regarding its own participation in this Agreement as desired.

Pursuant to Section 841(d) of the NASA Transition Authorization Act of 2017, Public Law 115-10 (the "NTAA"), NASA is obligated to publicly disclose copies of all agreements conducted pursuant to NASA's 51 U.S.C. §20113(e) authority in a searchable format on the NASA website within 60 days after the agreement is signed by the Parties. The Parties acknowledge that a copy of this Agreement will be disclosed, without redactions, in accordance with the NTAA.

ARTICLE 15. DISCLAIMER OF WARRANTY

Goods, services, facilities, or equipment provided by NASA under this Agreement are provided "as is." NASA makes no express or implied warranty as to the condition of any such goods, services, facilities, or equipment, or as to the condition of any research or information generated under this Agreement, or as to any products made or developed under or as a result of this Agreement including as a result of the use of information generated hereunder, or as to the merchantability or fitness for a particular purpose of such research, information, or resulting product, or that the goods, services, facilities or equipment provided will accomplish the intended results or are safe for any purpose including the intended purpose, or that any of the above will not interfere with privately-owned rights of others. Neither the government nor its contractors shall be liable for special, consequential or incidental damages attributed to such equipment, facilities, technical information, or services provided under this Agreement or such research, information, or resulting products made or developed under or as a result of this Agreement.

ARTICLE 16. DISCLAIMER OF ENDORSEMENT

NASA does not endorse or sponsor any commercial product, service, or activity. NASA's participation in this Agreement or provision of goods, services, facilities or equipment under this Agreement does not constitute endorsement by NASA. Partner agrees that nothing in this Agreement will be construed to imply that NASA authorizes, supports, endorses, or sponsors any product or service of Partner resulting from activities conducted under this Agreement, regardless of the fact that such product or service may employ NASA-developed technology.

ARTICLE 17. COMPLIANCE WITH LAWS AND REGULATIONS

A. The Parties shall comply with all applicable laws and regulations including, but not limited to, safety; security; export control; environmental; and suspension

and debarment laws and regulations. Access by a Participant to NASA facilities or property, or to a NASA Information Technology (IT) system or application, is contingent upon compliance with NASA security and safety policies and guidelines including, but not limited to, standards on badging, credentials, and facility and IT system/application access, including use of Interconnection Security Agreements (ISAs), when applicable.

B. With respect to any export control requirements:

1. The Parties will comply with all U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR), 22 C.F.R. Parts 120 through 130, and the Export Administration Regulations (EAR), 15 C.F.R. Parts 730 through 799, in performing work under this Agreement or any Annex to this Agreement. In the absence of available license exemptions or exceptions, the Partner shall be responsible for obtaining the appropriate licenses or other approvals, if required, for exports of hardware, technical data and software, or for the provision of technical assistance.
2. The Partner shall be responsible for obtaining export licenses, if required, before utilizing foreign persons in the performance of work under this Agreement or any Annex under this Agreement, including instances where the work is to be performed on-site at NASA and where the foreign person will have access to export-controlled technical data or software.
3. The Partner will be responsible for all regulatory record-keeping requirements associated with the use of licenses and license exemptions or exceptions.
4. The Partner will be responsible for ensuring that the provisions of this Article apply to its Related Entities.

C. With respect to suspension and debarment requirements:

1. The Partner hereby certifies, to the best of its knowledge and belief, that it has complied, and shall comply, with 2 C.F.R. Part 180, Subpart C, as supplemented by 2 C.F.R. Part 1880, Subpart C.
2. The Partner shall include language and requirements equivalent to those set forth in subparagraph C.1., above, in any lower-tier covered transaction entered into under this Agreement.

D. Partner shall annually certify for itself and its team members the following to the NASA Administrative Contact to this Agreement:

1. Neither Partner nor any of its subcontractors nor partners are presently debarred, suspended, proposed for debarment, or otherwise declared ineligible for award of funding by any Federal agency;

2. Neither Partner nor any of its subcontractors nor partners have been convicted or had a civil judgment rendered against them within the last three (3) years for fraud in obtaining, attempting to obtain, or performing a Government contract;
3. Partner and any of its team members, subcontractors, or partners receiving \$100,000 or more in NASA funding for work performed under this Agreement must have not used any appropriated funds for lobbying purposes prohibited by 31 U.S.C. § 1352; and
4. The Lead Partner must be a for-profit entity organized under the laws of the United States.
5. The Lead Partner and all team members must be:
 - A. More than 50 percent owned and controlled by United States nationals;
or
 - B. A subsidiary of a foreign company and such subsidiary has in the past evidenced a substantial commitment to the United States market through –
 - a. Investments in the United States in long-term research, development, and manufacturing (including the manufacture of major components and subassemblies); and
 - b. Significant contributions to employment in the United States

To the extent an entity proposes use of Government funding for any part of a commercial launch, the entity providing those launch services must meet the eligibility requirements of 51 USC 50913. In accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

NASA conducts research with foreign entities only on a cooperative, no-exchange-of funds basis. Although foreign individuals employed by a Partner in support of this FSAA may receive NASA funds, NASA funding may not support research efforts, including travel, by non-U.S. organizations, including sub-Partners, at any level. The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by the Partner is permitted.

E. Pursuant to The Department of Defense and Full-Year Appropriation Act, Public Law 112-10, Section 1340(a); The Consolidated and Further Continuing Appropriation Act of 2012, Public Law 112-55, Section 539; and future-year appropriations (hereinafter, "the Acts"), NASA is restricted from using funds appropriated in the Acts to enter into or fund any agreement of any kind to participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level or at any subrecipient level, whether the bilateral involvement is funded or performed under a no-exchange of funds

arrangement. Partner hereby certifies that it is not China or a Chinese-owned company, and that the Partner will not participate, collaborate, or coordinate bilaterally with China or any Chinese-owned company, at the prime recipient level or at any subrecipient level, whether the bilateral involvement is funded or performed under a no-exchange of funds arrangement.

(a) Definition: "China or Chinese-owned Company" means the People's Republic of China, any company owned by the People's Republic of China, or any company incorporated under the laws of the People's Republic of China.

(b) The restrictions in the Acts do not apply to commercial items of supply needed to perform this agreement. However, Partner shall disclose to NASA if it anticipates making any award, including those for the procurement of commercial items, to China or a Chinese-owned entity.

(c) Subawards – The Partner shall include the substance of this provision in all subawards made hereunder.

In addition to the above certification, Partner shall immediately disclose to the NASA Administrative Contact, for any individual involved in this NASA-funded activity, any current or pending professional and educational affiliations or commitments to China or a Chinese-owned company, including Chinese universities.

F. Regarding INKSNA requirements, Partner shall disclose to NASA if it intends to rely upon Russian entities for its demonstration. Partner shall not subcontract to Russian entities without first receiving written approval from NASA.

(a) Definitions: In this provision:

(1) The term "Russian entities" means:

(A) Russian persons, or

(B) Entities created under Russian law or owned, in whole or in part, by Russian persons or companies including, but not limited to, the following:

(i) The Russian Federal Space Agency (Roscosmos),

(ii) Any organization or entity under the jurisdiction or control of Roscosmos, or

(iii) Any other organization, entity or element of the Government of the Russian Federation.

(2) The term “extraordinary payments” means payments in cash or in kind made or to be made by the United States Government prior to December 31, 2025, for work to be performed or services to be rendered prior to that date necessary to meet United States obligations under the Agreement Concerning Cooperation on the Civil International Space Station, with annex, signed at Washington January 29, 1998, and entered into force March 27, 2001, or any protocol, agreement, memorandum of understanding, or contract related thereto.

(b) This clause implements the reporting requirement in section 6(i) of the Iran, North Korea, and Syria Nonproliferation Act. The provisions of this clause are without prejudice to the question of whether the Partner or its subcontractor(s) are making extraordinary payments under section 6(a) or fall within the exceptions in section 7(1)(B) of the Act. NASA has applied the restrictions in the Act to include funding of Russian entities via U.S. Contractors (Awardees).

(c) (1) The Partner shall not subcontract with Russian entities without first receiving written approval from the NASA Administrative Contact. In order to obtain this written approval to subcontract with any Russian entity as defined in paragraphs (a), the Partner shall provide the NASA Administrative Contact with the following information related to each planned new subcontract and any change to an existing subcontract with entities that fit the description in paragraph (a):

(A) A detailed description of the subcontracting entity, including its name, address, and a point of contact, as well as a detailed description of the proposed subcontract including the specific purpose of payments that will be made under the subcontract.

(B) The Partner shall provide certification that the subcontracting entity is not, at the date of the subcontract approval request, on any of the lists of proscribed denied parties, especially designated nationals and entities of concern found at:

BIS's Listing of Entities of Concern

(see <http://www.bis.doc.gov/index.php/policy-guidance/lists-of-parties-of-concern/entity-list>)

BIS's List of Denied Parties

(see <http://www.bis.doc.gov/index.php/policy-guidance/lists-of-parties-of-concern/denied-persons-list>)

OFAC's List of Specially Designated Nationals

(see <http://www.treasury.gov/resource-center/sanctions/SDN-List/Pages/default.aspx>)

List of Unverified Persons in Foreign Countries

(see <http://www.bis.doc.gov/index.php/policy-guidance/lists-of-parties-of-concern/unverified-list>)

State Department's List of Parties Statutorily Debarred for Arms Export Control Act Convictions

(see

https://www.pmdtc.state.gov/ddtc_public?id=ddtc_kb_article_page&sys_id=7188dac6db3cd30044f9ff621f961914)

State Department's Lists of Proliferating Entities

(see <http://www.state.gov/t/isn/c15231.htm>)

(2) Unless relief is granted by the NASA Administrative Contact, the information necessary to obtain approval to subcontract shall be provided to the NASA Administrative Contact 30 business days prior to executing any planned subcontract with entities defined in paragraph (a).

(d) After receiving approval to subcontract, the Partner shall provide the NASA Administrative Contact with a report every six months that documents the individual payments made to an entity in paragraph (a). The reports are due on July 15th and January 15th. The July 15th report shall document all of the individual payments made from the previous January through June. The January 15th report shall document all of the individual payments made from the previous July through December. The content of the report shall provide the following information for each time a payment is made to an entity in paragraph (a):

- (1) The name of the entity
- (2) The subcontract number
- (3) The amount of the payment
- (4) The date of the payment

(e) The NASA Administrative Contact may direct the Partner to provide additional information for any other prospective or existing subcontract at any tier. The NASA Administrative Contact may direct the Partner to terminate for the convenience of the Government any subcontract at any tier with an entity described in paragraph (a), subject to an equitable adjustment.

(f) On or after December 31, 2025, the Partner shall be responsible to make payments to entities defined in paragraph (a) of this provision. Any subcontract with entities defined in paragraph (a), therefore, shall be completed in sufficient time to permit the U.S. Government to make extraordinary payments on subcontracts with Russian entities on or before December 31, 2025.

(g) The Partner shall include the substance of this clause in all its subcontracts, and shall require such inclusion in all other subcontracts of any tier. The Partner shall be responsible to obtain written approval from the NASA Administrative Contact to enter into any tier subcontract that involves entities defined in paragraph (a).

G. With respect to the requirements in Section 889 of the National Defense Authorization Act (NDAA) for Fiscal Year 2019, Public Law 115-232:

1. In performing this Agreement, Partner will not use, integrate with a NASA system, or procure with NASA funds (if applicable), "covered telecommunications equipment or services" (as defined in Section 889(f)(3) of the NDAA).
2. The Partner will ensure that the provisions of this Article apply to its Related Entities.

ARTICLE 18. TERM OF AGREEMENT

This Agreement 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 X years from the Effective Date, whichever comes first.

ARTICLE 19. RIGHT TO TERMINATE

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

ARTICLE 20. CONTINUING OBLIGATIONS

The rights and obligations of the Parties that, by their nature, would continue beyond the expiration or termination of this Agreement, e.g., “Liability” and “Intellectual Property Rights” related clauses shall survive such expiration or termination of this Agreement.

ARTICLE 21. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Agreement.

Technical Points of Contact

NASA

[NAME]
[ADDRESS]
[PHONE]
[FAX]
[EMAIL]

LOCKHEED MARTIN CORPORATION

Michael Eller
13800 Old Gentilly Road
New Orleans, LA 70129
504-257-0366
michael.r.eller@lmco.com

ARTICLE 22. DISPUTE RESOLUTION

Except as otherwise provided in the Article entitled “Priority of Use,” the Article entitled “Intellectual Property Rights – Invention and Patent Rights” (for those activities governed by 37 C.F.R. Part 404), and those situations where a pre-existing statutory or regulatory system exists (e.g., under the Freedom of Information Act, 5 U.S.C. § 552), all disputes concerning questions of fact or law arising under this Agreement shall be referred by the claimant in writing to the appropriate person identified in this Agreement as the “Points of Contact.” The persons identified as the “Points of Contact” for NASA and the Partner will consult and attempt to resolve all issues arising from the implementation of this Agreement. If they are unable to come to agreement on any issue, the dispute will be referred to the signatories to this Agreement, or their designees, for joint resolution. If the Parties remain unable to resolve the dispute, then the NASA signatory or that person’s designee, as applicable, will issue a written decision that will be the final agency decision for the purpose of judicial review. Nothing in this Article limits or prevents either Party from pursuing any other right or remedy available by law upon the issuance of the final agency decision.

ARTICLE 23. INVESTIGATIONS OF MISHAPS AND CLOSE CALLS

In the case of a close call, mishap or mission failure, the Parties agree to provide assistance to each other in the conduct of any investigation. For all NASA mishaps or close calls, Partner agrees to comply with NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping" and [insert Center safety policies, as appropriate].

ARTICLE 24. MODIFICATIONS

Any modification to this Agreement shall be executed, in writing, and signed by an authorized representative of NASA and the Partner.

ARTICLE 25. ASSIGNMENT

Neither this Agreement nor any interest arising under it will be assigned by the Partner or NASA without the express written consent of the officials executing, or successors, or higher- level officials possessing original or delegated authority to execute this Agreement.

ARTICLE 26. APPLICABLE LAW

U.S. Federal law governs this Agreement for all purposes, including, but not limited to, determining the validity of the Agreement, the meaning of its provisions, and the rights, obligations and remedies of the Parties.

ARTICLE 27. INDEPENDENT RELATIONSHIP

This Agreement is not intended to constitute, create, give effect to or otherwise recognize a joint venture, partnership, or formal business organization, or agency agreement of any kind, and the rights and obligations of the Parties shall be only those expressly set forth herein.

ARTICLE 28. LOAN OF GOVERNMENT PROPERTY

The parties shall enter into a NASA Form 893, Loan of NASA Equipment, for NASA equipment loaned to Partner.

ARTICLE 29. SIGNATORY AUTHORITY

The signatories to this Agreement covenant and warrant that they have authority

to execute this Agreement. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

LOCKHEED MARTIN CORPORATION

BY: _____
James L. Reuter
Associate Administrator, STMD

BY: *Kevin Guilday*
Kevin Guilday
Contracts Manager

DATE: _____

DATE: 11/22/2022

THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS REQUIRED TO BE INCLUDED AS AN ATTACHMENT TO THE CENTER LETTER OF INTENT SUPPORTING THE PROPOSAL. SUBMISSION OF A CENTER LETTER OF INTENT AND RESPONSIBILITY AND SCHEDULE DOCUMENT IN A FINAL ACO PROPOSAL INDICATES PROPOSER'S ACCEPTANCE OF THE RESPONSIBILITIES AND SCHEDULE DOCUMENT PROPOSED BY THE CENTER IF SELECTED FOR AWARD.

PURSUANT OF THE TEMPLATE SPACE ACT AGREEMENT, THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS INCORPORATED FULLY BY REFERENCE INTO THE SPACE ACT AGREEMENT AND THEREFORE WILL BE PUBLISHED WITH THE SPACE ACT AGREEMENT IN ACCORDANCE WITH ARTICLE 14 OF THE SPACE ACT AGREEMENT.

RESPONSIBILITIES AND SCHEDULE

DEVELOPED BY **Glenn Research Center**

TO SUPPORT ACO 2022 PROPOSAL SUBMITTED BY

Lockheed Martin Corporation

1. RESPONSIBILITIES

A. Glenn Research Center will use reasonable efforts to:

1. Provide subject matter expert technical input to the evaluation of the manufacturing process for in-space manufacturing of thermoplastic bonds (WBS 1.1).
2. Perform material trade study assessment and make recommendation on thermoplastic composites and hybrid thermoplastic composite to metallic materials for bonding trials (WBS 1.2).
3. Test a minimum of 72 coupons following ASTM protocols: ASTM D3039/Tensile Test, ASTM D5868/Lap Shear, ASTM E8/Tensile, ASTM B769/ Lap Shear, ASTM D638/Tensile (WBS 1.6).

B. Lockheed Martin Corporation will use reasonable efforts to:

1. Project Management (WBS 1.0)
 - Provide Project Planning
 - Provide Schedule Tracking
 - Complete Procurements
 - Perform Contract Management

2. Structural profile Thermoplastic Co-Polyester (TPC) material selection (WBS 1.2)
 - Provide targets for cost, size, complexity, and power & energy consumption for ISM processing methods
3. Bonding trials on selected materials with Laser Beam Welding (LBW) (WBS 1.3)
 - Complete materials procurement
 - Perform LBW trials on TPC and hybrid TPC-metal coupons
 - Delivery of at least 30 coupons to TPCs for testing
4. Bonding trials on selected materials with Friction Stir Welding (FSW) (WBS 1.4)
5. Testing and analysis of bonded materials (WBS 1.6)
 - Provide test specification interpretation
 - Provide test coupon configuration guidance
6. Final Reporting (WBS 1.8)
 - Joining data, observations, and photographs

2. SCHEDULE

The planned schedule for the activities with Lockheed Martin Corporation as defined in Paragraph 1. RESPONSIBILITIES are as follows:

Task / Milestone	WBS Element	Responsible Party	Deliverable	Due Date
Project Kickoff	1.0	LM/NASA	N/A	ATP
Progress Meeting (Monthly)	1.0	LM/NASA	N/A	ATP+1 m (recurring)
ISM Structural Profile Material Selection	1.2	GSFC/MSFC/GRC	Selection Memo	ATP+6 m
Bonding Trials on Selected Materials w/ Laser Welding	1.3	LM	Test Report	ATP+11 m
Bonding Trials on Selected Materials w/ FSW	1.4	LM	Test Report	ATP+14 m
Testing and Analysis of Bonded Materials	1.6	LaRC/GSFC/GRC	Test Report	ATP+21 m
Prepare Final Report	1.8	LM/NASA	Final Report	ATP+22 m

3. COST

Center Contribution	Fiscal Year 1	Fiscal Year 2	Fiscal Year 3
Total Travel Dollars	\$0	\$4,600	\$2,300
Total Labor Dollars	\$7,575	\$42,331	\$30,728
Total Procurement Dollars	\$890	\$48,381	\$7,015
Sub Totals	\$8,465	\$95,292	\$40,042
Grand Total	\$143,799		

4. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Agreement.

GLENN RESEARCH CENTER

Derek J. Quade
21000 Brookpark Road
B162:321
P: 216.433.3830
[FAX]
derek.j.quade@nasa.gov

Lockheed Martin Corporation

Elizabeth Wampler
Lockheed Martin Corporation
Corporation
12257 S. Wadsworth Blvd
P: 720.563.5645
[FAX]
elizabeth.a.wampler@lmco.com

5. MODIFICATIONS

Any modification to this Responsibilities and Schedule document set forth herein after award shall be documented in writing, and signed by both the Glenn Research Center and the Lockheed Martin Corporation. Modification of this Responsibilities and Schedule document does not modify the terms of the Space Act Agreement.

6. SIGNATORY AUTHORITY

The signatory to this Responsibilities and Schedule document represents and warrants that he/she has authority to commit Glenn Research Center to support Lockheed Martin Corporation if selected for award.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

Glenn Research Center

BY: _____
Michael J. Barrett, Ph.D.

RESPONSIBILITIES AND SCHEDULE
DEVELOPED BY GODDARD
TO SUPPORT ACO 2022 PROPOSAL SUBMITTED BY
LOCKHEED MARTIN

1. RESPONSIBILITIES

A. Goddard will use reasonable efforts to:

1. WBS 1.0: Program Management

- PoP: May 2023 – April 2025, assuming ATP occurs in May 2023
- Goddard shall attend monthly meetings with Lockheed Martin (LM), held via teleconference, to status progress and schedule
- Goddard shall coordinate its personnel, resources, and laboratories to support this project
- Goddard shall provide procurement and contracts support for activities related to Goddard's scope of work on this project
- Deliverable: Goddard shall send LM and other Proposed Partner Centers (PPCs) a recurring set of monthly teleconference invitations using Goddard's preferred teleconference host. Delivery required by June 2023, assuming ATP occurs in May 2023.

2. WBS 1.1: ISM structural profile manufacturing process evaluation

- PoP: May 2023 – August 2023, assuming ATP occurs in May 2023
- Goddard shall assist with performing a trade study of optimal in-space manufacturing (ISM) processes for producing relevant TPC material profiles in space
- Goddard shall include in their trade study the following criteria (but not limited to): peak power during process operation, energy consumption per unit length (i.e. meters of extrusion, square meter of panel, etc.), relative size of equipment in cubic centimeters, relative mass of equipment in kilograms, and relative cost of equipment, and expected lifetime of equipment (i.e. in terms of total meters of material produced, square meters of panels produced, etc.).
- Goddard shall assist with making a final recommendation on ISM process and structural profile to make TPC materials for bonding trials

- Deliverable: Goddard shall deliver results of the trade study to LM and PPCs in a MS Word, Excel, and/or PowerPoint file. Delivery required before end of task Period of Performance (PoP).

3. WBS 1.2: Structural profile TPC material selection

- PoP: July 2023 – October 2023, assuming ATP occurs in May 2023
- Goddard shall assist with performing a trade study of optimal TPC materials that can be produced by the recommended ISM process identified in WBS 1.1.
- Goddard shall include in their trade study the following criteria (but not limited to): density, tensile strength, ductility, Young's modulus, shear strength, coefficient of thermal expansion, susceptibility to degradation from radiation, weldability, and cost.
- Goddard shall assist with making a final recommendation on TPC and hybrid TPC-metallic materials for bonding trials.

4. WBS 1.6 Testing and evaluation of bonded materials

- PoP: January 2024 – March 2025, assuming ATP occurs in May 2023
- Goddard shall expect to receive laser beam welding (LBW), friction stir welding (FSW) coupons, and electron beam welding (EBW) coupons from LM by May 2024 and August 2024, respectively according to the schedule shown below, assuming ATP occurs in May 2023
- Goddard shall perform preparation of at least 6 macrograph specimens & photos corresponding with tensile specimens for each joining method (LBW, FSW, EBW) per ASTM E3. A total of 18 specimens.
- Goddard shall perform preparation of at least 6 macrograph specimens & photos corresponding with lap shear specimens for each joining method (LBW, FSW, EBW) per ASTM E3. A total of 18 specimens.
- Goddard shall be responsible for cutting, machining, polishing, and etching the macrograph specimens.
- Goddard shall be responsible for performing coefficient of thermal expansion (CTE) testing for at least 6 TPC-metal lap shear specimens at a temperature range of 0-100°C for each joining method (LBW, FSW, EBW)
- Deliverable: Goddard shall deliver 36 macrograph photos in a MS Word document to LM detailing qualitative analysis for each photo. Delivery required before end of task PoP.

- Deliverable: Goddard shall deliver a test report in MS Word document format to LM detailing results of 18 TPC-metal CTE tests. Delivery required before end of task PoP.

5. WBS 1.8 Final reporting

- PoP: January 2025 – April 2025, assuming ATP occurs in May 2023
- Goddard shall assist with compiling a written report to include all joining data, testing data, material characterization data, and photographs.
- Deliverable: Goddard shall deliver a final report to LM in a MS Word document file in Goddard's preferred format. Delivery required before end of task PoP.

B. Lockheed Martin will use reasonable efforts to:

1. WBS 1.0: Program Management

- Project planning
- Schedule tracking
- Procurements
- Contract management

2. WBS 1.1: ISM structural profile manufacturing process evaluation

- Targets for cost, size, complexity, and power & energy consumption for ISM processing methods

3. WBS 1.2: Structural profile TPC material selection

- Targets for strength, stiffness, CTE, bond quality for leading ISM applications

4. WBS 1.3: Bonding trials on selected materials with LBW

- Materials procurement
- LBW trials on TPC and hybrid TPC-metal coupons
- Delivery of at least 30 coupons to PPCs for testing
- Materials procurement
- FSW trials on TPC and hybrid TPC-metal coupons
- Delivery of at least 30 coupons to PPCs for testing

5. WBS 1.4 Bonding trials on selected materials with FSW

- Materials procurement
- FSW trials on TPC and hybrid TPC-metal coupons
- Delivery of at least 30 coupons to PPCs for testing

6. WBS 1.5 Bonding trials on selected materials with EBW

- Materials procurement

7. WBS 1.6 Testing and evaluation of bonded materials

- Test specification interpretation
- Test coupon configuration guidance

8. WBS 1.7 Bonding demonstration of selected materials in a thermal vacuum chamber

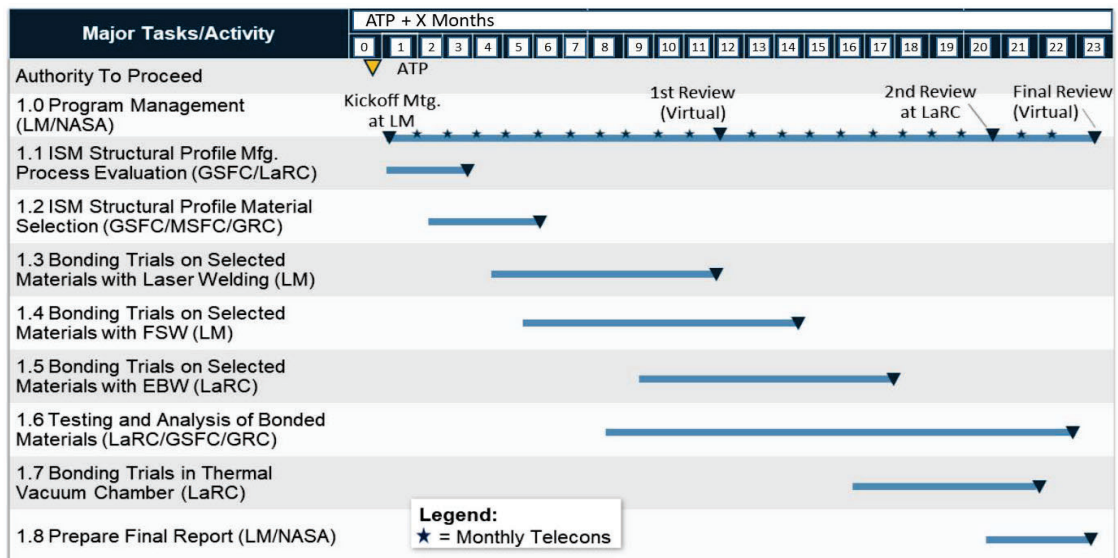
- TVAC requirements for industry use case
- TPC & metal materials

9. WBS 1.8 Final reporting

- Joining data, observations, and photographs

2. SCHEDULE

The planned schedule for the all activities with Lockheed Martin as defined in Paragraph 1. RESPONSIBILITIES are as follows:



3. COST

Center Contribution	Fiscal Year 1	Fiscal Year 2	Fiscal Year 3
Total Travel Dollars	\$ 2,472	\$ 2,546	0
Total Labor Dollars (<i>Civil Servants</i>)	\$ 33,738	\$ 89,628	\$ 59,353
Total Procurement Dollars (<i>Includes Contractor Labor</i>)	0	\$ 15,500	0
Sub Totals	\$ 36,210	\$ 107,674	\$ 59,353
Grand Total	\$ 203,237		

4. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Agreement.

NASA Goddard Space Flight Center

Ken Segal
Code 543
8800 Greenbelt Rd.
Greenbelt, MD 20771
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Kenneth.N.Segal@NASA.gov

Lockheed Martin

Elizabeth Wampler
Contracts Negotiator, Commercial
Civil Space
Lockheed Martin Space
12257 S Wadsworth Blvd.
Littleton, CO 80125
Phone: (720) 563-5645
elizabeth.a.wampler@lmco.com


5. MODIFICATIONS

Any modification to this Responsibilities and Schedule document set forth herein after award shall be documented in writing, and signed by both GSFC and the Lockheed Martin. Modification of this Responsibilities and Schedule document does not modify the terms of the Space Act Agreement.

6. SIGNATORY AUTHORITY

The signatory to this Responsibilities and Schedule document represents and warrants that he/she has authority to commit GSFC to support Lockheed Martin if selected for award.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER

BY: **CHRISTYL
JOHNSON**  Digitally signed by CHRISTYL
JOHNSON
Date: 2022.11.15 15:33:55
-05'00'

Christyl Johnson
Deputy Director for Technology and
Research Investments
NASA Goddard Space Flight Center

THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS REQUIRED TO BE INCLUDED AS AN ATTACHMENT TO THE CENTER LETTER OF INTENT SUPPORTING THE PROPOSAL. SUBMISSION OF A CENTER LETTER OF INTENT AND RESPONSIBILITY AND SCHEDULE DOCUMENT IN A FINAL ACO PROPOSAL INDICATES PROPOSER'S ACCEPTANCE OF THE RESPONSIBILITIES AND SCHEDULE DOCUMENT PROPOSED BY THE CENTER IF SELECTED FOR AWARD. PURSUANT OF THE TEMPLATE SPACE ACT AGREEMENT, THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS INCORPORATED FULLY BY REFERENCE INTO THE SPACE ACT AGREEMENT AND THEREFORE WILL BE PUBLISHED WITH THE SPACE ACT AGREEMENT IN ACCORDANCE WITH ARTICLE 14 OF THE SPACE ACT AGREEMENT.

RESPONSIBILITIES AND SCHEDULE
DEVELOPED BY NASA LANGLEY RESEARCH CENTER
TO SUPPORT ACO 2022 PROPOSAL SUBMITTED BY
LOCKHEED MARTIN

1. RESPONSIBILITIES

A. **NASA Langley Research Center** will use reasonable efforts to:

WBS 1.0: Program Management

1. Attend monthly meetings with Lockheed Martin (LM), held via teleconference, to status progress and schedule.
2. Host an in-person meeting for project participants that chose to travel to Langley to view bonding trial demonstration in thermal vacuum chamber.
3. Coordinate personnel, resources, and laboratories to support this project.
4. Provide procurement and contracts support for activities related to Langley's scope of work on this project.
5. Plan on at least one representative traveling to an in-person team meeting during the period of performance (PoP). This could be the kickoff meeting hosted by LM in New Orleans, LA or another review.

WBS 1.1: In-Space Manufacturing (ISM) structural profile manufacturing process evaluation

1. Assist with performing a trade study of optimal ISM processes for producing relevant thermoplastic composite (TPC) material profiles in space.
2. Include in the trade study the following criteria (but not limited to): peak power during process operation, energy consumption per unit length (i.e. meters of extrusion, square meter of panel, etc.), relative size of equipment in cubic centimeters, relative mass of equipment in kilograms, and relative cost of equipment, and expected lifetime of equipment (i.e. in terms of total meters of material produced, square meters of panels produced, etc.).
3. Assist with making a final recommendation on ISM process and structural profile to make TPC materials for bonding trials.

WBS 1.2: Structural profile TPC material selection

1. Assist with performing a trade study of optimal TPC materials that can be produced by the recommended ISM process identified in WBS 1.1.
2. Include in the trade study the following criteria (but not limited to): density, tensile strength, ductility, Young's modulus, shear strength, coefficient of thermal expansion, susceptibility to degradation from radiation, weldability, and cost.
3. Assist with making a final recommendation on TPC and hybrid TPC-metallic materials for bonding trials.

WBS 1.5: Bonding trials on selected materials with Electron Beam Welding (EBW)

1. Expect to receive the TPC and metal materials in a configuration that is ready for EBW trials (minus cleaning) from LM by the task start date of ATP +10 months.
2. Perform EBW trials on the lap-shear joint configuration provided by LM.
3. Perform EBW trials on the butt joint configuration as either flat configuration and/or tube-node configurations depending on the machine capability.
4. Perform up to three iterations of EBW trials on TPC and hybrid TPC-metal panels using the EBW machine where flat panel sizes are approximately 8" x 24" and can be made shorter as needed. The number of test coupons corresponding to the number of bonded panels will be provided by LM.
5. Record pertinent process data such as peak power, peak voltage, peak current, total energy consumption, weld speed, vacuum level,

- environment temperature, etc.
6. Deliver at least eight EBW panels to the respective Proposed Partner Centers (PPCs) that are performing subsequent testing and evaluation on the coupons. Delivery required before end of task PoP.

WBS 1.7: Bonding trials in thermal vacuum chamber

1. Expect to receive the TPC and metal materials for this task from LM before the start date of ATP +17 months.
2. Configure the EBW machine to have a minimum vacuum level of 10^{-5} torr with a target vacuum level of 10^{-6} torr and configure the platen to create hot and cold conditions for a TPC and/or TPC-metal bond demonstration.
3. Perform the TPC and/or TPC-metal EBW trial on a lap-shear coupon at a minimum, but also attempt a truss joint configuration such as tube-node tensile coupon if time allows.
4. Record pertinent process data such as peak power, peak voltage, peak current, total energy consumption, weld speed, vacuum level, environment and panel temperatures, etc.
5. Deliver the bonded demonstration coupon(s) to LM as a showcase article for high maturity ISM processing. Delivery required before end of task period of performance.

WBS 1.8: Final Reporting

1. Assist with compiling a written report to include all joining data, testing data, material characterization data, and photographs.

B. Lockheed Martin will use reasonable efforts to:

WBS 1.0: Project Management

1. Hold monthly meetings, held via teleconference, to status progress and schedule.

WBS 1.5: Bonding trials on selected materials with EBW

1. Send the TPC and metal materials for EBW trials to Langley by the task start date of ATP +10 months.
2. Provide the lap-shear joint configuration to Langley.
3. Provide the butt joint configuration to Langley.
4. Provide Langley with the number of test coupons corresponding to the number of bonded panels.

WBS 1.7: Bonding trials in thermal vacuum chamber

1. LM will send the TPC and metal materials for this task to Langley before the start date of ATP +17 months.

2. SCHEDULE

The planned schedule for the activities with Lockheed Martin as defined in Paragraph 1. RESPONSIBILITIES are as follows:

WBS	Start Date	Completion Date
1.0	ATP	ATP +24 months
1.1	ATP	ATP +4 months
1.2	ATP +3 months	ATP +6 months
1.5	ATP +10 months	ATP +20 months
1.7	ATP +17 months	ATP +22 months
1.8	ATP +21 months	ATP +24 months

3. COST

Center Contribution (\$K)	Fiscal Year 1	Fiscal Year 2	Fiscal Year 3
Total Travel Dollars	3.600	0	0
Total Labor Dollars	30.206	55.523	17.239
Total Procurement Dollars	93.445	152.465	57.353
Sub Totals	127.250	207.988	74.593
Grand Total	409.831		

4. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Agreement.

NASA Langley Research Center

Andrew Bergan
Research Engineer
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Hampton, VA 23681
757.864.3744 (o)
andrew.c.bergan@nasa.gov

Lockheed Martin

Elizabeth Wampler
Contracts Negotiator
Commercial Civil Space
12257 S Wadsworth Blvd
Littleton, CO 80125
720.563.5645 (o)
elizabeth.a.wampler@lmco.com

5. MODIFICATIONS

Any modification to this Responsibilities and Schedule document set forth herein after award shall be documented in writing and signed by both the NASA Langley Research Center and Lockheed Martin. Modification of this Responsibilities and Schedule document does not modify the terms of the Space Act Agreement.

6. SIGNATORY AUTHORITY

The signatory to this Responsibilities and Schedule document represents and warrants that he/she has authority to commit NASA Langley Research Center to support Lockheed Martin if selected for award.

NASA AERONAUTICS AND SPACE ADMINISTRATION

NASA Langley Research Center

JEFFREY
BY: HERATH

Jeff Herath

Digitally signed by
JEFFREY HERATH
Date: 2022.11.07 12:14:24
-05'00'

Lockheed Martin
Letter of Intent for Support under ACO 2022 Award

Attachment 1 – ED01 (22-093)

THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS REQUIRED TO BE INCLUDED AS AN ATTACHMENT TO THE CENTER LETTER OF INTENT SUPPORTING THE PROPOSAL. SUBMISSION OF A CENTER LETTER OF INTENT AND RESPONSIBILITY AND SCHEDULE DOCUMENT IN A FINAL ACO PROPOSAL INDICATES PROPOSER'S ACCEPTANCE OF THE RESPONSIBILITIES AND SCHEDULE DOCUMENT PROPOSED BY THE CENTER IF SELECTED FOR AWARD. PURSUANT OF THE TEMPLATE SPACE ACT AGREEMENT, THE RESPONSIBILITIES AND SCHEDULE DOCUMENT IS INCORPORATED FULLY BY REFERENCE INTO THE SPACE ACT AGREEMENT AND THEREFORE WILL BE PUBLISHED WITH THE SPACE ACT AGREEMENT IN ACCORDANCE WITH ARTICLE 14 OF THE SPACE ACT AGREEMENT.

RESPONSIBILITIES AND SCHEDULE

DEVELOPED BY THE NASA MARSHALL SPACE FLIGHT CENTER

TO SUPPORT ACO 2022 PROPOSAL SUBMITTED BY

LOCKHEED MARTIN

1. RESPONSIBILITIES

A. MSFC will use reasonable efforts to:

1. Provide subject matter expertise in the areas of composites manufacturing, composite joints, and thermoplastic welding in support of the following:
 - a. Program Reviews
 - b. ISM Structural Profile Manufacturing Process Evaluation
 - c. ISM Structural Profile Material Selection
 - d. Final Report

B. Lockheed Martin will use reasonable efforts to:

1. Manage and direct the efforts to investigate manufacturing of thermoplastic composite (TPC) materials for in-space applications with an optimal combination of affordability, low energy production, high thermal stability, and high strength bonds, then demonstrate TPC metal bonding in a thermal vacuum chamber.
2. Provide relevant information for MSFC to support

- a. Program Reviews
- b. ISM Structural Profile Manufacturing Process Evaluation
- c. ISM Structural Profile Material Selection
- d. Final Report

2. SCHEDULE

The planned schedule for the activities with Lockheed Martin as defined in Paragraph 1. RESPONSIBILITIES are as follows:

<u>Milestones</u>	<u>Date</u>
Kickoff meeting	ATP + 1 month
ISM Structural Profile Manufacturing Process Evaluation	ATP + 3 months
ISM Structural Profile Material Selection	ATP + 6 months
Program Review 1 st Review	ATP + 12 months
Program Review 2 nd Review	ATP + 21 months
Final Program Review	ATP + 24 months
Prepare Final Report	ATP + 24 months

3. COST

Center Contribution	Fiscal Year 1	Fiscal Year 2	Fiscal Year 3
Sub Totals	\$115,369	\$135,801	
Grand Total	\$251,169		

4. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Agreement.

NASA MSFC

Allison Clark
allison.m.clark@nasa.gov
Will Guin
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Martin Rd SW,
Huntsville, AL 35808

Lockheed Martin

Elizabeth Wampler
Contracts Negotiator
Commercial Civil Space
12257 S Wadsworth Blvd
Littleton, CO 80125
720.563.5645 (o)
elizabeth.a.wampler@lmco.com

5. MODIFICATIONS

Any modification to this Responsibilities and Schedule document set forth herein after award shall be documented in writing, and signed by both The NASA Marshall Space Flight Center and Lockheed Martin. Modification of this Responsibilities and Schedule document does not modify the terms of the Space Act Agreement.

6. SIGNATORY AUTHORITY

The signatory to this Responsibilities and Schedule document represents and warrants that he/she has authority to commit The NATIONAL AERONAUTICS AND SPACE ADMINISTRATION/MARSHALL SPACE FLIGHT CENTER to support Lockheed Martin if selected for award.