

NONREIMBURSABLE MEMORANDUM OF AGREEMENT
BETWEEN
THE PENNSYLVANIA STATE UNIVERSITY
THE APPLIED RESEARCH LABORATORY AT THE PENNSYLVANIA STATE
UNIVERSITY
AND
NASA
FOR
COLLABORATION ON THE DEVELOPMENT AND IMPROVEMENT OF
REACTION CONTROL ENGINES

ARTICLE 1. AUTHORITY AND PARTIES

In accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113), this Agreement is entered into by the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, located at 2101 NASA Parkway, Houston, Texas 77058 (hereinafter referred to as "NASA JSC," "JSC," or "NASA") and The Pennsylvania State University, The Applied Research Laboratory located at P.O. Box 30, State College, PA 16804-0030 (hereinafter referred to as "Partner" or "Penn State"). NASA and Penn State may be individually referred to as a "Party" and collectively referred to as the "Parties."

ARTICLE 2. PURPOSE

NASA JSC and Penn State wish to collaborate on the further development of a JSC in-house designed liquid oxygen (LO₂)/liquid methane (LCH₄) reaction control engine (RCE) to characterize its performance over an expanded range of operating conditions. The engine was originally developed under the NASA Propulsion Component Advanced Development (PCAD) project and is being further developed by the JSC Propulsion Systems Branch under the AES Morpheus project. Penn State is seeking an RCE for their Lunar Lion vehicle as part of its participation in the Google Lunar X-Prize.

NASA JSC will loan up to five LO₂/CH₄ RCE and supporting hardware to Penn State. NASA JSC will also provide input into Penn State's test plans and test constraints. The test constraints will emphasize limiting potential damage to the loaned hardware. Penn State will test the engine in accordance with the agreed to test plans. As the Penn State test program provides periodic engine performance data to NASA JSC, NASA JSC may modify the engine's design. Modified versions of the engine may then later be provided on loan to Penn State for testing. Penn State will perform the engine testing at its facilities at no cost to JSC and share the resulting data and analysis.

The testing will benefit Penn State in assessing vehicle control characteristics for their Lunar Lion vehicle and provide an opportunity to engage its students in hands-on engine testing. JSC will benefit by receiving additional test data on the engine over an expanded range of operating conditions and will provide an opportunity to investigate performance

improvements from design changes that may result from JSC and/or Penn State's analysis of the test data. The JSC Propulsion Systems Branch and the Penn State Applied Research Lab will both benefit through enhanced interaction and collaboration on LO2/CH4 engine technology.

ARTICLE 3. RESPONSIBILITIES

NASA will use reasonable efforts to:

- 1) Loan to Penn State for testing up to five (5) RCEs and supporting hardware.
- 2) Provide to Penn State supporting test and design data for each loaned engine.
- 3) Collaborate with Penn State on the development of test plans and test matrices, including definition of test constraints to limit potential damage to the hardware.

Penn State will use reasonable efforts to:

- 1) Collaborate with NASA on the development of test plans and test matrices, including definition of test constraints to limit potential damage to the hardware.
- 2) Perform testing on the JSC provided engines.
- 3) Provide resulting test data, data analysis, and any written test reports to NASA JSC.
- 4) At the end of this agreement, return all loaned hardware to NASA .

ARTICLE 4. SCHEDULE AND MILESTONES

The planned major milestones for the activities defined in the "Responsibilities" clause are as follows:

NASA to provide one engine assembly and supporting test/design data to Penn State.	On or about 2 weeks after the Effective Date of this Agreement.
Penn State to perform initial LO2/LCH4 reaction control engine hot fire testing.	On or about August 2013
Penn State to perform Variable Throttle Testing on initial engine.	On or about December 2013
Penn State to perform Variable Oxidizer-to-Fuel Ratio Testing on initial engine.	On or about January 2014
Penn State to perform Turbo-pump Pressurization Operational Testing on initial engine.	On or about April 2014

Penn State to perform Closed-loop Throttle Control Testing on initial engine.	On or about June 2014
Penn State to perform Enhanced Thermal Design Testing on initial engine.	On or about July 2014
Penn State to perform Autonomous Vehicle Integration Testing utilizing the initial engine.	On or about November 2014
Penn State to perform Autonomous Vehicle Free Flight Testing utilizing at least one loaned engine.	On or about February 2015
NASA to loan up to four additional reaction control engine assemblies to Penn State.	As agreed to between partners.
Penn State to perform additional testing on loaned engine assemblies.	As agreed to between partners
Penn State to provide test data to NASA.	Within 14 days of completion of each particular test.
Penn State to provide all test reports to NASA, if any are created.	Within 30 days of their completion or no later than November 01, 2016, whichever comes first.
Penn State to return all loaned hardware back to NASA	No later than at the termination of this agreement.

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 AND RISK OF LOSS

1. Each Party hereby waives any claim against the other Party, employees of the other Party, the other Party's Related Entities (including but not limited to contractors and subcontractors at any tier, grantees, investigators, customers, users, and their contractors or subcontractor at any tier), or employees of the other Party's Related Entities for any injury to, or death of, the waiving Party's employees or the employees of its Related Entities, or for damage to, or loss of, the waiving Party'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.

2. Except in circumstances where Penn State is subject to its state's Workers' Compensation Act prohibiting such a waiver arising from a workers' compensation claim and such subsection is not in conflict with any applicable United States Federal law or regulation, each Party further agrees to extend this cross-waiver to its Related Entities by requiring them, by contract or otherwise, to waive all claims against the other Party, Related Entities of the other Party, and employees of the other Party or of its Related Entities for injury, death, damage, or loss arising from or related to activities conducted under this Agreement. Additionally, each Party shall require that their Related Entities extend this cross-waiver to their Related Entities by requiring them, by contract or otherwise, to waive all claims against the other Party, Related Entities of the other Party, and employees of the other Party or of its Related Entities for injury, death, damage, or loss arising from or related to activities conducted under this Agreement. Nothing in this Article shall be interpreted to imply or obligate NASA to any state court's jurisdiction.

ARTICLE 9. LIABILITY AND RISK OF LOSS - PRODUCT LIABILITY

With respect to products or processes resulting from a Party's participation in a 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 AND RISK OF LOSS - 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

1. General

(a) "Related Entity" as used in this Data Rights clause 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.

(b) "Data" means recorded information, regardless of form, the media on which it is recorded, or the method of recording.

(c) "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:

(i) known or available from other sources without restriction;

(ii) known, possessed, or developed independently, and without reference to the Proprietary Data;

(iii) made available by the owners to others without restriction; or

(iv) required by law or court order to be disclosed.

(d) Data exchanged under this Agreement is exchanged without restriction except as otherwise provided herein.

(e) Notwithstanding any restrictions provided in this clause, the Parties are not restricted in the use, disclosure, or reproduction of Data provided under this Agreement that meets one of the exceptions in (c) 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.

(f) The Parties will not exchange preexisting Proprietary Data under this Agreement unless authorized herein or in writing by the owner.

(g) 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 clause unless otherwise directed in writing by the Providing Party.

(h) 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 clause.

(i) Disclaimer of Liability: NASA is not restricted in, or liable for, the use, disclosure, or reproduction of Data without a restrictive notice under paragraphs 1 (c), 2 or 8 of this clause or for Data Partner gives, or is required to give, the U.S. Government without restriction.

(j) Partner may use the following or a similar restrictive notice under paragraphs 1(c), 2 and 8 of this clause. 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 title or cover page."

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].

2. 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.

3. Data First Produced by NASA Under this Agreement

If Partner requests that Data first produced by NASA or its Related Entities 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 1 Year 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.

4. 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.

5. 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).

6. Copyright

Data exchanged with a copyright notice and no indication of restriction under paragraphs 1(c), 2, 3, or 8 of this clause (i.e., Data has no restrictive notice) is presumed to be published. The following royalty-free licenses apply.

(a) 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.

(b) Data without the indication of (a) is presumed to be first produced under this Agreement. Except as otherwise provided in paragraph 5 of this clause, and in the Inventions and Patent Rights clause of this Agreement for protection of reported inventions, the Data may be reproduced, distributed, and used to prepare derivative works for any purpose.

7. 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.

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

(a) NASA or Partner (as Disclosing Party) may provide the other Party or its Related Entities (as Receiving Party):

(i) Proprietary Data developed at Disclosing Party's expense outside of this Agreement (referred to as Background Data);

(ii) 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

(iii) U.S. Government Data, including software and related Data, Disclosing Party intends to control (referred to as Controlled Government Data).

(b) 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 clause.

(c) 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.

(i) Background Data:

None

(ii) Third Party Proprietary Data:

None

(iii) Controlled Government Data:

Design data for each loaned reaction control engine, including valves and igniters along with any associated support hardware and/or equipment design data.

(iv) 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 clause. 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:
None

(d) For Data with a restrictive notice and Data identified in this Agreement, Receiving Party shall:

- (i) Use, disclose, or reproduce the Data only as necessary under this Agreement;
- (ii) Safeguard the Data from unauthorized use and disclosure;
- (iii) Allow access to the Data only to its employees and any Related Entity requiring access under this Agreement;
- (iv) Except as otherwise indicated in (d)(iii), preclude disclosure outside Receiving Party's organization;
- (v) Notify its employees with access about their obligations under this clause and ensure their compliance, and notify any Related Entity with access about their obligations under this clause; and
- (vi) Dispose of the Data as Disclosing Party directs.

9. 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:

- (a) Orally informs NASA before initial disclosure that the Data is Proprietary Data, and
- (b) Reduces the Data to tangible form with a restrictive notice as required by paragraphs 1(c), 2 and 8 of this clause, and gives it to NASA within ten (10) calendar days after disclosure.

ARTICLE 12. INTELLECTUAL PROPERTY RIGHTS - INVENTION AND PATENT RIGHTS

1. General

(a) 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.

(b) "Related Entity" as used in this Invention and Patent Rights clause 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.

(c) 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 clause.

2. 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 5(a) of this clause.

3. 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 5(b) of this clause.

4. 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 5 of this clause:

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

5. Rights to be Reserved in Partner's License

Any license granted Partner under paragraphs 2, 3, or 4 of this clause is subject to the following:

(a) 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.

(b) For inventions made solely or jointly by employees of a NASA Related Entity, NASA reserves the rights in (a) 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).

6. Protection of Reported Inventions

For inventions reported under this clause, 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.

7. Patent Filing Responsibilities and Costs

(a) 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.

(b) 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 therefor.

ARTICLE 13. USE OF NASA NAME AND EMBLEMS

1. 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" clause, 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 Communication or designee ("NASA Communications") for review and approval. Approval by NASA Communications shall be based on applicable law and policy governing the use of the NASA name and initials.

2. 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

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

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 Partner 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.

(b) With respect to any export control requirements:

(i) 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.

(ii) 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.

(iii) The Partner will be responsible for all regulatory record-keeping requirements associated with the use of licenses and license exemptions or exceptions.

(iv) 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:

(i) 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.

(ii) The Partner shall include language and requirements equivalent to those set forth in subparagraph (c)(i), above, in any lower-tier covered transaction entered into under this Agreement.

ARTICLE 18. TERM OF AGREEMENT

This Agreement becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect for 3 Year(s) and 6 Month(s) from the Effective Date.

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 Risk of Loss," "Intellectual Property Rights," and 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.

Management Points of Contact

NASA Lyndon B. Johnson Space Center

John Applewhite
Morpheus RCE Lead
Mail Stop: EP4
2101 NASA Parkway
Houston, Texas 77058
Phone: 281-483-0446
john.applewhite-1@nasa.gov

The Pennsylvania State University

The Applied Research Laboratory at the
Pennsylvania State University
Michael Paul
Director of Space Systems Initiatives, The
Applied Research Lab at Penn State
Mail Suite: 2000A
Applied Research Laboratory
P.O. Box 30
State College, PA 16804-0030
Phone: (814) 865 9823
Michael.V.Paul@psu.edu

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. MODIFICATIONS

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

ARTICLE 24. ASSIGNMENT

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

ARTICLE 25. 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 26. 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 27. LOAN OF GOVERNMENT PROPERTY

1. In order to further activities set forth in this Agreement, the Parties acknowledge that NASA shall lend the following Government property to Partner:

Up to five (5) LO2/LCH4 RCEs including associated valves and igniters. See Attachment A for a detailed list of loaned property.

2. The property listed above (hereinafter referred to as the "Property") is not being provided to Partner as a substitute for the purchasing of the same type of property by Partner under any contract or grant that Partner has, or may have, with a third party. Furthermore, such Property is not excess to NASA's requirements and its use is anticipated upon its return to NASA.

3. In support of this loan the Partner shall:

- (a) Install, operate, and maintain the Property at Partner's expense;
- (b) Furnish all utilities (e.g., water, electricity) and operating materials required for the operation of the Property;
- (c) Bear all costs associated with the use and enjoyment of the Property under the terms of this Agreement, including but not limited to such costs as packing, crating, shipping, installing, maintaining, licensing, and operating the Property;
- (d) Transport the Property in accordance with good commercial practice;
- (e) Acknowledge that the privilege of using and enjoying the said Property exists solely by virtue of this Agreement with NASA, the owner of said Property, and not as of right;
- (f) Identify, mark, and record all of the Property promptly upon receipt, and maintain such identity so long as it remains in the custody, possession, or control of Partner.

(g) Maintain suitable records for each item of Property. At a minimum, such records shall include a description, identification number, unit cost, quantity, dates of receipt, condition upon receipt, and location. Partner shall perform an inventory of the Property one (1) year from the effective date of this Agreement, and every year thereafter, if the Agreement is still in effect, and send such inventory report to NASA. The report shall include a statement validating any requirement to continue the loan. Further, Partner shall provide to NASA upon reasonable request, records sufficient to disclose the date of inspections, the deficiencies discovered as a result of inspections, and any maintenance actions performed. This annual report shall be submitted to the following NASA point of contact (POC):

NASA Property Point of Contact:

Name: Patrick Mcmanamen

Title: Morpheus RCE lead

Email: j.patrick.mcmanamen@nasa.gov

Telephone: 281-483-4548

Address:

MS: EP4

2101 NASA Parkway

Houston, TX 77058

(h) Report any loss, damage, or destruction of Property to the NASA POC identified above within ten (10) calendar days from the date of the discovery thereof.

Inherently, engine testing of the type to be performed under this agreement may result in damage to an engine or related equipment. This type of damage is normal whether NASA tests the engines or any other third party tests the engines. For that reason, NASA is providing Penn State with the definition of test constraints to limit potential damage to the hardware in performance of this agreement. NASA will consider such potential damage to be reasonable wear and tear.

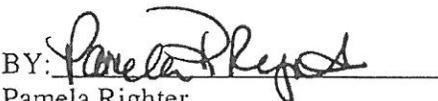
ARTICLE 28. SIGNATORY AUTHORITY

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
LYNDON B. JOHNSON SPACE
CENTER

THE PENNSYLVANIA STATE
UNIVERSITY
THE APPLIED RESEARCH
LABORATORY AT THE
PENNSYLVANIA STATE
UNIVERSITY

BY: 
LAURI N. HANSEN
Director, Engineering

BY: 
Pamela Righter
ARL Associate Director for Business
Operations

DATE: 8/6/13

DATE: 8/1/13

Attachment A to the Nonreimbursable Memorandum of Agreement between Pennsylvania State University and NASA

Component	Supplied	Description	Manufacturer	Part Number	Serial Number	Materials	Design Temp.	Design MAWP	Service Fluid	Service Temp.	Service MOP
Orifice	1	Z-63-1/4/20-6-BR, 1/4"-20 Thread, 0.040" ID	O'Keefe Controls	McMaster - 2943T887	N/A	Brass	35°F to 200°F	2000 psig	LOX, LNG	-300°F to Amb	400 psig
Solenoid Valve	2	1/4" F. NPT, 12 VDC, 15 W, 3/32" Orifice	Gem Sensors	D2063-LN2-C203	N/A	430F SS, PTFE, 316 SS	-320°F to Amb.	640 psig	LOX, LNG	-300°F to Amb	400 psig
Thermocouple	6	Type K TC wire welded to engine nozzle	Omega	5SR TC-TT-K-20-36	N/A	Chromel, Alumel, PFA coating	-328°F to 2282°F	Amb.	Air	-300°F to 1500°F	Amb.
Thruster	1	JSC Designed Pencil Thruster	N/A	N/A	PT-05	SS, Hayne's 230	-300°F to 1500°F	1000 psig	LOX, LNG, GHE, PLUME	-300°F to 1500°F (hi via redline)	300 psig (via redline)
Ignition Coil	1	Performance, LS series equivalent ignition coil	WeaponX	ICK8201	N/A	Plastic, SS, Epoxy	?	Amb.	Air	Amb.	Amb.
Spark Plug	1	Modified spark plug, M14 x 1.25 Spark plug thread, sized for .025" spark gap	AutoLite	258	N/A	SS, Alumina, Hayne's 230	?	?	LOX, LNG, GHE, PLUME	-300°F to 1500°F (hi via redline)	300 psig (via redline)