

IMPLEMENTING ARRANGEMENT
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
OF THE UNITED STATES OF AMERICA
AND
THE SWEDISH NATIONAL SPACE BOARD
OF THE KINGDOM OF SWEDEN
FOR
COOPERATION IN THE TESTING AND ANALYSIS OF
GREEN PROPULSION TECHNOLOGIES

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PREAMBLE

The National Aeronautics and Space Administration of the United States of America (hereinafter referred to as "NASA"), and the Swedish National Space Board of the Kingdom of Sweden (hereinafter referred to as "SNSB") (hereinafter referred to as the "Implementing Agencies");

Recognizing a mutual interest in the exploration and use of outer space for peaceful purposes and the over three decades of successful space cooperation between the Implementing Agencies; and

Recalling the terms of the Framework Agreement between the Government of the United States of America and the Government of the Kingdom of Sweden for Cooperative Activities in the Exploration and Use of Outer Space for Peaceful Purposes, signed at Stockholm October 14, 2005 (hereinafter referred to as the "Framework Agreement");

Have agreed as follows:

ARTICLE 1 PURPOSE OF COOPERATION

The purpose of this Implementing Arrangement is to set forth the respective responsibilities of the Implementing Agencies and the terms and conditions under which they will cooperate on spacecraft applications of High Performance Green Propulsion (HPGP) technologies.

SNSB, in collaboration with ECological Advanced Propulsion Systems (ECAPS AB) of Sweden, funded the development of HPGP technologies including Ammonium DiNitrimide (ADN)-based liquid monopropellant blends and associated catalytic ignition thrusters for which ECAPS AB holds numerous international patents. The ECAPS AB ADN-based monopropellants provide significantly reduced toxicity as compared to hydrazine, therefore eliminating the need for hazardous procedures during ground handling, transportation and spacecraft fueling operations. The ECAPS AB monopropellant and compatible HPGP thrusters have been flight-proven on the SNSB-funded Prototype Research Instruments and Space Mission technology Advancement (PRISMA) mission to provide a higher specific impulse over monopropellant hydrazine. Combined with the higher densities provided by HPGP monopropellant blends, ECAPS AB has demonstrated an overall (density impulse) performance increase of the ADN-based monopropellant LMP-103S of approximately 32% over monopropellant hydrazine.

Separately, NASA is seeking green propulsion alternatives to hydrazine to decrease environmental hazards and pollutants, to reduce operational hazards, to shorten spacecraft processing times and to increase propellant performance. NASA is interested in

conducting initial testing of the ECAPS AB HPGP technologies with a particular emphasis on thruster performance comparisons between LMP-103S and monopropellant hydrazine; life cycle cost assessments, as well as compliance of LMP-103S with range safety and transportation requirements in the United States.

Cooperation under this Implementing Arrangement will involve the exchange of information necessary to implement HPGP technologies in NASA spacecraft programs. Testing and evaluation will be conducted by NASA. The testing of the ECAPS AB monopropellant performed under this Implementing Arrangement will be for ECAPS catalyst technology only unless otherwise agreed.

Cooperation under this Implementing Arrangement is separate from any awards made by NASA through a competitive solicitation under the Technology Demonstration Program or any other NASA competitive solicitation. The initial testing and evaluation may be followed by a proposal for implementation of the HPGP technology on a NASA mission, which would require a separate agreement.

ARTICLE 2 RESPONSIBILITIES

1. NASA will use reasonable efforts to carry out the following responsibilities:
 - a) Develop jointly with SNSB a mutually agreed-to Test Plan that sets forth NASA's desired test conditions and firing sequences for each planned test campaign to be conducted under this Implementing Arrangement;
 - b) Receive from SNSB, through ECAPS AB, ADN-based monopropellant LMP-103S in an amount to be mutually agreed between a range of 100kg minimum and not to exceed 500kg (hereinafter referred to as "HPGP propellants");
 - c) Obtain any approvals necessary to allow HPGP propellants to be handled within the United States;
 - d) Receive from SNSB, through ECAPS AB, a minimum of one [REDACTED] 5 Newton (5N) HPGP thruster and one [REDACTED] 22 Newton (22N) HPGP thruster, with the potential of testing additional thrusters as mutually agreed (hereinafter referred to as "HPGP thrusters");
 - e) With the assistance of ECAPS AB, and consistent with the Test Plan, conduct testing and evaluation of the HPGP propellants and thrusters at NASA or NASA contractor facilities;
 - f) Provide SNSB and ECAPS AB personnel access to NASA facilities, as agreed in Article 7, appropriate during NASA testing of HPGP propellants and thrusters in the United States;

- g) Provide SNSB with all test results, including engineering data and analysis resulting from the testing of HPGP propellants and thrusters; and
 - h) Coordinate with SNSB on the preparation of a report on the testing, and evaluation of HPGP propellants and thrusters under this Implementing Arrangement.
2. SNSB will, through ECAPS AB (its related entity, as this term is described in Article 6 of the Framework Agreement), use reasonable efforts to carry out the following responsibilities:
- a) Develop jointly with NASA a mutually agreed-to Test Plan that sets forth NASA's desired test conditions and firing sequences for each planned test campaign to be conducted under this Implementing Arrangement;
 - b) Provide to NASA the HPGP propellants;
 - c) Provide to NASA the HPGP thrusters;
 - d) Fully assist NASA in understanding the basic design of the thrusters as necessary to develop an effective and safe test campaign;
 - e) Provide assistance to NASA with the conduct of testing and evaluation at NASA or NASA contractor facilities of the HPGP propellants and thrusters; and
 - f) Coordinate with NASA on the preparation of a report on the testing, and evaluation of HPGP propellants and thrusters under this Implementing Arrangement.

ARTICLE 3 POINTS OF CONTACT

The NASA designated point of contact is:

Caitlin Bacha
Associate Head, GSFC Propulsion Branch
NASA Goddard Space Flight Center
8800 Greenbelt Road
Greenbelt, MD 20771
Telephone: +301 286 6217
E-Mail: Caitlin.Bacha@nasa.gov

The SNSB designated point of contact is:

Christer Nilsson
P.O. Box 4006
SE-171 04 Solna
Sweden
Telephone: +46 8 627 6496
E-Mail: Christer.Nilsson@snsb.se

Any change in an Implementing Agency's points of contact, or in the corresponding details, will be communicated in writing by the Implementing Agency making such a change to the other Implementing Agency.

ARTICLE 4 DATA POLICY

The Implementing Agencies will have access to and use of all data generated under this Implementing Arrangement at the time the data is generated. The scientific data generated under this Implementing Arrangement will be made available for public access as soon as practicable.

ARTICLE 5 INTELLECTUAL PROPERTY RIGHTS

1. Nothing in this Implementing Arrangement will be construed as granting either expressly or by implication to the other Implementing Agency any rights to, or interest in, any inventions or works of an Implementing Agency or its related entities made prior to the entry into force of, or outside the scope of, this Implementing Arrangement, including any patents (or similar forms of protection in any country) corresponding to such inventions or any copyrights corresponding to such works.
2. Any rights to, or interest in, any invention or work made in the performance of this Implementing Arrangement solely by one Implementing Agency or any of its related entities, including any patents (or similar forms of protection in any country) corresponding to such invention or any copyright corresponding to such work, will be owned by such Implementing Agency or related entity. Allocation of rights to, or interest in, such invention or work between such Implementing Agency and its related entities will be determined by applicable laws, rules, regulations, and contractual obligations.
3. It is not anticipated that there will be any joint inventions made in the performance of this Implementing Arrangement. Nevertheless, in the event that an invention is jointly made by the Implementing Agencies in the performance of this Implementing

Arrangement, the Implementing Agencies will in good faith consult and agree within 30 calendar days as to:

- a) The allocation of rights to, or interest in, such joint invention, including any patents (or similar forms of protection in any country) corresponding to such joint invention;
 - b) The responsibilities, costs, and actions to be taken to establish and maintain patents (or similar forms of protection in any country) for each such joint invention; and
 - c) The terms and conditions of any license or other rights to be exchanged between the Implementing Agencies or granted by one Implementing Agency to the other Implementing Agency.
4. For any jointly authored work by the Implementing Agencies, should the Implementing Agencies decide to register the copyright in such work, they will, in good faith, consult and agree as to the responsibilities, costs, and actions to be taken to register copyrights and maintain copyright protection (in any country).
 5. Subject to the provisions of Article 6 (Exchange of Technical Data and Goods) of the Framework Agreement and Article 6 (Release of Results and Public Information) of this Implementing Arrangement, each Implementing Agency will have an irrevocable royalty-free right to reproduce, prepare derivative works, distribute, and present publicly, and authorize others to do so on its behalf, any copyrighted work resulting from activities undertaken in the performance of this Implementing Arrangement for its own purposes, regardless of whether the work was created solely by, or on behalf of, the other Implementing Agency or jointly with the other Implementing Agency.

ARTICLE 6 RELEASE OF RESULTS AND PUBLIC INFORMATION

1. The Implementing Agencies retain the right to release public information regarding their own activities under this Implementing Arrangement. The Implementing Agencies will coordinate with each other in advance concerning releasing to the public information that relates to the other Implementing Agency's responsibilities or performance under this Implementing Arrangement.
2. The Implementing Agencies will make the results available to the general scientific community, as appropriate and agreed between the Implementing Agencies, in a timely manner.
3. The Implementing Agencies acknowledge that the following data or information does not constitute public information and that such data or information will not be included in any publication or presentation by an Implementing Agency under this Article without the other Implementing Agency's prior written permission:

- a) Data furnished by the other Implementing Agency in accordance with Article 6 (Exchange of Technical Data and Goods) of the Framework Agreement which is identified as export-controlled or proprietary; or
- b) Information about an invention of the other Implementing Agency before an application for a patent (or similar form of protection in any country) corresponding to such invention has been filed covering the same, or a decision not to file has been made.

ARTICLE 7
EXCHANGE OF PERSONNEL AND ACCESS TO FACILITIES

1. To facilitate implementation of the activities conducted under this Implementing Arrangement, the Implementing Agencies may support the exchange of a limited number of personnel, including contractors and subcontractors from each Implementing Agency, at an appropriate time and under conditions mutually agreed between the Implementing Agencies.
2. Access by the Implementing Agencies to each other's facilities or property, or to each other's Information Technology (IT) systems or applications, is contingent upon compliance with each other's respective security and safety policies and guidelines including, but not limited to: standards on badging, credentials, and facility and IT system application/access.

ARTICLE 8
OWNERSHIP OF EQUIPMENT

1. Unless otherwise agreed in writing, each Implementing Agency will retain ownership of all equipment, including the goods, hardware, software, and associated technical data, it provides to the other Implementing Agency under the terms of this Implementing Arrangement, without prejudice to any individual rights of ownership of the Implementing Agencies' respective related entities. To the extent feasible and recognizing that equipment integrated into the other Implementing Agency's equipment cannot be returned, each Implementing Agency agrees to return the other Implementing Agency's equipment in its possession at the conclusion of activities under this Implementing Arrangement.

ARTICLE 9
INVESTIGATIONS OF MISHAPS AND CLOSE CALLS

In the case of a close call, mishap or mission failure, the Implementing Agencies agree to provide assistance to each other in the conduct of any investigation, bearing in mind, in particular, the provisions of the Exchange of Technical Data and Goods Article of the Framework Agreement. In the case of activities which might result in the death of or serious injury to persons, or substantial loss of or damage to property as a result of activities under this Implementing Arrangement, the Implementing Agencies agree to establish a process for investigating each such mishap.

ARTICLE 10
RELATIONSHIP TO THE FRAMEWORK AGREEMENT

This Implementing Arrangement incorporates by reference and is subject to the Framework Agreement. In the event of a conflict between the provisions of this Implementing Arrangement and the Framework Agreement, the terms of the Framework Agreement will prevail.

ARTICLE 11
AMENDMENTS

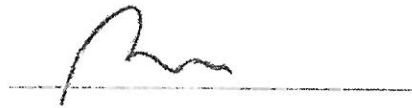
This Implementing Arrangement may be amended at any time by written agreement.

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**ARTICLE 12
ENTRY INTO FORCE AND DURATION**

This Implementing Arrangement will enter into force upon signature. The Implementing Arrangement will remain in force for three (3) years. The Implementing Arrangement may be terminated by either Implementing Agency by notifying the other Implementing Agency in writing three (3) months in advance.

FOR THE NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION



Place: Washington, DC

Date: 13 September 2013

FOR THE SWEDISH NATIONAL
SPACE BOARD



Place: Stockholm

Date: 16 September 2013