

**SPACE COOPERATION**

**ExoMars Mission**

**Memorandum of Understanding  
Between the UNITED STATES OF  
AMERICA and the EUROPEAN SPACE AGENCY**

Signed at Paris and Washington  
April 14 and 29, 2014



NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 89—497, approved July 8, 1966  
(80 Stat. 271; 1 U.S.C. 113)—

“. . .the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence . . . of the treaties, international agreements other than treaties, and proclamations by the President of such treaties and international agreements other than treaties, as the case may be, therein contained, in all the courts of law and equity and of maritime jurisdiction, and in all the tribunals and public offices of the United States, and of the several States, without any further proof or authentication thereof.”

**EUROPEAN SPACE AGENCY**

**Space Cooperation: ExoMars Mission**

*Memorandum of understanding signed at  
Paris and Washington April 14 and 29, 2014;  
Entered into force April 29, 2014.*

**MEMORANDUM OF UNDERSTANDING**

**BETWEEN**

**THE EUROPEAN SPACE AGENCY**

**AND**

**THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
OF THE UNITED STATES OF AMERICA**

**CONCERNING**

**THE 2016 EXOMARS MISSION**

## PREAMBLE

The European Space Agency, an international intergovernmental organisation established by the Convention, which was opened for signature in Paris, France, on 30 May 1975 and entered into force on 30 October 1980 (hereinafter referred to as "ESA"),

and

The National Aeronautics and Space Administration of the United States of America (hereinafter referred to as "NASA"),

hereinafter individually referred to as a "Party" and jointly referred to as the "Parties,"

RECALLING the longstanding cooperation between NASA and ESA in the conduct of space programs;

RECALLING that the 2016 and 2018 ExoMars missions form part of ESA's Robotic Exploration Programme – Aurora; and

CONSIDERING that cooperation on the 2016 ExoMars mission between the Parties would enhance the value of the mission and provide mutual benefits;

HAVE AGREED as follows:

### ARTICLE 1 - PURPOSE AND OBJECTIVES

- 1.1 The purpose of this Memorandum of Understanding (hereinafter referred to as the "MOU") is to define the terms and conditions under which the cooperation between the Parties will be conducted within the framework of the 2016 ExoMars mission.
- 1.2 This MOU sets forth the managerial, technical, and operational interfaces between the Parties that are necessary to ensure continuation of, and compatibility between, their respective activities; defines the roles and responsibilities of the Parties; and identifies the other commitments of the Parties with respect to the 2016 ExoMars mission.

### ARTICLE 2 - RELATED ENTITIES

- 2.1 For the purpose of this MOU, the term "Related Entity" means:
  - a. a contractor or subcontractor of a Party at any tier;
  - b. a grantee or any other sponsored entity, or investigator of a Party at any tier; or
  - c. a contractor or subcontractor of a grantee or any other sponsored entity, or investigator of a Party at any tier.
- 2.2 For the purpose of Article 15 (Liability and Risk of Loss), the term "Related Entity" also means:
  - a. a user or customer of a Party at any tier; or
  - b. a contractor or subcontractor of a user or customer of a Party at any tier.
  - c. It may also include another State or an agency or institution of another State, where such State, agency, or institution is an entity described above or is otherwise involved in the activities undertaken pursuant to this MOU.
  - d. The terms "contractor" and "subcontractor" include suppliers of any kind.

- 2.3 Without prejudice to the detailed provisions contained in this MOU, each Party will, by contract or otherwise, extend the obligations intended for its Related Entities, as set forth in this MOU, to the said Related Entities.

### **ARTICLE 3 - MISSION DESCRIPTION**

- 3.1 The 2016 ExoMars mission is an ESA-led mission with a launch expected in January 2016 on a Proton launch vehicle provided by the Russian Federal Space Agency (Roscosmos). It includes a Trace Gas Orbiter (TGO) and an Entry, Descent, and Landing (EDL) Demonstrator Module (EDM). The EDM will demonstrate key EDL technologies for hyperbolic entry, descent, and semi-soft landing, with limited surface lifetime to ensure EDL data return and a short science mission for surface science measurements.

The key science objectives for the ExoMars TGO payload are to pursue the analysis of atmospheric trace gases and examine water ice distribution in Martian soil. In addition, the ExoMars TGO is expected to be able to provide data relay and EDL telemetry services for future ESA, NASA, or other Mars missions, including but not limited to the 2016 and 2018 ESA ExoMars landed missions and NASA InSight lander and 2020 rover missions. The ExoMars TGO nominal science operations will be performed for one Martian year in the final Mars orbit, with relay functions based on the design lifetime of a six-year period starting from insertion into Mars orbit.

NASA will provide the Electra UHF proximity link transceivers and related engineering support. ESA will conduct the operation of the spacecraft during all phases of the mission.

- 3.2 ESA is also cooperating with Roscosmos on the 2018 ExoMars mission, currently planned for launch in May 2018, also on a Proton launch vehicle. The 2018 mission includes a Carrier Module, a Descent Module with a Surface Platform, and a Mars Rover.

### **ARTICLE 4 - ESA PROGRAMMATIC RESPONSIBILITIES**

To implement this cooperation, ESA will use all reasonable efforts to:

- 4.1 design and implement the overall 2016 ExoMars mission;
- 4.2 define the overall technical, managerial, and interface requirements for the 2016 ExoMars mission;
- 4.3 build, integrate, verify, and operate the 2016 ExoMars mission;
- 4.4 integrate and test, with support from the Jet Propulsion Laboratory, the NASA-provided Electra UHF proximity link transceivers on the ExoMars TGO;
- 4.5 define and lead end-to-end testing of the UHF radio link between Electra and the EDM UHF transceivers, as well as the overall system end-to-end testing;
- 4.6 provide the ExoMars TGO for use as proximity communications and telemetry support for NASA-landed missions, including in support of critical events such as EDL, within the overall technical and programmatic constraints, subject to specific arrangements to be established in due time by the Parties, through the international Mars relay coordination working group referred to under Articles 4.7 and 5.6;
- 4.7 participate in the international Mars relay coordination working group with NASA and Roscosmos (and others as may be appropriate) for coordination among all the orbiting and landed Mars missions in 2016 and beyond;
- 4.8 manage the ExoMars TGO science operations and data archive; and
- 4.9 support interactions between European and NASA-supported co-investigators as needed.

## **ARTICLE 5 - NASA PROGRAMMATIC RESPONSIBILITIES**

To implement this cooperation, NASA will use all reasonable efforts to:

- 5.1 build, test, verify, and deliver a prototype model and two flight models of the Electra UHF proximity link transceivers, one primary and one redundant, for the ExoMars TGO;
- 5.2 provide technical support for analytical and physical integration, system level ground testing, in-flight commissioning, and operations support of Electra with the ExoMars TGO;
- 5.3 provide technical support for end-to-end testing of the UHF radio link between Electra and the EDM UHF transceivers, as well as the overall system end-to-end testing;
- 5.4 provide, pending a review of any required orbital resynchronization efforts, if technically and programmatically feasible, communications support from (a) NASA Mars orbiter(s) during the EDL phase of the 2016 EDM;
- 5.5 provide proximity communications support, within overall technical and programmatic constraints, using (a) NASA Mars orbiter(s) for the 2016 EDM surface platform during a two-week period after landing;
- 5.6 participate in the international Mars relay coordination working group with ESA and Roscosmos (and others as may be appropriate), referred to under Article 4, for coordination between all the orbiting and landed Mars missions in 2016 and beyond;
- 5.7 provide support during engineering System Reviews of the 2016 EDM focused on the EDL mission timeline as well as selected EDL system functions as requested by ESA, while bearing in mind the provisions of Article 8 (Transfer of Goods and Technical Data);
- 5.8 provide DSN 70 meter or equivalent tracking support for the 2016 ExoMars mission, limited to specific critical activities (EDM release, Mars Orbit Insertion) and in case of emergencies;
- 5.9 provide Navigation and Ancillary Information Facility (NAIF) Spacecraft Planet Instrument C-matrix Events (SPICE) operational support to the ExoMars TGO science ground segment;
- 5.10 provide standard remote sensing data products to support ESA analyses for EDM landing site selection/certification and atmospheric modeling/monitoring; and
- 5.11 support, as appropriate, NASA investigators on the 2016 ESA mission.

## **ARTICLE 6 - MANAGEMENT, DOCUMENTATION, AND REVIEWS**

- 6.1 ESA is responsible for the overall management of the 2016 ExoMars mission. NASA is responsible for the management and delivery of the Electra Proximity Link transceivers to ESA.
- 6.2 Each Party will designate one or more representatives responsible for implementing the activities under this MOU.
- 6.3 The ESA and NASA designated representatives will cooperate in the implementation of the Parties' activities under this MOU. Each Party will manage, in accordance with its own rules and procedures, its activities under this MOU.
- 6.4 Management details concerning the hardware deliveries are contained in Interface Control Documents (ICDs) jointly established by the NASA/ESA project teams.

Management details concerning operational agreements are first called out in a service agreement and then detailed in an ICD. The development of service agreements and ICDs will be subject to the provisions of this MOU. These documents may address such items as management and procedural requirements, technical interfaces, a list of required documentation, program implementation schedule, technical reviews, applicable standards, verification and validation, etc.

- 6.5 The signature of the service agreements, as well as the ICDs, will be in accordance with each agency's requirements and take place in a timely manner. The Parties will provide to each other complete and timely documentation in accordance with the requirements specified in the service agreements and ICDs.
- 6.6 ESA and NASA will be invited to participate in each other's reviews as appropriate. Reviews will be conducted according to agreed-upon ESA/NASA procedures and in compliance with the 2016 ExoMars mission schedule and as specified in the service agreements and ICDs. Electra reviews will be conducted per NASA processes, with ESA invited to support. Delivery reviews for Electra will be combined NASA/ESA reviews with a jointly approved review procedure between the project offices of the Parties.

#### **ARTICLE 7 - RIGHTS IN AND DISTRIBUTION OF DATA**

The Parties shall have access to all data resulting from the mission upon their becoming available, in accordance with the policies established by ESA in the ExoMars Science Management Plan. European and NASA-supported investigators will have access to the scientific data commensurate with the roles for which they were selected to participate in the mission, as specified in the ExoMars Science Management Plan.

#### **ARTICLE 8 - TRANSFER OF GOODS AND TECHNICAL DATA**

The Parties are obligated to transfer only those goods and technical data (including software) necessary to fulfil their respective responsibilities under this MOU, in accordance with the following provisions, notwithstanding any other provision of this MOU:

- 8.1 All activities of the Parties will be carried out in accordance with applicable laws and regulations pertaining to export control.
- 8.2 The transfer of goods and technical data for the purpose of discharging the Parties' responsibilities with regard to interface, integration, and safety will normally be made without restriction, except as provided in paragraph 1 of this Article.
- 8.3 All transfers of export-controlled goods and proprietary or export-controlled technical data are subject to the following provisions.
  - a. In the event a Party or its Related Entity finds it necessary to transfer export-controlled goods or to transfer proprietary or export-controlled technical data, for which protection is to be maintained, such goods will be specifically identified and such technical data will be marked with a notice.
  - b. The identification for such goods and the marking of such technical data will indicate that the goods and technical data will be used by the receiving Party or its Related Entities only for the purposes of fulfilling the receiving Party's or Related Entity's responsibilities under this MOU, and that the identified goods and marked technical data will not be disclosed or retransferred to any other entity without the prior written permission of the furnishing Party or its Related Entity.
  - c. The receiving Party and its Related Entities will abide by the terms of the notice and protect any such identified goods and marked technical data from unauthorised use and disclosure.



d. The Parties to this MOU will cause their Related Entities to be bound by the provisions of this Article related to use, disclosure, and retransfer of identified goods and marked technical data through contractual mechanisms or equivalent measures.

8.4 All goods and marked proprietary or export-controlled technical data exchanged in the performance of this MOU will be used by the receiving Party or its Related Entity exclusively for the purposes of this MOU. Upon completion of the activities under this MOU, the receiving Party or its Related Entity will return or otherwise dispose of all goods and marked technical data provided under this MOU, as directed by the furnishing Party or its Related Entity.

#### **ARTICLE 9 - INTELLECTUAL PROPERTY**

9.1 Nothing in this MOU will be construed as granting, either expressly or by implication, to the other Party any rights to, or interest in, any inventions or works of a Party or its Related Entities made prior to the entry into force of, or outside the scope of, this MOU, including any patents (or similar forms of protection in any country) corresponding to such inventions or any copyrights corresponding to such works.

9.2 Any rights to, or interest in, any invention or work made in the performance of this MOU solely by one Party 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 Party or Related Entity. Allocation of rights to, or interest in, such invention or work between such Party and its Related Entities will be determined by applicable laws, rules, regulations, and contractual obligations.

9.3 It is not anticipated that there will be any joint inventions made in the performance of this MOU. Nevertheless, in the event that an invention is jointly made by the Parties in the performance of this MOU, the Parties 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 Parties or granted by one Party to the other Party.

9.4 For any work jointly authored by the Parties, should the Parties 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).

9.5 Subject to the provisions of Article 8 (Transfer of Goods and Technical Data) and Article 10 (Release of Results and Public Information), each Party 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 MOU for its own purposes, regardless of whether the work was created solely by, or on behalf of, the other Party or jointly with the other Party.

#### **ARTICLE 10 - RELEASE OF RESULTS AND PUBLIC INFORMATION**

10.1 The Parties retain the right to release public information regarding their own activities under this MOU. The Parties will coordinate with each other in advance concerning releasing to the public information that relates to the other Party's responsibilities or performance under this MOU.



## ARTICLE 14 - OWNERSHIP OF EQUIPMENT

Unless otherwise agreed in writing, each Party will retain ownership of all equipment, including the goods, hardware, software, and associated technical data it provides to the other Party under the terms of this MOU, without prejudice to any individual rights of ownership of the Parties' respective Related Entities. To the extent reasonably feasible and recognising that equipment sent into space or integrated into the other Party's equipment cannot be returned, each Party agrees to return the other Party's equipment in its possession at the conclusion of activities under this MOU.

## ARTICLE 15 - LIABILITY AND RISK OF LOSS

15.1 For the purposes of this article:

- a. The term "damage" means:
  - i. bodily injury to, or other impairment of health of, or death of, any person;
  - ii. damage to, loss of, or loss of use of any property;
  - iii. loss of revenue or profits; or
  - iv. other direct, indirect, or consequential damage.
- b. The term "launch vehicle" means an object or any part thereof intended for launch, launched from Earth, or returning to Earth which carries payloads or persons, or both.
- c. The term "payload" means all property to be flown or used on or in a launch vehicle.
- d. The term "Protected Space Operations" means all activities pursuant to this MOU, including launch vehicle activities and payload activities on Earth, in outer space, or in transit between Earth and outer space. "Protected Space Operations" begin at the entry into force of this MOU and end when all activities done in implementation of this MOU are completed. The term includes, but is not limited to:
  - i. research, design, development, test, manufacture, assembly, integration, operation, or use of launch or transfer vehicles, payloads, or instruments, as well as related support equipment and facilities and services;
  - ii. all activities related to ground support, test, training, simulation, or guidance and control equipment and related facilities or services.
- e. The term "Protected Space Operations" excludes activities on Earth that are conducted on return from space to develop further a payload's product or process for use other than for the 2016 ExoMars mission.

15.2 The Parties agree that a comprehensive cross-waiver of liability between the Parties and their Related Entities will further participation in space exploration, use, and investment. The cross-waiver of liability will be broadly construed to achieve this objective. The terms of the cross-waiver are set out below.

15.3 Cross-waiver of liability:

- a. Each Party agrees to a cross-waiver of liability pursuant to which each Party waives all claims against the other Party, the other Party's Related Entities, employees of the other Party, or employees of the other Party's Related Entities, based on damage arising out of Protected Space Operations. This cross-waiver will apply only if the person, entity, or property causing the damage is involved in Protected Space Operations and the person, entity, or property damaged is damaged by virtue of its

involvement in Protected Space Operations. The cross-waiver will apply to any claims for damage, whatever the legal basis for such claims.

- b. Each Party will extend the cross-waiver of liability to its own Related Entities by requiring them, by contract or otherwise, to agree to waive all claims, and require that their Related Entities waive all claims, against the other Party, the other Party's Related Entities, and employees of the other Party or its Related Entities, based on damage arising out of Protected Space Operations.
- c. For avoidance of doubt, this cross-waiver of liability includes a cross-waiver for any liability arising from the Convention on International Liability for Damage Caused by Space Objects, which entered into force on 1 September 1972 (hereinafter referred to as the "Liability Convention"), where the person, entity, or property causing the damage is involved in Protected Space Operations and the person, entity, or property damaged is damaged by virtue of its involvement in Protected Space Operations.
- d. Notwithstanding the other provisions of this Article, this cross-waiver of liability will not be applicable to:
  - i. claims between a Party and its own Related Entity or among its own Related Entities;
  - ii. claims made by a natural person, his/her estate, survivors, or subrogees (except when a subrogee is a Party to this MOU or is otherwise bound by the terms of this cross-waiver) for bodily injury, other impairment of health, or death of such natural person;
  - iii. claims for damage caused by willful misconduct;
  - iv. intellectual property claims;
  - v. claims for damage resulting from a failure of a Party to extend the cross-waiver of liability to its Related Entities, pursuant to paragraph 3(b) of this Article; or
  - vi. Claims by a Party arising out of or relating to the other Party's failure to perform its obligations under this MOU.
- e. Nothing in this Article will be construed to create the basis for a claim or suit where none would otherwise exist.
- f. In the event of third-party claims which may arise out of, inter alia, the Liability Convention, the Parties will consult promptly on any potential liability, on any apportionment of such liability, and on the defence of such claim.

#### **ARTICLE 16 - REGISTRATION, JURISDICTION, AND CONTROL**

ESA will register the 2016 ExoMars mission as a space object in accordance with the Convention on the Registration of Objects Launched into Outer Space, done on 12 November 1974. ESA will retain jurisdiction and control over the space object.

#### **ARTICLE 17 - MISHAP INVESTIGATION**

In the case of a mishap or mission failure, the Parties will provide assistance to each other in the conduct of any investigation, bearing in mind, in particular, the provisions of Article 8 (Transfer of Goods and Technical Data). In the case of activities that 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 MOU, the Parties will establish a process for investigating each such mishap as part of their program/project-level implementation plans.

## **ARTICLE 18 - AMENDMENT**

This MOU may be amended by written agreement of the Parties.

## **ARTICLE 19 - CONSULTATION AND SETTLEMENT OF DISPUTES**

The Parties will consult with each other promptly when events occur or matters arise that may question the interpretation or implementation of the terms of this MOU. Any dispute in the interpretation or implementation of the terms of this MOU will be referred to the ESA Director of Science and Robotic Exploration and the NASA Associate Administrator for the Science Mission Directorate, or their designees. Any dispute which cannot be resolved at this level will be referred to the Director General of ESA and the Administrator of NASA, or their designees. Failing agreement at that level, the Parties may agree to submit the dispute to an agreed-upon form of dispute resolution.

## **ARTICLE 20 - ENTRY INTO FORCE, DURATION, AND TERMINATION**

- 20.1 This MOU will enter into force upon signature by both Parties. It will remain in force for eight years after the launch of the 2016 ExoMars mission, or until 31 December 2023, whichever is earlier, unless extended by written agreement of the Parties, or terminated in accordance with Article 20.2 below.
- 20.2 Either Party may terminate this MOU at any time by giving the other Party at least 12 months written notice of its intent to terminate. In the event of termination, the Parties will endeavour to minimise any negative impact of such termination on the other Party.
- 20.3 Termination or expiration of this MOU will not affect a Party's continuing obligations under Article 7 (Rights In and Distribution of Data), Article 8 (Transfer of Goods and Technical Data), Article 9 (Intellectual Property), Article 10 (Release of Results and Public Information), Article 12 (Customs Clearance and Movement of Goods), Article 14 (Ownership of Equipment), Article 15 (Liability and Risk of Loss), Article 16 (Registration, Jurisdiction, and Control), Article 17 (Mishap Investigation), and Article 19 (Consultation and Settlement of Disputes), unless otherwise agreed upon by the Parties.

IN WITNESS WHEREOF, the undersigned duly authorised representatives of the Parties have signed this MOU, in two originals, in the English language.

Done in Paris on 14 April 2014 Done in Washington, DC on 29 April 2014

For the European Space Agency

For the National Aeronautics and Space  
Administration of the  
United States of America



Jean-Jacques Dordain  
Director General



Charles F. Bolden, Jr.  
Administrator