

## DEPARTMENT OF STATE

WASHINGTON

June 29, 2011

Excellency:

I have the honor to refer to the recent discussions between representatives of the Government of the United States of America and the Government of the Italian Republic concerning the terms and conditions whereby the National Aeronautics and Space Administration (NASA) and the Italian Space Agency (ASI) will undertake cooperation on the Juno Mission to Jupiter.

On behalf of the Government of the United States of America, I propose that cooperation between the two Governments on this project shall be in accordance with the terms and conditions set forth in the enclosed Memorandum of Understanding, signed on June 22, 2011, between NASA and ASI, and the enclosed Juno Appendix.

His Excellency

Giulio Terzi di Sant'Agata,  
Ambassador of Italy.

DIPLOMATIC NOTE

If the foregoing proposal is acceptable to the Government of the Italian Republic, I further propose that this note, including the enclosed Memorandum of Understanding, and your affirmative reply shall constitute an agreement between the two Governments which shall enter into force on the date of your reply and shall remain in force until the expiration or termination of the Memorandum of Understanding, in accordance with the terms thereof.

Accept, Excellency, the renewed assurances of my highest consideration.

For the Secretary of State:

A handwritten signature in black ink, appearing to read "Jack Marshall". The signature is written in a cursive, flowing style with a large initial "J".

Enclosure:

As stated.



AMBASCIATA D'ITALIA  
WASHINGTON, D. C.

NOTE VERBALE

Prot. n. 4168

The Embassy of Italy presents its compliments to the U.S. Department of State and has the honour to refer to its diplomatic note of June 29<sup>th</sup> 2011 concerning the terms and conditions whereby the National Aeronautics and Space Administration (NASA) and the Italian Space Agency (ASI) will undertake cooperation on the Juno mission to Jupiter.

The note is quoted as follows:

"I have the honour to refer to the recent discussions between representatives of the Government of the United States of America and the Government of the Italian Republic concerning the terms and conditions whereby the National Aeronautics and Space Administration (NASA) and the Italian Space Agency (ASI) will undertake cooperation on the Juno Mission to Jupiter.

On behalf of the Government of the United States of America, I propose that the cooperation between the two Governments on this project shall be in accordance with the terms and conditions set forth in the Memorandum of Understanding, signed June 22<sup>nd</sup> 2011 between NASA and ASI and the enclosed Juno Appendix.

If the foregoing proposal is acceptable to the Government of the Italian Republic, I further propose that this note, including the enclosed

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U.S. Department of State  
Washington, DC 20520

Memorandum of Understanding, and Your Excellency's affirmative reply shall constitute an agreement between the two Governments which shall enter into force on the date of Your Excellency's reply, and shall remain in force until the expiration or termination of the Memorandum of Understanding, in accordance with the terms thereof."

On behalf of the Government of the Italian Republic, the Embassy of Italy agrees that this note, together with the note from the U.S. Government dated June 29<sup>th</sup> 2011 shall constitute an agreement and shall be in accordance with the terms and conditions set forth in the Memorandum of Understanding, signed June 22<sup>nd</sup> 2011 between NASA and ASI.

The Embassy of Italy avails itself of this opportunity to renew to the U.S. Department of State the assurances of its highest consideration. *af*

Washington DC, August 3, 2011

*GS*



**MEMORANDUM OF UNDERSTANDING**

**BETWEEN THE**

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

**AND THE**

**ITALIAN SPACE AGENCY**

**CONCERNING THE**

**JUNO MISSION**

## **PREAMBLE**

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

The Italian Space Agency (hereinafter referred to as "ASI"),

Collectively hereinafter referred to as "the Parties":

CONSIDERING that NASA is developing the Juno mission as part of its New Frontiers program;

RECALLING that the Juno mission was selected in May 2005 under a New Frontiers Program Announcement of Opportunity (AO-03-OSS-03);

CONSIDERING that two Italian scientific payloads, named the Jovian Infrared Auroral Mapper (JIRAM) and Ka-Band Transponder (KaT), are part of the Juno mission;

CONSIDERING that NASA and ASI have a long history of cooperation in the exploration of the solar system;

RECALLING the interim agreement of March 21, 2008, between NASA and ASI for the early phases of cooperation on the Juno mission;

HAVE AGREED as follows:

### **ARTICLE 1 – SCOPE**

- 1.1 This Memorandum of Understanding (MOU) defines the responsibilities, as well as the terms and conditions, by which the cooperation between the Parties shall be conducted within the framework of NASA's Juno mission.
- 1.2 The primary activities addressed in this MOU concern scientific cooperation through the provision by ASI of the Italian JIRAM and KaT instruments for NASA's Juno mission.

### **ARTICLE 2 – THE JUNO MISSION**

- 2.1 NASA's Juno mission consists of a spacecraft carrying a scientific payload designed to further our understanding of planetary and solar system formation by studying the origin and evolution of Jupiter. Juno is intended to probe Jupiter's interior structure, atmospheric composition and dynamics, and polar magnetosphere. Using a spinning, solar-powered spacecraft, Juno is designed to make global maps of the gravity, magnetic fields, and atmospheric composition of Jupiter from a unique polar orbit with a close perijove. Juno will carry precise, high-sensitivity radiometers, magnetometers, and gravity science systems, and its planned 30 science orbits will extensively sample Jupiter's full range of latitudes and longitudes. From its polar perspective, Juno will also

combine in situ and remote sensing observations to explore the polar magnetosphere and determine what drives Jupiter's remarkable auroras.

- 2.2 Juno is planned for launch no earlier than August 2011 on a U.S. Atlas 5 expendable launch vehicle from the U.S. Cape Canaveral Air Station in Florida. The spacecraft is expected to arrive at Jupiter in July 2016.
- 2.3 NASA has picked U.S. Principal Investigator (PI), Dr. Scott Bolton, of the Southwest Research Institute in San Antonio, Texas, to lead an international team to develop the Juno instruments and to carry out the scientific investigations. The international Juno team includes participants from the United States, Italy, France, and Belgium.

### **ARTICLE 3 – PROGRAMMATIC RESPONSIBILITIES OF NASA**

NASA shall use reasonable efforts to carry out the following responsibilities:

- 3.1 Manage and conduct the Juno project throughout the life of the mission, including development, integration, test, launch, and operations activities during the cruise and science phases of the Juno mission.
- 3.2 Lead the Juno Science Operations Center development and operations activities.
- 3.3 Consistent with the Committee on Space Research (COSPAR) planetary protection policy and NASA directives, define material and biological contamination constraints for the Juno mission, and ensure that the integrated payload meets planetary contamination constraints.

In support of the JIRAM:

- 3.4 Support the development of the ASI-provided JIRAM instrument as outlined in Appendix A – “Jet Propulsion Laboratory (JPL) Document D-37646, Roles and Responsibilities – JIRAM and KaT Development.”
- 3.5 Provide opportunities for Italian participation in the Juno atmosphere and magnetosphere science working group(s), part of the Juno science team.

In support of the KaT:

- 3.6 Provide overall program management for the Telecom Subsystem (including the KaT).
- 3.7 Establish and maintain the Juno mission design for the gravity science investigation, including requirements definition, development of the KaT specification, subsystem level verification plans, and overall mission requirements.
- 3.8 Support the development of the ASI-provided KaT as outlined in Appendix A – “JPL Document D-37646, Roles and Responsibilities – JIRAM and KaT Development.”

- 3.9 Provide opportunities for Italian participation in the Juno interior science working group(s), part of the Juno science team.

#### **ARTICLE 4 – PROGRAMMATIC RESPONSIBILITIES OF ASI**

ASI shall use reasonable efforts to carry out the following responsibilities:

- 4.1 Design and provide to NASA for flight on the Juno mission, in close coordination with the Juno PI regarding material composition, a small aluminum plaque honoring Galileo Galilei, with final approval subject to NASA's acceptance and assurance procedures;

In support of the JIRAM:

- 4.2 Design, develop, test, calibrate, and deliver the JIRAM instrument to NASA within a mutually agreed-upon schedule to meet the Juno launch readiness date and support its operations throughout the cruise and science phases of the mission.
- 4.3 Complete specific detailed duties and tasks as outlined in Appendix A – “JPL Document D-37646, Roles and Responsibilities – JIRAM and KaT Development.”
- 4.4 Participate in the Juno atmosphere and magnetosphere science working group(s).
- 4.5 Provide high- and low-level data products consistent with the Juno science team data analysis and archiving plan through the ASI Science Data Center.

In support of the KaT:

- 4.6 Design, develop, test, calibrate, and deliver the KaT to NASA for integration into the Juno mission telecommunications subsystem within a mutually agreed schedule to meet the Juno launch readiness date.
- 4.7 Complete specific detailed duties and tasks as outlined in Appendix A – “JPL Document D-37646, Roles and Responsibilities – JIRAM and KaT Development.”
- 4.8 Support KaT operations throughout the cruise and science phases of the mission.
- 4.9 Participate in the Juno interior science working group.
- 4.10 Provide high- and low-level data products consistent with the Juno science team data analysis and archiving plan through the ASI Science Data Center.

## ARTICLE 5 – FINANCIAL ARRANGEMENTS

- 5.1 NASA and ASI shall each bear the costs of discharging their respective responsibilities, including travel and subsistence of personnel and transportation of all equipment and other items for which it is responsible. Further, the obligations of NASA and ASI under this MOU are subject to the availability of appropriated funds. Should either Party encounter budgetary problems in the course of its respective internal procedures which may affect the activities to be carried out under this MOU, the Party encountering the problems shall notify and consult with the other Party as soon as possible in order to minimize the negative impact of such problems in the cooperation.

## ARTICLE 6 – MANAGEMENT/POINTS OF CONTACT

- 6.1 NASA's Planetary Science Director, within the Science Mission Directorate, is responsible for overseeing NASA's New Frontiers Program, is supported by mission-specific program executives, and is responsible for oversight of all NASA planetary science program activities, as well as formal programmatic liaison with ASI and liaison and coordination with other U.S. Government agencies.
- 6.2 NASA's Juno Program Executive is responsible for the definition, integration, and assessment of all activities related to the Juno mission. The Juno Program Executive is also the principal point of contact for NASA in the performance of this MOU.
- 6.3 The PI is the primary point of contact for international discussions of Juno mission science goals, objectives, and policies.
- 6.4 NASA has designated JPL to lead the formulation and implementation of the Juno mission. A Juno Project Office has been established for this purpose, and a Juno Project Manager has been assigned. This Project Office is part of the New Frontiers Program Office, located at NASA's Marshall Space Flight Center.
- 6.5 For ASI, the Head of Exploration and Observation of the Universe Unit is responsible for overall programmatic management of the Italian-sponsored Juno contributions. The Head of Exploration and Observation of the Universe Unit is also the principal point of contact for ASI in the performance of this MOU. An ASI Juno Project Office has been established for the realization of the instruments, and an ASI Juno Project Manager has been appointed.
- 6.6 The ASI Principal Investigators of JIRAM and KaT are the primary points of contact for the science goals and data analysis.
- 6.7 Each Party will provide, on occasion and as mutually agreed upon, for its representatives to visit the other's facilities to participate in integration and testing and to observe, confer with, and advise the other Party in regard to aspects of design and development of compatible hardware interfaces, integration, and testing, as well as any activities required to ensure safe, reliable operations of the hardware as part of the overall Juno system.

## ARTICLE 7 – LIABILITY AND RISK OF LOSS

- 7.1 The objective of this Article is to establish a cross-waiver of liability in the interest of encouraging participation in the exploration, exploitation, and use of outer space. The Parties intend that the cross-waiver of liability be broadly construed to achieve this objective.
- 7.2 For 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, 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 Launch Vehicle activities and Payload activities on Earth, in outer space, or in transit between Earth and outer space in implementation of an agreement for launch services. Protected Space Operations begins at the signature of this MOU and ends when all activities done in implementation of this MOU are completed. It includes, but is not limited to:
    - (i) Research, design, development, test, manufacture, assembly, integration, operation, or use of Launch Vehicles, Payloads, or instruments, as well as related support equipment and facilities and services; and
    - (ii) All activities related to ground support, test, training, simulation, or guidance and control equipment and related facilities or services.“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 activities within the scope of an agreement for launch services.
  - (e) The term “Related Entity” means:
    - (i) A contractor or subcontractor of a Party at any tier;

- (ii) A user or customer of a Party at any tier; or
- (iii) A contractor or subcontractor of a user or customer of a Party at any tier.

The terms "contractor" and "subcontractor" include suppliers of any kind. The term "Related Entity" may also apply to a State, or an agency or institution of a State, having the same relationship to a Party as described in paragraphs 2(e)(i) through 2(e)(iii) of this Article, or otherwise engaged in the implementation of Protected Space Operations as defined in paragraph 2(d) of this Article.

7.3 Cross-waiver of liability:

- (a) Each Party agrees to a cross-waiver of liability pursuant to which each Party waives all claims against any of the entities or persons listed in paragraphs 3(a)(i) through 3(a)(iii) of this Article based on Damage arising out of Protected Space Operations. This cross-waiver shall 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 shall apply to any claims for Damage, whatever the legal basis for such claims, against:
  - (i) The other Party;
  - (ii) A Related Entity of any entity identified in paragraph 3(a)(i) of this Article; or
  - (iii) The employees of any of the entities identified in paragraphs 3(a)(i) through 3(a)(ii) of this Article.
- (b) In addition, each Party shall extend the cross-waiver of liability, as set forth in paragraph 3(a) of this Article, to its own Related Entities by requiring them, by contract or otherwise, to:
  - (i) Waive all claims against the entities or persons identified in paragraphs 3(a)(i) through 3(a)(iii) of this Article; and
  - (ii) Require that their Related Entities waive all claims against the entities or persons identified in paragraphs 3(a)(i) through 3(a)(iii) of this Article.
- (c) For avoidance of doubt, this cross-waiver of liability includes a cross-waiver of claims arising from the Convention on International Liability for Damage Caused by Space Objects, done on March 29, 1972, 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 shall not be applicable to:
  - (i) Claims between a Party and its own Related Entity or between 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 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 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 another Party's failure to perform its obligations under this MOU;
- (e) Nothing in this Article shall be construed to create the basis for a claim or suit where none would otherwise exist.
- (f) In the event of third-Party claims for which the Parties may be liable, the Parties shall consult promptly to determine an appropriate and equitable apportionment of any potential liability and on the defense of any such claims.
- (g) Except as otherwise provided in 7.3(c), nothing in this MOU shall affect liability, if any, pursuant to the Convention on International Liability for Damage Caused by Space Objects (Liability Convention), done on March 29, 1972. In the event of a claim arising out of the Liability Convention, the Parties shall request that their respective Governments consult promptly on any potential liability, on any apportionment of such liability, and on the defense of such claim.

#### **ARTICLE 8 - REGISTRATION OF SPACE OBJECTS**

- 8.1 NASA shall request that its Government register Juno as a space object in accordance with the Convention on the Registration of Objects Launched into Outer Space, done on November 12, 1974 (the Registration Convention). However, exercise of jurisdiction and control of Juno shall be subject to the relevant provisions of this MOU. Registration pursuant to this Article shall not affect the rights or obligations of the Parties under the Liability Convention.

## ARTICLE 9 -TRANSFER OF GOODS AND TECHNICAL DATA

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

- 9.1 All activities under this MOU shall be carried out in accordance with the Parties' national laws and regulations, including those laws and regulations pertaining to export control and the control of classified information.
- 9.2 The transfer of technical data for the purpose of discharging the Parties' responsibilities with regard to interface, integration, and safety shall normally be made without restriction, except as required by paragraph 1 of this Article.
- 9.3 All transfers of goods and proprietary or export-controlled technical data are subject to the following provisions.
  - (a) In the event a Party or its Related Entity (defined for the purpose of this Article as contractors, subcontractors, grantees, or cooperating entities, or any lower tier contractor, subcontractor, grantee, or cooperating entities of a Party) finds it necessary to transfer such goods or data, for which protection is to be maintained, such goods shall be specifically identified and such data shall be marked.
  - (b) The identification for such goods and the marking on such data shall indicate that the goods and data shall be used by the receiving Party and its Related Entities only for the purposes of fulfilling the receiving Party's or Related Entities' responsibilities under this MOU, and that such goods and data shall 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 or Related Entity shall abide by the terms of the notice and protect any such goods and data from unauthorized use and disclosure.
  - (d) The Parties to this MOU shall cause their Related Entities to be bound by the provisions of this Article through contractual mechanisms or equivalent measures.
- 9.4 All goods exchanged in the performance of this MOU shall be used by the receiving Party or Related Entity exclusively for the purposes of the MOU. Upon completion of the activities under this MOU, the receiving Party or Related Entity shall return or otherwise dispose of all goods and marked proprietary or export-controlled technical data provided under this MOU, as directed by the furnishing Party or Related Entity.

## ARTICLE 10 - INTELLECTUAL PROPERTY RIGHTS

- 10.1 Nothing in this MOU shall 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.
- 10.2 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, shall 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 shall be determined by applicable laws, rules, regulations, and contractual obligations.
- 10.3 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 shall, 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.
- 10.4 For any work jointly authored by the Parties, should the Parties decide to register the copyright in such work, they shall, 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).
- 10.5 Subject to the provisions of Article 9, Transfer of Goods and Technical Data, and Article 11, Release of Results and Public Information, each Party shall 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 11 - RELEASE OF RESULTS AND PUBLIC INFORMATION**

- 11.1 The Parties retain the right to release public information regarding their own activities under this MOU. The Parties shall 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. Full acknowledgement shall be made by both Parties of the role of the other Party in the Juno mission, including the commemoration of Galileo Galilei through the aluminum plaque provided by ASI as referred to in Article 4.1 above.
- 11.2 The Parties shall make the final results obtained from the Juno mission available to the general scientific community through publication in appropriate journals or by presentations at scientific conferences as soon as possible and in a manner consistent with good scientific practices.
- 11.3 The Parties acknowledge that the following data or information does not constitute public information and that such data or information shall not be included in any publication or presentation by a Party under this Article without the other Party's prior written permission:
- (a) data furnished by the other Party in accordance with Article 9, Transfer of Goods and Technical Data, of this MOU which is export-controlled, classified, or proprietary; or
  - (b) information about an invention of the other Party 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 12 - SHARING AND DISTRIBUTION OF SCIENTIFIC DATA**

- 12.1 All release of Juno data by the Juno investigation teams, including the JIRAM and KaT science teams, shall comply with the policies for release of data and public information as stated in the NASA New Frontiers Program Data Management Plan and in the Juno Project Data Management Plan (PDMP), which will be approved by NASA. All scientific and ancillary Juno data records, including JIRAM and KaT data, shall be submitted to NASA's Planetary Data System (PDS) in accordance with PDS standards and policies on suitable data levels on the schedule in the Juno PDMP, but not to exceed the six-month period defined in paragraph 2 of this Article.
- 12.2 Science data obtained by the JIRAM and KaT co-investigators shall be delivered to the Juno Science Operations Center (JSOC) in a timely manner as they are created for use by the Juno Science Team. Release of Juno science and ancillary data to the scientific community is accomplished when the products are delivered to the PDS. The archiving schedule in the PDMP shall not exceed six months for the Juno Science Investigation Teams to process, calibrate, and validate the data prior to delivery to the PDS. This validation period begins

with the receipt by the Juno investigators of usable science data, ground-based and flight calibration data, and any associated Juno data in a form suitable for analysis.

- 12.3 Data to be submitted to the JSOC and archived with the PDS include edited telemetry data (Committee on Data Management and Archive (CODMAC) Level 2 data), full resolution calibrated data (CODMAC Level 3), calibration documentation, and higher level products such as maps.
- 12.4 The Parties shall have the right to use the data (processed and unprocessed) at any time for support of their respective responsibilities to the mission.
- 12.5 The Parties and their investigators at any level, including co-investigators, collaborators, and other associated scientists, shall have full and immediate access to scientific data obtained by the Juno Project. The Parties shall work to ensure that all investigators have access to other telemetered science and engineering data relevant to the calibration/validation of the respective investigations.
- 12.6 Copies of all publications and reports detailing the scientific results of the Juno mission investigations shall be provided to the PDS in a timely manner (within three months of publication), as well as the data modules on which they are based. The PDS shall, in turn, submit these publications and reports to NASA's National Space Science Data Center (NSSDC), where appropriate. Such publications and reports shall include a suitable acknowledgement of the services afforded by the contributions or the cooperation of each Party.

#### **ARTICLE 13 - CUSTOMS CLEARANCE, IMMIGRATION, AND OWNERSHIP**

- 13.1 In accordance with its laws and regulations, each Party shall facilitate free customs clearance and waiver of all applicable customs duties and taxes for goods necessary for the implementation of this MOU. In the event that any customs duties or taxes of any kind are nonetheless levied on such equipment and related goods, such customs duties or taxes shall be borne by the Party of the country levying such customs duties or taxes. The Parties' obligation to facilitate duty-free entry and exit of equipment and related goods is fully reciprocal.
- 13.2 Subject to its laws and regulations, each Party shall facilitate provision of the appropriate entry and residence documentation, if required, for the other Party's nationals who enter, exit, or reside within its territory in order to carry out the activities under this MOU.
- 13.3 Equipment provided by NASA pursuant to this MOU shall remain the property of NASA. Equipment provided by ASI pursuant to this MOU shall remain the property of ASI. Each Party agrees to return any of the other Party's equipment in its possession to the other Party at the conclusion of the project.

#### **ARTICLE 14 - CONSULTATION AND DISPUTE RESOLUTION**

- 14.1 The Parties agree to consult promptly with each other on all issues involving interpretation, implementation, or performance of the MOU. An issue concerning the interpretation, implementation, or performance of this MOU shall first be referred to the appropriate points of contact identified above for the Parties in Article 6. If they are unable to come to agreement on any issue, then the issue shall be referred to the NASA Associate Administrator for Science Mission Directorate and the ASI Technical Director and if unresolved at this level, to the NASA Administrator and the ASI President, or their designated representatives, for joint resolution.

#### **ARTICLE 15 - MISHAP INVESTIGATION**

- 15.1 In the case of a mishap or mission failure, the Parties agree to provide assistance to each other in the conduct of any investigation, bearing in mind, in particular, the provisions of Article 9 (Transfer of Goods and Technical Data). 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 MOU, the Parties agree to establish a process for investigating each such mishap as part of their program/project implementation agreements.

#### **ARTICLE 16 - AMENDMENTS**

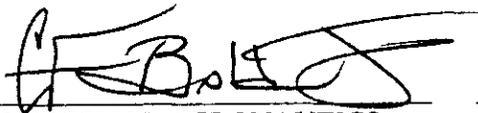
- 16.1 This MOU may be amended at any time by mutual written agreement.

#### **ARTICLE 17 - ENTRY INTO FORCE, TERMINATION, AND CONTINUING OBLIGATIONS**

- 17.1 This MOU shall enter into force upon signature by the Parties and the conclusion of an exchange of diplomatic notes between the Governments of the Parties incorporating its terms and conditions. This MOU shall remain in force until December 31, 2019, to permit the completion of the Juno mission and data analysis period. This MOU may be extended by mutual written agreement of the Parties, provided that the exchange of notes remains in force. The interim agreement of March 21, 2008, shall terminate upon entry into force of this MOU.

17.2 Either Party may terminate this MOU at any time by giving the other Party at least six months' written notice of its intent to terminate. The obligations of the Parties set forth in the Liability and Risk of Loss; Intellectual Property Rights; and Transfer of Goods and Technical Data provisions in this MOU shall continue to apply after the expiration or termination of this MOU. In the event of termination, each Party shall endeavor to minimize the negative impacts of any such termination on the other Party.

Done in duplicate in the English language.



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



FOR THE ITALIAN SPACE AGENCY

Date: June 22, 2011

Place: Rome

Date: June 22, 2011

Place: Rome

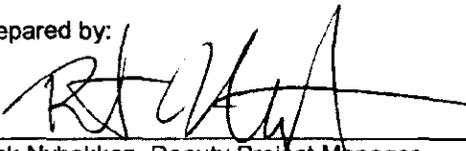


## Juno Project

### Roles and Responsibilities - Jovian Infrared Auroral Mapper (JIRAM) and Ka-Band Translator (KaT) Development

Initial Release

Prepared by:

  
Rick Nybakken, Deputy Project Manager

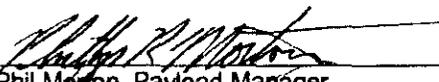
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Date

Approved by:

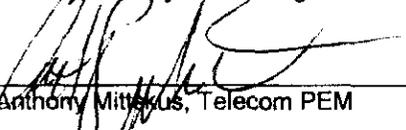
  
Jan Chodas, Project Manager

2/9/10  
Date

Concurred:

  
Phil Morton, Payload Manager

2/9/10  
Date

  
Anthony Mitterus, Telecom PEM

100209  
Date

Paper copies of this document may not be current and should not be relied on for official purposes. The current version is in the Juno DocuShare Library: <https://alpha-lib.jpl.nasa.gov/docushare/dsweb/View/Collection-34942>.

*This document has been reviewed for export control and it does NOT contain controlled technical data.*

February 5, 2010  
JPL D-37646



Jet Propulsion Laboratory  
California Institute of Technology

### CHANGE LOG

DATE	SECTIONS CHANGED	REASON FOR CHANGE (ECR)	REVISION
07-18-07	ALL		Preliminary
07-18-07	No change to content	Revised Header to match project format	Preliminary
02-05-10	Sections 1.1, 2.1, 1.3.1; Tables 2-1, 2-2	CR: 109424  <ul style="list-style-type: none"> <li>• Sections 1.1 and 2.1 - Name change from Galileo Avionica to Selex Galileo</li> <li>• Section 1.1 NASA/ASI Interim Letter of Agreement changed to NASA/ASI Memorandum of Understanding</li> <li>• Section 1.3.1 - Updated Applicable Documents</li> <li>• Table 2-1 - Updated JIRAM operations roles &amp; responsibilities to reflect revised operations architecture/structure</li> <li>• Table 2-2 - Changed EM KaT to FEM KaT and deleted rows with FM-2 KaT and FM-2</li> </ul> DRR: Juno-10-018	Initial Release

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## **1.0 INTRODUCTION**

### **1.1 Purpose and Scope**

The purpose of this document is to clarify and document the specific roles and responsibilities for NASA/JPL, ASI/Thales Alenia and ASI/Selex Galileo with respect to the development of the Ka-Band Translator (KaT) and the Jovian Infrared Auroral Mapper (JIRAM) for use on Juno. This document is intended to be a primary reference document for the NASA/ASI Memorandum of Understanding.

### **1.2 Change Control**

Change control for this document is specified in the project's Information, IT, and Configuration Management (IICM) Plan. This plan is approved by the project manager, and approved changes are recorded in the document change log.

### **1.3 Applicable and Reference Documents**

“Applicable” documents levy requirements on the areas addressed in this document; “reference” documents are identified in the text of the document only to provide additional information to readers.

#### **1.3.1 Applicable Documents**

1. D-33995 Juno Project Information and Configuration Management Plan, Rev D, December 7, 2009.

#### **1.3.2 Reference Documents**

None

## 2.0 ROLES AND RESPONSIBILITIES FOR JIRAM AND KAT

### 2.1 Overview

The following has been developed to clarify the various roles and responsibilities between NASA and ASI for development of the JIRAM instrument and the Ka-Band Translator. The primary parties involved in these developments are:

#### NASA

- The Jet Propulsion Laboratory      Responsible for the Juno Mission

#### ASI

- Selex Galileo      Responsible for the JIRAM development
- Thales Alenia      Responsible for the KaT development

### 2.2 Roles and Responsibilities - JIRAM

Table 2-1 lists the ASI and NASA roles and responsibilities for the JIRAM development.

**Table 2-1. JIRAM Development Roles and Responsibilities**

Mission Phase	ASI	NASA/JPL (or JPL/ASI joint responsibility if so noted)
B	Provide JIRAM point of contact (IM and MAM Equivalent)	Supplies insight/oversight POC (support role) - Project Interface to ASI and their Contractor
B	Provide JIRAM technical lead to Payload System Engineering Team - Functions as primary technical interface to Juno Payload Engineering Team (JPET) and Lockheed Martin	Leads JPET
B	Instrument schedule and planning, including: - Staffing Plan and Organization Chart - Schedule - Spares Plan - Long Lead Procurements - Deliverables	Reviews/approves planning
B	Develop Plans - Instrument Implementation Plan - Mission Assurance Plan - Reliability Assurance Plan - Configuration Management Plan	Provides corresponding project plans. This includes, but is not limited to: - Payload System Implementation Plan - Safety and Mission Assurance Plan - Radiation Control Plan

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	<ul style="list-style-type: none"> <li>- Quality Assurance Plan</li> <li>- Environmental Test Plan</li> <li>- Radiation Control Plan</li> <li>- Electronic Parts Assurance Plan</li> <li>- EMI &amp; Magnetics Control Plan</li> <li>- Materials and Processes Plan</li> <li>- Problem Failure Reporting Plan</li> <li>- System Safety Plan</li> <li>- Configuration Management Plan</li> <li>- Review Plan</li> <li>- Software Development Plan</li> <li>- Software Integration and Test Plan</li> <li>- Contamination Control Plan</li> <li>- Instrument Verification, Validation and Calibration Plan</li> </ul> <p>These plans may be written separately or integrated consistent with the instrument developer's institutional practices.</p>	<ul style="list-style-type: none"> <li>- EMC/EMI &amp; Magnetics Control Plan</li> <li>- Software Development Plan</li> <li>- Contamination Control Plan</li> <li>- Planetary Protection Plan</li> </ul> <p>Reviews/approves plans</p>
B	<p>Perform Preliminary Design</p> <ul style="list-style-type: none"> <li>- Generate Level 4 Instrument Functional Requirements and Description (IFRD)</li> </ul> <p>Document that responds to Level 3 Payload System Requirements Document (PSRD)</p> <ul style="list-style-type: none"> <li>- Generate Level 5 Software Requirements Document (SRD)</li> </ul>	<p>Generates L3 PSRD (Flowdown from L2).</p> <p>Reviews/approves IFRD.</p> <p>Reviews/approves SRD</p> <p>Reviews/approves preliminary design.</p>
B	<p>Incorporate use of LM developed S/C Emulator (SCE) in planning for EM and Flight Model testing</p>	<p>Provide SCE and user documentation for use during instrument testing.</p>
B	<p>Deliver preliminary design documentation</p> <ul style="list-style-type: none"> <li>- Schematics</li> <li>- Parts Lists</li> <li>- Materials Lists and Materials Usage Agreements</li> <li>- Inputs to spacecraft to instrument ICD</li> <li>- Interface FMECA</li> <li>- Parts Stress Analysis</li> <li>- Worst Case Analysis</li> <li>- Single Events Effects Analysis</li> <li>- Power Converter Analysis (Transient, average pwr, in-rush, etc)</li> <li>- BTE/GSE Interface FMEA</li> <li>- Structural Stress Analyses</li> <li>- Thermal Analyses</li> <li>- Radiation Analyses</li> <li>- Radiation Analysis Completion Statement (RACS)</li> <li>- Command and telemetry definitions</li> <li>- Instrument Structural Model</li> <li>- Instrument Thermal Model</li> </ul>	<p>Reviews/approves preliminary design documentation</p> <ul style="list-style-type: none"> <li>- Include JPL Div 35, 51 review and assessments</li> </ul> <p>Lockheed Martin-Denver (LM) leads development/production of the ICD for the project.</p>

	<ul style="list-style-type: none"> <li>- Instrument CAD Model</li> <li>- Software design documentation</li> <li>- Instrument behavioral description</li> <li>- Safety data package inputs</li> <li>- Planetary Protection data</li> </ul>	
B	Hold a successful JIRAM PDR & close Action Items (AIs)	<p>JPL/ASI:</p> <ul style="list-style-type: none"> <li>- Jointly convenes JIRAM PDR</li> <li>- Issues joint PDR board report</li> <li>- Issues Action Items and AI closure plan</li> <li>- Concurs with AI closures</li> </ul>
B	Support Project PDR <ul style="list-style-type: none"> <li>- Provide and present short presentation</li> <li>- Lead effort to close AIs</li> </ul>	Leads Project PDR
BC	Build Breadboard/Brassboard/EM units	Supports build effort as needed
BC	Perform Breadboard/Brassboard/EM testing <ul style="list-style-type: none"> <li>- Develop and provide test procedures</li> <li>- Functional and performance testing</li> <li>- Perform interface testing using the SCE.</li> <li>- Environmental Tests (Vibe, TV, EMI/EMC) if applicable</li> <li>- Complete Environmental Test Authorization &amp; Summary (ETAS) if any environmental testing is for qualification of FM</li> <li>- Provide test reports.</li> </ul>	Participates in test planning and testing. Reviews/approves ETAS (if applicable). Reviews/approves test plan and procedure.
BC	Deliver EM to LM for interface testing in System Test Laboratory (STL) <ul style="list-style-type: none"> <li>- For ~2 weeks one or two times</li> <li>- Include BTE/GSE as needed</li> <li>- Hold EM/BTE/GSE delivery review and close AIs</li> <li>- Support testing</li> <li>- Provide inputs for test procedures</li> <li>- Complete test report and provide to LM/JPL</li> </ul>	Convenes delivery review Concurs with AI closures Reviews/approves test procedures. Provides test support.
C	Perform Final Design <ul style="list-style-type: none"> <li>- Update IFRD as needed</li> </ul>	Updates L3 PSRD as needed. Reviews/approves IFRD update. Reviews/approves final design.
C	Deliver final design documentation (updates as necessary) <ul style="list-style-type: none"> <li>- Schematics</li> <li>- Parts Lists</li> <li>- Materials Lists and Materials Usage Agreements</li> <li>- Inputs to spacecraft to instrument ICD</li> <li>- Interface FMECA</li> <li>- Parts Stress Analysis</li> <li>- Worst Case Analysis</li> </ul>	Reviews/approves final design documentation <ul style="list-style-type: none"> <li>- Include JPL Div 35, 51 review and assessments</li> </ul> <p>Lockheed Martin-Denver (LM) leads development/production of the ICD for the project.</p>

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	<ul style="list-style-type: none"> <li>- Single Events Effects Analysis</li> <li>- Power Converter Analysis (Transient, average pwr, in-rush, etc)</li> <li>- BTE/GSE Interface FMEA</li> <li>- Structural Stress Analyses</li> <li>- Thermal Stress Analyses</li> <li>- Radiation Analyses</li> <li>- RACS</li> <li>- Command and telemetry definitions</li> <li>- Instrument Structural Model</li> <li>- Instrument Thermal Model</li> <li>- Instrument CAD Model</li> <li>- Software design documentation</li> <li>- Instrument behavioral description</li> <li>- Safety data package inputs</li> <li>- Planetary Protection data</li> </ul>	
C	Hold a successful JIRAM CDR & Close out Action Items	<p>JPL/ASI:</p> <ul style="list-style-type: none"> <li>- Jointly convenes JIRAM CDR</li> <li>- Issues joint CDR board report</li> <li>- Issues Action Items and AI closure plan</li> <li>- Concurs with AI closure</li> </ul>
C	Support Project CDR <ul style="list-style-type: none"> <li>- Provide and present short presentation</li> <li>- Lead effort to close AIs</li> </ul>	Leads Project CDR
CD	Build FM unit	Supports build effort as needed
CD	Perform FM Testing <ul style="list-style-type: none"> <li>- Develop and provide test procedures</li> <li>- Functional and performance tests</li> <li>- Environmental Tests (Vibe, TV, EMI/EMC)</li> <li>- Complete ETAS</li> <li>- Calibration</li> <li>- Develop and provide test and calibration reports</li> </ul>	Participates in test planning and testing. Reviews/approves ETAS.
CD	Provide a fit check template for check-out of instrument-spacecraft mechanical interface	Use template to perform interface check-out
C	Support Project System Integration Review (SIR) <ul style="list-style-type: none"> <li>- Provide and present short presentation</li> <li>- Lead effort to close AIs</li> </ul>	Leads Project SIR
D	Hold a successful JIRAM FM Pre-Ship Review (PSR)	<p>JPL/ASI:</p> <ul style="list-style-type: none"> <li>- Jointly convenes JIRAM FM PSR</li> <li>- Issues joint PSR board report</li> <li>- Issues Action Items and AI closure plan</li> <li>- Concurs with AI closures</li> </ul>
D	Provide component parameters (surface area, non-metallic volume, materials information,	Reviews data and incorporates into Flight System PP model

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	and high-temperature manufacturing/testing information) for estimation of biological contamination at launch.	
D	<p>Deliver final as-built documentation (updates as applicable and as needed)</p> <ul style="list-style-type: none"> <li>- Schematics</li> <li>- Parts Lists</li> <li>- Non-proprietary software source code</li> <li>- Materials Lists and Materials Usage Agreements</li> <li>- Requirements verification matrix</li> <li>- Environmental Analysis Completion Statement (EACS)</li> <li>- Structural Stress Analyses</li> <li>- Thermal Stress Analyses</li> <li>- Radiation analyses</li> <li>- Instrument Structural Model</li> <li>- Instrument Thermal Model</li> <li>- Flight rules, operational constraints and idiosyncrasies</li> <li>- Telemetry calibration data</li> <li>- Instrument User's Manual</li> <li>- BTE/GSE User's Manual</li> <li>- Safety data package inputs</li> <li>- Planetary Protection data (see line above for more detail)</li> <li>- Digital images</li> </ul>	<p>Reviews/approves final as-built documentation</p> <ul style="list-style-type: none"> <li>- Include JPL Div 35/ 51 reviews and assessments</li> </ul>
D	<p>Deliver FM JIRAM and necessary Bench Test Equipment (BTE)/Ground Support Equipment (GSE) to JPL</p> <ul style="list-style-type: none"> <li>- Assist JPL in completing HRCR, SRCR and SECR forms</li> <li>- Support JPL during HRCR, SRCR and SECR reviews</li> <li>- Lead effort to close out AIs</li> </ul>	<p>Completes delivery process</p> <ul style="list-style-type: none"> <li>- Performs receiving inspection</li> <li>- Completes HRCR, SRCR and SECR forms</li> <li>- Convenes HRCR, SRCR and SECR reports</li> <li>- Issues HRCR, SRCR and SECR reports</li> <li>- Issues Action Items and AI closure plan</li> <li>- Concurs with AI closures</li> </ul>
D	<p>Lead JIRAM integration and test at Flight System level</p> <ul style="list-style-type: none"> <li>- Provide inputs for procedures</li> </ul>	<p>Reviews/approves procedures. Provides integration and test support.</p>
D	<p>Lead JIRAM effort for Flight System Environmental Tests</p> <ul style="list-style-type: none"> <li>- Provide inputs for procedures</li> </ul>	<p>Reviews/approves procedures. Provides test support.</p>
D	<p>Support Project PSR</p> <ul style="list-style-type: none"> <li>- Provide and present short presentation</li> <li>- Lead effort to close AIs</li> </ul>	<p>Leads Project PSR</p>
D	<p>Support JPL pre-launch mission operations development activities</p> <ul style="list-style-type: none"> <li>- Support development of MOS/GDS interfaces and capabilities as needed</li> </ul>	<p>Leads pre-launch mission operations development activities</p> <ul style="list-style-type: none"> <li>- Defines JIRAM team's role in MOS/GDS and pre-launch operations</li> </ul>

	- Support Operational Readiness Reviews and/or Mission Dress Rehearsals (as needed)	readiness activities
D	Support Project Flight Readiness Review (FRR) - Lead effort to close AIs	Leads Project FRR
D	Lead JIRAM effort for Flight System Launch - Lead effort for KSC activities	Leads Flight System launch effort
BCD	Provide inputs to Bi-monthly Management Reviews (BMRs) - Every 2 weeks - Accomplishments, plans, issues, risks, schedule status/updates, etc.	Leads BMRs
BCD	Submit change requests to Project for changes that affect the rest of the flight system, requirements at Level 3 and above, or documents signed by JPL.	Reviews/approves change requests
BCD	Submit waivers to Project for non-compliances and lead effort to close them - Support JPL in assessment and closure of waivers generated during ATLO	Reviews/approves waivers
CD	Submit problem/anomaly reports to Project and lead effort to close them - Support JPL in assessment and closure of problem/anomaly reports generated post delivery.	Reviews all problem/anomaly reports reports Approves those: 1) that affect the rest of the flight system, or 2) are generated post delivery.
CD	Support Juno Science Operations Center development activities including pre-launch planning, interface verification, science activity plan generation, thread tests, and Operational Readiness Tests	Leads Juno Science Operations Center development activities
E	Support Juno Science Operations Center operations activities including science activity plan generation, Operational Readiness Tests, and Critical Event Readiness Reviews	Leads Juno Science Operations Center operations activities
CD	Support Juno operations and ground data system development activities including pre-launch planning, interface verification, sequence generation, instrument downlink analysis including instrument health and safety, instrument calibration activities, and Operational Readiness Tests	Leads Juno Mission Operations System development activities
E	Support Juno operations and ground data system activities including planning, sequence generation, instrument calibration activities, instrument downlink analysis including instrument health and safety, Operational Readiness Tests, and Critical Event Readiness Tests.	Leads Juno Mission Operations System operations activities

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E	Lead JIRAM effort to test post-launch hardware functionality and performance	Provides support
E	Lead JIRAM effort for S/C Post-Launch Assessment Review (PLAR) - Lead Effort to close Action Items	Leads PLAR

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### 2.3 Roles and Responsibilities - KaT

Table 2.2 below list the specific roles and responsibilities for the KaT development,

**Table 2-2. KaT Development Roles and Responsibilities**

Mission Phase	ASI	NASA/JPL (or JPL/ASI joint responsibility if so noted)
B	Develop Implementation Plan, including: <ul style="list-style-type: none"> <li>- Staffing Plan</li> <li>- L5 Schedule</li> <li>- Parts Procurement Plans</li> <li>- L6 Modules/Components schedule</li> <li>- Long Lead Components</li> <li>- Deliverables</li> <li>- Cost Plan</li> <li>- GSE Plan</li> <li>- MMR Plan (or equivalent reporting plan)</li> <li>- Product Assurance Plan</li> </ul>	Review and approve plans
B	Provide KaT point contact (PEM Equivalent)	Provides Insight/Oversight POC (support role) <ul style="list-style-type: none"> <li>- Serves as Project Interface to ASI and their contractor</li> </ul>
B	Provide KaT technical lead to Telecommunications/Gravity Science Teams <ul style="list-style-type: none"> <li>- Functions as primary technical interface for KaT technical communication/coordination</li> </ul>	Provides background support to PSET and JPET as needed
B	Develop Additional plans <ul style="list-style-type: none"> <li>- Mission Assurance Plan</li> <li>- Reliability Assurance Plan</li> <li>- Configuration Management Plan</li> <li>- QA Plan</li> <li>- Review Plan</li> <li>- Environmental Test Plan</li> <li>- Radiation Control Plan</li> <li>- Electronic Parts Assurance Plan</li> <li>- EMI &amp; Magnetics Control Plan</li> <li>- Materials and Processes Plan</li> <li>- Problem Failure Reporting Plan</li> <li>- System Safety Plan</li> <li>- Configuration Management Plan</li> <li>- Software Development, Integration and Test Plan</li> </ul>	Review and approve plans

	<ul style="list-style-type: none"> <li>- Contamination Control Plan</li> <li>- Instrument Verification, Validation and Calibration Plan</li> </ul> <p>These plans may be written separately or integrated consistent with the instrument developer's institutional practices.</p>	
B	<p>Perform Preliminary Design</p> <ul style="list-style-type: none"> <li>- Generate L5 Equipment specification that responds to L5 FRD</li> </ul>	<p>Generate L5 FRD (Flowdown from L3/L4)</p> <ul style="list-style-type: none"> <li>- Review/approve preliminary design</li> <li>- Review/Approve Equipment specification</li> </ul>
B	<p>Hold a successful KaT PDR &amp; Close out Action Items</p>	<p>JPL/ASI:</p> <ul style="list-style-type: none"> <li>- Jointly convenes KaT PDR</li> <li>- Issues joint PDR board report</li> <li>- Issues Action Items and AI closure plan</li> <li>- Confirms AI's are closed</li> </ul>
B	<p>Support Telecom PDR (KaT Lead)</p> <ul style="list-style-type: none"> <li>- Provide and make short presentation</li> <li>- Lead effort to close AI's</li> </ul>	<p>JPL leads Telecom PDR.</p>
B	<p>Support Project PDR (KaT Lead)</p> <ul style="list-style-type: none"> <li>- Support Telecom PEM as requested</li> </ul>	<p>JPL leads Project PDR</p>
BC	<p>Deliver preliminary design documentation (EM)</p> <ul style="list-style-type: none"> <li>- Users Manual</li> <li>- Command and telemetry definitions</li> <li>- Schematics</li> <li>- KaT Analyses: RF, Phase Noise, Spur, Loop, Allen Variance and Ring around. (KaT System Engineering)</li> <li>- Parts Lists</li> <li>- Interface Circuit Data Sheets (ICDS's)</li> <li>- Mechanical ICD</li> <li>- Parts Stress Analysis</li> <li>- Worst Case Analysis</li> <li>- Interface FMECA</li> <li>- Single Events Effects Analysis</li> <li>- Radiation Analysis</li> <li>- Structural Stress Analysis</li> <li>- Thermal Stress Analysis</li> <li>- Power Converter Analysis (Transient, average pwr, in-rush, etc)</li> <li>- BCE Schematics</li> <li>- BCE Interface FMECA</li> <li>- MIUL/MUA</li> <li>- Inputs to Safe to Mate Procedure</li> </ul>	<p>Review/approve preliminary design documentation and EACS</p> <ul style="list-style-type: none"> <li>- Include JPL Div 35/ 51 reviews and assessments</li> </ul> <p>Provides Juno Planetary Protection (PP) Plan and leadership of PP efforts</p> <ul style="list-style-type: none"> <li>- Reviews KaT plan to provide PP data in Phase C</li> </ul>

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	- Complete EACS., Approach for provision of PP data (in Phase D)	
BC	Deliver EM Plans and Documents - EM Test Plan - EM Test Procedures - EM As-Built Parts List - EM EIDP - EM Test Report	Review and approve documentation
BC	Hold Successful Manufacturing Readiness Review - Lead effort to close out AI's	Provide support
BC	Perform EM Tests - Functional and performance Tests - Environmental Tests (as needed)	Participate in Tests and review test data
BC	Hold a successful Delivery Review EM and EGSE	JPL/ASI: - Jointly convenes KaT EM PSR - Issues joint PSR board report - Issues Action Items and AI closure plan - Confirms AI's are closed
BC	Deliver EM to JPL for testing. Support test of FEM KaT in Bldg 298 Test Lab. - Write EM Test Procedure	Provides test support - Review/Approve Test Procedure
BC	Deliver EM BCE to JPL for Bldg 298. Test Support and EM Integration into the Telecom EM S/S.	Provides test support
BC	Successfully integrate FEM KaT into the EM Telecom S/S at JPL. - Write Integration and Test procedure	Provides test support - Review/approve I&T procedure
BC	Successfully Deliver FEM KaT	Completes HRRCR/delivery process: - Completes HRRCR form - Convenes HRRCR - Issues HRRCR report - Issues Action Items and AI closure plan - Confirms AI's are closed
BC	Lead KaT effort for S/C DSN Compatibility Tests-EM	Provides test support - Review and approve Test Procedures
BC	Submit problem/anomaly reports to Project and lead effort to close them - Support JPL in assessment and closure of problem/anomaly reports generated post delivery.	Provides support - Reviews/approves problem/anomaly reports
C	Perform Final Design - Update ES	Finalize final design: - Update L5 FRD (Flowdown from L3/L4) - Review/approve Final design - Review/Approve ES

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C	<p>Deliver Final design documentation (FM-Updates)</p> <ul style="list-style-type: none"> <li>- Users Manual</li> <li>- Schematics <ul style="list-style-type: none"> <li>- RF, Phase Noise, Spur, Loop, Allen Var., ring around, etc. Analyses (KaT System Engineering)</li> </ul> </li> <li>- Parts Lists</li> <li>- Interface Circuit Data Sheets (ICDS's) <ul style="list-style-type: none"> <li>- Mechanical ICD</li> <li>- Parts Stress Analysis</li> <li>- Worst Case Analysis</li> <li>- Interface FMECA</li> <li>- Single Events Effects Analysis</li> <li>- Radiation Analysis</li> <li>- Structural Stress (FEM) Analysis</li> <li>- Thermal (FEM) Analysis</li> <li>- Power Converter Analysis (Transient, average pwr, in-rush, etc)</li> <li>- BCE Schematics</li> <li>- BTE/BCE Interface FMECA</li> <li>- MIUL/MUA</li> <li>- Safe to Mate Procedure</li> </ul> </li> <li>- EIDP for each FM</li> </ul>	<p>Review/approve preliminary design documentation</p> <ul style="list-style-type: none"> <li>- Include JPL Div 35, 51 review and assessments</li> </ul>
C	<p>Hold Successful Manufacturing Readiness Review</p> <ul style="list-style-type: none"> <li>- Lead effort to close out AI's</li> </ul>	<p>Provides support</p>
C	<p>Hold a successful KaT CDR &amp; Close out Action Items</p>	<p>JPL/ASI:</p> <ul style="list-style-type: none"> <li>- Jointly convenes KaT CDR</li> <li>- Issues joint CDR board report</li> <li>- Issues Action Items and AI closure plan</li> <li>- Confirms AI's are closed</li> </ul>
C	<p>Support Telecom CDR (KaT Lead)</p> <ul style="list-style-type: none"> <li>- Provide and make short presentation</li> <li>- Lead effort to close AI's</li> </ul>	<p>JPL leads Telecom CDR.</p>
C	<p>Support Project CDR (KaT Lead)</p> <ul style="list-style-type: none"> <li>- Support Telecom PEM as requested</li> </ul>	<p>JPL leads Project CDR</p>
C	<p>Perform FM-1 Acceptance Tests</p> <ul style="list-style-type: none"> <li>- Functional and performance AT's</li> <li>- Environmental Tests (Vibe, TV, EMI/EMC)</li> <li>- Complete ETAS/TRSF etc</li> </ul>	<p>Participate in Tests and facility reviews</p> <ul style="list-style-type: none"> <li>- Review/Approve Facility Safety Survey</li> <li>- Review/Approve ETAS/TRSF etc.</li> </ul>
C	<p>Hold a successful FM-1 Pre-Ship Review (PSR)</p>	<p>JPL/ASI:</p> <ul style="list-style-type: none"> <li>- Jointly convenes KaT FM PSR</li> <li>- Issues joint PSR board report</li> <li>- Issues Action Items and AI closure</li> </ul>

		plan - Confirms AI's are closed
C	Deliver FM BCE to JPL Bldg 298. Support FM Integration into the Telecom FM S/S (Telecom Panel).	Provides Test Support
C	Provide component parameters (surface area, non-metallic volume, materials information, and high-temperature manufacturing/testing information) for estimation of biological contamination at launch.	Reviews data and incorporates into Flight System PP model
C	Successfully Deliver FM-1 KaT to JPL - Document any flight rules, operations constraints or idiosyncrasies - Assist JPL in completing HRCR and SECR forms - Support JPL during HRCR and SECR reviews - Lead effort to close out A/I's	Completes delivery process: - Completes HRCR and SECR forms - Convenes HRCR and SECR - Issues HRCR and SECR reports - Issues Action Items and AI closure plan - Confirms AI's are closed
C	Successfully test FM-1 KaT in Bldg 298 Test Lab. - Write FM Test Procedure	Provides test support - Review/Approve Test Procedure
C	Lead KaT Integration onto Telecom Panel at JPL and at S/C level - Write integration procedure	Provides Integration support - Review/approve integration procedure
CD	Provide a fit check template for check-out of instrument-spacecraft mechanical interface	Use template to perform interface check-out
D	Support Telecom effort for S/C Environmental Tests	Leads test effort
D	Support Telecom effort for S/C DSN Compatibility Tests-FM	Leads test effort
D	Support Telecom effort for S/C SIR - Lead effort to close KaT AI's	Holds review
D	Support Telecom effort for S/C PSR - Lead effort to close KaT A/I's	Holds review
D	Support Telecom effort for S/C LRR - Lead effort to close KaT A/I's	Holds review
D	Support Telecom effort for S/C Launch - Provide support as needed for KSC activities	Leads launch activities
D	Support JPL in generation and assessment of waivers, - support effort to close waivers	Generates waivers during ATLO - Completes assessments and documentation - Reviews/approves Waivers
D	Support JPL in generation of PFR (as	Generates PFR's during ATLO

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	needed) - support JPL risk assessments - support effort to close PFRs	- Completes assessments and documentation - Reviews/approves PFR's
D	Support JPL pre-launch mission operations development activities - Support Operational Readiness Reviews and/or Mission Dress Rehearsals (as needed)	Lead pre-launch mission operations development activities - Defines KaT team's role in pre-launch operations readiness activities
E	Support KaT effort to test post-launch hardware functionality and performance	Provides support
E	Support KaT effort for S/C Post-Launch Assessment Review (PLAR) - Support Effort to close Action Items	Provides support
E	Support KaT support to Juno operations team during cruise and science phases of mission.	Lead operations team activities during cruise and science phases of mission

### 3.0 APPENDIX – ACRONYMS

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-	ASI	Agenzia Spataiale Italiana (Italian Space Agency)
-	AT	Acceptance Test
-	BCE	Bench Checkout Equipment
-	BTE	Bench Test Equipment
-	DBAT	Design, Build, Assemble and Test
-	DSN	Deep Space Network
-	EGSE	Electronic Ground Support Equipment
-	EACS	Environmental Analysis Completion Statement
-	EIDP	End-Item Data Package
-	EM	Engineering Model
-	EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
-	EQM	Engineering/Qualification Model
-	ES	Equipment Specification
-	ETAS	Environmental Test Authorization and Summary
-	FEM	Finite Element Model
-	FM	Flight Model
-	FMECA	Failure Mode and Effects Criticality Analysis
-	FRD	Functional Requirements Document
-	FRR	Flight Readiness Review
-	GSE	Ground Support Equipment
-	HRCR	Hardware Review and Certification Requirement (Delivery Review)
-	ICD	Interface Control Drawing
-	IM	Instrument Manager
-	KaT	Ka-Band Translator
-	KSC	Kennedy Space Center
-	LM	Lockheed Martin (Denver, Colorado)
-	LRR	Launch Readiness Review
-	MAM	Mission Assurance Manager
-	MIUL	Material Identification and Usage List
-	MMR	Monthly Management Review
-	MOS/GDS	Mission Operations System/Ground Data System
-	MUA	Material Usage Agreement
-	NASA	National Aeronautics and Space Administration
-	PEM	Project Element Manager
-	PFR	Problem/Failure Report
-	PFT	Proto-Flight Test
-	POC	Point Of Contact
-	PP	Planetary Protection
-	PSE	Project System Engineering
-	PSET	Project system Engineering Team
-	PSR	Pre-Ship Review
-	QA	Quality Assurance
-	RACS	Radiation Analysis Completion Statement
-	SCE	Spacecraft Emulator
-	SDD	Software Design Document
-	SECR	Support Equipment Certification Review
-	SIR	System Integration Review

*This document has been reviewed for export control and it does NOT contain controlled technical data.*

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Juno Roles and Responsibilities – JIRAM and KaT Development

- SRCR      Software Review and Certification Requirement
- SRD      Software Requirements Document
- TRSF     Test Results Summary Form
- TV        Thermal Vacuum