MSL with France

DESCRIPTION

NASA's Science Mission Directorate (SMD) is sponsoring the development of the MSL mission, which is a project in the Mars Exploration Program. NASA will develop the MSL, a long-duration rover and mobile scientific laboratory equipped to perform scientific studies of Mars. NASA plans to launch the MSL in 2011 from Cape Canaveral Air Force Station, Florida, aboard an Atlas V launch vehicle. The primary scientific objectives, to be carried out during the surface science phase of the mission, will be to assess the biological potential of at least one target area, characterize the local geology and geochemistry, investigate planetary processes relevant to habitability, including the role of water, and characterize the broad spectrum of surface radiation. Instruments include a multi-spectral mast camera, micro-imager, descent imager, laser ablation chemistry camera, alpha-particle-X-ray-spectrometer, X-ray diffraction/X-ray fluorescence instrument, radiation assessment detector, gas chromatograph/mass spectrometer/laser spectrometer, and a neutron detector. The mission is planned to last at least one Martian year (687 days). The landing site has not been chosen, but will be selected based on an assessment of safety, planetary protection, and an analysis by the scientific community.

The SAM instrument suite, which will be located within the MSL Payload Module, consists of three components: the Quadrupole Mass Spectrometer (QMS), the Tunable Laser Spectrometer (TLS), and the Gas Chromatograph (GC). This instrument suite will be used to study geochemical conditions that are directly relevant to the larger goal of assessing the habitability of Mars. Dr. Paul Mahaffy of NASA Goddard Space Flight Center (GSFC) has been selected as the Principal Investigator for the SAM instrument suite through NASA's Announcement of Opportunity (AO) for Research Opportunities in Space Science, AO NNH04ZSS0010. Prof. Michel Cabane (the GC instrument lead), of the Laboratoire Atmosphères, Milieux, Observations Spatiales/Centre National de la Recherche Scientifique (LATMOS/CNRS), and Prof. Patrice Coll and Prof. Francois Raulin, of the Laboratoire Interuniversitaire des Systèmes Atmosphériques (LISA/CNRS), have been selected as Co-Investigators.

The ChemCam instrument suite consists of two remote sensing instruments: a Laser-Induced Breakdown Spectrometer (LIBS) and a Remote Micro-Imager (RMI). A portion of this instrument suite, including the laser, telescope, RMI, and associated electronics will be mounted on the MSL Remote Sensing Mast in what is known as the Mast Unit (MU). A second portion, consisting of the spectrometers and Data Processing Unit (DPU) will be housed on the MSL rover in the Body Unit (BU). The ChemCam instrument suite will be used to characterize the geology of the Mars landing region, investigate planetary processes relevant to past habitability, assess the biological potential of a target environment, and look for toxic materials. Dr. Roger Wiens of the Los Alamos National Laboratory (LANL) has been selected as the Principal Investigator for the ChemCam instrument suite through NASA's Announcement of Opportunity (AO) for Research Opportunities in Space Science, AO NNH04ZSS0010. Dr. Sylvestre Maurice of the Institut de Recherche en Astrophysique et Planétologie (IRAP/CNRS) is the Deputy Principal Investigator and the MU lead. Dr. Claude d'Uston and Dr. Olivier Gasnault, of IRAP/CNRS; Dr. Nicolas Mangold, of the Laboratoire de Planétologie et Géodynamique (LPGN/CNRS); Dr. Patrick Mauchien, of the Commissariat à l'Energie Atomique (CEA); Dr. Violaine Sautter, of Laboratoire de Minéralogie et Cosmochimie du Muséum (LMCM/CNRS);

Dr. Cécile Fabre, of Géologie et Gestion des Ressources Minérales et Energétiques (G2R/CNRS); and Dr. Yves Langevin, of the Institut d'Astrophysique Spatiale (IAS/CNRS), have been selected as Co-Investigators from France.

RESPONSIBILITIES FOR SAM

NASA Responsibilities for SAM

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

1. Develop the MSL mission to meet the expected 2011 launch date, conduct the launch, cruise phase, and landing on Mars, and conduct the surface science phase;

2. Provide the final integrated SAM instrument suite;

3. Define the resources available on MSL for the SAM instrument suite and make available reasonable accommodations for mass, power, and data rate requirements for the SAM hardware;

4. Provide technical information on required performance specifications, environments within which the SAM instrument suite must operate, and interfaces with other MSL elements;

5. Develop the QMS and TLS portions of the SAM instrument suite;

6. Develop the SAM flight software;

7. Develop subsystems to support multiple instruments in the SAM instrument suite, including the Digital Processing Unit (DPU), the Chemical Separation and Processing Laboratory (CSPL), the Sample Manipulation System (SMS), and the Wide Range Pumps (WRPs);

8. Integrate the CNES-provided GC system with the QMS, creating the Gas Chromatography Mass Spectrometer (GCMS);

9. Provide ground support equipment (GSE) to support suite-level testing of the SAM instrument suite;

10. Integrate, test, and validate the SAM instrument suite within the MSL Payload Module, test the SAM with the other MSL instruments, and integrate and test the full SAM instrument suite with the MSL; and

11. Consistent with the Committee on Space Research (COSPAR) planetary protection policy and NASA directives, define material and biological contamination constraints for the MSL mission, and ensure that the integrated payload meets planetary contamination constraints.

CNES Responsibilities for SAM

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

1. Support its affiliated researchers working on the SAM instrument suite, from hardware development through scientific data analysis;

2. Develop and deliver the three required models (development, engineering, and flight) of the GC system, including the structure, injection traps, chromatographic columns, thermal conductivity detectors (TCDs), TCD electronics, and GSE software;

3. Deliver and support the testing and calibration of the SAM engineering and flight models in accordance with specifications issued by NASA;

4. Ensure that material and biological contamination constraints are met, and that the CNES-supplied portions of the SAM are capable of meeting project-specified encapsulation requirements, as necessary;

5. Provide to NASA the necessary interface, safety, and planetary protection information for accommodation of the CNES-supplied GC system within the payload and spacecraft;

6. Support the integration, testing, and validation of the GC with the QMS and the SAM instrument suite, as well as testing and verification of the integrated SAM instrument suite with the MSL, as mutually agreed, in the United States;

7. Support launch operations, as needed, with respect to the CNES-delivered hardware and support equipment at Cape Canaveral, Florida; and

8. Participate in the mission planning and operations, as mutually agreed, including data analysis.

RESPONSIBILITIES FOR CHEMCAM

NASA Responsibilities for ChemCam

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

1. Develop the MSL mission to meet the expected 2011 launch date; conduct the launch, cruise phase, and landing on Mars; and conduct the surface science phase;

2. Provide the final integrated ChemCam instrument suite;

3. Define the resources available on MSL for ChemCam and make available reasonable accommodations for mass, power, and data rate requirements for the ChemCam instrument suite;

4. Provide pointing and pointing reference information for the ChemCam MU mounted to the rover-supplied Remote Sensing Mast;

5. Provide optical and electrical interconnections between the ChemCam MU and BU across the Remote Sensing Mast interfaces;

6. Provide technical information on required performance specifications, environments within which the ChemCam instrument suite must operate, and interfaces with other MSL elements;

7. Develop the ChemCam BU, including spectrographs, DPU, and power supply;

8. Develop ChemCam flight software;

9. Provide ground support equipment for overall functional test and support of instrument integration and test activities;

10. Integrate, test, and validate the MU as part of the ChemCam instrument suite, test the MU and other ChemCam components with the other MSL instruments, and integrate and test the full ChemCam instrument suite with the MSL; and

11. Consistent with the COSPAR planetary protection policy and NASA directives, define material and biological contamination constraints for the MSL mission, and ensure that the integrated payload meets planetary contamination constraints.

CNES Responsibilities for ChemCam

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

1. Support its affiliated researchers working on the ChemCam instrument suite, from hardware development through scientific data analysis;

2. Develop and deliver the ChemCam MU, including the laser, telescope, camera, and front-end electronics, including all agreed-upon developmental, engineering, and flight model hardware and GSE required for performance verification and support of integration and testing of the MU;

3. Support testing and calibration of the ChemCam engineering model and flight model in accordance with specifications as issued by NASA;

4. Ensure that material and biological contamination constraints are met, and that the CNES-supplied portions of the ChemCam are capable of meeting project-specified encapsulation requirements, as necessary;

5. Provide to NASA the necessary interface, safety, and planetary protection information for accommodation of the CNES-supplied MU within the payload and spacecraft;

6. Support the integration, testing, and validation of the ChemCam instrument suite, as well as testing and verification of the integrated ChemCam instrument suite with the MSL, as mutually agreed, in the United States;

7. Support launch operations as needed with respect to the CNES-delivered hardware and support equipment at Cape Canaveral, Florida; and

8. Participate in the mission planning and operations as mutually agreed, including data analysis.