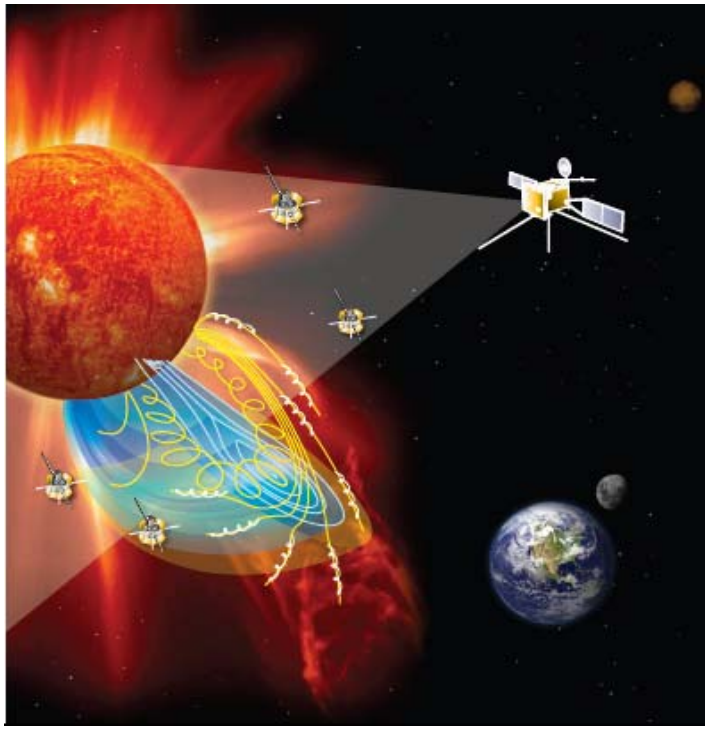
Focused Opportunity for Solar Orbiter (FOSO) Mission



Presentation at Pre-proposal Conference for SMEX/FOSO

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FOSO History

- Formation of International Living with a Star (ILWS) working group in 2001, to promote interagency cooperation/collaboration in the area of Sun-Solar System Connection/Heliophysics) missions.
- ESA Solar Orbiter Science Requirements Document was released in March, 2005,.
- NASA LWS/Solar Sentinels Science and Technology Definition Team Report was released in August, 2006.
- Early in 2007, ESA and NASA combined Solar Sentinels and Solar Orbiter into a single joint collaboration because of the synergy of the two missions.
  - A joint STDT (JSTDT) was formed and charged with prioritizing the science goals for the joint collaboration.
  - The JSTDT renamed the merged missions as the HELiophysical EXplorers (HELEX) mission.
  - The JSDT released its final report on October 5, 2007
- ESA released its Solar Orbiter AO on October 18, 2007
- NASA released FOSO as an addendum to the SMEX AO on October 22, 2007.

Primary FOSO Objective and HELEX Science Questions

Primary FOSO objective:

- Solicit science investigations for the Solar Orbiter mission
  - Solar Orbiter is one component of the HELEX collaboration that will explore the near-Sun environment

Three top HELEX science questions:

1. What are the origins of the solar wind streams and the heliospheric magnetic field?
2. What are the sources, acceleration mechanisms, and transport processes of solar energetic particles?
3. How do coronal mass ejections evolve in the inner heliosphere?

FOSO Solicitation for Proposals

- **Proposals for science investigations that address high priority science objectives for Solar Orbiter as defined in the HELEX JSTDT report are solicited**
  - **Several questions were submitted regarding the order of precedence for the science, requirements, and instruments**
    - **Order of precedence (highest to lowest):**
      - **FOSO**
      - **HELEX JSTDT Report**
      - **Solar Orbiter documentation from the European Space Agency**
- **Proposals for investigations are in two categories:**
  - ***Instrument investigations:*** **NASA funds an investigation that has a NASA-funded Principal Investigator (PI) leading the development of the instrument suite;**
    - **A wide angle coronagraph/ heliospheric imager to link the *in situ* Solar Sentinels observations to the environment of the inner heliosphere is one of the instrument investigations being solicited**
  - ***Sensor investigations:*** **NASA funds an investigation that has a NASA-funded PI providing a sensor for an ESA-led instrument suite**

FOSO AO Highlights

- **FOSO was released as an amendment to SMEX AO**
  - The FOSO amendment describes exceptions to the processes used in the SMEX AO
- **The candidate instruments in the model payload are examples and do not exclude other instruments.**
- **Joint ESA-NASA accommodation analysis will occur after categorization**
- **Payload selection will be made in coordination with ESA**
- **Proposals to this AO are expected to be selected through a single-step process**
  - No competitive Phase A; Initial Confirmation Review instead of competition
- **As a guideline, the total value of all investigations selected for Phase A study through end of Phase E is approximately $65 M in <u>Real</u> <u>Year</u> dollars**
  - SMEX uses FY 2008 dollars

FOSO AO Highlights (Continued)

- **NASA may designate one or more FOSO investigations as unfunded backups until all selected FOSO investigations pass or fail Initial Confirmation Reviews to enter Phase B**
  - Failure of a funded investigation to be confirmed to proceed to Phase B may provide an opportunity for an unfunded backup to enter Phase B.
- **Spacecraft resources -- mass, power, footprint, etc. -- are provided as guidelines (not requirements) in the ESA Solar Orbiter Payload Definition Document and the Experiment Interface Definition-A**
  - Sensor investigations (ESA-led instruments) should fit within the resource allocations for the ESA-led instrument
- **Questions from the community and responses are being posted in the FOSO section of the SMEX web site as Frequently Asked Questions (FAQ)**

FOSO Requirement: No Joint Designs with Non-U.S. Partners

What is a "joint design"?

- **A "joint design" is a situation where there is not a clean interface and an identifiable U.S. deliverable depends upon design information from a non-U.S. partner**
  - **Example of a joint design: A U.S. investigator provides flight software to a non-U.S. hardware provider; the software provider requires significant interaction and exchange of design details with the non-U.S. provider to complete the U.S. deliverable.**
- **The "what" that is being provided requires more than interface definition and control documentation**
  - **It also requires the definition and exchange of "how" the design is executed on both sides of the interface**
  - **The lack of a clean interface (or "joint design") involves the exchange of design details that may not be allowed by International Traffic in Arms Regulations or Export Administration Regulations**

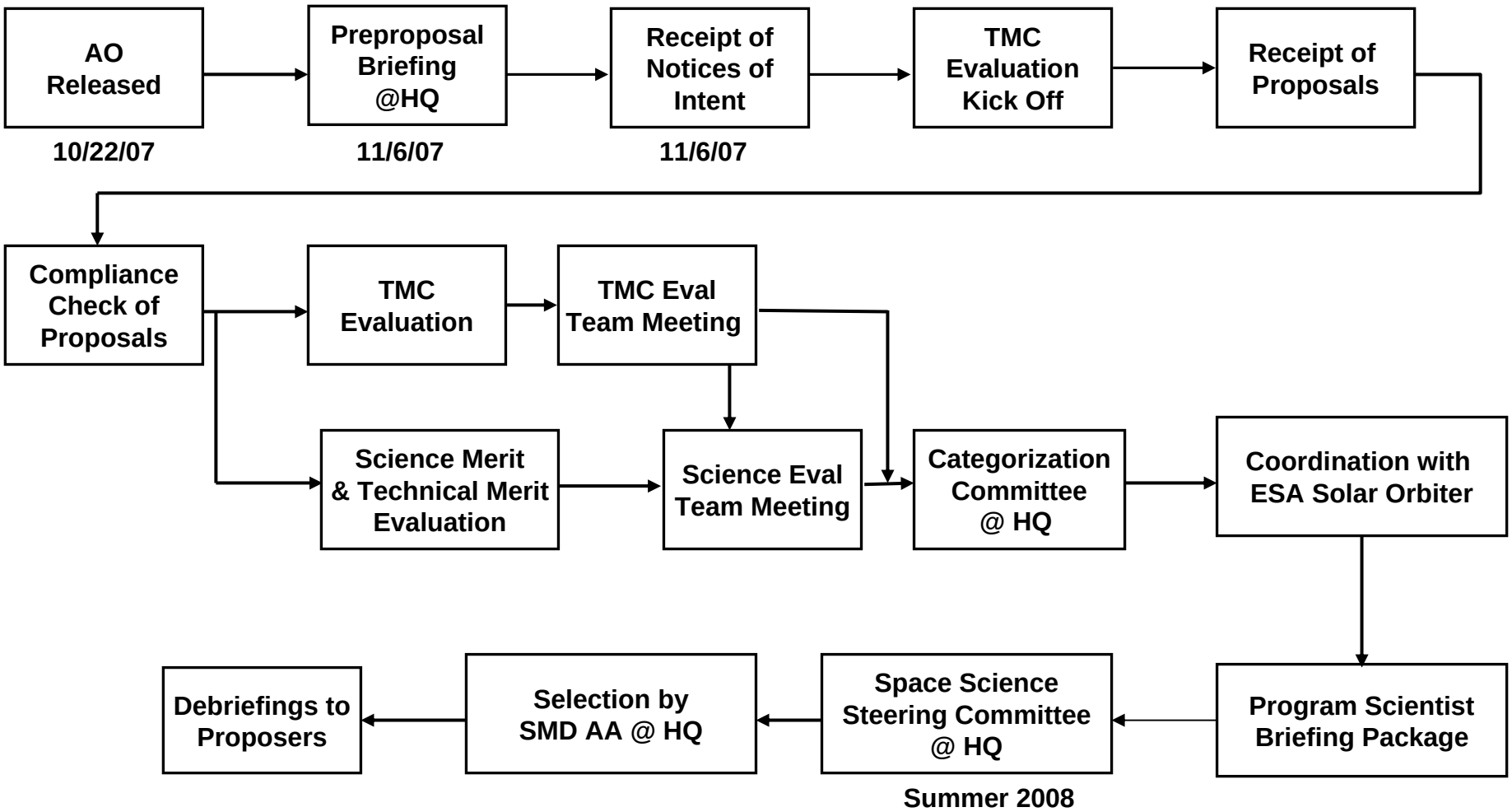
What is not a "joint design"?

- **An instrument design that includes contributions of flight hardware/software subsystems from U.S. and European co-Investigators where clean interfaces exist**
  - **A data acceptance package can be delivered when the instrument or sensor is delivered and the deliverable did not have to pass through customs several times before being delivered**

Comparison of SMEX and FOSO Opportunities

Category	SMEX	FOSO
Phase A	Competitive	Not competitive but Initial Confirmation Review with funded awardees contributing to project documentation
Costing	FY 2008 Fixed Year Dollars	Real Year Dollars
Science	Open	Focused on Solar Orbiter as defined in the FOSO and HELEX JSTDT Report
Instruments	Open; per proposal	Must fit within resource constraints of Solar Orbiter
Risk Category	D	C
Mission Assurance Requirements	SMEX MAR	RBSP MAR
Integration	As proposed in AO	U.S.-instrument integration in U.S.; integration of sensors to European-led instruments funded by Europe; integration of instruments to spacecraft funded by ESA
Mission Operations	As proposed in AO	Funded by Europe; Science Operations for U.S.-led instrument(s) funded by FOSO proposal

SMEX FOSO 2007 Proposal Evaluation Process



Proposal Evaluation Criteria for FOSO

- **Evaluation & categorization using same process as for SMEX (section 8.1):**
  - Scientific merit; scientific implementation merit; and, technical, management, and cost feasibility, including cost risk, of the proposed investigation
- **Additional FOSO evaluation factors for FOSO only:**
  - **Science:** The extent to which the proposed investigation addresses high priority science objectives, as defined in the HELEX JSTDT report
  - **Science implementation:** The extent to which the proposed instruments and sensors are compatible with the Solar Orbiter design
  - **Science implementation:** The maturity of the design or the demonstration of a clean path to achieve the necessary TRL on the schedule given in FOSO
  - **Technical, management, and cost feasibility:**
    - The extent to which the proposed instruments and sensors can be achieved within the resources available to Solar Orbiter instruments
    - Demonstration of a realistic plan to carry out all of the management responsibilities
    - Demonstration of a thorough understanding of the accommodation and environmental challenges for the Solar Orbiter mission; and
    - Demonstration of a realistic cost and adequate reserves for all phases of the investigation.

Technical & Scientific Inquiries

- All technical & scientific enquiries concerning the FOSO should be directed to:

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