Surface Water and Ocean Topography (SWOT) Mission

Science Definition Team Meeting
Washington DC, Jan 14-16, 2014

Program Status

Jared Entin, NASA Headquarters
Selma Cherchali, CNES Headquarters
Eric Lindstrom, NASA Headquarters
NASA & SWOT Science Updates

• New US Lead for Hydrology:
  President’s Early Career Award winner:
  TAMLIN PAVELSKY!!

• Global Precipitation Measurement Mission (GPM) will launch in a little over a month (Feb 28th)
• Soil Moisture Active Passive Mission (SMAP) will launch in Nov (5th?)
• CNES Scientific Prospective Seminar, La Rochelle, March 18, 19, 20
• USA takes a leadership role in the Arctic Council

• SWOT is now a mere ~6 years away from launching
SWOT Mission *Meets the Needs of The Community*

- **Recommended**
  - by the US Decadal Survey based on Water/Hydrosphere Concept
  - In the frame of the CNES Scientific Prospective Seminar (Biarritz, March, 2009)

- **Cooperation USA/France/Canada**
  - An emblematic Project of France-USA cooperation: more than 20 years cooperation in Space Altimetry

- The SWOT mission is a partnership between two communities, hydrology and physical oceanography that will deliver ocean surface and land water storage information to the entire Earth Science community!
NASA Program Status

- Currently in Phase-A.
- Creating Partnership agreements with Canadian Space Agency
- SWOT Science Definition Team (SDT) in full swing
  - Applications focus beginning
  - Field work for Algorithm Development planned
CNES Program Status

- Phase A review: Preliminary Requirement Review March 26, 2013
- Phase A review Steering Committee: April 17, 2013
- Budget and cost review Steering Committee: May 21, 2013
- CNES Board of Directors for budget assessment: October 8, 2013
- NASA HQ - CNES program meeting November 7, 2013 in Washington
- NASA HQ (M. Frielich) and CNES HQ (T. Duquesne), November 21
  - Signature of the IA B,C,D,E,F by the end of April
  - CNES Board of administrators approval end of March: tight timeline
CNES Budget Status

- Cost control and management is a driving constraint for CNES
- Investment Program money already allocated to SWOT
- CNES committed with Investment Program Committee to spend the money in between 2011 and 2020.
  ♦ Spendings flux reviewed every 3 months, overviewed by the Economical affairs committee at National Deputy chamber
  ♦ Focus on rate of spendings, industry type and technical indicators

- CNES complementary budget still under review for Mid Term Plan preparation
CNES Budget Status

Due to the specific budget constraints related to the Investment Program and because SWOT is an innovative mission (minimize the risks), **priorities are to safeguard margins.**

- Evaluating trades & options for maintaining budget and technical margins

• **On going budget consolidation actions:**
  • Assess the impact of Controlled reentry (technically and budgetary)
  • Cooperation with UKSA: additional funds approved
  • On-going actions for the nadir altimeter budget consolidation
Controlled Reentry

- Non Controlled Reentry (NCR) was baselined for SWOT as of today, but NCR casualty risk difficult to meet and context has changed
- S/C EoL disposal requires a Controlled reentry per French Space Law (LOS) for missions launching end of 2020
- CNES management has recommended to further study the Controlled reentry option and assess impacts
- Funding of the control reentry is out of the scope of the current mission baseline
  ♦ CNES is investigating how to mutualize this additional constraint regarding others potential missions in the future : CNES decision end of March 2014
UKSA Partnership Status

- Bilateral Meeting October 17, 2013 in Paris (Mr. J.Y.LeGall, Mr.David Parker)
  - Confirmation that SWOT is a United Kingdom Space Agency (UKSA) priority
  - Framework agreement document between UK and France is under preparation (to be signed January 31st 2014: French-English Summit)
  - Preparing a CNES - UKSA Implementing Arrangement to be signed first quarter 2014

- UKSA activities
  - Cooperation on the duplexer is of prime interest to UK industry
  - Planning English science team participation in SWOT science / applications activities
  - Development and provision of RF duplexer units through funding Phase B1, B2, C,D NRE
Nadir Altimeter Status

- Nadir Altimeter role
  - SWOT mean frequencies error calibration (between 200 and 1000km), needed for oceanography mesoscale science
  - Major contributor to the performance of the ocean products: cf. SDT position paper October 3rd, 2013
  - Linkage between low to mid wavelengths calibration errors: consolidation of the global performance budget
  - Risk reduction on Karin systematic errors
    - Identification (distinction between roll effects and wave heights gradients)
    - Understanding (geophysics, payload, platform)
    - Correction (an absolute value in the middle of the swath)
  - Long wavelengths and absolute precision determination depend on: Nadir altimeter + POD + radiometer
SWOT is a challenging mission with one innovative instrument (complex physics,..). CNES project recommends to maintain the NADIR ALTIMETER

- Nadir altimeter budget is under consolidation

- CNES decision on Nadir altimeter: **end of March 2014**
AIRSWOT Status

- AIRSWOT Campaign Design and Implementation
  - US campaigns
    - Early 2014 – AirSWOT check-out
    - Plans for Alaskan deployment in 2015
  - French campaign planning after the NASA/JPL US campaigns validation
    - Earliest possible date: January 2015

- AIRSWOT activities
  - Campaign and field experiment
  - Processing activities
  - Validation of the products

- NASA/CNES Campaign Science plan document,
- Statement of work, responsibilities, deliverables, receivables and schedule
Key Milestones and way forward

- SDT meeting January 14-15-16, 2014
- Mission Definition Review (MDR) - 2014
- NASA KDP-B (Phase B entry) – 2014
- Joint participation to US and French AirSWOT campaigns (Airborne and field campaign)

- NASA-CNES Implementing Arrangement extending joint activities beyond Phase A: extending the current IA
- NASA-CNES IA B, C, D, E,F
The Science Definition Team is a selected group of US/France/Canada scientists assembled to work with the SWOT Project to integrate science into the final spacecraft and mission design.

- A real platform of interaction between scientists and program/project team
  - To take into account the science requirements in the mission design
  - To analyze the evolution of those requirements
  - To make trade-off according to the maximum science needs and requirements in a constrained technical and budget framework
  - To take key decisions for the success of the mission jointly

- A key role to allow the project the provision of the right products with the required performances according to your needs