Space Weather Advisory Group Meeting 8

April 12, 2024

This webinar is a SWAG public meeting and will be recorded and transcribed. If you have a public comment, you acknowledge you may be recorded and are aware you can opt out of the meeting.

Welcome!

- In accordance with section 60601 of the PROSWIFT Act - NOAA established the SWAG to advise the White House SWORM Interagency Subcommittee

- All 15 non-governmental representatives of the SWAG, were appointed by the SWORM Subcommittee with 3-year terms beginning on October 1, 2021

- Each SWAG member here today serves as a representative member to provide stakeholder advice reflecting the views of the entity or interest group they are representing. The PROSWIFT Act directs SWAG members to receive advice from the academic community, the commercial space weather sector, and space weather end users that will inform the interests and work of the SWORM

Roll Call

SWAG Nongovernmental End-User Representatives

Tamara Dickinson, SWAG Chair
Science Matters Consulting

Rebecca Bishop
Aerospace Corp.

Craig Fugate
Bent Ear Solutions (former FEMA Adm)

Mark Olson
North American Electric Reliability Corporation

Michael Stills
United Airlines (retired)

SWAG Commercial Sector Representatives

Nicole Duncan
BAE Systems, Inc.

Jennifer Gannon
Computational Physics, Inc.

Seth Jonas
Lockheed Martin

Conrad Lautenbacher
GeoOptics, Inc. (former NOAA Adm)

Kent Tobiska
Space Environment Technologies

SWAG Academic Community Representatives

Heather Elliott
Southwest Research Institute

Tamas Gombosi
University of Michigan, Ann Arbor

George Ho
Southwest Research Institute

Delores Knipp
University of Colorado, Boulder

Scott McIntosh
NSF, National Center for Atmospheric Research, Boulder

Welcoming Remarks from the Chair

Dr. Tamara Dickinson

SWAG Chair

Nongovernmental End User Representative

President, Science Matters Consulting, LLC

Recap of Meeting 7 (March 2024)

- Brief out and discussion of finding and recommendations of the User Needs Survey
- Approved findings and recommendation for Electric Power Grid, Aviation, Emergency Management, Space Traffic Management/Coordination, and Human Space Flight
- Guest speakers
    - SWORM Co-Chair, Jinni Meehan
    - Space Weather Roundtable, Geoff Crowley
    - NASA Space Weather Council, Nicole Duncan

Past Meeting Minutes

- January 2023

Agenda

- Opening Remarks, Recap of Meeting 7 and Past Meeting Minutes
- Overview of Today's Meeting
- Status of User-Need Survey
- Discussion and Approval of User-Needs Survey Report Findings and Recommendations
- Public Comment
- Lunch Break
- Discussion and Approval of User-Needs Survey Report Findings and Recommendations (if needed)
- Next Steps and Closing Remarks
- Adjourn

Status of User Needs Survey

PROSWIFT Act - User Survey

User Survey Requirements:

1. Assess the adequacy of Federal Government goals for lead time, accuracy, coverage, timeliness, data rate, and data quality for space weather observations and forecasting;
2. Identify options and methods, in consultation with the academic and commercial space weather sectors, to advance the above goals;
3. Identify opportunities for collection of data to address the needs of space weather users;
4. Identify methods to increase coordination of space weather R2O2R;
5. Identify opportunities for new technologies, research, and instrumentation to aid in understanding, monitoring, modeling, prediction, and warning of space weather; and
6. Identify methods and technologies to improve preparedness for space weather.

Sectors for SWAG User Survey

2023-2024

- Electric Power Grid*
- Space Traffic Management/ Coordination
- Emergency Management*
- Aviation*
- Human space flight
- Research
- GNSS*

2024+

- Satellite*
- National Security
- Radio Frequency Application (comms and Radar)
- GNSS

* Sector in Abt 2019 report

User Survey Process

- Virtual and/or in-person focus groups
- Chatham House Rules
- Sessions were recorded for note taking purposes only
- High-level anonymized summary created by Science and Technology Policy Institute (STPI) for the SWAG

User Survey Topics

1. Current use of space weather observations, information, and forecasts
2. Current technological systems, components or elements affected by space weather
3. Current risk reduction and resilience activities
4. Future needs of space weather observations, information and forecasts
5. Future risk reduction and resilience activities
6. New or non-traditional sources of Space Weather Data
7. Next generation technologies, research, instrument, and models to address Space Weather

Thanks to the Team

- Jinni Meehan and Amy Macpherson, NWS
- Val Were - CIRA at NWS/OSTI/SBES
- Science and Technology Policy Institute (STPI) staff
  - Chris Cannizzaro, Sharon Williams, Casey Roepke, Asha Balakrishnan, Dan Pechkis
- SWAG members - especially the chairs and co-chairs of the sector working groups





Discussion and Approval of User Needs Survey Report Findings and Recommendations

- Discussion and approval of findings and recommendations to date
  - For presentation at Space Weather Workshop April 16
- Meeting today to discuss any Findings and recommendations
  - For the Research Sector
  - Any findings and recommendations that have been updated since our last meeting
  - Any additional findings and recommendations
- Will be able to revise these if needed as we prepare the full report. Hopefully only minor revision will be needed.

Discussion and Approval of User Needs Survey Report Findings and Recommendations

- Report contains two types of recommendations that are clearly labeled.
  - Recommendations that follow directly from the input from the users
  - SWAG recommendations
    - SWAG member lead the focus groups but did not participate in them
    - Issues the SWAG wanted to highlight that did not come up in focus groups

Research Sector

Research Sector

Planning and Investment

Finding 7.1. The national space weather enterprise needs an integrated and detailed functional implementation plan that enables appropriate research efforts to support the National Space Weather Enterprise.

Recommendation 7.1.1. SWORM should update the 2023 Implementation Plan to include results from this end user survey and the 2024 decadal survey with the addition of timelines and key milestones to optimize, prioritize, and sequence actions necessary to advance space weather forecast capabilities.

Research Sector

Planning and Investment

Finding 7.2. Focusing on the full Research-To-Operations ('R2O') and Operations-to-Research ('O2R') cycle is critical to improving space weather nowcasting, forecasting, and mitigation.

Recommendation 7.2.1. NOAA, NASA, NSF and DOD should improve coordination across the entire R2O-O2R selection and implementation process to include development standards and consistent procedures for testing, nowcasting, and forecasting capabilities.

Research Sector

Planning and Investment

Finding 7.3. An Observing System Simulation Experiment (OSSE) framework would transform the space weather enterprise's ability to assess the impacts of future potential observing systems for forecasts and predictions.

Recommendation 7.3.1. NASA, NOAA, NSF, USGS, and DOD should develop, in consultation with the research community (federal, commercial, and academic), a framework-based on OSSE analysis — to prioritize space weather observations.

Research Sector

Planning and Investment

Finding 7.4. Users need consistent and reliable data access and availability for historical and ongoing critical measurements, and improved spatial and temporal resolution of key parameters, to sustain and advance R&D programs and prediction capabilities.

Recommendation 7.4.1. NASA, NOAA, NSF, USGS, **DOE,** and DOD should preserve the continuity of long-term, historical key space, ground, and airborne network and sensor data through ensuring existing and new observations have the appropriate level of redundancy and capability to sustain these multi-decadal datasets in perpetuity.

Research Sector

Planning and Investment

Recommendation 7.4.2. NASA, NOAA, DOD, DOE, NSF, and the commercial sector should collaborate to ensure access to ancillary data are included as data products as part of observational datasets.

Recommendation 7.4.3. NASA, NOAA, NSF, **DOE,** and DOD should archive and maintain existing and future space weather, solar, space physics, and geophysical data.

Recommendation 7.4.4. NOAA, NASA, NSF, USGS, and DOD should augment the facilities' infrastructure and instrumentation capabilities to obtain real time or near real time observations.

Research Sector

Planning and Investment

Finding 7.5. Users need next generation computational resources and data analysis techniques for application to space weather research.

Recommendation 7.5.1. NASA, NOAA, NSF, and DOD should expand investment in and use of new computing architectures and resources.

Research Sector

Observational Capabilities

Finding 7.6. Users need improved spatial and temporal observations to enhance space weather forecasting.

Recommendation 7.6.1. NOAA, NASA, NSF, USGS, and DOD, in collaboration with commercial providers, should utilize current and future ground-, air-, and space-based sensors along with improved downlink and associated ground infrastructure to increase the resolution and coverage of key space weather, solar, space physics, and geophysical data.

Recommendation 7.6.2. NASA, NSF, and DOD should work with commercial providers and the research **and development** community to develop robust platforms to reduce risk and cost, and prioritize increased reliability, availability, and spatial sampling of space-based systems.

Research Sector

Product Acquisition and Availability

Finding 7.7. The users strongly stated the need for accessible historical and ongoing critical measurements that are integral for improving, verifying, and validating space weather research and forecast capabilities.

Recommendation 7.7.1. NASA, NOAA, DOD, DOE, national labs, and the commercial sector should work together to include ‘housekeeping’ and metadata as data products for all space-based environmental instrumental datasets.

Recommendation 7.7.2. NASA, NOAA, NSF, and DOD should archive and maintain existing and future space weather, solar, space physics, and geophysical data.

Research Sector

Product Acquisition and Availability

Finding 7.8. The users stated that many long standing observations (e.g. F10.7, Kp, magnetograph flux maps, sunspot number) are critical inputs for testing new nowcasting or forecasting capabilities.

Recommendation 7.8.1. NOAA, NASA, NSF, USGS, and DOD should adequately support the maintenance, validation, and calibration of existing key space weather ground-based, space-based, and airborne network and sensor data.

Recommendation 7.8.2. NOAA, NASA, NSF, USGS, and DOD should augment the facilities' infrastructure and instrumentation capabilities to obtain real time or near real time observations.

Research Sector

SWAG Findings and Recommendations

Finding SWAG 7.1. Non-Keplerian observations are required to improve forecast lead time and accuracy.

Recommendation SWAG 7.1.1. NASA should develop and demonstrate pointing stabilized alternative propulsion methods and small-satellite buses to explore, and station keep at, ~~non-Lagrangian points~~ positions along the Sun-Earth line, off the Sun-Earth line, and out of the ecliptic plane.

Research Sector

SWAG Findings and Recommendations

Finding SWAG 7.2. Key observation types are needed for accurate now-casts and longer-range forecasts and general Sun-Earth System understanding.

Recommendation SWAG 7.2.1. NASA and NSF should develop ground- and space-based imaging and coronagraphic technologies to characterize the magnetic field of the Sun's corona.

Recommendation SWAG 7.2.2. NASA and NSF should develop ground- and space-based spectroscopic imaging technologies to characterize the velocities of the Sun's atmosphere.

Discussion

Space Weather Workshop Preparation

SWW SWAG Panel

	Co-chairs	**Tammy Dickinson and Amy MacPherson**
10:45 AM - 10:55 AM	**Overview of PROSWIFT User-Survey Initiative**	**Tammy Dickinson, Science Matters Consulting**
10:55 AM - 11:00 AM	**Emergency Management**	**Seth Jonas, Lockheed Martin**
11:00 AM - 11:05 AM	**Space Traffic Management/Coordination**	**Delores Knipp, University of Colorado**
11:05 AM - 11:10 AM	**Electric Power**	**Mark Olson, North American Electric Reliability Corporation (NERC)**
11:10 AM - 11:20 AM	**Human Spaceflight and Aviation**	**Kent Tobiska, Space Environment Technologies**
11:20 AM - 11:25 AM	**Research**	**Scott McIntosh, NCAR**
11:25 AM - 11:45 AM	**Panel & Audience Discussion**	

SWW SWAG Panel

Emergency Management (Seth)

Intro slide, 4 slides with 4 findings and 9 recs

STM/C (Delores)

Intro slide, 4 slides with 4 findings and 9 recs

Electric Power (Mark)

Intro slide, 2 slides with 2 findings and 7 recs

Human Space Flight (Kent)

Intro slide

Aviation (Kent)

Intro slide, 4 slides with 4 findings and 10 recs

Research (Scott)

Intro slide, 4 slides with 4 findings and 8 recs

BREAK
11:25 - 11:45 am ET

Public Comments
11:45 - 12:00 pm ET

Next Steps

- Finish SWW slides
- Enjoy SWW
- Happy hour at SWW - Tuesday

- Continue editing chapter text. This will require chapter zoom meetings.
- Continue refining findings and recommendations (perhaps minor changes as we write the chapters)
- Develop sidebars/text boxes and figures with STPI help
- Title - any ideas
- Official roll out of full report summer 2024

Closing Remarks

Adjourn