Space Weather Advisory Group Meeting 2

March 17-18, 2022
10:00 AM – 2:00 PM EST

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 SWORM Interagency Working Group

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

- 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

Welcoming Remarks from the Chair

Recap of Meeting 1

- Introductions and discussion of our charter
- Briefing from the SWORM Co-chairs
- Briefing and discussion on the Abt Associates Report - Customer Needs and Requirements for Space Weather Products and Services
- Discussion on how we might proceed with user needs survey
  - Potential sectors
  - Potential survey methods
- Public comment session

Agenda Day 1

- Welcome and Recap of Meeting 1
- User Survey Discussion - Process
- User Survey Discussion – Questions
- User Survey Discussion – Sectors

  BREAK 12:00 - 12:30
- Update from SWORM
- Committee Discussion
- Closing Remarks
- Adjourn Day 1

Agenda Day 2

- Welcome and Recap of Day 1
- User Survey Discussion – Scenario
- User Survey Discussion – Timing and Next Steps
- Public Comments

  BREAK 12:00 - 12:30
- Related Activities
- Committee Brainstorming Roundtable
- Closing Remarks
- Adjourn Day 2

Committee Welcome

SWAG Nongovernmental End-User Representatives

Tamara Dickinson, SWAG Chair
Science Matters Consulting

Mark Olson
North American Electric Reliability Corporation

Michael Stills
United Airlines (retired)

Craig Fugate
One Concern

Rebecca Bishop
Aerospace Corp.

SWAG Commercial Sector Representatives

Jennifer Gannon
Computational Physics, Inc.

Conrad Lautenbacher
GeoOptics, Inc.

Seth Jonas
Lockheed Martin

Kent Tobiska
Space Environment Technologies

Nicole Duncan
Ball Aerospace

SWAG Academic Community Representatives

Tamas Gombosi
University of Michigan, Ann Arbor

Delores Knipp
University of Colorado, Boulder

Scott McIntosh
National Centers for Atmospheric Research

Heather Elliott
Southwest Research Institute

George Ho
Johns Hopkins University Applied Physics Laboratory

User Survey Discussion Process

PROSWIFT Act - User Survey

In general:

The SWAG shall conduct a comprehensive survey of the needs of users of space weather products to identify:

- space weather research,
- observations,
- forecasting,
- prediction, and
- modeling advances required to improve space weather products.

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.

Process Overview

Based on one-on-one discussions with SWAG members

- Use one or more space weather scenarios to illustrate possible impacts
- Use a set of common questions developed by SWAG in collaboration with NWS Social, Behavioral, and Economic Program
  - May have additional sector specific questions
  - Have questions reviewed by SWORM
- Define space weather sectors
  - Divide SWAG into sector specific subgroups
  - Possibly do pilot on one or two sectors
- Develop sector specific plans to conduct user survey
- Assimilate results into one or more products

SWORM Input Requested

- Provided this basic concept to the SWORM for feedback
- Also asked SWORM for input on :
  - What type of user-needs survey would be most useful?
    - If not what I laid out, then what would SWORM suggest?
  - What sectors should be surveyed?
  - When would the results be most useful?
  - How would the SWAG user-needs survey complement or build upon other work, completed or underway?
    - For example Abt Associates report and NOAA OPPA user engagement activity

SWORM Input

SWAG question - Should space weather event scenarios be used? Should the survey consist of a common set of questions developed by SWAG members in collaboration with survey experts?

SWORM Response:

- Agree with the process proposed
- Suggest developing a core set of questions to ask each sector - build off of the questions used in the Abt Associates report
- Add additional tailored questions appropriate for different sectors, for example, the Emergency Management (EM) community appreciates a scenario type approach
- NOAA has scenarios that can be shared with the SWAG, this is also a good education opportunity for entrepreneurial/startups that are not aware of space weather impacts

SWORM Input

SWAG question - What sectors should be surveyed? Do a pilot user-needs survey for a sector or two before rolling it out to more sectors? Should only high priority or under-surveyed sectors be addressed first in the survey?

SWORM Response:

- First focus on sectors not addressed in the recent Abt Associates report, particularly for Space Situational Awareness and National Security impacts—primary concern is effect on military installations and overall operations
- Then reassess the sectors addressed in the Abt Associates report - reaffirm and segment the sectors; identify any new scope or evolution in those sectors that need further evaluation.
- Call for comments by the public. Sectors may not be engaged that need to be.

SWORM Input

SWORM Response (continued):

- Next, make a list of the sectors that could be re-surveyed with additional scope or new sectors (e.g., space situational awareness, space commerce, national security) to be surveyed and allow the SWORM to prioritize these sectors. Could be prioritized by impact. Need to also understand the interrelationships of each sector (National Critical Functions).
- For the better known sectors, the SWAG can focus on determining if improved forecasting would aid in resilience and if the answer is yes then define how.
- As an alternative, could the SWAG survey be centered around the most recent major storms and identify what was impacted? There is a plan in place so that all power companies must be prepared to mitigate a 100-year storm by 2028.

SWORM Input

SWORM Response (continued):

- When conducting the survey, have SWAG engage with the various sectors during meetings, conferences, or via email to communicate the value of the survey for their sector.
- Entities we are most concerned with might not be engaged with the space weather enterprise or may not realize their vulnerabilities to space weather. How can we ask targeted questions? How do we interface with these less commonly known users? Can we utilize professional societies for outreach?
- Can leverage the DHS Critical Infrastructure Partnership Advisory Council for feedback on questions, etc.

SWORM Input

SWAG question - When would the results be most useful to the SWORM? Should the results be released sector by sector or when the report is finalized?

SWORM Response:

- Would appreciate the chance to review the results sector by sector.

SWORM Input

SWAG question - How would the SWAG user-needs survey complement or build upon other work, completed or underway now?

SWORM Response:

- The SWAG user-needs activity should identify any missing elements or changing needs from those assessed by the Abt Associates report, rather than duplicate the effort.

Process Overview

1. Use one or more s**pace weather scenarios** to illustrate possible impacts
2. Use a set of **common questions** developed by SWAG in collaboration with NWS Social, Behavioral, and Economic Program
   a. May have additional **sector specific questions**
   b. Have questions reviewed by SWORM
3. **Define space weather sectors**
   a. **Divide SWAG into sector specific subgroups**
   b. Possibly do pilot on one or two sectors
4. **Develop sector specific plans to conduct user survey**
5. Assimilate results into o**ne or more products**

Process Overview - EDIT

1. Use one or more s**pace weather scenarios** to illustrate possible impacts
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User Survey Discussion
Common Set of Questions

Question Development

- We need to build a common set of questions that we will all use during our survey process so we can make comparisons across sectors.
- May also need sector specific questions.
- How many questions is enough?
- We could pull from Abt Associates report
  - Build on them
  - Add others
  - Start a new.

The Paperwork Reduction Act (PRA)

1. What is PRA?
2. Who is subject to PRA?
3. Why should the PRA process be followed?
4. How does the process work?
5. How long does the process take?

WHAT: is the Paperwork Reduction Act?

- The Paperwork Reduction Act (PRA) was enacted to minimize the paperwork burden for individuals; small businesses; educational and nonprofit institutions; Federal contractors; State, local and tribal governments; and other persons resulting from the collection of information by or for the federal government

- The Office of Management and Budget (OMB) oversees PRA and approves all information collection requests

WHO: is subject to the PRA?

Any **Information Collection Request (ICR)** that:

- **obtains, solicits, or requires disclosure of facts or opinions by ten or more persons in a year**
- Both **voluntary** and **mandatory** collections are included
- Data collections conducted under **cooperative agreements or Federal contracts** are included
- Data collections conducted under **grants are included if the collection is conducted at the request of the agency** or is part of the terms and conditions of the grant
- Data collections from **Federal employees outside their duties are included***

WHY: should the PRA process be followed?

- **Minimize the paperwork burden** on the public and other entities
- Ensure the greatest possible public benefit from and **maximize the utility of information** created, collected, maintained, used, shared, and disseminated by or for the Federal Government.
- **Improve the quality and use of Federal information** to strengthen decision making, accountability, and openness in Government and society.
- **Minimize the cost to the Federal Government** of creating, collecting, maintaining, using, disseminating, and disposing of information.
- **Ensure the integrity, quality, and utility** of the Federal statistical system.

HOW: does the PRA process work?

The PRA requires agencies to go through public notice and comment and receive approval from OMB before information is collected.

Requirement: 60 day notice in the Federal Register, consultation with members of the public and affected agencies and provide all of the above to OMB and facilitate second public review period (30 days):

HOW: long does the process take?

- Short answer - IT DEPENDS
- Depends on collection type:
  - New Collection Request - Full Review
  - Generic Clearance - Abridged Review
- An average of: **4 to 6 months**
- ICR given an OMB Control number
- Clearance good for 3 years

Survey Development Basics

1. Factors to Consider
2. Tips for Constructing the Questionnaire
3. Bad vs. Good Survey Questions

Factors to Consider

- Define a clear goal
  - Avoid unnecessary or insignificant questions
- The delivery method
  - Web, Telephone, Face-to-Face Interview
- Sample Size
  - Prioritize representation over large sample size

Tips for Constructing the Questionnaire

- Length
  - Depends on question types
  - Shorter = better response rates
  - 20 to 25 questions in 10 minutes
- Use questions that allows for comparisons year to year

Tips for Constructing the Questionnaire

- Keep the wording simple
- Put the more important questions closer to the front
- Follow a logical and sequential order
- Pay attention to question format
  - Closed-ended (pick from these choices) vs Open-ended (write words)
- Test it!

Bad vs Good Survey Questions

Bad Question	Reason	**Revised (Good) Question**
How awesome is the space weather forecasting product?	Leading Question	How would you rate the forecasting product?
How often do you exercise twice a day?	Assumes respondent's habits or perceptions	Do you exercise? If yes, then ask how often do you exercise twice a day?
Was the information easy to find and did you use it?	Double-barreled question	The website made it easy for me to find the product + I used the information
The product helped you meet your OKRs	What are Objectives and Key Results (OKRs)	The product helped you meet your goals

Bad vs Good Survey Questions

Bad Question	Reason	**Revised (Good) Question**
The website isn’t easy to use unless I use the search bar.	Double negative	The website made it easy for me to find what I was needed.
How many times do you check your email in a day? A. 0-1 time | B. 1-2 times | C. 2-3 times | D. More than 3 times	Overlapping answer options	A. None | B. Once | C. Twice | D. 3 or More times

Resources

- Introduction to Survey Design and Delivery
- OMB Questions and Answers When Designing Surveys for Information Collections
- NWS Social Science How to Conduct a Survey

- Abt Associates: Final Report Customer Needs and Requests for Space Weather Products and Services (March 2019)
- Abt Associates: Space Weather User Needs Presentation (March 2019)

User Survey Discussion

Sectors

User Survey Discussion - Sectors

- Started this discussion at Meeting 1
- Need a manageable number of sectors (~5)
- Review and assess the survey not less than every 3 years and update, resubmit, and republish the survey
  - Build upon our results next time

DHS Critical Infrastructure Sectors

- Chemical Sector
- Commercial Facilities Sector
- Communications Sector
- Critical Manufacturing Sector
- Dams Sector
- Defense Industrial Base Sector
- Emergency Services Sector
- Energy Sector
- Financial Services Sector
- Food and Agriculture Sector
- Government Facilities Sector
- Healthcare and Public Health Sector
- Information Technology Sector
- Nuclear Reactor, Materials, and Waste Sector
- Transportation Systems Sector
- Water and Wastewater Systems Sector

Proposed Sectors Meeting 1

- Electric Power Grid
- Satellite
- Global Navigation Satellite System
- Aviation
- Emergency Management
- SSA/STC
- Radio Frequency Application (comms and Radar)
- Human space flight
- National Security
- Research

Proposed Sectors Discussion

- Electric Power Grid
- Satellite
- Global Navigation Satellite System
- Aviation
- Emergency Management
- Space Situational Awareness/Space Traffic Coordination
- Radio Frequency Application (comms and Radar)
- Human space flight
- National Security
- Research

Proposed Sectors and Leads

- Electric Power Grid – Olson, Gannon, Jonas
- Satellite – Duncan, Knipp, Lautenbacher
- Global Navigation Satellite System – Bishop, Gombosi, Stills, Jonas
- Aviation – Stills, Tobiska
- Emergency Management – Fugate, Jonas
- SSA/STC - Knipp, Bishop, Duncan, Tobiska, McIntosh
- Radio Frequency Application (comms and Radar) - Bishop, Fugate, Stills
- Human space flight – Tobiska, Ho, Gannon
- National Security – Jonas, Ho, Gannon, Elliott
- Research – McIntosh, Knipp, Gombosi, Elliott

BREAK

12:15 - 1:00pm ET

Office of Science and Technology Policy

National Science and Technology Council

Space Weather Operations, Research, and Mitigation Subcommittee

Current SWORM Activities and Priorities for the Space Weather Advisory Group

17 March 2022

Dr. Jennifer Meehan, Executive Secretary

SWORM Structure

Office of Science and Technology Policy (OSTP)

National Science and Technology Council (NSTC)

Committee for Homeland and National Security (CHNS)

Space Weather Operations, Research, and Mitigation (SWORM) Subcommittee

Co-Chairs

OSTP, Assistant Director of Space Policy

NOAA, Assistant Administrator for Weather Services

DHS, Director, National Risk Management Center

Objective 1

Enhance the Protection of National Security, Homeland Security, and Commercial Assets and Operations against the Effects of Space Weather

Co-leads
DOD & DHS

Objective II

Develop and Disseminate Accurate and Timely Space Weather Characterization and Forecasts

Co-leads
DOC & NASA

Objective III

Establish Plans and Procedures for Responding to and Recovering from Space Weather Events

Co-leads
DHS & DOC

SWORM Activities

2014 - 2016: White House charters the SWORM

- Coordinates executive branch actions to improve the understanding and prediction of and preparation for space weather phenomena
- 34 Departments, Agencies, and Offices
- Executive Order 13744, Coordinating Efforts to Prepare the Nation for Space Weather Events

2019: White House releases updated Strategy and Action Plan and

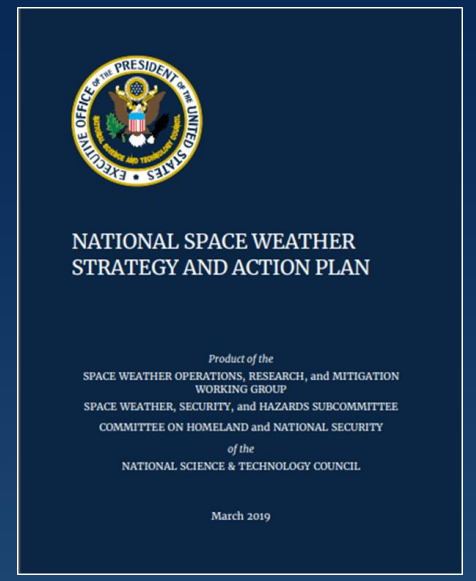
- Executive Order 13865, Coordinating National Resilience to Electromagnetic Pulses

2020: PROSWIFT Act codified the SWORM into law

- Directs NOAA to stand up the Space Weather Advisory Group to advise the SWORM

The 2019 Strategy and Action Plan seeks to achieve three objectives to enhance the Nation's resilience to space weather:

- Objective 1: Enhancing the protection of national security, homeland security, and commercial assets and operations against the effects of space weather
- Objective 2: Developing and disseminating accurate and timely space weather characterization and forecasts
- Objective 3: Establishing plans and procedures for responding to and recovering from space weather events.



There are 88 actions in the Implementation Plan that support the 24 high-levels actions in the Strategy and Action Plan

SWORM Priorities

- R2O2R framework for space weather forecasting
- Space weather events benchmarks;
- U.S. space weather scales
- Space weather hazard mapping of the United States
- Observations and forecasting support for human spaceflight
- Space weather observations and modeling to improve space traffic coordination and space situational awareness

SWORM Priorities

- Space weather observations and modeling necessary to maintain safe operations for aviation
- Response, recovery, and operations plans and procedures for space weather events across sectors and stakeholders
- Continuity of an operational satellite mission that provides coronagraph, solar wind, energetic particles, and other measurements essential to space-weather forecasting along the sun-Earth line, and seek novel space-based observations to further enhance forecasting.

Committee Discussion

Closing Remarks

Adjourned

Thank you!

Space Weather Advisory Group Meeting 2

March 17-18, 2022
10:00 AM – 2:00 PM EST

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Welcome!

Committee Roll Call

SWAG Nongovernmental End-User Representatives

Tamara Dickinson, SWAG Chair
Science Matters Consulting

Mark Olson
North American Electric Reliability Corporation

Michael Stills
United Airlines (retired)

Craig Fugate
One Concern

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Kent Tobiska
Space Environment Technologies

Nicole Duncan
Ball Aerospace

SWAG Academic Community Representatives

Tamas Gombosi
University of Michigan, Ann Arbor

Delores Knipp
University of Colorado, Boulder

Scott McIntosh
National Centers for Atmospheric Research

Heather Elliott
Southwest Research Institute

George Ho
Johns Hopkins University Applied Physics Laboratory

Recap of Day 1

- Agreed on overarching survey process
- Discussed how to develop the common set of questions
- Discussed and agreed on what sectors we should survey
- Received an update from the SWORM on their activities and priorities for this year

Process Overview

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2. Use a set of **common questions** developed by SWAG in collaboration with NWS Social, Behavioral, and Economic Program
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   b. Have questions reviewed by SWORM
3. **Define space weather sectors**
   a. D**ivide SWAG into sector specific subgroups**
   b. Possibly do pilot on one or two sectors
4. **Develop sector specific plans to conduct user survey**
5. Assimilate results into o**ne or more products**

Proposed Sectors and Leads

- Electric Power Grid – Olson, Gannon, Jonas
- Satellite – Duncan, Knipp, Lautenbacher
- Global Navigation Satellite System – Bishop, Gombosi, Stills, Jonas
- Aviation – Stills, Tobiska
- Emergency Management – Fugate, Jonas
- SSA/STC - Knipp, Bishop, Duncan, Tobiska, McIntosh
- Radio Frequency Application (comms and Radar) - Bishop, Fugate, Stills
- Human space flight – Tobiska, Ho, Gannon
- National Security – Jonas, Ho, Gannon, Elliott
- Research – McIntosh, Knipp, Gombosi, Elliott

Agenda Day 2

- Welcome and Recap of Day 1
- User Survey Discussion – Scenario
- User Survey Discussion – Timing and Next Steps
- Public Comments

  BREAK 12:00 - 12:30
- Related Activities
- Committee Brainstorming Roundtable
- Closing Remarks
- Adjourn Day 2

User Survey Discussion Scenario

User Survey Discussion - Scenario

- Basing the survey on one or more scenarios allows us to provide some background on space weather and in particular on the potential impacts of a storm
- Bill Murtagh (NOAA SWPC) will brief us on a scenario used for a space weather exercise prepared by the FEMA Exercise Division and their counterparts in Europe.
- Does this scenario meet our needs?
  - If not, what changes are needed?

User Survey Discussion - Scenario
R5 Solar Flare Radio Blackout

An large, magnetically complex sunspot cluster emerged on Feb 19-20, producing several major solar flares occurred on February 20-23.

On February 24, the strongest of these flares erupted, a powerful R5 on the NOAA Space Weather Scales (largest solar flare in space era).

- Widespread communication problems began in association with the flare
- High frequency (HF) communications were completely disrupted across North America, and satellite communications were also significantly degraded
- Air traffic radar systems were disrupted with numerous false targets, and significant interference was reported. Widespread loss of Global Positioning System (GPS) services was reported, with several aircraft reporting losing lock on GPS.
- The DoD reported significant impacts on classified and unclassified systems. Critical Over the Horizon (OTH) radar systems were significantly degraded.

These impacts lasted from tens of minutes to several hours.

S5 Radiation Storm

Within three hours of the flare, radiation storm levels exceeded the severe S4 level, and were rising fast.

A powerful and fast, Earth-directed coronal mass ejection (CME) was observed soon after the flare and is expected to impact Earth in approximately 20 hours.

Ten hours after the flare erupted, radiation storm levels crossed the extreme S5 level.

- Numerous satellite anomalies were experienced by many satellite agencies. Disruptions were reported in many industry sectors including banking, telecommunications, and aviation. Television coverage and satellite phone connections were lost, and credit card transactions were impossible in some areas for several hours.
- Numerous airlines rerouted flights away from Poles. Misleading information led to great confusion cross the aviation community, both with passengers and airline crew, resulting in flight delays and cancellations.

G5 Geomagnetic Storm

An intense geomagnetic storm began on February 25 during a particularly cold outbreak in the Northeastern U.S. and Northern Europe. Impacts were immediate and widespread.

- Significant electric power grid problems occurred. The intense magnetic storm generated currents that tripped several static compensators in numerous substations in New England.
- Within 15 minutes, power disruptions were reported in large parts of New England, New York, and parts of the Great Lakes region. Within 30 minutes, the Canadian Government reported power outages in large parts of the provinces of Quebec and Ontario. Within one hour, the outage cascaded in the central Atlantic Coast region through the Tennessee and Ohio Valley.

G5 Geomagnetic Storm (cont)

- Power stations reported numerous generator step-up transformers and transmission transformers out of commission, with projected repairs taking weeks to months. This raised immediate concern of a critical infrastructure collapse with loss of water distribution, sewage disposal, hospital care, phone service, fuel resupply, and more.
- Satellite outages were reported on several communication satellites. Cell phones experienced significant service disruptions as cellular transmission towers were without power or overloaded with the sudden increase in the volume of calls. Significant impacts to GPS-based applications occurred with large positional errors and loss-of-lock problems reported in many regions across the U.S.
- Most of the interstate rail transport North-East Corridor service was interrupted as both the power outage and the geomagnetically induced currents wreaked havoc on railway operations.

User Survey Discussion

Timing and Next Steps

Timing and Next Steps

- Developing the common set of questions?
- Sectors in Abt Associates report
- Additional sectors

Timing and Next Steps

- Developing the common set of questions?
  - Sector leads work with Jinni, Jenn, Val and me
  - Done by mid-May
  - Reviewed by SWORM
  - Brief SWAG at late May meeting

Timing and Next Steps

- Sectors in Abt Associates report
  - Review the report
  - Identify any gaps or sub sectors that need additional work
  - Develop any sector specific questions that might be needed
  - Start to develop the process to do the survey in each sector
  - Brief SWAG at late May meeting

Timing and Next Steps

- Additional sectors
  - Sector groups define what is in the sector
    - Decide what part(s) of the sector you want to focus on
  - Develop any sector specific questions that might be needed
  - Start to develop process to do survey in each sector
  - Brief SWAG at late May meeting

Timing and Next Steps

May 19-20, 2022 meeting

- Presentation, discussion and concurrence on common set of questions and any sector specific questions
- Abt Associates report sector leads brief SWAG on any gaps identified and how to fill those gaps
- Additional-sector leads brief SWAG on what will be included in sector for this survey
  - Thoughts on how to conduct the user survey

Timing and Next Steps

- March 17-18
  - SWAG meeting #2
- April 1
  - Abt Associate sector gaps identified
  - Other sectors defined (what part of the sector to focus on)
  - Spew draft of common set of questions

Timing and Next Steps

- April 15
  - Common set of questions refined to a “reasonable” number
  - Draft of sector specific questions (Abt sectors)
  - Draft of sector specific questions (new sectors)

Timing and Next Steps

- April 29
  - Continued refinement of common set of questions
  - Continued refinement of sector specific questions (Abt sectors)
  - Continued refinement of sector specific questions (new sectors)
  - Draft of process to conduct the survey for all sectors

Timing and Next Steps

- May 6
  - Submit documents to SWORM for review and comment
    - Common set of questions
    - Sector specific questions
    - Plan to conduct Atb and new sectors

Timing and Next Steps

- Jinni has provided share space on the SWAG share drive for each sector subgroup
- Subgroups can work via virtual meetings or all electronically or …
- Keep Jinni and I in the loop so we can help as needed
- Jinni and I are happy to join as many meetings as possible.
  - Val will join as she can. But we can reach out to her and Jenn if we have questions etc.

Stretch Break!

11:30 - 11:45 pm ET

Public Remarks

BREAK

12:00 - 12:30 pm ET

Related Activities

Related Activities

- National Academies of Science, Engineering, and Medicine Space Studies Board
  - National Academies Space Weather Roundtable (https://www.nationalacademies.org/our-work/space-weather-roundtable)
  - Heliophysics Decadal Survey
  - Committee on Solar and Space Physics

NASA

  - Space Weather Council of the Heliophysics Advisory Committee

The National Academies Space Weather Roundtable

(and a few words about decadal surveys and the committee on solar and space physics)

Art Charo, Ph.D.
Senior Program Office, Space Studies Board
The National Academies of Sciences, Engineering, and Medicine

Update to SWAG, March 18, 2022

https://www.nationalacademies.org/our-work/space-weather-roundtable

The National Academies of SCIENCES ENGINEERING MEDICINE

PUBLIC LAW 116-181—OCT. 21, 2020: PROMOTING RESEARCH AND OBSERVATIONS OF SPACE WEATHER TO IMPROVE THE FORECASTING OF TOMORROW ACT (PROSWIFT ACT)

- Assigns roles and responsibilities to agencies involved in space weather research and forecasting and ensures coordination within the government to better predict severe space weather events and mitigate their impact.
- It also calls for coordination between the government and the non-governmental space weather community including academia, the commercial sector, and international partners.

Sec. 60606. Space weather knowledge transfer and information

…the Administrator of NOAA, in collaboration with the Administrator of NASA and the Director of the NSF, shall enter into an arrangement with the National Academies.. to establish a Space Weather Government-Academic-Commercial Roundtable to facilitate communication and knowledge transfer among Government participants in the space weather interagency working group [NOAA, NASA, NSF, DoD, DOI, others per OSTP], the academic community, and the commercial space weather sector to:

1. facilitate advances in space weather prediction and forecasting;
2. increase coordination of space weather research to operations and operations to research; and
3. improve preparedness for potential space weather phenomena.

Statement of Task

The National Academies … will establish the Space Weather Roundtable (referred to in Public Law No. 116-181 as the "Government-University-Commercial Roundtable on Space Weather") to facilitate communication and knowledge transfer among Government participants in the Space Weather Operations, Research, and Mitigation (SWORM) Interagency Working Group, the academic community, and the commercial space weather sector. The Space Weather Roundtable will discuss activities that will facilitate advances in space weather forecasting; increase coordination of space weather research-to-operations and operations-to-research; and improve preparedness for space weather events.

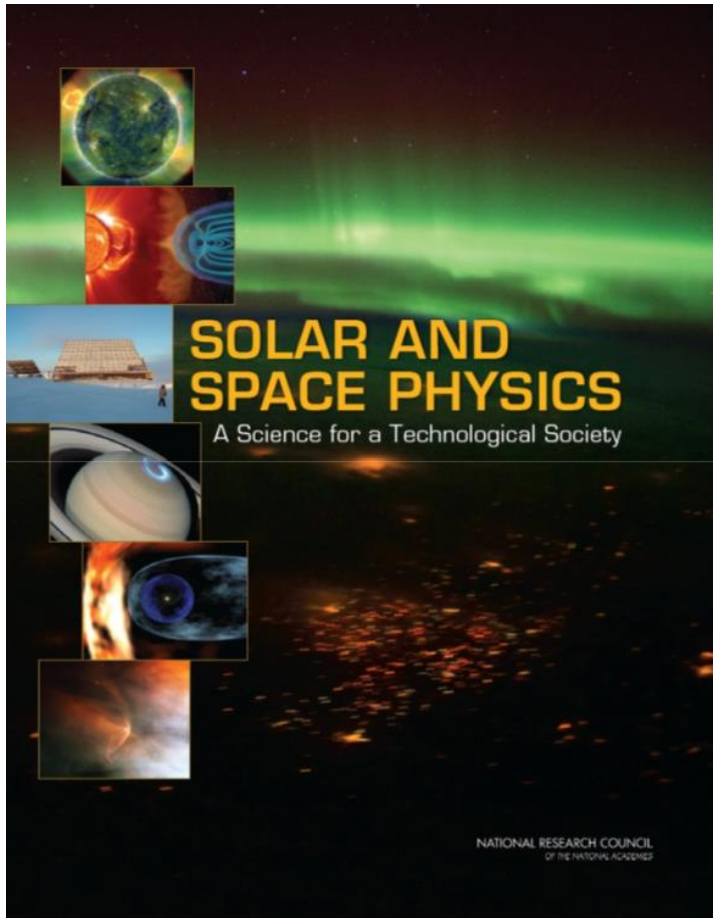
Space Weather Roundtable meetings will engage experts and stakeholders across disciplines and sectors, with a focus initially on those issues identified in the National Space Weather Strategy and Action Plan and the Promoting Research and Observations of Space Weather to Improve the Forecasting of Tomorrow Act that would benefit from greater engagement. Examples include space weather benchmarks and scales, communication of risk, steps to improve research to operations and operations to research pathways, commercial space weather data buys, and resilience to severe space weather events.

Committee Composition

The Space Weather Roundtable will be comprised of approximately 15 members appointed by the National Academies and drawn from the government, public, and private sectors. Membership may include subject matter experts; representatives from industries affected by space weather; government and other entities charged with forecasting space weather; representatives from the emergency response community; and experts on the social and economic impacts of space weather. In addition, each of the sponsors--NOAA, NASA, and NSF--will be invited to designate a federal representative as an ex-officio member. Collectively, the Space Weather Roundtable will have expertise across the scientific and policy domains relevant to the space weather enterprise.

National Academies Decadal Surveys

- Broad **community outreach** for ideas and input via white papers and community-based presentations.
- Careful selection of members having requisite **scientific, technical, and policy expertise.**
- Work done **independently** of outside influence.
- Assess the **current status of an entire scientific discipline**, including the state of the profession and health of the enterprise.
- Defines and **prioritizes the key scientific questions** to be addressed in the next decade and **develops a strategy** to address these priorities.
- Provides **actionable recommendations** to the funding agencies about activities.



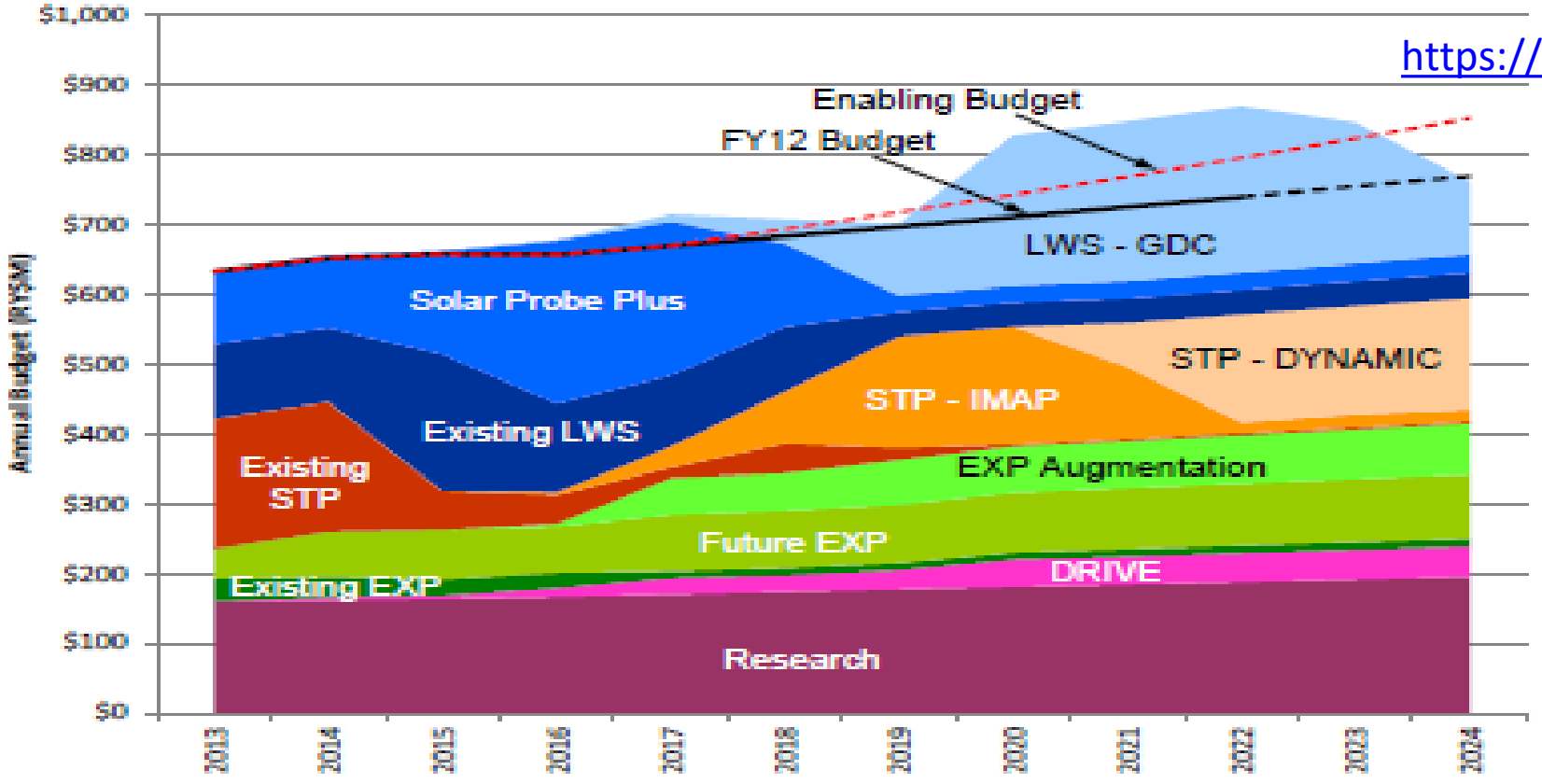
Decadal surveys advise government and other stakeholders on how to optimize the scientific return on national investments--facilitates planning, coordination, advocacy, and outreach.

The National Academies of SCIENCES ENGINEERING MEDICINE

Solar and Space Physics: A Science for a Technological Society (2013)

- **Presented a prioritized program of basic and applied research for 2013-2022** to advance scientific understanding of the Sun, Sun-Earth connections and the origins of space weather, and the Sun's interactions with other bodies in the solar system.
- **Recommendations directed to the study sponsors and other federal agencies**, esp. NOAA, which is responsible for the operational forecast of space weather. For NASA, includes the cost and phasing of the recommended program.

https://tinyurl.com/kqsvgm



Committee on Solar and Space Physics

- A standing discipline committee of the Space Studies Board
- Provides an independent, authoritative forum for identifying and discussing issues in solar and space physics with the research community, the federal government, and the interested public.
- Advice to the federal government on the implementation of decadal survey recommendations.
- Except in limited circumstances, does not write reports, but can help organize ad hoc studies, workshops or “meetings of experts.”

The National Academies of SCIENCES ENGINEERING MEDICINE

Overview of NASA'S Space Weather Council

Dr. Jim Spann
HPD Space Weather Lead
Space Weather Advisory Group
March 18, 2022

- The Space Weather Council (SWC) was established as a means to secure the counsel of community experts across diverse areas on matters relevant to space weather in support of the NASA Heliophysics Division (HPD).
  - The SWC serves as a community-based, interdisciplinary forum for soliciting and coordinating community analysis and input and providing advice.
  - It provides advice to the Heliophysics Advisory Committee (HPAC).
- The SWC is a standing subcommittee of the HPAC. As such, the SWC reports to and is responsive to actions levied by the HPAC.
  - As appropriate, the SWC may seek scientific and programmatic input from the heliophysics and space weather communities at large on matters relevant to their actions.

Space Weather Council Members

Ms Patricia Doherty
Boston College

Dr Daniel Baker
CU/LASP

Dr Michele Cash
NOAA/SWPC

Dr Angelos Vourlidas
JHU/APL

Dr Janet Green
Space Hazards Inc

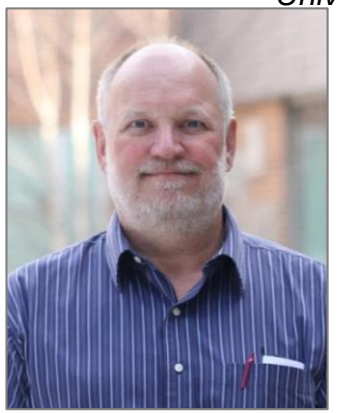
Dr Valeriy Tenishev
University of Michigan

Dr Alexa Halford
NASA/GSFC

Dr Piyush Mehta
West Virginia University

Dr Ronald Turner
ANSER

Ms Sage Andorka
USSF



Dr Joachim Raeder
UNH

Dr Paul O'Brien
Aerospace Corp.

Committee Brainstorming

From PROSWIFT Act

- The advisory group shall advise the SWORM on the following:
  - Facilitating advances in the space weather enterprise of the United States.
  - Improving the ability of the US to prepare for, mitigate, respond to, and recover from space weather phenomena.
  - Enabling the coordination and facilitation of research to operations and operations to research.
  - Developing and implementing the integrated strategy.
    - The Director of OSTP, in collaboration with the SWORM and upon the advice of the SWAG, shall develop a strategy for coordinated observation of space weather among members of the SWORM

SWAG Brainstorming

- Space Weather Satellite Mission concepts
- Strong Voice for observations and forecasting
- Expert review of SWORM products
- Benchmarks
- Space Weather Scales
- Resilience and preparedness
- What is role of commercial sector?
- Build constituency base
- Data output format and curation
- Space traffic coordination

SWAG Brainstorming

- Benchmark related - important sector thresholds
- Best approach for useful information gathering
- Wild west factor - close the gap between government/commercial planning
- Education for sectors - baseline education and a platform to push it out (start with aviation). Also EM community.
- Recommendations for international partnerships
- Security and availability of data for R2O2R
- All clear notification after an event has past (or forecasted)
- Make archived forecasts available for model validation
- Create flow chart for each sector that identifies communication lines from end-user, technology engineers, etc. to SWPC and what sort of info is required at each level. This may be a good way to focus/summarize the survey results as well.

SWORM Input on Potential SWAG Activities

- DOD, including Space Force, and National Security interests should be considered in the SWAG effort
- The SWAG should focus on trying to understand what are the operational requirements that are being hindered by the lack of research and development. If we could utilize the SWAG to bridge that gap and identify that information, we could then use that information to turn to the appropriate agencies and identify who should do the R&D.
- The SWAG should communicate and coordinate space weather priorities with the National Academy's Solar and Space Physics Decadal Survey.

SWORM Input on Potential SWAG Activities

- Advice on new elements and or new emphases on National Space Weather Strategy and Action Plan, whether at beginning, during, and/or end.
- SWAG could independently articulate the value of space weather services and efforts to national security, economic vitality, and STEM advancements - supports American leadership in space initiative.
- SWAG could illustrate various scenarios of space weather impacts and issues - both for extreme events and everyday impacts over time.

Closing Remarks

Adjourned

Thank you!

Back up slides

DHS Critical Infrastructure Sectors

Chemical Sector

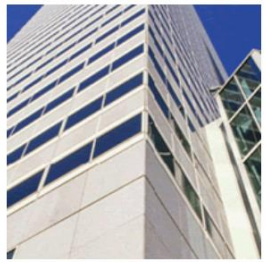
The Department of Homeland Security is designated as the Sector Risk Management Agency for the Chemical Sector.

Communications Sector

The Communications Sector is an integral component of the U.S. economy, underlying the operations of all businesses, public safety organizations, and government. The Department of Homeland Security is the Sector Risk Management Agency for the Communications Sector.

Energy Sector

The U.S. energy infrastructure fuels the economy of the 21st century. The Department of Energy is the Sector Risk Management Agency for the Energy Sector.



Commercial Facilities Sector

The Department of Homeland Security is designated as the Sector Risk Management Agency for the Commercial Facilities Sector, which includes a diverse range of sites that draw large crowds of people for shopping, business, entertainment, or lodging.

Critical Manufacturing Sector

The Department of Homeland Security is designated as the Sector Risk Management Agency for the Critical Manufacturing Sector.

Financial Services Sector

The Department of the Treasury is designated as the Sector Risk Management Agency for the Financial Services Sector.

DHS Critical Infrastructure Sectors

Dams Sector

The Department of Homeland Security is designated as the Sector Risk Management Agency for the Dams Sector. The Dams Sector comprises dam projects, navigation locks, levees, hurricane barriers, mine tailings impoundments, and other similar water retention and/or control facilities.

Emergency Services Sector

The Department of Homeland Security is designated as the Sector Risk Management Agency for the Emergency Services Sector. The sector provides a wide range of prevention, preparedness, response, and recovery services during both day-to-day operations and incident response.

Defense Industrial Base Sector

The U.S. Department of Defense is the Sector Risk Management Agency for the Defense Industrial Base Sector. The Defense Industrial Base Sector enables research, development, design, production, delivery, and maintenance of military weapons systems, subsystems, and components or parts to meet U.S. military requirements.

Food and Agriculture Sector

The Department of Agriculture and the Department of Health and Human Services are designated as the co-Sector-Risk Management Agencies for the Food and Agriculture Sector.

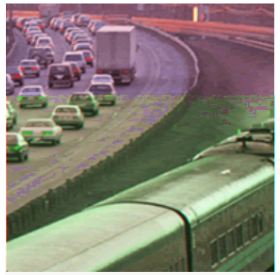
DHS Critical Infrastructure Sectors

Government Facilities Sector

The Department of Homeland Security and the General Services Administration are designated as the Co-Sector Risk Management Agencies for the Government Facilities Sector.

Information Technology Sector

The Department of Homeland Security is designated as the Sector Risk Management Agency for the Information Technology Sector.

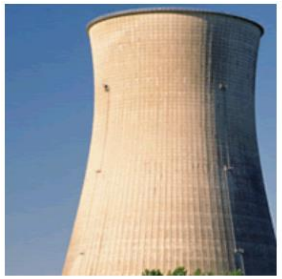


Transportation Systems Sector

The Department of Homeland Security and the Department of Transportation are designated as the Co-Sector-Specific Agencies for the Transportation Systems Sector.

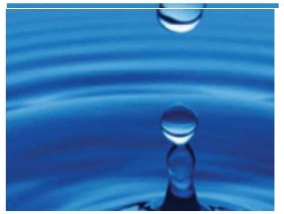
Healthcare and Public Health Sector

The Department of Health and Human Services is designated as the Sector Risk Management Agency for the Healthcare and Public Health Sector.



Nuclear Reactors, Materials, and Waste Sector

The Department of Homeland Security is designated as the Sector Risk Management Agency for the Nuclear Reactors, Materials, and Waste Sector.



Water and Wastewater Systems Sector

The Environmental Protection Agency is designated as the Sector Risk Management Agency for the Water and Wastewater Systems Sector.

Abt Associate Survey Questions

1. Identify technological components affected by space weather.
2. Describe steps already undertaken to reduce vulnerabilities.
3. Determine actions that could be taken to further reduce these vulnerabilities
4. Describe specific attributes of space weather information needed to further reduce these vulnerabilities
5. Describe potential improvements in how space weather information is communicated to increase its usability.
6. Describe desired format of space weather information.

Abt Associate Survey Questions

1. Identify technological components affected by space weather.
   - Review physical effects identified within each sector.
   - How have these vulnerabilities changed or how/why are they changing?
   - Rate of technology change and vulnerability assessment to inform the frequency that requirements should be reviewed.
2. Describe steps already undertaken to reduce vulnerabilities.
   - Industry preference for engineering vs. operational actions?
   - Relative effectiveness of engineering vs. operational actions?
   - Relations between engineering and operational actions?
   - Do current SWPC products and services support engineering vs. operational actions and how?

Abt Associate Survey Questions

3. Determine actions that could be taken to further reduce these vulnerabilities
   - What additional actions could be taken by these sectors? In both the short-term (within the next 1– 2 years) vs. longer term (within the next 5–10 years)?
   - What may be limiting the sector's ability to take these actions to reduce these vulnerabilities? Lack of education, lack of understanding, lack of resources?
4. Describe specific attributes of space weather information needed to further reduce these vulnerabilities.
   - Current products: Incremental improvements that you are working toward or have discussed needing to make? Importance of these incremental improvements?
   - New products that you are working on developing, a rough timeline for when they will be ready, what motivated their development, and what contributions they will make to reduce sector vulnerabilities?
   - Barriers to do your job well?
   - Lead time, cadence, and accuracy improvements of SWPC products that are needed?
   - New products needed and how they will be used?

Abt Associate Survey Questions

5. Describe potential improvements in how space weather information is communicated to increase its usability.
   - Feedback from stakeholders on current content, format, and/or delivery? Includes alerts, products, and overall website user experience.
   - How will improvements increase the number of SWPC customers and expand audience?
6. Describe desired format of space weather information.
   - What do engineers and operators within this sector need? Why?
   - Specific map or graphical products preferred over others?
   - Any “exemplar” products or services for users within this sector for addressing vulnerabilities, either those associated with space weather or other hazards

Space Weather Sectors

- Electric Power Grid
- Satellite
- Global Navigation Satellite System
- Aviation
- Emergency Management
- Human space flight
- National Security
- Research
- Space Situational Awareness