



# National Space Weather Coordination And Space Weather Operations, Research, and Mitigation (SWORM)

*Space Weather Operations  
and Research Infrastructure  
Workshop*

*June 16-17, 2020*

*NASEM Space Studies board  
Held Virtually*

*Michael Bonadonna Director, OFCM  
&  
Executive Secretary, SWORM*

*Office of the Federal Coordinator for Meteorology Services and Supporting Research*

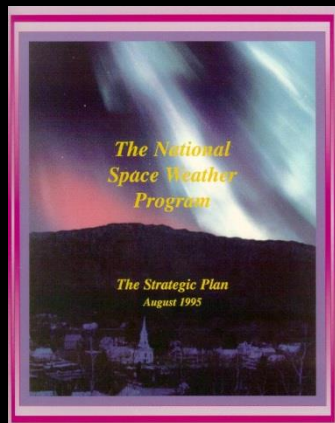
# Overview



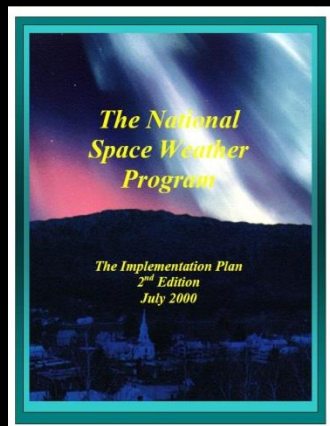
- **Historical Perspective**
- **Initial SWORM Activities and accomplishments**
- **Current SWORM plans and actions**

# National Space Weather Coordination

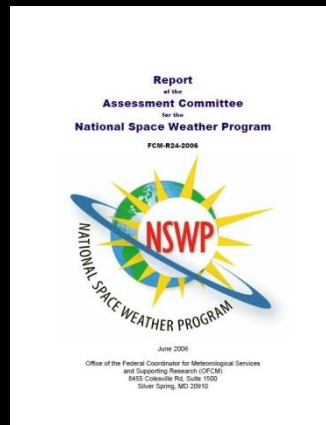
1995



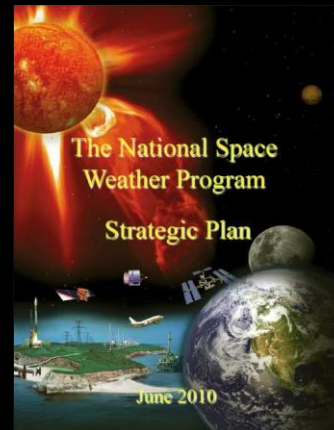
2000



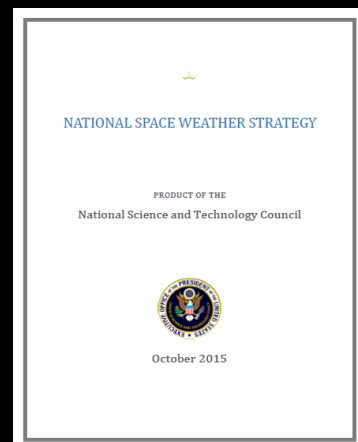
2006



2010



2015



NSTC National Space Weather Strategy & Action Plan

1995: National Space Weather Program Established

1998: Supported /Coordinated National Security Space Architect's Space Weather Architecture

1999: NSWP Established the Community Coordinated Modeling Center

2003: Space Environment Center closure averted

2007: 1<sup>st</sup> Annual Space Weather Enterprise Forum

2007-2011: Produced 5 Impact Studies for OSTP

2015: National Space Weather Policy elevated to White House

2015: DSCOVR launch  
2019: COSMIC-2 Launch





# National Security Space Architect (NSSA) Space Weather Architecture (1998)

NSSA provided 9 interagency approved recommendations and a detailed implementation plan

## Space Weather Architecture Vector

Space Weather Awareness

Space Weather Requirements

Coordinated Acquisition

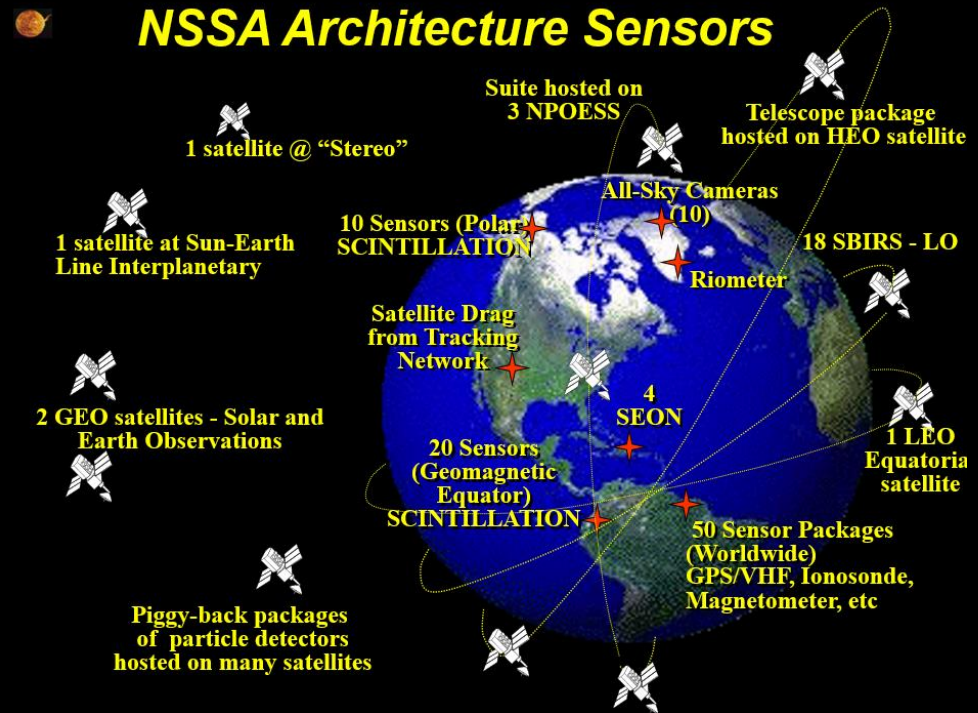
Space Weather Information Archive

Integrated User Information

National Space Weather Center

## R&D are Key to Space Weather Architecture

SWx and Man-Made Effects Information Coordination



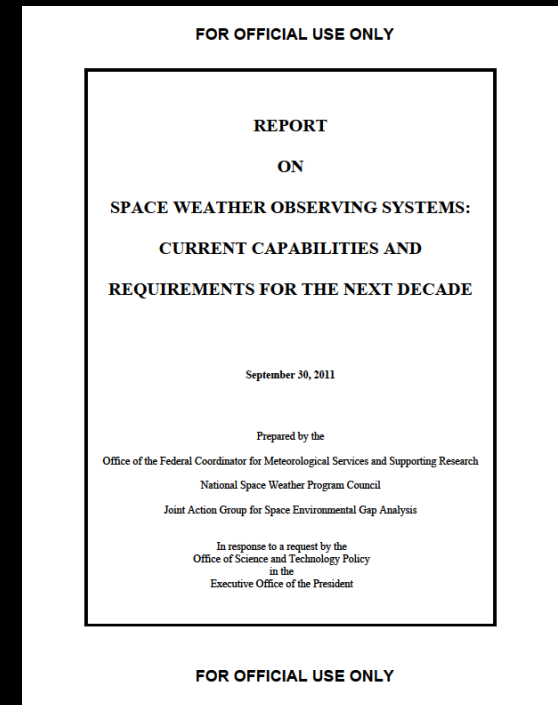
# NSWP Space Environmental Gap Analysis (SEGA) Reports

2011-2013: NSWP provided OSTP and Congress a series of 3 thorough, interagency-approved reports on:

- Current observing capabilities
- Projected needs through 2022
- System-Specific recommendations for improvement:

## Recommendation Areas:

1. Sustain Key Capabilities
2. Replace Aging Capabilities
3. Develop New and Improved Capabilities
4. Improve Data Exploitation
5. Conduct assessment on Space Weather Forecasting Capabilities



The SEGA Reports guided and helped justify many of the space weather observation systems we have today

# Overview



- Historical Perspective
- **Initial SWORM Activities and accomplishments**
- Current SWORM plans and actions

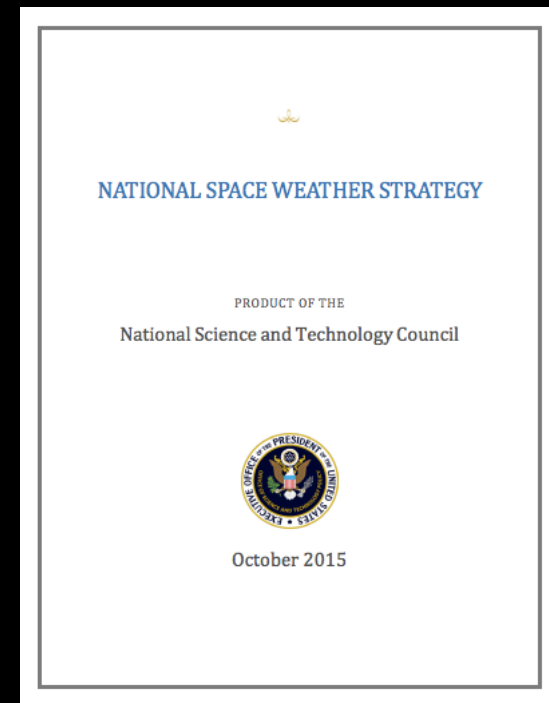
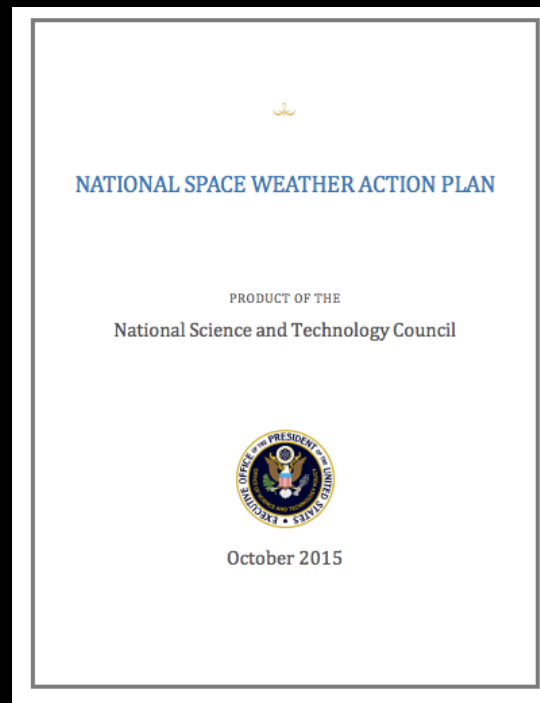
# SWORM Task Force Established

*A cohesive all-of-government strategy was necessary to ensure the federal government was positioned to mitigate, respond to and recover from a major space weather storm*

Nov 2014 – Space Weather Operations, Research, and Mitigation (SWORM) Task Force is established

Tasked to develop:

- National Space Weather Strategy
- Space Weather Action Plan



# National Space Weather Strategy Goals

---

1. Establish **Benchmarks** for Space-Weather Events
2. Enhance **Response and Recovery** Capabilities
3. Improve **Protection and Mitigation** Efforts
4. Improve Assessment, Modeling, and Prediction of **Impacts on Critical Infrastructure**
5. Improve Space-Weather Services through Advancing Understanding and Forecasting
6. Increase International Cooperation

Understand  
and prepare

Expand  
capabilities  
and service



# Space Weather Operations, Research and Mitigation Subcommittee

---

- The SWORM SC provides policy guidance and management support to execute the National Space Weather Strategy and Action plan
  - Six subordinate Working Groups
  - Working 107 Action Plan and Executive Order Actions
- The SWORM Subcommittee:
  - Chartered under the National Science and Technology Council
  - Moved to Committee for Homeland and National Security
  - Chaired by OSTP, NOAA, and DHS with members from 20 Departments / Agencies totaling over 70 participants (160+ including the Working groups)



# Actions on Observing Systems

---

**NSWAP Actions 5.3.n:** Sustainment and advancement of space weather observing systems

Status: 6 actions were completed , 3 actions on track

## **NSWAP Action 5.3.9**

DOC, in coordination with NASA, DOD, and NSF, will produce a plan for deployment of new operational space-weather-observing assets to provide the baseline measurements outlined above.

Status: Plan completed June 2018

**EO13744 Para 5d:** DoD, DOC, NASA, and the NSF, in collaboration with other agencies as appropriate, shall identify mechanisms for advancing space weather observations..." as an overarching executive directive.

Status: Ongoing function

# Research & Operations Synergy

---

“Federal and non-Federal partners must ensure that research is effectively transitioned to operational forecasting centers” *National Space Weather Strategy - Oct 2015*

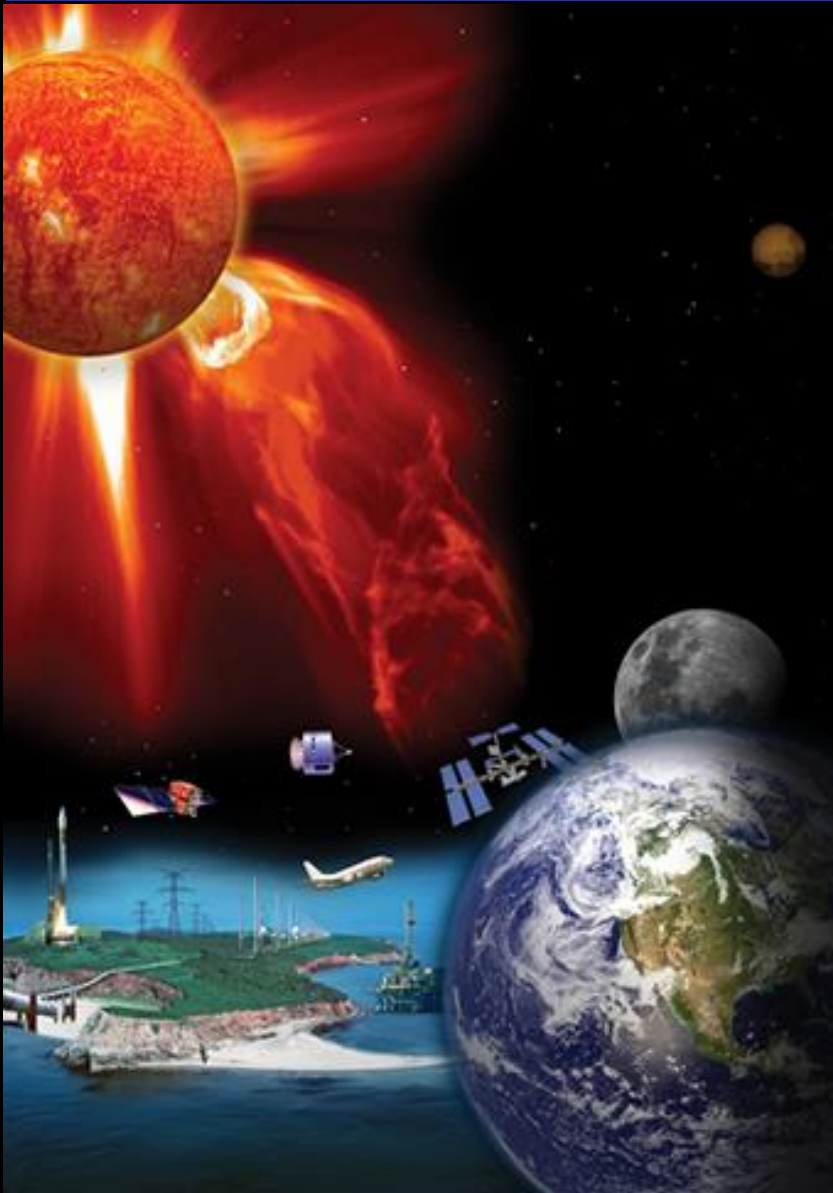
## Enhance existing capabilities

- Prioritize space weather research and operational requirements
- Define and implement a prototype O2R framework

## Expand Federal capabilities to establish the fundamental elements of R2O2R activities

- Establish community models
- Support research and development on operational models
- NOAA, NASA, and other federal agencies are working on a formal R2O2R framework to incorporate government, academia, private sector, and international contributions

# Overview



- Historical Perspective
- Initial SWORM Activities and accomplishments
- **Current SWORM plans and actions**



# 2018 Space Weather Strategy Review

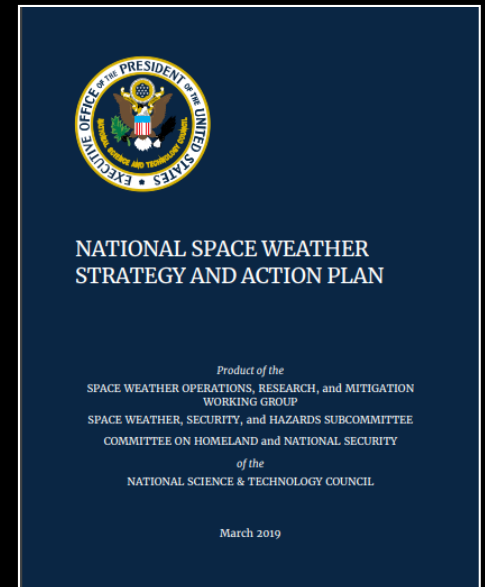
---

- 2015 strategy called for an update to the strategy and action plan at the three-year point
- With over 50% of the action plan complete, it was an appropriate time to do a scrub of the remaining actions
- While there were many successes in implementing actions from the 2015 action plan, we recognized that we can better define some of the remaining actions
- Changes since 2015 provide opportunity to align with new policy and priorities

# National Space Weather Strategy & Action Plan

The updated Strategy and *Action Plan* (2019) provided 3 Goals and 24 Objectives to enhance the Nation's situational awareness and resilience to space weather events:

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



# Summary

---

- The Federal space weather community has been developing space weather observing architectures and recognized the synergy between operations and research capabilities for over 25 years
- With advice from the National Academies and support from Congress the Federal agencies have brought many operational and research observing capabilities to fruition
- The SWORM continues and strengthens interagency coordination and cooperation to advance National Space Weather Capabilities

*Thank You!*

Slide credits to: OSTP, NOAA-SWPC, USAF A3W

# Backup Slides



# Congressional Direction

---

## NASA Authorization Act of 2010 (Sec. 809)

ACTION REQUIRED.—The Director of OSTP shall:

- (1) improve the Nation's ability to prepare, avoid, mitigate, respond to, and recover from potentially devastating impacts of space weather events;
- (2) coordinate the operational activities of the NSWP Council members
- (3) submit a report to the appropriate committees of Congress that details the current and future data sources, both space- and ground-based, that are necessary for space weather forecasting