

114TH CONGRESS
2D SESSION

S. 2817

To improve understanding and forecasting of space weather events, and for other purposes.

IN THE SENATE OF THE UNITED STATES

APRIL 19, 2016

Mr. PETERS introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

A BILL

To improve understanding and forecasting of space weather events, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Space Weather Re-
5 search and Forecasting Act”.

6 **SEC. 2. SPACE WEATHER.**

7 (a) IN GENERAL.—Subtitle VI of title 51, United
8 States Code, is amended by adding after chapter 605 the
9 following:

1 **“CHAPTER 607—SPACE WEATHER**

“60701. Space weather.

“60702. Observations and forecasting.

“60703. Research and technology.

“60704. Space weather data.

2 **“§ 60701. Space weather**

3 “(a) FINDINGS.—Congress makes the following find-
4 ings:

5 “(1) Space weather events pose a significant
6 threat to humans working in the space environment
7 and to modern technological systems.

8 “(2) The effects of severe space weather events
9 on the electric power grid, satellites and satellite
10 communications and information, airline operations,
11 astronauts living and working in space, and space-
12 based position, navigation, and timing systems could
13 have significant societal, economic, national security,
14 and health impacts.

15 “(3) Earth and space observations provide cru-
16 cial data necessary to predict and warn about space
17 weather events.

18 “(4) Clear roles and accountability of Federal
19 departments and agencies are critical for an efficient
20 and effective response to threats posed by space
21 weather.

22 “(5) In October 2015, the National Science and
23 Technology Council published a National Space

1 Weather Strategy and a National Space Weather
2 Action Plan seeking to integrate national space
3 weather efforts and add new capabilities to meet in-
4 creasing demand for space weather information.

5 “(b) NATIONAL SPACE WEATHER PROGRAM.—In
6 order to understand and respond to the adverse effects
7 of space weather, the National Space Weather Program
8 shall coordinate, collaborate, and leverage capabilities
9 across participating Federal agencies, including—

10 “(1) the National Oceanic and Atmospheric Ad-
11 ministration;

12 “(2) the National Aeronautics and Space Ad-
13 ministration;

14 “(3) the National Science Foundation;

15 “(4) the Department of Defense;

16 “(5) the Department of the Interior;

17 “(6) the Department of Homeland Security;

18 “(7) the Department of Energy;

19 “(8) the Department of Transportation; and

20 “(9) the Department of State.

21 “(c) FEDERAL AGENCY ROLES.—

22 “(1) FINDINGS.—Congress finds that—

23 “(A) the National Oceanic and Atmos-
24 pheric Administration provides operational
25 space weather forecasting and monitoring for

1 civil applications, maintains ground and space-
2 based assets to provide observations needed for
3 forecasting, prediction, and warnings, and de-
4 velops requirements for space weather fore-
5 casting technologies and science;

6 “(B) the Department of Defense provides
7 operational space weather forecasting, moni-
8 toring, and research for the department’s
9 unique missions and applications;

10 “(C) the National Aeronautics and Space
11 Administration provides increased under-
12 standing of the fundamental physics of the
13 Sun-Earth system through space-based observa-
14 tions and modeling and develops new space-
15 based technologies and missions;

16 “(D) the National Science Foundation pro-
17 vides increased understanding of the Sun-Earth
18 system through ground-based measurements,
19 technologies, and modeling; and

20 “(E) the Department of the Interior col-
21 lects, distributes, and archives operational
22 ground-based magnetometer data in the United
23 States and its territories, and works with the
24 international community to improve global geo-
25 physical monitoring.

1 “(2) OFFICE OF SCIENCE AND TECHNOLOGY
2 POLICY.—The Director of the Office of Science and
3 Technology Policy shall—

4 “(A) improve the Nation’s ability to pre-
5 pare, avoid, mitigate, respond to, and recover
6 from potentially devastating impacts of space
7 weather events; and

8 “(B) coordinate the activities of the Na-
9 tional Space Weather Program Council mem-
10 bers.

11 “(d) SPACE WEATHER INTERAGENCY WORKING
12 GROUP.—In order to continue executive branch efforts to
13 understand, prepare, coordinate, and plan for space
14 weather, the National Science and Technology Council
15 shall establish an interagency working group on space
16 weather that includes representatives of the Federal agen-
17 cies participating in the National Space Weather Pro-
18 gram, and of other Federal agencies, as appropriate.

19 “(e) INTERAGENCY AGREEMENTS.—

20 “(1) SENSE OF CONGRESS.—It is the sense of
21 Congress that the interagency collaboration between
22 the National Aeronautics and Space Administration
23 and the National Oceanic and Atmospheric Adminis-
24 tration on terrestrial weather observations pro-
25 vides—

1 “(A) an effective mechanism for improving
2 weather and climate data collection while avoid-
3 ing unnecessary duplication of capabilities
4 across Federal agencies; and

5 “(B) an agency collaboration model that
6 could benefit space weather observations.

7 “(2) INTERAGENCY AGREEMENTS.—The Ad-
8 ministrator of the National Aeronautics and Space
9 Administration and the Administrator of the Na-
10 tional Oceanic and Atmospheric Administration shall
11 enter into one or more interagency agreements pro-
12 viding for cooperation and collaboration in the devel-
13 opment of space weather spacecraft, instruments,
14 and technologies in accordance with this chapter.

15 **“§ 60702. Observations and forecasting**

16 “(a) POLICY.—It is the policy of the United States
17 to establish and sustain a baseline capability for space
18 weather observations.

19 “(b) INTEGRATED STRATEGY.—

20 “(1) IN GENERAL.—The Director of the Office
21 of Science and Technology Policy, in coordination
22 with the Administrator of the National Oceanic and
23 Atmospheric Administration, the Administrator of
24 the National Aeronautics and Space Administration,
25 the Director of the National Science Foundation,

1 and the Secretary of Defense, and in consultation
2 with the academic community, shall develop an inte-
3 grated strategy for solar and solar wind observations
4 beyond the lifetime of current assets, that con-
5 siders—

6 “(A) the provision of solar wind measure-
7 ments and other measurements essential to
8 space weather forecasting; and

9 “(B) the provision of solar and space
10 weather measurements important for scientific
11 purposes.

12 “(2) CONSIDERATIONS.—In developing the
13 strategy under paragraph (1), the Director of the
14 Office of Science and Technology Policy shall con-
15 sider small satellite options, hosted payloads, com-
16 mercial options, international options, and prize au-
17 thority.

18 “(c) CRITICAL OBSERVATIONS.—In order to sustain
19 current space-based observational capabilities, the Admin-
20 istrator of the National Aeronautics and Space Adminis-
21 tration shall—

22 “(1) maintain operations of the Solar and
23 Heliospheric Observatory/Large Angle and Spec-
24 trometric Coronagraph (referred to in this section as

1 ‘SOHO/LASCO’) for as long as the satellite con-
2 tinues to deliver quality observations; and

3 “(2) prioritize the reception of LASCO data.

4 “(d) ADDITIONAL CAPABILITY FOR SOLAR IMAG-
5 ING.—

6 “(1) IN GENERAL.—The Administrator of the
7 National Oceanic and Atmospheric Administration
8 shall secure reliable secondary capability for near
9 real-time coronal mass ejection imagery.

10 “(2) OPTIONS.—The Administrator of the Na-
11 tional Oceanic and Atmospheric Administration, in
12 coordination with the Secretary of Defense and the
13 Administrator of the National Aeronautics and
14 Space Administration, shall develop options to build
15 and deploy one or more instruments for near real-
16 time coronal mass ejection imagery.

17 “(3) CONSIDERATIONS.—In developing options
18 under paragraph (2), the Administrator of the Na-
19 tional Oceanic and Atmospheric Administration shall
20 consider commercial solutions, prize authority, aca-
21 demic and international partnerships, and opportuni-
22 ties to deploy the instrument or instruments as a
23 secondary payload on an upcoming planned launch.

24 “(4) COSTS.—In implementing paragraph (1),
25 the Administrator of the National Oceanic and At-

1 mospheric Administration shall prioritize a cost-ef-
2 fective solution.

3 “(5) OPERATIONAL PLANNING.—The Adminis-
4 trator of the National Oceanic and Atmospheric Ad-
5 ministration shall develop an operational contingency
6 plan to provide continuous space weather forecasting
7 in the event of a SOHO/LASCO failure.

8 “(6) BRIEFING.—Not later than 120 days after
9 the date of enactment of the Space Weather Re-
10 search and Forecasting Act, the Administrator of
11 the National Oceanic and Atmospheric Administra-
12 tion shall provide a briefing the Committee on Com-
13 merce, Science, and Transportation of the Senate
14 and the Committee on Science, Space, and Tech-
15 nology of the House of Representatives on the op-
16 tions for building and deploying the instrument or
17 instruments described in paragraph (2) and the
18 operational contingency plan developed in paragraph
19 (5).

20 “(e) FOLLOW-ON SPACE-BASED OBSERVATIONS.—
21 The Administrator of the National Oceanic and Atmos-
22 pheric Administration, in coordination with the Secretary
23 of Defense, shall develop requirements and a plan for fol-
24 low-on space-based observations for operational purposes,

1 in accordance with the integrated strategy developed
2 under subsection (b).

3 “(f) REPORT.—Not later than 180 days after the
4 date of enactment of the Space Weather Research and
5 Forecasting Act, the Director of the Office of Science and
6 Technology Policy shall submit to the Committee on Com-
7 merce, Science, and Transportation of the Senate and the
8 Committee on Science, Space, and Technology of the
9 House of Representatives a report on the integrated strat-
10 egy under subsection (b), including the plans for follow-
11 on space-based observations under subsection (e).

12 “(g) GROUND-BASED OBSERVATIONS.—The Na-
13 tional Science Foundation and the Air Force shall each—

14 “(1) maintain ground-based observations of the
15 Sun; and

16 “(2) provide space weather data by means of its
17 set of ground-based facilities, including radars,
18 lidars, magnetometers, radio receivers, aurora and
19 airglow imagers, spectrometers, interferometers, and
20 solar observatories.

21 “(h) GROUND-BASED OBSERVATIONS DATA.—The
22 National Science Foundation shall—

23 “(1) provide key data streams from the plat-
24 forms described in subsection (g) for research and to
25 support space weather model development;

1 “(2) develop experimental models for scientific
2 purposes; and

3 “(3) support the transition of the experimental
4 models to operations where appropriate.

5 **“§ 60703. Research and technology**

6 “(a) USER NEEDS.—

7 “(1) IN GENERAL.—The Administrator of the
8 National Oceanic and Atmospheric Administration
9 and the Secretary of the Air Force, in conjunction
10 with the heads of other relevant Federal agencies,
11 shall conduct a comprehensive survey to identify and
12 prioritize the needs of space weather forecast users,
13 including space weather data and space weather
14 forecast data needed to improve services and inform
15 research priorities and technology needs.

16 “(2) CONTENTS.—In conducting the com-
17 prehensive survey under paragraph (1), the Adminis-
18 trator of the National Oceanic and Atmospheric Ad-
19 ministration and the Secretary of the Air Force, at
20 a minimum, shall—

21 “(A) consider the goals for forecast lead
22 time, accuracy, coverage, timeliness, data rate,
23 and data quality for space weather observa-
24 tions;

1 “(B) identify opportunities to address the
2 needs identified under paragraph (1) through
3 collaborations with academia, the private sector,
4 and the international community;

5 “(C) identify opportunities for new tech-
6 nologies and instrumentation to address the
7 needs identified under paragraph (1); and

8 “(D) publish a report on the findings
9 under subparagraphs (A) through (C).

10 “(3) PUBLICATION.—Not later than 1 year
11 after the date of enactment of the Space Weather
12 Research and Forecasting Act, the Administrator of
13 the National Oceanic and Atmospheric Administra-
14 tion and the Secretary of the Air Force shall—

15 “(A) make the results of the comprehen-
16 sive survey publicly available; and

17 “(B) notify the Committee on Commerce,
18 Science, and Transportation of the Senate and
19 the Committee on Science, Space, and Tech-
20 nology of the House of Representatives of the
21 publication under subparagraph (A).

22 “(b) RESEARCH ACTIVITIES.—

23 “(1) BASIC RESEARCH.—As part of the Na-
24 tional Space Weather Program, the Director of the
25 National Science Foundation, the Administrator of

1 the National Aeronautics and Space Administration,
2 and the Secretary of Defense shall continue to carry
3 out basic research activities on heliophysics,
4 geospace science, and space weather and support
5 competitive, merit-based, peer-reviewed proposals for
6 research, modeling, and monitoring of space weather
7 and its impacts, including science goals outlined in
8 Solar and Space Physics Decadal surveys conducted
9 by the National Academy of Sciences.

10 “(2) MULTIDISCIPLINARY RESEARCH.—

11 “(A) FINDINGS.—Congress finds that the
12 multidisciplinary nature of solar and space
13 physics creates funding challenges that require
14 coordination across scientific disciplines and
15 Federal agencies.

16 “(B) MULTIDISCIPLINARY RESEARCH.—As
17 part of the National Space Weather Program,
18 the Director of the National Science Founda-
19 tion, the Administrator of the National Oceanic
20 and Atmospheric Administration, and the Ad-
21 ministrator of the National Aeronautics and
22 Space Administration shall pursue multidisci-
23 plinary research in subjects that further our
24 understanding of solar physics, space physics,
25 and space weather.

1 “(C) SENSE OF CONGRESS.—It is the
2 sense of Congress that the Administrator of the
3 National Aeronautics and Space Administration
4 and the Director of the National Science Foun-
5 dation should support competitively awarded
6 Heliophysics Science Centers.

7 “(c) SCIENCE MISSIONS.—The Administrator of the
8 National Aeronautics and Space Administration shall seek
9 to implement missions that meet the science objectives
10 identified in Solar and Space Physics Decadal surveys con-
11 ducted by the National Academy of Sciences.

12 “(d) RESEARCH TO OPERATIONS.—

13 “(1) IN GENERAL.—The Administrator of the
14 National Aeronautics and Space Administration, the
15 Director of the National Science Foundation, the
16 Administrator of the National Oceanic and Atmos-
17 pheric Administration, and the Secretary of the Air
18 Force, shall—

19 “(A) develop a formal mechanism to tran-
20 sition National Aeronautics and Space Adminis-
21 tration and National Science Foundation re-
22 search findings, models, and capabilities, as ap-
23 propriate, to National Oceanic and Atmospheric
24 Administration and Department of Defense

1 space weather operational forecasting centers;
2 and

3 “(B) enhance coordination between re-
4 search modeling centers and forecasting cen-
5 ters.

6 “(2) OPERATIONAL NEEDS.—The Adminis-
7 trator of the National Oceanic and Atmospheric Ad-
8 ministration and the Secretary of Defense, in coordi-
9 nation with the Administrator of the National Aero-
10 nautics and Space Administration and the Director
11 of the National Science Foundation, shall develop a
12 formal mechanism to communicate the operational
13 needs of space weather forecasters to the research
14 community.

15 “(e) TECHNOLOGY DEVELOPMENT.—

16 “(1) FINDINGS.—Congress finds that observa-
17 tions and measurements closer to the Sun and ad-
18 vanced instrumentation would provide for more ad-
19 vanced warning of space weather disturbances (as
20 defined in section 3 of the Space Weather Research
21 and Forecasting Act).

22 “(2) TECHNOLOGY AND INSTRUMENTATION DE-
23 VELOPMENT.—The Administrator of the National
24 Aeronautics and Space Administration and the Di-
25 rector of the National Science Foundation shall sup-

1 port the development of technologies and instrumen-
2 tation to improve space weather forecasting lead-
3 time and accuracy to meet the needs identified by
4 the Administrator of the National Oceanic and At-
5 mospheric Administration.

6 **“§ 60704. Space weather data**

7 “(a) IN GENERAL.—The Administrator of the Na-
8 tional Aeronautics and Space Administration and the Di-
9 rector of the National Science Foundation shall—

10 “(1) make space weather related data obtained
11 for scientific research purposes available to space
12 weather forecasters and operations centers; and

13 “(2) support model development and model ap-
14 plications to space weather forecasting.

15 “(b) RESEARCH.—The Administrator of the National
16 Oceanic and Atmospheric Administration shall make space
17 weather related data obtained from operational forecasting
18 available for scientific research.”.

19 (b) TECHNICAL AND CONFORMING AMENDMENTS.—

20 (1) REPEAL OF SECTION 809.—Section 809 of
21 the National Aeronautics and Space Administration
22 Authorization Act of 2010 (42 U.S.C. 18388) and
23 the item relating to that section in the table of con-
24 tents under section 1(b) of that Act (124 Stat.
25 2806) are repealed.

1 (2) TABLE OF CHAPTERS.—The table of chap-
 2 ters of title 51, United States Code, is amended by
 3 adding after the item relating to chapter 605 the fol-
 4 lowing:

“607. Space Weather 60701”.

5 **SEC. 3. SPACE WEATHER METRICS.**

6 (a) DEFINITIONS.—In this section:

7 (1) SPACE WEATHER DISTURBANCE.—The term
 8 “space weather disturbance” includes geo-electric
 9 fields, ionizing radiation, ionospheric disturbances,
 10 solar radio bursts, and upper atmospheric expansion.

11 (2) SPACE WEATHER BENCHMARK.—The term
 12 “space weather benchmark” means the physical
 13 characteristics and conditions describing the nature,
 14 frequency, and intensity of space weather disturb-
 15 ances.

16 (b) BENCHMARKS.—

17 (1) PRELIMINARY.—Not later than 90 days
 18 after the date of enactment of this Act, the Space
 19 Weather Interagency Working Group, established
 20 under section 60701 of title 51, United States Code,
 21 shall—

22 (A) assess existing data, the historical
 23 record, models, and peer-reviewed studies on
 24 space weather; and

1 (B) develop preliminary benchmarks, based
2 on current scientific understanding and the his-
3 torical record, for measuring solar disturbances.

4 (2) FINAL.—Not later than 18 months after
5 the date the preliminary benchmarks are developed
6 under paragraph (1), the Space Weather Inter-
7 agency Working Group shall publish final bench-
8 marks.

9 (3) REVIEW.—The Administrator of the Na-
10 tional Aeronautics and Space Administration shall
11 contract with the National Academy of Sciences to
12 review the benchmarks established under paragraph
13 (2).

14 (4) REVISIONS.—The Space Weather Inter-
15 agency Working Group shall update and revise the
16 final benchmarks under paragraph (2), as necessary,
17 based on—

18 (A) the results of the review under para-
19 graph (3);

20 (B) any significant new data or advances
21 in scientific understanding that become avail-
22 able; or

23 (C) the evolving needs of entities impacted
24 by solar disturbances.

1 **SEC. 4. PROTECTION OF CRITICAL INFRASTRUCTURE.**

2 (a) IN GENERAL.—The Administrator of the Na-
3 tional Oceanic and Atmospheric Administration, in con-
4 sultation with the heads of other relevant Federal agen-
5 cies, shall provide information about space weather haz-
6 ards to the Secretary of Homeland Security for purposes
7 of this section.

8 (b) CRITICAL INFRASTRUCTURE.—The Secretary of
9 Homeland Security, in consultation with sector-specific
10 agencies, the Administrator of the National Oceanic and
11 Atmospheric Administration, and the heads of other rel-
12 evant agencies, shall—

13 (1) include, in meeting national critical infra-
14 structure reporting requirements, an assessment of
15 the vulnerability of critical infrastructure to space
16 weather events, as described by the space weather
17 benchmarks under section 3; and

18 (2) support critical infrastructure providers in
19 managing the risks and impacts associated with
20 space weather.

21 (c) PROHIBITION ON NEW REGULATORY AUTHOR-
22 ITY.—Nothing in subsection (b) may be construed to grant
23 the Secretary of Homeland Security any authority to pro-
24 mulgate regulations that were not in effect on the day be-
25 fore the date of enactment of this Act.

1 (d) DEFINITION OF SECTOR-SPECIFIC AGENCY.—In
2 this section, the term “sector-specific agency” has the
3 meaning given the term in Presidential Policy Directive—
4 21 of February 12, 2013 (Critical Infrastructure Security
5 and Resilience), or any successor.

6 **SEC. 5. PROTECTION OF NATIONAL SECURITY ASSETS.**

7 (a) IN GENERAL.—The National Security Council, in
8 consultation with the Office of the Director of National
9 Intelligence, the Secretary of Defense, and heads of other
10 relevant Federal agencies, shall—

11 (1) assess the vulnerability of the national secu-
12 rity community to space weather events, as described
13 by the space weather benchmarks under section 3;
14 and

15 (2) develop national security mechanisms to
16 protection national security assets from space weath-
17 er threats.

18 (b) COOPERATION.—The Secretary of Defense, in
19 consultation with the heads of other relevant Federal
20 agencies, shall provide information about space weather
21 hazards to the National Security Council, the Director of
22 National Intelligence, and heads of Defense Agencies for
23 purposes of this section.

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