

AMENDMENT NO. _____ Calendar No. _____

Purpose: In the nature of a substitute.

IN THE SENATE OF THE UNITED STATES—115th Cong., 1st Sess.

H. R. 353

To improve the National Oceanic and Atmospheric Administration's weather research through a focused program of investment on affordable and attainable advances in observational, computing, and modeling capabilities to support substantial improvement in weather forecasting and prediction of high impact weather events, to expand commercial opportunities for the provision of weather data, and for other purposes.

Referred to the Committee on _____ and
ordered to be printed

Ordered to lie on the table and to be printed

AMENDMENT IN THE NATURE OF A SUBSTITUTE intended
to be proposed by Mr. THUNE (for himself, Mr. SCHATZ,
and Mr. NELSON)

Viz:

1 Strike all after the enacting clause and insert the fol-
2 lowing:

3 **SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**

4 (a) **SHORT TITLE.**—This Act may be cited as the
5 “Weather Research and Forecasting Innovation Act of
6 2017”.

7 (b) **TABLE OF CONTENTS.**—The table of contents for
8 this Act is as follows:

- Sec. 1. Short title; table of contents.
- Sec. 2. Definitions.

TITLE I—UNITED STATES WEATHER RESEARCH AND
FORECASTING IMPROVEMENT

- Sec. 101. Public safety priority.
- Sec. 102. Weather research and forecasting innovation.
- Sec. 103. Tornado warning improvement and extension program.
- Sec. 104. Hurricane forecast improvement program.
- Sec. 105. Weather research and development planning.
- Sec. 106. Observing system planning.
- Sec. 107. Observing system simulation experiments.
- Sec. 108. Annual report on computing resources prioritization.
- Sec. 109. United States Weather Research program.
- Sec. 110. Authorization of appropriations.

TITLE II—SUBSEASONAL AND SEASONAL FORECASTING
INNOVATION

- Sec. 201. Improving subseasonal and seasonal forecasts.

TITLE III—WEATHER SATELLITE AND DATA INNOVATION

- Sec. 301. National Oceanic and Atmospheric Administration satellite and data management.
- Sec. 302. Commercial weather data.
- Sec. 303. Unnecessary duplication.

TITLE IV—FEDERAL WEATHER COORDINATION

- Sec. 401. Environmental Information Services Working Group.
- Sec. 402. Interagency weather research and forecast innovation coordination.
- Sec. 403. Office of Oceanic and Atmospheric Research and National Weather Service exchange program.
- Sec. 404. Visiting fellows at National Weather Service.
- Sec. 405. Warning coordination meteorologists at weather forecast offices of National Weather Service.
- Sec. 406. Improving National Oceanic and Atmospheric Administration communication of hazardous weather and water events.
- Sec. 407. National Oceanic and Atmospheric Administration Weather Ready All Hazards Award Program.
- Sec. 408. Department of Defense weather forecasting activities.
- Sec. 409. National Weather Service; operations and workforce analysis.
- Sec. 410. Report on contract positions at National Weather Service.
- Sec. 411. Weather impacts to communities and infrastructure.
- Sec. 412. Weather enterprise outreach.
- Sec. 413. Hurricane hunter aircraft.
- Sec. 414. Study on gaps in NEXRAD coverage and recommendations to address such gaps.

1 **SEC. 2. DEFINITIONS.**

2 In this Act:

1 (1) SEASONAL.—The term “seasonal” means
2 the time range between 3 months and 2 years.

3 (2) STATE.—The term “State” means a State,
4 a territory, or possession of the United States, in-
5 cluding a Commonwealth, or the District of Colum-
6 bia.

7 (3) SUBSEASONAL.—The term “subseasonal”
8 means the time range between 2 weeks and 3
9 months.

10 (4) UNDER SECRETARY.—The term “Under
11 Secretary” means the Under Secretary of Commerce
12 for Oceans and Atmosphere.

13 (5) WEATHER INDUSTRY AND WEATHER EN-
14 TERPRISE.—The terms “weather industry” and
15 “weather enterprise” are interchangeable in this Act,
16 and include individuals and organizations from pub-
17 lic, private, and academic sectors that contribute to
18 the research, development, and production of weath-
19 er forecast products, and primary consumers of
20 these weather forecast products.

1 **TITLE I—UNITED STATES**
2 **WEATHER RESEARCH AND**
3 **FORECASTING IMPROVE-**
4 **MENT**

5 **SEC. 101. PUBLIC SAFETY PRIORITY.**

6 In conducting research, the Under Secretary shall
7 prioritize improving weather data, modeling, computing,
8 forecasting, and warnings for the protection of life and
9 property and for the enhancement of the national econ-
10 omy.

11 **SEC. 102. WEATHER RESEARCH AND FORECASTING INNO-**
12 **VATION.**

13 (a) PROGRAM.—The Assistant Administrator for the
14 Office of Oceanic and Atmospheric Research shall conduct
15 a program to develop improved understanding of and fore-
16 cast capabilities for atmospheric events and their impacts,
17 placing priority on developing more accurate, timely, and
18 effective warnings and forecasts of high impact weather
19 events that endanger life and property.

20 (b) PROGRAM ELEMENTS.—The program described
21 in subsection (a) shall focus on the following activities:

22 (1) Improving the fundamental understanding
23 of weather consistent with section 101, including the
24 boundary layer and other processes affecting high
25 impact weather events.

1 (2) Improving the understanding of how the
2 public receives, interprets, and responds to warnings
3 and forecasts of high impact weather events that en-
4 danger life and property.

5 (3) Research and development, and transfer of
6 knowledge, technologies, and applications to the Na-
7 tional Weather Service and other appropriate agen-
8 cies and entities, including the United States weath-
9 er industry and academic partners, related to—

10 (A) advanced radar, radar networking
11 technologies, and other ground-based tech-
12 nologies, including those emphasizing rapid,
13 fine-scale sensing of the boundary layer and
14 lower troposphere, and the use of innovative,
15 dual-polarization, phased-array technologies;

16 (B) aerial weather observing systems;

17 (C) high performance computing and infor-
18 mation technology and wireless communication
19 networks;

20 (D) advanced numerical weather prediction
21 systems and forecasting tools and techniques
22 that improve the forecasting of timing, track,
23 intensity, and severity of high impact weather,
24 including through—

6

- 1 (i) the development of more effective
2 mesoscale models;
- 3 (ii) more effective use of existing, and
4 the development of new, regional and na-
5 tional cloud-resolving models;
- 6 (iii) enhanced global weather models;
7 and
- 8 (iv) integrated assessment models;
- 9 (E) quantitative assessment tools for meas-
10 uring the impact and value of data and observ-
11 ing systems, including Observing System Sim-
12 ulation Experiments (as described in section
13 107), Observing System Experiments, and
14 Analyses of Alternatives;
- 15 (F) atmospheric chemistry and interactions
16 essential to accurately characterizing atmos-
17 pheric composition and predicting meteorolog-
18 ical processes, including cloud microphysical,
19 precipitation, and atmospheric electrification
20 processes, to more effectively understand their
21 role in severe weather; and
- 22 (G) additional sources of weather data and
23 information, including commercial observing
24 systems.

1 (4) A technology transfer initiative, carried out
2 jointly and in coordination with the Director of the
3 National Weather Service, and in cooperation with
4 the United States weather industry and academic
5 partners, to ensure continuous development and
6 transition of the latest scientific and technological
7 advances into operations of the National Weather
8 Service and to establish a process to sunset outdated
9 and expensive operational methods and tools to en-
10 able cost-effective transfer of new methods and tools
11 into operations.

12 (c) EXTRAMURAL RESEARCH.—

13 (1) IN GENERAL.—In carrying out the program
14 under this section, the Assistant Administrator for
15 Oceanic and Atmospheric Research shall collaborate
16 with and support the non-Federal weather research
17 community, which includes institutions of higher
18 education, private entities, and nongovernmental or-
19 ganizations, by making funds available through com-
20 petitive grants, contracts, and cooperative agree-
21 ments.

22 (2) SENSE OF CONGRESS.—It is the sense of
23 Congress that not less than 30 percent of the funds
24 for weather research and development at the Office
25 of Oceanic and Atmospheric Research should be

1 made available for the purpose described in para-
2 graph (1).

3 (d) ANNUAL REPORT.—Each year, concurrent with
4 the annual budget request submitted by the President to
5 Congress under section 1105 of title 31, United States
6 Code, for the National Oceanic and Atmospheric Adminis-
7 tration, the Under Secretary shall submit to Congress a
8 description of current and planned activities under this
9 section.

10 **SEC. 103. TORNADO WARNING IMPROVEMENT AND EXTEN-**
11 **SION PROGRAM.**

12 (a) IN GENERAL.—The Under Secretary, in collabo-
13 ration with the United States weather industry and aca-
14 demic partners, shall establish a tornado warning improve-
15 ment and extension program.

16 (b) GOAL.—The goal of such program shall be to re-
17 duce the loss of life and economic losses from tornadoes
18 through the development and extension of accurate, effec-
19 tive, and timely tornado forecasts, predictions, and warn-
20 ings, including the prediction of tornadoes beyond 1 hour
21 in advance.

22 (c) PROGRAM PLAN.—Not later than 180 days after
23 the date of the enactment of this Act, the Assistant Ad-
24 ministrator for Oceanic and Atmospheric Research, in co-
25 ordination with the Director of the National Weather

1 Service, shall develop a program plan that details the spe-
2 cific research, development, and technology transfer activi-
3 ties, as well as corresponding resources and timelines, nec-
4 essary to achieve the program goal.

5 (d) ANNUAL BUDGET FOR PLAN SUBMITTAL.—Fol-
6 lowing completion of the plan, the Under Secretary, acting
7 through the Assistant Administrator for Oceanic and At-
8 mospheric Research and in coordination with the Director
9 of the National Weather Service, shall, not less frequently
10 than once each year, submit to Congress a proposed budg-
11 et corresponding with the activities identified in the plan.

12 **SEC. 104. HURRICANE FORECAST IMPROVEMENT PRO-**
13 **GRAM.**

14 (a) IN GENERAL.—The Under Secretary, in collabo-
15 ration with the United States weather industry and such
16 academic entities as the Administrator considers appro-
17 priate, shall maintain a project to improve hurricane fore-
18 casting.

19 (b) GOAL.—The goal of the project maintained under
20 subsection (a) shall be to develop and extend accurate hur-
21 ricane forecasts and warnings in order to reduce loss of
22 life, injury, and damage to the economy, with a focus on—

23 (1) improving the prediction of rapid inten-
24 sification and track of hurricanes;

1 (2) improving the forecast and communication
2 of storm surges from hurricanes; and

3 (3) incorporating risk communication research
4 to create more effective watch and warning products.

5 (c) PROJECT PLAN.—Not later than 1 year after the
6 date of the enactment of this Act, the Under Secretary,
7 acting through the Assistant Administrator for Oceanic
8 and Atmospheric Research and in consultation with the
9 Director of the National Weather Service, shall develop
10 a plan for the project maintained under subsection (a)
11 that details the specific research, development, and tech-
12 nology transfer activities, as well as corresponding re-
13 sources and timelines, necessary to achieve the goal set
14 forth in subsection (b).

15 **SEC. 105. WEATHER RESEARCH AND DEVELOPMENT PLAN-**
16 **NING.**

17 Not later than 1 year after the date of the enactment
18 of this Act, and not less frequently than once each year
19 thereafter, the Under Secretary, acting through the As-
20 sistant Administrator for Oceanic and Atmospheric Re-
21 search and in coordination with the Director of the Na-
22 tional Weather Service and the Assistant Administrator
23 for Satellite and Information Services, shall issue a re-
24 search and development and research to operations plan

1 to restore and maintain United States leadership in nu-
2 merical weather prediction and forecasting that—

3 (1) describes the forecasting skill and tech-
4 nology goals, objectives, and progress of the Na-
5 tional Oceanic and Atmospheric Administration in
6 carrying out the program conducted under section
7 102;

8 (2) identifies and prioritizes specific research
9 and development activities, and performance metrics,
10 weighted to meet the operational weather mission of
11 the National Weather Service to achieve a weather-
12 ready Nation;

13 (3) describes how the program will collaborate
14 with stakeholders, including the United States
15 weather industry and academic partners; and

16 (4) identifies, through consultation with the Na-
17 tional Science Foundation, the United States weath-
18 er industry, and academic partners, research nec-
19 essary to enhance the integration of social science
20 knowledge into weather forecast and warning proc-
21 esses, including to improve the communication of
22 threat information necessary to enable improved se-
23 vere weather planning and decisionmaking on the
24 part of individuals and communities.

1 **SEC. 106. OBSERVING SYSTEM PLANNING.**

2 The Under Secretary shall—

3 (1) develop and maintain a prioritized list of
4 observation data requirements necessary to ensure
5 weather forecasting capabilities to protect life and
6 property to the maximum extent practicable;

7 (2) consistent with section 107, utilize Observ-
8 ing System Simulation Experiments, Observing Sys-
9 tem Experiments, Analyses of Alternatives, and
10 other appropriate assessment tools to ensure contin-
11 uous systemic evaluations of the observing systems,
12 data, and information needed to meet the require-
13 ments of paragraph (1), including options to maxi-
14 mize observational capabilities and their cost-effec-
15 tiveness;

16 (3) identify current and potential future data
17 gaps in observing capabilities related to the require-
18 ments listed under paragraph (1); and

19 (4) determine a range of options to address
20 gaps identified under paragraph (3).

21 **SEC. 107. OBSERVING SYSTEM SIMULATION EXPERIMENTS.**

22 (a) **IN GENERAL.**—In support of the requirements of
23 section 106, the Assistant Administrator for Oceanic and
24 Atmospheric Research shall undertake Observing System
25 Simulation Experiments, or such other quantitative as-
26 sessments as the Assistant Administrator considers appro-

1 puate, to quantitatively assess the relative value and bene-
2 fits of observing capabilities and systems. Technical and
3 scientific Observing System Simulation Experiment eval-
4 uations—

5 (1) may include assessments of the impact of
6 observing capabilities on—

7 (A) global weather prediction;

8 (B) hurricane track and intensity fore-
9 casting;

10 (C) tornado warning lead times and accu-
11 racy;

12 (D) prediction of mid-latitude severe local
13 storm outbreaks; and

14 (E) prediction of storms that have the po-
15 tential to cause extreme precipitation and flood-
16 ing lasting from 6 hours to 1 week; and

17 (2) shall be conducted in cooperation with other
18 appropriate entities within the National Oceanic and
19 Atmospheric Administration, other Federal agencies,
20 the United States weather industry, and academic
21 partners to ensure the technical and scientific merit
22 of results from Observing System Simulation Ex-
23 periments or other appropriate quantitative assess-
24 ment methodologies.

1 (b) REQUIREMENTS.—Observing System Simulation
2 Experiments shall quantitatively—

3 (1) determine the potential impact of proposed
4 space-based, suborbital, and in situ observing sys-
5 tems on analyses and forecasts, including potential
6 impacts on extreme weather events across all parts
7 of the Nation;

8 (2) evaluate and compare observing system de-
9 sign options; and

10 (3) assess the relative capabilities and costs of
11 various observing systems and combinations of ob-
12 serving systems in providing data necessary to pro-
13 tect life and property.

14 (c) IMPLEMENTATION.—Observing System Simula-
15 tion Experiments—

16 (1) shall be conducted prior to the acquisition
17 of major Government-owned or Government-leased
18 operational observing systems, including polar-orbit-
19 ing and geostationary satellite systems, with a
20 lifecycle cost of more than \$500,000,000; and

21 (2) shall be conducted prior to the purchase of
22 any major new commercially provided data with a
23 lifecycle cost of more than \$500,000,000.

24 (d) PRIORITY OBSERVING SYSTEM SIMULATION EX-
25 PERIMENTS.—

1 (1) GLOBAL NAVIGATION SATELLITE SYSTEM
2 RADIO OCCULTATION.—Not later than 30 days after
3 the date of the enactment of this Act, the Assistant
4 Administrator for Oceanic and Atmospheric Re-
5 search shall complete an Observing System Simula-
6 tion Experiment to assess the value of data from
7 Global Navigation Satellite System Radio Occulta-
8 tion.

9 (2) GEOSTATIONARY HYPERSPECTRAL SOUND-
10 ER GLOBAL CONSTELLATION.—Not later than 120
11 days after the date of the enactment of this Act, the
12 Assistant Administrator for Oceanic and Atmos-
13 pheric Research shall complete an Observing System
14 Simulation Experiment to assess the value of data
15 from a geostationary hyperspectral sounder global
16 constellation.

17 (e) RESULTS.—Upon completion of all Observing
18 System Simulation Experiments, the Assistant Adminis-
19 trator shall make available to the public the results an
20 assessment of related private and public sector weather
21 data sourcing options, including their availability, afford-
22 ability, and cost-effectiveness. Such assessments shall be
23 developed in accordance with section 50503 of title 51,
24 United States Code.

1 **SEC. 108. ANNUAL REPORT ON COMPUTING RESOURCES**
2 **PRIORITIZATION.**

3 Not later than 1 year after the date of the enactment
4 of this Act and not less frequently than once each year
5 thereafter, the Under Secretary, acting through the Chief
6 Information Officer of the National Oceanic and Atmos-
7 pheric Administration and in coordination with the Assist-
8 ant Administrator for Oceanic and Atmospheric Research
9 and the Director of the National Weather Service, shall
10 produce and make publicly available a report that explains
11 how the Under Secretary intends—

12 (1) to continually support upgrades to pursue
13 the fastest, most powerful, and cost-effective high
14 performance computing technologies in support of
15 its weather prediction mission;

16 (2) to ensure a balance between the research to
17 operations requirements to develop the next genera-
18 tion of regional and global models as well as highly
19 reliable operational models;

20 (3) to take advantage of advanced development
21 concepts to, as appropriate, make next generation
22 weather prediction models available in beta-test
23 mode to operational forecasters, the United States
24 weather industry, and partners in academic and
25 Government research; and

1 (4) to use existing computing resources to im-
2 prove advanced research and operational weather
3 prediction.

4 **SEC. 109. UNITED STATES WEATHER RESEARCH PROGRAM.**

5 Section 108 of the Oceanic and Atmospheric Admin-
6 istration Authorization Act of 1992 (Public Law 102-567;
7 15 U.S.C. 313 note) is amended—

8 (1) in subsection (a)—

9 (A) in paragraph (3), by striking “; and”
10 and inserting a semicolon;

11 (B) in paragraph (4), by striking the pe-
12 riod at the end and inserting a semicolon; and

13 (C) by inserting after paragraph (4) the
14 following:

15 “(5) submit to the Committee on Commerce,
16 Science, and Transportation of the Senate and the
17 Committee on Science, Space, and Technology of the
18 House of Representatives, not less frequently than
19 once each year, a report, including—

20 “(A) a list of ongoing research projects;

21 “(B) project goals and a point of contact
22 for each project;

23 “(C) the five projects related to weather
24 observations, short-term weather, or subsea-
25 sonal forecasts within Office of Oceanic and At-

1 ospheric Research that are closest to
2 operationalization;

3 “(D) for each project referred to in sub-
4 paragraph (C)—

5 “(i) the potential benefit;

6 “(ii) any barrier to operationalization;

7 and

8 “(iii) the plan for operationalization,
9 including which line office will financially
10 support the project and how much the line
11 office intends to spend;

12 “(6) establish teams with staff from the Office
13 of Oceanic and Atmospheric Research and the Na-
14 tional Weather Service to oversee the
15 operationalization of research products developed by
16 the Office of Oceanic and Atmospheric Research;

17 “(7) develop mechanisms for research priorities
18 of the Office of Oceanic and Atmospheric Research
19 to be informed by the relevant line offices within the
20 National Oceanic and Atmospheric Administration,
21 the relevant user community, and the weather enter-
22 prise;

23 “(8) develop an internal mechanism to track
24 the progress of each research project within the Of-
25 fice of Oceanic and Atmospheric Research and

1 mechanisms to terminate a project that is not ade-
2 quately progressing;

3 “(9) develop and implement a system to track
4 whether extramural research grant goals were ac-
5 complished;

6 “(10) provide facilities for products developed
7 by the Office of Oceanic and Atmospheric Research
8 to be tested in operational simulations, such as test
9 beds; and

10 “(11) encourage academic collaboration with
11 the Office of Oceanic and Atmospheric Research and
12 the National Weather Service by facilitating visiting
13 scholars.”;

14 (2) in subsection (b), in the matter preceding
15 paragraph (1), by striking “Not later than 90 days
16 after the date of enactment of this Act, the” and in-
17 serting “The”; and

18 (3) by adding at the end the following new sub-
19 section:

20 “(e) SUBSEASONAL DEFINED.—In this section, the
21 term ‘subseasonal’ means the time range between 2 weeks
22 and 3 months.”.

23 **SEC. 110. AUTHORIZATION OF APPROPRIATIONS.**

24 (a) FISCAL YEARS 2017 AND 2018.—For each of fis-
25 cal years 2017 and 2018, there are authorized to be ap-

1 appropriated to Office of Oceanic and Atmospheric Re-
2 search—

3 (1) \$111,516,000 to carry out this title, of
4 which—

5 (A) \$85,758,000 is authorized for weather
6 laboratories and cooperative institutes; and

7 (B) \$25,758,000 is authorized for weather
8 and air chemistry research programs; and

9 (2) an additional amount of \$20,000,000 for
10 the joint technology transfer initiative described in
11 section 102(b)(4).

12 (b) LIMITATION.—No additional funds are authorized
13 to carry out this title and the amendments made by this
14 title.

15 **TITLE II—SUBSEASONAL AND**
16 **SEASONAL FORECASTING IN-**
17 **NOVATION**

18 **SEC. 201. IMPROVING SUBSEASONAL AND SEASONAL FORE-**
19 **CASTS.**

20 Section 1762 of the Food Security Act of 1985 (Pub-
21 lic Law 99-198; 15 U.S.C. 313 note) is amended—

22 (1) in subsection (a), by striking “(a)” and in-
23 serting “(a) FINDINGS.—”;

24 (2) in subsection (b), by striking “(b)” and in-
25 serting “(b) POLICY.—”; and

1 (3) by adding at the end the following:

2 “(c) FUNCTIONS.—The Under Secretary, acting
3 through the Director of the National Weather Service and
4 the heads of such other programs of the National Oceanic
5 and Atmospheric Administration as the Under Secretary
6 considers appropriate, shall—

7 “(1) collect and utilize information in order to
8 make usable, reliable, and timely foundational fore-
9 casts of subseasonal and seasonal temperature and
10 precipitation;

11 “(2) leverage existing research and models from
12 the weather enterprise to improve the forecasts
13 under paragraph (1);

14 “(3) determine and provide information on how
15 the forecasted conditions under paragraph (1) may
16 impact—

17 “(A) the number and severity of droughts,
18 fires, tornadoes, hurricanes, floods, heat waves,
19 coastal inundation, winter storms, high impact
20 weather, or other relevant natural disasters;

21 “(B) snowpack; and

22 “(C) sea ice conditions; and

23 “(4) develop an Internet clearinghouse to pro-
24 vide the forecasts under paragraph (1) and the in-

1 formation under paragraphs (1) and (3) on both na-
2 tional and regional levels.

3 “(d) COMMUNICATION.—The Director of the Na-
4 tional Weather Service shall provide the forecasts under
5 paragraph (1) of subsection (e) and the information on
6 their impacts under paragraph (3) of such subsection to
7 the public, including public and private entities engaged
8 in planning and preparedness, such as National Weather
9 Service Core partners at the Federal, regional, State, trib-
10 al, and local levels of government.

11 “(e) COOPERATION.—The Under Secretary shall
12 build upon existing forecasting and assessment programs
13 and partnerships, including—

14 “(1) by designating research and monitoring ac-
15 tivities related to subseasonal and seasonal forecasts
16 as a priority in one or more solicitations of the Co-
17 operative Institutes of the Office of Oceanic and At-
18 mospheric Research;

19 “(2) by contributing to the interagency Earth
20 System Prediction Capability; and

21 “(3) by consulting with the Secretary of De-
22 fense and the Secretary of Homeland Security to de-
23 termine the highest priority subseasonal and sea-
24 sonal forecast needs to enhance national security.

25 “(f) FORECAST COMMUNICATION COORDINATORS.—

1 “(1) IN GENERAL.—The Under Secretary shall
2 foster effective communication, understanding, and
3 use of the forecasts by the intended users of the in-
4 formation described in subsection (d). This may in-
5 clude assistance to States for forecast communica-
6 tion coordinators to enable local interpretation and
7 planning based on the information.

8 “(2) REQUIREMENTS.—For each State that re-
9 quests assistance under this subsection, the Under
10 Secretary may—

11 “(A) provide funds to support an indi-
12 vidual in that State—

13 “(i) to serve as a liaison among the
14 National Oceanic and Atmospheric Admin-
15 istration, other Federal departments and
16 agencies, the weather enterprise, the State,
17 and relevant interests within that State;
18 and

19 “(ii) to receive the forecasts and infor-
20 mation under subsection (c) and dissemi-
21 nate the forecasts and information
22 throughout the State, including to county
23 and tribal governments; and

24 “(B) require matching funds of at least 50
25 percent, from the State, a university, a non-

1 governmental organization, a trade association,
2 or the private sector.

3 “(3) LIMITATION.—Assistance to an individual
4 State under this subsection shall not exceed
5 \$100,000 in a fiscal year.

6 “(g) COOPERATION FROM OTHER FEDERAL AGEN-
7 CIES.—Each Federal department and agency shall cooper-
8 ate as appropriate with the Under Secretary in carrying
9 out this section.

10 “(h) REPORTS.—

11 “(1) IN GENERAL.—Not later than 18 months
12 after the date of the enactment of the Weather Re-
13 search and Forecasting Innovation Act of 2017, the
14 Under Secretary shall submit to the Committee on
15 Commerce, Science, and Transportation of the Sen-
16 ate and the Committee on Science, Space, and Tech-
17 nology of the House of Representatives a report, in-
18 cluding—

19 “(A) an analysis of the how information
20 from the National Oceanic and Atmospheric
21 Administration on subseasonal and seasonal
22 forecasts, as provided under subsection (c), is
23 utilized in public planning and preparedness;

24 “(B) specific plans and goals for the con-
25 tinued development of the subseasonal and sea-

1 sonal forecasts and related products described
2 in subsection (c); and

3 “(C) an identification of research, moni-
4 toring, observing, and forecasting requirements
5 to meet the goals described in subparagraph
6 (B).

7 “(2) CONSULTATION.—In developing the report
8 under paragraph (1), the Under Secretary shall con-
9 sult with relevant Federal, regional, State, tribal,
10 and local government agencies, research institutions,
11 and the private sector.

12 “(i) DEFINITIONS.—In this section:

13 “(1) FOUNDATIONAL FORECAST.—The term
14 ‘foundational forecast’ means basic weather observa-
15 tion and forecast data, largely in raw form, before
16 further processing is applied.

17 “(2) NATIONAL WEATHER SERVICE CORE PART-
18 NERS.—The term ‘National Weather Service core
19 partners’ means government and nongovernment en-
20 tities which are directly involved in the preparation
21 or dissemination of, or discussions involving, haz-
22 ardous weather or other emergency information put
23 out by the National Weather Service.

24 “(3) SEASONAL.—The term ‘seasonal’ means
25 the time range between 3 months and 2 years.

1 “(4) STATE.—The term ‘State’ means a State,
2 a territory, or possession of the United States, in-
3 cluding a Commonwealth, or the District of Colum-
4 bia.

5 “(5) SUBSEASONAL.—The term ‘subseasonal’
6 means the time range between 2 weeks and 3
7 months.

8 “(6) UNDER SECRETARY.—The term ‘Under
9 Secretary’ means the Under Secretary of Commerce
10 for Oceans and Atmosphere.

11 “(7) WEATHER INDUSTRY AND WEATHER EN-
12 TERPRISE.—The terms ‘weather industry’ and
13 ‘weather enterprise’ are interchangeable in this sec-
14 tion and include individuals and organizations from
15 public, private, and academic sectors that contribute
16 to the research, development, and production of
17 weather forecast products, and primary consumers
18 of these weather forecast products.

19 “(j) AUTHORIZATION OF APPROPRIATIONS.—For
20 each of fiscal years 2017 and 2018, there are authorized
21 out of funds appropriated to the National Weather Serv-
22 ice, \$26,500,000 to carry out the activities of this sec-
23 tion.”.

1 **TITLE III—WEATHER SATELLITE**
2 **AND DATA INNOVATION**

3 **SEC. 301. NATIONAL OCEANIC AND ATMOSPHERIC ADMIN-**
4 **ISTRATION SATELLITE AND DATA MANAGE-**
5 **MENT.**

6 (a) **SHORT-TERM MANAGEMENT OF ENVIRON-**
7 **MENTAL OBSERVATIONS.—**

8 (1) **MICROSATELLITE CONSTELLATIONS.—**

9 (A) **IN GENERAL.—**The Under Secretary
10 shall complete and operationalize the Constella-
11 tion Observing System for Meteorology,
12 Ionosphere, and Climate-1 and Climate-2
13 (COSMIC) in effect on the day before the date
14 of the enactment of this Act—

15 (i) by deploying constellations of
16 microsattellites in both the equatorial and
17 polar orbits;

18 (ii) by integrating the resulting data
19 and research into all national operational
20 and research weather forecast models; and

21 (iii) by ensuring that the resulting
22 data of National Oceanic and Atmospheric
23 Administration's COSMIC-1 and COS-
24 MIC-2 programs are free and open to all
25 communities.

1 (B) ANNUAL REPORTS.—Not less fre-
2 quently than once each year until the Under
3 Secretary has completed and operationalized the
4 program described in subparagraph (A) pursu-
5 ant to such subparagraph, the Under Secretary
6 shall submit to Congress a report on the status
7 of the efforts of the Under Secretary to carry
8 out such subparagraph.

9 (2) INTEGRATION OF OCEAN AND COASTAL
10 DATA FROM THE INTEGRATED OCEAN OBSERVING
11 SYSTEM.—In National Weather Service Regions
12 where the Director of the National Weather Service
13 determines that ocean and coastal data would im-
14 prove forecasts, the Director, in consultation with
15 the Assistant Administrator for Oceanic and Atmos-
16 pheric Research and the Assistant Administrator of
17 the National Ocean Service, shall—

18 (A) integrate additional coastal and ocean
19 observations, and other data and research, from
20 the Integrated Ocean Observing System (IOOS)
21 into regional weather forecasts to improve
22 weather forecasts and forecasting decision sup-
23 port systems; and

24 (B) support the development of real-time
25 data sharing products and forecast products in

1 collaboration with the regional associations of
2 such system, including contributions from the
3 private sector, academia, and research institu-
4 tions to ensure timely and accurate use of ocean
5 and coastal data in regional forecasts.

6 (3) EXISTING MONITORING AND OBSERVATION-
7 CAPABILITY.—The Under Secretary shall identify
8 degradation of existing monitoring and observation
9 capabilities that could lead to a reduction in forecast
10 quality.

11 (4) SPECIFICATIONS FOR NEW SATELLITE SYS-
12 TEMS OR DATA DETERMINED BY OPERATIONAL
13 NEEDS.—In developing specifications for any sat-
14 ellite systems or data to follow the Joint Polar Sat-
15 ellite System, Geostationary Operational Environ-
16 mental Satellites, and any other satellites, in effect
17 on the day before the date of enactment of this Act,
18 the Under Secretary shall ensure the specifications
19 are determined to the extent practicable by the rec-
20 ommendations of the reports under subsection (b) of
21 this section.

22 (b) INDEPENDENT STUDY ON FUTURE OF NATIONAL
23 OCEANIC AND ATMOSPHERIC ADMINISTRATION SAT-
24 ellite SYSTEMS AND DATA.—

25 (1) AGREEMENT.—

1 (A) IN GENERAL.—The Under Secretary
2 shall seek to enter into an agreement with the
3 National Academy of Sciences to perform the
4 services covered by this subsection.

5 (B) TIMING.—The Under Secretary shall
6 seek to enter into the agreement described in
7 subparagraph (A) before September 30, 2018.

8 (2) STUDY.—

9 (A) IN GENERAL.—Under an agreement
10 between the Under Secretary and the National
11 Academy of Sciences under this subsection, the
12 National Academy of Sciences shall conduct a
13 study on matters concerning future satellite
14 data needs.

15 (B) ELEMENTS.—In conducting the study
16 under subparagraph (A), the National Academy
17 of Sciences shall—

18 (i) develop recommendations on how
19 to make the data portfolio of the Adminis-
20 tration more robust and cost-effective;

21 (ii) assess the costs and benefits of
22 moving toward a constellation of many
23 small satellites, standardizing satellite bus
24 design, relying more on the purchasing of

1 data, or acquiring data from other sources
2 or methods;

3 (iii) identify the environmental obser-
4 vations that are essential to the perform-
5 ance of weather models, based on an as-
6 sessment of Federal, academic, and private
7 sector weather research, and the cost of
8 obtaining the environmental data;

9 (iv) identify environmental observa-
10 tions that improve the quality of oper-
11 ational and research weather models in ef-
12 fect on the day before the date of enact-
13 ment of this Act;

14 (v) identify and prioritize new envi-
15 ronmental observations that could con-
16 tribute to existing and future weather
17 models; and

18 (vi) develop recommendations on a
19 portfolio of environmental observations
20 that balances essential, quality-improving,
21 and new data, private and nonprivate
22 sources; and space-based and Earth-based
23 sources.

24 (C) DEADLINE AND REPORT.—In carrying
25 out the study under subparagraph (A), the Na-

1 tional Academy of Sciences shall complete and
2 transmit to the Under Secretary a report con-
3 taining the findings of the National Academy of
4 Sciences with respect to the study not later
5 than 2 years after the date on which the Ad-
6 ministrator enters into an agreement with the
7 National Academy of Sciences under paragraph
8 (1)(A).

9 (3) ALTERNATE ORGANIZATION.—

10 (A) IN GENERAL.—If the Under Secretary
11 is unable within the period prescribed in sub-
12 paragraph (B) of paragraph (1) to enter into
13 an agreement described in subparagraph (A) of
14 such paragraph with the National Academy of
15 Sciences on terms acceptable to the Under Sec-
16 retary, the Under Secretary shall seek to enter
17 into such an agreement with another appro-
18 priate organization that—

19 (i) is not part of the Federal Govern-
20 ment;

21 (ii) operates as a not-for-profit entity;

22 and

23 (iii) has expertise and objectivity com-
24 parable to that of the National Academy of
25 Sciences.

1 (B) TREATMENT.—If the Under Secretary
2 enters into an agreement with another organi-
3 zation as described in subparagraph (A), any
4 reference in this subsection to the National
5 Academy of Sciences shall be treated as a ref-
6 erence to the other organization.

7 (4) AUTHORIZATION OF APPROPRIATIONS.—
8 There are authorized to be appropriated, out of
9 funds appropriated to National Environmental Sat-
10 ellite, Data, and Information Service, to carry out
11 this subsection \$1,000,000 for the period encom-
12 passing fiscal years 2018 through 2019.

13 **SEC. 302. COMMERCIAL WEATHER DATA.**

14 (a) DATA AND HOSTED SATELLITE PAYLOADS.—
15 Notwithstanding any other provision of law, the Secretary
16 of Commerce may enter into agreements for—

17 (1) the purchase of weather data through con-
18 tracts with commercial providers; and

19 (2) the placement of weather satellite instru-
20 ments on cohosted government or private payloads.

21 (b) STRATEGY.—

22 (1) IN GENERAL.—Not later than 180 days
23 after the date of the enactment of this Act, the Sec-
24 retary of Commerce, in consultation with the Under
25 Secretary, shall submit to the Committee on Com-

1 merce, Science, and Transportation of the Senate
2 and the Committee on Science, Space, and Tech-
3 nology of the House of Representatives a strategy to
4 enable the procurement of quality commercial weath-
5 er data. The strategy shall assess the range of com-
6 mercial opportunities, including public-private part-
7 nerships, for obtaining surface-based, aviation-based,
8 and space-based weather observations. The strategy
9 shall include the expected cost-effectiveness of these
10 opportunities as well as provide a plan for procuring
11 data, including an expected implementation timeline,
12 from these nongovernmental sources, as appropriate.

13 (2) REQUIREMENTS.—The strategy shall in-
14 clude—

15 (A) an analysis of financial or other bene-
16 fits to, and risks associated with, acquiring
17 commercial weather data or services, including
18 through multiyear acquisition approaches;

19 (B) an identification of methods to address
20 planning, programming, budgeting, and execu-
21 tion challenges to such approaches, including—

22 (i) how standards will be set to ensure
23 that data is reliable and effective;

24 (ii) how data may be acquired through
25 commercial experimental or innovative

1 techniques and then evaluated for integra-
2 tion into operational use;

3 (iii) how to guarantee public access to
4 all forecast-critical data to ensure that the
5 United States weather industry and the
6 public continue to have access to informa-
7 tion critical to their work; and

8 (iv) in accordance with section 50503
9 of title 51, United States Code, methods to
10 address potential termination liability or
11 cancellation costs associated with weather
12 data or service contracts; and

13 (C) an identification of any changes needed
14 in the requirements development and approval
15 processes of the Department of Commerce to
16 facilitate effective and efficient implementation
17 of such strategy.

18 (3) AUTHORITY FOR AGREEMENTS.—The As-
19 sistant Administrator for National Environmental
20 Satellite, Data, and Information Service may enter
21 into multiyear agreements necessary to carry out the
22 strategy developed under this subsection.

23 (e) PILOT PROGRAM.—

24 (1) CRITERIA.—Not later than 30 days after
25 the date of the enactment of this Act, the Under

1 Secretary shall publish data and metadata standards
2 and specifications for space-based commercial weath-
3 er data, including radio occultation data, and, as
4 soon as possible, geostationary hyperspectral sound-
5 er data.

6 (2) PILOT CONTRACTS.—

7 (A) CONTRACTS.—Not later than 90 days
8 after the date of enactment of this Act, the
9 Under Secretary shall, through an open com-
10 petition, enter into at least one pilot contract
11 with one or more private sector entities capable
12 of providing data that meet the standards and
13 specifications set by the Under Secretary for
14 providing commercial weather data in a manner
15 that allows the Under Secretary to calibrate
16 and evaluate the data for its use in National
17 Oceanic and Atmospheric Administration mete-
18 orological models.

19 (B) ASSESSMENT OF DATA VIABILITY.—

20 Not later than the date that is 3 years after the
21 date on which the Under Secretary enters into
22 a contract under subparagraph (A), the Under
23 Secretary shall assess and submit to the Com-
24 mittee on Commerce, Science, and Transpor-
25 tation of the Senate and the Committee on

1 Science, Space, and Technology of the House of
2 Representatives the results of a determination
3 of the extent to which data provided under the
4 contract entered into under subparagraph (A)
5 meet the criteria published under paragraph (1)
6 and the extent to which the pilot program has
7 demonstrated—

8 (i) the viability of assimilating the
9 commercially provided data into National
10 Oceanic and Atmospheric Administration
11 meteorological models;

12 (ii) whether, and by how much, the
13 data add value to weather forecasts; and

14 (iii) the accuracy, quality, timeliness,
15 validity, reliability, usability, information
16 technology security, and cost-effectiveness
17 of obtaining commercial weather data from
18 private sector providers.

19 (3) AUTHORIZATION OF APPROPRIATIONS.—For
20 each of fiscal years 2017 through 2020, there are
21 authorized to be appropriated for procurement, ac-
22 quisition, and construction at National Environ-
23 mental Satellite, Data, and Information Service,
24 \$6,000,000 to carry out this subsection.

1 (d) OBTAINING FUTURE DATA.—If an assessment
2 under subsection (c)(2)(B) demonstrates the ability of
3 commercial weather data to meet data and metadata
4 standards and specifications published under subsection
5 (c)(1), the Under Secretary shall—

6 (1) where appropriate, cost-effective, and fea-
7 sible, obtain commercial weather data from private
8 sector providers;

9 (2) as early as possible in the acquisition proc-
10 ess for any future National Oceanic and Atmos-
11 pheric Administration meteorological space system,
12 consider whether there is a suitable, cost-effective,
13 commercial capability available or that will be avail-
14 able to meet any or all of the observational require-
15 ments by the planned operational date of the system;

16 (3) if a suitable, cost-effective, commercial ca-
17 pability is or will be available as described in para-
18 graph (2), determine whether it is in the national in-
19 terest to develop a governmental meteorological
20 space system; and

21 (4) submit to the Committee on Commerce,
22 Science, and Transportation of the Senate and the
23 Committee on Science, Space, and Technology of the
24 House of Representatives a report detailing any de-
25 termination made under paragraphs (2) and (3).

1 (e) DATA SHARING PRACTICES.—The Under Sec-
2 retary shall continue to meet the international meteorolog-
3 ical agreements into which the Under Secretary has en-
4 tered, including practices set forth through World Mete-
5 orological Organization Resolution 40.

6 **SEC. 303. UNNECESSARY DUPLICATION.**

7 In meeting the requirements under this title, the
8 Under Secretary shall avoid unnecessary duplication be-
9 tween public and private sources of data and the cor-
10 responding expenditure of funds and employment of per-
11 sonnel.

12 **TITLE IV—FEDERAL WEATHER**
13 **COORDINATION**

14 **SEC. 401. ENVIRONMENTAL INFORMATION SERVICES**
15 **WORKING GROUP.**

16 (a) ESTABLISHMENT.—The National Oceanic and
17 Atmospheric Administration Science Advisory Board shall
18 continue to maintain a standing working group named the
19 Environmental Information Services Working Group (in
20 this section referred to as the “Working Group”)—

21 (1) to provide advice for prioritizing weather re-
22 search initiatives at the National Oceanic and At-
23 mospheric Administration to produce real improve-
24 ment in weather forecasting;

1 (2) to provide advice on existing or emerging
2 technologies or techniques that can be found in pri-
3 vate industry or the research community that could
4 be incorporated into forecasting at the National
5 Weather Service to improve forecasting skill;

6 (3) to identify opportunities to improve—

7 (A) communications between weather fore-
8 casters, Federal, State, local, tribal, and other
9 emergency management personnel, and the pub-
10 lic; and

11 (B) communications and partnerships
12 among the National Oceanic and Atmospheric
13 Administration and the private and academic
14 sectors; and

15 (4) to address such other matters as the
16 Science Advisory Board requests of the Working
17 Group.

18 (b) COMPOSITION.—

19 (1) IN GENERAL.—The Working Group shall be
20 composed of leading experts and innovators from all
21 relevant fields of science and engineering including
22 atmospheric chemistry, atmospheric physics, meteor-
23 ology, hydrology, social science, risk communica-
24 tions, electrical engineering, and computer sciences.

1 In carrying out this section, the Working Group may
2 organize into subpanels.

3 (2) NUMBER.—The Working Group shall be
4 composed of no fewer than 15 members. Nominees
5 for the Working Group may be forwarded by the
6 Working Group for approval by the Science Advisory
7 Board. Members of the Working Group may choose
8 a chair (or co-chairs) from among their number with
9 approval by the Science Advisory Board.

10 (c) ANNUAL REPORT.—Not less frequently than once
11 each year, the Working Group shall transmit to the
12 Science Advisory Board for submission to the Under Sec-
13 retary a report on progress made by National Oceanic and
14 Atmospheric Administration in adopting the Working
15 Group's recommendations. The Science Advisory Board
16 shall transmit this report to the Under Secretary. Within
17 30 days of receipt of such report, the Under Secretary
18 shall submit to the Committee on Commerce, Science, and
19 Transportation of the Senate and the Committee on
20 Science, Space, and Technology of the House of Rep-
21 resentatives a copy of such report.

22 **SEC. 402. INTERAGENCY WEATHER RESEARCH AND FORE-**
23 **CAST INNOVATION COORDINATION.**

24 (a) ESTABLISHMENT.—The Director of the Office of
25 Science and Technology Policy shall establish an Inter-

1 agency Committee for Advancing Weather Services to im-
2 prove coordination of relevant weather research and fore-
3 cast innovation activities across the Federal Government.

4 The Interagency Committee shall—

5 (1) include participation by the National Aero-
6 nautics and Space Administration, the Federal Avia-
7 tion Administration, National Oceanic and Atmos-
8 pheric Administration and its constituent elements,
9 the National Science Foundation, and such other
10 agencies involved in weather forecasting research as
11 the President determines are appropriate;

12 (2) identify and prioritize top forecast needs
13 and coordinate those needs against budget requests
14 and program initiatives across participating offices
15 and agencies; and

16 (3) share information regarding operational
17 needs and forecasting improvements across relevant
18 agencies.

19 (b) CO-CHAIR.—The Federal Coordinator for Meteor-
20 ology shall serve as a co-chair of this panel.

21 (c) FURTHER COORDINATION.—The Director of the
22 Office of Science and Technology Policy shall take such
23 other steps as are necessary to coordinate the activities
24 of the Federal Government with those of the United States

1 weather industry, State governments; emergency man-
2 agers, and academic researchers.

3 **SEC. 403. OFFICE OF OCEANIC AND ATMOSPHERIC RE-**
4 **SEARCH AND NATIONAL WEATHER SERVICE**
5 **EXCHANGE PROGRAM.**

6 (a) **IN GENERAL.**—The Assistant Administrator for
7 Oceanic and Atmospheric Research and the Director of
8 National Weather Service may establish a program to de-
9 tail Office of Oceanic and Atmospheric Research personnel
10 to the National Weather Service and National Weather
11 Service personnel to the Office of Oceanic and Atmos-
12 pheric Research.

13 (b) **GOAL.**—The goal of this program is to enhance
14 forecasting innovation through regular, direct interaction
15 between the Office of Oceanic and Atmospheric Research's
16 world-class scientists and the National Weather Service's
17 operational staff.

18 (c) **ELEMENTS.**—The program shall allow up to 10
19 Office of Oceanic and Atmospheric Research staff and Na-
20 tional Weather Service staff to spend up to 1 year on de-
21 tail. Candidates shall be jointly selected by the Assistant
22 Administrator for Oceanic and Atmospheric Research and
23 the Director of the National Weather Service.

24 (d) **ANNUAL REPORT.**—Not less frequently than once
25 each year, the Under Secretary shall submit to the Com-

1 mittee on Commerce, Science, and Transportation of the
2 Senate and the Committee on Science, Space, and Tech-
3 nology of the House of Representatives a report on partici-
4 pation in such program and shall highlight any innova-
5 tions that come from this interaction.

6 **SEC. 404. VISITING FELLOWS AT NATIONAL WEATHER**
7 **SERVICE.**

8 (a) **IN GENERAL.**—The Director of the National
9 Weather Service may establish a program to host
10 postdoctoral fellows and academic researchers at any of
11 the National Centers for Environmental Prediction.

12 (b) **GOAL.**—This program shall be designed to pro-
13 vide direct interaction between forecasters and talented
14 academic and private sector researchers in an effort to
15 bring innovation to forecasting tools and techniques to the
16 National Weather Service.

17 (c) **SELECTION AND APPOINTMENT.**—Such fellows
18 shall be competitively selected and appointed for a term
19 not to exceed 1 year.

20 **SEC. 405. WARNING COORDINATION METEOROLOGISTS AT**
21 **WEATHER FORECAST OFFICES OF NATIONAL**
22 **WEATHER SERVICE.**

23 (a) **DESIGNATION OF WARNING COORDINATION ME-**
24 **TEOROLOGISTS.**—

1 (1) IN GENERAL.—The Director of the National
2 Weather Service shall designate at least one warning
3 coordination meteorologist at each weather forecast
4 office of the National Weather Service.

5 (2) NO ADDITIONAL EMPLOYEES AUTHOR-
6 IZED.—Nothing in this section shall be construed to
7 authorize or require a change in the authorized
8 number of full time equivalent employees in the Na-
9 tional Weather Service or otherwise result in the em-
10 ployment of any additional employees.

11 (3) PERFORMANCE BY OTHER EMPLOYEES.—
12 Performance of the responsibilities outlined in this
13 section is not limited to the warning coordination
14 meteorologist position.

15 (b) PRIMARY ROLE OF WARNING COORDINATION
16 METEOROLOGISTS.—The primary role of the warning co-
17 ordination meteorologist shall be to carry out the respon-
18 sibilities required by this section.

19 (c) RESPONSIBILITIES.—

20 (1) IN GENERAL.—Subject to paragraph (2),
21 consistent with the analysis described in section 409,
22 and in order to increase impact-based decision sup-
23 port services, each warning coordination meteorolo-
24 gist designated under subsection (a) shall—

1 (A) be responsible for providing service to
2 the geographic area of responsibility covered by
3 the weather forecast office at which the warning
4 coordination meteorologist is employed to help
5 ensure that users of products of the National
6 Weather Service can respond effectively to im-
7 prove outcomes from weather events;

8 (B) liaise with users of products and serv-
9 ices of the National Weather Service, such as
10 the public, media outlets, users in the aviation,
11 marine, and agricultural communities, and for-
12 estry, land, and water management interests, to
13 evaluate the adequacy and usefulness of the
14 products and services of the National Weather
15 Service;

16 (C) collaborate with such weather forecast
17 offices and State, local, and tribal government
18 agencies as the Director considers appropriate
19 in developing, proposing, and implementing
20 plans to develop, modify, or tailor products and
21 services of the National Weather Service to im-
22 prove the usefulness of such products and serv-
23 ices;

24 (D) ensure the maintenance and accuracy
25 of severe weather call lists, appropriate office

1 severe weather policy or procedures, and other
2 severe weather or dissemination methodologies
3 or strategies; and

4 (E) work closely with State, local, and trib-
5 al emergency management agencies, and other
6 agencies related to disaster management, to en-
7 sure a planned, coordinated, and effective pre-
8 paredness and response effort.

9 (2) OTHER STAFF.—The Director may assign a
10 responsibility set forth in paragraph (1) to such
11 other staff as the Director considers appropriate to
12 carry out such responsibility.

13 (d) ADDITIONAL RESPONSIBILITIES.—

14 (1) IN GENERAL.—Subject to paragraph (2), a
15 warning coordination meteorologist designated under
16 subsection (a) may—

17 (A) work with a State agency to develop
18 plans for promoting more effective use of prod-
19 ucts and services of the National Weather Serv-
20 ice throughout the State;

21 (B) identify priority community prepared-
22 ness objectives;

23 (C) develop plans to meet the objectives
24 identified under paragraph (2); and

1 (D) conduct severe weather event pre-
2 paredness planning and citizen education efforts
3 with and through various State, local, and trib-
4 al government agencies and other disaster man-
5 agement-related organizations.

6 (2) OTHER STAFF.—The Director may assign a
7 responsibility set forth in paragraph (1) to such
8 other staff as the Director considers appropriate to
9 carry out such responsibility.

10 (e) PLACEMENT WITH STATE AND LOCAL EMER-
11 GENCY MANAGERS.—

12 (1) IN GENERAL.—In carrying out this section,
13 the Director of the National Weather Service may
14 place a warning coordination meteorologist des-
15 ignated under subsection (a) with a State or local
16 emergency manager if the Director considers doing
17 so is necessary or convenient to carry out this sec-
18 tion.

19 (2) TREATMENT.—If the Director determines
20 that the placement of a warning coordination mete-
21 orologist placed with a State or local emergency
22 manager under paragraph (1) is near a weather
23 forecast office of the National Weather Service, such
24 placement shall be treated as designation of the

1 warning coordination meteorologist at such weather
2 forecast office for purposes of subsection (a).

3 **SEC. 406. IMPROVING NATIONAL OCEANIC AND ATMOS-**
4 **PHERIC ADMINISTRATION COMMUNICATION**
5 **OF HAZARDOUS WEATHER AND WATER**
6 **EVENTS.**

7 (a) **PURPOSE OF SYSTEM.**—For purposes of the as-
8 sessment required by subsection (b)(1)(A), the purpose of
9 National Oceanic and Atmospheric Administration system
10 for issuing watches and warnings regarding hazardous
11 weather and water events shall be risk communication to
12 the general public that informs action to prevent loss of
13 life and property.

14 (b) **ASSESSMENT OF SYSTEM.**—

15 (1) **IN GENERAL.**—Not later than 2 years after
16 the date of the enactment of this Act, the Under
17 Secretary shall—

18 (A) assess the National Oceanic and At-
19 mospheric Administration system for issuing
20 watches and warnings regarding hazardous
21 weather and water events; and

22 (B) submit to Congress a report on the
23 findings of the Under Secretary with respect to
24 the assessment conducted under subparagraph
25 (A).

1 (2) ELEMENTS.—The assessment required by
2 paragraph (1)(A) shall include the following:

3 (A) An evaluation of whether the National
4 Oceanic and Atmospheric Administration sys-
5 tem for issuing watches and warnings regarding
6 hazardous weather and water events meets the
7 purpose described in subsection (a).

8 (B) Development of recommendations
9 for—

10 (i) legislative and administrative ac-
11 tion to improve the system described in
12 paragraph (1)(A); and

13 (ii) such research as the Under Sec-
14 retary considers necessary to address the
15 focus areas described in paragraph (3).

16 (3) FOCUS AREAS.—The assessment required
17 by paragraph (1)(A) shall focus on the following:

18 (A) Ways to communicate the risks posed
19 by hazardous weather or water events to the
20 public that are most likely to result in action to
21 mitigate the risk.

22 (B) Ways to communicate the risks posed
23 by hazardous weather or water events to the
24 public as broadly and rapidly as practicable.

1 (C) Ways to preserve the benefits of the
2 existing watches and warnings system.

3 (D) Ways to maintain the utility of the
4 watches and warnings system for Government
5 and commercial users of the system.

6 (4) CONSULTATION.—In conducting the assess-
7 ment required by paragraph (1)(A), the Under Sec-
8 retary shall—

9 (A) consult with such line offices within
10 the National Oceanic and Atmospheric Admin-
11 istration as the Under Secretary considers rel-
12 evant, including the National Ocean Service,
13 the National Weather Service, and the Office of
14 Oceanic and Atmospheric Research;

15 (B) consult with individuals in the aca-
16 demic sector, including individuals in the field
17 of social and behavioral sciences, and other
18 weather services;

19 (C) consult with media outlets that will be
20 distributing the watches and warnings;

21 (D) consult with non-Federal forecasters
22 that produce alternate severe weather risk com-
23 munication products;

24 (E) consult with emergency planners and
25 responders, including State and local emergency

1 management agencies, and other government
2 users of the watches and warnings system, in-
3 cluding the Federal Emergency Management
4 Agency, the Office of Personnel Management,
5 the Coast Guard, and such other Federal agen-
6 cies as the Under Secretary determines rely on
7 watches and warnings for operational decisions;
8 and

9 (F) make use of the services of the Na-
10 tional Academy of Sciences, as the Under Sec-
11 retary considers necessary and practicable, in-
12 cluding contracting with the National Research
13 Council to review the scientific and technical
14 soundness of the assessment required by para-
15 graph (1)(A), including the recommendations
16 developed under paragraph (2)(B).

17 (5) METHODOLOGIES.—In conducting the as-
18 sessment required by paragraph (1)(A), the Under
19 Secretary shall use such methodologies as the Under
20 Secretary considers are generally accepted by the
21 weather enterprise, including social and behavioral
22 sciences.

23 (c) IMPROVEMENTS TO SYSTEM.—

24 (1) IN GENERAL.—The Under Secretary shall,
25 based on the assessment required by subsection

1 (b)(1)(A), make such recommendations to Congress
2 to improve the system as the Under Secretary con-
3 siders necessary—

4 (A) to improve the system for issuing
5 watches and warnings regarding hazardous
6 weather and water events; and

7 (B) to support efforts to satisfy research
8 needs to enable future improvements to such
9 system.

10 (2) REQUIREMENTS REGARDING RECOMMENDA-
11 TIONS.—In carrying out paragraph (1)(A), the
12 Under Secretary shall ensure that any recommenda-
13 tion that the Under Secretary considers a major
14 change—

15 (A) is validated by social and behavioral
16 science using a generalizable sample;

17 (B) accounts for the needs of various de-
18 mographics, vulnerable populations, and geo-
19 graphic regions;

20 (C) accounts for the differences between
21 types of weather and water hazards;

22 (D) responds to the needs of Federal,
23 State, and local government partners and media
24 partners; and

1 (E) accounts for necessary changes to Fed-
2 erally operated watch and warning propagation
3 and dissemination infrastructure and protocols.

4 (d) WATCHES AND WARNINGS DEFINED.—

5 (1) IN GENERAL.—Except as provided in para-
6 graph (2), in this section, the terms “watch” and
7 “warning”, with respect to a hazardous weather and
8 water event, mean products issued by the Adminis-
9 tration, intended for consumption by the general
10 public, to alert the general public to the potential for
11 or presence of the event and to inform action to pre-
12 vent loss of life and property.

13 (2) EXCEPTION.—In this section, the terms
14 “watch” and “warning” do not include technical or
15 specialized meteorological and hydrological forecasts,
16 outlooks, or model guidance products.

17 **SEC. 407. NATIONAL OCEANIC AND ATMOSPHERIC ADMIN-**
18 **ISTRATION WEATHER READY ALL HAZARDS**
19 **AWARD PROGRAM.**

20 (a) PROGRAM.—The Director of the National Weath-
21 er Service is authorized to establish the National Oceanic
22 and Atmospheric Administration Weather Ready All Haz-
23 ards Award Program. This award program shall provide
24 annual awards to honor individuals or organizations that
25 use or provide National Oceanic and Atmospheric Admin-

1 istration Weather Radio All Hazards receivers or trans-
2 mitters to save lives and protect property. Individuals or
3 organizations that utilize other early warning tools or ap-
4 plications also qualify for this award.

5 (b) GOAL.—This award program draws attention to
6 the life-saving work of the National Oceanic and Atmos-
7 pheric Administration Weather Ready All Hazards Pro-
8 gram, as well as emerging tools and applications, that pro-
9 vide real-time warning to individuals and communities of
10 severe weather or other hazardous conditions.

11 (c) PROGRAM ELEMENTS.—

12 (1) NOMINATIONS.—Nominations for this
13 award shall be made annually by the Weather Field
14 Offices to the Director of the National Weather
15 Service. Broadcast meteorologists, weather radio
16 manufacturers and weather warning tool and appli-
17 cation developers, emergency managers, and public
18 safety officials may nominate individuals or organi-
19 zations to their local Weather Field Offices, but the
20 final list of award nominees must come from the
21 Weather Field Offices.

22 (2) SELECTION OF AWARDEES.—Annually, the
23 Director of the National Weather Service shall
24 choose winners of this award whose timely actions,
25 based on National Oceanic and Atmospheric Admin-

1 istration Weather Radio All Hazards receivers or
2 transmitters or other early warning tools and appli-
3 cations, saved lives or property, or demonstrated
4 public service in support of weather or all hazard
5 warnings.

6 (3) AWARD CEREMONY.—The Director of the
7 National Weather Service shall establish a means of
8 making these awards to provide maximum public
9 awareness of the importance of National Oceanic
10 and Atmospheric Administration Weather Radio,
11 and such other warning tools and applications as are
12 represented in the awards.

13 **SEC. 408. DEPARTMENT OF DEFENSE WEATHER FORE-**
14 **CASTING ACTIVITIES.**

15 Not later than 60 days after the date of the enact-
16 ment of this Act, the Under Secretary shall submit to the
17 Committee on Commerce, Science, and Transportation of
18 the Senate and the Committee on Science, Space, and
19 Technology of the House of Representatives a report ana-
20 lyzing the impacts of the proposed Air Force divestiture
21 in the United States Weather Research and Forecasting
22 Model, including—

23 (1) the impact on—

24 (A) the United States weather forecasting
25 capabilities;

1 (B) the accuracy of civilian regional fore-
2 casts;

3 (C) the civilian readiness for traditional
4 weather and extreme weather events in the
5 United States; and

6 (D) the research necessary to develop the
7 United States Weather Research and Fore-
8 casting Model; and

9 (2) such other analysis relating to the divesti-
10 ture as the Under Secretary considers appropriate.

11 **SEC. 409. NATIONAL WEATHER SERVICE; OPERATIONS AND**
12 **WORKFORCE ANALYSIS.**

13 The Under Secretary shall contract or continue to
14 partner with an external organization to conduct a base-
15 line analysis of National Weather Service operations and
16 workforce.

17 **SEC. 410. REPORT ON CONTRACT POSITIONS AT NATIONAL**
18 **WEATHER SERVICE.**

19 (a) **REPORT REQUIRED.**—Not later than 180 days
20 after the date of the enactment of this Act, the Under
21 Secretary shall submit to Congress a report on the use
22 of contractors at the National Weather Service for the
23 most recently completed fiscal year.

1 (b) CONTENTS.—The report required by subsection
2 (a) shall include, with respect to the most recently com-
3 pleted fiscal year, the following:

4 (1) The total number of full-time equivalent
5 employees at the National Weather Service,
6 disaggregated by each equivalent level of the General
7 Schedule.

8 (2) The total number of full-time equivalent
9 contractors at the National Weather Service,
10 disaggregated by each equivalent level of the General
11 Schedule that most closely approximates their du-
12 ties.

13 (3) The total number of vacant positions at the
14 National Weather Service on the day before the date
15 of enactment of this Act, disaggregated by each
16 equivalent level of the General Schedule.

17 (4) The five most common positions filled by
18 full-time equivalent contractors at the National
19 Weather Service and the equivalent level of the Gen-
20 eral Schedule that most closely approximates the du-
21 ties of such positions.

22 (5) Of the positions identified under paragraph
23 (4), the percentage of full-time equivalent contrac-
24 tors in those positions that have held a prior posi-
25 tion at the National Weather Service or another en-

1 tity in National Oceanic and Atmospheric Adminis-
2 tration.

3 (6) The average full-time equivalent salary for
4 Federal employees at the National Weather Service
5 for each equivalent level of the General Schedule.

6 (7) The average salary for full-time equivalent
7 contractors performing at each equivalent level of
8 the General Schedule at the National Weather Serv-
9 ice.

10 (8) A description of any actions taken by the
11 Under Secretary to respond to the issues raised by
12 the Inspector General of the Department of Com-
13 merce regarding the hiring of former National Oee-
14 anic and Atmospheric Administration employees as
15 contractors at the National Weather Service such as
16 the issues raised in the Investigative Report dated
17 June 2, 2015 (OIG-12-0447).

18 (c) ANNUAL PUBLICATION.—For each fiscal year
19 after the fiscal year covered by the report required by sub-
20 section (a), the Under Secretary shall, not later than 180
21 days after the completion of the fiscal year, publish on
22 a publicly accessible Internet website the information de-
23 scribed in paragraphs (1) through (8) of subsection (b)
24 for such fiscal year.

1 **SEC. 411. WEATHER IMPACTS TO COMMUNITIES AND IN-**
2 **FRASTRUCTURE.**

3 (a) **REVIEW.**—

4 (1) **IN GENERAL.**—The Director of the National
5 Weather Service shall review existing research, prod-
6 ucts, and services that meet the specific needs of the
7 urban environment, given its unique physical charac-
8 teristics and forecasting challenges.

9 (2) **ELEMENTS.**—The review required by para-
10 graph (1) shall include research, products, and serv-
11 ices with the potential to improve modeling and fore-
12 casting capabilities, taking into account factors in-
13 cluding varying building heights, impermeable sur-
14 faces, lack of tree canopy, traffic, pollution, and
15 inter-building wind effects.

16 (b) **REPORT AND ASSESSMENT.**—Upon completion of
17 the review required by subsection (a), the Under Secretary
18 shall submit to Congress a report on the research, prod-
19 ucts, and services of the National Weather Service, includ-
20 ing an assessment of such research, products, and services
21 that is based on the review, public comment, and recent
22 publications by the National Academy of Sciences.

23 **SEC. 412. WEATHER ENTERPRISE OUTREACH.**

24 (a) **IN GENERAL.**—The Under Secretary may estab-
25 lish mechanisms for outreach to the weather enterprise—

1 (1) to assess the weather forecasts and forecast
2 products provided by the National Oceanic and At-
3 mospheric Administration; and

4 (2) to determine the highest priority weather
5 forecast needs of the community described in sub-
6 section (b).

7 (b) OUTREACH COMMUNITY.—In conducting out-
8 reach under subsection (a), the Under Secretary shall con-
9 tact leading experts and innovators from relevant stake-
10 holders, including the representatives from the following:

11 (1) State or local emergency management agen-
12 cies.

13 (2) State agriculture agencies.

14 (3) Indian tribes (as defined in section 4 of the
15 Indian Self-Determination and Education Assistance
16 Act (25 U.S.C. 5304)) and Native Hawaiians (as de-
17 fined in section 6207 of the Elementary and Sec-
18 ondary Education Act of 1965 (20 U.S.C. 7517)).

19 (4) The private aerospace industry.

20 (5) The private earth observing industry.

21 (6) The operational forecasting community.

22 (7) The academic community.

23 (8) Professional societies that focus on meteor-
24 ology.

1 (9) Such other stakeholder groups as the Under
2 Secretary considers appropriate.

3 **SEC. 413. HURRICANE HUNTER AIRCRAFT.**

4 (a) **BACKUP CAPABILITY.**—The Under Secretary
5 shall acquire backup for the capabilities of the WP-3D
6 Orion and G-IV hurricane aircraft of the National Oee-
7 anic and Atmospheric Administration that is sufficient to
8 prevent a single point of failure.

9 (b) **AUTHORITY TO ENTER AGREEMENTS.**—In order
10 to carry out subsection (a), the Under Secretary shall ne-
11 gotiate and enter into 1 or more agreements or contracts,
12 to the extent practicable and necessary, with governmental
13 and non-governmental entities.

14 (c) **FUTURE TECHNOLOGY.**—The Under Secretary
15 shall continue the development of Airborne Phased Array
16 Radar under the United States Weather Research Pro-
17 gram.

18 (d) **AUTHORIZATION OF APPROPRIATIONS.**—For
19 each of fiscal years 2017 through 2020, support for imple-
20 menting subsections (a) and (b) is authorized out of funds
21 appropriated to the Office of Marine and Aviation Oper-
22 ations.

23 **SEC. 414. STUDY ON GAPS IN NEXRAD COVERAGE AND REC-**
24 **COMMENDATIONS TO ADDRESS SUCH GAPS.**

25 (a) **STUDY ON GAPS IN NEXRAD COVERAGE.**—

1 (1) IN GENERAL.—Not later than 180 days
2 after the date of the enactment of this Act, the Sec-
3 retary of Commerce shall complete a study on gaps
4 in the coverage of the Next Generation Weather
5 Radar of the National Weather Service
6 (“NEXRAD”).

7 (2) ELEMENTS.—In conducting the study re-
8 quired under paragraph (1), the Secretary shall—

9 (A) identify areas in the United States
10 where limited or no NEXRAD coverage has re-
11 sulted in—

12 (i) instances in which no or insuffi-
13 cient warnings were given for hazardous
14 weather events, including tornadoes; or

15 (ii) degraded forecasts for hazardous
16 weather events that resulted in fatalities,
17 significant injuries, or substantial property
18 damage; and

19 (B) for the areas identified under subpara-
20 graph (A)—

21 (i) identify the key weather effects for
22 which prediction would improve with im-
23 proved radar detection;

24 (ii) identify additional sources of ob-
25 servations for high impact weather that

1 were available and operational for such
2 areas on the day before the date of the en-
3 actment of this Act, including dense net-
4 works of x-band radars, Terminal Doppler
5 Weather Radar (commonly known as
6 “TDWR”), air surveillance radars of the
7 Federal Aviation Administration, and coop-
8 erative network observers;

9 (iii) assess the feasibility and advis-
10 ability of efforts to integrate and upgrade
11 Federal radar capabilities that are not
12 owned or controlled by the National Oee-
13 anic and Atmospheric Administration, in-
14 cluding radar capabilities of the Federal
15 Aviation Administration and the Depart-
16 ment of Defense;

17 (iv) assess the feasibility and advis-
18 ability of incorporating State-operated and
19 other non-Federal radars into the oper-
20 ations of the National Weather Service;

21 (v) identify options to improve haz-
22 ardous weather detection and forecasting
23 coverage; and

1 (vi) provide the estimated cost of, and
2 timeline for, each of the options identified
3 under clause (v).

4 (3) REPORT.—Upon the completion of the
5 study required under paragraph (1), the Secretary
6 shall submit to the Committee on Commerce,
7 Science, and Transportation of the Senate and the
8 Committee on Science, Space, and Technology of the
9 House of Representatives a report that includes the
10 findings of the Secretary with respect to the study.

11 (b) RECOMMENDATIONS TO IMPROVE RADAR COV-
12 ERAGE.—Not later than 90 days after the completion of
13 the study under subsection (a)(1), the Secretary of Com-
14 merce shall submit to the congressional committees re-
15 ferred to in subsection (a)(3) recommendations for im-
16 proving hazardous weather detection and forecasting cov-
17 erage in the areas identified under subsection (a)(2)(A)
18 by integrating additional observation solutions to the ex-
19 tent practicable and meteorologically justified and nec-
20 essary to protect public safety.

21 (c) THIRD-PARTY CONSULTATION REGARDING REC-
22 OMMENDATIONS TO IMPROVE RADAR COVERAGE.—The
23 Secretary of Commerce may seek reviews by, or consult
24 with, appropriate third parties regarding the scientific
25 methodology relating to, and the feasibility and advis-

1 ability of implementing, the recommendations submitted
2 under subsection (b), including the extent to which warn-
3 ing and forecast services of the National Weather Service
4 would be improved by additional observations.