

117TH CONGRESS  
2D SESSION

**S.** \_\_\_\_\_

To improve the forecasting and understanding of tornadoes and other hazardous weather, and for other purposes.

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IN THE SENATE OF THE UNITED STATES

\_\_\_\_\_  
Mr. WICKER introduced the following bill; which was read twice and referred to the Committee on \_\_\_\_\_

\_\_\_\_\_  
**A BILL**

To improve the forecasting and understanding of tornadoes and other hazardous weather, 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 “Tornado Observations  
5 Research and Notification Assessment for Development of  
6 Operations Act” or the “TORNADO Act”.

7 **SEC. 2. DEFINITIONS.**

8 In this Act:

9 (1) HISTORICALLY BLACK COLLEGE OR UNI-  
10 VERSITY.—The term “historically Black college or

1 university” has the meaning given the term “part B  
2 institution” in section 322 of the Higher Education  
3 Act of 1965 (20 U.S.C. 1061).

4 (2) INSTITUTION OF HIGHER EDUCATION.—The  
5 term “institution of higher education” has the  
6 meaning given the term in section 101(a) of the  
7 Higher Education Act of 1965 (20 U.S.C. 1001(a)).

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

11 **SEC. 3. HAZARDOUS WEATHER AND WATER EVENT RISK**  
12 **COMMUNICATION.**

13 (a) IN GENERAL.—The Under Secretary shall main-  
14 tain and improve the system of the National Oceanic and  
15 Atmospheric Administration by which the risks of haz-  
16 ardous weather and water events are communicated to the  
17 general public, with the goal of informing action and en-  
18 couraging response to prevent loss of life and property.

19 (b) HAZARD RISK COMMUNICATION IMPROVEMENT  
20 AND SIMPLIFICATION.—

21 (1) IN GENERAL.—The Under Secretary shall  
22 establish, or designate an existing office to serve as,  
23 a hazard risk communication office (in this sub-  
24 section referred to as the “Office”), for the purposes

1 of simplifying and improving the communication of  
2 hazardous weather and water event risks.

3 (2) TERMINOLOGY.—The Office shall identify,  
4 eliminate, or modify unnecessary, redundant, or con-  
5 fusing terms for hazardous weather and water event  
6 communications and add new terminology, as appro-  
7 priate.

8 (3) COMMUNICATIONS IMPROVEMENT.—The Of-  
9 fice shall improve the form, content, and methods of  
10 hazardous weather and water event communications  
11 to more clearly inform action and increase the likeli-  
12 hood that the public takes such action to prevent the  
13 loss of life or property.

14 (4) EVALUATIONS.—The Office shall, in coordi-  
15 nation with the performance branch of the National  
16 Weather Service, develop metrics for that branch to  
17 track and evaluate the degree to which hazardous  
18 weather and water event communications result in  
19 action and response.

20 (5) SUPPORT PLAN.—The Office shall develop a  
21 plan for the purpose of supporting the activities de-  
22 scribed in paragraph (3). The plan shall be periodi-  
23 cally updated and informed by internal and extra-  
24 mural research and the results of the evaluation of

1 hazardous weather and water event communications  
2 conducted under paragraph (4).

3 (6) METHODS.—In carrying out this subsection,  
4 the Office shall develop and implement recommenda-  
5 tions that—

6 (A) are based on the best and most recent  
7 understanding from authoritative social, behav-  
8 ioral, risk, and communication science research;

9 (B) are validated by social, behavioral,  
10 risk, and communication science sound survey  
11 designs, taking into account the importance of  
12 reproducibility and replicability of results, using  
13 rigorous statistical analyses;

14 (C) account for the needs of various demo-  
15 graphics, vulnerable populations, and geo-  
16 graphic regions;

17 (D) account for the differences between  
18 various types of weather and water hazards;

19 (E) respond to the needs of Federal, State,  
20 and local government partners and media part-  
21 ners; and

22 (F) account for necessary changes in the  
23 infrastructure, technology, and protocols for  
24 creating and disseminating federally operated  
25 watches and warnings.

1           (7) COORDINATION.—The Office shall periodi-  
2 cally provide updates on best practices for commu-  
3 nicating hazardous weather and water events to  
4 Federal, State, and local government partners, insti-  
5 tutions of higher education, private entities, and  
6 media partners.

7           (8) TIMELINESS AND CONSISTENCY.—The Of-  
8 fice shall develop best practices and guidance for en-  
9 suring timely and consistent communication across  
10 public facing platforms that disseminate hazardous  
11 weather and water event information.

12       (c) HAZARD COMMUNICATION RESEARCH AND EN-  
13 GAGEMENT.—

14           (1) IN GENERAL.—The Under Secretary shall  
15 establish or maintain a research program—

16               (A) to modernize the creation and commu-  
17 nication of risk-based, statistically reliable,  
18 probabilistic hazard information to inform effec-  
19 tive responses to hazardous weather and water  
20 events; and

21               (B) to improve the fundamental social, be-  
22 havioral, risk, and communication science re-  
23 garding hazardous weather and water event  
24 communication.

1           (2) COORDINATION.—In carrying out the re-  
2           search program required by paragraph (1), the  
3           Under Secretary shall coordinate and communicate  
4           with States, Tribes, localities, and emergency man-  
5           agers on research priorities and results.

6           (3) PILOT PROGRAM REQUIRED.—

7           (A) IN GENERAL.—To further research  
8           into hazard communication, the Under Sec-  
9           retary, in collaboration with one or more eligible  
10          institutions, shall establish a pilot program to  
11          test the effectiveness of implementing the re-  
12          search conducted under this subsection.

13          (B) ELIGIBLE INSTITUTION DEFINED.—In  
14          this paragraph, the term “eligible institution”  
15          means any of the following:

16               (i) A historically Black college or uni-  
17               versity located in an area of persistent pov-  
18               erty that is subjected to frequent severe  
19               weather, such as tornadoes, hurricanes,  
20               and floods.

21               (ii) An institution of higher education  
22               in close proximity to a National Weather  
23               Service Weather Forecast Office of the Na-  
24               tional Weather Service.

1 (d) DATA MANAGEMENT.—The Under Secretary  
2 shall establish, maintain, and improve a central repository  
3 system for the National Oceanic and Atmospheric Admin-  
4 istration for social, behavioral, risk, and economic data re-  
5 lated to the communication of hazardous weather and  
6 water events, including data developed or received pursu-  
7 ant to paragraphs (3), (4), and (5) of subsection (b).

8 (e) DIGITAL WATERMARKING.—The Under Secretary  
9 shall develop methods to reduce the likelihood of unauthor-  
10 ized tampering with online hazardous weather and water  
11 event risk communication, such as developing digital wa-  
12 termarks.

13 **SEC. 4. WARN-ON-FORECAST STRATEGIC PLAN.**

14 (a) IN GENERAL.—Not later than one year after the  
15 date of the enactment of this Act, the Under Secretary  
16 shall prepare and submit to Congress a strategic plan for  
17 developing and prioritizing the implementation of high-  
18 resolution probabilistic forecast guidance for tornadic con-  
19 ditions using a next-generation weather forecast and  
20 warning framework.

21 (b) PLAN ELEMENTS.—The strategic plan required  
22 by subsection (a) shall include the following:

23 (1) A discussion of—

1 (A) the priorities and needs of vulnerable  
2 populations and National Weather Service part-  
3 ners; and

4 (B) high-performance computing, visualiza-  
5 tion, and dissemination needs.

6 (2) A timeline and guidance for implementation  
7 of—

8 (A) high-resolution numerical weather pre-  
9 diction models;

10 (B) methods for meeting the high-perform-  
11 ance computing, visualization, and dissemina-  
12 tion needs discussed under paragraph (1)(B);

13 (C) real-time high-resolution probabilistic  
14 forecasts;

15 (D) improved observations, including  
16 through radars, satellites, and uncrewed aerial  
17 systems;

18 (E) a flexible framework to communicate  
19 clear and simple hazardous weather and water  
20 event information to the public; and

21 (F) social, behavioral, risk, and commu-  
22 nication research to improve the forecaster  
23 operational environment and societal informa-  
24 tion reception and response.

1 **SEC. 5. TORNADO RATING SYSTEM.**

2 (a) IN GENERAL.—The Under Secretary shall, in col-  
3 laboration with such stakeholders as the Under Secretary  
4 considers appropriate—

5 (1) evaluate the system used as of the date of  
6 the enactment of this Act to rate the severity of tor-  
7 nadoes; and

8 (2) determine whether updates to that system  
9 are required to ensure that the ratings accurately re-  
10 flect the severity of tornadoes.

11 (b) UPDATE REQUIRED.—If the Under Secretary de-  
12 termines under subsection (a) that updates to the tornado  
13 rating system are necessary, the Under Secretary shall up-  
14 date the system.

15 **SEC. 6. POST-STORM SURVEYS AND ASSESSMENTS.**

16 (a) IN GENERAL.—The Under Secretary shall per-  
17 form one or more post-storm surveys and assessments fol-  
18 lowing each hazardous weather or water event determined  
19 by the Under Secretary to be of sufficient societal impor-  
20 tance to warrant a post-event survey and assessment.

21 (b) COORDINATION.—The Under Secretary shall co-  
22 ordinate with Federal, State, and local governments, pri-  
23 vate entities, and relevant institutions of higher education  
24 when conducting post-storm surveys and assessments  
25 under subsection (a) in order to optimize data collection,  
26 sharing, and integration.

1           (c) DATA AVAILABILITY.—The Under Secretary shall  
2 make the data obtained from each post-storm survey and  
3 assessment conducted under subsection (a) available to the  
4 public as soon as practicable after conducting the survey  
5 and assessment.

6           (d) IMPROVEMENT.—The Under Secretary shall—

7               (1) investigate the role of uncrewed aerial sys-  
8 tems in data collection during post-storm surveys  
9 and assessments conducted under subsection (a);

10              (2) update tactics and procedures to enhance  
11 the efficiency and reliability of data obtained from  
12 post-storm surveys and assessments; and

13              (3) increase the number of post-storm commu-  
14 nity impact studies, including surveying individual  
15 responses and gathering survivability statistics.

16           (e) SUPPORT FOR EMPLOYEES.—The Under Sec-  
17 retary shall provide training, resources, and access to pro-  
18 fessional counseling to support the emotional and mental  
19 health and well-being of employees conducting post-storm  
20 surveys and assessments under subsection (a).

21 **SEC. 7. VORTEX-USA PROGRAM.**

22           (a) IN GENERAL.—Section 103 of the Weather Re-  
23 search and Forecasting Innovation Act of 2017 (15 U.S.C.  
24 8513) is amended—

1 (1) in the section heading, by striking “**TOR-**  
2 **NADO WARNING IMPROVEMENT AND EXTEN-**  
3 **SION**” and inserting “**VORTEX-USA**”;

4 (2) in subsection (a), by striking “establish a  
5 tornado warning improvement and extension pro-  
6 gram” and inserting “maintain a program for rap-  
7 idly improving tornado forecast and warnings”;

8 (3) by striking subsections (c) and (d); and

9 (4) by adding at the end the following:

10 “(c) **INNOVATIVE OBSERVATIONS.**—The Under Sec-  
11 retary shall ensure that the program required by sub-  
12 section (a) periodically examines the value of incorporating  
13 innovative observations with respect to the improvement  
14 of tornado forecasts, predictions, and warnings, such as  
15 acoustic or infrasonic measurements, observations from  
16 phased array radars, and observations from mesonets.

17 “(d) **WARNINGS.**—The program required by sub-  
18 section (a) shall—

19 “(1) continue the research necessary to develop  
20 and deploy probabilistic weather forecast guidance  
21 technology for tornados; and

22 “(2) incorporate, as appropriate, hazard com-  
23 munication research.

24 “(e) **RESEARCH.**—

1           “(1) IN GENERAL.—The Under Secretary shall,  
2 through the program required by subsection (a),  
3 award grants for research that focuses on improv-  
4 ing—

5           “(A) the social, behavioral, risk, commu-  
6 nication, and economic sciences related to  
7 vulnerabilities, risk communication, and delivery  
8 of information critical for saving lives and prop-  
9 erty related to tornadoes; and

10           “(B) the physical sciences, engineering,  
11 and technology related to tornado formation,  
12 the interactions of tornadoes with the built and  
13 natural environment, and the interaction of tor-  
14 nadoes and hurricanes.

15           “(2) PRIORITY INSTITUTIONS.—In awarding  
16 grants under paragraph (1), the Under Secretary  
17 shall prioritize awarding grants to historically Black  
18 colleges and universities.

19           “(f) AUTHORIZATION OF APPROPRIATIONS.—There  
20 is authorized to be appropriated to the Under Secretary  
21 to carry out this section \$7,500,000 for each of fiscal  
22 years 2022 through 2030, of which not less than  
23 \$2,000,000 each fiscal year shall be used for grants  
24 awarded under subsection (e).”.

1 (b) CLERICAL AMENDMENT.—The table of contents  
2 in section 1(b) of the Weather Research and Forecasting  
3 Innovation Act of 2017 (Public Law 115–25; 131 Stat.  
4 91) is amended by striking the item relating to section  
5 103 and inserting the following:

“Sec. 103. VORTEX-USA program.”.

6 **SEC. 8. REPORTS.**

7 (a) WEATHER RESEARCH AND FORECASTING INNO-  
8 VATION ACT OF 2017.—

9 (1) IN GENERAL.—Section 403 of the Weather  
10 Research and Forecasting Innovation Act of 2017  
11 (15 U.S.C. 8543) is amended by striking subsection  
12 (d).

13 (2) TECHNICAL AMENDMENT.—Section 403(a)  
14 of such Act (15 U.S.C. 8543(a)) is amended by in-  
15 serting “the” after “Director of”.

16 (b) NATIONAL OCEANIC AND ATMOSPHERIC ADMIN-  
17 ISTRATION AUTHORIZATION ACT OF 1992.—Section 106  
18 of the National Oceanic and Atmospheric Administration  
19 Authorization Act of 1992 (Public Law 102–567; 106  
20 Stat. 4274) is amended by striking subsection (c) (15  
21 U.S.C. 1537).