AMENDMENT NO._______ Calendar No._____

Purpose: In the nature of a substitute.


S. 3817

To improve the forecasting and understanding of tornadoes and other hazardous weather, 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 ____________

Viz:

1 Strike all after the enacting clause and insert the following:

2 SECTION 1. SHORT TITLE.

3 This Act may be cited as the “Tornado Observations Research and Notification Assessment for Development of Operations Act” or the “TORNADO Act”.

4 SEC. 2. DEFINITIONS.

5 In this Act:

6 (1) HAZARDOUS WEATHER AND WATER EVENTS.—The term “hazardous weather and water events” means weather and water events that have a high risk of loss of life or property, including—
(A) severe storms, such as hurricanes and short-fused, small-scale hazardous weather or hydrologic events produced by thunderstorms, including large hail, damaging winds, tornadoes, and flash floods;

(B) winter storms, such as freezing or frozen precipitation (including freezing rain, sleet, and snow), or combined effects of freezing or frozen precipitation and strong winds; and

(C) other weather hazards, such as extreme heat or cold, wildfire, drought, dense fog, high winds, river flooding and lakeshore flooding.

(2) HISTORICALLY BLACK COLLEGE OR UNIVERSITY.—The term "historically Black college or university" has the meaning given the term "part B institution" in section 322 of the Higher Education Act of 1965 (20 U.S.C. 1061).

(3) INSTITUTION OF HIGHER EDUCATION.—The term "institution of higher education" has the meaning given the term in section 101(a) of the Higher Education Act of 1965 (20 U.S.C. 1001(a)).

(4) NATIONAL LABORATORY.—The term “National Laboratory” has the meaning given the term
in section 2 of the Energy Policy Act of 2005 (42

(5) TRIBAL GOVERNMENT.—The term "Tribal
government" means the recognized governing body
of any Indian or Alaska Native tribe, band, nation,
pueblo, village, community, component band, or com-
ponent reservation, individually identified (including
parenthetically) in the list published most recently as
of the date of enactment of this Act pursuant to sec-
tion 104 of the Federally Recognized Indian Tribe

(6) UNDER SECRETARY.—The term "Under
Secretary" means the Under Secretary of Commerce
for Oceans and Atmosphere.

SEC. 3. HAZARDOUS WEATHER AND WATER EVENT RISK
COMMUNICATION.

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

(b) HAZARD RISK COMMUNICATION IMPROVEMENT
AND SIMPLIFICATION.—
(1) IN GENERAL.—The Under Secretary shall maintain a hazard risk communication office (in this subsection referred to as the "Office"), for the purposes of simplifying and improving the communication of hazardous weather and water event risks.

(2) TERMINOLOGY.—The Office shall identify, eliminate, or modify unnecessary, redundant, or confusing terms for hazardous weather and water event communications and add new terminology, as appropriate.

(3) COMMUNICATIONS IMPROVEMENT.—The Office shall improve the form, content, and methods of hazardous weather and water event communications to more clearly inform action and increase the likelihood that the public takes such action to prevent the loss of life or property.

(4) EVALUATIONS.—The Office shall, in coordination with the performance branch of the National Weather Service, develop metrics for that branch to track and evaluate the degree to which hazardous weather and water event communications result in action and response.

(5) SUPPORT PLAN.—The Office shall develop a plan for the purpose of supporting the activities described in paragraph (3). The plan shall be periodi-
ally updated and informed by internal and extramural research and the results of the evaluation of hazardous weather and water event communications conducted under paragraph (4).

(6) METHODS.—In carrying out this subsection, the Office shall develop and implement recommendations that—

(A) are based on the best and most recent understanding from social, behavioral, risk, and communication science research;

(B) are validated by social, behavioral, risk, and communication science, taking into account the importance of methods that support reproduction and replication of scientific studies, use of rigorous statistical analyses, and, as applicable, data analysis supported by artificial intelligence and machine learning technologies;

(C) account for the needs of various demographics, vulnerable populations, and geographic regions;

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

(E) respond to the needs of Federal, State, and local government partners and media partners; and
(F) account for necessary changes in the infrastructure, technology, and protocols for creating and disseminating federally operated watches and warnings.

(7) COORDINATION.—In implementing this Act, the Office shall coordinate with—

(A) Federal partners, including National Laboratories, Cooperative Institutes, and regional integrated sciences and assessments programs;

(B) State and local government partners;

(C) Tribal governments;

(D) institutions of higher education; and

(E) media partners.

(8) TIMELINESS AND CONSISTENCY.—The Office shall develop best practices and guidance for ensuring timely and consistent communication across public facing platforms that disseminate hazardous weather and water event information.

(c) HAZARD COMMUNICATION RESEARCH AND ENGAGEMENT.—

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

(A) to modernize the creation and communication of risk-based, statistically reliable,
probabilistic hazard information to inform effective actions and responses to hazardous weather and water events; and

(B) to improve the fundamental social, behavioral, risk, and communication science regarding hazardous weather and water event communication.

(2) COORDINATION.—In carrying out the research program required by paragraph (1), the Under Secretary shall coordinate and communicate with States, Tribal governments, localities, and emergency managers on research priorities and results.

(3) PILOT PROGRAM FOR TORNADO HAZARD COMMUNICATION REQUIRED.—

(A) IN GENERAL.—To further research into hazard communication, the Under Secretary, in collaboration with one or more eligible institutions, shall establish a pilot program for tornado hazard communication to test the effectiveness of implementing the research conducted under this subsection with respect to tornadoes.

(B) ELIGIBLE INSTITUTION DEFINED.—In this paragraph, the term “eligible institution” means any of the following:
(i) A historically Black college or university located in an area of persistent poverty that is subjected to frequent severe weather, such as tornadoes, hurricanes, and floods.

(ii) An institution of higher education in close proximity to a National Weather Service Weather Forecast Office of the National Weather Service.

(d) DATA MANAGEMENT.—The Under Secretary shall establish, maintain, and improve a central repository system for the National Oceanic and Atmospheric Administration for social, behavioral, risk, and economic data related to the communication of hazardous weather and water events, including data developed or received pursuant to paragraphs (3), (4), and (5) of subsection (b).

(e) DIGITAL WATERMARKING.—The Under Secretary shall develop methods to reduce the likelihood of unauthorized tampering with online hazardous weather and water event risk communication, such as developing digital watermarks.

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

(a) IN GENERAL.—Not later than one year after the date of the enactment of this Act, the Under Secretary shall prepare and submit to Congress a strategic plan for
developing and prioritizing the implementation of high-resolution probabilistic forecast guidance for hazardous weather and water events using a next-generation weather forecast and warning framework.

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

(1) A discussion of—

(A) the priorities and needs of vulnerable populations and National Weather Service partners; and

(B) high-performance computing, visualization, and dissemination needs.

(2) A timeline and guidance for implementation of—

(A) high-resolution numerical weather prediction models;

(B) methods for meeting the high-performance computing, visualization, and dissemination needs discussed under paragraph (1)(B);

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

(D) improved observations, including through radars, satellites, and uncrewed aerial systems;
(E) a flexible framework to communicate clear and simple hazardous weather and water event information to the public; and

(F) social, behavioral, risk, and communication research to improve the forecaster operational environment and societal information reception and response.

SEC. 5. TORNADO RATING SYSTEM.

(a) IN GENERAL.—The Under Secretary shall, in collaboration with such stakeholders as the Under Secretary considers appropriate—

(1) evaluate the system used as of the date of the enactment of this Act to rate the severity of tornadoes; and

(2) determine whether updates to that system are required to ensure that the ratings accurately reflect the severity of tornadoes.

(b) UPDATE REQUIRED.—If the Under Secretary determines under subsection (a) that updates to the tornado rating system are necessary, the Under Secretary shall update the system.

SEC. 6. POST-STORM SURVEYS AND ASSESSMENTS.

(a) IN GENERAL.—The Under Secretary shall perform one or more post-storm surveys and assessments following each hazardous weather or water event determined
by the Under Secretary to be of sufficient societal importance to warrant a post-event survey and assessment.

(b) COORDINATION.—The Under Secretary shall coordinate with Federal, State, and local governments, Tribal governments, private entities, and relevant institutions of higher education when conducting post-storm surveys and assessments under subsection (a) in order to optimize data collection, sharing, and integration.

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

(d) IMPROVEMENT.—The Under Secretary shall—

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

(2) identify gaps in and update tactics and procedures to enhance the efficiency and reliability of data obtained from post-storm surveys and assessments; and

(3) increase the number of post-storm community impact studies, including—

(A) surveying individual responses;
(B) conducting review of the accuracy of
prior risk evaluations;
(C) evaluating the efficacy of prior mitiga-
tion activity; and
(D) gathering survivability statistics.

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

SEC. 7. VORTEX-USA PROGRAM.

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

(1) in the section heading, by striking “TOR-
NADO WARNING IMPROVEMENT AND EXTEN-
SION” and inserting “VORTEX-USA”;
(2) in subsection (a), by striking “establish a
tornado warning improvement and extension pro-
gram” and inserting “maintain a program for rap-
idly improving tornado forecast and warnings”;
(3) by striking subsections (e) and (d); and
(4) by adding at the end the following:
“(e) INNOVATIVE OBSERVATIONS.—The Under Sec-
etary shall ensure that the program required by sub-
section (a) periodically examines the value of incorporating
innovative observations with respect to the improvement
of tornado forecasts, predictions, and warnings, such as
acoustic or infrasonic measurements, observations from
phased array radars, and observations from mesonets.

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

“(1) continue the research necessary to develop
and deploy probabilistic weather forecast guidance
technology for tornadoes; and

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

“(e) RESEARCH.—

“(1) IN GENERAL.—The Under Secretary shall,
through the program required by subsection (a),
award grants for research that focuses on improving—

“(A) the social, behavioral, risk, commun-
ication, and economic sciences related to
vulnerabilities, risk communication, and delivery
of information critical for saving lives and prop-
erty related to tornadoes; and

“(B) the physical sciences, engineering,
and technology related to tornado formation,
the interactions of tornadoes with the built and
natural environment, and the interaction of torna-
does and hurricanes.

"(2) PRIORITY INSTITUTIONS.—

"(A) IN GENERAL.—In awarding grants
under paragraph (1), the Under Secretary shall
prioritize awarding grants to minority-serving
institutions.

"(B) DEFINITION OF MINORITY-SERVING
INSTITUTION.—In this paragraph, the term ‘mi-
nority-serving institution’ means—

"(i) a part B institution (as defined in
section 322 of the Higher Education Act
of 1965 (20 U.S.C. 1061));

"(ii) a Hispanic-serving institution (as
defined in section 502(a) of that Act (20
U.S.C. 1101a(a)));

"(iii) a Tribal College or University
(as defined in section 316(b) of that Act
(20 U.S.C. 1059c(b)));

"(iv) an Alaska Native-serving institu-
tion (as defined in section 317(b) of that
Act (20 U.S.C. 1059d(b)));

"(v) a Native Hawaiian-serving institu-
tion (as defined in section 317(b) of that
Act (20 U.S.C. 1059d(b)));
“(vi) a Predominantly Black Institution (as defined in section 318(b) of that Act (20 U.S.C. 1059e(b)));

“(vii) an Asian American and Native American Pacific Islander-serving institution (as defined in section 320(b) of that Act (20 U.S.C. 1059g(b))); or

“(viii) a Native American-serving, nontribal institution (as defined in section 319(b) of that Act (20 U.S.C. 1059f(b))).

“(f) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to the Under Secretary to carry out this section $7,500,000 for each of fiscal years 2023 through 2030, of which not less than $2,000,000 each fiscal year shall be used for grants awarded under subsection (e).”.

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

“Sec. 103. VORTEX-USA program.”.

SEC. 8. REPORTS.

(a) WEATHER RESEARCH AND FORECASTING INNOVATION ACT OF 2017.—
(1) IN GENERAL.—Section 403 of the Weather Research and Forecasting Innovation Act of 2017 (15 U.S.C. 8543) is amended by striking subsection (d).

(2) TECHNICAL AMENDMENT.—Section 403(a) of such Act (15 U.S.C. 8543(a)) is amended by inserting "the" after "Director of".


SEC. 9. GOVERNMENT ACCOUNTABILITY OFFICE REPORT ON HAZARDOUS WEATHER AND WATER ALERT DISSEMINATION.

(a) IN GENERAL.—Not later than 540 days after the date of the enactment of this Act, the Comptroller General of the United States shall submit to the Committee on Commerce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a report that examines the information technology infrastructure of the National Weather Service of the National Oceanic and Atmospheric Administration, specifically regarding the system for timely public
notification of hazardous weather and water event alerts and updates.

(b) ELEMENTS.—The report required by subsection (a) shall include the following:

(1) An analysis of the information technology infrastructure of the National Weather Service, including software and hardware capabilities and limitations, including an examination of server and data storage methods, broadband, data management, and data sharing.

(2) An identification of secondary and tertiary fail-safes for the timely distribution of hazardous weather and water event alerts to the public.

(3) A determination of the extent to which public notifications are delayed and an identification of corrective measures that do not add additional notification time.

(4) An assessment of whether collaboration with other Federal offices, States, or private entities could reduce delays in notifications to the public.

(5) A description of actions being undertaken to better identify critical steps in the hazards notification process that may be vulnerable to disruption or failure in the event of communication, technological, or computational failure.