

Calendar No. 258

118TH CONGRESS }
1st Session }

SENATE

{ REPORT
118-138

TORNADO OBSERVATIONS RESEARCH AND
NOTIFICATION ASSESSMENT FOR DEVEL-
OPMENT OF OPERATIONS ACT

R E P O R T

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND
TRANSPORTATION

ON

S. 1284



DECEMBER 13, 2023.—Ordered to be printed

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

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Ms. CANTWELL, from the Committee on Commerce, Science, and
Transportation, submitted the following

R E P O R T

[To accompany S. 1284]

[Including cost estimate of the Congressional Budget Office]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 1284) to improve forecasting and understanding of tornadoes and other hazardous weather, and for other purposes, having considered the same, reports favorably thereon with an amendment, in the nature of a substitute, and recommends that the bill, as amended, do pass.

PURPOSE OF THE BILL

The purpose of S. 1284, the Tornado Observations Research and Notification Assessment for Development of Operations Act (TORNADO Act), is to require the National Oceanic and Atmospheric Administration (NOAA) to update its methods for predicting tornadoes and other hazardous weather and communicating severe weather alerts to the public, and for other purposes.

BACKGROUND AND NEEDS

Between January 1 and August 17, 2023, alone, tornadoes have claimed the lives of approximately 75 individuals, a number almost three times greater than the total number of fatalities in 2022, and have caused nearly \$529.75 million in damages.¹ Tornadoes are a particularly deadly type of natural disaster because they can form

¹“2023 US Tornadoes,” Center for Disaster Philanthropy, updated August 17, 2023 (<https://disasterphilanthropy.org/disasters/2023-us-tornadoes/>).

quickly with little to no warning time and may be visibly obscured by rain or clouds. While a tornado is on the ground, winds can reach up to 300 miles per hour, with damage tracks more than 1 mile wide and 50 miles long.² Around 1,200 tornadoes affect the United States annually, but this is likely an underestimation due to discrepancies in reporting methods.³ Tornadoes are present in all 50 States and can happen at any time of year.⁴ Tornadoes are just as common in the Deep South as they are in the Great Plains.⁵ Overall, regions with greater population density, urban sprawl, and manufactured homes are particularly vulnerable to tornadoes.⁶

Tornadoes remain one of the most challenging extreme weather events to predict and warn against. On December 10, 2021, a cluster of tornadoes swept across eight States from Arkansas to Ohio, killing 90 people and bringing devastating damage to communities.⁷ The fact that tornadoes of this strength struck in the December, rather than in the spring and summer when thunderstorms and tornadoes are more common, also made it a notable event. These types of events underscore the need to improve tornado forecasting and risk communication to better inform the public about hazardous weather events. As of June 26, 2023, there have been 199 tornadoes in the United States.⁸ Tornadoes occurring on June 15, 2023, in Perrytown, Texas, and on June 22, 2023, in Matador, Texas, killed seven people.⁹

TORNADO FORECASTING AND RISK COMMUNICATION

Enhanced tornado prediction and early warning systems reduce casualty rates because longer lead times on warnings provide extra opportunities to alert residents who can then take precautions.¹⁰ Tornadoes continue to have deadly consequences, in part due to short lead times of 15–18 minutes on average and the lack of risk-based and statistically reliable hazard information to inform effective responses.¹¹ Overnight tornadoes are 2.5 times more likely to kill than daytime tornadoes.¹² Ample warning time and effective

²“Tornado Definition,” NOAA, National Weather Service, accessed August 28, 2023 (<https://www.weather.gov/phi/TornadoDefinition>).

³“Severe Weather 101—Tornadoes: Tornado Basics,” NOAA National Severe Storms Laboratory, accessed August 28, 2023 (<https://www.nssl.noaa.gov/education/svrwx101/tornadoes/>).

⁴Ibid.

⁵Matthew Cappucci, “Tornado Alley in the Plains Is an Outdated Concept. The South Is Even More Vulnerable, Research Shows,” *The Washington Post*, May 16, 2020 (<https://www.washingtonpost.com/weather/2020/05/16/tornado-alley-flawed-concept/>).

⁶Ibid.

⁷Jacob Feuerstein and Ian Livingston, “December Tornado Record Crushed by Historic Onslaught of Storms in U.S.,” *The Washington Post*, December 22, 2021 (<https://www.washingtonpost.com/weather/2021/12/22/december-tornado-record-crushed-by-historic-onslaught-storms-us/>).

⁸NOAA, National Centers for Environmental Information, “Tornado Statistics for the Contiguous U.S.,” accessed August 28, 2023 (<https://www.ncei.noaa.gov/access/monitoring/tornadoes/>).

⁹Livia Albeck-Ripka and Mike Ives, “Tornado Kills 3 in Texas and Injures Dozens,” *The New York Times*, June 15, 2023 (<https://www.nytimes.com/2023/06/15/us/texas-tornado-power-outages.html#:text=The%20tornado%20destroyed%20a%20trailer,were%20injured%2C%20the%20authorities%20said;Jayme%20Lozano%20Carver,%20At%20Least%20Four%20People%20Killed%20After%20Tornado%20Hits%20Matador,%20a%20Small%20Town%20Outside%20Lubbock>), *The Texas Tribune*, June 22, 2023 (<https://www.texastribune.org/2023/06/22/texas-tornado-matador/>).

¹⁰Kevin M. Simmons and Daniel Sutter, “Tornado Warnings, Lead Times, and Tornado Casualties: An Empirical Investigation,” *Weather and Forecasting*, vol. 23: no. 2 (April 1, 2008) (https://journals.ametsoc.org/view/journals/wefo/23/2/2007waf2006027_1.xml).

¹¹Thomas Fuller and Tariro Mzezewa, “They Said the Tornado Would Hit at 9:30. It Hit at 9:30,” *The New York Times*, updated June 22, 2023 (<https://www.nytimes.com/2021/12/14/us/tornado-warnings.html>).

¹²Ibid.

public communications are critical in these situations since people may be asleep or unable to see funnel formation.

NOAA’s Storm Prediction Center monitors tornado-prone regions and provides daily forecasts.¹³ The NWS Weather Forecast Offices use these forecasts to issue tornado warnings to local constituents to help the public prepare. However, there are delays between the time the NWS issues warning and when the public can access them. In March 2022, three supercells swept across Iowa, producing 17 tornadoes that killed seven people and destroyed property across the State.¹⁴ Because of dissemination issues related to computing infrastructure, there was a 7-minute delay between when the NWS issued warnings and the public could access them.¹⁵ Addressing these inefficiencies is critical to improving information delivery related to tornadoes.

Improvements to radar technology will continue to advance severe weather warning systems for tracking tornadoes, strong wind gusts, blizzards, smoke, hail, and locally heavy rains responsible for flash floods and mudslides. Recent research has shown that detection of infrasound through low-frequency audio acoustic sensors can help identify directional movement, bearing, and the intensity of tornadoes as well as expand the distance of detection to over 50 miles.¹⁶ Because public perception of tornado risk affects how people prepare for and behave during tornado events, incorporating social, behavioral, risk, and communication science into risk communications systems is essential to ensure people can react in ways that can save lives. Additional work is needed to fill data gaps in weather prediction, improve observational capacity, update tornado rating systems, and improve communication of hazardous weather events to the public. It is particularly important to fill observational gaps in geographic regions where current infrastructure (cellular, internet, and radar coverage) constrain abilities to rapidly ascertain and communicate the impacts of severe weather events.¹⁷

NOAA’s National Severe Storms Laboratory (NSSL) is responsible for conducting forecast research to better understand the location and timing of tornadoes and other severe weather events.¹⁸ The NSSL administers NOAA’s Verification of the Origins of Rotation in Tornadoes Experiment (VORTEX) program, Warn-on-Forecast program, and Targeted Observation by Radars and UAS of Supercells (TORUS) program, which together seek to improve tornado detection accuracy and warning lead-times.¹⁹ The Warn-on-Forecast system aims to utilize advanced models to issue storm warnings, which have traditionally relied on radar detection. NSSL

¹³“Storm Prediction Center,” NOAA, accessed August 28, 2023 (<https://www.spc.noaa.gov/misc/about.php>).

¹⁴Eduardo Medina and Vimal Patel, “Tornadoes Rampage Across Iowa, Killing 7, Officials Say,” *The New York Times*, March 5, 2022 (<https://www.nytimes.com/2022/03/05/us/iowa-tornado-deaths.html>).

¹⁵Matthew Cappucci, “Weather Service’s Tornado Warnings Were Delayed During Deadly Iowa Outbreak,” *The Washington Post*, March 7, 2022 (<https://www.washingtonpost.com/weather/2022/03/06/nws-tornado-warning-dissemination-iowa/>).

¹⁶Maddie Stone, “Scientists are Using Nuclear Weapons Surveillance Tech to ‘Hear’ Tornadoes,” *The Washington Post*, February 23, 2020 (<https://www.washingtonpost.com/weather/2020/02/23/scientists-are-using-nuclear-weapons-surveillance-tech-hear-tornadoes/>).

¹⁷NOAA Science Advisory Board, *A Report on Priorities for Weather Research*, p. 64, December 2021 (http://ncas-m.org/wp-content/uploads/2022/01/PWR-Report_Final_12-9-21.pdf).

¹⁸“About NSSL,” NOAA National Severe Storms Laboratory, accessed August 28, 2023 (<https://www.nssl.noaa.gov/about/>).

¹⁹“NSSL Research: Tornadoes,” NOAA National Severe Storms Laboratory, accessed August 28, 2023 (<https://www.nssl.noaa.gov/research/tornadoes/>).

is also leveraging unmanned aerial vehicles, which can be deployed immediately following tornadoes to collect high resolution imagery for post-storm damage assessments. This work has the potential to advance tornado forecasts and warning through better documentation of severe weather events.²⁰

TORNADO RATING SYSTEMS

The Fujita Scale (F-Scale), which is used to assign a tornado rating, was originally developed based on the damage intensity of tornadoes. However, this method did not account for wind speed. Since 2007, the NWS has applied the Enhanced Fujita Scale (EF Scale) to assign a rating based on wind speeds and estimated damages associated with tornadoes.²¹ A large number of tornadoes move across rural areas with little infrastructure, meaning their recorded damage may not reflect their true strength.²² The EF Scale lacks a definitive correlation between damage and wind speed, which cause inconsistent tornado ratings.²³ Both scales are rated from 0 (weak; 65–85 mph winds) to 5 (violent; 200-plus mph winds).²⁴ The TORNADO Act would require NOAA to evaluate and update the tornado rating system to ensure it more accurately reflects the severity of tornadoes.

When the NWS determines severe weather, including tornadoes, may cause a threat to life or property, it alerts the public through a watch or warning system. Yet public understanding of the watch/warning system is low, with only 36 percent of people in tornado prone areas understanding the difference.²⁵ This lack of understanding of tornado warnings increases the risk for inappropriate safety actions by the public.

SUMMARY OF PROVISIONS

If enacted, S. 1284 would amend the Weather Research and Forecasting Innovation Act of 2017 to do the following:

- Establish or designate a hazard risk communication Office within NOAA to improve the communication of severe weather alerts to more clearly inform action and increase the likelihood that the public takes appropriate action to prevent the loss of lives or property.
- Require NOAA to develop an action plan for the national implementation of high-resolution probabilistic guidance for tornado forecasting and prediction.
- Require NOAA to evaluate and update the tornado rating system.

²⁰“Uncrewed Aircraft @ NSSL,” NOAA, accessed August 28, 2023 (<https://inside.nssl.noaa.gov/uas/>).

²¹“The Enhanced Fujita Scale (EF Scale),” NOAA, National Weather Service, accessed August 28, 2023 (<https://www.weather.gov/oun/efscale>).

²²Joshua Wurman et al., “Supercell Tornadoes Are Much Stronger and Wider Than Damage-based Ratings Indicate,” *Proceedings of the National Academies of Sciences*, vol. 118: no. 14 (March 22, 2021) (<https://www.pnas.org/doi/10.1073/pnas.2021535118>).

²³Wind Science and Engineering Center, *A Recommendation for an Enhanced Fujita Scale (EF-Scale)*, National Wind Institute at Texas Tech University, submitted to NOAA’s National Weather Service, June 2004 (<https://www.spc.noaa.gov/faq/tornado/ef-ttu.pdf>).

²⁴“The Enhanced Fujita Scale (EF Scale),” NOAA, National Weather Service, accessed August 28, 2023 (<https://www.weather.gov/oun/efscale>).

²⁵Jason Samenow, “The Problematic Confusion About Difference Between Tornado Watches and Warnings,” *The Washington Post*, May 2, 2011 (https://www.washingtonpost.com/blogs/capital-weather-gang/post/confusion-about-difference-between-tornado-watch-and-tornado-warnings-thats-a-problem/2011/05/02/AFW53ZaF_blog.html).

- Require NOAA to provide training, resources, and access to professional counseling to support the mental health of employees conducting post-storm assessments.
- Codify the VORTEX-USA program and authorize funding consistent with current appropriations for the program.
- Require a strategic plan for hazardous weather forecasting and warning frameworks, emphasizing a focus on the needs of vulnerable communities.

LEGISLATIVE HISTORY

S. 1284, the TORNADO Act, was introduced on April 25, 2023, by Senator Wicker (for himself and Senators Cruz, Thune, Grassley, Hyde-Smith, Young, Blackburn, Boozman, Peters, Moran, and Warnock) and was referred to the Committee on Commerce, Science, and Transportation of the Senate. On May 10, 2023, the Committee met in open Executive Session and, by voice vote, ordered S. 1284 reported favorably with an amendment (in the nature of a substitute with an amendment).

In the 117th Congress, S. 3817, the TORNADO Act, was introduced on March 10, 2022, by Senator Wicker (for himself and Senators Grassley, Hyde-Smith, Thune, Ernst, Duckworth, Cruz, and Peters) and was referred to the Committee on Commerce, Science, and Transportation of the Senate. On March 22, 2022, the Committee met in open Executive Session and, by voice vote, ordered S. 3817 reported favorably with an amendment (in the nature of a substitute).

ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

S. 1284, TORNADO Act			
As ordered reported by the Senate Committee on Commerce, Science, and Transportation on May 10, 2023			
By Fiscal Year, Millions of Dollars	2023	2023-2028	2023-2033
Direct Spending (Outlays)	0	0	0
Revenues	0	0	0
Increase or Decrease (-) in the Deficit	0	0	0
Spending Subject to Appropriation (Outlays)	0	60	not estimated
Increases <i>net direct spending</i> in any of the four consecutive 10-year periods beginning in 2034?	No	Statutory pay-as-you-go procedures apply? No	
Mandate Effects			
Increases <i>on-budget deficits</i> in any of the four consecutive 10-year periods beginning in 2034?	No	Contains intergovernmental mandate? No	
		Contains private-sector mandate? No	

S. 1284 would direct the National Oceanic and Atmospheric Administration (NOAA) to improve forecasting of and warnings about hazardous weather. The bill also would have NOAA initiate a pilot

program for communicating tornado hazards. Finally, the bill would require the Government Accountability Office (GAO) to report on the National Weather Service’s information technology infrastructure.

In total, CBO estimates that implementing the bill would cost \$60 million over the 2023–2028 period, as described below.

VORTEX-USA: The bill would authorize the appropriation of \$11 million annually over the 2023–2030 period for VORTEX-USA (Verification of the Origins of Rotation in Tornadoes Experiment) to develop accurate and timely tornado forecasts, predictions, and warnings. For this estimate, CBO assumes that S. 1284 will be enacted near the end of fiscal year 2023 and that the authorized amounts will be provided in each year beginning in 2024. (In 2023, NOAA allocated \$12 million to the project; because funds have been allocated for VORTEX-USA in 2023, CBO estimates no budgetary effect for that year.) Based on historical spending patterns for VORTEX-USA, CBO estimates that implementing this provision would cost \$49 million over the 2023–2028 period and \$28 million after 2028, assuming appropriation of the authorized amounts.

Other activities: Using information from NOAA, CBO estimates that the pilot program would require four full-time employees and one cooperative agreement with a research university at a total cost of \$11 million over the 2023–2028 period. Most of that cost would be for the cooperative agreement. CBO also estimates that the GAO report would cost less than \$500,000. Any spending would be subject to the availability of appropriated funds.

The costs of the legislation, detailed in Table 1, fall within budget function 300 (natural resources and environment).

TABLE 1.—ESTIMATED INCREASES IN SPENDING SUBJECT TO APPROPRIATION UNDER S. 1284

	By fiscal year, millions of dollars—						
	2023	2024	2025	2026	2027	2028	2023–2028
VORTEX-USA:							
Authorization	0	11	11	11	11	11	55
Estimated Outlays	0	7	9	11	11	11	49
Other Activities:							
Estimated Authorization	0	2	2	2	2	3	11
Estimated Outlays	0	2	2	2	2	3	11
Total Changes:							
Estimated Authorization	0	13	13	13	13	14	66
Estimated Outlays	0	9	11	13	13	14	60

VORTEX-USA = Verification of the Origins of Rotation in Tornadoes Experiment.

The CBO staff contacts for this estimate are Kelly Durand and Aurora Swanson. The estimate was reviewed by H. Samuel Papenfuss, Deputy Director of Budget Analysis.

PHILLIP L. SWAGEL,
Director, Congressional Budget Office.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported:

NUMBER OF PERSONS COVERED

S. 1284, as reported, would not subject individuals to new regulations.

ECONOMIC IMPACT

S. 1284, as reported, is not expected to have any significant adverse impacts on the Nation's economy. The bill will likely have a positive economic impact by reducing loss of lives and property.

PRIVACY

S. 1284, as reported, would not have any adverse impact on the personal privacy of individuals.

PAPERWORK

S. 1284, as reported, would not require additional paperwork.

CONGRESSIONALLY DIRECTED SPENDING

In compliance with paragraph 4(b) of rule XLIV of the Standing Rules of the Senate, the Committee provides that no provisions contained in the bill, as reported, meet the definition of congressionally directed spending items under the rule.

SECTION-BY-SECTION ANALYSIS

Section 1. Short title; table of contents.

This section would provide that the bill may be cited as the "TORNADO Act".

Section 2. Definitions.

This section would include definitions of the terms "hazardous weather and water events", "historically Black college or university", "institution of higher education", "National Laboratory", "Indian Tribe", and "Under Secretary".

Section 3. Hazardous weather and water event risk communication.

This section would direct the Under Secretary of Commerce for Oceans and Atmosphere to maintain and improve NOAA's systems of hazardous weather and water event communications. It would establish or designate an office for the purposes of simplifying and improving the communication of hazardous weather and water event risks. The office would develop recommendations to account for the needs of various populations; respond to the needs of including Federal, State, and local partners; and consider different types of weather and water hazards. To improve hazard communications and better understand their effectiveness, the office would collaborate with historically Black colleges or universities or institutions of higher education. Data obtained from the office on risk communication would be available through a NOAA central repository system for use and reference.

Section 4. Warn-on-forecast strategic plan.

This section would require a strategic plan for developing and implementing a high-resolution forecast and warning system for tornadic conditions. The plan would include priorities of vulnerable

populations such as Indian Tribes, and high-performance computing needs.

Section 5. Tornado rating system.

This section would direct NOAA to evaluate the tornado rating system and determine whether updates are required to ensure that the ratings accurately reflect the severity of tornadoes. If NOAA determines that the tornado rating system could be improved, NOAA would be required to update the tornado rating system.

Section 6. Post-storm surveys and assessments.

This section would require post-storm surveys following significant hazardous weather or water events. Surveys would be coordinated with Federal, State, and local governments, institutes of higher education, Indian Tribes, and private entities to optimize data collection and sharing.

Section 7. VORTEX-USA program.

This section would change the name of NOAA's Tornado Warning Improvement and Extension program to the VORTEX-USA program and require the program to continue research to develop weather forecast guidance for tornadoes and incorporate hazards communication research. It would require the program to award grants for social and behavioral research that improves risk communication, and scientific research related to tornadoes, prioritizing research completed at minority-serving universities. It would authorize funds for grants that would total \$11 million for each of fiscal years 2023 through 2030, of which not less than \$2 million each fiscal year would be for competitive research grants that focus on improving tornado forecasting and communication.

Section 8. Reports.

This section would eliminate an annual report on the participation in the NWS in an exchange program with NOAA Oceanic and Atmospheric Research.

Section 9. Government Accountability Office report on hazardous weather and water alert dissemination.

This section would require the Government Accountability Office to submit a report to Congress on the information technology infrastructure of the NWS of NOAA, specifically regarding the system for timely public notification of hazardous weather alerts. The report would include an analysis of the information technology infrastructure of the NWS, an evaluation of hazard weather communication information gaps, and an assessment of interagency collaboration.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

WEATHER RESEARCH AND FORECASTING INNOVATION ACT OF 2017

* * * * *

[15 U.S.C. 8513]

SEC. 103. [TORNADO WARNING IMPROVEMENT AND EXTENSION] VORTEX-USA PROGRAM.

(a) **IN GENERAL.**—The Under Secretary, in collaboration with the United States weather industry and academic partners, shall [establish a tornado warning improvement and extension program] *maintain a program for rapidly improving tornado forecast and warnings.*

(b) **GOAL.**—The goal of such program shall be to reduce the loss of life and economic losses from tornadoes through the development and extension of accurate, effective, and timely tornado forecasts, predictions, and warnings, including the prediction of tornadoes beyond 1 hour in advance.

(c) **INNOVATIVE OBSERVATIONS.**—The Under Secretary shall ensure that the program periodically examines the value of incorporating innovative observations, such as acoustic or infrasonic measurements, observations from phased array radars, and observations from mesonets, with respect to the improvement of tornado forecasts, predictions, and warnings.

(d) **WARNINGS.**—*The program required by subsection (a) shall—*

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

(2) *incorporate, as appropriate, hazard communication 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, communication, and economic sciences related to vulnerabilities, risk communication, and delivery of information critical for saving lives and property 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 tornadoes 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 “minority-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 institution (as defined in section 317(b) of that Act (20 U.S.C. 1059d(b)));

(v) a Native Hawaiian-serving institution (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))).

[(d)](f) PROGRAM PLAN.—Not later than 180 days after the date of the enactment of this Act, the Assistant Administrator for Oceanic and Atmospheric Research, in coordination with the Director of the National Weather Service, shall develop a program plan that details the specific research, development, and technology transfer activities, as well as corresponding resources and timelines, necessary to achieve the program goal.

[(e)](g) ANNUAL BUDGET FOR PLAN SUBMITTAL.—Following completion of the plan, the Under Secretary, acting through the Assistant Administrator for Oceanic and Atmospheric Research and in coordination with the Director of the National Weather Service, shall, not less frequently than once each year, submit to Congress a proposed budget corresponding with the activities identified in the plan.

(h) AUTHORIZATION OF APPROPRIATIONS.—*There is authorized to be appropriated to the Under Secretary to carry out this section \$11,000,000 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).*

* * * * *

[15 U.S.C. 8543 et seq.]

SEC. 403. OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH AND NATIONAL WEATHER SERVICE EXCHANGE PROGRAM.

(a) **IN GENERAL.**—The Assistant Administrator for Oceanic and Atmospheric Research and the Director of the National Weather Service may establish a program to detail Office of Oceanic and Atmospheric Research personnel to the National Weather Service and National Weather Service personnel to the Office of Oceanic and Atmospheric Research.

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

(c) **ELEMENTS.**—The program shall allow up to 10 Office of Oceanic and Atmospheric Research staff and National Weather Service staff to spend up to 1 year on detail. Candidates shall be jointly selected by the Assistant Administrator for Oceanic and Atmospheric Research and the Director of the National Weather Service.

[(d)] ANNUAL REPORT.—Not less frequently than once each year, the Under Secretary shall submit to the Committee on Com-

merce, Science, and Transportation of the Senate and the Committee on Science, Space, and Technology of the House of Representatives a report on participation in such program and shall highlight any innovations that come from this interaction.】

* * * * *

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION AUTHORIZATION ACT OF 1992

* * * * *

[Public Law 102-567; 106 Stat. 4274; 15 U.S.C. 1537]

SEC. 106. DATA AND INFORMATION SYSTEMS.

- (a) * * *
- (b) * * *

【(c) NEEDS ASSESSMENT FOR DATA MANAGEMENT, ARCHIVAL, AND DISTRIBUTION.—(1) Not later than 12 months after the date of enactment of this Act and at least biennially thereafter, the Secretary of Commerce shall complete an assessment of the adequacy of the environmental data and information systems of the National Oceanic and Atmospheric Administration. In conducting such an assessment, the Secretary shall take into consideration the need to—

【(A) provide adequate capacity to manage, archive, and disseminate environmental data and information collected and processed, or expected to be collected and processed, by the National Oceanic and Atmospheric Administration and other appropriate departments and agencies;

【(B) establish, develop, and maintain information bases, including necessary management systems, which will promote consistent, efficient, and compatible transfer and use of data;

【(C) develop effective interfaces among the environmental data and information systems of the National Oceanic and Atmospheric Administration and other appropriate departments and agencies;

【(D) develop and use nationally accepted formats and standards for data collected by various national and international sources; and

【(E) integrate and interpret data from different sources to produce information that can be used by decisionmakers in developing policies that effectively respond to national and global environmental concerns.

【(2) Not later than 12 months after the date of enactment of this Act and biennially thereafter, the Secretary of Commerce shall develop and 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 comprehensive plan, based on the assessment under paragraph (1), to modernize and improve the environmental data and information systems of the National Oceanic and Atmospheric Administration. The report shall—

【(A) set forth modernization and improvement objectives for the 10-year period beginning with the year in which the

plan is submitted, including facility requirements and critical new technological components that would be necessary to meet the objectives set forth;

[(B) propose specific agency programs and activities for implementing the plan;

[(C) identify the data and information management, archival, and distribution responsibilities of the National Oceanic and Atmospheric Administration with respect to other Federal departments and agencies and international organizations, including the role of the National Oceanic and Atmospheric Administration with respect to large data systems like the Earth Observing System Data and Information System; and

[(D) provide an implementation schedule and estimate funding levels necessary to achieve modernization and improvement objectives.]

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