

Chairman John Thune
Questions for the Record
Senate Committee on Commerce, Science, and Transportation
Nominations Hearing
November 1, 2017

As you mentioned in your testimony, it is NOAA's responsibility to include the appropriate standards when utilizing the private sector for data, equipment, and/or services, but there are additional considerations that are necessary to ensure that NOAA is able to accomplish its mission to protect life and property. If confirmed, how would you ensure:

1. That companies actually provide the data, equipment, and/or services for which they are contracted, particularly with respect to essential data, equipment, and/or services?

Answer. When it comes to essential data, equipment, or services, NOAA must retain core capability and not get into a position of being overly reliant on any one vendor.

2. That NOAA retains enough in house expertise and capacity that companies are not able to use the threat of not providing data, equipment, and/or a service to force NOAA to make a policy change that is not in the best interest of the public?

Answer. NOAA should retain adequate in-house expertise and capacity for the management, generation and dissemination of any essential data, equipment, or services. Commercially-acquired data should be considered additional regardless of its criticality. Avoiding a monopoly situation with commercial data providers is always a good idea because it protects the buyer from being overly reliant on one vendor. Likewise, commercial data providers can't exist without a customer, so the leverage works both ways. The circumstances for determining whether to use private companies are often case-specific and must weigh not only cost-effectiveness but, more importantly, the overall public interest.

Senator Roger Wicker
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Question 1. With regards to ocean and atmospheric modeling, how can unmanned autonomous systems help NOAA develop more accurate and reliable models for forecasts across a range of timescales?

Answer. Dynamical models across all time scales rely on the same observational data to initialize themselves; thus, unmanned autonomous systems will help regardless of spatial resolution or temporal duration. In-situ aircraft data has long been used, and is considered a primary driver in forecast skill. It is reasonable to assume that UAV data would show similar value. The limitation is more a function of the inability to fly UAVs in commercial airspace. Field studies in restricted airspace, as well as within tropical cyclones, show great value. Larger fixed-wing platforms are collecting data now, such as NASA's Ikhana, and Global Hawk, as well as the Hurricane Research Division's Coyote. The Global Hawk has the capability to deploy miniature dropsondes, which are extremely useful. The USAF, Naval and Army Research Labs also use them for weather data collection, and are testing both fixed wing platforms, as well as quadcopters, which can provide data similar to radiosondes at low levels. There are even UAVs that can deploy very small disposable UAVs called Close-In Covert Autonomous Disposable Aircraft (CICADA) drones, which are currently being tested at the Naval Postgraduate School. In addition to traditional UAVs, there are also unmanned and untethered, lighter-than-air vehicles that can operate in the stratosphere, and maintain a geostationary position by hovering. Valuable weather data can be extracted from these assets from wind speed and direction to temperature, and even solar radiation. Some of these are operated by DoD, but others, such as Alphabet's Project Loon, are designed for broadband capability, but have the ancillary benefit of producing weather data as a byproduct of standard operation.

As for underwater drones, gliders, and ROVs, these can add tremendous value to a greatly under-sampled environment. Code to assimilate data into ocean models exists now, and there are short-term plans to run fully coupled atmospheric-ocean models. The Argo float program is a fantastic way to get temperature, salinity, and pressure. These devices are free floating, and rise and sink at set periods to various depths. Newer versions, Deep SOLOs can go below 6000 m. The one major hurdle is that during the underwater sampling phase, the data are collected, but not transmittable. A standard Iridium connection is normally used, but the data can be several days old. While this is hugely valuable for research, its use in operational models might be limited by the age of the observations. Underwater gliders are also very useful for providing sea-state data, and can remain on the surface, or self-adjust to various depths. Marine observations will be of growing importance as we move from physical and dynamical models into biophysical modeling. When it comes to emergency response to events ranging from sub-surface water temperatures, which are critical to hurricane intensity forecasting, to management and prediction of oil slick dispersion, these data can add value. They can also provide needed data regarding harmful algal blooms and hypoxia. The technology exists now, and is being managed at various universities, as well as a few private companies.

Senator Roy Blunt
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Question 1. The Committee and I have asked the NWS to provide us with a report pointing out the many gaps in Doppler radar coverage throughout the country, particularly the lower-level boundary under 8-10K feet where severe weather actually takes place and gets harder to see the further you go out from existing NEXRAD sites. We also asked for recommendations on how to fill these gaps beyond just installing more expensive, now-dated NEXRAD systems, including considering dense networks of c/x-band radars that the private sector can provide. In fact, the 2011 NWS Joplin Assessment pointed out the need 6 years ago for radar “gap filling” capabilities to increase warning times.¹

I assume you are familiar with these Doppler weather radar gaps within our existing NEXRAD system. Can you assure me you will work with the Committee to address these gaps? I’m hopeful you can inject some much-needed private sector capabilities and new ways to approach this issue.

Answer. Yes, I can assure you that I will work with the Committee to explore all the various possible ways we can address these gaps in coverage. Gaps in radar coverage are well known and are problematic, not just from the aspect of beam overshoot, which can miss low-level phenomena like tornadic circulation, snow and sleet (all of which can be missed within the radar beam radial sweep), but also from general topographic blocking in mountainous terrain. Additional radars, managed by local TV stations and airports, do exist. Whether or not they are able to fill the gaps or are able to provide data to the quality and reliability that is needed would be something that should be explored. There may also be a need in industry to have radar data for purposes beyond protection of life and property of the general public. Public-private partnerships and possibly shared-cost models might be an option. Additionally, there may be non-radar related sampling and observing methods to mitigate some of these issues too. If confirmed, I would employ an approach to assess all reasonable and appropriate options to eliminate the gaps that leave taxpayers exposed to severe weather threats.

¹ Available here: http://www.nws.noaa.gov/os/assessments/pdfs/Joplin_tornado.pdf

Senator Todd Young
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Question 1. Mr. Jacobs, this past hurricane season drove home yet again the absolute necessity of high quality, accurate, and timely weather data to avert disaster and save lives. My state of Indiana is likewise familiar with extreme weather, though ours manifests itself as tornadoes rather than hurricanes. The work NOAA and its industrial base partners do to design, build, and fly our weather satellites undergirds our entire national system. In fact, hundreds of Hoosier workers provide dozens of complex instruments for U.S. and European weather satellites, like the Advanced Baseline Imager for the new GOES-R series satellites. We witnessed the utility of these instruments first hand as Harvey, Irma, and Maria bore down on the U.S. earlier this year. This industrial base, including numerous Hoosier companies, has been highly productive during the past decade on NOAA's GOES-R and JPSS programs. What is your plan for preserving these national scientific assets and ensuring U.S. technology remains the best in the world? What plans does NOAA have for including industry in formulating our next-generation weather architecture?

Answer. All numerical weather prediction (NWP) begins with observations, which can be divided into satellite and conventional. In the global modeling system, more than 90% of the data (per volume) comes from remotely sensed observations. There are many existing feeds that power the global modeling system including ATOVS, AQUA/TERRA, Suomi NPP (VIIRS), HIMAWARI-8, Megha-Tropiques (SAPHIR), ISS-RAPIDSCAT, GCOM-W (Advanced Microwave Scanning Radiometer 2), MODIS, etc., which are still being refined and optimized. There are also many new feed that will be available soon, such as GOES-R atmospheric motion vectors and radiances, JPSS-1 (ATMS, CrIS, VIIRS), COSMIC2 and commercial GPS-RO (conventional).

One thing that I would consider low hanging fruit would be to extract more value from existing satellite data. There are many new methods for using the existing data being developed in industry, as well as at many universities. There is tremendous value for these data outside of straight NWP; however, despite more than 90% of the data used in the model, after thinning, preprocessing, quality controlling, and actual assimilation, less than 5% of the total volume of data collected actually makes it into the analysis. Managing the data once it is on the ground is another area for efficiency work. Presently, more than 6TB a day are pulled down, and moving this amount of data is neither cheap or fast. The speed at which these data can be accessed is critical, especially for rapid-cycling models and real-time visualization. The point of tackling these less complex issues is to derive more value from existing assets; thus, driving up the value in future cost-benefit analyses.

As for the JPSS program, it is critical that there not be a gap in coverage in data from the polar-orbiting satellite constellation, and I intend to manage this situation closely to ensure any risk of a gap is minimized. I understand from the President's FY18 Budget that NOAA is

developing PFO/JPSS-3 and JPSS-4 instruments and spacecraft buses as copies of JPSS-2. This allows NOAA to take advantage of JPSS-2 instrument development to reduce cost and risk. In addition, NOAA has exercised simultaneous instrument block buys for PFO/JPSS-3 and JPSS-4 instruments on the current contracts for the most efficient acquisition strategy. The PFO/JPSS-3 and JPSS-4 spacecraft buses can be procured as options on the JPSS-2 spacecraft contract, thereby reducing risk and cost.

Industry is now involved in the entire process from sensor manufacturing to deployment and data collection. How the future relationship between industry and NOAA evolves is yet to be determined, so making decisions related to this in an open and transparent way with all stakeholder present is critical. We have yet to realize the full value potential of the existing sensor network, and the more progress we make on that, the more compelling the case will be that these instruments are essential for NOAA to fulfill its mission to the taxpayers.