



National Weather Service History

In presenting meteorological information, I have spoken as if the structure and background to this nation's National Weather Service (NWS) is well known. In a way, the NWS is unusual in comparison to many government entities and bureaucracies, in that the NWS is truly a "service" agency rather than one that is "regulatory" in its purpose and nature. While the "NWS Mission Statement" describes its function, the key phrase within the statement – "... provides forecasts and warnings...for the protection of life and property and the enhancement of the national economy," – is what helps distinguish this nation's weather agency from others around the world (See Sidebar #1: "NWS Mission Statement"). The raised concern about the threat from global warming and the contributions that climate services within the agency can make toward confirming and/or measuring that threat is evolving into a much bigger role over the last two decades.

The "service" aspect of the U.S. weather agencies has always been evident by its employees' character. An abridged list of well-known "modern era" soaring contest meteorologists such as Charles Lindsay, John Aldrich, Doug Armstrong, and Walt Rogers truly epitomize this service concept within the NWS. Although not an NWS Forecaster, even beloved Harry Senn, with his decades of service to soaring, was associated indirectly with the NWS through his ties as a National Oceanic and Atmospheric Administration (NOAA) Pilot flying hurricane research aircraft at one point in his career, in addition to his role as educator and research meteorologist.

Where did our nation's weather services originate? Its beginnings are rather interesting, and the development of weather services parallels the development of modern meteorology and communications capabilities to a large degree. I am extracting some informa-

tion judiciously taken from a publication edited by Meteorologist Gary Grice, *The Beginning of the National Weather Service: The Signal Years...* that gathered material from biographies and interviews in regard to the early years of weather services' development (See References).

In the years preceding 1870, even our nation's founding fathers, including the likes of Thomas Jefferson, Benjamin Franklin, and George Washington systematically noted weather conditions. For example, Jefferson participated in the taking of the first known simultaneous weather observations in America. Washington's last weather entry in his diary was made the day before he died.

As the United States (U.S.) recovered from the devastation of the Civil War, its population was concentrated largely between Chicago and New York. During the early to mid-1800s, weather observation networks had begun to grow and expand across the U.S. Although most basic meteorological instruments had existed for over 100 years, the telegraph was largely responsible for the formative stages of operational meteorology with its development during the nineteenth century.

With the telegraph operational in 1845, visionaries such as Joseph Henry, Secretary of the new Smithsonian Institution, envisioned opportunities utilizing the communications system to distribute weather observations across the country. Volunteer weather observers were recruited, and telegraph companies were persuaded to allot free time for the transmission of reports to the Smithsonian. By 1860, 500 of Henry's stations were furnishing daily telegraphic weather reports; observers and other existing weather reporting systems were gradually absorbed, including several state weather services. Observing the weather logically led to the next step, forecasting. As stated in the reference document of Grice's, "The ability to observe and fore-

cast weather over much of the country required considerable structure and organization – a government agency."

Professor Increase Lapham in Milwaukee, the New York Chamber of Commerce, and Colonel Albert Myer, Chief of the U.S. Signal Service, were all early enthusiastic proponents of a weather service. Myer traced a winter storm from the Midwest to Washington, D.C., as an example in forewarning inclement weather and the subsequent benefits of a weather service. In the midst of the U.S. Army raising its standards while being downsized following the Civil War, a Congressional Joint Resolution was passed on February 2, 1870, and signed by President Grant on February 9 that required the Secretary of War "to provide for taking meteorological observations at the military stations in the interior of the continent and at other points in the States and Territories... and for giving notice on the northern (Great) lakes and on the seacoast by magnetic telegraph and marine signals, of the approach and force of storms."

Considering the need for organization, structure – and, dependent upon reliable communications – this new service, a weather service, was placed under the Secretary of War because "military discipline would probably secure the greatest promptness, regularity, and accuracy in the required observations." Promoted by this time, Brevet Brigadier General Myer, gave the weather service its first name: The Division of Telegrams and Reports for the Benefit of Commerce. For historical note, the first systematized and synchronous meteorological reports were taken by observer-sergeants at 24 stations at 7:35 a.m. on November 1, 1870. These observations were trans-

NWS Mission Statement

"The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community."



mitted by telegraph to the central office in Washington, D.C., commencing the new division of the Signal Service.

The Signal Service's field stations grew in number from 24 in 1870 to 284 in 1878. Three times a day each station telegraphed an observation to Washington, D.C. These observations consisted of:

- 1) Barometric pressure and its change since the last report;
- 2) Temperature and its 24-hour change;
- 3) Relative humidity;
- 4) Wind velocity (speed and direction);
- 5) Pressure of the wind in pounds per square foot;
- 6) Amount of clouds; and,
- 7) State of the weather.

As members of the U.S. Army, employees and supervisors of the Signal Service were instructed and expected to conduct themselves with a military demeanor. The 1870s were relatively free of conflict or strife within the Signal Service, even as weather observers found themselves in the midst of cowboy gunfights and the Indian Wars in the West. Reporting was not limited to just weather information. For the benefit of commerce and agriculture, observers were known to report events such as locust flights. Employees also performed other extra public services during emergencies, including Yellow Fever epidemics, plagues, and fires (including a very detailed account of the Chicago Fire by an observer).

After General Myer's death in 1880, the Signal Service was rocked by allegations of fraud, scandals, and subsequent investigations among its employees despite attempts by General Hazen, Myer's successor, and then General A. W. Greeley to remedy. Also, Greeley attempted to reconcile conflict between weather research and observational factions within the service, but the problems were too great to overcome under the existing organizational structure.

President Benjamin Harrison recommended transfer of the national weather services to the Department of Agriculture. Congress agreed with that suggestion, and the transfer occurred on October 1, 1890. Note that the Signal Corps' meteorological division ended 20 years after it began. But in that time, it established the foundation for the U.S. Weather Bureau (USWB) and ultimately, the NWS. The United States already led the world in providing public weather information, forecasts, and warnings with its humble beginning. On July 1, 1891, the weather stations, telegraph lines, apparatus, and personnel (military people whom were honorably discharged from the War Department) were transferred from the Signal Corps' Division of Telegrams and Reports for the Benefit of Commerce to the Department of Agriculture's new civilian USWB.

Having given NWS early history in detail, the nation's weather services evolved as technology and the world changed through the twentieth century. What is historically significant in NWS history is quite arguable, but I have extensively condensed for purposes of brevity my interpretation of milestone dates, events, and people in the NWS evolution to the current state of the agency (See Sidebar #2: Milestones in NWS History).

In referencing the "NWS Milestones," note the movement of weather services within the Federal Government. As described weather services began as a service within the U.S. Army Signal Corps due to organizational as well as communication needs. The transfer of the newly formed USWB to the Department of

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Agriculture was due to not only internal organizational difficulties but likely also due to the recognition of weather's obvious adverse impacts on agriculture.

The USWB remained in the Department of Agriculture until 1940, when it became a part of the Department of Commerce (and the Army and Navy also began their own meteorological weather centers apart from the civilian USWB that year).

Questions were often asked during my tenure with the NWS why the USWB was located within the Department of Commerce (DOC), especially in consideration of the meteorological sensitivity of the aviation and agricultural communities. While aviation and agriculture both have weather information needs, the USWB's placement into any agency with a narrowed meteorological focus would have been detrimental to the needs of other communities in regard to weather information. But the wide economic impact of weather over the nation's broad interests and needs underscored sound reasoning for the placement of the USWB within the DOC.

To underscore this broad national interest in weather, even today the "weather portion" of the evening news garners the highest advertising dollar over that of advertising slots adjacent to the lead news stories, sports information, and other special reports!

After the passage of almost four decades, the next big organizational change occurred in 1965 with the creation of the Environmental Science Services Administration (ESSA) within the DOC. The USWB was transferred along with other environmentally sensitive agencies, e.g. Marine Fisheries Service, into ESSA. ESSA was renamed in 1970 to the National Oceanic and Atmospheric Administration (NOAA). Accompanying ESSA's name change, the USWB was renamed the National Weather Service. Thus, the NWS operates in the Executive Branch of the Federal Government, through the Cabinet Position of the Secretary of Commerce and within NOAA. The NWS budget is proposed yearly by DOC and NOAA through the Executive Branch for approval by the Legislative Branch (Congress). While my career was totally within the NWS-name era, I was consistently amused as I

answered weather inquiries through the year 2010 addressed habitually to the "Weather Bureau!"

Communication and distribution capabilities of the USWB /NWS helped mark technology improvements and benchmarks through the twentieth century. The year 1914 saw the important use of improved communication technology to relay weather information to the agricultural community, as well as the importance of weather information for the fledgling aviation community. The year 1921 witnessed the use of radiotelephony in broadcasting weather forecasts. During 1928, teletypes began to replace telegraphs and telephones as the primary means of distributing weather reports and forecast information. Subsequently, through 1981, the only changes in the teletype system in use by the NWS would be primarily in system speed. Initial typical teletypes ran at 15 to 25 words per minute (wpm) but by the late 1970s teletype speeds in NWS distribution circuits were in the 60-80wpm range (there were faster teletype systems but generally NWS circuits operated in this range).

With text and coded information conveyed by teletype, graphical charts and satellite imagery were distributed after 1934 to USWB (NWS) field offices primarily by facsimile machines. In 1979, the NWS began implementation of the first-generation of computers that enabled transmission of weather text and graphical data, display of that data, and word processing capabilities on cathode-ray tubes (electronic screens). This Automation of Field Operation Services (AFOS), developed by contract with Ford Aerospace out of the Silicone Valley, was heralded as an electronic "wonder of the world" even with AFOS's random access memory limitations!

Along with the development of desktop computers over the next four years, AFOS and early generation desktop computers phased-out data distribution by teletypes and fax machines within the NWS. Of particular note is the rapid improvement in numerical meteorological forecasting paralleling the exponential improvement in computing capabilities, especially after 1979.

Being unsure of the modern state of NWS computing, through at least 1990 the NWS was a beneficiary to the second fastest computers that this country had to offer, the Cray Supercomputer). The NWS computer speeds were eclipsed only by the speed of computers used by national defense entities. The current computer distribution system in use by national and field offices of the NWS is a next-generation system that replaced AFOS by 2000. The Advanced Interactive Weather Processing System (AWIPS) allows the movement of weather data, processing of weather data, display features that include overlay capabilities of forecast as well as observational graphics and data fields, and incorporates a variety of telecommunications capabilities within NWS Offices. The weather observers of the Signal Service have been replaced by automated observing technologies. Weather forecasts are initially done by numerical meteorological model outputs and subsequently adjusted by meteorologists in the NWS. Weather forecasts have become a man-machine mix.

After 1979, the evolution and current organization of the NWS field offices tie very closely to technology improvements. I will address those improvements and services as I describe the organizational structure of the NWS in the next rendition of *Weather To Fly*. ✈

