CHAPTER 4

COMMUNICATIONS

4.1 DOC/NOAA Communications Systems. Various distribution methods are used by NWS, as appropriate, to make warnings available to NWS field offices, other Federal agencies, National Centers, and to the public as rapidly as possible. The NWS Telecommunications Gateway (NWSTG) provides a majority of the connectivity between the producers and users of warnings for these distribution methods. Data collection is also accomplished by several methods within each agency and then shared between agencies. In addition, the NWSTG is the North and South American Regional Meteorological Telecommunications Network (RMTN) for the World Meteorological Organization (WMO) Global Telecommunications System (GTS) which provides global weather data and products to WMO members such as the U.S. and is a network of interconnected military, civilian and foreign computer interfaces, used for collecting and distributing environmental data worldwide.

4.1.1 NOAA Weather Wire Service (NWWS). The NWWS is the primary NWS medium for disseminating warning and forecasts to the media, emergency management agencies, and other users in the public and private sectors. It is a leased satellite communications system operated for the NWS by a private sector contractor. The NWWS will accept messages simultaneously entered from all NWS data entry nodes, primarily WFOs and the National Centers. The system delivers the information to subscribers through satellite broadcast with output in ASCII format. More information on this system is available via NWS web pages: http//www.nws.noaa.gov/**.**

4.1.2 NOAA Weather Radio (NWR). NWS field offices equipped with NOAA Weather Radio can transmit continuous weather information on one of following frequencies: 162.400, 162.425, 162.450, 162.475, 162.500, 162.525, and 162.550 MHZ. These radio transmitters provide continuous weather information to an area of about 40-mile (65 km) radius. Local radio and TV stations can record and rebroadcast the material even when land lines in the area have been disrupted. These transmitters have a tone alert capability used to activate specially designed commercially available receivers. Figure 4-1 shows locations of NOAA Weather Radio transmitters, and Appendix D lists the stations and their frequencies. The NWR network continually broadcasts coastal and marine forecasts. Recorded voice broadcasts are in the process of transitioning to voice synthesis or concatenated voice. The network provides near-continuous coverage of the conterminous U.S., Great Lakes, Hawaii, Guam, and the populated Alaska coastline. Typical coverage is 25 nm offshore.

4.1.2.1 NWR 1050 Hz Warning Tone Alarm. An analog 1050 Hz warning alarm precedes many critical watch and warning issuances to activate receivers in a preset muted condition to alert listeners of impending hazards.

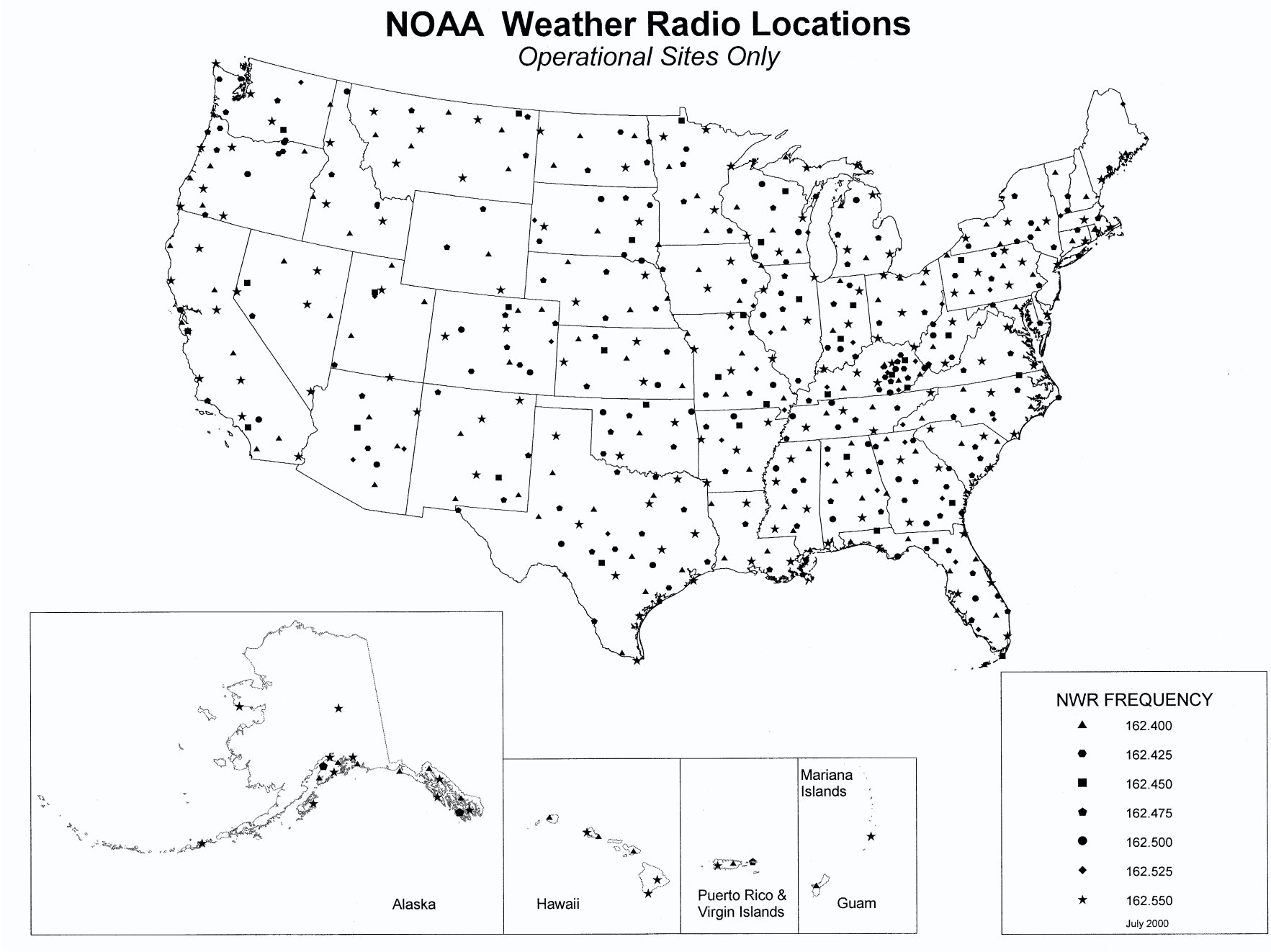


Figure 4-1. NOAA Weather Radio (NWR) Operational Transmitter Sites.

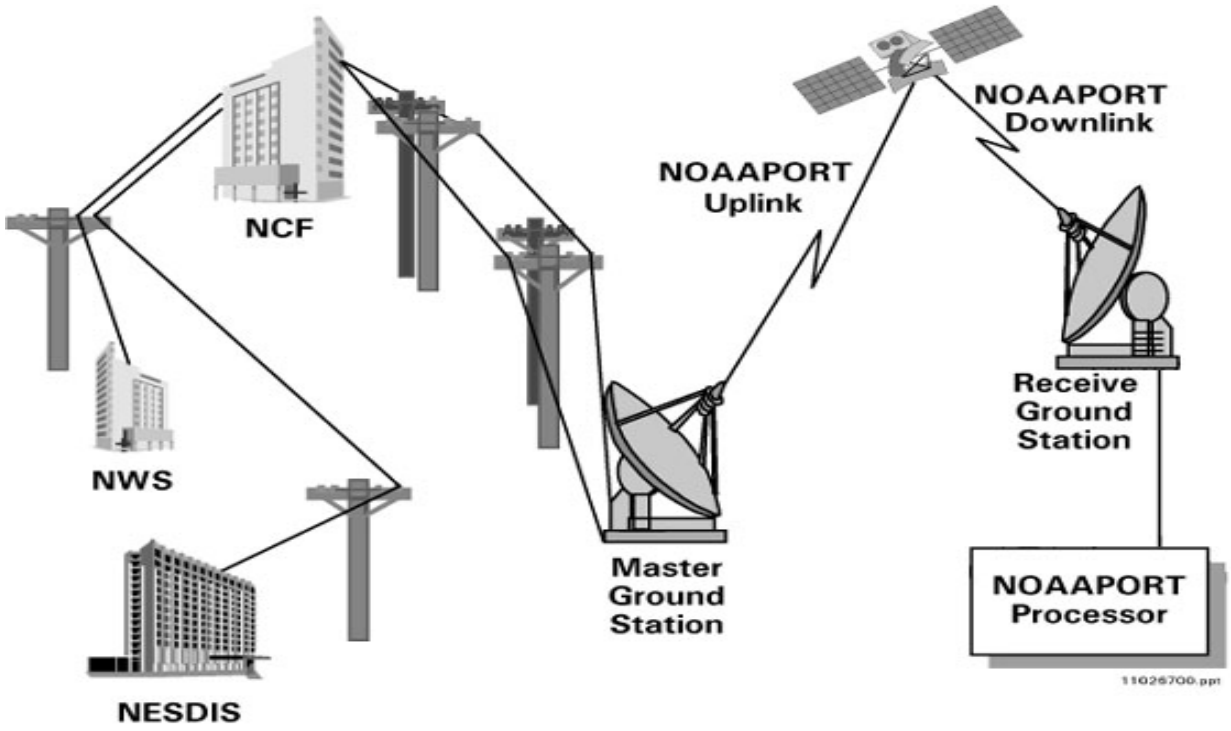
4.1.2.2 NWR Specific Area Message Encoder (SAME). SAME is a device that puts a special digital code at the beginning and end of selected transmissions of voice messages. The NWS employs SAME with NWR. The SAME code specifies both the type of message (tornado warning, severe thunderstorm watch, etc.) and area (by county) to which the message applies. This provides users with a decoding device, within listening range of the NWR signal, the ability to choose which site-specific hazardous weather messages will automatically interrupt their normal programming. Users of SAME include radio and television stations, schools, and cable companies, businesses, and dispatchers. Although SAME will provide much more specificity in both message content and area alerted than the analog 1050 Hz warning alarm, the 1050 Hz warning alarm shall continue to be used since it is a long standing feature of NWR. Many radio manufacturers have designed and developed SAME decoding capability in consumer and industrial grade NWR receivers.

4.1.3 Emergency Managers Weather Information Network (EMWIN). EMWIN is a continuously supported 9.6 KBPS open and non-proprietary data broadcast from GOES 8 and 10 satellites on a frequency of 1690.775 MHZ. It contains realtime warnings, watches, advisories, and most routine products that are currently on the existing NWWS system. EMWIN also contains satellite imagery and graphics. EMWIN was developed in partnership with FEMA to ensure the emergency management community access to a set of NWS products at no recurring cost.

4.1.4 Interactive Weather Information Network (IWIN). IWIN is an Internet site with realtime data very similar to EMWIN data. It is open to any and all users and contains real time warnings in addition to many routine categories of NWS products. IWIN depends on the availability of the Internet. This can be a problem during major weather events because of Internet bandwidth and connectivity limitations. The types of data include all standard warnings, watches, advisories, and routine data including state forecasts, short term forecasts, zone forecasts, and most routine NWS products. The IWIN web site is: http//iwin.nws.noaa.gov/.

4.1.5 NOAA Family of Services. NWS provides external users access to weather information through a collection of data services called the Family of Services (FOS). The FOS is accessible via dedicated telecommunications access lines from the Washington, DC, area. Users may obtain the individual services from NWS for a one-time connection charge and an annual user fee. The part of FOS that specifically pertains to forecasts, watches and warnings are the Public Product Service (PPS) which carries all public warnings and watches, and various hydrological, agricultural, and miscellaneous forecasts and products and the Domestic Data Service (DDS) which carries basic observations and various aviation, marine and miscellaneous products.

4.1.6 NOAAPort. The NOAAPort broadcast system provides a one-way broadcast communication of NOAA environmental data, forecasts, and watch and warning information to NOAA and external users. This service is implemented by a commercial provider of satellite communications utilizing C-band. The Advanced Weather Interactive Processing System (AWIPS) Network Control Facility (NCF) routes the products and data to the appropriate



NOAAPort channels for uplink and broadcast (see Figure 4-2). All products available on FOS,

Figure 4-2. NOAAPort flow of operational data and products.

and NWWS are also available on NOAAPort. This includes access to digital Geostationary Operational Environmental Satellite (GOES) and NOAA polar orbiting satellite data. Satellite data is passed to NWSTG, NCF, and NOAAAPort by the NESDIS Satellite Central Data Distribution Facility (CDDF) in Camp Springs, MD.

4.1.7 Data Collection and Distribution. Weather data is collected by GOES satellite environmental sensors and NWS observing systems, and processed to create products**.** Weather data from GOES satellite environmental sensors and Federal agency observing systems such as NWS Field Offices, National Centers, DOD Automated Weather Network (AWN) and other agencies are collected by the NWSTG. The data are fed to the AWIPS NCF and NOAAPort channels. In addition, the NWSTG distributes the data to the nation's operational processing centers and other national and international users through direct links to the NWSTG, the Shared Processing Program (SPP) network, and the DDS. All WFOs have access to the digital GOES satellite data stream through AWIPS workstations. A large amount of satellite data are also available on a number of web site servers, both government operated and in the private sector.

4.1.7.1 Marine Data Collection Communications. Moored buoy and Coastal Marine Automated Network (C-MAN) data are transmitted by ultrahigh frequency communications via the Geostationary Operational Environmental Satellite (GOES) to the

National Environmental Satellite, Data, and Information Service (NESDIS) and then are relayed to the NWS Telecommunications Gateway (NWSTG) for processing and dissemination. Drifting buoy data are telemetered through the NOAA polar orbiting satellites to the U.S. Argos Global Processing Center, Largo, MD.

Moored buoy observations are formatted into the World Meteorological Organization (WMO) FM 13-IX SHIP code. C-MAN measurements are formatted into C-MAN code, which is very similar to the WMO FM 12-IX SYNOP code. The full description of the C-MAN code is contained in the C-MAN Users' Guide, which is available from National Data Buoy Center (NDBC). Drifting buoy observations are processed and formatted by Service Argos into the WMO FM 18 BUOY code. The messages are then routed to the NWSTG for distribution. Both the SHIP and BUOY codes are defined in the WMO *Manual on Codes*, Volume I. Table F-3 in Appendix F gives the accepted code format for each type of these marine observations.

4.1.7.2 Radar Products Central Collection/Distribution Services (RPCCDS). Through RPCCDS, The AWIPS network collects radar products from NWS, DOD, and FAA WSR-88D radar sites and delivers them to central radar product collection servers integrated into the NWSTG. All radar products collected are available to users from RPCCDS servers. For more information about RPCCDS, link to:

http://www.nws.noaa.gov/oso/rpccds.html

4.2 Federal Emergency Management Agency (FEMA) Communications System.

4.2.1 National Warning System (NAWAS). This is the FEMA operated hot line interstate telephone system that connects FEMA Warning Points, WFOs within each state and between states, and NOAA/NWS National Centers. Figure 4-3 gives the location of FEMA warning points, and Appendix E contains a list of state contacts.

4.3 Federal Communications Commission (FCC) Communications System.

4.3.1 Emergency Alert System (EAS). The FCC designed the EAS as a tool for officials to quickly send out important emergency information targeted to a specific area. The EAS digital signal uses the SAME coding protocols that the NWS uses on NWR. This allows NWR signal to be decoded by the EAS equipment at broadcast stations and cable systems, facilitating almost immediate retransmission of NWS weather warning messages to their audiences. The EAS digital system architecture allows broadcast stations, cable systems, participating satellite companies, and other services to send and receive emergency information quickly and automatically even if those facilities are unattended. The EAS requires monitoring of at least two independent sources for emergency information, ensuring that emergency information is received and delivered to viewers and listeners. EAS digital messages can be automatically converted into any language used by the broadcast station or cable system or to external devices used to alert special populations such as the hearing impaired.

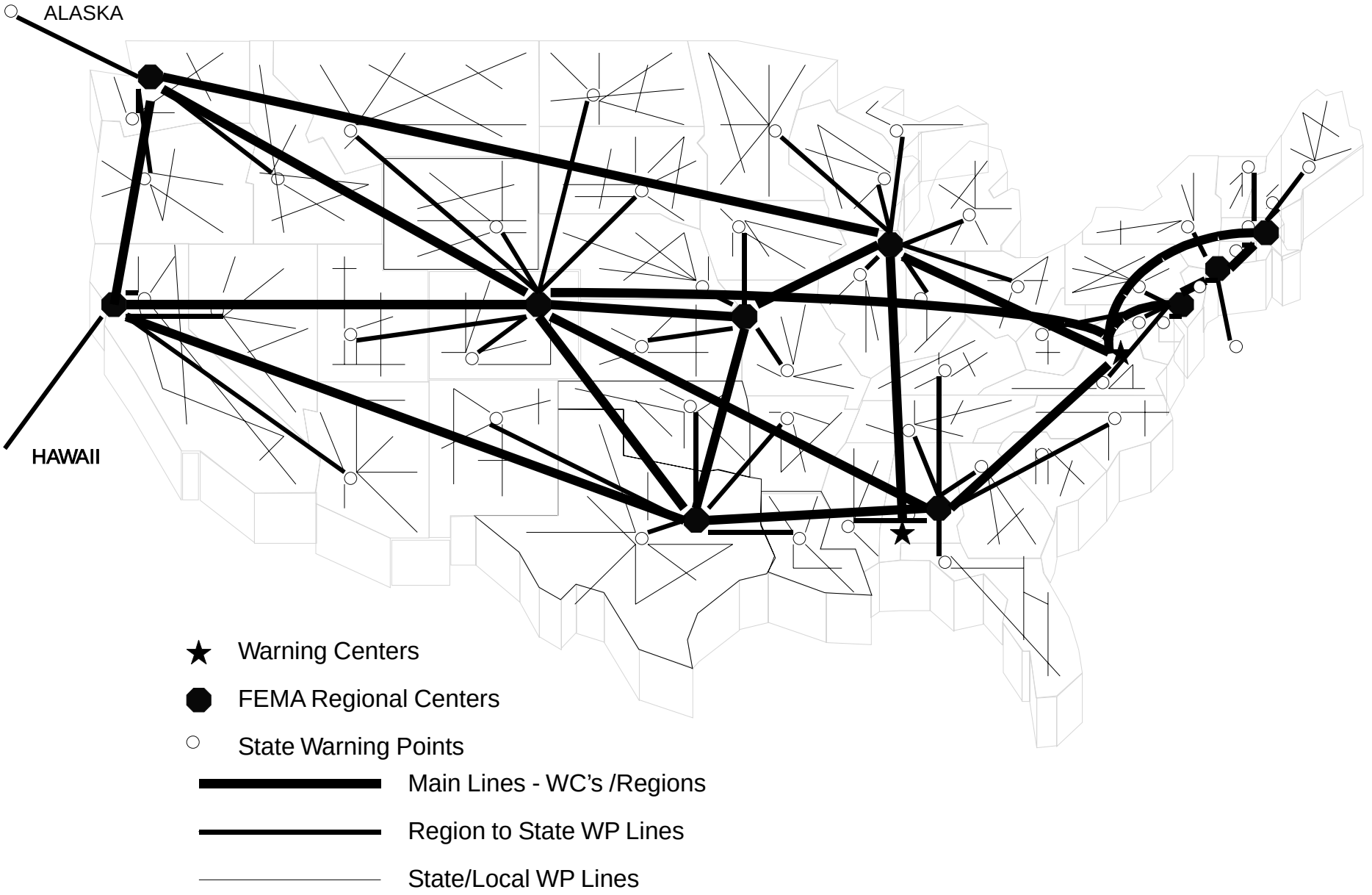


Figure 4-3. The National Warning System (NAWAS) is FEMA's Operational Hotline Telephone System.

4.4 DOD Communications Systems.

4.4.1 USAF Systems.

4.4.1.1 Joint Air Force and Army Weather Information Network (JAAWIN) and Advanced Weather Distribution System (AWDS). The Military Weather Advisory (MWA) chart is the primary Air Force severe weather graphics product. The MWA is transmitted to JAAWIN and the Advanced Meteorological Information System (AMIS) via the Satellite Data Handling System (SDHS) at AFWA. JAAWIN provides access to products via the Internet for any user at a military computer (.mil extension). Non-military computer users must first request an account and be issued a password. The Universal Resource Locator is:

http://weather.afwa.af.mil/

In the event of an outage, the charts are scanned and made available in JAAWIN but not in AMIS.

4.4.1.2 Automated Digital Weather Switch (ADWS) and Military Aircrew Information System (MAIS). Point Weather Warnings (PWWs) are alphanumeric products and are sent from AFWA to the ADWS where they are distributed to the appropriate Reserve or Guard customer based on state headings. The PWWs are also transmitted to the MAIS. A computer server is the primary distribution system for all Army Guard and Reserve customers. The server automatically contacts the proper customer via a pre-subscribed communication system of their choice, e.g., telephone, fax, cellular phone. For many customers, the primary back-up procedures include telephone, fax, and the Meteorological Information Standard Terminal (MIST).

4.4.2 USN and USMC Systems.

4.4.2.1 Fleet Numerical Meteorology and Oceanography Center (FNMOC). FNMOC, Monterey, CA, is the Naval Meteorology and Oceanography Command's processing center which is dedicated to running state-of-the-art, operational global and high resolution regional atmospheric and oceanographic analysis and forecast models. FNMOC is linked with the data collecting and distributing networks of the U.S. Air Force (USAF), the NOAA, and the WMO. Through these sources, FNMOC collects and assimilates massive volumes of global METOC data for input into its numerical models and distribution to DOD forces worldwide. Utilizing this collection of data, basic and applied numerically-generated (computer) meteorological and oceanographic (METOC) products are made available for distribution on Navy, Marine Corps and Joint Command, Control, Communications, Computers, and Intelligence (C^4I) systems. Additionally, the Navy Mobile METOC Support System (NMOSS) permits worldwide, dial-in access to FNMOC products.

4.4.2.2 Naval Oceanographic Office (NAVOCEANO).

NAVOCEANO, Stennis Space Center, MS, is a primary oceanographic production center for the Navy. It is responsible for collecting, processing, and distributing hydrographic, oceanographic and other geophysical data and derivative products. Products available from NAVOCEANO include ocean fronts and eddies analyses, and surface and three-dimensional ocean thermal fields which are distributed through the Navy, Marine Corps and Joint C^4I systems.

4.4.3 Data Collection. The AWN provides the means for data collection within DOD and serves as the DOD link to the WMO GTS through the NWSTG. The AWN currently terminates at Tinker AFB, Oklahoma, but will move to AFWA at Offutt AFB, Nebraska, in 2002. In addition, the High-speed Asynchronous Transfer Mode (ATM) Weather Communications Network (HAWCNET) links Air Force, Navy, and NOAA's NESDIS and NWS centers to share data and products.

Alphanumeric support is provided to end users via the DOD Non-secure Internet Protocol NETwork (NIPRNET). In addition, the Automatic Digital Network (AUTODIN) via landline, standard DOD C^4I systems, and the Joint Operational Tactical System (JOTS) provide another means to send METOC data to FNMOC and AFWA and to distribute METOC data and products to users.

4.5 DOT Communications Systems

4.5.1 Federal Aviation Administration (FAA) Systems.

4.5.1.1 Collection of Data and Distribution of Watches, Warnings, and Severe Weather Reports.

All FAA air traffic facilities are required to accept and relay pilot reports. FAA satellite, voice and telecommunications will be used for the collection and distribution of severe local storms observations and products as follows:

- METAR Aviation routine weather report;
- SPECI Aviation selected special weather report;
- PIREP Pilot reports (UA/UUA); and
- Convective SIGMET.

4.5.1.2 Weather Message Switching Center Replacement (WMSCR).

This is the FAA's main weather message switching system. It is designed to store and forward automatically all the various weather messages that contain a proper WMO header. The system consists of two sites, one in Atlanta, Georgia, and the other in Salt Lake City, Utah. These systems share the load but can support the entire system if the other one is not available.

4.5.1.3 Automated Flight Service Stations (AFSS)/Flight Service Stations (FSS). The AFSS/FSS are the main sources of disseminated PIREPs within the FAA. While this plan does not provide for the dissemination of severe weather information by AFSS/FSS, it occurs on a routine basis. Requests for information not available at the AFSS/FSS are forwarded to the appropriate NWS office for resolution. These stations also routinely pass information from observers, airport personnel and pilots to the appropriate NWS office. The FAA and NWS have agreed on the communications methods used to pass on this information.

4.5.2 USCG Marine Weather Broadcasts Systems. The USCG broadcasts forecast, watch and warning products that include information on severe local storms issued by SPC, MPC, NWSFOs, and NWSOs. The broadcast of these products supports the U.S. participation in the Global Maritime Distress and Safety System, which provides the communications support to the International Maritime Organization's (IMO) global search and rescue plan.

4.5.2.1 Global Maritime Distress and Safety System (GMDSS). The goals of GMDSS are to provide more effective and efficient emergency and safety communications, and to disseminate maritime safety information to all ships on the world's oceans regardless of location or atmospheric conditions. These goals are defined in the International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended in 1988. GMDSS is based upon a combination of satellite and terrestrial radio services and has changed international distress communications from being primarily ship-to-ship based to ship-to-shore (rescue coordination center) based. GMDSS provides for automatic distress alerting and locating, and requires ships to receive broadcasts of maritime safety information which could prevent a distress from happening in the first place. The NWS participates directly in the GMDSS by preparing weather forecasts and warnings for broadcast via two primary GMDSS systems--NAVTEX and Inmarsat-C SafetyNET.

4.5.2.1.1 NAVTEX. NAVTEX is an international, automated system for instantly distributing maritime navigational warnings, weather forecasts and warnings, search and rescue notices, and similar information to ships. It has been designated by the IMO as the primary means for transmitting coastal urgent marine safety information to ships worldwide. NAVTEX is broadcast from the twelve USCG facilities. Coverage is reasonably continuous along the east, west, and Gulf coasts of the United States, as well as the area around Kodiak, Alaska, Guam, and Puerto Rico. The typical NAVTEX transmission coverage ranges from 200-400 nm.

4.5.2.1.2. SafetyNET. Satellite systems operated by the International Mobile Satellite Organization (Inmarsat) are an important element of the GMDSS. Inmarsat-C provides ship/shore, shore/ship, and ship/ship store-and-forward data and telex messaging; the capability for sending preformatted messages to a rescue coordination center; and the SafetyNET service. The Inmarsat-C SafetyNET service is a satellite-based worldwide maritime safety information broadcast service for high seas weather warnings, navigational warnings, radio navigation warnings, ice reports and warnings generated by USCG-conducted International Ice Patrol, and other information not provided by NAVTEX.

4.5.2.2 Coastal Maritime Safety Broadcasts. In addition to NAVTEX and NWR, the USCG and other government agencies broadcast maritime safety information, using a variety of different radio systems to ensure coverage of different ocean areas for which the United States has responsibility and to ensure all ships of every size and nationality can receive this vital safety information.

4.5.2.2.1 Very High Frequency (VHF) Marine Radio. The USCG broadcasts near shore and storm warnings of interest to the mariner on VHF channel 22A (157.1 MHZ) following an initial call on the distress, safety, and calling channel 16 (156.8 MHZ). Broadcasts are made from over 200 sites, covering the coastal areas of the U.S., including the Great Lakes, major inland waterways, Puerto Rico, Alaska, Hawaii, and Guam. All ships in U.S. waters over 20 meters in length are required to monitor VHF channel 16 and must have radios capable of tuning to the VHF simplex channel 22A. Typical coverage is 25 nm offshore.

4.5.2.2.2 Medium Frequency (MF) Radiotelephone (Voice). The USCG broadcasts offshore forecasts and storm warnings of interest to mariners on 2670 kHz, after first being announced on the distress, safety, and calling frequency 2182 kHz.

4.5.2.2.3 Additional Information. Further information concerning these broadcasts can be found at the following Internet sites:

- http://www.navcen.uscg.mil/marcomms/marcomms.htm
- http://weather.noaa.gov/fax/marine.shtml.

In addition, National Imagery Mapping Agency (NIMA) Publication 117 contains detailed information on USCG radio schedules. This publication is available from your local National Ocean Service chart agent; it can also be ordered by calling 1-800-638-8972 or 301-436-8301 or by visiting the Internet site at http://chartmaker.ncd.noaa.gov.

4.6 <u>Interagency Shared Processing Program.</u> Polar Orbiting Satellite Data are processed and exploited by the DOD and NOAA to meet their requirements, are forwarded to each other through the ATM/Shared Processing Program (SPP) network, and further distributed to other agencies and the public, as appropriate. The ATM/SPP network interconnects the five U.S. Operational Processing Centers at AFWA, FNMOC, NESDIS, NCEP, and NAVOCEANO, and the NWSTG. The USAF/USN piece of this SPP connection is referred to as the High-speed Asynchronous transfer mode Weather Communications Network (HAWCNET) and is also used for exchange of numerical weather prediction model products. NWS Headquarters (HQ) is working to make all satellite data available over AWIPS. These data are archived on tapes and passed to the National Geophysical Data Center (NGDC) at the University of Colorado for permanent archive.

4.7 Distribution of Severe Local Storm Watch and Warning Bulletins. The intra- and inter-agency distribution of combined severe weather watch and warning bulletins and other information is shown in Figure 4-4. This represents the end to end process from the producers, represented by shaded boxes, to the users (public, emergency management, commercial, marine, aviation and military) which are represented by circles. The backup of the producers, described in para. 3.5 and in Appendix C, can be achieved because of their inter-connectivity as shown in Figure 4-4. Available Internet web sites are indicated by a double box around the producers (shaded) and connectivity and communications systems (clear).