



**PUBLIC  
RELEASE**

*National Oceanic and  
Atmospheric Administration*

*San Angelo Weather Forecast Office  
Performs Its Core Responsibilities Well,  
but Office Management and Regional  
Oversight Need Improvement*

*Final Inspection report No. IPE-13531/June 2001*

*Office of Inspections and Program Evaluations*



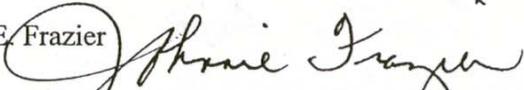


**UNITED STATES DEPARTMENT OF COMMERCE**  
**The Inspector General**  
Washington, D.C. 20230

JUN 28 2001

MEMORANDUM FOR: Scott B. Gudes  
Acting Under Secretary for Oceans and Atmosphere

John J. Kelly, Jr.  
Assistant Administrator  
National Weather Service  
National Oceanic and Atmospheric Administration

FROM: Johnnie E. Frazier 

SUBJECT: Final Inspection Report: *San Angelo Weather Forecast Office Performs Its Core Responsibilities Well, but Office Management and Regional Oversight Need Improvement (IPE-13531)*

As a follow-up to our February 28, 2001, draft report, this is our final report on our inspection of the San Angelo Weather Forecast Office. The report includes comments from NOAA's written response. A copy of this response is included in its entirety as an attachment to the report.

The report highlights our observation that the WFO staff in San Angelo is providing what its partners and service users described as valuable products and services. Indeed, most of the office's performance measures also indicate that the office is providing timely and accurate forecasts and severe weather warnings. At the same time, it also highlights our concerns about (1) the management of some of the office's other activities and responsibilities, such as its research and training programs and (2) the regional office's oversight of certain operations at the San Angelo WFO.

Please provide your action plan addressing the recommendations in our report within 60 calendar days. With you plan, we request that you provide documentation that supports the Dyess Air Force Base WSR-88D radar availability statistics used in your response and address the discrepancy between the Dyess and NWS radar data.

We thank the personnel in National Weather Service headquarters, the Southern Region, and the San Angelo WFO for the assistance and courtesies extended to us during our review. If you have any questions about our report or the requested action plan and documentation, please contact me at (202) 482-4661, or Jill Gross, Assistant Inspector General for Inspections and Program Evaluations, at (202) 482-2754.

Attachment

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## EXECUTIVE SUMMARY

Pursuant to the authority of the Inspector General Act of 1978, as amended, the Office of Inspector General conducted an inspection of the National Weather Service's (NWS) Weather Forecast Office (WFO) in San Angelo, Texas. Our fieldwork was conducted from November 13 through 17, 2000. The objective of this inspection was to determine how effectively the San Angelo WFO (1) delivers warnings, forecasts, and other information to its service users; (2) coordinates its activities with state and local emergency managers; and (3) manages its network of observers and volunteer spotters. We also assessed the adequacy of the office's management and its internal controls; its compliance with Department, NOAA, and NWS policies and procedures; and the effectiveness of NWS's regional oversight. This is the second in a series of OIG inspections of WFOs.

NWS, an agency within the National Oceanic and Atmospheric Administration, has 121 Weather Forecast Offices nationwide. Each WFO issues local weather forecasts and warnings of severe weather—such as tornadoes, severe thunderstorms, floods, hurricanes, and extreme winter weather—for its assigned counties. The San Angelo office was opened in October 1947 under the Weather Bureau as a Weather Service Office. In July 1999, the office converted to a Weather Forecast Office, which currently has a staff of 22 and services a warning area covering 24 counties. At the time of our visit, there was one satellite office in Abilene, but it subsequently closed on December 19, 2000.

The WFO uses various technology and programs to help protect the citizens in its county warning area. Radar, satellite, and automated surface observation systems are used to prepare forecasts and issue warnings for all types of severe weather. NWS commissioned the Advanced Weather Interactive Processing System in San Angelo on July 6, 2000. This system, which integrates NWS meteorological and hydrological data with NWS satellite and radar data, is designed to enable forecasters to prepare and issue more accurate and timely forecasts and warnings.

In performing our review, we examined pertinent records and documents and interviewed all of the staff at the San Angelo WFO. We also spoke by telephone with the regional director in Fort Worth, and interviewed many representatives from the Department and other federal, state, and local government agencies. We also interviewed individuals outside of government involved in meteorological activities to obtain their assessment of the services provided by the San Angelo WFO, as well as to elicit any suggestions they had for improving the WFO's conveyance of critical weather information.

We found that the office was effectively providing most services to the public. For example:

**The WFO has done a good job of issuing weather forecasts and warnings.** The office is responsible for issuing timely weather forecasts, severe weather and flood warnings, and advisories in order to inform people in its county warning area about anticipated weather events and protect them and their property from the dangerous effects of severe and hazardous weather.

Office performance statistics indicate that San Angelo personnel have generally been able to accomplish this goal for a variety of reasons, including the commitment of the staff, its “short-term, long-term” approach to forecasting, and its effective use of the Console Replacement System to reach its users. The only area of concern we found with regard to the office’s forecasting is that its Probability of Precipitation statistics have not kept pace with the Southern Region average (see page 5).

**Office outreach efforts to emergency managers and other users are effective.** We spoke with numerous public officials and emergency managers from several counties concerning the type and quality of their interaction with the San Angelo WFO and elicited their views on the quality of services the WFO provides. Without exception, the officials had favorable comments about their interaction with WFO staff and the quality of services they received (see page 10).

However, we also found a number of managerial, administrative, and operational deficiencies that require prompt attention by NWS and WFO managers.

**The WFO has conducted few local studies.** According to WFO officials, the office has completed five research studies during the last two years. The Science Operations Officer (SOO) prepared three of these studies, although each meteorologist has that function in his or her performance plan. The office did not have an adequate research planning process or a detailed plan outlining studies that were to be completed. In addition, some staff members said that they did not undertake research projects because they felt intimidated by WFO management’s harsh public criticism of their prior draft studies, while others suggested that many of the studies previously submitted were of poor quality and that the staff needed further guidance and training. The WFO’s meteorologist-in-charge (MIC) should continue to encourage the staff to participate further in local studies and provide constructive criticism when needed. The MIC and SOO should work with the staff to develop viable research topics and make themselves available to help staff in their efforts (see page 12).

**Until just before our visit, the WFO did not have a structured training program.** While some office employees said that they have received sufficient training, most believed that a more systematic and individual approach to training was needed. The WFO’s staff believed that the training officer concentrated primarily on computer-related issues and has had little time to address specific training needs. The MIC needs to clarify to all staff members how the new professional development plans will be used and interpreted during fiscal year 2001 and ensure that appropriate training, based on their plans, is provided to WFO staff (see page 14).

**Greater regional oversight of the WFO is needed.** Despite the regional staff’s admitted knowledge of some of the issues and problems noted in the report, certain problems have persisted—seemingly unaddressed—for far too long. For example, (1) office personnel cited frequent and lingering conflicts between management and staff; (2) until just before our visit, the station duty manual had not been updated for almost 7 years; and (3) the office’s Probability of Precipitation statistics have not kept pace with the Southern Region average. We believe that in addition to program reviews, regional managers’ visits should address other priority issues, such as management and employee concerns, and, where appropriate, corrective actions should be

taken. Lastly, WFO staff and management should be encouraged to more candidly discuss with regional managers those lingering concerns they have that cannot be or are not addressed at the local level (see page 17).

**Dyess Air Force Base’s radar availability is below operational standards.** The operational availability of the Air Force radar, on which the San Angelo office depends for complete coverage of its warning area, is below NWS, Department of Defense, and Department of Transportation standards. During calendar year 2000, the Air Force radar was available 92.2 percent of the time, which is below the 96.0 percent minimum operating standard for all Next Generation Weather Radars. Both Defense and NWS officials noted that delays in the receipt of repair parts is the primary reason for the below-standard radar availability. NWS should continue to work with Defense officials to facilitate the timely repair of radar equipment (see page 20).

**Most administrative activities are well controlled.** We reviewed office policies and procedures for inventory, supplies, bankcards, procurement, time and attendance, travel, and security. We found adequate controls over all of these areas and well-maintained documentation. It should be noted, however, that some employees expressed concern about the propriety of how some staff report their time and attendance. Although we found no documented evidence of time and attendance abuse, the regional office should closely monitor this situation to ascertain what, if any, changes or additional safeguards are needed to better document time for WFO employees who are not working on a rotational shift (see page 23).

**The WFO has only recently implemented NWS’s information technology security policies.** The WFO did not designate its information technology security officer until September 2000, and did not prepare a security plan, risk analysis, and disaster recovery plan until October. Before the security officer was designated, no one had been periodically re-evaluating security levels and ensuring that only approved hardware and software were installed. The MIC and the security officer need to comply with their newly developed security plans by (1) periodically revising system passwords; (2) preparing an updated software inventory; (3) testing the office’s backup system and contingency procedures in case of system failures as soon as possible; (4) sending the Information Technology Security Plan, Risk Analysis, and Disaster Recovery Plan to the NWS security officer, NOAA security officer, and the Department of Commerce Security Manager; and (5) revising the risk analysis to better document relative vulnerabilities and threats to the office’s systems (see page 24).

**New station duty manual can be improved.** After we announced our inspection in September 2000, San Angelo personnel updated the March 1994 station duty manual. Before this very recent update, the office lacked a current station duty manual to help ensure that the WFO could address regular operational and emergency needs. After reviewing the new manual, some employees expressed their concerns to us that they still did not understand some tasks, such as how they would shut down all computer systems in an orderly fashion. As appropriate, the new manual should be reviewed to identify opportunities where it could be further strengthened and where the roles and responsibilities of the staff for various activities could be more clearly defined (see page 27).

**Focal point responsibilities have not been effectively communicated to staff.** Each WFO is responsible for issuing forecasts and warnings and maintaining equipment. All office personnel perform or support these tasks through numerous “focal point” duties, such as fire weather duties, property management, office intranet maintenance, information technology security, cooperative observer coordination, and forecast quality control. San Angelo personnel had not been officially tasked with all primary and secondary focal point duties until shortly before our inspection of the office. During our visit, we found that some office personnel were unaware of who their backups were or unaware that they had been assigned backup responsibilities. Without a clear assignment of responsibilities, some staff were unprepared to be backups. The MIC needs to ensure that all office employees understand and are prepared to handle each of their primary and secondary focal point duties (see page 28).

**Quality control needs to be more systematic.** The San Angelo staff were not consistently performing systematic quality control reviews of office products before and after they were issued. As a result, some office products have been issued with improper information, such as watches and warnings containing improper meteorological codes. While the overall quality of office products we reviewed appeared adequate, staff acknowledged that the accuracy and completeness of products can be improved. The MIC needs to emphasize to all forecasters and hydrometeorological technicians that products must be reviewed, and implement an ongoing quality control system (see page 28).

On page 31, we offer a series of recommendations to the Assistant Administrator of the National Weather Service to address our concerns.



In its written response to our draft report, NOAA took exception to a number of our observations and recommendations. For most of those recommendations with which NOAA took exception, NOAA was primarily concerned that what was being recommended was already in practice at the San Angelo WFO or the regional office in Fort Worth. We disagree with several of the agency’s positions, as noted on pages 13, 19, 24, and 30.

NOAA's written response also provided clarification on several issues. Where appropriate, we adjusted the language in our draft report in response to NOAA's comments and supporting documentation provided subsequent to NOAA's response.

## INTRODUCTION

Pursuant to the authority of the Inspector General Act of 1978, as amended, the Office of Inspector General conducted an inspection of the National Weather Service's (NWS) Weather Forecast Office (WFO) in San Angelo, Texas.

Inspections are special reviews that the OIG undertakes to provide agency managers with timely information about operational issues. One of the main goals of an inspection is to eliminate waste in federal government programs by encouraging effective and efficient operations. By asking questions, identifying problems, and suggesting solutions, the OIG hopes to help managers move quickly to address problems identified during the inspection. Inspections may also highlight effective programs or operations, particularly if they may be useful or adaptable for agency managers or program operations elsewhere. This inspection was conducted in accordance with the *Quality Standards for Inspections* issued by the President's Council on Integrity and Efficiency. Our fieldwork was conducted from November 13 through 17, 2000. During the review and at its conclusion, we discussed our findings with the meteorologist-in-charge (MIC) of the San Angelo WFO, the director of NWS's Southern Region, the Assistant Administrator for NWS, and other NOAA senior managers.

## OBJECTIVES, SCOPE, AND METHODOLOGY

The objective of this inspection was to determine how effectively the San Angelo WFO (1) delivers forecasts, warnings, and other information to its service users; (2) coordinates its activities with state and local emergency managers; and (3) manages its network of observers and volunteer spotters. We also assessed the adequacy of the office's management and its internal controls; its compliance with Department, NOAA, and NWS policies and procedures; and the effectiveness of regional oversight. This is the second in a series of OIG inspections of WFOs.

In performing our review, we examined pertinent records and documents and interviewed all of the staff at the San Angelo WFO. We also spoke by telephone with the regional director in Fort Worth, and interviewed many representatives from the Department and other federal, state, and local government agencies. We also interviewed individuals outside of government involved in meteorological activities to obtain their assessment of the services provided by the San Angelo WFO, as well as to elicit any suggestions they had for improving the WFO's conveyance of critical weather information.

## BACKGROUND

The National Weather Service, an agency within the National Oceanic and Atmospheric Administration, has 121 Weather Forecast Offices nationwide. Each office issues (1) local forecasts, such as periodic zone forecasts and (2) warnings of severe weather—such as tornadoes, severe thunderstorms, floods, hurricanes, and extreme winter weather for their assigned counties. The offices, where applicable, also support NWS’s marine, aviation, and climatic data collection programs and prepare guidance for the fire weather program, supporting federal lands management and wildfire control. All U.S. counties are assigned to specific WFOs for warning purposes. The offices are responsible for effectively using advanced meteorological technology to issue weather predictions and continue to improve the timeliness and accuracy of forecasts and severe weather and flood warnings to the public.

The San Angelo office opened October 1947 under the Weather Bureau as a Weather Service Office. At that time, the office then had six full-time employees, who issued local weather forecasts and severe weather warnings for 14 west central Texas counties. In July 1999, the San Angelo office “spun-up,” a term used as part of NWS’s modernization program to identify Weather Service Offices<sup>1</sup> that were expanded to become WFOs with increased staff and responsibilities. (See Figure 1 for a photo of the current San Angelo WFO.)



Figure 1: NWS Weather Forecast Office, San Angelo, Texas

<sup>1</sup> Weather Service Offices were generally smaller in staff size and covered a smaller warning area than WFOs.

The WFO currently has a staff of 22, including a management team consisting of a meteorologist-in-charge, a warning coordination meteorologist, a science operations officer, a data acquisition program manager, an electronics system analyst, and an administrative assistant. The remainder of the staff consists of five lead forecasters, six journeyman forecasters, and five hydrometeorological technicians. The WFO's fiscal year 2001 operating budget, including its annual lease but excluding personnel costs, is \$205,723. At the time of our fieldwork, the WFO had a satellite office in Abilene, Texas, staffed by one hydrometeorological technician, but that office was closed on December 19, 2000, and the employee retired.

The San Angelo WFO's county warning area includes 24 counties in west central Texas (as shown in Figure 2). The WFO is located in NWS's Southern Region. The regional office, based in Fort Worth, is responsible for 31 WFOs.

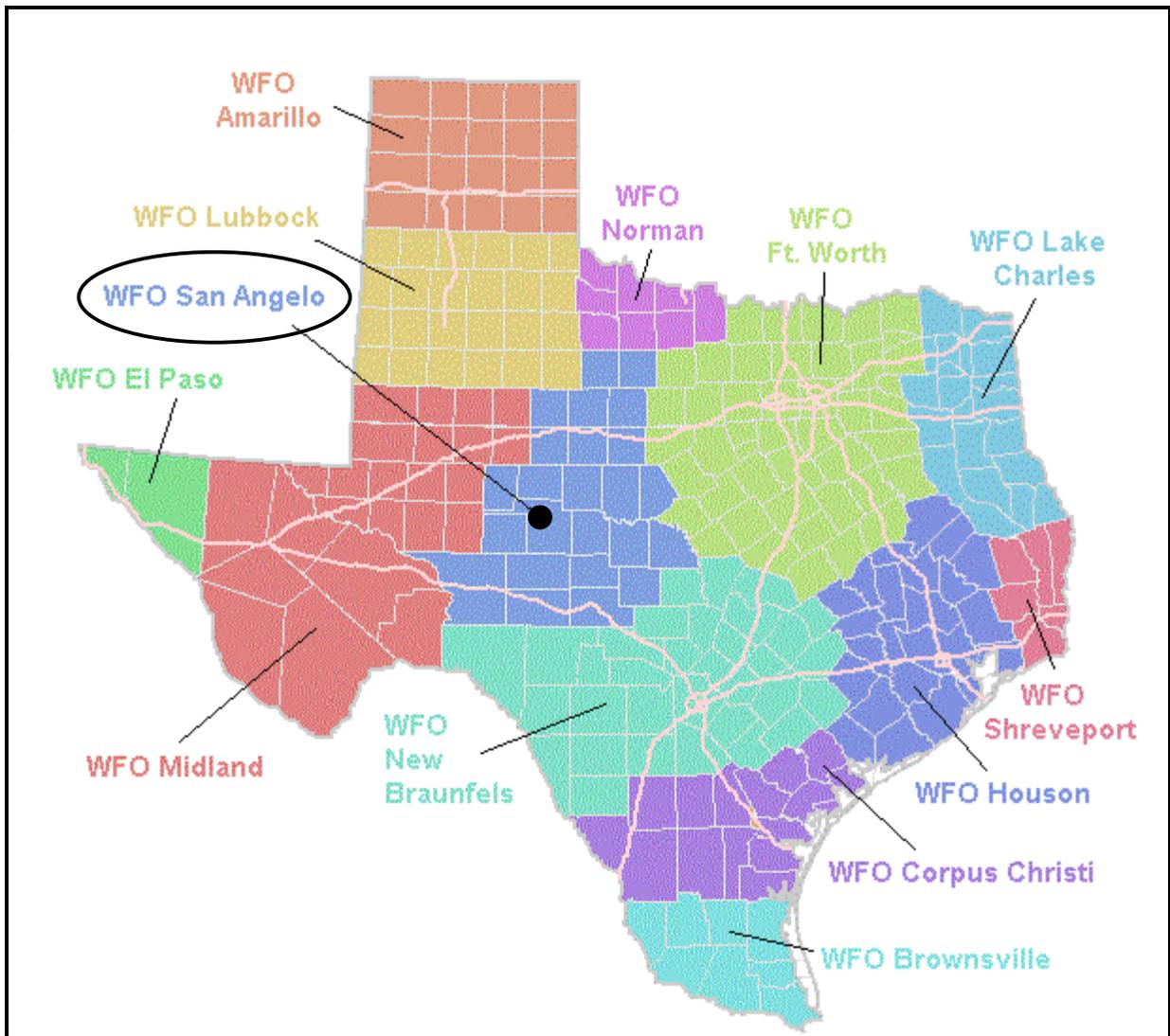


Figure 2: Texas WFOs' County Warning Areas

The WFO uses various technology and programs to help protect the citizens in its county warning area. Radar, satellite, and automated surface observation systems are used to prepare forecasts and issue warnings for all types of severe weather. NWS commissioned the Advanced Weather Interactive Processing System (AWIPS) in San Angelo on July 6, 2000. AWIPS, an interactive computer system that integrates NWS meteorological and hydrological data with NWS satellite and radar data, is designed to enable forecasters to prepare and issue more accurate and timely forecasts and warnings.

To effectively provide early warnings and collect important climatological data, the WFO must rely on its many partners. State and local emergency managers are vital components of the WFO's efforts to disseminate critical weather information to the public, while the WFO plays an important role in the state and local officials' efforts to keep abreast of severe weather events. Other partners include media representatives, and Skywarn and Cooperative Observer volunteers.

The office's Skywarn program, part of a nationwide effort, trains volunteer spotters to provide the office and the San Angelo community with timely and accurate eyewitness severe weather reports. The Cooperative Observer program uses volunteers to provide daily weather measurements, including rainfall and snowfall amounts. The meteorological community considers both programs critical in verifying and collecting data to improve forecast models and in recording accurate climatic data. After developing weather forecasts and obtaining critical information from its partners, the office disseminates that information to the general public through its partners, NOAA weather radio, the Internet, and other means.

## OBSERVATIONS AND CONCLUSIONS

### I. WFO Weather Forecasting and Outreach Efforts Are Generally Effective

As part of our review, we examined the San Angelo WFO's performance and other statistics that indicate to some degree the office's effectiveness. We also interviewed the office's staff and numerous public officials who work closely with them. For example, we spoke with emergency managers in several counties concerning the type and quality of their interaction with the San Angelo WFO and elicited their opinions on the quality of services the WFO provides. Without exception, these officials had favorable remarks about the services received from the WFO.

#### A. *Office generally issues timely and accurate weather warnings and forecasts*

The San Angelo WFO has done a good job of issuing forecasts and severe weather warnings, with the exception of its Probability of Precipitation forecasts. The office is responsible for issuing timely forecasts, severe weather and flood warnings, and advisories in order to inform people in its county warning area about anticipated weather events and protect them and their property from the dangerous effects of severe and hazardous weather. Office performance statistics indicate that the San Angelo WFO has generally been able to accomplish its mission for a variety of reasons, including the commitment of the staff, its "short-term, long-term" approach to forecasting, and its effective use of the Console Replacement System to reach its users.

#### San Angelo WFO's verification statistics are generally good, with one exception

Each WFO has two key areas of responsibility: severe weather products, such as thunderstorm and tornado warnings, and public forecast products, such as zone forecasts. The San Angelo WFO's performance statistics show that the office is generally issuing timely and accurate weather forecasts and severe weather products.

For its severe weather products, the lead-time,<sup>2</sup> False Alarm Ratio,<sup>3</sup> and the Probability of Detection<sup>4</sup> performance measures are very important. For the period January 1998 through December 2000, the office's False Alarm Ratio and Probability of Detection were better than the average of all Southern Region offices and the San Angelo WFO's fiscal year 2000 targets (see Table 1), as was its lead time for severe events.

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<sup>2</sup>Lead time is the interval between when a warning is issued and when an event reportedly occurs.

<sup>3</sup>The False Alarm Ratio is the fraction of all warnings that are unverified by office personnel. A high ratio indicates that an office is issuing warnings of events that do not occur.

<sup>4</sup>The Probability of Detection shows the fraction of all severe events (i.e., tornadoes and severe thunderstorms) for which warnings were issued. Attempting to achieve a high Probability of Detection by issuing more warnings would tend to have the undesirable effect of increasing the False Alarm Ratio.

**Table 1: Comparison of Severe Weather Performance Indicators**

Indicator	San Angelo	Regional Average	WFO FY 2000 Target
False Alarm Ratio	.495	.508	.75
Probability of Detection	.897	.843	.78
Lead Time	25.3 minutes	17.8 minutes	13.5

With regard to the WFO’s public forecasting, the office issues two zone forecasts every day, including forecasts for the different parts of its county warning area. Each WFO’s area of public forecast responsibility is divided into zones,<sup>5</sup> and WFOs issue public forecasts for each zone area. Zone forecasts include the temperature range, Probability of Precipitation (POP), precipitation type, cloud amount, snow amount, and wind direction and speed. We reviewed San Angelo’s zone forecasts from May 15 to June 15, 2000, and found that all had been issued before or at their scheduled times. Most of the office’s public forecast performance measures, such as temperature accuracy and zone forecast statistics, indicate that the office is providing timely and accurate forecasts.

The staff attribute much of their success to, among other things, their verification efforts. The *Weather Service Operations Manual* provides WFOs with general requirements for the quality control of all products, including those for severe storms.<sup>6</sup> Specifically, quality control of products is to be done before products are issued to ensure correct information, format, and spelling. After issuing severe thunderstorm and tornado warnings, WFOs should provide quality control through verification<sup>7</sup> and product review procedures. The WFOs collect information about the actual weather from trained spotters and cooperative observer sites to verify the accuracy of the warnings. This verification creates a baseline of skill or accuracy against which later changes in forecast procedures and products can be measured. It also helps NWS officials and staff measure NWS performance; answer congressional, media, and other requests for information; publish a historical climatological record (*Storm Data*); monitor trends; and improve forecaster performance.

San Angelo personnel emphasized that verification is important and helps to improve their forecasting efforts. Consequently, they dedicate significant resources to verification during and immediately after storms. Such efforts have contributed to more accurate forecasting because they are able to increase their knowledge of San Angelo’s climatology. Office personnel mentioned other factors that also have contributed to better forecasting and verification,

<sup>5</sup>“Zone and Local Forecasts,” Chapter 11, *Weather Service Operations Manual*.

<sup>6</sup>“Severe Local Storm Watches, Warnings, and Statements,” Chapter C-40, *Weather Service Operations Manual*.  
“National Watch/Warning Verification Program,” Chapter C-72, *Weather Service Operations Manual*.

<sup>7</sup>NWS determines how well it handles its forecasting and severe storms warnings through its verification process, which essentially matches warnings to actual weather observations and compiles statistical results of forecasting performance.

including more effective recruiting of spotters; greater reliance on amateur radio networks; and improved coordination with state and local emergency managers. As a result of the office's efforts, the major verification performance measures show an office that is issuing generally timely and accurate forecasts and warnings.

Unfortunately, the office's POP forecast statistics, yet another performance measure, have not kept pace with the model forecast guidance<sup>8</sup>. POP forecasts document the likelihood, expressed as a percentage, that measurable precipitation (0.01 inch or more) will occur at any point within a specified forecast area (usually a county or group of counties) over a specific period of time (typically 12 hours).<sup>9</sup> Forecasters prepare POP forecasts from meteorological model forecasts, their knowledge of local climatology, and their own experience. POP forecasts are compared to model forecasts to determine to what extent WFO-issued forecasts were more accurate than model forecasts. We found that the San Angelo office was the only Southern Region office from April through September 2000<sup>10</sup> that had fewer POP forecasts correct than its model forecasts, and did not improve on its model forecasts for the San Angelo data collection area.<sup>11</sup>

POP forecasts, which range between 0 and 100 percent, are verified on a point basis over a period of time using rain gages assigned to each WFO. Although gages will not measure every precipitation event, they will measure the percentage of time that measurable precipitation hit the rain gage when each POP level is forecast. If the percentage of times measurable precipitation occurs is significantly above or below that POP level, forecasters are either under or over forecasting and reducing service to WFO users. NWS officials told us that each office should have more POP forecasts correct than the model forecasts, and positively improve on each model forecast.

NWS headquarters and regional personnel cited several possible reasons for San Angelo's POP statistics being low, including the following: (1) staff may be inexperienced, (2) staff may be poorly trained, (3) the MIC or staff may have a bias toward forecasting or not forecasting rain, (4) staff may not know the local climatology, and (5) office may be going through a drought or near-drought conditions.

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<sup>8</sup> Model forecast guidance refers to statistically driven forecast guidance. This guidance is derived from the Computer Forecast Model and local climatology and is often used as a first guess for the local forecaster. It also provides a good baseline standard upon which to judge forecast skill.

<sup>9</sup> *Probability of Precipitation (POP)*, Gregory E. Jackson, December 2000. The value of the POP has no direct relationship to the amount of rain that may occur, despite the belief that higher POP values would imply greater precipitation accumulation. For example, as little as 0.01 of precipitation may occur with a 100 percent POP value and heavy precipitation may occur with a 20 percent value.

<sup>10</sup> We chose this period because it was the most recent available information from NWS.

<sup>11</sup> The average southern region office improved their forecasts (based on model forecasts) by 5 percent compared to San Angelo, which had a -5.5 percent improvement for April through September 2000 for the San Angelo data collection area. However, POP statistics for the Abilene area showed a 14 percent improvement for the same period.

NWS personnel were concerned that San Angelo forecasters have not consistently outperformed the model forecasts. Forecasters at San Angelo complained that the MIC has told them for the last two years to reduce their POP forecasts because the area is experiencing a drought. From April through September 2000, the office's forecasters underforecast the precipitation that actually occurred. Southern Region and San Angelo management need to determine the cause or causes for the office's negative POP statistics and take corrective actions, if necessary.



In their response, agency officials stated that the WFO's POP statistics are good and imply that no action is necessary. Their response also stated that the OIG focused on precipitation forecast verification statistics only for San Angelo and not Abilene.

We reviewed data for both the San Angelo and Abilene data collection sites and found that the percent of forecasts correct for both San Angelo and Abilene was below guidance. The data we reviewed showed that the percent of forecasts correct for San Angelo was 94.3 versus the guidance percentage of 95.1, and for Abilene the percent correct was 94.2 versus the guidance percentage of 94.6. Although the deficiencies do not appear significant, as noted above, San Angelo was the only WFO of 31 WFOs in the region that had fewer POP forecasts correct than its model forecasts and did not improve on its model forecasts for the San Angelo data collection area. Thus, we recommend that the agency take corrective action if NWS officials find the noted differences warrant such actions.

Corrections to a few technical terms and descriptions were made in response to NOAA's comments and as appropriate.

#### Short-term, long-term forecast approach meets WFO's needs

Forecast offices have traditionally been assigned two forecasters, one to maintain the public forecast desk and the other to maintain the aviation forecast desk. While each forecaster has specific products to issue during a shift, each also oversees weather events for their desk. Instead of using this typical public and aviation approach to forecasting,<sup>12</sup> the San Angelo WFO uses a short-term, long-term approach. This approach divides the workload according to weather time rather than program area or products to better address immediate and long-term weather events.<sup>13</sup>

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<sup>12</sup>A typical forecast shift includes one public and one aviation forecaster, and a hydrometeorological technician or meteorological interns. Both the public and aviation forecasters have specific programs and forecast schedules to maintain, such as public zone forecasts and airport forecasts. These two forecasters often perform comparable reviews and analyses, issuing forecasts for concurrent time frames and geographical areas. However, while preparing these types of forecasts, it can be disruptive to issue detailed forecasts for immediate severe weather events. The hydrometeorological technician or meteorological intern receives data from different sources, interacts with emergency managers and others during severe weather events, operates the unit control position of the office's radar, and issues forecasts over the NOAA Weather Radio.

<sup>13</sup>*Short-Term Forecast Tools and Concepts in a Modern NWS Forecast Office*, Dennis H. McCarthy, David L. Andra, Jr., and James K. Purpura, NWS, 1996.

The San Angelo office has used the short-term, long-term approach to forecasting since late 1995.

San Angelo personnel stated that there are multiple advantages to the short-term, long-term approach. For example, all forecasters receive cross-training in public and aviation forecasting; the short-term forecaster on a eventless shift should have time for ancillary activities, such as training or research; and journeymen forecasters get to enhance their careers by making meaningful weather decisions. Most importantly, because of enhanced communications between short-term and long-term forecasters, forecasts and warnings are normally fully discussed by all team members, thereby creating better and more timely products.

#### The Console Replacement System is generally well maintained despite some problems

NOAA Weather Radio is a nationwide network of radio transmitters broadcasting continuous weather information directly from WFOs across the country. The Radio broadcasts NWS watches, warnings, forecasts, and other hazard information 24 hours a day. The Console Replacement System (CRS) is a relatively new, personal-computer-based broadcasting console installed at each NWS office that automatically translates written NWS forecasts and warnings into synthesized-voice broadcasts over NOAA Weather Radio. CRS is designed to provide more efficient broadcasts over the NOAA Weather Radio.

Before CRS, San Angelo's hydrometeorological technicians would manually record the office's forecasts and current weather information for each transmitter area. Each forecast and warning had to be written, printed, edited, and then taped for broadcast. The former technology used by NWS offices had limited programming variability and locked messages into a repetitive sequential order. CRS allows more control of data and enables multiple warnings to be recorded and transmitted immediately to different areas.

Despite CRS's advantages, San Angelo's users and staff had two complaints about the new system. First, users told us that they found the computer voice of the new system annoying and at times difficult to understand. Although CRS uses a text-to-speech voice synthesis, it is a computer voice and not a human voice. In a recent survey of about 1,100 users conducted by the southern region, their biggest complaint was the poor quality of the CRS automated voice. NWS has initiated a Voice Improvement Project to address such concerns. The new voicing system's scheduled nationwide implementation is early to mid-2002.

San Angelo's users and staff also complained that the radio broadcasts of the office's forecasts and other products are too long and difficult to manage. With five transmitters, San Angelo personnel have five loops<sup>14</sup> of the office's short-term and long-term forecasts to maintain. Each loop may be over 10 minutes long, which users told us is too long. They stated that watches and warnings might take several minutes to hear when they are placed on the loop. Users also stated during the recent southern region survey that WFOs need to update their severe weather statements on each loop more frequently. The office's hydrometeorological technicians told us

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<sup>14</sup> A loop is a repeated broadcast of the WFO's forecasts and warnings.

that oversight of the five loops even during relatively calm weather consumes a great amount of time. They stated that the workload can become overwhelming during threatening weather conditions, and the priority for updating the office's five loops is not clear. The office shift supervisor needs to provide the hydrometeorological technician in charge of CRS with a priority list of loops to change during severe weather. The staff should also look to reduce the length of the loops where appropriate.

**B. Office outreach efforts to emergency managers and other users are effective**

State and local emergency managers in Texas help citizens in their communities prepare for potential natural disasters, such as floods, tornadoes, and other emergencies, that may affect public safety. WFO staff are responsible for working with these managers to help increase public responsiveness to warnings and critical weather, better prepare customers and partners for extreme weather events, develop and strengthen existing partnerships, and increase customer feedback to enhance NWS services.

Without exception, the state and local officials with whom we met spoke highly of the cooperation and service of the San Angelo WFO. According to state and local emergency managers we interviewed, San Angelo WFO officials make themselves available to discuss severe weather forecasts and provide assistance over and above the call of duty. In addition to being generally pleased with the timeliness and quality of the office's forecasts and warnings, the emergency managers applauded the WFO's outreach efforts. For example, several county emergency managers noted that the San Angelo staff loaned them their Emergency Managers Weather Information Network (EMWIN)<sup>15</sup> equipment for evaluative purposes. Although few emergency managers in San Angelo's county warning area employed the system, the WFO's staff actively promoted EMWIN. In fact, the emergency manager in Abilene, who had earlier received the system on loan from the WFO, recently purchased EMWIN for the county.

In November 1999, the NWS published its *Fiscal Year 2000 Outreach Action Plan*. The plan outlines steps various NWS components, including the WFOs, should consider in accomplishing their outreach goals. The San Angelo WFO and its partners work well together in pursuing these goals.

The office incorporated an aggressive outreach effort in its annual operating plan. Our review of the various documented activities during fiscal year 2000 showed that the office is implementing most of the plan. For example, the office conducted over 20 spotter training sessions with nearly 800 participants. WFO staff also presented numerous safety talks before various clubs, groups, and committees. In addition, they took time to visit schools to increase students' awareness of meteorology and weather safety, and to act as judges in school science fairs. Lastly, tours of the WFO are provided to school groups, emergency managers, and media representatives. We met with a number of representatives from organizations who have had contact with the San Angelo

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<sup>15</sup> EMWIN is hardware and software that allows users to receive a live stream of weather and other critical emergency information. EMWIN's present methods in use or under development for disseminating the basic data stream include radio, Internet, and satellite.

WFO, including the director of the “Summer 2000 Kids College” at Angelo State University. This 10-hour program was geared toward increasing weather awareness among elementary school students. The director of the program thought so highly of the WFO’s participation in the program that she recommended the program be continued and expanded to include adults.

The office also has a good relationship with media representatives. Good relations with the media are important because the media is a key element in the WFO’s outreach and information dissemination efforts. The media representatives with whom we spoke thought very highly of the services and responsiveness of the WFO. Although some were meteorologists themselves, they valued the insight and professional opinions that the staff at the WFO provided. The staff in San Angelo gave about 25 interviews during fiscal year 2000 to representatives of television, radio, and print media on various subjects, including the Skywarn and Cooperative Observer programs, Severe Weather Awareness Week, and the WFO’s general services and operations.

The office’s outreach efforts have been effective in improving citizens’ awareness of weather terminology, severe weather risks and precautions, and NWS products and services in the San Angelo county warning area. In addition, the efforts have allowed the WFO to form excellent relations with emergency officials, the media, and schools—relations that are important to enhancing the office’s public awareness activities.

## II. Research and Training Activities Need More Attention

Although the office is generally effective in providing its core programs and services, we found that some of its non-core activities receive little attention. Local studies conducted by staff meteorologists are considered important to improving techniques and procedures for forecasting. However, the staff in San Angelo has done little research. Also, the office only recently developed a structured training program for meteorologists, as required by NWS. These two areas are important because they are geared toward improving the meteorological techniques and the staff's understanding of and ability to address forecasting problems.

### A. Research efforts have been minimal

In its “*Strategic Plan for Weather, Water, and Climate Services 2000–2005*,” NWS states that:

“Sound science and innovative technologies are the foundation of NWS product and service quality. Improving products and services to meet customer and partner needs in the future is critically dependent on providing a well trained work force with a continual infusion of new and proven scientific ideas and technological systems.”

To that end, meteorologists in the office are tasked in their performance plans to conduct or participate in local studies and developmental projects designed to capitalize on or incorporate the benefits of new science, technology, and local techniques into the WFO's operations.

Local research by staff in WFOs has often yielded significant findings and improvements for not only the WFOs where the research is conducted, but also for NWS in general. For example, research efforts in the Raleigh WFO (the subject of an earlier OIG inspection)<sup>16</sup> have resulted in a better understanding of forecast problems found in the Southeast and the Carolinas, such as cold air damming, mixed precipitation, and coastal flooding. Research done by the Raleigh WFO has resulted in applications that have helped NWS meteorologists better forecast various meteorological phenomena.

In San Angelo, staff have also conducted some interesting studies, including the effect of moisture on daytime heating and the effects of population density on severe storm warning verification. Unfortunately, according to WFO officials, although the office has completed five research studies over the past two years, as illustrated in Table 2, the SOO conducted three of the studies.

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<sup>16</sup> *Raleigh Weather Forecast Office Provides Valuable Services but Needs Improved Management and Internal Controls*, Final Inspection Report No. IPE-12661, Office of Inspector General, September 2000.

**Table 2**

<b>Research Studies Completed in Last Two Years</b>	<b>Year</b>
El Nino or La Nina?	2000
The Effect of Moisture on Daytime Heating	2000
Probability of Precipitation	2000
Effects of Population Density on Severe Storm Warning Verification	2000
Annual and Monthly Average Precipitation 1961–90	1999

The office’s Science and Operations Officer is responsible for technology transfer and development activities, which includes developing, leading, and conducting local studies and advising WFO staff during their participation in the studies. The SOO should also identify and formulate hypotheses for these specific study efforts, assign projects to staff, and evaluate study results for potential application at the WFO.

The office does not have an adequate research planning process or a detailed plan outlining studies that were to be completed. In addition, some of the staff said they felt intimidated by WFO management’s harsh criticism of prior draft studies in open forums, while others suggested that many of the studies previously submitted were of poor quality, and the staff needed further guidance and training.

Many San Angelo staff thought the WFO could be one of the best offices in the Southern Region if it paid greater attention to research. They stated that with few local studies, the office’s “infusion of new and proven scientific ideas and technological system” is not as swift as it could be. Recently, the MIC developed professional development plans for each employee that include research goals for meteorologists. The MIC should continue to encourage the staff to participate further in local studies and provide constructive criticism when needed. The MIC and SOO should work with the staff to develop viable research topics and make themselves available to help staff in their efforts.



NOAA did not concur with our recommendation to develop a detailed research plan and specific project assignments to encourage the WFO’s staff to participate in local studies and research. NOAA officials emphasized that the WFO is “an operational forecast office, not a research office.” Additionally, the agency’s response states, “the IG inspectors took an incorrectly narrow definition of the phrase ‘local studies and developmental projects’ and, consequently, failed to give the San Angelo staff credit for many technology infusion and other projects in which they have been involved.” It goes on to suggest that other projects, such as the AWIPS focal point’s tasking to implement system patches and configure AWIPS software, should have been considered research in this section. The response also mentions the staff’s development of manuals and “help binders,” an annual severe weather awareness brochure, and the station’s semiannual cooperative program newsletter as important projects.

Local research conducted by WFO staff serves a number of useful purposes. It is a platform for the staff to develop innovative processes to address either unique problems encountered at their particular WFO or common problems found throughout the NWS network of forecast offices. Local research is also a useful tool in training staff on various aspects of the local climatology, such as the probability of precipitation.

During our inspection, we asked management in the WFO to provide us with all of the research conducted by office staff. We used what was provided to us for our analysis of this issue. In addition, although we consider many of the activities noted in the agency's response to be important and even essential to the office's ability to provide sound forecasts to its county warning area, we, and apparently the WFO managers, do not consider them to meet the criteria for local research projects. In fact, on the WFO's homepage, it lists its "Local Research and Studies." Developing help binders and AWIPS focal point's tasking to implement system patches and configure AWIPS software are not listed. In fact, we reviewed a sample of research listings from various WFOs, including others in the Southern Region. None of the offices we reviewed included such items on its list of local studies and research. In addition, although one WFO we sampled conducted six local studies during the two-year period, they involved eight WFO staff members and the office had a detailed research plan; this is compared to only three staff members completing studies in San Angelo and the WFO not having a research plan.

***B. Office has only recently implemented a structured training program***

The San Angelo WFO did not have a structured training program until just before our visit when professional development plans were prepared for all employees. While some office employees thought that they have received enough training, most believed that a more systematic approach to individual training was needed. Employees stated that they participate in seasonal "drills" for winter weather, severe weather, and fog. However, while the training officer has worked up these useful drills for the meteorologists, employees stated that training has not focused on all of their individual needs to improve their job performance and potentially advance their careers.

NWS has emphasized the importance of training programs for its employees for many years to maximize employee proficiency and potential. In 1998, NWS began preparing a National Strategic Training and Education Plan to support field training and education requirements with easily accessible, usable, and effective training materials. The plan establishes NWS's overall training requirements and defines the required knowledge, skills, and abilities needed by NWS forecasters and other employees to successfully perform their jobs. However, the WFO's employees emphasized that other than the office drills, the office lacks an overall plan or approach to training. They stated that this has resulted in insufficient training in areas such as AWIPS, the CRS, UNIX software, security, and hydrology. Although the office's training officer believes the training needs of the staff are being adequately addressed, WFO staff believed the officer concentrated primarily on computer-related issues and seems to have little time to address their training needs. As a result, some employees pursue training videos and classes on their own. If there is new hardware or software to learn, employees reportedly learn it on the job.

The MIC agreed that office personnel need more training. She told us that she has tried to direct office staff to training and encouraged them to read meteorological and hydrological studies and reports. She emphasized that not all staff members are interested in receiving training. She also indicated that while no local university has a meteorological or hydrological program, CD-ROM and tele-training<sup>17</sup> is available. In August 2000, she arranged for UNIX training for some personnel from the San Angelo, Corpus Christi, and Midland WFOs.

The training officer also agreed that employees need individual training plans. The Southern Region recently issued a Regional Operations Manual Letter suggesting that yearly training plans, developed in collaboration with the SOO and others, would be very helpful.<sup>18</sup> As a result, the MIC and the training officer recently prepared a template 2001 Professional Development Plan and requested that each employee complete it.

The plan should document each employee's required training, such as office drills. It should also outline elective training and professional development, such as video or tape-based training, research papers, and outreach activities. For elective training and professional development activities, the plan has a list of proposed activities with assigned point totals. Staff members were asked to submit a signed plan that identified training courses, development activities, and yearly point goals by December 15, 2000. Although most staff members stated that Professional Development Plans were needed and beneficial, they were uncertain how or whether management would use the plans when preparing their performance appraisals.

The Southern Region recently issued a revised training guideline for the region's WFOs.<sup>19</sup> It states that local managers are responsible for employee training and that training plans would be helpful in identifying where further professional development is needed. Because the WFO employees told us that they were confused with the new plans, the office MIC needs to clarify to all staff members how the new plans will be used and interpreted during fiscal year 2001. The MIC should then ensure that appropriate training, based on their plans, is provided to WFO staff.



In the agency's response, NOAA officials agreed with our recommendation, stating "the new professional development plans will be discussed with each employee during the April 2001 mid-term performance reviews.

However, NOAA also noted, "While it is true the WFO was in the process of putting into place a new professional development and training program about the time of the IG's visit, the WFO had previously been conducting significant training activities." The response also includes a list of training activities in San Angelo since 1998.

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<sup>17</sup>Tele-training allows an NWS instructor to train multiple individuals over the phone.

<sup>18</sup>*Training Policies and Procedures*, Southern Region ROML S-09-2000, October 5, 2000.

<sup>19</sup>Southern Region ROML S-09-2000, "Training Policies and Procedures," updated and replaced S-02-96.

As we state in the report, office personnel have received meaningful training. However, the office only recently developed a structured training program and some staff training needs have gone unmet.

After reviewing the list of training provided in the agency's response, it is worth noting that (1) there were few, if any, classes in some of the areas noted in the report, such as UNIX, hydrology, and IT security; (2) many of the classes were held over two years ago or subsequent to our visit; and (3) many of the training classes were employee-initiated—not a result of a training plan.

### III. Greater Regional Oversight of WFO Is Needed

As part of our review, we examined certain aspects of the NWS Regional Office's management and oversight of the San Angelo WFO. Specifically, we inquired about steps taken by managers in the Southern Region to address the WFO staff's concerns about management practices and provide regular oversight of WFO operations, management, and administrative support. This included a look at the types and frequency of station inspections conducted by the regional office.

The Southern Region managers hold periodic conference calls with the MIC and have visited the San Angelo office on six occasions between January 1994 and the time of our visit. These visits included a station inspection in 1994, an administrative review in June 1996, and an inspection of San Angelo's weather observation program by the staff from the Corpus Christi WFO in February 1998. Station inspections are internal NWS reviews that, among other things, evaluate WFOs' adherence to NWS policies in various areas, including reviews of systems and equipment, the upper air program, and surface observations.

Despite these visits, during our inspection we observed several conditions that suggest a lack of adequate regional oversight. These include (1) continuing conflicts between management and staff that could undermine office operations; (2) until just before our visit, the station duty manual had not been updated for 7 years; and (3) the WFO's Probability of Precipitation statistics are below the Southern Region average, as discussed on page 5.

#### Office morale and turnover have been a problem

Regional officials failed to address turnover and the staff's report of low morale. San Angelo personnel claimed that low morale was the office's most significant and persistent problem. Reportedly, the management style of the MIC has alienated the staff and reduced their initiative, created a poor working environment, and allegedly contributed to some employees' decision to leave. We were told that the MIC has publicly criticized staff and discussed employees' performance with other employees. While we were unable to confirm or refute these complaints during our one-week visit, most employees discussed the tension in the office and poor communication between the MIC and staff that could undermine office operations.

Office personnel also stated that personnel turnover has been a growing problem over the last two years. Mountain Administrative Support Center officials informed us that the San Angelo office lost 6 individuals from August 1998, to December 2000. Current and former personnel told us that the office environment was one reason that some former employees left the office. Current and former San Angelo personnel believe that all office managers should receive basic management training in appropriate areas, including conflict resolution, human resource management, and sensitivity training. We agree.

The MIC told us that office morale has generally been adequate and that the employees work well together as a team. She admits that she has had to be critical of some employees'

performance because she believes that some of the staff have not yet successfully transitioned from a smaller Weather Service Office to the larger WFO environment.

Even though regional office records show that regional staff in Fort Worth visited the San Angelo WFO on six occasions since 1994 and regional staff informed us that that were aware of some of the noted issues and problems, certain problems have persisted. Given the number and nature of problems noted above, we believe regional representatives should maintain effective communications with both WFO management and staff and take whatever actions are necessary to improve working relationships in the office.

Before our visit, the station duty manual had not been updated for 7 years

Station duty manuals are instructions describing how local operations and emergency procedures are to be accomplished.<sup>20</sup> Specifically, the manual documents the office's standard operating procedures, all WFO tasks, and most conceivable situations that may confront the WFO. The manual's topics range from issuing warnings and ordinary forecasts to responding to power outages and other emergency situations. The station duty manual in San Angelo was 7 years old before it was updated just before our visit. San Angelo's manual reflected a small office with only six employees, whereas the WFO had 24 employees at the time of our visit. Managers in the Southern Region should have been aware of this. While MICs are primarily responsible for maintaining station duty manuals, regional managers and staff should periodically visit WFOs to review management, technical, and administrative operations. Specifically, as part of their oversight, regional management should ensure that station duty manuals are updated annually.

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After our visit to San Angelo, the regional director indicated to us that he has implemented a "Visitation Program" for the Southern Region and provided us with his memo to the southern region MICs, hydrologists-in-charge, and division chiefs, dated July 28, 2000, notifying them that the program would begin during fiscal year 2001. Attached to the memo was a list of senior regional managers and the field offices for which they were responsible. The memo, however, did not include a schedule for the visits, or include any discussion of how visits should or would be prioritized. The memo did state that the agendas for the visits would be based on the needs of the particular office being visited.

We believe that in addition to program and administrative reviews, regional managers' visits should address other priority issues, such as management and employee concerns, and, where appropriate, take corrective actions to address. Lastly, WFO staff and management should be encouraged to more candidly discuss with regional managers those lingering concerns they have that cannot be or are not addressed at the local level.

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<sup>20</sup>"Station Duty Manual," Chapter A-13, *Weather Service Operations Manual*.



In the agency's response, NOAA states that regional officials visited the San Angelo office twice in 1996, twice in 1997, once in 1999, and twice thus far in 2001. According to NOAA's response, on one of the visits in 1996, the chief of the region's Administrative Services Division conducted an administrative review.

Prior to our visit to San Angelo, we requested all reviews conducted by the regional office of San Angelo within a two-year period. Regional officials gave us only one review: a station inspection conducted by staff from the Corpus Christi WFO. We then asked for the last review conducted by a regional office official. We were given the station inspection that was conducted in January 1994.

During our visit to San Angelo, we specifically asked the staff when the last time someone from the regional office visited the WFO. Overwhelmingly, the staff stated that it was at least four or five years ago. Others could not remember when.

On December 11, 2000, after returning from San Angelo, we conducted a teleconference with the regional director and four of his senior managers. We asked them when was the last time someone visited the WFO in San Angelo. Neither the regional director nor the other attendees could recall a prior visit.

On December 19, 2000, we had a teleconference with the regional director and the chief program officer. Once again, we requested the most recent visits to San Angelo by regional officials. We were told by the chief program officer "we have no record of a visit by regional staff since the January 1994 station inspection."

Lastly, we raised this issue at our exit conference. Present at the exit conference was the Assistant Administrator for the National Weather Service, other senior NWS headquarters officials, and, via teleconference, the regional director for the Southern Region and the region's chief program officer. At no time during that meeting were any of the visits outlined in NOAA's response mentioned, including when we specifically discussed the issue of regional oversight and field visits.

On June 10, 2001, NOAA officials were able to provide documentation supporting all of the claimed visits except the October 1997 visit. However, we remain concerned that despite the regional staff's admitted knowledge of some of the problems noted in the report, the problems persisted. We believe that management reviews and oversight visits should be well documented, and a plan for follow-up action should be prepared to help ensure that WFO problems or shortcomings are adequately monitored and addressed. The region provided little documentation to show that this was done in the past to ensure effective oversight of the San Angelo WFO.

#### IV. Dyess Air Force Base's Radar Availability Is Below Operational Standards

The availability of the Air Force radar used by the San Angelo office is below NWS, Department of Defense, and Department of Transportation standards. The San Angelo office uses both the Air Force and NWS radar for coverage of its county warning area. The Air Force radar used by the San Angelo office is located at Dyess Air Force Base. When the Dyess radar is not operational, San Angelo staff use other NWS radars for backup. However, because these radars are at different locations, the WFO radar coverage is less than that provided when the Dyess radar is working. According Dyess officials, in calendar year 2000, the Air Force radar was available 92.2 percent of the time,<sup>21</sup> which is below the 96.0 percent minimum operating standard for all NEXRAD<sup>22</sup> radars.

In 1984, NWS and the Departments of Defense and Transportation implemented a tri-agency maintenance agreement for all NEXRAD systems. The agreement specified that each agency would maintain its own radars; a centralized hardware and software support center, as well as a centralized maintenance depot, would be established; and operational availability of all NEXRAD radars would be at least 96 percent.<sup>23</sup> A National Research Council study emphasized in 1995 that all NEXRAD radars should be properly maintained or national radar coverage would be degraded.<sup>24</sup> The council was concerned that Defense Department radars might not operate with the same “standards, quality, and availability” as the other NEXRAD radars.

The program manager at Dyess Air Force Base compiles radar availability statistics and provides them to the national Radar Operations Center.<sup>25</sup> The program manager confirmed that the Dyess radar did not meet the required 96 percent operational availability for most of 2000, with availability rates as low as 70.4 percent in one month.

According to NWS personnel, NOAA's National Logistics Support Center in Kansas City provides parts and materials for all NEXRAD radars. The center allows Defense sites to quickly requisition and receive radar parts, and therefore quickly repair and restore radars to operational availability. However, Defense sites such as Dyess Air Force Base cannot directly requisition

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<sup>21</sup> We received conflicting data from Defense personnel documenting the Dyess radar availability in 2000 and from NWS's Radar Operations Center, primarily for the months of January and July. The data obtained from Dyess showing 92.2 percent availability included detailed descriptions of problems occurring during each month and, for the months in question, the number of days the transmitter was down awaiting parts.

<sup>22</sup>The National Weather Service, the Department of Defense, and the Department of Transportation operate 158 Next Generation Weather Radars as part of a tri-agency network providing nationwide weather support.

<sup>23</sup>Operational availability is total operating and standby time that requires downtime, corrective maintenance time, logistics delay time, and administrative delay time.

<sup>24</sup>*Assessment of NEXRAD Coverage and Associated Weather Services*, National Research Council, June 1995.

<sup>25</sup>In 1988, the NEXRAD agencies established the Radar Operations Center in Norman, Oklahoma. The center has 130 employees from NWS, the Air Force, the Navy, and the Federal Aviation Administration, and support contractors, for centralized radar meteorological, computer software, maintenance, and engineering support.

parts and materials from the center. Figure 3 outlines the requisitions process for NWS and the Departments of Defense and Transportation to order parts from the support center.

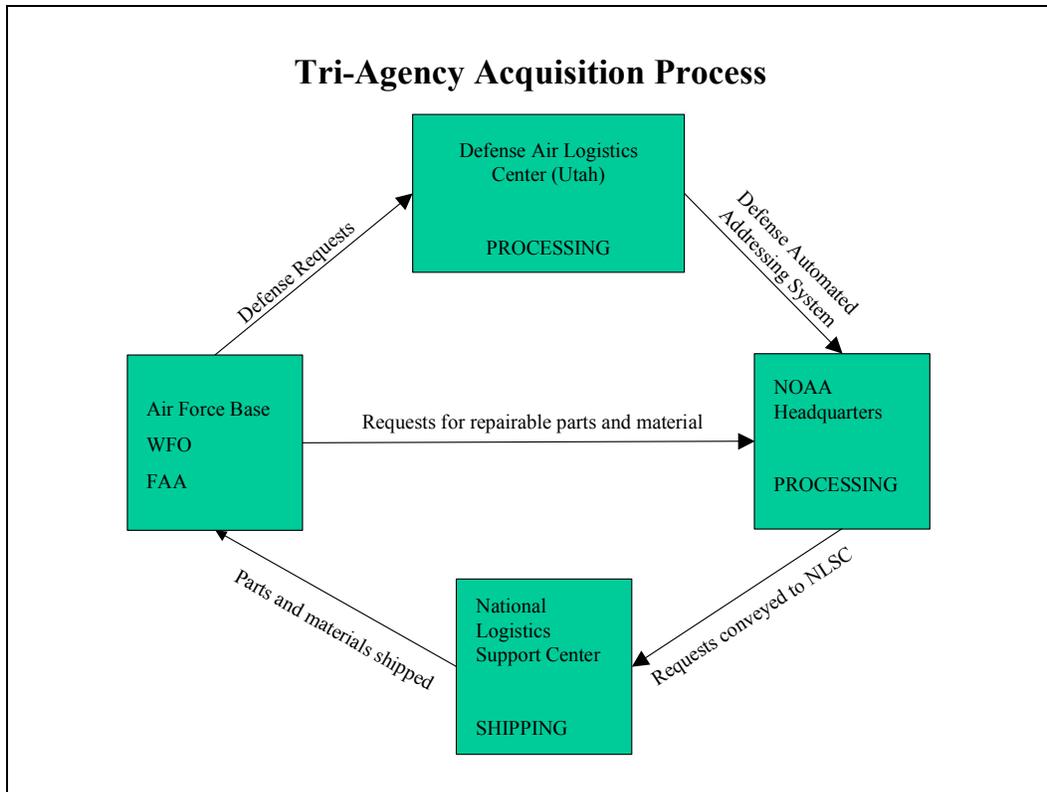


Figure 3

NWS personnel stated that the support center’s portion of the acquisition process has been significantly streamlined over the last several years. For example, Figure 3 shows that Defense requests are simultaneously sent to Defense’s logistics center and NOAA. Consequently, NWS officials emphasized that the average completion time for routine requests is 50 hours, while the average for emergency requests is about 11.5 hours.<sup>26</sup> NWS personnel believe that these response times should allow Defense and other customers to adequately maintain their equipment. Knowledgeable defense personnel cited delays in the Defense Department’s acquisition approval process and local problems in maintaining the Dyess radar as reasons for the decreased radar operational availability.

They emphasized that although NOAA’s system has been streamlined, getting Defense requisitions reviewed and approved for system input has been an ongoing problem. Defense personnel stated that turnover and inexperience of base personnel sometimes delay the requisitions process.

<sup>26</sup> Calculation of response time starts when an electronic requisition is received at NOAA headquarters in Silver Spring, Maryland, and ends when an item leaves the shipping dock at the support center.

Defense personnel also cited other problems occasionally contributing to the downtime of radars. Specifically, the Defense-maintained radars lack backup systems, some bases lack on-site operations personnel, commercial carriers have restrictive pick-up and delivery times for necessary replacement parts, and the Defense Automated Addressing System has operational limitations. They stated that if certain parts are not available on a base, base personnel sometimes request parts and materials from other bases rather than use the support center. They emphasized that requesting parts from other bases takes longer and parts can sometimes be sent to the wrong base if the request has been incorrectly coded. Defense personnel stated that all of the above problems were recently reviewed.

Department of Defense officials stated that the specific problems with the Dyess radar include ongoing problems with the radar's air conditioning, ductwork, and power supply that have reduced the radar's operational availability. They stated that the Radar Operations Center (ROC) in Norman, Oklahoma, has sent specifications to replace the air conditioning system and install new interior ducts. They emphasized that these improvements need to be performed so this radar can effectively assist the San Angelo office with its radar coverage. The NWS should continue to work with Defense officials to complete the timely repair of radar equipment and to help maintain its continuing availability.



In their response, agency officials stated “The NWS Radar Operations Center will continue to work with DOD for timely repair of all DOD radars, including the Dyess WSR-88D.” They emphasized that this responsibility lies with the ROC and not with the region or the WFO. We agree.

The ROC indicates that in calendar year 2000, the Dyess radar was available 95.8 percent of the time. The percentage we use in the report, 92.2 percent, came directly from officials at Dyess Air Force Base. We also received data from the regional office that indicated that the data availability for the radar during the period November 1999 thru October 2000 was 93.9 percent. Additionally, the issue was brought to our attention by San Angelo staff, who were concerned about what they considered to be a significant problem with the radar's availability.

Although better than the 92.2 percent availability rate used in our report, data provided in the agency's response shows that radar availability is still slightly below the agreed upon standard.

Considering the conflicting information provided by Dyess Air Force Base officials and the NWS in its response, we request that agency officials provide documentation to support the availability statistics used in their response. We also request agency officials to determine why there is a discrepancy and which availability percentage is correct. If the radar is not actually available as much as the ROC's data might indicate, then NWS may wish to give more attention to the problem.

## **V. Internal Controls Are Adequate, but Improvements Are Needed in Some Areas**

Although we found most of the San Angelo WFO's administrative operations were well managed, we identified a few areas that warrant management attention. Specifically, (1) information technology controls are improving but need more attention, (2) the new station duty manual can be improved, (3) the focal point responsibilities should be better communicated to staff, and (4) quality control procedures are not being consistently performed.

### **A. Most administrative activities are well controlled**

We reviewed office policies and procedures for management of inventory, supplies, bankcards, procurement, time and attendance, travel, and security. We found adequate controls over most of these areas and well-maintained documentation. We conducted a sampling of items on the inventory list and were able to identify all the items selected. We also compared a sample of accountable property in the office with the inventory list and found no reason to question the accuracy or completeness of the inventory list. We physically accounted for all of the lap-top computers, other visual aids, and the copier and fax machines. We also randomly selected other items on the inventory list, such as cameras, and verified that they are in the San Angelo WFO and have the proper inventory labels.

At the time of our visit, the San Angelo WFO had four official government vehicles for maintaining NWS field equipment and facilitating outreach efforts:

- One is used by the electronic systems analyst to maintain surface observation equipment.
- Another is used mostly by the Cooperative Observer program manager to make field visits for maintenance and repair of equipment.
- A third is used by the data acquisition program manager and the MIC.
- The fourth is used by the warning coordination meteorologist primarily for outreach activities.

The hydrometeorological technician in the Abilene satellite office also had a vehicle until the office closed in December 2000. This vehicle is now used by the San Angelo WFO, increasing the total to five.

The MIC implemented a vehicle log system only two weeks prior to our visit, thus we were unable to adequately assess whether the vehicles were being used for only official government business and whether the WFO actually needs five vehicles based on usage data. According to the MIC, the logs were created as a result of findings and recommendations made in our earlier inspection report on the Raleigh WFO. The MIC should periodically review the logs to ensure that the vehicles are being used in an appropriate manner and to determine whether there is a demonstrated need for the current number of vehicles.

The time and attendance records were also well maintained, but there are some questions about whether leave is being properly accounted for by those not working shifts. Staff who work on the rotating shifts are easily accounted for because there are only three employees working on each shift and they are listed on the schedule. If someone cannot work an assigned shift, the replacement employee's name is inserted on the schedule and initialed. There are, however, several employees in the San Angelo WFO whose time worked is not documented daily on a schedule. The office does not currently have a policy requiring employees to sign in and out.

Although we found no documented evidence of the alleged time and attendance abuse, it should be noted that some employees expressed concern about the propriety of how some staff report their time and attendance. To address these concerns, the Regional Director should closely monitor this situation to ascertain what, if any, changes or additional safeguards are needed to better document time and attendance for at least San Angelo WFO employees who are not working a rotational shift. A schedule is maintained for shift employees, but there is no such documentation for others. Implementing a sign-in/sign-out sheet for non-shift workers would allow the MIC to know when any employee is in or out of the office. Although we understand that it is not NWS policy to require employees to sign in and out, several WFOs reportedly use such a system to effectively manage time and attendance. For example, the WFO in Raleigh has a sign in and out system that appears to work well.



In its response, NOAA reported that the MIC periodically reviews the vehicle logs and based on her review and the office's vehicle needs, the MIC decided to surplus the vehicle previously used at the Abilene office. NOAA reported that it was turned back to GSA on March 20, 2001.

In the agency's response, agency officials stated that they choose not to implement a sign-in/sign-out system for non-shift workers because there is no indication it is needed. They also stated that Raleigh does not use a sign-in/sign-out system for time and attendance purposes.

We disagree that there is no indication that a system is needed. While we were in San Angelo, some employees raised serious questions about possible leave abuse. The fact that questions were raised about possible leave abuse indicates that some type of system that better documents the time of non-shift workers might be needed. Additionally, Raleigh officials informed us that the office maintains a sign-in/sign-out board to indicate whether non-shift workers are in the office, out to lunch, or on a business trip; they also use a leave log for employees arriving late or leaving early.

Agency officials should reconsider our recommendation to implement a system that will better document the San Angelo staff's time and attendance.

***B. IT controls are improving***

The San Angelo office had just begun to implement NWS's information technology (IT) security policies when we arrived there. The office's IT security officer was designated as such in

September 2000, and the office's security plan,<sup>27</sup> risk analysis,<sup>28</sup> and disaster recovery plan<sup>29</sup> were prepared in October 2000. Office personnel stated that the required NWS documents were completed only in preparation for this OIG inspection and that the office's security officer was designated after the San Angelo staff read the OIG inspection report on the Raleigh WFO.

[REDACTED]

To provide IT security at all forecast offices, NWS has issued policies for maintaining the security of each site's hardware and software systems.<sup>30</sup> In August and December 1999, NWS issued a new AWIPS security policy and an overall NWS IT security plan.<sup>31</sup> The new security plan greatly expands system security requirements for each NWS site, including requiring an office-level security plan, risk analysis, and disaster recovery plan. Both the AWIPS security policy and the NWS IT Security Plan, like prior NWS security policies, require the MIC to perform various actions, such as ensuring that the prescribed level of security is maintained and designating an office IT security officer.

All San Angelo staff members signed the office's IT Security Plan just before our November 2000 inspection. As a result, office security had not been officially documented and properly implemented at the time of our visit.

[REDACTED]

We also found no documentation that the office's IT Security Plan, Risk Analysis, and Disaster Recovery Plan had been approved by the MIC and reviewed by the NWS Information Technology Security Officer, who must approve all three documents.<sup>32</sup> We believe that the office's risk analysis needs some revision.

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<sup>27</sup>Security plans will contain detailed technical information about the office's systems, its security requirements, and the controls implemented to provide protection against vulnerabilities.

<sup>28</sup>Risk analyses measure the relative vulnerabilities and threats to an office's information technology systems in order that resources can be used to strengthen security and minimize potential losses.

<sup>29</sup>Disaster recovery plans provide continuity in data processing services should catastrophic events occur causing interference with normal system operations.

<sup>30</sup>(1) *IT Security Management*, NOAA Administrative Order, August 1990, (2) *National Weather Service Office Automation Policy and Guidelines*, Weather Service Operations Manual Chapter A-50, May 1991, (3) *Final Advanced Weather Interactive Processing System Security Policy*, December 1996.

<sup>31</sup>*Advanced Weather Interactive Processing System (AWIPS) Information Technology Security Policy*, August 1999, and *National Weather Service Information Technology (IT) Security Plan*, December 1999.

<sup>32</sup>*National Weather Service Information Technology (IT) Security Plan*, December 1999.

[REDACTED]

San Angelo personnel stated that they had received little or no guidance from the Southern Region on security plan preparation and approval. However, office personnel planned to send the office's security plan to the region for approval. In addition to NWS's security officer approving all three documents, NOAA's Information Technology Security Officer and the Department of Commerce Information Technology Security Manager must approve all office security plans.

Both the MIC and Region should ensure that (1) the office security officer periodically revises system passwords; (2) the office security officer and electronics systems analyst prepare an updated software inventory; (3) office personnel test the office's backup and contingency procedures as soon as possible; (4) the office security officer sends the IT Security Plan, Risk Analysis, and Disaster Recovery Plan to the NWS security officer, NOAA security officer, and the Department of Commerce Security Manager; and (5) the office security officer revises the risk analysis to document all appropriate risks, including that of outside intrusion.



In their response, agency officials agreed with most of our recommendations in this area and have started to take corrective action.

However, the response disagrees that the security plan is required to be submitted to the Department's IT security officer. On page 9, the December 1999 NWS Security Plan states "the NWS ITSO shall review all security plans and submit them to the NOAA ITSO for review and comments, the NOAA ITSO shall submit final plans to the DOC Information Technology Security Manager for final approval."

The response also disagrees that the risk of intrusion should be adjusted.

[REDACTED]

[REDACTED]

### **C. New station duty manual can be improved**

After we announced our inspection in September 2000, San Angelo personnel hurriedly updated the WFO's March 1994 station duty manual. During our inspection, employees complained that the office had lacked a station duty manual to outline policies and procedures for the office's current operations and emergencies.

As noted on page 18, NWS policy requires all WFOs to annually review station duty manuals and review appropriate station duty manual chapters before each weather season.<sup>33</sup> However, San Angelo's manual had been severely outdated and incomplete. Without an updated version, office personnel lacked a single, definitive source of information for daily and emergency office operations. For example, office personnel stated that when some telephone, telecommunications, and system problems occurred, they did not know what to do or whom to call. The office should have performed required tests of backup and contingency procedures outlined in the station duty manual to address such emergencies.

While each office employee has read the current station duty manual, it takes time for all office tasks and operations to be incorporated and employees to understand a new manual. Office personnel followed the outline for station duty manuals suggested by NWS guidelines.<sup>34</sup> However, even after reading the new manual, some employees stated that they still do not understand some tasks, such as how they would shut down all computer systems in an orderly fashion. As a result, office employees believe that the new manual needs to be improved and refined. We agree.

We believe that all office personnel need to review and the MIC should revise the new station duty manual in six months, if needed, rather than waiting for the yearly review. Office personnel, including the MIC, agreed that updating the station duty manual sooner would benefit office operations.



The agency's response states that their records indicate that the WFO has been performing intraoffice and community drills. The response goes on to list the drills, their dates, and the number of participants. While we recognize that certain drills have been performed, some employees were still confused about what to do in emergency situations, primarily because of the outdated station duty manual. We have adjusted our recommendation.

Agency officials concurred with our recommendation to direct all office personnel to read the new station duty manual and revise it, if necessary, in six months rather than wait for the yearly review. They stated that on "March 26, 2001, the MIC instructed the staff to review the manual

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<sup>33</sup> "Emergency Drills," Chapter A-17, *Weather Service Operations Manual*.

<sup>34</sup> "Station Duty Manual," Chapter A-13, *Weather Service Operations Manual*.

at an interim six-month period in addition to the annual review in 2001.” Officials went on to say, “In addition, as sections of the manual are revised, employees are required to read the revised sections and initial that it has been done.”

**D. Focal point responsibilities should be better communicated to staff**

Each weather forecast office is tasked with issuing forecasts and warnings and maintaining equipment. All office personnel perform or support these tasks through numerous “focal point” duties, such as fire weather duties, property management, office intranet maintenance, IT security, forecast quality control, *Storm Data*<sup>35</sup> input, and cooperative observer duties. Focal point duties improve the quality of office products and overall office operations. Forecast office personnel fulfill focal point responsibilities as team members or as the primary or secondary individuals to contact. However, we found that San Angelo personnel had not been officially tasked with all primary and secondary focal point duties until we announced our inspection of the office. Although the MIC stated that an informal list of duties had existed, she could not find a copy of the list.

The MIC confirmed that written documentation, including a focal point list, had not been properly prepared. Because focal point duties had only been recently documented, some office personnel had just determined or confirmed what primary or secondary duties they had been assigned. For example, some staff members were only informally responsible for quality control of different office products. As a result, a systematic process of quality control had not been implemented. (See below for a detailed discussion of this issue.) Some office personnel also were unaware who their backups were or unaware that they had been assigned backup responsibility. Staff emphasized that the lack of an updated list of primary and secondary focal point duties and an updated station duty manual (as previously discussed) contributed to the WFO’s lack of a systematic process of quality control. The MIC needs to ensure that all office employees understand and are prepared to handle each of their primary and secondary focal point duties.



Agency officials concurred with our recommendation and stated in their response that focal point responsibilities have been incorporated in the Station Duty Manual.

**E. Quality control needs to be more systematic**

We found that the San Angelo staff were not performing systematic quality control reviews of office products before and after they were issued. Office personnel stated that they only occasionally ask other personnel to proof daily products. Consequently, some office products have been issued with improper information. In addition, the CRS requires a lot of oversight to

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<sup>35</sup>Each WFO submits monthly data into the national *Storm Data* database to document its verification efforts for severe storms and tornadoes.

ensure that accurate products are issued to the public. While office personnel believe that the overall quality of office products has been adequate, they emphasized that the accuracy and completeness of products can be improved with a more consistently applied quality control program.

The *Weather Service Operations Manual* provides WFOs with general requirements for the quality control of products.<sup>36</sup> The manual states that each office should establish quality control, consisting of training on the operational use of update criteria, proper coding, and clear wording of products. Specifically, quality control of products is a two-part process. WFOs must review forecasts and warnings before issuance for correct information, format, and spelling. After issuance, WFO staff must verify and review forecasts and warnings for accuracy and for future improvement.

Office personnel cited examples where product errors were overlooked. In one example, a tornado warning was issued as a severe thunderstorm warning, and an updated weather statement was issued as a severe thunderstorm warning. They also stated that some products are too wordy and do not adequately describe upcoming weather. In addition, problems with the CRS have caused errors, including forecasts with extra words, missing words, sentence fragments, words that are not in the CRS dictionary and that the system cannot pronounce properly, and redundant messages.

Office personnel stated that because CRS reads and issues text exactly as the forecasters write it, the system requires human intervention to keep the programming accurate and understandable to the public. While office personnel told us that there have been problems with the equipment and quality control since CRS was installed, they have been working to improve the quality control of products. To maintain quality control, office personnel emphasized that both forecasters and hydrometeorological technicians need to spend more time reviewing all products that are issued.

The San Angelo WFO needs a formal quality control program to adequately review office products before and after they are issued. Specifically, the MIC needs to emphasize to all forecasters and hydrometeorological technicians that products must be reviewed, and an ongoing quality control system should be implemented. The MIC has taken steps to improve quality control. The office's 2001 Operating Plan states that the office will implement a quality control program specifically aimed at development of forecast effectiveness, especially in the public products area. Implementation of such a plan should improve quality control over the office's products. Regional oversight visits should ensure that such progress on quality control of San Angelo's weather forecast products is achieved.

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<sup>36</sup>“Severe Local Storm Watches, Warnings, and Statements,” Chapter C-40, *Weather Service Operations Manual*.  
“National Watch/Warning Verification Program,” Chapter C-72, *Weather Service Operations Manual*.



Agency officials did not concur with our recommendation to implement an ongoing quality control system. NOAA's response notes that the shift supervisor is assigned the responsibility to monitor, either personally or by delegation, the quality of products issued during the shift. The response also stated that the WCM reviews products issued by the WFO. Lastly, it states that focal points are tasked with quality control of the products issued in their specialty area.

While we agree that the overall quality of the products issued by the San Angelo WFO is good and the office staff have a responsibility to employ a system of quality control, we were told by staff—those responsible for implementing the quality control system—that the office does not consistently use that system. There were no checks and balances in place to ensure that the system was implemented. As our report notes, the San Angelo staff were not performing systematic quality control reviews of office products, and we were provided examples of product errors that were overlooked. In addition, because the controls are not consistently applied, staff cannot be certain how many mistakes were made. Therefore, we reiterate our recommendation that the NWS officials implement an ongoing quality control system for weather forecast products and emphasize to all forecasters and hydrometeorological technicians that products must be reviewed for quality before being issued.

## RECOMMENDATIONS

We recommend that the Assistant Administrator for NWS instruct the Regional Director to take the following actions:

1. Determine why the office's Probability of Precipitation statistics have not kept pace with other offices in the Southern Region and take corrective actions, if necessary (see page 5).
2. In addition to program and administrative reviews, regional management should address other priority issues during site visits, such as management and employee concerns. Documentation and a follow-up system to track corrective actions should be put in place to ensure that problems and concerns noted during oversight reviews are addressed (see page 17).
3. Encourage WFO staff and management to discuss with regional managers any concerns they have that cannot be or are not being addressed at the local level (see page 17).
4. In conjunction with the MIC, continue to work with Defense officials to complete the timely repair of the Dyess Air Force Base radar equipment and help maintain its continuing availability (see page 20).

We recommend that the Assistant Administrator for NWS instruct the MIC to take the following actions:

1. Develop a detailed research plan and specific project assignments to encourage the staff in San Angelo to participate in local studies and research and provide support and constructive criticism to staff on such projects, when needed (see page 12).
2. Clarify to all staff members how the new professional development plans will be used and interpreted during fiscal year 2001 and ensure that appropriate training, based on their plans, is provided to WFO staff (see page 14).
3. Periodically review the vehicle log to ensure that official vehicles are being used in an appropriate manner and to determine whether there is a demonstrated need for the current number of vehicles. Unneeded vehicles should be surplus (see page 23).
4. Take appropriate measures to bring the WFO's information technology security into compliance with NWS standards. This includes complying with the office's newly developed IT security plan and having (1) the office security officer periodically revise system passwords; (2) the office security officer and electronics systems analyst prepare an updated software inventory; (3) office personnel test the WFO's backup and contingency procedures as soon as possible; (4) the office security officer send the IT Security Plan, Risk Analysis, and Disaster Recovery Plan to the NWS security officer, NOAA security officer, and the Department of Commerce Security Manager; and (5) the

- office security officer revise the risk analysis to document risk of outside intrusion and any other potential risks (see page 24).
5. Direct all office personnel to read the new station duty manual and revise it, if necessary, in six months rather than wait for the yearly review (see page 27).
  6. Ensure that all office employees understand and are prepared to handle each of their primary and secondary focal point duties (see page 28).
  7. Implement an ongoing quality control system for weather forecast products and emphasize to all forecasters and hydrometeorological technicians that products must be reviewed for quality before being issued (see page 28).

## AGENCY RESPONSE



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
CHIEF FINANCIAL OFFICER/CHIEF ADMINISTRATIVE OFFICER

APR 30 2001

MEMORANDUM FOR: Johnnie Frazier  
Inspector General

FROM: Sonya G. Stewart 

SUBJECT: Response to the Office of Inspector General Draft Inspection Report:  
San Angelo Weather Forecast Office Performs Its Core  
Responsibilities Well, But Office Management and Regional  
Oversight Need Improvement, Report No. IPE-13531

The National Oceanic and Atmospheric Administration appreciates the opportunity to review and comment on the subject draft inspection report.

The draft inspection report identifies several management and internal control recommendations for the National Weather Service Assistant Administrator. Appropriate actions are identified where we agree with the OIG. Where we disagree, our rationale is provided. We have also included our comments on the observations and conclusion section of the draft inspection report.

Attachment



**National Weather Service (NWS)  
Response To  
Office of Inspector General Draft Report**

*San Angelo Weather Forecast Office (WFO)  
Performs Its Core Responsibilities Well,  
but Office Management and Regional  
Oversight Need Improvement  
Draft Inspection Report No. IPE-13531/February 2001*

**Background**

On page 2, second paragraph, the statement, "In July 1999, the San Angelo office began to 'spin-up,' a term used as part of NWS's modernization program to identify Weather Service Offices that were slated to become WFOs.", is incorrect. The spin-up process began at the San Angelo office in 1994.

**Observations and Conclusions**

**I. WFO Weather Forecasting and Outreach Efforts Are Generally Effective**

On page 5, the word "generally" is used in three title statements to describe the office's weather forecasting and outreach efforts. Use of the word "generally" is inappropriate. The Report states in the first paragraph on page 5, "...we spoke with emergency managers in several counties concerning the type and quality of their interaction with the San Angelo WFO and elicited their opinions on the quality of services the WFO provides. Without exception, these officials had favorable remarks about the services received from the WFO." In addition, forecast verification statistics show the office is performing well.

San Angelo WFO's verification statistics are generally good, with one exception

In the first full paragraph on page 6, the statement is made, "Zone forecasts include the temperature range, Probability of Precipitation (POP), precipitation type, cloud amount, snow amount, ceiling height, visibility, and wind direction and speed." Zone forecasts do not contain ceiling heights or visibility.

In the second full paragraph on page 7, a definition of POPs (Probability of Precipitation) is given as well as a description of how POPs are verified. The statement is made for a given POP level, "the actual precipitation should equal that POP level." This is incorrect. POPs have nothing to do with precipitation amounts but rather reflect the percentage of times that measurable precipitation is expected to occur. The term "actual precipitation" is used again in the next sentence which is also incorrect. The correct interpretation is: If the percentage of times measurable precipitation occurs is significantly above or below that POP level, forecasters are either under or over-forecasting...

In the first full paragraph on page 7 the statement; “Unfortunately, the office’s POP forecast statistics, yet another performance measure, have not kept pace with the regional average.” is misleading.

The San Angelo WFO provides forecasts for an area in west-central Texas that covers 24 counties and verifies precipitation forecasts at two locations in the area, San Angelo (SJT) and Abilene (ABI), Texas. The Draft Report focused on forecasts for only one of the locations and for only one specific period of time (April through September, 2000). Using data for both verifying locations during the time when statistics on San Angelo’s precipitation forecasts are available (October 1999 through September 2000) provide a more reliable basis for reaching a conclusion regarding forecast performance.

The Table below compares precipitation forecast performance of the San Angelo WFO with all Southern Region WFOs

Period (season)	Verifying Office	% improvement over model forecast guidance <sup>1</sup>
Apr. - Sep. 2000 (warm season)	San Angelo WFO	+5.0%
Apr. - Sep. 2000 (warm season)	Southern Region WFOs	+5.0%
Oct. 99 - Mar. 2000 (cool season)	San Angelo WFO	+11.4%
Oct. 99 - Mar. 2000 (cool season)	Southern Region WFOs	+5.1%
Oct. 99 - Sep. 2000 (combined)	San Angelo WFO	+8.2%
Oct. 99 - Sep. 2000 (combined)	Southern Region WFOs	+5.1%

Furthermore, during the period October 1999 through September 2000, the San Angelo Office’s precipitation forecasts were correct 94.6% of the time compared to a regional average of 89.2%. Consequently, when all data are considered, they show the San Angelo Office is performing above the regional average in quality of precipitation forecasts.

## II. Research and Training Activities Need More Attention

The IG inspectors took an incorrectly narrow definition of the phrase “local studies and developmental projects” (page 11, second paragraph under Item A.) and, consequently, failed to give the San Angelo staff credit for many technology infusions and other projects in which they have been involved.

<sup>1</sup> Model forecast guidance refers to statistically-derived forecast guidance. This guidance is derived from the Computer Forecast Model and local climatology and is often used as a “first guess” for the local forecast. It also provides a good baseline standard upon which to judge forecast skill.

For example, the Advanced Weather Interactive Processing System (AWIPS) focal point was tasked with implementing system patches and configuring AWIPS software, including warning templates on WarnGen, Hydroview configuration, and RiverPro setup. As the NWS modernization progressed and the WFO was assigned additional service responsibilities, other staff members were assigned projects to revise or develop various manuals. A few examples of these efforts include production of a Hydrologic Services Manual, a River Flood Manual, a Flash Flood Manual, and a Fire Weather Manual.

Staff members have also been assigned outreach activities during some of their “non-operational” work time such as community preparedness, spotter training sessions, etc. Staff have contributed regularly to the station’s semi-annual cooperative program newsletters and annual Severe Weather Awareness brochures. Though these are not research activities, they are important aspects of the office’s mission delivery and should be considered as projects.

In Section B, on page 12, the Report states, “The San Angelo WFO did not have a structured training program until just before our visit when professional development plans were prepared for all employees.” While it is true the WFO was in the process of putting into place a new professional development and training program about the time of the IG’s visit, the WFO had previously been conducting significant training activities.

As new technologies were introduced in the office, training was accomplished using techniques such as seminars, one-on-one, small group classes, assigned readings, and computer based learning technology. Such training was conducted with the introduction of the Automated Surface Observing System, AWIPS, and the NOAA Weather Radio Console Replacement System. As additional service programs were assigned to the office (e.g., fire weather, public, and aviation forecast responsibility), the staff completed multi-step training programs including assigned readings, seminars, and drills. See the Addendum for an abridged tabulation of training activities in San Angelo since 1998.

### **III. Greater Regional Oversight of WFO Is Needed**

The statements on page 14, second paragraph, “. . .we found that no one from the regional office has conducted a station inspection in San Angelo since January 1994...” and in the fifth paragraph, “By failing to make any official visits to the San Angelo office for over 7 years...” are incorrect. The Regional Director and the Assistant Chief of the Meteorological Services Division of the Headquarters visited the office in May 1996. In addition, the Chief of the Administrative Services Division visited in June 1996 and conducted an administrative review; the Chief of the Observations and Facilities Branch visited the office in March, 1997 and again in March, 1999; the Assistant Chief of the Scientific Services Division visited the office in October, 1997; the Chief Program Officer visited in January 2001; and the Deputy Director visited in March 2001.

The IG makes the comment in the last paragraph on page 14 that office staff turnover has been a problem at San Angelo yet also notes staff turnover at the San Angelo WFO is normal for most WFOs. Unless the IG is inferring staff turnover at all NWS WFOs is a problem, this statement should be removed. There have been 7 employees leave San Angelo since October 1994. Four left to move with their spouse or significant other to another locale, two left for promotions, and one left for unknown reasons.

#### **IV. Dyess Air Force Base's Radar Availability is Below Operational Standards**

On page 17, first paragraph under Section IV, the Report states, "In 2000, the Air Force radar was available 92.2 percent of the time, which is well below the 96.0 percent minimum operating standard for all NEXRAD radars." We have not been able to verify this statement. Official data from the Radar Operations Center (ROC) in Norman, Oklahoma, indicate that in CY 1999 the Dyess radar was available 95.4% of the time and in CY 2000 the Dyess radar was available 95.8% of the time. While these figures are slightly below the standard of 96%, this performance is not "well below" the standard.

##### **I. Internal Controls Are Adequate, but Improvements Are Needed in some Areas**

In the second paragraph of page 21, we should point out that the Raleigh Office does not use a sign-in/sign-out procedure as indicated in the IG Draft Report. Raleigh uses a magnetic board to enable staff to indicate if they are temporarily out of the office; this is not used for time and attendance purposes.

We take issue with the statement found on page 23, third full paragraph, "First, the office needs to perform intra-office and community drills that determine how the office would perform internally and with outside users in simulated emergencies." The records show the San Angelo WFO has been performing such drills. The following table lists the type of drill conducted, the date conducted, and the number of WFO employees participating in the drill.

<u>Drill</u>	<u>Date</u>	<u>Participants</u>
Winter Weather	11/14/97	14
NWR/SAME <sup>2</sup> Alarm Proficiency	1/30/98	14
Hydrological Operations	2/20/98	14
Spring Severe Weather	3/13/98	13
NWR/SAME Alarm Proficiency	10/16/98	18
Winter Weather	12/12/98	18
NWR Alarm Proficiency	2/11/99	17
Spring Severe Weather	4/16/99	17
NWR Proficiency	5/7/99	17
Public Forecast and Fire Weather	7/2/99	12
NWR Proficiency	10/1/99	18
Winter Weather	12/3/99	18
CRS <sup>3</sup> Warning Proficiency	2/11/00	18
Spring Severe Weather	4/14/00	19
CRS Warning Proficiency	4/28/00	19
CRS Live Backup Warning	7/31/00	19
Product Distribution	8/4/00	19
CRS Live Backup Warning	10/31/00	17
Winter Weather/Safety	11/17/00	17
Probability of Precip Quiz	12/22/00	10
CRS Live Backup Warning	1/31/01	17
CSSA <sup>4</sup> Manual	3/5/01	5
Spring Severe Weather	3/9/01	17

Also, we disagree with the assertion on Page 24, first paragraph under Section V.E. which states, "We found that the San Angelo staff were not performing systematic quality control reviews of office products before and after they were issued." WFO San Angelo does perform systematic quality control of office products.

The shift supervisor is assigned the responsibility to monitor, either personally or by delegation, the quality of products issued during his/her shift. For example, during the year 2000, WFO San Angelo issued 35 tornado warnings, 205 severe thunderstorm warnings, and 100 flash flood warnings. Out of these 340 warnings, only 3 errors occurred and these errors were immediately caught and corrected. In all three cases, because of ongoing real time quality control reviews, corrections were made in less than a minute or two.

<sup>2</sup> NWR/SAME = NOAA Weather Radio Special Area Message Encoder

<sup>3</sup> CRS = Console Replacement System (part of NOAA Weather Radio)

<sup>4</sup> CSSA = Cooperative Station Service Accountability

Additionally, within a few days of issuance, each warning issued by WFO San Angelo is reviewed by the Warning Coordination Meteorologist and compared to daily or weekly warning lists compiled by the verification group at Headquarters. The Warning Coordination Meteorologist also regularly reviews a random sample of all other products issued by WFO San Angelo. In addition, focal points are tasked with quality control of the products issued in their specialty area. For example, the short term forecast focal point has quality control responsibility for short term forecasts.

**Addendum**  
**Training Activities at WFO San Angelo**

The following table (abridged) lists type of training given, date given, and number of San Angelo employees participating.

<u>Training Given</u>	<u>Date</u>	<u>Employees Participating</u>
<b>Seminar On</b>		
Hydrology	1/30/98	16
Severe Weather	3/12/98	14
Warning Decision Making	5/4/98	9
WSR-88D <sup>5</sup> Build 10	11/20/98	16
Map Briefing Techniques	11/23/98	12
Introduction to AWIPS <sup>6</sup>	12/11/98	8
Isentropic Analysis & Winter Weather	12/11/98	8
Public Weather Workshop	2/5/99	12
Fire Weather Workshop	2/5/99	12
Warning Decision Making	4/11/99	5
RFC <sup>7</sup> Operations & Coordination	8/31/99	11
Satellite Interpretation	11/5/99	17
email Etiquette	11/5/99	18
Winter Weather Seminar	11/19/99	11
Severe Weather Seminar	3/21/00	18
TWEB <sup>8</sup> Training	3/16/00	12
OSF <sup>9</sup> Convection and Severe Weather	4/18/00	4
Winter Weather Seminar	11/14/00	9
Commerce Purchase Card System	3/30/00	7

<sup>5</sup> WSR-88D = Weather Surveillance Radar-1988 Doppler

<sup>6</sup> AWIPS = Advanced Weather Interactive Processing System

<sup>7</sup> RFC = River Forecast Center

<sup>8</sup> TWEB = Transcribed Weather Broadcast

<sup>9</sup> OSF = Operational Support Facility (now Radar Operations Center)

<u>Training Given</u>	<u>Date</u>	<u>Employees Participating</u>
<b>Commercial Seminars</b>		
Franklin Covey	1/21/98	3
Career Track - Team Leadership	1/28/99	9
National Seminar - Conference for Women	5/18/99	3
Fred Pryor - Self Assured, etc	10/15/99	4
<b>Classroom Type</b>		
AWIPS On-site User Training	1/99	17
CRS <sup>10</sup> Operational Training	6/1/99	17
First Aid and CPR <sup>11</sup>	10/6/99	3
<b>Computer Based Learning</b>		
Introduction to Windows 95	7/6/98	3
Windows 95 Advanced	7/14/98	2
<b>Computer Based Learning</b>		
Learning WordPerfect 8	7/14/98	2
CRS CBL <sup>12</sup> Module	11/30/98	18
COMET <sup>13</sup> Fire Weather Module	3/31/99	9
Intermediate Fire Behavior	6/30/99	11
ASOS <sup>14</sup> V2.6	10/22/99	1
Satellite Meteorology Case Studies	6/9/00	13
<b>One-on-One Assisted</b>		
WISE <sup>15</sup> Warning Software	3/98	11
AWIPS WHFS <sup>16</sup> Training	4/99	16
AWIPS WarnGen Training	4/99	16
AWIPS Riverpro Training	6/99	16

<sup>10</sup> CRS = Console Replacement System (part of NOAA Weather Radio)

<sup>11</sup> CPR = Cardio-Pulmonary Resuscitation

<sup>12</sup> CBL = Computer Based Learning

<sup>13</sup> COMET = Cooperative Program for Operational Meteorology Education and Training

<sup>14</sup> ASOS = Automated Surface Observing System

<sup>15</sup> WISE = Warning and Interactive Statement Editor

<sup>16</sup> WHFS = WFO Hydrologic Forecast System

<u>Training Given</u>	<u>Date</u>	<u>Employees Participating</u>
CRS Live Backup Training	4/00	16
AWIPS Climat Program	1/01	6
CRS Training	1/01	6
Individual User Accounts	2/01	17
<b>Tele-Training</b>		
MCS <sup>17</sup> Propagation	6/23/98	3
Recent NCEP <sup>18</sup> Model Changes	10/14/98	6
WSR-88D Build 10	10/20/98	2
Cumulus Parameterization Schemes	4/2/99	1
GOES <sup>19</sup> Enhancements	4/14/99	4
Enhanced V	4/29/99	8
C-G <sup>20</sup> Lightning Activity in U.S.	8/12/99	3
AWIPS Hourly Roundup	8/30/99	1
AWIPS Service Area Forecast	9/1/99	1
AWIPS Climate Report	9/3/99	1
AWIPS Watch, Warning, Advisory	9/13/99	1
AWIPS Verification	9/17/99	1
GOES Rapid Scan Operations	10/5/99	5
Evelated Mesoscale Ascent	11/23/00	17
Using AWIPS to Evaluate Model Init.	12/12/00	3
AWIPS Build 5 Enhancements	2/6/01	10
HPC <sup>21</sup> Medium Range Forecasting	1/16/01	2
Medium Range Pattern Recognition	1/31/01	2
Lightning Meteorology	2/13/01	5
Top 10 NWP <sup>22</sup> Misconceptions	3/8/01	2

<sup>17</sup> MCS = Mesoscale Convective System

<sup>18</sup> NCEP = National Centers for Environmental Prediction

<sup>19</sup> GOES = Geostationary Operational Environmental Satellite

<sup>20</sup> C-G = Cloud-to-Ground

<sup>21</sup> HPC = Hydrometeorological Prediction Center (part of NCEP)

<sup>22</sup> NWP = Numerical Weather Prediction

### NWS Response to OIG Recommendations

The IG states, “We recommend that the Assistant Administrator for NWS instruct the Regional Director to take the following actions:”

**Recommendation 1:** Determine the cause or causes for the office’s negative POP statistics and take corrective actions, if necessary.

**NOAA Response:** The office’s POP statistics are good. We did examine this issue in some detail and provided a summary analysis previously in this response. Briefly, the IG used an incomplete set of statistics on which to formulate their conclusion, i.e., they focused on precipitation forecast verification statistics for only one of San Angelo’s verification locations and for only one specific time period, the calendar year 2000 warm season (April through September). Other precipitation forecast verification data for San Angelo were available. Specifically data were available for both of San Angelo’s verification locations (San Angelo and Abilene) for the period October 1999 through September 2000. When all the data are considered, those data show the San Angelo WFO issued POP forecasts from October 1999 through September 2000 which were 8.2% better than the computer guidance forecast available to the forecasters. This compares to a region wide average improvement over guidance in POP forecasts of 5.1%. Furthermore, during the same period, the San Angelo Office’s precipitation forecasts were correct 94.6% of the time compared to a regional average of 89.2%.

**Target Date of Completion:** Not applicable

**Recommendation 2:** Make more routine visits to WFOs in the region and prioritize those visits, considering such factors as an office’s forecast statistics, management concerns, and employee requests.

**NOAA Response:** We do not concur. The Regional Director and the Assistant Chief of the Meteorological Services Division of the Headquarters visited the office in May, 1996, the Chief of the Administrative Services Division visited in June 1996, and the Assistant Chief of the Scientific Services Division visited the office in October of 1997. The Chief of the Observations and Facilities Branch visited the office in March of 1997 and again in March of 1999. The Chief Program Officer visited the office in January 2001, and the Deputy Director visited the office in March 2001. The Southern Region Headquarters schedules special visits to field offices when there is a particular reason to do so, e.g. management or employee concerns, requests, etc.

In the summer of 2000 a program was formalized to establish a more structured visitation program by Regional Headquarters Senior Staff. The program provides for at least one visit to each of the Region’s WFOs, River Forecast Centers, and Center Weather Service Units each calendar year, and includes a suggested agenda for each visit.

**Target Date of Completion:** Not applicable

**Recommendation 3:** Periodically review the San Angelo WFO's programmatic, administrative, and management operations and take correction actions if necessary.

**NOAA Response:** We do not concur. The Southern Region Headquarters periodically reviews the operations of the 44 field offices under its jurisdiction. The Regional Performance Evaluations Meteorologist reviews products issued by field offices and provides feedback to the offices as needed. As example, after reviewing products from the San Angelo office, constructive criticism was provided back to the office on March 25, 2000, April 12, 2000, July 5, 2000, and July 13, 2000. Other oversight is provided during on-site visits as mentioned in #2 above. When it is determined a corrective action is needed, it is taken.

**Target Date of Completion:** Not applicable

**Recommendation 4:** Encourage WFO staff and management to discuss with regional managers any concerns they have that cannot be or are not being addressed at the local level.

**NOAA Response:** We concur. WFO San Angelo and the Southern Region practice this "open door" management policy and has a number of mechanisms in place encouraging its managers and employees to feel free to communicate concerns. Such mechanisms include quarterly MIC/HIC conference calls, annual MIC/HIC conferences, and meeting with staff while visiting offices. The Regional Director and the Assistant Chief of Meteorological Services met with staff during their visit in 1996 and the Chief Program Officer met with staff during his visit in 2001. Management at the San Angelo Office conducts open staff meetings on Tuesday mornings at 8:30am.

**Target Date of Completion:** Ongoing

**Recommendation 5:** In conjunction with the MIC, continue to work with Defense officials to complete the timely repair of the Dyess Air Force Base radar equipment and help maintain its continuing availability.

**NOAA Response:** We concur. The NWS Radar Operations Center (ROC) will continue to work with DOD to urge timely repair of all DOD radars, including the Dyess WSR-88D. Under a tri-agency agreement between the Departments of Commerce, Defense and Transportation, the ROC provides technical and operational support for each agency's maintenance and repairs of its radars. That responsibility does not lie with the Region or the local WFO.

**Target Date of Completion:** Ongoing

**Recommendation 6:** Consider implementing a sign-in/sign-out system for San Angelo employees who are not working a rotational shift.

**NOAA Response:** We concur. We considered the recommendation and determined not to establish such a system. The IG inspectors stated they found no evidence of time and attendance abuse at the San Angelo office. We do not choose to implement a procedure when there is no indication it is needed.

**Target Date of Completion:** Completed

**The IG states:** “We recommend that the Assistant Administrator for NWS instruct the MIC to take the following actions:”

**Recommendation 1:** Develop a detailed research plan and specific project assignments to encourage the staff in San Angelo to participate in local studies and research and provide support and constructive criticism to staff on such projects, when needed.

**NOAA Response:** We do not concur. The San Angelo WFO is an operational forecast office, not a research office. Additionally, as mentioned previously in this response, we believe the IG has taken too narrow a view of what can be considered a project assignment. The IG quoted the NWS Strategic Plan regarding the continual infusion of new and proven scientific ideas and technological systems and went on to state on page 11, “...meteorologists are tasked...to participate in...developmental projects designed to capitalize on or incorporate the benefits of new science, technology, and local techniques into the WFO’s operations.” The San Angelo staff have undertaken such projects. Members of the staff have been tasked with preparing numerous aids (53 Help Binders at last count) to assist the operational staff in making efficient use of the latest techniques, technology, and data available for providing and enhancing services. As previously discussed in this response, staff members also have been assigned tasks (projects) associated with configuring new technology for incorporation into operations.

**Target Date of Completion:** Not applicable

**Recommendation 2:** Clarify to all staff members how the new professional development plans will be used and interpreted during fiscal year 2001 and ensure that appropriate training, based on their plans, is provided to WFO staff.

**NOAA Response:** Concur.

**Target Date of Completion:** The new professional development plans will be discussed with each employee during the April 2001 mid-term performance reviews.

**Recommendation 3:** Periodically review the vehicle log to ensure that official vehicles are being used in an appropriate manner and to determine whether there is a demonstrated need for the current number of vehicles. Unneeded vehicles should be surplus.

**NOAA Response:** We concur. The Meteorologist-In-Charge periodically reviews her vehicle log. Furthermore, based on her review and the office's vehicle needs, the Meteorologist-In-Charge decided to surplus the vehicle which had been assigned to the recently retired employee at the Abilene office (to which the IG made reference) and it was turned back to the General Services Administration on March 20, 2001.

**Target Date of Completion:** Ongoing.

**Recommendation 4:** Take appropriate measures to bring the WFO's information technology security into compliance with NWS standards. This includes having (1) the office security officer periodically revise system passwords; (2) the office security officer and electronics systems analyst prepare an updated software inventory; (3) office personnel test the WFO's backup and contingency procedures as soon as possible; (4) the office security officer send the IT Security Plan, Risk Analysis, and Disaster Recovery Plan to the NWS security officer, NOAA security officer, and the Department of Commerce Security Manager; and (5) the office security officer revise the risk analysis to document risk of outside intrusion and any other potential risks.

**NOAA Response:** We partially concur.

1) 

2) The Electronic System Analyst has a file on each WFO managed computer system which contains all pertinent information for that computer including the software inventory for each computer. These folders are kept under lock and key in the Electronics Technician shop. Each system is identified by a unique internal tracking number. An information sheet is included in each folder giving specific information such as network name, internal identification number, operating system, applications software inventory, licensing information, if necessary, property accounting number, system serial number, and any other information as needed. The folder also includes the operating system disk(s). The Electronic System Analyst also maintains files of locally approved and developed software for the AWIPS workstations.

3) The San Angelo office has conducted several back-up tests which confirmed the viability of the established backup procedures. On three occasions in 1999 WFO San Angelo performed back-up operations for WFO Midland. In 2000 WFO San Angelo backed up WFO Fort Worth/Dallas on two occasions. On two occasions in 2001 WFOs Midland and/or Fort Worth/Dallas have backed-up WFO San Angelo. WFO San Angelo coordinates on an annual basis with WFOs Midland, Fort Worth/Dallas, and Austin/San Antonio exchanging information so that backup operations, if needed, can be implemented

promptly. As noted below, the NWS Information Technology Security Officer (ITSO) has reviewed the San Angelo Disaster Recovery Plan and provided suggestions for strengthening the Plan. Those suggestions will be considered and implemented, as appropriate, by the dates suggested by the ITSO.

4) The San Angelo Security Plan was approved by the NWS ITSO and the NOAA ITSO in March, 2001. There is no requirement for NWS to submit the Security Plan to the Department of Commerce Security Officer. This approved Security Plan, the San Angelo Risk Assessment, and the San Angelo Contingency/Disaster Recovery Plan have been reviewed by the NWS ITSO. (There is no requirement for NWS to submit these documents to NOAA or the Department.) The NWS ITSO recommended accreditation of the San Angelo (and Southern Region) systems. Suggestions by the NWS ITSO for strengthening these plans will be evaluated and implemented, as appropriate, by the dates suggested by the ITSO.

5) The only outside access to the San Angelo computer network is through   


- Target Date of Completion:**
- 1) Ongoing
  - 2) Completed
  - 3) Suggestions by NWS ITSO implemented, as appropriate, by March 2002.
  - 4) Suggestions by NWS ITSO implemented, as appropriate, by March 2002.
  - 5) No action necessary

**Recommendation 5:** Perform intra-office and community drills to test how well the office would perform internally and with outside users in simulated emergencies.

**NOAA Response:** We do not concur with the implication that this is not being done at WFO San Angelo. Records show the San Angelo office has been conducting these type drills routinely. Records show at least 22 such drills since late 1997 including 1 in November 1997, 4 in 1998, 6 in 1999, 8 in 2000, and 3 so far in 2001.

**Target Date of Completion:** Not applicable

**Recommendation 6:** Direct all office personnel to read the new station duty manual and revise it, if necessary, in six months rather than wait for the yearly review.

**NOAA Response:** We concur. On March 26, 2001, the MIC instructed the staff to review the station duty manual at an interim six month period in addition to the annual review in 2001. In addition, the station duty manual will be revised as needed and not on a preset schedule. The San Angelo station duty manual underwent a major revision in October 2000 and since then, sections were revised on November 3, 2000, December 7, 2000, January 29, 2001, January 30, 2001, February 2, 2001, and February 14, 2001. In addition, as sections of the station duty manual are revised, employees are required to read the revised sections and initial that it has been done.

**Target Date of Completion:** Completed

**Recommendation 7:** Ensure that all office employees understand and are prepared to handle each of their primary and secondary focal point duties.

**NOAA Response:** We concur. Responsibilities regarding focal point duties have been incorporated in the Station Duty Manual.

**Target Date of Completion:** Completed

**Recommendation 8:** Implement an ongoing quality control system for weather forecast products and emphasize to all forecasters and hydrometeorological technicians that products must be reviewed for quality before being issued.

**NOAA Response:** We do not concur with the implication that an ongoing quality control system is not in place and that quality control is not being performed at the San Angelo WFO. Products are reviewed in real time and after-the-fact. Quality control procedures are documented in the SDM; examples were provided previously in this response.

**Target Date of Completion:** Not applicable