



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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COMMUNITY AND ECONOMIC
DEVELOPMENT DIVISION

August 4, 1976

Dr. Robert M. White
Administrator, National Oceanic
and Atmospheric Administration
Department of Commerce



Dear Dr. White:

We recently completed a survey of the activities of the National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service (NWS) to obtain general working information on important aspects of that agency. During this phase of our work we focused on NWS's basic mission responsibilities of weather forecast and warning services. Accordingly, we looked at NWS's current development of the Automation of Field Operations and Services (AFOS) program.

We examined AFOS's program objectives based on current and projected requirements, AFOS Automatic Data Processing (ADP) equipment procurement, AFOS system hardware and communications components, AFOS experimental site testing and evaluation, AFOS projected manpower requirements, and the overall AFOS implementation plan.

Visits were made to Weather Service Forecast Offices (WSFOs), River Forecast Centers, Weather Service Offices (WSOs) and the AFOS experimental site to gain a thorough insight of the present "old" system and the planned AFOS system. We noted that AFOS represents dramatic and imaginative progress in support of the NWS's sophisticated meteorological and hydrological programs, however, we identified certain weaknesses in NOAA's management of its ADP program.

NEED TO IMPROVE
MANAGEMENT OF ADP
AND COMMUNICATIONS EQUIPMENT

We specifically determined there are several managerial and functional areas that appear questionable in respect to achieving necessary systems efficiency and economy. These include WSO planned equipment capacity, AFOS communications requirements, NWS proliferation of ADP equipment, and NWS plans for future integration of automated observation and data acquisition subsystems with AFOS.

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Some AFOS ADP equipment
at WSOs may be excessive

We were informed that the AFOS contract with the Aeronutronic Ford Corporation under the AFOS program provides for placing completely automated systems at most WSOs.

Based on the limited scope of the WSO forecast responsibilities, it appears that completely automating WSO functions by placing AFOS systems at most WSOs may be excessive. If, as planned, all WSOs are connected to WSFOs via the State Distribution Circuit to the National Distribution Circuit, then remote access terminals might be a more efficient automation alternative for WSO functions, and result in significant hardware and software savings.

Based on the cost estimates we were furnished by the NWS AFOS implementation staff, a completely automated WSO, including equipment, installation, facilities and spare parts, under the AFOS concept will cost approximately \$125,000, while a remote access terminal will cost approximately \$40,000 to \$45,000. Accordingly, the NWS could save about \$80,000 for each WSO, which it can equip with a remote access terminal instead of a completely automated AFOS site.

We were informed that 135 WSOs included under the present contract proposal were scheduled for complete automation. On May 3, 1976, we discussed the possibility of using remote access terminals versus completely automating WSOs with the Chief, AFOS Implementation Staff, and the Deputy Director, NWS. We were informed that not all WSOs had to be fully automated and that certain WSOs could operate efficiently with a remote access terminal. The Deputy Director stated that NWS was considering the possibility of equipping about 63 of the total 250 WSOs with remote access terminals instead of fully automating all sites.

We believe, in light of the limited forecast responsibilities of the WSOs and the considerable savings which could accrue, if WSOs were equipped with remote access terminals rather than fully automated systems, NOAA should reconsider the necessity of completely automating each WSO, on a case by case basis.

Archival storage subsystems
at WSOs may be excessive

The Aeronutronic Ford Corporation contract also includes providing dual disk drives which permit disk cartridge interchanges with the WSFO and WSO, and an archival storage subsystem for storage purposes at the WSFOs and WSOs. The plan to place archival storage subsystems at WSOs, to archive climatic information, appears to be a duplication of storage functions because such information will be

stored at the National Climatic Center. According to the AFOS program development plan, the National Climatic Center will function primarily as a receiver in the early stages of AFOS, collecting data for entry into the National Climatic Archives. Since the National Climatic Center will operate as a node on the National Distribution Circuit, archival information could be obtained by the WSOs.

We discussed this with the Chief, AFOS Implementation Staff, and the Deputy Director, NWS. We were informed that the archiving at WSFOs and WSOs was only a temporary duplication arrangement and that, as soon as the National Circuit is fully operational and archiving at the National Climatic Center proves to be reliable, then the National Climatic Center will assume full responsibility for archiving.

We agree that a certain amount of duplication for archiving purposes may be necessary until the National Climatic Center proves to be a reliable way to archive. However, we question whether such duplication is necessary at the WSO level, or whether it might be more economical to have the WSOs input its archival data via the storage subsystems at the WSFOs.

Incomplete analysis of AFOS communications requirements

We did not undertake a reliability or cost/benefit analysis of the planned AFOS communications circuits, and, accordingly, we have no opinion as to its reliability or cost effectiveness. However, we identified certain managerial tasks we believe should have been accomplished during the communications planning process.

Federal Property Management Regulations 101-32.1104 and 101-32.1106 provide that agencies should conduct or procure a systems study that will provide for the orderly programming and engineering of Government telecommunications facilities, including data transmission. The data communications study should include a detailed analysis of the proposed data processing system that will be implemented.

In this regard, we were informed by an NWS official that the National Bureau of Standards conducted a study for NWS entitled, "Study of AFOS Network Reliability and Standards," dated March 12, 1974. This was a review of the proposed computer-communications network under development in the AFOS program. However, we were informed by the National Bureau of Standards officials that this study was based on a National Distribution Circuit configuration that included State Distribution Circuit overlap and back-up for the National Circuit. The study was not based on the current plan that includes a complete back-up National Circuit and eliminates the State Circuit overlap and back-up functions.

We discussed the lack of a study based on the new National Circuit configurations with an AFOS Implementation Staff official. We were informed that, while a cost effectiveness study had been performed, no comprehensive communications analysis study comparable to that performed by the National Bureau of Standards for the former configurations had been done for the new configuration.

We discussed this with a General Services Administration official, responsible for reviewing NWS's AFOS automation plans, and NOAA's Telecommunications Manager and Coordinator, who is responsible at the NOAA level for overall policy and standards and for the coordination and guidance of operational telecommunications planning, design, acquisition, and evaluation. These officials informed us that they were unaware of the change in the NWS proposed National Distribution Circuit configuration that would require a complete back-up National Circuit.

We believe that NWS should provide appropriate General Services Administration and NOAA officials with a detailed explanation of the new National Circuit configuration including projected capacity requirements and reliability projections. NOAA's Telecommunications Manager and Coordinator should play an active role in managing future communications plans. Such management could permit broad identification and analysis of viable cost efficient alternative communications systems, and possibly result in pooling resources to plan, design, procure, and implement integrated communications systems that could serve the combined requirements of NOAA's component agencies.

Proliferation and ADP equipment

We found that NOAA's ADP Management and Planning Division has not made any management reviews of the proliferation of ADP equipment within the NWS area. In this regard, we noted that NWS maintains at least four complete AFOS prototype minicomputer systems and peripheral support equipment, one of which was assembled from spares.

During our visit to the AFOS experimental site on March 11, 1976, we were informed by an experimental site official that the system assembled from spares was not being utilized, but eventually would be used for management support. On May 3, 1976, we discussed utilization of the system assembled from spares, with the Deputy Director, NWS. He said this system was being utilized to support AFOS experimentation, software development, and testing. He said, eventually all prototype systems, including the one assembled from spares, would be replaced with Keronix minicomputers and peripherals. He further stated that, after delivery of the Keronix systems, the prototype systems equipment will be utilized for management support.

We believe that NOAA should be aware of the additional systems equipment that will become available so effective uses for such equipment can be considered within all NOAA program organizational elements. In this regard, NOAA should conduct management reviews to ensure efficient management of ADP equipment within NWS.

Inadequate systems plans for
integration of automated observation
and data acquisition subsystems with AFOS

NWS has a number of projects underway which provide for automated data observation and acquisition. Such projects include new and additional radars, radar data processor systems, radar remoting systems, remote automatic surface observing stations and upper air minicomputers.

Although NWS's general plans are to merge these subsystems with AFOS, we could not find any consolidated or cohesive systems plans for their integration with AFOS.

In June 1976, we discussed the lack of systems interface plans with the Chief of NWS's Data Systems Division. He said there are no systems interface plans to merge the data acquisition and observation subsystems with AFOS. He stated, however, that his group is beginning work on the development of plans to merge these subsystems.

NOAA should ensure that such plans are developed to adequately identify and define, in relation to specific mission needs, those subsystems that will be included in the major AFOS system.

RECOMMENDATIONS

Future ADP systems management by NOAA could prevent unwarranted duplication of ADP equipment, reduce systems costs, and create an overall efficient ADP equipment environment. Accordingly, we recommend that NOAA take an active role in managing the acquisition and utilization of ADP and communications equipment within its component agencies. In this regard, among other things, the Administrator of NOAA should

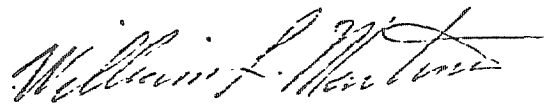
- reevaluate the complete automation of WSOs, on a case-by-case basis, in view of the limited scope of WSO forecast responsibilities;
- reevaluate the planned archival storage subsystems for the WSOs in terms of current and projected requirements and cost effectiveness;
- take appropriate steps to ensure that NWS's AFOS's communications plans are coordinated with appropriate NOAA and General Services Administration Officials;

--conduct management reviews to ensure efficient management of ADP equipment; and

--ensure that complete cohesive program development plans for integration of NWS automated observation and data acquisition subsystems with AFOS are developed.

We wish to acknowledge the cooperation given to our representatives during this phase of our survey. A copy of this report is being sent to the Director, Office of Audits, Department of Commerce and the Director, National Weather Service, for their information. Your comments on actions taken or contemplated on the above matters would be appreciated.

Sincerely yours,



William L. Martino
Assistant Director