AN ASSESSMENT OF THE FISCAL REQUIREMENTS TO OPERATE THE MODERNIZED NATIONAL WEATHER SERVICE DURING FISCAL YEARS 1998 AND 1999

A Report To

The Secretary Of Commerce
and
Under Secretary for Oceans and Atmospheres

by

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October 14, 1997

Acknowledgments

A report like this can only result from the contributions of many people. First, I must thank the men and women of the National Oceanic and Atmospheric Administration and National Weather Service who provided the needed data and information and responded to our numerous requests for additional information and answers to questions. Next, the Department of Commerce provided me with a team of experts—John Dutton, Craig Dorman, Al Kaehn and David McMillian – each provided wise counsel, useful information and helped get the requisite analyses accomplished. Third, Bob Winokur, Acting Director, NWS and Captain Don Winter insured we received the necessary information and helped us determine locations to visit. Fourth, the MITRE cost analyst team of Robert Abramson, Julia Taylor, Thomas Troiano and Steve Welman, who brought order, insight and meaning to large reams of numbers.

My deepest appreciation goes to the government team – Susan Sutherland, Gary Knebel, Paul Nipko, Greg Mandt and Diana Abney - who assisted in accomplishing this study. This report would not have been done without their hard work, intellectual acuity and persistent efforts.

While I appreciate the inputs and advice from each contributor, this was not a committee effort; the final recommendations and funding decisions are solely the author's.

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During the past several months serious questions have arisen within the DOC and NOAA concerning the fiscal and people resources required by the NWS to continue to provide regular operations and maintain current modernization program schedules. These concerns resulted in the commissioning of this study to ascertain appropriate resources needed to operate the NWS.

A preliminary budget analysis was conducted to assess the reasonableness and underlying rational for the FY 1998 and 1999 NWS budgets. The results of this analysis are presented within appropriate sections of this report.

The NWS budget structure is complex with fiscal resources budgeted, appropriated and expended in multiple accounts: a BASE account and five modernization accounts. Within the modernization accounts, budget categories are clearly defined and activities identified and costed. Fiscal resources in the FY 1998 President's Budget and the FY 1999 OMB submit were discernible and our approach involved evaluating the reasonableness of the activity, its associated cost and making appropriate adjustments. This was not the case with the BASE account. Traditionally, NWS, like many government agencies, does not apportion BASE dollars into component parts and activities. Thus, identifying what activities and categories are included and how labor and non-labor costs were allocated within the FY 1998 and 1999 budgets was impossible. Our approach was to develop for both labor and non-labor the level of resources NWS needs to provide required levels of products and services and maintain a supporting infrastructure. We accomplished this by visiting NWS units, meeting with customers, receiving briefings and holding discussions with DOC, NOAA and NWS staffs, analyzing pertinent budget data including NWS' newly developed Zero Base Budget and considering comparable industry norms.

Overall, the NWS FY 1998 budget projections to support modernization activities appear reasonable. We decreased funding ($2.9 million) for acquisition management activities and communication circuits. In FY 1999, projected operations and maintenance costs for the NEXRAD program appeared high when considered within the context of our recommended increase to base. We decreased funding ($7.0 million). Remaining funding will enable NWS to maintain a healthy and sustainable NEXRAD O&M program to include Preventative Maintenance Inspections, procuring spares, initiating a modification program and continuing system evolution efforts. We also reduced funding ($1.0 million) for communication circuits and acquisition management activities. In both years, we increased funding for facilities maintenance ($500,000).

Our analysis of the BASE budget indicates both the FY 1998 President's Budget and FY 1999 OMB Submit under-fund labor and non-labor inflationary costs and do not provide sufficient resources to maintain required field (i.e., Weather Forecast Offices) staffing levels. The labor shortfall is particularly acute in FY 1999, which would have reduced field office staffing by approximately 200 positions below the recommended level of 3600 FTE. Delays

in the AWIPS delivery schedule necessitate corresponding delays in the planned drawdown of field office staff. We included additional funding in both years.

We noted funding for several NWS-wide programs (e.g., GOES-Tap, Cooperative Institute program) was fragmented into different offices with no one office assigned overall responsibility; we consolidated funding for these programs. We discovered instances where funds for a program were allocated to one office, but implementation responsibility was assigned to a different office; we consolidated funding in the implementation office.

In FY 1997, NWS streamlined staffing levels allocated to the regional headquarters infrastructure (292 to 235). We saw no evidence to indicate these reduced levels are not adequate. As part of this streamlining, NWS decided to close the Southern Region Headquarters (SRH) and downgrade the Alaska and Pacific Regions. This latter action has been tabled. During our review we noted the NWS Regional Directors had developed a plan to maintain the SRH within the 235 person ceiling. An analysis of this proposal vis-à-vis NWS' showed it to be operationally and managerially superior. From a resource perspective, it is only marginally more expensive. We recommend the Regional Directors' plan be adopted and plans to close the SRH be terminated.

We ascertained the field office staffing model used to allocate labor resources in the modernized NWS is reasonable. The model is predicated on AWIPS and its associated productivity tools meeting design specifications. Our analysis indicates NWS development efforts are on track; when the systems are fielded and the subsequent restructuring completed, NWS should be able to meet programmed staffing levels.

AWIPS like many large information technology programs has experienced technical difficulties, cost growth and schedule delays. Our review indicates the program is making progress. All field personnel who have used the current software release (Build 3) are complimentary about its utility and functionality. We noted several areas (program management structure and approach, system engineering) that require attention and provided recommendations to improve the overall management of this critical program.

Since the required analysis was needed in a comparatively short period of time (less than 90 days), we could not analyze in detail all relevant issues raised by the proposed budgets. Instead, we identified those issues and uncertainties that require more complete analysis and highlight their significance so they can be more fully examined by DOC, NOAA, and NWS. Additionally, we indicate several service activities that should be reviewed to determine if they can be more economically and efficiently provided by other than a government work force. We provided (Section XII) a number of recommendations to improve NOAA and NWS planning, budget analysis and evaluation, program prioritization, cost identification and control, requirements definition and approval, management and decision-making processes.

SECTION II. — OVERVIEW

The National Weather Service (NWS) is a component of the National Oceanic and Atmospheric Administration (NOAA) within the Department of Commerce (DOC). NWS' core mission is to provide weather and flood warnings, public and marine forecasts and advisories primarily for the protection of life and property. NWS' operations also support the nation's economic development and aviation safety. In carrying out this mission, NWS operates a variety of systems to collect, process, analyze and disseminate weather information and products to and among its network of field offices, national centers and the American public. NWS offices are located in every state and several territories and its personnel interact daily with the U.S. population. From a resources and employee perspective NWS accounts for 16 % of the total DOC annual budget and 13 % of DOC's personnel ceiling.

During the 1980's, NWS initiated a program to both modernize and restructure its field operation. The program was designed to simultaneously provide the nation with weather and hydrological products and services and complete required modernization and restructuring activities necessary to realize the benefits and efficiencies of the technologies. The modernization program is designed to skillfully use emerging information and observational technology to improve field operations. The restructuring will consolidate 52 Weather Service Forecast Offices, 204 smaller and less capable Weather Service Offices, 13 River Forecast Centers and 3 National Centers into 119 Weather Forecast Offices (equal and more capable), 13 River Forecast Centers, 13 Data Collection Offices and 9 National Centers. The mutual goals of the Modernization and Associated Restructuring (MAR) were to: achieve more uniform weather services nationwide, provide more reliable detection and prediction of severe weather and flooding, improve the accuracy, responsiveness and quality of the services and products, improve employee productivity and generate a more cost-effective operation. Critical components of the modernization include fielding of the Next Generation Weather Radar (NEXRAD), the Next Generation Geostationary Operational Environmental Satellite (GOES-NEXT), the Automated Surface Observing System (ASOS) and the Advanced Weather Interactive Processing System (AWIPS). The first three systems are in use nation-wide and the last is currently in the final stages of development. The deployment of these new systems, coupled with a better educated and trained NWS work force, has over the past several years resulted in significantly improved weather warnings and forecasts to the public. For example, tornado forecast performance measures (Government Performance and Results Act) reflect a doubling of lead times and a 26% increase in warning accuracy; 24 hour hurricane landfall forecasts show a 25% accuracy improvement.

AWIPS is the "central nervous system" of the modernized NWS. It is the information processing, and display system that forecasters and hydrologists will use to integrate, analyze, and fuse the vast amounts of data now available. Additionally, it will be the national communications infrastructure for the forecast offices and centers, serving as a link to each other and the diverse set of product users throughout the nation. AWIPS like many large information technology programs has experienced technical difficulties, cost growth and schedule delays. These problems have resulted in considerable oversight from external agencies and a congressional mandate to complete development and deployment activities

within a $550M cap. Senior DOC/NOAA officials indicate any costs above this cap will be absorbed within the NOAA budget. Current schedules project completion of development activities in November 1998 and deployment in July 1999. Coincident with AWIPS development are a series of other important actions to integrate local data with improved product sets from the National Centers, and deploy several forecaster productivity enhancement programs (Interactive Forecast Preparation system, Local Data Acquisition and Dissemination System and the Weather Radio Console Replacement Program with a text to voice capability). These activities are scheduled to be completed during the latter portions of the AWIPS deployment. When these systems are available and tested, NWS will complete (mid-2001) the final stages of the restructuring, resulting in 119 equally capable Weather Forecast Offices (WFO) and 13 River Forecast Centers (RFC).

Despite the challenges associated with the development and deployment of the modernized systems and the new productivity enabling tools, the hardest part of the restructuring remains to be accomplished. Effective and efficient use of the new systems and National Center products require a "cultural" change in the way forecasters approach and accomplish (team versus specialized forecaster) their job and in how the public views this more generalist forecaster. The required changes are deep and the embedded culture will not change easily. Strong and consistent leadership at all levels of the NWS, as well as a proactive plan to "sell" new processes and products to NWS employees and external customers, will be necessary. Without these components, it is unlikely cultural changes will occur within the necessary timelines to meet programmed field staff levels.

During the past several months serious questions have arisen within the DOC and NOAA concerning the fiscal and people resources required by the NWS to continue to provide regular operations and maintain current modernization program schedules. These concerns resulted in the commissioning of this study to ascertain appropriate resources needed to operate the NWS.

SECTION III. — TASK and SCOPE

Task

Determine the Fiscal Year (FY) 1998 and 1999 resources required to operate the National Weather Service as it completes its planned modernization and transitions to a restructured field office alignment. (See Appendix A – NOAA TASK STATEMENT)

Scope

Conduct a sufficient analysis to assess the fiscal resources required to operate the NWS in Fiscal Years 1998 and 1999; identify areas of fiscal uncertainty within the specified budget years as well as those that could impact completion of the programmed modernization and restructuring; and provide recommendations and options to address the uncertainties. Secondary tasks were to analyze the regional headquarters infrastructure to determine the feasibility of plans to accelerate the closure of the Southern Region Headquarters, identify issues/uncertainties with the AWIPS program, and examine and comment on programmed office closures and WFO staffing levels.

The specified budget years span the planned completion of the modernization and are a *way point* on the path to a restructured field operation. Within this report "modernization" and "restructuring" are defined as:

> **Modernization** denotes deployment and use of the planned technological – NEXRAD, GOES-NEXT, ASOS and AWIPS – systems as well as completion of the Central Computer and WFO/NCEP construction programs; and implementation of the WFO facility maintenance program.
>
> **Restructuring** denotes a comprehensive series of actions that enables 119 WFOs to provide the total spectrum of products and services with programmed staff levels. Necessary conditions include adequate and trained staff, availability of a pre-defined set of NCEP gridded products, and operational implementation of several productivity enhancement systems – e.g., Console Replacement System with a text to voice capability, Local Data Acquisition and Dissemination System and Interactive Forecast Preparation system.

SECTION IV. — APPROACH and METHODOLOGY

Approach

This report has been developed using the following approach. Zero-based budget information provided by the NWS was assessed to establish a baseline cost determination of existing and projected NWS programs. This assessment considered past spending patterns as well as NWS request levels associated with the following budget elements:

- The current and projected staffing plan.
- The current and planned modernized field office operations.
- The current and planned NCEP and Regional Headquarters infrastructure and operations.
- Development and deployment of the new technology systems and associated system evolution plans.
- Recurring requirements such as operations and maintenance, research and development, technology refreshment, and training needs.
- Program changes due to statutory/regulatory mandates.

NWS fiscal requirements were derived using the methodology described below. Of particular interest with respect to each element was whether the President's FY 1998 budget and the FY 1999 OMB Submit provide adequate support, and if not, what resources will be needed.

Methodology

The methodology employed was tailored to meet the imposed time constraints and consisted of the following elements:

- A bottom-up analysis of the BASE budget account to determine labor and non-labor costs for headquarters NWS, NCEP, Regional Headquarters and field units.
- A review and assessment of:

  Component (capital asset and operations) accounts of modernization budgets with particular attention on *operations and maintenance* projections for deployed new technology systems, AWIPS development and deployment, and system evolution/technology infusion cost estimates.

Budget documents including FY 1992 through 1996 actuals, FY 1997 expenditure projections and NWS FY 1998 and 1999 proposed budgets including DOC, Office of Management and Budget (OMB) and Congressional changes thereto.

Several University Corporation for Atmospheric Research (UCAR) reports on the operation of NCEP's Environment Modeling Center, Tropical Prediction Center, Space Environmental Center and the Central Operations Center.

Correspondence from interested citizens, trade and professional associations, commercial interests, and federal, state and county officials.

NWS planning and programmatic documentation, analysis of FY 1997 streamlining, restructuring and realignment proposals, and provided briefing material.

- Briefings, meetings, interviews and consultations with:

  Key DOC and NOAA policy and budget officials.

  Several Members of Congress and staff members of appropriate Senate and House Appropriations and Authorization Committees and sub-committees.

  Key Headquarters, NWS management, policy and budget officials and staff members regarding:

  - current and planned staffing requirements
  - baseline organizational operating costs
  - current programs
  - future plans and requirements
  - operative management, decision making and budget analysis, development and execution processes.

  All NWS Regional Directors and Director, National Data Buoy Center.

  Representatives of the National Emergency Management Association (NEMA) and the National Coordinating Council on Emergency Management (NCCEM) as well as with numerous state and county emergency managers (Texas, Florida, Maryland, Ohio etc.)

  Members of the NWS Modernization Transition Committee and the National Research Council's NWS Modernization Committee, as well as with officials of several professional meteorological associations.

  President and several shop stewards of the NWS Employee Union.

  Representatives of the private weather industry.

Government officials in various agencies that use NWS products and services (e.g., Department of Agriculture, Federal Aviation Administration, Fire Service and Water Management Agencies).

Key policy, contract and acquisition officials of NOAA System Acquisition Office.

Members of the GAO's Information Resources Management staff.

- Visits to:

  All mainland Regional headquarters.

  Several Weather Forecast Offices and River Forecast Centers.

  All NCEP (except for Storm Prediction Center) Product centers as well as the National Training Center (NTC), National Reconditioning Center (NRC) and the Central Administrative Support Center.

SECTION V. — CONSTRAINTS and ASSUMPTIONS

This report has been governed by a prescribed set of constraints; and several assumptions governed cost determinations.

Constraints

The following constraints regarding the baseline for NWS modernization and service levels were followed:

- FY 1996 current level of services and products, adjusted for permanent changes made as part of the FY 1997 budget, will continue in FY 1998-1999
- NWS modernization plan will be pursued and completed as currently defined and scheduled in the National Implementation Plan
- The staffing plan will be implemented as defined in the Human Resources Plan, adjusted for National Performance Review decisions, current AWIPS deployment schedules and NWS FY 1997 streamlining actions.
- Guidance for addressing the FY 1997 budget must be followed in the FY 1998-1999 budgets – i.e., there shall be no direct impact on warning programs, no reductions to modernization systems and schedules, and no permanent staffing reductions in weather forecast offices and river forecast centers.

Assumptions

The following assumptions governed cost determinations:

- FY 1998 and 1999 pay raises of 2.8% and FY 1998 locality pay as specified by OPM were applied.
- A non-labor inflation factor of 1.7% was applied.
- AWIPS development and deployment schedule approved by Secretary of Commerce in February 1997 is maintained.
- Procedures contained in the NWS Modernization Act (PL 102-567) pertaining to station closures will not be streamlined; no fiscal savings will be realized.
- NOAA Common Services charges were assumed to equal $35.3 million in FY 1998 and $35.4 million in FY 1999; permanent transfers to equal $0.7 million in FY 1998/1999; and non-discretionary fees for services to equal $1.3 million in FY 1998/1999.

SECTION VI. — FTE and LABOR COST ANALYSIS

The following sections analyze and discuss the FYs 1998 and 1999 labor and non-labor costs required to operate and modernize the NWS. Proposed NWS budgets for both fiscal years are detailed in Appendix B – RECOMMENDED BUDGET for FYs 1998 and 1999.

Introduction

The NWS budget structure is complex with fiscal resources budgeted, appropriated and expended in multiple accounts; a BASE account and five modernization accounts. The BASE budget account encompass normal operating costs for operations, research, and facilities and essentially represents the pre-Modernization and Restructuring (MAR) level of resources. The modernization systems budgets are found in both Operations and Research and Capital Assets Acquisition Appropriations. NEXRAD, ASOS and AWIPS accounts encompass resources to develop and deploy new systems and computers, funding for program management, system evolution activities, and operations and maintenance costs. The Capital Assets Account also identifies resources to build/lease new NCEP and WFO facilities. In FY 1998, NOAA moved WFO Facility Maintenance to the Operations, Research and Facilities budget. The Modernization and Restructuring Demonstration Initiative (MARDI) account encompass incremental costs above BASE to implement the MAR, and when completed, the additive costs (above pre-MAR BASE) to operate the modernized NWS (e.g., O&M, salary). Within the modernization accounts, budget categories are clearly defined and activities identified and costed. Fiscal resources in the FY 1998 President's Budget (PB) and the FY 1999 OMB Submit were discernible and our analysis involved evaluating the reasonableness of the activity, its associated cost, and making appropriate adjustments.

This was not the case with the BASE account. Traditionally, NWS, like many government agencies, does not apportion BASE dollars into component parts and activities. Thus, identifying what activities and categories are included and how labor and non-labor costs were allocated within the FY 1998 and 1999 budgets was impossible. In FY 1997 NWS did initiate a study to build a zero-base budget (ZBB) to account for BASE activities. While this study is still somewhat dynamic and in the development phase, we did consider it. The ZBB intermingled activities funded in the FY 1998 PB with unfunded needs and did not distinguish between either. This made our analysis difficult, as we had no clear baseline as to what was in the FY 1998 PB. We reviewed the entire NWS operation, including prior year actual costs for recurring activities and desired changes and initiatives to determine appropriate resource levels. Results of these analyses were then compared to the NWS ZBB. Where possible we also compared projected costs to relevant industry and government bench-marks.

A. — Labor (Staffing) Requirements

The data and analyses presented in the following sections represents the total NWS labor requirement regardless of budget account. Regarding FTE levels in the FY 1998 PB and FY 1999 OMB Submit, we were only able to ascertain the total number of FTEs NWS-wide. In constructing overall FY 1998 and 1999 budgets (Appendix B), reimbursable costs were accounted for and labor costs reflected in appropriate budget accounts.

1. — National Weather Service Headquarters and Central Operations

In FY 1997, NWS, pursuant to congressional direction, streamlined and reduced headquarters staffing levels by 153 positions. Prior to FY 1997, policy (and associated program management and oversight) and service provider functions were intermeshed within the Headquarters organization. As part of the streamlining action, NWS attempted to separate and realign policy from service providing activities. This resulted in the creation of a headquarters level Office of System Management and the establishment of the Centers for Communications, Radar and Logistics. This approach has merit and should help focus the headquarters staff on those functions which are appropriate for a government line office. While the initial NWS plan is good, our analysis indicates the headquarters organization still blurs the policy/service distinction; we believe the Technique Development Laboratory and the Hydrology Research Laboratory are service functions and should fall within the purview of Central Operations or NCEP. Accordingly, in the following organizational and labor charts (Table 1 – Headquarters & Central Operations Staffing) we treat these activities as non-headquarters functions. While the past headquarters reductions were significant, we believe with prioritizing of tasks and implementing more efficient staff coordination and decision-making processes, the staff should be able to handle the workload.

NWS, in a series of briefings in August 1997, stated requirements for 841 FTEs within Headquarters and Central Operations. We used this information as a requirements baseline. With minor adjustments, the proposed allocations of FTEs appear reasonable. We reduced the Associate Administrator's office by 6 (3 in Federal Coordinator's Office and 3 unassigned FTEs), National Reconditioning Center by 4 (reduced number of FTEs in Quality Control Division, as percentage of the work force assigned to QC functions appeared excessive) and the National Data Buoy Center by 2 (1 manager and 1 administrative support position as supervisor/employee and administrative support/employee ratios appear excessive). These changes reduce the HQ/Central Operations staffing requirements from 841 to 829.

Table 1 – Headquarters & Central Operations Staffing
(Full Time Equivalent)

Office	*NWS Brief Aug. 1997*	*NWS ZBB Review*	*NOAA Review*
Headquarters National Weather Service			
Associate Administrator	100	105	94
System Development*			
Director	7	7	7
System Evolution	26	25	26
Meteorology	80	81	80
Hydrology**			
Director	7	5.8	7
Operations	42	43.5	42
Systems Management			
Director	6	15.5	6
Staff	93	81	93
Sub-Total	**361**	**363.8**	**355**
Central Operations			
TDL***	40	41	40
HRL***	33	33.5	33
Centers for Communications, Radar and Logistics			
Director	5	4	5
Telecom Center	105	106	105
Radar	82	95	82
Field Engineering	77	61	77
National Reconditioning Center	73	82.5	69
National Training Center	30	31	30
National Data Buoy Center	35	36	33
Sub-Total	**480**	**490**	**474**
Total	**841**	**853.8**	**829**

* Excludes Technique Development Laboratory (TDL)

** Excludes Hydrology Research Laboratory (HRL)

*** Considered function as non-policy and categorized as part of Central Operations

Policy functions are an inherent government activity whereas service activities (be they operational, development or support) are not. Service activities are often best provided by other than government entities. Once NWS has clearly separated all headquarters policy from service providing functions, they should objectively and continually assess which services must be absolutely performed in-house. For services that may be provided by others (public or private) including Research/Development and technical infusion, NWS should seek the best long term return for their scarce resources. In addition, consideration should be given to out-sourcing all (or portions of) the various national logistics and data buoy service infrastructure.

2. — National Centers for Environmental Prediction

In FY 1997, NCEP also permanently reduced staffing levels by 44 positions. Our analysis used the FTE staffing needs provided in August 1997 by the NCEP Director as a baseline. Overall, with the exception of the Tropical Prediction Center (TPC), we concur with NCEP's analysis. The TPC difference is one FTE (41 vice 42) per information received, during our visit, from the Acting TPC Director. Table 2 – National Centers For Environmental Prediction Staffing – depicts NCEP staffing requirements and allocation by Prediction Center.

The overall staffing resources identified are sufficient to permit NCEP to restore the products (e.g., marine 96 hr sea-state forecast and sea state analysis) that were eliminated in FY 1997. While restoring these products may require reallocation of resources among or within centers, that is a management and not a resource issue. Additionally, the budgeted staffing levels are sufficient to enable NCEP to accomplish required development work and meet implementation timelines to provide the Interactive Forecast Preparation (IFP) system with needed gridded products.

NCEP Central Operations (NCO) is an area wherein all the functions need not necessarily be done in-house and selected portions could be considered for out-sourcing to the private sector. While this is not a new concept (see UCAR 1997 Review Team Report on NCEP Central Operations), given the near certainty of continual budget pressure it deserves renewed thoughtful consideration. Given the public safety and international implications of NCO products and services, out-sourcing must be approached with deliberate and thoughtful planning.

Table 2 – National Centers For Environmental Prediction Staffing
(Full Time Equivalent)

	NWS Data Aug. 1997	*NWS ZBB Review*	*NCEP Data Aug. 1997*	*NOAA Review*
Director	8	9	8	8
NCEP Central Operations	82	78.5	82	82
Environmental Modeling Center	46	46	46	46
Hydrometeorological Prediction Center	40	42	40	40
Marine Prediction Center	20	21	22	22
Climate Prediction Center	51	51	51	51
Aviation Weather Center	45	48	49	49
Storm Prediction Center	30	34	32	32
Tropical Prediction Center	35	41.5	42	41
Total	**357**	**371**	**372**	**371**

3. — Regional Headquarters

Throughout the past year, the required NWS regional headquarters infrastructure has been a controversial issue. A specific task was to evaluate the feasibility of plans to accelerate the closure of the Southern Region. An analysis of this issue and the rationale for the recommendation on the regional headquarters infrastructure required to lead NWS through the MAR is contained in Section XI. For this phase of the report, suffice it to note we believe six albeit smaller (than FY 1996 staffing levels) regions are required and plans to close the Southern Region should be terminated. From a budget perspective, costs of this alignment are similar to the NWS proposed 5 (three CONUS and Alaska and Pacific) region plan. Both yield savings of over $3 million associated with the draw down of staff levels at the regional headquarters. We experienced considerable difficulty in ascertaining the "official" NWS position relative to what regional infrastructure was required and the logic and analyses to support that position. As Table 3 – Regional Headquarters Staffing Proposals – indicates, we noted at least five different plans or variations of an existing plan; with the exception of the two non-CONUS regions, the aggregate staffing differences are small. For comparative cost considerations, we used the data provided by NWS in early September.

Table 3 – Regional Headquarters Staffing Proposals
(Full Time Equivalent)

Region	*FY 1996 FTE*	*Report to Congress*	*NWS ZBB Review*	*GAO Report July '97*	*NWS Plan Aug. '97*	*NWS Plan Sept.'97*	*RD Plan May '97*	*NOAA Review*
Eastern	57	58	59	59	58	59	45	45
Central	58	58	56	60	58	60	45	45
Southern	61	0	0	0	0	0	45	45
Western	49	58	54	58	58	58	45	45
Sub-total	**225**	**174**	**169**	**177**	**174**	**177**	**180**	**180**
Cost ($M)	**$15.0M**					**$12.0M**		**$12.4 M**
Alaska	39	20	20	34	20	31	36	35
Pacific	28	20	27	22	16	27	24	24
Sub-total	**67**	**40**	**47**	**56**	**36**	**58**	**60**	**59**
Total	**292**	**214**	**216**	**233**	**210**	**235**	**240**	**239**
Cost ($M)	**$19.5M**					**$16.3M**		**$16.5M**

While the recommended regional structure retains the historical 6 region alignment, staffing is reduced from the FY 1996 level (292 to 239). We believe this alignment and attendant staffing levels will enable the regions to meet essential mission and support requirements.

4. — Field Offices (Weather Forecast Offices, River Forecast Centers etc.)

As noted earlier, the NWS field structure is in the throes of the modernization and restructuring. The nucleus of the new NWS can be found in the nation-wide network of 52 NEXRAD Weather Service Forecast Offices and the 67 NEXRAD Weather Service Offices. All these offices have ASOS and NEXRAD technology and several have early versions of AWIPS. While the NWS 1993 Human Resources Plan (HR) posited staffing levels for these offices, nation-wide application has been inconsistent, new productivity tools (NOAA Weather Radio with text to voice) are not available and ASOS augmentation requirements have not been relaxed.

Based on the delays in policy implementation and deployment of productivity enhancing tools, we concluded (Table 4 – Field Staffing) the field required 3600 FTE in both FY 1998 and 1999, a small and manageable (56 FTE) increase over the 1993 HR Plan projections. NWS must exercise caution in filling these positions because significant reductions of field level staffing is programmed (down to 3270 FTEs field-wide in the restructured era) once the new technology is deployed and tested. Selection of the hiring method is a policy decision but consideration should be given to temporary and interim hires and use of contract employees; hiring of <u>permanent</u> personnel should be done <u>judiciously</u>. Additionally, these numbers assume the requirement for warning liaison services will be satisfied remotely at all but 9 locations, thus freeing 20 additional personnel for use in WFOs.

Table 4 – Field Staffing

(Full Time Equivalent)

Region	*FY 1998 NWS Plan*	*FY 1998 NOAA Rvw*	*FY 1999 NWS ZBB*	*FY 1999 NOAA Rvw*
Total	**3578***	**3600**	**3588.4**	**3600**

* NWS Paper "End-State Staffing" dated 9/2/97

B. — Labor Cost Model Review and Labor Costs

Labor costs make up a large part of the NWS budget, consequently we conducted an analysis to determine if the NWS labor pricing model accurately represented costs. We tested assumptions regarding basic compensation, benefit and differential pay levels, and reasonableness of grade demographics. Appendix C contains a detailed discussion of the analysis. Overall, the NWS model over estimates labor costs by about 1%, due to the labor and benefit rates mandated by DOC/NOAA for budget formulation. Table 5 – NWS Direct Funded FTEs – depicts total labor costs for the BASE/MARDI accounts and provides a comparison with FTE authorizations in the FY 1998 PB and FY 1999 OMB Submit. In developing our labor budgets, we included pay raises of 2.8% and used OPM specified locality pay. Senior NOAA policy officials advised us the FY 1998 PB and FY 1999 OMB Submit only partially fund the pay raises and locality pay.

Table 5 – NWS Direct Funded FTEs

Labor Costs($M)

	FY 1998 President Budget	*FY 1998 NOAA Review*	*FY 1999 OMB Submit*	*FY 1999 NOAA Review*
Headquarters NWS				
Policy	*	355	*	355
Central Operations	*	411	*	411
NTC and NDBC	*	63	*	63
NCEP	*	371	*	371
Regional Headquarters	*	239	*	239
Field	*	3600	*	3600
Total FTEs	**4,962**	**5039**	**4,834**	**5039**
BASE+MARDI	4,521	4,598	4,401	4,606
Modernization	219	219	211	211
BASE +MARDI Cost	*	$311.1	*	$324.9
Modernization Cost	*	$14.5	*	$14.6

* Data not available; FY 1998 PB and FY1999 OMB Submit do not present Labor & Benefits tables for NWS.

SECTION VII. — Non-LABOR COST ANALYSIS

Headquarters, NWS, and Central Operations

This analysis focuses on the non-labor components of the BASE and MARDI budget accounts. Most offices and organizations also receive funding from programs in the modernization accounts. In determining, non-labor funding requirements, we reviewed FY 1992-1997 expenditures and made adjustments to reflect changes associated with MAR activities. We then evaluated and analyzed the NWS FY 1998 and 1999 Zero Based Budget projections to ascertain their reasonableness and to determine the resources necessary to both sustain baseline operations and service infrastructure and accomplish required program changes or new initiatives. The number of staff at Regional and NWS Headquarters has decreased significantly over the past two years and video teleconferencing capability has been installed at each Region and several central support locations. The proposed budget allocation for travel reflects current staffing levels and projected workload; all are reduced from previous years (see Section VIII.E).

Table 6 – Headquarters NWS and Central Operations Non-LABOR – outlines proposed funding levels. Costs for NOAA Common Services are not included. Since the NWS did not provide the BASE and MARDI FY 1998 PB or FY 1999 OMB Submit at the office or organization level, a direct comparison was not possible.

A. — Office of the Associate Administrator (AA)

This office includes the Associate Administrator, two deputies and supporting staff plus several staff elements – Management and Budget (MB), National Implementation Staff, International Affairs (IA), Office of the Federal Coordinator for Meteorology (OFCM), and Industrial Meteorology (IM). The latter three office's budgets are small and consist primarily of supplies, travel and limited support activities and NWS FY 1998/1999 projections are reasonable.

A substantial portion of the AA and MB budget allocations are fixed business costs over which NWS has limited control, i.e., $13 million cover central NWS charges like GSA rents, NOAA salary reimbursement and guard services. We noted a number of programs within this budget that more appropriately belong at the office level (e.g., Telecommunications Center or Office of Meteorology). We transferred funding to the Telecommunications Center for the GOES-Tap ($1.5M in FY 1998 and $1.0M in FY 1999 and the Flight Documentation contract ($400,000 annually); we transferred $950,000 to the Office of Meteorology for disaster survey work, marine evaluation and verification contract activities and the U.S. Weather Research Program. With the following exceptions, we agree with the NWS ZBB budget projections. Postage costs were reduced 10% ($100,000), support contracts were reduced 5% ($300,000) and all unassigned funding ($2 million) was eliminated.

Table 6 – Headquarters NWS and Central Operations Non-LABOR
(BASE and MARDI only, $M)

Office	*FY 1998 NOAA Review*	*FY 1999 NOAA Review*
NOAA Common Services	35.3	35.4
Headquarters Organizations		
Associate Administrator	21.3	22.6
Systems Development*	0.3	0.4
Meteorology	9.5	9.8
Hydrology**	1.5	1.6
Systems Management	10.8	11.6
Subtotal Headquarters	43.4	46.0
Central Operations		
TDL	0.7	0.7
HRL	1.5	1.6
Centers for Communications, Radar and Logistics	13.8	13.1
National Training Center	0.6	0.6
National Data Buoy Center	9.6	9.7
Subtotal Central Operations	26.2	25.7
Total Headquarters + Central Operations	**69.6**	**71.7**

*Does not include TDL funding (shown separately under Central Operations)
**Does not include HRL funding (shown separately under Central Operations)

B. — Office of Systems Development

FY 1996 and FY 1997 expenditures were sufficient and that level of resources were maintained in FY 1998 and FY 1999. The only adjustment made was to transfer $100,000 for the Pennsylvania State University Cooperative Institute to OM for central administration.

C. — Office of Meteorology

The majority of the activities within this office are devoted to supporting NWS-wide training (see Section VIII.B) and operational meteorological programs. Traditionally, funding for several OM managed programs has been included in the Associate Administrator's budget. We transferred this funding. Also, funding for Cooperative Institutes has been dispersed throughout NWS Headquarters Offices, NCEP and the Regions. We consolidated funding ($1.5M) and allocated it to OM for management and execution. Also, we increased OM funding above FY 1997 levels to support several critical programs that have been neglected over the past several years $100,000 for Quantitative Precipitation Forecasting work and $225,000 to replace deficient observing equipment on vessels that participate in the Voluntary

Observing Ship (VOS) program. Additionally, training program increases summarized in Section VIII.B are included.

D. — Office of Hydrology

FY 1996 and 1997 expenditures were sufficient and that level of resources were maintained in FY 1998 and 1999.

E. — Office of Systems Management

The funding provided is sufficient to complete deployment of the NOAA Weather Radio (NWR) Console Replacement System, provide lightning data to newly deployed AWIPS systems, resume cooperative observer training and oversight, and sustain operations and consumable replenishment for the upper air observing program. It includes funding for preliminary activities necessary to modify and/or replace the existing upper air system in response to the government mandate to vacate a portion of the currently allocated radio frequency spectrum. An increase ($460,000) is provided for NWR maintenance in acknowledgment of the growth of these systems under Vice President Gore's initiative for a national emergency warning system. A pricing adjustment of ($265,000 in FY 1998 and $1.6 million in FY 1999) was included to accommodate increased costs associated with the sole source extension of the existing NOAA Weather Wire Service contract. Additionally, in FY 1999 price increases ($876,000) for GPS radiosondes were accommodated.

F. — Technique Development Laboratory.

FY 1996 and FY 1997 expenditures were sufficient and that level of resources were maintained.

G. — Hydrology Research Laboratory.

FY 1996 and 1997 expenditures were sufficient and that level of resources were maintained.

H. — Centers for Communications, Radar and Logistics.

Proposed funding levels continue pre-modernization era telecommunications services with appropriate reductions to account for deployment of the new technology systems. Overall NWS budget projections were supported as they provide for a viable repair and reconditioning capability adequate to sustain prudent supply pipeline and warehouse stock levels. Some adjustments were made to communications programs. First, additional NWS-wide communications program budgets were consolidated and moved into the Telecommunications Center's budget; to wit: (a) GOES Tap funding (including local dissemination systems) was consolidated and then reduced by $779,000 in FY 1998 and an

additional $500,000 in FY 1999 to accelerate replacement of this legacy system and conversion to modernized data streams and (b) Flight Documentation Program funding of $400,000 (FY 1998 and FY 1999) was transferred. Second, funding for the DIFAX system was permanently eliminated with a FY 1998 savings of $115,000, again to encourage conversion to the modernized data streams. A recurring FY 1998 increase of $1.3 million was included to restore a modest equipment replacement program to sustain the high technology NWS infrastructure. Additionally, a recurring increase of $1 million was included to meet the minimum requirements for Safety and Environmental programs mandated by statute and regulation. This level of funding is the minimum required to protect NWS managers from criminal liability under these laws. The team encourages NOAA/NWS to pursue a more pro-active OSHA/EPA compliance effort as resources and priorities permit.

I. — National Weather Service Training Center

FY 1996 and 1997 BASE expenditures were sufficient and that level of resources were maintained in FY 1998 and 1999. Additionally, MARDI funds are available to support the move to a new building.

J. — National Data Buoy Center

The current network of approximately 128 moored buoys and C-MAN stations has evolved over the past decade in an unplanned and ad-hoc basis. Funding for the network has been unstable, particularly in FY 1997, as many agencies withdrew support. Projections indicate a continued downward trend in network size. The NDBC has supported this network with a combination of NWS (reimbursable and BASE) and discretionary funding. The team recognized without additional funding the NDBC will be unable to adequately maintain the entire network. Given study constraints, our analysis provided sufficient funding to maintain the network at the FY 1996 level (71 base and 11 additional buoys). We also included a recurring $500,000 increase to remedy equipment maintenance and spares shortfalls.

National Centers for Environmental Prediction

Funding (Table 7 – NCEP Non-Labor) covers operations of all NCEP Prediction Centers. We increased the budget $800,000 over FY 1997 levels. This funding will allow NCEP to sustain FY 1996 product/service levels, procure needed equipment and supplies, properly maintain equipment and accomplish necessary development activities. Additionally, we adjusted the budget to account for savings ($570,000 in FY 1998 and $645,000 in FY 1999) associated with the use of N-AWIPS at the various Prediction Centers and removal of legacy systems.

Table 7 – NCEP Non-Labor

(BASE and MARDI, $K)

Office	*FY 1998 NOAA Review*		*FY 1999 NOAA Review*
NCEP	**8,400**		**8,500**

Regional Headquarters and Field Offices

Our analysis indicates that budget formulation for the regions, traditionally, has been "past behavior based". In the time available for this report, we were unable to gain a sufficient understanding of the relationship between regional non-labor expenditures and the adequacy of support provided to WFOs by the regions and how that in turn related to the quality of WFO forecast products and services. This limited our ability to realistically evaluate and determine budget levels.

We provided $49.0 million of funding (BASE and MARDI) for operations, maintenance and infrastructure sustainment within the NWS Regions. This is nearly a 26% reduction ($17.6 million) from actual FY 1996 expenditures, and an increase of approximately $4.3 million above FY 1997 projected expenditures. We believe that while the region's could absorb a 26% reduction from historical spending levels for a single year, it should not be continued indefinitely without a clearer understanding of the probable immediate and cumulative impacts. Our allocation applies pressure to normalize spending across the CONUS regions and accounts for the 20% decrease in overall staffing at the regional headquarters. Additionally, in FY 1999 we included funds (Section VII – New Initiatives) to increase the capacity of the regional frame relay communications networks to accommodate interactive visual capabilities necessary for effective distance learning programs.

NWS does not appear to have a detailed understanding of regional non-labor business practices and is not able to relate non-labor expenditures to the types and quality of services provided by WFO/RFCs. Likewise, we were unable to gain a comprehensive understanding of regional non-labor resource requirements. In budgeting, NWS assumes past expenditures are valid. For lack of a better alternative we also followed that assumption. This assumption of past behavior being correct has several risks, including punishing the more efficient portions of NWS and not maximizing the return-on-investment (ROI) for non-labor expenditures. While non-labor costs across the CONUS regions are consistent, with Eastern and Southern slightly more expensive in total, the regions are not the same size. The Central Region has more WFOs (72% more than Eastern Region) and employs more FTEs. However, from FY 1992-1996, the Central Region spent 3% less on non-labor than the Eastern Region and in FY 1997 is projected to spend 31% less. The Central Region also spends consistently less than the Southern Region.

We attempted to understand these variations by aggregating the data to remove differences in budgeting practices, stages of modernization, and color of money distinctions between the BASE, MARDI, and the program accounts. We were unable to understand the

cost variations within and across the regions. Further analysis of NWS financial data and more detailed assessments of the individual regions should resolve some of these issues. However, the essential fact is NWS apparently cannot provide a compelling explanation and justification for regional non-labor expenditures. We are not implying that regional non-labor funding allocations are wrong; rather they rest on little justification. NWS needs to better understand the relationship between a WFO's non-labor costs, its unique characteristics (e.g., number of FTEs, location, workload, etc.) and the type and quality of provided services and products. Such information would enable NWS to assess the appropriateness of WFO and regional non-labor expenditures, rather than simply accepting past behavior as valid.

The fiscal resources involved with these budgets are large. If all regions operated at the same per location non-labor rate as the Central Region, substantial non-labor regional budget savings could be realized. As the restructuring progresses, analysis of the Regional similarities and differences should become easier. It is essential that NOAA invest the effort to do so.

Table 8 – Regional and Field Non-LABOR

(BASE and MARDI, $K)

	FY 1998 NOAA Review		***FY 1999 NOAA Review***
Regional HQ + Field Offices	**49,000**		**52,400**

Modernization Program

Costs in the following accounts include both labor and non-labor.

A. — AWIPS

Costs cover completion of both development activities and the nation-wide deployment in July 1999, operations and maintenance of fielded systems, the Network Control Facility, the AWIPS Communications Network, training and operational test and evaluation activities. Funds also cover System Acquisition Office (SAO) acquisition activities, program management functions and support initial NWS system evolution studies.

NWS budget estimates appear reasonable except for those associated with the terrestrial portion of the AWIPS Communication Network and planned levels of acquisition management support. The delay in AWIPS deployment schedules will generate savings in communications costs. Reductions in acquisition management staff (reduction of 11 FTEs in FY 1998 and an additional 10 in FY 1999 over programmed levels) reflect a more reasonable projection of required support activities. Table 9 – AWIPS Program Costs – depicts the proposed AWIPS budget. However, DOC/NOAA may wish to retain the full funding available under the $550 million cap to reduce program risks associated with uncertainties and challenges identified in Section X.E.

Table 9 – AWIPS Program Costs

($K)

	FY 1998 Pres.Budget	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY 1999 NOAA Rvw*
Program Management				
AAO	3,619	2,779	3,312	2,522
NWS	823	823	893	893
SAO Allocated	1,300	1,300	975	975
Development	24,701	24,701	9,208	9,208
Production	81,755	81,755	54,034	54,034
Systems Evolution			250	250
O&M	4,712	4,504	13,189	12,974
Total	**116,910**	**115,862**	**81,861**	**80,856**

B. — NEXRAD

Costs cover operations and maintenance of the deployed 123 radar network, operation of the NEXRAD Operational Support Facility, National Logistics Support Center and the National Reconditioning Center, SAO acquisition management and program support activities/contracts and NWS product improvement activities.

Recommended funding (Table 10 – NEXRAD Program Costs) enables NWS to fund a healthy O&M program to insure the radars meet stated operational availability requirements, procure spares, supplies and materials, maintain an adequate Preventative Maintenance Inspection (PMI) program, initiate a modest modification program and continue improvement efforts to move to an "open system" architecture. Reductions in acquisition management staff (reduction of 3 FTEs in FY 1998 and an additional 1 in FY 1999 over programmed levels) and support contracts reflect a more reasonable projection of required (O&M, communications, travel and contract support costs etc.) activities. We did not fund acquisition of a transportable radar to be used in the event of a catastrophic radar failure. This initiative has merit, but should be justified on its own rather than using O&M funds.

Table 10 – NEXRAD Program Costs

($K)

	FY 1998 Pres. Budget	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY 1999 NOAA Rvw*
ORF				
Operations Support	1,671	1671	1,785	630
Comm.	4,395	4,275	4,565	4,275
Utilities	7,830	7,830	8,220	8,220
Logistics	9,774	8,852	11,650	8,108
Field Maintenance	2,377	2,377	2,450	2,450
Maintenance Consumable	1,947	1,947	2,035	2,035
Offsets	(2,790)	(2,790)	(1,057)	(1,057)
Training	387	387	400	400
OSF	10,500	10,125	10,750	8,785
Training (OSF)	2,500	2,500	2,500	2,500
Mods	1,000	1,000	2,000	2,000
ORF Sub-Total	**39,591**	**38,174**	**45,298**	**38,346**
CAA				
Program Management	2,240	2,000	1,021	930
Support Contracts	525	430	895	800
Planned Product Improvement	5,588	5,588	7,440	7,440
Acquisition/ Deployment	2,400	2,400	0	0
Logistics Support	624	624	0	0
Sub-total	**11,377**	**11,042**	**9,656**	**9,170**
Total	**50,968**	**49,216**	**54,954**	**47,516**

C. — ASOS

Costs cover operations and maintenance of deployed systems, software maintenance, SAO acquisition management and program support activities and NWS product improvement programs.

Table 11 – ASOS Program Costs

($K)

	FY 1998 Pres.Budget	*FY 1998 NOAA Rvw*	*FY 1999 Submit*	*FY 1999 NOAA Rvw*
ORF				
O&M	5,341	5,341	8,116	8,116
CAA				
Program Mgt. & SAO Allocated Costs	457	317	0	140
Product Improvement	4,037	4,037	3,855	3,855
Total	**9,835**	**9,695**	**11,971**	**12,111**

Given the current status of the program and projected size of DOD and FAA buys in FY 1998, we believe acquisition management costs were excessive and reduced them by $150K. The SAO will be working to close out the contract in FY 1999; consequently, a small staff will be required to finish this effort (Table 11 – ASOS Program Costs).

D. — Central Computer

Budgeted cost estimates (Table 12 – Central Computer Upgrade) to complete the CRAY Y-MP8 replacement and NWS Telecommunications Gateway Upgrade, and acquire the Class VII and VIII super computers and associated interactive workstations, are reasonable.

Table 12 – Central Computer Upgrade

($M)

Category	*FY 1998PB*	*FY 1998 NOAA Rvw*	*FY 1999 Submit*	*FY 1999 NOAA Rvw*
System Acquisition	8.0	8.0	4.6	4.6
Capital Assets Acct.	5.9	5.9	10.9	10.9
Total	**13.9**	**13.9**	**15.5**	**15.5**

E. — Construction

1. — NCEP Construction

NWS cost estimates for consolidation of the Aviation Weather Center and the National Training Center into a new facility in Kansas City, MO. appear reasonable (Table 13 – NCEP Construction). This study did not address NOAA's program to consolidate several units at a new facility in Norman, Oklahoma (see Section IX – New NWS Initiatives). Currently, the Storm Prediction Center (SPC) is housed in temporary facilities. DOC/NOAA should develop a plan to move this nationally important center into adequate workspace. The proposed Norman consolidation may be one way to accomplish this; however, the completion date (mid-2003) leaves the SPC in inadequate facilities for too long a period.

Table 13 – NCEP Construction

($K)

	FY 1998 Pres.Budget	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY1998 NOAA Rvw*
NCEP Construction	**700**	**700**	**850**	**850**

2. — WFO Construction

This account provides funds to acquire and lease facilities, conduct required architecture and engineering studies to support construction activities, and build new facilities as well as retrofit existing facilities. Cost estimates (Table 14 – WFO Construction) appear reasonable.

Table 14 – WFO Construction

($K)

	FY 1998 Pres.Budget	*FY 1998 NOAA Rvw*	*FY 1999 Submit*	*FY 1999 NOAA Rvw*
Property Acquisition	3795	3795	3576	3576
A&E Service	761	761	0	0
Construction	6192	6192	0	0
Retrofits	575	575	2570	2570
Management. support	0	0	180	180
Alaska and Pacific Modernization	2500	2500	3200	3200
Total	13,823	13,823	9,526	9,526

3. — WFO Maintenance

This account provides funds associated with routine and preventative maintenance for over 200 NWS buildings. It encompasses contractual janitorial, landscaping, HVAC and UPS maintenance services plus, cyclical facility maintenance and equipment replacement.

Recommended funding in FY 1998 provides sufficient resources to maintain annual operations and services contracts, restore equipment maintenance efforts plus conduct a reasonable preventative and corrective maintenance program. This funding is comparable to industry norms. FY 1999 funding maintains these activities and provides a small amount for cyclical replacement programs.

Table 15 – WFO Facility Maintenance Program

($K)

	FY 1998 Pres.Budget	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY 1999 NOAA Rvw*
Facility Maintenance	**2,950**	**3,468**	**4,950**	**5,400**

F. — New Initiatives

While the major focus of NWS modernization activities center on AWIPS, several existing programs require replacement/modification. Additional funding is needed for continued receipt of critical observational data to support forecast and warning responsibilities and the existing Distance Learning system must be improved. These FY 1999 initiatives are highlighted in Table 16 – New Initiatives. These funds are additive to those identified in earlier sections.

Table 16 – New Initiatives

($K)

Program	*FY 1998 Pres.Budget*	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY1999 NOAA Rvw*
Radiosonde Replacement	**910 ***	**910 ***	**3700 ***	**4000**
Cooperative Observer Network			0	**750**
Distance Learning System Upgrade			0	**1000**

* Included in BASE

The added funds above the FY 1999 OMB Submit for the radiosonde replacement program will enable NWS to procure an additional 24 radiosonde computer workstations (total of 74), thus accelerating the modernization of the existing national upper air observing network. The Cooperative Observer Network is a volunteer effort of observers who provide NWS with an order of magnitude increase in the number of surface observations available for

the CONUS. Cooperative observations have also traditionally provided valuable supplemental data to forecast offices. Their value to the climate community has increased as ASOS equipment replaced human observers at many locations, because important elements of the climate record cannot be measured by automated methods. Over time, the quality of the equipment used by these observers has degraded, the number of participants in the network has decreased and the geographic representation of the network has eroded. This initiative will begin to address these deficiencies. The Distance Learning Upgrade adds NWS-wide two-way motion capability to the existing regional wide area network.

G. — Summary

As Table 17 depicts we believe both the FY 1998 President's Budget and FY 1999 OMB Submit contain inadequate base funding. The majority of the shortfall is caused by insufficient funds to account for labor and non-labor inflationary costs and to support required field (i.e., Weather Forecast Offices) staffing levels. The labor shortfall is particularly acute in FY 1999. Another factor is both budgets assume savings associated with the relaxation of station closure requirements mandated in Public Law 102-356 (NWS Modernization Act). Repeal of this Act is unlikely.

Table 17 – Budget Comparisons
($K)

	FY 1998 Pres.Budget	***FY 1998 NOAA Rvw***	***FY 1999 OMB Submit***	***FY 1999 NOAA Rvw***
BASE/MARDI	450,831	473,400	470,023	492,900
Selected Initiatives	*	*	*	5,750
Systems Acquisition	191,623	188,683	164,286	155,983
Construction and Maintenance	17,473	17,991	15,326	15,776
Total	**659,927**	**680,074**	**649,635**	**670,409**

* Included in BASE

While increases are required in the BASE account, we believe some offsetting reductions are possible particularly in FY 1999 in the modernization accounts. Our revisions preserve NWS priorities; however, we did shift funds to rectify systematic deficiencies in core mission areas (e.g., Cooperative Observing Program, Voluntary Observing Ship program). Funding levels provide necessary resources to sustain NWS' infrastructure.

SECTION VIII. — CROSS-CUT ANALYSIS

The activities and programs discussed in this section encompass all NWS organizational levels and contain both labor and non-labor costs. The costs of these activities have been included in Sections VI and VII.

A. — Research/Development and Technology Development/Refreshment

For NWS to fulfill its policy, operational, and support role it must not only maintain state of the art awareness (i.e., be a smart-buyer and smart-user of technology), but play a national leadership role in promoting knowledge and technology in the areas for which it has core responsibility. NWS need not be the biggest contributor, but it must be able to ensure that R&D addresses the issues most critical to meeting its mission requirements. It can only do this by being a key contributor to the process. NWS has this responsibility in important aspects of observation, phenomenology, forecasting and dissemination in meteorology, hydrology, and climatology.

NWS requires a broad range of research and developmental activities to maintain and improve the products and services provided to the nation and uses NOAA's Office of Oceanic and Atmospheric Research (OAR) as its primary research arm. Within OAR, the Environmental Research Laboratories (ERL) accomplish the majority of the NWS-related work. While NWS does not either directly fund the bulk of OAR's programs or control internal OAR prioritization of research efforts or decisions on the levels of work to be accomplished, it does collaborate with OAR in defining research objectives and in the transition of new science and techniques into routine operations. In FY 1997, OAR expended approximately $23.2M on NWS related work. Efforts to improve short-term warnings and forecasts equaled $19.8M ($12.3M of OAR funds and $7.5M of NWS funds) with an additional $3.4M of funding directed at climate related research.

From a funding perspective, NWS supports in a limited way the U.S. Weather Research Program. NWS also draws on research performed by the academic community, private sector and national laboratories. The ties with the academic components of the atmospheric science community have traditionally been strong and fruitful. NWS through the Collaborative Science and Technology and Applied Research (CSTAR) program states science needs to the University community and provides funds (Cooperative Institute, Partners program and graduate fellowships) for R/D activities.

While the laboratories and academic community focus on the research end of the R/D spectrum, NWS, as one would expect from a science based service organization, devotes considerable resources to the development end. At all levels, from WFOs and RFCs to Headquarters, NWS staffs are actively engaged in technical development, infusion and product improvement activities. The Offices of Meteorology and Hydrology formulate policy for, and facilitate orchestration, of hydrometeorology development activities. Table 18 – NWS FY 1997 Technical Development/Infusion – outlines our estimate of the FY 1997 staff

and contractor efforts engaged in technical development/infusion work. Funding for these activities is provided from BASE and modernization accounts (primarily AWIPS and NEXRAD). NCEP also obtains funding , so-called "soft money" (approximately $5.5M in FY 1997) from many external sources to support numerical model development efforts.

Overall, in FY 1997, approximately 332 NWS employees and 116 contractor personnel were engaged either full or part time with technical development activities. This level of activity will continue in both FY 1998 and FY 1999. The majority of efforts by the Headquarters, NWS staff were directed at applications software development for AWIPS. Our analysis revealed that meaningful and productive work was being accomplished (in the case of the Environmental Modeling Center –EMC– and the Climate Prediction Center –CPC– much of it is "world class") by these individuals and their respective offices and collectively the NWS and the nation will benefit.

However, we could not find an overall NWS plan that ties all these activities together, prioritizes them in terms of importance and specifies required completion dates. Additionally, we could not locate a formal NWS policy directive outlining how R/D and technical development requirements are stated, related to end-users needs, validated and prioritized nor could we see evidence of a corporate process to manage, allocate resources, assign priorities and coordinate the overall NWS technical development program. Lack of such a process also limits NWS' ability to coordinate and leverage the work being accomplished by external agencies. We did note that several individual offices and organizations do have plans (several are very good) reflecting their views on needs and initiatives to pursue, but in the aggregate, they did not hang together as a coherent whole, traceable to a NWS-wide vision or plan or to budgets. Additionally, absence of an overarching NWS-wide plan introduces the possibility of unnecessary duplication of efforts, reduced teamwork, sub-optimal use of valuable technical resources and allows pursuit of an activity that may not support NWS goals.

An area of concern is the amount of "soft money" required to support the EMC. Over time, EMC has been allowed to grow to the point that now over 50% of its funding is from external sources. To put this in perspective, the fraction of "soft money" underwriting EMC is higher than that at many university-based atmospheric science departments. This reliance on outside sources for operating capital raises two potential problems. First, the administrative burden of dealing with multiple grants and contracts is large and impacts time available to conduct the development work. Second, the potential exists to focus on the fund providers development priority vice NWS needs. Within Headquarters NWS, funding for a large portion of the Hydrology and System Development staffs are linked to AWIPS and NEXRAD. The activities these staffs accomplish extend beyond the bounds of these two modernization programs and should be funded from BASE accounts.

Table 18 – NWS FY 1997 Technical Development/Infusion

	Positions *		Staff	
Organization	***NWS Staff***	***Contr -actor***	***Value ($K)***	***Activity***
Office of Hydrology	27	11.5	797	AWIPS hydrological application software and improvement of precipitation, hydrological and flood forecasting
Office of Meteorology		4	224	Quantitative precipitation forecasts and severe weather software
			150	USWRP grants
			450	Cooperative projects
			65	Partners projects
			450	Fellowships
			486	Cooperative Institutes (only partially funded in FY 1997)
Office of System Development	34			Improvement of objective and local forecasts, development of AWIPS meteorology application programs
		29.5	2,843	AWIPS hydromet application software, NEXRAD product improvement and improvement of storm surge forecast models
NCEP				
Environmental Modeling Center	44	40	4,000	Improvement of numerical prediction models and data assimilation techniques
Computer Operations	5	12	1,800	N-AWIPS development
Climate Prediction Center	13	19	1,753	Improvement/development climate prediction models
Hydrometeorology PC	5			Improve hydromet products
Marine PC	1			Improve marine products
AWC	7			Improve aviation products
SPC	3			Improve severe storm products
TPC	6			Improve tropical storm forecast models and products
NEXRAD OSF	6		800	NEXRAD product improvement
NDBC	14			Improve buoy sensors
River Forecast Centers	48			Calibrate models and improve flood forecast models
Weather Forecast Offices	119			Science and Operations Officer's duties entail working on techniques to improve forecast methods/products

* These are Positions involved fully or partially, not expressed in FTE

Another technical challenge facing NWS is the daunting task of carefully prioritizing, time phasing and implementing relevant technical refreshment efforts once new systems are fielded and become reasonably stable. The aim must be to prevent the systems from becoming technologically and operationally obsolete, thus avoiding the cost of a major replacement. In essence this is a form of continuous improvement. Evolution or technical refreshment efforts typically take the form of improvements to decrease life-cycle costs, increase capability or improve products. NWS' major focus to date has been on evolution of the AWIPS, NEXRAD and ASOS systems. Table 19 – System Evolution: AWIPS, NEXRAD and ASOS – outlines the fiscal resources projected for these programs.

Plans for NEXRAD and ASOS are relatively mature. Programmed NEXRAD activities include a software rehost to a non-proprietary open system platform that will decrease life-cycle operating costs and yield significant increases in processing capacity plus efforts to improve the systems' capability to identify precipitation types. ASOS efforts are directed at adding sensors to automatically measure critical atmospheric elements. AWIPS plans are still in the early stages and the FY 1999 OMB Submit provides funds ($250,000) to develop a definitive plan for technology refreshment for this system. Taken individually these plans have merit, but as with our discussion of technical development activities, what's lacking is an overall and coherent NWS plan or vision that integrates, prioritizes and time-phases all these refreshment programs. NWS efforts to create a NWS Weather System Architecture is a good start.

Table 19 – System Evolution: AWIPS, NEXRAD and ASOS

($K)

	FY 1998	*FY 1999*	*FY 2000*	*FY 2001*	*FY2002*	*FY2003*
AWIPS	0	250	1,700	3,200	3,200	3,200
NEXRAD	5,588	7,740	5,520	5,495	3,975	8,500
ASOS	4,037	3,855	4,180	7,285	7,840	5,325
Total	**9,625**	**11,845**	**11,400**	**15,900**	**15,020**	**17,025**

In the limited time available for this review, the team could not devote sufficient time to determine the adequacy of funding allocated for R/D, technical development and technology refreshment activities. In general, the aggregate resources available for technical development and refreshment efforts seem sufficient. A few areas were detected (i.e., IFP) where it appears that critical activities were not receiving sufficient attention; these are management not resource issues.

Given the importance of technology infusion and development, NOAA should have a small panel of outside experts review NWS R/D and technology development and refreshment plans. The study should focus on the requirements development and validation process and assess the adequacy, timing and resource implications of NWS plans to infuse new technology. The study should also evaluate how technical plans are linked to societal needs and gauge the value of the improvements gained via technical innovation to end users and NWS.

B. — Training

As a science based service organization, NWS must continually provide technical and professional development training and education to insure its professional work force maintains currency with new technology, understands and is able to apply research advances and knows how to effectively use the new equipment being deployed by the modernization program. This education and training yields improved forecasts and warnings. Scientific education has been provided to meteorologists and hydrologists at the various NWS training facilities, selected Universities and through the Cooperative Meteorological Education and Training (COMET) program. Technical training has been provided via a mix of NWS training facilities, e.g., NWSTC and OSF, contractor personnel, on-the-job training and distance learning. The training encompasses basic meteorology and hydrology concepts, equipment and software maintenance, operation of the NEXRAD and AWIPS equipment and leadership and management development programs.

Training has from the inception of the modernization been an integral part of the NWS modernization plan. It has enjoyed robust fiscal support. Over the period, FY 1990-1996, NWS has expended approximately $85 million to prepares its work force to effectively employ the technology being procured and apply advances in scientific learning. FY 1997 training projections indicate expenditures in the range of $13 million. NWS training expenses in FY 1997 are in line with high technology private industry companies wherein training budgets normally comprise 1-2 % of revenue. Additionally, FY 1998 and 1999 plans provide approximately 114 hrs/year of formal and informal training for the technical work force. This is slightly below (114 vs. 122 hours) the U.S. industry average (per Bureau of Labor Statistics).

Until this year the predominant training method was via on-site classes at a NWS training facility, COMET, and seminars and/or workshops. Some distance learning programs were available but their use was limited. In FY 1997, NWS redesigned the training program to make more effective use of emerging distance learning (DL) technology. Several factors caused this change: a) maturity of DL technology, b) increasing travel costs, c) operational and family pressures to minimize student time away from station and home and d) budget pressures to maximize output for available training dollars. While this approach is reasonable, NWS must insure they maintain a balanced approach in the allocation of resources between DL and in-house class room, seminar and workshop training. Certain types of education and training are best suited to the class room environment.

Fiscal resources required in FY 1998 and 1999 are depicted in Table 20 – NWS FY 1998 & 1999 Training Budgets. The table depicts both the NWS and NOAA Review team training budgets; following the budget data, adjustments to the NWS plan are discussed.

Table 20 – NWS FY 1998 & 1999 Training Budgets

($M)

	FY 1998 NWS	*FY 1998 NOAA Rvw*	*FY 1999 NWS*	*FY 1999 NOAA Rvw*
National Training Center	5.1	5.1	5.2	5.2
Operational Support Facility	2.2	2.2	2.7	2.7
COMET	3.8	4.3	3.9	4.4
Other Training	2.1	2.1	2.1	2.9
Total	**13.2**	**13.7**	**13.9**	**15.2**

For FY 1998, we increased the COMET budget by $500,000 to develop a training program for Quantitative Precipitation Forecasting (QPF), the top priority NWS forecasting initiative and included $250,000 to evaluate the effectiveness of the new DL procedures; we decreased the Conference and Workshop budget by $250,000. In FY 1999, we included $500,000 for continued development of the COMET QPF training program and $1million to improve DL technology (adds two-way motion video capability NWS-wide) and decreased the conference/workshop program by $250,000. Within NWS, training activities are managed in several organizations. We experienced difficulty in pulling together all the component parts. We believe overall management of the training program would be enhanced by assigning a single organization lead responsibility.

C. — Operations and Maintenance

NWS system operations and maintenance (O&M) include field level and central support activities. To sustain system capabilities and maximize their operational utility, resources are required in the following functional areas: operations and maintenance, communications, training, field maintenance, repair and replenishment, modifications, configuration management, and field support.

On average, the NWS expends $27.5 million (FY 1998 dollars) for non-labor operation and maintenance activities. In addition, NWS transfers a recurring $1.8 million of NEXRAD funds to Government laboratories for technique development ($1.0 million) and to the National Climatic Data Center for data archival ($800,000). Also not reflected in these expenditures is the annual $4.2 million in operational support modifications which were allowed to accumulate in anticipation of the NEXRAD Transition Power and Maintenance Shelter (TPMS) procurement. In total, non-labor O&M activities total $33.5 million per year. Of this total $11.4 million is expended by the NWS Regions and the remaining $22.1 million by the NWS Centers for Telecommunications, Radar, and Logistics (Central Operations) and the Office of System Management (OSM).

The Regional expenditures are for: (1) Field maintenance - $1.0 million, (2) NEXRAD utilities and ASOS communications - $4.0 million, (3) Consumables - $700,000 and (4) Field maintenance and spares - $5.7 million. The ASOS program funds $1.5 million and NEXRAD funds the remaining $9.9 million. Additional funds are expended for maintenance of legacy weather systems and other equipment used at the WFO/RFCs; however, we could not readily discern these resources.

Central Operations and OSM expenditures are for: (1) NEXRAD Operational Support Facility (OSF) and Operations Training Branch (OTB) - $5.6 million, (2) Central Communications - $6.1 million, (3) Engineering Support - $1.5 million, (4) Repair, reconditioning, and quality control - $2.0 million, (5) modifications - $4.2 million, (6) System Management - $1.2 million and (7) legacy weather systems - $1.5 million.

D. — Communications

Weather data is a perishable commodity – to be effective observations must be in a forecaster's hands soon after recording and forecasts need to be in decision-makers hands soon after issuance. NWS maintains many diverse and independent communication networks to collect and disseminate essential observational, forecast and warning information. In FY 1997 total communications expenditures are projected at $30 million; growing to $35 million by FY 1999. The majority of communications activities (management and operation) are accomplished at the Headquarters NWS (66%) but both NCEP and the Regions plan for and operate communications systems. Currently, at the national level, data is collected and distributed over approximately 15 network and 10 dissemination systems. At the Regional level the systems collect unique local observations, disseminate warnings and interconnect all WFO/RFC's (i.e., Regional wide area network). AWIPS, once deployed, with its associated communications network will replace a number of legacy systems. But, information provided us indicates that in the AWIPS era the majority of the current stand-alone network/dissemination systems will remain. The Regional wide area network is discussed separately in Section X – UNCERTAINTIES. We believe that economies and efficiencies may be possible, at least, with the national systems if the disparate networks and dissemination programs were integrated. As in several other areas, we could find no evidence of an overall NWS-wide communications plan governing management of the overall NWS communications program or plans to merge and combine the many existing systems. Also, within the Headquarters, we could not find the lead office responsible for NWS-wide communications.

E. — Travel

Over the period, FY 1992-1996 NWS BASE and MARDI travel budgets averaged $8.6 million annually (in FY 1998 dollars). Additionally, another $2-3 million of travel related expenditures were paid from modernization and reimbursable accounts. Of the BASE/MARDI total, $2.6M was expended by the field units and $6.0M by Regional and Headquarters NWS staffs. NWS has deployed Video Teleconferencing Capability (VTC) at each Regional Headquarters and selected central support locations. The impact of this

deployment is reflected in the $400,000 reduction in travel expenditures during FY 1996. Last year, responding to budget pressures, NWS accelerated plans to reduce resident training and increase distance learning investments. This move contributed to a decrease in the requirement for Headquarters funded travel; we believe similar reductions will continue in the future. Additionally, permanent staffing reductions at the National Headquarters (153 FTE) and the CONUS Regional Headquarters (20%) should further reduce travel requirements. Accordingly, we reduced the FY 1998 and FY 1999 Regional and National Headquarters travel budgets by approximately $1.5 million dollars from the historical requirement and increased field travel by $500,000 to restore Cooperative Observer Network site visits.

SECTION IX. — PROGRAMS and CHARGES NOT CONSIDERED

NOAA-directed Programs

- NOAA Common Services charges equal to $35.3 million in FY 1998 and $35.4 million in FY 1999; permanent transfers equal to $0.7 million in FY 1998/1999; and non-discretionary fees for services equal to $1.3 million in FY 1998/1999 were added to the NWS Budget requirements. Any variance from these amounts will require an appropriate adjustment.

- Within grade pay raises – NOAA must compute this amount and increase the budget requirement accordingly.

- Capital costs to bring NWS facilities into compliance with OSHA requirements and environmental regulations and laws. Complying with these requirements is a major NOAA-wide challenge. The current NOAA-wide backlog for environmental projects exceeds $21M and the safety program backlog exceeds $37M.

New NWS Initiatives

- Costs associated with the implementation of new initiatives that provide services and products above levels provided in FY 1996. While the boundary conditions governing this review limited costing of these programs, our study did reveal several new NWS initiatives which, if adequately supported would, provide significant improvement in the flood warning and climate prediction areas and provide better service to the public. Exclusion of these initiatives from our analysis should not be interpreted as lack of support for required resources. The key initiatives are:

    - **Advanced Hydrological Prediction System (AHPS)** FY 1999 $11.6M

    This program is designed to provide the public with improved (magnitude and probability of occurrence for river conditions) and longer lead time (several days to months) flood and river condition forecast products. FY 1999 funding would start initial national implementation (adaptation and calibration of the system to 4 river basins) of the system.

    - **Operational Climate Forecast System** FY 1999 $2.0M

    This program will improve predictions and forecasts of the seasonal to interannual variations in sea surface temperature and precipitation associated with the El Nino Southern Oscillation (ENSO) phenomena. When implemented ENSO forecast lead times will increase from seasons to years.

- The **Marine Observing Network (MAROB)** expansion. The current network of approximately 128 moored buoys and C-MAN stations has evolved over the past decade in an unplanned and ad-hoc basis. Funding for the network has been unstable particularly in FY 1997 as many agencies withdrew support. Projections indicate a continued downward trend in the number of stations in the network. In FY 1999, NWS submitted a new multi-year initiative to expand the network and site stations in optimum locations along the U.S. coast with the aim of improving coastal warnings and forecasts. Additionally, at NOAA's request the National Research Council is evaluating requirements for an improved and more representative national data buoy network. Given study constraints, this analysis provided sufficient funding to maintain the network at the FY 1996 level. After the NRC evaluation is completed, adjustments to MAROB funding may be necessary.

- Operational costs for the **Regional Climate Centers (RCCs)**. The RCCs provide specialized diagnosis and analysis to specific regions of the nation. The Administration favors privatization of these centers, while some in the Congress believe they should remain a government function. If the RCCs are retained as a government entity, they should be aligned within the National Environmental Satellite Data and Information Service (NESDIS).

- Costs associated with the **Norman Consolidation**. This NOAA program is designed to consolidate and modernize facilities of the National Severe Storms Laboratory, Storm Prediction Center, NEXRAD Weather Service Forecast Office and the NEXRAD Operational Support Facility in a new building on the grounds of the University of Oklahoma.

- **North American Atmospheric Observing System (NAOS)**. This program is designed to determine the optimum (sensor mix and location) and most cost efficient observing network to meet forecast requirements in the 21st century. The program has merit; however, overall program leadership should rest with NOAA's Office of Oceans and Atmospheric Research (OAR).

- **Contingency Radar.** This program funds procurement of a transportable, albeit less capable, Doppler radar to be used as a "backfill" in case of the catastrophic loss of a network radar. Although the NEXRADs are relatively new systems, NWS has already experienced such a failure. The termination of the NEXRAD production line limits NWS' ability to quickly respond to such events in the future. Procurement of such a radar requires about $2.0 million.

SECTION X. — UNCERTAINTIES

A. — Weather Forecast Staffing Model

The methodology used by NWS to develop a WFO manpower allocation model appears reasonable. The model was originally developed in the late 1980's and updated in 1996. It assumed a fully integrated WFO operation, determined core staffing needs for a nominal WFO's workload and then adjusted staffing by individual WFO based on additional workload factors. The model assumed planned AWIPS capabilities (build 6 functionality), the NOAA Weather Radio Console replacement program, Local Data Acquisition and Dissemination system and Interactive Forecast Preparation System are available for routine use, meet design specifications and forecasters can efficiently and effectively use these tools to produce the total spectrum of required products and services (e.g., watches and warnings, fire weather products, bilingual language forecasts etc.). None of these systems has been rigorously tested in an operational environment. If these systems do not provide planned capabilities or the tools do not enable forecasters to efficiently provide the total spectrum of required general and specialized products, the model will have to be re-evaluated and possibly adjusted. This could impact post FY 2001 staffing levels and labor costs.

Programmed "end-state" staffing levels at all 119 WFOs, with the exception of those at the Jackson, KY and Guam WFOs appear consistent with the manpower model. Staffing levels at Jackson appear particularly low and may limit the office's ability to provide required services.

B. — Interactive Forecast Preparation System (IFP)

This system (includes the Interactive Computer Worded Forecast -ICWF- and AWIPS Forecast Preparation System -AFPS) is designed to reduce the forecaster's workload in preparing a variety of forecast and warning products. Gridded products (both numerical model output and point forecasts) from NCEP as well as software from the ICWF software program, are required. Development of the ICWF software is progressing satisfactorily and the system should be available to meet baseline schedules. Available information indicates considerable uncertainty revolves around the availability dates for the gridded NCEP data. Our analysis indicates the problem is not one of resources, but of assigning the appropriate priority to effort, allocating resources and executing a plan to meet the IFP schedule. Failure to have necessary products ready in time may delay completion of WFO restructuring and staffing plans.

C. — Station Closures

As part of the restructuring NWS plans to close approximately 204 offices. This analysis assumed all closures proceed according to current schedules. If the offices fail to close on schedule, associated labor and non-labor costs are additive to the derived numbers.

D. — Assessment Sites

Last year the Secretary of Commerce approved acquisition and siting of three additional NEXRADs and one WFO. Additionally the Secretary directed office and/or radar operations continue at 5 other offices (Caribou ME, Key West Fl, Erie PA, South Bend IN and Williston ND) until completion of specific assessments regarding the adequacy of the planned radar coverage and weather delivery system for these locations. These reviews are scheduled to be completed by the Fall of 1997. Once completed, results will be analyzed and recommendations provided to the Secretary. This analysis assumed existing NWS plans are not modified. If the assessments alter current NWS plans (require fielding of additional weather radars or establishment of additional forecast offices), associated labor and/or non-labor costs are additive to the fiscal resources determined in this analysis.

E. — Advanced Weather Interactive Processing System

AWIPS is the final technology system required to complete the current modernization program and the linchpin for operations of the realigned and modernized NWS field structure. Like many large information technology programs AWIPS has experienced development difficulties with the attendant result of cost growth, schedule slippage and routine monitoring from the DOC OIG and GAO, as well as added oversight from the Congress. Additionally, the delays have generated skepticism in the field about whether the system will ever be delivered or perform to expectations. During the past 18 months, the program has made considerable progress. The 1996 decision to incorporate the FSL developed WFO-Advanced software into AWIPS Build 3 was wise and should significantly reduce development risks and yield a system that meets functional requirements and field expectations for meteorological and hydrological applications. Visits to sites using prototype WFO-Advanced software and discussions with field forecasters and hydrologists at other sites indicate the WFO-A software performs well. Once additional capabilities are added, it should meet their needs. Despite the recent progress, serious challenges remain.

The DOC has agreed to develop and deploy a fully compliant system within a congressionally imposed cap of $550M. Our limited review indicates achieving this will be a challenge. The DOC FY 1998 and 1999 budgets reflect delivery of the system within the cap and allocate approximately $185M for remaining development, deployment and O&M activities. Deployment is forecast to be completed in July 1999. The projected schedules are "success oriented" and the program only maintains a small management reserve. Any perturbations to program schedules (e.g., modifications to the 1997 DOC Secretary's decision regarding deployment, or ability of the field to accept deployed systems) will impact costs and may cause a cap breach.

Additional software development is still required. Software build 4 is projected for completion in May 1998 with Build 5/6 following in December 1998. With the incorporation of WFO-Advanced as the system baseline, three different government offices and the prime contractor are engaged in software development. We were unable to obtain estimates as to the size and complexity of Build 4 or 5/6. Given the known functionality that must be

incorporated and the diverse number of software development agencies, the remaining software work (particularly that associated with build 4) will be complex and challenging.

Finally, until completion of the deployment phase, hardware and software O&M costs are considered within the cap. FY 1998 and 1999 budgets project $1.8M and $2.6M respectively to cover software maintenance. These estimates may prove adequate; however, to thoroughly assess their reasonableness, definitive information regarding software size, structure, languages and complexity and maintenance work force productivity is necessary. Any delay in completion of the deployment phase will likely result in an increase in the O&M period covered under the cap with the potential for added costs.

The current AWIPS acquisition/program management structure is costly, inefficient, and blurs responsibility. In theory, NOAA's System Acquisition Office is responsible for acquisition matters (performance cost and schedule baselines) with NWS responsible for requirements, milestones and budgets. In practice, there is overlap in execution, much time expended in coordination and uncertainty as to responsibility boundaries. The structure is inefficient. In FY 1998, approximately $9M ($5M for government activities and $3.8M for support contractors) will be allocated to the SAO to cover acquisition management activities and about $1.1M to NWS for program management activities (note this is a conservative figure as a number of NWS non-AWIPS funded employees routinely work program issues). It appears that individuals or offices are normally not assigned responsibility for critical components of the development. As an example, we noted several NWS offices were engaged in software maintenance planning, however we could not (as of September 29,1997) discern who (specific office and individual) was assigned the overall responsibility for developing the NWS approach and plan to accomplish required actions so that a viable software maintenance system is in place for fielded systems. The same is true with respect to System Engineering.

In the place of assigning responsibility and accountability to individuals or established offices, multiple teams and committees work issues and strive to resolve problems. Given the existing distribution of responsibilities, both SAO and NWS staff routinely participate on the committees. The blurred responsibilities coupled with the committee approach to issues/projects results in a time-consuming coordination process and a consensus approach to decision-making. Additionally, since few have been given responsibility and authority in functional areas, accountability is not established. This management philosophy inhibits individual empowerment, delays identification and rapid resolution of critical issues affecting development and deployment efforts, and adds unnecessary time and costs to the process.

The Fall 1996 decision to incorporate the WFO-advanced software into AWIPS significantly increased government system development responsibilities. This was particularly true with respect to System Engineering (i.e., those activities that facilitate the coordinated design of a system made of many elements and subsystems such that the system as a whole optimally meets the requirements and constraints imposed on it). NWS was slow to react to the need to address System Engineering issues. In May 1997, a System Engineering Team was established. Figure 1 summarizes my understanding of the current AWIPS System

Engineering structure. The structure reflects a committee approach in which no one person has specific responsibility or the authority required to carry out responsibilities and no one is accountable. Also the prime contractor's System Engineer is not considered a team member. In discussions with System Engineering team and senior acquisition management staff members we discerned the team views their role as essentially that of a coordinator and does not perceive it has the authority to alter system design or make trades among sub-systems to improve overall system performance and design. Additionally, the team has met infrequently and informally.

AWIPS is a complex system with distributed elements, multiple sites, intricate interconnections through multiple networks (satellite, terrestrial wide area networks, local connections to radars and data sources), loosely integrated software and multiple data base architectures. To achieve optimal system performance and reduce long term operating and system evolution costs, someone must have authority over and responsibility for the system/subsystem architecture, allocation of requirements among systems, specification of interfaces between subsystems and making the necessary trades in subsystem capabilities. Lack of a strong System Engineering capability introduces uncertainty regarding AWIPS' potential to satisfy user expectations and out year budget projections for operating and evolution costs. Key System Engineering areas requiring attention in the near term are the software and hardware issues associated with the Local Data Acquisition and Dissemination System (LDADS) and overall system security.

From a software perspective AWIPS consists of a loosely integrated series of software components (e.g., Build 3.1 will contain approximately 1.4M Delivered Lines of Code) developed by four different organizations (Prime contractor, Technique Development Laboratory, Office of Hydrology, Forecast System Laboratory) using a variety of programming languages and database architectures. The FSL component was initially designed as a research system so attendant documentation is somewhat limited. These factors will complicate software maintenance efforts. The time available for this study, coupled with our inability to receive definitive information regarding size (no estimates were available regarding total LOCs anticipated upon completion of Build 6), complexity, structure, quality and adequacy of documentation precluded a detailed analysis of the reasonableness of FY 1998, FY 1999 and out year software maintenance budget estimates. Given what we know about the code, we believe NWS may have insufficiently budgeted for software maintenance in both fiscal years. To reduce uncertainties particularly in the out years, software maintenance estimates should be analyzed in a more rigorous manner.

Figure 1
AWIPS System Engineering (SE) Approach

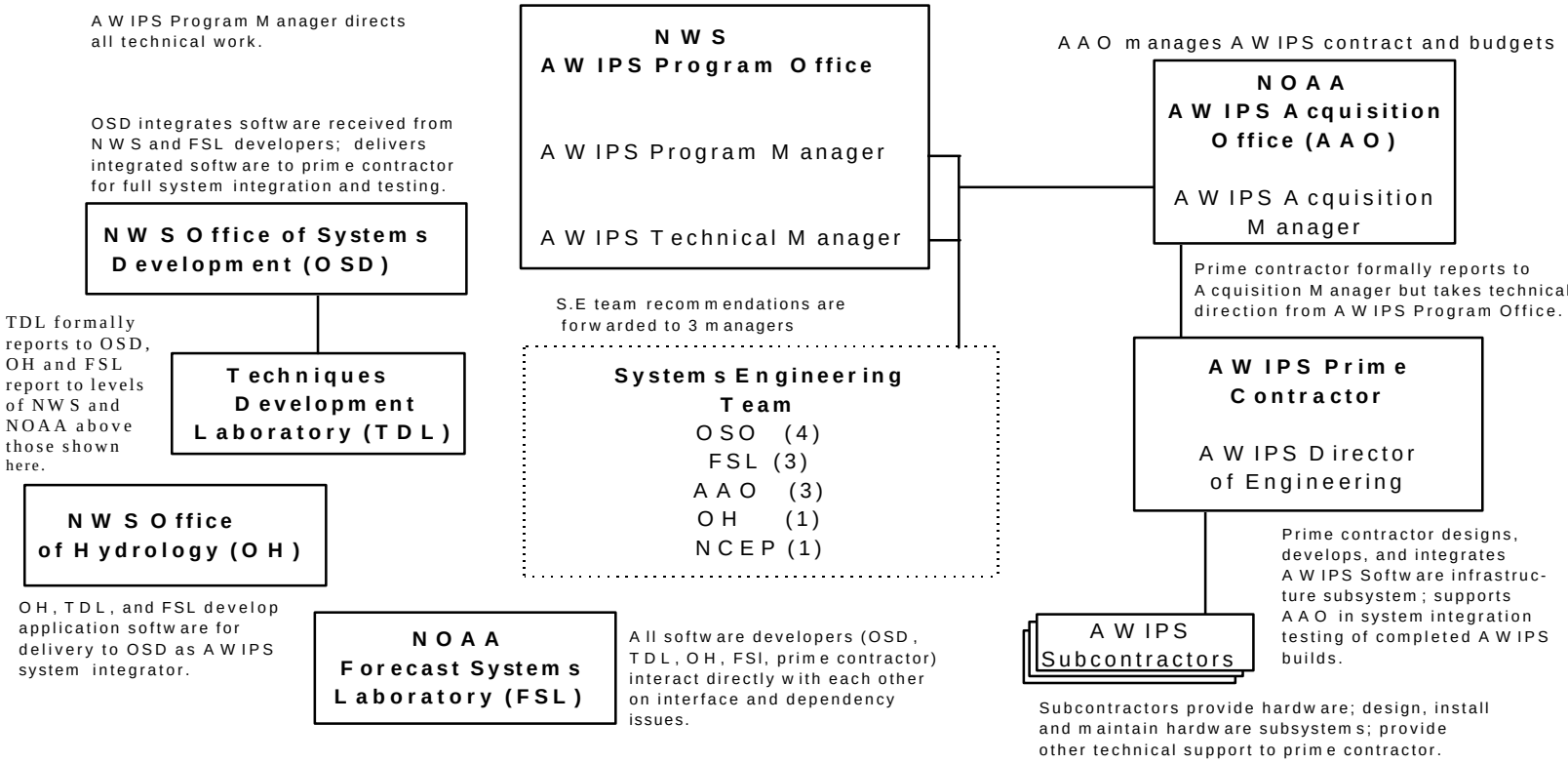

Figure 1 – AWIPS Systems Engineering Concept

F. — N-AWIPS

The AWIPS budget funds the separate development of an interactive processing system to meet the needs of the NCEP Prediction Centers. While this effort uses AWIPS funds and hardware solutions there is no technical relationship between the two programs. The stated differences between the two stem from N-AWIPS's focus on analysis and visualization of model data nation-wide whereas AWIPS focuses on analysis of observations for a specific WFO forecast and warning area. The incorporation of the WFO-Advanced software as the baseline AWIPS system has tended to blur this distinction. To date, N-AWIPS costs have totaled about $2.8 million for contractor support and $1.8 million for government staff. FY 1998-1999 costs are projected at $1.8 million for contractor support and $900,000 for government staff with out year projections through FY 2002 of an additional $2.3 million and $1.5 million respectively. The majority of N-AWIPS (through FY 1999) costs fall within the AWIPS cap. Development and deployment of this system will standardize the information technology used at the various NCEP Prediction Centers and eliminate costly legacy systems (to date use of N-AWIPS has yielded savings of approximately $1.2 million annually). Budget uncertainties extend beyond the FY 1998 and 1999 time frame and stem from the questions concerning the maintainability of the N-AWIPS software (GEMPAK),its ability to adequately accommodate growth in NCEP requirements, communications interfaces to the AWIPS communications network and the migration of the two divergent systems into a more common and standard NWS software system.

G. — Regional Wide Area Network

Currently all mainland Regions operate and maintain a Wide Area Network that provides two-way connectivity to their field offices. This was a regionally conceived and funded program to provide field units with operational weather data – high resolution satellite data and gridded NCEP model data – that were not available on standard NWS communications systems. The network's capability has expanded to include Internet and World Wide Web service and a variety of administrative services, e.g., electronic mail and electronic forms submission. Plans are being formulated to enlarge the system's capacity for audio and video teleconferencing and experimental NCEP model data. Over time this unofficial network has become a key region/field office link. The AWIPS communication network will provide the field with all required operational data (high resolution satellite and NCEP model data); however, it was not intended to satisfy administrative needs, e.g., Internet and World Wide Web access, electronic mail, video-teleconferencing etc. NWS plans for the AWIPS era do not include continuation of the existing Regional wide area network. If AWIPS does not satisfy the field's total data needs, the Regions will press to continue and expand the current network. Projected FY 2000 costs for a stand alone Regional wide area network are about $1.9 million. NWS should review the field's needs and determine how they can most efficiently be accommodated (e.g., handled within the AWIPS communication network). Maintenance of two separate NWS wide area networks should be avoided.

H. — Observation Networks

Despite the successful deployments of ASOS and the NEXRAD systems, many NWS constituencies express concern over the quality of the existing observational network and NWS' commitment to maintain and improve it. Concerns ranged from the adequacy of the current cooperative observer program, marine observation networks, and the Voluntary Observing Ship program, to efforts to centrally collect, quality control and disseminate all observational data. The quality of weather warning products and the ability to produce meaningful climate products are related to the continuity, representativeness and quality of the observational networks. Maintaining and upgrading it is a matter of basic importance that goes to the core of the NWS mission. Information gained during this study indicates parts of the network are threatened. Again, we could find no central office within Headquarters NWS that could be classed as the data or observation "guru" and no NWS-wide program to address or assign a priority to this many faceted issue. Funds to upgrade selected portions of the network are included in the proposed budgets. Sustainment and upgrade of the current observational infrastructure will have budget implications in out year budgets.

I. — Regional Non-Labor Budgets

NWS does not appear to have a detailed understanding of regional non-labor business practices and is not able to relate non-labor expenditures to the types and quality of services provided by WFO/RFCs. Likewise, we were unable to gain a comprehensive understanding of regional non-labor resource requirements. The fiscal resources involved with these budgets are large. If all regions operated at the same per location non-labor rate as the Central Region, substantial non-labor regional budget savings could be realized. NOAA should invest the effort to understand the true fiscal resources required to operate the WFO/RFCs.

SECTION XI. — SPECIFIC ISSUES

Two issues were identified as requiring special assessment: a) AWIPS functionality and its impact on programmed staffing levels and planned station closures and b) feasibility of plans to accelerate the closure of the Southern Region.

A. — Advanced Weather Interactive Processing System Assessment

- AWIPS functionality and station closures.

  At the onset of the restructuring program, NWS plans linked closure of a Weather Service Office (WSO) or residual WSO to AWIPS commissioning (availability of Software build 4). Available evidence indicates NWS has modified this linkage. While AWIPS deployment and use will be occurring during the same time period as WSOs and residual WSOs are being certified for closure, NWS does not believe closure is dependent on an operational AWIPS. In point of fact, all but a few closures (Redding and Riverside, CA, Olympia and Wenatchee, WA, Kahului, HI and Valdez, AL) will occur before scheduled AWIPS commissioning activities are completed.

- AWIPS functionality and "end-state" staffing model.

  The end-state staffing model is predicated on both AWIPS (with software build 6 functionality) and several productivity enhancing tools performing to design specifications. Failure of either to provide required forecaster productivity tools will impact validity of the model. While uncertainty exists as to the adequacy of both systems, discussions with the NWS staff indicates AWIPS is not the "long pole in the tent." Plans for the IFP, particularly the NCEP portion, require review and attention.

B. — The Regional Structure Of The Weather Service

The regional headquarters provide oversight, program management, technical, operational and administrative support to assigned field units and facilitate coordination of service programs that cross WFO boundaries with federal, state and local emergency managers and water management agencies. Additionally, they manage and orchestrate the myriad of activities necessary to implement modernization and restructuring plans and oversee actions to comply with P.L. 102-567 certification requirements at the WFOs and closing stations. Regional headquarters do not prepare or deliver forecast and warning products to the public. In FY 1996, NWS had a 292 FTE regional infrastructure consisting of six regions – four mainland (Eastern, Central, Southern and Western) plus the Alaska and Pacific regions.

A central tenet of NWS' Strategic Modernization plan has been to streamline the regional headquarters infrastructure after completion of the restructuring. While the 1989 Strategic plan did not provide details, discussions with the NWS senior staff revealed their intent was to replace the six region infrastructure with a three CONUS based structure. In FY 1994, DOC and NOAA recognized projected delays in the AWIPS deployment schedule and the critical role the regions play in accomplishing essential transitional activities associated with the NWS modernization and restructuring required continued funding of the SRH through, at least, FY 1999.

In order to operate within lower FY 1997 spending levels, NWS initiated a series of cost reductions actions. An acceleration (i.e., closure of the SRH and consolidation of administrative and program oversight functions for the Alaska and Pacific Regions in the Western Region Headquarters) of the regional realignment was one of many actions. It was a budget based decision.

A specific task assigned the team was to evaluate the feasibility of plans to accelerate the closure of the Southern Region. Although not specifically assigned we also included an evaluation of the feasibility of NWS plans to relegate the Alaska and Pacific regions to "element" status and the reasonableness of projected staffing levels at these regions. At the outset, we requested documentation on all realignment options considered and underlying analyses (i.e., studies identifying merits, pro's/con's, risk analysis, risk mitigation plans and costs etc.) along with an explanation of the rationale and decision logic used to select the NWS FY 1997 realignment position. We did not receive that information. During the many discussions we held with the NWS senior staff, we noted (Table 21 – Regional Headquarters Staffing Proposals) that while a realignment plan was sent to the Congress in March 1997, considerable uncertainty existed as to precisely how NWS planned to organize and staff the regions. During our meetings with the Regional Directors (RDs), we were provided with a plan they proposed in May 1997 that maintained the existing regional structure with reduced (i.e., essentially met NWS staff reduction goals) staffing at each region. The major labor differences between that plan and the early March 1997 NWS plan involve the Alaska and Pacific regions.

Given the realities of the Federal budget situation, the need to make the government more efficient and the projected regional headquarters management workload, I believe the NWS decision to reduce the staffing levels in the regional headquarters below the FY 1996 level (292 FTEs) was sound and will yield significant recurring savings (approximately $3 million). The central issue remaining is how to most effectively organize the regional infrastructure to manage and guide the field units through this critical period of the MAR and support public safety activities.

Table 21 – Regional Headquarters Staffing Proposals

(Full Time Equivalent)

Region	*FY 1996 FTE*	*Report to Congress*	*NWS ZBB Review*	*GAO Report July 97*	*NWS Plan Aug. 97*	*NWS Plan Sept. 97*	*RD Plan May 97*	*NOAA Review*
Eastern	57	58	59	59	58	59	45	45
Central	58	58	56	60	58	60	45	45
Southern	61	0	0	0	0	0	45	45
Western	49	58	54	58	58	58	45	45
Sub-total	225	174	169	177	174	177	180	180
Cost $M	$15.0M					**$12.0M**		**$12.4 M**
Alaska	39	20	20	34	20	31	36	35
Pacific	28	20	27	22	16	27	24	24
Sub-total	67	40	47	56	36	58	60	59
Total	**292**	**214**	**216**	**233**	**210**	**235**	**240**	**239**
Cost $M	**$19.5M**					**$16.3M**		**$16.5M**

Based on information from the senior NWS staff, we believe proposals to downgrade the Alaska and Pacific regions have been tabled. Considering the many MAR related actions that still must be accomplished, we support that position. Our recommended staffing for those regions agrees with that provided by the respective RDs. In conducting our analysis of the mainland regional structure, we evaluated the September 1997 NWS three CONUS region and the RD's four CONUS region structure. From a labor perspective, the difference between the plans is small (3 FTEs) – the latest NWS plan requires 177 FTEs and the RD's plan requires 180 FTEs. We looked at four factors: a) operational impacts, b) external customer impact, c) Regional Director views and d) cost impacts.

1. — Operational

Span of Control. The NWS proposal would, on average, require an RD to supervise 42 field units; the RD proposal would, on average, require supervision of 31 units. While the senior grade level of WFO/RFC supervisors will enable the RDs to effectively manage a larger than typical number of employees, the current level is stretching their capability. The supervisory ratio in the NWS proposal, is in our opinion, excessive.

Disruption to Field Units. The NWS proposal will require 43 operational units and approximately 50 closing units to transfer to new regions. This disruption would be minimal if the regions managed the field units in a similar manner, but NWS field management activities are decentralized and management approaches differ considerably from region to region. Thus in the midst of the AWIPS deployment and with station closures on-going, field supervisors would have to adjust to new management philosophies and requirements.

Impact on MAR activities. As was noted earlier, the regions play a major role in accomplishing MAR activities. A major restructuring and realignment of regional responsibilities in the midst of this will introduce further complexity to an already complex situation. Staffs at the three regions will have to rapidly get up to speed on a myriad of MAR issues at the realigned units and establish contacts with a host of citizens in affected communities.

2. — External Customer Impact

Many constituents in the Southern Region's area of responsibility, especially those in the states of Florida and Texas, believe the NWS proposed alignment will result in degraded severe weather mitigation support. The Emergency Manager community in particular perceive the resultant span of control in a three region alignment, coupled with the geographic remoteness of the Central and Eastern regions, will result in degraded support to their critical functions. Whether these fears are real or perceived they have caused a loss of confidence in a key NWS constituency. The Emergency Managers we met favor the four mainland region alignment over the current NWS plan.

3. — Regional Director's Views

Regardless of which regional alignment (four or three) is adopted, the RDs will have to make the structure work. We contacted each independently to determine their position. All were uniform in their preference for the four versus three region proposal. All indicated that required operational and transition work can be accomplished with the staffing levels proposed for the four regions (i.e., 180 FTEs in the mainland regions and 59 in the Alaska and Pacific regions). NWS, in August

1997, commissioned a study to assess the impact of the SRH closure on external customers. The study's team leader confirmed the RDs believe that a 4 (smaller staffed) CONUS regional structure is better and more effective than a three (with marginally larger staffs) region structure.

4. — Costs

We worked with the mainland RDs to develop a grade structure for their regions and applied FY 1998 salary and benefits to determine labor costs. The same grade demographics were then applied to the mainland regions in the NWS proposal and labor costs determined. The labor cost differences between both proposals are small (about $400,000). With the assistance of the RDs we developed a notional grade structure for a 45 FTE staffed region (Figure 2 – CONUS Regional HQ Structure).

The majority of a Region's non-labor budget is allocated to field operations. In both proposals, the total number of field units requiring support remain unchanged. Thus the non-labor cost differential in the 4 versus 3 Region plan is support to the 3 additional staff positions. We believe the cost differential to be minimal.

Were the SRH to close, NWS estimated one time closure costs would range from $1.2 million to $2.6 million to settle personnel issues, plus another $400,000 to integrate the existing wide area network into the Central and Eastern networks. Retention of four regions would avoid these costs.

5. — Summary

I believe closure of the Southern Region Headquarters and relegation of the Alaska or Pacific regions to sub-region status is <u>not</u> warranted at this time. The degradation in operational effectiveness of field support that would result from closure of the SRH at this point in the modernization outweighs the small dollar savings. NWS should maintain a 6 Region infrastructure with an aggregate staffing of 239 FTEs (180 FTEs in four mainland regions, 35 in Alaska and 24 in Pacific) until significant progress has been made with essential MAR activities. Nearer the completion of the restructuring, NWS should conduct an objective and comprehensive study to determine the optimum infrastructure (number and location of regions) to operate the modernized NWS.

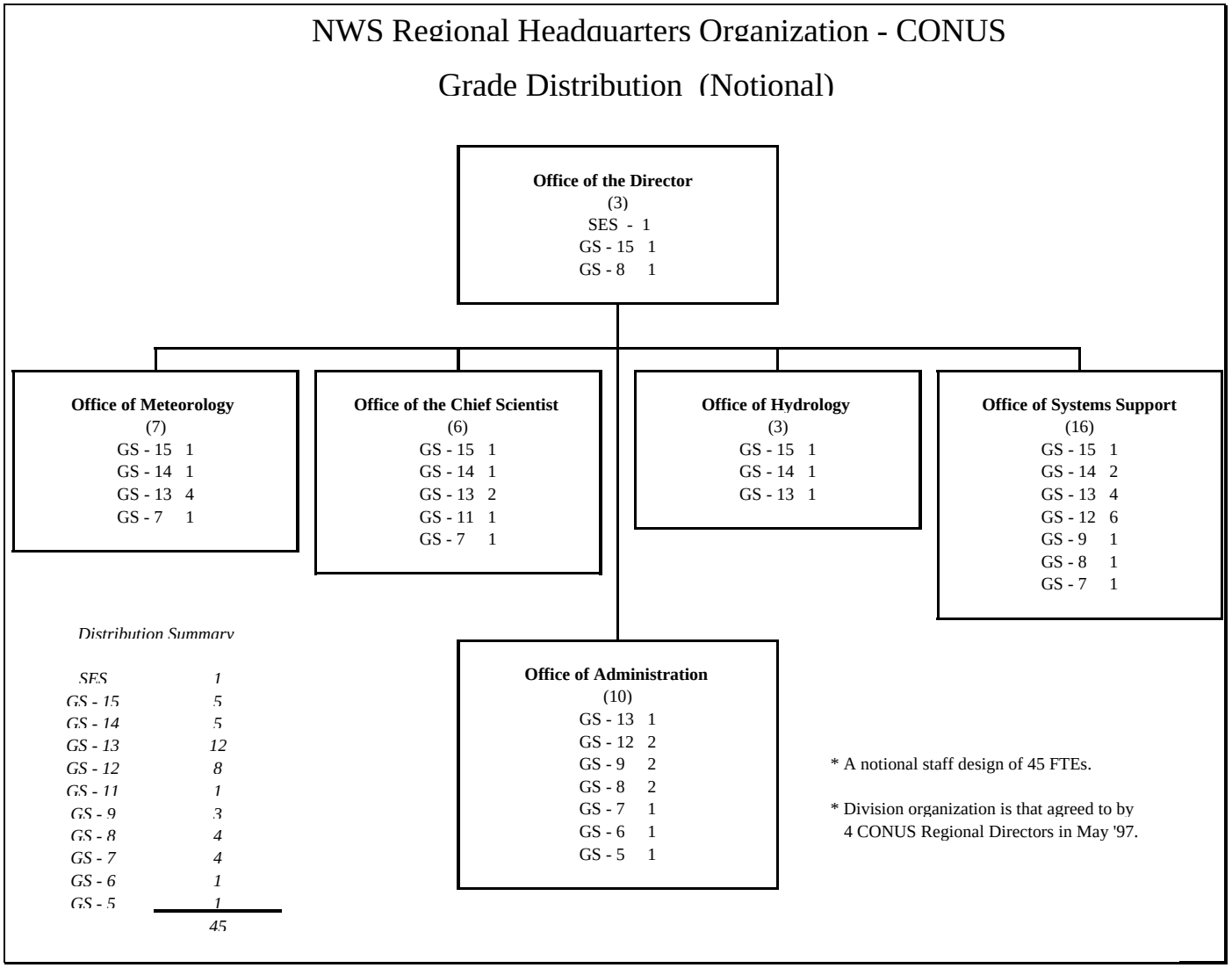

Figure 2 – CONUS Regional HQ Structure

SECTION XII. — CONCLUSIONS and RECOMMENDATIONS

Conclusions

- DOC and NOAA financial management information systems, coupled with NWS' complex budget structure, budget formulation/execution policies and management processes, limit visibility of operational and overhead costs and tracebility of these costs to products and services. This complicates NWS' ability to develop compelling and understandable justifications for new resources or continued support of existing resource levels.

- NWS requires additional base funding above the levels contained in the FY 1998 President's Budget and the FY 1999 OMB Submit.

- The dialog between NWS and many of its customers appear strained, at least in the view of the customers. Two constituents in particular were emphatic on the need for a change – Emergency Management community and commercial weather service providers.

- Culturally, NWS did not anticipate or accept the reality of a serious decline in government funding; plans to adjust to this possibility were not well developed.

- Overarching NWS plans for and procedures to manage common NWS-wide activities require improvement.

Recommendations

A. — DOC

- NWS requires funding of $680.1 million ($473.4 million in BASE plus MARDI, and $206.7 million in Systems Acquisition and Construction) for FY 1998 and $670.4 million ($498.7 million and $171.7 million) in FY 1999 to provide essential public services and complete modernization activities.

- Do not close the Southern Region (maintain 4 mainland structure) or relegate the Alaska and Pacific Regions to sub-regional status.

- Maintain a 6 Region infrastructure through the MAR (FY 2000 budget cycle) with an aggregate staffing of 239 FTEs (180 FTEs in 4 CONUS regions and 59 FTEs in Alaska and Pacific).

- Near the completion of the MAR conduct an objective and comprehensive (to include a risk analysis) study to determine the optimum infrastructure required to operate the NWS. Consider both internal and external aspects.

- The 1890 Organic Act contains some outdated wording and does not reflect the current capabilities of the private sector weather industry. Within NWS, government agencies (both Federal and local) and the private sector, disagreement exists as to what is the appropriate mission for and the level of services and products required from the NWS. A review (U.S. Congress or DOC) should be conducted to determine the NWS mission for the 21st Century and lead to an updating of the Act. Such a review should improve public awareness and thus the national consensus on what the nation wants from its weather service. Once a consensus is formed, a more meaningful budget to meet service requirements can be formulated.

B. — NOAA

1. — Technology Infusion

- Commission a panel of outside experts to review NWS technology infusion plans. The review should focus on Research and Development requirements and adequacy of funding, as well as the adequacy, timing and resource implications of NWS-wide plans to infuse new technology. It should also evaluate how the plan is linked to societal needs and gauge the value of the improvements gained via technical innovation to end users and NWS.

2. — Management and Budget

- Implement a financial management system that provides visibility on costs and assists with cost control and pricing equity. Hold Managers accountable for delivering services and controlling costs.

- Identify, at all stages of the budget process, the extent to which Adjustments to Base cover pay raises, locality pay and non-labor inflationary increases and assign dollars values. NWS should be required to provide attendant impacts.

- Initiate a detailed examination of regional non-labor expenditures to develop a method to control costs and maximize ROI. In addition to information on the non-labor costs of particular services, some measure of the quality of services provided by WFOs and region are essential. Until such an assessment is made, NWS should generally budget based on past behavior, remembering this propagates any current inefficiencies. The assessment should be completed to affect FY 1999 regional budget allocations. NOAA should also require NWS to standardize business practices across their six NWS regions.

- Create a Working Capital Fund to provide NWS managers control and flexibility in purchasing general purpose equipment and administrative services.

3. — AWIPS Program Management

- Streamline the NOAA and NWS management structure with an aim of reducing redundancy and inefficiency.

C. — NWS

1. — Management and Planning

- Implement a management process to oversee NWS-wide R/D, system evolution, technical infusion and refreshment activities. The process should integrate current and proposed efforts, establish goals, set priorities, define resource levels and specify milestones.

- Develop, like other government and private agencies, a defined process to generate requirements and program priorities. The process need not be overly formal or involve onerous documentation, but it must clearly provide a mechanism to state requirements, tie them to end-user needs, and allow for validation and prioritization. Both existing and proposed programs and initiatives should be prioritized with a corporate view by senior NWS policy officials. Once in place such a process will support resource allocation decisions among competing needs within the overall agency and insure NWS prudently and effectively allocates resources to satisfy organizational versus narrower goals.

- Develop a overall Strategic Plan for the post-MAR era. The plan would support and build on the NOAA Strategic Plan and clearly identify where NWS plans to go, how it will get there, and specific requirements, priorities and resources. Much of the planning and programmatic documentation for such a plan already exists in individual NWS offices. Many contain contributions from several offices or even other agencies, but they do not "hang together" in any way that reflect an overall corporate NWS approach to a coherent Strategic Plan. Instead, they represent individual offices' interpretation of their roles and responsibilities and allow them to individually interpret and execute its charge.

- Review the FY 1997 Headquarters realignment to insure it has completely separated policy from service provider functions. Once these functions are clearly separated NWS should carefully, objectively and continuously assess which services must absolutely be performed by government employees. Examples to consider for accomplishment by non-government agencies include operation of telecommunications systems, logistics functions, selected portions of NCEP's NCO, and functions performed at the NRC and NDBC.

- Assign a lead office within Headquarters NWS to manage and integrate the NWS-wide programs (e.g., training, communications, observation networks, "data" and cooperative institutes).

- Develop an aggressive NWS-wide plan to secure "buy-in" on MAR era business practices and procedures. Maximize use of field personnel with relevant experience in using AWIPS.

2. — Customer Dialog and Service Adjustments

- Establish some type of committee or panel wherein the Director of the NWS and key representatives of the Emergency Management community (National Emergency Management Association and National Coordinating Council on Emergency Management) meet throughout the year to mutually discuss issues, problem areas and programs and develop solutions. The committee/forum should be modeled along the lines of the existing National Emergency Management Association/Federal Emergency Management Association Mitigation Committee.

- Establish a similar arrangement with a small but representative number of the commercial weather industry.

3. — Budget Formulation and Execution

- Culturally, prepare to continuously improve services while reducing costs, and be able to demonstrate clearly and convincingly the long term as well as immediate impact of financial choices. Tight budget constraints and close scrutiny are continuing facts of life**.** The current budget "crisis" is not the last. Reductions can be anticipated to continue, and will worsen to the degree that an organization cannot convince the Administration or Congress that it is providing best value for money to meet well defined and prioritized needs of customers.

- Formulate the BASE budget in sufficient detail (both funding and FTEs) to facilitate internal and external review, analysis and decision making. To this end, a crosswalk should exist by office or Financial Management Category (FMC) with labor and non-labor breakdowns, that tracks the current appropriation and changes to out years, i.e., FY 1997 Appropriation, FY 1998 PB and FY 1999 DOC and/or OMB Budget Submission.

- Institute a management process and create, within the existing Management and Budget organization, a Program Evaluation function to routinely evaluate and analyze programs in terms of cost, effectiveness and efficiency and assess each with a corporate view as to the value of that program to the agency's overall operation. Such analyses would aid in determining budget priorities, program trades, defining the value of existing programs and time-phasing the implementation of and funding levels for new initiatives. Lack of such a system typically allows narrow organizational entities to determine resource allocation and results in a non-integrated budget plan that fails to coherently support organizational goals or strategic plans.

- Implement a financial management system that provides visibility on costs and assists with cost control and pricing equity. Managers should be held accountable in the performance of their duties for delivering services and controlling costs.

- Organize the ZBB data base to reflect approved budget submissions with any additional unfunded requirements clearly delineated in a separate category. The practice of mixing unfunded requirements with funded activities should be discontinued. Once ZBB data is provided for external review, NWS should guard against subsequent internal adjustments that are not provided to reviewers, e.g., official NWS charts provided to external NOAA officials refer to a need for $51 million over resources contained in the FY 1998 PB; actual ZBB data reflects a $56 million shortfall.

- Implement a process to evaluate and prioritize on a corporate basis (vice individual office or sector) those initiatives, programs or activities that receive in a given budget year no or partial funding, i.e., "unfunded requirements." During budget execution as additional funds become available the listing will serve as a guide to allocate funds to satisfy corporate priorities.

- Modify existing NOAA/NWS labor costing model to reflect actual grades and steps or, if that is not possible, use step 5.

- Conduct a thorough analysis to determine how to more accurately project benefit costs in the NOAA/NWS labor costing model.

- Continue with on-going efforts to relate budget requests to functional activities and resultant products and services. This budget formulation method would enable better traceability of expenditures to delivered products and services, spur the development of sound cost-benefit metrics, and form the foundation for application of quantitative methods to measure improvements in product delivery.

4. — AWIPS

- Everyone involved in the remaining AWIPS development and deployment activities need to strive to deliver a compliant and effective system and do it within the cap. All need to focus on cost containment.

- Streamline the current management structure with an aim of reducing redundancy and inefficiency.

- *Assign Individuals* vice committees and teams responsibly, authority and accountability.

- Identify a lead AWIPS system engineer now and give the individual sufficient authority and responsibility to accomplish necessary actions. Assistance via non-government agencies should be provided (e.g., contractor or FFRDC) to the selected individual. LDAD and security issues should be addressed as top priority items.

- Review AWIPS projected software maintenance for reasonableness and adequacy.

- Review both the AWIPS and N-AWIPS software to evaluate the extent of commonality and the long term feasibility and costs of using the GEMPAK software.

5. — Other Areas

- Increase efforts to publicize availability of maintenance dollars to cover expansion of the NOAA Weather Radio transmitter network. NWS has funds available to cover transmitter O&M costs associated with the new systems implemented as a result of the "Gore" initiative. For some reason, regional staffs, WFOs and emergency managers are unaware that these centrally managed funds are available for their use.

- Address and ascertain what is the appropriate mix of NWS and "soft money" funding to support EMC and NCEP operations.

- Determine the most cost efficient method to satisfy the field's total data requirements in the AWIPS-era. Strive to consolidate the Regional Wide Area Network within the AWIPS Communications Network.

- Review end-state staffing levels at the Jackson, KY and Guam WFOs; if necessary adjust programmed staffing levels.

SECTION XIII. — APPENDICES

Appendix A – NOAA TASK STATEMENT

Report /Mission:

In the next few months, NOAA and the Department of Commerce will need to determine the level of resources needed to operate the modernized National Weather Service (NWS). This report is required in a short time frame to assist NOAA and the Department in making resource allocation decisions for the FY 1998 NWS operating plan. NOAA and the Department of Commerce will need to understand the programmatic impact of the FY 1998 conference allocation for the National Weather Service and determine if additional resources are required to meet the criteria defined in the assumptions. In addition, resource information is needed for the FY 1999 Departmental budget request to Office of Management and Budget (OMB) to ensure that the criteria defined in the assumptions can be supported.

Recognizing that this time frame is short, we are requesting that the report contain sufficient analysis to determine the necessary resources, or indicate major areas of uncertainty and provide proposals on how to address those issues, consistent with the criteria defined in the assumptions. General Kelly is requested to provide an analysis and recommendations distinguishing between issues which need to resolved in the short term (e.g., FY 1998) and those which are longer term (e.g., FY1999 and beyond).

In particular, General Kelly should provide an assessment of issues associated with AWIPS functionality and staffing levels (including reductions) and NWS closure plans. He also is requested to analyze the operational regional infrastructure of the NWS as it affects the cost of delivery of services, with specific focus on the NWS plans to accelerate the closure of the Southern Region Headquarters.

Approach:

General Kelly will receive briefings as well as other requested information from NWS and other relevant parties (see Assumptions section). In addition, it is expected that General Kelly will meet with users of NWS products and services to include government and non-government groups and other interested parties such as state emergency managers, commercial weather service providers, and the National Research Council's NWS Modernization Committee, to discuss parameters which would affect the cost of weather service operations, such as timeliness, accuracy, responsiveness, communication and others.

General Kelly should assess the zero-based budget review information which will be provided by the NWS to establish a baseline cost determination of the existing programs. This assessment should consider the costs associated with:

> the current and projected staffing plan; (and, in particular, whether the FY 1998 President's budget is adequate to support this; and what resources are needed in FY1999);
>
> the current and planned modernized field office operations;
>
> the current and planned modernized weather office infrastructure, including the regional headquarters; and
>
> recurring requirements such as operations and maintenance, research and development, technology refreshment, service and product improvement, and training needs.

Outside Experts:

We recommend that General Kelly contact the following people as soon as possible to develop a work plan which would take advantage of their expertise. In parallel, we will contact them to discuss the specific

arrangements necessary to provide for their participation in this effort. One possible work plan and personnel assignment could be built upon the following:

Good – technology infusion – plans for both phasing and level of resources
Dutton – identify a priority list of issues which are important to the academic community
McMillion – identify a priority list of concerns with respect to weather services and emergency manager needs;
Dorman – review the cost of planned service and product improvements
Kaehn – assist in the evaluation of the NWS regional infrastructure, specifically focusing on NWS plans to accelerate the closure of the Southern Region Headquarters; and provide an assessment of issues associated with AWIPS functionality and staffing levels (including reductions)/NWS closure plans

NOAA Support:

NOAA will provide access to all information that is required to conduct this assessment, including briefing materials, budget and cost information, GAO and IG reports, staffing and modernization plans, and all other relevant documentation. NOAA will ensure that appropriate NOAA staff are made available to General Kelly for his support , including administrative and clerical, budget, technical and program management. Specific NOAA individuals that General Kelly has identified are being contacted to ascertain their availability.

NOAA will also arrange access to other appropriate government and non-government officials. We anticipate that briefings to Congressional staff will be necessary and NOAA will make the necessary arrangements for these meetings.

Office space in NOAA facilities in Silver Spring has been made available. NOAA will also pay for authorized travel, phones, fax, computer and other required support. NOAA will make appropriate arrangements to acquire additional support from contractors for budget or technical analysis expertise, if required.

Assumptions:

For purposes of preparing this report, General Kelly should base his analysis and recommendations or options on the following assumptions regarding the baseline for NWS modernization and service levels (detailed briefings will be provided to him on this):

FY 1996 current level of services and products, adjusted for permanent changes made as part of the FY 1997 budget shortfall, will continue in FY 1998-1999;

NWS modernization plan will be pursued and completed as currently defined and scheduled in he National Implementation Plan;

Staffing plan will be implemented as defined in the Human Resources staffing plan, adjusted for actions undertake in FY 1997 as part of the NWS streamlining plan;

NWS budget profiles defined in the President's FY 1998 budget request and run-outs, adjusted for Congressional actions;

Guidance established to address the FY 1997 budget situation can continue to be supported in FY 1998-1999. The guidance for FY 1997 is: (1) no direct impact on warning programs; (2) no reductions to modernization systems and schedules; and (3) no permanent staffing reductions in weather forecast offices and river forecast centers.

Deliverable and Time Frame

A report is request that will contain an assessment of the fiscal resources necessary to operate the modernized weather service, as defined in the National Implementation Plan, focusing on resource requirements for FY 1998 and FY 1999. The report should identify major cost uncertainties associated with the end state of modernization and provide recommendations and/or options on how to proceed with addressing these issues. The report will be due to the Under Secretary and the Secretary of Commerce 60-days from General Kelly's entry-on-duty (EOD) as a limited term SES appointment which will run for 90 days.

REPORT OUTLINE

I. Scope

II. Approach

III. Methodology

IV. Assumptions

V. Cost Analysis

Determination of the level of resources needed in FY 1998 and FY 1999 to proceed on schedule with weather service modernization and ensure that the current levels of services are supported, to include the cost of the following recurring fiscal requirements:

- Operations and maintenance
- Current and projected staffing plan
- Infrastructure to support current level of services and to meet modernization as defined in NIP
- Research and development
- Technology refreshment and infusion (both phasing and level of resources)
- Service and product improvement (including addressing concerns identified by the emergency management community)
  Training

VI. Specific Issues

- Assessment of issues associated with AWIPS functionality and staffing levels (including reductions) and NWS closure plans.

- Analysis of the operational regional infrastructure of the NWS as it affects the cost of delivery services, with specific focus on the NWS plans to accelerate the closure of the Southern Region Headquarters.

VII. Recommendations and/or Options

- Recommendation and/or options on levels of necessary resources necessary for FY 1998 and FY 1999 based upon the above analysis.

- Recommendations and/or options identifying major areas of uncertainty associated with the end state of modernization which would affect cost and proposals on how to address the uncertainties.

Appendix B – RECOMMENDED BUDGET for FYs 1998 and 1999

Table 22 summarizes the NOAA Review recommendations. This table is provided in the budget account terms commonly used by NOAA/NWS in order to provide a quick reference for this report. The same information is provided in the official NOAA budget structure on the following pages.

Table 22 – Recommended NWS Budget

FY 1998 Budget Summary			Presented in Simplified Structure
Pres. Budget	***NOAA Review***	***Delta***	($ in thousands)
			Operations and Research
377,157			NWS BASE **
73,674			MARDI
450,831	**473,400**	**22,569**	**Subtotal O&R (BASE and MARDI)**
			Systems
50,968	49,216	(1,752)	NEXRAD
9,835	9,695	(140)	ASOS
116,910	115,862	(1,048)	AWIPS/NOAAPort
13,910	13,910	0	Central Computer
191,623	**188,683**	**(2,940)**	**Subtotal Systems**
			Facilities
2,950	3,468	518	Facility Maintenance
13,823	13,823	0	WFO Construction
700	700	0	NCEP Construction
17,473	**17,991**	**518**	**Subtotal Facilities**
659,927	**680,074**	**20,147**	**FY 1998 TOTAL**

FY 1999 Budget Summary			*Presented in Simplified Structure*
OMB Submit	***NOAA Review***	***Delta***	*($ in thousands)*
			Operations and Research
405,987			NWS BASE **
64,036			MARDI
470,023	**498,650**	**28,627**	**Subtotal O&R (BASE and MARDI)**
			Systems
54,954	47,516	(7,438)	NEXRAD
11,971	12,111	140	ASOS
81,861	80,856	(1,005)	AWIPS/NOAAPort
15,500	15,500	0	Central Computer
164,286	**155,983**	**(8,303)**	**Subtotal Systems**
			Facilities
4,950	5,400	450	Facility Maintenance
9,526	9,526	0	WFO Construction
850	850	0	NCEP Construction
15,326	**15,776**	**450**	**Subtotal Facilities**
649,635	**670,409**	**20,774**	**FY 1999 TOTAL**

** -- Local Forecasts and Warnings, Central Forecast Guidance, and Atmospheric and Hydrological Research

A. — Budget Summary In Traditional NOAA Structure

Table 23 reflects the FY 1998 President's Budget in the NOAA budget structure format and compares it to the NOAA Review recommendations.

Table 23 – FY 1998 Budget in Traditional NOAA Structure

FY 1998 NOAA Budget Structure			
Pres. Budget	***NOAA Review***	***Delta***	***($ in thousands)***
OPERATIONS, RESEARCH, & FACILITIES APPROPRIATION			
			Operations and Research
308,000			Local Warning & Forecasts +
			(Includes $10,794k Increase - see Table 25)
73,674			MARDI
910			Radiosonde Replacement +
619			Susquehanna River Basin Flood System +
35,596			Aviation Forecasts +
418,799			**Subtotal Local Forecasts &Warnings**
29,543			Central Forecast Guidance +
2,489			Atmospheric and Hydrologic Research +
450,831	**473,400**	**22,569**	**Subtotal O&R (BASE and MARDI)**
			+ Baseline items/activities/programs
			Systems Acquisition
39,591	38,174	(1,417)	NEXRAD
5,341	5,341	0	ASOS
0	0	0	AWIPS/NOAAPort
8,000	8,000	0	Computer Facility Upgrades
52,932	**51,515**	**(1,417)**	**Subtotal Systems Acquisition**
503,763	**524,915**	**21,152**	**Subtotal , NWS direct-Funded O&R**
			Facilities
2,950	3,468	518	WFO Maintenance
506,713	**528,383**	**21,670**	**SubTOTAL, ORF**
CAPITAL ASSETS ACQUISITION APPROPRIATION			
			System Acquisition
11,377	11,042	(335)	NEXRAD
4,494	4,354	(140)	ASOS
116,910	115,862	(1,048)	AWIPS/NOAAPort
5,910	5,910	0	Central Computer
138,691	**137,168**	**(1,523)**	**Subtotal Systems Acquisition**
			Construction
13,823	13,823	0	WFO Construction
700	700	0	NCEP Construction
14,523	**14,523**	**0**	**Subtotal Construction**
153,214	**151,691**	**(1,523)**	**SubTOTAL , CAA**
659,927	**680,074**	**20,147**	**TOTAL**

Table 24 reflects the FY 1999 OMB Submission in the NOAA budget structure format and compares it to the NOAA Review recommendations.

Table 24 – FY 1999 Budget in Traditional NOAA Structure

FY 1999 NOAA Budget Structure			
OMB Submit	***NOAA Review***	***Delta***	***($ in thousands)***
OPERATIONS, RESEARCH, & FACILITIES APPROPRIATION			
			Operations and Research
333,150			Local Warning & Forecasts +
			(Includes $25,150k Increase - see Table 26)
64,036			MARDI
4,590			Radiosonde Replacement +
619			Susquehanna River Basin Flood System +
35,596			Aviation Forecasts +
437,991			**Subtotal Local Forecasts &Warnings**
29,543			Central Forecast Guidance +
2,489			Atmospheric and Hydrologic Research +
470,023	**498,650**	**28,627**	**Subtotal O&R (BASE and MARDI)**
			+ = Baseline items/activities/programs
			Systems Acquisition
45,298	38,346	(6,952)	NEXRAD
8,116	8,116	0	ASOS
13,189	13,189	0	AWIPS/NOAAPort
4,600	4,600	0	Computer Facility Upgrades
71,203	**64,251**	**(6,952)**	**Subtotal Systems Acquisition**
541,226	**562,901**	**21,675**	**Subtotal , NWS direct-Funded O&R**
			Facilities
4,950	5,400	450	WFO Maintenance
546,176	**568,301**	**22,125**	**SubTOTAL, ORF**
CAPITAL ASSETS ACQUISITION APPROPRIATION			
			System Acquisition
9,656	9,170	(486)	NEXRAD
3,855	3,995	140	ASOS
68,672	67,667	(1,005)	AWIPS/NOAAPort
10,900	10,900	0	Central Computer
93,083	**91,732**	**(1,351)**	**Subtotal Systems Acquisition**
			Construction
9,526	9,526	0	WFO Construction
850	850	0	NCEP Construction
10,376	**10,376**	**0**	**Subtotal Construction**
103,459	**102,108**	**(1,351)**	**SubTOTAL , CAA**
649,635	**670,409**	**20,774**	**TOTAL**

B. — Summary of Program Increases in the Budget Structure

According to NOAA policy officials, the FY 1998 President's Budget only partially restored mandatory personnel pay raises and adjustments for real inflation, and leaves an un-funded residual of $15.65 million. In the FY 1999 OMB Submit, the un-funded residual is $11.76 million.

Table 25 and Table 26 reflect the Program Change Increases in the FY 1998 President's Budget and FY 1999 OMB Submit (associated with Local Forecasts and Warnings) and compares them to the NOAA Review recommendations.

Table 25 – FY 1998 PB – Program Increases

Pres. Budget	*NOAA Review*	*Delta*	*($ in thousands)*
6,655			BASE Restoration
4,139			Mandatory Inflationary Costs Increases
10,794	**10,794**		**Total**

Table 26 – FY 1999 OMB Submit – Program Increases

OMB Submit	*NOAA Review*	*Delta*	*($ in thousands)*
18,000	18,000		BASE Restoration
1,650	0	(1,650)	MAROB
750	750	0	Lightning Data Network
4,750	0	(4,750)	Advanced Hydrological Prediction System
25,150	**18,750**	**(6,400)**	**Subtotal, Program Increases**
New Initiatives, separately Identified under Local Forecasts and Warnings			
3,680	**4,000**	**320**	**Radiosonde Replacement Network**
			(Increase of 3,680k over 910k - Total 4,590k)
28,830	**22,750**	**(6,080)**	**Total**

C. — NWS FTE Distributed By Funding Sources

Several sources provide funding for the FTE counted on NWS staffing rolls. Table 27 and Table 28 provide an overall summary. These tables reflect the FTEs contained in the FY 1998 President's Budget and the FY 1999 OMB Submission and compares them to the NOAA Review recommendations. It also compares each of these categories to the NWS FTE Streamlining Plan Targets for FY 1998 and FY 1999.

Table 29 and Table 30 show the distribution, in greater detail, within the NWS organizational structure.

Table 27 – NWS FY 1998 FTE Distribution

FY 1998 FTE Distribution Funding Source	*Pres. Budget*	*NOAA Review*	*Delta*
BASE/MARDI	4521	4598	77
Modernization Systems	219	219	0
NWS Direct Funded FTE	**4740**	**4817**	**77**
Other Funding Sources	222	222	0
TOTAL, NWS	**4962**	**5039**	**77**
FTE Streamlining Target	5070	5070	
DELTA	-108	-31	77

* In FY 1998, assumes that of the 373 FTE for Systems in the President's Budget, 219 FTE are allocated to the NWS and 154 FTE to other line offices;

Table 28 – NWS FY 1999 FTE Distribution

FY 1999 FTE Distribution Funding Source	*OMB Submit*	*NOAA Review*	*Delta*
BASE/MARDI	4401	4606	205
Modernization Systems	211	211	0
NWS Direct Funded FTE	**4612**	**4817**	**205**
Other Funding Sources	222	222	0
TOTAL, NWS	**4834**	**5039**	**205**
FTE Streamlining Target	4809	4809	
DELTA	25	230	205

* In FY 1999, assumes that of the 264 FTE for Systems in the OMB Submission, 211 FTE are allocated to the NWS and 53 FTE to other line offices

Table 29 – FY 1998 Recommended FTEs by FMC and Account

Organization.	*TOTAL*	*BASE*	*MARDI*	*FMAINT*	*ASOS*	*NEXRAD*	*AWIPS*	*FMP*	*REIMB*	*LINOFF*	*NIDS*	*NRCRVL*
Headquarters												
AA	94	82	0	0	0	0	13	0	0	0	0	0
OM	80	73	0	0	0	0	5	0	0	2	0	0
OH	82	50	0	0	0	3	21	0	8	0	0	0
OSD	73	62	0	0	0	1	10	0	0	0	0	0
NWSTC	30	26	0	0	0	4	0	0	0	0	0	0
NDBC	33	33	0	0	0	0	0	0	0	0	0	0
NCEP	371	366	2	0	0	0	1	0	0	2	0	0
CENTRAL	338	164	1	0	4	114	4	0	17	0	0	34
OSM	99	71	0	0	14	6	3	0	4	0	1	0
Subtotal HQ	**1,200**	**927**	**3**	**0**	**18**	**128**	**56**	**0**	**29**	**5**	**1**	**34**
Regional Headqtrs												
East Region	45	44	0	0	1	0	0	0	0	0	0	0
Southern Region	45	45	0	0	0	0	0	0	0	0	0	0
Central Region	45	44	0	0	1	0	0	0	0	0	0	0
Western Region	45	45	0	0	0	0	0	0	0	0	0	0
Alaskan Region	35	34	0	0	1	0	0	0	0	0	0	0
Pacific Region	24	22	0	0	0	0	0	0	3	0	0	0
Subtotal Regional HQ	**239**	**234**	**0**	**0**	**3**	**0**	**0**	**0**	**3**	**0**	**0**	**0**
Field	**3,600**	**3,345**	**90**	**0**	**14**	**0**	**0**	**0**	**151**	**0**	**0**	**0**
GRAND Total	**5,039**	**4,506**	**93**	**0**	**35**	**128**	**56**	**0**	**183**	**5**	**1**	**34**

Table 30 – FY 1999 Recommended FTEs by FMC and Account

Organization.	*TOTAL*	*BASE*	*MARDI*	*FMAINT*	*ASOS*	*NEXRAD*	*AWIPS*	*FMP*	*REIMB*	*LINOFF*	*NIDS*	*NRCRVL*
Headquarters												
AA	94	82	0	0	0	0	13	0	0	0	0	0
OM	80	73	0	0	0	0	5	0	0	2	0	0
OH	82	56	0	0	0	3	15	0	8	0	0	0
OSD	73	64	0	0	0	1	8	0	0	0	0	0
NWSTC	30	26	0	0	0	4	0	0	0	0	0	0
NDBC	33	33	0	0	0	0	0	0	0	0	0	0
NCEP	371	367	2	0	0	0	0	0	0	2	0	0
CENTRAL	338	164	1	0	4	114	4	0	17	0	0	34
OSM	99	71	0	0	14	6	3	0	4	0	1	0
Subtotal HQ	**1,200**	**935**	**3**	**0**	**18**	**128**	**48**	**0**	**29**	**5**	**1**	**34**
Regional Headqtrs												
East Region	45	44	0	0	1	0	0	0	0	0	0	0
Southern Region	45	45	0	0	0	0	0	0	0	0	0	0
Central Region	45	44	0	0	1	0	0	0	0	0	0	0
Western Region	45	45	0	0	0	0	0	0	0	0	0	0
Alaskan Region	35	34	0	0	1	0	0	0	0	0	0	0
Pacific Region	24	22	0	0	0	0	0	0	3	0	0	0
Sub-total Regional Hqs.	**239**	**234**	**0**	**0**	**3**	**0**	**0**	**0**	**3**	**0**	**0**	**0**
Field	**3,600**	**3,368**	**67**	**0**	**14**	**0**	**0**	**0**	**151**	**0**	**0**	**0**
GRAND Total	**5,039**	**4,536**	**70**	**0**	**35**	**128**	**48**	**0**	**183**	**5**	**1**	**34**

D. — NWS Modernization Program Budget

Table 31 summarizes the Modernization Programs by funding account, Table 32 shows the funding totals for each Modernization System.

Table 31 – NWS Modernization Program Budgets by Account

($K)

Line Item	*FY 1998 Pres. Budget*	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY 1999 NOAA Rvw*
Capital Acquisition Account (CAA)				
NEXRAD	11,377	11,042	9,656	9,170
ASOS	4,494	4,354	3,855	3,995
AWIPS	116,910	115,862	68,672	67,667
Central Computer	5,910	5,910	10,900	10,900
System Acquisition (ORF)				
NEXRAD	39,591	38,174	45,298	38,346
ASOS	5,341	5,341	8,116	8,116
AWIPS	0	0	13,189	13,189
CENTRAL COMPUTER	8,000	8,000	4,600	4,600
Capital Acquisition Account (CAA)				
WFO Construction	13,823	13,823	9,526	9,526
NCEP Construction	700	700	850	850
Facilities (ORF)				
WFO Maintenance	2,950	3,468	4,950	5,400
Total	**209,096**	**206,674**	**179,612**	**171,759**
Difference	**2,422**		**7,853**	

Table 32 – NWS Modernization Systems Budget Summary

	FY 1998 Pres. Budget	*FY 1998 NOAA Rvw*	*FY 1999 OMB Submit*	*FY 1999 NOAA Rvw*
Systems Totals (CAA + ORF))				
NEXRAD	50,968	49,216	54,954	47,516
ASOS	9,835	9,695	11,971	12,111
AWIPS	116,910	115,862	81,861	80,856
Central Computer	13,910	13,910	15,500	15,500

Appendix C – ANALYSIS of NOAA/NWS LABOR MODEL

A. — Summary

An analysis of the NOAA/NWS labor model used to generate the labor budget requests was conducted. The main goal of the analysis was to determine if the model accurately represents NWS' current labor demographics, spending and business practices. Three specific areas of the model were closely examined:

basic compensation (i.e., salaries)
other compensation (e.g., premium pay and differentials)
personnel benefits

Based upon preliminary analyses, three major issues were identified:

(1) is the practice of costing MARDI and other modernization accounts at step 1 and BASE at step 4 appropriate given the current NWS labor mix
(2) are the percentages used in the budget for other compensation reflective of actuals
(3) are the percentages used in the budget for benefits reflective of actuals.

Recommendations were based upon existing budgeting practice, historical variances between budgeted amounts and actuals, and the current/projected NWS workforce demographics.

The analysis revealed that the current NWS labor modeling process very slightly over estimates required labor resources. This is the result of a very small under estimate in basic compensation/salaries (because the NWS staff is on average above step 4), a very small under estimate in other compensation (largely due to actual overtime usage) and an over estimate in the benefits rate (compared to 1992-1997 year to date actuals). Details regarding each of these findings are presented below.

B. — Basic Compensation/Salaries

The NOAA budget guidance (NOAA Budget Handbook Chapter 5, Appendix H and all other applicable updates by NOAA and DOC) requires NWS budget analysts to cost all program change FTEs (i.e., modernization accounts) at step 1. In addition, the NWS budget analysts cost all other accounts at step 4. We estimated the cost of 4,869 FTEs (the actual number of FTEs in August 1997) using their actual grade and step and compared that to an estimate with all the labor at step 4. Although modernization accounts (e.g., MARDI) are actually costed (in the zero base budget) at step 1, 90% of the FY 1998 FTEs are costed under the step 4 scenario (to simplify our analysis we costed all FTEs at step 4).

Our analysis shows that costing all FTEs at step 4 versus their actual step underestimates the basic compensation by 2.4%. An analysis of the 4 largest pay grades, GS11, GS12, GS13 and GS14, (which accounts for 75% of the NWS labor force) shows that the weighted average

step for these four grades is 4.86 (see Table 33 – NWS Average "Steps" for the Four Major Grades). If the NOAA/NWS labor model were to use an average step of 5 (instead of 4) the estimate would increase by 2.8% (very close to the 2.4% shortfall). **We recommend that the NOAA/NWS labor model use step 5.** A better long term solution would be to price labor based upon the precise grade/step of each member of the NWS workforce.

Table 33 – NWS Average "Steps" for the Four Major Grades

Grade	*Number of FTEs**	*Average Step*
GS 11	1,080	4.96
GS 12	1,247	4.24
GS 13	998	5.25
GS 14	304	5.70
Total	**3,629**	**4.86**

*total FTEs as of 30 August 1997 was 4,869

C. — Other Compensation/Differentials

We examined fiscal year 1992 through year to date 1997 actuals for other compensation. Other compensation (or differentials) falls largely into four categories:

Overtime
Night Pay
Sunday Pay
Holiday Pay

There is also a very small but immaterial amount of Hazard Pay and Foreign Pay in the actuals (there is no budget, however, for Foreign Pay and Hazard Pay in FY 1998 and 1999). The 1992 to 1997 average for other compensation (as a percent of Basic Compensation) is 6.0%. The 1996 actual is 5.9% and the 1997 YTD actual is 5.5%. The budgeted amounts are only 5.2% in FY 1998 and 5.3% in FY 1999 (see Table 34 – Other Compensation as a Percent of Basic Compensation). This is primarily due to the fact that the budgeted Overtime appears significantly lower (in 1998 and 1999) than NWS actuals. **We recommend the use of 5.9% for both FY 1998 and FY 1999.** It should be noted that NWS applies other compensation/differentials in accordance with NOAA guidance (e.g., 3% for overtime and 10% for night pay) and they apply the NOAA guidance only to those in the workforce to whom a particular differential applies. Therefore, NOAA budget analysts can **NOT** use the 5.9% in future budget exercises. A separate memo will document our recommended factors for future budget exercises.

Table 34 – Other Compensation as a Percent of Basic Compensation

	1992-97 Average	*1996 Actual*	*1997 YTD*	*1998 Budget*	*1999 Budget*	*NOAA Review Recommendation*
Overtime	1.8%	1.9%	1.5%	1.2%	1.2%	1.8%
Night Pay	1.5%	1.5%	1.5%	1.6%	1.7%	1.6%
Sunday Pay	1.3%	1.3%	1.3%	1.2%	1.2%	1.3%
Holiday Pay	1.4%	1.2%	1.2%	1.2%	1.2%	1.2%
Total	6.0%	5.9%	5.5%	5.2%	5.3%	5.9%

D. — Personnel Benefits

We examined benefits for fiscal years 1992 through 1997. We found significant increases in the budgeted amounts in FY 1998 and FY 1999 (versus 1992 through 1997 actuals) for three benefits categories: (1) cash awards, (2) FICA and (3) health benefits. We verified that where NOAA or DOC budget guidance exists, the recommended or required percentages were used.

For Cash Awards, the NOAA guidance has historically resulted in budgeted amounts which are higher than what NWS actually spends. Therefore, we recommend lowering the percentage slightly (to 1.4%).

For FICA, while we appreciate that their is a migration of NWS staff **from** accounts where FICA is not applied **to** accounts where FICA is applied the increase (from a historical average of 3% to over 6%) is not consistent with the number of FTEs that will be migrating to the FICA accounts. **Given, this situation we recommend setting FICA at 3.5% for both FYs 1998 and 1999**.

Finally, while health care costs are certainly rising the 1998 increase from a historical average of around 7% to almost 9% (in FY 1998) is not justified. **We recommend holding health care benefits at 6.9% for both FY 1998 and FY 1999 (6.9% was, in fact, the actual budget request for FY 1999).**

Table 35 – Benefits as a Percent of Basic Compensation – summarizes our findings and Table 36 – Recommended Benefits as a Percent of Basic Compensation – shows our recommended benefits percentages for FYs 1998 and 1999.

Table 35 – Benefits as a Percent of Basic Compensation

	1992-97 Average	*1996 Actual*	*1997 YTD*	*1998 Budget*	*1999 Budget*
Cash Awards	0.8%	1.0%	1.2%	1.6%*	1.6%*
COLAs	1.3%	1.4%	1.4%	1.5%	1.4%
PCS	2.9%	2.2%	0.9%	2.0%	1.6%
FICA	**	3.0%	3.1%	6.3%	6.4%
Health	**	6.8%	6.7%	8.8%	6.9%
Life Ins.	**	0.2%	0.2%	0.3%	0.3%
Retirement	21.0%	10.7%	11.0%	11.9%	12.7%
Total* **	26.0%	25.4%	24.6%	32.4%	30.8%

* NOAA actually requires 1.5% of Basic PLUS Other Compensation. This percentage is of Basic Compensation only.
** included in Retirement.
*** MAY not add due to rounding.

Table 36 – Recommended Benefits as a Percent of Basic Compensation

	1998 Budget	*1999 Budget*
Cash Awards	1.4%	1.4%
COLAs	1.4%	1.4%
PCS	2.0%	1.6%
FICA	3.5%	3.5%
Health	6.9%	6.9%
Life Ins.	0.3%	0.3%
Retirement	11.5%	12.0%
Total	27.0%	27.1%

E. — Conclusions

For our cost analysis we have increased Basic Compensation by 2.4%, increased Other Compensation from budgeted amounts of 5.2% and 5.3% (for FY 1998 and FY 1999) to 5.9% for both years, and lowered Personnel Benefits from 32.4% and 30.8% (for FY 1998 and FY 1999) to 27.0% and 27.1%. The "net" result of these two increases and one decrease is about a **1% overall decrease**. That is, given the same number (and grade/step) of FTEs our recommended adjustments will produce a labor cost estimate that is 1% lower than what NWS currently budgets and it will represent a more accurate projection of the individual labor and benefits accounts.

We recommend the following:

1. That the NOAA/NWS labor model use step 5 for all pay grades if actual grades and steps (based on the most current NWS labor demographics) can NOT be used. Further, the NWS demographics should be verified annually and the "step assumption" should be adjusted as necessary.

2. Further examination of Cash Awards, Health and FICA accounts be conducted to determine why there are significant differences between the estimates produced using NOAA/DOC budget guidance and the NWS actuals.

3. If recommendation #1 is **NOT** accepted, the NWS model should be used unchanged. The benefits and other compensation rates can **NOT** be lowered without increasing the basic compensation (by estimating at step 5 or by using the actual grade and step of the current NWS workforce).

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Appendix E – ACRONYMS

ASOS..... Automated Surface Observing Systems

AWC..... Aviation Weather Center

AWIPS..... Advanced Weather Interactive Processing System

CPC ..... Climate Prediction Center

CWSU ..... Air Route Traffic Control Center Weather Support Unit

DCO ..... Data Collection Office

DL ..... Distance Learning

DOC ..... Department of Commerce

EMC ..... Environmental Modeling Center

GOES NEXT ..... Next Generation Geostationary Operational Environmental Satellite

HPC ..... Hydrometeorological Prediction Center

ICWF ..... Interactive Coded Weather Forecast

IFP ..... Interactive Forecast Preparation

LOC..... Lines of Code

MAR..... Modernization and Restructuring

MPC ..... Marine Prediction Center

NCEP..... National Center for Environmental Prediction

NCF ..... Network Control Facility

NCO ..... NCEP Central Operations

NDBC..... National Data Buoy Center

NESDIS ..... National Environmental Satellite and Data Information Service

NEXRAD..... Next Generation Weather Radar

NIP ..... National Implementation Plan

NLSC..... National Logistics Support Center

NOAA..... National Oceanographic and Atmospheric Administration

NRC..... National Reconditioning Center

NWS ..... National Weather Service

NWSTC ..... National Weather Service Training Center

OAA ..... Office of the Associate Administrator

OFCM..... Office Federal Coordinator of Meteorology Services

OH..... Office of Hydrology

OM ..... Office of Meteorology

OSD..... Office of Systems Development

OSO..... Office of Systems Operations

PB..... President's Budget

QPF ..... Quantitative Precipitation Forecasting

RD ..... Regional Director

RFC ..... Regional Forecast Center

RSC ..... Remote Sensing Center

SOO..... Science and Operations Officer

SPC..... Storm Prediction Center

SRH..... Southern Regional Headquarters

TPC ..... Tropical Prediction Center

TWC..... Tsunami Warning Center

WCM..... Warning and Coordination Meteorologist

WFO..... Weather Forecast Office

WSO..... Weather Service Office

ZBB..... Zero Based Budget