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FUTURE OPTIONS FOR THE RESTRUCTURING AND REORGANIZATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

A report prepared for:

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Under Secretary of Commerce for Oceans and Atmosphere

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PREFACE

Environmental challenges confront us every day: the impacts of severe weather -- hurricanes, tornados, floods, droughts -- on human life and property; changing climatic conditions brought on by El Nino and other shifts in global patterns; growing problems due to lack of water resources; degradation of our coastal ocean and marine environments due to over development and pollution, leading to loss of valuable living marine resources; and problems of over fishing and resultant loss of valuable food stocks. The list of problems and challenges is daunting. Which is why it is critical that, as a Nation, we address these challenges head on.

In many ways, our vulnerabilities are greater today than in the past. For example, changing demographics have exposed more of our population than ever to potential impacts from severe weather and environmental changes. The cost of environmental disasters and mismanagement of our Nation's environmental resources, both in terms of human lives and economic losses, is tremendous. Globally, these same environmental issues can lead to destabilization in other countries that engender conflicts and threaten our own national security.

For the past 32 years, NOAA has served as the Nation's premier environmental science and service agency. Through its programs, NOAA has provided the American public with timely forecasts and warnings of impending severe weather, managed our valuable marine fishery resources, and served as steward for our vast coastal ocean resources. But in the decade ahead the challenges are far greater. We need not only to continue to deliver services to the public; we need to do it better, more efficiently, and above all more effectively. Moreover, we must fashion NOAA's mission and organizational structure in a way that will allow us to take advantage of the latest in scientific knowledge, technology, and resource management approaches to address an ever-expanding range of environmental problems.

The PRT process concluded that NOAA is not currently organized in a way that maximizes our potential and allows us to meet the challenges ahead. The purpose of this report is to look at future options for restructuring and reorganizing the agency to achieve that goal … to create a NOAA that is positioned to best meet and contribute to the solution of the domestic and global environmental challenges that lie ahead.

Timothy R.E. Keeney
Deputy Assistant Secretary
for Oceans and Atmosphere
September 27, 2002

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INTRODUCTION

On February 1, 2002, NOAA Administrator and Under Secretary for Oceans and Atmosphere, VADM Conrad C. Lautenbacher, Jr., invited all NOAA employees to consider and provide responses to three critical questions concerning the Agency's future. The three questions were:

1. Is the NOAA organization aligned with its current missions and future missions? If not, what are your recommendations for change, near term and/or long-term?
2. Are there significant imbalances in resources versus requirements? If so, what are your recommendations for change, near term and/or long-term?
3. Are we being as efficient as possible in meeting our current and future mission tasking? If not, what are your recommendations for change, near term and/or long-term?

The comments provided by NOAA employees and the follow-on deliberations of the NOAA Program Review Team (PRT), concluded that while NOAA is generally doing a good job in executing current missions and in providing relevant products and services to the Nation, there is room for improvement … that NOAA is not currently organized in a way that maximizes our potential and allows the Agency to meet the challenges that lie ahead.

The PRT stated in its report, that NOAA should specifically identify where the Agency ultimately wants to go and to move toward that future structure:

> *"... a future NOAA structure to align with future missions over the next five years and beyond."*[1]

In response to the PRT recommendation, Under Secretary Lautenbacher, requested additional study, to provide greater detail before making any final recommendation.

> *"I concur with the PRT recommendation on the need for a future NOAA structure to align with future missions. Because structure is a critical question, I am tasking a cross-line team, led by the DAS for Oceans and Atmosphere, to further assess options and report back to me in 3 months with detailed proposals, including a preferred option and plan to achieve that option."*[2]

The report that follows responds to the above tasking. It is designed to provide a more in depth look at the issues surrounding any restructuring and reorganization of NOAA, the pros and cons of various proposed organizational structures, and steps that would be required to achieve this result.

WHY RESTRUCTURE AND REORGANIZE?

Restructuring and reorganization of any organization represents a significant event. It is something that should never be undertaken lightly. Changes of this magnitude can be extremely disruptive, costly, and in the end create more problems than they resolve. On the other hand, there are good and sufficient reasons for exploring and undertaking such changes. Organizational structures can outlive their usefulness – they can become

[1] NOAA Program Review, Report to VADM Conrad C. Lautenbacher, Jr., USN (retired), Under Secretary of Commerce for Oceans and Atmosphere, May 2002, p. 11.
[2] Memorandum for the Honorable Donald L. Evans, Secretary of Commerce, June 2002.

cumbersome, entrenched and bureaucratic; they can fail to incorporate new technologies and ways of conducting business; lose their flexibility to deal effectively with changing external conditions; and moreover, lose their ability to truly accomplish the missions for which they were created.

Is NOAA's current organizational structure out of date? Is the Agency positioned to be responsive to the President's Management Agenda: to be citizen-centered, not bureaucracy-centered; results-oriented, and market-based, actively promoting rather than stifling innovation through cooperation? As the Agency has added new legislative mandates and programs, as its budgetary resources have grown from $283 million in 1970 to over $3.0 billion in 2002; as new technologies have emerged; as we have gained new understanding about Earth systems; and as new environmental challenges have presented themselves, it is reasonable to ask if the organization of the Agency has kept pace with these developments. Is NOAA structured to meet its evolving and future missions? Based on comments received from NOAA employees, the deliberations of the PRT and Mission Working Group, and the general perceptions of many outside the Agency, the consensus appears to be that it is not!

The environmental challenges that lie before us, as a Nation, are of a magnitude greater than we have ever faced in the past. The expectation of our stakeholders, on our ability to respond, is higher than it has ever been. Confronting these challenges demands a new look at how we conduct our business day-to-day, how we ensure that the resources that are available to NOAA are utilized in a way that will best meet NOAA's missions and goals and draw from the Agency the best in science, service, and stewardship for the American public. In the end, any restructuring and reorganizing of NOAA is about making sure that the Agency is organized in a way that will best achieve the future that we envision. That is why this task is so important.

Historical Evolution of NOAA's Organizational Structure

To get a sense of how NOAA's mission and current organizational structure came about, it is useful to look back at the establishment of the Agency and its evolution over the past 32 years. The National Oceanic and Atmospheric Administration (NOAA), was created by Presidential Executive Order in 1970.[3] NOAA's creation was, simultaneously with the establishment of the Environmental Protection Agency (EPA), part of a major reorganization of Federal efforts to develop, "knowledge, and effectively ensure the protection, development and enhancement of the total environment itself."[4]

Drawing on the work of the Stratton Commission, NOAA was formed out of components from: the Environmental Science Services Administration (ESSA), including the Weather Bureau, Coast and Geodetic Survey, and the Environmental Data Service; the Bureau of Commercial Fisheries from Interior; the National Oceanographic Data Center and Instrumentation Center from the Navy; the National Data Buoy Project from Transportation; the Office of Sea Grant Programs from NSF; and elements of the U.S. Lake Survey from the Army.

In signing the order establishing NOAA, President Nixon said that he expected NOAA would *exercise leadership in developing a national oceanic and atmospheric program of research and development* ... and that the Agency would continue to provide services to government, industry,

[3] Reorganization Plan No. 4, signed by President Richard M. Nixon, July 9, 1970, 15 U.S.C. 1511
[4] Ibid.

and private individuals which have become essential to the efficient operation of transportation systems, our agriculture and our *national security*.[5]

The initial organizational structure for NOAA was largely the product of bringing together existing organizations from different Federal departments and agencies under a newly established NOAA headquarters structure that included: an Administrator, Deputy Administrator, and an Associate Administrator (all Senate confirmed); three new Associate Administrators (for Environmental Monitoring and Prediction, Marine Resources, and InterAgency Relations), and two Assistant Administrators (one for Administration; one for Environmental Modification).[6]

In its early years, NOAA was essentially, "the old ESSA with some new parts fitted in," and even Robert White, the first Administrator was quoted as saying he was "the first to admit NOAA is more like a collection of the groups that came into it than a coherent Agency."[7] In many ways, this characterization of NOAA has followed the Agency over the past 32 years. Despite restructurings and reorganizations along the way, many of the current NOAA components remain (and retain) vestiges of the very elements that went into the Agency's creation back in 1970.

From an overall management perspective, the early NOAA structure was characterized by strong (independent) operational components and a layer of management, represented by the Associate Administrators, whose job was to coordinate policy, represent the Agency externally, and deal with 'politically' charged program issues.

Throughout the 1970's, NOAA's program scope and responsibilities saw tremendous growth as Congress enacted major environmental legislation and assigned it to the Agency. These included the Coastal Zone Management Act (CZMA), the Magnuson Fishery Conservation and Management Act, the Endangered Species Act, Marine Mammal Protection Act, and the National Marine Sanctuaries Act, to cite just a few.

With these legislative changes came adjustments in the NOAA organizational structure. For example, the enactment of the CZMA resulted in the creation of a new Assistant Administrator for Coastal Zone Management. Other new programs assigned to relevant components of the Agency, resulted in the establishment of new program offices. In all, the legislative changes to NOAA's mandate over the past 32 years have been fairly dramatic; they have served, in many ways, to change the outlook of the Agency and its role and mission within the Federal structure.

Since the establishment of NOAA there have been seven different changes made to the structure.[8] Some of these restructurings were major, but most were minor in scope. One of the most significant reorganizations of the Agency occurred in early 1982 under Administrator John Byrne. It resulted in the elimination of the Associate Administrator positions and the establishment of the five NOAA Line Offices that serve as the basic underlying structure for the Agency today. This structure simplified the overall organization (combining the Environmental Data Service and National Environmental Satellite Service); created the National Ocean Service (incorporating the National Ocean Survey) to oversee the many new pieces of ocean related legislation that had been enacted; and folded the Office of Sea Grant into a new Office of Oceanic and Atmospheric Research (incorporating the Environmental Research Laboratories).

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[5] Emphasis added.
[6] NOAA Organizational Chart, March, 1972.
[7] The Politics of the Ocean, Edward Wenk, Jr., University of Washington Press, 1972.
[8] See Appendix B for a fuller discussion of NOAA's organizational changes from 1970 to the present.

Despite the efficiencies achieved in this reorganization of the Agency and in its appropriation and budget structure, it was still largely characterized (as it is today) by the same components that made up the original structure. If anything, the elimination of the coordinating layer of management represented by the Associate Administrators further strengthened the position of the Assistant Administrators of the Line Offices and solidified the "stove-pipe" nature of the Agency.

As the PRT noted in its report, "Many employees cited NOAA's history as the reason for our current organizational structure and the *lack of corporate identity*. They pointed out that NOAA is not the result of any explicit design process, but instead was formed by combining several disparate organizations which have never fully merged. NOAA's line office structure is largely decentralized, with separate line offices primarily responsible for its (their) own strategic direction, policy implementation, and operations. The existing whole of NOAA is, in many ways, a sum of parts originally combined in 1970 to form the Agency."[9]

> *The centerpiece to improving our ability to meet current and future missions is the development of a corporate NOAA identity ... a coordinated "one Agency" approach is crucial to accomplishing NOAA's mission.*
>
> *PRT Report*

Making NOAA Work Better

In 1993, NOAA undertook its first major attempt to define an overall mission and establish a set of interrelated goals for the Agency. The resulting NOAA Strategic Plan, "A Vision for 2005,"[10] is illustrative in that for the first time the Agency recognized that there was something more to NOAA than just carrying out legislative mandates through its established organizational line offices -- that there were cross-cutting relationships and synergies to be explored and developed. New environmental challenges, such as those presented by global climate change, demand more of the Agency ... "a sharper focus on issues, ways of breaking down old structures and unlocking and creating new ways of addressing issues, creating structures that work more on horizontal than vertical lines ... working across Agency boundaries – blurring them into virtual organizations.[11]

The NOAA Strategic Plan received accolades as a pilot effort under the Government Performance and Results Act. It attempted to force a new way of thinking throughout the Agency. Seven cross-cutting strategic planning teams were established, with line office representation, to review existing programs and develop new initiatives. Four teams were established under 'Environmental Assessment and Prediction': 1) Advance Short-term Warnings and Forecasts, 2) Implement Seasonal to Inter-annual Climate Forecasts, 3) Predict and Assess Decadal to Centennial Change, and 4) Promote Safe Navigation; and three teams under 'Environmental Stewardship': 1) Build Sustainable Fisheries, 2) Recover Protected Species, and 3) Sustain Healthy Coasts.

The new strategic planning process proved that the old (i.e., current) NOAA organizational structure was not working. It showed that there were potential synergies and efficiencies to be gained by opening up programs to cross-Agency review. It forced the Agency to begin to work together in ways it had never done before ... challenging program managers to work more

[9] PRT Report, p. 26.
[10] NOAA Strategic Plan, September, 1998
[11] Ibid, p.17 Executive Summary.

collaboratively with their counterparts in other line offices. And, importantly it began the process of sensitizing NOAA employees to a broader corporate view of NOAA and its missions.

But this process was not without its faults. While it was envisioned that the new goal structure might eventually lead to organizational changes, none occurred. Attempts to convince the Department, OMB, and importantly the Congressional appropriations committees to use the new strategic planning structure to evaluate budget requests and new initiatives, largely failed to win support. While new cross-cutting programs and working relationships were forged, the teams tended to support each other's line office input rather than making hard decisions as to what should be supported and what should be curtailed or eliminated. In the end the Assistant Administrators and Line Offices had the final say!

Overall, however, the ideas and efforts embodied in the strategic planning process have paved the way for rethinking the Agency's mission and focusing on how NOAA should best be structured to carry out its mission.

What works? What doesn't?

One of the problems with changing organizational structures is that usually some elements of the existing structure work well. The challenge is to get at the elements that are not working without destroying what is working.

NOAA's current strengths lie in its recognized operational and research programs.

- The public forecasts and warnings issued by the National Weather Service (NWS) are the most recognizable strengths. This is an area where NOAA excels. The modernization of the Weather Service, built around the the NEXRAD radar system, has resulted in significant improvement in forecast skill level, extended forecasts, and the ability to issue more timely public warnings of severe weather events.

- The GOES and Polar-orbiting satellites, operated by the National Environmental Satellite, Data, and Information Service (NESDIS), provide 24hr. monitoring of our Earth environment and the means for early detection of potential severe and threatening weather. New cooperative efforts with NASA and DOD are reaping benefits. The National Climatic Data Center provides researchers, the government, and the private sector access to working archives of some of the most scientifically important and significant data on our earth systems.

- The modernized nautical charts and tide and current predictions produced by the National Ocean Service (NOS) are providing both commercial and private interests with the tools needed for safe navigation of our waterways and safe and efficient operations of our Nation's ports and harbors. NOS's growing portfolio of coastal observation and assessment products and services, its oversight of our Nation's marine and estuarine sanctuaries, and collaborative work with coastal States, is building a strong base for guiding future sustainable development of our valuable coastal resources.

- NOAA scientific research, carried out under the aegis of the Office of Oceanic and Atmospheric Research (OAR) is recognized in many areas as being "world class." In the climate area NOAA in-house and extramural sponsored research has been at the heart of the many advances that have been made over the past decade in unlocking the mysteries

surrounding global climatic variations and why they occur. NOAA has led the way in the development and delivery of leading edge climate products and services both domestically and internationally. The NOAA TOGA/TAO array in the Pacific provides the key early warning indicator of shifts in El Nino.

- The National Marine Fisheries Service (NMFS) constant struggle to balance resource conservation with fishing pressure has led to innovative management techniques for highly migratory fish stocks, protected species, and restoration of important habitats. The establishment of management regimes for important commercial and recreational species, and elimination of over fishing in our exclusive economic zone (EEZ) by foreign operators had arrested the downward spiral in many fisheries.

NOAA's current organizational structure has been successful in carrying out specific legislative mandates and programs. But, it has not been without criticism from both inside and outside the Agency. The current 'stove piped' structure has had two significant effects on the Agency as a whole. One, is that it has tended to ***stifle creativity and cooperation*** across line offices. Despite some successes, for the most part there is still little true horizontal communication or program collaboration across NOAA. This has contributed to the second significant effect, that of ***duplication of effort*** and competition due to overlapping missions.

One specific example of this discussed in the PRT process deals with ocean observing systems. The PRT found that the decentralization of observing responsibilities in the line offices and the lack of a common architecture has made it difficult to ensure that observing systems are designed to provide maximum value to NOAA, are not duplicative of existing systems, and are operated in a cost-effective manner. This results in lost opportunities to develop and build more robust observation systems.[12]

Unfortunately, there are other examples of where program efforts in the respective line offices are either working on the same or a similar issue or worse yet, competing with each other. This same criticism was also reflected in a number of the employee comments, which suggested that the current organizational structure could diminish efficiency and effectiveness, especially by causing problems of overlapping and incompatible missions and duplication of effort.

There are other criticisms, as well, which have been made of current NOAA operations that deserve to be noted and looked at in the context of considering future organizational options. These include:

- Inequities in resource allocation between weather/climate programs and ocean/fisheries/marine programs.[13]
- Poor levels of coordination with relevant external Agency interests and in building international partnerships in science and resource management.
- The lack of useful social and economic data to apply to Agency decision making processes, particularly where resource management issues are involved.
- Poor infrastructure planning and support for programs; particularly facilities, with no coherent investment plan.

[12] See fuller discussion in the PRT Report, p. 163, Appendix 3-2

[13] Employees, the PRT, and Mission Working Group identified several specific examples where there are significant imbalances in resources versus requirements: (e.g., in hydrographic surveys and marine transportation systems, in meeting fisheries management needs, and in facilities, safety, and compliance. PRT Report, p. 68.

- Ineffective administrative processes across the board; including procurement and grants management; weaknesses in the financial accounting system, and a confusing and complex budgetary formulation and execution process.
- A broken personnel system for recruitment, hiring, and retention of the best talent.
- A lack of focus on human capital, professional development, and workforce planning for the future.

Other criticisms touch on the subject of how NOAA research is organized and conducted:

- The lack of relevance of some of NOAA's research work to operational and resource management program requirements.
- The apparent inability to easily transition research results into operations (e.g., the inability to "operationalize" the climate program).
- The lack of explicit and consistent research priorities and a clear policy on in-house vs. extramural research.
- The perception in the academic community and beyond that NOAA's ocean and fisheries science is weak.
- The continuing lack of sufficient scientific, environmental, and socio-economic data to legally back up fisheries management decisions.

Some of these issues can be addressed without restructuring or reorganization, but in a many cases the underlying problems point to structural and cultural weaknesses in the Agency. Clearly there are significant continuing problems in the **administrative support** area, which are hobbling the Agency's ability to make real strides in the future. These need to be addressed or all other changes will be for naught. There are also serious issues surrounding how NOAA's **research** program is organized and conducted. This was a significant topic of discussion and heated debate both in the PRT and in the Mission Working Group deliberations. These areas need to be addressed regardless of the outcome of the debate over reorganization.

Program Review Team Recommendations

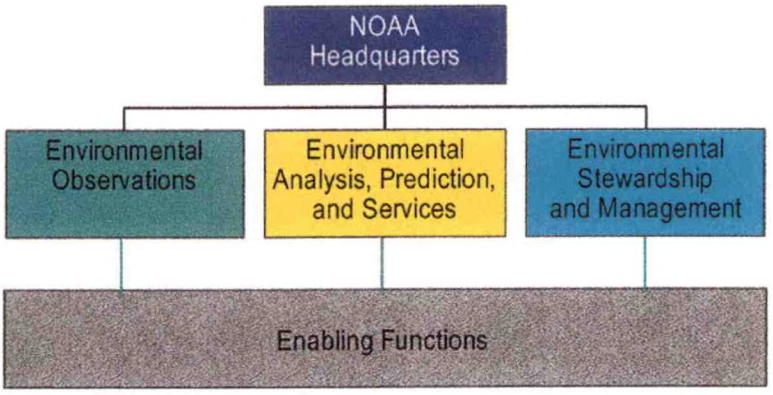
The PRT process has been extremely useful in identifying not only problems but also importantly, opportunities for improving NOAA in a number of areas. There are a number of important points that can be gleaned from the Team's deliberations and its report concerning the subject of Agency restructuring and reorganization

The PRT used the Administrator's three questions posed to NOAA employees and their responses. In all, some 243 responses were received, with over 500 individual comments – interestingly, the majority of these employee responses dealt with some form of organizational change. Employee suggestions ranged from realignment of individual programs to complete reorganization of the Agency.

Overall, the PRT concluded that NOAA is generally doing a good job in executing current missions and in providing relevant products and services to the Nation. But, in line with many employee comments, the PRT felt that NOAA's future did depend on some form of restructuring – moving away from the existing line office structure to one that reflects the interdisciplinary and multidisciplinary nature of the challenges facing society, one that builds on core strengths in forecasting, environmental observations and stewardship, and one that identifies and overcomes the limitations of the current organization.

It is important to note that the PRT envisioned NOAA evolving toward a suite of products and services based on discrete functions, *with clear implications for the future organizational structure* of the Agency. As a starting point, the PRT put forward a conceptual 'high-level' structure for the Agency consisting of three major components: 1) Environmental Observations, 2) Environmental Analysis, Prediction and Services, and 3) Environmental Stewardship and Management.[14]

Vision for a Future NOAA 2007 and Beyond
Figure 1.1 Program Review Team Report



The PRT 'high level' model is perhaps the most important piece of organizational thinking to emerge from this process. It envisions a future for NOAA that is bold, different, and most importantly one that recognizes the value of building strong integrated functional elements. The model suggests a future NOAA with capabilities to provide the Nation with a global to local environmental observing system, fully integrated environmental analysis and predictions; and improved environmental management. It abandons the 'traditional' organizational structure of 'stove piped' organizations, with limited ability to work horizontally across lines to attack common problems.

While this model is not sufficient in and of itself to describe a future NOAA organization, it has had a significant impact on the thinking of Agency, members of the PRT, the Mission Working Group, and on the ideas that have gone into the development of the 'preferred model.' … most notably, the creation of a stand alone observations function and the establishment of the positions of Associate Administrator for Environmental Assessment and Prediction (EAP) and Associate Administrator for Environmental Management(EM). The PRT suggested that NOAA's future missions build on current capabilities to provide the Nation with integrated environmental analysis and prediction; environmental management and service; a global to local interdisciplinary observing system; ocean discovery; and environmental literacy.

The PRT was, however, quite conservative when it came to recommending major structural changes or reorganizations in the Agency. The closest that the PRT came to addressing the issue of organizational structure was in its debate over a proposed organizational structure which was put forward by the PRT Chair.[15]

[14] PRT Report, p. 3
[15] PRT Report, p. 27, Figure 3.1 Note: This model is discussed in further detail under the section 'Options for Restructuring and Reorganization of NOAA.'

That structure would:

- Consolidate NMFS, NOS, NESDIS Ocean Data, and OAR Marine Research into a single Oceans, Coasts, and Fisheries Organization.
- Consolidate all environmental observations systems planning and acquisition into a single line office.
- Distribute some of OAR's research activities, with its climate and weather research activities consolidated with NESDIS and NWS weather and climate programs.
- Established a new Program Planning and Integration office with matrix management across line offices.

A majority of the PRT member voted against the proposal expressing concerns that it could exacerbate the division between atmospheric and oceanic programs. Aside from a few recommended lab transfers, the PRT rejected any near-term shifts in the current line office structure, concluding that the cost of any immediate reorganization would likely outweigh the benefits. The PRT did, however, recommend a number of changes in the NOAA headquarters structure, aimed at strengthening operations, including the creation of a program analysis and evaluation function.[16]

One interesting point to emerge from the PRT's deliberations was its view of the importance of using 'matrix management' to help overcome some of the Agency's coordination problems. The PRT fully supported the use of matrix management as *a tool* for moving NOAA towards a more integrated structure. To help achieve this, the PRT recommended the creation of the new position of Assistant Administrator for Program Planning and Integration – a recommendation that has been accepted by the NOAA Administrator and is being implemented.[17]

In its defense, the PRT did not have the time to thoroughly consider various reorganization options, but the position which it took also reflects the underlying culture of the Agency and its unwillingness when pressed to agree to or support significant changes in the traditional line office structure that has existed, essentially unchanged, for 32 years.

Overall, the PRT process was excellent in identifying a number of issues and problems in the Agency. The scope and breadth of the issues raised by the members is impressive given the short time frame in which the review process took place. The recommendations are well formulated and provide a range of actions that should help NOAA improve its overall operation. The PRT's willingness to acknowledge that the current NOAA organizational structure might not be optimal is refreshing; its high level conceptual vision of a future organizational structure presents an exciting new look at what might be the NOAA of the future.

Mission Working Group Deliberations

In response to the recommendations of the PRT and the tasking by the Administrator, a cross line office 'Mission Working Group' (MWG) was formed to consider future organizational structures for NOAA, recommend a preferred option, and the steps to achieve that goal.[18] The Working Group held several meetings to review and discuss the PRT findings. Three sub-groups tackled

[16] PRT Report, p. 28, See Figure 3.2
[17] PRT Report, p.21, Section E.
[18] The Mission Working Group members included: Timothy R.E. Keeney, DAS; David P. Rodgers (OAR); Ronald Baird (OAR); Louisa Koch (OAR); H. Lee Dantzler (NESDIS); Jack Hayes (NWS); RADM Nick Prahl (OMAO); Rebecca Lent (NMFS); Douglas L. Brown (NOS); and Mary Glackin (NESDIS).

the subject of NOAA's mission, looking at: 1) Environmental Prediction, 2) Environmental Management, 3) Environmental Services, Ocean Discovery, and Global to Local Observations.

The discussions produced some interesting observations and surprisingly similar comments across the three groups. Among the general points of agreement reached were the following:

- **Creation of an Environmental Assessment and Prediction (EAP) and Environmental Management (EM) mission focus for the Agency** was the right basic structure for a future NOAA organization; each headed by an Associate Administrator. The MWG agreed that these two areas reflect NOAA's basic competencies and form a framework within which other key NOAA competencies (e.g., People, Scientific Excellence, and Environmental Observations) can be placed in a consistent organizational context. The precise definitions of EAP and EM were not, however, determined. The crucial issue revolved around the location of scientific activities, which support management actions and whether EAP should be a service provider to EM, or EM more of a self-sufficient entity.

- **Endorsement of the PRT recommendation calling for establishment of a Program Planning and Integration (PPI) office** headed by an Assistant Administrator; with the general functions described by the PRT.

- **Support for the idea that all observation activities, or at least major observation systems, should be centralized**, including satellites and data buoys. The Group did favor including ships and aircraft in this centralization (although it should be noted, OMAO did not). There was no definitive agreement, however, on whether the centralized observations would be in a stand-alone organization or under EAP. As in other areas, the precise definition of "observations" was not determined, leaving some ambiguity about exactly which activities would be transferred to the new office. In particular, some members questioned the merit of transferring certain observation activities that serve only one office or division.

- **Establishment of an Assistant Administrator for Research and Development (modifying the responsibilities of the current AA) to serve as a focal point for strategic, non-operational science.** The "new" AA for Research would have mainly a crosscutting and coordinating role, but would have some authority over R&D funds under a matrix management approach. The MWG agreed that there needs to be a balance in resources and responsibilities between a centralized research organization and EAP and EM, which would allow the efficient and effective development of new science capabilities and their timely implementation into operations. The exact balance was not, however, agreed to by the MWG.

- **Consolidation of EM regional activities into a regional structure to facilitate delivery of services and a "single point of contact" for constituents.** While not explicitly agreed to, there was also support for retaining the idea of co-location of facilities wherever possible in the field and otherwise increasing coordination. NOAA's substantial regional presence (e.g., NWS, NMFS, NOS, Sea Grant) offers an unrealized opportunity to improve NOAA's corporate presence and services with its users. Consideration of any NOAA organizational realignment should realize this potential. The MWG believed that the delivery of EM services should be accomplished through consolidation at the regional level. On the other hand there was also agreement that NOAA should not be structured like EPA, with a single, unified regional structure with program authority and mini-Administrators in each region.

The Mission Working Group discussed several specific organizational models with variations for both a transition phase as well as a final NOAA organizational structure. The primary difference in these models was the placement of the centralized observations office and the degree to which the research function was distributed through out the organization. All of the models reflected a basic structure built around the EAP and EM missions, inclusion of the new Program Planning and Integration function, and the retention of an Assistant Administrator for Research.

Developing A Strategic Plan

The process of revising the NOAA Strategic Plan began this past July. Thus far, regional meetings with stakeholders have been held in Seattle, New Orleans, Boston, Washington, D.C. and Boulder. While it is early in the process, there are a number of interesting comments emerging that relate to how NOAA's mission is viewed and bear on the future organization of the Agency. Most stakeholders, for example, see fewer organizing themes for NOAA -- four as opposed to the current seven in the existing Strategic Plan. These include: 1) Commerce and Economic Development, 2) Protection of Life and Property, 3) Healthy Oceans, Coasts, and Coastal Communities, and 4) Environmental Awareness and Knowledge.

Stakeholders have also expressed support for much greater investments in educating the public on environmental issues, increased reliance on the use of innovative partnerships to accomplish NOAA's missions, and improvements in basic research and the transition from basic to applied and on to operational application.[19] What comes across in the comments is that stakeholders want NOAA to think and act in a more integrated way, and work more across the current line office structure to deliver integrated products and services. It is important that any proposed new organizational structure for NOAA be assessed in the light of the final theme areas that emerge from the strategic planning process, to ensure that the structure is responsive to those themes and the final goals and objectives.

DISCUSSION

Several issues raised by employee comments, the PRT process, the Mission Working Group deliberations, and by external stakeholders, deserve further discussion as they bear on the question of NOAA's future organizational structure.

Policy and Program Considerations:

Research – More than any other topic the subject of how to address research in NOAA came under the most intensive scrutiny and comment in both the PRT and Mission Working Group processes. It is clear from the debate that the current structure for research in the Agency is not working well. This is no way meant to demean NOAA's research programs. In many areas, such as in atmospheric and climate research, NOAA science and scientists are considered to be of 'world class' stature. But as important as stature and quality is the responsiveness of NOAA research to meeting mission requirements. While one can point to examples of where NWS has gained operationally from OAR directed research, there are far fewer examples when it comes to the transfer of research results into operational programs in either NMFS or NOS. Further, in its report, the PRT suggested that there was *a need for improved coordination and oversight of NOAA's research activities*, including an increased commitment to competitive research and the need to leverage partnerships at all levels.[20]

[19] The reference to "basic research" is as defined in the DOD research topology (i.e., 6.1 research)
[20] PRT Report, p. 5

Employee responses raised the issue of how research activities should be organized, whether they should be centralized or decentralized. The PRT preferred option was to maintain the existing "hybrid" of centralized and decentralized science and research activities, with possible alignment of the labs along thematic lines in order to improve coordination … the PRT also stated, "regardless of the organizational structure, *NOAA needs to ensure that research is responsive to the needs of NOAA's operating programs*."[21]

Two complementary approaches would go a long way toward addressing the weaknesses of the current research structure. One is to assign funding responsibility to program managers so that they can have a direct say in what research is carried out in the Agency. If the in-house capability is not up to the task, then they can search elsewhere to get the work done. Second is to consolidate NOAA's lab structure under one 'National Lab' with a Director who answers to senior policy and program management officials. Combined, these strategies would help ensure accountability and responsiveness of research to furthering mission requirements. It would also provide the basis for better integration of NOAA's many laboratory facilities reporting under a new structure and even through the creation of virtual laboratories using scientists from other organizations. Moreover, it would allow for streamlining (i.e., elimination) of those laboratories, which are not performing, have lost touch with the NOAA mission, are 'living off' of reimbursable work, or are otherwise not of sufficient national caliber.

Resource Management – One of the key challenges in the future is how to improve NOAA's basic capacity in the area of resource management. We currently produce management plans for various fishery species; use the CZMA state grant program as a carrot and stick to encourage good coastal practices; operate a National network of sanctuaries and reserves to conserve and protect special areas, and protect habitats and endangered species. All of this in general contributes to 'better' management and stewardship. But we are seriously deficient in the science of resource management; in the capacity to look at new ways of managing environmental resources. We lack the intellectual capacity to bring all of this together and form an understanding of the social and economic consequences of different approaches and decisions we make. Reorganizing NOAA's environmental management activities provides an opportunity to build this important new capacity for the future, which will be of increasing importance.

Climate – Public awareness and concern over global climate change is increasing. This places increased pressure on NOAA to improve the scientific understanding (and evidence) regarding the nature of the change and its potential natural impacts and societal consequences. It also places increased pressure on NOAA to develop information that can support both national and international decision making processes and products and services that will help the private sector and individuals respond in a rational way. NOAA needs an organizational focal point for its climate related activities to meet the demands of the future.

Hydrology – A future mission for NOAA that is evolving is *water*. Water is fast becoming, if not already, the next major global crisis. The recent World Summit on Sustainable Development in Johannesburg highlighted the role of water in alleviating world poverty, improving health and sanitation conditions, and building sustainable communities. NOAA has an important role to play in water forecasting and prediction. In a recently issued report, the National Research Council cited the need for a national hydrologic program to develop new techniques for measuring water, including remote sensing and *in situ* techniques, improved forecasts of the hydrologic cycle over a range of time scales and on a regional basis, increased understanding and ability to predict the frequency and cause of floods and droughts, and assessments of the

[21] PRT Report, p. 32; also see PRT Appendix 3-4, p.171-178

hydrologic impacts of global change. As with climate, NOAA needs an organizational focal point for its hydrology and water related activities to meet the demands of the future.

Observations – The PRT noted that consolidation of NOAA's observing systems would support a more integrated and efficient NOAA. There appears to be a consensus on this point. NOAA should not build separate and discrete observing systems to meet narrowly defined program requirements. It is not only costly and duplicative, it is a poor way to manage and build the robust earth observing system that will be needed in the future. The PRT went part of the way recommending that NOAA "centrally plan and acquire all observing systems through a single office, but it did not support adding operations and maintenance of systems."[22] This approach basically maintains the status quo. There is no reason for saddling program offices with operations and maintenance. Placing all activities together would help ensure that individual systems are not duplicative and they take full advantage of multiple use possibilities. It would also ensure that they are designed, built, and operated to satisfy 'NOAA' mission requirements.

Regulatory Functions – Like it or not, NOAA is in the regulatory and enforcement business. In the past the Agency has been schizophrenic about how to incorporate this function into its operations, but it should be recognize that regulation and enforcement is a legitimate and important tool in carrying out resource management and ensuring good stewardship of our natural resources. One way to do this is to strengthen this function by consolidating disparate activities now spread across NMFS, NOS and in the General Counsel's office into a new separate structure to provide oversight and direction for all of NOAA's regulatory and enforcement activities. This would have the added advantage of addressing the concerns expressed by many that the regulation and enforcement function is not sufficiently 'independent' from program management.

Information - NOAA's role as an information resource makes it a key player in what has come to be called the "knowledge economy." NOAA is unique among Federal agencies in its ability to capitalize on this new area. NOAA's weather and climate related data, assessments, forecasts, and prediction already support a $400-700 million private sector industry. There is great potential in other areas such as in mapping and charting and in coastal resource management to promote the dissemination of 'knowledge' and spur the development of new private sector commercial enterprise. This will require an organizational model for NOAA in the future that is focused on customers and supports the formation of new 'business' partnerships to exploit new technologies for dissemination of information and to create new opportunities for innovation.

Technology – Any future NOAA organizational structure should also exploit to the maximum extent possible new and evolving technologies for linking different elements of the Agency together. This would involve the development and application and more sophisticated 'Web-based' access to NOAA data that can be can be applied in program analysis and decision-making. It would allow for significantly improved coordination of national programs and crosscutting programs, creating in effect"virtual" organizations within the Agency's organizational structure. NOAA derived data and information should be available in an easy to access form that promotes cross-utilization and exploration of new ways of looking at old problems. Developing this capability would serve as a complement to and important tool for the new Program Planning and Integration Office, allowing NOAA to develop the matrix management approach envisioned by the PRT. [23]

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[22] PRT Report, p. 30; also see PRT Appendix 3-2, p.163-169

[23] For a more detailed discussion of external trends likely to impact NOAA over the next 5-10 years, see Appendix D, Executive Summary of the Hudson Institute Trend Analysis, September 2002.

Management/Decision Structures:

Lines of Authority – It is important that the any future (or interim) organizational structure for NOAA have absolutely clear lines of authority. Nothing undermines an organization more than blurred or confusing authorities, with managers and Agency leadership 'tripping' over one another. It should be clear what each individual in the organizational structure has responsibility for, where decisions are made, and who controls the resources. This should be codified in official organizational descriptions, reflected in individual manager's performance plans and in their subsequent evaluations, and importantly, practiced in day-to-day operation of the Agency.

Corporate Culture – Much has been said about building a "corporate NOAA." This is a laudable goal. It is one that has been attempted repeatedly in the past. It should be recognized, however, that changes in the organizational structure alone will not achieve this goal. It will take a concerted effort on the part of the Agency leadership to bring this about. One place to start is with the senior management team, the NOAA Executive Committee (NEC) and the NOAA Executive Panel (NEP). Individual member contributions and performance on these respective management oversight groups needs to be continuously evaluated and rewarded, in terms of their level of commitment to the Agency as a whole – or they should be replaced! Changing long-established patterns of behavior will not be easy. But such change is essential if we are to build a new foundation for the Agency's future.

Accountability vs. Responsibility – Agency managers are accountable for how well they manage the resources (both financial and human) to which they are entrusted and how well their programs are executed. But an organizational model that simply relies on accountability will not create the kind of NOAA that is envisioned. This is in no way meant to diminish the importance of accountability in organizational management, but managers need to understand that they are also 'responsible' for the achievement of the overall NOAA mission. They need to be actively engaged in taking 'ownership' for issues and working across organizational lines to bring about the best solutions. This is a model that carries with it a higher level of risk, but it is also one that brings greater rewards. Managers should be recognized and rewarded for successes in this area.

Flexibility – Predicting the future is difficult, which is something NOAA understands perhaps more than many. We can't be sure that whatever organizational structure and arrangements are put in place will be perfect. We need to build in the flexibility to change if we see that things are not working as they were envisioned. The present budget structure and organization structure at NOAA is too rigid and too hard to change or 'fine-tune' without mounting a major effort and expenditure of resources. The clearance process alone is so time consuming that it dissuades one from initiating the changes that are necessary. One element of this organizational change should be an agreement to establish thresholds that give the NOAA Under Secretary greater latitude to change the organization at operational levels without having the strictures imposed by Departmental Orders, OMB reviews, and Congressional reprogrammings.

Budget, Administrative, and Resource Considerations:

Budget Structure – The NOAA budget structure has become overly complex and difficult for many outside the Agency to understand. In part, this is because the budget attempts to serve too many masters: the Department, OMB, and the Congress, and various constituencies. Each expects to see his or her special interest or program displayed to their satisfaction. The attempt to create a detailed cross-walk of the budget to the current strategic planning structure underscores the nature of the complexity of this problem and the level of resources required to maintain these systems. The number of line items in the NOAA budget needs to be significantly reduced to a

manageable and understandable level. At present there is a serious disconnect between the Agency's budget formulation and execution. NOAA needs a simpler budget structure, one that aligns how funds are requested with how they are spent, and with the outcomes that will be expected. Without a breakthrough in this area any organizational change will be superficial at best!

Human Resources – NOAA's strength is in its workforce of exceptional quality and dedication. But not enough has been done to nurture and ensure that this will continue in the future. This is an important organizational issue, because without the right people in place and good succession planning any organizational structure can falter. Weaknesses in leadership and management competency set up the conditions for breakdowns in communications and coordination, duplication of effort, and ineffective program delivery. One of the underpinnings of the future NOAA organization needs to be a strong human resources program. The personnel process in NOAA is not working to the benefit of the Agency. NOAA should seek special authority from the Department and OPM to institute new flexible hiring and pay for performance systems. This would aid in attracting strong non-governmental candidates to key senior SES and ST positions.

NOAA also needs to institute an active rotational programs for employees at all levels to break down cultural barriers and broaden the base of new 'NOAA' employees. Many individuals have spent a career working in one of NOAA's line offices without ever having the opportunity to learn about, work in, or contribute to programs in other areas of the Agency. While there are many specialty professional fields within the Agency that make such moves difficult, there are also a number of areas, particularly involving management positions, where such rotations should take place. The current lack of movement of personnel within the Agency has contributed to the 'stove pipe' structure and a culture that is inward looking.

Administrative Processes – Another underpinning of the future NOAA organization needs to be efficient and effective administrative processes that take full advantage of evolving information technology. Current administrative processes in NOAA from procurement and grants management to financial management, are too labor intensive and slow. The current system is a not only a drain on Agency resources it is more importantly a drain on program delivery and professional credibility … limiting the flexibility of program managers and drawing out the time lines for accomplishing program goals. The introduction of the Department's CAMS system has been too slow and has yet to produce any efficiencies or savings. The regional administrative support structure under the Administrative Service Centers (ASC's), which report to the Department, has further complicated NOAA's ability to introduce and carry out consistent administrative policies in support of field operations. One step that should be taken to deal with the range of administrative issues facing the Agency is to establish a strong Chief Executive Officer position reporting to the Under Secretary. The functions of Chief Financial Officer (CFO) and Chief Administrative Officer (CAO) should be separated from one another and report independently to the CEO so that these areas are accorded the senior management direction and oversight that is needed.

Performance Measures – As part of the existing strategic planning process, NOAA undertook the development of performance measures to provide a guide to the effectiveness of the Agency in meeting the seven goals that were outlined in the Strategic Plan. For the most part, the measures that were developed were too technical and complex to understand. Each organizational element in the future NOAA structure needs to have a clear mandate and a set of performance measures against which to assess its contribution to meeting Agency goals and missions.

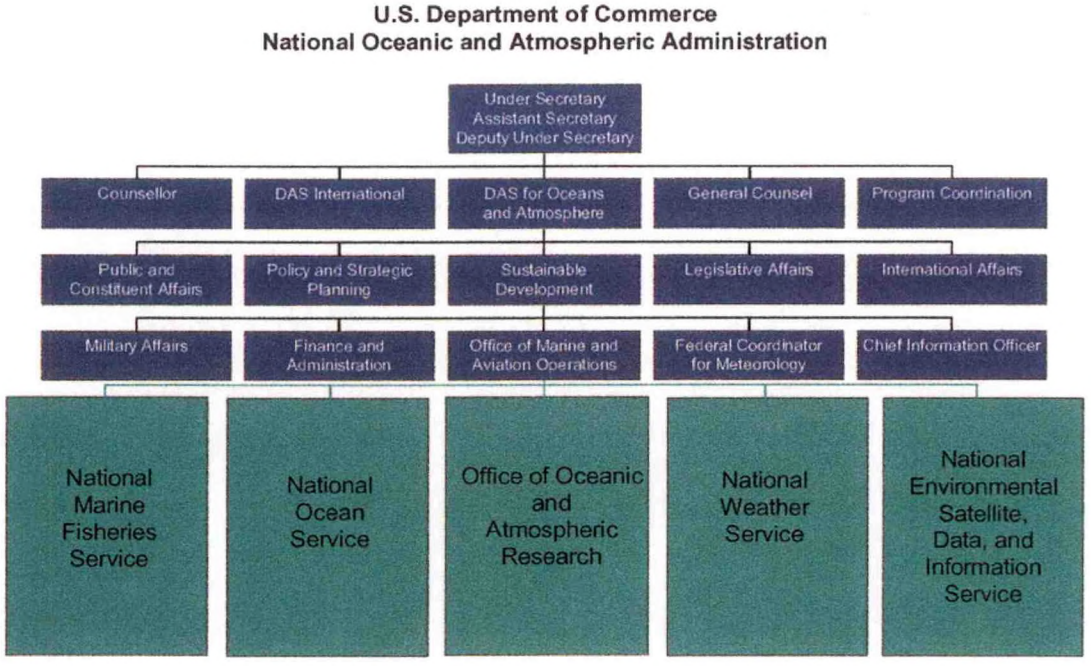
OPTIONS FOR RESTRUCTURING AND REORGANIZING NOAA

Several models have emerged that point toward what a future NOAA organization might look like. It should be noted up front, however, that no model is perfect. For every problem solved with one structure others are created. The questions are which model affords the best opportunity for accomplishing NOAA's future missions and which is achievable, given the time and costs (both real and political) that will be involved in accomplishing any change?

The range of models presented run from the existing NOAA organizational structure to one that is far more reaching in terms of the structural changes involved. The models presented are the:

1. Existing NOAA Organization,
2. PRT Consolidation Model,
3. Mission Working Group Model, and the
4. Preferred Model

Option 1 – Existing NOAA Organization (with PPI)



The existing NOAA structure is marked by strong, nationally recognized organizations that have finely honed their delivery of products and services and programs to carry out existing Federal statutes.

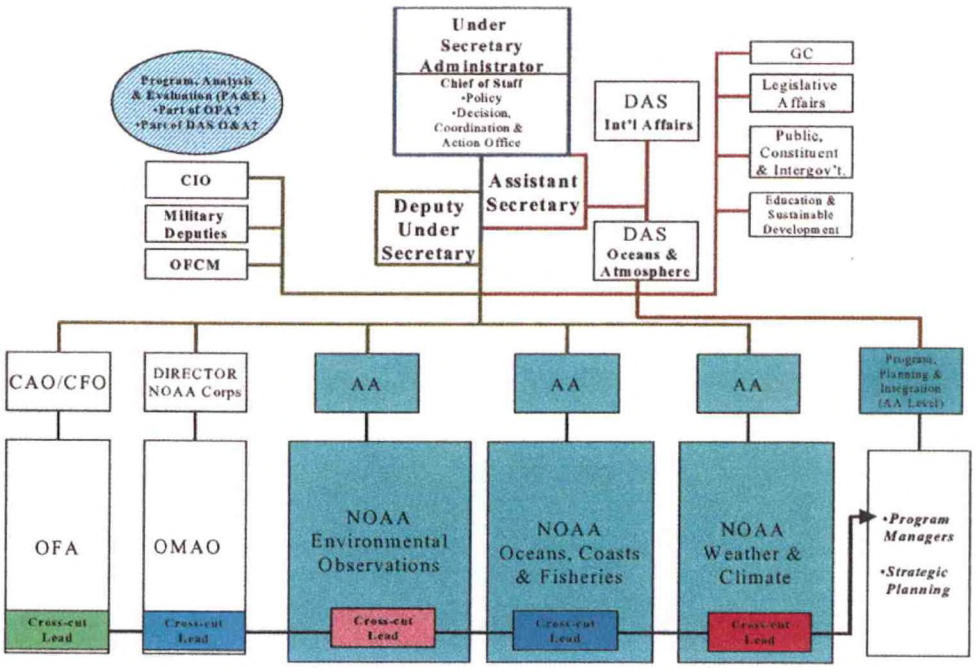
While many of NOAA's underlying problems and external criticisms of the Agency have potential organizational implications, reorganizing the Agency is not necessarily the only answer. Without undertaking major structural changes, there are a number of actions that could (and should) be undertaken to strengthen administrative and management systems, improve program direction and coordination, eliminate duplication of effort, and promote a more integrated organization.

The pros and cons of staying with the current structure are as follows:

PROS	CONS
• Continues the current organizational structure and delivery of important products and services to the public.	• Changing the structure could potentially disrupt the delivery of existing products and services to the public.
• Provides a basic organizational structure for carrying out existing statutory requirements and missions as defined in law.	• Current structure reflects "gaps" in NOAA's missions and future ability to develop national program responses to emerging environmental concerns.
• Maintains existing ties to NOAA constituents and consumers of NOAA products and services without change.	• Changes would disrupt constituent relationships and force new arrangements for interacting with the Agency (which may or may not be welcomed).
• Allows (within this structure) for the introduction of new "management approaches": 1. Creation of the new Program Planning and Integration function to help develop new cross cutting programs and synergies. 2. Introduction of more matrix management of national and cross-cutting programs. 3. Establishment of new internal approaches for setting priorities for NOAA research and ensuring it is more responsive to mission requirements.	• While allowing for new management approaches it does not address the structural changes needed to achieve a permanent, long-term shift in the way NOAA programs are managed. The introduction of the PPI Office and matrix management approaches may work or may fail to have any appreciable impact on program direction depending on how they are implemented. New management approaches of this nature are not permanent (i.e., structural changes in the organization) and can be easily changed or undone in the future.
• Keeps the focus of the senior NOAA management team on policies and programs as opposed to the distractions that arise from implementing major organizational changes.	• Undertaking any significant organizational change will entail a significant commitment of senior management time and resources to effect the change.

While it is attractive (and comfortable) to stay with the existing structure and try to work through the many management problems, the fundamental problem with this approach is that it fails to confront the underlying structural problems in the Agency and provide a more permanent long-term solution. If there is a strong interest (and desire) to create a more integrated NOAA in the future, one that capitalizes on its core competencies, promotes synergy, and is positioned to meet future evolving missions, then it will require a change in the organization of the Agency.

Option 2 - PRT Consolidation Model:



The PRT 'Consolidation Model' was discussed in the team deliberations. Its significant features are the:

- Consolidation of NMFS, NOS, NESDIS Ocean Data, and OAR Marine Research into a single Oceans, Coasts, and Fisheries Organization,
- Consolidation of all environmental observations systems planning and acquisition into a single line office,
- Distribution of OAR research activities, with climate and weather research consolidated with NESDIS and NWS weather and climate programs, and the
- Establishment of a new Program Planning and Integration office with matrix management across line offices.

This model shows the evolution of thinking regarding a possible future NOAA organization. As the PRT high-level model envisions,[24] it looks toward bringing together NOAA's oceans, coastal, and fisheries activities into a single organization that could set the stage for the evolution of the environmental management function. It also recognizes the importance of the new position of Assistant Administrator for Program Planning and Integration and the introduction of matrix management in the Agency. To address administrative management problems in the Agency, it proposes to align the functions of the CFO/CAO and the Office of Finance and Administration as an equivalent of the program line offices.

Perhaps the most dramatic change proposed in this model is the distribution of NOAA research and laboratory structure to the new line offices -- this step aimed at achieving greater responsiveness of research work to meeting program goals.

[24] See page 8 for a diagram and discussion of the PRT 'high level' model.

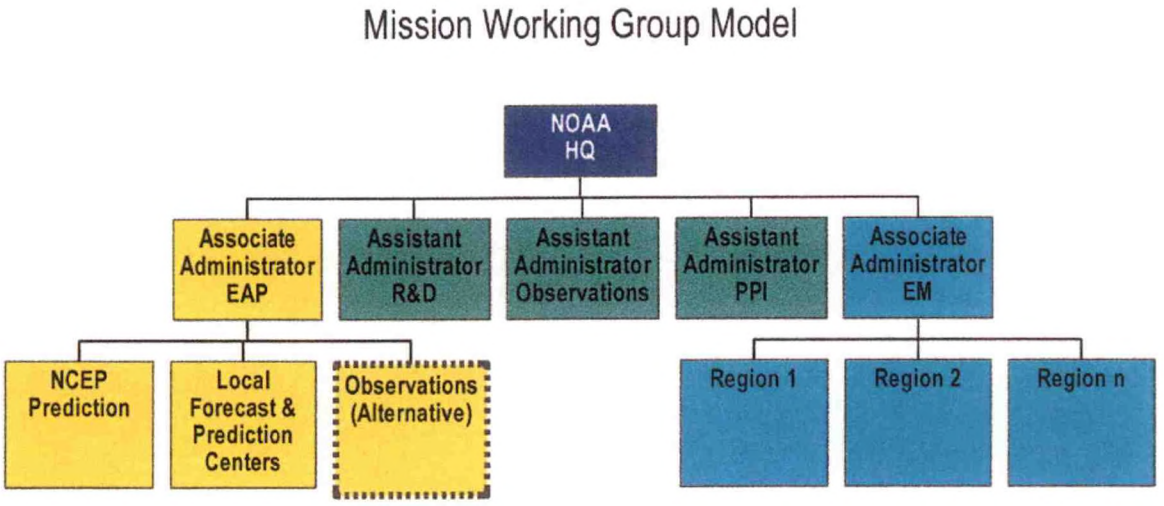
The pros and cons for this model are as follows:

PROS	CONS
• Retains much of the current line office structure and working relationships, while making progress toward strengthening program integration in the areas of research and observations.	• Retains much of the current line office structure, preserving the 'stove piped' structure. The gains from these changes may not be sufficient to justify the effort.
• Brings research under the operating line offices and closer to the programs they support.	• National stature of NOAA research may be lost; future funding for basic research may lose out to support for operations.
• Creates the new Program Planning and Integration function to help develop cross cutting programs and synergies.	
• Explicitly recognizes the role of climate in the future of the Agency.	• Climate role may be lost or subverted to weather.
• Retains a strong NOAA Corps function with operational responsibility for ships and aircraft.	• Fails to recognize that ships and aircraft are observation platforms just like satellites and data buoys.
• Provides for integration of fisheries, living marine and protected species, and special area management all under one organization.	• Sets up a wet vs. dry structure for the Agency, which does not recognize the interdependencies of each.
• Recognizes the importance of OFA by giving it line office status.	• The line offices retain their own budgetary resources and control.
• Overall level of change is not likely to encounter strong external constituent opposition.	• It is not clear what external advocacy could be developed for this level of change.

What this model fails to do is to fundamentally shift away from the old (i.e., current) structure. While it does consolidate and decrease the number of Assistant Administrators and line offices, it still fundamentally maintains the same basic NOAA line office structure – the single exception to this is the break-up of OAR and distribution of research activities and laboratories.

While this model makes some progress toward better integration of programs, it is not clear that the benefits from the proposed changes would be worth the time and cost involved in achieving them. Additionally, two major concerns with this approach for the future are the tendency of this organizational structure to exacerbate the difference and 'gap' between NOAA's 'wet' and 'dry' programs, actually lessening coordination and potential synergy, and the distribution of research, which could result in the loss of a national focus and capability to undertake and support fundamental research in oceanic and atmospheric processes and their interactions. This approach was specifically rejected by both the PRT and the MWG.

Option 3 - Mission Working Group Model:



The Mission Working Group's view of a future NOAA organizational structure is important in several respects.

- Organizes NOAA around a the Agency's basic competencies in Environmental Assessment and Prediction (EAP) and in Environmental Management (EM),
- Creates a central focus for observations (stand alone or under EAP)
- Highlights the future role of NCEP (the National Center for Environmental Prediction) in developing environmental assessment and prediction capabilities,
- Creates a focus for strategic, non-operational science by establishing an AA for R&D (with from 30% to 50% of current research budget), and
- Proposes 'regionalization' of NOAA's environmental management functions.

The most significant feature of this proposal is the organizational structure built around NOAA's basic competencies in environmental assessment and prediction, and environmental management. This idea was first proposed by the PRT in its 'high-level' model.[25] It marks a clear departure from the old (current) organizational focus of the Agency, creating a structure that is focused on NOAA's missions and capabilities to provide the Nation with an integrated global to local environmental observing system, fully integrated environmental analysis and predictions; and strengthened environmental management.

The other significant feature of this model is its focus on a single regional structure for the delivery of services in the field, particularly in the environmental management area. NOAA's current regional structure represents a mix of different offices with different ranges of services and responsibilities. The idea of 'rationalizing' NOAA's field operations makes good sense. This idea was also supported by several comments made by constituents in the regional strategic planning meetings. Several of the programs under the proposed EM structure, such as fisheries management, coastal management and services, sanctuaries and reserves might well benefit from a coordinated regional delivery structure. It should be noted, however, that while supporting

[25] See page 8 for a diagram and discussion of the PRT 'high level' model.

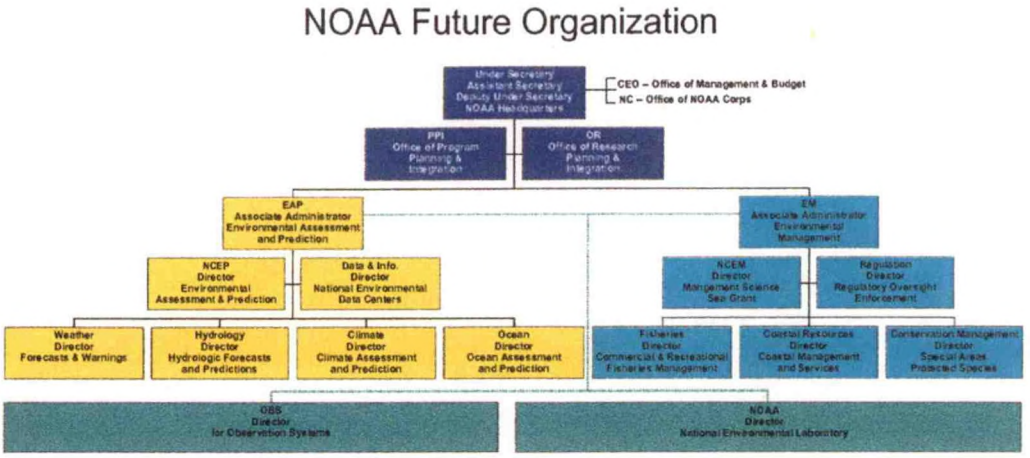
regionalization, the MWG did caution against the creation of a unified regional structure with program authority vested in "mini-NOAA Administrators." This was viewed as having the potential for creating substantial policy and program disparities and conflicts.

The pros and cons for this model are as follows:

PROS	CONS
• Creates a new focus for the Agency built around environmental assessment and prediction and environmental management, which is more directly representative of NOAA's missions.	• Eliminating current line office structure could be disruptive to established constituent relationships; result in program delivery problems in the near-term.
• Centralizes observation systems under an Assistant administrator or as part of the EAP structure.	• Still retains many of the vestiges of the current NESDIS structure.
• Creates the new Program Planning and Integration function to help develop cross cutting programs and synergies.	
• Establishes a regional structure for enhanced delivery of EM products and services.	• New regional structure for service delivery could add personnel costs to staff the function; may result in political pressure for more offices than necessary.
• Provides for the integration of fisheries, living marine and protected species and special area management with NOAA's ocean programs.	• May result in diminution of the ocean/coastal focus in Agency.
• Fosters increased environmental science planning and coordination.	• May open NOAA to criticism that it is duplicating the work of EPA.
• Overall level of change is significant in terms of eliminating the current 'stove piped' line office structure in the Agency, improving coordination and eliminating duplication.	• Proposed structure is confusing and may require significant additional cost and effort to manage.

While this model represents a significant improvement over the previous model, it still leaves unanswered several important questions, including: 1) The preferred organizational placement for the observations function, 2) how research dollars, as well as the laboratories and research work would actually to be distributed, and 3) how the proposed regional structure for environmental management would actually function vis-à-vis the Office of the Associate Administrator. The most important feature, however, that is missing in the MWG proposal is the lack of focus on building in flexibility and new program capacity for meeting NOAA's future missions.

Option 4 - Preferred Model (with variations):



This model represents an evolution in the thinking of the PRT and Mission Working Group regarding a future organizational structure for NOAA. At the same time it goes significantly beyond where either the PRT or Mission Working Group ended up. It presents a more substantial change in the Agency's underlying structure, breaking up the existing line offices, creating new organizational capacity for the future, and concentrating a focus on delivery of products and services to customers.

The key features of this model are:

- **Strengthened Agency policy and program direction** – The model envisions a strong NOAA headquarters, providing clear leadership and policy direction, working through the NOAA Executive Council and the NOAA Executive Panel.

    - Establishment of two new key management positions, that of Associate Administrator for Environmental Assessment and Prediction (EAP) and Associate Administrator for Environmental Management (EM).

    - Strengthened program coordination across organizational lines provided by an Assistant Administrator for Program Planning and Integration (PPI) and an Assistant Administrator for Research. The new PPI function is envisioned to serve a number of important roles: providing leadership for cross-cutting programs; incubator for new programs, focal point for national programs (e.g., coral reefs, wetlands); ensuring that NOAA's assessment and prediction capabilities (EAP) support environmental management (EM) requirements, and conducting evaluations of the effectiveness of programs.

      The AA for Research and office is envisioned to serve a similar role, coordinating across line office structures to ensure the health and vitality of NOAA research and development activities and ensure that they serve NOAA missions; conducting independent research program evaluations, building relationships with other Federal laboratories, the academic community, and international scientific organizations; and serving as a focal point for national research programs (e.g., NOPP, CCRI).

- Strengthened administrative support functions, through the establishment of the position of Chief Executive Officer (CEO) reporting directly to the NOAA Administrator, with an independent Chief Financial Officer (CFO) and Chief Administrative Officer (CAO); consolidation of line office management and budget (MB) operations under the CFO and new Associate Administrator offices for EAP and EM; and the elimination of duplicative "shadow" administrative staff in the existing line offices.

- **New NOAA program capability** -- The model envisions building new capacity and capability in NOAA to strengthen current operations and provide the underpinning for meeting future mission requirements.

  - Establishment of two National Centers to support NOAA's mission activities: a separate National Center for Environmental Prediction (NCEP), under the Associate Administrator an Environmental Assessment and Prediction. And, a new National Center for Environmental Management (NCEM), under the Associate Administrator for Environmental Management.

  - Expanded environmental assessment and prediction capability. Unlike the current NCEP operation (housed in NWS), the model envisions building a new, independent, broad-based assessment and prediction capacity in the Agency, one that would grow its capabilities over time to deliver assessments and predictions across the board in not only in weather forecasting and prediction, but also in space weather, climate, hydrology, and importantly in living marine resource, ocean, and coastal assessment and prediction (e.g., ecological forecasting and ocean and ocean and coastal health). This 'new' NCEP is envisioned to be the heart of the future EAP structure.

  - A new focal point for environmental management. Under the new NCEM, the model envisions the creation of a new capacity within the Agency to develop and apply the latest science and thinking in the area of resource management.. This would involve bringing together resource managers, biologists, marine scientists, economists, sociologists, anthropologists, political scientists, lawyers, etc., to develop "best management practices" for accomplishing the Agency's environmental management missions. The new NCEM would provide the intellectual underpinning for Agency decision-making that is sorely lacking. Included in the new Center would be the National Sea Grant program, the Coastal Ocean Program (COP), and existing NMFS fisheries operational science and near-term development science activities. This would provide the new Center with a means for carrying out research to support future changes in Agency resource management practices. The new NCEM is envisioned (similar to NCEP) to form the heart of the new EM structure.

  - Establishment of an independent regulatory function through the creation of an Office of Regulation to handle NOAA's increased level of regulatory, legal, and enforcement matters. This new office would provide a needed independent, "arms length" separation from resource management operations and permit more aggressive use of these tools in meeting resource management goals and objectives. The office would be responsible for the drafting and issuing of all regulations and ensuring a uniform approach and enforcement of Federal statutes (e.g., NEPA) and regulations falling under NOAA's purview. It would also be responsible for handling (and developing and implementing improvements in) the Federal consistency appeal decision process for the Secretary of Commerce.

- **Responsive NOAA research capability** – The model envisions an entirely new structure for carrying out research in the Agency, designed to make it more responsive to Agency mission requirements and to national needs.

    - New research management structure. It envisions a new research management structure for NOAA consisting of: 1) An Assistant Administrator for Research (as discussed above); 2) a NOAA National Laboratory structure headed by a Director; and 3) a NOAA Science Board to establish research policy, composed of the Under Secretary, DAS for Oceans and Atmosphere, Associate Administrators, Assistant Administrator for PPI and Research, and the National Lab Director.

    - NOAA National Environmental Research Laboratory. The NOAA National Laboratory would combine existing NOAA laboratories under a single management structure designed to provide greater national visibility for NOAA's research and development program, creating a recognized 'center of excellence' -- similar in nature to ONR and the NSF Centers of Excellence (e.g. UCAR). The new National laboratory would administratively house all of NOAA's existing national labs.[26]

    - New funding arrangements for research. Funding for the new laboratory structure would be allocated from NOAA's research appropriation, as follows: 1) 30% would go directly to the National Laboratory to support NOAA's research infrastructure, e.g., maintenance of individual laboratory facilities, scientific equipment and computer capabilities, hiring of leading scientists, and conduct of 'basic' research[27]; and 2) 70% would flow through the relevant EAP and EM program areas, as part of a coordinated and agreed to long-range research program between EAP, EM, and the National laboratory.

    - Mission driven research. The National Laboratory Director would report jointly to the Associate Administrator for EAP and EAM and be responsible for the efficient operation of the National Laboratory structure and for ensuring that all research undertaken was proposal driven, peer reviewed, high quality, and above all responsive to Agency program requirements and missions. The laboratory structure would mirror the new NOAA organization, with focuses on environmental assessment and prediction, environmental management, the development of observation technology, and development of next generation products.

    - Balance. The goal of the new structure would be to support a more balanced mix of in-house and extramural research involving the academic community and private sector research organizations. Ultimately the goal should be to reach a level of 50% in-house; 50% extramural.

    - A new focus on improving the quality of fisheries research. The new National Laboratory would absorb existing NMFS (and NOS) scientists and begin the process of building NOAA's capacity and capability to conduct leading-edge fisheries and habitat research, both internally and extramurally. Over time opportunities to consolidate these scientists and research activities into a central laboratory or 'virtual' laboratory structure would be sought.

[26] While no geographic location for the new National Laboratory is recommended, consideration should be given to re-establishing this structure in Boulder, Colorado, where it existed until 1995.
[27] Basic research is defined as in the DOD model for classification of research activities.

- **Integrated observation support systems** – This model supports the idea of fully integrating NOAA's observations capabilities -- development, procurement, implementation, maintenance, and operation into a single supporting organization.

    - Developing an integrated environmental observing system. The model calls for a new Observations Systems Office to provide for coordinated development of a robust, fully integrated global observing system. The new office would provide a means for deploying new technologies (e.g., unmanned ROV's) and leveraging existing and planned assets to meet a broad range of observational requirements.

    - Strengthened management of NOAA's observation assets. A Director of Observation Systems would head this office and report to the NOAA Administrator and to the Associate Administrators for EAP and EM. This office would assume responsibility for all current observing systems including the polar and geostationary satellites systems, NEXRAD and ASOS systems, and all ocean observing systems – the TOGA/TAO array, Argos system, data buoys, tide and water level network, and voluntary ship observing program. The office would provide a single point of focus to manage the long lead times in budgeting and acquisition required for the large capital investments needed to support and sustain NOAA program operations.

    - Ship and Aircraft Operations. The model envisions transitioning all ship and aircraft operations to the new observations office to better integrate these observation platforms into the array of NOAA's observation assets. The NOAA Corps, however, would continue to report directly to the Under Secretary.

- **Enhanced delivery of products and services** – The model envisions the creation of seven 'working level' offices drawing on the resources of the Agency as a whole, to develop and deliver enhanced, integrated products and services to the American public. A Director, reporting to the relevant Associate Administrator, would head each office.

    1) **Weather Forecast and Warnings** – ensure the continued provision of basic public weather forecast and warning services to protect human life and property.

    2) **Hydrology** – provide a new forward-looking capacity to integrate NOAA's hydrologic related assessment and prediction capabilities, with the aim of developing a new suite of products to address the growing national and global water crisis.

    3) **Climate** – issue a comprehensive suite of both governmental and public assessments and predictions of both short and long-term climate variability to aid government policy officials and improve national and regional response planning and capability.

    4) **Ocean Assessment and Prediction** – undertake an effort to build NOAA's capacity to understand the oceans and deliver the assessments and predictions needed to develop and utilize their capacity for the future.

    In the environmental management area, the offices would deliver services within a watershead/ecosystems context to ensure proper stewardship of our natural resources:

    5) **Fisheries** – be responsible for developing workable management plans for key commercial and recreational fisheries stocks to ensure their future sustainability.

6) **Coastal Resources** – provide a suite of coastal products and services for front line coastal agencies and resources managers to support sustainable use and development of the fragile and economically important coastal areas.

7) **Conservation Management** – develop conservation, management, and restoration plans for special areas (e.g., habitats, sanctuaries, estuarine reserves) and protected species to ensure their vitality and contribution to the ocean and coastal ecosystem. (One possible variation would be to establish a separate stand-alone restoration office, given the unique character of these activities).

This model envisions the establishment of a 'NOAA-wide' regional structure, underpinning the above offices. This structure should be designed around the delivery of NOAA products and services and focused on ensuring that user needs are met. It would provide a single point of contact for constituents seeking information. Regional public affairs, program specialists and a senior level management individual would staff these offices with responsibility to coordinate NOAA programs and activities with other relevant Federal agencies in the region. These regional offices would report back through the Office of Program Planning and Integration.

Finally, the model envisions NOAA increasingly looking for opportunities to work with the private sector to promote the transfer of information and technology and to spur modernization and innovation in product and service delivery. NOAA can't do it all. The future organization must be one that is focused on collaboration with others to leverage its available resources to accomplish its future missions.

The pros and cons for this model are as follows:

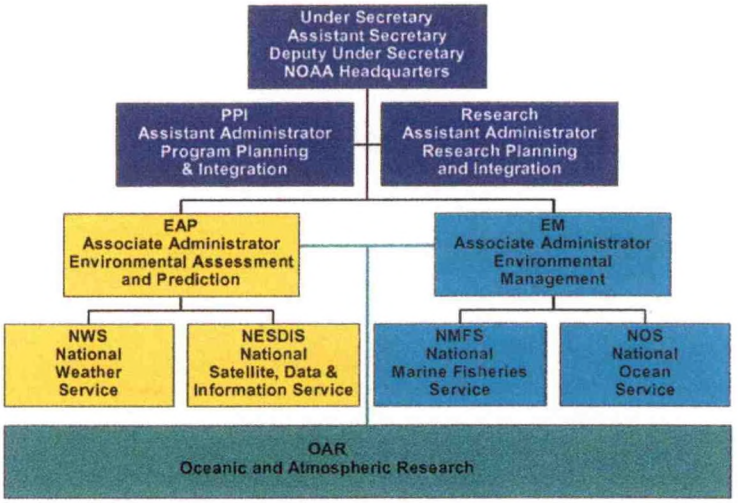
PROS	CONS
• Eliminates the current NOAA line office structure.	• Weakens traditional line office control; may be viewed as weakening delegated authority to program managers.
• Strengthened Agency policy and program direction better position Agency for future missions.	• Requires new crosscutting coordination protocols.
• Responsive research capability; new capacity in hydrology and climate.	• Could be perceived as lessening the focus on oceans.
• Fully integrated observation support systems.	• Puts NOAA squarely in the regulatory business.
• Enhanced delivery of products and services.	• Disrupts current constituent/client working relationships with line offices.
• Strengthened financial and administrative operations.	• Overall level of change in the Agency organization structure is substantial and could encounter strong external constituent opposition.

Process/Steps to Achieve

While the PRT discussed several organization options it did not recommend any immediate reorganization of NOAA's line offices. What the PRT did say was that NOAA should identify where the Agency ultimately wants to go and then move toward that future structure (as opposed to taking a number of interim steps).[28]

One simple way to accomplish the future organizational model for NOAA envisioned above, is to quickly move to the following interim structure:

NOAA Interim Organizational Structure



This interim structure would accomplish a number of important objectives. It would:

- Introduce stronger policy level direction and coordination for the Agency, through the establishment of the Program Planning and Integration and Research Planning and Integration functions.
- Create the basic structure for the new Environmental Assessment and Prediction (EAP) and Environmental Management (EM) functions, through the establishment of the two new Associate Administrators and related offices.
- Provide the basis for the evolution of the final organizational structure; allowing for follow-on parallel development of the detailed EAP and EM structures, as well as the new centralized observations office.
- Allow for restructuring the management of research in the Agency, beginning with the establishment of a planning and integration office, new laboratory reporting structure, and new oversight, priority setting, and funding arrangements for research activities.

NOAA program operations and management under the existing line offices (with the exception of OAR) would remain unchanged. However, line office reporting relationship would change, as would the title of the head of the line office from the current 'Assistant Administrator' to the title of 'Director.' The interim structure also envisions a consolidation of many of the current line office management and budget functions into the new EAP and EM Associate Administrator

[28] PRT Report, p. 11, See Figure 1.1

offices, the establishment of tighter controls over budget resources, and efforts to eliminate duplicative administrative staff. It is also recommended that the interim structure also include the establishment of the position of Chief Executive Officer to oversee improvements in Agency budget, finance, and administrative operations, as discussed.

All of the proposed changes should be carried out within existing budget and personnel levels, without the need for any additional resources. The overall level of NOAA SES positions would remain unchanged, however, there would probably be a need to identify short-term reassignments to accomplish these objectives.

This interim structure can be achieved in two simple steps:

Step 1. Establish the PPI function/office – this process is already underway. The proposed reprogramming should be pursued and hiring of new Assistant Administrator should take place as soon as possible.

Step 2. Establish the two Associate Administrator positions and supporting offices – this would involve the development of a follow-on reprogramming to establish the two positions, codify the roles and responsibilities, and identify the staff and resources needed to support the two new offices.

As a follow on to the above, it is also recommended that several additional steps be taken internally to help move NOAA toward a final organizational structure.

Step 3. Redefine the role and responsibilities of the Assistant Administrator for Research to focus on coordination and integration of NOAA's research program, oversight of national programs, and the development of research policy and direction for the Agency.

Step 4. Restructure the Office of Finance and Administration – seeking approval to establish the position of Chief Executive Officer and initiating a comprehensive review of budget, finance, and administrative operations in the Agency to improve support services and identify savings.

Step 5. Establish 4 'tiger teams' to work on the development of the final reprogramming for the Environmental Assessment and Prediction, Environmental Management, Observations, and Research structure. This parallel development of the final structure could be designed to come together in one final reorganization (and reprogramming) proposal or structured in modules to evolve the final structure in steps or combinations thereof.

Any major reorganization of the Agency will also require:

1) A clear commitment from the top leadership of the Agency to achieving this goal. This must be reflected in a clear vision of where the Agency is going and why, and a commitment to devote the time, energy, and effort required to pursue this goal at every opportunity.

2) An up-front agreement with NOAA senior management on the interim and final structures, the benefits to be gained from reorganization, and a personal commitment to support and pursue the changes.

3) A comprehensive communications plan to "sell" the reorganization concept and details to the Department, OMB, and the Congress. The general reaction to such proposals is likely to be

skepticism at all levels. In particular, a carefully developed and executed congressional strategy will be needed to build key member and staff support for the proposed final reprogramming actions.

4) Development of an understanding by NOAA employees and constituents of the value and benefits to be achieved from making this change. Internal and external support for organizational changes can make a big difference. Part of this process might include initiating a series of client/user needs assessments to build support from constituents and ensure that NOAA product and service delivery is addressed correctly in the new organizational structure.

5) A clear plan of action to keep the effort on track. Accompanying this must be a willingness to commit the necessary personnel and resources to back up the effort -- any reorganization effort, based on past experience, is a time and resource intensive undertaking and one that can take away from other Agency priorities. To ensure that the final structure and resources are properly aligned, any effort of this magnitude should also include a full 'base budget' review to eliminate duplication and 'free up' resources for redirection to higher priority activities.

NEXT STEPS

Before any steps are taken, however, with respect to these recommendations several things need to occur:

1. The ongoing Strategic Planning Process needs to be finished – there may well be things that we learn from this process, from internal and external stakeholders, that might influence how we look at the future organizational structure for the Agency. Regardless of the outcome, however, we should not appear to have the 'cart before the horse' by internally or publicly announcing organizational changes ahead of the completion of this process.

2. These ideas should be discussed with the Department and OMB to ensure that they are aware of NOAA's plans and ensure that the efforts are compatible with and support the President's Management Initiatives.

3. The NOAA Executive Committee should be briefed in closed session on the elements of the proposed structure and an opportunity provided for further discussion and debate on the final model.

4. There should be a quiet assessment undertaken of likely constituent and Hill reaction to such changes and the level of support or opposition they might engender.

5. There should be private discussions with the Ocean Commission to assess how these changes complement the forthcoming recommendations of the Commission.

The environmental problems that we are likely to face in the next decade make a compelling case for a new NOAA structure ... one that is far more integrated, responsive, mission oriented, and focused on its core competencies and strengths. The 'preferred model' sets forth a vision for the future with sufficient detail to engage scientists, policy officials, constituents, and the public in debate over how to strengthen NOAA to meet its future missions. At a very minimum this debate should be initiated. It is important for the future of the Agency.

CONCLUSION

Based on comments received from NOAA employees, the deliberations of the PRT and Mission Working Groups, and the general perceptions of many outside the Agency, the consensus appears to be that NOAA is structured improperly to meet its evolving and future missions.

Despite past restructurings and reorganizations, many of the current NOAA components remain (and retain) vestiges of the very elements that went into the Agency's creation in 1970. Many NOAA employees cited NOAA's history as the reason for its current organizational structure and the lack of corporate identity.

The NOAA strategic planning process undertaken in 1993 highlighted the fact that the current NOAA organizational structure was lacking, that there were crosscutting relationships and synergies to be explored and developed across traditional organizational lines. The current NOAA structure tends to stifle creativity and cooperation across line offices and has contributed to duplication of effort. It has also resulted in inequities in resource allocation and poor levels of coordination in building external and international relationships.

The NOAA Program Review Team (PRT) concluded that NOAA's future depended on some form of restructuring that would move from the existing line office structure to one that reflects the interdisciplinary and multidisciplinary nature of the environmental challenges facing society. The PRT's high-level organizational model was the single most important piece of new thinking to emerge. It suggests a future organizational model for NOAA that is bold and forward thinking, one that is based on NOAA's missions to provide environmental assessment and prediction and environmental management (stewardship) of our ocean and atmospheric resources. The NOAA Mission Working Group carried this thinking forward, recognizing the value of this new conceptual approach to organizing the Agency.

If NOAA is to position itself as a premier national and global leader in oceanic and atmospheric science and in environmental management and services, it will require a major effort to break down the existing structural barriers that have long existed in the Agency and are impeding its progress. It will require a major effort as well to change the NOAA culture that has developed over the past 32 years.

The proposed NOAA organizational structure: 1) takes a holistic approach to organizing and managing ocean and atmospheric programs and activities, 2) strengthens the policy and program direction of the Agency, 3) builds new capacity and capability to meet evolving environmental challenges, 4) brings products and services closer to the public and users, 5) eliminates duplication and overlapping missions; and 6) restructures NOAA's research program to make it more responsive to mission needs, while at the same time renewing its national status and revitalizing its working relationship with the academic community.

Bringing about such change is programmatically challenging. It is time consuming. And it is also politically difficult to achieve. But, the potential rewards are significant. The proposed NOAA organizational structure envisions an Agency with a sharper focus on its missions, an ability to bring together resources in totally different ways to produce the leading-edge products (i.e., assessments, forecasts, and, predictions) and services that are needed to help us achieve national goals ... protection of life and property, and ensuring sustainable use and development of our Nation's valuable natural resources.

APPENDICIES:

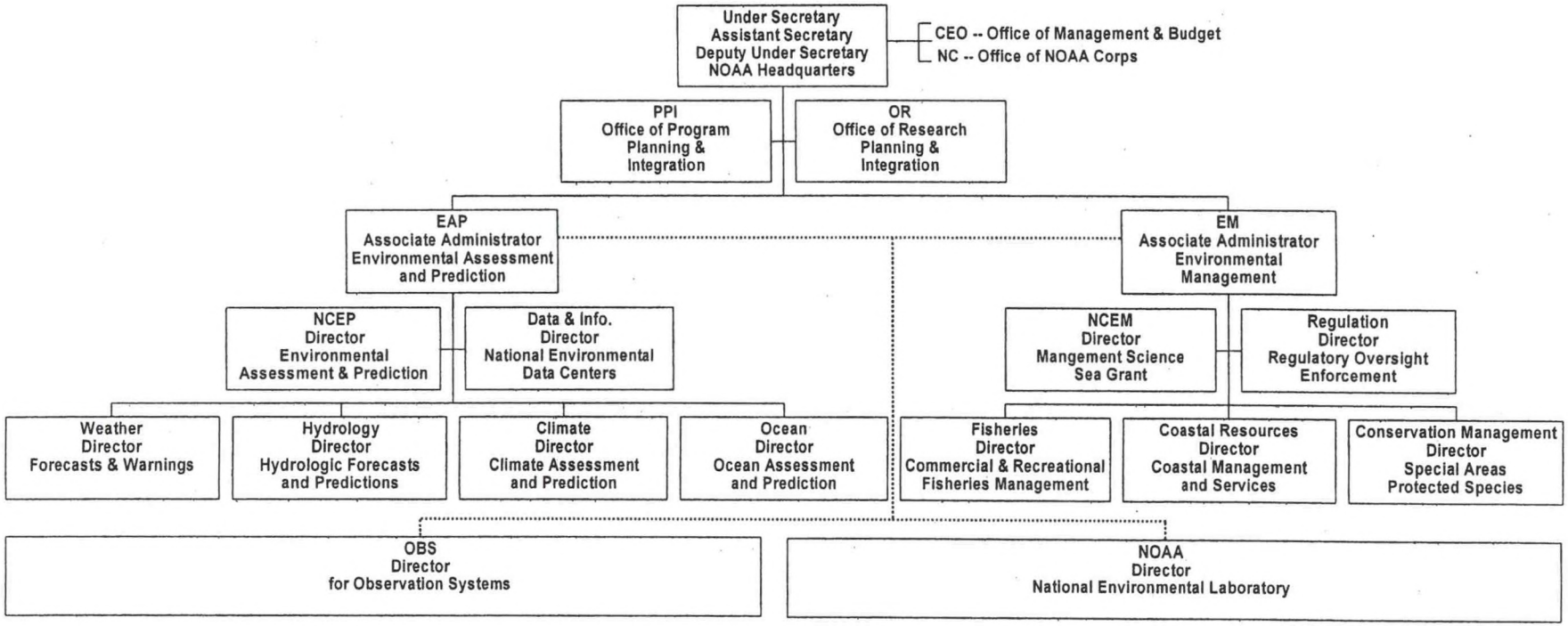
A. Organization Charts

B. The Evolution of NOAA

C. Mission Working Group Report

D. Hudson Trends Analysis

NOAA Future Organization



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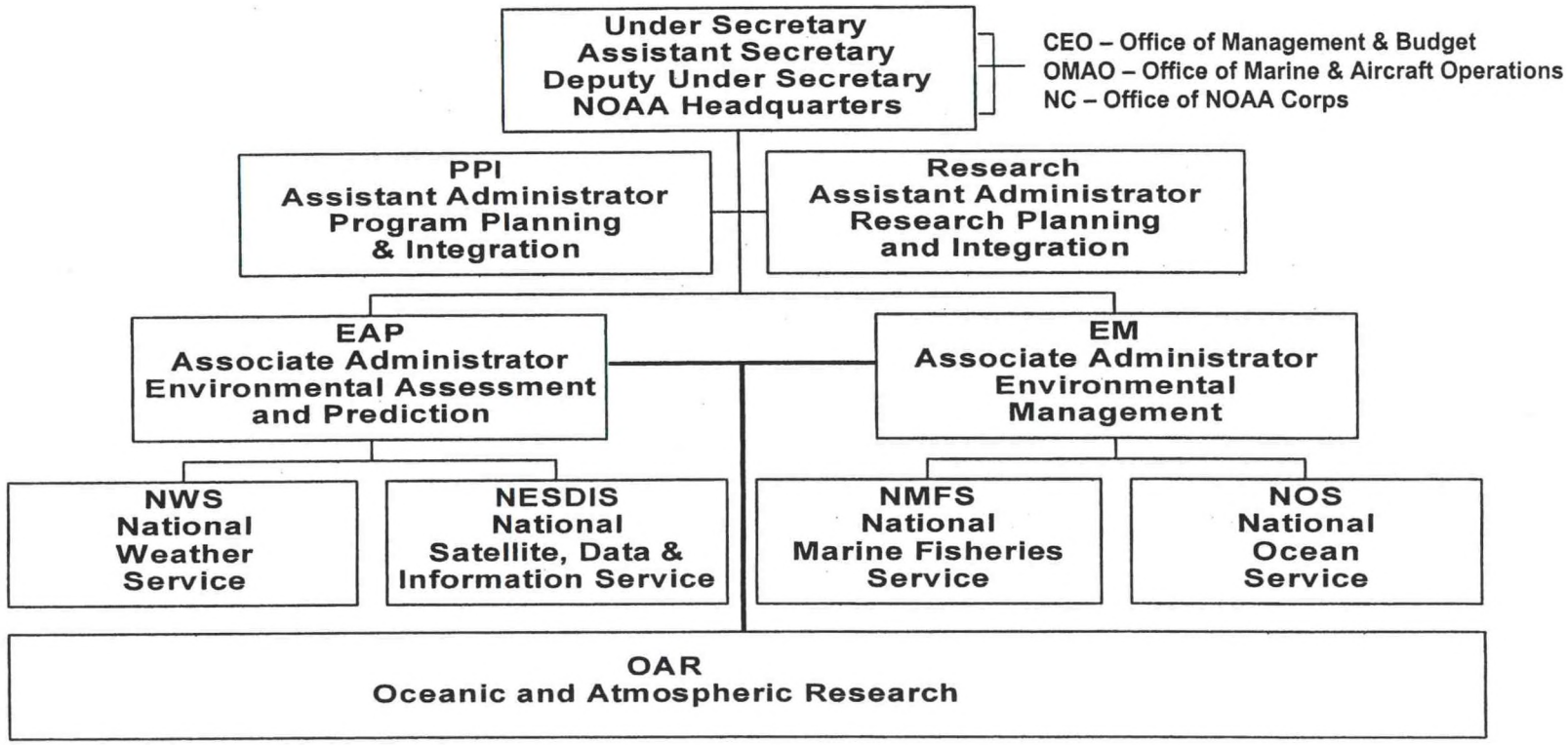
NOAA Interim Organization



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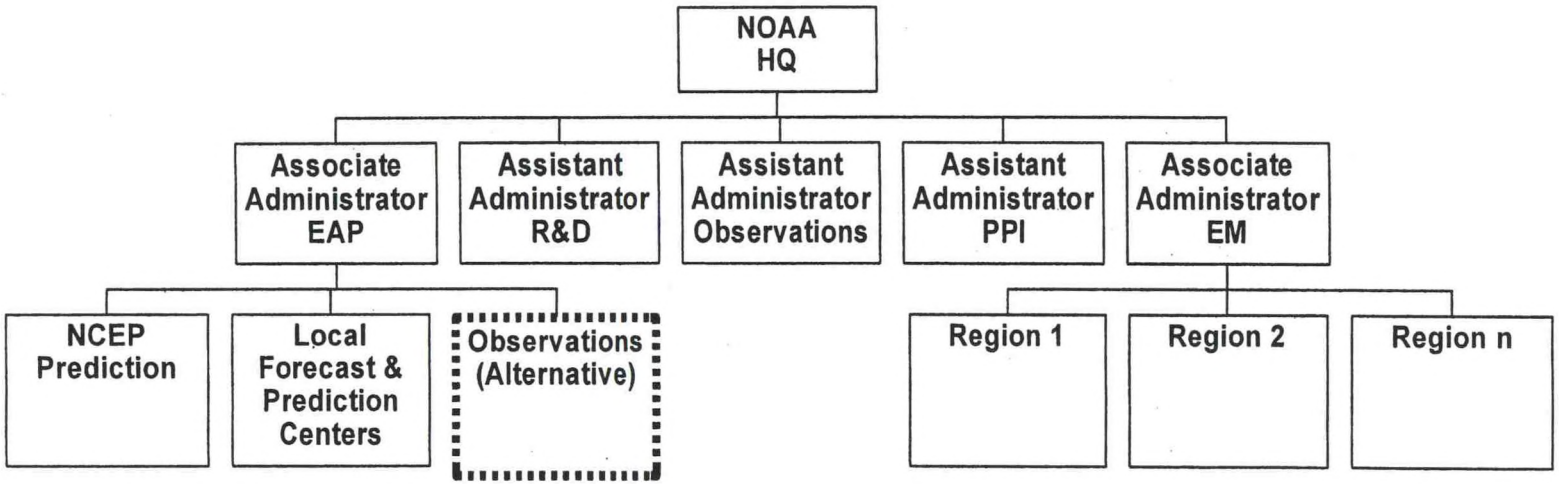
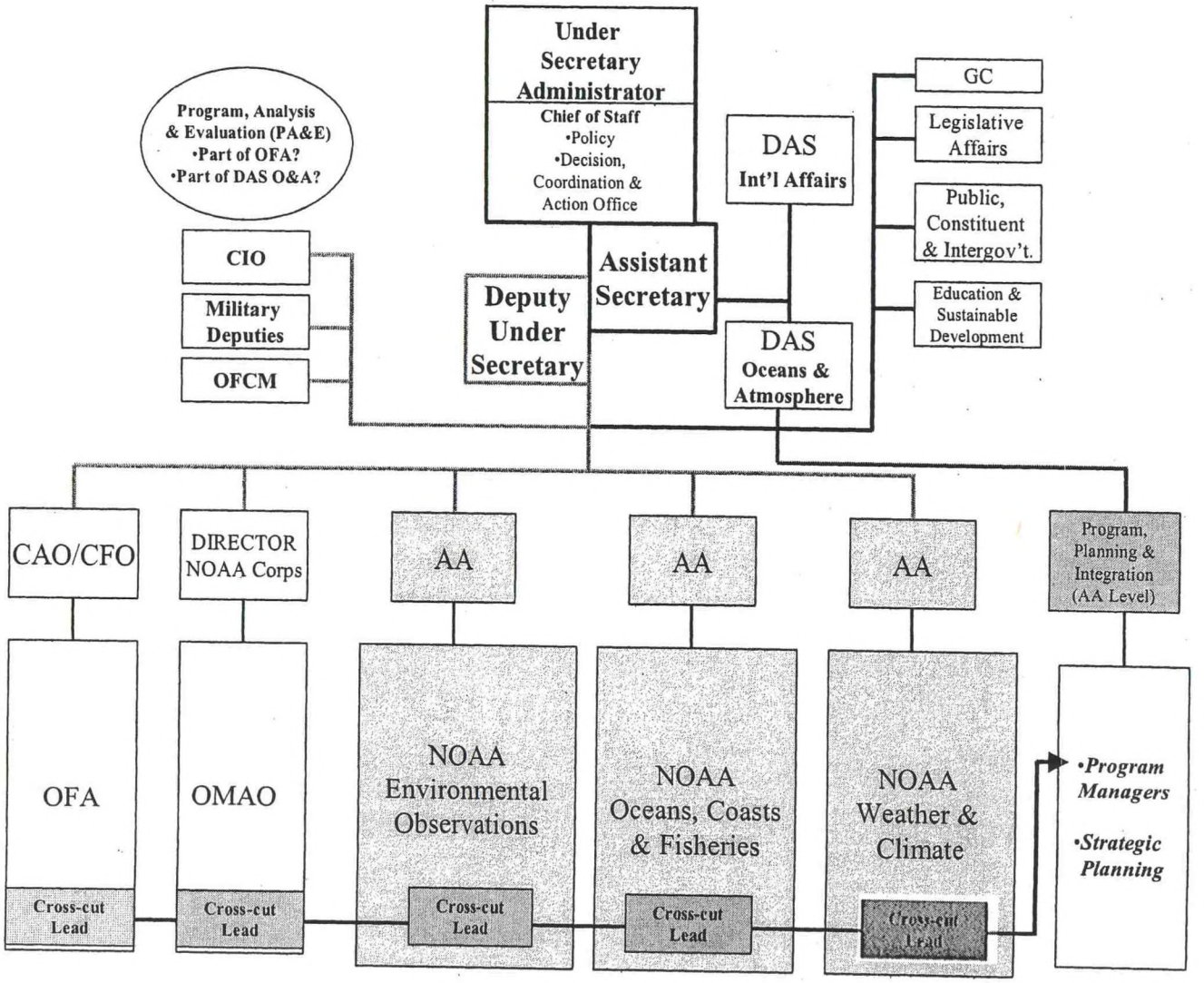
Mission Working Group Model



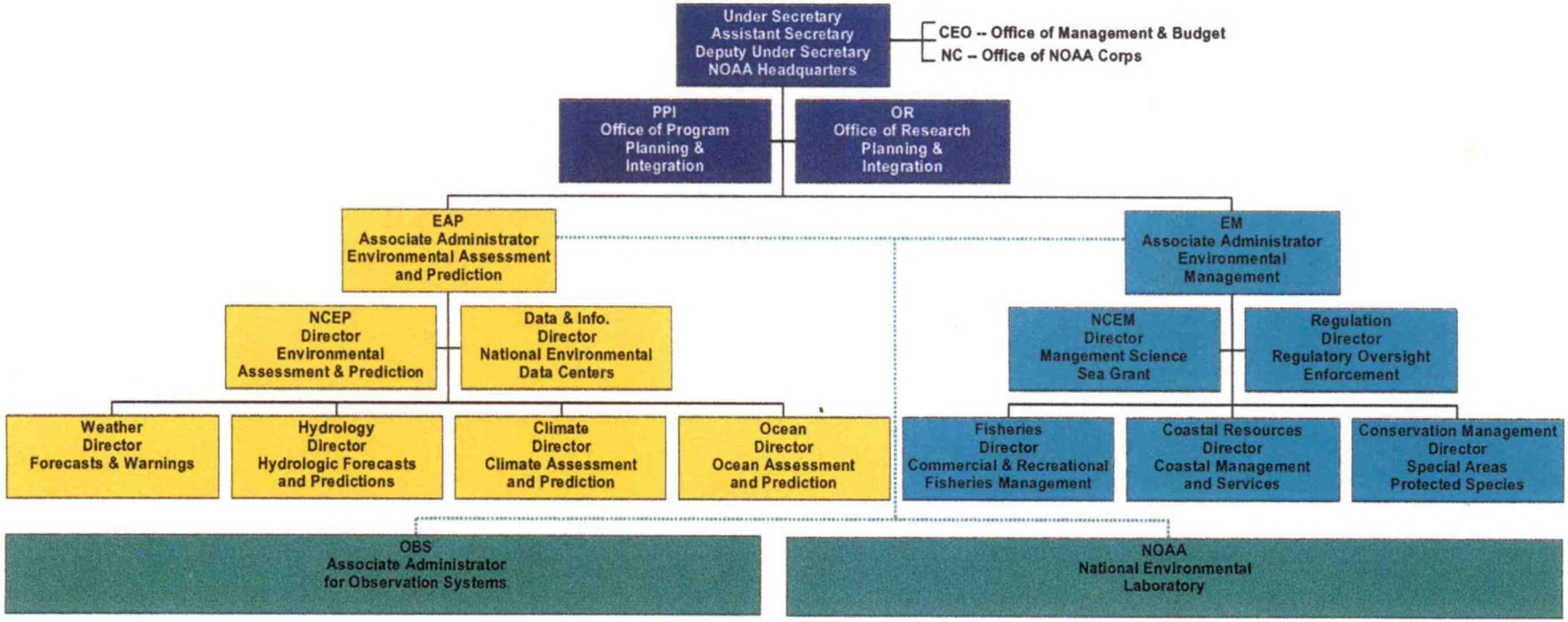
PRT Consolidation Model



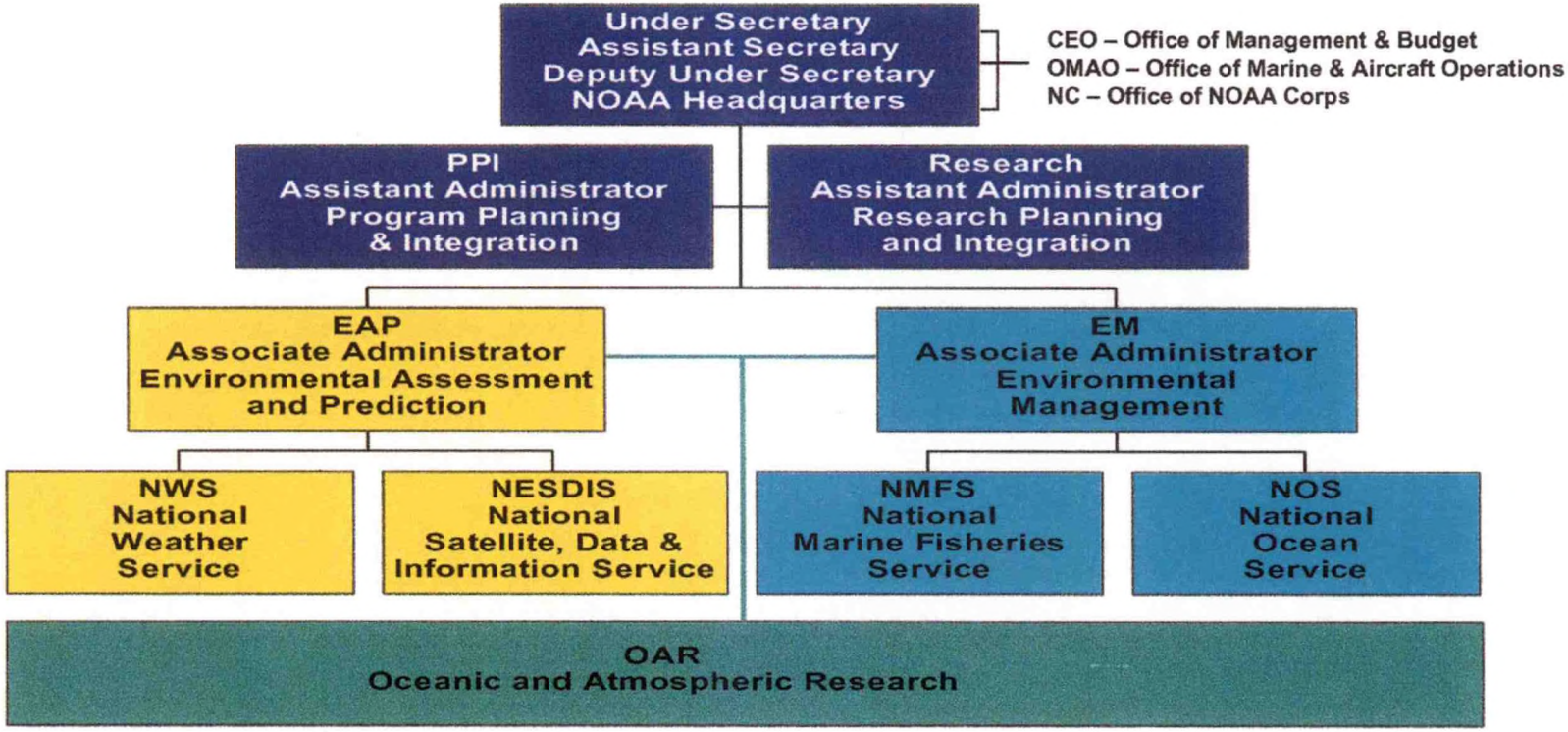
APPENDIX A

ORGANIZATION CHARTS

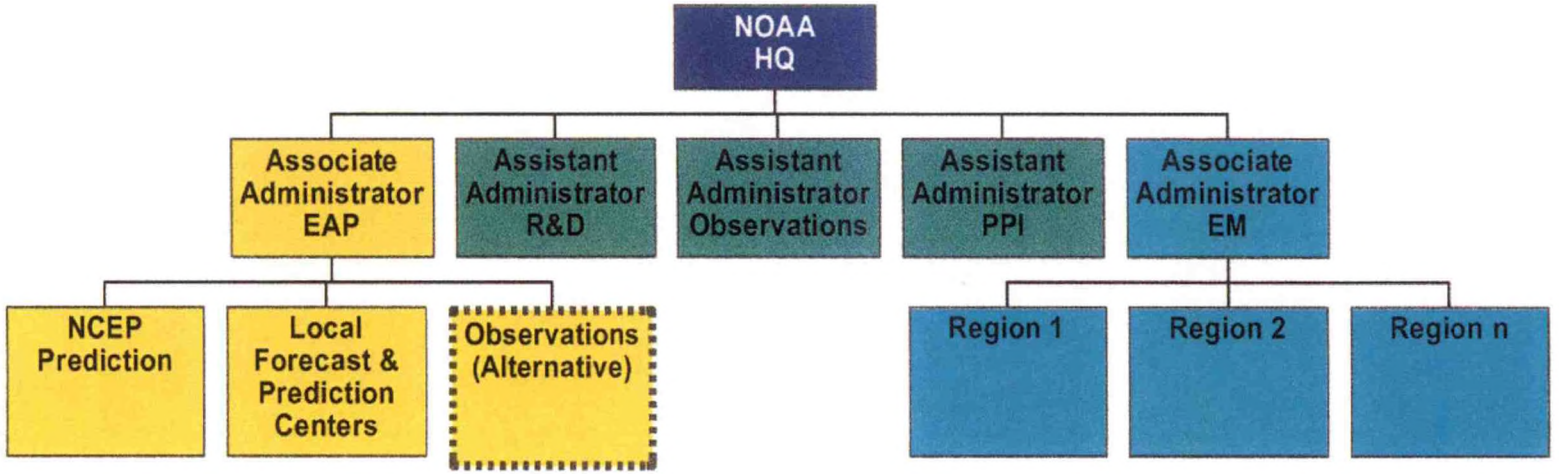
NOAA Future Organization



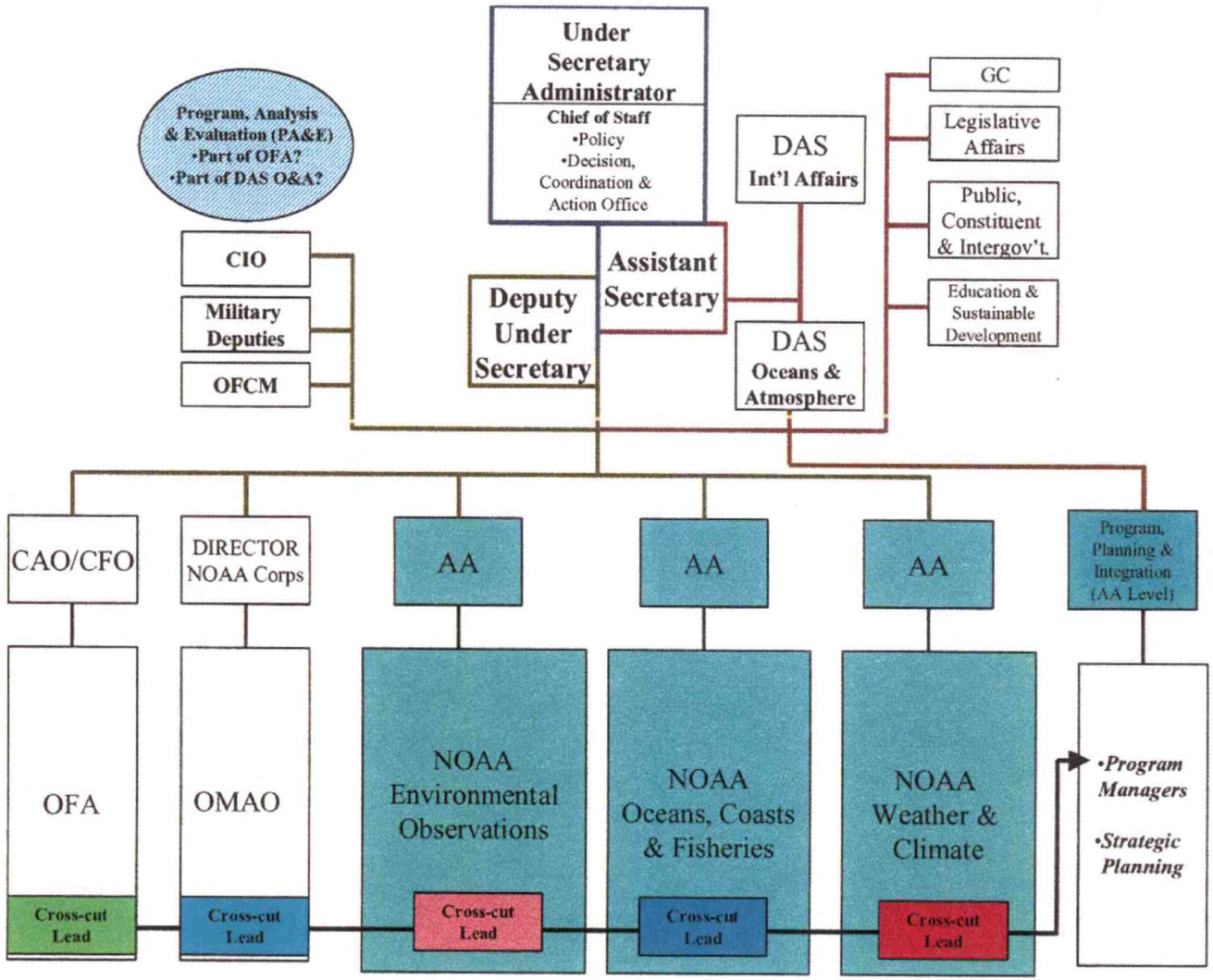
NOAA Interim Organization



Mission Working Group Model



PRT Consolidation Model



U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

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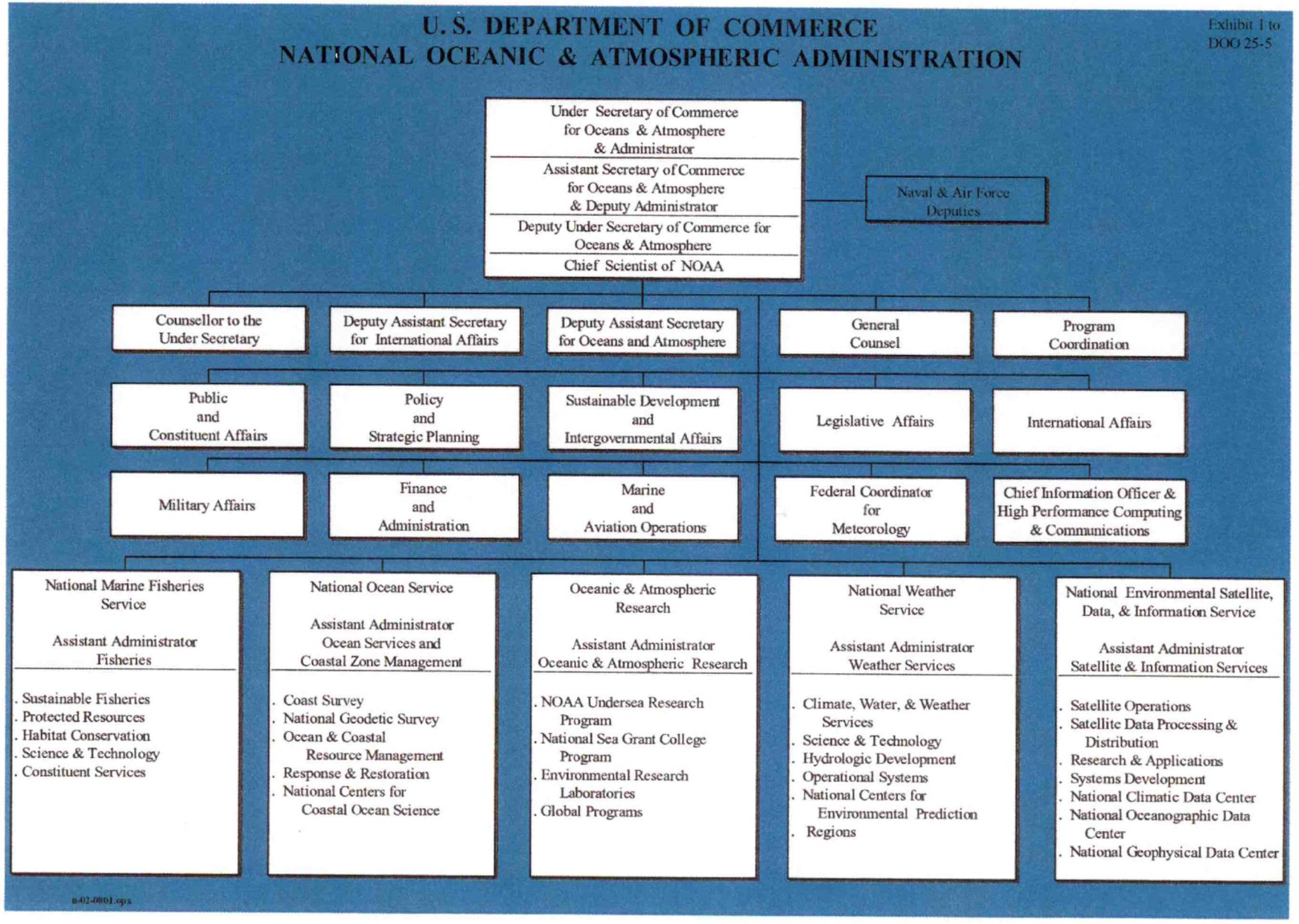

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APPEXDIX B

HISTORICAL EVOLUTION
Of
NOAA ORGANIZATION

The Evolution of NOAA as an Organizational Experiment

Purpose: "Lessons Learned"

The purpose of this analytical summary is to review the basic features of the National Oceanic and Atmospheric Administration's (NOAA) organization since its establishment by President Nixon in 1970 through Reorganization Plan No. 4. This macro-level summary is intended to be used in NOAA's strategic planning process in 2002 and 2003 to identify strategic goal and organizational structure opportunities based upon NOAA's actual experience as an agency. These opportunities will require more detailed analysis and evaluation prior to decision and implementation in practice than will be presented here.

Two very important contextual factors for understanding NOAA's past, present and future will not be considered here, but warrant significant attention as a separate effort:

1) the state of Federal organization for oceanic, atmospheric and environmental science, and related services and regulation (NOAA is not the NOAA recommended by the Stratton Commission, and interagency coordination and integration are now at the weakest point since the 1970s), and;

2) the evolution of the Environmental Protection Agency pursuant to Reorganization Plan No. 3 of 1970 (Plans 3 and 4 were linked at least conceptually by President Nixon, but EPA took a decidedly different path to organizing as an independent agency).

Approach: "7 NOAAs"

A federal agency the size and complexity of NOAA undergoes organizational changes (structure, process, priorities and resources) on a continuous basis, at least at some level of programmatic detail or nuance. When the political leadership of NOAA has changed, new priorities and even major reorganizations have occurred based upon different priorities or expectations about NOAA's mission given national needs at the time. These reorganizations have been proposed (and rationalized) by various "principles" or "themes" that justify change to internal and external NOAA stakeholders. That will be the macro-level of analysis used here. With that perspective, seven distinguishable NOAA organizations can be seen in broad outline in NOAA's past.

"NOAA Zero"

Although NOAA was established on October 3, 1970, it took more than a year to move much beyond the establishment of mutual working relationships between the two largest organizational components of the new agency: The Environmental Science Services Administration (ESSA) and the Bureau of Commercial Fisheries (BCF). In fact, ESSA comprised approximately 70 percent of the NOAA workforce, and other than BCF, the other merged components were quite minor in

scope (marine minerals technology, Sea Grant, Lake Survey, oceanographic data and instrumentation, data buoys). In terms of budget, ESSA programs represented 77% of the NOAA budget in FY 1971, and with BCF's funding share of 12%, nearly 90% of the original NOAA budget was devoted to these two components. The Weather Bureau share of the first NOAA budget alone was 57%.

This "NOAA Zero" organizational discussion will focus on ESSA as the initial NOAA "keel", because ESSA had such an overwhelming influence over NOAA's early evolution. This influence stemmed in part from the fact that the ESSA Administrator (Dr. Bob White) became the first NOAA Administrator. But it also extended to the momentum of ESSA's operating units and the prevailing physical sciences culture of that agency.

The young ESSA was only formed in 1965 by President Johnson (Reorganization Plan No. 2) to consolidate two relatively large environmental science services bureaus in the Department of Commerce (DOC) : the Weather Bureau and the Coast and Geodetic Survey. The rationale was a mixture of increased efficiency from common management as well as scientific and programmatic benefits of a more integrated DOC investment in the emerging physical "environmental sciences". From DOC's perspective, the benefits of the environmental sciences were truly promising but the costs of sophisticated ships, laboratories and the advancing satellite remote sensing tools were exceedingly expensive by DOC standards.

ESSA was intended to "provide a single national focus for our efforts to describe, understand, and predict the state of the oceans, the state of the lower and upper atmosphere, and the size and shape of the earth". Under law, ESSA was responsible for "issuing hazards warnings to the general public" and "services for marine, land, and air commerce, agriculture, forestry, business and industry." The final organization chart for ESSA is presented in Figure 0.

Two basic types of lessons were learned from the ESSA experience. First, a more integrated (ocean and atmosphere) focus was taken centrally in administrative and budgetary management, especially the quest for budget savings through shared facilities and support. DOC had previously viewed the Weather Bureau and Coast and Geodetic Survey separately. During ESSA's five year history, some investments were made successfully in operations and research especially for technology development. Management of operations, on the other hand, was expanded from two bureaus (Weather Bureau and Coast and Geodetic Survey) to five operating components (see Figure 0).

Second, ESSA took a more centralized approach to the organization of research and development. At the formation of the ESSA, supporting research was primarily managed by the operating bureaus in such program areas as "geophysical, telecommunications and space environment, oceanographic and hydrographic, weather and river, and satellite". By the time ESSA was slated to become the largest part of the new NOAA, it had largely centralized R&D in the ESSA Research Laboratories. This centralization gained support and provided critical mass for oceanographic and weather research.

"NOAA 1"

By early 1972, the new NOAA leadership took complex steps to organize the merger based upon the NOAA "mandate" contained in Reorganization Plan No. 4 proposed by President Nixon in 1970. According to Reorganization Plan No. 4,

> The oceans and the atmosphere are interacting parts of the total environmental system upon which we depend not only for the quality of our lives but for life itself.
>
> We face immediate and compelling needs for better protection of life and property from natural hazards, and for a better understanding of the total environment–an understanding which will enable us more effectively to monitor and predict its actions, and ultimately, perhaps to exercise some degree of control over them.
>
> We also face a compelling need for exploration and development leading to the intelligent use of our marine resources. The global oceans, which constitute nearly three-fourths of the surface of our planet, are today the least-understood, the least-developed, and the least-protected part of our earth...We must understand the nature of these resources, and assure their development without either contaminating the marine environment or upsetting the balance.
>
> Establishment of the National Oceanic and Atmospheric Administration–NOAA--within the Department of Commerce would enable us to approach these tasks in a coordinated way. By employing a unified approach to the problems of the oceans and atmosphere, we can increase our knowledge and expand our opportunities not only in those areas, but in a third major component of our environment, the solid earth, as well.
>
> Scattered through various Federal departments and agencies, we already have the scientific, technological and administrative resources to make a unified approach possible. What we need is to bring them together. Establishment of NOAA would do so.

Reorganization Plan No. 4 went on to say that bringing these activities together in a single agency

> ...would make possible a balanced Federal program to improve our understanding of the resources of the sea, and permit their development and use while guarding against the sort of thoughtless exploitation that in the past laid waste to so many of our precious national assets. It would make possible a consolidated program for achieving a more comprehensive understanding of oceanic and atmospheric phenomena, which so greatly affect our lives and activities. It would facilitate the cooperation between public and private interests that can best serve the interests of all.

In his remarks transmitting Reorganization Plan No. 4, President Nixon stated that

> I expect that NOAA would exercise leadership in developing a national oceanic and atmospheric program of research and development. It would coordinate its own scientific and technical resources with the technical and operational capabilities of other government agencies and private institutions. As important, NOAA would continue to provide those services to other agencies of government, industry and private individuals which have become so essential to the efficient operation of our transportation systems, our agriculture and our national security. I expect it to maintain continuing and close liaison with the new Environmental Protection Agency and the Council on Environmental Quality as part of an effort to ensure that environmental questions are dealt with in their totality and that they benefit from the full range of the government's technical and human resources.

Finally, President Nixon acknowledged that the NOAA reorganization resulted from more than the Stratton Commission recommendations and that further reorganization may be necessary in the future:

> In formulating these reorganization plans, I have been greatly aided by the work of the President's Advisory Council on Executive Organization (the Ash Council), the Commission on Marine Science, Engineering and Resources (the Stratton Commission, appointed by President Johnson)), and my special task force on oceanography headed by Dr. James Wakelin, and by the information developed during both House and Senate hearings on proposed NOAA legislation. Many of those who have advised me have proposed additional reorganizations, and it may well be that in the future I shall recommend further changes.

With this mandate in mind, NOAA leaders adopted an organizational strategy that simultaneously preserved the internal structures of the operating components assigned to NOAA while adding a senior staff-level organization for program planning and integration to provide for what was "new" in the NOAA mandate. Surviving virtually intact structurally, most of the NOAA predecessor components underwent name changes reflecting the new NOAA status as an organization with a "national" mission. These changes included:

Pre-NOAA	NOAA
Weather Bureau	National Weather Service
Coast and Geodetic Survey	National Ocean Survey
Bureau of Commercial Fisheries	National Marine Fisheries Service
National Environmental Satellite Center	National Environmental Satellite Service
ESSA Research Laboratories	Environmental Research Laboratories

The new NOAA staff offices for program planning and integration mirrored the overwhelming predominance of the ESSA and BCF subject matter in the NOAA reorganization. An Associate Administrator for Environmental Monitoring and Prediction and an Associate Administrator for Marine Resources were established and given significant staff resources to focus on building NOAA while the operating components largely continued their programmatic activities unchanged. Other additions included the formation of the NOAA Corps (building upon the ESSA uniformed service), and the designation of a small office for Environmental Modification under an Associate Administrator (reflecting the prevailing interest in weather modification at the time). See Figure 1a for the NOAA organizational chart as of March, 1972.

Between 1972 and late 1976 when NOAA's first Administrator Bob White left the agency, several important events occurred which shaped NOAA's future, but they were largely a result of external forces. The passage of the Coastal Zone Management Act, the Marine Research, Protection and Sanctuaries Act and the Marine Mammal Protection Act in 1972 and the Endangered Species Act in 1973 gave impetus to a concrete environmental protection and management mission for NOAA distinct from the ESSA and BCF functions. In 1972, NOAA established a new Office of Coastal Environment reporting to the Administrator to attend to these environmental responsibilities while the species protection functions went to the National Marine Fisheries Service. By 1976, the environmental responsibility was assigned to a new Assistant Administrator for Coastal Zone Management. In 1973, a small Office of Ocean Engineering was established to respond to external advocacy for the technology development proposals for NOAA contained in the Stratton Commission report.

The other major mission change for NOAA occurred in 1976 with the passage of the Fishery Conservation and Management Act. For the first time, NOAA was given a regulatory responsibility for commercial fisheries in the U.S. Exclusive Economic Zone. This led to significant organizational additions to NMFS reflecting the full range of new duties ranging from stock assessment supporting fishery management to enforcement. See figure 1b for an organizational chart for NOAA in 1976.

By the end of 1976, the evolution of the NOAA organization ("NOAA 1") had taken on great complexity while retaining much of the structure of the pre-NOAA organizations. The NOAA budget had grown 187% from $270 million in 1971 to $505 million in 1976. Of this five year 187% ($235 million) increase, the following shares went overwhelmingly to three pre-NOAA program areas: ESSA 78% ($184 million), BCF 14% ($35 million), and Sea Grant 7% ($16 million). The largest part of the increase of $235 from 1971 to 1976 went to the old Weather Bureau activities which accounted for 66% ($154 million) alone. In addition, the Coastal Zone Management Program grew from an initial appropriation of $12 million in 1974 to $18 million in 1976.

Several organizational lessons can be learned from the NOAA 1 experiment. First, the fundamental task of program integration to implement the NOAA mandate from Reorganization Plan No. 4 as well as subsequent legislation, proved to be more challenging than probably anticipated by most stakeholders. The internal integration task had several dimensions. One dimension was the oceanic and atmospheric cleavage of NOAA components. While ESSA had a

major commitment to oceanic and atmospheric integration (weather forecasting can't be done well without ocean observations) that union was forged entirely from a physical science perspective. The new environmental mission for NOAA as well as the transfer of the marine living resources responsibility from BCF required a move toward integration of the physical and biological sciences. There is little evidence that this physical/biological science integration increased during NOAA 1, except perhaps in some extramural work funded by Sea Grant.

Another program integration task involved the creation of effective relationships between science-based service activities (the bulk of NOAA work in terms of budgetary investment), supporting research, and regulation/management. Building and strengthening linkages between these activities (research should support regulation etc.) was a major organizational challenge for NOAA. This challenge of integrating science, service and regulatory/management was compounded by organizational culture issues between the formerly ESSA workforce, the formerly BCF staff and the emerging "environmental analysis" staff in NOAA. The professional culture from the physical science traditions of ESSA stressed objectivity, data integrity through quantification of observations and analysis and, above all, neutrality. The culture in NMFS and in the new NOAA environmental/coastal management activities had to cope with uncomfortable excursions into advocacy, controversy and even conflict in situations of often great scientific uncertainty. During NOAA 1, the task of linking scientific support to the new environmental management activities was recognized, but little progress occurred organizationally.

The responsibility for program planning and integration was assigned to the Associate Administrator for Environmental Monitoring and Prediction and the Associate Administrator for Marine Resources. As mentioned before, these two components took as a point of departure the organizational cleavage between ESSA activities (physical sciences) and BCF activities (biological sciences). For largely practical reasons, the primary work of the two Associate Administrators with their professional staffs focused on program planning and analysis with a view to future programs with additional funding, not current (base) program activities. It was designed as a limited form of matrix management. The current work of the operating Major Line Components received little critical scrutiny from the Associate Administrators, either from a program integration or organizational performance perspective. The Associate Administrators had little influence over the direct management of operating units (people and funds).

The decision to adopt a limited form of matrix management for program planning and integration by NOAA management was as much personal as it was organizational. Both Bob White and his Deputy, Dr. Jack Townsend, had direct and engaged management styles that promoted "hands on" interaction with the heads of the NOAA operating units on a daily basis. A stronger form of matrix management by the Associate Administrators would have become another management layer that could have impeded interactions between top management and the operating unit heads. There was also a tendency to view NOAA management as two distinct tasks: 1) keeping current operations on track with efficient decision making using the largely inherited organizational structures predating NOAA; and 2) building the new NOAA with program increases and new mandates through the Associate Administrators.

Because there was significant program growth in the Environmental Monitoring and Prediction arena during NOAA 1, that Associate Administrator had many opportunities to shape and help integrate the research, service and observing activities devoted to prediction in the agency. On the marine resources side, the Associate Administrator for Marine Resources experienced less program growth, so there were fewer opportunities to shape program integration. The Marine Resources Associate and staff did contribute to program planning that cut across the NOAA structure in new environmental quality/management activities and to a certain degree the requirements for the eventual Federal regulatory role for NMFS. To the extent that NOAA's emerging environmental protection/management mission required program integration between Environmental Monitoring and Prediction and Marine Resources perspectives, the NOAA 1 structure did not facilitate that.

"NOAA 2"

In 1977, the arrival of the Carter Administration caused a significant shift in priorities in NOAA policy, programs and management that eventually led to a major reorganization of the agency the following year. The second NOAA Administrator, Dick Frank, and his Deputy, Bud Walsh, had direct personal experience in national and international policy making in the Federal government. Each was steeped by participation in negotiations in the Third United Nations Law of the Sea Conference, especially on issues relating to the environment and marine resources conservation. Bud Walsh wrote the FCMA for the Senate Commerce Committee with assistance from the first Director of the BCF, Ambassador Don McKernan. The Associate Administrator, Dr. George Benton, was a highly regarded atmospheric scientist who had recently conducted a review of NOAA R&D for the National Research Council.

The new NOAA leadership had definite views of what directions NOAA should take, and what impediments the NOAA 1 organizational structure presented for progress. Nominally guided by the agenda of the ongoing National Ocean Policy Study in the Senate, the NOAA leadership emphasized the need for aggressive implementation of new NOAA mandates for fisheries regulation and broader environmental management. They also stressed the development of "ocean policy" to increase management and protection of the ocean through policy decisions and interagency activism.

This ocean policy orientation had direct and far reaching ramifications for a NOAA reorganization in 1977. By personal style and professional training (the top two officials were lawyers), the NOAA leadership preferred to be involved with the resolution of policy issues of a controversial nature primarily involving NOAA's environmental management and regulatory responsibilities. "Routine" program management decisions related to operations that did not involve significant external controversy were tasks to be delegated to Assistant Administrators with considerable freedom for action.

Given this NOAA leadership perspective, the most obvious "defect" in the NOAA 1 organization inherited from the Ford Administration was complexity and communications overload. Thirteen operating units reported directly to the Office of the Administrator (not counting the Assistant Administrator for Administration and the internal Headquarters offices such as General Counsel,

Public Affairs etc.). Another weakness was the absence of a high level policy focus for an activist approach to advance NOAA's role in ocean policy and environmental management, especially in new areas. Finally, reduced organizational complexity and increased consolidation could be the basis for efficiencies and even savings in terms of staffing.

The organizational remedy proposed and implemented by the NOAA leadership in the Carter Administration –NOAA 2– can be seen in Figure NOAA 2. The most striking feature of this reorganization was the total consolidation of all of NOAA's observation and prediction service activities under an Assistant Administrator for Oceanic and Atmospheric Services. Virtually downgrading the entire ESSA organization –weather, ocean survey, data, satellites–to report to a NOAA Assistant Administrator, this action placed nearly 70% of NOAA employees in one NOAA operating unit.

The next major feature of the 1977 reorganization was the consolidation of various NOAA research and development activities under an Assistant Administrator for R&D. The Environmental Research Laboratories, Sea Grant and Ocean Engineering reported to the Assistant Administrator for R&D, but there was no internal restructuring of these programs.

The increased policy focus sought by the NOAA leadership was expressed in several organizational changes. The Assistant Administrator for Coastal Zone Management, assigned responsibilities for CZM, Coastal Energy Impact Program funding, Marine Sanctuaries and Coastal Environmental Assessment, was given the full status accorded to the other Assistant Administrators (reporting to the Administrator, delegation of authority etc.). The priority given this Assistant Administrator was evident given the fact that the AA for CZM supervised approximately 200 employees while the AA for OAS oversaw approximately 8,000.

An Assistant Administrator for Policy and Planning was established with the full status of an comparable to the other AA's. This office (Policy and Planning) was designed to have more of a policy studies function than planning, and the AA was primarily a personal policy advisor to the Administrator who had the authority to participate in any decision meeting involving the Administrator. A small Office of Ocean Management was also created to do some long-range thinking about comprehensive management of ocean space.

Finally, an Assistant Administrator for Management and Budget was established. This position largely assumed the responsibilities of the former Assistant Administrator for Administration, but there was the expectation that the AA for MB would play a higher profile role on the NOAA Executive management team giving broad management and budget advice rather than simply overseeing routine administrative services.

Minor organizational additions were eventually made to respond to statutes expanding NOAA's responsibilities. Explicit interagency coordination legislation led to the National Climate Program Office and the National Marine Pollution Program Office in NOAA Headquarters. An Office of Ocean Minerals and Energy was created later to administer seabed mining and ocean thermal energy conversion regulations. The transfer of an operational Landsat system to NOAA also resulted in an additional structure in the National Environmental Satellite Service.

Compared to the NOAA 1 organization, NOAA 2 elevated policy planning for NOAA's environmental and marine resource initiatives to a very high level with an integrated focus across NOAA. However, program planning and budgeting functions were primarily delegated to the AA's for NOAA's operating units. Interagency and legislative victories in the ocean policy arena led to increases in NOAA's influence and assigned responsibilities. However, NOAA funding during the period 1977-1980 increased modestly at best. NOAA's operating programs did not expand significantly, except in two areas. NMFS increased 39% ($35 million) primarily for the extended jurisdiction fishery regulation effort. CZM expanded 39% ($15 million). Overall, NOAA's 1977 budget went from $622 million (not counting Coastal Energy Impact pass-through) to $772 in 1980, a change of 24%. While this increase may seem impressive, it was during a period of high inflation in America, so that in constant dollar terms, the "purchasing power" was much less.

With respect to program integration, there is little evidence of significant progress during the NOAA 2 organization. The greatest expectation for efficiencies from the OAS consolidation did not materialize. In fact, the AA for OAS managed that organization as a mini-ESSA with each component largely seen as distinct from the others. Eventually the AA for OAS became just another organizational layer in NOAA management, and the Directors for NWS, NOS, EDIS and NESS found ways to advocate their separate interests to NOAA top management, especially in budget matters. Strong constituent, and therefore Congressional alignments with each of the separate operating units in OAS impeded flexibility in setting program and budget priorities across OAS.

One interesting initiative for NOAA integration focused on the regional scale. With the decision to close the Seattle Naval Station at Sand point in the late 1970s, Senator Magnuson's staff arranged for the construction of NOAA's Western Regional Center (WRC) on the site. Collocation of NOAA field offices in weather, fisheries, research and coastal programs with the Western Administrative Support Center created NOAA's second largest concentration of activities outside of the Washington, D.C. area. However, NOAA leadership never considered or took steps to create any form of NOAA level coordination at the WRC for the programmatic level. The benefits of the WRC were limited to opportunities for cross-communication among NOAA components of the type eventually sought and experienced at the NOAA Silver Spring campus in the 1990s.

"NOAA 3"

During pre-confirmation meetings in early 1981 between NOAA Administrator -Designate John V. Byrne and Congressional members and staff, Dr. Byrne received strong encouragement to build up NOAA's ocean programs after a decade of modest growth. The formation of NOAA a decade earlier had raised expectations for the agency's leadership and expansion.) On the other hand, the new Reagan Administration had a less activist view of NOAA's role in Federal environmental programs as well as a pervasive commitment to slow the growth of the Federal Government. Accordingly, Dr. Byrne and Deputy Administrator Tony Calio decided to give reorganization of NOAA a very high priority to address these conflicting goals.

There were several major features of the NOAA reorganization which was implemented in 1982. See Figure 3. First and foremost was the creation of strong operating Line offices to be headed by Assistant Administrators with a no-nonsense approach to program accountability and management. The asymmetry and pronounced policy orientation of the Carter Administration reorganization of NOAA in 1977 were largely muted. In fact, the Assistant Administrator for Policy and Planning was downgraded in 1982 to a Director-level staff office, and the function was eliminated entirely in 1986.

As for the Line Office structure, the National Weather Service and National Marine Fisheries Service were retained in a largely unaltered state. The Office of Research and Development was simply renamed the Office of Oceanic and Atmospheric Research. However, major new consolidations occurred for ocean services and satellite/data services.

Strong Congressional support for a NOAA "Ocean Program" was frequently voiced by the slogan "put the "O" back in NOAA". Therefore, the centerpiece of the 1982 reorganization was elevation of the National Ocean Survey into the National Ocean Service as a free standing Line Office. It built upon NOAA's charting and geodetic services and combined oceanography and marine assessment, ocean and coastal resource management, marine operations (ships) and ocean services. Informally Dr. Byrne and Mr. Calio referred to the new NOS as "the ocean equivalent to the National Weather Service". The explicit intent was to forge critical mass for NOAA's "Ocean Program" and build a broader-based constituency to sustain its momentum.

The other significant realignment was the creation of another separate Line Office combing the National Environmental Satellite Service with the Environmental Data and Information Service. This reorganization effectively carved up the earlier Office of Oceanic and Atmospheric Services into more manageable and symmetrically sized organizations that reduced the scale and predominance of the National Weather Service in the NOAA structure by separating out the increasingly costly environmental satellite program. With increasing volumes of satellite remote sensing data, the merger between satellite operations and data archiving seemed appropriate at the time. Moreover, a trend toward more integrated environmental remote sensing with the transfer of the operational LANDSAT Program to NOAA moved away from the more narrow "meteorological satellite" program. See Figure 3 for a chart of the NOAA 3 reorganization.

A seemingly cosmetic organizational change occurred in 1984involving the titles and grades of NOAA's top three political executives. These changes had important implications later in NOAA's history. The NOAA Administrator, Deputy Administrator and Associate Administrator were given additional Department of Commerce titles of Under Secretary for Oceans and Atmosphere, Assistant Secretary for Oceans and Atmosphere, and Chief Scientist respectively. The grades were changed from Executive Level (E.L.) III, E.L. IV and E.L. IV to E.L. III, E.L. IV and E.L. V thereby demoting the Chief Scientist to non-Senate confirmation status. The rationale for the changes were complicated. On the one hand, the Department desired to integrate the relatively independent NOAA more directly into the Department's executive team like the other bureaus. From NOAA's perspective, the Under Secretary title was expected to give NOAA a measure of more clout in dealing with the Department.

The demotion of the Associate Administrator position was mostly a result of friction between the top three leaders early in the Reagan Administration and the desire to create a Chief Scientist position with little authority except special projects. By 2001, the Scientist position had atrophied to the point that the position was eliminated by the new Bush Administration. This deterioration of a senior scientific perspective in NOAA Headquarters was likely one major factor in the weak support for NOAA science in the 1990s.

By the time that Tony Calio left as the NOAA Administrator in 1988 (Dr. Byrne returned to Oregon State University in 1985), two major innovations occurred, largely driven by the new NOAA Line Office Structure, not NOAA Headquarters. One was the experiment in matrix management for the Prototype Regional Observing and Forecasting System (PROFS) that coupled cutting edge mesoscale meteorological research, integrated new weather observing technologies and operational forecasting services. PROFS was jointly managed by the Assiatnt Administrators for NWS, NESDIS and OAR on a voluntary basis through an ad hoc structure known as the "Troika". PROFS became the foundation for the other significant NOAA innovation: the Modernization and Associated Restructuring (MAR) of the National Weather Service. Literally changing the entire observing, computing and operating field structure of the NWS over a ten year period, it matched a reduction in field offices by half with a professionalization of the NWS workforce emphasizing professional meteorologists rather than technicians. The MAR was NOAA's most ambitious reorganization.

A similar attempt to provide crosscutting action in the agency came with the establishment of the Office of NOAA Corps Operations, thereby putting direct management responsibility for NOAA ships and aircraft in the hands of the NOAA uniformed Service. Commissioned Officer "billets" grew by more than 50 during this period.

Because of Federal budget constraints during the Reagan Administration, the 1982 NOAA Reorganization did not make much progress in building NOAA's programs other than in the weather area. However, the 1982 reorganization provided the basic Line Office operating unit structure for NOAA that has persisted for twenty years with several limited, but important modifications. The 1982 reorganization became the "laboratory" for NOAA's organizational experiments.

"NOAA 4"

Responding to emerging external needs and fine-tuning the NOAA 3 organization, NOAA tried three organizational innovations during the first Bush Administration. See figure 4. The first innovation was the establishment of the position of Deputy Under Secretary. Intended to serve as a day-to-day Chief Operating Officer, the position took on many dimensions of the role of NOAA's first Deputy Administrator, Jack Townsend. Initially filled as a Schedule C position (Gray Castle was the first incumbent who actually had any authority), the DUS assignment oscillated between career and political appointments (2 each). None of the incumbents (2 lawyers and 2 budget officials) have had scientific or technical expertise in NOAA subject matter. The responsibilities of the DUS focused on NOAA strategic planning, operations management through the Annual Operating Plan and Monthly Operating Reviews, and budgeting

as well as NOAA Executive Resources performance evaluation. Analytical support from a permanent Headquarters staff trained for this purpose that was assigned to the DUS was changed to a new Program Coordination Office comprised entirely of temporary detailees from the Line Offices in 1992.

Strategic planning as an organizational responsibility affecting the budget oscillated between being a separate NOAA Headquarters staff office (1990-2001) and being a part of the Budget Office (1988-1990, 2001-present).

With respect to new initiatives in crosscutting (matrix) NOAA management, experiments from 1988 through 1992 implemented successful NOAA initiatives in several mission areas. Noticeable budgetary success was achieved in the Office of Global Programs, the Coastal Ocean Program and the Environmental Data and Information Program. These programs were implemented (planned, budgeted, executed) from NOAA Headquarters Program Offices. These crosscutting matrix programs received high priority in the NOAA budget process by NOAA top leadership to the point that NOAA Assistant Administrators began to perceive that they could not get significant budget increases for Line Office except through the matrix programs. Moreover, two of the crosscutting programs (OGP and COP) adopted strategies of major extramural funding at least in part to generate external constituent support to obtain appropriations increases. As a result, the Assistant Administrators expressed growing concern that Line Offices could not "get well" with budget enhancements if the matrix programs were favored. Line Office opposition to matrix programs mounted.

Less successful were Fleet Modernization and Aircraft Modernization Plans prepared by the Office of the Chief Scientist. The primary problem with these high cost investment areas (fleet modernization alone was expected to cost at least $2 billion), was the difficulty for NOAA to make a compelling case for program requirements for ships and aircraft to justify investments. One consequence of this problem was that NOAA's only new Class One vessel (*Ron Brown*) and only modern jet (Gulfstream 4) were funded outside of the normal budget process by Congressional action to buy these platforms originally built for other agencies.

NOAA's first attempt to establish program integration at the regional level occurred in 1991-1992. At the request of the Deputy Under Secretary, the NOAA Strategic Planning Staff conducted an eighteen month study of the feasibility of establishing a coordinated NOAA program involving field offices and laboratories in the Monterey Bay area. Involving every Line Office, the strategic plan for this initiative would have created a joint plan of action on a permanent for all NOAA activities in the Central California Coast area. The establishment of a NOAA-level coordinator for the Monterey Bay area was considered by the NOAA Administrator, Dr. John Knauss, in late 1992, but the new Administration did not act on the proposal.

"NOAA 5"

With the advent of the Clinton Administration, a major initiative to prepare a crosscutting NOAA Strategic Plan was undertaken in 1993 as a part of the FY 1995 budget process. One reason for this initiative was the Government Performance and Results Act (GPRA) of 1993 which required major Federal departments and agencies to submit strategic plans to Congress (technically, DOC was requiredby GPRA to submit the strategic plan with NOAA as a component, but NOAA volunteered to serve as a GPRA Pilot agency to experiment with implementation of the new law requiring strategic planning in Federal agencies). Every year since 1993 until 2002, the Seven NOAA Strategic Goals drove NOAA budget formulation through Strategic Planning Teams comprised of program staff from across the agency. However, the NOAA commitment to matrix management weakened noticeably with the transfer of the NOAA Program Offices (OGP, COP, ESDIM) to Line Office in the late 1990s. See Figure 5. Similarly, crosscutting management of research was reduced with the elimination of the Director of the Environmental Research Laboratories. Perhaps most symbolic of the "institutional glue" binds NOAA together, the NOAA Corps itself was proposed for termination in the mid-1990s.

NOAA management was probably the most active in courting White House political support during the 1990s than at any time in its history. Year of the Ocean Initiatives, The National Ocean Conference, and the President's Ocean Exploration Initiative as well as the Vice President's GLOBE Program gave NOAA a level of White House visibility. However, this visibility tended to create a sense of politicizing NOAA (in partisan terms). For example, only one Republican member of Congress participated on the program at the National Ocean Conference in 1998. Being a team player was also made a requirement by the top NOAA leadership, and the Counselor to the Under Secretary remarked in public meetings that every NOAA Assistant Administrator and Deputy had been replaced during the Clinton Administration.

"NOAA 6"

By the late 1990s, professional staffing for analysis in NOAA Headquarters dropped to its lowest point in NOAA's history. Detailees, with little training in Headquarters functions who remained on Line Office payrolls, staffed both the Program Coordination Office (supporting the DUS) as well as most of the Office of Policy and Strategic Planning. This tendency to decentralize responsibility from NOAA Headquarters to Line Offices was most remarkable in the case of the grants of authority to NOS to build the NOAA Ocean Program. The Under Secretary asked the AA for NOS to take the lead to expand NOAA's Ocean Program through direct engagement of stakeholders. NOS promoted the legislation for the Commission on Ocean Policy and was designated as the secretariat for the Commission. Program growth in NOS occurred in various areas, both from transfer of programs from other NOAA Line Offices to new starts in Coastal Services and Ocean Exploration. NOS also advocated budget increases for the agency, especially politically popular pass-through funds to engender its external base of support with the encouragement of the White House.

"NOAA7" and Beyond

As a result of VADM. Lautenbacher's NOAA Program Review, and his subsequent decisions based upon the PRT's recommendations, NOAA will establish a new Assistant Administrator for Program Planning and Integration as well rebuild program analysis capabilities in NOAA Headquarters in 2002. This reorganization is intended to be an interim step leading ultimately to a more integrated NOAA structure. The new NOAA Strategic Plan, due in early 2003, will address many of the policy, program, management and budget questions that have punctuated NOAA's history from the very beginning. The shape of NOAA's organization for its Fourth Decade will be substantially determined by these activities.

Currently, there is negligible external advocacy for NOAA reorganization of any kind, except potentially by the statutory Commission on Ocean Policy. Congressional approval of any reorganization proposed by NOAA will require significant external acceptance if not advocacy in the face of likely opposition to change in the status quo from constituents of the existing NOAA Line Offices. To the degree that the Commission on Ocean Policy could be an advocate for a stronger NOAA organization (both internally and at the interagency level) in its final report to the President and Congress in 2003, the window of opportunity for effective NOAA reorganization may be small. In fact, the next opportunity for significant organizational improvement may be many years in the future.

Summary and Conclusions

The effective implementation of NOAA7 and longer-term pursuit of NOAA 8 involve most of the organizational issues that NOAA has already attempted to address with previous reorganizations and management initiatives. The issues include:

– Program Integration (ocean/atmosphere, physical/biological science, science/ service/regulation balance, internal/interagency/international activities);

–Effective investment and management for R&D;

–Consolidation of expensive observing system programs for greater efficiency;

–Production of reliable and consistent management information at all levels;

–Increased accountability of managers for organizational performance; and

–Streamlined and responsive delivery of administrative services.

These issues have been addressed many times before in NOAA reorganizations with a mixed record of success.

At least from the perspective of the NOOA Program Review (NOAA employees and PR Team members), NOAA still has not gotten the organization "right". Careful attention to lessons

learned during 32 years of the NOAA experiment can greatly increase the odds that NOAA management will avoid past mistakes and successfully raise NOAA to a higher plane of performance in its vital mission of service to America.

It is ironic that Reorganization Plan No.4 of 1970 contemplated a NOAA organization with an integrated environmental science capability to, ultimately, modify the environment to protect society's interests. From climate change to invasive species, it is increasingly apparent that humanity is modifying the environment of earth in many inadvertent and unintended ways. There is an urgent need in the early 21st century for society to learn how to manage and control its modification of the environment. Current and future generations will depend on NOAA's success in providing knowledge of the changing earth through the environmental sciences. NOAA is the only organization with this mission.

Figure 0: Organization of the Environmental Science Services Administration in 1969

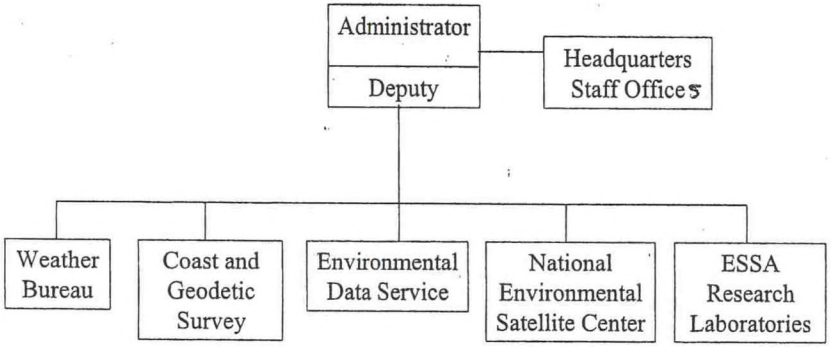


Figure 1a

Organization Chart of NOAA as of March 1972

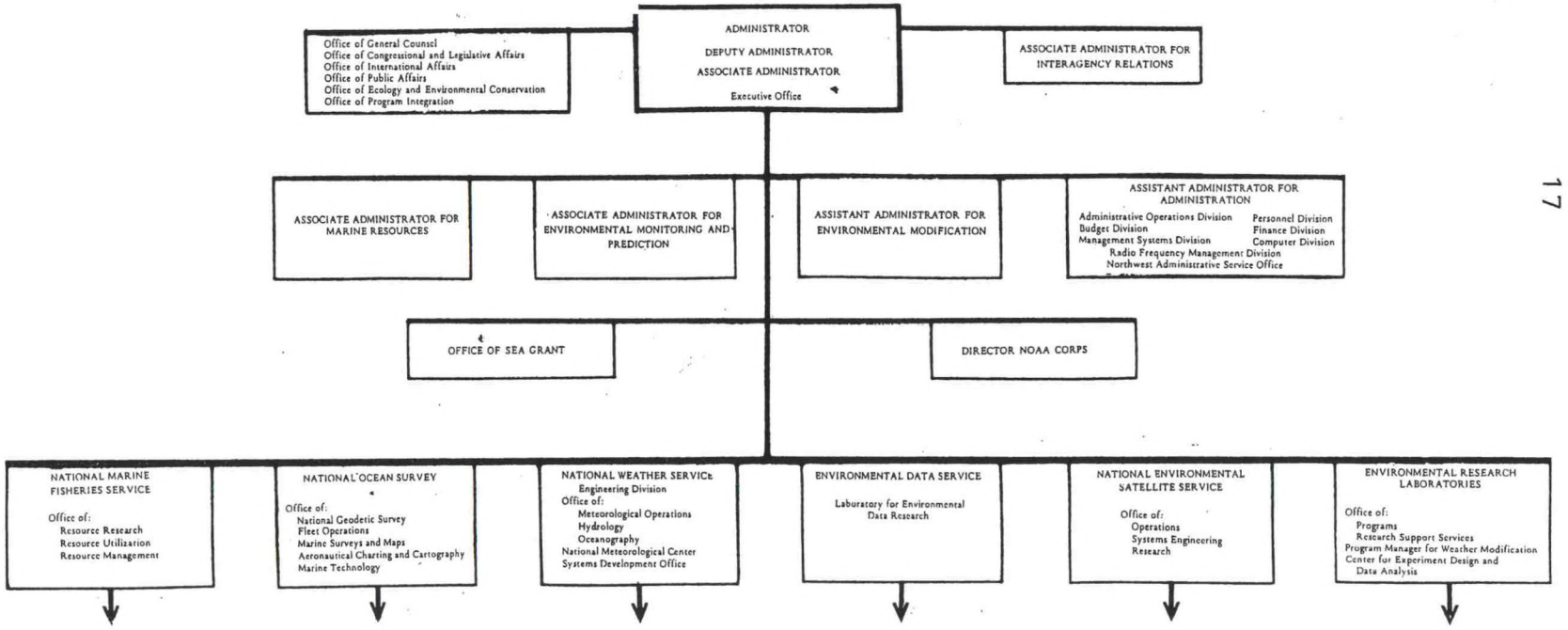


Figure 1b
NOAA Organization Chart as of 1976

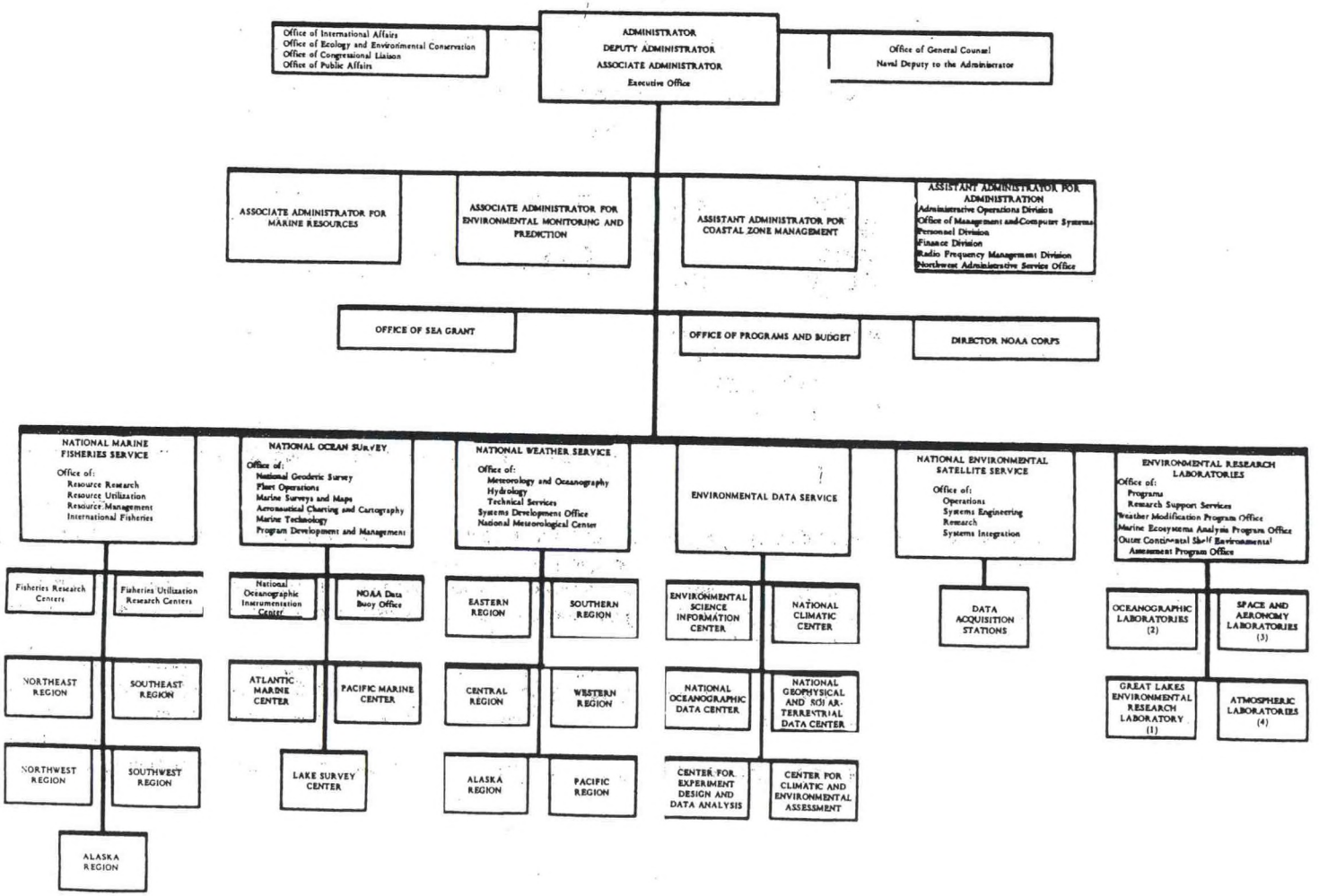


Figure 3
NOAA Organization Chart as of 1984

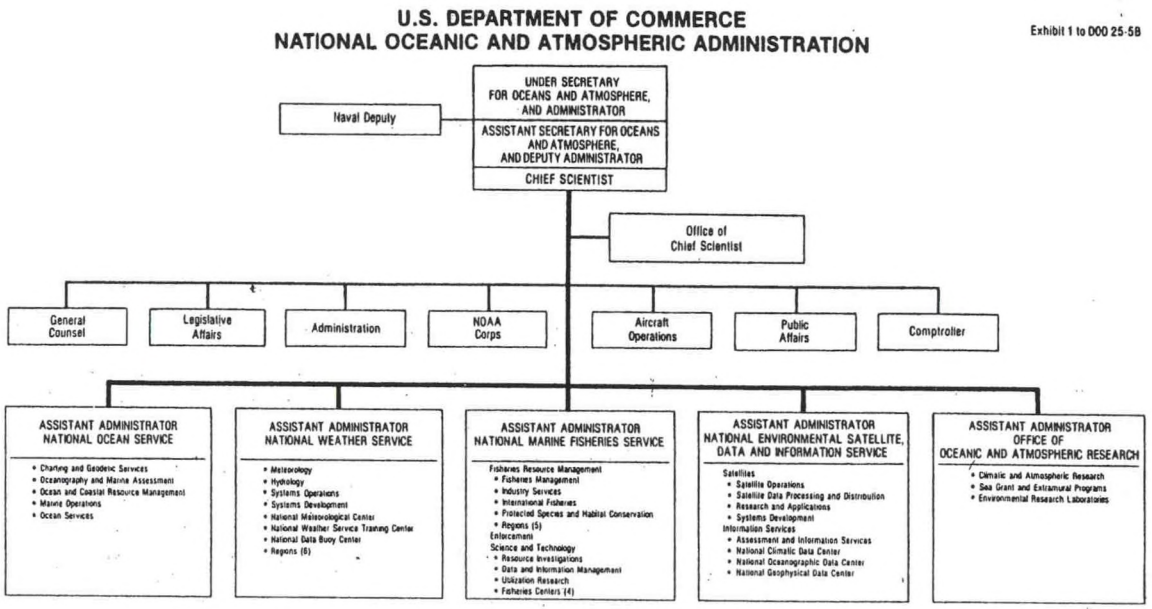


Figure 4
NOAA Organization Chart as of 1990

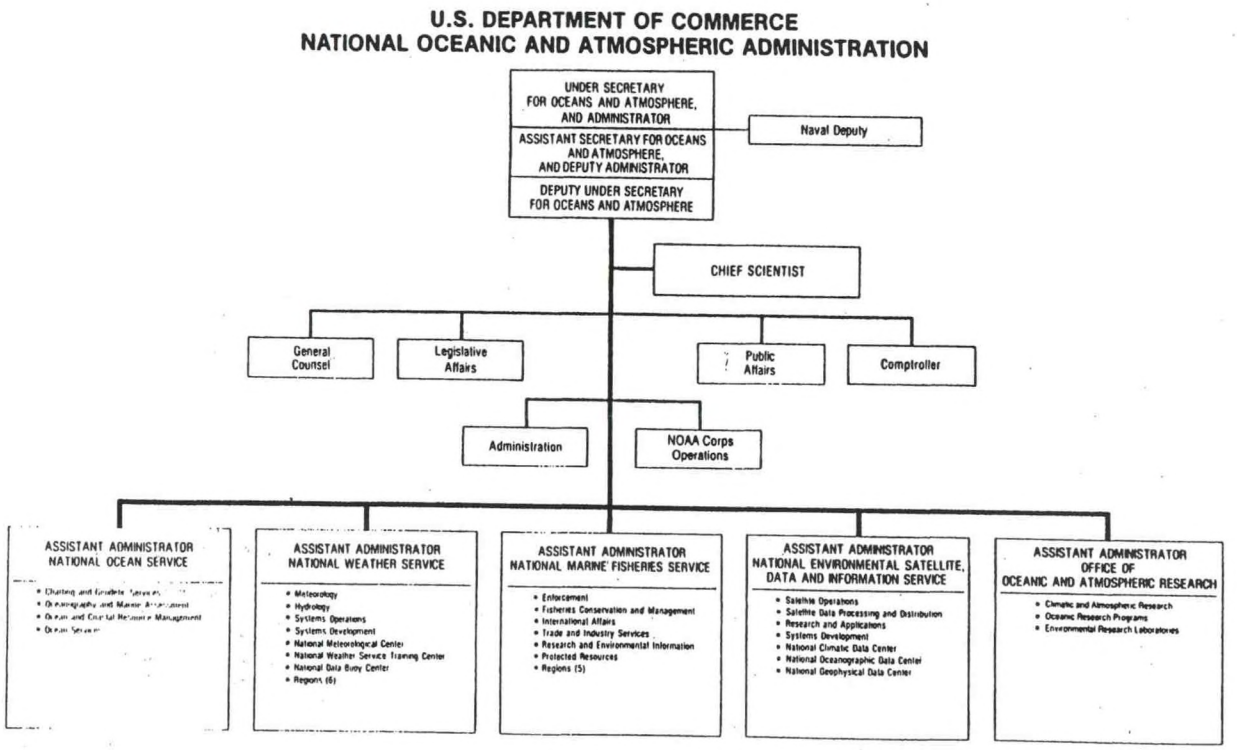
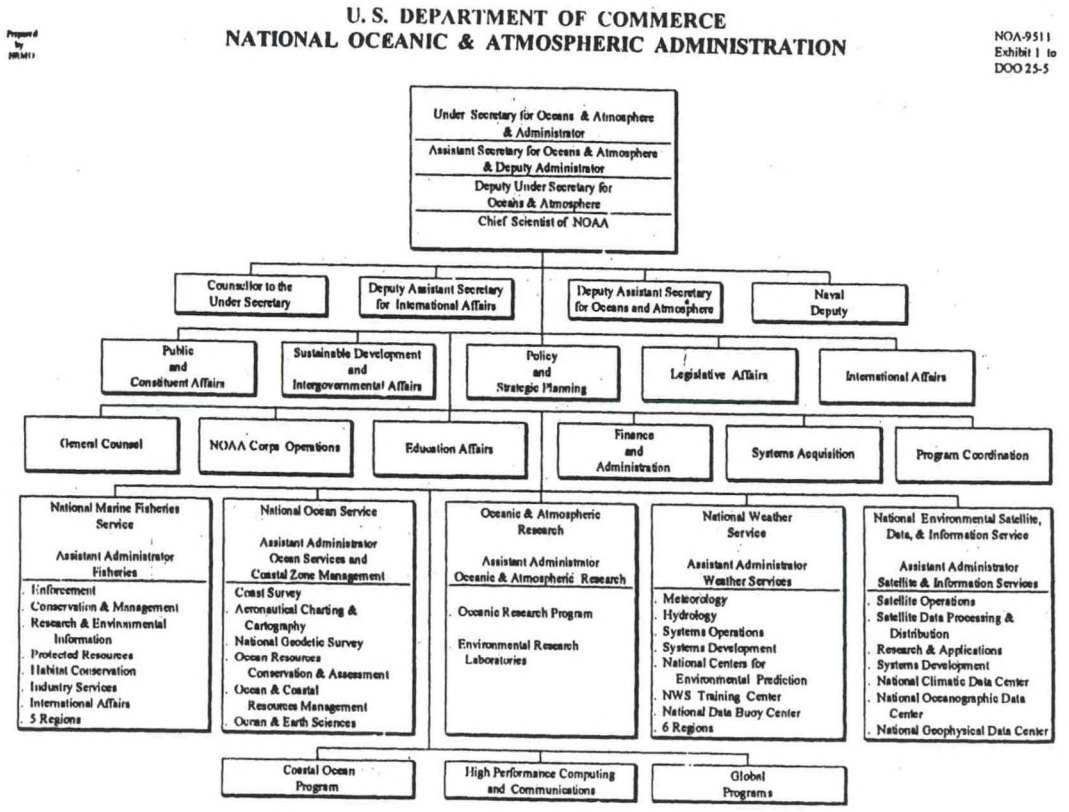


Figure 5
NOAA Organization Chart as of 1996



APPENDIX C

MISSION WORKING GROUP REPORT

SUMMARY OF KEY QUESTIONS AND MODELS FROM THE MISSION WORKING GROUP (MWG)

Introduction:

The purpose of this paper is to summarize key points of agreement regarding NOAA's mission, and to outline suggested future NOAA organizational options identified from the Mission Working Group (MWG) discussions. Although it is not meant to be a comprehensive account of the discussions, it is intended to accurately reflect the consensus that existed at the conclusion of the meetings.

The MWG believes that the current NOAA mission statement substantially reflects NOAA's current and future missions, but that simplification and clarification of the statement is appropriate. The MWG recommends that the revised NOAA mission read: "To describe and predict changes in the earth's environment and conserve and manage coastal and marine resources to balance the nation's economic, social and environmental needs."

The MWG also reached consensus that NOAA's mission activities can be described in terms of two core competencies: Environmental Analysis and Prediction (EAP); and, Environmental Management (EM). These core competencies form the framework within which other key NOAA competencies can be examined (e.g., People, Scientific Excellence, Environmental Observations) and placed in a consistent organizational context. The MWG explored various NOAA vision statement options, but did not reach consensus agreement on any single candidate.

The MWG examined various NOAA organizational options consistent with revisions to the proposed NOAA mission and identified core competencies. Organizational options were reviewed with respect to a variety of considerations, including: PRT recommendations; alignment of core competencies and associated activities; resource balance; span of control; potential for improvement in NOAA services and services delivery; experience gained from alternative organizational models in other federal agencies; and other considerations.

These MWG discussions resulted in several potential organizational structures being considered that represent a range of options from "evolutionary" to "significant changes" from NOAA's current organizational structure. The models served as strawmen for discussion, and helped highlight important trade-offs and challenges associated with an organizational re-alignment.

Over the course of the MWG discussions, several models seemed to emerge as serious candidates. Each highlights important considerations (span of control; scope and responsibilities of each organizational component; processes and procedures governing relationships among components; resource balance; service delivery paths (*i.e.*, how NOAA customers might expect to be affected); and loss of present corporate public identity). These considerations must be fully understood in examining any potential realignment.

While the MWG agreed that a reorganization or realignment should be examined to better position NOAA to meet its future goals, it recognized that such an undertaking would need to be

accomplished through careful planning to ensure the intended results. In the time allotted to the MWG, it was possible to plan only at the conceptual level.

On certain key points, the MWG achieved agreement (see Part I). Other issues were discussed extensively, and agreement on options was reached, but there was no resolution (see Part II). The five major issue areas are: Environmental Analysis and Prediction (EAP) and Environmental Management (EM) structures; the Program, Planning, and Integration (PPI) function; organization and alignment of observations; organization and alignment of research; and regional structure(s).

During the course of the meetings, an exercise was also undertaken to populate the models with estimated funding levels to provide a sense of magnitude among the different options and configurations. A summary of the organizational models with accompanying numbers is contained in Part III. The various organizational models are presented solely as options for discussion, and do not represent MWG final decisions.

PART I - Points of agreement:

- **Revised NOAA Mission Statement:** There was agreement that NOAA's current mission statement continues to substantially reflect NOAA's mission, but that some simplification and clarification is appropriate. The MWG recommends a revised NOAA mission that reads: "To describe and predict changes in the earth's environment and conserve and manage coastal and marine resources to balance the nation's economic, social and environmental needs."

- **Environmental Analysis and Prediction (EAP) and Environmental Management (EM):** The MWG agrees that these reflect NOAA competencies and form a framework within which other key NOAA competencies (e.g., People, Scientific Excellence, Environmental Observations) can be placed in a consistent organizational context.

- **Rejection of the Wet/Dry Model:** There was agreement that dividing NOAA explicitly into Ocean and Atmosphere divisions is not advisable.

- **Two Associate Administrators:** There was agreement that EAP and EM should each be headed by an Associate Administrator.

- **Regional Operations:** There was agreement that NOAA has a substantial regional presence (*e.g.*, NWS, NMFS, NOS, Sea Grant), and that this presence offers an unrealized opportunity to improve NOAA's corporate presence and services with its users. Consideration of any NOAA organizational realignment should work to realize this potential. There was agreement to consolidate the regional activities and facilities that currently reside in NOS and NMFS (and the relevant parts of OAR (Sea Grant Extension)) into a single, unified EM regional structure.

- **Rejection of the EPA Model:** There was agreement that NOAA should not be structured like EPA, with a single, unified regional structure with program authority and mini-NOAA Administrators in each region.

- **Planning and Program Integration (PPI):** There was agreement that there should be a Planning and Program Integration office headed by an Assistant Administrator. The group did not attempt to define the precise nature or function of this office beyond the work of the PRT.

- **Observations:** There was agreement that major observations systems, including satellites, ships, aircraft, and buoys, should be centralized. The NOAA Corps, however, would continue to exist as a separate organizational unit reporting directly to the Under Secretary.

- **Research:** There was agreement to establish an Assistant Administrator for Research and Development, modifying the responsibilities of the current AA. This AA would serve as a focal point for strategic, non-operational science. This AA would have direct

authority over some R&D funds with matrix management linkages to the remaining NOAA operationally-linked research and development.

The MWG agreed that a further examination of NOAA's research and development is needed in order to understand better NOAA's strategic and operational-related research and development activities, and to examine possible improvement in the "R&D to operational transition" pathways. DoD uses a structured set of R&D categorizations that the MWG believes form a starting point.

- **Balance of Resources:** There was agreement that it would be desirable to achieve the closest possible balance in terms of funding between the major divisions (EAP/EM or EAP/EM/Observations).

- **Accountability and Leadership**: There is general agreement that organizational changes without improvement in leadership and accountability may cause the effort to fall short of the PRT goals. Reorganization alone may mask problems in these areas and potentially delay needed improvement, while new arrows may not ensure collaboration.

Part II–Agreed-upon Issues Without Resolution

- **Environmental Analysis and Prediction (EAP) and Environmental Management (EM):** The precise definitions of EAP and EM were not determined. The crucial issue revolves around the location of scientific activities which support management actions. Should EAP be a service provider to EM? Or should EM be more of a self-sufficient entity? On the one hand, keeping all activities which support management actions together would help to ensure their responsiveness to management needs. On the other hand, an organizational separation of science from management would help to ensure the independence of the science and thus build its credibility. Also, including some ocean-related activities in EAP would help to create the more integrated, holistic NOAA that employees and constituents have expressed enthusiasm for building.

  The group recognizes that many activities fall into a "gray area" which could be seen as either EAP or EM. Due to limited time and resources, the MWG did not determine an exact demarcation between the two. Instead, the MWG deferred that decision to a later phase in the process.

- **Observations:** As in other areas, the precise definition of "observations" was not determined, leaving some ambiguity about exactly which activities would be transferred to the Observations unit. In particular, some members questioned the merit of transferring certain observation activities which serve only one office or division. It was not possible to get to that level of detail give the time and resources available. Therefore, the issue was deferred until after the publication of the report on observations architecture currently being prepared by NESDIS for publication in November.

  Another unresolved issue concerns the location within NOAA of the observations unit: should it stand alone as a separate division with its own Assistant Administrator, or should it be embedded in EAP?

- **Research:** Although there was agreement to create an AA for R&D with some direct budget authority and some matrix management authority, the precise scope of these authorities was not defined. The MWG recognized that research activities in NOAA span the spectrum from basic research (a very limited amount) through applied research (the majority of the current efforts) to operational development.

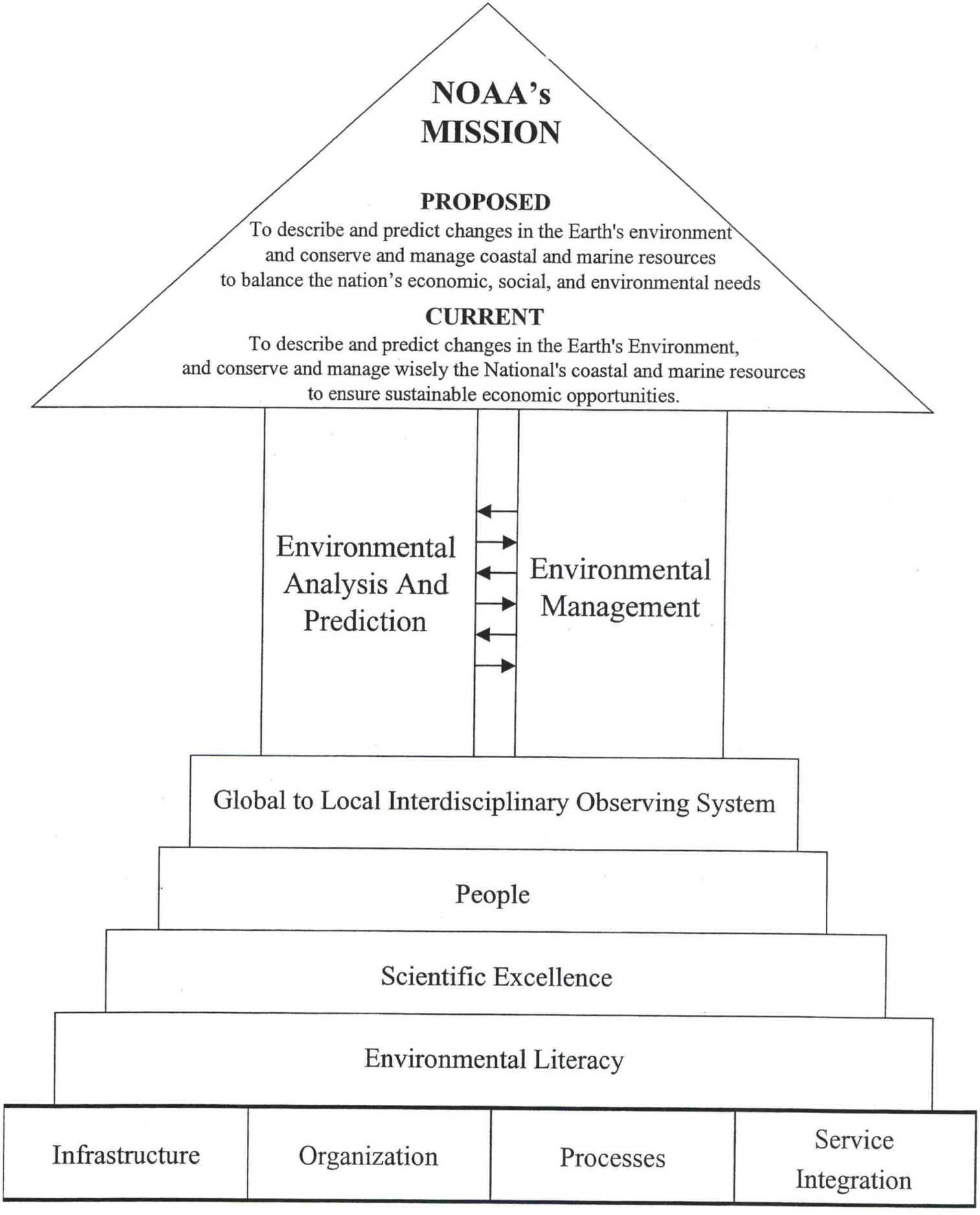
  The MWG agreed that there needs to be a balance in resources and responsibilities between a centralized research organization and EAP and EM, which are responsible for implementing new developments. A proper balance would allow the efficient and effective development of new science capabilities and their timely implementation into operations. The exact balance was not agreed to by the MWG.

  Regarding the use of research dollars allocated to the AA for Research, it was noted that this AA would receive requirements for new capabilities from both Associate Administrators. Additionally, the nature and scope of the R&D unit's matrix authority

over research funds assigned to EAP and EM was not defined.

- **Regional Management Structure:** Although there was agreement that EM should have an integrated regional structure (see Part I above), the issue of the relationship between EM and EAP regional facilities and activities was not resolved. On the one hand, members did not want to create an EPA-style structure based on unified regions that would function like mini-NOAAs. They also did not want to risk interference with the smooth operation of NCEP by embedding it in a larger programmatic regional structure.

  On the other hand, however, members were uncomfortable with recommending a reorganization plan that would result in two separate, unconnected regional structures. There was a general sense that the reorganization should create a non-programmatic unified NOAA regional structure with some type of regional service centers covering all NOAA activities that would focus on coordination, communication, program integration, constituent relations, one-stop shopping, and co-location where possible, but no definite conclusions on the exact form or function of this structure were reached.


NOAA's
MISSION
PROPOSED
To describe and predict changes in the Earth's environment
and conserve and manage coastal and marine resources
to balance the nation's economic, social, and environmental needs
CURRENT
To describe and predict changes in the Earth's Environment,
and conserve and manage wisely the National's coastal and marine resources
to ensure sustainable economic opportunities.
Environmental Analysis And Prediction
Environmental Management
Global to Local Interdisciplinary Observing System
People
Scientific Excellence
Environmental Literacy
Infrastructure
Organization
Processes
Service Integration

Part III Analysis of Organizational Options by Mission Working Group

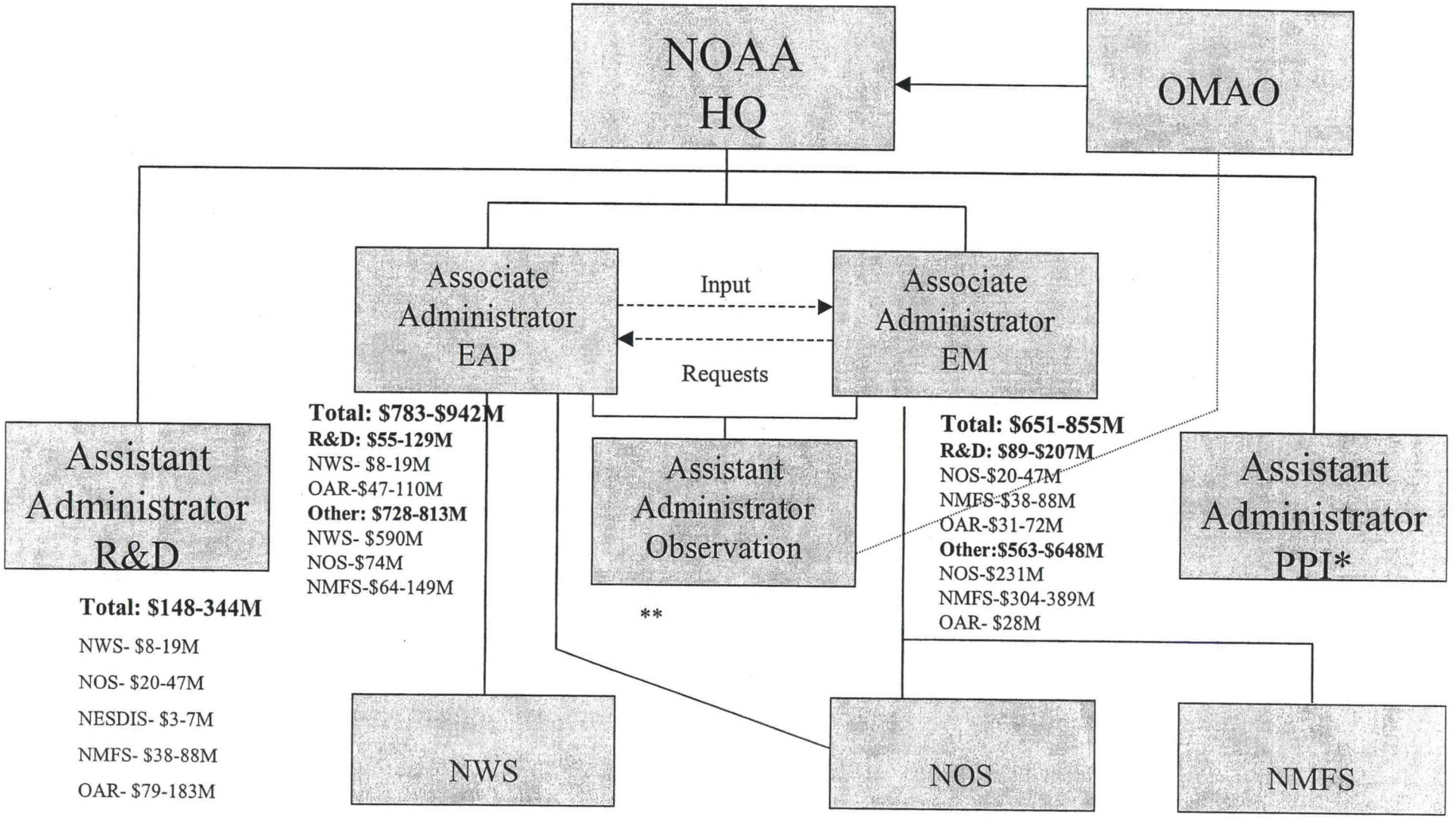
Introduction:

Described in this section are models for reorganization or realignment that emerged as serious candidates for consideration during Mission Working Group discussions. These options are:

- Modest/Full Matrix
- Regional Model
- Regional Model with Elevated Observations
- PRT Model

For each of these models, an overview description, effects on the Line Offices, pro's and con's and budget descriptions are provided. For the budget descriptions, FY 2002 figures from the *NOAA FY 2003 Budget Summary* were used. Please note that the budget calculations are rough estimates and are only presented here to give an indication of how resources might be allocated at a very general level. If any of these options is to be considered further for implementation, a more in depth analysis of budget implications at the program level is needed.

Modest/Full Matrix Model



***Note:** *Resources remain in line offices with full matrix management*

Option: Modest/Full Matrix

Overview:

Provides for integrated planning and operations across three theme areas, while maintaining most of the current line-office structure. Establishes Associate Administrator* positions for the two key mission areas – ***Environmental Analysis & Prediction*** (EAP) and ***Environmental Management*** (EM). Provides formal collaboration between EAP and EM for planning and resource allocation purposes. Consolidates ***Observations*** (OBS) as a separate functional element and places it in a supporting role to EAP and EM. Creates a focal point for strategic, non-operational science by establishing an ***Assistant Administrator for Research and Development*** [*AA(R&D)*] with some budgetary responsibility for NOAA R&D funding and matrix management linkages to the remainder, which is distributed among EAP, EM and OBS.

L.O. Effects:

- generally maintains line-office configurations and allows them to retain existing internal structures
- places existing NESDIS programs under an ***Assistant Administrator for Observations*** [*AA(Obs)*], reporting equally to the new Associate Administrators
- NWS elements involved in observational activities are matrix managed under the *AA(Obs)* with the remainder of NWS residing under EAP
- a portion of OAR is placed under the *AA(R&D)*, with those current elements focused on more applied science, having direct management application, or supporting *OBS* is matrix managed among EAP, EM, and the *AA(Obs)*
- OMAO is retained in its current configuration and remains external to the new structure with the addition of a matrix management link to OBS.
- bulk of NOS and NMFS programs are housed and managed under EM with the exception of:
  - non-EM science (estimated at 30-70% of non-R&D science funding) and other non-EM programs, which remain in their respective line office and are matrix-managed under EAP lead; and
  - any observation-related activities, which are matrix managed under the *AA(Obs)*
- 30-70% of NOS, NMFS, NWS and NESDIS R&D resources are matrix managed to the *AA(R&D)*

Assumptions:

- nautical charting and related navigational programs are matrix-managed to EAP and so assigned (could be linked to EM, or partially OBS)

- the 30-70% ranges are used for illustrative purposes only; ultimate breakdown contingent on Research Committee review and sorting of the NOAA science budget among EAP, EM and OBS.

Pros & Cons:

Pros

- maintains much of current line office structure, requires fewer organizational shifts to implement
- creates opportunity for centralized planning of observations programs, with oversight by both EM and EAP
- provides for coordinated planning across EAP and EM through matrix management by Associate Administrators
- minimizes EAP/EM resource imbalance
- can serve as a transitional step towards a more fully-integrated organization
- retains NOAA corporate organizational identity to the public for its core services (*e.g.*, weather forecasting, coastal and ocean services, observations, research, *etc.*)
- creates a NOAA corporate research strategy

Cons

- adds a management layer between the line offices and NOAA HQ
- maintaining OMAO as a separate office may make coordination on OBS more challenging
- splitting science into R&D, OBS, EAP and EM bins may be conceptually feasible, but difficult to implement from a personnel, facility and resource management perspective
- more complex reporting structure for NOS because they report to both EAP and EM Associate Administrators

***Role of Associate Administrators:**

EAP

- Oversight of all EAP activities
- Evaluate performance of line office directors
- Approve budgets and Annual Operating Plans
- Develop and implement Observations for EAP

EM

- Oversight of all EM activities
- Evaluate performance of Line Office directors
- Approve budgets and Annual Operating Plans
- Develop and implement Observations for EM

Budget Description:

Research and Development (source: NSF survey figures)
Assumes 30-70% of total NOAA R&D is basic or developmental (as opposed to applied/operational). The budget for basic/developmental R&D is under the Assistant Administrator for R&D. The remaining 30-70% is assumed to be applied or operational. The budgets for applied/operational remain with their "home" Line Offices.

30% Basic R&D Scenario*
NWS: $8M NOS: $20M
NESDIS:$3M NMFS:$38M
OAR: $79M (NSF survey figure, with OBS backed out)

70% Basic R&D Scenario*
NWS: $19M NOS: $47M
NESDIS:$7M NMFS:$88M
OAR: $183M (NSF survey figure, with OBS backed out)

Total: $148- $344M

Other Budget Figures (source: FY 2002 figures from *NOAA FY 2003 Budget Summary*):

EAP- $783M-$942M

Applied/Operational R&D	**30% Basic Scenario***	**70% Basic Scenario***
Total	*$129M*	*$55M*
NWS	$19M	$8M
OAR (Climate Research and Weather and AQ Research lines)	$110M	$47M

Other Matrix Managed Resources (actual dollars remain in LO's)	**30% EAP Scenario****	**70% EAP Scenario****
Total	*$728M*	*$813M*
NWS	$590M	$590M
NOS (mapping and charting)	$74M	$74M
NMFS (non R&D Science)	$64M	$149M

EM **$652M- $855M**

Applied/Operational R&D	**30% Basic Scenario***	**70% Basic Scenario***
Total	*$207M*	*$89M*
NOS	$47M	$20M
NMFS	$88M	$38M
OAR (Oceans, Coastal and GL Research line)	$72M	$31M

Other Matrix Managed Resources (actual dollars remain in LO's)	**30% EAP Scenario****	**70% EAP Scenario****
Total	*$648M*	*$563M*
NOS	$231M	$231M
NMFS	$240M	$240M
NMFS (non R&D science)	$149M	$64M
OAR (Sea Grant Extension)	$28M	$28M

OBS **$299M-$303M**

Applied/Operational R&D	**30% Basic Scenario***	**70% Basic Scenario***
NESDIS	$7M	$3M

Other Matrix Managed Resources (actual dollars remain in LO's, except for NESDIS)		
Total	*$296M*	*$296M*
NWS (NEXRAD and ASOS)***	$55M	$55M
NOS (geodesy, tide and currents)	$42M	$42M
OAR (Obs base review number)	$67M	$67M
NESDIS	$132M	$132M

*First column assumes that 30% of NOAA R&D is basic/developmental and those resources are placed under the AA for R&D, while the remaining 70% is assumed to be applied/operational and therefore remains in EAP, EM or OBS. The second column assumes that 70% of NOAA R&D is basic developmental and those resources are placed under the AA for R&D, while the remaining 30% is assumed to be applied/operation and therefore remain in EAP, EM or OBS.

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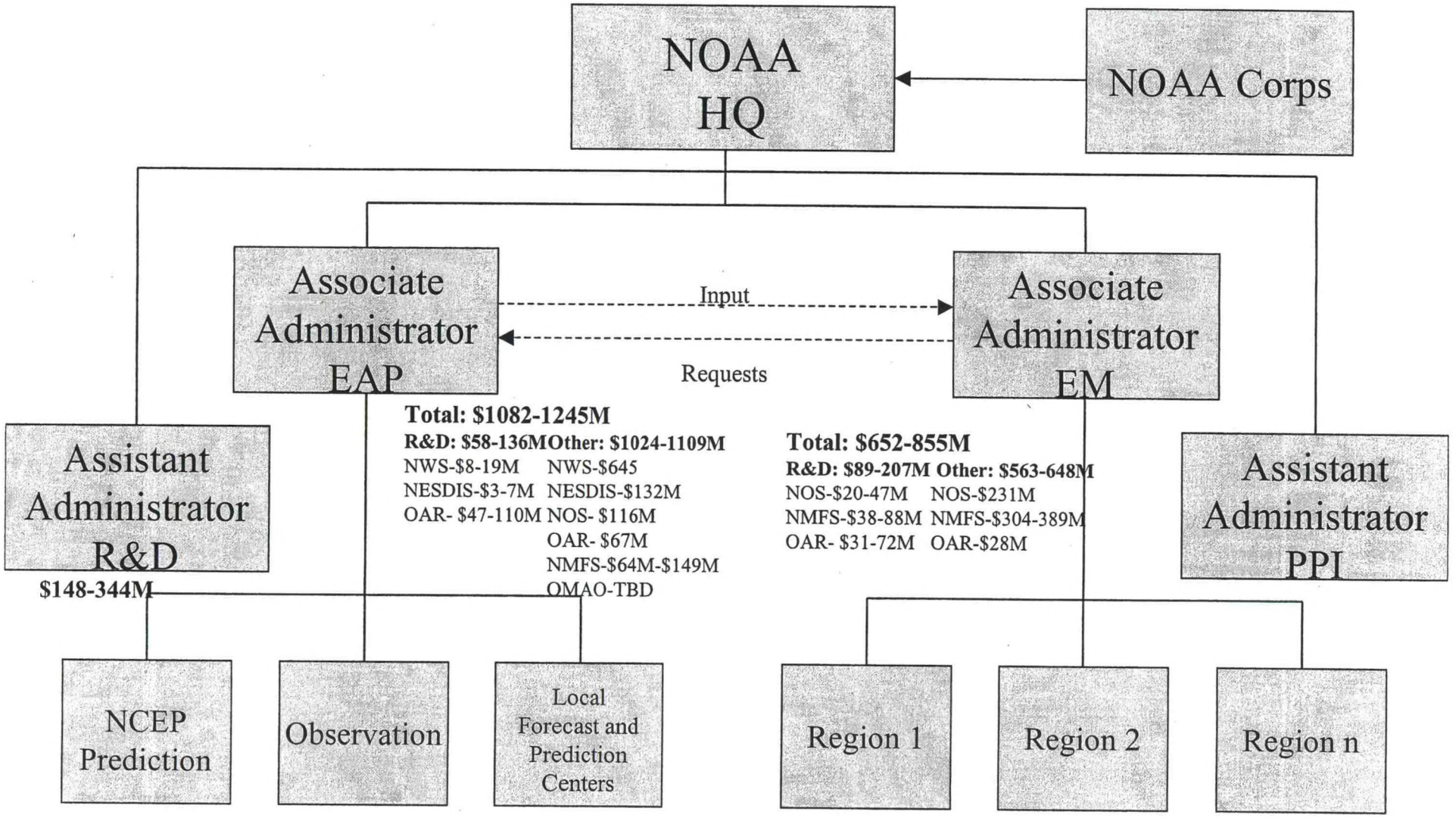
**First column assumes that 30% of NMFS non-R&D science is placed under EAP, with the remaining 70% under EM. The second column assumes that 70% of NMFS non-R&D science is placed under EAP, with the remaining 30% under EM. NOS non-R&D science numbers were not included because it appears that almost all NOS science is counted in the R&D figures.

***Assumption made that NEXRAD and ASOS are the OBS components of NWS for illustrative purposes. This does not represent a recommendation or endorsement by the MWG.

Regional Model



Option: Regional Model

Overview:

Provides for integrated planning and operations across major missions. Establishes Associate Administrator* positions for the two key mission areas – ***Environmental Analysis & Prediction*** (EAP) and ***Environmental Management*** (EM). Provides formal collaboration between EAP and EM for planning and resource allocation purposes. Creates a central focus for ***Observations*** (OBS) through consolidation as an element within EAP. Reorganizes the current line-office structure into a modified regional approach (*i.e.*, some subunits, *NCEP Prediction* and *Observations,* are not regionalized). Retains EM-related science within the EM regions. Provides for the development of an increased role in environmental prediction capabilities. Creates a focal point for strategic, non-operational science by establishing an ***Assistant Administrator for Research and Development*** [*AA(R&D)*] with some budgetary responsibility for NOAA R&D funding and matrix management linkages to the remainder, which is distributed between EAP and EM.

L.O. Effects:

- a portion of OAR is placed under the *AA(R&D)*, with those current elements focused on more applied science, having direct management application, or supporting observations distributed between EAP and EM
- OMAO, except for the NOAA Corps, is moved within *EAP-OBS* in the new structure. The NOAA Corps is maintained as a separate unit with a linkage to the NOAA Administrator.‡
- places existing NESDIS programs under *EAP-OBS*, as well as those NWS elements involved in observational activities
- NOS and NMFS field EM programs are merged under the regional EM structure, with the exception of:
  - non-EM science (estimated at 30-70% of non-R&D science funding) and other non-EM programs, which are placed under the EAP lead
- national EM program offices are established to ensure consistency in policy and program implementation and to provide for oversight and evaluation
- 30-70% of NOS, NMFS, NWS and NESDIS R&D resources are matrix managed to the *AA(R&D)*

Assumptions:

- envisioned role for new and increased environmental predictive capabilities (*e.g.*, air quality advisories) that would be

housed within the EAP *NCEP/Prediction* subunit develops sufficiently to warrant a separate organizational element

- the 30-70% ranges are used for illustrative purposes only; ultimate breakdown contingent on Research Committee review and sorting of current NOAA science budget between EAP and EM.

Pros & Cons:

Pros

- establishes a regional approach for most functions, bringing NOAA products and services closer to constituents/users and eases access to NOAA in the long term
- provides opportunity to strengthen/broaden NOAA's predictive capabilities and the ability to deliver those services through the *NCEP/Prediction* "office" and *Regional Service Centers*
- provides for consolidated planning for observations programs on the EAP side
- potential for greater coordination of EAP and EM activities at the regional level, ***if*** EAP and EM regional offices are co-located
- utilizes existing WFO structure as the foundation for regional service centers that provide enhanced 24x7 forecasting capabilities
- creates a NOAA corporate research strategy

Cons

- entails a major shift from current line office structure, requiring considerable effort to accomplish and necessitating careful planning and execution
- initially NOAA constituents will likely find it more difficult to access products, services and other needs and to interact with the agency
- internal and external support will need to be built for such a major change and NOAA must ensure that constituents understand the changes and become familiar with the new structure
- consolidating OBS on the EAP side could limit the ability of EM programs to effectively utilize this information as well as to provide input into budget and planning for observations
- loss of NOAA corporate organizational identity to the public for its core services (*e.g.*, weather forecasting, coastal and ocean services, observations, *etc.*)
- splitting science into R&D, EAP and EM bins may be conceptually feasible, but difficult to implement from a personnel, facility and resource management perspective

***Role of Associate Administrators:**

EAP

- Oversight of all EAP activities
- Evaluate performance of line office directors
- Approve budgets and Annual Operating Plans
- Develop and implement Observations for EAP

EM

- Oversight of all EM activities
- Evaluate performance of line office directors
- Approve budgets and Annual Operating Plans
- Develop and implement Observations for EM

‡ Note: Not all MWG members were in agreement that the NOAA Corps should exist as a separate organization from the rest of OMAO. In this case, it was seen as better to keep OMAO as an intact organization either reporting directly to the NOAA Administrator or as part of the OBS organizational unit.

Budget Description:

Research and Development (source: NSF survey figures)
Assumes 30-70% of total NOAA is basic or developmental (as opposed to applied/operational). The budget for basic/developmental R&D is under the Assistant Administrator for R&D. The remaining 30-70% is assumed to be applied or operational. The budgets for applied/operational remain with their "home" Line Offices.

30% Basic R&D Scenario*
NWS: $8M NOS: $20M
NESDIS:$3M NMFS:$38M
OAR: $79M (NSF survey figure, with OBS backed out)

70% Basic R&D Scenario*
NWS: $19M NOS: $47M
NESDIS:$7M NMFS:$88M
OAR: $183M (NSF survey figure, with OBS backed out)

Total: $148- $344M

Other Budget Figures (source: FY 2002 figures from *NOAA FY 2003 Budget Summary*):
EAP $1082-$1245M

Applied/Operational R&D	**30% Basic Scenario***	**70% Basic Scenario**
Total	*$136M*	*$58M*
NWS	$19M	$8M
NESDIS	$7M	$3M
OAR (Climate Research and Weather and AQ Research lines)	$110M	$47M

Other Resources	**30% EAP Scenario****	**70% EAP Scenario****
Total	*$1024*	*$1109*
NWS	$645M	$645M
NESDIS	$132M	$132M
NOS (mapping and charting, geodesy, tides and currents)	$116M	$116M
OAR (Obs base review number)	$67M	$67M
NMFS (non R&D science)	$64M	$149M
OMAO	TBD	

EM **$652-$855M**

Applied/Operational R&D	**30% Basic Scenario***	**70% Basic Scenario***
Total	*$207M*	*$89M*
NOS	$47M	$20M
NMFS	$88M	$38M
OAR (Oceans, Coastal and GL Research line)	$72M	$31M

Other Matrix Managed Resources	**30% EAP Scenario****	**70% EAP Scenario****
Total	*$648M*	*$563M*
NOS	$231M	$231M
NMFS	$240M	$240M
NMFS (non R&D science)	$149M	$64M
OAR (Sea Grant Extension)	$28M	$28M

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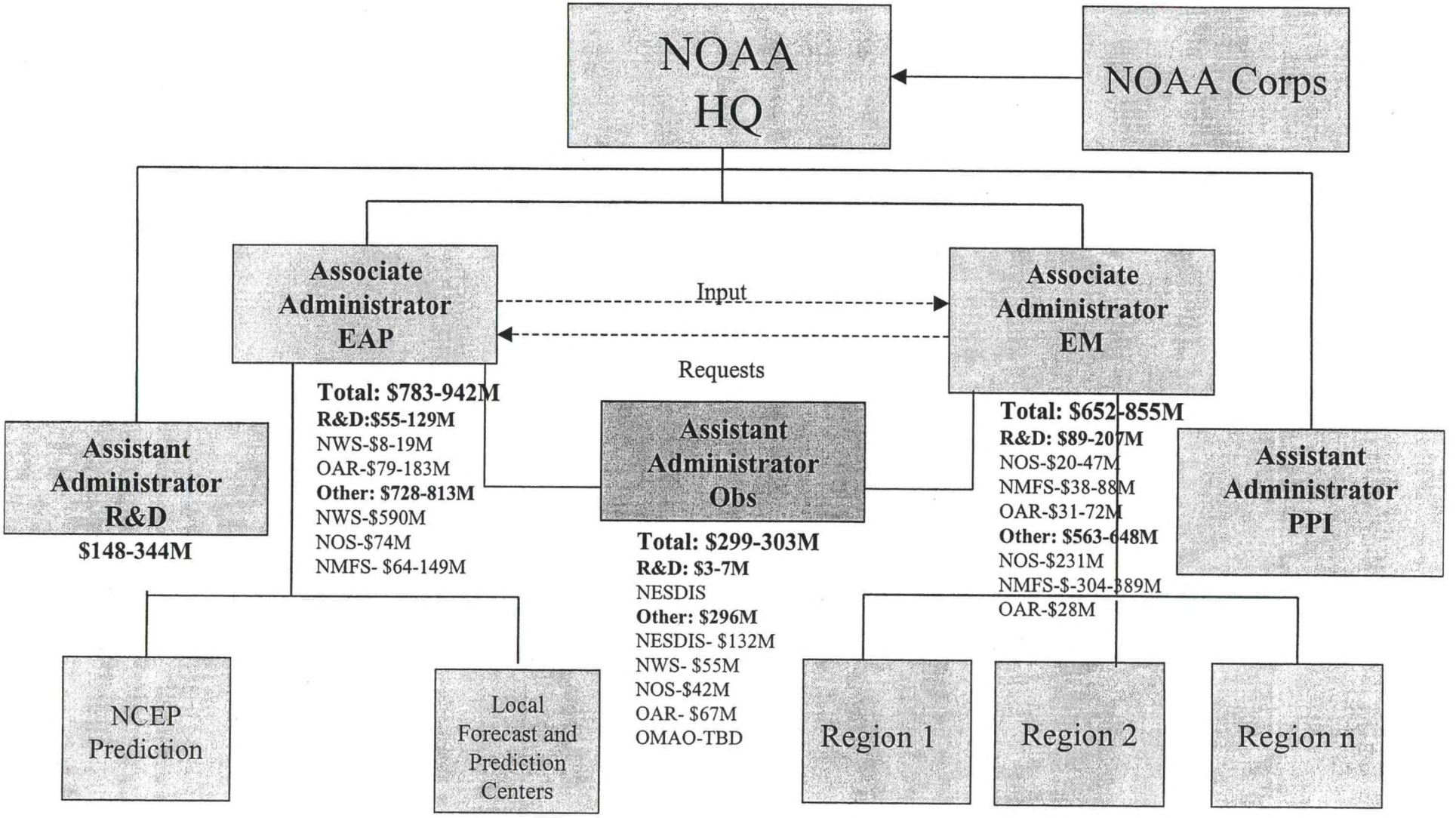
**First column assumes that 30% of NMFS non-R&D science is placed under EAP, with the remaining 70% under EM. The second column assumes that 70% of NMFS non-R&D science is placed under EAP, with the remaining 30% under EM. NOS non-R&D science numbers were not included because it appears that almost all NOS science is counted in the R&D figures.

Regional Model with Elevated Observations



Option: Regional Model with Elevated Observations

Overview:

[*Same as Regional Model, with the exception of separate Observations element.*] Provides for integrated planning and operations across major missions. Establishes Associate Administrator* positions for the two key mission areas – ***Environmental Analysis & Prediction*** (EAP) and ***Environmental Management*** (EM). Provides formal collaboration between EAP and EM for planning and resource allocation purposes. Consolidates ***Observations*** (OBS) as a separate functional element and places it in a supporting role to EAP and EM. Reorganizes the current line-office structure into a modified regional approach (*i.e.*, some subunits, *NCEP Prediction* and *Observations,* are not regionalized). Retains EM-related science within the EM regions. Provides for a projected increased role in environmental prediction capabilities. Creates a focal point for strategic, non-operational science by establishing an ***Assistant Administrator for Research and Development*** [*AA(R&D)*] with some budgetary responsibility for NOAA R&D funding and matrix management linkages to the remainder, which is distributed among EAP, EM and OBS.

L.O. Effects:

- a portion of OAR is placed under the *AA(R&D)*, with those current elements focused on more applied science, having direct management application, or supporting observations distributed among EAP, EM and OBS
- OMAO, except for the NOAA Corps, is moved within *EAP-Observations* in the new structure. The NOAA Corps is maintained as a separate unit with a linkage to the NOAA Administrator.‡
- places existing NESDIS programs under OBS, as well as those NWS elements involved in observational activities
- NOS and NMFS field EM programs are merged under the regional EM structure, with the exception of:
  - non-EM science (estimated at 30-70% of non-R&D science funding) and other non-EM programs, which are managed under EAP lead; and
  - any observation-related activities, which are matrix managed under the *AA(Obs)*
- national EM program offices are established to ensure consistency policy and program implementation and to provide for oversight and evaluation
- 30-70% of NOS, NMFS, NWS and NESDIS R&D resources are matrix managed to the *AA(R&D)*

Assumptions:

- envisioned role for new and increased environmental predictive capabilities (*e.g.*, air quality advisories) that would be housed within the EAP *NCEP/Prediction* subunit develops sufficiently to warrant a separate organizational element

- the 30-70% ranges are used for illustrative purposes only; ultimate breakdown contingent on Research Committee review and sorting of NOAA science budget among EAP, EM and OBS.

Pros & Cons:

Pros

- establishes a regional approach for most functions, bringing NOAA products and services closer to constituents/users and eases access to NOAA in the long term
- provides opportunity to strengthen/broaden NOAA's predictive capabilities and the ability to deliver those services through the *NCEP/Prediction* "office" and *Regional Service Centers*
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- entails a major shift from current line office structure, requiring considerable effort to accomplish and necessitating careful planning and execution
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- internally and externally support will need to be built for such a major change and NOAA must ensure that constituents understand the changes and become familiar with the new structure
- consolidating OBS on the EAP side could limit the ability of EM programs to effectively utilize this information as well as to provide input into budget and planning for observations
- loss of NOAA corporate organizational identity to the public for its core services (*e.g.*, weather forecasting, coastal and ocean services, observations, *etc.*)
- splitting science into R&D, OBS, EAP and EM bins may be conceptually feasible, but difficult to implement from a personnel, facility and resource management perspective

***Role of Associate Administrators:**

EAP

- Oversight of all EAP activities
- Evaluate performance of line office directors
- Approve budgets and Annual Operating Plans
- Develop and implement Observations for EAP

EM

- Oversight of all EM activities
- Evaluate performance of line office directors
- Approve budgets and Annual Operating Plans
- Develop and implement Observations for EM

‡ Note: Not all MWG members were in agreement that the NOAA Corps should exist as a separate organization from the rest of OMAO. In this case, it was seen as better to keep OMAO as an intact organization either reporting directly to the NOAA Administrator or as part of the OBS organizational unit.

Budget Description:

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NWS: $19M NOS: $47M
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OAR: $183M (NSF survey figure, with OBS backed out)

Total: $148-$344M

Other Budget Figures (source: FY 2002 figures from *NOAA FY 2003 Budget Summary*):

EAP $783M-$942M

Applied/Operational R&D	**30% Basic Scenario***	***70% Basic Scenario***
Total	*$129M*	*$55M*
NWS	$19M	$8M
OAR (Climate Research and Weather and AQ Research lines)	$110M	$47M

Other Resources	**30% EAP Scenario****	**70% EAP Scenario****
Total	*$728M*	*$813M*
NWS	$590M	$590M
NOS (mapping and charting)	$74M	$74M
NMFS (non R&D science)	$64M	$149M

EM $652-855M

Applied/Operational R&D	**30% Basic Scenario***	**70%Basic Scenario**
Total	*$207M*	*$89M*
NOS	$47M	$20M
NMFS	$88M	$38M

OAR (Oceans, Coastal and GL Research line)	$72M	$31M
Other Resources	**30% EAP Scenario****	**70% EAP Scenario**
Total	*$648M*	*$563M*
NOS	$231M	$231M
NMFS	$240M	$240M
NMFS (non R&D science)	$149M	$64M
OAR (Sea Grant Extension)	$28M	$28M
OBS $299-303M		
Applied/Operational R&D	**30% Basic Scenario***	**70% Basic Scenario**
NESDIS	$7M	$3M
Other Resources		
Total	*$296M*	*$296M*
NWS (NEXRAD and ASOS)**	$55M	$55M
NOS (geodesy, tide and currents)	$42M	$42M
OAR (Obs base review number)	$67M	$67M
NESDIS	$132M	$132M
OMAO	TBD	TBD

*First column assumes that 30% of NOAA R&D is basic/developmental and those resources are placed under the AA for R&D, while the remaining 70% is assumed to be applied/operational and therefore remains in EAP, EM or OBS. The second column assumes that 70% of NOAA R&D is basic developmental and those resources are placed under the AA for R&D, while the remaining 30% is assumed to be applied/operation and therefore remain in EAP, EM or OBS.

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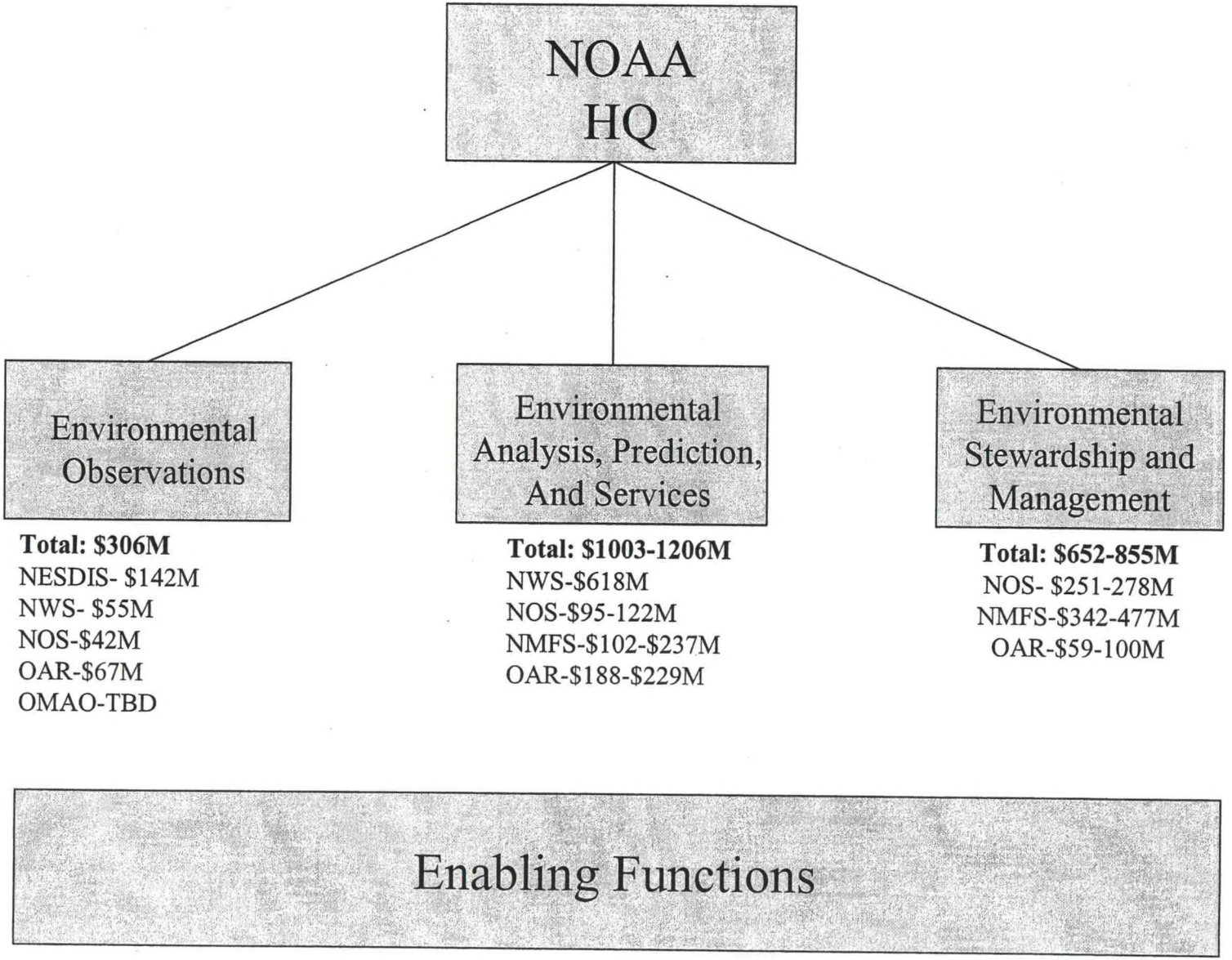
**First column assumes that 30% of NMFS non-R&D science is placed under EAP, with the remaining 70% under EM. The second column assumes that 70% of NMFS non-R&D science is placed under EAP, with the remaining 30% under EM. NOS non-R&D science numbers were not included because it appears that almost all NOS science is counted in the R&D figures.

***Assumption made that NEXRAD and ASOS are the OBS components of NWS for illustrative purposes. This does not represent a recommendation or endorsement by the MWG.

PRT Model


NOAA HQ
Environmental Observations
Total: $306M
NESDIS- $142M
NWS- $55M
NOS-$42M
OAR-$67M
OMAO-TBD
Environmental Analysis, Prediction, And Services
Total: $1003-1206M
NWS-$618M
NOS-$95-122M
NMFS-$102-$237M
OAR-$188-$229M
Environmental Stewardship and Management
Total: $652-855M
NOS- $251-278M
NMFS-$342-477M
OAR-$59-100M
Enabling Functions

Option: PRT

Overview:

Depicts an organizational structure for the agency based on the deliberations of the NOAA Program Review Team (PRT). The structure is based on the draft core and future NOAA missions developed by the PRT. The PRT option also reflects the PRT's general agreement that "*NOAA should identify where we ultimately want to go and move toward that future structure (as opposed to taking a number of interim steps).*" Simplifies existing line-office structure by establishing three key mission areas – ***Environmental Observations*** (EOBS), ***Environmental Analysis, Prediction & Services*** (EAPS), and ***Environmental Stewardship & Management*** (ESM). Consolidates observations as a separate functional element equivalent in stature to the other missions. Restructures current line office configuration as ***Enabling Functions***, but does not identify specific programmatic changes.

L.O. Effects:

- places NESDIS and OMAO programs under EOBS
- combines NMFS with most NOS coastal and ocean management programs
- combines NWS with NOS navigational services programs
- eliminates OAR and allocates programs across EOBS, EAPS, and ESM

Assumptions:

- nautical charting and related navigational programs are assigned to EAPS (could be linked to ESM, or partially OBS)

Pros & Cons:

Pros

- addresses coordination issues within the current line office structure by establishing a new structure based on functional areas
- creates opportunity for centralized planning of observations programs
- provides for coordinated planning across EOBS, EAPS and ESM through matrix management

Cons

- entails a major shift from current line office structure, requiring considerable effort to accomplish and necessitating careful planning and execution
- NOAA constituents initially will likely find it more difficult to access products, services and other needs and to interact with the agency
- internally and externally support will need to be built for such a major change and NOAA must ensure that constituents understand the changes and become familiar with the new structure
- does not provide separate mechanism for coordination of research activities across the three functional areas
- consolidating EOBS could limit the ability of EAPS and ESM programs to effectively utilize this information, as well as to provide input into budget and planning for observations
- splitting science into EOBS, EAPS and ESM bins may be artificial from a personnel, facility and resource management perspective
- loss of NOAA corporate organizational identity to the public for its core services (*e.g.*, weather forecasting, coastal and ocean services, observations, *etc.*)
- splinters NOAA's research and reduces its visibility and influence; would also reduce NOAA's ability to infuse new science and technology into operations and NOAA's credibility with the research community; leaves NOAA more vulnerable to becoming like EPA, where the lack of scientific credibility is a major obstacle to the organization's effectiveness

Budget Description:

(source: FY 2002 figures from *NOAA FY 2003 Budget Summary*)

	30% EAP Scenario*	70% EAP Scenario*
Environmental Observations	**$306M**	**$306M**
NESDIS (all)	$142M	$142M
NOS (geodesy, tide and current)	$42M	$42M
NWS (NEXRAD, ASOS)**	$55M	$55M
OAR (Obs base review number)	$67M	$67M
OMAO	TBD	TBD
Environmental Analysis, Prediction, and Services	**$1003M**	**$1206M**
NOS (mapping and charting)	$75M	$75M
NOS (R&D)	*$20M*	*$47M*
NMFS (science- R&D plus non-R&D)	*$102M*	*$237M*
NWS (all, except NEXRAD and ASOS)	$618M	$618M
OAR (Climate Research and Weather and Air Quality Research)	$157M	$157M
OAR(Oceans, Coastal and GL Research)	*$31M*	*$72M*
Environmental Stewardship and Management	**$855M**	**$652M**
NOS (remaining non R&D programs)	$231M	$231M
NOS (R&D)	*$47M*	*$20M*
NMFS (science-R&D plus non-R&D)	*$237M*	*$102M*
NMFS (remaining non-science programs)	$240M	$240M
OAR (Oceans, Coastal and GL Research)	*$72M*	*$31M*
OAR Sea Grant Extension	$28M	$28M

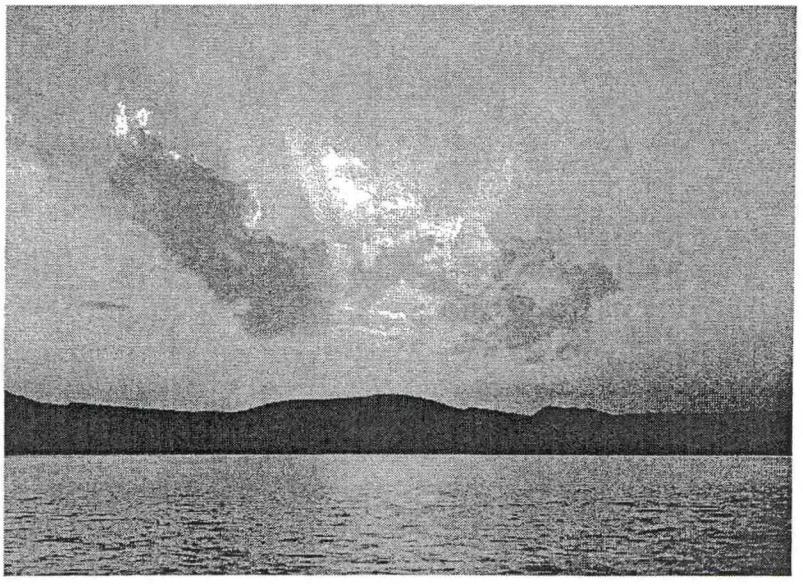
*italicized lines are subject to 30/70 split, the rest are not.

**Assumption made that NEXRAD and ASOS are the EOBS components of NWS for illustrative purposes. This does not represent a recommendation or endorsement by the MWG.

APPENDIX D

HUDSON INSTITUTE ECONOMIC TREND ANALYSIS

HUDSON TREND ANALYSIS



FINAL REPORT
to the
National Oceanic and Atmospheric Administration

EXECUTIVE SUMMARY
with table of contents and Appendix A of full report

September 2002

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Preface

Hudson Institute was engaged by NOAA to examine external trends over the next 5-10 years, to assess implications of critical trends for NOAA and to provide an ongoing resource to assist NOAA in understanding and addressing future prospects.

The analysis comes at an especially important time in NOAA's evolution. Since the study started in October 2001, NOAA underwent a change in leadership, went through a major program review, was designated the lead science agency for the President's climate change initiative and began preparing a 2003-2008 strategic plan. Several important pieces of legislation are up for renewal and the Congressionally mandated U.S. Commission on Ocean Policy, a successor to the Stratton Commission that, more than 30 years ago, ushered in profound changes, has been deliberating. The private Pew Oceans Commission effort is underway, the National Academy of Public Administration is undertaking a review of the National Marine Fisheries Service and the National Research Council is examining public/private sector boundary issues with special interest in weather and climate services.

This report provides an overview of a range of trends and sources of change. The emphasis on 5-10 years is intended to encourage and support longer-range and innovative thinking about strategies, policies and programs. Some developments can be expected to be important quickly or are significant today. Others, while making their greatest impacts further out in the future, may require attention in today's decision-making. Implications for NOAA are noted in the summary section and an appendix and are shown in italics in the body of the report.

The study is not intended to make specific recommendations. Rather, it provides a context for NOAA decisions. While the study was initiated before the current strategic plan development process, an important objective is to provide analysis that can be useful in thinking about issues that will arise in the plan and in processes that will follow.

Significant attention is given to technology because of its critical role in NOAA's future. Technology issues and developments are discussed both in a separate section and throughout the study. Focuses of the study include resource management and business trends. NOAA's interest in resource management arises from its many responsibilities for measurement and management and its need to deal with changing pressures, new understanding of problems and changing approaches. Understanding of business trends can help NOAA meet demands for services, interface with evolving types of business organizations and learn from developments in the private sector that may help it to improve its own effectiveness.

The Principal Investigator is Dr. Irving Leveson, Adjunct Senior Fellow and Chief Economic Consultant of Hudson Institute. The study team includes Charles Horner, Hudson Institute Senior Fellow and Dr. Kenneth Weinstein, Vice President and Director of the Hudson Washington Office. Dongmei Zhou and Nazan Riahy provided research assistance.

Hudson Institute wishes to thank the many people inside and outside of NOAA who provided information, comments and suggestions. The study has benefited from discussions with and guidance from Scott Gudes, Tim Keeney, Scott Rayder, Jim Burgess, Jim Cohen, Margaret McCalla and participants in group discussions at NOAA. Special thanks go to Rodney Weiher who served as contract officer for his helpful suggestions and insights. A list of persons interviewed is provided in Appendix D.

The views expressed are those of the authors and need not reflect those of NOAA personnel or agencies or persons contacted in or out of government.

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Executive Summary

MAJOR TRENDS

During the next 5-10 years NOAA will face many powerful trends with far-reaching impacts on its activities and decisions. In discussing these changes, trends are grouped into seven categories. Developments in each of these areas will be critical to NOAA's future and its impact.

- Science, Technology and Communication
- Globalization
- Climate Change
- Demands for Services and Cooperation
- Economic and Business Trends
- Environment and Resource Management Trends and Policies
- Government Initiatives

Within these categories and often cutting across them are many transformational changes such as the Internet, global warming, the new economy, use of incentive and management approaches to resource management, government improvement, reliance on markets and the private sector, security imperatives and patterns of international competition and cooperation.

Helping Society Adapt

In studies ranging from the genetics of brain size in the evolutionary development of human beings to the effects of education on earnings, it has been found that increased rates of change in the environment increase the advantage of skill and cognitive ability.

These traits become more valuable with greater information and analytic tools.

At a time of extraordinary change in many areas, NOAA's services add to society's ability to adapt and succeed.

SCIENCE, TECHNOLOGY AND COMMUNICATION

Technological change has been especially rapid during the last two decades and the pace of change may even be accelerating. As more is applied and its cumulative effects are felt, technology is having increasing impacts on every aspect of society.

Dramatic gains are occurring in microprocessor speed and throughput, bandwidth, storage, compression, networking, wireless and multimedia, embodying both hardware and software. The shift from digital to analog is deepening, last miles of connections are being upgraded, mobility is ever more information-enabled and new devices are proliferating. The power of the Internet is just beginning to be realized.

Exciting developments are occurring in materials technology, biotechnology, medicine, energy, optics, chemistry and other areas along with those in information technology. Tools for creating further progress are evolving rapidly.

With fundamental knowledge expanding, and with so much knowledge being processed with modern information handling techniques, interactions among fields are flourishing. Convergence is occurring both in science and applications.

Developments in information technology will have a wide range of impacts:

- Automation.
- Miniaturization.
- Distributed and mobile activity.
- Determination of formats and other standards more often by the market rather than by government.
- "Programmed human capital" - the ability to embody knowledge in software and systems for ease of use by less skilled or narrowly specialized workers.
- Growth of information services, including bandwidth-intensive multimedia, interactivity and large data sets.
- Data mining.
- Improved sensing, integration of sensor measures and widely distributed monitoring.
- Improved modeling, model integration and resolution.
- Convergence of applications (telephone, cable TV, Internet, game controllers) leading to new services such as Internet telephony.
- Growth of R&D and changes in its nature and composition.
- High levels of capital spending (despite boom-bust cycles).
- Flatter organizational structures.
- Managing based on continuous feedback.
- Self-organizing systems.
- Great diversity of products and capabilities, tailored to diverse needs.
- Shorter life spans of products/high obsolescence and constant adaptation to changing markets.
- Intense competition.
- More frequent restructuring of organizations and their relationships to customers, suppliers, competitors and collaborators as technology and business models evolve.
- Increased difficulty of keeping information private or limiting its distribution.
- Policy challenges involving access, privacy, security, ownership and safety.
- Difficult moral issues in some areas.

The greatest challenges of technology will be social and psychological — adjusting our thinking, speed and direction of response and even willingness to respond, and learning to live in an economy and society that evolves rapidly in new and often unexpected ways.

Government can facilitate diffusion of technologies in which it has a special interest such as transmission of high-resolution images by rapidly deploying the new technologies to create a critical mass of demand. The ability to interface with government at a higher level will give the private sector a greater incentive for rapid and more complete deployment.

Technological change in NOAA has largely been evolutionary rather than revolutionary, in part because of long lead times in budgeting and acquisition for large capital investments. However, discoveries that result from use of technology can have revolutionary consequences. For example:

> The understanding of El Niño, La Niña and the Southern oscillation led to better weather and climate prediction.
>
> The discovery of the hole in the ozone layer led to more attention to global warming and to other environmental issues as well. This contributed to increases in the scale of data collection and research on global change and prospects for additional policy initiatives.

Even if technological change in NOAA systems remains evolutionary, NOAA can expect that there will be important discoveries as a result of scientific advances and persistence with existing technologies that will significantly change the nature of its understanding of the planet and the services it provides.

NOAA will have to manage complex transitions to a new technological environment. For example, expectations are for an increase in satellite data of at least five orders of magnitude or about 100,000 times as much during the current decade and possibly far more. Efforts are under way to assure that the data can be handled in computers, models, storage and communication and overconfidence is being avoided. Most of those with whom Hudson spoke do not expect extraordinary difficulties in NOAA handling the very large quantities of data that are expected, either in processing or storage capacity. Similar challenges have arisen in the past, without abnormal amounts of difficulty.

Nevertheless, NOAA will have to be prepared if increases at the high end of the range occur. NOAA also will have to assure that it can handle intervening imbalances between demand and supply of technological capabilities and skills so it can take earlier advantage of opportunities as well as assure smooth transitions in service.

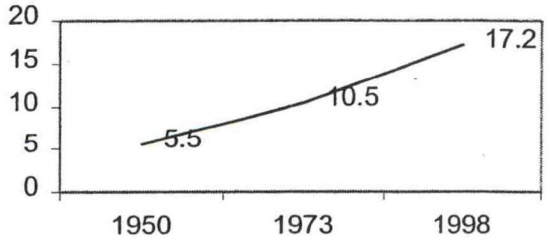
With international capabilities also increasing, NOAA may have greater opportunities to take advantage of foreign efforts for launching satellites, collecting data and/or distributing information.

GLOBALIZATION

Globalization has been associated with:

- Increasing contact through travel, communications and trade.
- Development of a world market for technology.
- Cross-ownership of business and financial assets.
- Growth of reliance on markets vs. regulation, government ownership and central planning.
- Spread of democracy with pressures from exposure to ideas, rising incomes and strengthened business classes.

Rising World Merchandise Exports as a Percent of GDP



Beneficial interactions can significantly raise living standards and prevent or overcome problems, including problems that are byproducts of increases in incomes.

The principal implication of rising global interdependence for NOAA and other agencies is the growing importance of international cooperation in science and resource management for achieving results. The burgeoning scope of cooperation among countries and linkages among private organizations creates opportunities to transcend fragmented approaches to data collection, dissemination, research, policy and operations. It also adds enormous complexity as NOAA and constituents seek to understand each other's needs and find ways to work together across numerous geographic, organizational, scientific and cultural dimensions.

The possibility that U.S. global dominance could erode also must be considered seriously. Perhaps the most important consequence of lessened U.S. dominance from NOAA's point of view is the fragmentation that could result in data collection, research coordination and information dissemination. One critical example is European efforts to develop a competitor to the Global Positioning System.

CLIMATE CHANGE

A continuing warming trend is likely to increase public pressures for action. Public concerns may also be increased by shorter-term increases in warming or erratic weather patterns that have little or nothing to do with long run trends, especially if short-term developments are associated with widespread drought or other severe consequences.

However, the public is not likely to be willing to make great sacrifices anytime soon — such as adopting a large carbon tax or prohibiting construction in areas likely to experience extensive flooding if the sea level rises.

Under these circumstances, efforts can be expected to focus on:

- Improving the evidence.
- Developing policies that are less costly or restrictive.
- Finding ways to maintain good international relations despite differences in attitudes and policies between the U.S. and other nations.

Concerns about global climate change will have far-reaching impacts on NOAA's policies, products and operations. Consequences include:

- Accelerating attention to ecosystem approaches that transcend previously segmented areas of measurement, research and prediction. For NOAA this includes:
  - More complete observation of oceans.
  - Integration of observations and analyses of behavior of oceans, atmosphere and land.
- Support for larger scale scientific approaches and major investments that address the concerns. This includes the extensive use of more types of and more powerful sensors on remotely operated vehicles (ROV's), autonomous unmanned vehicles (AUV's) and satellites, and investments in supercomputing.
- Increased demands for both observations and forecasts, including more measurement of climate change generally, water flows, air quality and space weather and more forecasts of societal consequences of observations and analysis.
- Greater pressure for NOAA to develop "products" that can assist in understanding the nature of the threats, facilitating research and planning by other organizations and providing support to the public policy process.
- More regional and local data and management, including much higher resolution weather and climate data and more complete counts of marine species and their movements.
- Greater cooperative efforts to improve and coordinate ocean policy.
- Pressure for interagency cooperation to more effectively utilize resources and make better use of information.
- Influences of government-wide efforts to reallocate research budgets related to climate change.
- Improvements in international cooperation in addressing observed consequences of climate change.
- Continuing tension between approaches that emphasize science vs. those that emphasize precaution.

Over the next decade, advances in technology and further deployment of existing technology will make it possible for NOAA to provide a larger set of environmental data and to provide more continuous and high resolution data in all kinds of weather. Integration of disciplines will be necessary for many information products.

Climate change research will become more well-rounded, integrating considerations of glaciers, atmospheric chemistry and ecosystems, and including a capacity for ecosystem forecasts that is independent of global warming. It will take some time before a full climate model of the U.S. can be

developed.

Because of the focus in the scientific community on global warming, climate change research can be expected to give particular attention to ways in which warming impacts may be intensified, for example by causing oceans to hold less CO_2, contributing to further warming. Interest will be more heavily focused on mechanisms that can contribute to extremes of warming than on those that can modify a warming trend or produce cooling.

NOAA increasingly will be involved in assessing the potential and the after-the-fact impacts of policies to moderate the effects of climate change. NOAA capabilities could play an important role in monitoring and analyzing outcomes of international participation in the Kyoto protocol.

The U.S. will be under continuing international pressure to curb its use of fossil fuels. The debate over responsibilities of high-consumption developed countries and the leeway to be given to developing countries will never fully be resolved. The debate over use of incentive approaches vs. command and control approaches to environmental management also will be ongoing because of international differences in how the approaches are viewed.

DEMANDS FOR SERVICES AND COOPERATION

Concern over weather patterns will raise demand for weather and climate forecasts, coastal, ocean and atmospheric observations and for efforts to protect coastal communities and prepare for evacuations. It will raise issues of changing patterns of species migration, including non-native species and threats to species. It also will generate greater interest in alternative energy sources, including those from the sea.

The imperative of educating the electorate and providing the foundation of knowledge that can guide new generations, both in the U.S. and internationally, is stronger than ever. NOAA can contribute further to understanding by encouraging its knowledge relating to the environment to be made available to publics as well as to scientists in other countries.

NOAA will be called on to provide more data in support of regulation and to expand some regulatory functions as interest in climate change grows.

Air quality will be a growing effort within NOAA, involving collecting, analyzing and distributing information. Data will be collected on a growing number of subjects — such as CO_2, aerosols, nitrogen deposits and atmospheric density.

Demand for more kinds of and better environmental information such as air quality will in part be driven by the heightened concern of the large and politically important baby boom generation for matters of health and safety. Another motivating factor is the general rise in demand for comforts and aesthetics with greater affluence.

The importance of water issues and associated political/military repercussions and the interplay of water with land and atmosphere imply a need for increased attention to hydrologic measurement and analysis.

NOAA will be asked to increasingly accommodate the desire for rapid selection and automatic distribution of information in appealing forms, whether provided directly to end users or through intermediaries. The development of self-describing data sets will be an important tool in that effort.

A consequence of the use of technology by consumers is "swarming" or surges in demand from many participants. In one formulation "smart mobs" linked by high-tech communications devices act in concert to rapidly move to the same activities or destinations. The implication of swarming for NOAA is that it is necessary to be ready for very high levels of peak demand.

Many demands will come from the needs of specific industries such as energy and insurance. The telecommunications industry could become a large consumer of NOAA information in the future, with solar storms and other phenomena having a great influence and with wireless communication growing rapidly.

A large rise in energy prices would raise demand for weather and climate services from power producers and distributors and from industrial and commercial energy customers interested in managing supplies, buying before price increases, locking in prices in contracts, and hedging and trading on energy markets.

NOAA increasingly will be providing climate and environmental information for regional and local areas. NOAA may play any number of roles in processes to develop operational forecasts, directly providing information, working with universities, regional consortia and private firms and/or serving as a catalyst for local efforts. In any of these roles, NOAA will be central to the development and operation of a regional system.

NOAA has had increasing calls for information about other countries to help other Federal agencies and international organizations in relief efforts. It can expect greater demands from other agencies and requests for information that is increasingly international.

NOAA will collaborate more with the military in development of space and ocean capabilities, engaging in more joint efforts and situations where the military is the customer. It will sometimes compete with the military for resources or control of programs and more often couch requests in national security terms. Its measurement efforts will go beyond support for military operations to include assessment of environmental and commercial impacts of war.

The missile defense initiative can give a major impetus to satellite development. NOAA could be called upon for data services, monitoring and research, satellite rescue and other activities.

NOAA could face increased demands for services and play an expanded advisory role in disaster prevention and response.

- NOAA could bring to bear information, research and analytic capabilities to assess how spread of contamination would be affected by weather and ocean conditions. Valuable contributions can be made by predicting or tracking effects of winds or currents in distributing harmful substances or organisms.

- Nuclear contamination would create particularly challenging, far-reaching and long-term challenges. It would require extensive interagency and potentially international coordination.

- NOAA's skills can assist in locating the sources or origins of some contaminants as well as their impacts.

Increased demands for information to support military and homeland defense could lead to patriotic and security-motivated demands for greater U.S. self-sufficiency in data collection. Concerns about security could lead to restrictions on research, information-sharing and international collaboration at the same time as some aspects of research and collaboration are encouraged.

ECONOMIC AND BUSINESS TRENDS

Economic Trends

The bust in capital spending after the boom of late 1990s left industry with excess capacity and weakened many leading technology companies. Working off excesses will take several years. In the meantime it will be harder for NOAA to rely on the private sector for investment and technology in satellites. There also will be slower introduction of some communications technology since introduction often comes as part of new capital investment. However, slowing of the introduction of technology will be selective and temporary.

The "new economy", although tempered, remains very much alive. It is morphing into a more traditional high growth period that, when it arrives, will be more sustainable and stable.

The extended economic slowdown, bear market in stocks, telecommunications implosion and collapse of many dotcoms, along with effects of September 11, 2001 raised serious questions about how quickly and fully the U.S. and global economies would recover and whether any resumption of rapid growth could persist. However, there are strong underlying positive factors. Most significantly, despite the sharp decline in capital spending, new technologies and products continue to be introduced at an unusually rapid pace.

Economic growth and productivity are not expected to maintain the pace of the boom years. However, new economy influences of rapid technological change, intense competition and opening of global markets will bring significantly higher growth during the coming decade. Sustainable U.S. productivity is expected to be higher by about 1% per year than in the two decades prior to the mid-1990s acceleration, nearly double the earlier rate.

Implications of sustained rapid technological change and renewal for business and the economy include:

- A need for government to become more business-like — to be decisive, focused on products, performance and customers and open to many ways of getting things done.
- A need to rely heavily on resources, capabilities and the diversity of sources in the private sector to respond effectively to rapidly changing prospects and opportunities.
- Greater need for open markets, along with appropriate oversight.
- More competition among technology standards so as not to prematurely lock in one standard while others that may be superior need some time to develop.
- Intense competition and a shorter half-life of monopolies.
- Many big winners and big losers among prominent companies.

Gains from the new economy will be associated with:

- Creation of new markets, uses, customers and associations among individuals and groups through widespread use of both general and specialized information and communications systems.
- Growth of markets and demands for information through rising incomes.
- More rapid obsolescence of technology, but also more opportunities to introduce new technology rapidly as heavy investments are made to support growth.
- Expanded opportunities for scientific cooperation.
- Increased pressure on the environment if the global economy grows more rapidly, but also greater knowledge, incomes and technological opportunities for solutions.
- Improved government budget positions, albeit in the context of deteriorated levels.
- More rapid deployment of high bandwidth but also greater increases in demand.

Some of the gains from the new economy will be offset by influences of the "dis-economy." We use the term "dis-economy" to refer to a series of recent and emerging developments that collectively exert a significant drag on the economy. These include restrictions and costs associated with terrorism, the war on terrorism and homeland security, the crisis of confidence in business ethics and its manifestations, increased interferences with the information economy (hacking, spam, viruses) and various increases in regulation.

The dis-economy operates at the same time as the new economy. It does not overshadow the new economy, but the net effect of the two forces is significantly less economic growth than would be possible if the new economy influences more fully dominated. Adverse effects are greater in the early portion of the next ten years. Adjustments will lessen adverse effects over time but many forces will be long-lasting and new impediments and disruptions from war can arise.

NOAA will face a continuously tight budget environment. Issues of NOAA's role could be more prominent as agencies compete for limited funds and government is reorganized. Overall budget stringency will require particularly effective efforts to justify expenditures. It will be particularly necessary to demonstrate the benefits to the nation and to do so quantitatively wherever possible. The links between research and development will require greater clarification and strengthening.

Energy is important for many reasons:

- Prices affect demand for weather and climate information.
- Technology and prices affect the scale of deep ocean development.
- International development can engender negotiations over rights and boundaries and environmental impacts.
- Energy can be at the center of tensions that lead to wars, with attendant demands for information and effects on the economy.
- Technologies developed for energy exploration and development, such as remotely operated vehicles, could be very useful for NOAA activities.
- Efforts to induce movement away from reliance on fossil fuels can change the nature and location of energy development and distribution. It also might lead to reduced maintenance or abandonment of facilities, with resulting environmental impacts.
- Technology and prices could eventually lead to large-scale development of undersea methane hydrates.

The long run pattern is for a gradually rising trend of energy prices and large fluctuations around the trend that last for several years. Prices are low relative to their historic range. They are likely to go a lot higher in the decade ahead because of economic growth and political and military vulnerabilities. Far less likely is the possibility of a decline in relative energy prices induced by technology and new sources of supply.

Use of the oceans may increase more rapidly than recent experience suggests. Despite decades-old suggestions for undersea mining, tourism and human habitats, wave power and other uses of the oceans, development has been limited until recently. Growth is now being fostered by technologies for deep-sea oil and gas recovery, by interest in new sources of energy and by interest in a wider array of minerals of potential commercial value. New technologies such as unmanned Slocum Gliders and improved sensors can be expected to expand opportunities for exploration and monitoring as well.

Renewed interest in oceans raises complex issues of international law and diplomacy as competing claims arise. The United States can expect to be drawn into an increasing number of boundary and jurisdictional issues relating to uses of the oceans over the next decade. NOAA will be asked to provide detailed information that can be used to delineate boundaries and chart passageways.

Business Trends

Understanding changes in private organizations can help government meet demands for services, interface with evolving types of business organizations and learn from developments in the private sector that may help it to improve its own effectiveness.

Of the forces are shaping the private sector, technology and especially the information revolution is most pervasive. Other powerful influences include globalization, deregulation and the emergence of a modern service economy, which themselves are profoundly influenced by information technology. Together, these result in extensive competition, automation and in heightened demands for information.

In this environment there is a premium on arrangements for making effective use of information to manage and operate the organization, to link the organization to suppliers, partners and customers and to provide information as a service and a basis for transactions.

For many information and software providers the cost of producing additional unit of each product is zero or near-zero after the initial fixed costs are met, facilitating rapid growth of markets.

Many information products exhibit "network externalities" or "demand-side economies of scale." Such economies arise because the value to each user of participating in the network increases exponentially with the number of participants ("Metcalf's Law").

Network externalities make demand for products more price-sensitive since lower prices that add customers lead to even more customers. Economies in production, especially those from low incremental costs of adding users, can interact with demand economies from network externalities to produce rapid growth in the number of users. They also can bring about major changes in ways of doing business.

New types of multi-firm organizational structures have evolved to take advantage of transaction cost efficiencies and opportunities for market growth. Configurations include the "virtual corporation" that directs activities of other entities without having its own production facilities, the focused firm that sticks to its core competencies, strictly out-sourcing for other capabilities, the networked company, in which separate entities act together to produce a result, sometimes in self-organizing systems and business-to-business e-commerce exchanges that create markets centered around an industry or large buyer.

Information technology increases the viability of many smaller organizations as lower costs of inter-firm communication facilitate participation in networks. However, information technology also creates efficiencies within larger organizations by lowering costs of coordinating people and departments. The result is consolidation of firms but at a slower pace, with larger roles for smaller firms than otherwise.

The form and function of the modern organization is evolving to embody many features that are heavily influenced by advances in information technology. Formulations emphasizing various aspects include:

Horizontal Management

> With horizontal management, as emphasized by Peter Drucker, ease of communication means there are fewer layers of management through which communication has to filter.

The Professional Service Organization

> Henry Mintzberg made the distinction between machine bureaucracies that focus on repetitive standardized tasks and professional service organizations in which individuals have greater skill and autonomy in defining and carrying out tasks.

The Network Organization

> The network organization draws extensively on resources in external organizations through arrangements under which participants can acts as a coherent whole.

The Adaptive Enterprise

> The adaptive enterprise adjusts production to information fed from its units and the external environment, increasingly in real-time. Rapid adaptation to current developments is emphasized over planning and forecasting for longer range prospects.

Mass Customization

> Mass customization flexibly allows a wide variety of products and features to be produced and tailored to the customer and at the same time benefits from efficiencies of mass production.
>
> One example of mass customization is efforts to provide localized individual weather information on demand to cars, cell phones and PDAs.

Electronic Marketplaces and Online Distribution

> Electronic distribution of information services, media and financial products facilitates direct contact, transactions and self-service.
>
> New models have begun to develop that incorporate a wider range of services — both in arrangements among the participants and through tie-ins with outside vendors.

An organization may need two kinds of business models for different activities, one for units dealing with longer term changes or more predictable environments and one for those requiring a high degree of feedback and rapid adaptability to external information and developments.

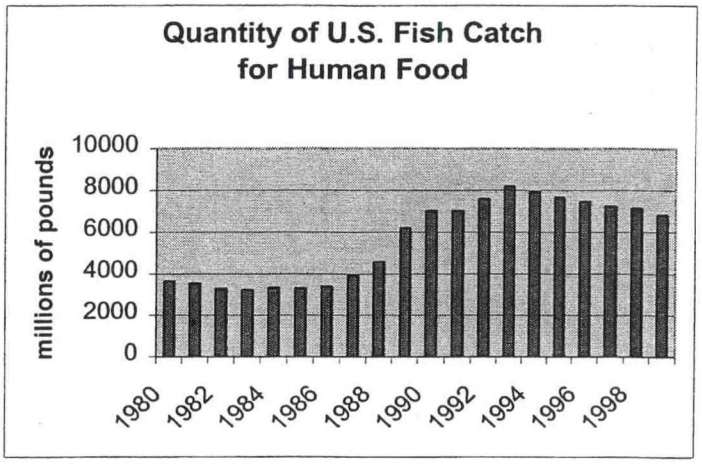
Over the years there have been many formulations of strategic and management models for improving business capabilities and strategic effectiveness. What is changing is the growing urgency of responding to market pressures and to technology through physical, organizational and human resource decisions.

Flatter organizational structures create an issue for managers of how to deal with information overload in an era when they can receive endless messages through email, cell phones and faxes. Ironically, for a decentralized world this is a problem of over-centralization. The traditional way to deal with overload is to decentralize — to delegate more decision-making authority. The ability to delegate in NOAA is closely tied to how well it can recruit personnel and how well it can develop and train the right mix of personnel to enable more decentralized decisions.

The need for managers with both technical and management skills has traditionally been handled by drawing on a mix of people with technical and managerial backgrounds. With technology more complex, the balance is shifting toward greater reliance on technical staff for management. This approach is supported by greater use of information technology and formal processes to channel management efforts.

ENVIRONMENT AND RESOURCE MANAGEMENT TRENDS AND POLICIES

Resource management encompasses the full range of policies and programs dealing with the condition of natural resources. It includes weather and climate as well as air, land and water pollution, fish stocks, endangered species, creation of new species by natural or artificial means, forest management and issues relating to energy and minerals. It addresses government and industry practices, incentives, governance, conservation and regulation.



NOAA's interest in resource management is not only in its main areas of responsibility such as weather and climate, oceans and fisheries — but also in the broader concerns about the planet and in pressures that may affect future responsibilities. Recent heightened concerns about global climate change will have far-reaching impacts on NOAA's policies, products and operations.

NOAA will have to balance concerns about resource management and the environment with those of economic development and security. While these emphases can lead to some actions that coincide, they also can involve very different priorities. Resource management can involve more regulatory functions while economic development looks more to markets and security concerns lead to particular kinds of interventions.

Trends in resource management include:

- Economic development as complementary to environmental improvement rather than as a trade-off in policy-making.
- Ecosystem approach — reflecting interactions among all parts of the ecosystem in place of separate analyses and decisions, and closely related to that,
- Global approach to measurement and science, including:
  - A global ocean observing system.
  - Integration of observations of ocean, atmosphere and land.
  - Much more extensive use of unmanned systems - including sensors in remotely operated vehicles (ROV's) and autonomous unmanned vehicles (AUV's) for ocean systems and satellites.
  - More comprehensive weather and climate modeling.
- Possible expansion of some regulatory roles for NOAA in addition to expanded science and information to support regulation related to ocean and climate change.

Ecosystem Management Implications

- Understanding ecosystem interrelationships and responses to changes.
- Effectively utilizing new technologies and information.
- Evolving newer resource management approaches for application on an ecosystem scale.
- Working extensively with other nations and NGOs.
- Assessing potential and actual outcomes of policies.

- A halting, at least temporarily, of increasing regulation and regulatory costs in society as a whole relating to resource management.

- New regulatory approaches.

    - Favoring regulatory initiatives with the highest benefits relative to costs.
    - Increased use of incentive approaches in regulation.
    - Greater use of management and governance arrangements to bring parties together.
    - Greater reliance on science for policy and regulation.
    - More regulatory reviews of agency actions.
    - The Data Quality Act potentially complicating regulation and scientific staffing.
    - Further use of the precautionary principle outside the United States.
    - Incentive approaches to resource management being adopted less widely in nations that do not place as great a reliance on markets generally.

- Technology providing important solutions to resource management problems, sometimes accompanied by regulation.

- Changing marine demands and responses.

    - Expansion of marine protected areas and marine reserves.
    - Overfishing reduced primarily by limits and only slowly by capacity reduction, while racing with increases in fishing productivity brought about by technology.
    - Limits on fishing continuing to be the main policy tool by which capacity is reduced, with resulting difficulties in moving to a more cooperative model.

- Increased attention to international issues.

    - Renewed U.S. reliance on multinational institutions and networks.
    - Growth of international participation.
    - International policy divergence.
    - Growth of NGOs.
    - Eco-consumption.
    - Increased environmental regulation through trade.
    - "Water and resource wars".
    - Addressing environmental fallout from terrorism and war.

As interest in undersea areas grows, marine regulation increasingly will involve land management, directly or indirectly controlling uses of the seabed that go beyond those prevalent today.

Major gaps will continue to exist between the state of scientific knowledge and the degree of knowledge necessary to make policy. NOAA will be under growing pressure to produce practical results and to extend its analyses to emerging issues in spite of these limitations.

As NOAA and other agencies seek to rely more on science to avoid biases in policy they will have to confront professional opinions that do not always take appropriate account of evidence. Leadership will be required to rely on the most critical evidence even when vocal scientific opinion lags or personal predilections influence conclusions of those who would be looked to for concensus. This has always been an issue in resource management, but its intensified focus in the area of climate change and its role for fisheries management are of particular importance to NOAA.

Effectively maintaining focuses on both science and complex socially-oriented resource management initiatives will present major ongoing challenges.

- Developing and implementing ecosystem approaches and making use of the rapid advances in biotechnology and related fields will require NOAA to utilize many disciplines, including giving much more attention to the biological sciences.

- There will continue to be questions of how organizationally separate science should be from regulation. Closeness can allow science to be more fully used in decisions but open science to greater political pressures. The greater the political pressure, the more important is separation. The greater the ability of science to deal objectively with socioeconomic issues behind the pressures, the more important is closeness.

- The extensive negotiation required by managers employing evolving methods of resource management will necessitate developing skills and organizational structures that go beyond the scientific emphasis that is at the heart of the agency.

- The growth of informal and electronic publication opportunities means that NOAA will have to find the right balance between goals of peer review and more rapid or administrative forms of distribution.

International cooperation carries with it complex demands. Divergent laws, regulations and interests must be reconciled. NOAA will find it necessary to deal with many organizations and to support negotiation efforts with scientific evidence and management capabilities on many issues and across vast distances.

High levels of coordination of disciplines and departments will be needed inside and outside of NOAA for:

- The evolution of management roles along with science roles in science management and regulation
- Development of ecosystem approaches
- Increased international responsibilities

GOVERNMENT INITIATIVES

Policies, Organization and Laws

The Stratton commission was instrumental in establishing U.S. ocean policy and structure more than 30 years ago. That has led to some anticipation that the new commission will have far-reaching effects, even including the possibility of a federal oceans department. Admiral James D. Watkins, U.S. Navy (retired), chairman of the Commission, has been quoted as saying: "We're already assuming that there has to be a national ocean policy coordinating body." In the cover letter to the September 2002 interim report he states: "...policy may well call for new and creative governance mechanisms."

The impact of the Commission on Ocean Policy is uncertain because of the complex climate, but a number of factors could come together with upcoming legislative reauthorizations including the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Coastal Zone Management Act and the Endangered Species Act, along with the influence of the Pew Oceans Commission, to produce significant change.

The Commission on Ocean Policy also has endorsed U.S. accession to the Law of the Sea Convention but more generally support has been weak. It is not clear whether the Commission, by bringing the issue of accession to the Law of the Sea convention into a larger coalition for ocean policy can significantly increase its prospects.

NOAA will have to be ready to address proposals for a range of legislative possibilities and for receiving resulting responsibilities. That will require breadth of management so that current responsibilities will not be compromised and opportunities to use legislative change to chart a course will not be foregone.

The U.S. has been seeking international recognition for the potential of economic development to enable both reduction in poverty and improvement in the environment. NOAA increasingly will be enlisted in making that case and in promoting its understanding in other parts of the world.

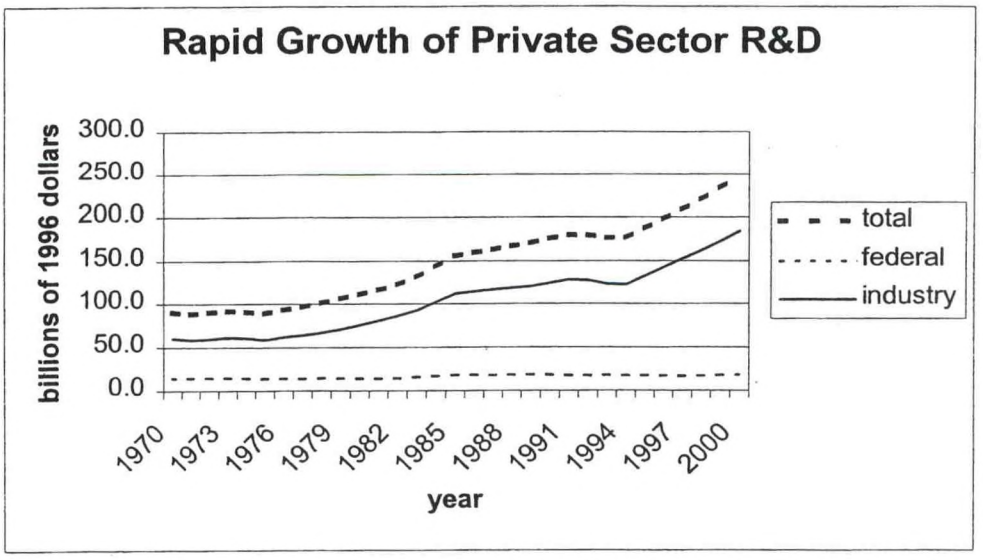
Public/Private Roles and Business Models

Rapid technological change and the evolution of sophisticated organizations and networks are creating growing opportunities for NOAA and government generally to build on the capabilities of firms, research organizations, universities and/or other government agencies.

Increasingly, the question is not what government should do, but what government should take responsibility for. There are many ways in which that responsibility can be provided for.

NOAA can work with new types of organizations in many ways. It can be a catalyst, organizer, partner, owner, member, customer or supplier. NOAA will want to explicitly determine appropriate roles in each circumstance and define ways of managing those roles. Through the many possible forms of involvement, government can facilitate efforts of private organizations to fulfill functions previously performed by government.

Increasingly, the question is not what government should do, but what government should take responsibility for. There are many ways in which that responsibility can be provided for.



Privatization has been limited in the U.S. because of the much smaller role of government enterprises and greater reliance on the private sector generally. The U.S. generally is privatizing "from the bottom up" through detailed reviews of activities, rather than rather than by "top down" efforts that lead to disengaging from entire industries.

Boundaries between the public and private sectors will be shifting as a result of the increasing capabilities of the private sector, its technological sophistication, access to risk capital and the growing scale of firms.

NOAA will be engaged in continual negotiation with the private sector over where boundaries of public activities should fall and how interactions should take place.

Weather services will continue to be a principal area of controversy regarding public/private roles. Similar issues may arise with climate information services. The role of industry self-regulation will continue to be prominent in fisheries management. Other areas, particularly measurement of the local environment such as air quality, will become sources of tension as NOAA expands its activities and as the potential size of the private market becomes more interesting.

Private commercial firms that wish to process and redistribute information will increase pressure on NOAA to provide data in basic forms through automated processes in real time.

NOAA will face growing competitive challenges from the private sector in providing information-related services as government advantages from scale economies are reduced by declines in price and increases in capabilities of equipment and software, and by the continued evolution of large technology firms that can mount sizeable efforts.

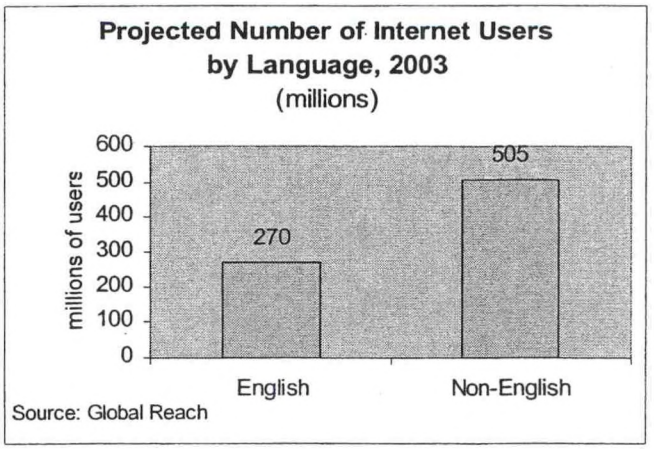
The structure of the business community is being profoundly influenced by the information revolution, with some functions being performed by interlinked specialized organizations rather than being integrated within large organizations. Such networks add to competitive pressures and demands for greater private roles in enhancing and distributing information.

Under these conditions, cooperative discussions of plans and services become essential to avoid contentious and counterproductive relationships as well as to find ways to work together.

NOAA increasingly will have to consider opportunities to work with the private sector where that offers an avenue for modernization and innovation. A tight budget environment could put pressure on NOAA to contract more with the private sector, especially if there are potential costs savings and/or if that is a way to get adequate capital investment and keep up with technology.

NOAA could face more difficult choices between drawing further on resources of the private sector to extend its and the nation's capabilities vs. trying to do more on its own for tighter security.

Electronic Government



NOAA has demonstrated excellence and continued progress in electronic government. Additional possibilities include:

- Moving beyond early stages in developing transaction capabilities.
- Evolving more extensive interagency capabilities for Web and other applications.
- Developing cooperative arrangements with universities, research institutions and private firms to offer the user packages and choices with seamless navigation on the Web.
- Finding additional ways to communicate with international constituencies.

More will have to be done to take advantage of extensible markup language and other Web services capabilities. The development of extensible markup language (XML) creates a challenge because

participation in setting standards and structures must be done well in advance of use. The federal government has tended to lag and risks losing the ability to easily build on systems in their early years.

The long lead time in increasing the capacity to provide IP addresses in the United States could mean an important bottleneck for NOAA by mid-decade. Contingency planning for issues that could arise would be appropriate.

The trend has been toward increasing availability of government information in response to greater consumer sophistication, populist demands and technological opportunities. The Post-September 11 environment, the Data Quality Act and computer security concerns are likely to lead to temporary and selective slowing of the trend. Nevertheless, the long-term trend of providing more information will remain intact and may even be enhanced by increased interest in civic issues after 9-11.

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In this effort a 5-10 year period of interest was indicated. For some NOAA issues it will be important to consider longer time frames.