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Strategic Plan Implementation Guide

December 2001

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Foreword

The Strategic Plan Implementation Guide (SPIG) is the implementation planning baseline of the National Weather Service (NWS) Strategic Plan. It is subject to revisions based on the changing realities of program accomplishments and resource availability.

The SPIG incorporates 23 roadmaps. Each roadmap was developed by a team and team leader charged to produce an implementation plan for assigned portions of the NWS Strategic Plan. The teams developed their first working roadmap drafts February, 2000. Each team has a responsible manager, typically a member of the NWS Corporate Board, who provides roadmap guidance and direction before the Corporate Board's approval. The roadmaps were completed in March, 2000 and assembled into the first SPIG draft in May, 2000.

The SPIG links long-term NWS strategic objectives to key annual planning cycles. A typical planning cycle includes NWS Annual Operating Plans (AOPs) which obligates the NWS to specific activities and yearly budget considerations. To assist meeting our strategic goals, the SPIG helps to advance our commitment toward making the appropriate progress and determine needed resources.

Our budget planning cycle incorporates a 5 year time period. Since current budget planning extends beyond the NWS Strategic Plan's time frame, this edition of the SPIG will reflect the most recent roadmap planning baselines with most extending to FY2007.

The SPIG focuses on planning baseline activities in the NWS Strategic Plan which may not include all NWS activities but attempts to communicate a general scope of NWS efforts to continue delivering quality products and services. Resource estimates are not included in the SPIG but should be factored when developing NWS AOPs. Needed resources should address the efficiencies for base operations as FMC operating plans are formulated.

In summary, the roadmap process was established to provide a means to implement the NWS Strategic Plan with concurrence of the NWS Corporate Board. The SPIG is a consolidated effort of this process and is intended to assist in producing annual operating plans and contribute to budget considerations. Some of the NWS's most knowledgeable employees help develop the roadmaps. The SPP office provides support to the roadmap process and extends the SPIG as a primary means to help implement the NWS "Vision 2005" Strategic Plan.

Edward R. Johnson, Director
Strategic Planning and Policy Office

STRATEGIC PLAN IMPLEMENTATION GUIDE

1.0 Executive Summary

1.1 Overview

Strategic Goals

The National Weather Service (NWS) has defined ***five*** strategic goals to improve its services to the Nation and strengthen U.S. leadership in the global arena. The NWS Strategic Plan describes these goals, identifies specific objectives for each goal, and recognizes critical end-state performance measures required to meet the goals and objectives. These goals, will enable NWS to strengthen linkages among the disciplines of weather, water, and climate prediction; take advantage of advances in information technology; work more effectively with partners; and become a more responsive and efficient government agency. The five NWS strategic goals are to: ***(1) Deliver Better Products and Services; (2) Capitalize on Scientific and Technological Advances; (3) Exercise Global Leadership; (4) Change the NWS Organizational Culture; and (5) Manage NWS Resources***.

Purpose of Implementation Guide

The NWS Strategic Plan outlines a framework for the agency's goals, objectives, and performance measures but does not provide a specific plan to achieve them. The Strategic Plan Implementation Guide (SPIG) defines major activities the NWS can undertake to accomplish the NWS Strategic Plan.

The SPIG provides an executable path for our agency and include roadmaps which represent major activities and milestones which can be used to achieve the Strategic Plan goals and objectives. These roadmaps are high-level guidance to assist the NWS Office and Regional Directors define their individual annual operating plans and to aid the NWS budget formulation process.

Each year, roadmap milestones for the upcoming fiscal year will be extracted from the SPIG and used to generate the NWS's Annual Operating Plan (AOP). Office and Regional Directors will utilize the list of roadmap activities to determine specific tasks and activities needed to allow the NWS to accomplish strategic planning objectives. Regional Directors are expected to work closely with field offices to determine the most appropriate focus for their operating plans. The SPIG provides the requisite linkages between the NWS Strategic Plan and the NWS AOP.

As individual operating plans are developed and incorporated into the NWS AOP, activities not defined in the Guide to support the strategic plan's implementation can be identified. This process will be a means to provide yearly SPIG updates and more accurately reflect the most current plans for implementing the Strategic Plan objectives.

Each year new budgets are approved at various levels and funding may not be included for some

activities. If this becomes apparent, those activities should be identified and postponed for the subsequent year. Roadmap activities for later years can be used in the budget formulation process. Out year budget preparations should include each office identifying the resources needed for the year in question and indicate how those resources need to be allocated. Resource estimates or other requirements should be developed by the appropriate FMC. Major activities may require drafting new budget initiatives to ensure adequate funding for specific activities.

Roadmaps

The list below show individual roadmap area objectives outlined in the Strategic Plan. The roadmaps were developed by a group of NWS experts and represent the implementation path for meeting many of our agency's strategic goals and objectives.

Roadmaps are defined for the following areas:

- Public
  - Public Service Accessibility
  - Aviation
  - Marine
  - Hydrologic Services
  - Fire Weather
  - Space Weather
  - Tsunami
  - Volcanic Ash
  - Climate Services
- Customer Service/Outreach
- Improved Observations
- Focused Research
- Data Assimilation/Modeling
- Climate Prediction
- International Activities
- Organizational Change - Human Resources Management
- Organizational Change - Budget/Financial Management
- Training
- Diversity
- Representation
- Budget and Strategic Planning
- Information Technology

2.0 Public Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Increase the accuracy and timeliness of NWS warnings***
  - ✓ ***Reduce the national average tornado warning false alarm rate from 0.80 (1998) to 0.55 or lower and increase the probability of detection from 0.64 (1998) to 0.80 or higher and the lead time from 11 minutes (1998) to 15 minutes (2005).***

Approach: Milestones and activities of this objective will occur in two strategic phases. The short term goal of phase one will cover years 2000 - 2001 and concentrate on training and information sharing. While this is occurring, all WFOs will be challenged to meet or exceed the performance scores of the existing top 25% of WFOs nationally. Scores for the top 25% of WFOs over the past 3 years are POD=0.70, FAR=0.61, Lead Time = 11.2 minutes. This interim approach provides time for longer term training, development, and technology to be implemented to achieve long term goals. Beginning in 2002 a more aggressive approach will be employed. From 2002-2005, FAR reduction performance improvements will be targeted at 0.10 per year over 4 years resulting in a goal of 0.55 by 2005. Performance improvement of increasing the POD will be targeted at 0.04 per year over 4 years resulting in a goal of 0.80 by 2005. Lead time performance improvements will be targeted to increase by 1 minute per year resulting in a 2005 goal of 15 minutes.

Benefits will be achieved through expanded training, improved research and technology, and agency-wide information sharing. This is expected to optimize forecaster proficiency, enhance skills, and improve severe weather warning accuracy and verification. Ultimately external customers will benefit by receiving quality services in the form of increased warning lead times, decreased false alarms, and increased storm detection.

Milestones/Initiatives:

FY 2002

- Field SCAN B2.x in AWIPS B5.1
- Display TDWR Products in web-based display for WFOs with TDWR in CWA, IFPS and Warngen software development for warning product simulation for the DRT training and case studies.

The Fire & Public Weather Services (F&PWS) Branch will charge a team to determine how to meet the strategic vision goals of more accurate and timely warnings. F&PWS proposes initiation of a nationwide systematic evaluation of false-alarms, missed events and "hits".

- Forecaster symposiums and warning workshops (regional, state, local) will be conducted nationally.
- Warning Decision Making Workshops will be conducted in Boulder
- Implement AWIPS Displaced Real Time (DRT) functionality into operations
- Develop and implement AWIPS optimization and refresher WSR-88D operator's training
    - Deploy Open RPG Build 1
    - Develop Open RPG Build 2
    - Implement new Volume Coverage Patterns (VCPs)
    - Disseminate analysis results in Tornado Warning Guidance'02 (TWG02)
    - Continue development of VDDA

FY 2003
- Deploy SCAN B3.0 in AWIPS 5.2 (assumes wideband radar comms)
- Ingest TDWR data into Open RPG for integration with WSR-88D data
- Test techniques to improve storm tracking
- Convert WSR-88D algorithms to be VCP independent
- Deploy RPG Build 2

FY 2004
- Continue SCAN Prototype Testing at four WFOs
- Continue ingest and display of TDWR data/products (continuing comms cost)
- Field advanced VCP's that go beyond simple optimization and field rapid update versions of mesocyclone and tornado algorithms with the second available ORPG build
    - Implement techniques to improve storm tracking
    - Begin to deploy ORDA

FY 2005
- Continue SCAN Prototype Testing at four WFOs
- Continue ingest and display of TDWR data/products (continuing comms cost)
- Continue to deploy ORDA with hardware/software to reduce folding/aliasing, increase reflectivity resolution, and improve spectrum width quality

FY 2006
- Continue SCAN Prototype Testing at four WFOs
- Continue ingest and display of TDWR data/products (continuing comms cost)
- Continue to deploy ORDA with hardware/software to reduce folding/aliasing, increase reflectivity resolution, and improve spectrum width quality

FY 2007
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1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Increase the accuracy and timeliness of NWS warnings***
  - ✓ ***Increase the average lead time for hurricane landfall forecasts from 19 hours (1998) to beyond 24 hours with no increase in warned area. Improve hurricane wind speed forecasts by 20 percent (2005).***

Approach: Improvements in tropical cyclone track and wind speed forecasting will be accomplished by improvements in numerical weather prediction guidance models and observations used to initialize these guidance models. Improving tropical model guidance and expanding observational data network will result in improved track and landfall forecasts and improved lead times. Economic losses from tropical storms will be reduced and mitigation efforts facilitated through advanced warning and unnecessary evacuations.

The National Data Buoy Center proposes adding ten new moored buoy stations. (OM, through Marine Observation (MAROB) work, established "requirements" with the regions for buoy locations across all coasts). Expansion calls for one new Coastal-Marine Automated Network (C-MAN) station, and an array of ten drifting buoys. These buoys would not only assist landfall forecasts, but assist winter storm forecasts and marine warnings.

Milestones/Initiatives:

FY2002

- Continue tropical cyclone official and model-forecast verification program. (TPC)
- Hurricane Specialists and other TPC meteorologists attend tropical meteorology conferences and meetings to stay abreast of recent developments and to promote the high priority and funding of guidance model development and associated developments. (TPC)
- EMC to continue efforts to improve tropical model guidance. (EMC).
- Participate in the USWRP Hurricane Landfall Implementation Plan including hurricane test bed development activities. (TPC, OS).

FY 2003

- Continue tropical cyclone official- and model-forecast verification program. (TPC)
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- Continue improving tropical guidance models. (EMC)

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Increase the accuracy and timeliness of NWS warnings***
  - ✓ ***Increase probability of detection of winter storms to 90 percent and the lead time to 18 hours (2005).***

Approach: Milestones and activities of this objective will be achieved by an extensive NWS-

wide training and information sharing, evaluation and possible revision of national policy, improved Hydrometeorological Prediction Center (HPC) guidance, and technological radar and AWIPS improvements. Achieving these goals will result in improved HPC guidance, expanded field training, and technological improvements in AWIPS and radar. Customers will benefit by the provision of improved products and services resulting from increased Probability of Detection (POD) and extended lead times of winter storm forecasts and warnings. This will have a positive economic impact on winter storm planning and pre-storm decisions by municipalities.

Milestones/Initiatives:

FY 2002

- Review and change policy if necessary to encourage local offices to include warnings in second period of zone forecast as necessary. Continue Warning Improvement/ Top Gun projects to highlight best warning practices; share and implement similar projects in other regions.
- HPC is tasked with improved coordination efforts by making operational its model diagnostic (i.e. initialization, trends, favored model of the day) discussions (NFDPMDHMD). HPC is tasked with conducting periodic seminars at forecaster symposiums, workshops, COMET courses, teletraining etc. regarding use of models. HPC is also tasked with implementing changes in its guidance suite, including heavy snow criteria and ice accumulation criteria, based on regional evaluation.
- Conduct forecast symposiums and winter weather workshops (local, regional, national). COMET/ FSL / CSTAR research projects should be accelerated.
- Utilize and expand practice of 'all- season' spotter networks, and share lessons learned from offices that have deployed this concept. Perform local studies and post analysis for specific events that threaten each office (lake effect vs. coastal lows, etc.)
- Implement the WSR-88D Snow Accumulation Algorithm.
- Integrate Snow Accumulation Algorithm products into AWIPS
- Provide ensemble forecasts on AWIPS. Use ensembles to provide probabilistic forecasts from HPC. Implement event simulations on AWIPS and perform practice drills/events. This requires archive/replay capabilities in AWIPS and IFPS running in the "Delayed Real-Time" mode.

FY 2003

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FY 2005

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- Review and change policy if necessary to encourage local offices to include warnings in second period of zone forecast as necessary. Continue Warning Improvement/ Top Gun projects to highlight best warning practices; share and implement similar projects in other regions.
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- Utilize and expand practice of 'all- season' spotter networks, and share lessons learned from offices that have deployed this concept. Perform local studies and post analysis for specific events that threaten each office (lake effect vs. coastal lows, etc.)
- Provide ensemble forecasts on AWIPS. Use ensembles to provide probabilistic forecasts from HPC. Implement event simulations on AWIPS and perform practice drills/events. This requires archive/replay capabilities in AWIPS and IFPS running in the "Delayed Real-Time" mode.

FY 2007

- Review and change policy if necessary to encourage local offices to include warnings in second period of zone forecast as necessary. Continue Warning Improvement/ Top Gun projects to highlight best warning practices; share and implement similar projects in other regions.
- Conduct forecast symposiums and winter weather workshops (local, regional, national). COMET/ FSL / CSTAR research projects should be accelerated.
- Utilize and expand practice of 'all- season' spotter networks, and share lessons learned from offices that have deployed this concept. Perform local studies and post analysis for specific events that threaten each office (lake effect vs. coastal lows, etc.)
- Provide ensemble forecasts on AWIPS. Use ensembles to provide probabilistic forecasts from HPC. Implement event simulations on AWIPS and perform practice drills/events. This requires archive/replay capabilities in AWIPS and IFPS running in the "Delayed Real-Time" mode.

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Increase the accuracy and timeliness of NWS warnings***
  - ✓ ***Increase flash-flood warning lead time from 52 minutes (1998) to 58 minutes (2005).***

Approach: Milestones and activities of this objective will be achieved by delivery of improved radar precipitation processing capabilities, delivery of rain gauges for network observation expansion, and delivery of improved numerical guidance products. Improvements will be produced through integration of advanced technologies (radar, satellite, rain gages, improved Quantitative Precipitation Forecast (QPF)) combined with a higher resolution data network. Improved identification of flood threats, analysis, and refined flood products will advance hydrologic services and increase warning lead time.

Technology:

- Accelerate improvements to accuracy of WSR-88D Precipitation Processing Subsystem (PPS) radar precipitation estimates.
- Accelerate Improvements to WSR-88D radar data used in precipitation estimation.
- Accelerate development and evaluation of techniques for short term (0-3 hr) prediction of heavy rain events.
- Improve Watershed Definitions by developing a high resolution (~2 sq. mi.) flash flood watershed database essential to implement critical and proven, field-requested flash flood decision assistance tool as a component of AWIPS. Resources required: This NWS-

funded projected is underway at NSSL.

– Improve Quantitative Precipitation Forecasts by developing and implementing a more accurate, higher resolution, single model (e.g., Eta, WRF) and statistically post-processed short-range ensemble forecast (SREF)-based QPF guidance critical for identifying the location and quantifying the risk of heavy precipitation.

Implement real-time, spatially distributed all-season rain gage observation network per WSR-88D umbrella with continuous real-time reports. Deliver a minimum of 30 gages with a target of 50.

– Improve satellite precipitation estimates, and calibrate and integrate satellite estimates with radar and rain gage data to generate an optimal multi-sensor Quantitative Precipitation Estimate (QPE) in real-time.
– Incorporate diverse environmental data into rainfall algorithm to improve QPE.

Research:

– Evaluate potential improvement in radar-derived precipitation estimates.

Milestones/Initiatives:

FY 2002

- Evaluate/field test VPR algorithm.
- Evaluate/field test redefined PPS Preprocessing algorithm
- Evaluate/field test extended use of REC (stratiform/convective, rain/snow, precip/no precip, etc.) to improve precipitation estimates.
- Evaluate/field test Ensemble PPS and probabilistic products.
- Deploy Open RPG build 2
- Implement REC.
- Implement radar/rain gage Bias Adjustment algorithm into AWIPS.
- Improve QPF
- Develop/optimize/assess operational polarimetric rainfall estimation algorithm
- Expand rain gage network
- Improve satellite precipitation estimates
- Objective radar-rainfall rate relationship guidance

FY 2003

- Deploy Open RPG, build 3
- Implement enhanced PPS Preprocessing algorithm.
- Implement VPR.
- Evaluate/field test Ensemble PPS and probabilistic products.
- Continue evaluation and implementation of extended uses of REC output.
- Evaluate/field test - improve polarimetry-based precipitation estimates.
- Improve QPF
- Expand rain gage network
- Improve satellite precipitation estimates
- Objective radar-rainfall rate relationship guidance

FY 2004

- Deploy Open RPG, build 3
- Implement enhanced PPS Preprocessing algorithm.
- Implement VPR.
- Implement Ensemble PPS and probabilistic products.
- Continue evaluation and implementation of extended uses of REC output.
- Evaluate/field test - improve polarimetry-based precipitation estimates.
- Begin to deploy ORDA
- Improve QPF
- Expand rain gage network
- Improve satellite precipitation estimates
- Objective radar-rainfall rate relationship guidance

FY 2005

- Continue to evaluate/field test - improve polarimetric-based precipitation estimates.
- Implement improved clutter filtering logic using REC information.
- Improve QPF
- Implement Ensemble PPS and probabilistic products.
- Expand rain gage network
- Improve satellite precipitation estimates
- Objective radar-rainfall rate relationship guidance
- Deploy ORDA

FY 2006

- Continue to evaluate/field test - improve polarimetric-based precipitation estimates.
- Implement improved clutter filtering logic using REC information.
- Improve QPF
- Implement Ensemble PPS and probabilistic products.
- Expand rain gage network
- Improve satellite precipitation estimates
- Objective radar-rainfall rate relationship guidance
- Deploy ORDA

FY 2007

- Continue to evaluate/field test - improve polarimetric-based precipitation estimates.
- Implement improved clutter filtering logic using REC information.
- Improve QPF
- Implement Ensemble PPS and probabilistic products.
- Expand rain gage network
- Improve satellite precipitation estimates
- Objective radar-rainfall rate relationship guidance
- Deploy ORDA

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Extend the time periods and improve the accuracy and formats of weather, water, and climate forecast products.***
  - ✓ ***Extend weather forecasts to 7 days (2000).***

Approach: Milestones and activities of this objective will be achieved through a two phased approach. Phase one requires field offices to use existing guidance to "begin" implementation of a 7 day zone forecast before or during the 4th quarter of FY 2000. Concurrently, HPC will provide graphical products supporting the day 6-7 forecast. Phase two will commence upon completion of AWIPS build 5.0 delivery and training to individual offices, (beginning 9/00 - ending 9/03). Each office will use IFPS to deliver a 7 day zone forecast. NCEP estimates by 4th quarter FY02 they can provide "value-added" day 6-7 guidance (alphanumeric and graphic) to facilitate forecast efforts.

Longer range forecasts previously found in two separate products will now be delivered in one consolidated product providing customers with "one stop shopping". The 5 day zone forecast (begun in the 40s) has been in place for over a half a century. Extending the range of the zone forecast out to 7 days is a century milestone, demonstrating improved public services as a result of the decade-long NWS modernization and restructuring.

Milestones/Initiatives:

FY 2002

- Extend MOS verification through seven days and evaluate how MOS can be improved. Implement AWIPS intersite coordination of forecast grids. Expand HPC value-added guidance products to initialize IFPS. HPC to provide additional post-processed medium range forecast guidance to WFOs (UKMET, ensemble forecasts) on AWIPS.
- Extend coded cities forecasts (CCF) to seven days, and develop plans to include every element in a verification message.

FY 2003

- Extend MOS verification through seven days and evaluate how MOS can be improved. Implement AWIPS intersite coordination of forecast grids. Expand HPC value-added guidance products to initialize IFPS. HPC to provide additional post-processed medium range forecast guidance to WFOs (UKMET, ensemble forecasts) on AWIPS.
- Extend coded cities forecasts (CCF) to seven days and containing all forecast elements.

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Extend the time periods and improve the accuracy and formats of weather, water, and climate forecast products.***
  - ✓ ***Provide weather, water, and climate forecasts in probabilistic terms (2005).***

Approach: Milestones and activities of this objective will be in several different product lines for weather and climate. Initial efforts to create probabilistic products and to extend those products in time began early in 2000 at NCEP's Hydrometeorological Prediction Center (HPC). HPC will begin testing Probabilistic Quantitative Precipitation Forecasts (PQPF) in 2000 using software developed by a contractor to the Office of Meteorology (OM). These products will only be for testing purposes this year to provide training for HPC staff (operational and developmental). Development of software for PQPF products on AWIPS/N-AWIPS is expected to take several years.

If HPC demonstrates skill in the preparation of probabilistic forecasting, the resulting products will enable customers and partners to better assess their risk if a forecast event occurs and to make appropriate plans or take appropriate action based on cost-benefit calculations.

Milestones/Initiatives:

FY 2002

- Continue categorical winter weather products
- Modify definition of categories if sufficient verification data is available
- Continue winter weather category verification
- Test PQPF software developed for incorporation into AWIPS/N-AWIPS
- Verify test PQPF products to refine and document skill in this area.
- Assess Eastern Region's pilot project on probabilistic snowfall forecasts.

FY 2003

- Continue categorical winter weather products
- Implement probabilistic snowfall forecasts nationwide, if shown successful in FY02 Eastern Region Pilot Project.
- Modify definition of categories if sufficient verification data is available
- Continue winter weather category verification
- Test PQPF software developed for incorporation into AWIPS/N-AWIPS
- Verify test PQPF products to refine and document skill in this area.

FY 2004

- Continue categorical winter weather products

- Modify definition of categories if sufficient verification data is available
- Continue winter weather category verification
- Test PQPF software developed for incorporation into AWIPS/N-AWIPS
- Verify test PQPF products to refine and document skill in this area.

FY 2005
- If sufficient skill exists, issue probabilistic winter weather and/or QPF products for sophisticated partners and customers
- Continue verification in measuring and refining forecast skill
- Incorporate these products into AWIPS/N-AWIPS for operational preparation of the new products.

FY 2006
- If sufficient skill exists, issue probabilistic winter weather and/or QPF products for sophisticated partners and customers
- Continue verification in measuring and refining forecast skill
- Incorporate these products into AWIPS/N-AWIPS for operational preparation of the new products.

FY 2007
- If sufficient skill exists, issue probabilistic winter weather and/or QPF products for sophisticated partners and customers
- Continue verification in measuring and refining forecast skill
- Incorporate these products into AWIPS/N-AWIPS for operational preparation of the new products.

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Extend the time periods and improve the accuracy and formats of weather, water, and climate forecast products.***
  - ✓ ***Extend precipitation forecasts to 3 days, and attain current Day 2 accuracy at Day 3 (2005).***

Approach: HPC began issuing operational QPFs for Day 3 in early FY 2000. Measurement of the accuracy of these forecasts began at the same time. As we gain experience with the new products HPC will document and share the "lessons learned" among its staff.

The Day 3 QPF will enable NWS offices to better alert their customers and partners to potentially dangerous conditions by providing longer lead time for the users to evaluate and prepare for significant precipitation events. As skill is demonstrated and improved, customers will gain more confidence in the use of this products and will be able to make informed decisions on

potential evacuations and commerce impacts to mitigate them in advance of large precipitation events

Milestones/Initiatives:

FY 2002
- Continue operational Day 3 QPF
- Continue verification of Day 3 product
- Continue diagnostic tool development
- Conduct internal review/training sessions
- Threat score to be achieved: 0.8

FY 2003
- Continue operational Day 3 QPF
- Continue verification of Day 3 product
- Continue diagnostic tool development
- Conduct internal review/training sessions
- Threat score to be achieved: 0.9

FY 2004
- Continue operational Day 3 QPF
- Continue verification and development of diagnostic tools, etc.
- Threat score to be achieved: 0.11

FY 2005
- Continue operational Day 3 QPF
- Continue verification and development of diagnostic tools, etc.
- Threat score to be achieved: 0.14

FY 2006
- Continue operational Day 3 QPF
- Continue verification and development of diagnostic tools, etc.
- Threat score to be achieved: 0.14

FY 2007
- Continue operational Day 3 QPF
- Continue verification and development of diagnostic tools, etc.
- Threat score to be achieved: 0.14

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Extend the time periods and improve the accuracy and formats of weather, water, and climate forecast products.***
  - ✓ ***Improve numerical model guidance over the Pacific and West Coast so it is as accurate as the rest of the country (2005)..***

Approach: Milestones and activities of this objective will be achieved by increasing the observational data network in the Pacific by adding buoys and further supplemented by aircraft reconnaissance. Results in improved west coast public forecasts achieved by increasing the density of observational data network and aircraft reconnaissance is expected to further improve model guidance.

Milestones/Initiatives:

FY 2002

- Task WSH, NCEP, and WR to work together in delivering better model guidance through the expanded data observational network.
- Deliver more Pacific observational data platforms to site specific locations to provide observational data for ingest into model initialization.

FY 2003

- Deploy aircraft reconnaissance to specific Pacific target locations as determined by NCEP for increased observational data to be used in initialization of model runs.
- NOAA G-IV aircraft operational flight costs are; ($2,800/hr x 9 hour typical flight=25K), (dropsondes are $500.00 x 20/mission=10K), (perdiem is $1,500/day for crew of 9). Estimate 12 winter missions at ($36,500 = $ 365K/yr).
- Task WSH, NCEP, and WR to work together in delivering better model guidance through the expanded data observational network.
- Deliver more Pacific observational data platforms to site specific locations to provide observational data for ingest into model initialization.

FY 2004

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- Deliver more Pacific observational data platforms to site specific locations to provide observational data for ingest into model initialization.

2.0 Capitalize on Scientific and Technological Advances

2.5 ***Prepare and disseminate NWS products in a form that offers high resolution and maximum flexibility to customers and partners.***

✓Prepare and disseminate NWS forecast products in digital form (2003).

Approach: Milestones and activities of this objective will be achieved by the delivery of the Revised Digital Forecast (RDF) and future digital forecasts (such as those produced by the Graphical Forecast Editor) produced with IFPS software in AWIPS. Results from implementing a National Digital Database will provide internal and external customers with modernized products which has never before been available.

Milestones/Initiatives:

FY 2002

- The Revised Digital Forecasts (RDF) will be implemented at WFOs as IFPS training proceeds, beginning in 9/00. Training is scheduled to continue for two years after delivery.
- IFPS will provide a mechanism for exchange of grids with adjacent WFOs for intersite coordination. Results from the eastern Region demonstration Project will be incorporated into this.
- Demonstration Project in Eastern Region: For three weather elements (max-min temperature and POP) assemble the IFPS generated digital products into regional and state mosaics. Evaluate the meshing of these products and establish a methodology for implementing the digital consolidation of these products nationally. This test will be conducted toward the goal of implementing a national digital database.
- IFPS- exchange of grids with adjacent sites (WFOs) for coordination. (Results from the Eastern Region Demonstration Project will be incorporated in this).
- Evaluate dissemination technologies to provide digital products to external customers on the internet. AWIPS LDAD will provide this to emergency managers who do have internet access. In addition the Rapid Prototyping Project for IFPS will provide a means to experimentally prototype new digital products for display on the local internet servers. NOAAPORT will provide gridded data to external customers. External customers will use their means of access to these data.

FY 2003

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The following needs to be added to the Public Services roadmap:

In the SPIG seems to fit well under section 2.0 Public, page 27, where we are extending the public weather forecast to 7 days.

- Extend the Tropical Cyclone Forecasts from 3 to 5 Days (2003) and 5-day wind radii forecasts (2005)

Approach: Milestones and activities of this objective are based upon extending numerical weather prediction guidance models and verification schemes, performing in-house extended forecasts, and conducting outreach efforts.

The 5 day forecast will enable TPC and NWS offices to better alert their customers and partners to prepare from the societal and economic effects of tropical cyclones. As skill is demonstrated and improved, customers will gain more confidence in the use of this product. They will be able to make informed decisions on potential evacuations and commerce impacts well in advance of an event.

Milestones/Initiatives:

FY 2002
- Verify 2001 model and in-house extended forecasts
- Continue development activities not completed in 2001
- Develop verification scheme for wind radii
- Make in-house 5-day track and intensity forecasts
- Brief users (first experimental year results and implications) and continue to obtain user requirements

FY 2003
- Verify 2002 model and in-house extended forecasts
- Continue development activities not completed in 2002
- Issue 5-day forecasts operationally, **IF** TPC in-house forecasts in 2002 and projected quality of forecasts in 2003 merit
- Brief users (second experimental year results and implications)

FY 2004
- Follow-up on track and intensity forecasts contingent on outcome of 2003
- Make 5-day in-house wind radii forecast

FY 2005
- Issue 5-day wind radii forecasts **IF** in-house forecasts in 2004 and projections for 2005 show sufficient utility

3.0 Accessibility of Public Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Public Services

- ***Improve the accessibility and availability of weather, water, and climate information to the American people.***
  - ✔ ***Post NWS products and data on the Internet in graphic-oriented format (2002).***
  - ✔ ***Increase coverage of the NOAA Weather Radio (NWR) transmitter network to 95 percent of U.S. population (2006).***
  - ✔ ***Deploy improved NWR voice, for critical products. (2003)***
- ***Improve accessibility of weather, water, and climate information to high risk communities.***
  - ✔ ***Increase NWR coverage to 100 percent in hazardous weather high-risk areas (2005).***
  - ✔ ***Where demographics demand, convert NWR products into multilingual formats (2003).***

Objective: The objective is to improve the availability of weather, water, climate and All-Hazard information to the American people. This includes making the information more accessible to special needs and high risk populations and making National Weather Service (NWS) data and products available to the American people when they want it and when they need it most. The outcome and success of this program is strictly related to concrete milestones to be funded and accomplished each year beginning in 2000 and beyond.

Approach: The milestones and activities for this objective focus on three areas: (1) analysis to accomplish the following: a) baseline the current NWS dissemination avenues and the target audiences and their requirements, b) assess the target audiences and requirements for any currently planned dissemination methods, and c) assess applicability of new and alternate technologies, and plan for expansion of dissemination avenues and target audiences using these technologies, (2) the continuation of the planned expansion and enhancement and/or replacement of certain existing systems, and (3) increasing the public knowledge of and use of such dissemination methods. This approach recognizes the NWS commitment to support the private sector in its effort to develop specialized, complementary services (e.g., products, communications, information capabilities) that together with increasingly more sophisticated basic NWS products and services, afford users access to the most complete and comprehensive hydrometeorological information possible.

Improving the availability of "All-Hazards" information denotes an additional level of dedication

to saving lives in all emergency situations in a spirit of partnership with other agencies rather than limiting the focus to weather-related emergencies. This is a key concept taking root in increasingly more visible avenues and at the highest levels of the government. The NOAA Weather Wire Service (NWWS) already provides dissemination services to the United States Geological Survey (USGS) National Earthquake Information Center, the Space Environment Center in Colorado and the Tsunami Warning Centers in Hawaii and Alaska. The NWS has entered into agreements in a number of states to transmit and broadcast on NWR Civil Emergency Messages (CEM) regarding nuclear energy and Chemical Stockpile Emergency Preparedness Program (CSEPP) emergencies. As part of the National Partnership for Reinventing Government, a team comprised of the United States Department of Agriculture, the Federal Emergency Management Agency, as well as the United States Department of Commerce produced a significant report titled "Saving Lives With an All-Hazard Warning Network." This report specifically discusses refining and expanding the all-hazard network of NWR. In addition, the White House National Science and Technology Council's Committee on Environment and Natural Resources formed the Working Group on Natural Disaster Information Systems Subcommittee on Natural Disaster Reduction - a group comprised of federal agencies tasked to save lives and/or property including NOAA, NWS, USGS, DOD, DOT/FAA, Voice of America/U.S. Information Agency (VOA/USIA), Federal Communications Commission (FCC), Federal Emergency Management Agency (FEMA), and Bureau of Land Management (BLM). One key recommendation in this group's report published in 2000 titled "Effective Disaster Warnings" is "NWS systems should be expanded to collect and relay all types of hazard warnings and rapid reports locally, regionally, and nationally..."

Milestones/Initiatives:

FY 2002

- Identify target audiences of existing and planned NWS dissemination avenues and the audiences' requirements. (OCWWS, OST)
- Identify and assess applicability of emerging telecommunication technologies for expanding dissemination avenues (e.g., cellular, home satellite systems, cable, pagers, PCS, personal computers, etc.). (OST)
- Promote utilization of LDAD for CEM (Civil Emergency Message) and other All Hazard input by Emergency Management community into NWS dissemination systems from external agencies. (OCWWS)
- Evaluate the benefit and feasibility of simultaneous dissemination of multilingual alphanumeric and audio products. (OCWWS, OST)
- Maintain open communication with partners to ensure that products satisfy automated dissemination systems, to include participation in NWS Partners Workshop, professional conferences and trade shows. (OOS, OCWWS,OST, Regions, Field Offices)
- Assess feasibility of and implement, if possible, Internet, Emergency Managers Weather Information Network (EMWIN), and NOAA Weather Wire Service (NWWS) distribution of "screen capture" of WSR-88D WarnGen warning polygons. (Note: timing of this activity is dependent on AWIPS build development schedule.) (OST)

FY 2003

- Study results from Customer Satisfaction Index and NWS audience assessment to evaluate the effectiveness of our dissemination systems for meeting the needs of high risk and special needs population. (OCWWS, OST)
- Maintain open communication with partners to ensure that products satisfy automated dissemination systems, to include participation in NWS Partners Workshop, professional conferences and trade shows. (OOS, OCWWS, OST, Regions, Field Offices)
- Implement AWIPS formatter revisions to incorporate partial county Unified Universal Geographic Code (UGC). (Note: timing of this activity is dependent on AWIPS build development schedule.) (OST)

FY 2004-2007

- Maintain open communication with partners to ensure that products satisfy automated dissemination systems, to include participation in NWS Partners Workshop, professional conferences and trade shows. (OOS, OCWWS, OST, Regions, Field Offices)

NWS Dissemination Development and Expansion Tasks not specific to NWR, NWWS or EMWIN

FY 2002

- Investigate partnership with NESDIS for creation of a "Climatology Line" voice phone service for the public to query climatological records for all data points in the U.S. (OCWWS, OST)
- Encourage private industry development of special features on cell phones, such as a "weather button" and use of SAME technology. (OCWWS, OOS, OST)
- Encourage private industry development of weather data dissemination (especially warnings) via Direct Broadcast Satellite (DBS), cell phone, pagers, PCS. (OCWWS, OOS, OST)
- Assess feasibility of integrating duplicative systems without eliminating needed redundancy. (OST)
- Evaluate expansion of SBN channels.
- Begin development of backup NWSTG and if possible begin implementation. (OOS)

FY 2003

- Fully implement backup NWSTG. (OOS)
- Assess feasibility of integrating networks, both nationally and worldwide.
- Implement, if appropriate, expansion of SBN channels.

FY 2004

- If feasible, develop plan to integrate networks, both nationally and worldwide.

FY 2005

- If feasible, integrate networks, both nationally and worldwide.

Outreach Tasks Common to Multiple NWS Dissemination Systems

FY 2002

- Develop information packets for targeted audiences such as Mass News Disseminators and special needs/ high risk populations.
- Provide outreach efforts to targeted audiences such as Mass News Disseminators and special needs/ high risk populations through professional and trade organizations' publications and conferences. (OOS, OCWWS, Regions, Field Offices)

FY 2003-2007

- Provide outreach efforts to targeted audiences such as Mass News Disseminators and special needs/ high risk populations through professional and trade organizations' publications and conferences. (OOS, OCWWS, Regions, Field Offices)

NWWS Related Tasks

FY 2002

- Assess implementation of a voice order wire capability as either an adjunct to or replacement for networks such as the Hurricane Hot Line and other NWS collaborative tools. (OOS)
- Assess the operational availability of the network and consider the feasibility and desirability of upgrading the network to add 2-way transmission capabilities to additional Weather Forecast Offices. (OOS)

FY 2003

- Implementation of the AWIPS LAN configuration interface with NWWS, and provide assistance to external customers as needed and appropriate. (OOS)
- Implement revisions to NWWS software for new partial county UGC. (Note: timing of this activity is dependent on AWIPS build development schedule.) (OOS)

Internet Related Tasks

FY 2002

- Convert, if feasible, all field offices Internet URL's to plain language names for the office, for example http://stlouisweather.gov .
- Assess feasibility of, and implement if appropriate, NWS Web pages for personalized weather information (such as current local weather and forecasts, watches and warnings). The customer accesses the NWS web site and has a page of information customized for him/her, tailored to the local area.
- Assess feasibility of, and implement if appropriate, using popular NWS pages to advertise NWS products, services, and offices through banner ads (e.g., " Is your family prepared for a tornado? Click here...").
- Implement consistent format of many critical products or services on all field office web

pages, such as:

a) Local Storm Data for completed months
b) Climatological Data
c) Forecast and observation data
d) Spotter talks and other public activities
e) Local news and information about the office
f) Contacting the local office via e-mail and phone
g) An online form for sending delayed severe weather reports

- Explore the use of new Internet technologies for broadcast of warnings.
- Implement LDAD-Web Dissemination capability in AWIPS to take data from the WFO's and centers (forecasts, watches, warnings, guidance, outlooks, observations, graphical products, and WSR-88D images, and provide high capacity, high-bandwidth service to Emergency Managers and other critical users and develop training for those users. (Note: timing of this activity is dependent on availability of resources in addition to AWIPS.)
- NDBC Dial-a-Buoy system improvements
- Assess feasibility of, and implement if appropriate, providing NOAA Weather Radio audio nationwide to the Internet via streaming audio.
- Put in place resources to ensure consistent web presence/proficiency at each site (i.e., training and tools for web masters).
- Implement Internet 2 for enterprise only access for research/educational purposes.
- Assess feasibility of multilingual alphanumeric and audio products.

FY 2003

- Explore ways to overcome concerns with Internet speed and security. This would allow the Internet to become an "official" dissemination media.
- Implement, if appropriate, multilingual alphanumeric and audio products.

FY 2004-2006

- Evaluate and expand as appropriate Internet 2 access to public.

EMWIN Related Tasks

FY 2002

- Contact direct satellite broadcast companies to encourage inclusion of EMWIN in their data stream, allowing home satellite customers the capability to create a weather information channel customized for their location and particular interests.
- Promote EMWIN to state Departments of Education, Teachers Associations, etc, for the purpose of utilizing for planning and student protection in all K-12 schools.
- Produce updated EMWIN video promotion videos.
- Provide 88D national and regional composite images in EMWIN data stream.
- Develop standardized process to insert local 88D imagery into EMWIN VHF rebroadcasts.

FY 2003

- Provide funding for at least one EMWIN 9600 baud VHF rebroadcast per CWA (with future goal of an EMWIN rebroadcast transmitter co-located with each NWR transmitter).
- Procure 12 portable EMWIN rebroadcast units (2 per Region) for demonstrations.

FY 2004
- Continue expansion of radio retransmit capability.

NWR Related Tasks

FY 2002
- Continue planning for national expansion and add new (80)stations to the NWR Network. (OOS)
- Continue planning for national NWR upgrade and upgrade (8) stations in the existing NWR Network. (OOS)
- Produce and test text transmission capability. (OOS)
- Maintain NWR Management Information System (MIS) to support operation of NWR, provide single source of information on NWR and provide widespread access via the Internet. (OOS)
- Promote rebroadcast of NWR using alternative technologies. (OOS)
- Promote more widespread use of NWR. (OOS, OCWWS, Regions, Field Offices)
- Complete prototype development, acquire and deploy voice improvement capability for broadcast of all products. (OST, OOS, OCWWS)

FY 2003
- Add new (50-70) stations to the NWR Network. (OOS)
- Upgrade (40) stations in the existing NWR Network. (OOS)
- Deploy text transmission capability. (OOS)
- Maintain NWR MIS and provide widespread access via the Internet. (OOS)
- Promote rebroadcast of NWR. (OOS)
- Promote more widespread use of NWR. (OOS, OCWWS, Regions, Field Offices)

FY 2004
- Add new (50-70) stations, including 5 marine stations, to the NWR Network. (OOS)
- Upgrade (40) stations in the existing NWR Network. (OOS)
- Deploy text transmission capability. (OOS)
- Maintain NWR MIS and provide widespread access via the Internet. (OOS)
- Promote rebroadcast of NWR. (OOS, OCWWS, Regions, Field Offices)
- Promote more widespread use of NWR. (OOS, OCWWS, Regions, Field Offices)
- Install marine NWR (5 per year). (OOS)

FY 2005-2006
- Add new (50-70) stations, including 5 marine stations, to the NWR Network. (OOS)
- Upgrade (40) stations in the existing NWR Network. (OOS)
- Explore, plan, and implement, if feasible, Digital Broadcast Satellite as alternative

technology for NWR dissemination. (OST, OOS)
- Promote rebroadcast of NWR. (OOS, OCWWS, Regions, Field Offices)
- Promote more widespread use of NWR. (OOS, OCWWS, Regions, Field Offices)

FY 2007
- Continue installing marine NWR (5 per year). (OOS)
- Promote rebroadcast of NWR. (OOS, OCWWS, Regions, Field Offices)
- Promote more widespread use of NWR. (OOS, OCWWS, Regions, Field Offices)

CRS Related Tasks

FY 2002
- Conduct a broad-based study to assess new applicable technology for the CRS and plan for its infusion. Major areas covered will include an end-to-end analysis of the NWR automation process and development of a plan for assessing and introducing new enhancements. This study will provide a maintainability assessment of the current CRS hardware base, a Text-to-speech (TTS) technology market survey, and a market assessment of multilingual translator software development sources.
- Deploy replacement PC's used in CRS for maintainability reasons. (OOS)

Tasks to convert NWR products into multi-lingual formats

FY 2002
- As needed, translate additional NOAA Weather Radio and other important NWS outreach products into Spanish.
- Assess feasibility of, and implement if appropriate, automated voice broadcast of critical products in Spanish language.
- Assess needs for and feasibility of adding additional multi-lingual NWR and other dissemination support across the country.
- Assess feasibility of, and award contract if appropriate, to produce meteorologically-specific Spanish conversion software to support NWR as well as web sites and other dissemination methods.
- Translate additional NOAA Weather Radio and other important NWS outreach products into other languages as needed.

FY 2003
- Assess applicability of next-generation software-based text-to-speech (TTS) synthesized voice technology for use in automating other languages.
- Implement additional language(s) for critical products as assessment indicates.

FY 2004
- Assess effectiveness and community feedback to multi-lingual services. Plan for expansion of services to additional products/dedicated transmitters where indicated.
- As demographics and community needs assessments dictate, contract production of

meteorologically-oriented conversion software for use in translating for NWR, web sites and other dissemination means.

FY 2005-2007

- Re-assess demographics and adjust services as needed.

4.0 Aviation Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Aviation Services

- ***Improve terminal and domestic en route warnings and forecasts.***
  - ✓ ***Ensure verification rate for desired lead time met on local airport weather warnings for established criteria meets or exceeds 60 percent, with a false alarm rate at/below 40 percent (2006)***.

Objective: Local Airport Advisories (LAA) are currently issued for 59 airports by 41 NWS Forecast Offices across the country. LAAs will migrate to Airport Weather Warnings (AWW), a higher level of service. These forecasts must be accurate and timely to effectively support airport ground operations.

Approach: Achieving this performance measure is highly dependent upon collaboration by the NWS with both external and internal research and developmental efforts. AWWs will cover a wide variety of weather conditions and depend upon local needs. Accurate information on wind, hail, and snow in amounts significant to users along with thunderstorms will be required in these warnings. Adequate forecast guidance will depend not only on the enhancement of operational mesoscale models, and improved aviation forecaster training, but also the continued development, refinement and implementation of WSR-88D algorithms.

Enhancements to current WSR-88D algorithms and display (i.e. SCAN) must utilize ongoing developmental efforts that are part of the FAA's Aviation Weather Research Program (AWRP). The AWRP is a collaborative effort between the sponsoring organization, FAA, with the National Center for Atmospheric Research (NCAR), NOAA's Forecast Systems Laboratory (FSL), the National Severe Storms Laboratory (NSSL), NCEP, MIT/Lincoln Laboratories, and the Naval Research Laboratory (NRL). Program areas, or Product Development Teams (PDTs) specifically address the detection and forecast of numerous weather phenomena affecting aviation ground operations. Use of the Terminal Doppler Weather Radar (TDWR) and the Integrated Terminal Weather System (ITWS) is emphasized. Obtaining output on from algorithms on these platforms, or transfer of that technology into the suite of WSR-88D algorithms, will be critical to the success of this performance measure.

<u>Milestones/Initiatives</u>:

FY 2002

- Begin manually tabulating AWW performance statistics from select set of AWW terminals, (at least one warm and one cool season location), to establish baseline POD and FAR

- Test acquisition and display of TDWR and ITWS products, at coincident AWW sites

FY 2003
- Deliver Distance Learning Module on shift to open WSR-88D architecture for all forecasters
- Continue collection of AWW performance statistics from select set of AWW terminals to complete performance baseline by end of FY

FY 2004
- Continue to deliver Distance Learning Module on shift to open WSR-88D architecture for all forecasters
- Continue Distance Learning on Forecasting Low Altitude Clouds and Fog for use by all forecasters
- Nationwide implementation of full AWW-supporting suite of WSR-88D and, where applicable, TDWR products
- Begin development of automated AWW verification procedure
- Begin nationwide AWW verification program at the same time as full implementation, calculating performance delta

FY 2005
- Continue to deliver Distance Learning Module on shift to open WSR-88D architecture for all forecasters
- Continue development and test automated AWW verification procedure

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Aviation Services

- ***Improve terminal and domestic en route warnings and forecasts.***
  - ✓ ***Reduce false alarm rate from .55 to .40 and increase the probability of detection from .40 to .60 for the 0 to 6 hour (cumulative) period for critical ceiling (<200 feet) and visibility (<1/2 mile) forecasts as contained in aviation terminal forecasts (2006).***
  - ✓ ***Reduce false alarm rate from 52 percent (1998) to 30 percent and increase the probability of detection by 50 percent for the 0 to 12 hour period for critical ceiling (200 feet) and visibility (1.4 mile) forecasts as contained in aviation terminal forecasts (2005).***
  - ✓ ***Increase probability of detection by 50 percent and reduce false alarm rate by 50 percent for the 0- to 12-hour aviation terminal forecasts of ceiling and visibility within instrument flight rules (IFR) and marginal visual flight rules (MVFR) categories (2005)***.

NOTE: These two performance measures have been grouped together because of their similarity. The second of these is submitted to replace the third aviation performance measure on page 12 of the Vision 2005 Strategic Plan which calls for reducing the number of Terminal Aerodrome Forecast (TAF) amendments by 30 percent by 2005. The Aviation Roadmap Team believes that reducing the number of TAF amendments is too easily achieved and does not address stated customer needs of providing the most accurate forecast possible.

Milestones/Initiatives:

FY 2002

- Implement "visiting forecaster" program with Automated Flight Service Stations (AFSSs), airlines, other customer groups, so that forecasters will gain a better feel for how their products are used
- Using Collaborative Decision Making (CDM) techniques, establish "short term discussions" of aviation related issues (e.g., low ceilings, visibilities) for WFO aviation forecasters. Discussions to be initiated either by AWC or CWSU forecasters
- Rewrite WSOM D-31 chapter to provide clear, concise guidance to forecasters
- Continue to develop ceilometer and visibility improvements in ASOS
- Continue to deliver Distance Learning on Forecasting Low Altitude Clouds and Fog for use by all forecasters
- Provide increased Meteorological Data Collection and Reporting System (MDCRS) data readings and improved dissemination to forecasters
- Establish datalinks from installed Terminal Doppler Radars (TDWR) and Integrated Terminal Weather Sensors (ITWS) to nearby Center Weather Service Units (CWSUs) and WFOs
- Implement new TAF preparation program in AWIPS 1st Quarter
- Begin development of Local AWIPS MOS Program (LAMP)
- Evaluate and change TAF product to 0-6/12 hour detailed forecast, with 7/13-24 hour outlook period
- Begin to mesh AWRP ceiling and visibility research efforts with the Interactive Forecast Preparation System (IFPS)

FY 2003

- Increase support for mesonet observation systems throughout the country
- Begin experimental production of National Ceiling and Visibility Forecast product, based on AWRP-produced algorithm
- Continue development of interface between AWRP-provided ceiling and visibility products and IFPS
- Develop WSR-88D aviation-specific applications and training via OSF
- Continue to deliver Distance Learning on Forecasting Low Altitude Clouds and Fog for use by all forecasters
- Provide automated experimental satellite technique data sets/graphics such as Cloud Base and Fog Depth estimates currently under development at NESDIS
- Continue development of remote sensing algorithms for detection of cloud and visibility

characteristics
- Continue to develop ceilometer and visibility improvements in ASOS
- Begin development of Local AWIPS MOS Program (LAMP)
- Begin development of Local Probabilistic Model
- Being initial development of aviation forecast database
- Develop forecaster "product awareness" distance learning module

FY 2004
- Continue Distance Learning on Forecasting Low Altitude Clouds and Fog for use by all forecasters
- Produce operational national ceiling and visibility forecast product
- Complete initial IFPS interface to national ceiling and visibility forecast product
- Continue to develop ceilometer and visibility improvements in ASOS
- Continued training of aviation forecasters and "visiting forecaster" program
- Continue development of Local AWIPS MOS Program (LAMP) - complete convection forecast portion
- Continue development of Local Probabilistic Model
- Continue development of Aviation forecast database
- Begin development of aviation "guidance" TAF capability

FY 2005
- Continue Distance Learning on Forecasting Low Altitude Clouds and Fog for use by all forecasters
- Continue to develop ceilometer and visibility improvements in ASOS
- Implement Local AWIPS MOS Program (LAMP)
- Implement Local Probabilistic Model
- Deliver prototype guidance TAF forecast process for WFO's
- Conduct human factors testing of new TAF forecast processes

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Aviation Services

- ***Improve terminal and domestic en route warnings and forecasts.***
  - ✓ ***Increase the probability of detection for turbulence, icing, and thunderstorm warnings by 50 percent, and reduce the false alarm rate by 50 percent (2005).***
  - ✓ ***Implement graphical aviation products capable of cockpit display (2005).***

Milestones/Initiatives:

FY 2002

- Produce operational national Integrated Icing Diagnosis and Forecast Product
- Produce experimental national Integrated Turbulence Forecast Product
- Continue installing humidity sensors on commercial aircraft
- Continue recurring funding of MDCRS program and obtain turbulence data from aircraft
- Support NWS/TDL development efforts on aviation FLT LVL Model Output Statistics (MOS)]
- Assimilate MDCRS turbulence measurements into models
- Develop Real time Verification System (RTVS) for Alaska graphics
- Develop in-flight icing algorithm for 4D data base and test generated products in Alaska
- Develop training module on probabilistic forecast processes
- Complete initial (Version 1.0) tranfer of ADDS to operational platform
- Deliver design for Capstone cockpit graphics in Alaska
- Ensure NWS aviation products are disseminated in GRIB/BUFR to all communication nodes
- Determine risks and resources for production of all NWS products in database (i.e., GRIB/BUFR format)
- Determine and initiate development of basic end-user aviation database tools
- Monitor NASA development of AWIN (and other) formats for "Weather in the cockpit" displays

FY 2003

- Deliver 2nd generation experimental National Convective Weather Forecast product
- Merge the Convective SIGMET with NCWF and CCFP for a comprehensive graphic for thunderstorm risks
- Improve collection of general aviation-reported pilot reports to the AWC and the AAWU
- Continue installing humidity and turbulence sensors on commercial aircraft
- Develop interfaces to FAA Advanced Avionic Architecture for Free Flight communication systems to obtain observations of winds, temperature, and turbulence from general aviation airplanes
- Continue the development of Flight Level MOS - complete turbulence and icing tools
- Assimilate MDCRS turbulence measurements into models
- Deliver Real time Verification System for Alaska graphics
- Deliver Capstone test products to users and evaluate usefulness
- Continue development and validation of in-flight icing products

FY 2004

- Deliver 2nd generation operational National Convective Weather Forecast product - evaluate continued production of national convective SIGMETS
- Fund a demonstration project of mm cloud radars at major aviation Hubs where climatology shows that icing is a major threat
- Develop quality control algorithms for new MDCRS observations
- Continue installing humidity and turbulence sensors on commercial aircraft
- Implement ingestion of E-PIREP data from FAA Free Flight aircraft
- Continue development and implement Flight Level MOS
- Complete in-flight icing product development and tie to RTVS in Alaska

FY 2005

- Continue installing humidity and turbulence sensors on commercial aircraft
- Continue development and implement Flight Level MOS
- Increase WFO/CWSU/AWC/AAWU communications capability to handle end-user requests and collaborative forecast processes

5.0 Marine Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Marine Services

- ***Extend and improve the accuracy of marine (wind and wave) forecasts.***
  - ✔ ***Improve the accuracy by 20 percent of wind and wave forecasts (2005).***
  - ✔ ***Improve by 15 percent the lead time and accuracy for Storm, Gale, Small Craft Advisories (2005).***
  - ✔ ***Improve by 20 percent the Probability of Detection for Special Marine Warnings (2005).***
  - ✔ ***Reduce over-warned coastline from the 1998 average of 45 miles to 30 miles (2005).***
  - ✔ ***Extend wind and wave forecasts from 36 hours out to seven days (2005).***
- ***Improve the format and distribution of marine products.***
  - ✔ ***Increase NWR programming to include routine and special marine products, and tailor it to needs of marine community (2005).***
  - ✔ ***Increase the number of graphic marine forecasts (2005).***

Objective: Increase the usefulness of marine forecasts by (1) improving forecast accuracy, (2) adding necessary marine weather forecast elements, (3) extending the forecast periods, and (4) modernizing marine weather products.

Approach: Improving NWS marine services through 2007 is critical to the safety of the marine community, economic health of the USA, and the Marine Transportation System (MTS). The NWS marine strategic plan milestones emphasize means to improve marine forecasts, modernize marine products and verification, and take advantage of the new technologies to develop and disseminate marine products. Means to improve marine forecasts include establishing a more comprehensive observing system and providing training for marine forecasters.

Modernized marine products will include graphic and gridded forecasts for marine weather elements generated by the Interactive Forecast Preparation System (IFPS). Ultimately users will define their own marine forecast areas and access gridded forecasts for their selected weather elements through the National Digital Forecast Database (NDFD). Finally ensuring broad dissemination of marine products is essential to increase the usefulness of marine forecasts.

NWS is striving for cost effective ways to disseminate products to vessels at sea via satellite, High Frequency (HF) radio, and cellular technologies.

Milestones/Initiatives:

FY 2002

Develop and maintain quality measurement system of marine forecasts.

- Submit proposal to modernize marine verification program. **OS**
- Participate in major marine exhibitions. **OS**
- Document strengths and weaknesses of marine forecasts based on customer feedback. **OS, regions, NCEP**
- Begin verifying Special Marine Warnings. **OS, regions**
- Complete a National assessment of marine/tropical storm customer needs and satisfaction. **OS**

Gain better knowledge of state and understanding of the atmosphere.

- Continue partnerships with other NOAA line offices such as NOS/National Marine Sanctuaries (NMS). **OS**
- Participate in Safe Boating Week by giving presentations and distributing safety info in partnership with National Data Buoy Center, National Safety Council, U.S. Coast Guard, and other agencies. **OS**
- Complete the installation of relative humidity sensors to the marine observing network. **OS, OOS**

Derive products from model output for marine elements (wind and wave).

- Continue generating experimental gridded graphic marine products. **OS, OST, NCEP**
- Develop policy for producing gridded graphic marine forecast products and blending the graphic with alpha-numeric products. **OS, regions, NCEP**

Improve forecast operations.

- Develop capability to acquire, store, and display graphical display of astronomical tides versus actual water levels (location selectable) on AWIPS workstations. **DONE**
- Extend coastal and offshore wind and wave forecasts from 36 hours to 5 days. **OS, NCEP, WR, AR, PR, SR, ER**
- Make GLERL wave guidance available on AWIPS. **OS, NCEP, CR, ER**
- Complete marine Professional Development Series (PDS). **NCEP, regions, OS**
- Conduct two marine workshops (Pacific and other). **Regions**

FY 2003

Develop and maintain quality measurement system.

- Provide real-time, local verification feedback to forecasters. Develop and maintain automated local verification database. **OS**
- Document strengths and weaknesses of marine forecasts based on customer feedback.

OS, NCEP, regions

- Participate in major marine exhibitions. **OS, NCEP, regions**
- Continue research to modernize the marine verification program. **OS, NCEP, regions**

Gain better knowledge of state and understanding of the atmosphere.

- Begin to expand NWS access to three-dimensional observations of the marine environment. Increase remote sensing and in-situ observations. Integrate upper ocean layer with atmospheric observations. **OS, OST, NCEP, regions**

Derive products from model output for marine elements.

- Develop model derived ensemble package for marine elements (wind and wave). Provide additional model forecast elements from NCEP; sea surface temperature, ocean currents, marine layer movement/inland intrusions, fog/stratus (inversion height), and ice accretion.
  OS, OST, NCEP
- Derive statistical products (wind and wave) from existing local models at coastal and Great Lakes marine offices. **OS, OST, NCEP**
- Put into operation ice models (100 m, 1 hour); ice boundaries and movement vectors. **OS, NCEP**
- Improve model physics in marine boundary layer/air-sea interface (1km). **OS, OST, regions, NCEP**
- Improve data assimilation of marine boundary layer observations into NCEP models. **OS, OST, regions, NCEP**

Develop new products and services.

- Make data accessible in real-time delivery by automatic processing and integration with other data sets. **OS, regions**
- .Blend MPC, TPC, and WFO marine forecast grids to produce seamless sets of grids across the coastal waters, offshore waters, and high seas as part of a comprehensive digital forecast database. **OS, OST, NCEP, regions**
- Add wave period and wave steepness to marine forecasts. **OS, NCEP, regions**

Improve forecast operations.

- Develop and integrate displays of marine data and model products (internal and external sources) on AWIPS workstations. **OS, OST, regions**
  - Vertical profiles (atmosphere and ocean surface layer).
  - Ocean currents.
  - Meteogram style.
  - Wave spectrum.
- Fully implement SAFESEAS. **OS, OST, NCEP, regions**
- Develop formatters to decode plain language marine reports (MAREPS) on AWIPS workstations. **DONE**
- Complete marine Professional Development Series (PDS). **OS, regions, NCEP**

FY 2004

Develop and maintain quality measurement system.

- Document strengths and weaknesses of marine forecasts based on customer feedback. **OS, regions, NCEP**
- Participate in major marine exhibitions. **OS, regions, NCEP**

Gain better knowledge of state and understanding of the atmosphere.

- Continue to expand NWS access to three-dimensional observations of the marine environment. Increase remote sensing and in-situ observations. Integrate upper ocean layer with atmospheric observations. **OS, OST, NCEP, regions**

Derive products from model output for marine elements.

- Develop and expand local models to include fog/visibility, beach erosion, salinity, water level, surge, currents, upwelling, wind, ocean currents, and surf zone. **OS, OST, NCEP, regions**
- Put into operation ocean current models (10m resolution) which include major currents (Gulf Stream, Japan current, California current, Loop). **OS, OST, NCEP**

Develop new products and services.

- Develop new marine forecast products utilizing latest model output.
    - Develop graphical and tabular presentations of coastal, offshore, and high seas forecasts. **OS, OST, NCEP, regions**
    - Through a gridded database, develop interactive user-defined point to point forecasts. **OS, OST, NCEP, regions**
    - Share gridded databases with other NOAA line offices. **OS, OST, NCEP**

Improve forecast operations.

- Develop archive of significant marine weather events for training purposes on AWIPS workstations. **OS, regions**

FY 2005

Develop and maintain quality measurement system.

- Document strengths and weaknesses of marine forecasts based on customer feedback. **OS, NCEP, regions**
- Participate in major marine exhibitions. **OS, NCEP, regions**
- Implement modernized marine verification program. **OS, NCEP, regions**

Gain better knowledge of state and understanding of the atmosphere.

- Continue to expand NWS access to three-dimensional observations of the marine environment. Increase remote sensing and in-situ observations. Integrate upper ocean layer with atmospheric observations. **OS, OST, NCEP, regions**

Provide better knowledge of state and understanding of the atmosphere.

- Standardize format, distribution, and display of non-NWS data sets. **OS, regions**

Develop new products and services.

- Make all NWS marine products available from the web at ftp and ftp-mail sites. **OS, OOS**
- Begin installing cooperative weather stations at each National Marine Sanctuary (NMS) kiosk/visitor center. **OS, regions**
- Install a NOAA Weather Radio and/or a weather exhibit at each National Marine Sanctuary (NMS) kiosk/visitor center. **OS, regions**

Improve forecast operations.

- Implement classroom training (non-teletraining) of marine subjects. **OS**
- Extend coastal and offshore wind and wave forecasts from 5 to 7 days. **OS, WR, PR, AR, ER, SR**
- Display bathymetry and geographic features of marine areas on AWIPS and options to highlight: **OS, OST, NCEP, regions**
  - Geographic Information System (GIS).
  - Marine sanctuaries.
  - Fishing grounds.
  - Radio coverage maps.
  - Transmitter locations and schedules.

FY 2006

- Derive statistical products from model output on current buoy/CMAN location. **OS, OST, OOS, NCEP**
- Continue to expand NWS access to three-dimensional observations of the marine environment. Increase remote sensing and in-situ observations. Integrate upper ocean layer with atmospheric observations. **OS, OST, NCEP, regions**
- Install weather data buoy inside each National Marine Sanctuary (NMS) site. **OS, OOS**
- Participate in major marine exhibitions. **OS, NCEP, regions**
- Document strengths and weaknesses of marine forecasts based on customer feedback. **OS, NCEP, regions**

FY2007

- Continue to expand NWS access to three-dimensional observations of the marine environment. Increase remote sensing and in-situ observations. Integrate upper ocean layer with atmospheric observations. **OS, NCEP, OST, regions**
- Develop new marine forecast products. **OS, OST**
- Develop new products which might include estuary salinity, ocean currents, surf, and water level.
- Develop software on AWIPS workstations to run coastal flood scenarios (similar to Sea, Lake, and Overland Surges from Hurricanes - SLOSH, HURRicance EVACuation - HURREVAC). **OS, OST, regions**
- Display bathymetric and geographic features of marine areas on AWIPS and options to highlight: **OS, OST, regions**

  - Inundation mapping.
  - Great circle tracks.
- Participate in major marine exhibitions. **OS, NCEP, regions**
- Document strengths and weaknesses of marine forecasts based on customer feedback. **OS, NCEP, regions**

6.0 Hydrologic Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Flood Forecasting and Water Management

- ***Improve accuracy and lead time of hydrological forecasts and relevance of products..***
  - ✓ ***Deploy the Advanced Hydrologic Prediction System (AHPS) to 50 percent of river forecast sites (2005)***
  - ✓ ***Specify the confidence level of all river and flood forecasts produced by AHPS and increase accuracy at AHPS points by 25 percent (2005)***
  - ✓ ***Integrate within AWIPS the functionality of all hydrologic applications required to support Weather Forecast Offfice and River Forecast Center operations (2005).***

Objective: Implement advanced hydrometeorological procedures providing more accurate forecasts of river levels and river flow volumes from hours to days to several months in advance of the event. Produce forecasts with new information on the magnitude and likelihood of occurrence for river levels and flow volumes.

Approach: The approach to meeting the flood forecasting and water management objective is to develop and implement a lengthened hydrologic forecast for specific locations to meet customer needs. Essential elements to meet the objective include: work with partners – Cooperators will provide supplemental resources, i.e., data, technical support, and the identification of service needs; Improve science models - Implement advanced hydrometeorological rainfall-runoff and river models; and, provide verification of model improvements; Couple weather, water, and climate forecasts - Use NWS Quantitative Precipitation Forecasts (QPF), Quantitative Temperature Forecasts (QTF), and climate forecasts; water quantity data provided by NWS partners; and advanced NWS hydrometeorological models to provide more accurate flash-flood and river forecasts; Provide forecasts in probabilistic terms – Supplement deterministic forecasts with probabilistic forecasts; Graphical formats - Supplement text formatted forecast products with visual products.

These include the use of graphs, charts and maps to display the forecasts; extend time-range of products - provide hydrometeorological products and services for periods ranging from hours to days to months; recruit and retain qualified Hydrologists; train NWS Forecasters and Hydrologists on hydrologic forecasting capabilities; increase outreach in order to establish requirements for new products and services to meet the changing needs of our customers; interact with federal and state partners to identify the most efficient means to meet needs of our common customers; directly communicate with associations of users at national, state, and local forums to get validation of new

products and services; and coordinate new product formats and transmission schedules with the media.

Milestones/Initiatives:

FY 2001

Expand AHPS implementation (i.e., model calibration) for selected basins covered by the North Central River Forecast Center (NCRFC) and the Ohio River Forecast Center (OHRFC)

- Begin development of baseline verification for AHPS products
- Enhance RFC AHPS computer operations
- Begin development of site-specific model for use in WHFS
- Tailor CPC climate outlooks to meet ESP long-term river forecasts needs.
- Establish product requirement for short-term and long-term forecasts for each river forecast point in each HSA.
- Begin to develop capability to blend short/intermediate/long term meteorological forecast information as input to ESP (e.g. short term (1-3 days) and intermediate (4-14 days) PQPF blended into CPC forecast)
- Develop capability to issue short-term (1 to 3 days) probabilistic river forecasts using NCEP HPC QPF/QTF input
- Define user thresholds in assessing flood risk based on probabilistic river forecasts to improve product visualization.
- Develop and implement area-wide graphical HMD/Flood Potential Outlook at RFC

FY 2002

- Begin delivery of a hydrologic outlook product targeted to the specific service location
- Continue AHPS implementation, including calibration, within the Ohio and North Central
- RFCs and expand implementation for selected basins covered by the Southeast River
- Forecast Center (SERFC), Middle Atlantic River Forecast Center (MARFC), Missouri
- Basin River Forecast Center (MBRFC), Northwest River Forecast Center (NWRFC), and Colorado Basin River Forecast Center (CBRFC)
- Assess both the locations where inundation mapping is desirable and the availability of appropriate digital elevation data at those locations.
- Continue to develop capability to blend short/intermediate/long term meteorological forecast information as input to ESP (e.g. short term (1-3 days) and intermediate (4-14 days) PQPF blended into CPC forecast)
- Continue to develop capability to blend short/intermediate/long term meteorological forecast information as input to ESP (e.g. short term (1-3 days) and intermediate (4-14 days) PQPF blended into CPC forecast)
- Complete development of site-specific model for use in WHFS
- Continue to review requirements and modify design of SEUS and Snow update system by NOHRSC
- Automate in AWIPS a near real time verification program for river forecasts and flood warnings and begin baseline verification for 10% of proposed AHPS locations per RFC area
- Develop distributed runoff models for flash flood and river forecasts
- Continue to develop capability to issue short-term (1 to 3 days) probabilistic river forecasts

using NCEP HPC QPF/QTF input.
- Establish a Hydrology Intern program at the RFCs.
- Present river forecasts in graphical format on WWW making use of point and click capability for viewing latest stage and forecast hydrographs

FY 2003
- Continue AHPS implementation, including calibration, within OHRFC, NCRFC, MBRFC, MARFC, NWRFC, SERFC, and CBRFC and expand implementation for selected basins covered by the Arkansas-Red Basin River Forecast Center (ABRFC), California-Nevada River Forecast Center (CNRFC), Northeast River Forecast Center (NERFC), and West Gulf River Forecast Center (WGRFC)
- Begin to make inundation maps available to all locations where partners provide topographic data.
- Complete development of SEUS and Snow update system by NOHRSC
- Increase use of GIS in development of hydrologic tools and distributed models.
- Incorporate distributed runoff models for flash flood and river forecasts.
- Develop techniques to increase accuracy of QPE using satellite estimation techniques and integrate into RFCWide application
- Continue to develop capability to blend short/intermediate/long term meteorological forecast information as input to ESP (e.g. short term (1-3 days) and intermediate (4-14 days) PQPF blended into CPC forecast) -requires development of techniques to allow for hydrometeorological coupling.
- Continue to develop capability to issue short-term (1 to 3 days) probabilistic river forecasts using NCEP HPC QPF/QTF input (requires development of techniques to allow for hydrometeorological coupling.)
- Begin GIS flood forecast mapping for additional number of forecast points each year in accordance with planned implementation (For example, by 3 additional points each year)
- Expand the number and type of hydro products in graphical format on WWW

FY 2004
- Continue AHPS implementation, including calibration, within OHRFC, NCRFC, MBRFC, ABRFC, NWRFC, CNRFC, CBRFC, MARFC, NERFC, SERFC, and WGRFC
- Continue implementation of distributed runoff models for flash flood and river forecasts.
- Continue to develop capability to blend short/intermediate/long term meteorological forecast information as input to ESP (e.g. short term (1-3 days) and intermediate (4-14 days) PQPF blended into CPC forecast) -requires development of techniques to allow for hydrometeorological coupling.
- Continue to increase accuracy of QPE using satellite estimation techniques and integrate into RFCWide application
- Continue to develop capability to issue short-term (1 to 3 days) probabilistic river forecasts using NCEP HPC QPF/QTF input (requires development of techniques to allow for hydrometeorological coupling.)
- Develop capability to issue intermediate term (3 days to 2 weeks) probabilistic river forecasts using meteorological forecast model input i.e. Global ensemble method (requires development of techniques to allow for hydrometeorological coupling.)
- Continue GIS flood forecast mapping for additional number of forecast points each year in

accordance with planned implementation (For example, by 3 additional points each year)

- Continue the Hydrology Intern program at the RFCs.
- Continue to expand the number and type of hydro products in graphical format on WWW
- Continue to make inundation maps available to all locations where partners provide topographic data.

FY 2005

- Continue AHPS implementation, including calibration, within OHRFC, NCRFC, MBRFC, ABRFC, NWRFC, CNRFC, CBRFC, MARFC, NERFC, SERFC, and WGRFC
- Deliver GIS flood forecast mapping capability to users in conjunction with joint mapping strategy.
- Complete testing and implementation of distributed runoff models for flash flood and river forecasts
- Begin development of tools which combine the use of existing information on dams, current conditions (i.e., reservoir heights, river levels below dam, etc.), and high resolution GIS maps and techniques for preparing warnings and guidance on actual and potential dam failures.
- Continue to increase accuracy of QPE using satellite estimation techniques and integrate into RFCWide application
- Continue to make inundation maps available to all locations where partners provide topographic data.
- Complete capability to blend short/intermediate/long term meteorological forecast information as input to ESP (e.g. short term (1-3 days) and intermediate (4-14 days) PQPF blended into CPC forecast) -requires development of techniques to allow for hydrometeorological coupling.
- Complete capability to issue short-term (1 to 3 days) probabilistic river forecasts using NCEP HPC QPF/QTF input (requires development of techniques to allow for hydrometeorological coupling.)
- Complete capability to issue intermediate term (3 days to 2 weeks) probabilistic river forecasts using meteorological forecast model input i.e. Global ensemble method (requires development of techniques to allow for hydrometeorological coupling.)
- Continue the Hydrology Intern program at the RFCs.
- Continue to expand the number and type of hydro products in graphical format on WWW.

7.0 Fire Weather Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Fire Services

- ***Implement a seamless suite of fire-weather products and services uniformly across the Nation.***
  - ✔ ***Implement Day 1 to seasonal outlook products for critical fire-weather elements and patterns (2002).***
  - ✔ ***Specify the forecast confidence on all national outlook and local forecast products (2005).***
  - ✔ ***Develop baseline for fire-weather parameters and improve accuracy by 30 percent (2005).***

Approach: The fire weather program will expand from a regional part time program anchored in the western states to year round fully integrated operations in all forecast offices. The objective will be achieved in two steps. During 2000-2001, all offices will implement daily routine fire weather forecast products in their warning areas and deliver site specific forecasts upon user request. Critical to the standardization of these products will be the capabilities of Advanced Weather Interactive Processing System (AWIPS) Interactive Forecast Preparation System (IFPS) to initialize fire weather templates. Annual operating plans will be put in place to ensure users needs are addressed. Implementation of routine verification of fire weather forecasts and a customer satisfaction and feedback process will provide a baseline for future improvements in accuracy and timeliness. National Centers for Environmental Prediction (NCEP) guidance products for 1-2 days will be implemented and new products for days 3 and beyond will be developed. During the second phase, 2002-2005, additional training, model improvements and better resolution, expanded NCEP guidance and ensemble/probabilistic approaches in cooperation with and input from interagency research efforts will provide forecaster confidence levels that are critical to user assessment of potential risks and lead to improvements to baseline established in 2001 of 30 percent or greater by 2005.

<u>Milestones/Initiatives</u>:

FY 2001

- Continue to develop national fire weather verification program. Begin to implement and develop baseline for fire weather product/services accuracy, timeliness, and usability with user feedback process.
- Establish cooperative research efforts with interagency fire science program.
- Develop requirements for seasonal fire weather guidance products.

- Develop coordination/briefing mechanism for dispatch and geographical area needs as well as for critical fire situations.

FY 2002

- Implement standardized routine fire weather product formats including forecast trends of key fire weather parameters.
- Integrate (Remote Automated Weather Station) RAWS, Fire RAWS, and other portable observation systems into AWIPS mapping and other Geographic Information System (GIS) applications.
- Implement external coordination/briefing system.
- Develop tech transfer working group to move fire research applications into operations.
- Establish partner/Local Data Acquisition and Dissemination (LDAD) link to expand user interactivity with NWS database/products.
- Plan for Advanced Technology Meteorological Unit (ATMU) upgrade for on site all hazards support. Develop series of advanced fire behavior, complex terrain meteorology workshops as part of training PDS.
- Develop WSR-88D fire weather applications.
- Develop national (NOAAPORT) dissemination to IMET ATMU laptop unit
- Develop Climate Prediction Center (CPC) seasonal fire weather guidance.
- Implement GOES hot spot/smoke imagery
- Sponsor Fire Weather Symposium at American Meteorological Society (AMS) to evaluate fire weather advances and set future direction.
- All hazards response added to Fire Weather Forecasters Course.

FY 2003

- Field next generation ATMU for all hazards IMET response.
- Develop and begin implementation of enhanced and customizable graphical products for fire weather via AWIPS and Internet.
- Extend daily routine forecasts out to seven days with outlooks to two weeks.
- Implement daily NCEP fire weather guidance out to two weeks and seasonal fire weather outlooks
- Expand verification data base to include all routine as well as requested fire weather products. Develop training materials/workshop to address program weaknesses as noted in verification statistics.
- Hold workshop to define requirements and establish method to quantify confidence on fire weather products.

FY 2004

- Begin experimental use of confidence factor in fire weather forecasts.
- Establish interagency oversight team to monitor and evaluate use of confidence.
- Integrate 24 hour fire danger rating sensors into NWS data base.
- Design new ways for users to access and process fire weather database via LDAD/Internet
- Implement confidence measures on all fire weather guidance and forecast products.
- Implement new generation of graphical and interactive fire weather products based on user feedback and changing needs.
- Implement high resolution (1km) coupled fire model to address site-specific forecasts and

terrain issues.

- Implement next generation fire danger rating based on hourly observations and high resolution models.

8.0 Space Weather

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Space Services

- ***Integrate standard space weather forecasts into the NWS operational product suite.***

  ✓ The total integration of space weather products was planned previously based on FY 2002 initiative to cover the costs of conversion and integration. Without additional funding, integration of selected, standard text products will continue on a case-by case basis as products are updated over the next 5 years.

Objective: The NWS Strategic Plan has an objective to "Integrate space weather forecasts into the NWS operational product suite." With NWS capabilities, NOAA can improve the accuracy and timeliness of its space weather warnings, improve the accessibility and availability of space weather information, and make space weather data an everyday part of the nation's beneficial use of environmental information. Space weather products will be seamlessly integrated with tropospheric weather and climate information. NWS programs to extend the accuracy and lead time of forecasts, the enhancement of partnerships with emergency management officials, the development of critical partnerships to deliver space weather information, capitalizing on scientific and technological advances, customer service improvement programs, and additional organizational goals of NWS can be applied directly to NOAA space weather services as they continue to evolve from those currently produced.

Approach: The milestones and activities for this objective emphasize making space weather services fully operational and integrating them into the equivalent functions in the National Weather Service. The approach builds on the current capability of the Space Environment Center in the NOAA Office of Oceanic and Atmospheric Research (OAR); this capability is now sufficiently mature to move into and be funded in NWS' operational environment, offsetting OAR's costs so SEC can continue to develop improved space weather physical understanding and models through research and development. This plan envisions continuing close linkage between the NWS and OAR-supported activities, allowing for shared and cooperative use of satellite tracking facilities, data ingest and storage capability. A single, linked entity facilitates transition of research results into operations, relying on the daily use of the complementary expertise of space weather researchers and forecasters; this capability is preserved in our plan.

This is a feasible approach, since the current NOAA space weather capability depends upon an infrastructure that encompasses functions similar to those provided to other NCEPs, and supported by OAR, NWS, NCEP, and NESDIS. An example of this synergistic relationship is

that the researchers and forecasters in OAR/SEC work together to develop requirements for new space weather sensors, and continue in working groups through procurement, to develop plans and concepts of operation together, and finally consult together when the products are prepared in daily operations. The transition plan to carry out the objective of the NWS Strategic Plan envisions continuing this close end-to-end relationship through the entire technology transition, providing for the improved services that can be gained by making use of National Weather Service communications channels and providing a more seamless suite of environmental products.

The plan provides for parallel efforts in each of the functional areas. It envisions a step-by-step process in each area to move from SEC's distinct and unique operations now toward a uniform process with NWS products and services. In some cases the changes can be accomplished by revision, redefinition, or reformatting of SEC products. In other cases the processes require the development of additional computer system capabilities, the connection of SEC into the NWS infrastructure, and the development of training materials about the invisible but destructive nature of space weather storms. There is no funding in FY00 or FY01 to begin implementation of this part of the NWS Strategic Plan. With no funding planned in the FY 2002 and following years, these objectives remain valid but specific plans will be postponed pending future resolution of funding issues. Even without formal actions on these tasks, space weather service providers will strive to achieve the overall strategic goals of the National Weather Service, most of which apply to space weather services as much as to meteorological weather services.

Milestones/Initiatives:

FY 2002

- Complete alignment of SEC space weather operations staff to be consistent with NWS guidelines.
- Complete alignment of SEC systems operations staff to be consistent with NWS guidelines.
- COMET begins developing a training class for WCM and/or SOO on space weather science and applications
- Existing (text-based) space weather alerts, warnings, and forecasts are integrated into satellite broadcast, NOAAPORT, WMO, and ICAO.
- Develop and implement ability to transmit first level (text) space weather products through AWIPS into NWS networks by mid-FY02
- Complete study comparing costs and benefits of modifying AWIPS/N-AWIPS to handle space weather forecasting, including test and graphical products compared to cost and benefits of developing a new space weather analysis and display system consistent with AWIPS
- SEC completes and uses new data link to NCEP/NESDIS.
- Establish Procedures for space weather model operation on NCEP system
- Complete plan and procedures to incorporate improved space weather services and customer requirements and understanding of space weather impacts in WFO systems and for customers.

FY 2003

- Maintain alignment of SEC space weather operations staff consistent with NWS guidelines. Though dependent on sufficient funding, it is anticipated that this task would be done under both Options 1 and 2 described above.
- Maintain alignment of SEC systems operations staff consistent with NWS guidelines. This task and the extent of its completion is subject to funding consistent with only Option One above.
- COMET completes development of a training class for WCM and/or SOO on space weather science and applications
- NWS will provide classroom training on space weather science, forecasting, and application for all WCM/SOO
- Upgrade space weather alerts, warnings, and forecasts including first phase of space weather graphical products into NWS networks.
- Develop a plan for increasing AWIPS compatibility in space weather operations. (Task 4)
- Begin a phased implementation over FY03-FY06 to provide the additional capability to meet NWS requirements using recommendations of cost/benefit study.
- Provide recurrent communication cost for appropriate data link between Boulder and NCEP.
- Complete annual review and update of process and procedures to incorporate improved space weather services and customer requirements and understanding of space weather impacts in WFO systems and for customers.

FY 2004

- Maintain alignment of SEC space weather operations staff consistent with NWS guidelines.
- Maintain alignment of SEC systems operations staff consistent with NWS guidelines.
- COMET develops and put on line ongoing web-based space weather training class for WCM/SOO, WFO forecasters, and SEC forecaster staff.
- Complete upgrade of products incorporating graphical space weather products into NWS system.
- Continue a phased implementation over FY03-FY06 to provide the additional capability to meet NWS requirements using recommendations of cost/benefit study.
- Recurrent communication cost for appropriate data link between Boulder and NCEP.
- Complete annual review and update of process and procedures to incorporate improved space weather services and customer requirements and understanding of space weather impacts in WFO systems and for customers.
- Include space weather hazard training in the NOAA/Federal Emergency Management Agency core hazard course.

FY 2005

- Maintain alignment of SEC space weather operations staff consistent with NWS guidelines.
- Maintain alignment of SEC systems operations staff consistent with NWS guidelines.
- NWS will provide two annual update classes on space weather for WCM
- Complete an annual evaluation and upgrade of space weather alerts, warnings, specification, and forecasts.
- Complete annual update of codes, headers, and file standards to remain compliant with

standards while developing new products. (Task 3; $230K for this and previous bullet)

- Begin a phased implementation over FY03-FY06 to provide the additional capability to meet NWS requirements using recommendations of cost/benefit study.
- Provide recurrent communication cost for appropriate data link between Boulder and NCEP.
- Establish space weather as part of storm ready program

9.0 Tsunami Program

Strategic Plan Context:

3.0 Exercise Global Leadership

3.4 ***Continue U.S. leadership of the International Tsunami and Volcanic Ash Programs***

- ✔ ***Expand U.S. Tsunami Program to the Caribbean area (2005).***
- ✔ ***Continue active U.S. support to the International Tsunami Warning Program.***
- ✔ ***Improve the timeliness, accuracy, reliability, coverage, and effectiveness of tsunami warnings.***

Objective: The objective of improving the Tsunami Program is to enhance the program's capability to reduce loss of life, injury, and property damage caused by the tsunami hazard.

Approach: Since NOAA's tsunami warning responsibilities include the U.S. and other nations, partnerships with two organizational structures need to be maintained to successfully implement this plan. Partnership with the NOAA-led National Tsunami Hazard Mitigation Plan (NTHMP) is essential to satisfy U.S. customer needs, while partnership with the United Nation's Tsunami Coordination Group for the Tsunami Warning System in the Pacific (ITSU) is essential to satisfy international customer needs. Through NWS base funding and NTHMP annual Congressional funding the following activities to improve the speed, accuracy, reliability and effectiveness of tsunami warnings will be implemented: better data and methods for rapid seismic and water level analysis, improved tsunami forecasting based on the real-time fusion of data, numerical models, and historical or prehistoric tsunami data, alternate communication links to data sources, alternate communication links between the two warning centers, improved backup procedures between the two NWS warning centers, enhanced product content, and development of graphical products for dissemination on the web and via the Emergency Managers Weather Information Network (EMWIN). These changes are driven by customer feedback through the NTHMP and ITSU. Warning coverage will be expanded in the Pacific by extending the reach of EMWIN through the Pan-Pacific Education and Communication Experiments by Satellite (PEACESAT), and in the Caribbean through development of a new program.

Benefits: Although destructive tsunamis are rare, only affecting coastlines outside the U.S. a few times each decade and U.S. coastlines a few times each century, the increasing development of shorelines for working, living, and recreation means that there are continually more persons and assets at risk from this natural hazard. The two U.S. tsunami warning centers, the Pacific Tsunami Warning Center (PTWC) and the West Coast / Alaska Tsunami Warning Center (WC/ATWC), provide warnings to the U.S. for Pacific Ocean tsunamis generated outside the U.S. and for local tsunamis generated along the U.S. Pacific coasts. They are situated to work most closely with emergency management organizations and the public in the two states most likely to be affected by destructive tsunamis, Hawaii and Alaska. They also work closely with the

emergency management organizations of Oregon, Washington, and California, and of the other U.S. assets in the Pacific including Guam and American Samoa. In addition, as the operational center for the Tsunami Warning System in the Pacific, and under the guidance of the ITSU, PTWC provides tsunami warnings to countries throughout the entire Pacific Basin. This international function has significant benefit to the U.S. since it facilitates the rapid international exchange of key seismic and sea level data needed to evaluate a tsunami as it crosses the Pacific. It also facilitates U.S. leadership and participation in international programs of tsunami education, tsunami science, and other tsunami mitigation activities. There is a real but lesser risk for tsunamis in the Caribbean region, and a warning system for that area is planned for implementation in 2005.

Efforts in the roadmap to improve speed are to provide warnings that will be effective along coastlines located as close to the tsunami source as possible, and also to give emergency management organizations as much time as possible to carry out organized evacuations. The speed of warning bulletins depends upon the speed of all the associated warning system components - data collection and analysis, decision-making, and message dissemination. Consequently, speed improvements in all those areas are beneficial.

Efforts in the roadmap to improve accuracy are in order to maximize the areas warned for destructive tsunamis, to reduce the number of areas warned unnecessarily, and to build and maintain confidence in the tsunami warning system so that warnings will continue to be effective. Recent advances in instrumentation for tsunami wave observations and in methods of tsunami analysis may also lead to the warning centers' ability to provide some forecast of tsunami heights. Such forecasts will enable emergency managers to design evacuations and other steps as appropriate for each warning situation and thus minimize the disruption to unaffected areas.

Efforts in the roadmap to improve reliability are to ensure that data analysis and warning capabilities are fully maintained on a 7-by-24 basis, since a tsunami may occur at any time and warnings must be issued very quickly, sometimes within minutes. Within each center, this involves the constant effort to identify and eliminate single points of failure, and to establish procedures to recognize and correct critical problems in a timely manner. In addition, modern high speed communications and data exchange methods now make it possible for each of the two centers to provide a more comprehensive backup capability for the other. On a limited scale this could be needed if, for instance, a key communications link was down at one center. In the more extreme case it would be needed if either center ever became completely disabled by an earthquake or a hurricane.

Efforts in the roadmap to improve effectiveness are to help ensure that warnings issued lead to the appropriate actions that save lives and reduce property damage. Effectiveness is improved through feedback from the NTHMP and ITSU and via direct feedback from emergency managers. Bulletins should be received in a timely manner, contain the key information needed to make decisions, and be clearly understood. New methods of dissemination such as EMWIN will provide a way for tsunami bulletins to rapidly reach more emergency management offices and also to include useful graphical information such as a tsunami travel time map.

The National Tsunami Hazard Mitigation Program is a cooperative program involving several government agencies as well as other partners and that encompasses all aspects of tsunami mitigation including hazard assessment, warning, education, and response. The activities of this program have a direct benefit to the warning centers through the establishment of new and better

data sources, and through other activities such as education for the public and emergency managers and the creation of accurate tsunami hazard maps that help to make warnings more effective.

Milestones/Initiatives:

FY 2002

US

- Continue PTWC and WC/ATWC activities as the tsunami warning centers for U.S. coasts and other U.S. interests in the Pacific basin. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Continue activities of the NTHMP: deployment and maintenance of DART tsunami gauge systems, installation and maintenance of real time, broadband seismometers in Alaska, California, Hawaii, Oregon, and Washington, maintenance of the Tsunami Inundation Mapping Efforts Center, and continuation of tsunami mitigation activities in the states of Alaska, California, Hawaii, Oregon, and Washington (funding required). (NOAA, USGS, FEMA, AK, CA, HI, OR, WA)
- Begin construction of a new WC/ATWC operations facility. (NWS/AR, WC/ATWC)
- Transfer/Develop/Implement computer codes for more advanced seismic analysis techniques applicable to the assessment of the earthquake as a tsunami source. (PTWC, WC/ATWC)
- Establish dedicated VSAT voice and data communication between PTWC and WC/ATWC. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Implement strategies for ensuring the timeliest and most accurate possible regional and Pacific-wide evaluation of a tsunami by maintaining, upgrading, and adding water level instrumentation, and by maintaining or creating partnerships. (PTWC, WC/ATWC)

International

- Continue PTWC activities as the operational center for the Tsunami Warning System in the Pacific. (NWS/PR, PTWC)
- Operate the International Tsunami Information Center in support of ITSU. (NWS/PR, ITIC)
- Work with the OAS and interested parties to improve the runup database for the HTDB/Caribbean. (NWS/PR)
- Within the OAS and ITSU framework define the structure of a tsunami warning system to meet the needs of the Caribbean area. (NWS/PR)
- Implement improved warning criteria as approved by ITSU. (PTWC)
- Implement improved bulletin language as approved by ITSU. (PTWC)
- Begin establishment of VSAT communication links with key seismic stations in the western and central Pacific. (NWS/PR, PTWC)
- Participate in the ITSU-XVIII Meeting. (NWS/PR, ITIC, PTWC)
- Implementation of Spanish-language version of international bulletins as approved by ITSU. (PTWC)

FY 2003

US

- Continue PTWC and WC/ATWC activities as the tsunami warning centers for U.S. coasts and other U.S. interests in the Pacific basin. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Continue activities of the NTHMP: deployment and maintenance of DART tsunami gauge systems, installation and maintenance of real time, broadband seismometers in Alaska, California, Hawaii, Oregon, and Washington, maintenance of the Tsunami Inundation Mapping Efforts Center, and continuation of tsunami mitigation activities in the states of Alaska, California, Hawaii, Oregon, and Washington (funding required). (NOAA, USGS, FEMA, AK, CA, HI, OR, WA)
- Complete construction of the new WC/ATWC operations facility. (NWS/AR, WC/ATWC)
- Implement strategies for ensuring the timeliest and most accurate possible regional and Pacific-wide evaluation of a tsunami by maintaining, upgrading, and adding water level instrumentation, and by maintaining or creating partnerships. (PTWC, WC/ATWC)
- Continue to enhance backup capabilities between PTWC and WC/ATWC. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Expand the capability of the GOES and GMS downlinks at PTWC for more rapid and direct access to Pacific-wide sea level data. (NWS/PR, PTWC)
- Develop automated techniques based on synthetic tsunami data to improve the accuracy of tele- and regional tsunami forecasts. (PTWC, WC/ATWC)

International

- Continue PTWC activities as the operational center for the Tsunami Warning System in the Pacific. (NWS/PR, PTWC)
- Operate the International Tsunami Information Center in support of ITSU. (NWS/PR, ITIC)
- Work with the OAS and interested parties to improve the runup database for the HTDB/Caribbean. (NWS/PR)
- Within the OAS and ITSU framework define the structure of a tsunami warning system to meet the needs of the Caribbean area. (NWS/PR)
- Continue establishment of VSAT communication links with key seismic stations in the western and central Pacific. (NWS/PR, PTWC)

FY 2004

US

- Continue PTWC and WC/ATWC activities as the tsunami warning centers for U.S. coasts and other U.S. interests in the Pacific basin. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Continue activities of the NTHMP: deployment and maintenance of DART tsunami gauge systems, installation and maintenance of real time, broadband seismometers in Alaska, California, Hawaii, Oregon, and Washington, maintenance of the Tsunami Inundation Mapping Efforts Center, and continuation of tsunami mitigation activities in the states of Alaska, California, Hawaii, Oregon, and Washington (funding required). (NOAA, USGS, FEMA, AK, CA, HI, OR, WA)
- Implement strategies for ensuring the timeliest and most accurate possible regional and

Pacific-wide evaluation of a tsunami by maintaining, upgrading, and adding water level instrumentation, and by maintaining or creating partnerships. (PTWC, WC/ATWC)
- Implement automated techniques based on synthetic tsunami data produced to improve accuracy of tsunami forecasts. (PTWC, WC/ATWC)
- Investigate the possibility of including tsunami height forecasts in warning bulletins. (PTWC, WC/ATWC)

International
- Continue PTWC activities as the operational center for the Tsunami Warning System in the Pacific. (NWS/PR, PTWC)
- Operate the International Tsunami Information Center in support of ITSU. (NWS/PR, ITIC)
- Implement the defined Tsunami Warning System for the Caribbean. (NWS/PR)
- Continue establishment of VSAT communication links with key seismic stations in the western and central Pacific. (NWS/PR, PTWC)
- Participate in the ITSU-XIX Meeting. (NWS/PR, PTWC, ITIC)

FY 2005

US
- Continue PTWC and WC/ATWC activities as the tsunami warning centers for U.S. coasts and other U.S. interests in the Pacific basin. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Continue activities of the NTHMP: deployment and maintenance of DART tsunami gauge systems, installation and maintenance of real time, broadband seismometers in Alaska, California, Hawaii, Oregon, and Washington, maintenance of the Tsunami Inundation Mapping Efforts Center, and continuation of tsunami mitigation activities in the states of Alaska, California, Hawaii, Oregon, and Washington (funding required). (NOAA, USGS, FEMA, AK, CA, HI, OR, WA)
- Implement strategies for ensuring the timeliest and most accurate possible regional and Pacific-wide evaluation of a tsunami by maintaining, upgrading, and adding water level instrumentation, and by maintaining or creating partnerships. (PTWC, WC/ATWC)
- Contingent upon the results of previous investigations, implement the inclusion of tsunami height forecasts in domestic warning bulletins. (PTWC, WC/ATWC)

International
- Continue PTWC activities as the operational center for the Tsunami Warning System in the Pacific. (NWS/PR, PTWC)
- Operate the International Tsunami Information Center in support of ITSU. (NWS/PR, ITIC)
- Implement the defined Tsunami Warning System for the Caribbean. (NWS/PR)
- Complete establishment of VSAT communication links with key seismic stations in the western and central Pacific. (NWS/PR, PTWC)
- Based on the results of previous investigations, and following approval at ITSU-XX, implement the inclusion of tsunami height forecasts in international warning bulletins. (PTWC)

FY 2006

US

- Continue PTWC and WC/ATWC activities as the tsunami warning centers for U.S. coasts and other U.S. interests in the Pacific basin. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Continue activities of the NTHMP: deployment and maintenance of DART tsunami gauge systems, installation and maintenance of real time, broadband seismometers in Alaska, California, Hawaii, Oregon, and Washington, maintenance of the Tsunami Inundation Mapping Efforts Center, and continuation of tsunami mitigation activities in the states of Alaska, California, Hawaii, Oregon, and Washington (funding required). (NOAA, USGS, FEMA, AK, CA, HI, OR, WA)
- Implement strategies for ensuring the timeliest and most accurate possible regional and Pacific-wide evaluation of a tsunami by maintaining, upgrading, and adding water level instrumentation, and by maintaining or creating partnerships. (PTWC, WC/ATWC)

International

- Continue PTWC activities as the operational center for the Tsunami Warning System in the Pacific. (NWS/PR, PTWC)
- Operate the International Tsunami Information Center in support of ITSU. (NWS/PR, ITIC)
- Participate in the ITSU-XX Meeting. (NWS/PR, PTWC, ITIC)

FY 2007

US

- Continue PTWC and WC/ATWC activities as the tsunami warning centers for U.S. coasts and other U.S. interests in the Pacific basin. (NWS/PR, PTWC, NWS/AR, WC/ATWC)
- Continue activities of the NTHMP: deployment and maintenance of DART tsunami gauge systems, installation and maintenance of real time, broadband seismometers in Alaska, California, Hawaii, Oregon, and Washington, maintenance of the Tsunami Inundation Mapping Efforts Center, and continuation of tsunami mitigation activities in the states of Alaska, California, Hawaii, Oregon, and Washington (funding required). (NOAA, USGS, FEMA, AK, CA, HI, OR, WA)
- Implement strategies for ensuring the timeliest and most accurate possible regional and Pacific-wide evaluation of a tsunami by maintaining, upgrading, and adding water level instrumentation, and by maintaining or creating partnerships. (PTWC, WC/ATWC)

International

- Continue PTWC activities as the operational center for the Tsunami Warning System in the Pacific. (NWS/PR, PTWC)
- Operate the International Tsunami Information Center in support of ITSU. (NWS/PR, ITIC)

10.0 Volcanic Ash

Strategic Plan Context:

3.0 Exercise Global Leadership

3.4 ***Continue U.S. leadership of the International Tsunami and Volcanic Ash Programs***

- ✓ ***Host one meeting a year of the Coordinators of the Volcanic Ash Advisory Centers.***
- ✓ ***Continue U.S. efforts to standardize global response to volcanic activity.***

Objective: In collaboration with other NOAA line organizations, position the NWS as a global leader in providing standardized volcanic ash services using advanced science, tools and communications to increase awareness, understanding and response. This will enable NWS to meet the functional requirements of customers by mitigating the effects of volcanic ash.

Approach:
This can be accomplished by: meeting requirements of customers and forecasters; optimizing use of existing data; facilitate globally uniform volcanic ash operations and services; training commercial aviators and air traffic controllers for volcanic ash avoidance; expanding the NWS volcanic ash program to address public and marine customer needs; and continuing efforts to improve the detection and tracking of airborne volcanic ash

Benefits: To address the threat of volcanic ash, the agency needs to make the best use of available information, increase our ability to detect, analyze and warn for ash, provide more advanced computer modeling, increase the knowledge and awareness of those at risk, and respond to the needs of a broader segment of the population. The activities in this Roadmap will meet these needs.

Currently, significant areas of our Volcanic Ash Advisory Centers' areas of responsibility are devoid of satellite based initial eruption detection capability. Further, current algorithms are substantially flawed in their ability to detect volcanic ash. Our commercial customers have requested we provide warnings for ash with five minutes of detection. Considering that volcanic ash can rise from the volcano to flight level in one minute, and commercial airlines traverse 8 miles in one minute, quick detection and issuance of warnings is essential. Currently, warnings are issued generally within an hour of eruption, but some volcanic eruptions remain undetected for several hours in eastern Asia.

The research associated with volcanic ash transport and dispersion models, including increasing the precision of the model and relocating it to operational computer platforms at NWS Forecast Offices, will allow forecasters a tool to provide more timely and detailed forecasts and warnings. A new generation of satellite-based sensors will give volcanic ash forecasters more information

about the nature and extent of volcanic ash clouds, including their three-dimensional configuration, their physical properties (chemical composition, granularity of ejecta, explosive nature, viscosity), and their most likely dispersion pattern. With such tools, forecasters will be equipped to meet the needs of customers.

Our customers are placed at extreme risk in the event of a volcanic ash event. Annually, more than 3.5 million passengers and 11 million pounds of cargo traverse the North Pacific air routes alone. This region is peppered by over 100 active volcanoes, and averages 13 days per year with volcanic ash at commercial flight level. Forecasters must warn for volcanic ash risk to allow air carriers safe passage around airborne ash, but must do so without causing unnecessary expense of time and fuel. This means warning specifically and accurately. Since total avoidance is the only option in volcanic ash aviation safety, those forecasts must be reliable. The result of an encounter with volcanic ash likely will result in jet turbine flame out and extreme hazard to passengers and crew. The 1989 KLM-aircraft encounter with ash from Mt. Redoubt caused $80M damage to a new Boeing 747-400. Had the aircraft actually crashed instead of narrowly escaping, more than 300 passengers and crew would have perished. Given the cost of a single fatal volcanic ash encounter with a commercial airliner (estimated by industry officials at $1.2B, including loss of the aircraft, crew and payout of numerous lawsuits), avoiding the chance of such an encounter is the only option. Even in non-fatal ash encounters, damage to aircraft may be several tens of millions of dollars.

This agency is charged with meeting the increasing risk of volcanic ash by providing high quality model output, timely, accurate warnings, and increasing its customers' level of awareness and ability to respond effectively. This Roadmap provides the tools to meet these needs.

Milestones/Initiatives:

FY 2002

Meeting Operational Requirements of Customers & Forecasters

- Finalize Interagency Volcanic Ash Agreement
- Conduct tabletop exercise to test VAAC coordination, handoff and backup procedures
- Acquire World Area Forecast System (WAFS) downlink in Alaska
- Acquire needed technology to receive digital GMS/MTSAT data in Alaska in support of International Airways Volcano Watch responsibility for Eastern Russia

Optimizing Use of Existing Data

- Support optimizing use of existing volcanic ash detection tools
- Implement graphical VAA

Facilitate Globally Uniform Volcanic Ash Operations and Services

- Host, in conjunction with Federal Aviation Administration, International VAAC Workshop
- Perform volcanic ash communications test for VAACs, MWOs, and customers

Training Commercial Aviators and Air Traffic Controllers for Volcanic Ash Avoidance

- Implement routine Volcanic Ash avoidance training for aviators, air traffic controllers and meteorological watch office staff

Expanding the NWS Volcanic Ash Program to Address Public and Marine Customer Needs
- Initiate establishment of International Volcanic Ash Hazards Mitigation program
- Draft coordinated National Volcanic Ash Hazards Mitigation plan
- Begin efforts to measure the economic impact of volcanic ash

Continuing Efforts to Improve the Detection and Tracking of Airborne Volcanic Ash
- Refine ability to detect, measure, track and forecast volcanic ash
- Assess the optimum design for volcanic ash remote sensing tools

FY 2003

Meeting Operational Requirements of Customers & Forecasters
- Conduct tabletop exercise to test VAAC coordination, handoff and backup procedures
- Update National Operations Plan for Volcanic Ash
- Update Backup plan for VAACs covering North America/Pacific
- Connectivity charges required to receive WAFS, GMS data

Optimizing Use of Existing Data
- Support optimizing use of existing volcanic ash detection tools

Facilitate Globally Uniform Volcanic Ash Operations and Services
- Host North American/Pacific VAAC Workshop
- Host North American/Pacific MWO Workshop
- Perform volcanic ash communications test for VAACs, MWOs, and customers

Training Commercial Aviators and Air Traffic Controllers for Volcanic Ash Avoidance
- Continue Volcanic Ash avoidance training for aviators, air traffic controllers and meteorological watch office staff

Expanding the NWS Volcanic Ash Program to Address Public and Marine Customer Needs
- Finalize establishment of International Volcanic Ash Hazards Mitigation program
- Finalize National Volcanic Ash Hazards Mitigation plan
- Draft coordinated International Volcanic Ash Hazards Mitigation plan
- Finalize efforts to measure the economic impact of volcanic ash

Continuing Efforts to Improve the Detection and Tracking of Airborne Volcanic Ash
- Refine ability to detect, measure, track and forecast volcanic ash
- Provide design input recommendations for advanced volcanic ash remote sensing tools
- Continue evaluation of new technology satellites to determine best use for volcanic ash detection, analysis and monitoring

FY 2004

Meeting Operational Requirements of Customers & Forecasters
- Conduct tabletop exercise to test VAAC coordination, handoff and backup procedures
- Connectivity charges required to receive WAFS, GMS data

Optimizing Use of Existing Data
- Support optimizing use of existing volcanic ash detection tools

Facilitate Globally Uniform Volcanic Ash Operations and Services
- Perform volcanic ash communications test for VAACs, MWOs, and customers

Training Commercial Aviators and Air Traffic Controllers for Volcanic Ash Avoidance
- Continue volcanic ash avoidance training for aviators, air traffic controllers, and meteorological watch office staff

Expanding the NWS Volcanic Ash Program to Address Public and Marine Customer Needs
- Finalize coordinated International Volcanic Ash Hazards Mitigation plan
- Integrate National Volcanic Ash Hazard Mitigation Plan objectives, as applicable, into NWS operational guidelines

Continuing Efforts to Improve the Detection and Tracking of Airborne Volcanic Ash
- Refine ability to detect, measure, track and forecast volcanic ash
- Continue evaluation of new technology satellites to determine best use for volcanic ash detection, analysis and monitoring

FY 2005

Meeting Operational Requirements of Customers & Forecasters]
- Conduct tabletop exercise to test VAAC coordination, handoff and backup procedures
- Connectivity charges required to receive WAFS, GMS data

Optimizing Use of Existing Data
- Support optimizing use of existing volcanic ash detection tools

Facilitate Globally Uniform Volcanic Ash Operations and Services
- Perform volcanic ash communications test for VAACs, MWOs, and customers
- Host North American/Pacific VAAC Workshop
- Host North American/Pacific MWO Workshop

Training Commercial Aviators and Air Traffic Controllers for Volcanic Ash Avoidance
- Continue volcanic ash avoidance training for aviators, air traffic controllers, and meteorological watch office staff

Expanding the NWS Volcanic Ash Program to Address Public and Marine Customer Needs

Integrate National Volcanic Ash Hazard Mitigation Plan objectives, as applicable, into NWS operational guidelines

Continuing Efforts to Improve the Detection and Tracking of Airborne Volcanic Ash
- Refine ability to detect, measure, track and forecast volcanic ash
- Continue evaluation of new technology satellites to determine best use for volcanic ash detection, analysis and monitoring

FY 2006

Meeting Operational Requirements of Customers & Forecasters
- Conduct tabletop exercise to test VAAC coordination, handoff and backup procedures
- Connectivity charges required to receive WAFS, GMS data

Optimizing Use of Existing Data
- Support optimizing use of existing volcanic ash detection tools

Facilitate Globally Uniform Volcanic Ash Operations and Services
- Perform volcanic ash communications test for VAACs, MWOs, and customers

Training Commercial Aviators and Air Traffic Controllers for Volcanic Ash Avoidance
- Continue volcanic ash avoidance training for aviators, air traffic controllers, and meteorological watch office staff

Expanding the NWS Volcanic Ash Program to Address Public and Marine Customer Needs
- Finalize coordinated International Volcanic Ash Hazards Mitigation plan
- Integrate National Volcanic Ash Hazard Mitigation Plan objectives, as applicable, into NWS operational guidelines

Continuing Efforts to Improve the Detection and Tracking of Airborne Volcanic Ash
- Refine ability to detect, measure, track and forecast volcanic ash
- Continue evaluation of new technology satellites to determine best use for volcanic ash detection, analysis and monitoring

FY 2007

Meeting Operational Requirements of Customers & Forecasters
- Conduct tabletop exercise to test VAAC coordination, handoff and backup procedures
- Connectivity charges required to receive WAFS, GMS data

Optimizing Use of Existing Data
- Support optimizing use of existing volcanic ash detection tools

Facilitate Globally Uniform Volcanic Ash Operations and Services

- Perform volcanic ash communications test for VAACs, MWOs, and customers
- Host North American/Pacific VAAC Workshop
- Host North American/Pacific MWO Workshop

Training Commercial Aviators and Air Traffic Controllers for Volcanic Ash Avoidance
- Continue volcanic ash avoidance training for aviators, air traffic controllers, and meteorological watch office staff

Expanding the NWS Volcanic Ash Program to Address Public and Marine Customer Needs
- Finalize coordinated International Volcanic Ash Hazards Mitigation plan
- Integrate National Volcanic Ash Hazard Mitigation Plan objectives, as applicable, into NWS operational guidelines

Continuing Efforts to Improve the Detection and Tracking of Airborne Volcanic Ash refine ability to detect, measure, track and forecast volcanic ash
- Continue evaluation of new technology satellites to determine best use for volcanic ash detection, analysis and monitoring

11.0 Climate Services

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.2 Produce a seamless suite of products and services.

- ***Produce a seamless suite of products and services linking weather, water, and climate with an emphasis on emerging climate products.***
  - ✔ ***Introduce threat assessments which link climate events to hazardous weather forecasts (2000).***
  - ✔ ***Link climate forecasts and threat assessments to local weather and water forecasts (2002).***

Objectives: To produce a seamless suite of products and services linking weather, water, and climate with an emphasis on emerging climate products. To enhance the use of climate information in the U.S. by the public and private sector for the benefit of society; this includes the effective communication, dissemination and interpretation of the information as a basis for decision support and services at the national, regional and subregional levels.

To achieve the objective of a seamless suite of products that emphasize climate requires addressing a host of issues related to the identification and provision of climate products and services that go well beyond the simple time extension of existing real-time weather products. The vision for climate products and services in 2005 is:

To provide a continuous and comprehensive suite of climate forecast and data products flowing from producers to customers with mechanisms in place to convey customers' needs and requirements back to the producers and applied researchers.

Approach: The milestones and activities for this objective are extensive, covering a broad range of issues and topics. These include identifying customers and their expanding needs, specifying products for technology infusion, developing a procedure by which the applied research community works with product developers to bring technological innovations into operations, developing climate training materials for NWS field personnel, specifying appropriate roles for local, state, federal, private, and academic communities, exploring a range of technologies for effective dissemination of a rapidly-expanding product suite, upgrading and enhancing appropriate observing systems, and linking the climate product suite with those of the NWS hydrology community.

There is extensive overlap with many of the other NWS Road Map Teams, particularly those focusing on technology infusion, observation systems, and dissemination mechanisms.

In assessing needs and documenting users' requirements for climate products/services, a working

group of NWS regional and field office representatives will be established to develop a survey. Training in climate for field personnel will be crucial, so it will be necessary to create a Professional Development Series (PDS) for climate. Regional focal points will be utilized for the important process of providing feedback to climate service producers and improving customer support. Outreach to the research community will be encouraged, and this should include periodic workshops composed of NWS climate forecasting and data groups, researchers from OAR laboratories, and those conducting regional assessments or examining aspects of the human dimension to climate issues. Topics to be discussed: decision making context (entry points for information); communication and dissemination of information; information needs; and incentives and constraints to the use of information. Following the workshops, it will be crucial to maintain a continuing dialogue among the human dimensions and impacts research communities, management and operational decision makers, and the NWS/OAR.

Some of the issues/questions to be addressed include the extent to which we involve other agencies, such as USDA, USGS, and U.S. interests abroad, such as USAID and the World Bank. NWS climate staff should be included in the collaboration on Human Dimensions and Regional Assessments projects to ensure ongoing dialogue and more fruitful insight. The River Forecast Centers have focused particularly on ensuring an adequate and stable monitoring system through an expanded and stable network of high quality observations capable of real-time reporting.

Milestones/Initiatives:

FY 2002

- Perform an inventory of work being done on impacts and use of climate information by the research community and different agencies and/or field offices.
- NWS/OAR sponsored workshop on lessons learned from dissemination of climate information and working with decision makers with preliminary focus on different sectors (e.g., agriculture, water management, fisheries management, energy or health) including perspectives from foreign countries.
- Identify customers and their climate needs through customer survey.
- Complete work on Professional Competency Units (PCUs) for the climate Professional Development Series (PDS).
- Conduct first two out of five sessions of the residence training climate program for WFO SOOs and/or a climate focal person. The residence training will meet requirements of the PCUs 2 and 4 (Understanding of Climate Variability and Interpret and Apply CPC Products)
- Continue development of the Visitor/Partnership Program
- Continue Climate Talk Series in the NWS Headquarters
- Together with research partners, work to expand threats assessment to include expected probability shifts of extreme weather events for periods out to a season in advance
- Incorporate new products and services in the forecast process.
- Educate customers on new products and services.

FY 2003

- Provide feedback to climate services producers on usefulness of products through regional

offices.

- Develop needs for future climate products/services based on results of survey conducted in 2002 and information obtained on future planned climate services and products.
- Continue to educate customers on new products and services.
- Work with the IRI and other partners to develop and implement a global threats assessment
- Update the PDS for future training needs based on new climate services/products.
- Complete the last three out of five sessions of the residence training
- Start tele-training series for understanding Basis and Methodologies of CPC Products (PCU3) and interpretation and application of CPC Products (PCU4)
- Continue development of the Visitor/Partnership Program
- Continue Climate Talk Series in the NWS Headquarters
- Engage the user community to ensure needs are being met, and establish any new requirements for climate services/products.
- Assist producers of climate services/products in developing and implementing new products based on emerging science and technology.
- Continue local research with universities to better understand climate controls and forecasting.
- Transition to climate forecast system based primarily on dynamical models.
- Work with the Storm Prediction Center to develop a seamless product suite for severe weather

FY 2004

- Review/Update PDS to ensure all training needs are met.
- Engage the user community to ensure needs are being met, and establish any new requirements for climate services/products.
- Work with the Tropical Prediction Center to develop a seamless suite of forecast products for Atlantic and eastern Pacific tropical cyclone activity.
- Continue tele-training series for understanding Basis and Methodologies of CPC Products (PCU3) and interpretation and application of CPC Products (PCU4)
- Continue development of the Visitor/Partnership Program
- Continue Climate Talk Series in the NWS Headquarters

FY 2005

- Ensure all forecasters are fully trained in the area of climate diagnosis/prediction.
- Continue to provide feedback to climate producers based on customer established and/or new requirements.
- Incorporate results from local research efforts through communications with regional and COMET representatives.
- Establish any new objectives to ensure a fully integrated, seamless suite of products and services to our customers.
- Review priorities and update the PDS program as needed
- Continue tele-training series for understanding Basis and Methodologies of CPC Products (PCU3) and interpretation and application of CPC Products (PCU4)
- Continue development of the Visitor/Partnership Program
- Continue Climate Talk Series in the NWS Headquarters

FY 2006

- Continue to provide feedback to climate producers based on customer established and/or new requirements.
- Continue training local forecasters on science and operational issues related to climate.
- Engage the user community to ensure needs are being met, and establish any new requirements for climate services/products.
- Establish any new objectives as needed to ensure a fully integrated, seamless suite of products and services to our customers.
- Review priorities and update the PDS program as needed
- Continue tele-training series for understanding Basis and Methodologies of CPC Products (PCU3) and interpretation and application of CPC Products (PCU4)
- Continue development of the Visitor/Partnership Program
- Continue Climate Talk Series in the NWS Headquarters

FY 2007

- Continue to provide feedback to climate producers based on customer established and/or new requirements.
- Incorporate results from local research efforts through communications with regional and COMET representatives.
- Establish any new objectives as needed to ensure a fully integrated, seamless suite of products and services to our customers.
- Review priorities and update the PDS program as needed
- Continue tele-training series for understanding Basis and Methodologies of CPC Products (PCU3) and interpretation and application of CPC Products (PCU4)
- Continue development of the Visitor/Partnership Program
- Continue Climate Talk Series in the NWS Headquarters

12.0 Customer Service/Outreach

12.1 Customer Service Improvement Program

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.4 ***Implement a customer service improvement program.***

- ✔ ***Establish a customer satisfaction index (2003).***
- ✔ ***Track customer index with the goal of a 10% increase yearly (2005).***

Objective: The objective of implementing a Customer Service Improvement Program is to ensure the National Weather Service (NWS) products and services meet our partners and customers expectations. The outcome and success of this program is related to concrete milestones to be accomplished each year beginning in 2000. A customer satisfaction index will be established in 2003 and tracked thereafter. The process includes solicitation of opinions, and feedback from customers/partners. Gathered data will be used to improve service thereby increasing satisfaction levels.

Approach: The milestones and activities for this objective emphasize interaction with partners and customers through a three tier approach: (1) development of a customer satisfaction index through national annual surveys and will be used to identify specific areas for improving customer satisfaction; (2) Comprehensive customer service training for all NWS employees; (3) creation of a process using customer feedback to influence future NWS operating plans.

Activities for the customer satisfaction survey may include areas such as: public weather, aviation, marine, hydrology, fire weather. Other activities would include: areas such as severe weather products and services; office interaction and partnership with the media, emergency managers, other government agencies; outreach activities (school visits, talks, participation at boat shows, training of HAM radio operator network, etc.); NOAA Weather Radio, NOAA Weather Wire Service, Emergency Managers Weather Information Network, and other NWS dissemination systems; and public access (ease of use in accessing through digital telephone answering systems, visits, etc.).

Milestones/Initiatives:

FY 2002

- Conduct prototype Customer Satisfaction survey. [OS]
- Evaluate prototype Customer Satisfaction survey and modify as needed. [OS]
- IWT develops plan for nationwide Customer Satisfaction survey distribution. [IWT]
- Team develops plan to provide customers with Customer Satisfaction survey results. [OS]

- Conduct partners workshop to define partner requirements. [OS]

FY 2003
- Conduct nationwide Customer Satisfaction survey. [OS]
- Create and publish first annual customer satisfaction report with 1st of 2 years of baseline data. [COMMS]
- Evaluate nationwide Customer Satisfaction survey and modify as needed. [IWT]
- Use enhanced customer feedback mechanisms for FY 2003 AOPs to influence FY 2004 AOPs. [ALL]
- Conduct partners workshop to define partner requirements. [OS]

FY 2004
- Conduct Customer Satisfaction survey. [OS]
- Create and distribute second annual customer satisfaction report. [Comms]
- Define baseline customer satisfaction index and targets (2%) based on strategic plan. [OS]
- Use enhanced customer feedback mechanisms for FY 2004 AOPs to influence FY 2005 AOPs [OS]
- Conduct partners workshop to define partner requirements. [OS]

FY 2005
- Conduct nationwide Customer Satisfaction survey. [OS]
- Create and distribute third annual customer satisfaction report. [COMMS]
- Review 2% performance measure and adjust as necessary. [IWT]
- Use enhanced customer feedback mechanisms for FY 2005 AOPs to influence FY 2006 AOPs [ALL]
- Conduct partners workshop to define partner requirements. [OS]

FY 2006
- Conduct nationwide Customer Satisfaction survey. [OS]
- Create and distribute third annual customer satisfaction report. [COMMS]
- Review 2% performance measure and adjust as necessary. [IWT]
- Use enhanced customer feedback mechanisms for FY 2006 AOPs to influence FY 2007 AOPs [ALL]
- Conduct partners workshop to define partner requirements. [OS]

FY 2007
- Conduct nationwide Customer Satisfaction survey. [OS]
- Create and distribute third annual customer satisfaction report. [COMMS]
- Review 2% performance measure and adjust as necessary. [IWT]
- Use enhanced customer feedback mechanisms for FY 2007 AOPs to influence FY 2008 AOPs [ALL]
- Conduct partners workshop to define partner requirements. [OS]

12.2 Nurturing Critical Partnerships

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.3 Nurture critical partnerships to provide effective and efficient delivery of NWS products and services.

- ✔ ***Increase the number of state and local emergency managers trained in the NOAA/Federal Emergency Management Agency core hazard courses by 5% annually (2005).***
- ✔ ***Expand fire-weather incident response from regional to nationwide for all hazards (2005).***
- ✔ ***Eliminate backlog of Federal Aviation Administration pilot weather briefer certifications (2005).***
- ✔ ***Ensure, in concert with the U.S. Coast Guard, a delivery rate of 99.5 percent of all marine weather products within 5 minutes of schedule (2005).***

Objective: The objective is to create and nurture partnerships so together the NWS and its partners can provide our mutual customers with the services they expect.

Approach: The milestones and activities for this objective emphasizes interaction with partners and customers. Our critical partners were categorized into 8 groups: (1) Emergency management; (2) Media; (3) Private sector meteorologists; (4) Hydrology; (5) Marine; (6) Aviation; (7) Educators; (8) Land management and incident response.

The scope for nurturing our partnerships ranges from national to local and spans across our future NWS product suite. Activities considered include; outreach, training, public relations, and review of critical agreements with our partners. The result is a mutual understanding of our shared roles and a continued dialogue for improved services.

<u>Milestones/Initiatives</u>:

FY 2002

- A new "Policy Statement on the Weather Service/Private Sector Roles" is agreed to and signed by appropriate parties. [SP]
- Revise and update MOU's as necessary. [ALL]
- Produce new emergency management training course [OS/COMET]
- Team review need for additional PMO's.[OS]
- Train first third excising IMET's in "all hazards" course [OS]
- Modify current Fire Weather course to include "All Hazards" information [OS]
- Support AMS education programs and National Science Teachers Association, National Geographic Society [OS]

- Provide funds to AMS Graduate Scholarship to promote meteorology as a career. [OS]
- Attend and support the Project Atmosphere Teacher Workshop [OS]
- Reproduce copies of National Geographic Society/NOAA USA Hazards map [OS]
- Produce a NWS annual report to our partners [COMMS]
- Develop Unifying Outreach Plan [OS]
- Evaluate FAA Pilot Weather Briefing certification program and determine future needs [OS]

FY 2003
- WFO's attend and participate in state and regional broadcasters conferences. [ALL]
- Train second third excising IMET's in "All Hazards" course [OS]
- Update one existing emergency management course to computer based independent study [OS]
- Support AMS education programs and National Science Teachers Association, National Geographic Society [OS]
- Provide funds to AMS Graduate Scholarship to promote meteorology as a career. [OS]
- Attend and support the Project Atmosphere Teacher Workshop [OS]
- Reproduce copies of all hazards brochures and marketing materials [OS]
- Produce a NWS annual report to our partners [COMMS]
- Develop Unifying Outreach Plan [OS]

FY 2004
- Train last third excising IMET's in "all hazards" course [OS]
- Notify partners of NWS increased NWS incident response capabilities. [OS]
- Produce new emergency management training course [OS/COMET]
- Support AMS education programs and National Science Teachers Association, National Geographic Society [OS]
- Provide funds to AMS Graduate Scholarship to promote meteorology as a career. [OS]
- Attend and support the Project Atmosphere Teacher Workshop [OS]
- Reproduce copies of all hazards brochures and marketing materials [OS]
- Produce a NWS annual report to our partners [COMMS]
- Develop Unifying Outreach Plan [OS]

FY 2005
- Support AMS education programs and National Science Teachers Association, National Geographic Society [OS]
- Update one emergency management course to computer based Independent Study [OS]
- Provide funds to AMS Graduate Scholarship to promote meteorology as a career. [OS]
- Attend and support the Project Atmosphere Teacher Workshop [OS]
- Reproduce copies of all hazards brochures and marketing materials [OS]
- Produce a NWS annual report to our partners [COMMS]
- Develop Unifying Outreach Plan [OS]

FY 2006
- Support AMS education programs and National Science Teachers Association, National Geographic Society [OS]

- Produce new emergency management training course [OS/COMET]
- Provide funds to AMS Graduate Scholarship to promote meteorology as a career. [OS]
- Attend and support the Project Atmosphere Teacher Workshop [OS]
- Reproduce copies of all hazards brochures and marketing materials [OS]
- Produce a NWS annual report to our partners [COMMS]
- Develop Unifying Outreach Plan [OS]

FY 2007

- Support AMS education programs and National Science Teachers Association, National Geographic Society [OS]
- Produce new emergency management training course [OS/COMET]
- Provide funds to AMS Graduate Scholarship to promote meteorology as a career. [OS]
- Attend and support the Project Atmosphere Teacher Workshop [OS]
- Reproduce copies of all hazards brochures and marketing materials [OS]
- Produce a NWS annual report to our partners [COMMS]
- Develop Unifying Outreach Plan [OS]

12.3 Enhancing our Partnerships with Emergency Management

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.1 Expand and improve the existing weather, water, and climate product and service line:

☛Emergency Management

- ***Enhance partnerships with the emergency management community and increase the lead time for information delivered on emergency weather and water situations.***
  - ✓ ***Establish "StormReady" community recognition program, and designate 20 communities as "StormReady" each year.***
  - ✓ ***Establish two-way links to state emergency management communications infrastructure (2005).***

Objective: The objective of enhancing our partnership with emergency management serves to increase our ability to get emergency weather and water information to the public as quickly as possible. The outcome and success of this program is strictly related to concrete milestones to be accomplished in each year beginning in 2000 and beyond. To meet the objective, 2 performance measures have been developed.

Approach: The milestones and activities for this objective emphasize interaction with emergency management. The focus on recognizing excellent emergency management programs and improving 2-way communications.

Milestones/Initiatives:

FY 2002

- National StormReady advisory board review and modify StormReady criteria as needed. [OS,Regions]
- Designate at least one StormReady community per state nationwide [OS, WFO's]
- Develop external coordination video teleconferencing plan for WFO's [OS]
- Produce quarterly "Aware" newsletter and distribute to emergency management [OS]
- Develop a new NOAA/FEMA Memorandum of Agreement [OS]

FY 2003

- National StormReady advisory board review and modify StormReady criteria as needed. [OS]
- Designate at least one StormReady community per forecast office [OS, WFO's]
- Hold joint WCM/International Association of Emergency Management conference. [OS]
- Convert video teleconferencing capability to wideband Internet platform for WFO's.

[OS/OST]
- Produce quarterly "Aware" newsletter and distribute to emergency management [OS]

FY 2004
- National StormReady advisory board review and modify StormReady criteria as needed. [OS]
- Increase StormReady communities by 5% annually [OS/WFO's]
- Produce quarterly "Aware" newsletter and distribute to emergency management [OS]

FY 2005
- National StormReady advisory board review and modify StormReady criteria as needed. [OS]
- Increase StormReady communities by 5% annually [OS/WFO's]
- Hold joint WCM/International Association of Emergency Management conference. [OS]
- Produce quarterly "Aware" newsletter and distribute to emergency management [OS]

FY 2006
- National StormReady advisory board review and modify StormReady criteria as needed. [OS]
- Increase StormReady communities by 5% annually [OS/WFO's]
- Produce quarterly "Aware" newsletter and distribute to emergency management [OS]

FY 2007
- National StormReady advisory board review and modify StormReady criteria as needed. [OS]
- Increase StormReady communities by 5% annually [OS/WFO's]
- Hold joint WCM/International Association of Emergency Management conference. [OS]
- Produce quarterly "Aware" newsletter and distribute to emergency management [OS]

13.0 Improved Observations

Strategic Plan Context:

1.0 Deliver Better Products and Services

1.2 Produce a seamless suite of products and services.

- ***Improve the use, integration, quality, and cost effectiveness of observations.***
  - ✓ ***Achieve the optimal mix of observing and data processing systems to support the NWS mission (2005~~7~~).***
  - ✓ ***Complete modernization or replacement of the Radiosonde Network, Cooperative Observer Program, Marine Observation Networks, and Voluntary Ship Program (2005~~7~~).***
  - ✓ ***Support the Global Ocean Observing System (known as GOOS) and the Global Climate Observing System (known as GCOS) by building on NWS and other observing systems (2007).***

Approach: The approach for achieving improvements in observations consists of several efforts: (1) make better use of data from observing systems that currently exist; (2) extend the system life of current observing systems to postpone technical obsolescence; (3) replace obsolete observing systems; (4) implement new observing technologies that better meet the data needs of users; (5)increase the use of observations from external data networks; and (6) strengthen the link between user requirements and technology research and development. These improvements are to be consistent with the objectives of the Global Ocean Observing System and Global Climate Observing System; the NWS will participate in these cross-cutting activities.

To make better use of data from existing systems (including those from organizations outside of NOAA), the NWS will pursue improved assimilation of data from current observing systems (particularly satellites) into the numerical forecast models (see strategic objective 2.3) and improve the real-time accessibility of these data sources to NWS field offices. A formal partnership with the airlines will be sought to ensure the continued availability and expansion of meteorological data measured by commercial aircraft.

Product improvement programs will be continued for the weather radar and surface observing systems. The WSR-88D system will be evolved into one with an open systems structure. ASOS product improvement will be in the form of specific sensor and processor upgrades.

The NWS will pursue full modernization or replacement of the current radiosonde system, using Global Positioning System (GPS) based radiosondes. Data logging capabilities and improved communications will be implemented in the Cooperative Observer Network. Efforts will also be underway to revitalize and expand the various marine observing systems, including the voluntary ship program.

As the forecast services of the NWS become more sophisticated, requirements for new or improved quality observation measurements have been accumulating. Measurement system technology has also been progressing. The North American Atmospheric Observing System (NAOS) Program will perform scientific studies and observing system simulation experiments to determine the relative applicability of various proposed observing technologies for improving NWS warning and forecast services.

Planning for improvements to the observing systems involve the responsibilities and expertise of various segments of the organization. Therefore, the NWS will establish integrated work teams to address all aspects of improving the various NWS observing programs, similar to the approach described in the roadmap for strategic objectives 2.1 and 2.2.

There are several main uses of observation data produced by the NWS. Data are used in the forecast process for initializing numerical weather prediction (NWP) models through data assimilation, and real-time use by forecasters (independent of NWP). They are also used to verify numerical models and validate independent sources of data (e.g., comparing satellite data with aircraft or radiosonde observations). Finally, the data are used in climate modeling and diagnosis.

Full application of existing data sources is a first step toward improving NWS forecasts and services. This is particularly true of the application of data from meteorological satellites in numerical weather prediction. Given the substantial investment the nation has made in this observing platform, more complete assimilation of the data it produces is a high priority. The approach for meeting this strategic objective will also support making more informed investment decisions regarding future observation platform investments. Scientific studies of the relative benefits of various proposed systems should be part of the decision process.

Product improvement programs (e.g., weather radar and surface observing systems) are critical to continuing the operation of these systems on a cost-effective basis. Resources are required on an annual basis to continually evolve these systems to implement advances in science and technology, minimize system maintenance costs, and support relatively easy upgrades in technology that would postpone a large-scale replacement program.

Some observing systems in current use are already obsolete and are difficult or impossible to maintain in an economical manner. These include the radiosonde network, the Cooperative Observer network, the marine observing network, and equipment used in the voluntary ship program. Failure to maintain these observing networks would jeopardize the NWS's ability to perform its mission.

Milestones/Initiatives:

Observation Improvement - Radar Observing Program

FY 2002

- Complete full-scale production/deployment of the open systems Radar Product Generator
- Continue full scale development of ORDA

- Investigate the potential benefit of assimilated WSR-88D data into NWP models.
- Deploy product in ORPG Build 2 to derive NCEP model initialization data from the full resolution WSR-88D data; disseminate product to NCEP in real-time
- Participate in Joint Polarization Experiment (JPOLE)
- Deploy ORPG Build 2
- Develop interim capability for utilization of FAA radar data at selected offices

FY 2003
- Complete full scale development of ORDA
- Deploy permanent S-band Doppler radar for Evansville, IN.
- Continue participation in JPOLE
- Make corporate decision on development/deployment of Dual Polarization for WSR-88D; if positive decision, begin full scale development
- Deploy FAA radar data utilization capability as part of ORPG baseline
- Deploy two releases of ORPG application packages

FY 2004
- Complete integration and testing of ORDA
- Continue development of Dual Polarization capability for the WSR-88D.
- Deploy two releases of ORPG application packages

FY 2005
- Complete deployment of ORDA
- Complete full scale development of Dual Polarization capability for the WSR-88D
- Deploy two releases of ORPG application packages

FY 2006
- Complete integration and testing of Dual Polarization capability
- Deploy two releases of combined ORPG/ORDA application packages

FY 2007
- Begin deployment of Dual Polarization capability
- Deploy two releases of combined ORPG/ORDA application packages

FY 2008
- Complete deployment of Dual Polarization capability
- Deploy two releases of combined ORPG/ORDA application packages

Milestones/Initiattives:

Observation Improvement - Surface Observing Program

FY 2001
- Select and award contract for ASOS All Weather Precipitation Accumulation Gauge

- Complete software rehosting for new ASOS processor upgrade
- Develop and issue an RFP for an enhanced lightning network

FY 2002
- Begin and complete deployment of new ASOS processor upgrade
- Begin deployment of new ASOS dewpoint sensor
- Award contract for enhanced lightning data system

FY 2003
- Complete deployment of new ASOS dewpoint sensor
- Begin deployment of ASOS All Weather Precipitation Accumulation Gauge; Begin acquisition of Enhanced Precipitation Identification
- Award contract for Enhanced Precipitation Identification Sensor

FY 2004
- Complete deployment of the All Weather Precipitation Gauge
- Begin acquisition of a replacement Ceilometer for ASOS
- Begin deployment of Ice-Free Wind Sensor for ASOS
- Begin production of Enhanced Precipitation Identification Sensor

FY 2005
- Award contract for replacement Ceilometer for ASOS
- Complete deployment of the Ice-Free Wind Sensor for ASOS
- Begin deployment of Enhanced Precipitation Identification Sensor

FY 2006
- Complete deployment of Enhanced Precipitation Identification Sensor
- Begin deployment of replacement Ceilometer for ASOS

FY 2007
- Continue deployment of replacement Ceilometer for ASOS

Milestones/Initiatives:

Observation Improvement - Hydrologic Observations Program

FY 2002
- Collect airborne snow water equivalent measurements over those regions of the U.S. where snow is a significant hydrometeorological variable (See Tom Carrolls response)
- Begin LARC replacement effort. (OCWWS - Observing Systems Division)
- Begin ARC replacement effort. (OCWWS - Observing Systems Division)
- Replace functionality of CADAS. (HSD has submitted requirements to OST. Dave, as the lead for the SPIG, you will need to coordinate the responsibility for this action with OST.)

- Begin Hourly Precipitation Data (HPD) rescue effort. (The paper tape punch mechanism is being replaced.) (OCWWS - Observing Systems Division)
- Begin Cooperative Observer Program (COOP) Modernization. (OCWWS - Observing Systems Division)

FY 2003
- Update and submit to the United States Geological Survey (USGS) a prioritized list of requirements to increase the number of rated river gaging stations (including satellite telemetry). (OCWWS - HSD)
- Submit to the Natural Resources Conservation Service (NRCS) a prioritized list of requirements to increase the number of sites reporting liquid water equivalent of snow depth (OCWWS - HSD)
- Continue LARC replacement. (OCWWS - Observing Systems Division)
- Continue ARC replacement. (OCWWS - Observing Systems Division)
- Continue HPD rescue effort. (OCWWS - Observing Systems Division)
- Continue COOP Modernization. (OCWWS - Observing Systems Division)

FY 2004
- Update and submit to the USGS a prioritized list of requirements to increase the number of rated river gaging stations (including satellite telemetry). (OCWWS - HSD)
- Update and submit to the NRCS a prioritized list of requirements to increase the number of sites reporting liquid water equivalent of snow depth (OCWWS - HSD)
- Complete LARC replacement. (OCWWS - Observing Systems Division)
- Complete ARC replacement. (OCWWS - Observing Systems Division)
- Complete HPD rescue effort. (OCWWS - Observing Systems Division)
- Continue COOP Modernization. (OCWWS - Observing Systems Division)

FY 2005
- Continue COOP Modernization. (OCWWS - Observing Systems Division)

FY 2006
- Continue COOP Modernization. (OCWWS - Observing Systems Division)

FY 2007
- Complete COOP Modernization. (OCWWS - Observing Systems Division)

Milestones/Initiatives:

Observation Improvement - Marine Observation Program

FY 2002

- Deploy 3 Alaskan buoys to expand observing network (OPR: OOS, NDBC)
- Deploy 1 NE Florida buoy to expand observing network (OPR: OOS, NDBC)
- Develop prototype and standards for automated ship observations (OPR: OS, OOS, NDBC)
- Complete adding relative humidity sensors to Gulf of Mexico and Atlantic buoy and C-MAN stations (OPR: OOS, NDBC)
- Begin to add ocean currents and ocean temperature profiles to NWS observation stations and to NDBC web site (OPR: OOS, NDBC)
- Provide multi-variate time series plot capability on NDBC web site (OPR: OOS, NDBC)

FY 2003

- Begin to expand NWS access to three-dimensional observations of the marine environment.
- Deploy 2 Alaskan buoys to expand observing network (OPR: OOS, NDBC)
- Deploy 1 NW Pacific buoy to expand observing network (OPR: OOS, NDBC)
- Deploy 1 South California Bight buoy to expand observing network (OPR: OOS, NDBC)
- Begin transition of OAR DART System to NWS/NDBC (OPR: OOS, NDBC)
- Integrate upper ocean layer with atmospheric observations
- On NDBCs web site, expand the posting of ocean observations, create time series plots that merge marine forecast winds and waves with those recently observed by NDBC stations (OPR: OOS, NDBC)

FY 2004

- Continue to expand NWS access to three-dimensional observations of the marine environment.
- Deploy 3 Coastal Storms buoys to expand observing network (OPR: OOS, NDBC)
- Begin to deploy 3 Coastal Upper Air Wind Profilers for Coastal Storms.(OPR: OOS, NDBC)
- Begin the modernization of the NWS VOS Program Automate 50 vessels using INMARSAT and 10 USCG Small Boat Stations (OPR: OOS, NDBC)
- Begin to install additional sensors (ex., wind profilers) to marine observing network (OPR: OOS, NDBC)
- Complete transition of OAR DART System to NWS/NDBC Operate 6 New NMON buoy stations (OPR: OOS, NDBC)
- Continue the expansion of ocean current and temperature profile data acquisitions and WEB posting, begin adding salinity measurements (OPR: OOS, NDBC)

- Deploy NWS operational drifters and floats in support of climate prediction (OPR: OOS, NDBC)

FY 2005

- Continue to install additional sensors (ex., wind profilers) to marine observing network (OPR: OOS, NDBC)
- Increase remote sensing and in-situ observations (OPR: OOS, NDBC)
- Continue the modernization of the NWS VOS Program Automate 80 vessels using INMARSAT (OPR: OOS, NDBC)
- Deploy 3 Coastal Storms buoys to expand observing network (OPR: OOS, NDBC)
- Begin to deploy 3 Coastal Upper Air Wind Profilers for Coastal Storms. (OPR: OOS, NDBC)
- Continue the expansion of ocean current and temperature profile data acquisitions expand salinity measurements (OPR: OOS, NDBC)
- Expand the network of NWS operational drifters and floats in support of climate prediction (OPR: OOS, NDBC)
- Deploy the first NWS ocean climate reference station (OPR: OOS, NCBC)

FY 2006

- Continue the modernization of the NWS VOS Program Automate 50 vessels using INMARSAT (OPR: OOS, NDBC)
- Introduce automated GPS Radiosonde Upper Air observations (OPR: OOS, NDBC)
- Deploy 3 Coastal Storms buoys to expand observing network (OPR: OOS, NDBC)
- Begin to deploy 3 Coastal Upper Air Wind Profilers for Coastal Storms (OPR: OOS, NDBC)
- Complete the expansion of ocean current and temperature profile data acquisition salinity measurements (OPR: OOS, NDBC)
- Expand the network of NWS operational drifters and floats in support of climate prediction (OPR: OOS, NDBC)
- Expand the NWS ocean climate reference station (OPR: OOS, NDBC)

FY 2007

- Continue the modernization of the NWS VOS Program Automate 50 vessels using INMARSAT (OPR: OOS, NDBC)
- Continue the modernization of the NWS VOS Program (OPR: OOS, NDBC)
- Deploy 3 Coastal Storms buoys to expand observing network (OPR: OOS, NDBC)
- Begin to deploy 3 Coastal Upper Air Wind Profilers for Coastal Storms. (OPR: OOS, NDBC)
- Complete the network wide deployment of salinity measurements. (OPR: OOS, NDBC)

- Complete the network of NWS operational drifters and floats in support of climate prediction. (OPR: OOS, NDBC)
- Complete the NWS ocean climate reference station network (OPR: OOS, NDBC)

Milestones/Initiatives:

Cooperative Observer Program

FY 2002
- Complete network density study to determine optimal mix and distribution of COOP locations
- Complete replacement of remaining tape punch devices and replacement of obsolete Maximum/Minimum Temperature Systems
- Begin implementation of COOP modernization initiative

FY 2003
- Continue network implementation of modernized COOP Weather Observing Systems and real-time communications capabilities

FY 2004
- Continue network implementation of modernized COOP Weather Observing Systems and real-time communications capabilities

FY 2005
- Continue network implementation of modernized COOP Weather Observing Systems and real-time communications capabilities

Milestones/Initiatives:

Observation Improvement - Upper Air Observing Program

FY 2002
- Begin implementation of GPS radiosondes and new ground system; and deploy new computers and implement radiosonde system software with new GPS radiosonde equipment
- Begin negotiation with the airlines on establishment of formal partnership for provision of Meteorological Data Collection and Reporting System (MDCRS) data; develop plan for improved access to real-time MDCRS data for field offices; conduct evaluation of Water Vapor Sensor System
- Negotiate new MOA with FAA adding the WVSS-II sensor to MDCRS support package
- Procure WVSS systems (60-120)
- Evaluate TAMDAR performance test data; if TAMDAR meets NWS

performance criteria, begin working with FAA and Regional Air Carriers to establish MOA

FY 2003

- Continue site implementation of new radiosondes and ground systems
- Begin deployment of turbulence reporting software on 100 aircraft per year; Complete the evaluation of water vapor measurements from commercial aircraft; implement improved real-time access for field offices to MDCRS data
- Begin full-scale deployment of water vapor sensors on commercial aircraft (60 aircraft); continue deployment of turbulence reporting software on 100 commercial aircraft per year
- Evaluate the operational potential of targeted observations over the N. Pacific in NWP models during The Hemispheric Observing System Research and Predictability Experiment

FY 2004

- Continue site implementation of new radiosondes and ground systems
- Continue full-scale deployment of water vapor sensors on commercial aircraft (120 aircraft);
- Continue deployment of turbulence reporting software on 100 commercial aircraft per year
- Begin evaluation of the potential service improvements that would result from implementation of a national mesoscale in-situ and ground-based remote observing system

FY 2005

- Complete the replacement of the current radiosonde systems
- Continue full-scale deployment of water vapor sensors on commercial aircraft (120 aircraft)
- Continue deployment of turbulence reporting software on 100 commercial aircraft per year

Milestones/Initiatives:

Observation Improvement - Satellite Observations Program

FY 2002

- Evaluate Advanced Earth Observing System - II (ADEOS-II), Phased Array type L-band Synthetic Aperture Radar (PALSAR), Windsat microwave polarimeter for sea surface wind vectors, GOES M (12) and NOAA M (17) observations, and, if positive results, integrate into NWS operations

FY 2003

- Evaluate 1-km global AVHRR, Infrared Atmospheric Sounding

Interferometer (IASI), Global Ozone Monitoring Experiment (GOME), GNNS Receiver for Atmospheric Sounder (GRAS), Global Positioning Satellite (GPS)/Met, GOES N (13) observations and, if positive results, integrate into NWS operations
- Begin testing of Japan geo-synchronous Multi-functional Transport Satellite (MTSAT-1) in NCEP numerical weather prediction

FY 2004
- Evaluate Geostationary Imaging Fourier Transform Spectrometer (GIFTS) and NOAA N (18) observations and, if positive results, integrate into NWS operations

FY 2005
- Evaluate Visible/Infrared Imager/Radiometer Suite (VIIRS), Cross-track Infrared Sounder (CrIS), Advanced Technology Microwave Sensor (ATMS) observations, National Polar-orbiting Operational Environmental Satellite System Preparatory Program (NPP) instruments and, if positive results, integrate into NWS operations
- Begin testing of Japan geo-synchronous Multi-functional Transport Satellite (MTSAT-2) in NCEP numerical weather prediction
- Begin testing of EURMETSAT sun-synchronous METOP-1 satellite in NCEP numerical weather prediction

Milestones/Initiatives

Observation Improvement - Lightning

FY2002
- Evaluate operational usefulness of Pacnet- Very Low Frequency (VLF) long range Cloud to Ground (CG) lightning mapping in Pacific Ocean Basin
- Evaluate operational usefulness of EuroStarnet- Europe/Atlantic Ocean Basin long range CG VLF lightning mapping

FY 2003
- Test utility in operations of Lightning Mapping Array (LMA) at Birmingham, Huntsville, Nashville, Morristown WFOs

FY 2004
- Launch first NASA Earth System Science Pathfinder (ESSP)-3: Geosynchronous orbit of Lightning Mapper Sensor (LMS) stationed over North and South America

FY 2005
- Launch second NASA ESSP-3: Geosynchronous orbit of Lightning Mapper

Sensor (LMS) stationed over Pacific Ocean

FY 2006

- Transition to operations LMS, LMA, and VLF lightning detection systems, as required

FY 2007

- Transition to operations LMS, LMA, and VLF lightning detection systems, as required

14.0 Focused Research

Strategic Plan Context:

2.0 Capitalize on Scientific and Technological Advances

2.1 ***As operational leaders in weather, water, and climate, expand cooperation with the entire research community to promote and guide research and development toward product- and service-improvement goals.***

- ✔ ***Link NOAA research and development activities to NWS improvement goals (2000).***
- ✔ ***Based on NWS service priorities, develop a multi-year research plan and process involving the NWS and its research partners (2005).***
- ✔ ***Assess annually the impact of NWS service improvement goals on research and development programs and initiatives including the National Disaster Reduction Initiative, the U.S. Global Change Research Program, the U.S. Weather Research Program, and the Collaborative Science Technology and Applied Research Program among others.***

2.2 ***Reduce the time required to implement proven research and technology into operations.***

- ✔ ***Increase the number of cooperative alliances to 5 percent per year.***
- ✔ ***Establish six experimental test beds to accelerate the infusion of new science and technology into the forecast process (2005).***
- ✔ ***Sustain the NWS/Cooperative Program for Operational Meteorology, Education, and Training (known as COMET) outreach program.***
- ✔ ***Develop and implement standardized procedures for introducing science and technology into the forecast process (2005).***

Approach: The identification, development, evaluation, and implementation or "infusion" of science and technology (S&T) into NWS operations is a key to many of the specific product and service improvement goals defined in the NWS Strategic Plan - Vision 2005. Moreover, S&T infusion will always be a foundation of NWS product and service quality. Through the ongoing development of an NWS Science and Technology Infusion Plan (STIP), the NWS is planning for the S&T advances necessary to support improved product and service capabilities and organizational efficiency and productivity in the first decades of the twenty-first century. The STIP will provide a coherent roadmap integrated across S&T areas by which the NWS can strategically plan, focus, and coordinate research and development, testing, and transition to operations internally and with partners.

Using the STIP as a guide, the NWS will develop a process by which NOAA and non-NOAA S&T are identified and infused into NWS operations. Therefore, the milestones and activities for this objective are based on a new way of doing S&T

planning and implementation in the NWS and other components of NOAA. Specifically, a new processes is proposed below to bring generally more energy and efficiency to service-science linkages in NOAA, and particularly, to meet the specific goals and performance measures under 2.1 and 2.2 in Vision 2005. Not surprisingly, the establishment of these processes will take resources and a change of culture. Moreover, it is imperative they not be so bureaucratic so as to stifle what they were designed to do - bring focus and speed to S&T infusion.

The process provides for S&T planning and oversight requiring NWS Headquarters and other NOAA line offices to participate more closely in activities linking our services and science. Specifically, this process provides a foundation for: the identification and implementation of S&T across all service areas; consideration of local, regional, and national issues; the pull and push of ideas and solutions; greater coordination and collaboration with our R&D partners; more direct user-driven justification for S&T; prioritization and redirection of activities; and the development of new initiatives.

Process to Define NWS Science and Technology Needs, Solutions, and Plans

In order to speed the identification and implementation of S&T into operations, NOAA must establish a management group which will focus continually and aggressively on improving and standardizing the NWS science infusion process using the STIP as a guide. Both the R&D and operational components of NOAA must be engaged.

The first 3 bullets below occur with the concurrence of NESDIS, NOS, and OAR[1].

The NWS, OAR, NESDIS and NOS AAs will provide high-level oversight of the:

- Evaluation of unmet service needs;
- Determination of scientific and technological capabilities and development areas;
- Establishment of evaluation criteria and implementation plans; and
- Establishment of appropriate liaisons with national R&D organizations outside NOAA.

Form Integrated Oversight Group (IOG). The IOG will consist of NWS, OAR, NESDIS, and NOS managers at the Office Director Level representing needs, capabilities, and implementation areas. The IOG will provide primary oversight of the activities listed above and the Integrated Work Teams (see next bullets).

Continually identify topical areas which adequately capture the spectrum of NWS (NOAA) services. For the NWS , these areas would most likely follow along the lines of the OS service programs and subprograms within (e.g., public–severe weather, marine–tropical, hydrology, etc.).

The IOG will support Integrated Work Teams (IWTs), which will work closely with the NWS Requirements Board to refine and prioritize product and service improvement goals in each topical area, promote the pull and push of ideas in developing S&T solutions and plans, facilitate inter-office, and inter-LO communication and coordination, and support operational implementation.

The IWTs consist of representatives who can address issues related to needs, capabilities, implementation and cross-cutting issues (e.g., NWP). The members of the IWTs, including the members of the Ad Hoc groups (see next bullet), will officially represent their organizations and be able to identify potential development activities defined in the STIP and related resource requirements.

Form IWT Ad Hoc Groups (AHG) as needed which will be asked to attend IWT meetings as additional expertise and advice is needed. For example:

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[1]IOG and IWTs can still function as NWS entities if NESDIS, OAR, and NOS do not agree to participate. For instance, AA oversight would become the NWS AA only, IOG would become a subset of NWS Corporate Board, etc.

- Needs (Field, Customers)
- Capabilities (U.S. Weather Research Program [USWRP], U.S. Global Climate Research Program [USGCRP], universities, federal agencies)
- Implementation (OST Programs, Field)

The IWTs will:

- Refine and prioritize product and service improvement goals in each topical area, assuring adequate pull and push of ideas.
- Use the STIP as a guide to determine what S&T is necessary in each topical area to reach these product and service goals. That is, determine S&T needs by breaking needs/improvements out in the following areas:
    - Basic/Applied research
    - Observations
    - Data Assimilation
    - Modeling
    - Post Processing
    - Forecast Applications
    - Verification
    - Supporting systems, including communications, hardware, computational resources, and other IT.
    - Training (interact with NSTEP process)
    - etc.

Working with appropriate Programs, develop a multi-year, topical S&T development, evaluation, and implementation "action plan"[2] which identifies:

- Internal and external (non-NWS) activities;
    - The responsibilities of participating organizations;
    - Necessary resources, including grants (e.g., Collaborative Science, Technology, and Applied Research [CSTAR] program), contracts, etc.
- The IWTs will present topical plans to the IOG, including detailed resource requirements.
- The IOG directs the formulation of a cross-cutting S&T development, evaluation, and implementation action plan utilizing existing NWS planning (e.g., OST Science Branch) staff resources. The plan will:
    - List national S&T priorities
    - Integrate the individual topical plans with internal and external activities identified as above.

[2]This planning process as a whole and the plans that result must be "light on their feet." We are entering a rapidly evolving and at times chaotic environment of innovation. The IWTs must be responsive to new opportunities and their plans easily updated. The phrase "action plan" is used to indicate that the plans at this level should specify only information regarding what activities will be performed, by which organizations, by when, and how the various components will flow together to meet the desired end. Detailed work and implementation plans should be left to those organizations carrying out the work.

    - Prioritize activities, identify cross cutting issues, and recommend implementation strategies
- Approval from line offices (e.g., NWS Corporate Board) and AAs.
    - Plan is released to NOAA and external organizations (e.g., USWRP) under AAs signatures.
    - Include specific items in relevant SES plans.
- Hold annual workshops with representatives from NOAA and external R&D partners (e.g., USWRP, USGCRP, etc.) to review NWS S&T programs, plans and initiatives and to assess the impact of NWS service improvement goals on these programs.
- Programs and initiatives reviewed and plans revised periodically following similar process.

Milestones/Initiatives:
(Items either led or coordinated by OST/SPB)

FY 2002
- Finalize Version 1 of the Science and Technology Infusion Plan (STIP).
- Based on STIP, establish NWS basic and applied research priorities.
- Develop STIP implementation plans for specific R&D targets through Integrated Work Teams and in collaboration with internal and external partners.
- Develop a coordinated FY04 S&T budget initiative in coordination with partners.
- Develop FY 05 initiative themes.
- Fund 4 new CSTAR projects through RFP.
- Fund existing 8 CSTAR projects from previous RFPs.
- Fund 4-8 new COMET cooperative outreach proposals to universities.
- Update STIP (V.2)
- Assess impact of STIP on R&D plans of NWS partners.
- Develop umbrella national testbed plan.
- Establish Joint Hurricane Testbed.
- Develop plans for Joint Mesoscale Testbed.

FY 2003
- Establish Joint Mesoscale Testbed
- Develop plans for other joint centers.
- Develop a coordinated FY05 S&T budget initiative in coordination with partners.
- Develop FY 06 initiative themes
- Update STIP (V.3)
- Develop STIP implementation plans for specific R&D targets through Integrated Work Teams and in collaboration with internal and external partners.
- Maintain/increase cooperative alliances through CSTAR etc. and utilize COMET Outreach and other grants programs as specified in S&T plan to meet service improvement goals.

FY 2004
- Develop a coordinated FY06 S&T budget initiative in coordination with partners.
- Develop FY 07 initiative themes.
- Update STIP (V.3).
- Develop STIP implementation plans for specific R&D targets through Integrated Work Teams and in collaboration with internal and external partners.
- Maintain/increase cooperative alliances through CSTAR etc. and utilize COMET Outreach and other grants programs as specified in S&T plan to

meet service improvement goals.

FY 2005

- Develop a coordinated FY07 S&T budget initiative in coordination with partners.
- Develop FY 08 initiative themes.
- Update STIP (V.4).
- Develop STIP implementation plans for specific R&D targets through Integrated Work Teams and in collaboration with internal and external partners.
- Establish new joint testbed.
- Maintain/increase cooperative alliances through CSTAR etc. and utilize COMET Outreach and other grants programs as specified in S&T plan to meet service improvement goals.

FY 2006

- Develop a coordinated FY08 S&T budget initiative in coordination with partners.
- Develop FY 09 initiative themes.
- Update STIP (V.5).
- Develop STIP implementation plans for specific R&D targets through Integrated Work Teams and in collaboration with internal and external partners.
- Maintain/increase cooperative alliances through CSTAR etc. and utilize COMET Outreach and other grants programs as specified in S&T plan to meet service improvement goals.

FY 2007

- Develop a coordinated FY09 S&T budget initiative in coordination with partners.
- Develop FY 10 initiative themes
- Update STIP (V.6).
- Develop STIP implementation plans for specific R&D targets through Integrated Work Teams and in collaboration with internal and external partners.
- Maintain/increase cooperative alliances through CSTAR etc. and utilize COMET Outreach and other grants programs as specified in S&T plan to meet service improvement goals.

15.0 Data Assimilation/Modeling

Strategic Plan Context:

2.0 Capitalize on Scientific and Technological Advances

2.3 ***Improve data assimilation systems and numerical forecasts.***

- ✔ ***Develop and implement a weather research and forecast community model (2004).***
- ✔ ***Develop and implement the next generation Global/Climate prediction system (2005).***
- ✔ ***Decrease by 50 percent the time necessary to incorporate new satellite data sets into an operational assimilation system (2005).***
- ✔ ***Incorporate Doppler radar data into operational mesoscale models (2002)***

Objectives: The objectives are to improve numerical forecast systems used operationally by the NWS. Numerical forecast systems components are as follows: data processing, including quality control and data selection; data assimilation of timely observations into the system to produce accurate model initial conditions; numerical forecast models with state-of-the-science components; and gridded output products for customers/users/partners.

Also included in this roadmap are associated development, training and coordination activities to enhance the scope, use, tracking and understanding of NWS numerical products. These activities are: development of verification and validation programs for all products; improved mechanisms for training and translating feedback from customers/users/partners into continually evolving and improving forecast systems; establishing effective scientific partnerships with the external community to leverage and focus available talent on producing improved numerical forecasts; expanding the NWS seamless suite of numerical products ranging from hourly to seasonal/interannual time scales, and kilometer to global spatial scales; and coordinating with other NWS Offices for effective dissemination of required numerical products to NWS Field Offices and other customers/users/partners.

Approach: The NCEP Environmental Modeling Center (EMC) will focus development activities on scientific areas which promise the greatest improvements in numerical forecast system accuracy and efficiency. The following activities will be included: advanced numerical algorithms will be incorporated into operations as human and computational resources permit; new observations (particularly remotely-sensed from satellites and the WSR-88D Doppler radars) will be gathered, processed, and assimilated into operational forecast systems and the necessary scientific development will be done; community

scientific resources will be leveraged by establishing a National Test Bed for Numerical Weather Prediction (with USWRP) and a Joint Center for Advanced Observing Systems (with NESDIS, OAR); EMC will be a focal point for development of community forecast systems such as the Weather Research and Forecast (WRF) system; it will continue to develop the global forecast model, both maintaining it as a state-of-the-science system and transforming it into a community accessible model; through collaborations with NOAA, NASA NCAR and University partners, emphasizing these community forecast systems, the rate of technology infusion will be increased and new satellite data will be used sooner after launch.

New members of the NCEP operational suite will be introduced, including a Coastal Ocean Forecast System (COFS), a coupled ocean-atmosphere hurricane model, a Threats Model for episodic severe weather forecasts, daily global ocean data assimilation runs, and an enhanced ensemble suite [including a Short-Range Ensemble Forecast (SREF) system and a higher resolution global ensemble system] to support probabilistic forecasts for all NWS products and services, particularly QPFs. An NCEP global atmosphere-ocean-land-surface coupled model will be implemented as the next generation climate forecast system to produce fully coupled forecasts.

To increase the range of NWS products and services, EMC will distribute mesoscale forecast systems to NWS forecast offices and collaborate with NWS forecast offices and other NOAA components to begin prototype forecast systems for new, local applications such as pollution, biological hazards, etc. and to improve specific local forecast elements such as fog, ceiling and visibility, terrain-induced local weather and sea breezes.

These improvements to NCEP numerical forecast systems will benefit all NWS forecast functions and parts of the U. S. economy which are weather sensitive. For example, probabilistic forecasts will enable improved decision making by users. Introduction of COFS products will save up to $50 K/day for each ship unloading in major harbors along the U. S. East Coast (e.g. Baltimore, MD). The Threats model (2 km resolution, non-hydrostatic) will enable improved warnings for tornadoes and winter storms. Improved initialization of hurricanes through data assimilation and higher resolution forecast models should contribute significantly to the NWS goal of increased lead time for landfall forecasts and a 20% improvement for intensity forecasts.

Higher resolution forecast systems, such as the 10 km Eta, will improve QPFs and wind forecasts for the mountainous Western U. S. Implementation of targeted observing strategies has improved local QPFs by up to 60% and improved wind and surface pressure forecasts more than 70% of the time.

Establishing a National Test Bed for Numerical Weather Prediction and a Joint Center for Advanced Observing Systems will enable NOAA and other community

partners to access and improve NCEP operational systems and to prepare for the huge volume of new satellite data and number of new instruments appearing by 2005.

Engaging in community model development will produce increased generality and portability of operational codes which is important for reducing the time necessary to implement the periodic migrations to new computer architecture. Community modeling activities will also increase the rate of technology infusion into NWS operations and accelerate the improvement of numerical forecast systems. Most important, the consolidation of NCEP models into a common infrastructure, including data handling, models, and analysis algorithms, will allow increased development, faster transition to operations and better documentation of forecast system changes for users than previously possible. All the following milestones are subject to availability of current (FY2000) and future (FY2001-2005) resources as specified below and computational resources as outlined in the NCEP IT plan, in particular the Class IX computer system.

Milestones/Initiatives:

FY 2001

- Operationally obtain WSR-88D (Level III) products from central collection of all sites at OSO and occasionally obtain Level II base data from the limited set of sites available through CRAFT (Collaborative Radar Acquisition Field Test) or equivalent. Implement use of wind data products. Begin implementation of use of precipitation products.
- Implement NOAA-15 AMSU-B data (if positive impact), maintain and improve use
- Implement operational targeted observing strategies
- Implement data assimilation techniques for precipitation initialization
- Implement Quikscat data operationally (if positive impact), maintain and improve use, in progress, no positive impact yet

FY 2002

- Implement 12 km Eta model
- Establish National Test Bed for Numerical Weather Prediction
- Establish Joint Center for Advanced Observing Systems
- Begin to develop improved background error covariances
- Begin to develop advanced four-dimensional data assimilation techniques
- Begin to develop improved land surface data assimilation algorithms
- Incorporate WSR-88D radar data (Level II wind and precipitation products from all sites and Level II base wind data from limited set of sites) into operational mesoscale models.
- Begin to develop data assimilation techniques for clouds maybe by November 2001 or latest March 2002
- Begin to assimilate Atmospheric Infrared Sounder (AIRS) data in a test

mode
- Provide prototype high resolution (distributed) modeling study for strategic planning

FY 2003
- Assimilate AIRS data operationally (if positive impact), maintain and improve use
- Begin to use salinity data in coastal ocean data assimilation
- Begin to test improved background error covariances for the atmosphere and ocean
- Begin to test advanced four-dimensional data assimilation techniques
- Begin to participate in the Global Ocean Data Assimilation Experiment (GODAE)
- Incorporate WSR-88D radar data (Level II wind, precipitation, and reflectivity products from all sites and Level II base wind and reflectivity data from more complete set of sites) into operational mesoscale models (requires development of transmission, collection, and acquisition infrastructure to deal with Level II base data). [$2.5M]

FY 2004
- Complete development and implement, maintain and improve a Weather Research and Forecast (WRF) community model
- Implement, maintain and improve a Coastal Ocean Forecast System (COFS) for East Coast and Gulf of Mexico
- Incorporate full set of WSR-88D radar data (Level II base wind and reflectivity data from complete set of sites) into operational WRF (mesoscale, threat, and RUC applications) model (requires implementation of transmission, collection, and acquisition infrastructure to deal with Level II base data). [$2.5M]

FY 2005
- Begin to assimilate IASI data if available
- Decrease by 50 percent the time necessary to incorporate new satellite data sets into an operational assimilation system (2005)
- Complete development and implement the next generation global atmosphere-ocean-land-surface coupled climate prediction system, air quality modeling, advanced NPOESS -e.g. IASI, physics development for mesoscale models, climate “carbon cycle” initiative and economically driven forecast systems
- Begin to assimilate hurricane inner core observations if operationally available
- Implement a Coastal Ocean Forecast System (COFS) for West Coast

16.0 Climate Prediction

Strategic Plan Context:

2.0 Capitalize on Scientific and Technological Advances

2.4 ***Improve understanding and prediction of long-term climate variability.***

- ✔ ***Increase forecast accuracy for long-term decadal trends by 25 percent (2004).***
- ✔ ***Implement, with our partners, a coupled atmospheric-oceanic model for global data assimilation and for seasonal to interannual to decadal prediction (2005).***

Objective: To improve understanding and forecasting of long-term climate variability and the impacts of this on extremes by implementing a coupled atmosphere-ocean-land-surface-climate forecast model and global ocean data assimilation system to produce a seamless suite of products and services linking weather, water and climate.

Seasonal climate variability results from the impacts of natural climate variability resulting from coupled ocean-atmosphere interactions in the tropics, changes of zonal flows in mid-latitudes, the impacts of changes in land surface properties, and longer term trends possibly related to anthropogenic impacts. To be able to forecast this variability will require the development and implementation of a coupled climate forecast model, ocean data assimilation system, deployment and improvement of ocean and climate observing systems, an ability to assimilate and forecast land surface property evolution, and application of climate observations. The vision for NWS operational climate forecast system for 2005 includes a global coupled atmosphere-ocean-land general circulation model, a global ocean data assimilation system utilizing global realtime observations from in situ observing systems (ships, buoys, floats) and satellite observing platforms (altimetry, scatterometry, SST, precipitation), a land data assimilation system, and embed high resolution regional climate forecast models. The regional climate model allows estimation of systematic regional errors such as those associated with topography and enables forecast the regional manifestation of global climate forecasts.

Improved forecast accuracy for long-term decadal trends is achieved by incorporating global ocean and land surface effects and by improved understanding of the physics of these trends derived by participation in national and international research programs. These will allow implementation of new and improved forecast products such as forecast for extremes, drought, and seasonal forecasts for Atlantic hurricane activity.

Approach: The primary approach to achieve the above objective is a vigorous, focused, well-coordinated developmental activity in EMC and CPC linking climate

forecast system development with new and improved forecast products. Equally important is a program to aggressively and continually infuse science and technological advances in modeling and data assimilation research by collaborating closely with the NOAA laboratories and the research community. Key components of this are collaborative agreements with the Office of Global Programs (OGP), OAR research laboratories, NOAA funded Applied Research Centers, the International Research Institute for Climate Prediction (IRI), and NASA/GSFC. Active participation in national and international climate research programs such as CLIVAR (CLImate VARiability) and GODAE (Global Ocean Data Assimilation Experiment) will also contribute to infuse of technological innovations in modeling, data assimilation, and basic understanding into NWS operational climate forecast system.

There is extensive overlap with many of the other NWS Road Map Teams, particularly those focusing on development of new climate products and services, observation systems, numerical weather prediction (NWP) modeling and data assimilation, and dissemination of new and improved suite of products and services.

Partners in the research community include NOAA laboratories such as GFDL, PMEL, AOML, and CDC, and NOAA funded applied research centers (ARCs), International Research Institute for climate research and applications, NASA/GSFC, NCAR, and FNMOC of U.S. Navy.

CPC and the Climate Modeling Branch/EMC will work with the NWS Climate Service Division to establish guidelines and mechanisms for implementation, dissemination though NWS fields and evaluation of operational climate forecast products.

The ultimate success in achieving the strategic goal will depend on the availability of the resources requested and reaching agreements between the NWS management and the management for NOAA laboratories and NOAA funded research activities.

Milestones/Initiatives:

FY 2002

- Implement global assimilation for ARGO
- Implement drought (soil moisture) forecast
- Implement model based probability forecasts for extremes
- Implement a prototype global ocean data assimilation system based on GFDL ocean model and 3D variational method.
- Begin collaborations with GFDL on 4D Var ocean data assimilation system.
- Implement QC program for ARGO (a global array of profiling floats) with NOAA/AOML.

FY 2003

- Participate in research/operational phase of GODAE
- Implement parallel testing of Kalman filter based error covariance estimation.
- Implementing dynamical model based seasonal Atlantic hurricane forecasts
- Implement probability forecasts for wild fires (2003)
- Implement medium resolution (~32km) regional climate forecast model
- Begin development of high resolution (T126) global coupled climate forecast model
- Implement parallel testing of CLDAS
- Implement parallel testing of Kalman filter based error covariance estimation.

FY 2004

- Implement parallel testing of 4D variational ocean data assimilation system
- Implement Kalman filter based error covariance estimate for global 3D variational ocean data assimilation
- Participate in research/operational phase of GODAE
- Implement high resolution regional climate forecast model (~15 km)
- Implement forecasts of improved regionality for extremes and hurricanes.

FY 2005

- Implement operational high resolution (T126) global coupled model
- Implement 4D variational ocean data assimilation system
- Implement operational CLDAS
- Implement forecasts of extremes based on decadal impacts
- Implement drought forecasts with incorporation of decadal impacts

17.0 International Activities

Strategic Plan Context:

3.0 Exercise Global Leadership

Objective: To maintain international leadership and influence in meteorology and hydrology, to improve U.S. warnings and forecasts, and to work with other government agencies to advance U.S. government foreign policy objectives.

Overview: The NOAA Assistant Administrator for Weather Services is appointed by the Department of State to serve as the U.S. Permanent Representative to the World Meteorological Organization to represent the U.S. meteorological and hydrological interests of the public, academic and private communities. The National Weather Service (NWS) establishes bilaterals with other countries for cooperative activities that benefit both countries. The activities of the NWS abroad must follow U.S. government policy. Where no relevant policy exits, NWS must take the lead in engaging others to address issues and develop the necessary policy.

Approach: The NWS supports Department of State foreign policy initiatives by developing and implementing projects in specific countries and regions. The NWS currently participates in the S. Africa Binational Commission and has bilateral protocols established with Mexico, Korea, Viet-Nam, Saudi Arabia, Canada, China, as well as, 10 Caribbean countries. Bilaterals mainly have regularly scheduled meetings where cooperative activities are discussed and agreed upon. More frequent contact is maintained with countries providing data needed for warnings and forecasts for the United States.

Resources: Money used will be the Department of State's (DOS) contribution to the WMO Voluntary Cooperation Program (VCP), administered by the National Weather Service (NWS). Money is transferred from DOS to NWS each year. Amount varies, but is generally around $2 M. Funds for bilateral activities average about $200K per annum. The end-state staffing of 18 FTE's will be augmented by professional services contracts as necessary and appropriate.

Milestones/Initiatives:

FY 2002

- Advance U.S. foreign policy objectives. (W/IA)
- Provide technical guidance as requested to improve and strengthen NMHSs. (W/IA)
- Consider requests for additional bilateral activities. (W/IA)
- Promote building partnerships and cooperative activities between NMHSs and the media and private sector by implementing projects (e.g., Automatic Weather Station school projects). (W/IA)

- Continue to implement Bilateral and Binational Commission activities. (W/IA)
- S. Africa Binational Commission:
  Install additional educational meteorological observing systems in South Africa. (W/IA)
  Provide teachers from S. Africa with the opportunity to attend the AMS teacher-training workshop in meteorology. (W/IA)
  Finish modeling of the Vaal River Basin. (W/IA)
- Mexico:
  Establish relationships between U.S. and Mexican River Forecast Centers. (W/IA)
  Establish new bilateral agreement. (W/IA)
- Canada: Hold joint meeting, renew agreement. (W/IA)
- China: Host joint meeting. (W/IA)
- Viet-Nam: Hold 1st U.S.-V.N. Science and Technology Committee meeting (W/IA)
- S. Arabia: Move to Internet telecommunications for meteorological data and forecasts including input data for running their high-resolution model. (W/IA)
- Korea: Assist with improvements in mesoscale modeling. (W/IA)
- Identify existing sources of historical and current upper-air and surface data in seven African countries and provide for its compilation and digitization. (W/IA)
- Provide equipment, software and training to seven African countries to digitize current and future upper-air data. (W/IA)

FY 2003

- Advance U.S. foreign policy objectives. (W/IA)
- Continue to provide technical guidance as requested to improve and strengthen NMSs.(W/IA)
- Consider requests for additional bilateral activities. (W/IA)
- Promote building partnerships and cooperative activities between NMHSs and the media and private sector by implementing projects (e.g., Automatic Weather Station school projects). (W/IA)
- Continue to implement Bilateral and Binational Commission activities. (W/IA)
- S. Africa Binational Commission:
  Install additional educational meteorological observing systems in South Africa. (W/IA)
  Provide teachers from S. Africa with the opportunity to attend the AMS teacher-training workshop in meteorology. (W/IA)
- Canada: Host coordination meeting MSC. (W/IA)
- Korea: Hold coordination meeting with KMA. (W/IA)
- China: Continue bilateral activities. (W/IA)
- S. Arabia: Work to develop increased capabilities for marine meteorology data and forecasting. (W/IA)
- Mexico: Continue bilateral activities. (W/IA)

- Viet Nam: Continue bilateral activities. (W/IA)
- Upgrade system to obtain upper-air data from African countries. (W/IA)
- Begin the rescue of surface data from seven African countries. (W/IA)
- Establish methodology to provide for the rescue of historical surface and upper-air data in developing countries based on recent rescue experience. (W/IA)
- Construct Program Plan for the worldwide rescue of hydrometeorological data in jeopardy. (W/IA)
- Work with non-NOAA sponsors/donors to help fund the world wide hydrometeorological data rescue effort. (W/IA)

FY 2004

- Advance U.S. foreign policy objectives. (W/IA)
- Continue to provide technical guidance as requested to improve and strengthen NMSs.(W/IA)
- Consider requests for additional bilateral activities. (W/IA)
- Promote building partnerships and cooperative activities between NMHSs and the media and private sector by implementing joint projects.(W/IA)
- Continue to implement Bilateral and Binational Commission activities: (W/IA)
- S. Africa Binational Commission:
  Install additional educational meteorological observing systems in South Africa. (W/IA)
- Canada: Hold coordination meeting with MSC. (W/IA)
- China: Hold coordination meeting, renewal of agreement. (W/IA)
- S. Arabia: Focus on improved forecasting and increased data exchange. (W/IA)
- Korea: Continue bilateral activities. (W/IA)
- Mexico: Continue bilateral activities. (W/IA)
- Viet Nam: Continue bilateral activities. (W/IA)
- Continue to upgrade system to obtain upper-air data from all African countries. (W/IA)
- Construct Project Plans for the rescue of hydrometeorological data from other interested countries in Africa with international partners. (W/IA)

FY 2005

- Advance U.S. foreign policy objectives. (W/IA)
- Continue to provide technical guidance as requested to improve and strengthen NMSs.(W/IA)
- Consider requests for additional bilateral activities. (W/IA)
- Promote building partnerships and cooperative activities between NMHSs and the media and private sector by implementing joint projects. (W/IA)
- Continue to implement Bilateral and Binational Commission activities: (W/IA)
- S. Africa Binational Commission:
  Install additional educational meteorological observing systems in South Africa. (W/IA)

- Canada: Coordination meeting, renewal of Weather Radar Exchange Products agreement (W/IA)
- China: Continue bilateral activities. (W/IA)
- Korea: Continue bilateral activities. (W/IA)
- S. Arabia: Continue bilateral activities. (W/IA)
- Mexico: Continue bilateral activities. (W/IA)
- Viet Nam: Continue bilateral activities. (W/IA)
- Construct Project Plans for the rescue of hydrometeorological data from interested countries in South and Central America and the Caribbean with international partners. (W/IA)

FY 2006

- Advance U.S. foreign policy objectives. (W/IA)
- Continue to provide technical guidance as requested to improve and strengthen NMSs.(W/IA)
- Consider requests for additional bilateral activities. (W/IA)
- Promote building partnerships and cooperative activities between NMHSs and the media and private sector by implementing projects. (W/IA)
- Continue to implement Bilateral and Binational Commission activities: (W/IA)
- S. Africa Binational Commission:
  Install additional educational meteorological observing systems in South Africa. (W/IA)
- Canada: Continue bilateral activities. (W/IA)
- S. Arabia: Continue bilateral activities. (W/IA)
- Korea: Continue bilateral activities, renew agreement. (W/IA)
- China: Continue bilateral activities, host joint meeting. (W/IA)
- Mexico: Continue bilateral activities. (W/IA)
- Viet Nam: Continue bilateral activities, renew agreement. (W/IA)
- Construct Project Plans for the rescue of all hydrometeorological data from interested countries in Asia with international partners. (W/IA)

FY 2007

- Advance U.S. foreign policy objectives. (W/IA)
- Continue to provide technical guidance as requested to improve and strengthen NMSs.(W/IA)
- Consider requests for additional bilateral activities. (W/IA)
- Promote building partnerships and cooperative activities between NMHSs and the media and private sector by implementing joint projects. (W/IA)
- Continue to implement Bilateral and Binational Commission activities:. (W/IA)
- S. Africa Binational Commission:
  Install additional educational meteorological observing systems in South Africa. (W/IA)
- Canada: Continue bilateral activities. (W/IA)
- S. Arabia: Continue bilateral activities. (W/IA)
- Korea: Continue bilateral activities. (W/IA)

- China: Continue bilateral activities. (W/IA)
- Mexico: Continue bilateral activities, renew agreement. (W/IA)
- Viet Nam: Continue bilateral activities. (W/IA)
- Construct Project Plans for the rescue of hydrometeorological data from other interested countries**.** (W/IA)

3.0 Exercise Global Leadership

3.1 Promote the open exchange of data and information worldwide.

- ✔ ***Continue to actively advocate open exchange of information worldwide.***
- ✔ ***Use regional/international forums to disseminate information on new affordable data and information systems as they become available.***

Objective: Promote open and unrestricted exchange of data and information worldwide by: advocating the U.S. position and enlisting support of like-minded groups/countries, making as much information available as possible on existing dissemination systems, and by using regional international meetings to present information about the various dissemination systems and data.

Overview: Beginning in the 1980's, a number of European Union countries began to attempt to take certain governmental functions, e.g. government data collections such as geographic data, "off budget" by asserting strong copyrights in an attempt to raise revenue from data sales. This was occurring just as U.S. data policy was consolidating around the goal of "open and unrestricted" access to taxpayer-funded government information.

Under this pressure, some European countries began to sell meteorological data and products in the early 1990s. Some even began to withdraw data from international exchange. In response to this, the United States (U.S.) insisted that WMO (World Meteorological Organization) take up the issue of how to preserve the sharing of weather and climate data and products worldwide. We often stood alone. But out of these intense international negotiations came WMO Resolution 40 (Cg-XII). While bowing to the concept that core meteorological data must continue to be shared openly, it contemplates a restrictive regime whereby countries can declare certain data is non-basic, put conditions on its use, and attempt to sell it. What WMO Resolution 40 does on its face is to allow all weather and climate data and products which we receive from international sources to be provided to all U.S. interests but not to send it outside the U.S.

The 1996 revisions to OMB Circular No. A-130 specifically recognized this trend in Europe, and directed U.S. agencies to take steps, in consultation with OMB and State, to counter it wherever it manifests itself. See 61 Federal Register 6452 (February 20, 1996).

Many developing countries and countries in transition find it difficult, if not impossible to keep abreast of the developments in fields that have a direct impact on their organizations and the services they provide. Many speak of the technological gap between developed and developing countries. Some feel that the gap is becoming greater, not lessening. With this restricted view of their hydrometeorological services, they are easily swayed to sell their observational data. By attempting to provide an awareness of evolving technologies and by continually attempting to close the informational and technological gap, a more cohesive international hydrometeorological community will evolve.

Approach: Since its adoption in 1995, we have had to deal with many conflicting interpretations of WMO Resolution 40 and how it should be implemented. The issue of maintaining free and open exchange of environmental data may never be completely resolved. The economic value of global data and products is far too great, for both developed and developing countries, to exacerbate the limited amount of environmental data already available. Our international responsibilities for programs such as the Tropical Cyclone Program, the Volcanic Ash Advisory Program, and the Tsunami Program, demand a continuing sharing of environmental data. We must actively work with other agencies and groups to ensure a free and open flow of environmental data and information worldwide.

For many reasons, the developing countries and/or countries in transition are seldom in a position to grasp new technologies as they become available in the operational arena. Frequently, new technologies reduce overall operational costs and/or improve the "product" and its delivery. Whilst the best approach may be for a regional consortium approach (it is far more cost-effective for a number of countries to band together and to share resources), the next best effort may be for those on the leading edge of technologies to provide leadership in assimilating these at the national level.

Resources: Money used will be the Department of State's (DOS) contribution to the WMO Voluntary Cooperation Program (VCP), administered by the National Weather Service (NWS). Money is transferred from DOS to NWS each year. Amount varies, but is generally around $2 M. The end-state staffing of 18 FTE's will be augmented by professional services contracts as necessary and appropriate.

Milestones/Initiatives:

FY 2002

- Continue to monitor and raise discussions on international data exchange to higher levels of government, as necessary, through meetings, visits, and other international interactions. (W/IA)
- Continue to press our views in other intergovernmental bodies such as ICAO and WMO (WMO E.C., Geneva, June; ICAO Divisional, Regional Meetings). (W/IA)
- Continue to enlist like-minded groups/countries to develop a unified front to limit further data restrictions. (W/IA)

- Increase use of Internet/Intranet for exchange of data and products (e.g., disaster and early warning information, hurricane positions and tracks, and climate forecasts) by getting other NMHSs connected and using Internet/Intranet. (W/IA)
- Continue to collect and distribute satellite and radar imagery via the Internet. (W/IA)
- Test limits of WMO data exchange resolutions, e.g., for early warnings. (W/IA)
- Introduce an international hydrologic standard data exchange format for WMO RA-IV. (W/IA)
- Work with AID, multi-lateral financial institutions and NGOs to implement projects to get more data and information flowing between NMHSs, disaster and emergency response organizations and their user communities. (W/IA)
- Solicit views and involvement of U.S. private sector in WMO activities e.g., WMO RA-I and RA-IV meetings, exhibits, relevant issues. (W/IA)
- Coordinate issues and represent U.S. on telecom, data coding and other system issues at international meetings. (W/IA)
- ncrease number of CARMEN stations (AWS observations from ham radio operators) to 65 operating in the greater Caribbean region. (W/IA)
- Upgrade NMHS automatic weather station modem baud rates. (W/IA)
- Provide funding for international COSMIC consortium to test methodology to produce global upper-air observations from satellites. (W/IA)
- Establish and implement U.S./Mexico exchange of hydromet data and forecast products
- Use WMO RA-IV Hurricane Committee, Meeting; Conjoint session of the ICAO MET/COM Divisional Meeting and WMO Commission for Aeronautical Meteorology and other fora to disseminate information on new data and information systems as they become available. (W/IA)
- Support pilot projects and use of new observing concepts. (W/IA)
- Encourage use of latest Information Communication (IC) technologies by NMHSs. (W/IA)

FY 2003

- Prepare, coordinate and articulate a U.S. policy (with other Federal Agencies , academia, and the private sector) that focuses on minimizing/eliminating the restrictions on the international exchange and use of meteorological and hydrologic data and products. (W/IA)
- Liaise with groups/countries having a similar position on international data exchange to develop a common approach prior to WMO Cg-XIV (May, Geneva) (W/IA)
- Summarize and ensure dissemination of the results of WMO Cg-XIV to interested parties, especially with regard to the data exchange issue. (W/IA)
- Continue to press U.S. views for international data exchange policies in other international organizations, such as ICAO and IOC. (W/IA)
- Continue to collect and distribute satellite and radar imagery via the Internet. (W/IA)

- Increase use of Internet/Intranet for exchange of data and products (e.g. disaster and early warning information, hurricane positions and tracks, climate forecasts) by getting other NMHSs connected and using Internet/Intranet. (W/IA)
- Continue implementation of a standard hydrologic exchange format. (W/IA)
- Work with AID, multi-lateral financial institutions and NGOs to implement projects to get more data and information flowing between NMHSs, disaster and emergency response organizations and their user communities. (W/IA)
- Solicit views and involvement of U.S. private sector in WMO activities e.g., WMO Congress XIV (May, Geneva), exhibits, relevant issues. (W/IA)
- Coordinate issues and represent U.S. on telecom, data coding and other system issues at international meetings. (W/IA)
- Increase number of CARMEN stations to 70 operating in the greater Caribbean region and introduce the Automated Packet Radio System for reporting as far as possible. (W/IA)
- Upgrade NMHS automatic weather station modem baud rates. (W/IA)
- Provide funding for international COSMIC consortium and discuss future recurring funding possibilities with other potential international partners. (W/IA)
- Obtain Canadian radar products. (W/IA)
- Use WMO RA-IV Hurricane Committee, WMO Congress XIV and other fora to disseminate information on new data and information systems as they become available. (W/IA)
- Continue to put as many data and products as possible on the Internet. (W/IA)
- Support pilot projects and use of new observing concepts. (W/IA)
- Encourage use of latest IC technologies by NMHSs. (W/IA)
- Evaluate Pan American Climate Studies Sounding Network real time data for impact on hurricane forecasts. (W/IA)

FY 2004

- Monitor the international exchange of data and products with respect to the decisions taken at Cg-XIV. (W/IA)
- Develop position(s) for EC-56 (June, Geneva) that reflect(s) information gained in the monitoring of data and products exchanged internationally. (W/IA)
- Pursue aggressive open and unrestricted international data exchange policy in WMO and other meetings to increase the type and amount of available data. (W/IA)
- Work with AID, multi-lateral financial institutions and NGOs to implement projects to get more data and information flowing between NMHSs, disaster and emergency response organizations and their user communities. (W/IA)
- Continue implementation of a standard hydrologic exchange format. (W/IA)

- Move to collect and distribute all types of meteorological, hydrological data via the Internet. (W/IA)
- Solicit views and involvement of U.S. private sector in WMO activities e.g., meetings, exhibits, relevant issues. (W/IA)
- Coordinate issues and represent U.S. on telecom, data coding and other system issues at international meetings. (W/IA)
- Obtain additional data from existing and new Caribbean and Central American radar networks. (W/IA)
- Increase number of CARMEN stations to 75 operating in the greater Caribbean region and continue to upgrade the Automated Packet Radio System as far as possible. (W/IA)
- Upgrade additional NMHS automatic weather station modem baud rates. (W/IA)
- Provide funding for international COSMIC consortium and hold meeting with potential international partners to agree on how to fund continuing operations after the pilot phase. (W/IA)
- Obtain non-NMHS automatic weather station data through GOES. (W/IA)
- Use WMO RA-IV Hurricane Committee, WMO EC meetings, Regional ICAO meetings and other fora to disseminate information on new data and information systems. (W/IA)
- Support pilot projects and use of new observing concepts. (W/IA)
- Encourage use of latest IC technologies by NMHSs. (W/IA)
- Coordinate access to Caribbean composite radar data for WMO RA-IV and TPC (TPC/IA)

FY 2005

- Continue to monitor the international exchange of data and products in light of the decisions taken at Cg-XIV and EC-56. (W/IA)
- Develop U.S. positions for EC-57 (June, Geneva) that reflects any variance found in the international arena with respect to earlier decisions. (W/IA)
- Work with AID, multi-lateral financial institutions and NGOs to implement projects to get more data and information flowing between NMHSs, disaster and emergency response organizations and their user communities. (W/IA)
- Continue implementation of a standard hydrologic exchange format. (W/IA)
- Move to collect and distribute all types of meteorological, hydrological data via the Internet. (W/IA)
- Solicit views and involvement of U.S. private sector in WMO activities e.g., meetings, exhibits, relevant issues. (W/IA)
- Coordinate issues and represent U.S. on telecom, data coding and other system issues at international meetings. (W/IA)
- Obtain additional data from new Caribbean and Central American radar networks. (W/IA)
- Fully automate the CARMEN network and provide around the clock updates of weather data by using Automated Packet Radio System. (W/IA)
- In association with other international sponsors, provide funding for

continuation of COSMIC. (W/IA)
- Upgrade NMHS automatic weather station modem baud rates. (W/IA)
- Improve supplementary observation network in East Africa using low cost weather stations and ham radio operators. (W/IA)
- Use WMO RA-IV, WMO EC meetings and other fora to disseminate information on new data and information systems. (W/IA)
- Support pilot projects and use of new observing concepts. (W/IA)
- Encourage use of latest IC technologies by NMHSs. (W/IA)

FY 2006
- Work with AID, multi-lateral financial institutions and non-profit agencies to implement projects to get more data and information flowing between NMHSs, disaster and emergency response organizations and their user communities. (W/IA)
- Move to collect and distribute all types of meteorological, hydrological data via the Internet. (W/IA)
- Solicit views and involvement of U.S. private sector in WMO activities e.g., meetings, exhibits, relevant issues. (W/IA)
- Coordinate issues and represent U.S. on telecom, data coding and other system issues at international meetings. (W/IA)
- Obtain additional data from new Caribbean and Central American radar networks. (W/IA)
- Improve supplementary observation network in East Africa using low cost weather stations and ham radio operators. (W/IA)
- Upgrade NMHS automatic weather station modem baud rates. (W/IA)
- Use relevant forums to disseminate information on new data and information systems as they become available. (W/IA)
- Support pilot projects and use of new observing concepts. (W/IA)
- Encourage use of latest IC technologies by NMHSs. (W/IA)

FY 2007
- Raise discussions of international data exchange to higher levels in other governments and in other fora, as necessary, though meetings, visits, and other international interactions. (W/IA)
- Work with AID, multi-lateral financial institutions and non-profit agencies to implement projects to get more data and information flowing between NMHSs, disaster and emergency response organizations and their user communities. (W/IA)
- Move to collect and distribute all types of meteorological, hydrological data via the Internet. (W/IA)
- Solicit views and involvement of U.S. private sector in WMO activities e.g., meetings, exhibits, relevant issues. (W/IA)
- Coordinate issues and represent U.S. on telecom, data coding and other system issues at international meetings. (W/IA)
- Obtain additional data from new Caribbean and Central American radar networks.(W/IA)
- Improve supplementary observation network in East Africa using low cost

weather stations and ham radio operators. (W/IA)

- Upgrade NMHS automatic weather station modem baud rates. (W/IA)
- Use relevant forums to disseminate information on new data and information systems as they become available. (W/IA)
- Support pilot projects and use of new observing concepts. (W/IA)
- Encourage use of latest IC technologies by NMHSs. (W/IA)

3.0 Exercise Global Leadership

3.2 Increase U.S. participation in international activities.

- ✔ ***Develop and implement in association with all meteorological service agencies in the World Meteorological Organization (WMO) Region IV, an integrated regional observing system (2005).***
- ✔ ***Establish a regional maintenance activity for surface and upper-air observing systems in developing countries in WMO Region IV (2002)***

Objective: Increase U.S. participation in international activities by hosting various workshops and collaborative efforts, including working to develop an integrated regional observing system and to establish regional maintenance for surface and upper-air observing systems.

Overview: The global network of surface and upper air observations is becoming difficult to sustain. Advanced technologies of observations from space-based satellites, automated meteorological information from aircraft, and automated surface observations have made a number of innovations possible. The classic manned surface observing site has a need for at least five persons to maintain a 24-hour, 7-day per week program. Many locations have observations only during certain times of the day - not continuously. And the instrumentation is difficult to maintain, both from the perspective of training technicians and spare parts. Upper air observations are taken at best only twice per day - frequently only once and sometimes not at all because of the cost of expendables (radiosondes, balloons, etc.) and maintenance of the equipment. A cost-effective system of surface and upper air observations would have the proper blend of manned and automated surface observations; radiosondes launched from manned sites along with automated meteorological observations both en route and ascent and descent reports; and observations from space-based meteorological satellites.

Observations are critical to the mission of the NWS's warning and forecast programs, especially to the hurricane warning program. The U.S., with the Tropical Prediction Center (TPC) as the action body, has taken on the role of a Regional Specialized Meteorological Center (RSMC). Not all countries have the infrastructure to maintain their own surface and upper air observational programs (routine maintenance, emergency repairs, replacements, training). Keeping the surface and radiosonde observing equipment in working order has become a problem. Many years ago the NWS maintained a cadre of skilled maintenance technicians that made routine maintenance calls as well as emergency trips to fix broken equipment. The individual countries did not have the in house expertise to maintain and fix their observing equipment. And since these observations were vital to the U.S. and the fulfillment of its national and international meteorological obligations, the U.S. maintained this capability. However, with the competition for limited resources, this approach was abandoned. Several attempts are being made to accomplish this maintenance activity in other ways.

Approach: The optimum mix of the various forms of surface and upper air observation methodologies for an operationally acceptable and cost-effective observing scheme must be determined. This will require the interaction and cooperation of many government and private sector entities. Automated surface observations can, to a certain extent and at certain locations, replace the labor-intensive manned sites as well as making observations continuously available and from locations previously inaccessible. Upper air observations from radiosonde stations are taken at most twice per 24-hour period. Automated meteorological reports from enroute and landing and taking off aircraft can greatly enhance and supplement a backbone upper air network; and meteorological information from satellites enrich other observations. The "proper mix" of these various observing techniques must be determined in consultation from the producers of Numerical Weather Prediction (NWP) output and from users including forecasters and "end users." These observations and NWP output for the Caribbean and Central American areas are critical to the mission of the NWS, especially the Tropical Prediction Center for its national and international responsibilities.

Because these observational programs are critical to the role and mission of the U.S. NWS, an activities will be undertaken to ensure their availability, including timeliness and accuracy. The National Logistics Supply Center is able to deliver parts and radiosondes to sites in Region IV within 24 hours ninety percent of the time. In addition maintenance help to these stations is routinely provided to these stations via telephone. Some countries do have an expertise in logistical and maintenance matters that they can share with others. Also, some contractor support, especially in the maintenance of upper air equipment, is necessary.

Resources:
Money used will be the DOS's contribution to WMO's VCP, administered by the NWS. Other funds would be solicited from other international organizations such as the World Bank, United States Agency for International Development (USAID), etc. Staffing will be augmented by professional services contracts, as necessary and appropriate.

Milestones to Accomplish Objective:

FY 2002
- Support U.S. government, World Bank, IADB and OAS objectives, to strengthen regional observing and forecasting capabilities in Central America and Caribbean. (W/IA)
- Develop regional hydro/met center concept for Central America. (W/IA)
- Sponsor Mexican and Caribbean participation to NAOS meeting. (W/IA)
- Host a planning meeting to establish a regional hydro/met project within APEC. (W/IA)
- Secure additional facilities, if needed, for a centralized Regional maintenance activity. (W/IA)
- Implement a regional maintenance activity for surface and upper air

observing systems for developing countries in WMO RA-IV. (W/IA)
- Replace 3 Hydrogen generators in RA-IV to assist countries with their provision of upper air observations for U.S. forecasts. (W/IA)
- Replace CHUAS ART-1 and Viz Loran-C upper air systems with 5 RDF systems to utilize common radiosonde in entire CHUAS network. Provide technical advice to other NMHSs as needed. (W/IA)

FY 2003
- Support U.S. government, World Bank, IADB and OAS objectives, to strengthen regional observing and forecasting capabilities in Central America and Caribbean. (W/IA)
- Implement a hydro/met center concept with CRRH for Central America. (W/IA)
- Sponsor Mexican and Caribbean participation to NAOS meeting. (W/IA)
- Implement a regional hydro/met project within APEC. (W/IA)
- Submit RSMC concept document for hydrological forecasting for approval by WMO CG-XIV. (W/IA)
- Replace 3 Hydrogen generators in RA-IV to assist countries with their provision of upper air observations for U.S. forecasts. (W/IA)

FY 2004
- Develop the final integrated regional observing system. The WMO RA-IV Hurricane Committee would provide a proper international forum. (W/IA)
- Present the final integrated regional observing system to CBS for approval. The CBS Extraordinary Meeting would provide a forum for this presentation. (W/IA)
- Support U.S. government, World Bank, IADB and OAS objectives, to strengthen regional observing and forecasting capabilities in Central America and Caribbean. (W/IA)
- Sponsor Mexico and Caribbean participation to NAOS meeting. (W/IA)
- Continue to support regional center operations in Central America. (W/IA)
- Propose RSMCs for hydrological forecasting at WMO Commission for Hydrology meeting. (W/IA)
- Work with APEC and SPREP partners on regional projects in Pacific Rim. (W/IA)
- Replace 4 Hydrogen generators in RA-IV to assist countries with their provision of upper air systems for U.S. forecasts. (W/IA)

FY 2005
- At the WMO RA-IV meeting, agree to the implementation by NMHSs and others for the implementation of the final integrated regional observing system, as approved. (W/IA)
- Support U.S. government, World Bank, IADB and OAS objectives, to strengthen regional observing and forecasting capabilities in Central America and Caribbean. (W/IA)
- Establish RSMC for hydrological forecasting in U.S. (W/IA)
- Consider extending regional pibal network based on evaluation of PACS-

SONET project.(W/IA)

- Prepare revision to NWS GOES-DCS Procedure Guide. (W/IA)
- Sponsor Mexican and Caribbean participation to NAOS meeting. (W/IA)
- Work with APEC and SPREP partners on regional projects in Pacific Rim. (W/IA)
- Continue as focal point for CHUAS stations and support maintenance and improvements in data flow. (W/IA)

3.0 Exercise Global Leadership

3.3 Foster national and international education efforts and technology transfer programs.

- ✔ ***Develop courses in "distance learning over Internet" in meteorology and hydrology in at least two languages (initiate 3 courses by 2000, and 10 courses by2005)***
- ✔ ***Develop a course in "Application of Climate Data" for international students (2002).***

Objective: Foster international education efforts by developing Internet based distance learning training courses.

Overview: The lack of trained and capable hydrometeorologists and technicians is one of the major shortfalls facing the worldwide meteorological and hydrological community. In their absence, the infrastructure of a NMHS is diminished, further weakening the international community and its ability to provide timely and accurate warnings and forecasts for the protection of life and property and its contribution to the economic well being of a center of commerce. It is important to promote capacity building by assisting NMHSs in the attainment of self-sufficiency in meeting training needs and in developing their own human resources. It is in the best interest of the U.S. and the international community to promote the exchange of training knowledge, resources and expertise, making particular use of new and emerging relevant technologies and techniques.

One of the best ways to foster international education efforts is demonstrated by the International Desks program at NCEP. While preparing forecasts for their local area, international visiting forecasters from other countries work side by side with NCEP forecasters to learn about NWS models, data assimilation techniques, observation information, etc., and to give valuable feedback on the performance of our global products in their areas.

Climate and river flow forecasting are important tools for governments and the public. These new applications are just being realized as a new technology to improve life on our planet. The United States is a leader in these applications. We must contribute to capacity building by assisting National Meteorological and Hydrological Services in the attainment of meeting these challenges.

Approach: The U.S. is one of the recognized leaders in these areas. The components of this training project may include the preparation and translation of training publications, audio-visual aids and computer software. Coordination within RA-IV and with other WMO Members is important to consider mutual interaction and exchanges of training knowledge.

Climate is and will be the "hot topic" globally for the foreseeable future. We must promote the exchange of training knowledge, resources and expertise with Members on the opportunity presented by the climate issue, making particular use of new and emerging technologies and techniques. Utilizing climate information for water management and agriculture by NMHSs in their capacity building efforts will enhance the quality of life of their peoples and enhance their (the NMHSs) visibility and role in their governments. Therefore, to foster the effective application of climate knowledge and information for the benefit of society and the provision of climate services, including the prediction of significant climate variations both natural and as a result of human activity, a course will be developed to facilitate this capacity building through the effective collection and management of climate data.

The NWS has developed and deployed sophisticated software systems to provide the basis for hydrologic forecasts needed for a variety of purposes, from flood and drought mitigation to overall water management. This technology, aided by parallel advances in satellite and radar technologies, data assimilation and processing capabilities, has many humanitarian and economic development applications. International donors and aid agencies have asked NWS to install flood forecasting systems in other countries. Installing these systems in other countries not only increases their hydrometeorological development, but it provides a dividend to NWS as a test bed for further advancement.

Resources: Money used will be the DOS's contribution to WMO's VCP, administered by the NWS. Staffing will be augmented by professional services contracts as necessary and appropriate.

Milestones/Initiatives:

FY 2002

- Review and promote the use of suitable courses for distance learning in meteorology, hydrology and related subjects. (W/IA)
- Support development of distance learning via CDs and Internet (e.g. Meteoforum, web master) (W/IA)
- Develop NWS RFS Internet course to be used internationally. (W/IA)
- Develop an interactive satellite interpretation course. (W/IA)
- Implement one regional course. (W/IA)
- Provide on-the-job training at international desks to improve capabilities of international scientists and provide operational scrutiny of performance of NWS products outside the U.S. (W/IA)
- Offer short courses in cooperation with WMO or ICAO on binary codes, tropical cyclone forecasting, use of Internet, and climate applications. (W/IA)
- Develop projects to modernize and strengthen capabilities of NMHSs and cooperating agencies in foreign governments using U.S. technology. (W/IA)
- Provide technical expertise to help rebuild and upgrade NMHSs in response to natural disasters such as hurricanes.(W/IA)

- Complete operational implementation of satellite precipitation estimates in Mexico. (W/IA)

FY 2003

- Monitor and update courses as needed (including the development of new courses if new products and technology dictate). (W/IA)
- Conduct a test of distance learning involving RMTCs in Barbados and Costa Rica. (W/IA)
- Conduct an interactive satellite interpretation course in English. (W/IA)
- Translate NWS RFS Internet course into Spanish for use internationally (W/IA).
- Provide on-the-job training at international desks to improve capabilities of international scientists and provide operational scrutiny of performance of NWS products outside the U.S. (W/IA)
- Offer short courses in cooperation with WMO on tropical cyclone forecasting, operational hydrology, use of Internet, and climate applications. (W/IA)
- Develop projects to modernize and strengthen capabilities of NMHSs and cooperating agencies in foreign governments using U.S. technology. (W/IA)
- Provide technical expertise to help rebuild and upgrade NMHSs in response to natural disasters such as hurricanes. (W/IA)

FY 2004

- Review and update courses as needed (including development of new courses as new technologies and products emerge). (W/IA)
- Provide capabilities for distance learning in meteorology, hydrology and related subjects in other languages. (W/IA)
- Conduct an interactive satellite interpretation course in Spanish. (W/IA)
- Provide on-the-job training at international desks to improve capabilities of international scientists and provide operational scrutiny of performance of NWS products outside the U.S. (W/IA)
- Offer short courses in cooperation with WMO or ICAO on binary codes, tropical cyclone forecasting, and management concepts for hydrometeorological services. (W/IA)
- Develop projects to modernize and strengthen capabilities of NMHSs and cooperating agencies in foreign governments using U.S. technology. (W/IA)
- Provide technical expertise to help rebuild and upgrade NMHSs in response to natural disasters such as hurricanes. (W/IA)

FY 2005

- Review and promote the use of suitable courses for distance learning in meteorology, hydrology and related subjects. (W/IA)
- Work with others to translate available courses in other languages. (W/IA)
- Provide on-the-job training at international desks to improve capabilities of international scientists and provide operational scrutiny of performance of

NWS products outside the U.S. (W/IA)
- Offer short courses in cooperation with WMO on tropical cyclone forecasting, and operational hydrology. (W/IA)
- Develop projects to modernize and strengthen capabilities of NMHSs and cooperating agencies in foreign governments using U.S. technology. (W/IA)
- Provide technical expertise to help rebuild and upgrade NMHSs in response to natural disasters such as hurricanes. (W/IA)

FY 2006
- Provide on-the-job training at international desks to improve capabilities of international scientists and provide operational scrutiny of performance of NWS products outside the U.S. (W/IA)
- Offer short courses in cooperation with WMO or ICAO on binary codes, tropical cyclone forecasting, and management concepts for hydrometeorological services. (W/IA)
- Develop projects to modernize and strengthen capabilities of NMHSs and cooperating agencies in foreign governments using U.S. technology. (W/IA)
- Provide technical expertise to help rebuild and upgrade NMHSs in response to natural disasters such as hurricanes. (W/IA)

FY 2007
- Provide on-the-job training at international desks to improve capabilities of international scientists and provide operational scrutiny of performance of NWS products outside the U.S. (W/IA)
- Offer short courses in cooperation with WMO on tropical cyclone forecasting, and operational hydrology. (W/IA)
- Develop projects to modernize and strengthen capabilities of NMHSs and cooperating agencies in foreign governments using U.S. technology. (W/IA)
- Provide technical expertise to help rebuild and upgrade NMHSs in response to natural disasters such as hurricanes. (W/IA)

18.0 Organizational Change - Human Resources Management

Strategic Plan Context:

4.0 Change the NWS Organizational Culture

4.1 ***Implement human resources and management practices to support our Vision and reflect our Core Values.***

- ✔ ***Review the 1998 and 1999 National Partnership for Reinventing Government Employee Survey Results and 1999 NOAA Survey Feedback and Action (SFA) results, and other relevant documents to determine the organizational culture deficits related to implementing the NWS Vision (2000).***
- ✔ ***Develop and implement an improvement plan to address culture deficits with specific targets tied to the results of applicable survey instruments in 2001 and beyond.***
- ✔ ***Implement effective tools to assess management performance, and provide feedback to managers (2002).***
- ✔ ***Implement core competencies for all supervisors and leaders (2005).***

Approach: The Strategic Plan envisions the organizational culture of the NWS must change. A key element of that change is in the manner with which the valued staff of the NWS are treated in their workplace and in how the NWS understands and respects the strengths and differences of the diverse NWS workforce.

In January 2001, the General Accounting Office (GAO) designated Strategic Human Capital Management as a Government-wide High-Risk Area. GAO stated, "all Federal agencies need to give strategic human capital management the enhanced and sustained attention it deserves and to modernize their human capital policies and practices." In May 2001, the Office of Management and Budget (OMB) issued OMB Bulletin 01-07 directing all agencies to complete a workforce analysis. The Office of Personnel Management (OPM) is developing tools to assist agencies in workforce planning.

The NWS Director has established a Corporate Board Committee on Workforce/Human Capital, with a mission to: "Review and assess current and make recommendations to the Board to improve NWS Human Capital practices, procedures and policies; provide guidance on Human Capital issues and policies". The Committee is chaired by the NWS Chief Financial Officer/Chief Administrative Officer. The NWS Workforce/Human Capital Committee has undertaken development of a strategic workforce plan for the National Weather Service. The strategic workforce plan will be a long-range projection of workforce needs and contain strategies for meeting those needs. The plan will enable NWS to: 1) take a pro-active approach to change (based on anticipated changes in science, technology, operations and services, etc.); 2) ensure succession planning; 3) facilitate retraining of employees in mission critical areas; 4) provide a planned approach to recruitment and retention; and 5) enable the agency to achieve

maximum organizational effectiveness.

4.0 Change the NWS Organizational Culture

4.3 ***Encourage, recognize, and reward innovation at all levels, especially for improved service to customers.***

- ***Incorporate customer satisfaction indices (refer to 1.4) and reduced operating costs when performing employee appraisals and determining employee recognition (2005).***

Approach: The Strategic Plan envisions the adjustment of the NWS organizational culture to one that is immersed in and encourages innovation and the assumption of personal responsibility for achieving the mission and managing resources wisely. A key element of that change is in identifying and implementing ways NWS staff can be recognized for their creativity and innovation in customer service, and for their insight and actions to utilize and manage NWS resources to reduce NWS operating costs so that new and important science, technology and innovative services can be developed at a reasonable cost to Americans.

Reviewing and understanding the best employee recognition practices of the public sector and of profit and non-profit organizations in the private sector is the first step to incorporating customer service and cost reduction into employee performance appraisal and recognition systems. Customer service indices are being developed in Strategic Plan Objective 1.4 and are scheduled to be available for use in FY 2004. Objective 4.3 will be accomplished as part of the NWS Strategic Workforce Planning effort described under Objective 4.1.

Milestones/Initiatives:

FY 2002

- Complete an NWS Strategic Workforce Planning outline. (CFO)
- Obtain the advice of the Private Sector Council. (CFO)
- Complete an analysis of the National Academy of Sciences study of public-private responsibilities for weather services for possible effects on future NWS workforce needs. (CFO)
- Complete assessment of the Office of Science and Technology's Technology Infusion Plan on future NWS workforce needs. (CFO)
- Work with the Office of Climate, Water and Weather Services and the NWS Strategic Planning and Policy Office to assess the need for change in operations concepts in the future and the impact of future workforce needs. (CFO)
- Complete analysis of NWS and societal demographic data. (CFO)
- Conduct baseline and future skills assessments for mission critical occupations. (CFO)
- Define succession planning needs to avoid loss in leadership continuity, institutional knowledge, and expertise. (CFO)

- Begin development of a workforce toolbox to increase competitiveness in recruiting and retention. (CFO)
- Review award and recognition practices in government and industry, with special emphasis on recognition programs focusing on innovative customer service and cost reduction. (CFO)
- Explore the requirements and limits of the existing NOAA Performance Management System and NOAA Awards System with regard to innovative customer service and cost reduction. (CFO)

FY 2003
- Complete the first NWS Strategic Workforce Plan and begin implementation. (CFO)
- Develop an on-going assessment program to assess the effectiveness of the plan. (CFO)
- Complete development of a workforce toolbox to increase competitiveness in recruiting and retention. (CFO)
- Develop action plan to incorporate customer service indices and cost reduction measures into NOAA Performance Management System and NOAA Awards system and coordinate with Strategic Plan Objective 1.4 roadmap team lead. (CFO)
- Support NWS participation in the next Survey Feedback Action. (CFO)

FY 2004
- Complete the annual update to the NWS Strategic Workforce Plan. (CFO)
- Complete the first year assessment on the effectiveness of the plan. (CFO)
- Implement action plan to incorporate customer service indices and cost reduction measures into NOAA Performance Management System and NOAA Awards system, including NOAA/DoC Human Resources community coordination, collective bargaining agreement obligations, and familiarization of supervisors and employees. (CFO)
- Complete negotiations on a new collective bargaining agreement with the NWS Employees Organization. (CFO)

FY 2005
- Complete the annual update and assessment of the NWS Strategic Workforce Plan. (CFO)
- Support NWS participation in the next Survey Feedback Action. (CFO)

FY 2006
- Complete the annual update and assessment of the NWS Strategic Workforce Plan. (CFO)

FY 2007
- Complete the annual update and assessment of the NWS Strategic Workforce Plan. (CFO)
- Support NWS participation in the next Survey Feedback Action. (CFO)
- Complete negotiations on a new collective bargaining agreement with the

NWS Employees Organization. (CFO)

19.0 Organizational Change - Budget/Financial Management

Strategic Plan Context:

4.0 Change the NWS Organizational Culture

4.2 ***Place decision and budget authority at the lowest and most effective levels.***

✔ ***Implement a financial information management system which supports delegation of budget authority; periodically review operating procedures to ensure delegation of authority to lowest appropriate level (2005).***

5.0 Manage NWS Resources

5.1 Implement an integrated policy, planning, budgeting, assessment, and accountability system that links decision making and goals to program implementation and evaluation.

- ***Ensure*** *operational* ***costs are the minimum required to carry out the NWS mission and meet the goals of this strategic plan.***

✔ ***Base decision to eliminate or add services or activities on assessment of costs to be incurred and the benefits to be achieved.***

Objective: The purposes of these subgoals are to support the larger NWS strategic goals of changing the NWS organization culture to embrace change and foster innovation, and manage our resources to maximize the return on investment to America. Effective implementation of these subgoals will result in a well-trained management team exercising appropriate authority at the level closest to the relevant decision point using timely, complete financial and performance information. Senior management will be able to hold each organizational level accountable for use of resources and results by having timely, effective management information available against which to evaluate the manager. To accomplish these subgoals, NWS will need better financial systems which broaden our ability to hold managers accountable in their exercise of their new authority.

Approach: These sub-goals will greatly assist in achieving the cultural change needed to assure that decision making is accomplished at the lowest possible level with the accountability for those decisions enlightened with the best financial systems.

The CFO's office will lead the development of a broad range of proven management tools and systems to regularly provide all levels of NWS management NWS financial and performance information. All levels of management will be trained in their use. The CFO's office will enhance its capabilities to provide objective information to decision makers, including the Director, to enhance planning and decision-making in NWS. The approach will make full use of the existing and planning systems from NOAA, such as the new accounting system, CAMS (Commerce Administrative Management System), as they come on line. The CFO's office will work as closely as possible with NOAA in their development. The CFO's office will immediately

undertake development a regular financial reporting system based on the existing accounting and personnel systems. Inclusion of existing performance measures will be explored. To modernize and streamline existing financial and information systems, a contract study was completed that documented and proposed an automated financial management system. Based on this effort a cost management/accounting system is being developed to know the full/relevant costs of providing services and products. The system will require a means of gathering/reporting cost information, and full use of the proposed NWS financial management system and CAMS. Extensive training will need to regularly occur within the CFO's office and throughout NWS. The CFO's office will develop plans for initial and continuing training to understand the data gathering requirements, the use of the resulting information for decision making purposes and the use of automated systems as appropriate. All of these efforts will need to be an integral part of supporting the integrated policy, planning, budgeting, assessment, and accountability system (Subgoal 5.1). Funding commitments will be more fully defined over the next year and may be substantial to put an operational financial management and cost accounting system in place. These costs are likely to be borne within existing budgets**.**

Milestone/Initiatives:

FY 2002

- Financial management system fully operational NWS-wide. Regular reportsare provided for budget formulation and execution using a cost basis
- Complete headquarters model for cost management, and pilot test. Training programs for cost management and use of the financial management system are implemented.
- Plans are made to convert to CAMS as CAMS comes on line in NOAA.
- CFO's office provides written financial policies and guidance on an ongoing basis
- Begin operations with spending authority at lowest possible level.

FY 2003

- Regular updates/revisions are made to financial management system to reflect changes to strategic plans, budgets and operating plans. Potential system upgrades are reviewed
- Cost accounting is institutionalized as a significant NWS management tool with successive value added uses developed and implemented, such as activity based budgeting
- Financial training is routinely provided managers and staff as needed.
- Delegations of authority are assessed based on results, and adjusted accordingly
- CAMS is implemented.

FY 2004

- Regular updates/revisions are made to financial management system to reflect changes to strategic plans, budgets and operating plans. Potential system upgrades are reviewed

- Commence using the system to routinely capture performance measures to support formulation and planning. Operating measures help to analyze execution data. System begins using annual performance and operating plans for NWS and generates reports against them.
- Cost accounting is institutionalized as a significant NWS management tool with successive value added uses developed and implemented, such as activity based budgeting
- Financial training is routinely provided managers and staff as needed
- Delegations of authority are assessed based on results, and adjusted accordingly

FY 2005

- Regular updates/revisions are made to financial management system to reflect changes to strategic plans, budgets and operating plans. Potential system upgrades are reviewed
- Cost accounting is institutionalized as a significant NWS management tool with successive value added uses developed and implemented, such as activity based budgeting
- Financial training is routinely provided managers and staff as needed
- Delegations of authority are assessed based on results, and adjusted accordingly

20.0 Training

Strategic Plan Context:

4.0 Change the NWS Organizational Culture

4.4 ***Enhance the professional development and training program for our work force to include teamwork, leadership, diversity, EEO, customer service, and implementing change.***

- ✔ ***Complete leadership training for all supervisors and leaders (2005).***
- ✔ ***Establish and apply Baseline Proficiency Standards (known as BPS) to all operational positions (2005).***
- ✔ ***Ensure all employees have an individual development plan (2003).***
- ✔ ***Expand the National Strategic Training and Education Program (known as NSTEP) to address all training needs of the work force (2005).***

Approach: The goal of the NWS Training Program is to ensure all staff possess the required skills and abilities needed to achieve and maintain a consistent high level of product and service quality, and to provide NWS managers with the necessary leadership skills and guidance to accomplish these objectives. All training requirements are defined and prioritized by field representatives as defined in the National Strategic Training and Education Plan (NSTEP). To ensure leadership training goals are met, NWS plans to utilize government and contract experts to teach classes in leadership, teamwork, customer service, diversity and implementing change for all first line supervisors and other key personnel.

Individual Development Plans (IDPs) will be developed utilizing an existing model from Department of Commerce Headquarters. National and Regional Headquarters representatives will coordinate to develop such plans for NWS employees and ensure their implementation by 2003.

Finally, to meet the goal of expanding NSTEP to complete the definition of training requirements for all positions at each NWS field office, NWS will conduct an annual process with the NSTEP Team. This Team is comprised of representatives from the field, National and Regional Headquarters, and the three NWS training facilities, and defines and establishes priorities for training via a well-defined process each year. This process ensures that training deficiencies and associated requirements are driven directly by the field for systematic coordination and prioritization by the Team. The prioritized requirements are then passed directly to trainers for development of relevant and easily accessible training materials. All planned activities are then articulated in annual Implementation Plans for Training.

Milestones/Initiatives:

FY 2002

Leadership

- The NWS Training Center (NWSTC) will continue sponsoring the Army Personnel Management for Executives (PME) I course.
- NWS Directors will evaluate leadership training using Survey/Feedback/Action (SFA) data and additional tools developed under section 4.1 roadmap to ensure supervisors and leaders have appropriate skills and abilities.
- NWSTC will continue offering PME II training classes.

BPS: ***pending future negotiations with the NWS Employees Union.***

IDPs; All managers will implement IDPs for their staff

Expand NSTEP

- The NSTEP Team will ensure all training needs of the NWS work force are met through the FY 2002 Training Implementation Plan.
- NWSTC will continue offering Basic Management and Basic Supervision courses.
- NWSTC will continue sponsoring a NOAA Diversity Change Agent course for NWS.
- The NWS Office of Services (OS) will coordinate with the Regions and the NWS National Centers for Environmental Prediction (NCEP) to continue initial contract team training on site.
- NWSTC will continue a Team Facilitator training course.
- NWSTC will continue courses in maintenance of existing office systems, systems administration and computer language applications.
- NWSTC will continue initial Interactive Forecast Preparation System (IFPS) training classes and conduct attrition WFO Hydrologic Forecasting System and AWIPS Application courses.
- The NWS/Cooperative Program for Operational Meteorology, Education and Training (COMET) will offer Symposia on Heavy Precipitation/Flash Flood Forecasting for NWS Science and Operations Officers (SOOs) and subject matter experts. Distance learning materials will be developed in association with these Symposia.
- The NWS Warning Decision Training Branch (WDTB) will offer teletraining sessions and severe weather case studies on WSR-88D Operations for NWS meteorologists, hydrologists, and hydrometeorological technicians, as well as advanced Warning Decision Making (WDM) workshops which will address severe and winter weather topics.
- NWS will continue to support the generation of distance learning materials via the Internet, teletraining, and other means on Integrated Remote Sensing (including polar satellite data applications), Numerical Weather

Prediction, AWIPS Applications, and Hydrology.

- NWS will continue to support the generation of World Wide Web-based hydromete- orological case studies.
- The WDTB will continue to support the Displaced Real Time (DRT) capability in AWIPS by performing software updates and releasing case studies.
- COMET will implement a new Basin Customization/Localization course for Service Hydrologists and hydrologic focal points to give an overview of the Flash Flood Monitoring and Prediction (FFMP) approach and the basin delineation process.
- COMET will develop and implement a new Climate Symposium for SOOs to provide background on all NWS climate products to answer climate questions from the public, and provide the latest developments in climate analysis and forecasting.
- OS will purchase new learning management system software to establish a comprehensive, structured training mechanism and database for the NWS training program, and will allow employees and their supervisors to access their training history and define future training needs.
- NWSTC will continue offering a course in Managing the WFO Hydrology Program for WFO Service Hydrologists and Hydrology Focal Points.
- COMET will develop and offer an Aviation distance learning course on the topic of improving ceiling and visibility forecasts of fog and stratus.
- NWSTC will develop and offer a new course to all NWS Electronics Technicians on maintenance of the new NOAA Weather Radio Crown Transmitter system.
- The Regions will offer regional Aviation workshops to focus on awareness of customer requirements in regional aviation issues.
- The Regions will offer regional Marine workshops to address regional marine training needs.
- NWSTC will develop and offer a Data Acquisition Operations course for all NWS operational and management staff involved in data acquisition to address identified training deficiencies associated with equipment operation and to review the latest NWS policies on the data acquisition process.
- NWSTC will work with the office of the Chief Information Officer to develop and offer a distance learning Network Security class addressing network security issues.
- COMET will offer a COMET Mesoscale Analysis and Prediction course for new SOOs to provide an in-depth education of mesoscale meteorology.
- Continue Women, Minorities, and person with Disabilities (WMD) training at regional Warning Coordination Meteorologists (WCM) conferences. The WCM Initiatives Team (WIT) reviews and adjusts WMD Program and associated training as needed.
- NWSTC will develop and release a one-stop Internet shopping source for all training information, including residence and distance learning course descriptions and schedules. This web link will be referred to as the NWS Training Page or “NWSTRN”.

- Alaska Region will work with Canada to hold an arctic meteorology workshop addressing forecast issues in northern latitudes**.**

FY 2003

Leadership

- NWSTC will continue to sponsor a PME I course.
- NWS Directors will evaluate leadership training using SFA data and additional tools developed under section 4.1 roadmap to ensure supervisors and leaders have appropriate skills and abilities.
- NWSTC will continue to sponsor a PME II course.

BPS: ***pending future negotiations with the NWS Employees Union.***

IDPs: Local managers will utilize IDPs routinely in NWS

Expand NSTEP

- The NSTEP Team will ensure all training needs of the NWS work force are met through the FY 2003 Training Implementation Plan.
- NWSTC will continue offering Basic Management and Basic Supervision courses.
- Individual NWS regions and NCEP will coordinate the offering of 1-day, on-site contract courses ($1K / day + travel expenses) on rotating topics to include customer service, conflict resolution, media training, and enhanced team training, with each office receiving one subject per year.
- NWSTC will continue sponsoring a NOAA Diversity Change Agent course for NWS.
- OS will coordinate with the Regions and NCEP to continue initial contract team training on site.
- NWSTC will continue a Team Facilitator training course.
- NWSTC will continue courses in maintenance of basic office systems, systems administration and computer language applications.
- NWSTC will develop and offer a new "Radiosonde Replacement System Maintenance" course for NWS Electronics Technicians (ETs) and Electronics Systems Analysts (ESAs), and a new "Radiosonde Replacement System Operations" course for system users to accompany the delivery of the new Radiosonde Replacement System.
- NWSTC will conduct follow-on classes on IFPS and attrition classes of WFO Hydrologic Forecasting System applications on AWIPS. NWSTC will provide follow-on training for any new AWIPS software builds.
- COMET will continue to offer Symposia on Climate, Heavy Precipitation/Flash Flood Forecasting for NWS SOOs and subject matter experts. Distance learning materials will be developed in association with these Symposia.
- WDTB will continue to offer teletraining sessions and severe weather case studies on WSR-88D Operations for NWS meteorologists, hydrologists

and hydrometeorological technicians, and advanced WDM workshops addressing severe and winter weather topics.

- WDTB will continue to support the DRT capability in AWIPS by performing software updates and releasing case studies.
- NWS will continue to support the generation of distance learning materials via the Internet, teletraining, and other means on Integrated Remote Sensing (including polar satellite data applications), Numerical Weather Prediction, AWIPS Applications, and Hydrology.
- NWS will continue to support the generation of World Wide Web based hydromete-orological case studies.
- COMET will continue to offer a Basin Customization/Localization course for Service Hydrologists and hydrologic focal points.
- NWSTC will continue offering an attrition course in Managing the WFO Hydrology Program for WFO Service Hydrologists and WFO Hydrology Focal Points.
- COMET will continue to offer an Aviation distance learning course on the topic of improving ceiling and visibility forecasts of fog and stratus.
- The Regions will offer regional Aviation workshops to focus on awareness of customer requirements in regional aviation issues.
- The Regions will continue to offer regional Marine workshops to address regional marine training needs.
- NWSTC will continue to offer a Data Acquisition Operations course for all NWS operational and management staff involved in data acquisition.
- NWSTC will continue to offer a distance learning Network Security class addressing network security issues.
- Continue WMD training at regional WCM conferences. WIT reviews and adjusts WMD Program and associated training as needed.
- NWSTC will update the "NWSTRN" web page for new science and technology and field feedback.

FY 2004

Leadership

- NWSTC will continue to sponsor a PME I course.
- NWS Directors will evaluate leadership training using SFA feedback and additional tools developed under section 4.1 roadmap to ensure supervisors and leaders have appropriate skills and abilities.
- NWSTC will continue to sponsor a PME II course.

BPS: ***pending future negotiations with the NWS Employees Union.***

Expand NSTEP

- The NSTEP Team will ensure all training needs of the NWS work force are met through the FY 2004 Training Implementation Plan.
- NWSTC will continue offering Basic Management and Basic Supervision courses.

- Individual NWS regions and NCEP will continue to coordinate the offering of 1-day, on-site contract courses ($1K / day + travel expenses) on rotating topics to include customer service, conflict resolution, media training, and enhanced team training, with each office receiving one subject per year.
- NWSTC will continue sponsoring a NOAA Diversity Change Agent course for NWS.
- OS will coordinate with the Regions and NCEP to offer contract refresher team training on site.
- NWSTC will continue a Team Facilitator training course.
- NWSTC will continue courses in maintenance of basic office systems, systems administration and computer language applications.
- NWSTC will continue to offer a "Radiosonde Replacement System Maintenance" course for ETs and ESAs, and a "Radiosonde Replacement System Operations" course for system users of the Radiosonde Replacement System.
- NWSTC will continue classes in Interactive Forecast Preparation System (IFPS) and attrition WFO Hydrologic Forecasting System applications on AWIPS. NWSTC will continue to provide training for any new AWIPS software builds.
- COMET will continue to offer Symposia on Climate, Heavy Precipitation/Flash Flood Forecasting for NWS SOOs and subject matter experts. Distance learning materials will be developed in association with these Symposia.
- The Warning Decision Training Branch (WDTB) will continue to offer teletraining sessions and severe weather case studies on WSR-88D Operations for NWS meteorologists, hydrologists and hydrometeorological technicians, and advanced WDM workshops addressing severe and winter weather topics.
- The WDTB will continue to support the Displaced Real Time (DRT) capability in AWIPS by performing software updates and releasing case studies.
- NWS will continue to support the generation of distance learning materials via the Internet, teletraining, and other means on Integrated Remote Sensing (including polar satellite data applications), Numerical Weather Prediction, AWIPS Applications, and Hydrology.
- NWS will continue to support the generation of World Wide Web based hydrometeorological case studies.
- COMET will continue to offer a Basin Customization/Localization course for Service Hydrologists and hydrologic focal points.
- NWSTC will continue offering attrition courses in Managing the WFO Hydrology Program for WFO Service Hydrologists and WFO Hydrology Focal Points.
- COMET will continue to offer an Aviation distance learning course on the topic of improving ceiling and visibility forecasts of fog and stratus.
- The Regions will offer regional Aviation workshops to focus on awareness of customer requirements in regional aviation issues.

- The Regions will continue to offer regional Marine workshops to address regional marine training needs.
- NWSTC will continue to offer a Data Acquisition Operations course for all NWS operational and management staff involved in data acquisition to address identified training deficiencies associated with equipment operation and to review the latest NWS policies on the data acquisition process.
- NWSTC will continue to offer a distance learning Network Security class concerning network security issues.
- Continue WMD training at regional WCM conferences. WIT reviews and adjusts WMD Program and associated training as needed.
- NWSTC will update the "NWSTRN" web page for new science and technology and field feedback.

FY 2005

Leadership
- NWSTC will continue to sponsor a PME I course.
- NWS Directors will evaluate leadership training using SFA data and additional tools developed under section 4.1 roadmap to ensure supervisors and leaders have appropriate skills and abilities.
- NWSTC will continue to sponsor a PME II course.

BPS: ***pending future negotiations with the NWS Employees Union***

Expand NSTEP
- The NSTEP Team will ensure all training needs of the NWS work force are met through the FY 2005 Training Implementation Plan.
- NWSTC will continue offering Basic Management and Basic Supervision courses.
- Individual NWS regions and NCEP will continue to coordinate the offering of 1-day, on-site contract courses ($1K / day + travel expenses) on rotating topics to include customer service, conflict resolution, media training, and enhanced team training, with each office receiving one subject per year.
- NWSTC will continue sponsoring a NOAA Diversity Change Agent course for NWS.
- OS will coordinate with the Regions and NCEP to offer contract refresher team training on site.
- NWSTC will continue a Team Facilitator training course.
- NWSTC will continue courses in maintenance of basic office systems, systems administration and computer language applications.
- NWSTC will continue classes in IFPS and training associated with any new AWIPS software builds.
- COMET will continue to offer Symposia on Climate, Heavy Precipitation/Flash Flood Forecasting for NWS SOOs and subject matter

experts. Distance learning materials will be developed in association with these Symposia.

- WDTB will continue to offer teletraining sessions and severe weather case studies on WSR-88D Operations for NWS meteorologists, hydrologists and hydrometeorological technicians, and advanced WDM workshops addressing severe and winter weather topics.
- WDTB will continue to support the DRT capability in AWIPS by performing software updates and releasing case studies.
- NWS will continue to support the generation of distance learning materials via the Internet, teletraining, and other means on Integrated Remote Sensing (including polar satellite data applications), Numerical Weather Prediction, AWIPS Applications, and Hydrology.
- NWS will continue to support the generation of World Wide Web based hydrometeorological case studies.
- COMET will continue to offer attrition Basin Customization/Localization courses for Service Hydrologists and hydrologic focal points.
- NWSTC will continue offering attrition courses in Managing the WFO Hydrology Program for WFO Service Hydrologists and WFO Hydrology Focal Points.
- COMET will continue to offer an Aviation distance learning course on the topic of improving ceiling and visibility forecasts of fog and stratus.
- The Regions will continue to offer regional Aviation workshops to focus on awareness of customer requirements in regional aviation issues.
- The Regions will continue to offer regional Marine workshops to address regional marine training needs.
- NWSTC will continue to offer a Data Acquisition Operations course for all NWS operational and management staff involved in data acquisition to address identified training deficiencies associated with equipment operation and to review the latest NWS policies on the data acquisition process.
- NWSTC will continue to offer a distance learning Network Security class concerning network security issues.
- Continue WMD training at regional WCM conferences. WIT reviews and adjusts WMD Program and associated training as needed.
- NWSTC will update the "NWSTRN" web page for new science and technology and field feedback.

FY 2006

Leadership

- NWSTC will continue to sponsor a PME I course.
- NWS Directors will evaluate leadership training using SFA data and additional tools developed under section 4.1 roadmap to ensure supervisors and leaders have appropriate skills and abilities.
- NWSTC will continue to sponsor a PME II course.

Expand NSTEP

- The NSTEP Team will ensure all training needs of the NWS work force are met through the FY 2006 Training Implementation Plan.
- NWSTC will continue offering Basic Management and Basic Supervision courses.
- Individual NWS regions and NCEP will continue to coordinate the offering of 1-day, on-site contract courses ($1K / day + travel expenses) on rotating topics to include customer service, conflict resolution, media training, and enhanced team training, with each office receiving one subject per year.
- NWSTC will continue sponsoring a NOAA Diversity Change Agent course for NWS.
- OS will coordinate with the Regions and NCEP to offer contract refresher team training on site.
- NWSTC will continue a Team Facilitator training course.
- NWSTC will continue courses in maintenance of basic office systems, systems administration and computer language applications.
- NWSTC will continue classes in IFPS and training associated with any new AWIPS software builds.
- COMET will continue to offer Symposia on Climate, Heavy Precipitation/Flash Flood Forecasting for NWS SOOs and subject matter experts. Distance learning materials will be developed in association with these Symposia.
- WDTB will continue to offer teletraining sessions and severe weather case studies on WSR-88D Operations for NWS meteorologists, hydrologists and hydrometeorological technicians, and advanced WDM workshops addressing severe and winter weather topics.
- WDTB will continue to support the DRT capability in AWIPS by performing software updates and releasing case studies.
- NWS will continue to support the generation of distance learning materials via the Internet, teletraining, and other means on Integrated Remote Sensing (including polar satellite data applications), Numerical Weather Prediction, AWIPS Applications, and Hydrology.
- NWS will continue to support the generation of World Wide Web based hydrometeorological case studies.
- COMET will continue to offer attrition Basin Customization/Localization courses for Service Hydrologists and hydrologic focal points.
- NWSTC will continue offering attrition courses in Managing the WFO Hydrology Program for WFO Service Hydrologists and WFO Hydrology Focal Points.
- COMET will continue to offer an Aviation distance learning course on the topic of improving ceiling and visibility forecasts of fog and stratus.
- The Regions will continue to offer regional Aviation workshops to focus on awareness of customer requirements in regional aviation issues.
- The Regions will continue to offer regional Marine workshops to address regional marine training needs.
- NWSTC will continue to offer a Data Acquisition Operations course for

all NWS operational and management staff involved in data acquisition to address identified training deficiencies associated with equipment operation and to review the latest NWS policies on the data acquisition process.
- NWSTC will continue to offer a distance learning Network Security class concerning network security issues.
- Continue WMD training at regional WCM conferences. WIT reviews and adjusts WMD Program and associated training as needed.
- NWSTC will update the "NWSTRN" web page for new science and technology and field feedback.

FY 2007

Leadership
- NWSTC will continue to sponsor a PME I course.
- NWS Directors will evaluate leadership training using SFA data and additional tools developed under section 4.1 roadmap to ensure supervisors and leaders have appropriate skills and abilities.
- NWSTC will continue to sponsor a PME II course.

Expand NSTEP
- The NSTEP Team will ensure all training needs of the NWS work force are met through the FY 2007 Training Implementation Plan.
- NWSTC will continue offering Basic Management and Basic Supervision courses.
- Individual NWS regions and NCEP will continue to coordinate the offering of 1-day, on-site contract courses ($1K / day + travel expenses) on rotating topics to include customer service, conflict resolution, media training, and enhanced team training, with each office receiving one subject per year.
- NWSTC will continue sponsoring a NOAA Diversity Change Agent course for NWS.
- OS will coordinate with the Regions and NCEP to offer contract refresher team training on site.
- NWSTC will continue a Team Facilitator training course.
- NWSTC will continue courses in maintenance of basic office systems, systems administration and computer language applications.
- NWSTC will continue classes in IFPS and training associated with any new AWIPS software builds.
- COMET will continue to offer Symposia on Climate, Heavy Precipitation/Flash Flood Forecasting for NWS SOOs and subject matter experts. Distance learning materials will be developed in association with these Symposia.
- WDTB will continue to offer teletraining sessions and severe weather case studies on WSR-88D Operations for NWS meteorologists, hydrologists and hydrometeorological technicians, and advanced WDM workshops

addressing severe and winter weather topics.

- WDTB will continue to support the DRT capability in AWIPS by performing software updates and releasing case studies.
- NWS will continue to support the generation of distance learning materials via the Internet, teletraining, and other means on Integrated Remote Sensing (including polar satellite data applications), Numerical Weather Prediction, AWIPS Applications, and Hydrology.
- NWS will continue to support the generation of World Wide Web based hydrometeorological case studies.
- COMET will continue to offer attrition Basin Customization/Localization courses for Service Hydrologists and hydrologic focal points.
- NWSTC will continue offering attrition courses in Managing the WFO Hydrology Program for WFO Service Hydrologists and WFO Hydrology Focal Points.
- COMET will continue to offer an Aviation distance learning course on the topic of improving ceiling and visibility forecasts of fog and stratus.
- The Regions will continue to offer regional Aviation workshops to focus on awareness of customer requirements in regional aviation issues.
- The Regions will continue to offer regional Marine workshops to address regional marine training needs.
- NWSTC will continue to offer a Data Acquisition Operations course for all NWS operational and management staff involved in data acquisition to address identified training deficiencies associated with equipment operation and to review the latest NWS policies on the data acquisition process.
- NWSTC will continue to offer a distance learning Network Security class concerning network security issues.
- Continue WMD training at regional WCM conferences. WIT reviews and adjusts WMD Program and associated training as needed.
- NWSTC will update the "NWSTRN" web page for new science and technology and field feedback.

21.0 Diversity

Strategic Plan Context:

4.0 Change the NWS Organizational Culture

4.5 ***Capitalize on the diversity of our workforce to improve participation, communication, and overall organizational performance.***

- ✔ ***Use geographically and functionally diverse teams to implement this strategic plan (2000).***
- ✔ ***Establish baseline Managing Diversity Performance Measures (2002).***
- ✔ ***Set targets for Managing Diversity performance measures for 2003 and beyond, using 2002 as a baseline (2003).***

Approach: It is recognized that bringing about fundamental positive changes in NWS organizational culture will be difficult to achieve and problematic to measure. No single approach is guaranteed to be successful. No single performance measure can be expected to be adequate. A multi-faceted approach is therefore advocated. We have adopted such an approach for Objective 4.5.- Capitalize on the diversity of our workforce to improve participation, communication, and overall organizational performance. The roadmap team recognizes this wording as synonymous to "effectively manage diversity", and for brevity will refer to it as such throughout this roadmap. Effective management of our workforce diversity means helping each NWS employee realize their maximum potential in helping the NWS satisfy is basic mission. The NWS must skillfully manage our Information Technology (IT) resources in order to carry out our mission. We must also apply the same level of skill toward managing the diversity of our human resources. NWS employees design, purchase, install, maintain, and use IT software. They purchase, install, maintain, and use IT hardware. Proposed efficiency gains associated with improvements in IT will be not be met if the NWS workforce is poorly managed. Effective management of workforce diversity means creating an organizational culture where people look forward to coming to work each day and ahead to a meaningful and satisfying career with the NWS.

The benefits of effective management of workforce diversity are many. They include, but are not limited to, high employee productivity, reduced stress in the workplace, high retention rates, fewer discrimination complaints filed, fewer labor grievances filed, lower sick leave rates, better customer service, better community outreach, and improved ability to recruit high quality employees.

There is a significant amount of overlap with Objective 4.5 and the other objectives in under Strategic Goal 4.0. While the 4.5 Roadmap Team was aware of this overlap, no attempt was made to take into account these other roadmaps. Roadmap 4.5 was written independently of these other studies. Another

fundamental assumption made in putting together this roadmap, is that many of the activities proposed will be coordinated with the NOAA Office of Diversity. Every attempt will be made to leverage the resources (staff, training opportunities, education materials, Survey Feedback Action resources) of the NOAA Office of Diversity in order to reduce direct costs to the NWS.

Currently, the NWS implements its Managing Diversity initiative through a voluntary network of employees and managers. The network is composed of a national coordinator, regional and office coordinators, office focal points, diversity consultants/change agents, and SFA and Myers-Briggs personality type indicator facilitators. The members of the network partner with officials of the NWS Employees Organization (NWSEO) as well as NWS EEO managers in a variety of activities. Coordination of the NWS Diversity Network, establishment of NWS diversity policy are the basic charters of NWS Diversity Council. The council meets monthly and is composed of the Deputy Assistant Administrator of the NWS, the national Diversity coordinator, as well as the regional and office diversity coordinators. It is assumed that the dedicated group of employees which make up the NWS Diversity Network will be the principle implementors of this roadmap.

The approach adopted by the roadmap team is divided into two components 1) Educate and Train all NWS employees on Managing Diversity and 2) Establish and Track Managing Diversity Performance Measures.

Educate and Train all NWS Employees on Managing Diversity
If the NWS is to capitalize on the diversity of its workforce, its employees must understand the importance of diversity, and its mangers and leaders must acquire the skills needed to manage diversity effectively. To achieve these goals this effort must address the education and training of both new and existing employees. A one week NWS Cultural Change Agent course, modeled after the NOAA Diversity Change Agent Course, is proposed

Establish and Track Managing Diversity Performance Measures
For this Diversity roadmap is to be meaningful and successful, a variety of performance measures must be implemented quickly, tracked over time, and evaluated regularly. The following is a list of standard performance measures statistics proposed for implementation: labor Grievances; EEO complaints; retention Rates; exit surveys; diversity webpage utilization; awards; sick leave rates; outreach activities; SFA survey results; diversity library utilization; and team composition

The absolute results and trends in these performance measures would be evaluated annually and used as input towards modifying and updating the Diversity Roadmap.

Milestones/Initiatives:

FY 2002
- Plan NWS Cultural Change Agent Course at NWSTC
- Establish Managing Diversity Performance Measures
- Administer SFA-II

FY 2003
- Evaluate Diversity Performance Measures and Update Roadmap
- Implement NWS Change Agent Course at NWSTC

FY 2004
- Evaluate Diversity Performance Measures and Update Roadmap
- Administer SFA-III

FY 2005
- Evaluate Diversity Performance Measures and Update Roadmap

FY 2006
- Evaluate Diversity Performance Measures and Update Roadmap
- Administer SFA-IV

FY 2007
- Evaluate Diversity Performance Measures and Update Roadmap

22.0 Representation

Strategic Plan Context:

> **4.0 Change the NWS Organizational Culture**
>
> **4.6** ***Increase the representation of women, minorities, and people with disabilities in NWS.***
>
> ✔ ***Increase the representation of women, minorities, and people with disabilities in the NWS as compared to the National Civilian Labor Force (NCLF). Use 1999 as baseline; set targets for 2000 and beyond.***

Objective:
To make America's National Weather Service world class workforce representative of the people it serves as defined by the National Civilian Labor Force statistics, the National Weather Service (NWS) will strive to increase the representation of Women, Minorities and Persons with Disabilities (WMD) by 1% each year.

Overview:
It takes only one person to make a difference, but a change in organizational culture requires an effort and commitment from every member of NWS, from senior management to the lowest staff levels. A well trained and motivated workforce with diverse perspectives creates an organizational culture that embraces change, values service, promotes teamwork, and fosters commitment to mission and vision accomplishments.

Meeting the objective requires taking advantage of opportunities to recruit and promote WMDs from within NWS, other agencies, universities, industry and emphasizing special programs to familiarize WMDs with the positions available in the NWS. The strategy for this roadmap=s objective is to enhance and embrace existing programs, work to eliminate barriers to promotion and recruitment, expand the availability of positions to women, minorities and persons with disabilities, and increase communication and outreach, both internally and externally.

Approach:
The NWS Representation roadmap team first meeting was held December, 1999. The team then identified a strategy to help the NWS workforce become representative of the people it serves as defined by the National Civilian Labor Force statistics. The following three milestones were identified by the roadmap team to help increase and sustain the representation of WMDs in NWS:

Recruit at least 48 WMDs nationally

Recruit at least 8 High School/High Tech students

Develop an NWS Affirmative Employment Plan to eliminate barriers to promotion for senior and entry level positions and to improve retention of WMDs.

Two teams were established in FY 2001: the Warning Coordinator Meteorologist Initiatives Team (WIT) and the Positions Analysis and Change Team (PACT). The WIT and PACT team members are drawn from the headquarters and the field with financial support primarily provided by the EEO Program Office. Senior management in the regions and headquarters must support team activities by providing time for member participation in team meetings and relevant activities. The NWS will continue to be visible and active with Minority Serving Institutions (MSIs), minority organizations, and special emphasis programs. This will be accomplished by developing a formal communications network targeting under represented groups.

The EEO Program Office will work with the teams to develop activities and programs to assure the retention of WMDs, enhance their capabilities, and better equip them for advancement at all levels. Being an agency with under-representation, it is essential that the NWS do all in its power to support and retain the WMDs already in place. In addition, the EEO Program Office will lead the effort to increase communications between MSIs and the NWS by establishing viable partnerships and promoting opportunities for WMDs in the NWS.

The NWS participates in several outreach and familiarization programs. The current programs include: Graduate Scientist Program, Student Career Employment Program, High School High Tech Program, the Presidential Management Intern and many others. These programs can provide a source for recruiting diverse applicants utilizing all job series and professions within the NWS.

WCM Initiatives Team (WIT)

The WCM Initiatives Team (WIT) is established to develop a formal training and outreach program for Warning Coordination Meteorologists (WCMs). In each Weather Forecast Office (WFO), the WCM is the primary public representative with access to segments of society across the U.S. By equipping the WCM=s with the knowledge needed to reach more diverse parts of society, they can encourage more WMDs to enter traditional Weather Service career paths. This initiative should result in an increase of available WMDs, expand our current diversity workforce, and eventually improve our services to all aspects of society.

The WIT will establish an advisory board with members from the secondary and university educational systems who have experience with WMD school populations, and understanding of the environmental sciences, as well as, a sensitivity to the WMD educational issues. Using the advisory board as a resource, the team will identify and develop affirmative employment WCM training initiatives, activities and requirements for, but not limited to, the following:

- Understanding and developing solutions to barriers inhibiting the entrance of WMDs into the traditional Weather Service educational and career paths.
- Providing WCMs with expanded knowledge of outreach activities within WFO areas, including working with MSIs and training sessions at WCM

conferences.

- Providing information on ways each WFO can improve service to WMD communities.
- Developing and implementing a mentoring/monitoring program which will include identifying career advancement training opportunities for WMDs to ensure that they are aware of and provided support to take advantage of these opportunities.
- Sharing best practices and success stories at WCM meetings.

The work of the WIT is carried out through teleconferencing and meetings twice each year, if needed, to work on milestone activities and to integrate and coordinate their work with the PACT. The EEO Program Office will work with both teams and provide the guidance and needed support.

Position Analysis and Change Team (PACT)

The Position Analysis and Change Team (PACT) was established to identify and eliminate roadblocks in current job series and position descriptions that would impede potential hiring, retention or promotions of WMDs. Many job series and position descriptions were developed during times when awareness and opportunities for WMDs were lower. Traditional hiring, retention, and promotion practices have developed a Weather Service where most management positions are filled from within by non-WMD scientists. While sometimes appropriate, position descriptions may have old qualifications and classifications which inadvertently create unnecessary barriers or roadblocks for potential WMDs wanting to enter into the NWS (i.e., a degree in meteorology may not always be required for management positions within the NWS). The PACT activities include:

- ✔ Establishing an advisory board consisting of two or three managers from private corporations including a scientific and service organization to be used as a resource in helping to identify and review position descriptions and qualifications within the NWS.
- ✔ Making recommendations to and obtain corporate board approval of changes to position descriptions and qualifications to broaden recruitment sources beyond the traditional NWS pool.

The work of the PACT will be carried out through teleconferencing and meetings twice each year, if needed, to work on activities and to integrate and coordinate their work with the WIT. The EEO Program Office will work with both teams and provide guidance and needed support.

NWS Affirmative Employment Team (NAET)

As the strategic planning roadmap dissolves, some of these members and others will comprise another team to develop an NWS program to support the NOAA Affirmative Employment Plan for grades 13 and above. The NWS Affirmative Employment Plan (AEP) will differ from the NOAA plan, in that, it will incorporate activities to not only improve representation at the GS-13 and above levels, but also to improve retention of WMDs, and to increase the number of WMDs that fill GS-5/7 entry level positions. In additon, the AEP will seek to obtain a special, non-competitive hiring authority for some positions under the Bilingual/Bicultural and Outstanding Scholar programs. Once the NWS AEP is approved by the corporate board, the EEO program office will lead the effort to implement the programs throughout NWS. The success of the AEP

will be monitored using the DAA=s Representation Report, which incorporate year-to-date statistics of the NWS workforce.

Resources:
Resources will be identified and actions taken at the national and regional levels of the Weather Service each year to promote existing affirmative employment programs. Accomplishment of the following milestones are dependent upon the support of NWS national and regional management and their agreement to allow PACT and WIT members time to meet and work on activities. In addition to the end-state staffing for the EEO Program Office, the EEO budget should support those activities needed to accomplish the milestones. To augment EEO Program Office activities, contracts will be used as necessary and appropriate.

Milestones/Initiatives:

FY 2002

Recruit at least 48 Women, Minorities and people with Disabilities nationally (HQs, REGIONs,WFOs)
- sponsor two meetings of the WIT and PACT teams (EEO/Regions)
- Finalize plans with NWSTC to develop a WIT portion of WCM Training
- Course to be held in FY03 (WIT)
- Develop and implement a WIT Outreach Section on WCM Resource Page (WIT)
- Establish a team to develop a WIT field mentoring program for WFOs for implementation in FY03
- Establish PACT advisory board (PACT/EEO)
- Complete review of 2 of management position descriptions (PACT)
- Establish new partnerships with MSIs (EEO)
- Host NWS EEO Conference for EEO practitioners (EEO)

Recruit 8 participants in the High School High Tech Program (HQs, WFOs).
- Develop information on High School High Tech Program to be incorporated in WIT
- Training port of WCM course
- Obtain support from both WFOs and NWSH, including NCEP to participate in program
- Complete review of at least 2 management positions within the NWS and develop recommendations for changes to PDs and recruitment strategies) for approval by the corporate board by September 2002. (PACT/EEO)
- Hold two meetings to develop national affirmative employment goals, training initiatives, and requirements and seek corporate board approval (WIT/EEO)

Develop a NWS Affirmative Employment Plan to eliminate barriers to promotion and recruitment for senior and entry level positions (AASPT/EEO)
- Present NWS AEP to corporate board for approval (NAET)
- Develop a formal communication network to target under represented

groups (NAET)
- Increase partnerships with MSIs (EEO)

FY 2003

Recruit at least 48 Women, Minorities and people with Disabilities nationally
- Sponsor two meetings of the WIT and PACT teams (EEO/Regions)
- Implement WIT portion of WCM Training Course (WIT)
- Complete review of any remaining management and non-management positions within the NWS (PACT)
- Develop recommendations (changes to PDs and recruitment strategies) for approval by the corporate board (PACT)
- WIT review of training and progress towards goals along with revaluation of goals
- Program adjustments identified and implemented

Recruit at least 16 participants in the High School High Tech Program
- Obtain support from both WFOs and NWSH, including NCEP to participate in program
- Implement NWS Affirmative Employment Plan to eliminate barriers to promotion and recruitment for senior and entry level positions (HQs, REGIONS, WFOs, EEO)
- Conduct training at regional WCM conferences (WIT)

Publicize and implement NWS Affirmative Employment Plan (EEO, NAET)

FY 2004

Recruit at least 48 Women, Minorities and people with Disabilities nationally
- Conduct training at regional WCM conferences (WIT/EEO/Regions)
- Make additional training opportunities available
- WIT review of training and progress towards goals along with revaluation of goals.
- National EEO program office will oversee the implementation of the recommendations of the task team

Recruit at least 30 participants in the High School High Tech Program
- Obtain support from both WFOs and NWSH, including NCEP to participate in program

Monitor NWS Affirmative Employment Plan to eliminate barriers to promotion and recruitment for senior and entry level positions
- Review progress towards goals in Affirmative Employment Plan make adjustments as needed (EEO)

FY 2005

Recruit at least 48 Women, Minorities and people with Disabilities nationally

- WIT review of training and progress towards goals along with revaluation of goals
- Program adjustments identified and implemented
- WIT disbanded in the last quarter
- National EEO program office will oversee the implementation of the recommendations of the task team

Recruit at least 40 participants in the High School High Tech Program

- Obtain support from both WFOs and NWSH, including NCEP to participate in program

Monitor NWS Affirmative Employment Plan to eliminate barriers to promotion and recruitment for senior and entry level positions

FY 2006

Recruit at least 48 Women, Minorities and people with Disabilities nationally

Recruit at least 40 participants in the High School High Tech Program

- Obtain support from both WFOs and NWSH, including NCEP to participate in program

Monitor NWS Affirmative Employment Plan to eliminate barriers to promotion and recruitment for senior and entry level positions

FY 2007

Recruit at least 48 Women, Minorities and people with Disabilities nationally

Recruit at least 40 participants in the High School High Tech Program

- Obtain support from both WFOs and NWSH, including NCEP to participate in program

Monitor NWS Affirmative Employment Plan to eliminate barriers to promotion and recruitment for senior and entry level positions

23.0 Budget and Strategic Planning

Strategic Plan Context:

5.0 Manage NWS Resources

5.1 Implement an integrated policy, planning, budgeting, assessment, and accountability system that links decision making and goals to program implementation and evaluation.

- ***Link planning processes into a system that cascades from strategic to operational to individual performance plans.***
  - ✔ ***Align NWS budget and reporting process with the strategic plan for FY 2003 budget (2002).***
  - ✔ ***Put performance measures in place for programs and operations (2000).***
  - ✔ ***Put annual operating plans in place for all entities of NWS linked to the strategic plan (2000). Individual performance plans linked to annual plan (2001).***

Objective: The goal of this objective is to support the larger NWS strategic goals to manage our resources, change our organizational culture, and shape our infrastructure to facilitate the effective, productive, and cost-effective delivery of products and services to our customers and partners. The performance measures for this objective will ensure that internal planning and performance measurement systems effectively support the mission, vision, and purpose of the National Weather Service. To achieve this objective, the NWS will need to develop a new comprehensive agency planning and reporting process. The new planning process will need to integrate strategic planning, program operations, and financial management processes into one agency-wide planning process that focuses on "performance management". Specifically, this process will link the agency's mission, vision, strategic plan, five-year implementation plans (road maps), budget planning and formulation, annual operating plans, budget execution, financial reporting, and performance measurement activities. The planning process will also build a direct link between individual performance plans, annual operating plans, and the strategic plan, ensuring each NWS manager and employee recognizes their contribution toward performing the agency mission and goals.

Accomplishing this objection will provide the following benefits: accomplish the mission and vision of the NWS; link budget planning and resources expenditures to goals of the organization; improve the efficiency and coordination of planning processes within NWS; improve investment planning and budget review processes in the NWS; and improve management information to oversee and manage operations**.**

In the mid-1980s, the NWS realigned its budget structure to better reflect the overall program functions of the agency. Over time, this structure has become outdated and does not provide sufficient visibility into NWS base accounts or accurately reflect NWS operations and programs. With the issuance of the new NWS strategic plan and the re-organization of NWS Headquarters, we should consider a realignment of the NWS budget structure to better reflect the strategic planning goals and program operations. Currently, the NOAA Office of Finance and Administration (OFA) has created a task-force to examine possible realignment for NOAA's overall budget. NWS should develop possible alternatives for realigning its budget and provide this information to the NOAA taskforce.

With respect to internal planning, the NWS should continue actions to integrate the new strategic plan into the budget and program planning processes. The roadmaps should be condensed into a five year implementation plans which would be updated each year and serve as the "planning foundation" or starting point for the annual budget formulation process. The five year implementation plans will also provide the foundation for the annual operating plans. These plans and budgets should be organized according to the goals and objectives outlined in the new NWS Strategic Plan. Specifically, the budget formulation process should focus on investments that are needed to accomplish the goals of the plan. For example, for the FY 2002 budget planning process, NWS conducted a strategic planning retreat in October of 1999 to discuss and plan what investments where needed to accomplishment the strategic plan. This practice should continue for the FY 2003 budget cycle. However, a five year implementation plan should be developed to ground this discussion and prepare for the FY 2003 budget formulation process. This implementation plan will provide individual milestones for a five year horizon with milestone details similar to the current NWS annual operating plan.

To promote more coordinated planning within the Agency, the NWS should revise the current agency budget formulation planning calendar into one agency-wide planning calendar. The planning calendar would logically integrate all critical agency planning events and deliverables. The calendar would outline key dates for deliverables such as Information Technology Strategic Plans, Five Year Implementation Plans, Budget Formulation, Business Report, and Annual Operating Plans. In addition, the multi-year planning calendar will outline update cycles for the NWS Strategic Plan and other key planning documents.

NWS should also develop an action plan to integrate each of key elements in the NWS planning process. This would link the strategic plan, five year implementation plan, budget, annual operating plans, and individual performance plans. This plan should outline and help develop a direct relationship between each individual staff member contribution to accomplishing the mission and achieving the goals outlined in the strategic plan. To build incentive at the staff level, individual performance plan would need to include a direct link to accomplishing the goals of the NWS strategic plan.

To measure progress towards accomplishing the new strategic plan, the NWS should also prepare an annual "business report". This report would represent an annual assessment of the agency's progress toward meeting the goals and objectives in the strategic plan. The document would also include details on program accomplishments and financial status. The report would also provide vital information to external NWS partners to better understand our programs and gage our progress towards improving products and services. This report would also link our budget to the plan by reporting on expenditures and assessing our actual financial position. NOAA recently published a similar report which has been well received by Congressional Staff as well as NOAA and DOC managers.

Finally, NWS should establish an Investment Review Board for budget planning purposes. Currently, NWS requests input for new initiatives in the Fall of each year, the inputs are reviewed by the CFO's Office, and various Directors present the initiatives for approval to the Corporate Board in February. However, under this process, the Agency program staff do not have sufficient time to prepare and coordinate initiatives. In addition, Agency budget and management staff do not have sufficient time to fully analyze review the initiatives. Investment Review Board Members will have the opportunity to fully understand each proposal before approving for Corporate Board consideration. The IRB will meet to consider investments through out the year. This process will ensure agency budget initiatives have received full consideration and accomplish the strategic goals of the NWS.

Approach:
The purpose of this performance measure is to ensure NWS is a performance based organization that utilizes "relevant" measures to allocate and plan resource requirements, manage operations, manage programs, and develop policies and procedures. The NWS should attempt to implement these measures for all aspects of the organization. The term relevant measure refers to a subset of critical performance measures that provide NWS managers and employees with an appropriate mix and quantity of measures to manage their respective organization and gage progress toward meeting milestones and performance measures. Currently, NWS has already established performance measures for both services and operations. The measures are reported by OSO, OM, and OH on a quarterly basis. NWS should conduct an assessment on what additional measures should be established to better assess each organization's success and progress toward meeting the goals outlined in the NWS Strategic Plan. Overall, NWS should develop a core set of "critical success indexes" or key performance measures for financial performance, including improved cost information and reporting, operational performance (systems, facilities, maintenance), customer services (lead times, products), project management (schedule, cost, performance) and workforce (diversity, morale, turnover, training). NWS should maintain such measures at a Agency, Directorate, and Office level. A cross cutting team of agency managers and employees should be formed to develop a core list of critical measures that will be relevant at all levels.

In addition, the NWS should also develop a standard set of policies, procedures, and measures for acquisition projects within the agency. Each should be have standards and methodologies for program management of each acquisition, including cost management, schedule, performance, and problem reporting. These program objectives and specification should also have a direct relationship to agency operational requirements and formalize key decision point processes and reporting. The recommendation will form a strong performance measure for agency acquisition program which **are vital to sustain and improve NWS programs and services.**

To implement the critical success index process and feedback, NWS should consider implementation of a real time management information system to report status of this information to managers and employees. This will allow timely delivery of performance measures to provide better information for decision making within the agency, including allocations of resources and day to day management.

NWS should also explore methods to measure "outcomes" of NWS products and services to the Public. Policy officials with the Administration as well as Congress are increasingly interested with a outcome of services performed by the Federal Agencies. The current NWS performance measures focus on internal output oriented performance measures such as lead times and accuracy. NWS should explore opportunities with academia and the emergency management community to better assess the actual outcome of our services. The outcome measures will provide a better focus and priority to NWS service delivery and aid our external advocacy and investment review efforts within the Administration and Congress. At a minimum, NWS should develop a process to estimate the economic value of weather forecasts and warning to the Nation. This type of cost-benefit analysis was performed by National Institute of Standards and Technology (NIST) prior to the NWS Modernization and Associated Restructure. The study outlined the economic benefit from improved weather services and proved instrumental in obtaining funding for the $4.5 billion NWS Modernization.

Milestones/Initiatives:

FY 2002

- Develop a five year implementation plan for the NWS in time for the FY 2004 budget formulation cycle. **(CFO)**
- Begin operations with Individual Performance Plans linked to the NWS Strategic Plan. **(CFO, SP)**
- Develop improved capability for analysis of NWS performance measurement data. **(OS)**
- Support National Academy of Science study of appropriate roles of public, private, and academic sectors in provision of weather and climate information. **(SP)**
- Initiate process to develop next NWS Strategic Plan. **(SP)**

24.0 Information Technology

Strategic Plan Context:

5.0 Manage NWS Resources

5.2 ***Leverage information technology to improve the cost effectiveness of NWS systems, programs, and operations.***

- ✔ ***Base decisions on use of information technology on business needs and an NWS-wide systems architecture.***
- ✔ ***Base decisions concerning telecommunications on business needs and the NWS telecommunications architecture and strategic plan.***
- ✔ ***Equip NWS facilities with computer resources necessary to achieve planned and evolving operational and strategic results.***

Objective: The objective of this goal is to ensure that information technology (IT) effectively supports our ability to perform the NWS mission and to facilitate the exchange of information. NWS information technology must continually evolve to meet increased demands for robust technology and information dissemination both internally and to the public. In conjunction with strategic planning efforts, we seek to ensure that IT is interoperable, flexible, and dynamic. Efforts will be made to take advantage of economies of scale and to leverage existing resources, capabilities, and talent.

Defining Leveraging Information Technology

Leveraging information technology means to take advantage of the capabilities offered by information technology to give our forecasters the best tools available to perform our mission. To be able to leverage information technology we must be able to keep pace with our changing environment. Technology continues to rapidly evolve in the market place. New and improving scientific understanding requires ever larger investments in IT infrastructure capacity and performance to improve our service to the nation. Our challenge is to be able to maintain an understanding of our options and to continuously develop the technological skills of our personnel fast enough to keep pace with advancing technology.

Scope

The scope of this roadmap is to address the improvements in our management of our investments in the information technology required to support the mission of the NWS necessary to ensure we get the best bang for the buck. The NWS defines Information Technology in accordance with the Information Technology Management Reform Act of 1996 (Clinger-Cohen Act) and means any equipment, or interconnected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. It typically includes computers,

ancillary equipment, software, firmware and similar procedures, services (including support services) and related resources.

Related Documents/reference
Draft NWS Information Technology Architecture
Draft Telecommunications Strategic Plan
IT Strategic Plan

Vision
To ensure that information technology continually provides effective, reliable and timely solutions in a dynamic business, science, and technology environment.

Objectives
To meet our vision we have defined the following objectives which we will consider to leverage information technology:

- Productivity: To enhance productivity and reduce costs by improving the accuracy, timeliness, and speed with which NWS responsibilities can be met.
- Information Availability: To increase and improve information and data availability, thereby assisting NWS staff in decision making and in providing services to the public.
- Environmental Responsiveness: To ensure, from an information technology perspective, NWS is responsive to an environment that is constantly changing as a result of changes federal laws, regulations, interpretations, and funding.
- Infrastructure: To augment and improve the infrastructure of the NWS information systems, including the technical architecture, the organizations structure, and human resource capabilities.
- New Technology: To evaluate new technology to determine if it will provide benefits to NWS in achieving its business objectives and implement as appropriate.

Principles
NWS has developed the following IT Principles to guide IT decision making. The principles represent an organizational consensus of how we view IT. These principles will act as a framework for evaluating IT investment decisions.

- The National Weather Service exists to serve end users
- The Asset Base is dispersed. The NWS relies on a diverse database from internal as well as from external (e.g., Non-NWS radar, commercial aircraft, etc) data sources to perform its mission
- Information is a corporate asset that, while any particular office, program, or individual may manage it, remains an asset to be shared
- Systems Engineering methodologies will incorporate a phased-in modular approach and maximize the use of commercial off-the-shelf (COTS) and Government off-the-shelf (GOTS) technology. The National Weather Service information Technology Architecture will be based on open systems,

standards- based approach

- Information Systems will be implemented or enhanced only after work processes have been examined for possible simplification or reengineering and will result in improved user productivity
- Acquisition strategies will appropriately allocate risk, effectively use competition, and be performance-based
- NWS will use a structured investment management process to evaluate and approve all investments in major systems based on the Information Technology Architecture. Security is designed into all architectural elements, balancing accessibility and ease of use with protection of data
- The NWS Information Technology Architecture will be periodically updated to support the Strategic Plan goals, objectives, and strategies
- NWS will support a common network environment using a standard set of protocols to interconnect workstations, computers, and communications devices and provide such services as file transfer, electronic mail, directory management, and network management.

Approach:

Establish an NWS Information Technology Architecture and Telecommunications Strategic Plan to Facilitate Strategic/Operational Planning and integrate into the overall NWS Planning cycle

Information technology requirements must be evaluated with respect to the mission function they support. An NWS IT Architecture provides an integrated framework for evolving or maintaining existing information technology and acquiring new information technology to achieve the NWS Strategic Goals and Objectives outlined in this guide. As such, the NWS IT Architecture and telecommunications strategic plan are expected to become the companion of the to the NOAA and NWS Strategic Plans, defining and documenting the future systems and technologies necessary to achieve our goals. The NWS Architecture defines our existing baseline, documents our target, or vision, and the resulting gap analysis helps us develop our strategy for defining and implementing information technology solutions. The NWS Systems Architecture and associated Telecommunications Architecture efforts play a major role in our ability to leverage information technology. Once completed these documents will define the "vision" for our Information Technology and Telecommunications infrastructure and will guide us in developing ongoing information technology requirements. The architecture is dynamic in nature and will require constant review and evaluation.

Promote Information Technology Infusion

Information technology is one of the most rapidly evolving areas in the marketplace today. Internet technology is revolutionizing the ways we interact, do business, and go about our daily lives. Presidential and Departmental directives are promoting an all-electronic environment to support the business of government and the services the government provides to the nation, including weather, water and climate services. To leverage this change, NWS intends: to position our technology program to take full

advantage of the next generation Internet (NGI); to work to create an NWS Virtual Private Network (VPN) to meet our internal messaging requirements based on the NGI; to continue to add to our Massively Parallel Processing (MPP) infrastructure to support the continued evolution of our NWP capabilities; to promote and utilize web-based technologies for the public and private dissemination of all weather data; to work to continue to invest in evolving office automation technology (e.g. e-Forms and digital signature technology); and to continue to maintain an emphasis on security and keep pace with the evolution of security mechanisms.

Create Standards for Technology Replacement Cycles and Technology Infusion

Opportunities exist to leverage information technology for the purpose of improving cost effectiveness of NWS systems. These opportunities can be found in technological improvements as well as through coordination and consolidation of resources. The NWS must be positioned to capitalize on technology improvements, remaining on the leading edge while avoiding the "bleeding" edge. These opportunities must be identified, categorized, and prioritized.

IT infrastructure requirements in support of budget initiatives for the out years will be evaluated and identified. In order to support the administrative infrastructure, a Technology Life cycle will be developed. This will be incorporated into the operating budgets of each FMC ensuring desktop systems and applications evolve in accordance with the most cost efficient cycle.

Establish CIO Organization

Organizational changes will facilitate the process of identifying opportunities. The recent identification of a CIO "organization" within DOC, NOAA and NWS will provide an infrastructure for managing IT. Within the NWS, the CIO will report to the Assistant Administrator and will coordinate IT activities NWS-wide. The scope of responsibility will include leading the effort to integrate NWS-wide the several ongoing technology planning efforts, leading the effort to identify and leverage in a timely manner new and emerging information technologies, and maintaining the NWS IT Architecture, Strategic and Operational Plans and Telecommunications Strategic Plans. It is envisioned that the CIO will closely and collaboratively with all NWS Corporate Board Member and especially the Director of the Office of Science and Technology to ensure the overall technology planning for the NWS has a high level of integration for both the science and the supporting technology infrastructure. These individuals will consider the resources required to support national programs as well as NWS administrative infrastructure. Each year, a "technology roadmap" will be defined to identify key IT milestones for the coming year. The scope of these milestones will be IT improvements impacting the entire organization. Specific performance measures will be identified for each milestone. IT Officers are critical to ensure the architectural vision is accurate and reflects the goals of each NWS component. Each officer will perform a yearly review to ensure budget initiatives and IT efforts are consistent with the NWS Strategic Plan and IT Architecture. By focusing on our mission goals, we will be able to determine when technology improvements must be made and develop technology upgrade cycles and development

plans consistent with the NWS mission.

Milestones/Initiatives:

FY 2002
- Information Technology Planning integrated with overall NWS Planning
- Measure Results of Prior Year Technology Roadmap
- Establish Annual Review Criteria and Process
- Update IT Strategic Plan (5 Year)
- Produce a *more formal* Information Technology Roadmap (1 Year) and corresponding performance measures
- Produce Information Technology Opportunities Document for review by Technology implementation programs.
- Update policy for web management and related technologies

FY 2003
- Conduct IT annual review process

FY 2004
- Conduct IT annual review process

FY 2005
- Conduct IT annual review process