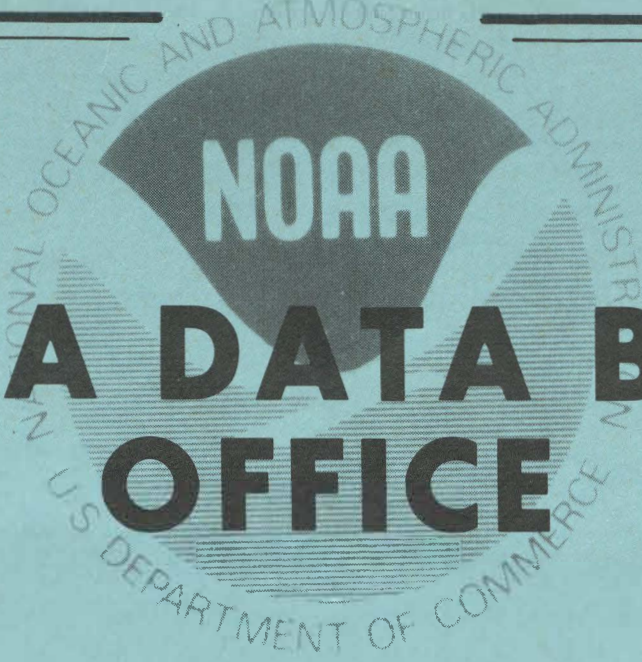


NOAA DATA BUOY OFFICE

PROGRAM REVIEW

OFFICE OF OCEAN ENGINEERING
NATIONAL SPACE TECHNOLOGY LABORATORIES

NOVEMBER 16-17, 1976

J. Vadus

CONTENTS

INTRODUCTION TO NDBO AND ITS PROGRAMS

A. BACKGROUND AND MANAGEMENT PHILOSOPHY

B. NDBO PROGRAMS

C. BUDGET DISCUSSION

A. BACKGROUND AND MANAGEMENT PHILOSOPHY

HISTORY OF NDBO

- IN 1966, THE ICO SUGGESTED A NATIONAL DATA BUOY SYSTEM TO REDUCE THE NUMBER OF AGENCIES THEN DEVELOPING BUOYS.
- THE USCG MANAGED THE FEASIBILITY STUDY BY TRAVELERS RESEARCH.
- THE MARINE SCIENCES COUNCIL ENDORSED THE CONCEPT AND THE USCG ESTABLISHED THE NATIONAL DATA BUOY DEVELOPMENT PROJECT (NDBDP) IN DECEMBER 1967.
- THE "STRATTON COMMISSION" IN "OUR NATION AND THE SEA" SELECTED A PILOT BUOY NETWORK AS ONE OF SIX ACTIVITIES DESERVING NATIONAL PRIORITY IN 1969.
- IN 1970, NDBDP WAS FUNDED AND MOVED TO NASA'S MTF, NOW NSTL.
- TRANSFERRED FROM USCG WITH CREATION OF NOAA IN OCTOBER 1970 AND NAMED NATIONAL DATA BUOY CENTER IN JULY 1971.
- IN 1972, PROGRAM RESTRUCTURED TO BE MORE RESPONSIVE TO USER NEEDS.
- IN 1973, THE NAME WAS CHANGED TO NDBO.

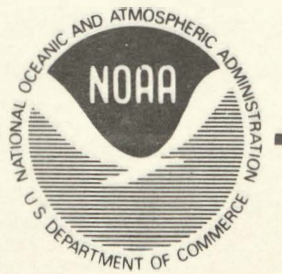
MISSION OF NDBO

A CENTER OF ENVIRONMENTAL DATA BUOY TECHNOLOGY

- CONDUCT THE ENVIRONMENTAL TEST AND EVALUATION NECESSARY TO ASSESS THE PRESENT AND FUTURE LEVELS OF PERFORMANCE AND RELIABILITY OF INTEGRATED BUOY SYSTEMS,
- CONDUCT THE ENGINEERING DEVELOPMENT NECESSARY TO ADVANCE THE LEVEL OF CAPABILITY AND RELIABILITY OF BUOY COMPONENTS, AND
- SERVE AS A NATIONAL AND INTERNATIONAL SOURCE OF TECHNICAL INFORMATION AND ADVICE FOR ENVIRONMENTAL DATA BUOYS AND THEIR ASSOCIATED TECHNOLOGY.

CENTER OF ENVIRONMENTAL DATA BUOY APPLICATIONS

- DEVELOP DATA BUOYS NECESSARY TO MEET THE NEEDS FOR LONG-TERM MEASUREMENT APPLICATIONS,
- DEVELOP DATA BUOYS NECESSARY TO MEET THE NEEDS FOR SHORT-TERM AND SPECIAL MEASUREMENT APPLICATIONS, AND
- ASSIST USER ORGANIZATIONS IN THE DESIGN OF THEIR CONFIGURATIONS OF ENVIRONMENTAL DATA BUOYS AND BUOY SYSTEMS AND PROVIDE OPERATIONAL DATA BUOYS AS SUPPORTED BY USERS.



NDBO MANAGEMENT PHILOSOPHY

- CONTRACT MANAGEMENT OFFICE - RESTRICTED IN HOUSE CAPABILITIES.
- DEVELOPMENT EFFORTS DIRECTED TOWARDS CONCEPT OF SPECIALIZED SYSTEMS FOR INDIVIDUAL USERS.
- DEVELOPMENTS UNDERTAKEN FOR PROGRAMS IN WHICH THE FEDERAL GOVERNMENT HAS MADE SIGNIFICANT COMMITMENTS.
- DEVELOPMENTS EMPHASIZE BUOY SYSTEM CAPABILITY - NO SENSOR DEVELOPMENT
- DEVELOPMENT EFFORTS PHASED TO PRODUCE AND DEMONSTRATE EARLY OPERATING PROTOTYPES - SUBSEQUENT EMPHASIS ON SYSTEM IMPROVEMENT.
- OPERATIONAL BUOYS SUPPLIED OR OPERATED ONLY WHEN COSTS REIMBURSED TO NDBO.

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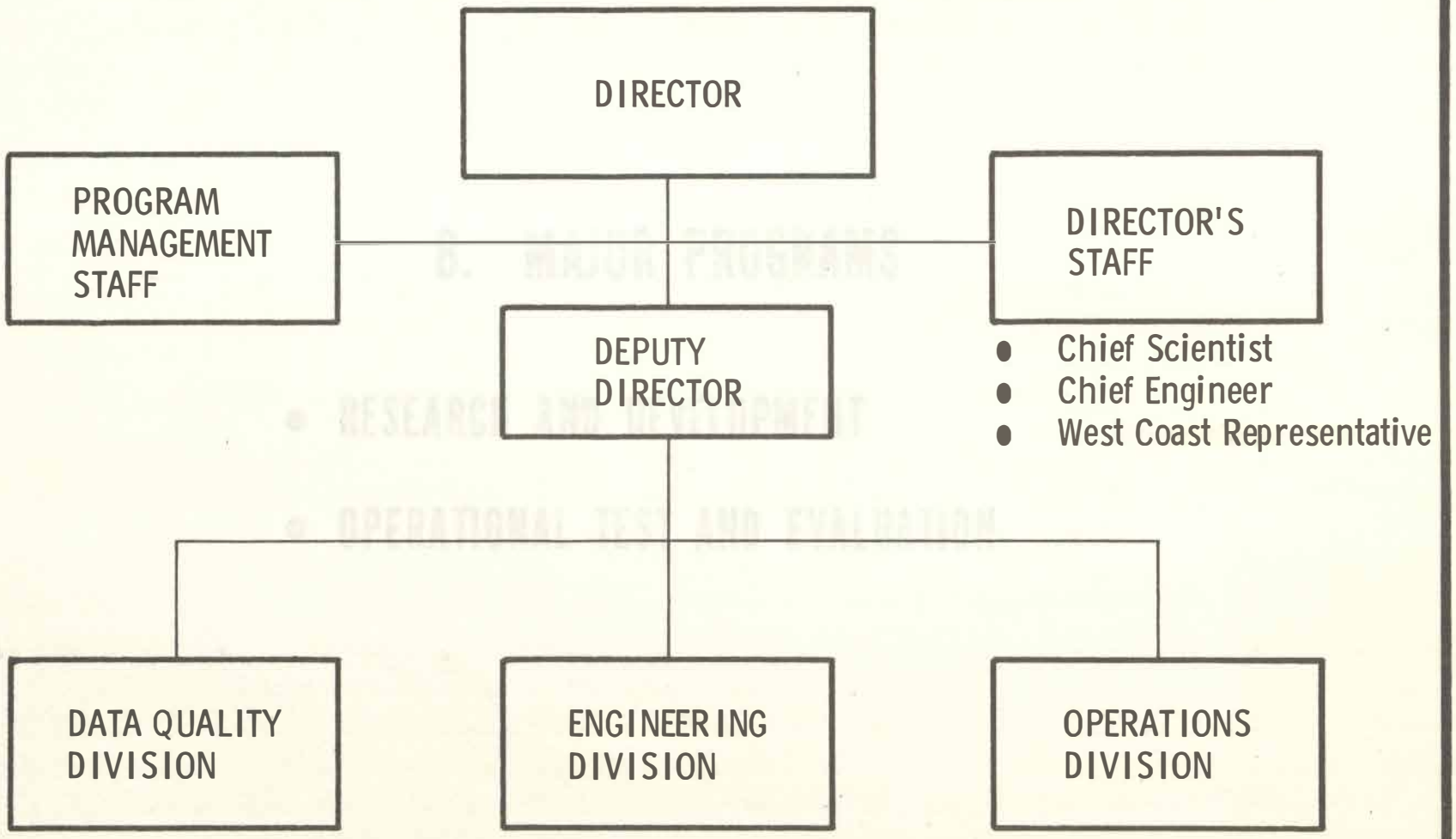
NDBO ORGANIZATION



- Chief Scientist
- Chief Engineer
- West Coast Representative

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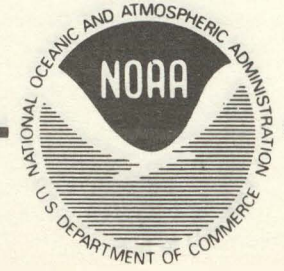
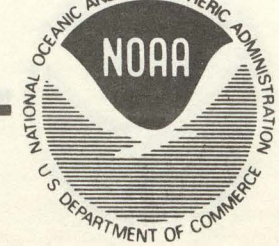
B. MAJOR PROGRAMS

- RESEARCH AND DEVELOPMENT
- OPERATIONAL TEST AND EVALUATION



NDBO RESEARCH AND DEVELOPMENT PROGRAM



NDBO RESEARCH AND DEVELOPMENT PHILOSOPHY

- PURPOSE IS TO PROVIDE OBSERVATIONAL TOOLS FOR NATIONAL AND INTERNATIONAL PROGRAMS WHERE PRESENT TECHNOLOGY IS INADEQUATE.
- ELEMENTS IN THE PROGRAM REFLECT EMERGENCE OF MAJOR NEW PROBLEM AREAS IN WHICH NOAA IS INVOLVED
  - IMPROVED WEATHER PREDICTION
  - CLIMATE RELATED STUDIES
  - CONTINENTAL SHELF AND ENERGY RELATED PROBLEMS
  - APPLIED OCEANOGRAPHY
- POTENTIAL ROLE OF BUOYS IN MONITORING PROGRAMS GREATLY EXCEEDS PRESENT STATE-OF-THE-ART
- APPROACH IS TO UTILIZE PROVEN OFF-THE-SHELF HARDWARE TO EVOLVE NEW SYSTEM CONCEPTS
- OBJECT IS TO DEVELOP AND DEMONSTRATE STABLE OR SPECIALIZED BUOYS FOR INDIVIDUAL APPLICATION

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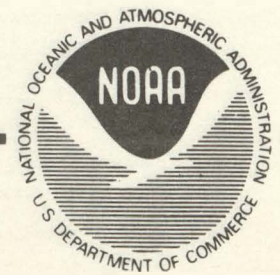
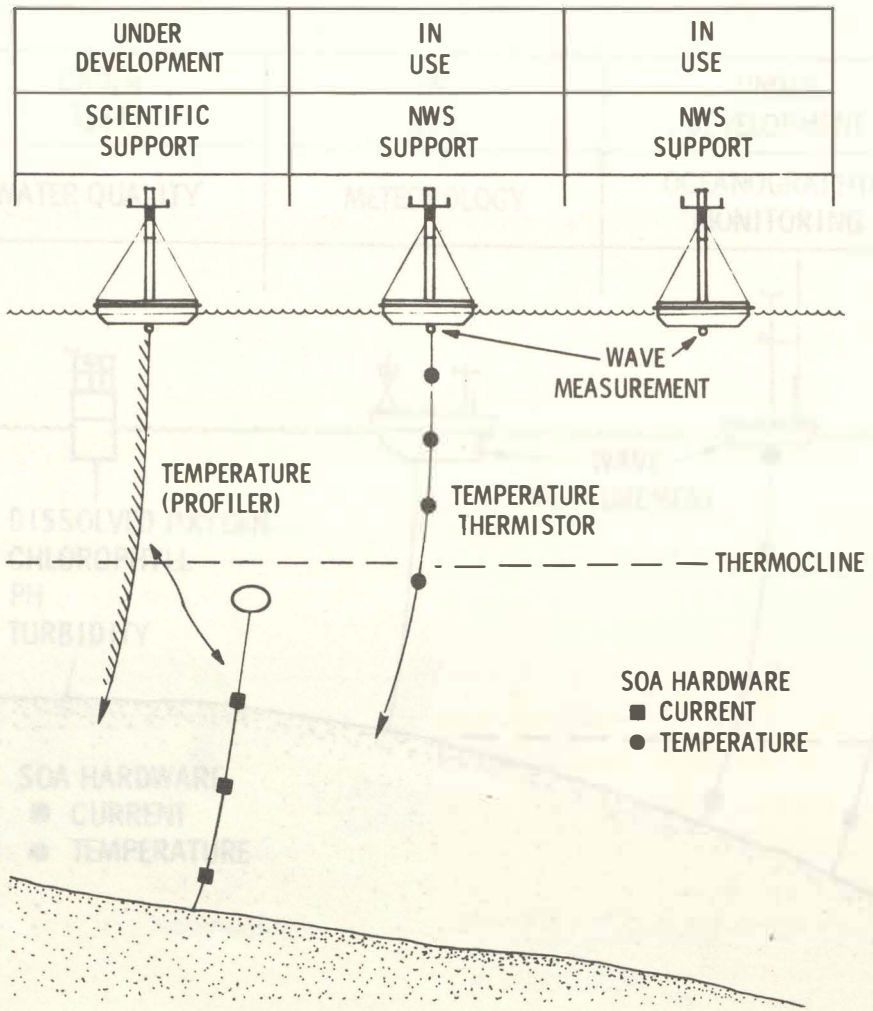
CURRENT RESEARCH AND DEVELOPMENT PROGRAMS

- DEMONSTRATE OPERATIONAL PROTOTYPE ENVIRONMENTAL BUOY NET FOR METEOROLOGICAL SUPPORT
- PERFORM TESTS AND DEMONSTRATE ON SATELLITE LINK COMMUNICATION SYSTEMS FOR CONVERSION OF OPERATING DATA BUOYS
- CONTINUE THE DEVELOPMENT OF RELIABLE OCEAN SENSOR AND WAVE SENSOR SYSTEMS
- CONTINUE TO SEEK WAYS TO REDUCE HARDWARE AND OPERATIONAL COSTS FOR DATA BUOYS - NEW HULLS AND PAYLOADS
- CONTINUE PROGRAMS TO INCREASE OVERALL RELIABILITY AND CAPABILITY
- USE ENGINEERING TEST PLATFORM IN AN AT-SEA ENVIRONMENT FOR COMPONENT TEST AND EVALUATION
- DEVELOP DRIFTING BUOYS AND SPECIALIZED MOORED BUOYS FOR SCIENTIFIC APPLICATIONS
- DEVELOP REMOTE LOWER ATMOSPHERIC SOUNDING CAPABILITY



DEEP OCEAN MOORED BUOY SYSTEM DEVELOPMENT STATUS



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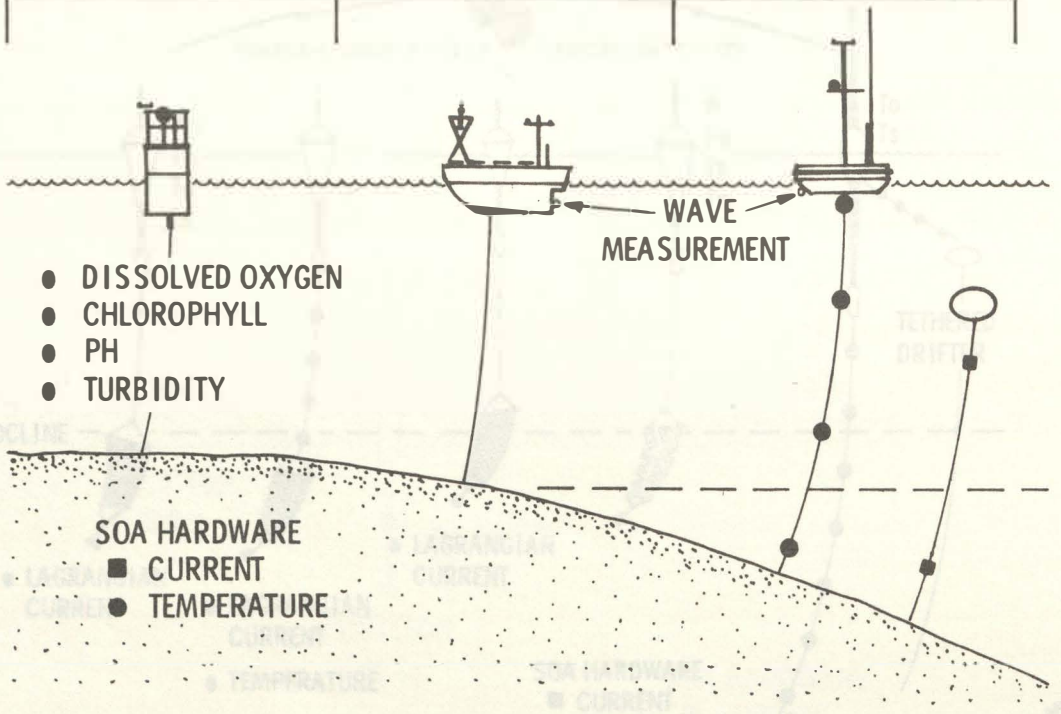
CONTINENTAL SHELF MOORED BUOY SYSTEM DEVELOPMENT STATUS

UNDER TEST	IN USE	UNDER DEVELOPMENT
WATER QUALITY	METEOROLOGY	OCEANOGRAPHIC MONITORING



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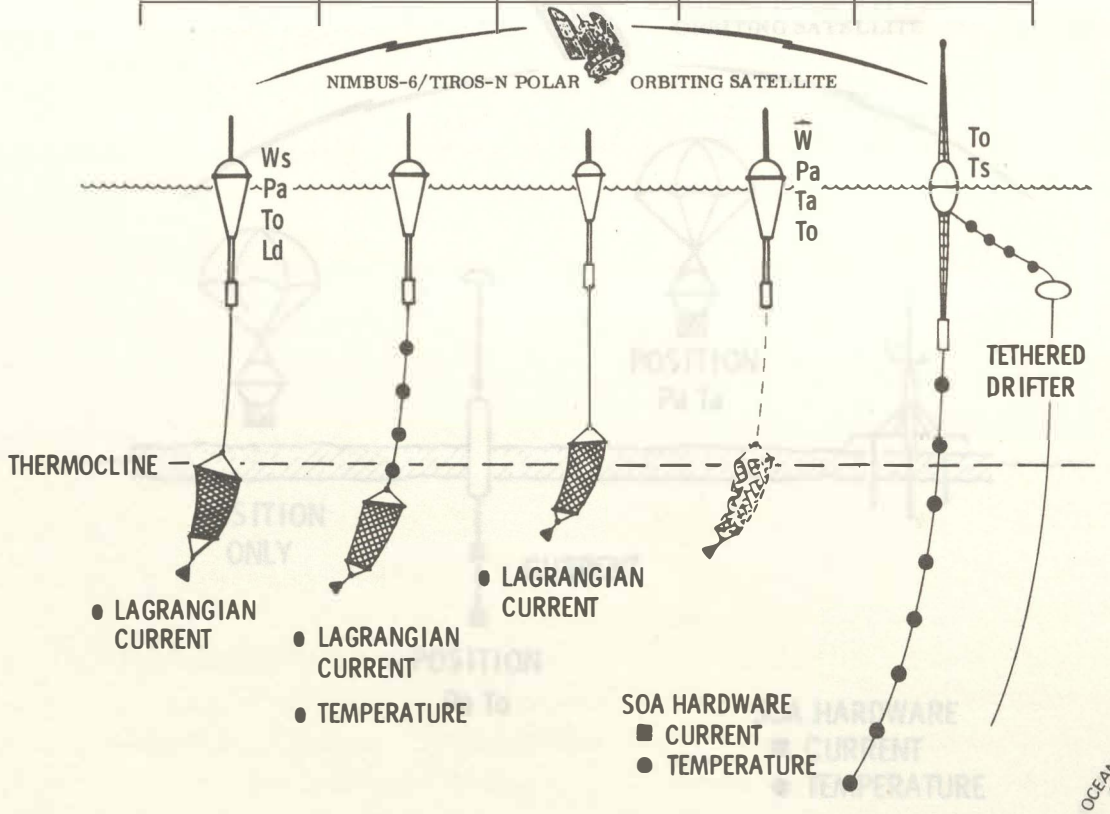
DRIFTING BUOY SYSTEM DEVELOPMENT STATUS

UNDER TEST	UNDER DEVELOPMENT		PLANNED	
SEVERE ENVIRONMENT SCIENTIFIC SUPPORT	SCIENTIFIC SUPPORT	CONTINENTAL SHELF SCIENTIFIC SUPPORT	NWS SUPPORT	SCIENTIFIC SUPPORT



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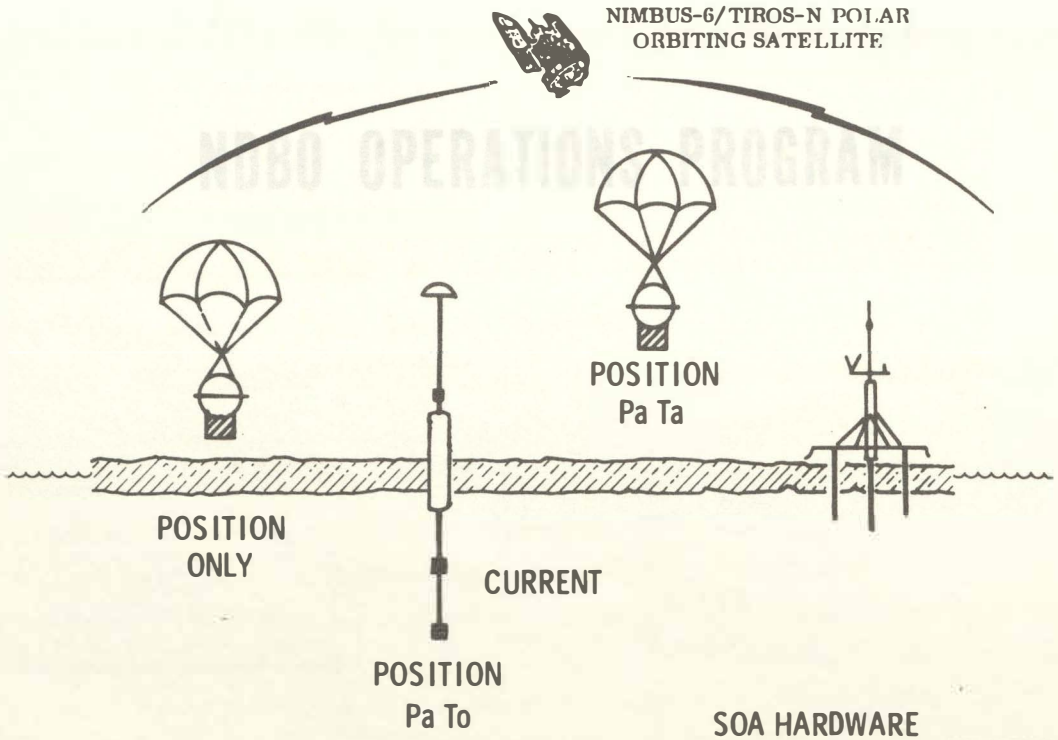
ICE BUOY SYSTEM DEVELOPMENT STATUS

UNDER TEST	UNDER DEVELOPMENT	IN USE
ARCTIC SUPPORT	ARCTIC, GARP SUPPORT	POLAR SUPPORT



SOA HARDWARE
- ■ CURRENT
- ● TEMPERATURE

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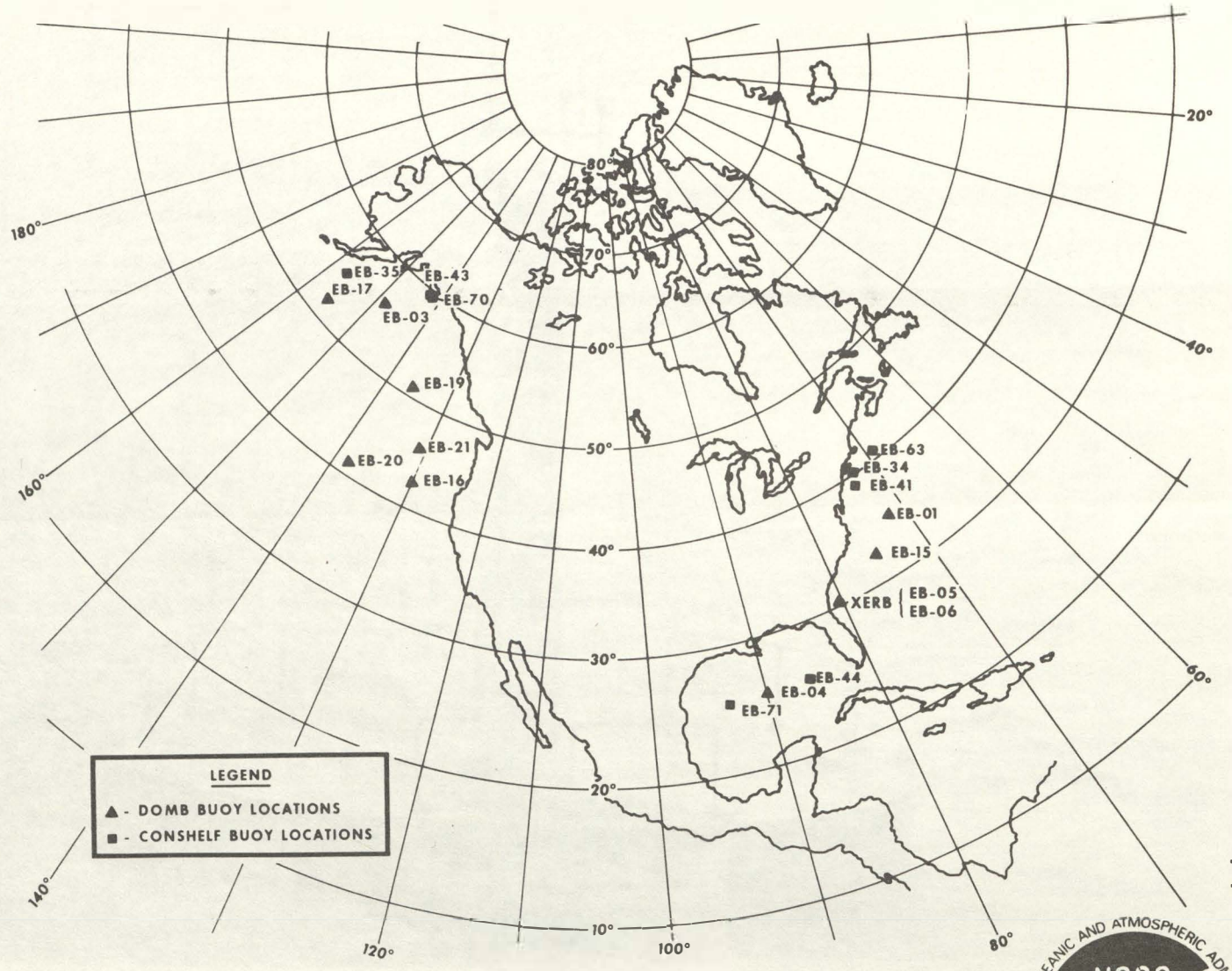
NDBO OPERATIONS PROGRAM

NOAA DATA BUOY LOCATIONS



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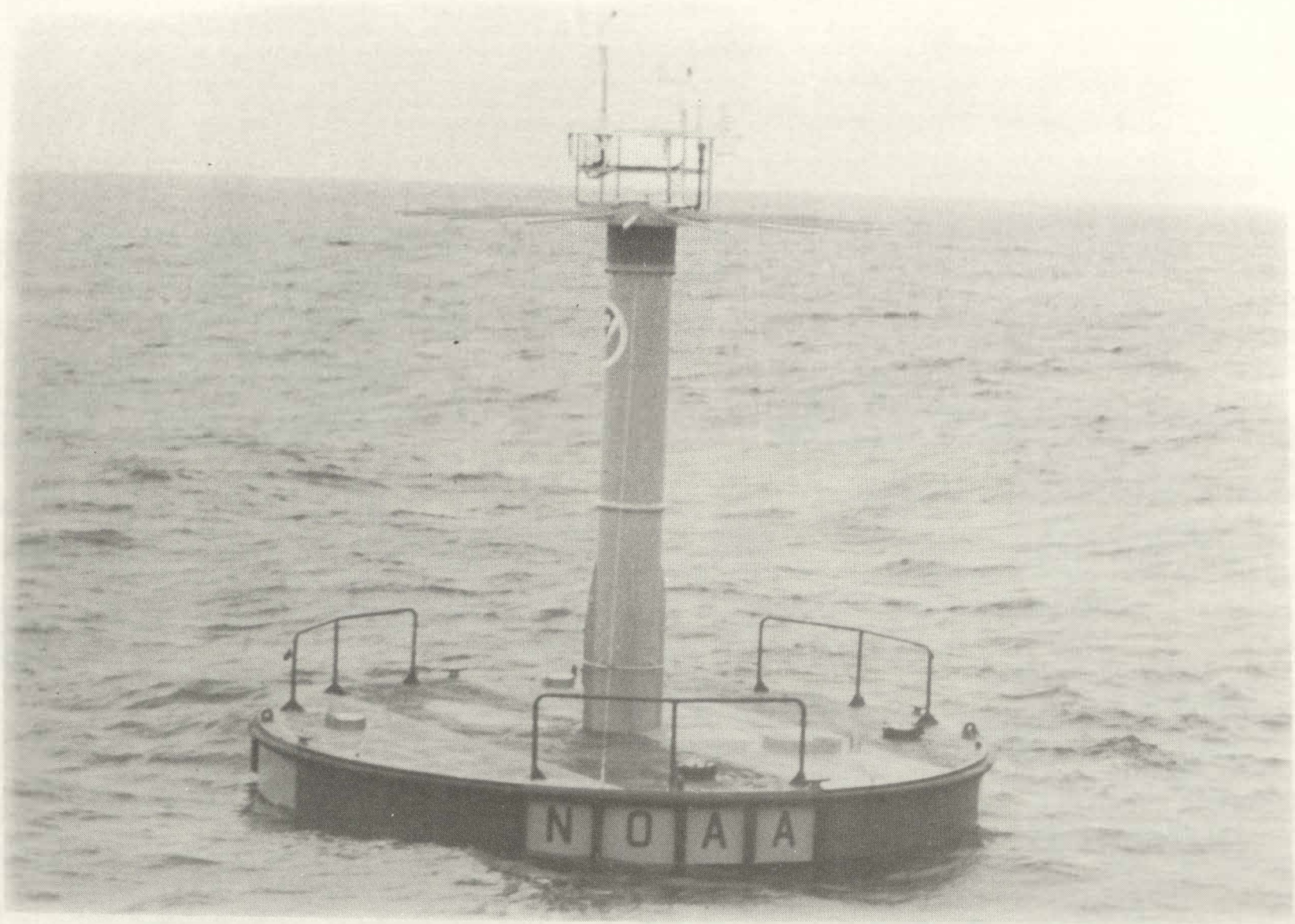
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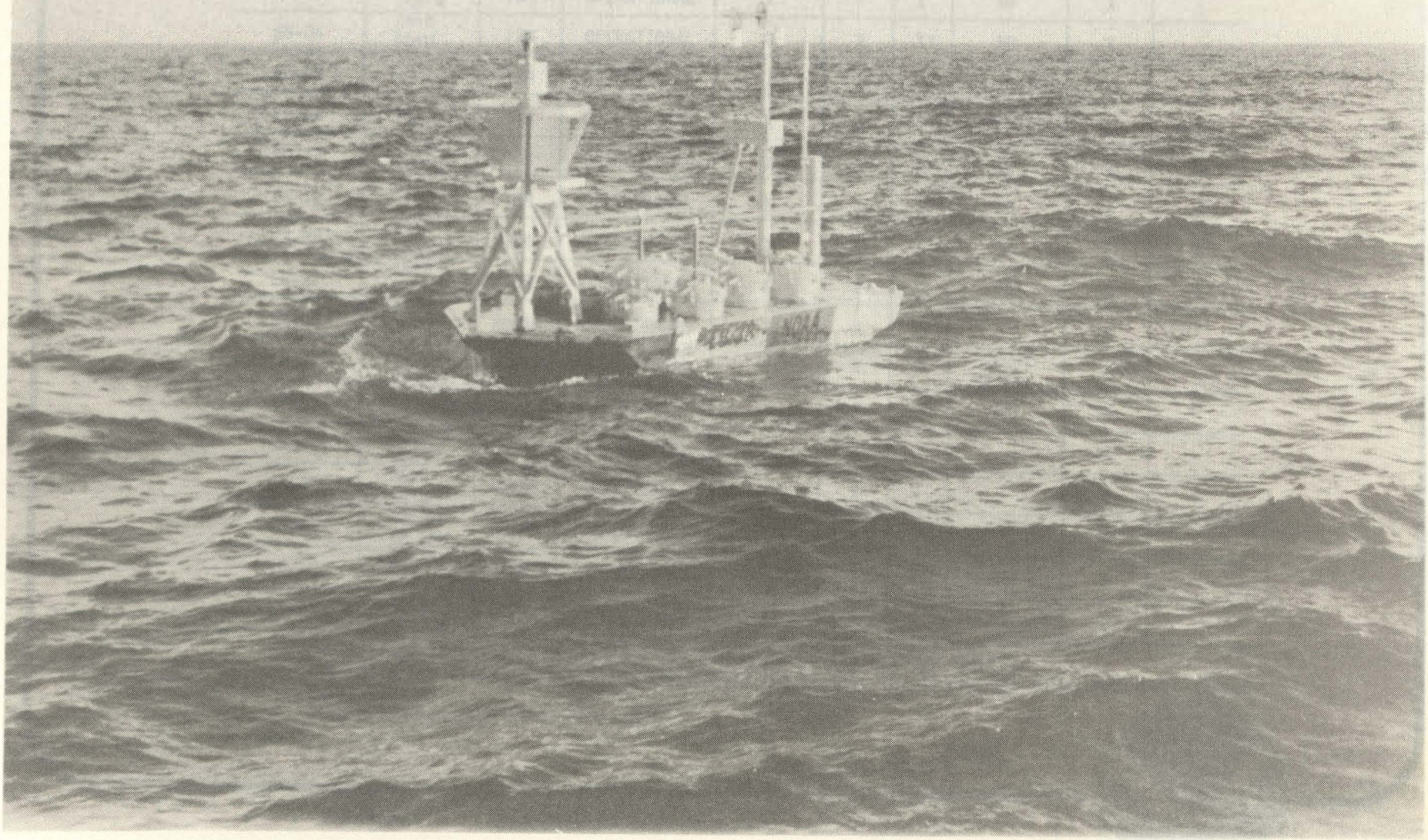
NDBC OPERATIONAL BUOYS AND MEASUREMENT CAPABILITIES



NDBO OPERATIONAL BUOYS AND MEASUREMENT CAPABILITIES

BUOY STATION DESIGNATION	LOCATION	HULL	STATUS/DEPLOY DATE	WIND DIR/SPEED	AIR PRESS	AIR TEMP	WAVE SPECTRAL ESTIMATES	SEA SURFACE TEMP	SUB* SURFACE TEMP
EB-01	35°N 72°W	12M**	OPERATIONAL	X	X	X	12	X	X
EB-03	56°N 148°W	12M	OPERATIONAL	X	X	X	40	X	
EB-04	26°N 90°W	12M	OPERATIONAL	X	X	X†	50	X	
EB-15	32.3°N 75.3°W	12M	OPERATIONAL	X	X	X	12 (8/76)	X	X
EB-16	42.5°N 130°W	10M	OPERATIONAL	X	X	X	12 (8/76)	X	X
EB-17	52°N 156°W	10M	OPERATIONAL	X	X	X	12	X	X
EB-19	51°N 136°W	10M	OPERATIONAL	X	X	X	12	X	X
EB-20	41°N 138°W	10M	OPERATIONAL	X	X	X	12	X	X
EB-21	46°N 131°W	10M	OPERATIONAL	X	X	X	12	X	X
EB-34	40°N 73°W	NOMAD	OPERATIONAL	X	X	X		X	
EB-35	55.3°N 157°W	NOMAD	OPERATIONAL	X	X	X	EXPERI-MENTAL	X	
EB-41	38.7°N 73.6°W	5M	OPERATIONAL	X	X	X	12	X	
EB-43	59.5°N 142°W	NOMAD	OPERATIONAL	X	X	X		X	
EB-44	26°N 86°W	NOMAD	LATE FALL	X	X	X		X	X
EB-63	40.8°N 68.5°W	NOMAD	LATE FALL	X	X	X		X	
EB-70	59.3°N 142.1°W	12M	OPERATIONAL	X	X	X	40	X	
EB-71	26°N 93.5°W	12M	OPERATIONAL	X	X	X	40	X	

* Sub-Surface thermistors located at 10, 20, 50, 100, 200 and 300 meters.

** All hulls are discus shape except the NOMADS (EB-34, 35, 43, 44 and 63) which have boat-shaped hulls (6Mx3M).

† Also measures Dewpoint Temperature.

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FUNDING SOURCES FOR OPERATIONAL BUOYS

- ATLANTIC

EB-15, 01	NDBO PEB DEMONSTRATION
EB-34, 41, 63	BLM AND MESA JOINT FUNDING

- GULF OF MEXICO

EB-04	NDBO EXPERIMENTAL BUOY
EB-71, 44	USGS FUNDING

- PACIFIC

EB-03, 16, 17, 19, 20, 21	NDBO PEB NET DEMONSTRATION
EB-70, 35, 43	ERL - OCEAP FUNDS

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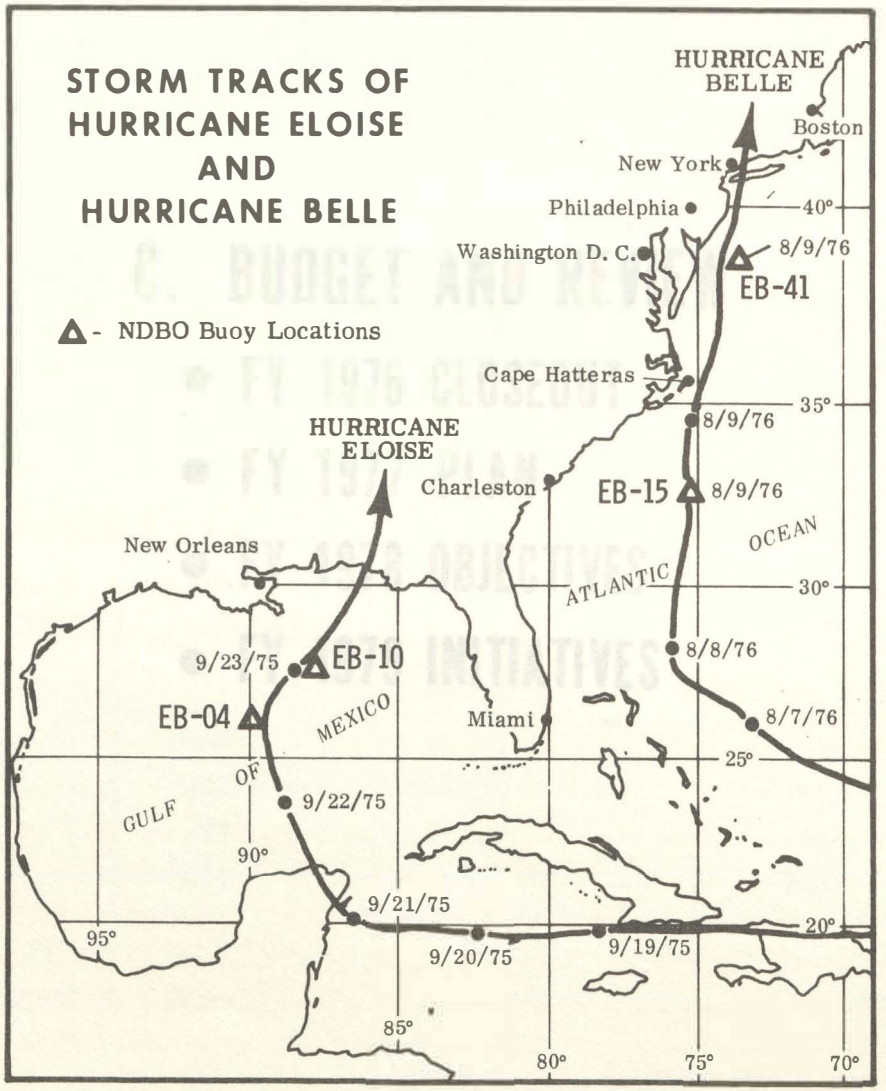
NOTEWORTHY EXAMPLE OF DATA BUOY OPERATION



C. BUDGET AND REVIEW

- FY 1976 CLOSEOUT
- FY 1977 PLAN
- FY 1978 OBJECTIVES
- FY 1979 INITIATIVES

NDBO FUNDING PLAN

	FY 1976	TRANSITION QUARTER	FY 1977 (Plan)	FY 1978 (Projection)
FUNDS AVAILABLE				
Base	6977	1793	7256	7358
Reimbursible Accounts	542	98	798	985
Capital Outlay Funds	----	----	----	900
Operations & Maintenance	----	----	----	700
Prior Year Adjustments	219	----	----	----
Total Funds Available	7738	1891	8054	9925
FUNDS UTILIZATION				
NDBO Administration	151	36	156	167
NDBO Support Services	352	90	385	425
Operational Buoy Procurements (Payloads)	89 (R)	--	283 (R)	900 (R)
Field Operations	453	98 (R)	512 (R)	1685 (R)
Field Test and Evaluation	1574	426	1490	800
R & D Inhouse*	494	129	522	525
R & D Management	799	207	864	930
R & D Contract Actions	3826	907	3842	4493

*Includes R & D Data Processing Costs

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PRIMARY 1977 OBJECTIVES

PRIMARY R&D OBJECTIVES

- DEMONSTRATE PEB NETWORK OPERATION
- ESTABLISH CREDITABLE CONSHELF PROGRAM CAPABILITY (REIMBURSIBLE MOSTLY)
- DEVELOP FGGE RESPONSE CAPABILITY
- EXECUTE OCEAN PROTOTYPING SYSTEM EVALUATION
  - WAVE MEASURING SYSTEMS
  - CURRENT MEASURING SYSTEMS
- ADVANCE STATE-OF-THE-ART IN KEY TECHNICAL AREAS
  - PAY LOAD COST
  - SUBSURFACE TEMPERATURE
  - UPPER AIR TEMPERATURE
  - SPECIAL BUOY SYSTEMS

PRIMARY OPERATIONAL OBJECTIVES

- CONSHELF REIMBURSIBLE OPERATIONS
- ACQUIRE CONSHELF PAYLOADS

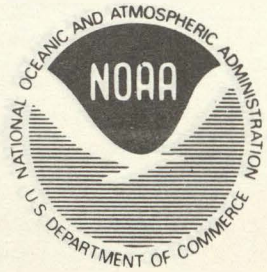
PRIMARY 1978 OBJECTIVES

PRIMARY RESEARCH & DEVELOPMENT OBJECTIVES

- DEMONSTRATE FGGE RELATED SYSTEMS
- IMPLEMENT AND EXPAND CONSHELF OPERATIONS (REIMBURSIBLE TASK)
- COMPLETE GOES CONVERSION FOR MOORED BUOYS
- COMPLETE OCEAN PROTOTYPING FIELD EXPERIMENTS
- IMPLEMENT AND TEST LOWER COST BUOY SYSTEMS
- TEST AND DEMONSTRATE OCEAN TEMPERATURE SYSTEM
- TEST UPPER AIR TEMPERATURE SYSTEMS
- DEMONSTRATE SPECIALIZED BUOY SYSTEMS (REIMBURSIBLE PRIMARILY)

PRIMARY OPERATIONAL OBJECTIVES

- INITIATE DEEP OCEAN MOORED BUOY OPERATIONS
- ACQUIRE EIGHT OPERATIONAL BUOY PAYLOADS



NDBO 1979 INITIATIVES

1979 RESEARCH & DEVELOPMENT INITIATIVES

- DEMONSTRATE LOW COST BUOY PERFORMANCE
- DEVELOP AND DEMONSTRATE RESPONSE TO CLIMATE PROGRAM REQUIREMENTS AS APPLICABLE TO BUOYS
- INITIATE EFFORTS TO REDUCE COST OF BUOY MAINTENANCE AND SUPPORT
- DEVELOP AND DEMONSTRATE RESPONSIVE WATER QUALITY MONITORING SYSTEM
- DEMONSTRATE INITIAL CURRENT MEASUREMENT SYSTEMS
- EVALUATE OPERATIONAL WAVE DIRECTIONAL SYSTEMS
- PROCURE PROTOTYPE OPERATIONAL UPPER AIR SYSTEM

1979 OPERATIONAL INITIATIVES

- PROCURE - SUPPORT CAPABILITY FOR EXPANDED OPERATIONAL SYSTEMS
- PROCURE - SUPPORT SYSTEMS FOR SPECIALIZED BUOY SYSTEMS

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DEEP OCEAN MOORED BUOY PROGRAM (DOMB)

A. OPERATIONAL PROGRAM APPLICATIONS ENGINEERING ACTIVITIES

B. DEVELOPMENT PROGRAM

A. OPERATIONAL PROGRAM

- PRESENT ACTIVITIES
- PLANNED OPERATIONS
- ASSOCIATED APPLICATIONS ENGINEERING FUNCTIONS

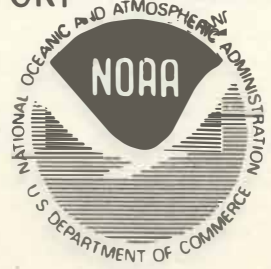
DOMB PROGRAM

OBJECTIVE

- DEMONSTRATE PEB NETWORK
- CONVERT OPERATIONS TO UHF-GOES SYSTEMS
- EXPAND CAPABILITY IN RESPONSE TO USERS
- REDUCE COSTS

STATUS

- OPERATIONS AND MAINTENANCE
  - PACIFIC
    - -- SIX PEB IN NET OPERATION DEMONSTRATION
  - ATLANTIC OPERATIONS
    - -- TWO PEB PAYLOADS OPERATING IN EEP HOURS
  - GULF OF MEXICO OPERATION
    - -- ONE EEP OPERATING
    - -- PEB PAYLOAD CHANGEOUT SCHEDULED
  - LOGISTICS AND SUPPORT
    - -- ADEQUATE CAPABILITY ON HAND TO SUPPORT OPERATIONS



COMPLEMENTS OF ENVIRONMENTAL SENSORS, RANGES AND ACCURACIES

Measurement	Transducer Type	Number of Sensors	Range	Total System Accuracy (1σ)	Total System Accuracy Requirement
Wind Speed Wind Direction	Vane Directed, Propeller type rotor	2	0 - 65 mps 0 - 360°	0.77 mps 3.29°	1 mps or 10% 10°
Buoy Heading	Gimbaled digital magnetic compass	2	-	-	-
Air Pressure	Bonded Strain Gage	2	900 to 1050 mb	0.68 mb	1 mb
Air Temperature	Platinum Resistor	1	-15 to 40° C	0.33° C	1° C
Wave Height Wave Period	(GFE)	1	0.5 to 30 m 2 to 30 s	0.32 m 1.05 s	0.5 m or 10% 1.5 s or 10%
Surface Water Temperature	Platinum Resitor	1	-5 to 35° C	0.18° C	1° C
Subsurface Water Temperature (6 Levels) 10, 20, 50, 100, 200 and 300m	Thermistor string	6	-5 to 35° C	0.37° C	0.5° C

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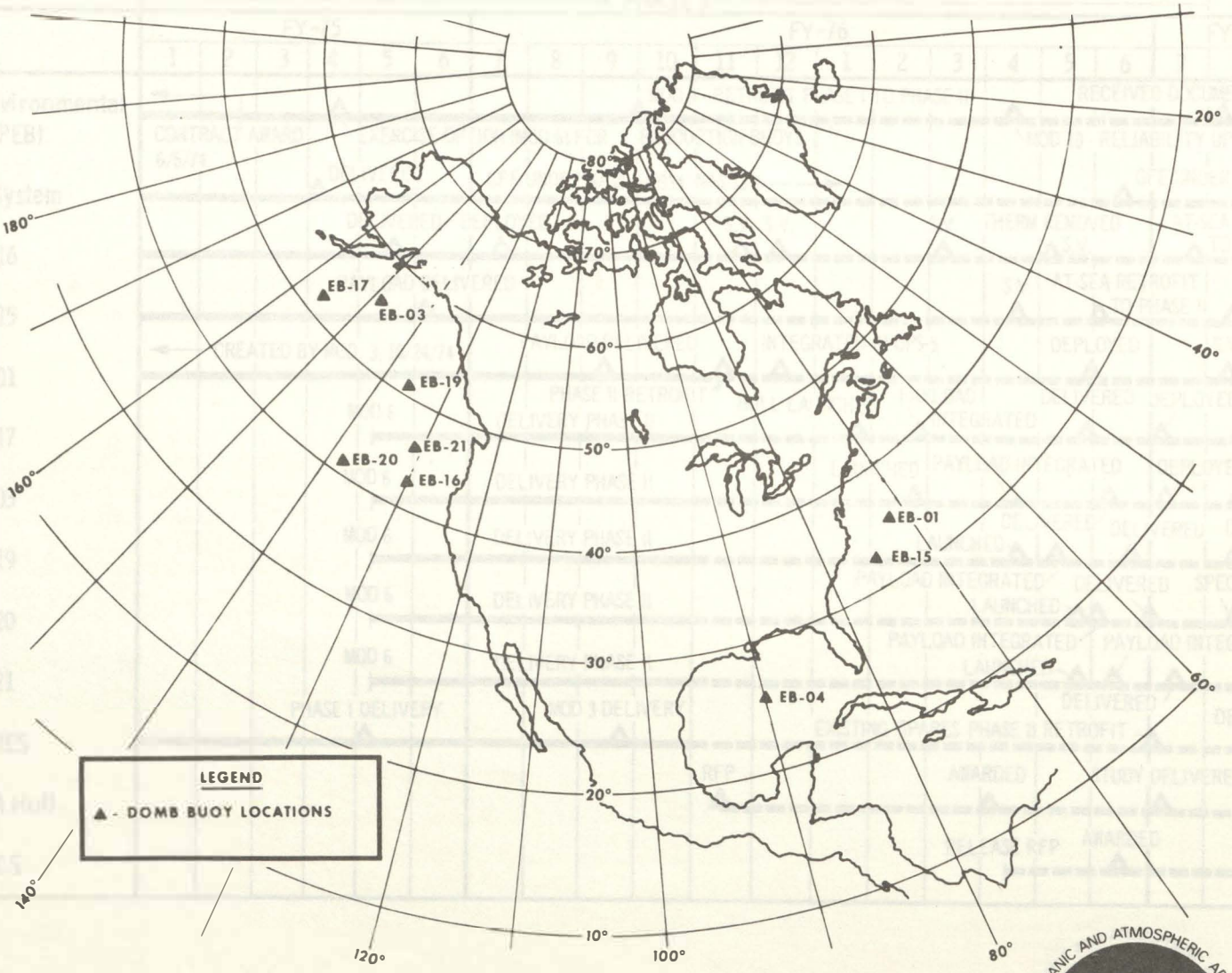
DEEP OCEAN MOORED BUOY LOCATIONS



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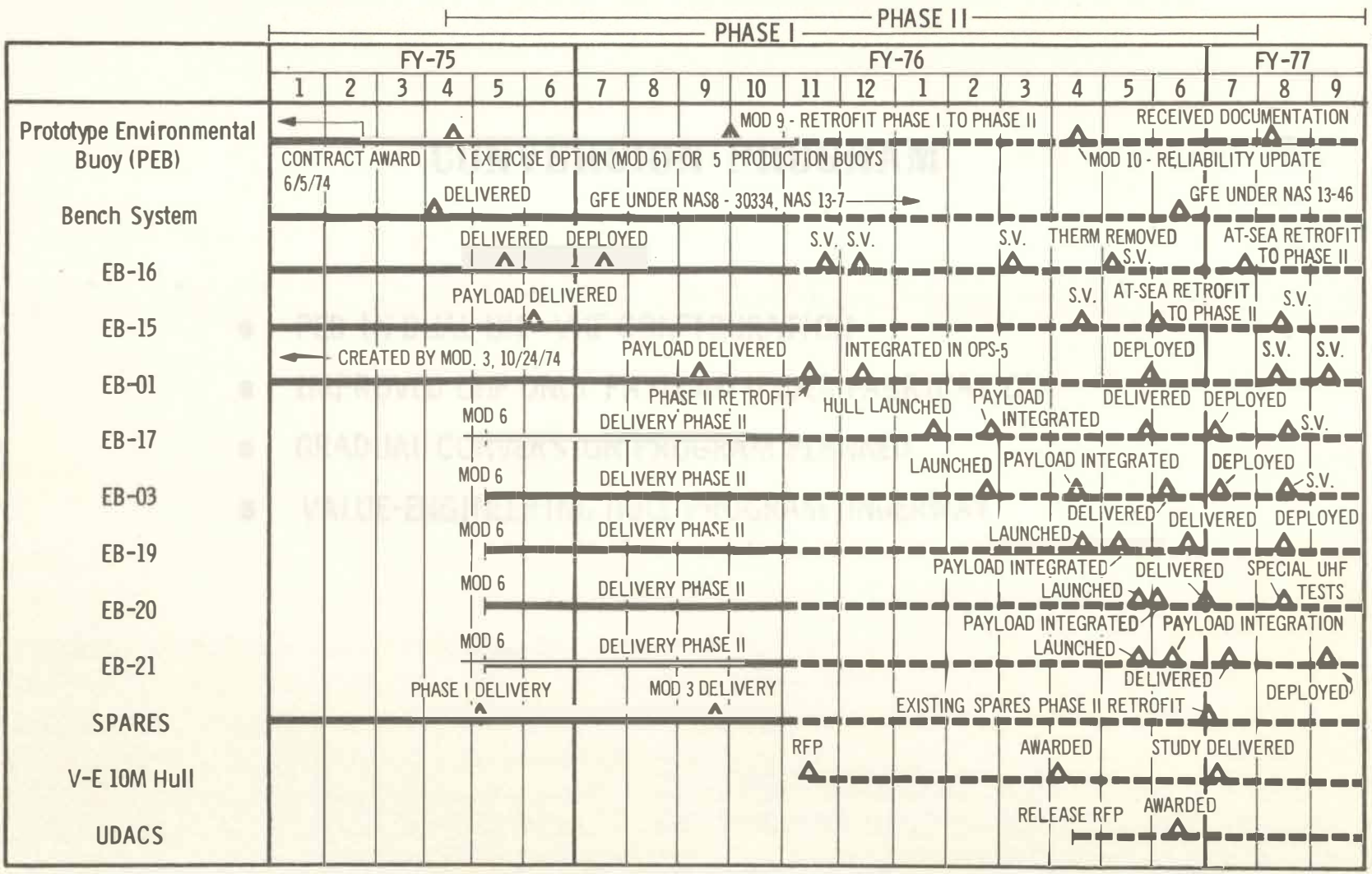
OPERATIONAL AND CONVERSION SCHEDULE



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CONVERSION PROGRAM

- PEB IN DUAL UHF-VHF CONFIGURATION
- IMPROVED UHF ONLY PAYLOAD UNDER FABRICATION
- GRADUAL CONVERSION PROGRAM PLANNED
- VALUE-ENGINEERING HULL PROGRAM UNDERWAY

PLANNED OPERATIONS

TERMINATE PEB NET T & E DEMONSTRATION

- SHIFT TO FULL OPERATIONAL CONCEPT - FY 1978

REREFURBISHMENT PROGRAM

- RECOVER AND REFIT FIRST BUOY (EB-16)
- AT SEA REPAIR FOR REMAINING SYSTEMS

UPGRADING PROGRAM

- DELIVER AND DEPLOY VE BUOY HULL WITH UDACS PAYLOAD FOR T&E
- PROGRAM ACQUISITION OF NEW PAYLOADS - FY 1978
  - SAME MEASUREMENTS AS PEB. UHF ONLY
  - ESTIMATED COST - $900K
    - 8 PAYLOADS - $570K
    - HULL REFURBISHMENT - $150K AND PAYLOAD INTEGRATION
    - MOORING - $180K

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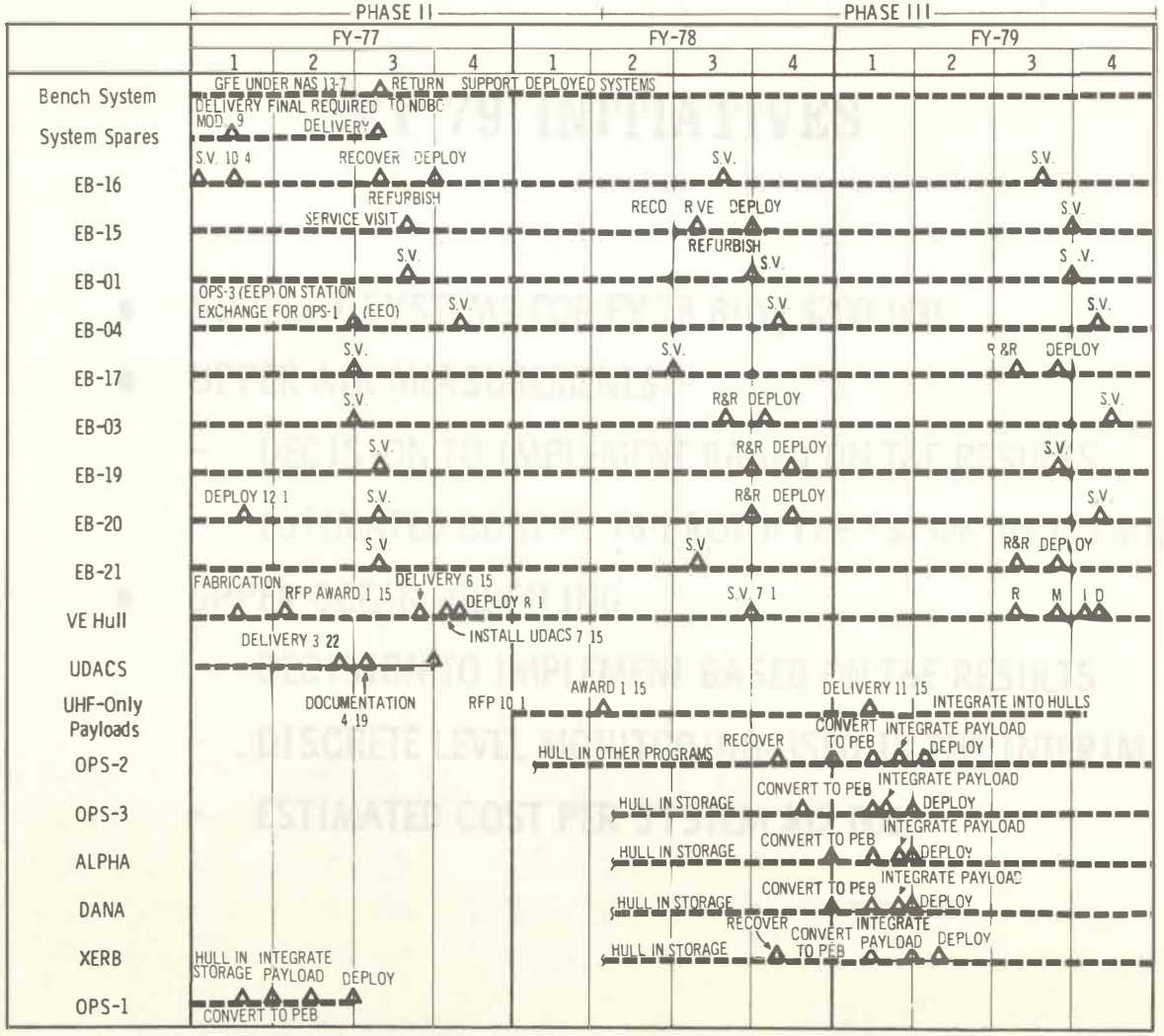
DOMB PLANNED OPERATION SCHEDULE



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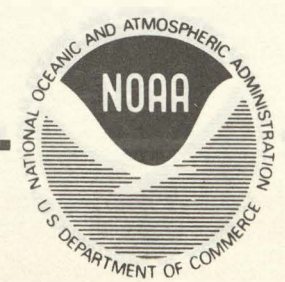
FY 79 INITIATIVES

- SUPPORT SYSTEMS FOR FY 78 BUY; $200,000
- UPPER AIR MEASUREMENTS
  - DECISION TO IMPLEMENT BASED ON T&E RESULTS
  - ESTIMATED COST FY 78 PROTOTYPE - $750K TO 1.0 MILLION
- UPPER OCEAN PROFILING
  - DECISION TO IMPLEMENT BASED ON T&E RESULTS
  - DISCRETE LEVEL MONITORING USED IN THE INTERIM
  - ESTIMATED COST PER SYSTEM $65,000



PLANNED OPERATIONS (Continued)

- EXPANDED NETWORK PER FEDERAL PLAN
  - DECISION TO IMPLEMENT NEEDED
  - 36 STATIONS; 6 ROTATING REPLACEMENTS PLANNED
  - PROPOSED PROCUREMENT SCHEDULE

FY 79	6 BUOYS
FY 80	6 BUOYS
FY 81	6 BUOYS
FY 82	6 BUOYS
FY 83	3 BUOYS

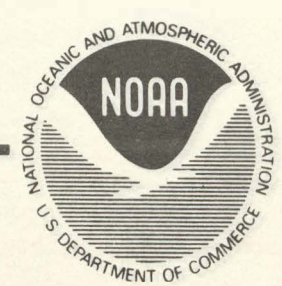
  - ESTIMATED PROCUREMENT COSTS/BUOY

PAYLOAD	75,000
HULL	80,000
MOORING	30,000

  - OPERATIONAL FUNDS REQUIRED

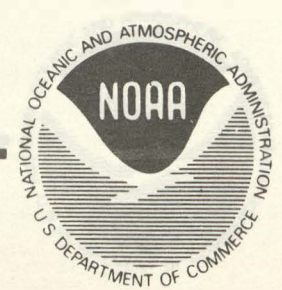
FY 79	700,000
FY 80	1,120,000
FY 81	1,540,000

EXPANDED NERWORK WILL INCREASE OPERATIONAL COSTS IN OUT YEARS APPROXIMATELY $70,000 PER BUOY PLUS INCREASED SPARES.



B. DEVELOPMENT PROGRAM

- **SCIENTIFIC BUOY DEVELOPMENT**
  - SMALL HULL DEVELOPMENT
  - THERMISTOR LINE DEVELOPMENT AND TESTING
- **MOORING DYNAMICS EXPERIMENT**
- **OCEAN PROFILING SENSOR DEVELOPMENT**



SCIENTIFIC BUOY DEVELOPMENT

OBJECTIVE

DEVELOP, TEST AND DEMONSTRATE DEEP OCEAN MOORED BUOY SUITABLE FOR USE BY NORPAX AND SIMILAR SCIENTIFIC PROGRAMS FOR REPORTING SURFACE AND SUBSURFACE OCEANOGRAPHIC PARAMETERS

REQUIREMENTS

- REPORT OCEAN TEMPERATURES ONLY
- LIFE OF ONE YEAR OR MORE
- LOW COST - $25,000.00 PER UNIT

SCOPE

- DEVELOP AND TEST LOW COST HULL/MOORING
- DEVELOP AND DEMONSTRATE ADEQUATE THERMISTOR LINE
- INTEGRATE AND DEMONSTRATE EFFECTIVE DATA HANDLING SYSTEM

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TYPICAL SYSTEM DATA CHARACTERISTICS

- To Range - -5°C to +35°C
- Accuracy - ±0.15°C
- Averaging time - Approximately 10 Minutes
- Data Acquisition
  - GOES Systems - hourly
  - NIMBUS 6 System - hourly - Stores 12 hours of data
  - TIROS N System - hourly - Stores 12 hours of data
- Data Transmission
  - GOES System - every 3 hours (1, 3, 6 hour options)
  - NIMBUS 6 System - transmits 4 hours of data every satellite pass
  - TIROS N System - transmits 12 hours of data every satellite pass
- Word Length - 8 bits
- Resolution - 0.13°C

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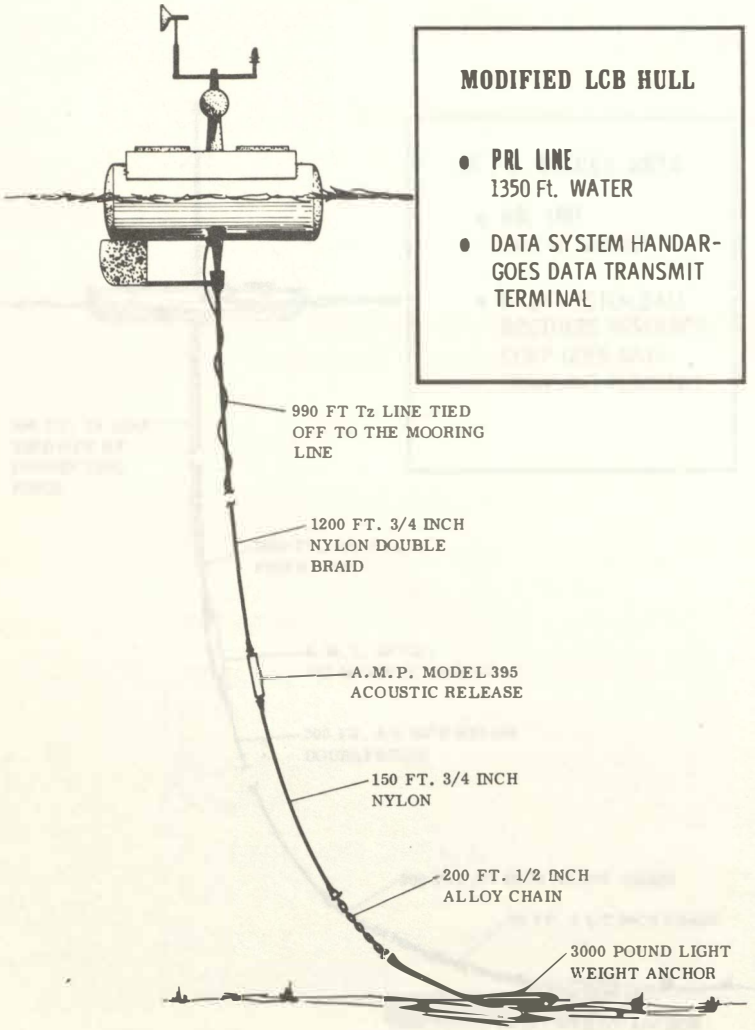
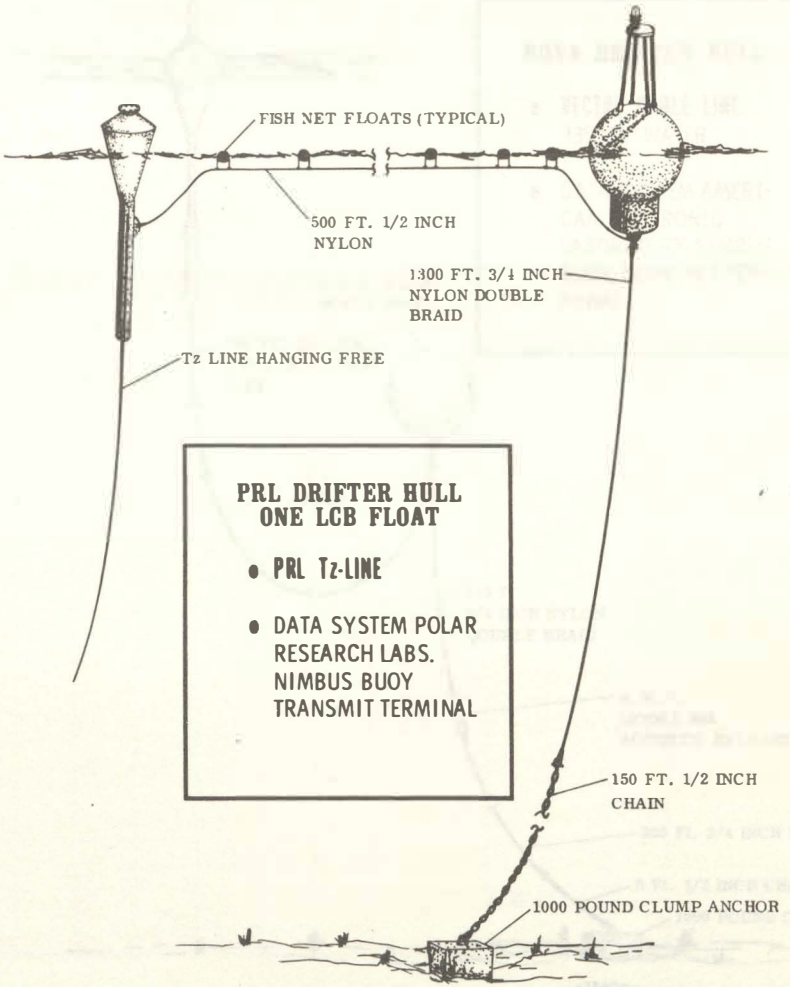
Tz CLUSTER EXPERIMENT





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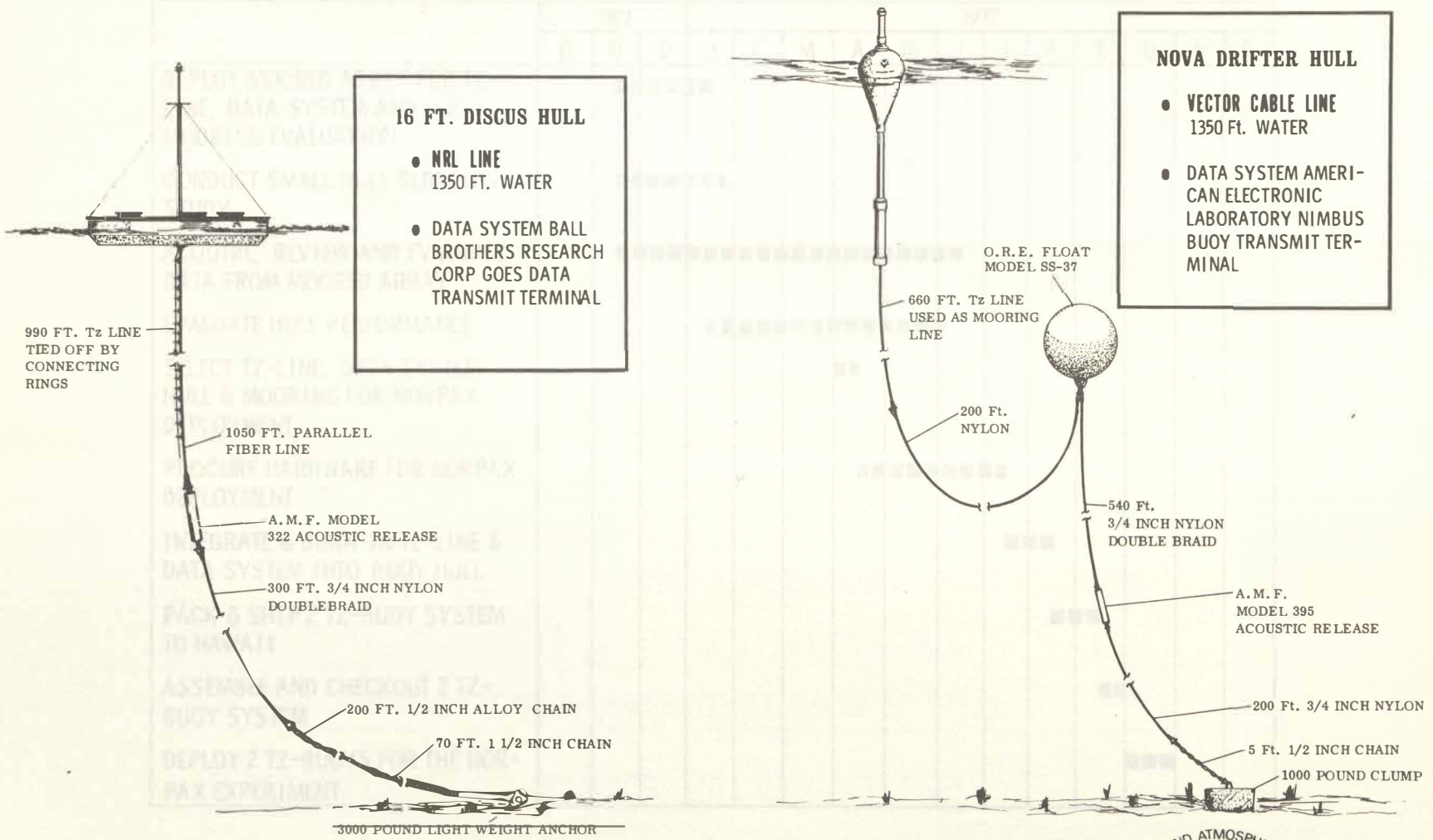
Tz CLUSTER EXPERIMENT (Continued)



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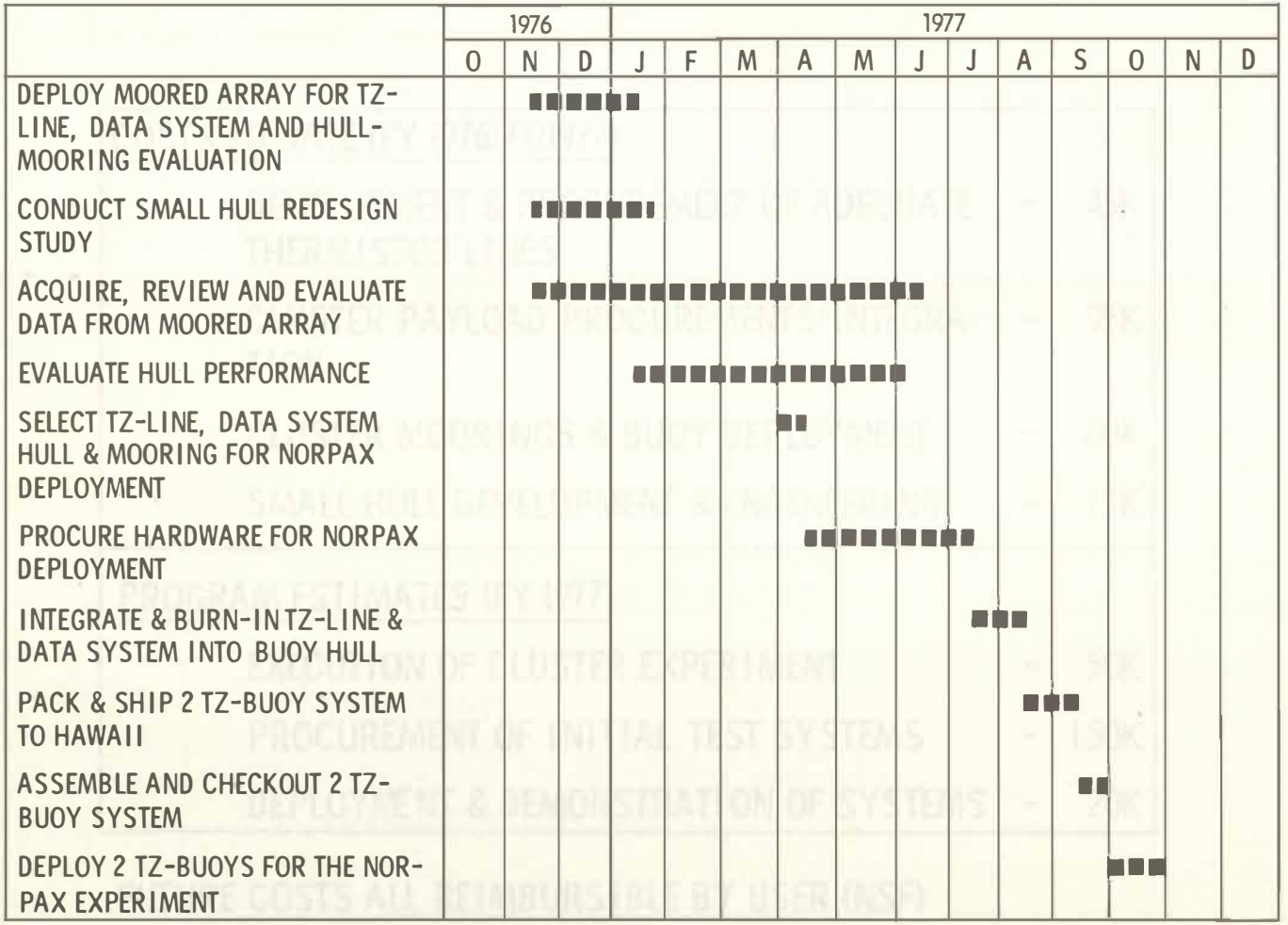
PROGRAM PLAN



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SCIENTIFIC BUOY DEVELOPMENT BUDGET

COSTS TO DATE (FY 1976/7T/1977)	
DEVELOPMENT & PROCUREMENT OF ADEQUATE THERMISTOR LINES	- 45K
CLUSTER PAYLOAD PROCUREMENTS/INTEGRATION	- 95K
CLUSTER MOORINGS & BUOY DEPLOYMENT	- 60K
SMALL HULL DEVELOPMENT & ENGINEERING	- 15K
PROGRAM ESTIMATES (FY 1977)	
EXECUTION OF CLUSTER EXPERIMENT	- 50K
PROCUREMENT OF INITIAL TEST SYSTEMS	- 150K
DEPLOYMENT & DEMONSTRATION OF SYSTEMS	- 20K

FUTURE COSTS ALL REIMBURSIBLE BY USER (NSF)

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MOORING DYNAMICS EXPERIMENT

PURPOSE

- VALIDATE ANALYTIC SIMULATION PROGRAMS FOR HULL MOORING DYNAMICS
- PROVIDE OPERATING ENVIRONMENT DATA FOR SENSOR SYSTEM DEVELOPMENTS

SCOPE

- JOINT ONR-NDBO, NCEL-NOO SUPPORTED PROGRAM
- WHOI & CSDC PROVIDE PRINCIPAL INVESTIGATORS
- INSTRUMENTATED FULL SCALE TESTS IN VARIETY OF ENVIRONMENTS
- FIVE WEEKS OF TESTS UNDER VARIETY OF CONDITIONS AT BARKING SANDS PMRF

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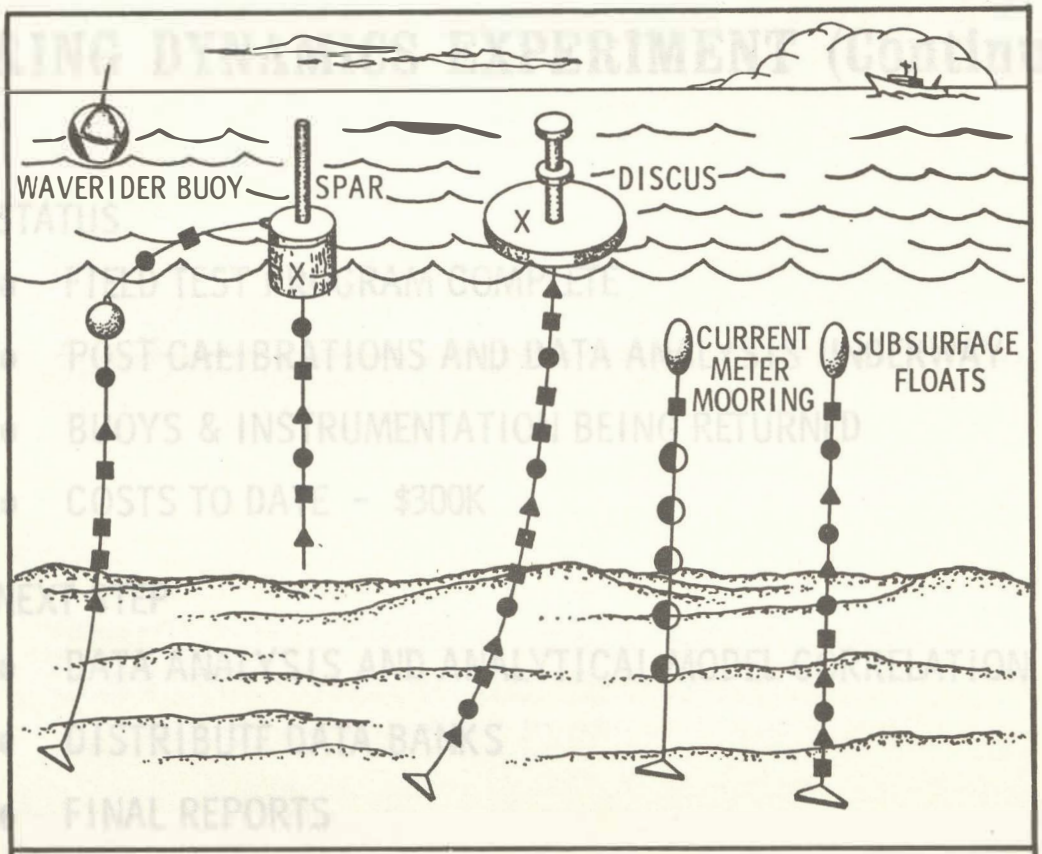
MOORING CONFIGURATION



SYMBOL	INSTRUMENT	SYMBOL	INSTRUMENT
●	FORCE VECTOR RECORDER	▲	ACOUSTIC TRACKER
■	PRESSURE/TEMPERATURE	◯	FLOATATION
X	POPMIP	◐	CURRENT METER

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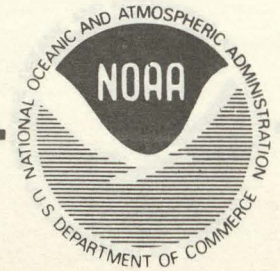
MOORING DYNAMICS EXPERIMENT (Continued)

STATUS

- FIELD TEST PROGRAM COMPLETE
- POST CALIBRATIONS AND DATA ANALYSIS UNDERWAY
- BUOYS & INSTRUMENTATION BEING RETURNED
- COSTS TO DATE - $300K

NEXT STEP

- DATA ANALYSIS AND ANALYTICAL MODEL CORRELATION
- DISTRIBUTE DATA BANKS
- FINAL REPORTS
- PLANNED COST TO COMPLETE - $40K



OCEAN PROFILING SENSOR PROJECT

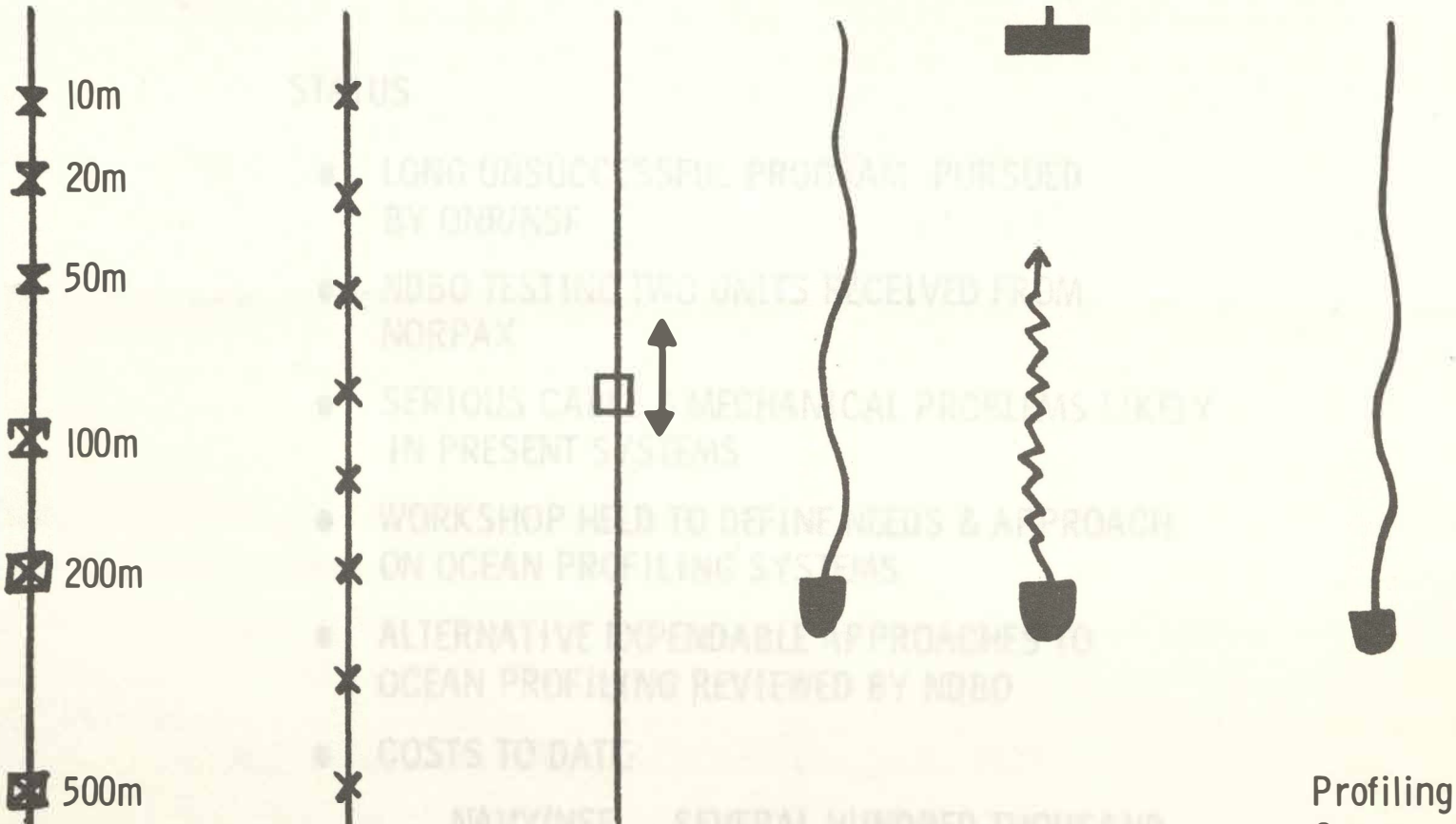
PURPOSE

DEVELOP & PROVIDE CAPABILITY FOR MONITORING TEMPERATURE, PROFILES (SALINITY LATER) FROM BUOYS FOR MILITARY, SCIENTIFIC, CLIMATE AND RESEARCH PURPOSES.

SCOPE

DEVELOP & TEST SINGLE PROBE OCEAN PROFILE OR OTHER COMPETITIVE SYSTEM TO PROVIDE OCEAN TEMPERATURE & SALINITY PROFILES FROM BUOYS

PROFILING SENSORS



Discrete Levels (Thermistor String)

Multiple Moving Sensors (LETS)

Single Movable Sensor (RABBIT)

Wire XBT

Acoustic XBT

Profiling Ocean Sensor (POS)

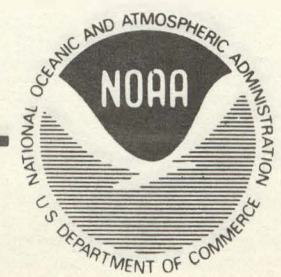
PROFILING OCEAN SENSOR PROJECT (Continued)

STATUS

- LONG UNSUCCESSFUL PROGRAM PURSUED BY ONR/NSF
- NDBO TESTING TWO UNITS RECEIVED FROM NORPAX
- SERIOUS CABLE & MECHANICAL PROBLEMS LIKELY IN PRESENT SYSTEMS
- WORKSHOP HELD TO DEFINE NEEDS & APPROACH ON OCEAN PROFILING SYSTEMS
- ALTERNATIVE EXPENDABLE APPROACHES TO OCEAN PROFILING REVIEWED BY NDBO
- COSTS TO DATE:

  NAVY/NSF - SEVERAL HUNDRED THOUSAND

  NDBO - $45,000.00



PROFILING OCEAN SENSOR PROJECT (Continued)

NEXT STEP

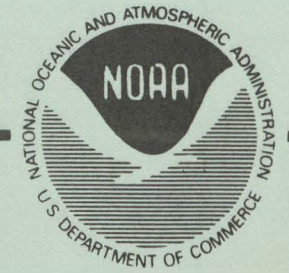
- COMPLETE TESTS NOW UNDERWAY PRESENT P. O. S.
- EVALUATE ALTERNATIVE WINCH SYSTEMS
- EVALUATE SENSOR UTILITY FOR POS APPLICATION

FUTURE ACTIVITY

- SET UP JOINT NORDA-NDBO PROGRAM FOR DEVELOPMENT-TESTING PROFILING SYSTEMS ($50K FY 77 FUNDS)
- TOTAL DEVELOPMENT ESTIMATED COSTS $500K

CONSHELF MOORED BUOY PROGRAM

- CONSHELF OPERATIONAL PROGRAM
- CURRENT APPLICATIONS ENGINEERING PROJECTS
- RESEARCH AND DEVELOPMENT PROJECTS



CONSHELF OPERATIONAL PROGRAM

- GENERAL PROGRAM CHARACTERISTICS
- PRESENT SYSTEM CAPABILITES
- PRESENT COMMITMENTS
- TYPICAL COSTS TO USER

GENERAL PROGRAM CHARACTERISTICS

- PRIMARY PURPOSE

  GATHER ENVIRONMENTAL DATA FROM THE CONTINENTAL MARGIN TO FURTHER THE UNDERSTANDING OF THE METEOROLOGICAL FORCING FUNCTIONS THAT AFFECT OCEAN DYNAMICS OVER THE CONTINENTAL SHELF

- PROGRAM FUNDING

  BY USER ON A COST-REIMBURSIBLE BASIS

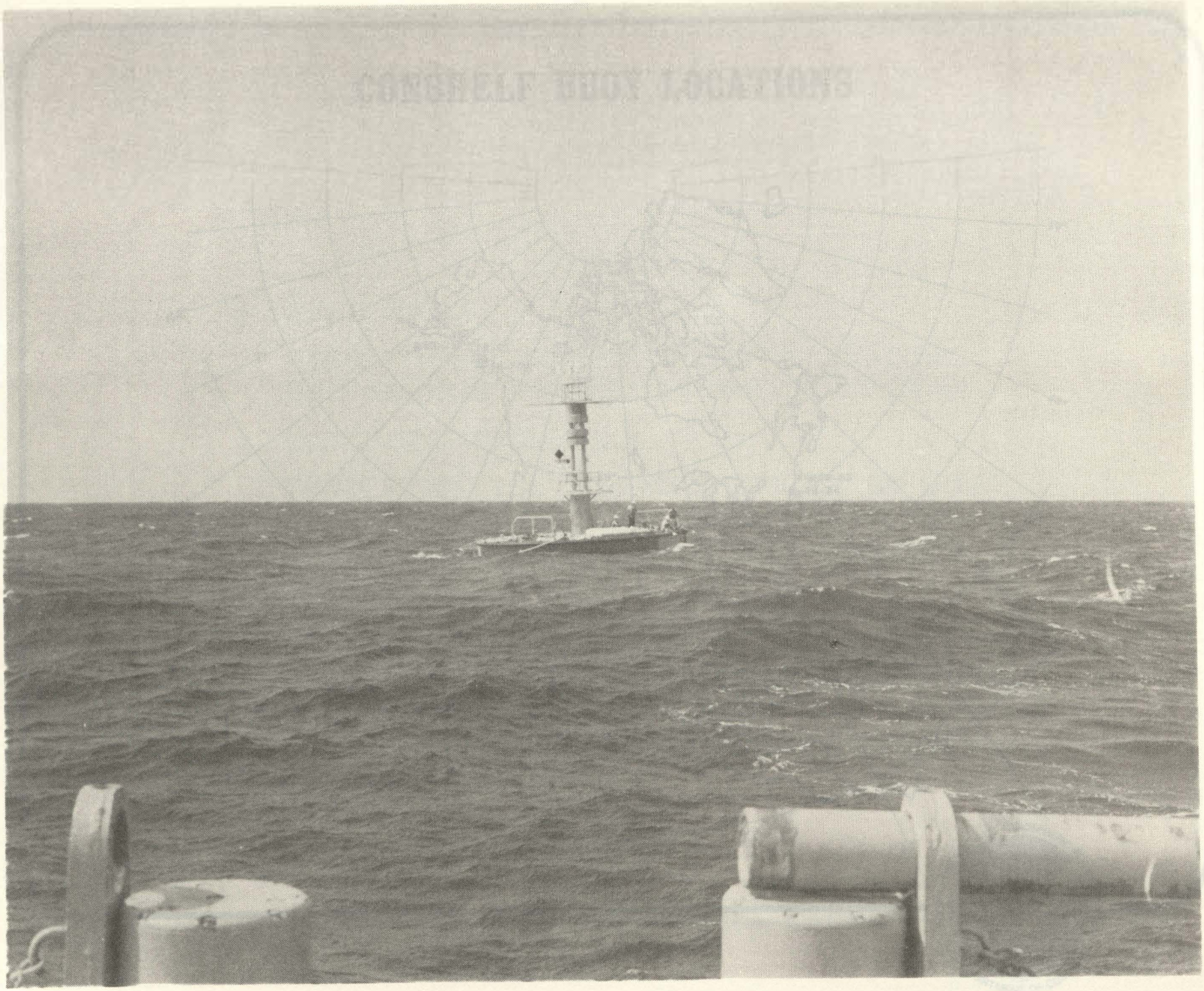
- PROGRAM GROWTH POTENTIAL
  - ONE BUOY/ONE AGENCY - 1974
  - EIGHT BUOYS/THREE AGENCIES - 1976
  - UP TO TWENTY BUOYS BY 1978

- BENEFITS
  - USER REQUIREMENTS SATISFIED
  - NOAA ELEMENTS (NWS AND OTHERS) BENEFIT AT LITTLE OR NO COST

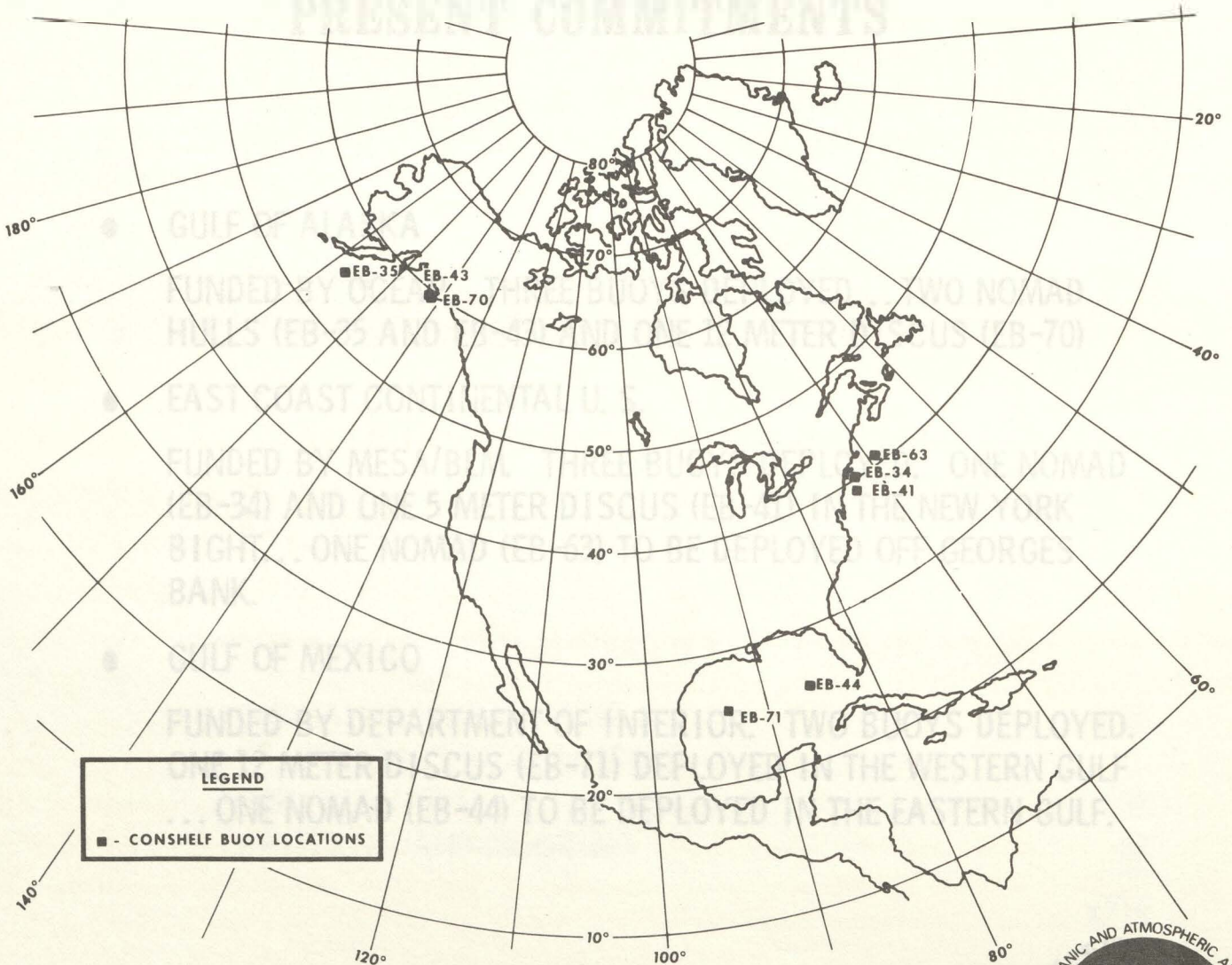
PRESENT SYSTEM CAPABILITIES

- PARAMETERS REPORTED
  - METEOROLOGICAL
    - WIND SPEED
    - WIND DIRECTION
    - ATMOSPHERIC PRESSURE
    - AIR TEMPERATURE
  - OCEAN - SEA SURFACE TEMPERATURE
  - WAVES
    - SIGNIFICANT WAVE HEIGHT AND PERIOD
    - WAVE SPECTRA
- HULL TYPES
  - NOMAD (BOAT HULL)
  - DISCUS (5 METER AND 12 METER)
- COMMUNICATIONS
  - HF VIA MIAMI/SAN FRANCISCO SHORE COLLECTION STATION
  - UHF VIA GOES SYSTEM


NOAA
EB-34
IDAA
UARD



CONSHELF BUOY LOCATIONS



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PRESENT COMMITMENTS

- GULF OF ALASKA

  FUNDED BY OCEAP. THREE BUOYS DEPLOYED...TWO NOMAD HULLS (EB-35 AND EB-43) AND ONE 12 METER DISCUS (EB-70)

- EAST COAST CONTINENTAL U. S.

  FUNDED BY MESA/BLM. THREE BUOYS DEPLOYED. ONE NOMAD (EB-34) AND ONE 5 METER DISCUS (EB-41) IN THE NEW YORK BIGHT...ONE NOMAD (EB-63) TO BE DEPLOYED OFF GEORGES BANK.

- GULF OF MEXICO

  FUNDED BY DEPARTMENT OF INTERIOR. TWO BUOYS DEPLOYED. ONE 12 METER DISCUS (EB-71) DEPLOYED IN THE WESTERN GULF ...ONE NOMAD (EB-44) TO BE DEPLOYED IN THE EASTERN GULF.

TYPICAL COSTS TO USER

- INITIAL HARDWARE (WHERE APPLICABLE)*

- BASIC PAYLOAD	$60K
- GOES COMMUNICATIONS	8K
- WAVE MEASUREMENT SYSTEM	10K
- BTT	2K
* HARDWARE AUTHORIZED AT 20% PER YEAR	$80K

- FIRST YEAR O & M COSTS (PER BUOY)

- INSTALLATION, CHECKOUT, HULL REFURBISHMENT, SHIPMENT, DEPLOYMENT	$16K
- SERVICE VISIT	3K
- BATTERIES AND MOORING	8K
	$27K

- SECOND AND ADDITIONAL YEAR O & M COSTS (PER BUOY)

- ANNUAL REFURBISHMENT (ELECTRONICS/MECHANICAL)	$10K
- SERVICE VISIT	3K
- BATTERIES AND MOORING	8K
	$21K

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CURRENT APPLICATIONS ENGINEERING PROJECTS

- FIELD SUPPORT AND LOGISTICS
- IMPROVEMENT OF SYSTEM CAPABILITY
- CONSHELF MODIFICATION - HULLS OF OPPORTUNITY
- CONVERSION TO UHF GOES SYSTEM

FIELD SUPPORT AND LOGISTICS

- SPARES/REPAIR FUNCTION
- LOGISTICS RESPONSE TIME
- FIELD AND LABORATORY SUPPORT SYSTEMS
- IMPROVE SYSTEM INTEGRATION/CHECKOUT TECHNIQUE
- DATA QUALITY/SYSTEM (END-TO-END) VERIFICATION

IMPROVEMENT OF SYSTEM CAPABILITY

- WAVE MEASUREMENT SYSTEM ON NOMAD HULLS
- STANDARDIZATION OF MAGNAVOX PHASE I AND PHASE II PAYLOAD COMPONENTS
- POWER SYSTEM
- MOORING DESIGN/TECHNIQUES

CONSHELF MODIFICATION - HULLS OF OPPORTUNITY

- HULL REDESIGN TO MEET USER REQUIREMENTS
- HULL MODIFICATION TO ACCOMMODATE AVAILABLE PAYLOADS
- MOORING DESIGN TO FIT AVAILABLE HULL TO USER REQUIREMENTS

CONVERSION TO GOES SYSTEM

- MAGNAVOX PHASE II PAYLOADS
- FEASIBILITY OF CONVERTING MAGNAVOX PHASE I PAYLOAD FOR USE WITH GOES SYSTEM
- DEVELOPMENT AND DEPLOYMENT OF UHF GOES ONLY BUOY (NO HF CAPABILITY)

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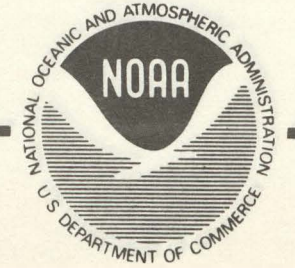
RESEARCH AND DEVELOPMENT PROJECTS

- LOW COST PAYLOAD DEVELOPMENT
- LOW COST HULL DEVELOPMENT
- DIAL-UP BUOY SYSTEM
- GREAT LAKES TEST PROGRAM
- SHALLOW WATER MOORING SIMULATION/DEVELOPMENT



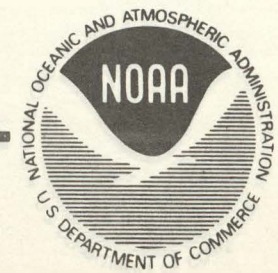
LOW COST CONSHELF BUOY PAYLOAD

PURPOSE

- DEVELOP, TEST AND DEMONSTRATE A SIMPLE, RELIABLE, LOW COST BUOY PAYLOAD (LESS AND $25K) FOR CONTINENTAL SHELF APPLICATIONS
- MAKE AVAILABLE TO REIMBURSIBLE USERS A GROUP OF BUOYS USING THE LOW COST PAYLOAD. AMORTIZE HARDWARE COSTS TO REDUCE IMPACT OF FIRST YEAR COST TO OPERATE

SCOPE

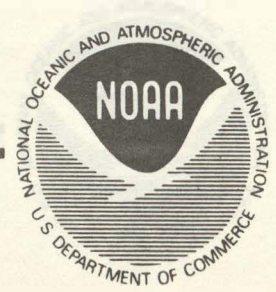
- DEVELOP TESTS AND DEMONSTRATE PROTOTYPE PAYLOAD
- PROCURE EIGHT PAYLOADS AND SUPPORTING SPARES AND TEST EQUIPMENT



LOW COST CONSHELF BUOY PAYLOAD (Continued)

PAYLOAD CHARACTERISTICS

- USES GOES SYSTEM TELEMETRY LINK
- OPERATES IN SELF-TIMED MODE ONLY
- DESIGNED FOR HIGH RELIABILITY AND LOW POWER CONSUMPTION
- RUGGEDIZED ENVIRONMENTAL PACKAGING FOR USE IN DIFFERENT HULL CONFIGURATIONS
- MEASURES BASIC METEOROLOGICAL PARAMETERS
- OPTIONAL WAVE MEASUREMENT SYSTEM AND THERMISTOR LINE CAPABILITY AVAILABLE



LOW COST CONSHELF BUOY PAYLOAD (Continued)

PARAMETERS MEASURED

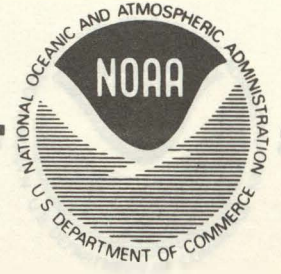
- WIND SPEED AND DIRECTION
- MAXIMUM WIND SPEED (GUST) PER SAMPLING INTERVAL
- AIR PRESSURE
- AIR TEMPERATURE
- SEA SURFACE TEMPERATURE

OPTIONAL PARAMETERS

- SIGNIFICANT WAVE HEIGHT, WAVE PERIOD AND SPECTRAL DENSITY
- SUBSURFACE TEMPERATURE (10 MEASUREMENTS AND SUBSURFACE PRESSURE (2 MEASUREMENTS)

LOW COST CONSHELF BUOY PAYLOAD (Continued)

- FUNDING
  - $75K IN FY-76
  - $283K IN FY-77
- SCHEDULE
  - RFP ISSUED - OCTOBER 8, 1976
  - PROPOSALS DUE - NOVEMBER 22, 1976
  - EVALUATION COMPLETE - DECEMBER 15, 1976
  - CONTRACT AWARD - JANUARY 15, 1977
  - PROTOTYPE ACCEPTANCE 42 WEEKS AFTER CONTRACT AWARD
  - PRODUCTION UNITS 58-65 WEEKS AFTER CONTRACT AWARD



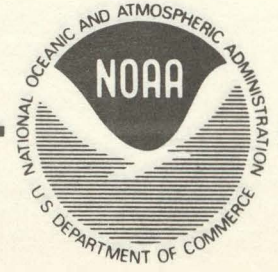
LOW COST HULL DEVELOPMENT

PURPOSE

DEVELOP, BUILD AND TEST A LOW COST HULL (LESS THAN $10K) FOR CONSHELF APPLICATIONS

SCOPE

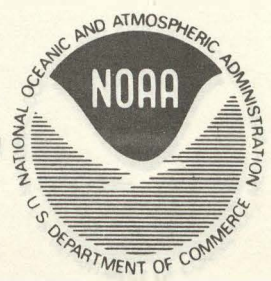
- EVALUATE VARIOUS SHAPES, MATERIALS AND SIZES FOR CONSHELF APPLICATIONS
- DESIGN AND BUILD PROTOTYPE HULL



LOW COST HULL DEVELOPMENT (Continued)

PROJECT STATUS

- FUNDING (DESIGN PHASE)
  - $20K EXPENDED TO DATE
  - $20K ESTIMATED TO COMPLETE
- FUNDING (PROTOTYPE CONSTRUCTION)
  - $15 - 50K DEPENDING ON CONSTRUCTION/MATERIAL
- SCHEDULE
  - CONTRACT AWARDED (NICKUM-SPAULDING)
  - EVALUATION OF CANDIDATE HULL DESIGNS/MATERIALS - IN PROGRESS
  - DESIGN
- EVALUATION OF DESIGN EFFORT (NDBO)
- BUILD AND TEST PROTOTYPE



DIAL-UP BUOY SYSTEM

PURPOSE

TO FILL A NEED FOR "AVAILABLE ON DEMAND" NEAR SHORE MARINE METEOROLOGICAL DATA TO IMPROVE LOCAL MARINE FORECASTS. DATA TO BE MADE AVAILABLE TO LOCAL FORECAST OFFICES VIA DIRECT DIAL ACCESS.

SCOPE

DEVELOP, BUILD AND TEST A PROTOTYPE SYSTEM CONSISTING OF ONE SHORE SIDE CONTROL STATION AND SEVERAL REMOTE DATA COLLECTION UNITS. TARGET COST PER REMOTE DATA COLLECTION UNIT, $10K OR LESS. TARGET COST PER SHORE SIDE CONTROL STATION $30K OR LESS.

DIAL-UP BUOY SYSTEM (Continued)

SYSTEMS CHARACTERISTICS

- TELEPHONE LINE OR RADIO LINK FROM REMOTE DATA COLLECTION UNIT TO SHORE SIDE CONTROL STATION
- DIRECT DIAL ACCESS TO SHORE SIDE CONTROL CENTER BY LOCAL FORECAST OFFICE/USER AT ANY TIME
- DATA TAKING INTERVAL...EVERY 30 MINUTES
- MEASURES BASIC METEOROLOGICAL PARAMETERS
  - WIND SPEED AND DIRECTION
  - AIR PRESSURE
  - AIR TEMPERATURE
- MODULAR CONSTRUCTION/RUGGEDIZED ENVIRONMENTAL PACKAGING
- DESIGNED FOR EASE OF SERVICING/VENDOR REPAIR

DIAL-UP BUOY SYSTEM (Continued)

SYSTEM STATUS

- FUNDING (NDBO) $150K FY-77
- SCHEDULE
  - RFP ISSUED - FEBRUARY 15, 1977
  - PROPOSALS DUE - APRIL 1, 1977
  - PROPOSAL EVALUATION COMPLETE - MAY 1, 1977
  - CONTRACT AWARD (CPFF) - JUNE 1, 1977
  - PROTOTYPE SYSTEM ACCEPTANCE - 42 WEEKS AFTER CONTRACT AWARD

GREAT LAKES SYSTEM TEST PROGRAM

PURPOSE

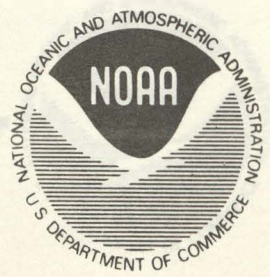
TEST EXISTING BUOY SYSTEMS (SENSORS, POWER SUPPLIES, COMMUNICATIONS) UNDER THE SEVERE ICING CONDITIONS ANTICIPATED FOR BUOY OPERATIONS ON THE GREAT LAKES.

SCOPE

TEST AN ARRAY OF SENSORS, AT THE FIVE METER LEVEL, UNDER SPRAY AND ICING CONDITIONS ON LAKE SUPERIOR. USE SATELLITE COMMUNICATIONS, CHECK VARIOUS ANTENNA CONFIGURATIONS AND STANDARD BUOY POWER SYSTEMS.

GREAT LAKES SYSTEM TEST PROGRAM (Continued)

- FUNDING - $44K FY-77 R&D FUNDS
- SCHEDULE
  - SITE SELECTION — MID-NOVEMBER 1976
  - SYSTEM INTEGRATION — NOVEMBER 1976-JANUARY 1977
  - SYSTEM INSTALLATION & TEST — LATE FEBRUARY-MAY 1977
  - EVALUATION OF TEST RESULTS COMPLETE — JUNE 1977



SHALLOW WATER MOORING SIMULATION

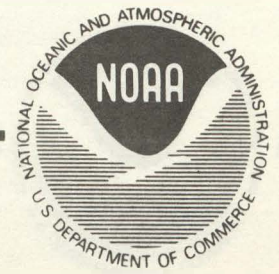
PURPOSE

DEVELOP AN ANALYTIC SIMULATION OF CONSHELF (SHALLOW WATER) MOORING DYNAMICS FOR OPERATIONAL ENGINEERING PURPOSES.

SCOPE

MODIFY EXISTING DEEP OCEAN SIMULATION TO ACCOUNT FOR

- LARGE WAVE/DEPTH RATES
- SLACK CABLE CONDITIONS
- TIDAL EFFECTS
- LARGE VARIETY OF HULLS



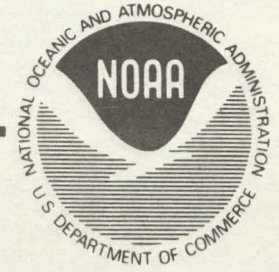
SHALLOW WATER MOORING SIMULATION (Continued)

STATUS

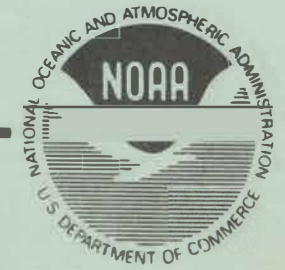
- FIRST CUT OF OCEANICS SIMULATION COMPLETE, INCLUDING LOWER END EFFECTS
- DROGUE MODEL COMPLETE
- MOORING DYNAMICS EXPERIMENT COMPLETE
- COST TO DATE - $50K

TO BE ACCOMPLISHED

- INCORPORATE RESULTS OF DROGUE NUMERICAL MODEL PROCESSES
- VALIDATE RESULTS WITH FULL SCALE TESTING
  - T_Z PROGRAM OUTPUT
  - MOORING DYNAMICS EXPERIMENT OUTPUT
- INSTRUMENT AND TEST HULLS IN CONJUNCTION WITH FUTURE PROGRAMS
- MODIFY AND VALIDATE SIMULATION AS A FUNCTION OF TIME

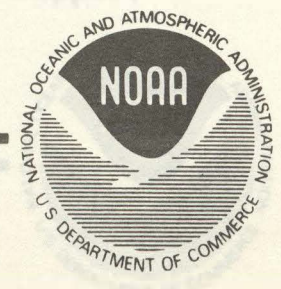


NDBO DATA PROCESSING

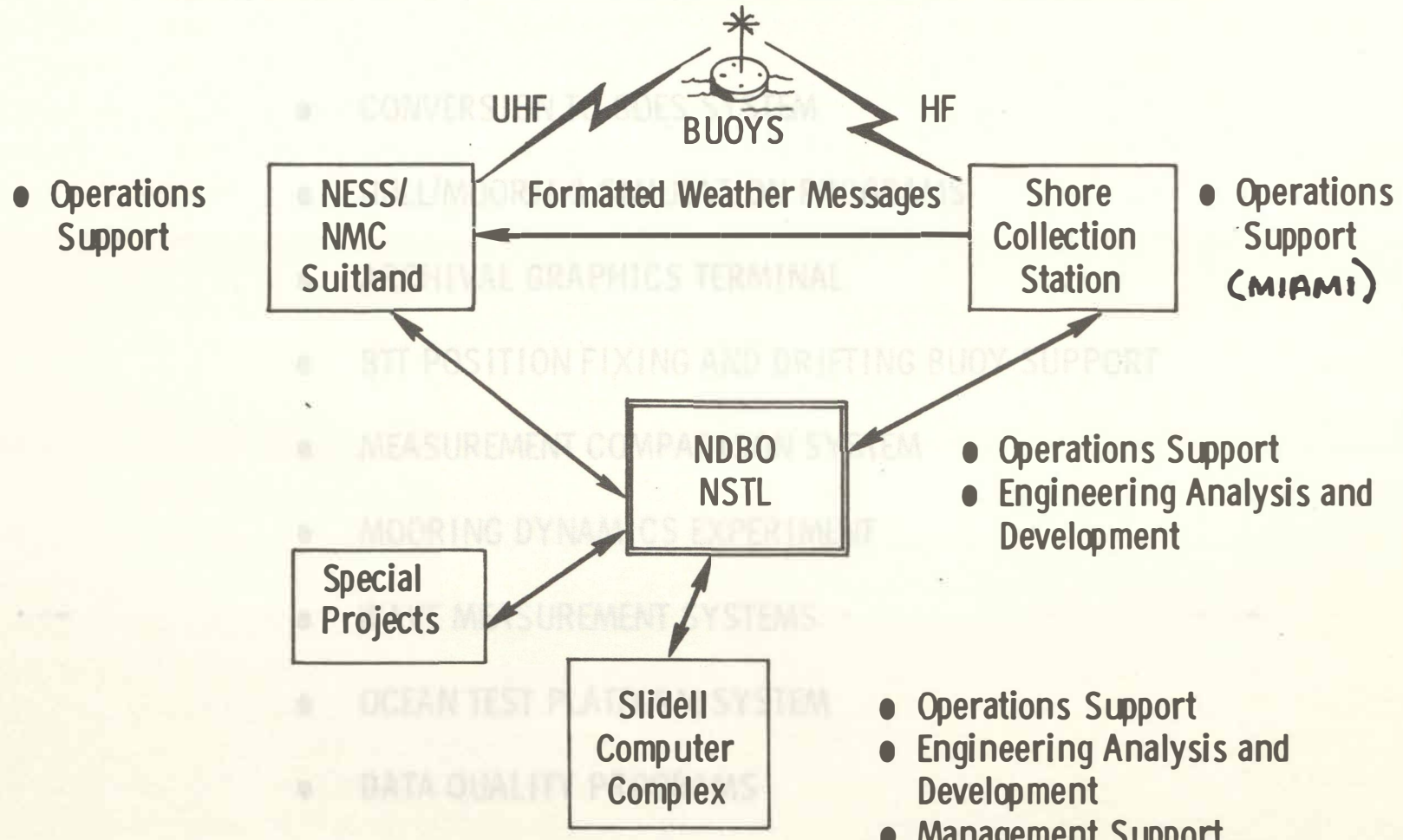


MAJOR NDBO DATA HANDLING FUNCTIONS

- ENGINEERING DEVELOPMENT AND ANALYSIS
- MANAGEMENT SUPPORT
- OPERATIONS SUPPORT



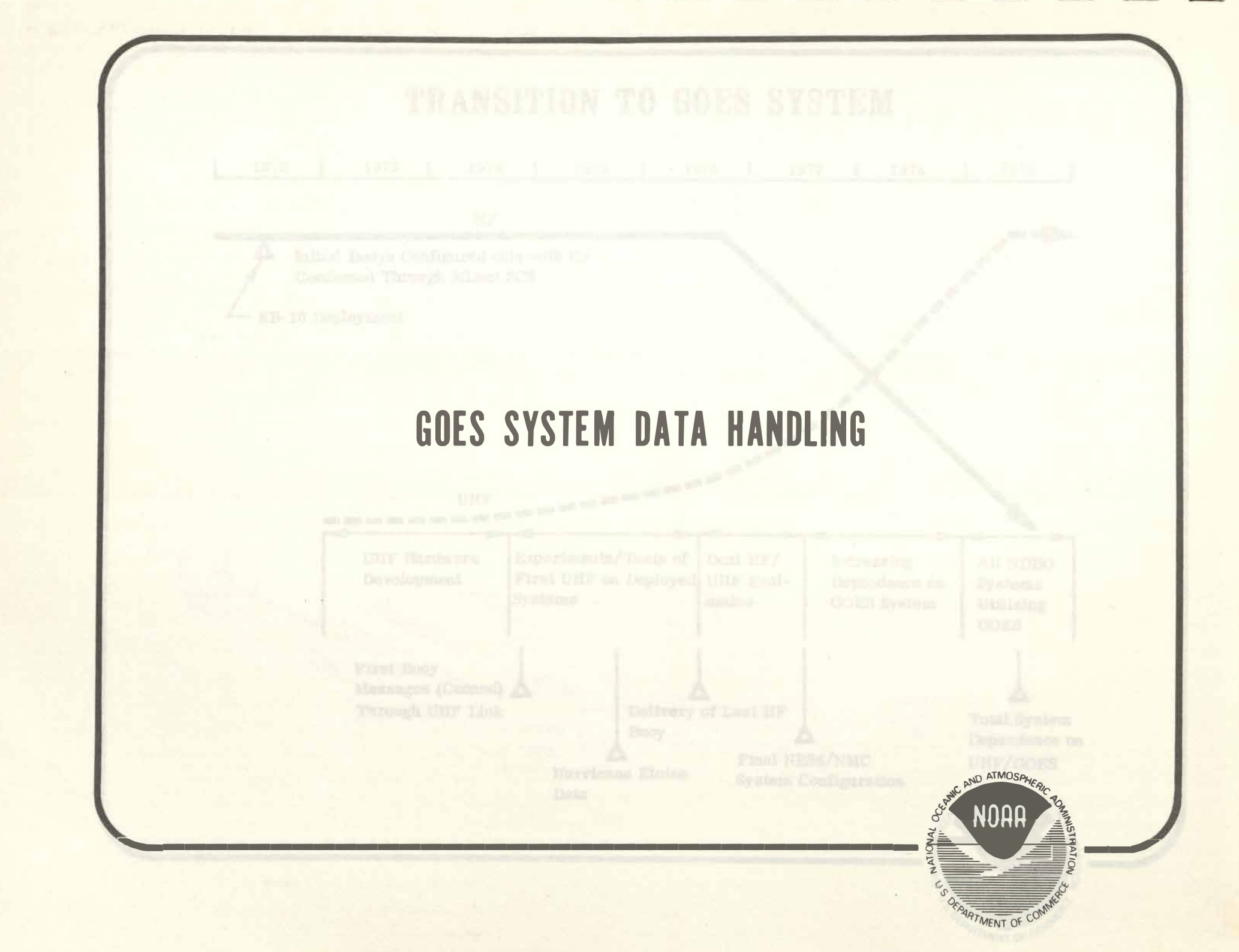
NDBO DATA FLOW



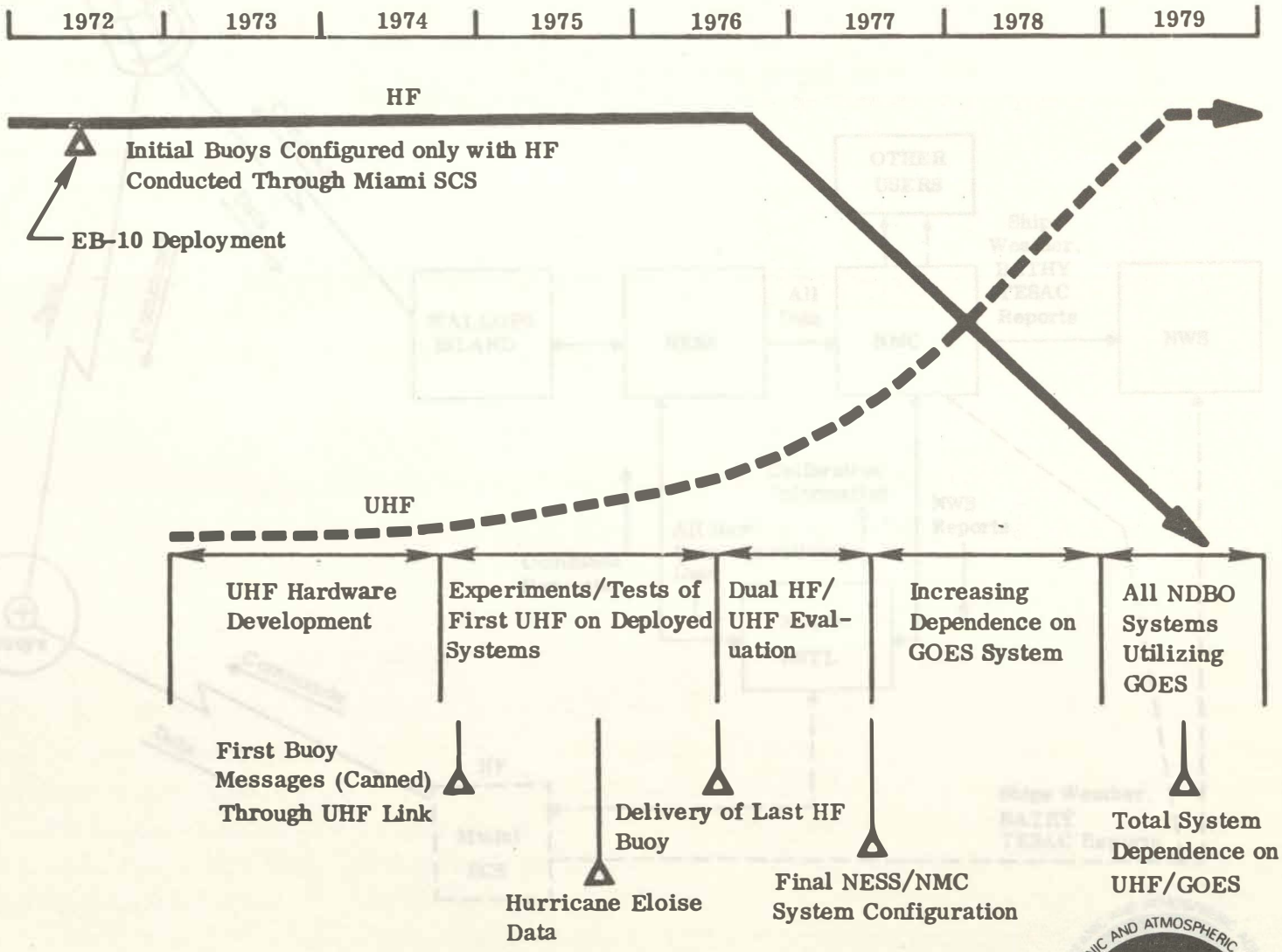
ENGINEERING DEVELOPMENT AND ANALYSIS

- CONVERSION TO GOES SYSTEM
- HULL/MOORING SIMULATION PROGRAMS
- ARCHIVAL GRAPHICS TERMINAL
- BTT POSITION FIXING AND DRIFTING BUOY SUPPORT
- MEASUREMENT COMPARISON SYSTEM
- MOORING DYNAMICS EXPERIMENT
- WAVE MEASUREMENT SYSTEMS
- OCEAN TEST PLATFORM SYSTEM
- DATA QUALITY PROGRAMS
- SENSOR TEST SUPPORT

GOES SYSTEM DATA HANDLING



TRANSITION TO GOES SYSTEM



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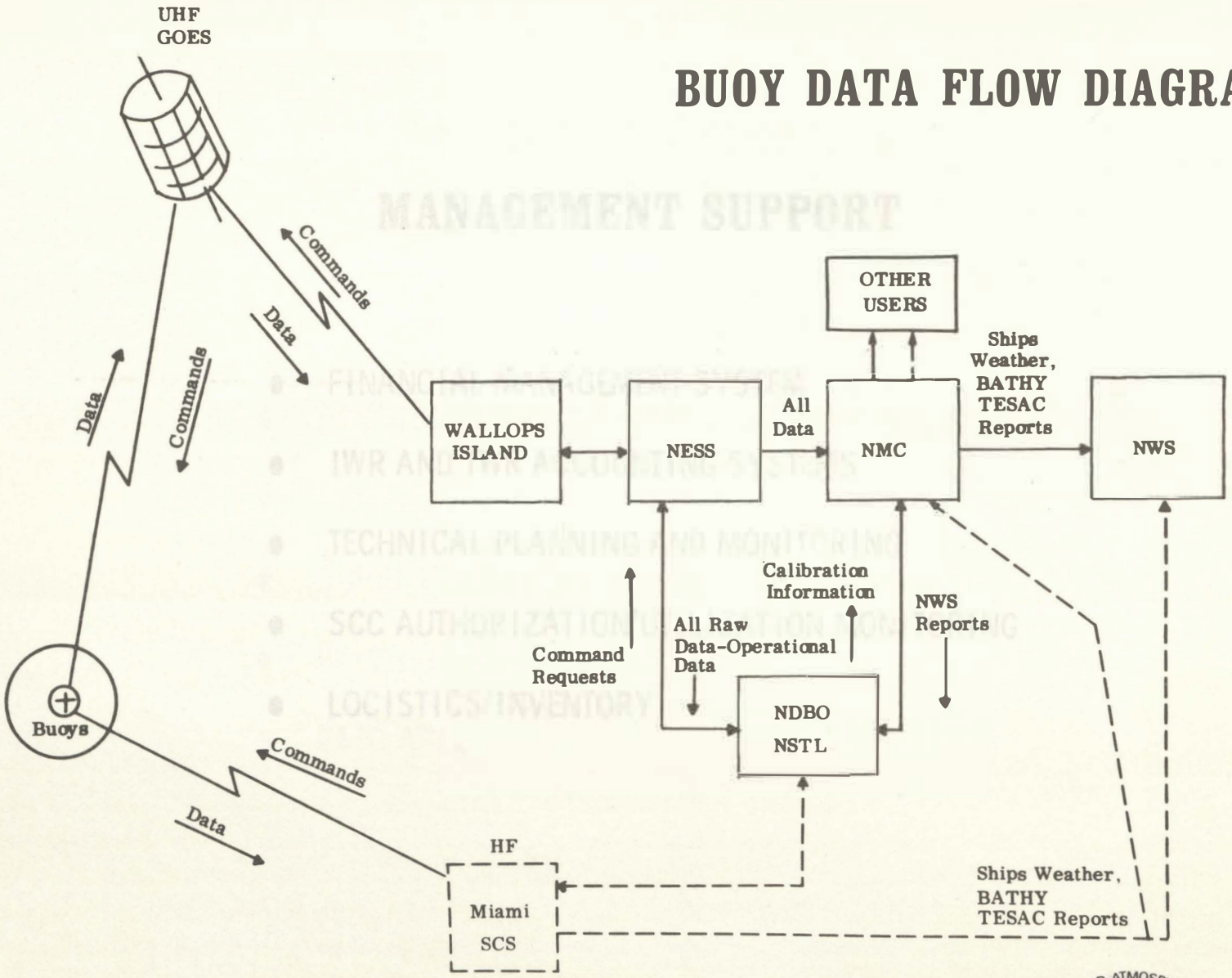
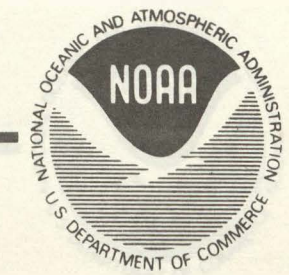
BUOY DATA FLOW DIAGRAM



MANAGEMENT SUPPORT

- FINANCIAL MANAGEMENT SYSTEM
- IWR AND TWR ACCOUNTING SYSTEMS
- TECHNICAL PLANNING AND MONITORING
- SCC AUTHORIZATION/UTILIZATION MONITORING
- LOCISTICS/INVENTORY



OPERATIONS SUPPORT

- ACQUISITION AND DISSEMINATION OF BUOY DATA
- MONITOR BUOY PERFORMANCE
- SUPPORT BUOY DEPLOYMENT/MAINTENANCE
- AT-SEA/ON-SITE TESTING
- DATA ARCHIVAL

NDBO FIVE YEAR DATA PROCESSING PROGRAM FINANCIAL SUMMARY

	FY-76		FY-77	FY-78	FY-79	FY-80
	FIRST TWELVE MONTHS	TRANSITION QUARTER				
OPERATIONS	$248	$ 69	$178	$173	$188	$199
• NSTL/SCC	193	48	178	173	188	199
• SCS	55	21	-	-	0	0
SOFTWARE	$277	$ 69	$258	$245	$233	$247
• NSTL/SCC	196	49	208	220	233	247
• SCS	35	8	-	-	0	0
• GOES SYSTEM						
-- NSTL TERMINAL	26	7	14	0	0	0
-- WMC/NDBO INTERFACE	20	5	11	0	0	0
• ARCHIVAL GRAPHICS TERMINAL	-	-	25	25	0	0
SCC CPU TIME	$ 92	$ 23	$ 80	$ 72	$ 65	$ 60
ADP EQUIPMENT	$ 58	$ 4	$127	$ 35	$ 36	$ 23
• WMC/NSTL TERMINAL	40	-	28	15	15	0
• NSTL/SCC (Leased)	18	4	19	20	21	23
• ARCHIVAL GRAPHICS TERMINAL	-	-	80	-	-	-
TOTAL	$675	$165	$643	$525	$522	$529

($ IN THOUSANDS)

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IV

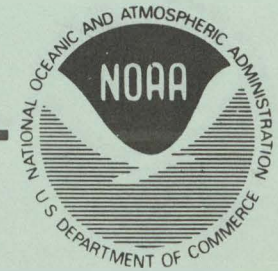
DRIFTING BUOY PROGRAM

A. GENERAL

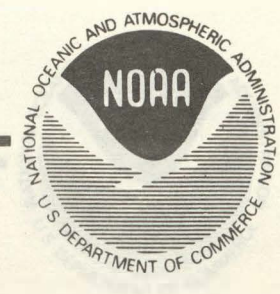
B. NIMBUS DRIFTER ACTIVITIES

C. TIROS DRIFTER ACTIVITIES

D. OTHER RELATED EFFORTS



A. GENERAL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DRIFTING BUOY APPLICATIONS

SCIENTIFIC EXPERIMENTS

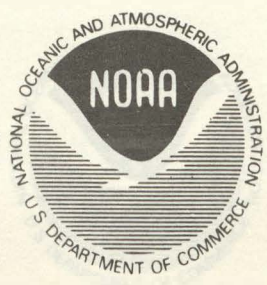
- ARCTIC ICE DYNAMICS
- LAGRANGIAN CURRENT MEASUREMENTS
- OCEANOGRAPHIC MEASUREMENT
- METEOROLOGICAL MEASUREMENT

SUPPORT REQUIREMENTS

- DRIFT MONITOR FOR MOORED BUOYS

RELATED EFFORTS

- PORPOISE TRACKING
- SEA TURTLE TRACKING



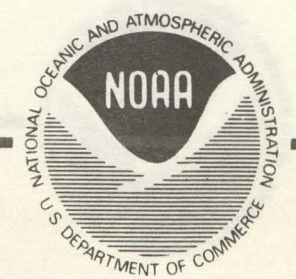
MAJOR APPLICATIONS
FOR SATELLITE - DRIFTING BUOY SYSTEMS

FGGE: FIRST GARP GLOBAL EXPERIMENT

POLEX: POLAR NORTH AND SOUTH PROGRAMS

NORPAX: NORTH PACIFIC EXPERIMENT

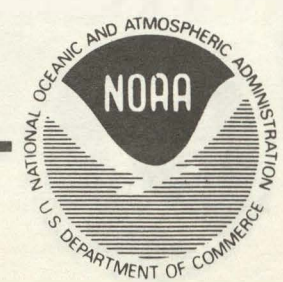
ISOS: INTERNATIONAL SOUTHERN OCEAN STUDY



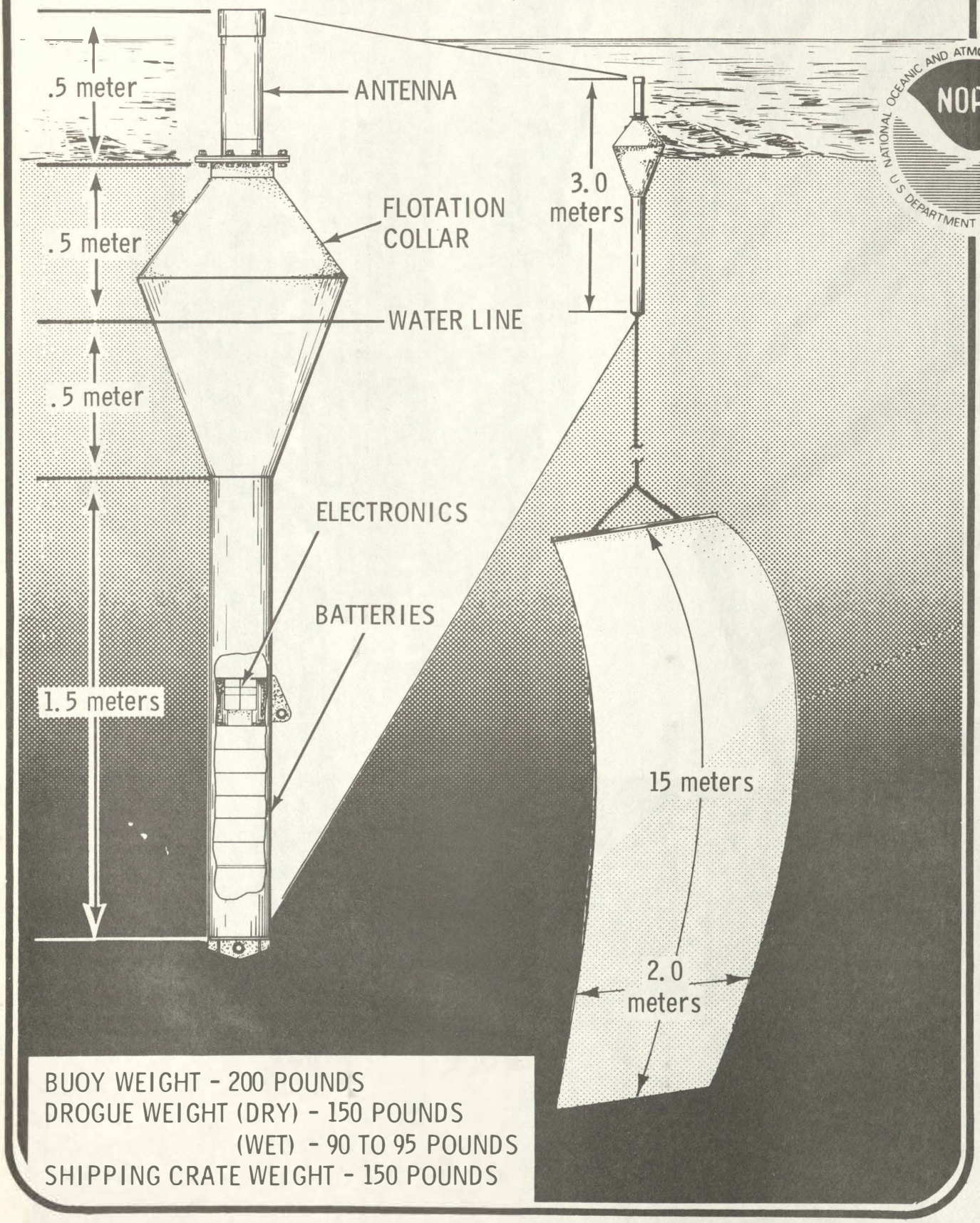
DRIFTING BUOY REQUIREMENTS

- POSITION TRACKING CAPABILITY
- LOW COST (EXPENDABLE)
- WORLD - WIDE APPLICATION
- SMALL VOLUME DATE
- NON REAL - TIME REPORTING

B. NIMBUS DRIFTER ACTIVITIES

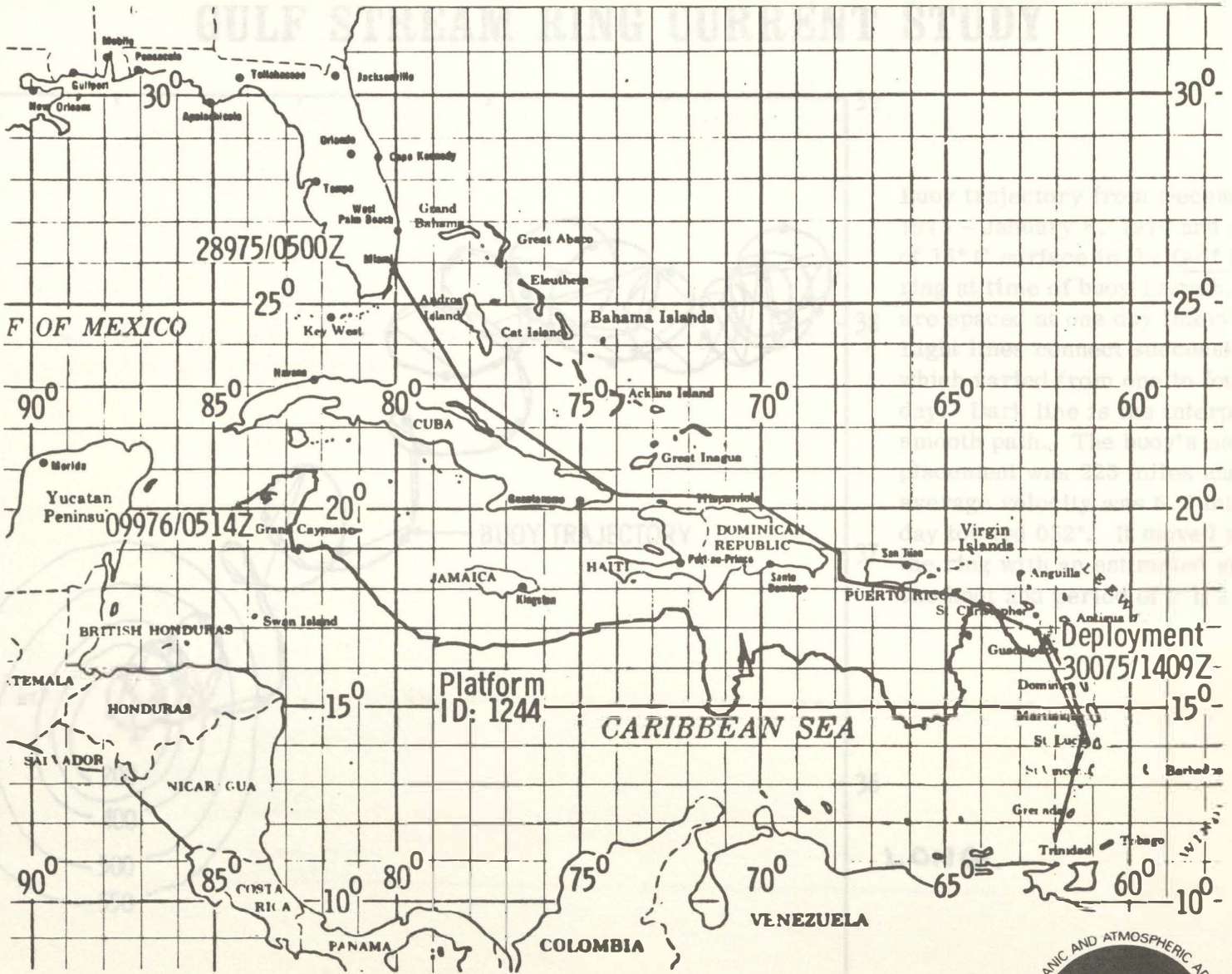


CONSHELF DRIFTER

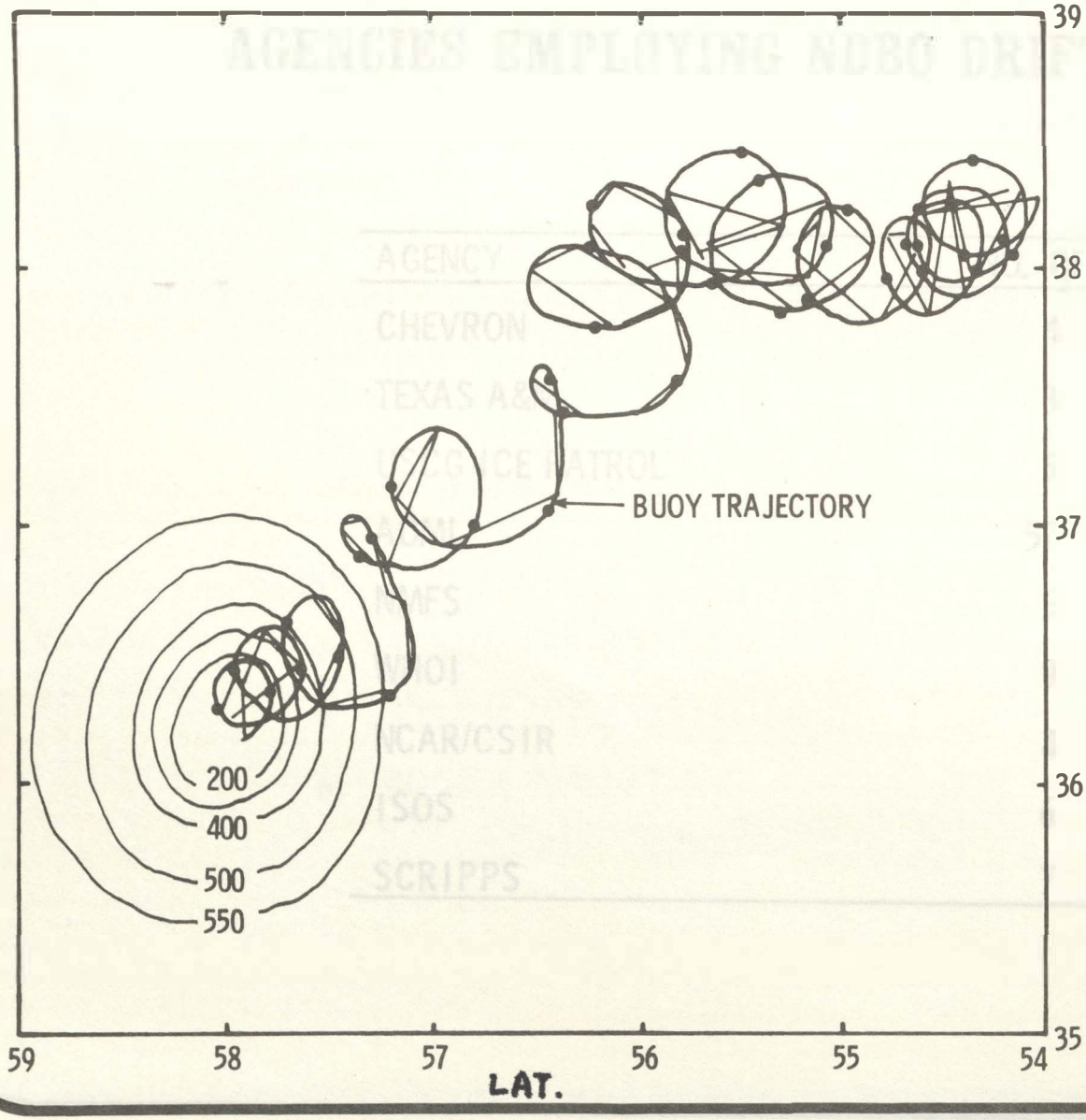


BUOY WEIGHT - 200 POUNDS
DROGUE WEIGHT (DRY) - 150 POUNDS
(WET) - 90 TO 95 POUNDS
SHIPPING CRATE WEIGHT - 150 POUNDS


ARCTIC OCEAN
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH PACIFIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
INDIAN OCEAN
THE WORLD
Produced in the Cartographic Division
National Geographic Society
NATIONAL GEOGRAPHIC MAGAZINE



GULF STREAM RING CURRENT STUDY



Buoy trajectory from December 3, 1975 - January 8, 1976 and depth of 15° C surface in the Gulf Stream ring at time of buoy Launch. Dots are spaced at one day intervals. Light lines connect successive fixes which varied from one to four per day. Dark line is the interpreted smooth path. The buoy's net displacement was 225 miles and its average velocity was 6.3 miles per day toward 052°. It moved around the ring with an estimated speed of one knot and period of 2 1/3 days.

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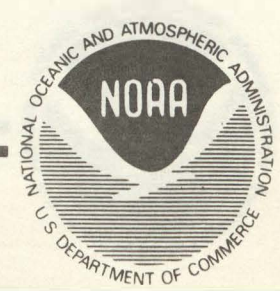
AGENCIES EMPLOYING NDBO DRIFTING BUOYS

AGENCY	NO. OF BUOYS
CHEVRON	4
TEXAS A&M	3
USCG ICE PATROL	5
AOML	57
NMFS	5
WHOI	9
NCAR/CSIR	4
ISOS	6
SCRIPPS	7



DRIFTING BUOY DROGUE TESTING

PURPOSE

PROVIDE A TEST BED FOR EVALUATING THE RELIABILITY OF VARIOUS DROGUE CONFIGURATIONS. THESE DROGUES, WHEN ATTACHED TO NDBO DRIFTING BUOYS, PROVIDE FOR LAGRANGIAN CURRENT MEASUREMENTS OF WATER MASSES AT VARIOUS DEPTHS. DROGUES ARE A DEMONSTRATED REQUIREMENT FOR MANY SCIENTIFIC APPLICATIONS.

SCOPE

- SYSTEM DESIGN
- SYSTEM IMPLEMENTATION
- DROGUE EVALUATIONS

DRIFTING BUOY DROGUE TESTING (Continued)

STATUS

- SUCCESSFULLY IMPLEMENTED
- SEVERAL DROGUES UNDER TEST
- SOME DROGUE DESIGN WEAKNESSES DISCOVERED
- $35K EXPENDED

NEXT STEP

- CONTINUE TO IMPROVE DROGUE DESIGNS AND EVALUATE RELIABILITY
- FUND FOR SUPPORT THROUGH FY 78 ($30K FY 77 -- $20K FY 78)

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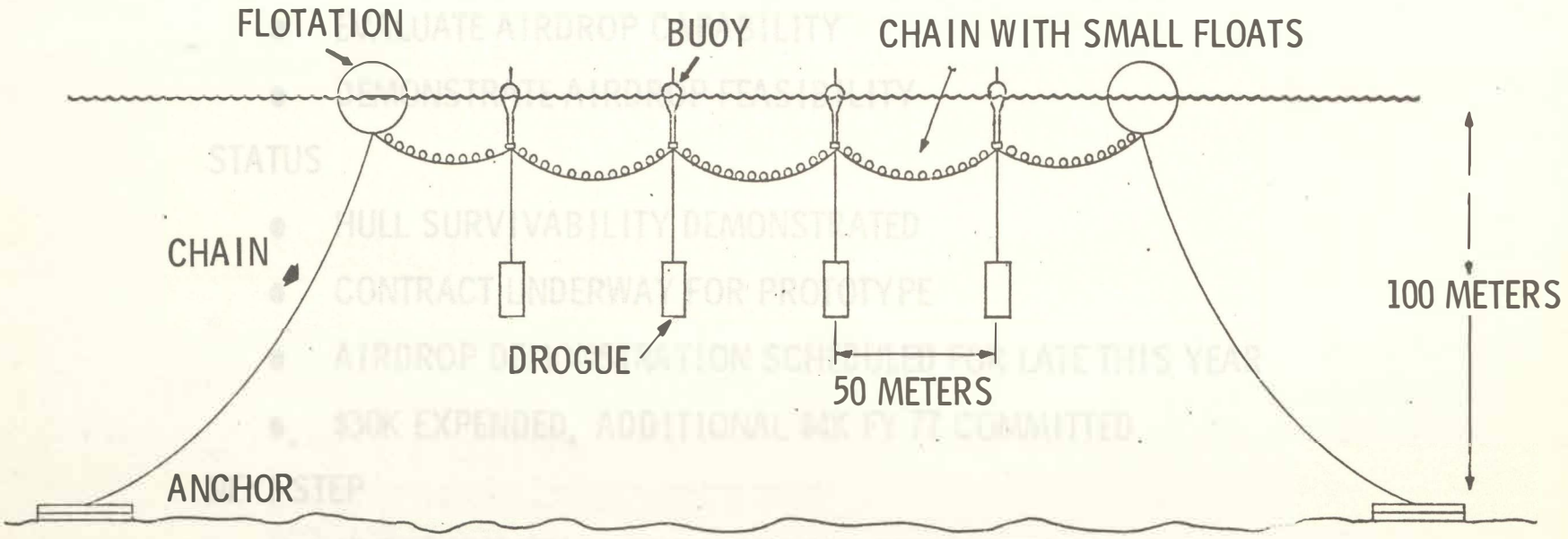
DRIFTING BUOY DROGUE TESTING CONCEPT

(BAHAMAS - NOVA U.)



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AIR DEPLOYABLE DRIFTERS

PURPOSE

PROVIDE ALTERNATIVE DEPLOYMENT CAPABILITY FOR DRIFTING BUOYS.

SCOPE

- DESIGN AND FABRICATE PROTOTYPE HARDWARE
- EVALUATE AIRDROP CAPABILITY
- DEMONSTRATE AIRDROP FEASIBILITY

STATUS

- HULL SURVIVABILITY DEMONSTRATED
- CONTRACT UNDERWAY FOR PROTOTYPE
- AIRDROP DEMONSTRATION SCHEDULED FOR LATE THIS YEAR
- $30K EXPENDED, ADDITIONAL $4K FY 77 COMMITTED

NEXT STEP

- IF CAPABILITY IS SUCCESSFULLY DEMONSTRATED, AND ADDITIONAL COST PER BUOY IS PRACTICAL ($500), SEVERAL BUOYS WILL BE PROCURED IN FY 78 FOR TEST AND EVALUATION DURING FGGE. THEY WILL UTILIZE THE TIROS SATELLITE. ($50K FY 78)

DRIFTERS FOR SUBSURFACE TEMPERATURE MEASUREMENTS

PURPOSE

PROVIDE A CAPABILITY FOR MEASURING OCEAN SUBSURFACE TEMPERATURES WITH DRIFTING BUOYS.

SCOPE

- DEVELOP CANDIDATE THERMISTOR LINES
- INTEGRATE CAPABILITY INTO DRIFTING BUOYS FOR SUBSURFACE TEMPERATURE MEASUREMENTS
- EVALUATE TETHERED DRIFTERS
- PROCURE THREE PROTOTYPE DRIFTERS

STATUS

- THREE Tz LINES PROCURED
- BEGIN TETHERED EXPERIMENTS 1976
- $40K EXPENDED

NEXT STEP

- EVALUATE TETHERED BUOYS ($10K FY 77)
- PROCURE THREE ADDITIONAL Tz DRIFTERS FOR T&E ($40K FY 77)

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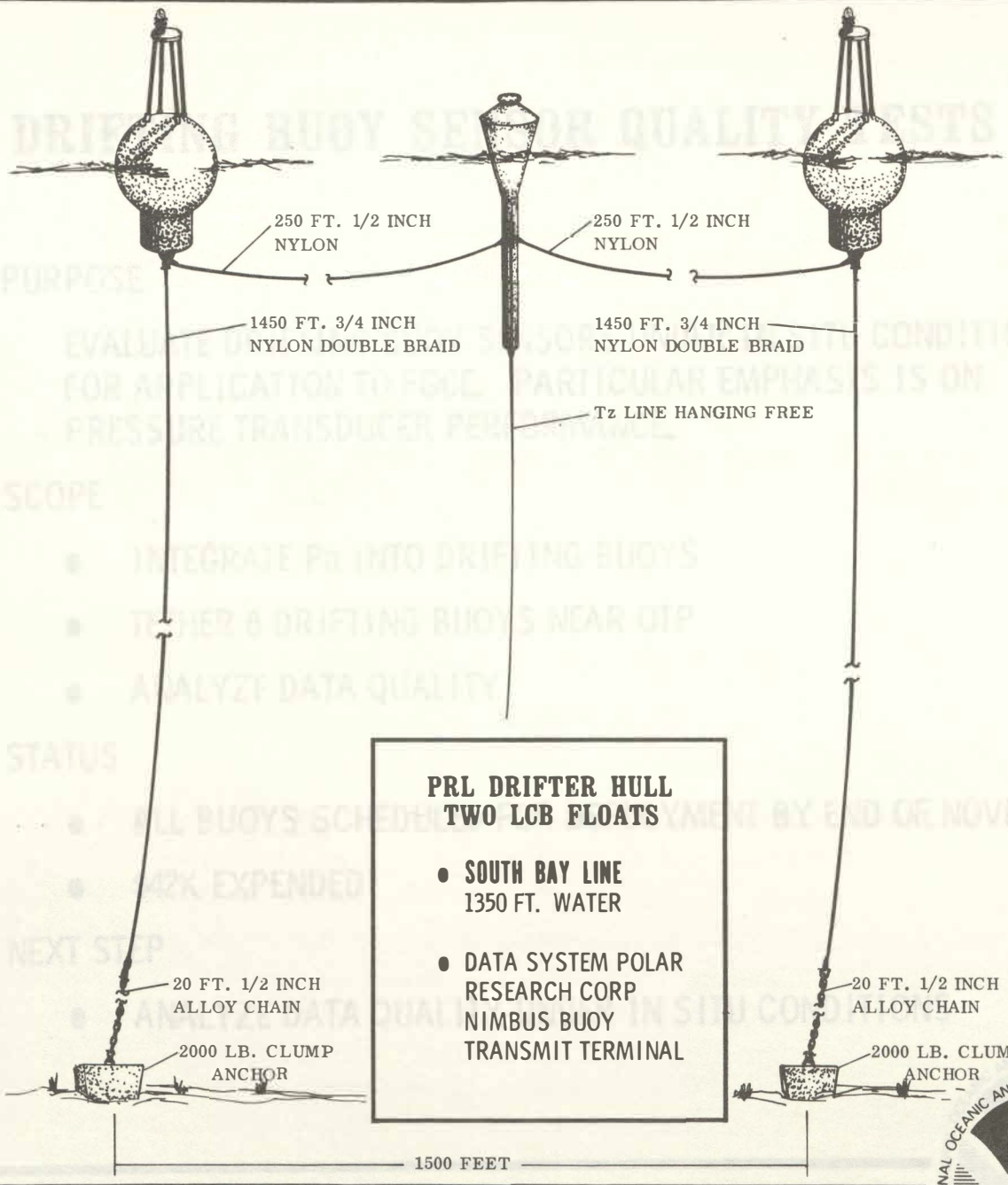

PRL DRIFTER HULL
TWO LCB FLOATS

- **SOUTH BAY LINE**
  1350 FT. WATER
- DATA SYSTEM POLAR
  RESEARCH CORP
  NIMBUS BUOY
  TRANSMIT TERMINAL

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DRIFTING BUOY SENSOR QUALITY TESTS

PURPOSE

EVALUATE DRIFTING BUOY SENSORS UNDER IN SITU CONDITIONS FOR APPLICATION TO FGGE. PARTICULAR EMPHASIS IS ON PRESSURE TRANSDUCER PERFORMANCE.

SCOPE

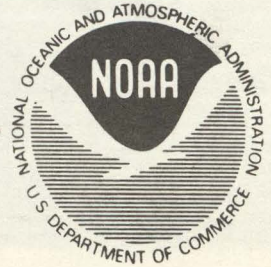
- INTEGRATE Pa INTO DRIFTING BUOYS
- TETHER 6 DRIFTING BUOYS NEAR OTP
- ANALYZE DATA QUALITY

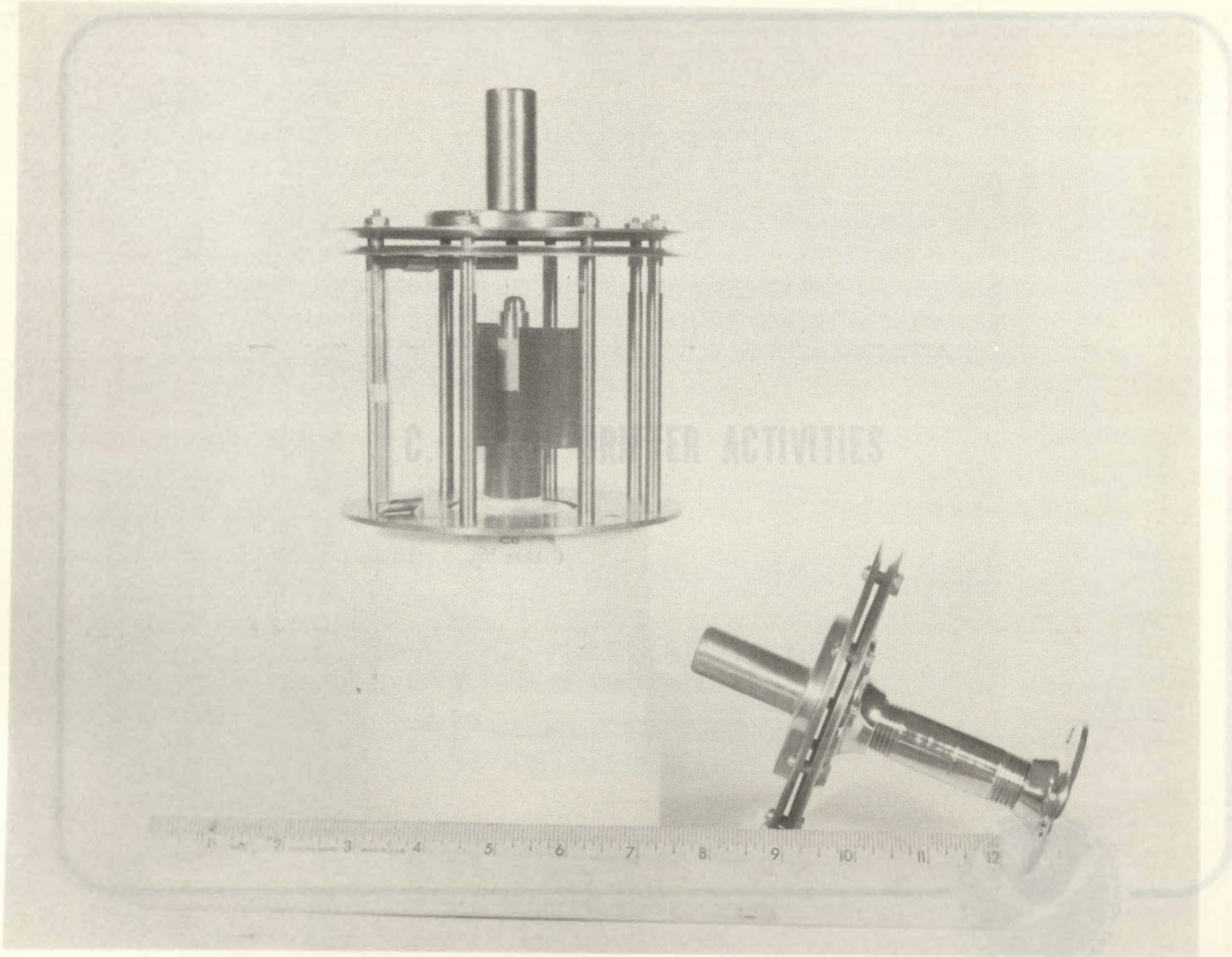
STATUS

- ALL BUOYS SCHEDULED FOR DEPLOYMENT BY END OF NOVEMBER.
- $42K EXPENDED

NEXT STEP

- ANALYZE DATA QUALITY UNDER IN SITU CONDITIONS





Venting pressure sensor

C. TIROS DRIFTER ACTIVITIES

TIROS DRIFTERS

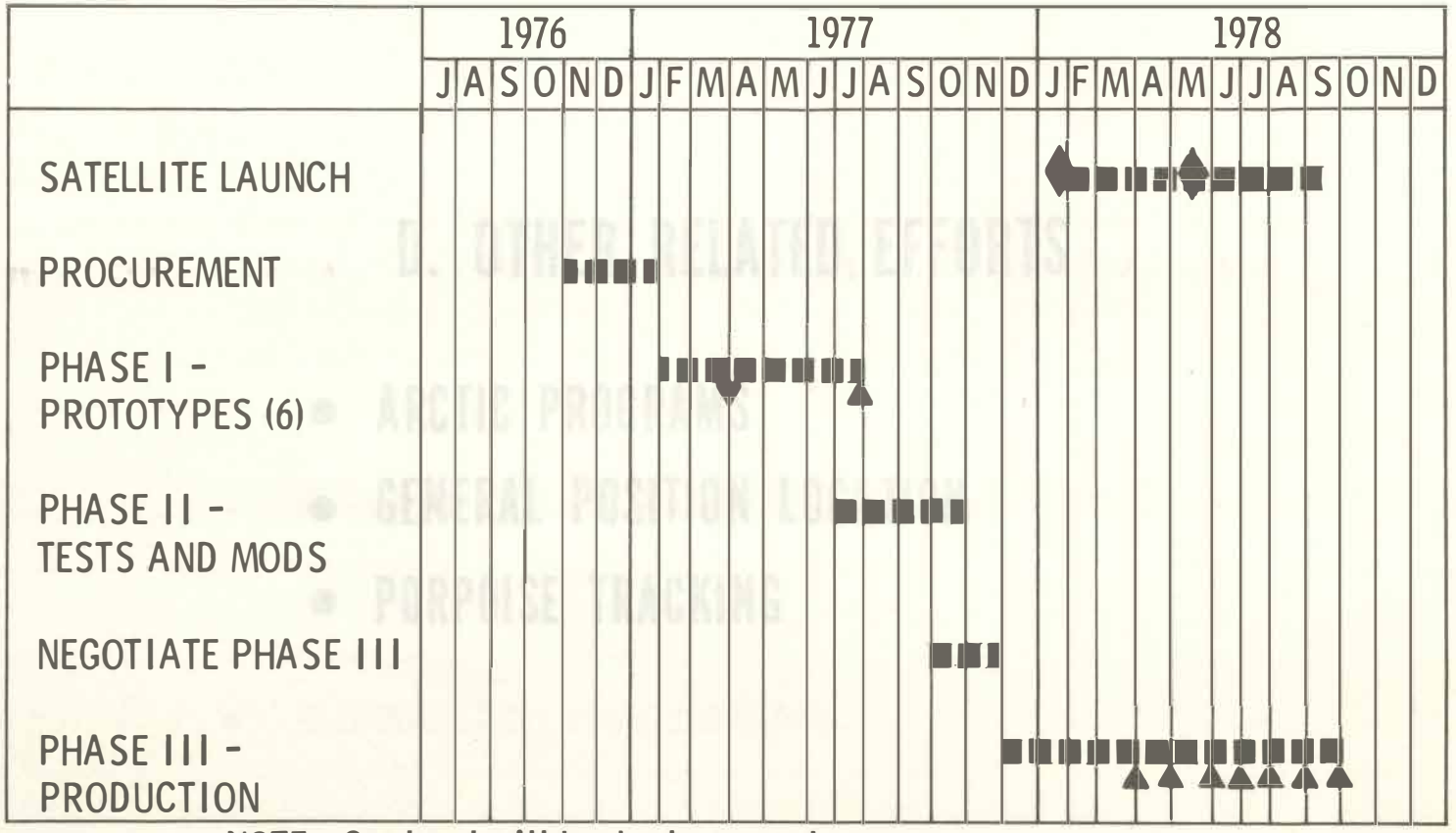
PURPOSE

PROVIDE DRIFTING BUOYS WITH TIROS CAPABILITY FOR THE VARIOUS SCIENTIFIC APPLICATIONS. A FGGE REQUIREMENT FOR 50 DRIFTERS IN FY 78 WITH P_a AND T_o CAPABILITY IS THE PRIMARY CONSIDERATION.

SCOPE

- DEVELOP AND TEST PROTOTYPE DRIFTERS
  ($160K 12 BUOYS FY 77)
- DEVELOP TEST SETS FOR PRODUCTION AND FIELD TESTING
  ($55K FY 77)
- CONTRACT FOR PRODUCTION OF FGGE BUOYS
  ($210K FY 78 REIMBURSABLE)
- MODIFY BASIC DESIGN FOR ADDITIONAL CAPABILITY AS REQUIREMENTS ARE DETERMINED.

TIROS DRIFTING BUOY SYSTEM DEVELOPMENT SCHEDULE



NOTE: Contract will be dual sourced

◆ - Satellite Launch

▼ - Design Review

▲ - Hardware Deliverables

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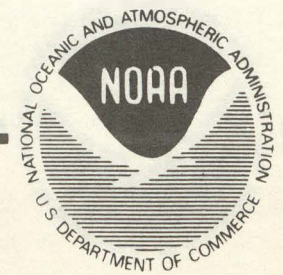
D. OTHER RELATED EFFORTS

- ARCTIC PROGRAMS
- GENERAL POSITION LOCATION
- PORPOISE TRACKING



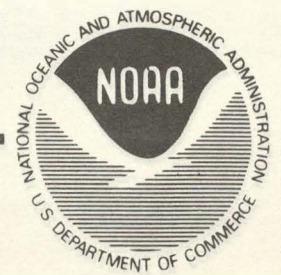
AIR DEPLOYABLE RANDOM ACCESS SYSTEM - (ADRAMS)

PURPOSE

DEVELOP AIR DEPLOYABLE INSTRUMENTATION CAPABLE OF REMOTELY MONITORING AIR PRESSURE, AIR TEMPERATURE, AND ICE MOTION IN ARCTIC AND ANTARCTIC REGIONS. THIS DEVELOPMENT SUPPORTS AIDJEX, BLM, AND NSF EFFORTS.

SCOPE

- DESIGN AND DEVELOP PROTOTYPE UNITS
- IN SITU EVALUATIONS
- ADDITIONAL CAPABILITIES
- REIMBURSABLE PROCUREMENTS



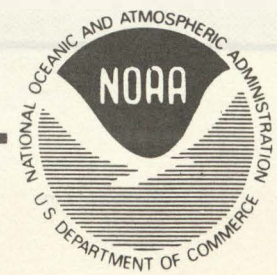
AIR DEPLOYABLE RANDOM ACCESS SYSTEM (Continued)

STATUS

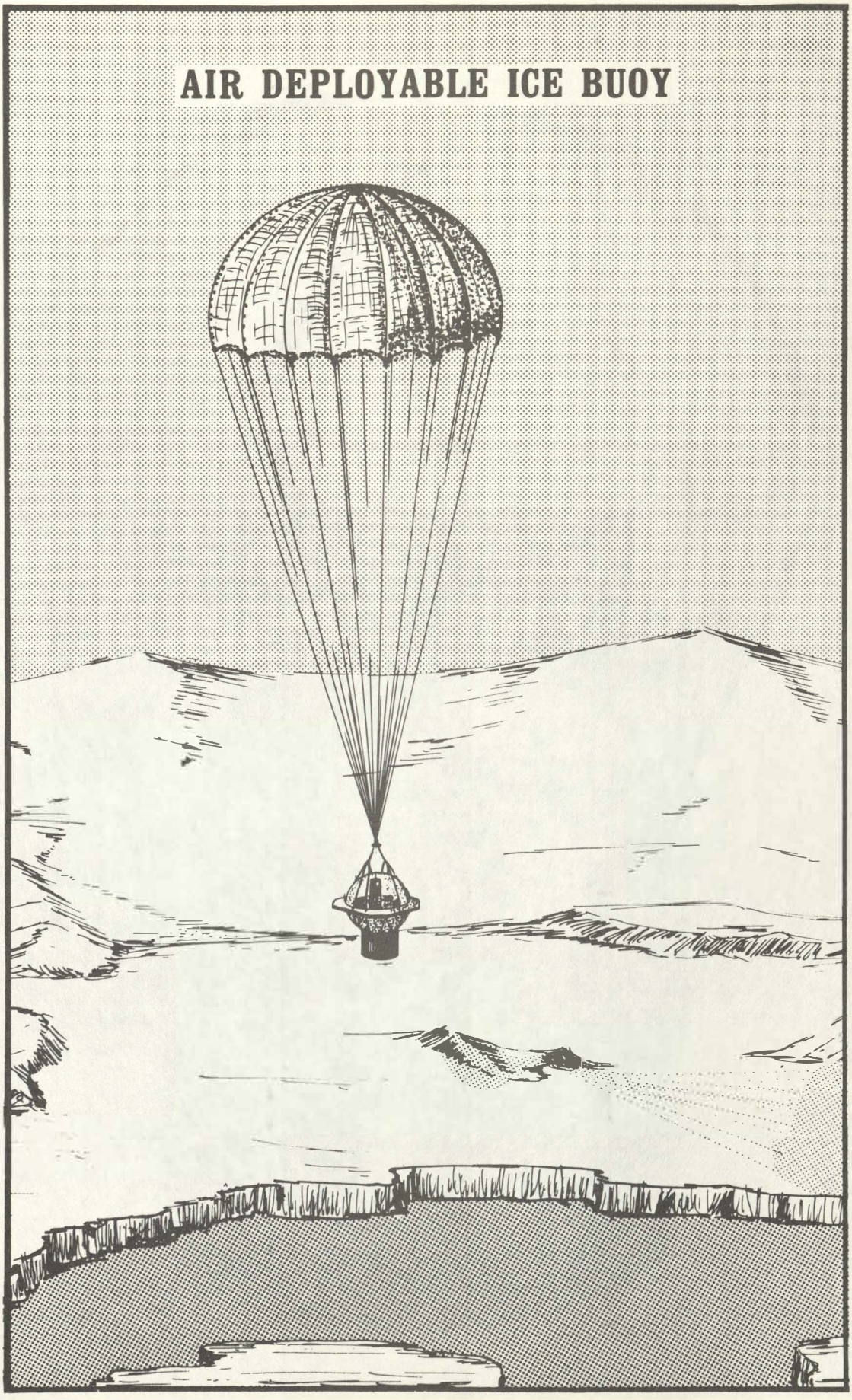
- 16 ADRAMS SUCCESSFULLY DEPLOYED
- 6 MORE UNITS UNDER PROCUREMENT
- 2 UNITS MODIFIED FOR ANTARCTIC OPERATIONS /NSF
- 2 UNITS DESIRED BY USCG ICE PATROL
- $275K EXPENDED ($225K REIMBURSABLE)

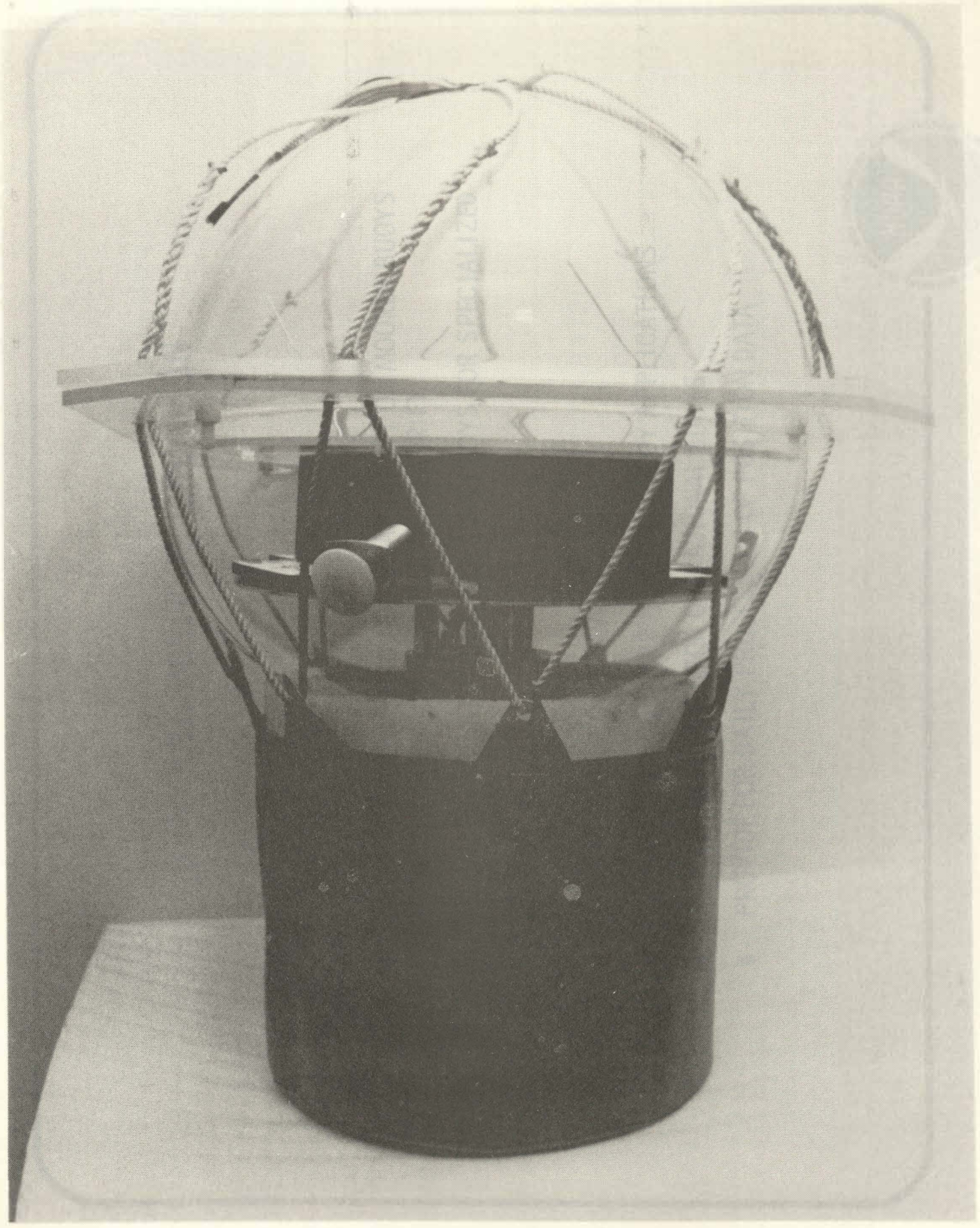
NEXT STEP

- EVALUATE T_a AND ANTARCTIC CAPABILITY



AIR DEPLOYABLE ICE BUOY





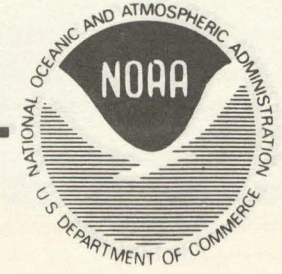
GENERAL POSITION LOCATION

PURPOSE

- DRIFT MONITORS - PROVIDE A CAPABILITY ON MOORED BUOYS TO VERIFY POSITION OR DETECT WHEN ADRIFT.
- PROVIDE ALTERNATIVES TO DRIFTING BUOYS FOR SPECIALIZED REQUIREMENTS.

SCOPE

- SURVEY COMMERCIAL DEVELOPMENTS
- EVALUATE LOW-COST HARDWARE FOR BUOY APPLICATIONS
- PROCURE HARDWARE FOR OPERATIONAL BUOYS
- PROVIDE FOR DAILY PROCESSING OF POSITION DATA



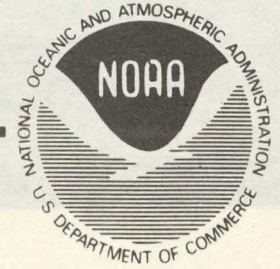
GENERAL POSITION LOCATION (Continued)

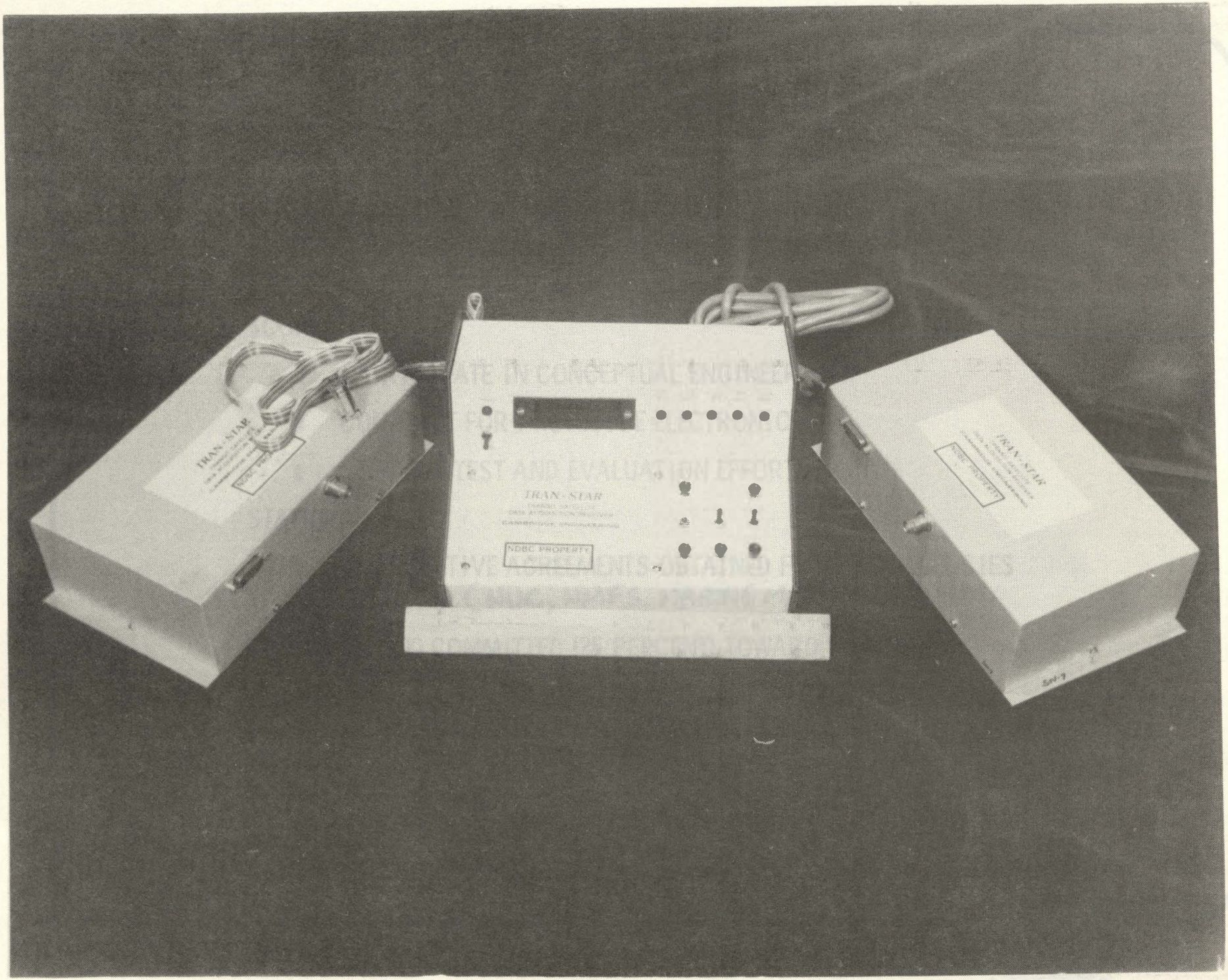
STATUS

- DRIFT MONITOR DESIRABILITY DEMONSTRATED
- NIMBUS TRANSMITTERS NOW ON MOST BUOYS, WITH DAILY MONITORING.
- NAVSAT HARDWARE UNDER EVALUATION
- $80K EXPENDED

NEXT STEP

- DEMONSTRATE TRANSTAR/GOES CAPABILITY IN SITU ($50K FY 77)
- DECIDE FEASIBILITY OF NAVSAT VS TIROS POSITIONING
- PROCURE OPERATIONAL HARDWARE ($125K FY 78)
- PROVIDE FOR DAILY POSITIONING ($50K-150K/YEAR) FY 78





TRANS STAR

PORPOISE TRACKING SUPPORT

PURPOSE

PROVIDE FOR EFFICIENT DEVELOPMENT OF IMPROVED BTT'S AND FOR APPLICATION OF DATA BUOY TECHNOLOGY TO NMFS PORPOISE TRACKING REQUIREMENTS.

SCOPE

- PARTICIPATE IN CONCEPTUAL ENGINEERING
- CONTRACT FOR PROTOTYPE ELECTRONICS
- SUPPORT TEST AND EVALUATION EFFORTS

STATUS

- COOPERATIVE AGREEMENTS OBTAINED FROM SIX AGENCIES INVOLVED (NUC, NMFS, MARINE MAMMAL COMM.
- $15,000 COMMITTED (25 PERCENT) TOWARD PROTOTYPE DEVELOPMENT
- CONTRACT AWARD SCHEDULED FOR EARLY 1977.

NEXT STEP

- CONTRACT FOR PROTOTYPE HARDWARE
- TEST AND EVALUATE

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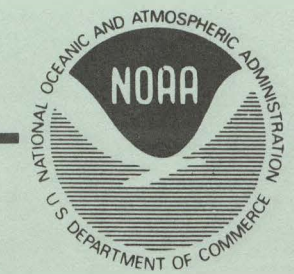
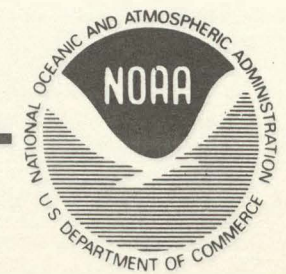
DATA QUALITY PROGRAM



NDBO DATA QUALITY PROGRAM BACKGROUND

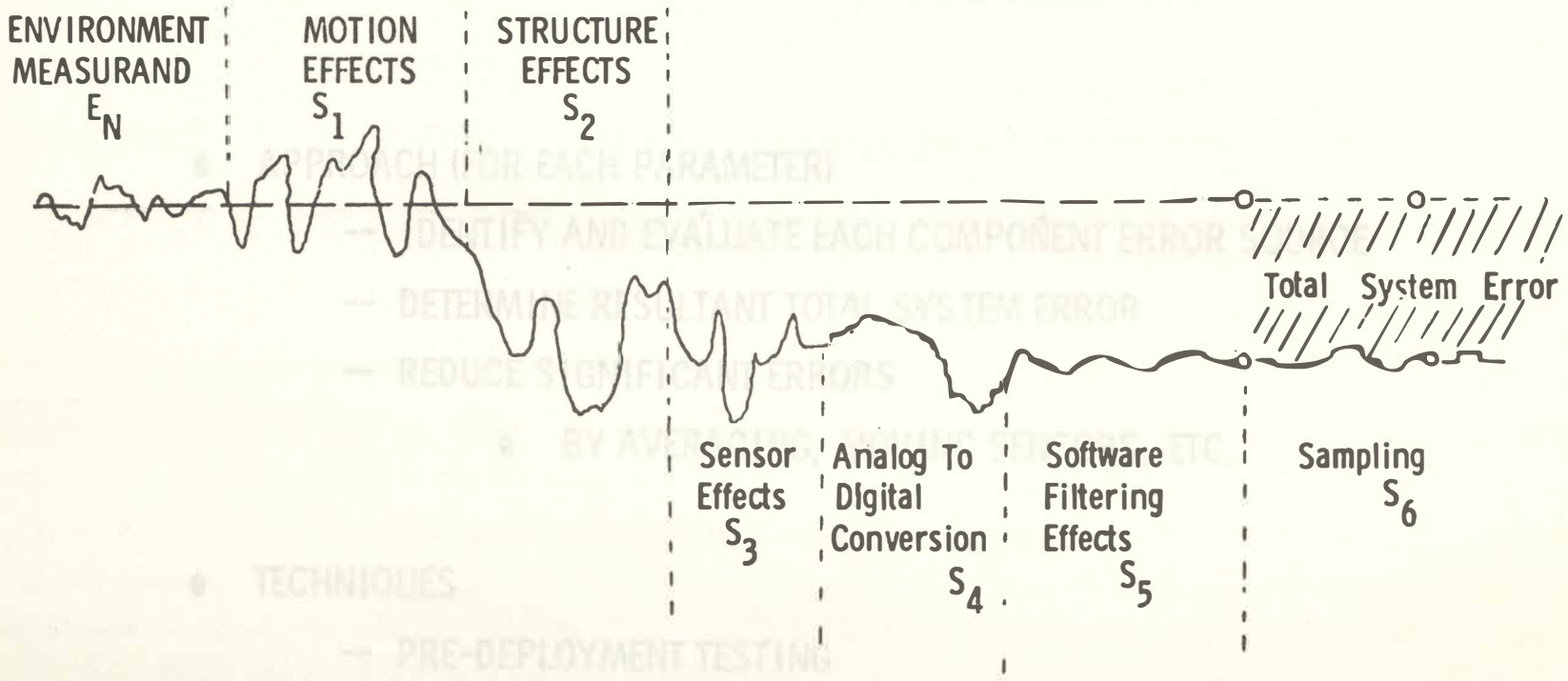
- REAL PRODUCT IS ENVIRONMENTAL DATA
  - -- NDBO GOAL
    - DATA OF SUFFICIENT ACCURACY TO MEET USER'S NEEDS
  - -- ENSURED BY DATA QUALITY PROGRAM
    - BUOY SYSTEM EVALUATION AND IMPROVEMENT
- ERRORS IN BUOY DATA
  - -- BUOYS CAN CAUSE ERRORS IN DATA
    - MORE THAN LAND STATIONS
  - -- INTRODUCED BY BUOY MOTION, STRUCTURE, HEATING, ETC.



INADEQUACY OF TYPICAL QUALITY APPROACH

- SENSOR CALIBRATION IN LABORATORY IS INADEQUATE
  - -- IT'S A STATIC CHECK - NOT DYNAMIC
  - -- DYNAMIC OCEAN ENVIRONMENT IS NOT SIMULATED
  - -- DOES NOT TAKE INTO ACCOUNT:
    - NATURAL VARIABILITY OF ENVIRONMENTAL DATA
    - BUOY SYSTEM EFFECTS ON DATA QUALITY
    - OCEAN SURFACE MOTION
    - COMPLEX INTERACTION OF PARAMETERS

THE NATURAL SEQUENCE OF ERRORS IN A BUOY DATA ACQUISITION SYSTEM



——— Propagated Signal

— — — Desired Signal

TOTAL SYSTEM ERROR = $f(E_N, S_1, S_2, S_3, \text{-----})$

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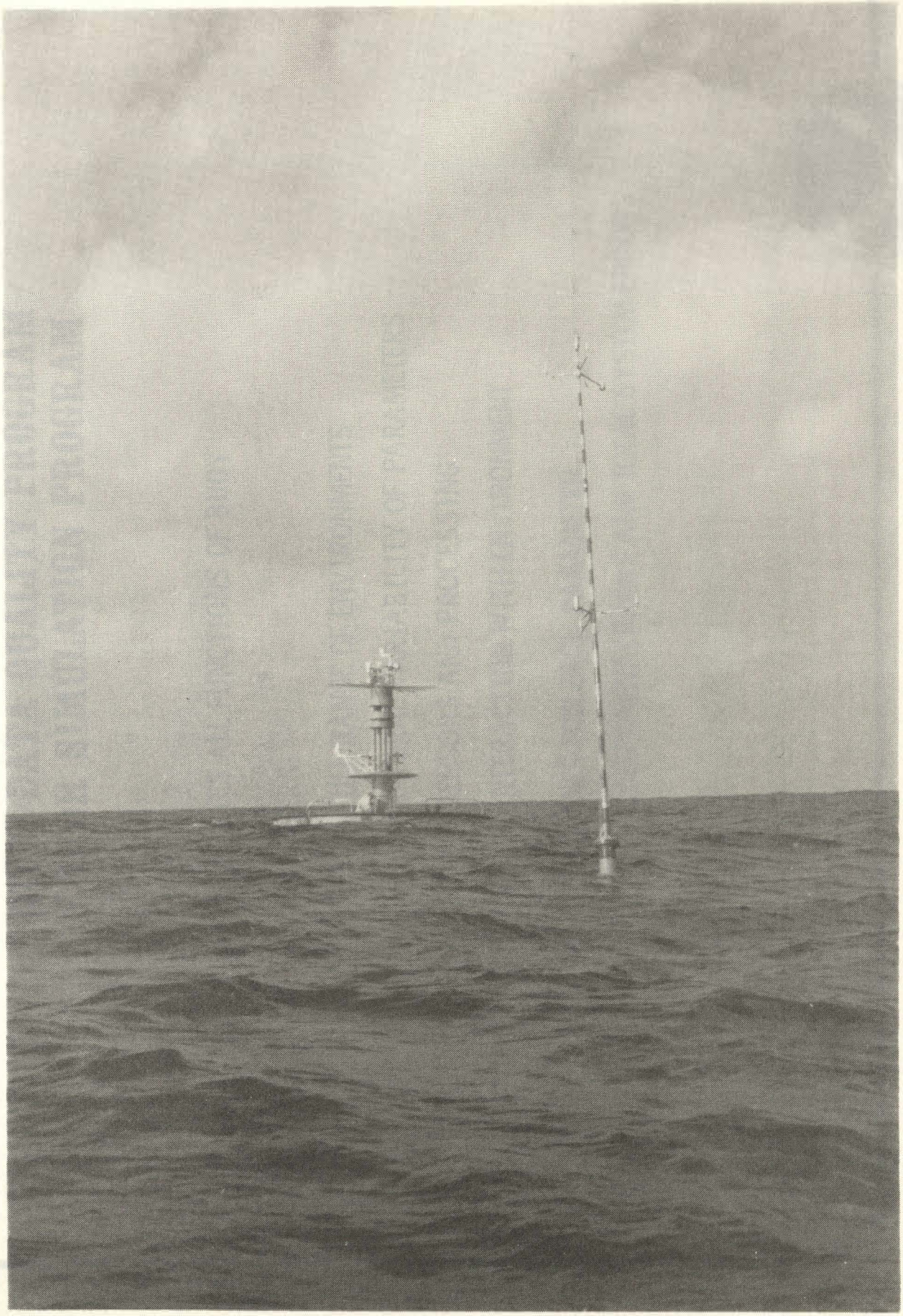
NDBO DATA QUALITY PROGRAM EVALUATION AND IMPROVEMENT

- APPROACH (FOR EACH PARAMETER)
  - -- IDENTIFY AND EVALUATE EACH COMPONENT ERROR SOURCE
  - -- DETERMINE RESULTANT TOTAL SYSTEM ERROR
  - -- REDUCE SIGNIFICANT ERRORS
    - BY AVERAGING, MOVING SENSORS, ETC.

- TECHNIQUES
  - -- PRE-DEPLOYMENT TESTING
  - -- AT-SEA COMPARISONS (FOR LIMITED ENVIRONMENT)
  - -- BUOY ERROR SIMULATION (FOR ALL ENVIRONMENTS)

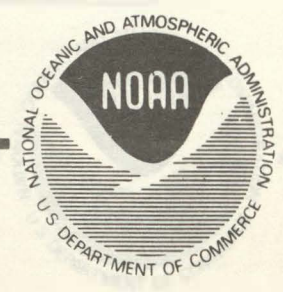
NDBO DATA QUALITY PROGRAM TESTING

- PRE-DEPLOYMENT
  - -- SENSOR CALIBRATION AND PARAMETER INTERACTION TESTS (LABORATORY).
  - -- SPECIFIC ERROR COMPONENT TESTS (LABORATORY AND CONTROLLED TESTS) IN SITU TESTS (OCEAN TEST PLATFORM).
  - -- DOCKSIDE COMPARISON (SYSTEM VERIFICATION).
- AT-SEA COMPARISONS
  - -- PORTABLE INSTRUMENTS, SERVICE SHIP DATA
  - -- "STRAP-ON" COMPARISON SYSTEM
  - -- WAVERIDER COMPARISONS
  - -- XBT
- ANALYSIS OF EVALUATION DATA

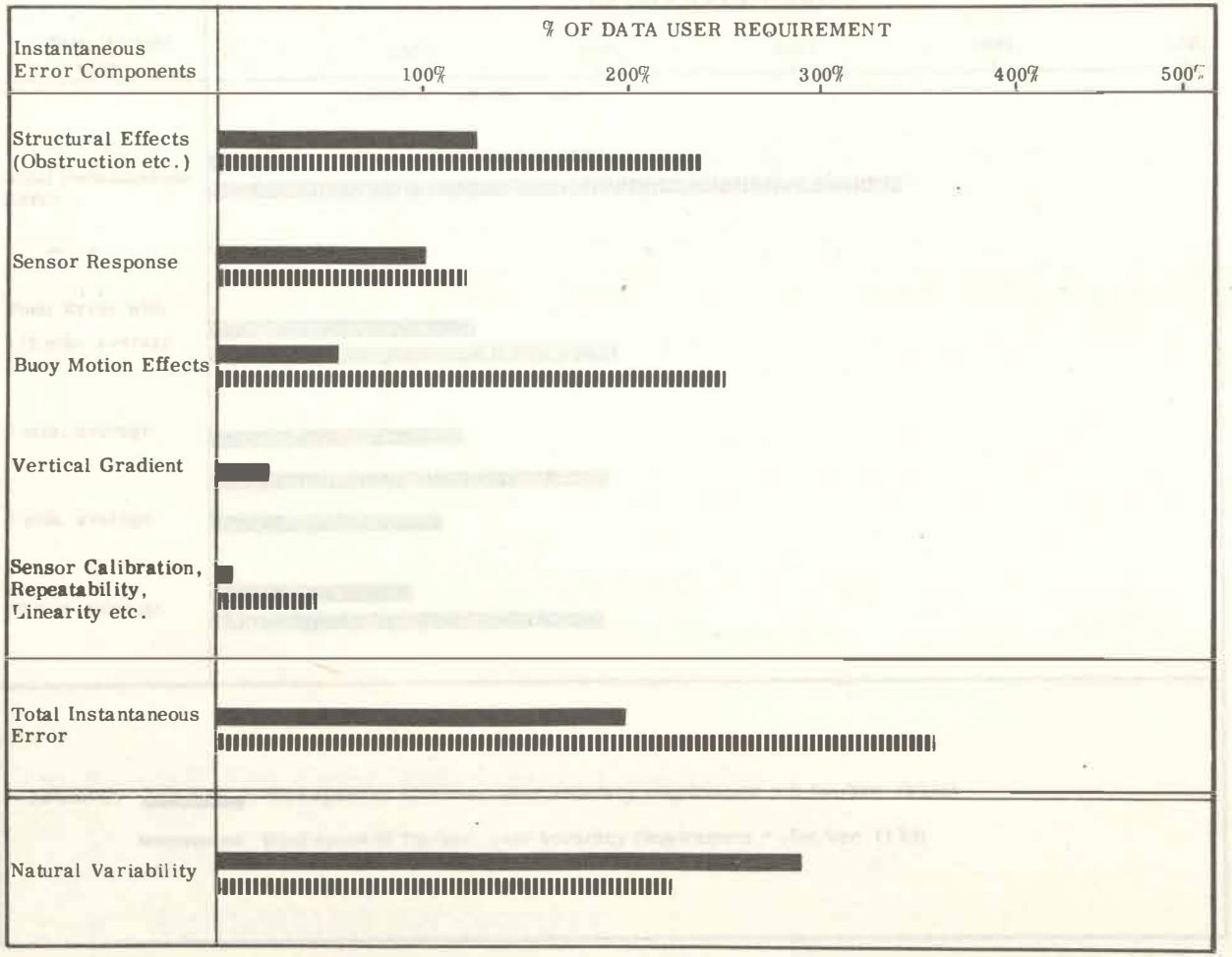


NDBO DATA QUALITY PROGRAM
ERROR SIMULATION PROGRAM

- SIMULATES ALL FUNCTIONS OF BUOY
- CONSIDERS:
  - -- FULL RANGE OF ENVIRONMENTS
  - -- NATURAL VARIABILITY OF PARAMETERS
  - -- SENSORS AND PROCESSING
  - -- INTERACTION WITH ENVIRONMENT
- DETERMINES FOR EACH PARAMETER
  - -- COMPONENT ERRORS AND TOTAL SYSTEM ERRORS



EXAMPLE OF INSTANTANEOUS COMPONENT ERRORS FOR WIND SPEED



LEGEND: ——— Wind speed of 50m/sec: user accuracy requirement = 2.5m/sec (5 kts)

▪▪▪▪▪▪▪▪▪▪▪▪▪▪ Wind speed of 7m/sec: user accuracy requirement = .5m/sec (1 kt)

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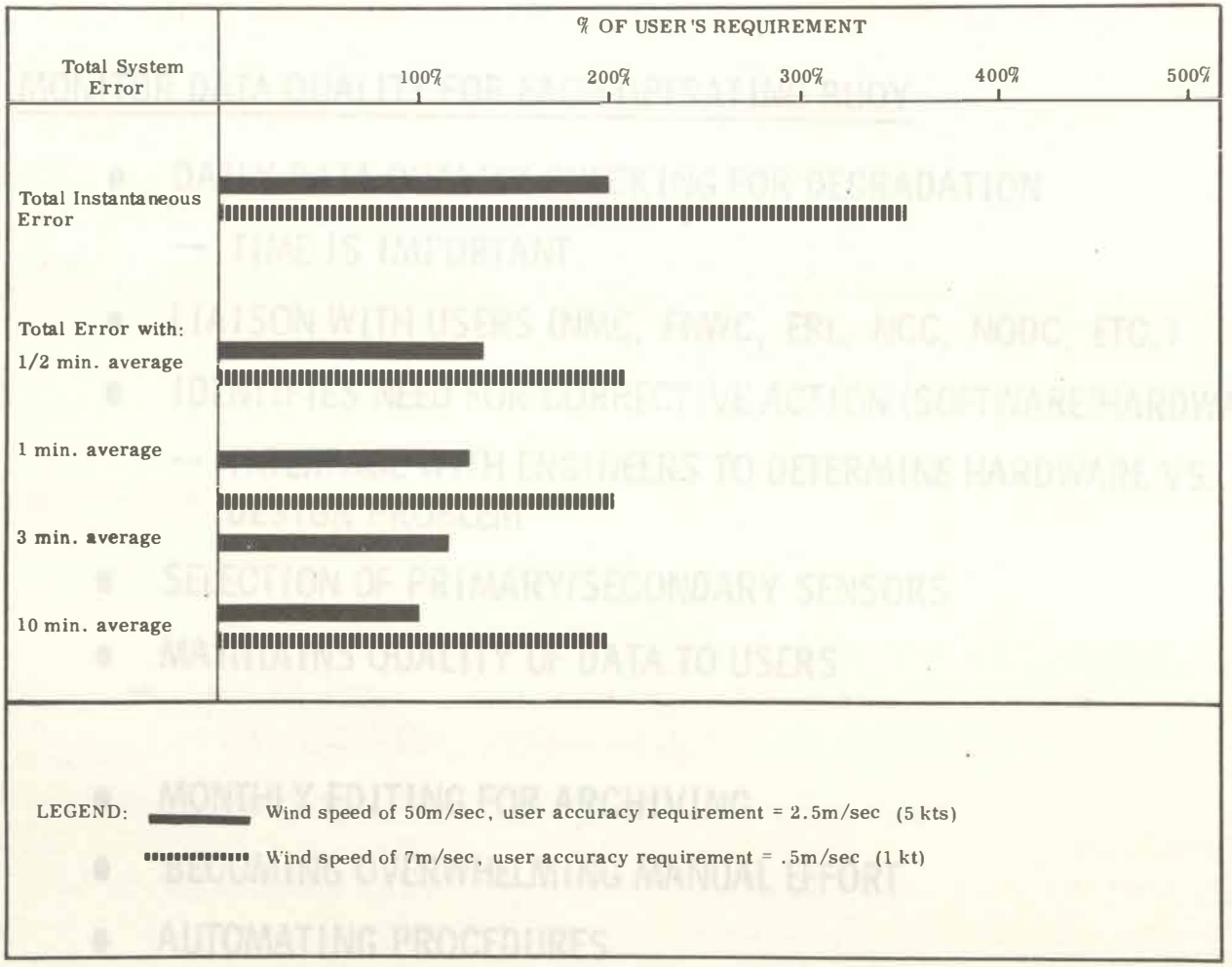
EXAMPLE OF AVERAGING OF TOTAL SYSTEM ERROR FOR WIND SPEED



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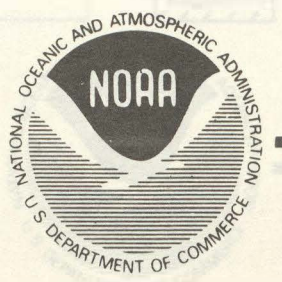
NDBO OPERATIONAL DATA QUALITY CONTROL

MONITOR DATA QUALITY FOR EACH OPERATING BUOY

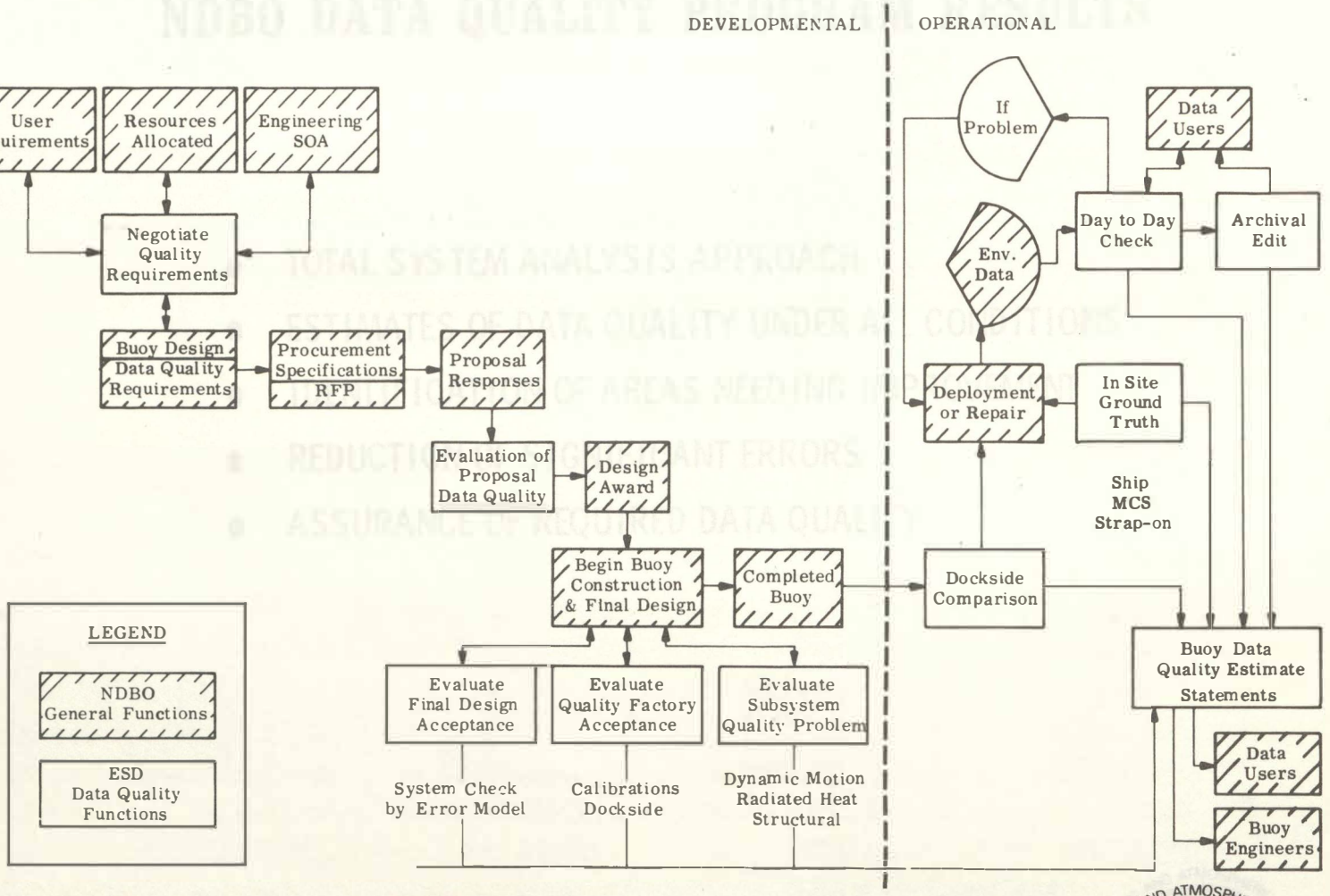
- DAILY DATA QUALITY CHECKING FOR DEGRADATION
  - -- TIME IS IMPORTANT
- LIAISON WITH USERS (NMC, FNWC, ERL, NCC, NODC, ETC.)
- IDENTIFIES NEED FOR CORRECTIVE ACTION (SOFTWARE/HARDWARE)
  - -- INTERFACE WITH ENGINEERS TO DETERMINE HARDWARE VS. DESIGN PROBLEM
- SELECTION OF PRIMARY/SECONDARY SENSORS
- MAINTAINS QUALITY OF DATA TO USERS
- MONTHLY EDITING FOR ARCHIVING
- BECOMING OVERWHELMING MANUAL EFFORT
- AUTOMATING PROCEDURES

DRIFTING BUOY DATA QUALITY PROGRAM

- SIMILAR APPROACH AS FOR MOORED OPERATIONAL BUOYS
- OBJECTIVES
  - -- DETERMINE QUALITY FOR RANGE OF ENVIRONMENTS
  - -- COMBINE QUALITY RESULTS WITH RELIABILITY AND COST FACTORS TO ARRIVE AT FGGE DESIGN
- TECHNIQUES
  - -- LABORATORY AND CONTROLLED FIELD TESTING
    - ICE, WIND, MOTION, HUMIDITY, TEMPERATURE, SHOCK, OVER PRESSURE, LINEARITY, HYSTERISIS, RESULUTION, CALIBRATION, REPEATABILITY
  - -- IN SITU COMPARISON EXPERIMENT WITH OTP
  - -- DATA ANALYSIS



DATA QUALITY FUNCTIONS IN THE LIFE-CYCLE OF A BUOY SYSTEM



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NDBO DATA QUALITY PROGRAM RESULTS

- TOTAL SYSTEM ANALYSIS APPROACH
- ESTIMATES OF DATA QUALITY UNDER ALL CONDITIONS
- IDENTIFICATION OF AREAS NEEDING IMPROVEMENT
- REDUCTION OF SIGNIFICANT ERRORS
- ASSURANCE OF REQUIRED DATA QUALITY

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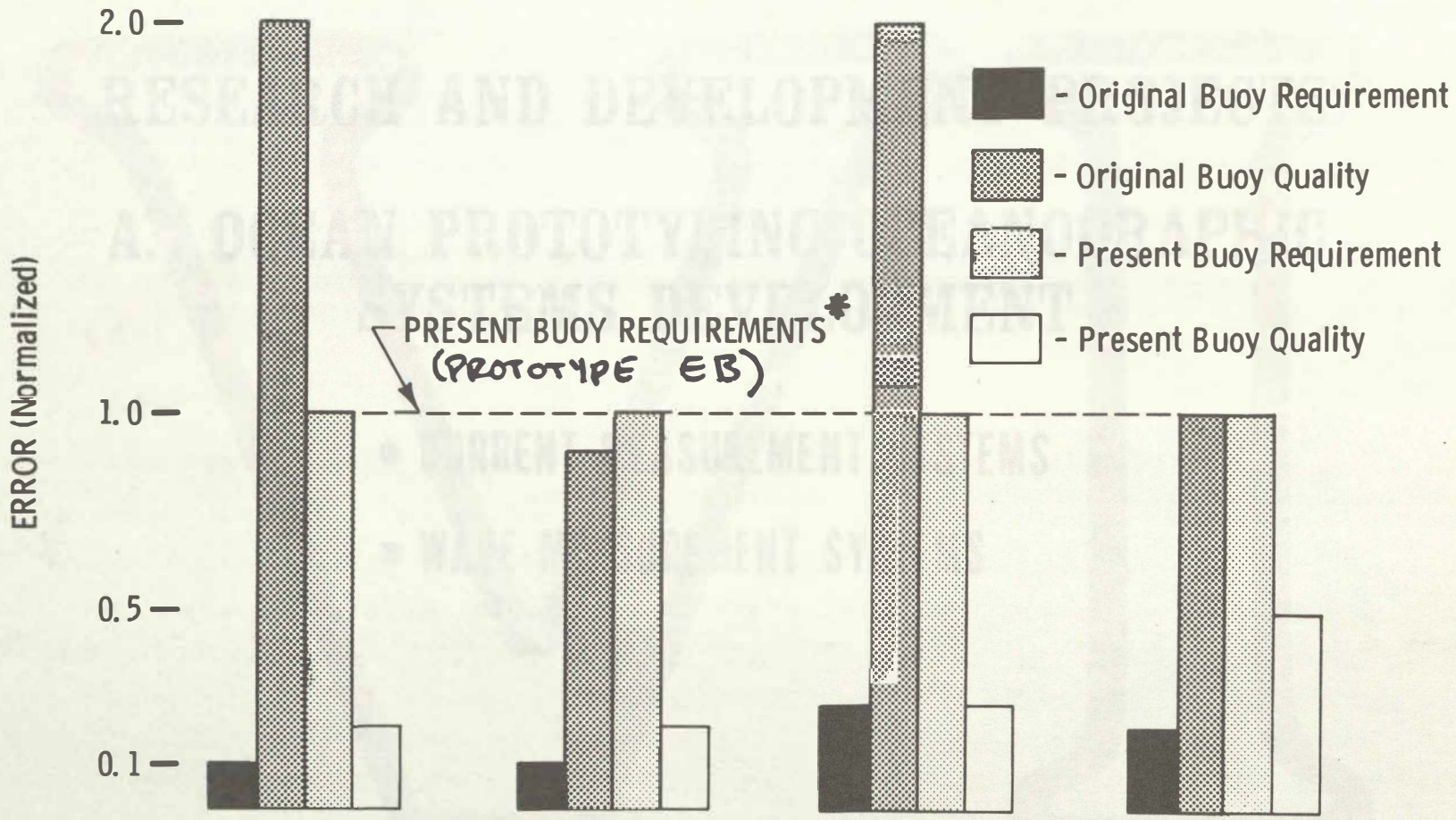
EVOLUTION OF BUOY DATA QUALITY



Negotiated Reg't.

RESEARCH AND DEVELOPMENT PROJECTS

A. OCEAN PROTOTYPING OCEANOGRAPHIC SYSTEMS DEVELOPMENT

- CURRENT MEASUREMENT SYSTEMS
- WAVE MEASUREMENT SYSTEMS

CURRENT MEASUREMENT SYSTEMS

PURPOSE

DEVELOP AND DEMONSTRATE A CURRENT MEASUREMENT SYSTEM FOR BUOYS ESPECIALLY CONTINENTAL SHELF BUOYS

SCOPE

USI NG AVAILABLE SENSORS - DEVELOP AND TEST CURRENT MEASURING SYSTEMS FOR BUOYS

-- EXECUTE CAREFULLY INSTRUMENTED FIELD EVALUATIONS TO TEST AND DEMONSTRATE SUCH SYSTEMS

-- NEAR TERM SCOPE IS DEVELOPMENT AND DEMONSTRATION OF RELIABLE EFFECTIVE HARDWARE

-- LONG TERM SCOPE IS REAL TIME TRANSMISSION OF CURRENT MEASUREMENTS FROM BUOYS

CURRENT MEASUREMENT SYSTEMS (Continued)

PROGRAM STATUS

- SELECT AND LAB TEST THREE CURRENT MEASUREMENT MENT CONFIGURATIONS
- SPONSORING IMPROVEMENT OF ONE PROFILING SYSTEM
- ASSEMBLE AND INTEGRATE FIELD SYSTEM FOR MONITORING CURRENT MEASUREMENTS SYSTEM ELEMENT PERFORMANCE
- COSTS TO DATE APPROXIMATELY ~~$400K~~ 600K (FY 75/76)

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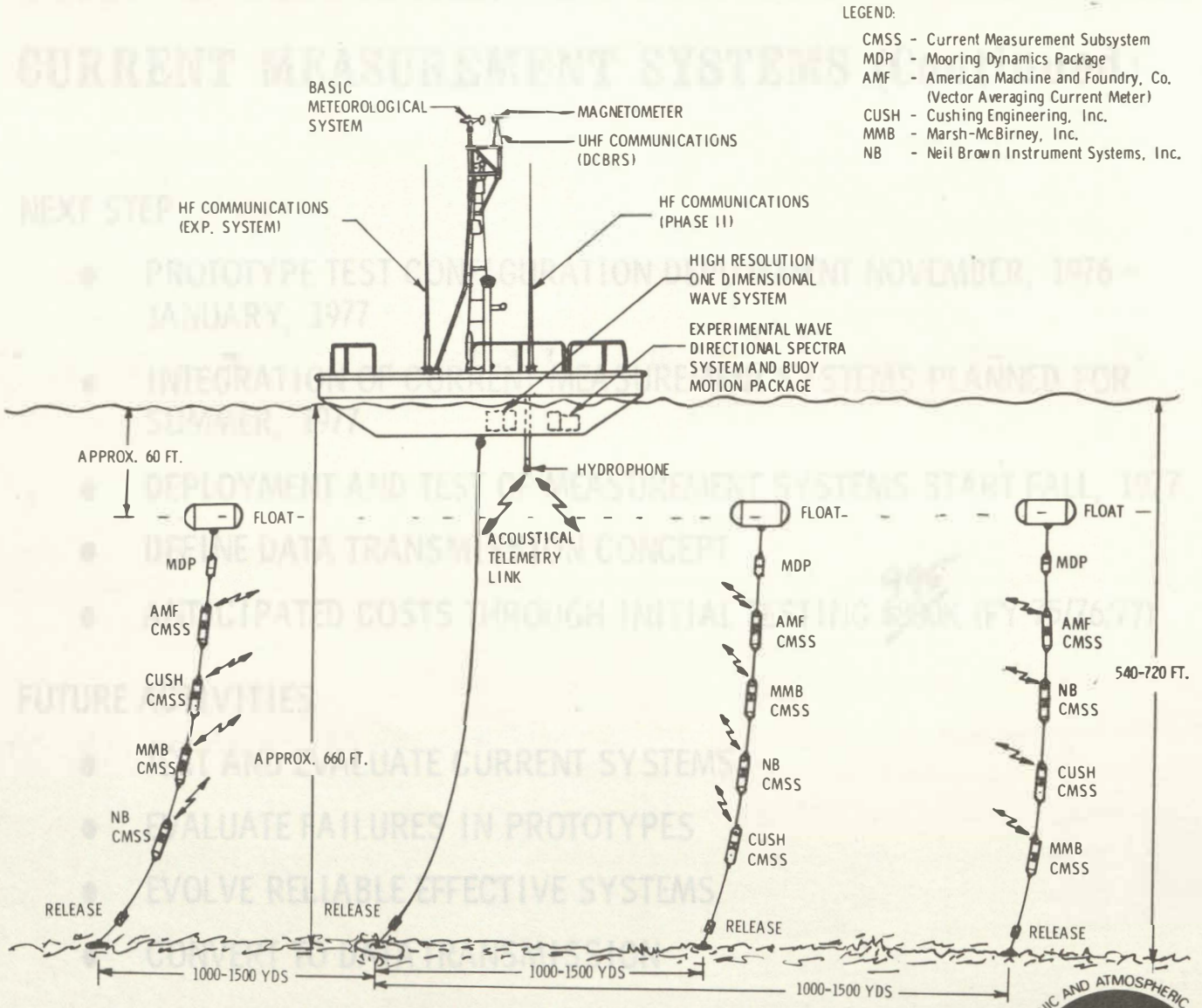
OPERATIONAL CONFIGURATION FOR THE CMS EVALUATION



670'
60mi OFF Jacksonville Fla.

Sub Surface floats
Xmit via acoustic
Telemetry

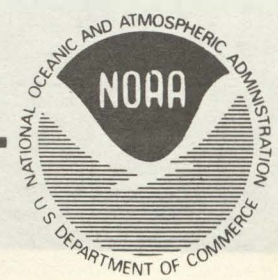
CURRENT MEASUREMENT SYSTEMS (Continued)

NEXT STEP

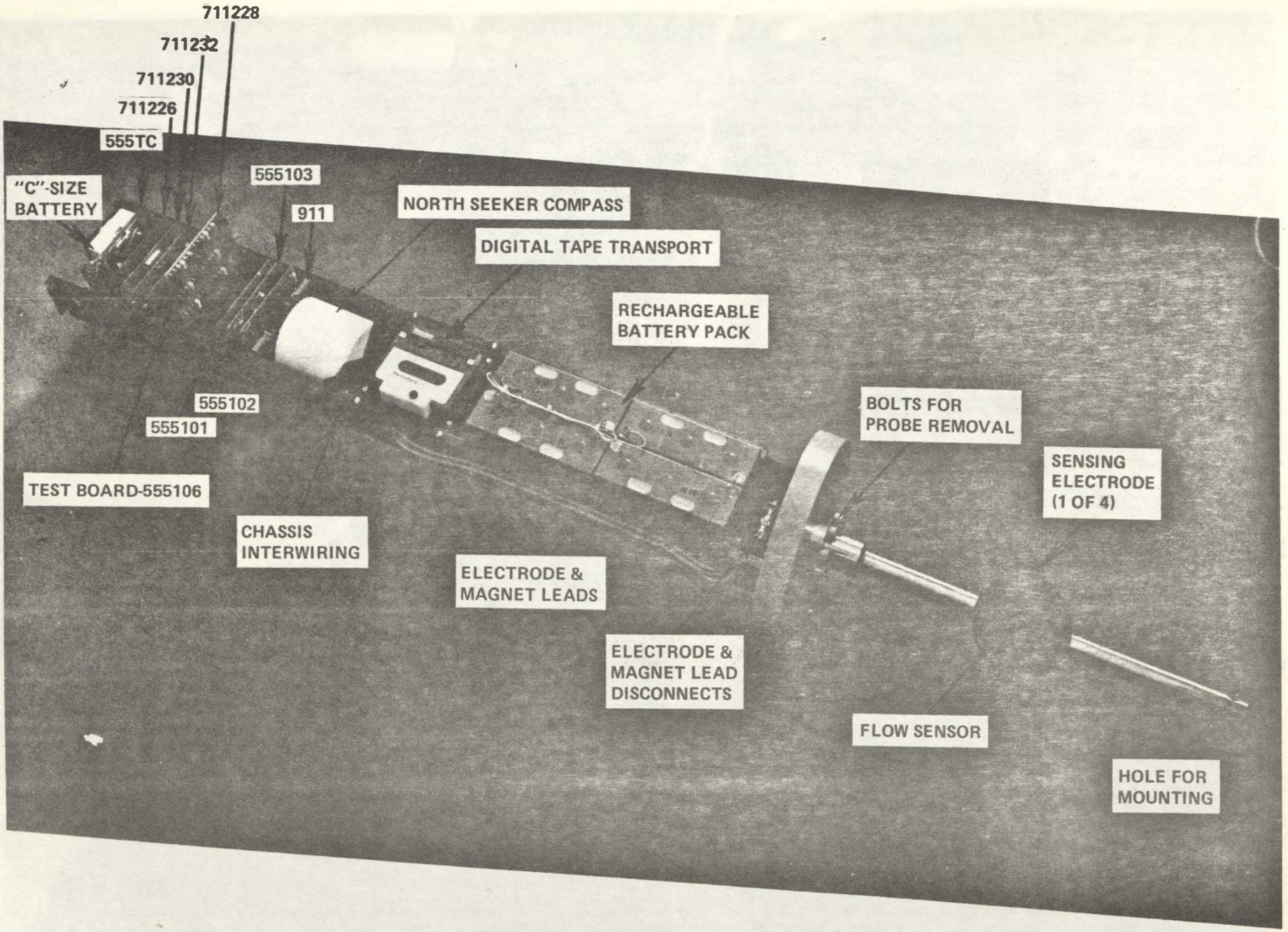
- PROTOTYPE TEST CONFIGURATION DEPLOYMENT NOVEMBER, 1976 - JANUARY, 1977
- INTEGRATION OF CURRENT MEASUREMENT SYSTEMS PLANNED FOR SUMMER, 1977
- DEPLOYMENT AND TEST OF MEASUREMENT SYSTEMS START FALL, 1977
- DEFINE DATA TRANSMISSION CONCEPT
- ANTICIPATED COSTS THROUGH INITIAL TESTING ~~$800K~~ 995K (FY 75/76/77)

FUTURE ACTIVITIES

- TEST AND EVALUATE CURRENT SYSTEMS
- EVALUATE FAILURES IN PROTOTYPES
- EVOLVE RELIABLE EFFECTIVE SYSTEMS
- CONVERT TO DATA TRANSMISSION



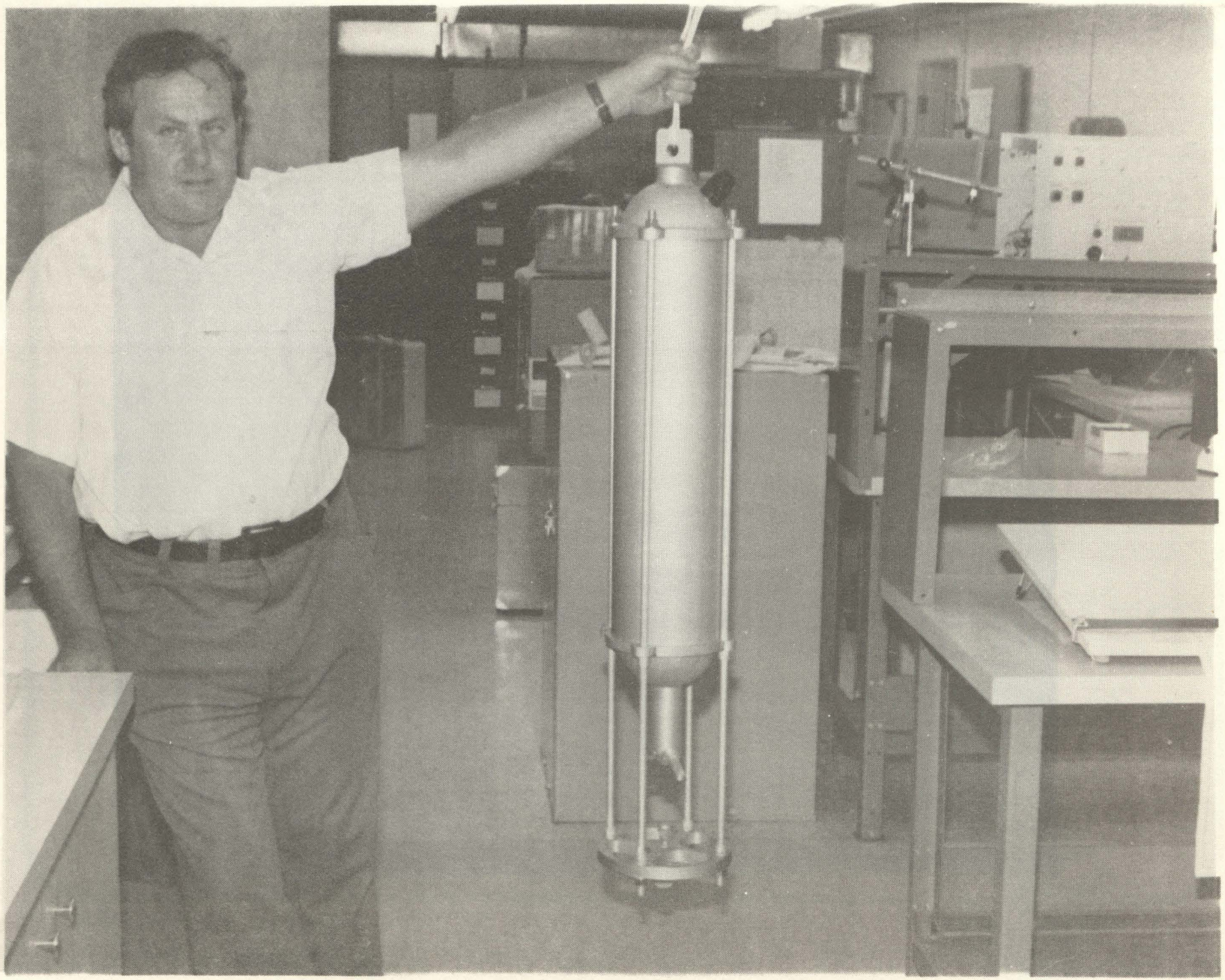
CUSHING MTR.



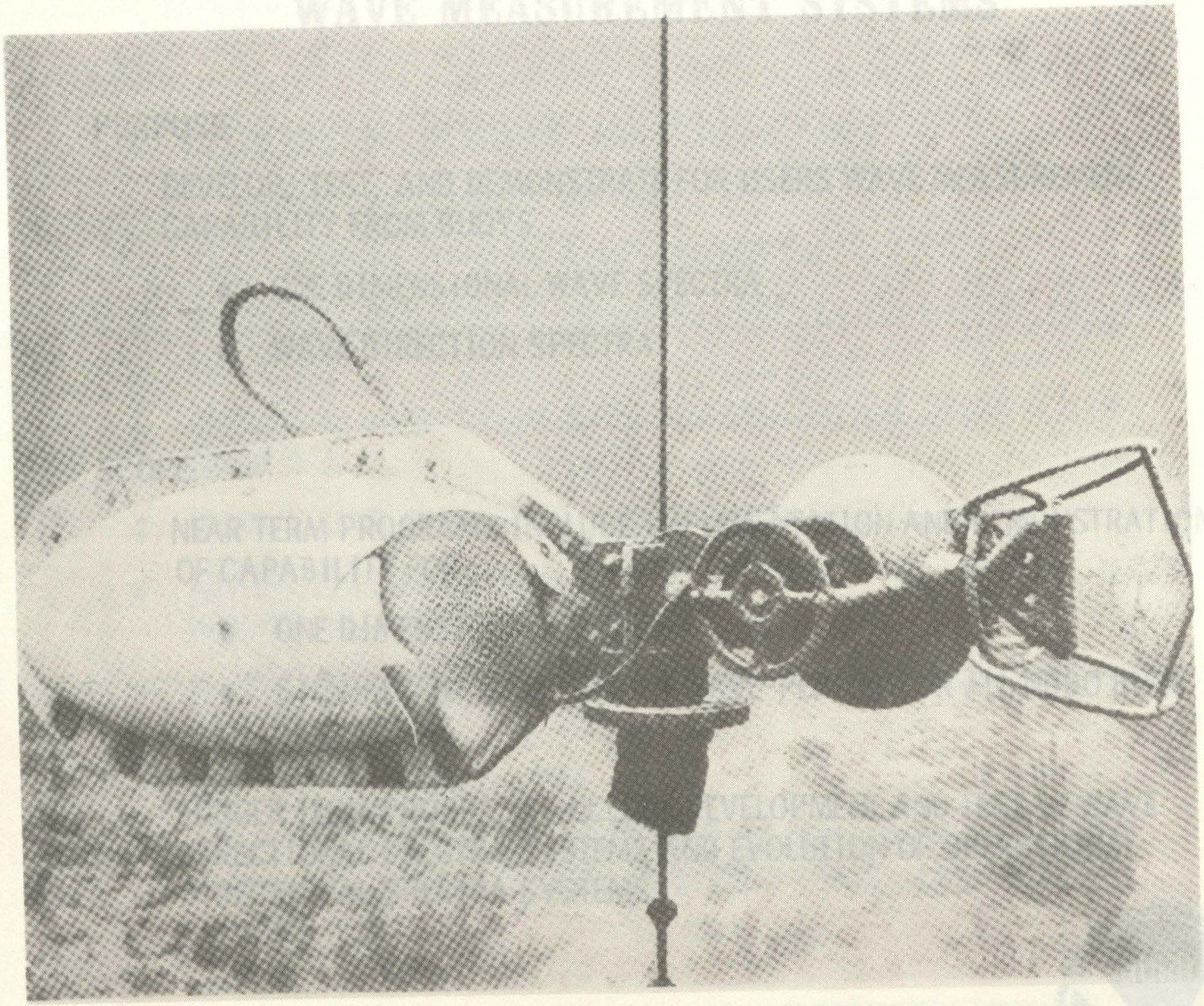
555A

MARSH - McBIRNEY INC.

VI A #7



Neil Brown



WAVE MEASUREMENT SYSTEMS

PURPOSE:

DEVELOP, TEST, AND DEMONSTRATE FOR USERS WAVE MEASUREMENT CAPABILITY FROM BUOYS

- ONE DIMENSIONAL WAVE SPECTRA
- WAVE DIRECTION SPECTRA

SCOPE:

NEAR TERM PROGRAMS INCLUDE IMPLEMENTATION AND DEMONSTRATION OF CAPABILITY FOR ...

- ONE DIMENSIONAL SPECTRA
- SIGNIFICANT WAVE-HEIGHT WAVE-PERIOD FOR ALL NDBO BUOY HULL FORMS

LONGER TERM PROGRAMS INCLUDE DEVELOPMENT AND TEST OF WAVE DIRECTIONAL SPECTRA SYSTEMS AND EVOLUTION OF OPERATIONAL DIRECTIONAL SPECTRA SYSTEMS.

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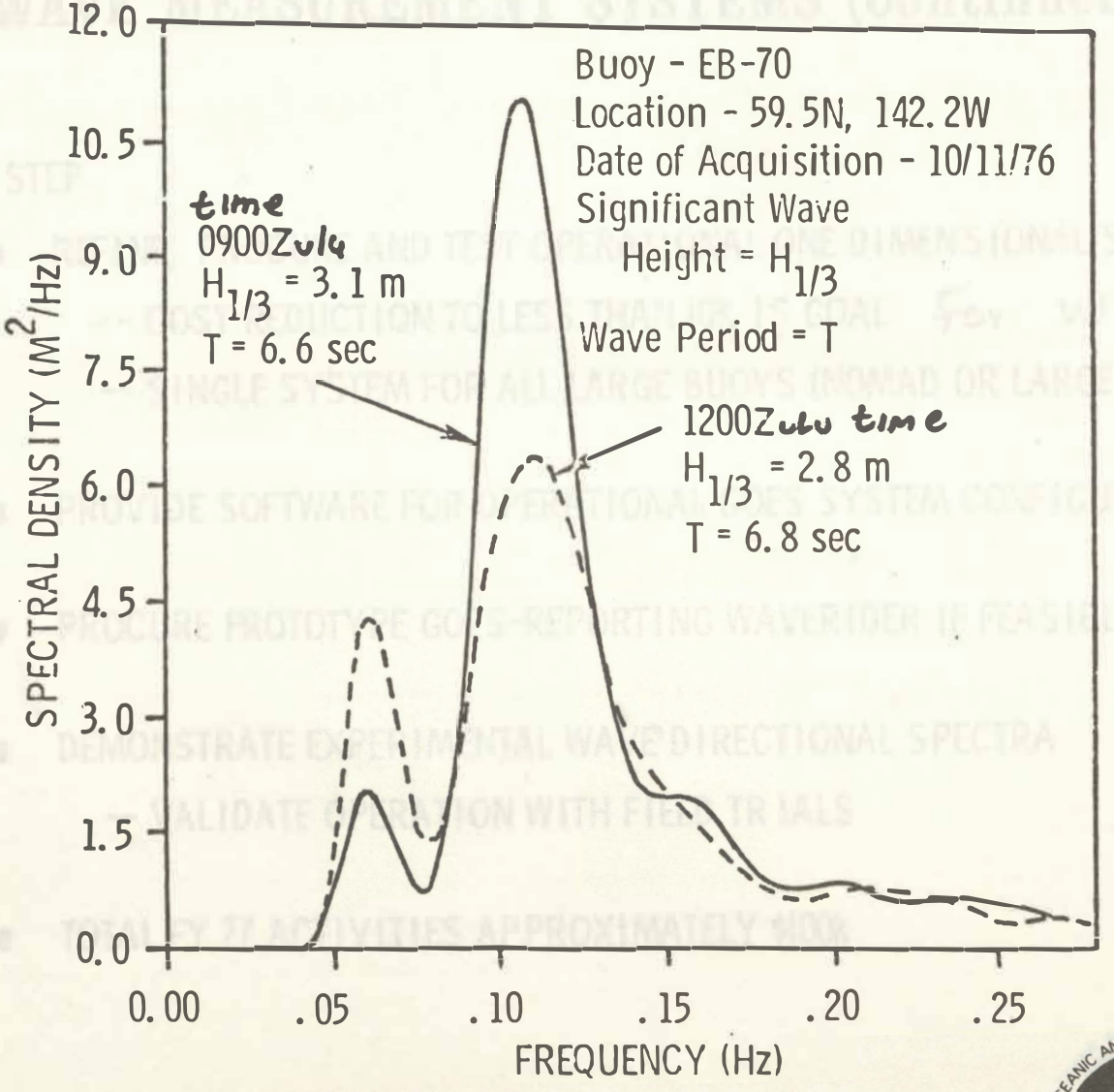
WAVE MEASUREMENT SYSTEMS (Continued)

STATUS

- EARLY SYSTEMS DEVELOPED AND TESTED (FY 1974)
  - -- ONE DIMENSIONAL SPECTRA
  - -- GENERAL PURPOSE COMPUTER NEEDED
- ANALOG FILTERS USED TO PROVIDE APPROXIMATE SPECTRA FOR PEB BUOYS 12 Spectral est
- PROTOTYPE OPERATIONAL SYSTEM DEVELOPED AND BEING TESTED ON EB 70/71
- TESTS TO DATE HIGHLY SATISFACTORY FOR DISCUS HULLS
- INITIAL IMPLEMENTATION ON NOMAD LOOKS GOOD, BUT EVALUATIONS NOT YET FULLY UNDERWAY
- WORK UNDERWAY ON EXPERIMENTAL WAVE DIRECTIONAL SPECTRA SYSTEM
- COSTS TO DATE $300 - $400K
- ANALYSIS UNDERWAY TO DETERMINE FEASIBILITY OF MODIFYING WAVERIDER TO REPORT SPECTRA DIRECTLY THRU GOES--LOOKS PROMISING

EXAMPLES OF WAVE DATA ANALYZER (WDA) DATA

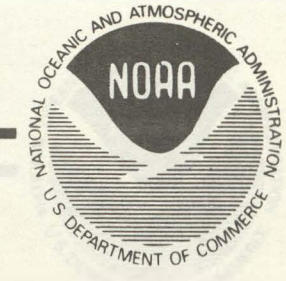


Resolution
.01 Hz

WAVE MEASUREMENT SYSTEMS (Continued)

NEXT STEP

- REFINE, PROCURE AND TEST OPERATIONAL ONE DIMENSIONAL SYSTEM
  - -- COST REDUCTION TO LESS THAN 10K IS GOAL for WDA
  - -- SINGLE SYSTEM FOR ALL LARGE BUOYS (NOMAD OR LARGER)
- PROVIDE SOFTWARE FOR OPERATIONAL GOES SYSTEM CONFIGURATION
- PROCURE PROTOTYPE GOES-REPORTING WAVERIDER IF FEASIBLE
- DEMONSTRATE EXPERIMENTAL WAVE DIRECTIONAL SPECTRA
  - -- VALIDATE OPERATION WITH FIELD TRIALS
- TOTAL FY 77 ACTIVITIES APPROXIMATELY $100k



WAVE MEASUREMENT SYSTEM (Continued)

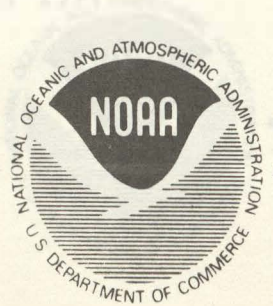
- PROCUREMENT OF OPERATIONAL SYSTEMS ONE DIMENSIONAL WAVE SPECTRA
- TEST AND EVALUATE DIRECTIONAL WAVE SPECTRA SYSTEMS
- CONVERT EXPERIMENTAL SYSTEM TO OPERATIONAL WAVE DIRECTIONAL SYSTEM

RESEARCH AND DEVELOPMENT PROJECTS

B. GENERAL TECHNOLOGY ENHANCEMENT

- SPECIALIZED SYSTEMS DEVELOPMENTS
- SENSOR SYSTEMS TEST AND EVALUATION
- POWER SYSTEMS TEST AND EVALUATION
- SPECIAL FIELD TESTS
- WATER QUALITY INSTRUMENTATION SYSTEMS APPLICATIONS
- OCEAN TEST PLATFORM

SPECIALIZED SYSTEMS DEVELOPMENTS



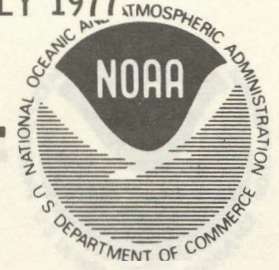
UPPER AIR PROGRAM

PURPOSE

- DEVELOP CAPABILITY TO PROVIDE INTEGRATED UPPER AIR TEMPERATURE PROFILES FROM DEEP OCEAN MOORED BUOYS

SCOPE

• SIMULATION STUDY	NOV. 1975
• IN SITU PT. MUGU STUDY 1	JULY 1976
• IN SITU PT. MUGU STUDY 2	OCT. 1976
• IN SITU OCEAN STATION "P" STUDY	MARCH 1977
• DATA ANALYSIS AND RESULTS	MAY 1977
• SYSTEM COST ANALYSIS	~~JAN.~~ JUL 1977
• PRESENTATION OF RESULTS TO OE, EM, NWS FOR EVALUATION OF DATA FROM SYSTEM	~~JUNE~~ JUL 1977
• DECISION TO CANCEL OR PROCEED WITH JULY 1977 PROTOTYPE	JULY 1977



UPPER AIR PROGRAM (Continued)

STATUS

- SIMULATION STUDY COMPLETED
- IN SITU PT. MUGU STUDIES COMPLETED
- OCEAN STUDY "P" EXPERIMENT IN PREPARATION

NEXT STEP

- CONVERSION OF SATELLITE HARDWARE FOR SHIPBOARD EXPERIMENT
- PERFORM OCEAN STATION "P" EXPERIMENT
- COMPILATION OF RESULTS AND PRESENTATION TO NOAA

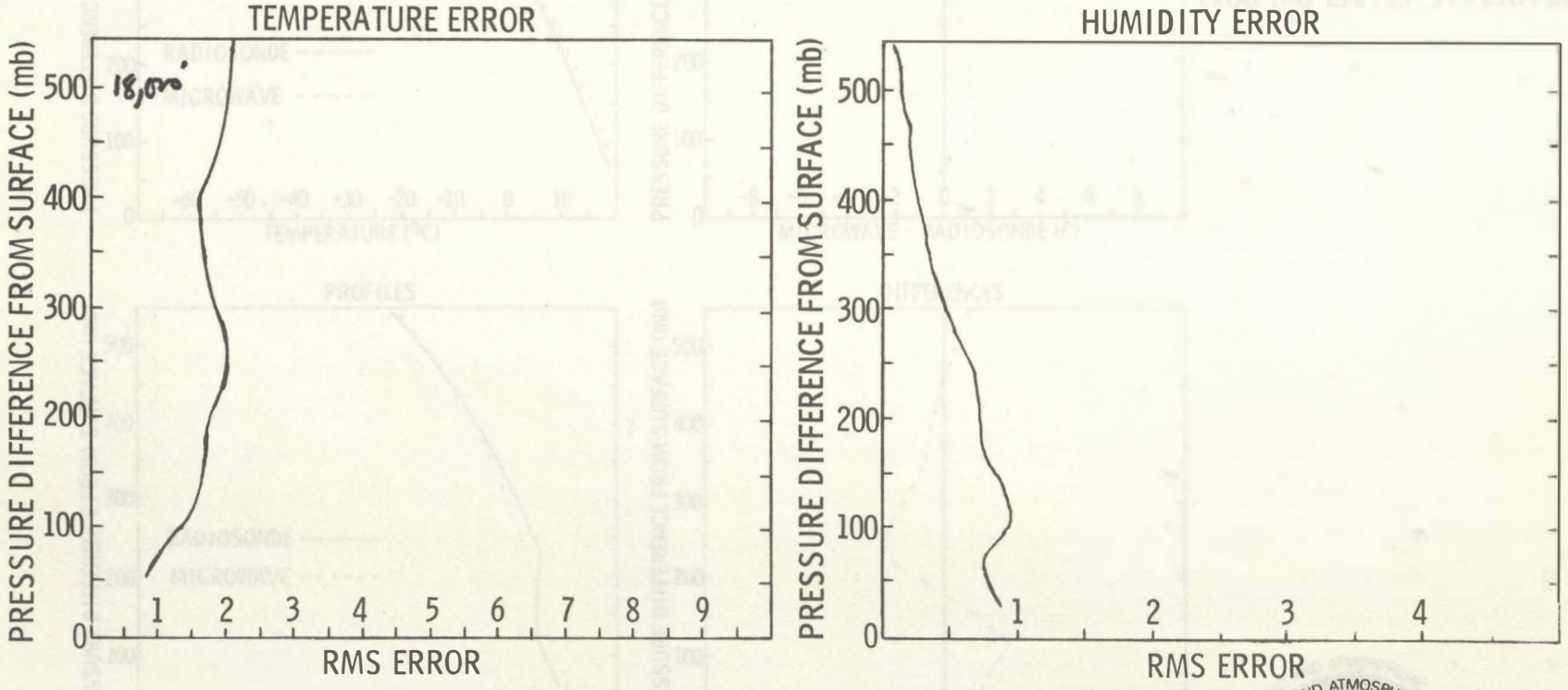
UPPER AIR TEMPERATURE SOUNDER

- NATIONAL WEATHER SERVICE REQUIREMENTS
  - AVERAGE TEMPERATURE FOR 100 mb LAYER TO $\pm 1^{o}C$
  - WOULD LIKE SOUNDINGS TO 500 mb (5.6 Km, 18,000 FT)
  - DATA TO 850 mb (1.5 Km, 4,400 FT) WOULD BE USEFUL FOR SOME PURPOSES
  - HUMIDITY DATA WOULD BE USEFUL

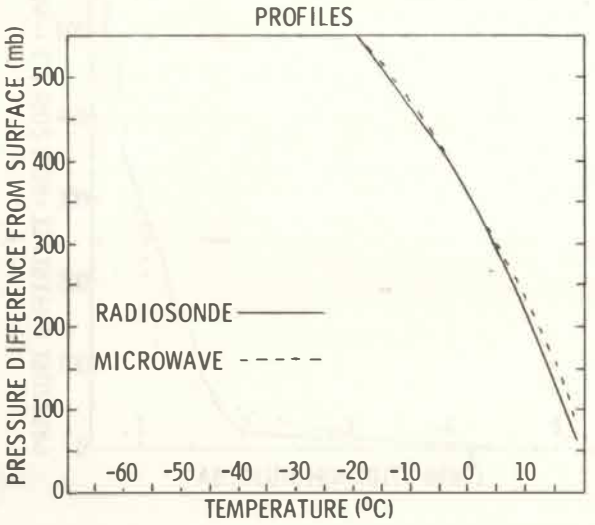
- no mid data obtained

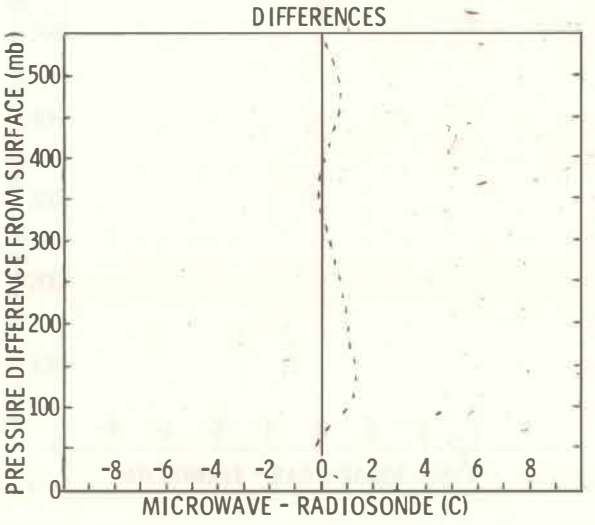
RESULTS OF PT. MUGU STUDY NO. 1

- 100mb LARGER AVERAGED TEMPERATURE PROFILE AVAILABLE WITHIN ~~± 2° C (RMS)~~ BETWEEN SURFACE AND 500mb
- ABSOLUTE HUMIDITY INFORMATION MAY BE OBTAINED WITH AN ACCURACY OF ± 1 gm/m^3
- MICROWAVE SOUNDINGS APPEAR TO BE INSENSITIVE TO INVERSION LAYERS



COMPARISON OF RADIOSONDE AND MICROWAVE TEMPERATURE SOUNDINGS

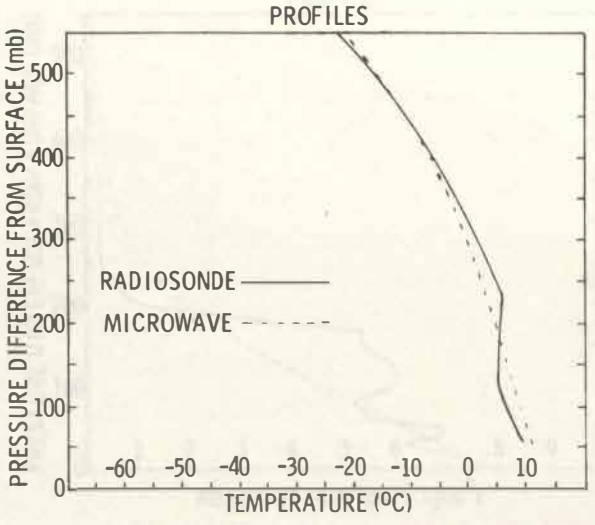


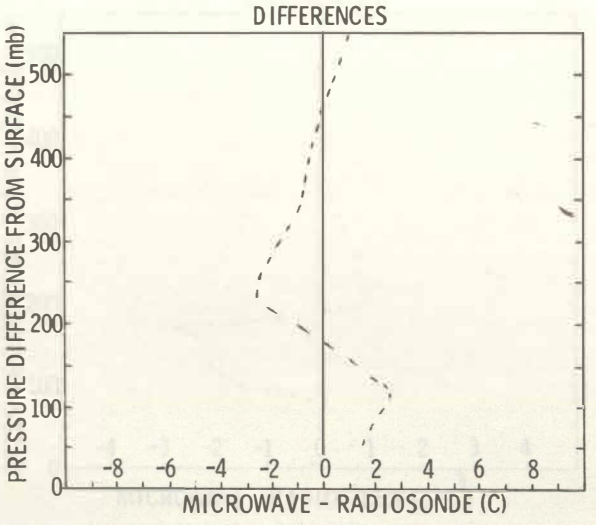


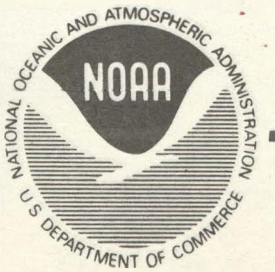
FROM PT. MUGU

STUDY NO. 1

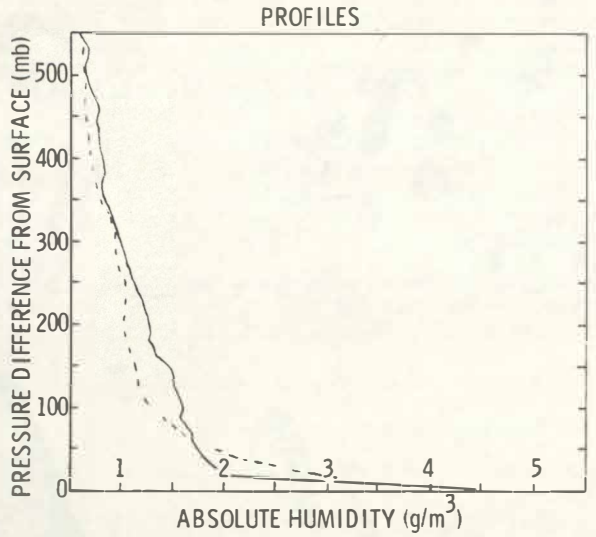
(100 mb LAYER AVERAGES)

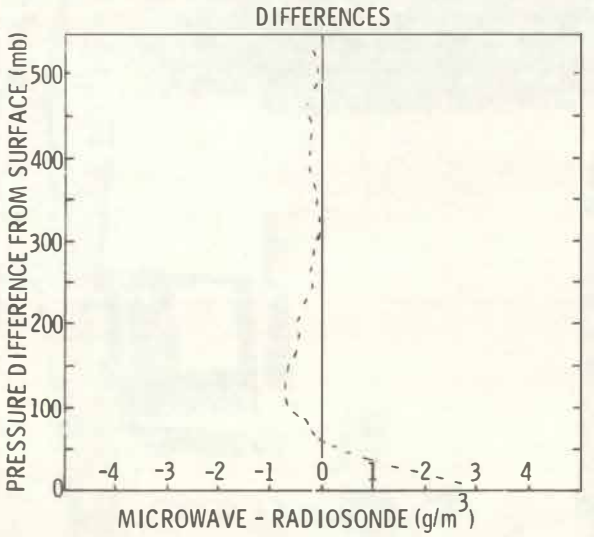






COMPARISON OF RADIOSONDE AND MICROWAVE HUMIDITY SOUNDINGS

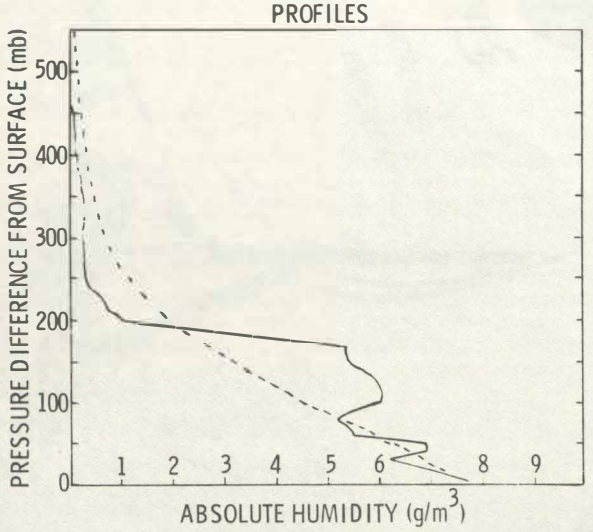


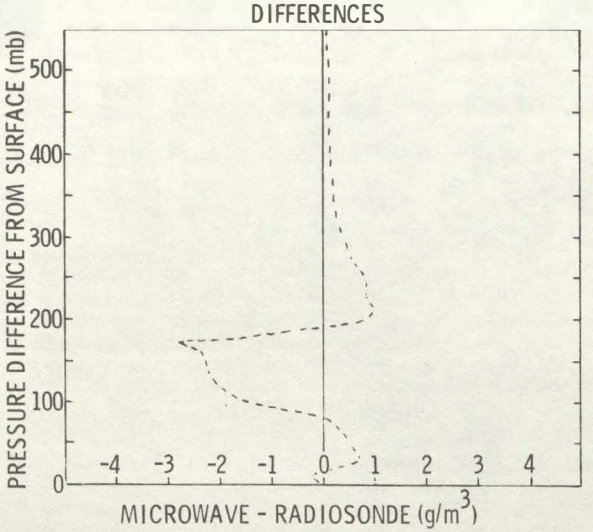


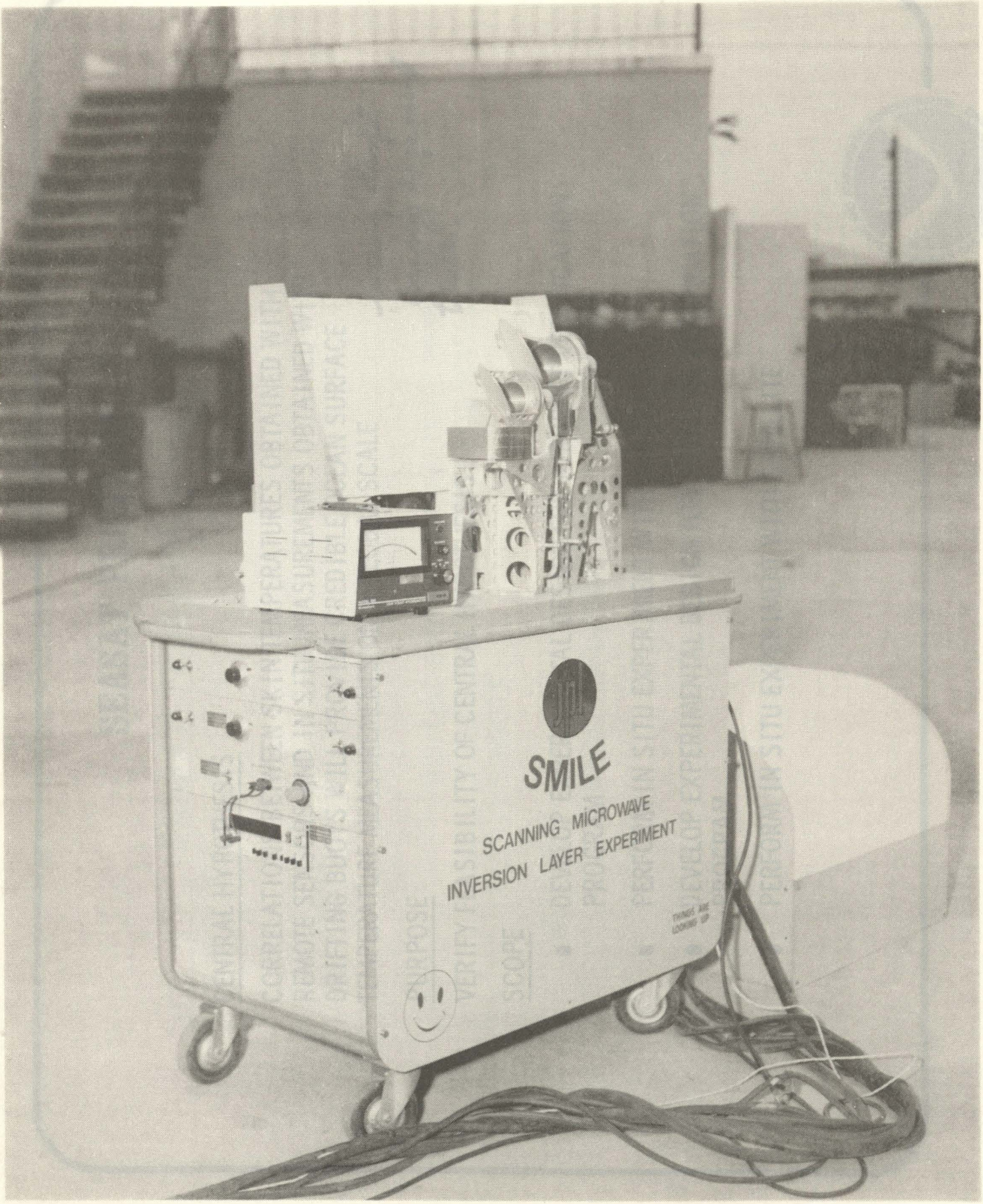
FROM PT. MUGU

STUDY NO. 1

(100 mb LAYER AVERAGES)







30 Gigahz H_2O (Vapor) 50 Giga Hz Temp

SEASAT PROGRAM

CENTRAL HYPOTHESIS

CORRELATIONS BETWEEN SKIN TEMPERATURES OBTAINED WITH REMOTE SENSORS AND IN SITU MEASUREMENTS OBTAINED WITH DRIFTING BUOYS WILL PROVIDE CREDIBLE OCEAN SURFACE TEMPERATURE MEASUREMENTS ON A GLOBAL SCALE

using drift Buoys as ground truth.

PURPOSE

VERIFY FEASIBILITY OF CENTRAL HYPOTHESIS

SCOPE

- DEVELOP EXPERIMENTAL DESIGN FOR AIRCRAFT VERIFICATION PROGRAM
- PERFORM IN SITU EXPERIMENT WITH AIRCRAFT
- DEVELOP EXPERIMENTAL DESIGN FOR SATELLITE VERIFICATION PROGRAM
- PERFORM IN SITU EXPERIMENT WITH SATELLITE

SEASAT PROGRAM (Continued)

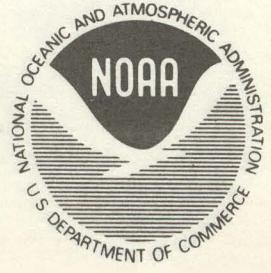
STATUS

- SPRING 1977 DEPLOY 2 OR 3

  DRIFTING BUOYS TO GROUND TRUTH ~~PROSPECTIFE.~~
  PROSPECTIVE SEA-SAT SATELLITE SENSORS.
  SENSORS.

NEXT STEP

- PLANNING FOR IN SITU SATELLITE EXPERIMENT



PRELIMINARY RESULTS OF PT. MUGU STUDY NO. 2

- RETRIEVAL SUCCESSFULLY CORRECTING FOR THE PRESENCE OF CLOUDS
- RETRIEVAL OF WATER VAPOR PROFILES IS MUCH BETTER THAN EXPECTED.
- TEMPERATURES APPEAR TO BE CONSISTENTLY SLIGHTLY WARMER THAN RADIOSONDE MEASUREMENTS

SUMMARY OF SIMULATION FEASIBILITY STUDY

RANGE IN RMS ACCURACY (°K) ON RETRIEVAL OF 100 mb LAYER AVERAGED TEMPERATURE PROFILE (5 OCEAN STATIONS)

	CLEAR (6337 PROFILES)		CLOUDY (600 PROFILES)	
	850 mb	500 mb	850 mb	500 mb
2 CHANNELS	1.0-1.3	2.5-4.1	1.0-1.4	2.5-4.2
3 CHANNELS	0.9-1.2	1.7-2.7*	1.0-1.4	2.5-4.2
5 CHANNELS	0.9-1.2	1.7-2.7	0.9-1.2	2.0-3.0

* REQUIRES INDEPENDENT CLOUD-COVER INFORMATION TO BE APPLICABLE

NUMERICAL MODEL

PURPOSE

- DEVELOP DESIGN TOOL TO AID IN DESIGN OF DRIFTING AND MOORED BUOY SYSTEMS
- TIME DOMAIN ANALYSIS - USED IN CONJUNCTION WITH EXISTING FREQUENCY DOMAIN MODEL

SCOPE

- FORMULATE MODEL - JULY 1976
- IMPLEMENT AND TEST MODEL - SEPTEMBER 1976
- MODEL VALIDATION - PHASE 1: JANUARY 1977
  IN SITU PHASE 2: -----
- MODEL UTILIZATION - OCTOBER 1976

NUMERICAL MODEL (Continued)

STATUS

- MODEL OPERATIONAL AT NDBO AND OSU /Dr. Nath
- DESIGN INVESTIGATIONS HAVE HIGHLIGHTED PROBLEM AREAS

NEXT STEP

- DEVELOP "COOK BOOK" DESIGN PROCEDURES
- TETHER LINE FATIGUE STUDIES
- LAGRANGIAN EFFECTIVENESS VALIDATION
- FULL SCALE PARTIAL VALIDATION (JOINT NDBO/NSF PROGRAM)

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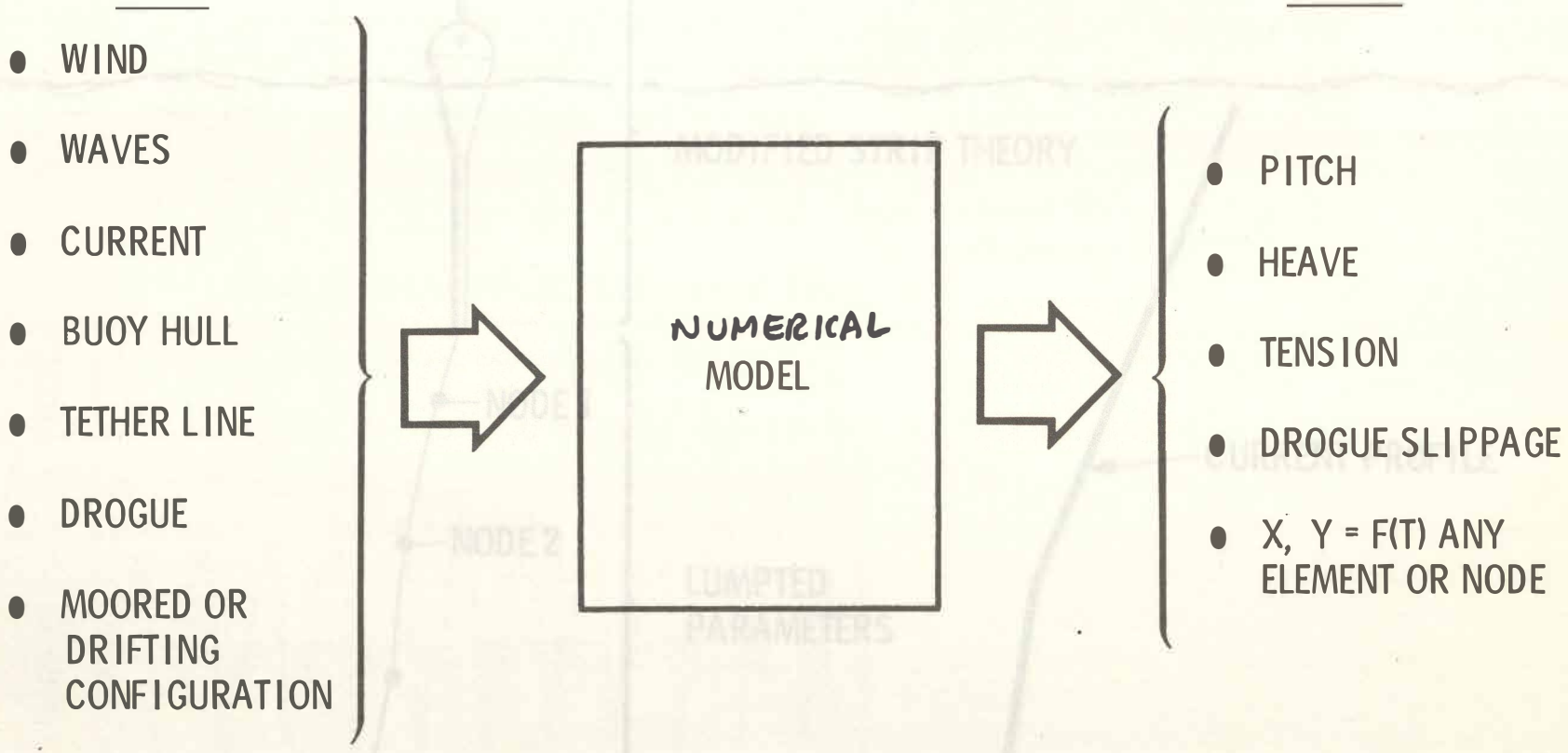
NUMERICAL MODEL INPUT/OUTPUT



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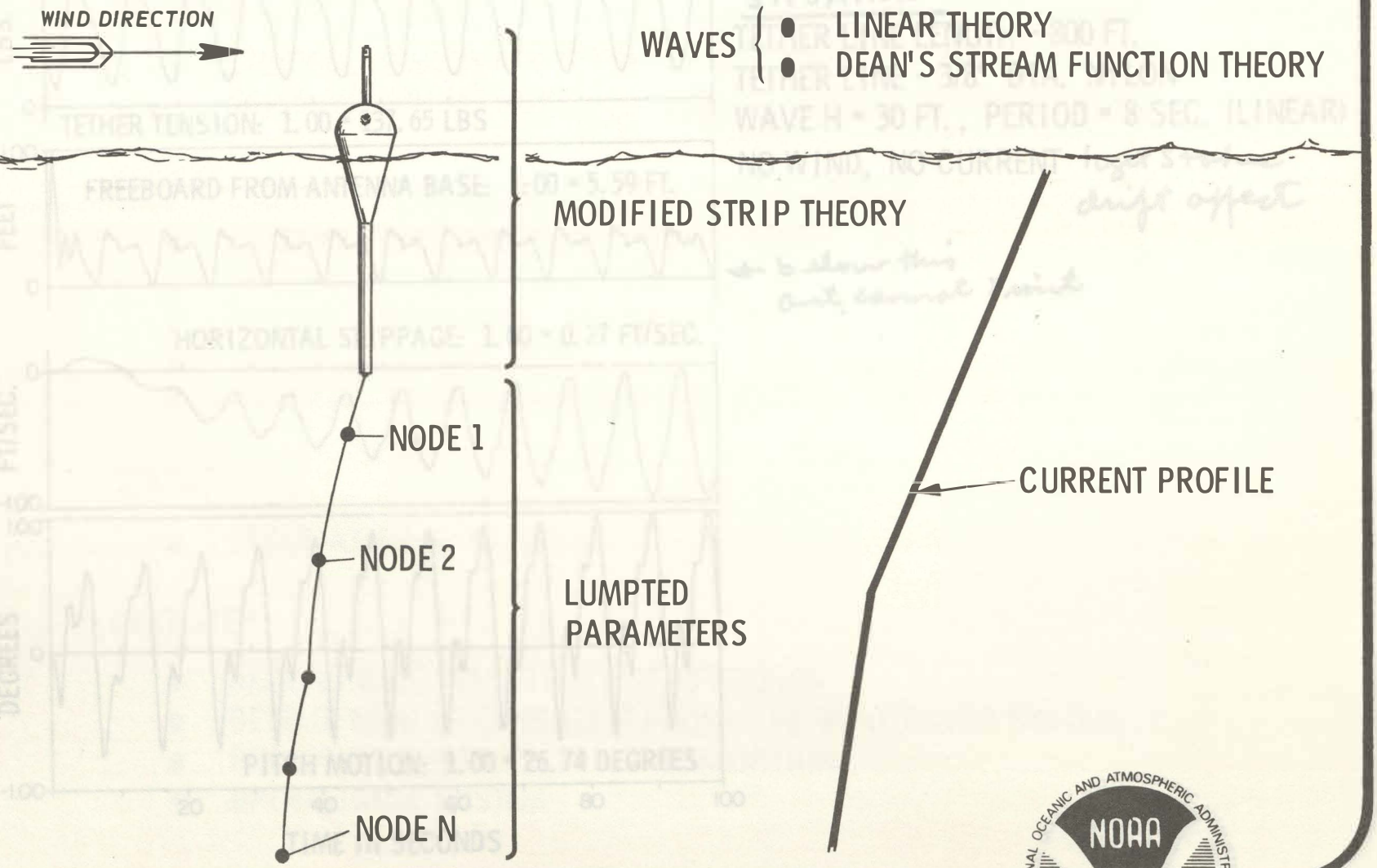
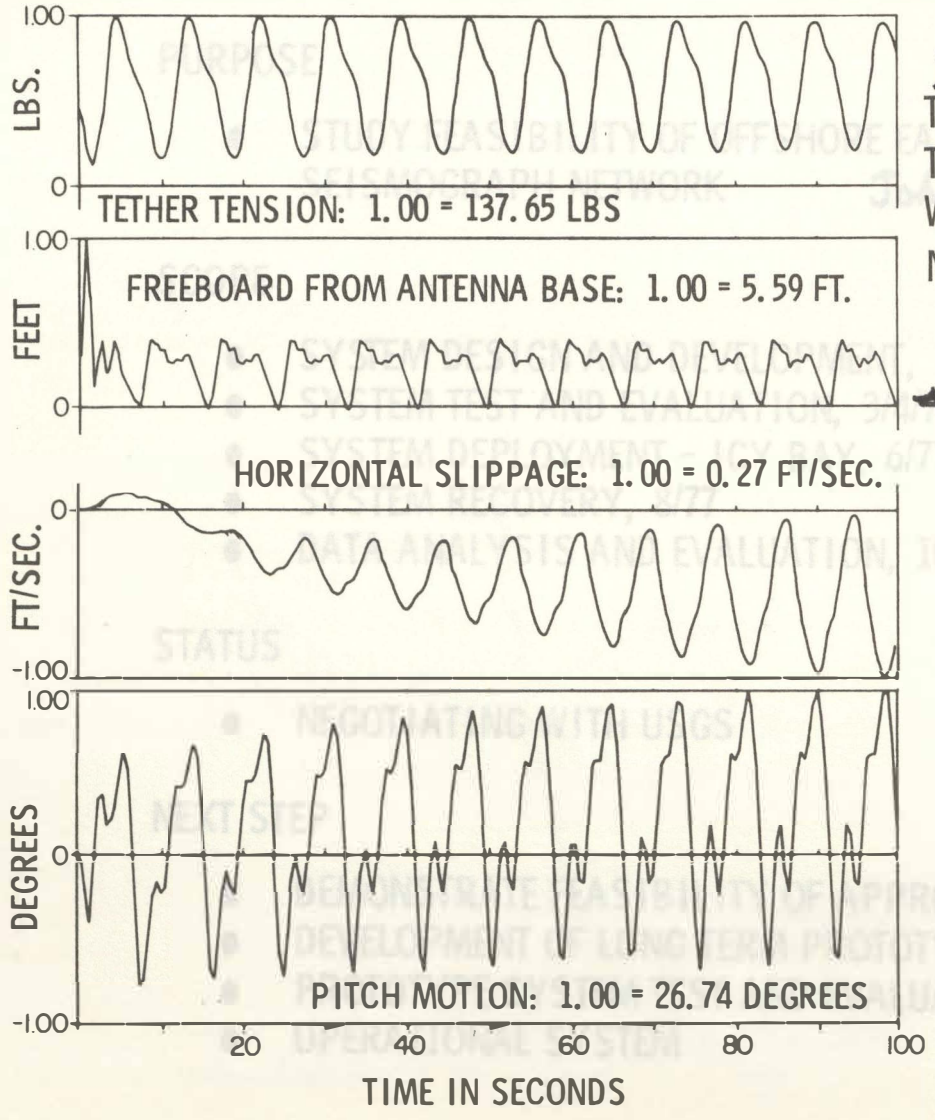
NUMERICAL MODEL CONFIGURATION



NUMERICAL MODEL OUTPUT for Drifter Design



SITUATION

TETHER LINE LENGTH - 800 FT.

TETHER LINE - 3/8" DIA. NYLON

WAVE H = 30 FT., PERIOD = 8 SEC. (LINEAR)

NO WIND, NO CURRENT toget s to hes drift affect

← below this ant. cannot exist

USGS - ICY BAY SEISMIC STUDY

PURPOSE

- STUDY FEASIBILITY OF OFFSHORE EARTHQUAKE MONITORING WITH SEISMOGRAPH NETWORK John Lahr Menlo Park

SCOPE

- SYSTEM DESIGN AND DEVELOPMENT, 1/2/77
- SYSTEM TEST AND EVALUATION, 3/4/77
- SYSTEM DEPLOYMENT - ICY BAY, 6/77
- SYSTEM RECOVERY, 8/77
- DATA ANALYSIS AND EVALUATION, 10/77

STATUS

- NEGOTIATING WITH USGS

NEXT STEP

- DEMONSTRATE FEASIBILITY OF APPROACH
- DEVELOPMENT OF LONG TERM PROTOTYPE MONITORING SYSTEM
- PROTOTYPE SYSTEM TEST AND EVALUATION
- OPERATIONAL SYSTEM

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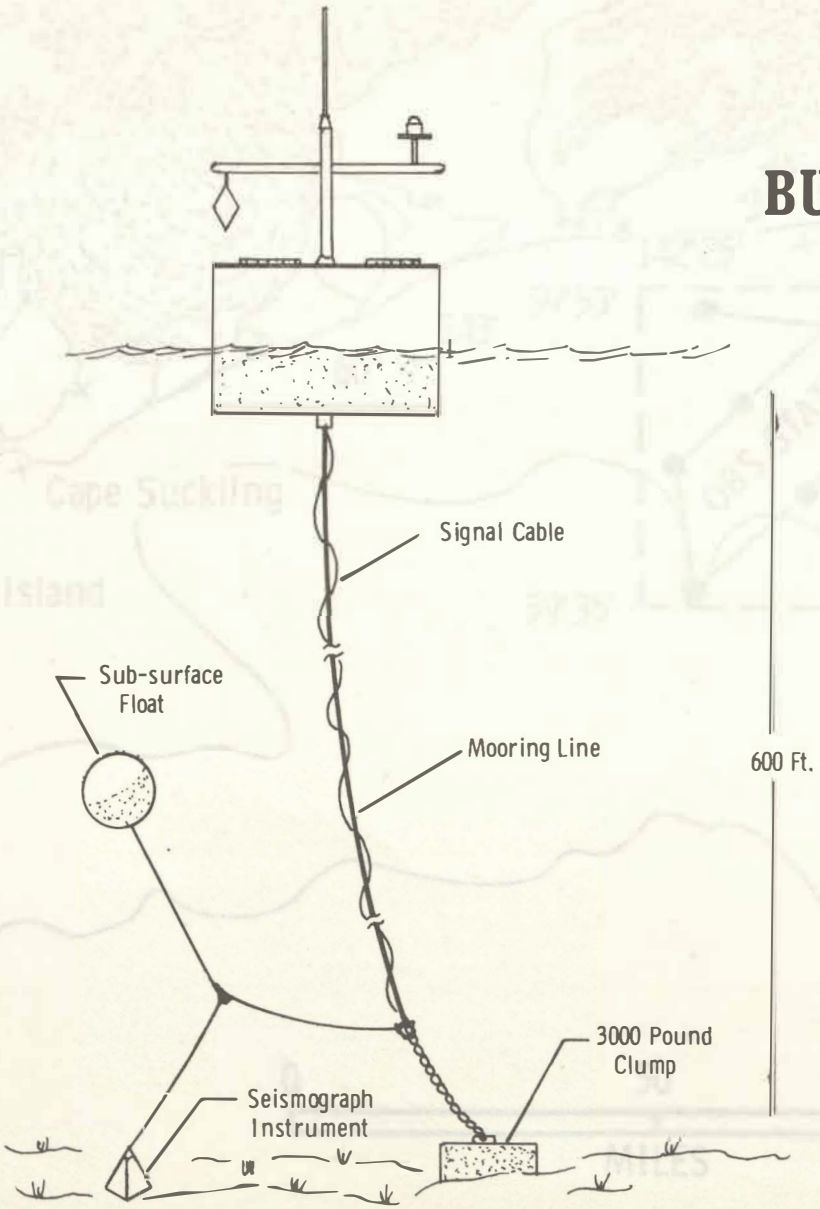
PROPOSED ICY BAY BUOY ARRANGEMENT



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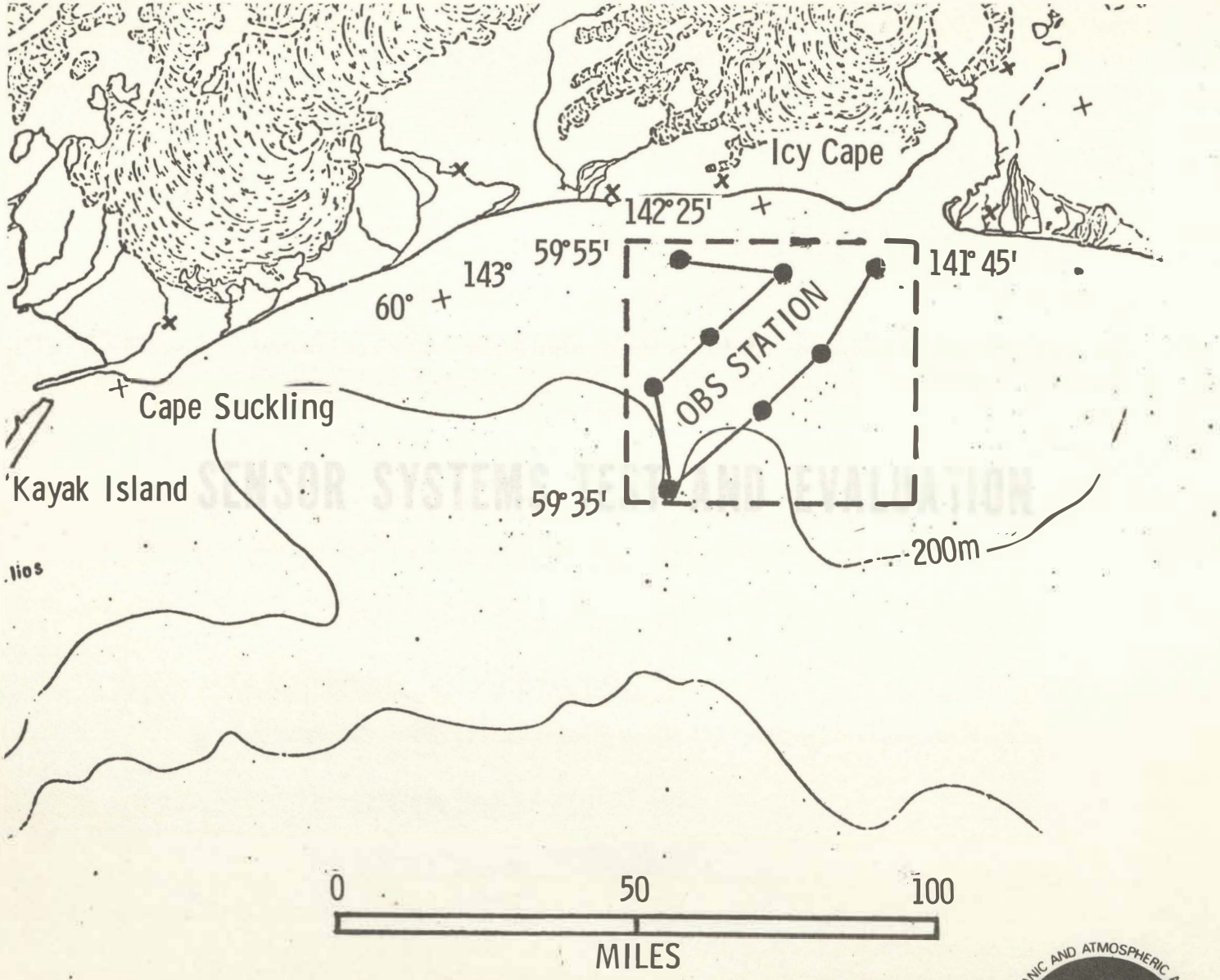
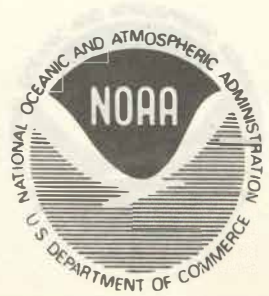


SENSOR SYSTEMS TEST AND EVALUATION



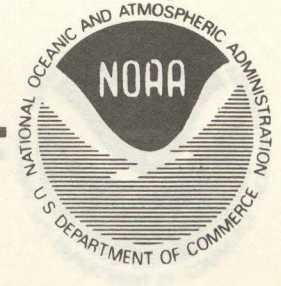
SENSOR SYSTEMS

PURPOSE

- EVALUATE VARIOUS METEOROLOGICAL SENSORS FOR BUOY APPLICATION
- CONDUCT INTEGRATION AND SYSTEM ENGINEERING TO INCORPORATE SPECIFIC SENSORS INTO BUOY SYSTEMS

SCOPE

- CONDUCT LABORATORY AND FIELD SENSORS TESTS
  - -- EVALUATE PERFORMANCE
  - -- ESTABLISH RELIABILITY
- ACQUIRE AND EVALUATE AVAILABLE NEW SENSOR SYSTEMS
  - -- LOWER COST
  - -- IMPROVED PERFORMANCE



SENSOR SYSTEMS (Continued)

STATUS

PRESENT SENSOR SYSTEM TESTS/EVALUATIONS UNDERWAY

- BAROMETERS
  - MANUFACTURER'S DATA VERIFICATION
  - DRIFTER/ARCTIC USAGE TESTS
  - LOW COST SYSTEM EVALUATIONS
  - ENCAPSULATION APPROACH EVALUATIONS
- ANEMOMETERS
  - NO MOVING PARTS SYSTEM EVALUATIONS (Possible use with Drifters)
  - OPERATIONAL SYSTEM IMPROVEMENT TESTS
    - -- SMALLER
    - -- LOWER COST

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SENSOR SYSTEMS (Continued)

STATUS (Continued)

- HUMIDITY SENSORS
  - PERFORMANCE/CAPABILITY EVALUATIONS
- SYSTEM ENGINEERING
  - BUOY MOTION EFFECTS EVALUATIONS
  - SENSOR HOUSING IMPROVEMENTS

FY 77 BUDGET

- BAROMETER TESTS - $25K
- ANEMOMETER TESTS - $15K
- HUMIDITY SYSTEM TESTS - $20K
- SYSTEM EVALUATIONS/ENGINEERING - $40K

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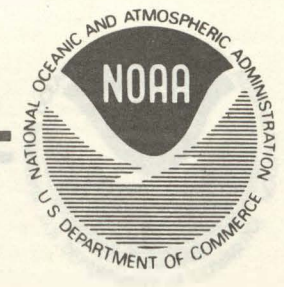
POWER SYSTEMS TEST AND EVALUATION



POWER SYSTEM DEVELOPMENT

PURPOSE

IMPROVE PERFORMANCE, REDUCE COST, ELIMINATE ENVIRONMENTAL DISPOSAL HAZARDS IN POWER SYSTEMS

SCOPE

TEST AND EVALUATE AVAILABLE TECHNIQUES FOR BUOY APPLICATIONS

POWER SYSTEMS DEVELOPMENT (Continued)

Now use Batteries

STATUS

- SOLAR CELLS
  - -- U. S. COAST GUARD - NDBO PROJECT (Joint study)
  - -- INITIAL EVALUATIONS COMPLETE - RESULTS ENCOURAGING
- FUEL CELLS
  - -- TEST AND EVALUATION UNDERWAY . USCG Engelhard Co. uses H_2, O_2

NEXT STEP

- TEST OF SOLAR CELLS ON PEB

FY 77 BUDGET

- FUEL CELLS - $5K
- SOLAR CELLS - $20K

WATER QUALITY INSTRUMENTATION SYSTEMS
APPLICATIONS OCEAN TEST PLATFORM

WATER QUALITY INSTRUMENTATION SYSTEMS

PURPOSE

DEVELOP AND DEMONSTRATE INSTRUMENT SYSTEM FOR MONITORING WATER QUALITY AT REMOTE SITES

SCOPE

INTEGRATE AND DEMONSTRATE PROTOTYPE WQIS BUOY SYSTEM

WATER QUALITY INSTRUMENTATION SYSTEMS (Continued)

STATUS

- TWO PROTOTYPES DEPLOYED AND TESTED
  - -- LEAKS AND FOULING ENCOUNTERED
  - -- LIFE ABOUT THREE (3) MONTHS FORECAST
- SYSTEMS IN REWORK/REPAIR STATUS

NEXT STEP

- REPAIR AND REDEPLOY SYSTEMS
  - -- USER SUPPORTED DEMONSTRATION

FY 77 BUDGET

- 75K

PROTOTYPE WATER QUALITY INSTRUMENT PACKAGE

Parameter	Units	Range	Accuracy (RMS)	Transducers/Description
Turbidity (Ser #1)	% Transmitted	0 to 100	$\pm$ 1	Hydroproducts Model 6125 10 cm path length transmissometer
Turbidity (Ser #2)	% Transmitted	0 to 100	$\pm$ 1	Inter Ocean Systems Inc., Model 513 10 cm path length transmissometer
Chlorophyll	mg/m^3	0 to 20	$\pm$ 2	Turner Designs Model 10-000R Fibered Fluorometer
Dissolved Oxygen	mg/l	0 to 20	$\pm$ .2	Interocean Systems Inc., Model 513 Membrane Type Polargraphic unit
Temperature	^oC	-10 to 40	$\pm$ .2	Magnavox Furnished Encapsulated Bean Thermister
Conductivity	mmho/cm	0 to 75	$\pm$ .08	Interocean Systems Inc., Model 513 Inductive Type
pH	pH	2 to 12	$\pm$ .1	Great Lakes Instrument Inc., Model 60 Reference Type pH Probe

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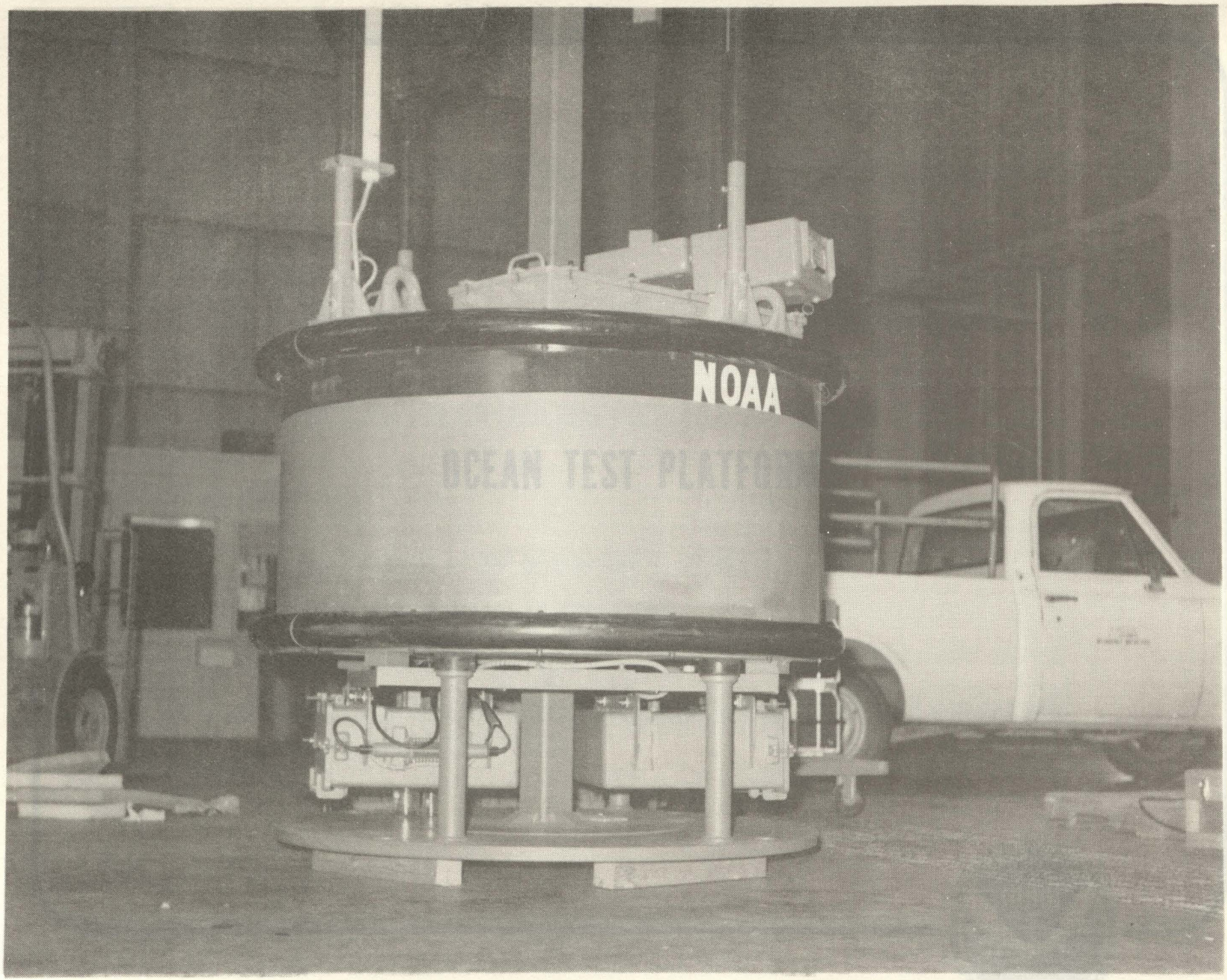
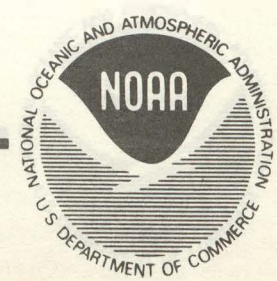


MAGNAVOX - THICK DISCUS

OCEAN TEST PLATFORM



OCEAN TEST PLATFORM (OTP) - IN SITU TEST
25Mi S. of Gulfport

PURPOSE

- TEST BUOY COMPONENTS UNDER ACTUAL IN SITU CONDITIONS
- COMPLEMENT CONTROLLED LABORATORY TESTING
- UNCOVER UNEXPECTED ENGINEERING DEFICIENCIES

SCOPE

- OTP MOORED AT 30° 05.0'N 88° 52.25'W
- EXPOSURE TESTING IS STRESSED
- YEAR ROUND OPERATION
- COST FOR MAINTENANCE, INSTALLATION OF TESTS AND OPERATION IS ABOUT $30K/YEAR

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OCEAN TEST PLATFORM (Continued)

STATUS

- ENVIRONMENTAL REFERENCE SENSOR PACKAGE (RAMOS) OPERATIONAL
- POWER - BATTERY AND DIESEL POWER AVAILABLE
- VHF DATA AND VOICE COMM SYSTEM OPERATIONAL
- SHORE SIDE SYSTEM AT NSTL OPERATIONAL
- TESTS TO DATE:
  - -- ECHO SOUNDER - PROVEN NOT FEASIBLE WITHOUT FURTHER WORK
  - -- RAMOS - WORKS RELIABLY AT SEA
  - -- DCPRS - WORKS RELIABLY AT SEA
  - -- SOLAR CELLS - ONGOING
  - -- STATIC AIR PRESSURE PROBE - PROBLEMS FOUND AND SOLVED
  - -- NAVOCEANO PLATE FOULING - PLATES DELIVERED PER SCHEDULE
  - -- FOAM - EXPOSURE DATA IS BEING OBTAINED
  - -- SALT - IN PROGRESS
  - -- DIATOMETER - FINISHED SUCCESSFULLY

XMTR TO GOES

Covers

biological Meas.

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OCEAN TEST PLATFORM (Continued)

FUTURE TESTS

- DRIFTING BUOY DATA QUALITY EXPERIMENT
- WINDMILL GENERATOR – French 2 blade 4 ft dia Joe Green (Powerman)
- WAVE SYSTEM COMPARISON
- BUOY MOTION EFFECTS ON COMPASS
- AIR PRESSURE IN SITU INTERCOMPARISON
- INSTALLATION OF DATA LOGGING SYSTEM (RECORDER AND SENSORS)