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OBSERVED CURRENTS FROM THE ENTRANCE OF PENSACOLA BAY TO THE VICINITY OF THE ALLEGHENY PIER

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Prepared under the authority of
Commander,
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In July 1992, the Naval Oceanographic Office received a request to provide real-time current measurements in support of USS FORRESTAL prior to and during several docking evolutions between late July 1992 and early September 1992. This report summarizes the development of a measurement system that collects and forwards current measurements in real time and describes the data collected from the Pensacola Bay entrance to the Allegheny Pier at the Pensacola Naval Air Station, Florida.

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In July 1992, the Naval Oceanographic Office received a request to provide real-time current measurements in support of USS FORRESTAL prior to and during several docking evolutions between late July 1992 and early September 1992. This report summarizes the development of a measurement system that collects and forwards current measurements in real time and describes the data collected from the Pensacola Bay entrance to the Allegheny Pier at the Naval Air Station, Pensacola, Florida.

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1.0. INTRODUCTION

In February 1992, USS FORRESTAL was reassigned to the Naval Air Station (NAS) Pensacola, FL, to assume duties as the Navy's training aircraft carrier. The 1039-foot-long USS FORRESTAL is longer and has a deeper draft than the former training ship, USS LEXINGTON. A 2000-foot turning basin adjacent to the Allegheny Pier at the air station was dredged to 45 feet to accommodate USS FORRESTAL's deeper draft; the turning basin, however, is less than twice the length of USS FORRESTAL. Based on the constricted turning area and earlier docking maneuvers hampered by unexpected currents, the Naval Oceanographic Office (NAVOCEANO) received a request to provide real-time current measurements to USS FORRESTAL prior to and during several docking evolutions between late July 1992 and early September 1992. This report includes a summary of the development of a measurement system to collect and forward current measurements in real time, a description of the data collected in the vicinity of the Allegheny Pier, and recommendations for real-time coastal observation capability.

2.0. SYSTEM DEVELOPMENT

With only 1 week to prepare, a current measurement system was assembled within 2 days, which consisted of a 1200-kHz self-contained Acoustic Doppler Current Profiler (SCADCP), a depth echo sounder to verify water depths, and a laptop computer with acquisition and processing software. ADCPs measure vertical profiles of horizontal current velocities by transmitting sound at a fixed frequency along four beams pointed in different directions and measuring the Doppler-shifted sound reflected back from "scatterers" in the water column. A receiver in the ADCP listens for the reflected signals at discrete time intervals and stores the signals in uniform length segments called depth-cells or bins. Subsequent processing converts the return signals for each bin into current speeds and direction. Each depth-cell can be thought of as a single current meter or, for the 1200-kHz SCADCP, up to 30 current meters collecting continuous underway data between the surface and a depth of 30 m.

An initial test with the SCADCP system was conducted on the Pearl River in Louisiana on a NAVOCEANO inflatable boat. The depth echo sounder and the GPS receiver were connected to the boat's 12-volt battery, while the laptop computer and SCADCP ran on internal batteries. Current measurements were successfully acquired, the depth echo sounder verified ADCP bottom-tracking depths, and profiles of current speed and direction were displayed on the laptop.

A rack-mounted personal computer (PC) system was configured to acquire and process the raw ADCP measurements into real-time graphic displays of current profiles at 1-m vertical resolution along survey tracks. The profiles were transmitted to a second rack-mounted PC and merged with navigation data obtained from a Global Positioning System (GPS) receiver. In addition, current speeds and directions were vector averaged over an entire transect. The merged and vector-averaged current profiles were displayed on the monitor and stored on disk.

Two days prior to USS FORRESTAL's planned departure on 22 July 1992, the SCADCP acquisition and processing system was installed on a dive boat provided by NAS Port Operations. A portable generator provided power directly to the computers, and to the SCADCP and GPS receiver through a power supply. The ADCP transducer was mounted on the bow of the dive boat at a depth of 1 m. Once this system was installed, configured, and tested, data acquisition in support of USS FORRESTAL commenced.

3.0. DATA COLLECTION

The main objective of this measurement effort was to provide real-time current information on demand to USS FORRESTAL during their docking/undocking evolutions on 22 to 23 July, 28 July, 18 August, 21 August, and 9 September. These measurement efforts were augmented by additional data collected prior to USS FORRESTAL's maneuvers. The additional measurements served to delineate the current field within this area and allow comparisons with tidal current predictions for the Pensacola Bay entrance (point O, figure 1), approximately 2 nautical miles to the west of the turning basin. The tidal current predictions were provided by the National Oceanic and Atmospheric Administration's (NOAA) Tidal Current Tables for 1992. Table 1 lists the predicted times of slack water and maximum ebb and flood at the Pensacola Bay entrance for the periods 17 to 21 August and 8 to 9 September. In addition, wind speeds and directions were collected by the Naval Oceanographic Command Detachment at the NAS and are presented in figures 2 and 3. In the following section, descriptions of the observed currents and winds are presented.

3.1. 20 to 28 July 1992

Data collection efforts in support of USS FORRESTAL began during the afternoon of 20 July, and continued through 28 July. These efforts were primarily focused on data collection techniques; data transmission to USS FORRESTAL during their successful arrivals and departures on 22, 23, and 28 July, and processing capabilities. A systematic approach to collect, transmit, and process data was established by the end of this survey period. A description of the July data awaits further study.

3.2. 17 to 21 August 1992

Based on a review of the data collected during July and requests from USS FORRESTAL, data collection efforts were concentrated within the area of the turning basin (locations A, B,

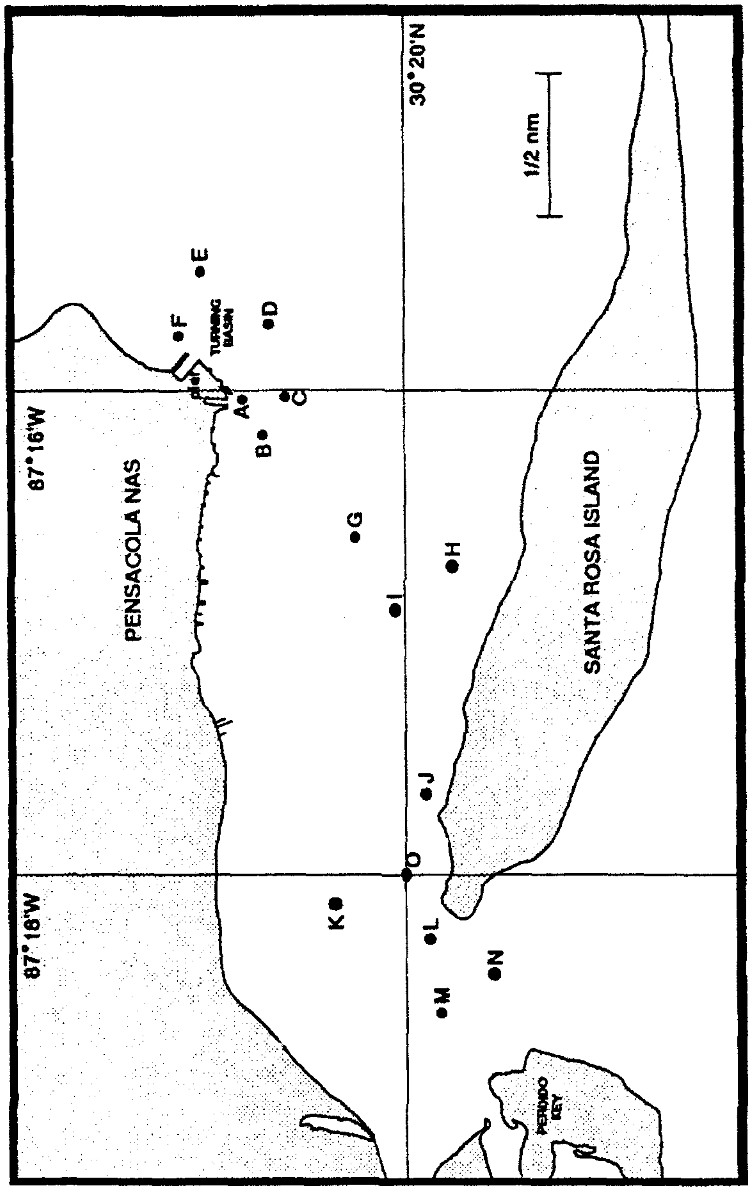

Figure 1. Entrance to Pensacola Bay, FL.

C, D, E, and F, figure 1) and along the channel from the pier to the entrance of the bay (locations A, B, C, G, H, I, J, K, L, M, and N, figure 1). Times of data collection, survey tracks, predicted tidal currents at point O, and observed current speeds and directions at depths of 2 m (first depth level of acquired data below the transducer), 5 m, and 8 m along the survey tracks are presented in table 2. Data collection took approximately 30 minutes for the turning basin and 40 minutes along the channel. This allowed for a comprehensive look at the current structure and enabled the survey team to transmit to USS FORRESTAL current information in greater detail during their departure at 1030 hours on 18 August and arrival at 1700 hours on 21 August.

3.2.1. 17 August 92: Data were collected between 1431 and 1643 hours in the vicinity of the turning basin and from location A near the pier southward across the channel to location H. The predicted tidal currents at point O were expected to flood, with speeds decreasing from 0.19 to 0.15 kn. Observed currents were, however, ebbing and increased in magnitude with time at all depths. Winds veered from the east to the south between 4 to 8 kn during the survey period.

3.2.2. 18 August 92: Data were collected between 0825 and 1045 hours in the vicinity of the turning basin in support of USS FORRESTAL's 1030 hours departure, between 1310 and 1453 hours along the channel from location A near the pier to location M at the entrance of Pensacola Bay, and between 1456 and 1530 hours adjacent to the pier. Tidal currents at point O were predicted to ebb during the morning surveys, decreasing from 0.45 to 0.28 kn, and change from ebb to flood during the afternoon, increasing from 0.02 to 0.27 kn.

Observed current speeds within the turning basin were close to the values predicted for point O, but current direction changed from ebb to flood approximately 3 to 4 hours before predicted slack at 1320 hours. The change in current direction began at the deepest levels first and progressed upward with time. Wind speeds were between 3 and 8 kn from the southeast during the change from ebb to flood. Current speeds along the channel from locations A to M were expected to be small (slack to 0.20 kn) but ranged from 0.20 to 0.50 kn. Current speeds decreased along the channel from west to east and decreased from depths of 2 m to 8 m. Currents generally followed the direction of the channel.

3.2.3. 19 August 92: Data were collected between 0937 and 1203 hours, 1327 and 1347 hours, and 1540 and 1643 hours in the vicinity of the turning basin. Rain and thunderstorms prevented data from being collected between 1347 and 1540 hours. Tidal currents at point O were predicted to ebb (decreasing in speed from the morning to early afternoon from 0.94 to 0.33 kn) and flood (increasing in speed from 0.19 to 0.46 kn during the late afternoon runs).

Within the turning basin, observed current speeds, decreased throughout the data collection period, were approximately 50 percent lower than predicted for point O and were lower near the pier than within the basin. Currents were generally from the east throughout the time period but switched from the north at depths of 5 m and 8 m along the eastern part of the turning basin beginning at 1614 hours. This rotation of the current may be the first indication of the change from ebb to flood predicted to occur 1 hour and 20 minutes earlier at point O. Wind speeds were between 3 and 10 kn from the south to southwest during the survey period.

3.2.4. 20 August 92: Data were collected between 0801 and 0920 hours, 1119 and 1148 hours, 1415 and 1448 hours, and 1640 and 1746 hours in the vicinity of the turning basin and between 0925 and 1116 hours and 1455 and 1633 hours along the channel from locations A to M. Tidal currents at point O were predicted to ebb between 0801 and 1601 hours, speeds increasing from 1.26 to 1.48 kn and then decreasing to slack. Between 1601 and 1746 hours, tidal currents were expected to flood, speeds ranging from slack to 0.66 kn.

Observed current speeds at 2 m within the turning basin during the morning were significantly less (30 to 50 percent) than predicted for point O but were close to predicted values during the afternoon. Throughout the day, current speeds at 8 m were half the values at 2 m. Current direction at 2 m within the turning basin matched predicted values, but a shift in direction at 5 m and 8 m from ebb to flood began at approximately 1400 hours, 2 hours earlier than predicted. Throughout the survey period, wind speeds were between 3 and 10 kn and rotated clockwise from the east to the southwest.

During the morning, observed current speeds along the channel were highest at location M and were 20 to 50 percent larger at 2 m than at 8 m. Current speeds at location M were close to predicted values, but speeds decreased by 60 percent from location M to location A. During the afternoon and midway along the first east to west channel track, the current shifted from ebb to flood. This occurred at approximately 1 nautical mile to the east and 40 minutes before predicted slack at 1601 hours. The observed currents on the return west to east track had completely shifted to flood. Current speeds at 8 m were larger than at 2 m at the entrance of the bay but were smaller than at 2 m in the vicinity of the turning basin.

3.2.5. 21 August 92: Thunderstorms limited data collection to within the turning basin from 1130 to 1239 hours and 1435 to 1729 hours. Tidal currents at point O were predicted to ebb during the noon-time runs (decreasing in speed from 1.92 to 1.72 kn) and change from ebb to flood during the afternoon (ranging from 1.12 kn at ebb to 0.22 kn at flood). Slack water was predicted for 1702 hours, the scheduled docking time for USS FORRESTAL.

Observed current speeds decreased throughout the day and were larger at 2 m than 8 m. Between 1130 and 1540 hours, current speeds at 2 m were 50 to 60 percent lower than predicted for point O but approached predicted values when the flow switched from ebb to flood. Current direction changed from ebb to flood at 2 m when predicted but began to change 2 hours earlier at 8 m. Wind speeds were between 3 to 10 kn, mainly from the southeast.

3.3. 8 to 9 September 1992

Similar to the August data collection efforts, current measurements were acquired within the turning basin and along the channel from locations A through N. USS FORRESTAL departed from the NAS at 1100 hours on 9 September.

3.3.1. 8 September 92: Data were collected between 0907 and 0939 hours, 1143 and 1216 hours, and 1409 and 1502 hours in the vicinity of the pier and between 0948 and 1139 hours and 1520 and 1639 hours along the channel from location A near the pier to location N at the entrance of the bay. Tidal currents at point O were predicted to flood from 0907 to 1030 hours (decreasing in speed from 0.62 kn to slack) and ebb from 1030 to 1639 hours (increasing in speed from 0.17 to 1.53 kn).

Observed currents within the turning basin ebbed between 0907 and 1502 hours. Throughout this time period, current speeds at 2 m increased from 0.35 to 1.00 kn but were 35 to 65 percent lower than predicted. Surface speeds were twice the value than at 8 m. Current speeds along the channel increased between the first and last surveys, increased by 50 percent from east to west, and decreased from the surface to the bottom, and at location N, speeds were close to predicted. Observed winds were from the southeast to southwest between 5 and 10 kn.

3.3.2. 9 September 92: Data were collected between 0805 and 1105 hours in the vicinity of the turning basin in support of the scheduled departure of USS FORRESTAL at 1100 hours. Tidal currents at point O were predicted to flood, decreasing in speed from 1.10 to 0.17 kn.

Between 0805 and 1024 hours, observed current speeds at 2 m were 40 to 60 percent less than predicted but were close to expected from 1025 to 1105 hours. The current field within the turning basin changed from flood to ebb at approximately 0830 hours at 8 m and 0910 hours at 5 m, 2.5 to 3.0 hours before the predicted slack. Current speeds were lower near the pier than within the turning basin and speeds decreased in magnitude from 2 m to the bottom. Winds speeds were between 4 and 7 kn from the southeast.

4.0. RESULTS

Flood and ebb current predictions for point O agreed with observed current speeds within the turning basin for speeds less than 0.5 kn. Observed current speeds within the turning basin were 30 to 50 percent of predicted values for point O for speeds greater than 0.5 kn. On average, observed speeds within the turning basin decreased from 2 m toward the bottom and were lowest along the pier.

Observed currents speeds at a depth of 2 m at the entrance of Pensacola Bay (locations M and N) were close to predicted values and decreased to half their value at a depth of 8 m. Current speeds decreased by 50 percent from the entrance of the bay eastward along the channel to the turning basin. An exception occurred along the channel between locations I and J on 20 August, when the observed current switched from ebb to flood. Speeds decreased with depth east of the I to J midpoint but increased with depth west of the I to J midpoint.

Significant differences were found between predicted and observed current directions during the August and September surveys. On 17 August, currents at all depths were ebbing when they were expected to flood. On 18 August, the direction changed from ebb to flood beginning with the deepest levels, a few hours earlier than predicted. The current did not change from ebb to flood as expected during the 2 hours of data collection on 19 August. The current at a depth of 2 m changed from ebb to flood as predicted on 20 and 21 August but began earlier near the bottom, progressing upward toward the surface with time. Current direction changed from flood to ebb earlier than predicted on 8 and 9 September. The change began 2.5 to 3.0 hours early on 9 September, but insufficient data were collected on 8 September to determine its time of occurrence. The analysis of the effects of wind on current reversals was inconclusive due to insufficient data.

5.0. CONCLUSION

With a limited amount of lead time, NAVOCEANO personnel successfully configured, assembled, tested, and evaluated a transportable ADCP acquisition and processing system. This system was used to provide real-time current speed and direction measurements in support of USS FORRESTAL's docking/undocking evolutions adjacent to the Allegheny Pier at the Pensacola NAS, Florida. In addition, these current measurements were compared with NOAA's predicted tidal currents for the Pensacola Bay Entrance, approximately 2 nautical miles west of the pier.

Based on the limited amount of current data collected, use of the NOAA's tidal current prediction table for point O near the Pensacola Bay entrance would not give an accurate representation of the current field within the turning basin. Our efforts showed that differences between predicted current speeds and directions with observed currents within the turning basin occurred both spatially (vertically and horizontally) and temporally. Efforts to determine the changes within the current field by USS FORRESTAL and the tug boats during docking/undocking evolutions has yet to be studied. Observed currents at the entrance of Pensacola Bay were close to predicted values for point O, but the number of observations were significantly lower than within the turning basin.

With the limited areal extent of data collection, the effects of tidal current flow from fresh water input, effects of long duration winds from one direction, and topographical changes have yet to be studied.

6.0. RECOMMENDATIONS

A longer (seasonal) and more inclusive study should be undertaken to define the currents within the turning basin and along the channel from the pier to the entrance of Pensacola Bay. Data need to be collected continuously to determine when the currents change direction, the vertical current structure, effects of winds, and the relationship of observed currents to tidal-current predictions. One result of such study may be the development of a special tidal current table for the turning basin.

Presently, two approaches to acquire, process, and transmit real-time current information when requested have been successfully tested by NAVOCEANO. The first approach consists of responding quickly to requests for real-time measurements by transporting a system containing a SCADCP, GPS receiver, laptop computer, and an inflatable boat. Real-time selectable current speed and direction measurements are collected and transmitted to the requesting platform, but processing, data analysis, and products are deferred. The second approach consists of transporting a system consisting of a SCADCP, GPS receiver, two rack-mounted PC systems, a printer, and a generator to power the hardware. Delivery of the system requires more time in addition to acquiring the use of a seagoing platform large enough to handle the equipment. The capabilities of this second system includes on-site processing, product generation, and near-real-time analysis.

If NAVOCEANO is tasked to provide the full capabilities of both approaches, the purchase of a dedicated hardware/software acquisition and processing system, differential GPS system, inflatable boat, diesel generator, and printer would be required. In addition, some additional software would have to be developed to enhance data processing and generation of near-real-time hard-copy products.

Table 1. Predicted Daily Currents - Pensacola Bay Entrance, Midchannel. 30° 20.1'N - 87° 18.0'W

DATE	JDAY	SLACK (CDT)	FLOOD (CDT)	SPD (KT)	EBB (CDT)	SPD (KT)
17 AUG	230	06:50	12:58	0.21		
18 AUG	231	01:48 13:20	20:52	0.62	07:05	0.48
19 AUG	232	03:34 14:55	21:40	1.10	08:38	0.98
20 AUG	233	04:41 16:01	22:34	1.54	09:44	1.49
21 AUG	234	05:45 17:02	23:35	1.92	10:43	1.97
08 SEP	252	10:31 21:25	03:54	1.61	14:23	1.86
09 SEP	253	11:29 22:28	05:06	1.41	15:09	1.56

Table 2. Observed and Predicted Current Speeds and Direction for 17 to 21 August and 8 to 9 September 1992

DATE TIME (CDT)	SURVEY TRACK LINE	PREDICTED (1) CURRENT SPD AT BAY ENTR.	AVG (2) SPD (KT) 2M	AVG (2) DIR (DEG) 2M	AVG SPD (KT) 5M	AVG DIR (DEG) 5M	AVG SPD (KT) 8M	AVG DIR (DEG) 8M
17 AUG 92								
1431-1514	A-B-C-D-E-F-A	0.19 - 0.18	0.25	(210)	<.10	(225)	<.10	(225)
1522-1533	A-B-H	0.18 - 0.18	0.25	(245)	0.10	(240)	0.15	(240)
1549-1604	H-B-A	0.17 - 0.17	0.40	(270)	0.35	(225)	0.35	(225)
1623-1637	A-G-A	0.16 - 0.15	0.50	(280)	0.25	(255)	0.25	(225)
1538-1653	H-B-A	0.15 - 0.15	0.55	(270)	0.35	(225)	0.35	(225)
18 AUG 92								
0825-0856	A-B-C-D-E-F-A	(0.45)-(0.44)	0.50	(240)	0.40	(225)	0.30	(225)
0859-0922	A-B-C-D-E-F-A	(0.42)-(0.40)	0.45	(240)	0.35	(225)	0.25	(225)
0926-0942	A-B-C-A	(0.39)-(0.37)	0.35	(225)	0.20	(245)	0.10	(245)
0944-0953	A-B-MIDPT BTWN B&C	(0.37)-(0.36)	0.30	(225)	0.20	(VAR)	<0.10	(VAR E)
1001-1006	C-A	(0.35)-(0.34)	0.25	(210)	0.20	(225)	CALM	
1007-1019	A-B-C	(0.34)-(0.32)	0.25	(175)	0.20	(VAR)	0.15	(VAR E)
1020-1024	C-B	(0.32)-(0.31)	0.25	(180)	<0.10	(VAR)	0.10	(090)
1027-1033	B-C	(0.31)-(0.30)	0.35	(180)	<0.10	(025)	0.20	(060)
1035-1038	C-B	(0.30)-(0.29)	0.35	(180)	<0.10	(225)	0.20	(090)
1040-1045	B-A	(0.29)-(0.28)	0.50	(VAR SE)	0.20	(165)	0.20	(090)
1310-1405	A-B-H-I-J-K-L-M	(0.02)- 0.10	0.20E	(VAR E)	0.30E	(225)	0.40E	(135)
1310-1405			0.30W	(VAR E)	0.50W	(075)	0.50W	(VAR E)
1407-1453	M-L-K-J-I-H-A-B	0.10 - 0.20	0.10E	(090)	0.35E	(135)	0.30E	(135)
			0.25W	(VAR E)	0.50W	(VAR NE)	0.50W	(VAR E)
1456-1530	A-B-C-D-E-F-E-A	0.20 - 0.27	0.10	(VAR)	0.15	(VAR NE)	0.15	(VAR)
19 AUG 92								
0937-1008	A-B-C-D-E-F-A-D-F	(0.94)-(0.91)	0.60	(250)	0.55	(250)	0.40	(250)
1013-1045	F-A-B-C-D-E-F-D-A	(0.90)-(0.84)	0.50	(250)	0.60	(250)	0.25	(250)

(1) PREDICTED CURRENT SPEEDS: ( ) - EBB FLOW AT 256 DEG, OTHERWISE FLOOD AT 074 DEG
(2) AVG SPD: E - EASTERN PART OF A TRACK LINE, W - WESTERN PART OF A TRACK LINE
AVG DIR: VAR - VARIABLE, VAR NE - VARIABLE BETWEEN NORTH AND EAST

Table 2. Observed and Predicted Current Speeds and Direction for 17 to 21 August and 8 to 9 September 1992 (con.)

DATE TIME (CDT)	SURVEY TRACK LINE	PREDICTED (1) CURRENT SPD AT BAY ENTR.	AVG (2) 2M SPD (KT)	AVG (2) 2M DIR (DEG)	AVG 5M SPD (KT)	AVG 5M DIR (DEG)	AVG 8M SPD (KT)	AVG 8M DIR (DEG)
19 AUG 92								
1050-1121	A-B-C-D-E-F-A-D-F	(0.83)-(0.76)	0.40	(250)	0.45	(250)	0.25	(250)
1130-1203	F-A-B-C-D-E-F-D-A	(0.73)-(0.64)	0.40	(250)	0.35	(250)	0.15	(250)
1327-1347	A-B-C-D-E-F-A	(0.36)-(0.33)	0.25	(215)	0.25	(270)	0.10	(270)
1540-1611	A-B-C-D-E-F-A-D-F	0.19 - 0.33	0.15	(235)	0.20	(250)	0.15	(275)
1614-1643	F-A-B-C-D-E-F-D-A	0.34 - 0.46	0.15	(235)	0.20	(270)	0.15	(270)
20 AUG 92								
0801-0840	A-B-C-D-E-F-A-D-F	(1.26)-(1.41)	1.00	(250)	0.50	(250)	0.40	(250)
0848-0920	F-A-B-C-D-E-F-D-A	(1.42)-(1.48)	0.80	(250)	0.50	(250)	0.40	(250)
0925-1010	A-B-D-G-H-I-J-K-L-M	(1.48)-(1.47)	0.90E	(285)	0.75E	(275)	0.60E	(250)
			1.50W	(250)	1.25W	(250)	1.00W	(250)
1023-1116	M-L-K-J-I-H-G-D-B-A	(1.46)-(1.36)	0.60E	(275)	0.40E	(255)	0.40E	(255)
			1.50W	(245)	1.25W	(245)	1.25W	(245)
1119-1148	A-B-C-D-E-F-A-D-F	(1.35)-(1.28)	0.50	(250)	0.35	(250)	0.30	(250)
1415-1448	F-A-B-C-D-E-A-D-F	(0.64)-(0.45)	0.15	(250)	0.25	(190)	0.20	(215)
1455-1545	A-B-C-G-H-I-J-K-L-M	(0.41)-(0.16)	0.20E	(VAR EW)	0.25E	(225)	0.10E	(VAR)
			0.20W	(VAR)	0.25W	(135)	0.40W	(VAR)
1547-1633	M-L-K-J-I-H-G-C-B-A	(0.16)- 0.21	0.50E	(090)	0.20E	(090)	0.15E	(VAR)
			0.20W	(090)	0.20W	(090)	0.35W	(075)
1640-1709	A-B-C-D-E-F-A-D-F	0.26 - 0.44	0.40	(090)	0.10	(VAR)	0.15	(VAR)
1714-1746	F-A-B-C-D-E-F-D-A	0.45 - 0.66	0.40	(090)	0.15	(VAR E)	0.15	(VAR)
21 AUG 92								
1130-1206	A-B-C-D-E-F-A-D-F	(1.92)-(1.84)	0.80	(225)	0.60	(270)	0.40	(270)
1211-1239	F-A-B-C-D-E-F-D-A	(1.82)-(1.72)	0.70	(230)	0.50	(270)	0.30	(270)
1435-1505	A-B-C-D-E-F-A-D-F	(1.12)-(0.91)	0.60	(245)	0.40	(270)	0.50	(245)

(1) PREDICTED CURRENT SPEEDS: ( ) - EBB FLOW AT 256 DEG, OTHERWISE FLOOD AT 074 DEG
(2) AVG SPD: E - EASTERN PART OF A TRACK LINE, W - WESTERN PART OF A TRACK LINE
AVG DIR: VAR - VARIABLE, VAR NE - VARIABLE BETWEEN NORTH AND EAST

Table 2. Observed and Predicted Current Speeds and Direction for 17 to 21 August and 8 to 9 September 1992 (con.)

DATE TIME (CDT)	SURVEY TRACK LINE	PREDICTED (1) CURRENT SPD AT BAY ENTR.	AVG (2) 2M SPD (KT)	AVG (2) 2M DIR (DEG)	AVG 5M SPD (KT)	AVG 5M DIR (DEG)	AVG 8M SPD (KT)	AVG 8M DIR (DEG)
21 AUG 92								
1509-1540	F-A-B-C-D-E-F-D-A	(0.89)-(0.66)	0.50	(245)	0.35	(270)	0.40	(215)
1545-1604	A-B-C-D-E-F-A	(0.62)-(0.48)	0.40	(245)	0.20	(270)	0.25	(215)
1608-1630	A-B-C-D-E-F-A	(0.45)-(0.27)	0.40	(235)	0.20	(270)	0.20	(245)
1634-1651	A-B-C-D-A	(0.24)-(0.10)	0.30	(260)	0.30	(VAR W)	0.25	(025)
1653-1716	A-B-G-C-B	(0.08)- 0.12	0.25	(285)	0.20	(180)	0.20	(VAR)
1717-1729	B-C-A	0.12 - 0.22	0.20	(VAR)W	0.20	(VAR S)	0.30	(045)
08 SEP 92								
0907-0939	A-B-C-D-E-F-A-D-F	0.62 - 0.40	0.35	(270)	0.15	(210)	0.10	(VAR)
0948-1032	A-B-C-G-I-J-K-L-M-N	0.34 -(0.01)	0.35E	(270)	0.10E	(270)	0.15E	(270)
			0.75W	(225)	0.55W	(225)	0.15W	(225)
1049-1139	N-M-L-K-J-I-G-C-B-A	(0.17)-(0.73)	0.75E	(270)	0.50E	(270)	0.30E	(270)
			1.00W	(225)	1.00W	(225)	0.75W	(225)
1143-1216	A-B-C-D-E-F-A-D-F	(0.78)-(1.16)	0.35	(250)	0.25	(250)	0.25	(250)
1409-1432	SEARCHING FOR A SUNK	(1.84)-(1.85)	1.00	(255)	0.80	(260)	0.75	(270)
1432-1502	BOAT IN THE VICINITY	(1.85)-(1.82)	1.00	(270)	0.70	(270)	0.60	(270)
1520-1551	A-B-C-G-H-I-J-K-L-M-N	(1.79)-(1.70)	1.00E	(285)	0.75E	(270)	0.60E	(255)
			1.50W	(225)	1.25W	(225)	1.25W	(225)
1601-1639	N-M-L-K-J-I-H-G-C-B-A	(1.68)-(1.53)	1.00E	(285)	0.80E	(270)	0.60E	(255)
			2.00W	(225)	1.25E	(245)	1.20W	(225)
09 SEP 92								
0805-1084	A-B-C-D-E-F-A-D-F	1.10 - 1.00	0.50	(090)	0.40	(100)	0.10	(VAR E)
0837-0907	F-A-B-C-D-E-F-D-A	0.99 - 0.86	0.35	(100)	0.35	(100)	0.10	(VAR)
0909-0940	A-B-C-D-E-F-A-D-F	0.85 - 0.70	0.30	(VAR SW	0.30	(VAR SE)	0.10	(VAR SW)
0943-1013	F-A-B-C-D-E-F-D-A	0.68 - 0.51	0.30	(VAR SW)	0.20	(180)	0.20	(VAR SW)
1014-1024	A-B-C-A	0.51 - 0.45	0.25	(215)	0.20	(170)	0.15	(260)

(1) PREDICTED CURRENT SPEEDS: ( ) - EBB FLOW AT 256 DEG, OTHERWISE FLOOD AT 074 DEG
(2) AVG SPD: E - EASTERN PART OF A TRACK LINE, W - WESTERN PART OF A TRACK LINE
AVG DIR: VAR - VARIABLE, VAR NE - VARIABLE BETWEEN NORTH AND EAST

Table 2. Observed and Predicted Current Speeds and Direction for 17 to 21 August and 8 to 9 September 1992 (con.)

DATE TIME (CDT)	SURVEY TRACK LINE	PREDICTED (1) CURRENT SPD AT BAY ENTR.	AVG (2) SPD (KT) 2M	AVG (2) DIR (DEG) 2M	AVG SPD (KT) 5M	AVG DIR (DEG) 5M	AVG SPD (KT) 8M	AVG DIR (DEG) 8M
09 SEP 92								
1025-1034	A-B-C-A	0.44 - 0.39	0.35	(215)	0.15	(180)	0.20	(260)
1036-1045	A-B-C-A	0.37 - 0.31	0.40	(245)	0.20	(190)	0.20	(260)
1046-1055	A-B-C-A	0.31 - 0.25	0.40	(260)	0.20	(245)	0.20	(270)
1055-1105	A-C-B-A	0.25 - 0.17	0.40	(260)	0.30	(260)	0.25	(270)

(1) PREDICTED CURRENT SPEEDS: ( ) - EBB FLOW AT 256 DEG, OTHERWISE FLOOD AT 074 DEG
(2) AVG SPD: E - EASTERN PART OF A TRACK LINE, W - WESTERN PART OF A TRACK LINE
AVG DIR: VAR - VARIABLE, VAR NE - VARIABLE BETWEEN NORTH AND EAST

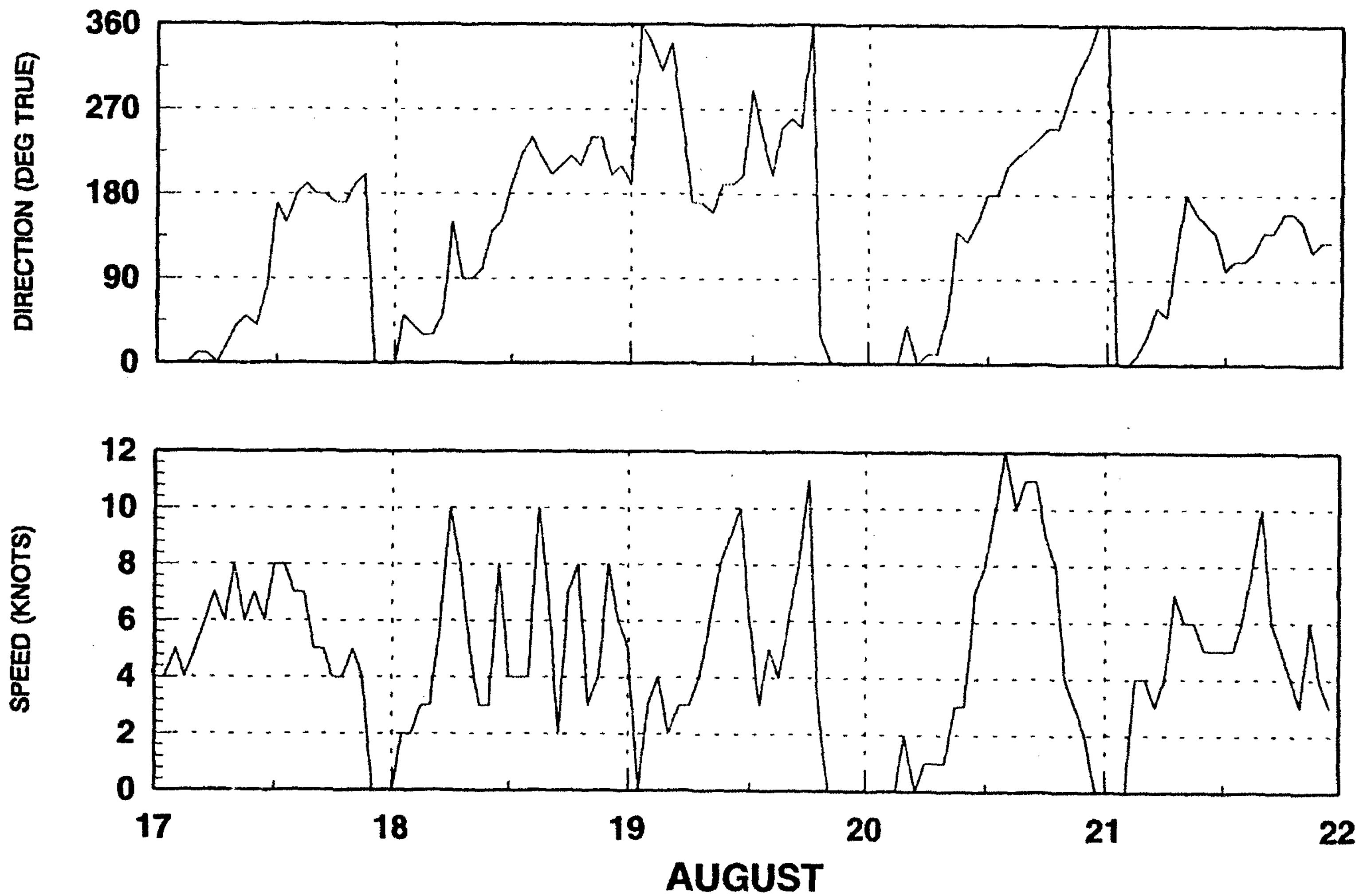

Figure 2. Wind speed and direction at Pensacola NAS, 17 to 21 August 1992.

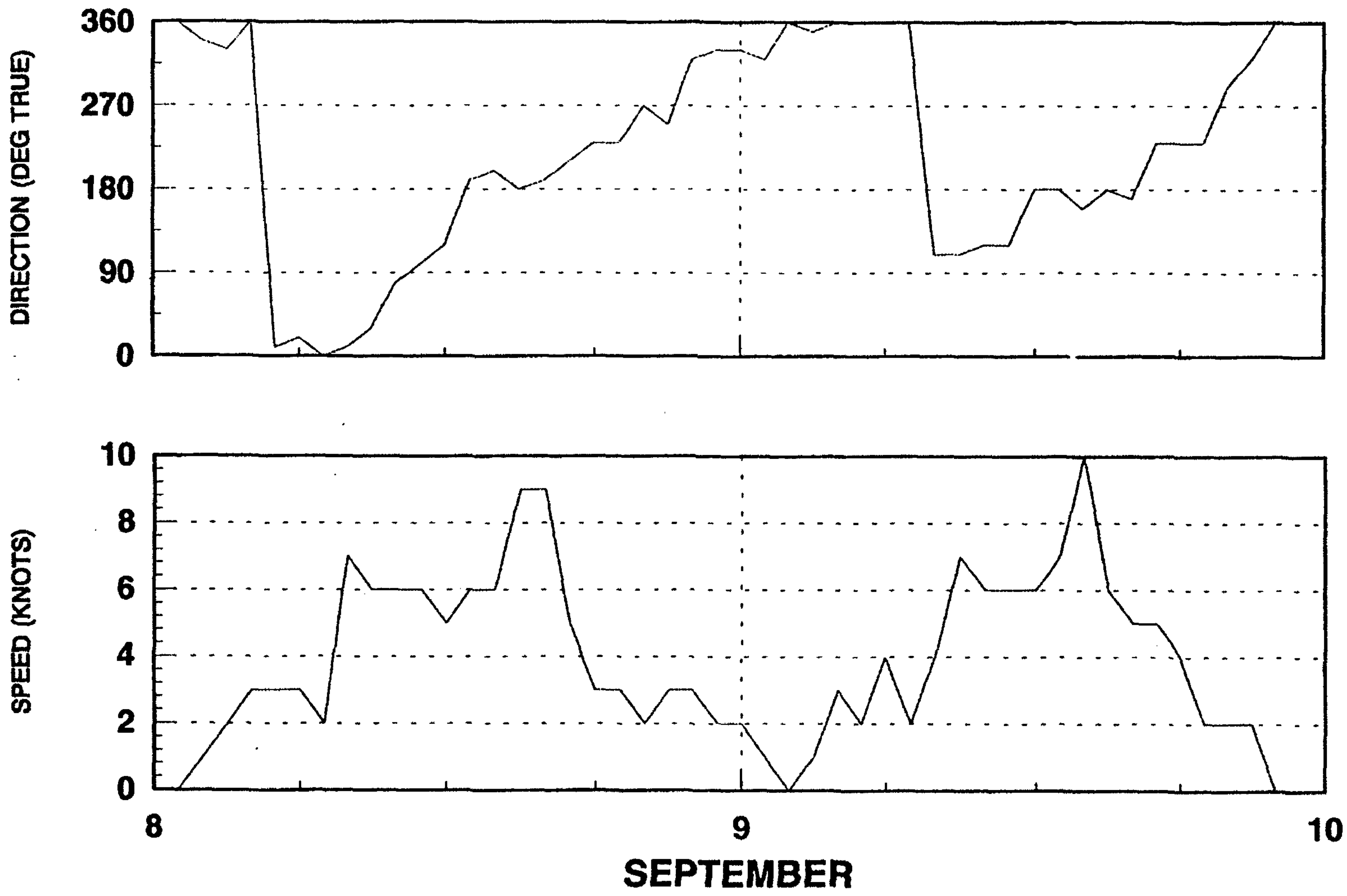

Figure 3. Wind speed and direction at Pensacola NAS, 8 to 9 September 1992.

Distribution List

USS FORRESTAL		2
COMNAVOCEANCOM (N3)		1
NAVOCEANCOMDET Pensacola		2
NOAA National Ocean Service (NOES33)		1
DTIC		2
NAVOCEANO Code	00	1
	OT	1
	N2	1
	N22	1
	N3	1
	N311	1
	N312	1
	N331	1
	N34	1
	N341	1
	N4311	1
	N4312	20
	N512	1