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**PRELIMINARY SWEEP WIDTH DETERMINATION FOR
HU-25A AIRBORNE RADARS: LIFE RAFT AND
RECREATIONAL BOAT TARGETS**

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16. Abstract During June 1987, the U.S. Coast Guard R&D Center conducted a 3-week experiment to determine sweep widths for airborne radar search by Coast Guard HU-25A aircraft. Search objects were 6- to 10- person life rafts and 24- to 43-foot recreational-type boats. Two radar systems were evaluated: the AN/APS-127 forward-looking airborne radar (FLAR) and the AN/APS-131 side-looking airborne radar (SLAR). Realistic radar searches were conducted to collect data using unalerted sensor operators and standard search patterns. Aircraft and target positions were recorded by a precision microwave tracking system. Target detections and environmental conditions were recorded by observers onboard the search aircraft and a target vessel. Sea conditions were dominated by waves less than 3 feet and winds less than 12 knots, with a limited amount of data collected in 3- to 5-foot seas with winds up to 18 knots. Analysis of the data confirmed that sweep widths varied with significant wave height, search altitude, and target size. Recommended sweep width values and HU-25A search guidance are presented, along with recommendations for additional data collection.		
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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	* 2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (WEIGHT)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
fl ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (EXACT)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures. Price \$2.25. SD Catalog No. C13 10 286



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (WEIGHT)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	0.125	cups	c
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (EXACT)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

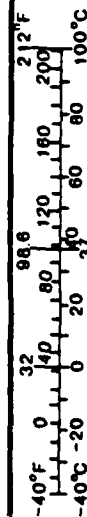


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EXECUTIVE SUMMARY

INTRODUCTION

1. Background

This report evaluates the detection performance of the AN/APS-131 side-looking airborne radar (SLAR), and the AN/APS-127 forward-looking airborne radar (FLAR) in detecting 6- to 10-person life rafts and a variety of work and pleasure boats in the 24- to 43-foot size range. In support of this evaluation, an experiment was conducted during the period 2 to 28 June 1987 in coastal waters off Fort Pierce, Florida, by the United States Coast Guard Research and Development Center (R & D Center). Coast Guard Air Station Miami provided an HU-25A aircraft equipped with the APS-131 SLAR and APS-127 FLAR to collect sensor performance data.

2. AN/APS-127 System Description

The AN/APS-127 FLAR is an x-band air-to-surface search radar developed to detect small targets in a sea clutter environment. Pertinent system data are summarized in table 1. FLAR detection performance data were collected using a 7-inch plan position indicator (PPI) in ground-stabilized mode.

3. AN/APS-131 System Description

The AN/APS-131 SLAR is an x-band surveillance and oil slick detection system derived from the AN/APS-135 SLAR used on Coast Guard HC-130 aircraft. The AN/APS-131 is one of five components that comprise the AN/ASD-6 AIREYE system. Pertinent system data are summarized in table 1. The SLAR imagery is produced in a near-real time video format using the AIREYE multipurpose display (MPD) or on a permanent copy dry-silver film.

Table 1. Radar System Characteristics

SYSTEM	MANUFACTURER	RANGE SCALES (nmi)	PEAK POWER (kW)	SCAN RATE (deg/sec)	PULSE WIDTH/ PRF	TRANSMIT FREQ. (MHz)	BEAM- WIDTH (deg)
AN/APS-127	Texas Instruments	5, 10, 20, 40, 80, 160	200	720 (120 rpm) search mode	0.5 μ s/ 1600 Hz search mode	8500 to 9600	Azimuth: 5.0 Elevation: 6.5
AN/APS-131	Motorola	13.5, 27, 54, 80 (to one or both sides of the aircraft)	200	N/A	0.2 μ s/ 750 Hz	9250	Azimuth: 0.4 Elevation: -4 to -45 (csc pattern)

4. Approach

Data were collected using unalerted sensor operators and standard search patterns. Aircraft and target positions were recorded by a precision microwave tracking system. Target detections and environmental conditions were recorded by observers onboard the search aircraft and a target vessel.

Data reconstruction was performed to determine detection and closest point of approach (CPA) ranges for each target opportunity. Raw data files were developed for each search day and entered into a VAX 11/780 computer for analysis.

FLAR and SLAR detection performance levels were evaluated independently and combined sensor search performance was estimated analytically. The influence of interactions among primary search parameters of interest were investigated using a sophisticated binary multivariate regression analysis technique.

RESULTS AND CONCLUSIONS

1. Results

A total of 1,128 valid sensor-target interactions were reconstructed from the experiment. Data quantities categorized by sensor, range scale, and target type are shown in table 2. Sea conditions during the experiment were dominated by waves less than 3 feet and winds less than 12 knots, with a limited amount of data collected in 3- to 5-foot seas with winds up to 18 knots.

Least-squares fitted lateral range curves and sweep width estimates were developed for each significant sensor/target/search parameter combination identified during data analysis.

2. Conclusions

- o The AN/APS-127 FLAR provides a useful detection capability against boats and life rafts. Search altitude, significant wave height, and target size were found during regression analysis to exert significant influence on FLAR target detection probability.

- o The AN/APS-131 SLAR provides a useful detection capability against boats and life rafts. Target size was found to exert a significant influence on target detection probability.
- o Target detection probability was influenced by time on task in two ways. During the first half-hour of a sortie, collateral operator duties and sensor adjustments appear to have a negative effect. After approximately 1.5 hours' time on task, fatigue appears to exert a negative influence.

Table 2. Number of Searcher/Target Interactions

RADAR SYSTEM	LIFE RAFT TARGETS		BOAT TARGETS	
	10-nmi Range Scale	20-nmi Range Scale	10-nmi Range Scale	20-nmi Range Scale
AN/APS-127 FLAR	224	59	412	120
AN/APS-131 SLAR	83	15	185	30

RECOMMENDATIONS

1. AN/APS-127 FLAR Searches

- o The sweep widths provided in table 3 should be used by Coast Guard search planners to represent the FLAR search performance of HU-25A aircraft.

- o AN/APS-127 operators should keep the sweep origin near the bottom of the PPI display when searching in the preferred Ground Stabilized mode. This practice will maximize exposure time for targets that pass close aboard.

Table 3. Sweep Widths for AN/APS-127 FLAR

RANGE SCALE (nmi)	TARGET TYPES	SEARCH ALTITUDES REPRESENTED (feet)	SIGNIFICANT WAVE HEIGHTS REPRESENTED (feet)	SWEEP WIDTH (nmi)
10	6- to 10- person life rafts	500 to 4500	< 2	5.4
			2 to 3	1.8
	24- to 43-foot boats	500	< 2	12.8
			2 to 5	10.8 ¹
		2500 to 5000	< 2	8.5
			2 to 5	7.2
20	6- to 10-person life rafts	500 to 4000	1 to 3	nil ²
	24- to 27-foot boats	500 to 4000	< 2	23.2 ³
			2 to 3	9.7 ³
	34- to 43-foot boats	500 to 4000	< 2	31.1 ³
			2 to 3	17.4 ³

NOTES

1. Extrapolated value only. No data were collected at this altitude/wave height.
2. Based upon data collected at lateral ranges between 9 and 20 nmi only. Some detection capability may exist at closer ranges, but this capability was not evaluated during the experiment due to time limitations.
3. Based upon data collected at lateral ranges between 6 and 20 nmi only. Contribution of sensor performance at closer ranges was estimated as described in section 1.3.2.4.

- o AN/APS-127 searches should be conducted at 500 feet whenever flight operations permit. When higher search altitudes must be used due to weather, air traffic, or the operating requirements of other onboard sensors/systems, degraded sweep width estimates should be used where available in table 3.

2. AN/APS-131 SLAR Searches

- o Based on previous analyses, 2500- to 4000-foot search altitudes should be used when searching with the AN/APS-131 SLAR for small targets.
- o The SLAR overheating problems experienced during this evaluation should be investigated and alleviated, if possible, to improve sensor reliability.

3. Combined FLAR/SLAR Searches

- o When both sensor operators are FLAR- and SLAR-qualified, they should consider exchanging positions near the midpoint of a search sortie.

4. General Recommendations

- o Sufficient time should be provided prior to commencing search for electronic sensor operators to initialize and adjust their equipment. Collateral operator duties other than the search task should also be completed prior to commencing search.

5. Recommendations for Future Research

- o Additional data should be collected using the 20-nmi range scale of the AN/APS-127 FLAR against 20- to 45-foot boat targets. Special emphasis should be placed on obtaining some of the detection opportunities at lateral ranges less than 10 nmi.
- o Additional data should be collected using the 20-nmi swath width of the AN/APS-131 SLAR against 20- to 45-foot boats and life rafts.

- o Additional data should be collected using the 10-nmi range scale of the AN/APS-127 FLAR against raft targets. Specifically, the 500-foot search altitude should be evaluated in 2- to 5-foot seas.
- o The FLAR and SLAR sensors should be further evaluated against boats in seas greater than 4 feet.
- o The detection performance of longer SLAR range scales should be investigated against appropriate SAR targets when resources become available.

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The authors would like to acknowledge the support and cooperation of the Seventh Coast Guard District staff, Coast Guard Air Station Miami, Coast Guard Station Fort Pierce, and the Coast Guard Aids to Navigation Team Miami without whom the experiment would not have been possible. We would like to especially thank the Coast Guard Auxiliary units of the 7th District for assisting us with their time and their boats. We would like to acknowledge the advice and critical review provided by Dr. David Paskausky during the planning and analysis phases of this experiment. The time and effort of the following people from the R&D Center, Analysis & Technology, Inc., Florida Atlantic University, and Input Output Computer Services, Inc. was essential to the success of this experiment and is greatly appreciated: A. Allen, M. Couturier, S. Eynon, T. Johnson, S. Shedlack, and C. Wellman.

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CHAPTER 1

INTRODUCTION

1.1 SCOPE AND OBJECTIVES

This report documents a field experiment and subsequent data analysis conducted by the U.S. Coast Guard Research and Development (R&D Center) to evaluate the detection performance, for search and rescue, of the AN/APS-131 side-looking airborne radar (SLAR), which is part of the AIREYE Remote Instrumentation System, and the AN/APS-127 forward-looking airborne radar (FLAR). These sensors are installed on a Coast Guard HU-25A medium range surveillance (MRS) aircraft.

This experiment, conducted from 2 to 28 June 1987, was performed as part of the R&D Center's Improvement in Probability of Detection (POD) in Search and Rescue (SAR) project. Project objectives are to improve search planning; search execution; and the evaluation of search results in the areas of visual and electronic search, leeway drift, ocean current drift, and visual distress signals.

The research documented in this report was conducted to evaluate the detection performance of the HU-25A radars during realistic searches for 6- to 10-person life rafts and a variety of work and pleasure boats in the 24- to 43-foot size range. The governing assumption during data collection and analysis was that the capabilities of a whole system including operator, radar, signal processing/display, and aircraft were being evaluated.

1.2 HU-25A RADAR SYSTEM DESCRIPTIONS

The HU-25A Guardian is a Falcon 20 jet aircraft specially modified to perform the medium-range surveillance missions of the U.S. Coast Guard. These missions include SAR, law enforcement, fisheries patrol, and marine environmental protection. The HU-25A replaces the HU-16E Albatross and HC-131 Convair aircraft in this role. A limited number of these Guardian aircraft are equipped with both the AN/APS-127 FLAR and the AN/ASD-6 AIREYE multisensor surveillance system. The AIREYE system includes the AN/APS-131 SLAR. Both of the

Guardian's airborne radars were evaluated during this experiment. Salient characteristics of these radars are provided in sections 1.2.1 and 1.2.2.

1.2.1 AN/APS-127 FLAR

The AN/APS-127 FLAR is an X-band air-to-surface search radar developed to detect small targets in a sea clutter environment. Pertinent FLAR characteristics are shown in table 1-1.

Primary controls for the AN/APS-127 are located on the avionicsman's console in the rear of the HU-25A cabin. A 7-inch plan position indicator (PPI) is located at this station. This PPI is designed primarily for operation in the search mode and was used for all FLAR data collection.

The FLAR system contains special selectable features that may enhance system performance when used correctly. These features include sea clutter envelope processor (CEP), fast time constant (FTC), sensitivity time control (STC), antenna tilt, frequency agility, long or short pulse mode, and heading/north/ground stabilization. Range scales are selectable from 5 to 160 nautical miles with the option of moving the display origin from its normal centered position to any location on the PPI.

The AN/APS-127 offers three distinct display modes: heading stabilized, ground stabilized, and north stabilized. The heading-stabilized display provides a PPI presentation wherein targets and terrain move relative to the sweep origin, which represents aircraft position. North stabilization aligns the display with magnetic north, and the degree marks around the scope represent magnetic bearings from the aircraft. The ground-stabilized display provides a PPI presentation that is an unchanging view of the earth's surface as long as the selected area remains within radar range. This stabilization mode provides a greater signal gain than the other modes and has been determined to be the best mode for small target search (reference 1). A detailed AN/APS-127 system description can be found in reference 2.

Previous AN/APS-127 experiments were performed in 1983 and 1984 using Coast Guard HU-25A aircraft. The evaluations of these experiments are found in references 1 and 3. System parameter settings that appear to optimize small target detection performance were determined during these evaluations. Based upon these results and on system technical documentation (reference 2), the following settings were chosen for use during the majority of data collection.

Table 1-1. Radar System Characteristics

SYSTEM	MANUFACTURER	RANGE SCALES (nmi)	PEAK POWER (kW)	SCAN RATE (deg/sec)	PULSE WIDTH/ PRF	TRANSMIT FREQ. (MHz)	BEAM- WIDTH (deg)
AN/APS-127	Texas Instruments	5, 10, 20, 40, 80, 160	200	720 (120 rpm) search mode	0.5 μ s/ 1600 Hz search mode	8500 to 9600	Azimuth: 5.0 Elevation: 6.5
AN/APS-131	Motorola	13.5, 27, 54, 80 (to one or both sides of the aircraft)	200	N/A	0.2 μ s/ 750 Hz	9250	Azimuth: 0.4 Elevation: -4 to -45 (csc ² pattern)

RANGE:	10 nmi	MODE:	SEARCH
STAB:	GND	FTC:	OFF
FREQ:	FIXED	ANT. TILT:	as required
PULSE:	SHORT	CEP:	OFF

The AN/APS-127 system has an interface with the aircraft navigation computer to receive inputs for stabilization and cursor position computation. The AN/APS-127 is not integrated into the AN/ASD-6 AIREYE system, but can pass target positions to the AIREYE multipurpose display and to the aircraft navigation computer.

1.2.2 AN/APS-131 SLAR

The AN/APS-131 SLAR is a surveillance and oil slick detection system capable of operation in all weather conditions, day or night. The AN/APS-131 is one of five components that comprise the AN/ASD-6 AIREYE system. Pertinent SLAR characteristics are shown in table 1-1. The SLAR produces an aerial map containing an imagery swath width of up to 160 nautical miles centered on the aircraft's ground track. This map is produced in a near-real time video format using the AIREYE multipurpose display (MPD) or on a permanent copy dry-silver film. Both display methods include annotations of critical flight data, aircraft position, and target position (MPD only). AN/APS-131 imagery can be recorded from the AIREYE MPD on a format video receiver for post-operation viewing and processing.

The SLAR radar antenna is designed to provide wide coverage in elevation and very narrow coverage in azimuth. The SLAR antenna is mounted on the aircraft so that it radiates nearly broadside to the aircraft centerline. The imagery produced by this system includes a blind zone centered on the aircraft's ground track. The width of this blind zone is approximately twice the aircraft's altitude. A detailed AN/APS-131 system description can be found in reference 4.

An evaluation of a similar radar, the AN/APS-135 SLAR, was performed in 1985 using an HC-130 aircraft. The AN/APS-135 is nearly identical to the AN/APS-131 with the major difference being use of a longer antenna. A summary of this evaluation can be found in reference 5. Parameter settings determined to optimize small target detection performance were chosen based upon this evaluation.

The following settings were used during the majority of SLAR data collection.

RANGE:	13.5 nmi (control panel)	ANTENNA:	BOTH
	10 nmi (CDU menu)	DISPLAY:	NORMAL (CDU MENU)
DELAY:	0 (both sides)	NAV:	AUTO
PULSE RATE:	AUTO	STC:	as required

1.3 EXPERIMENT DESCRIPTION

1.3.1 Participants

This evaluation was conducted and controlled by the R&D Center, Avery Point, Groton, Connecticut. A field team consisting of five Coast Guard military and civilian personnel from the R&D Center and four contractor personnel performed on-site monitor, control, maintenance, liaison, and data collection supervision functions.

The radar systems were installed on Coast Guard HU-25A aircraft No. 2118 assigned to Coast Guard Air Station Miami, Florida. Air Station Miami flight crews operated the aircraft and sensors. The normal crew complement included two aviators and four aircrew (two sensor operators, and two visual scanners). Air Station Miami also provided valuable technical support in keeping the aircraft and its sensors in operating condition. This support ensured that 90 percent of the scheduled flight days were actually provided. Air Station Miami also provided videotape copies of the SLAR imagery for later evaluation.

Florida Atlantic University (FAU) was contracted to provide the R/V Oceaneer as a work platform/monitoring vessel. The Oceaneer was used for daily deployment of the three life raft search targets, and was itself used as a search target.

Coast Guard Station Fort Pierce, Florida, provided logistics support including mooring space, communications support, and use of messing facilities for the Coast Guard Auxiliary search target vessel crews. The station provided use of station vessels as search targets when the operational workload permitted. Station Fort Pierce also assisted with liaison between the R&D Center field team and local Auxiliarists.

Coast Guard Aids to Navigation Team Miami, Florida, provided the buoy vessel CG 55106 and crew to deploy a miniature meteorological buoy.

The majority of the search object/radar target vessels were provided by members of the Coast Guard Auxiliary (Seventh Coast Guard District, Auxiliary Division 5 East). The 7 vessels were operated and crewed by 29 Auxiliarists, who volunteered their time, skill, and effort. Use of the Coast Guard Auxiliary provided for target vessels of various sizes and types, at a substantially lower cost than if all search target vessels had to be chartered.

Table 1-2 lists the aircraft and vessels resources used in conducting this experiment.

Table 1-2. Participating Aircraft and Vessels

<u>SOURCE</u>	<u>AIRCRAFT/VESSEL</u>
Coast Guard Air Station Miami, Opa Locka, FL	CGNR 2118
Coast Guard Station Ft. Pierce Ft. Pierce, FL	CG 41341 CG 252501
Coast Guard Auxiliary Seventh Coast Guard District, Auxiliary Division 5 East	Sea Hawk (Facility No. 2167) Gen Too III (Facility No. 6031) Vivant (Facility No. 9216) Jade East (Facility No. 6117) Skippers II (Facility No. 6104) Lady Irene (Facility No. 9204) Pete's Pride (Facility No. 6089)
Florida Atlantic University Boca Raton, FL	R/V Oceaneer

1.3.2 Exercise Area

The site used for the experiment was a 15- by 30-nautical mile area located in the Atlantic Ocean off Ft. Pierce, Florida (figure 1-1). All target vessels were located in this area. Actual search tracks assigned to the aircraft for different data collection objectives were not limited to this area. Allowance was made for the aircraft to fly beyond the test area so the aircraft would be parallel to the major axis, wings level prior to its track entering the search area. For longer range data collection/detection opportunities, the flight track was parallel to but seaward of the search area. Examples of two flight tracks are shown in figure 1-2 (A and B).

1.3.3 Targets

Three types of life rafts and ten different boats were used as search objects/radar targets during the experiment. The boats used provided a good variety of vessel types, 24 to 43 feet in length overall. This range of vessel length was selected as representative of the vessel size expected to be encountered in a majority of search and rescue cases. Table 1-3 provides the salient characteristics of each target type. The boats and rafts were not outfitted with radar reflectors. Some of the vessels did have radar antennae, but during the searches, vessel operators were asked to not have the radar operating.

1.3.4 Experiment Design and Conduct

Detection data were obtained by conducting operationally-realistic search missions using the SLAR and FLAR mounted on the HU-25A. The aircrew and radar operators, following standard Coast Guard procedures, conducted search missions to provide detection performance data that would accurately reflect the detection capabilities of the AN/APS-131 SLAR and the AN/APS-127 FLAR searching for typical SAR targets.

A daily SAR Exercise (SAREX) message provided the aircrew with target information and the specific search patterns to be executed. Figure 1-2 provides examples of the types of search patterns used for data collection. Target life rafts were anchored at positions chosen for each day of the exercise so as to vary the range of detection opportunities. Other target boats were positioned within the search area according to data collection requirements to provide a wide variety of possible detection ranges. Controllable parameters such as search area, track spacing,

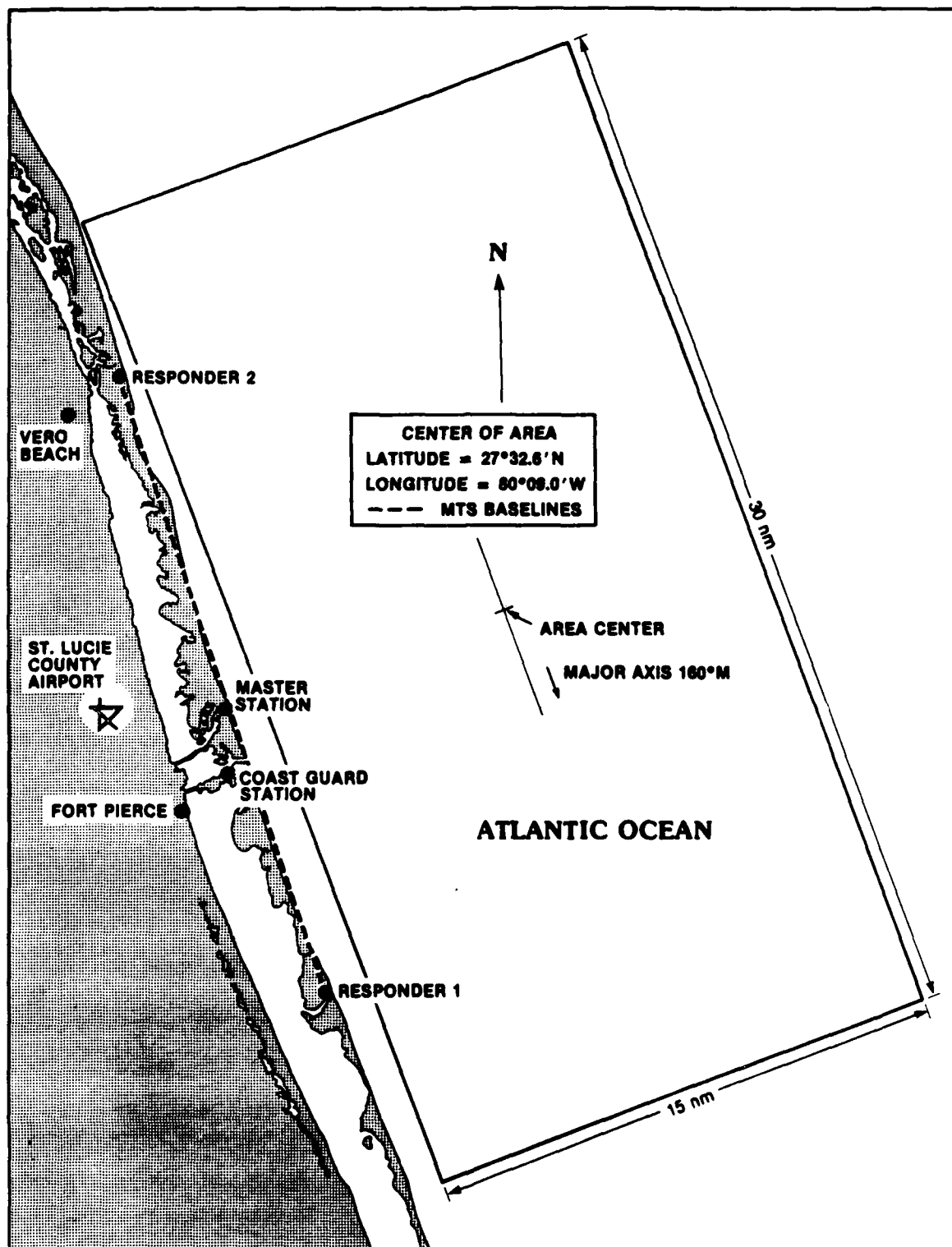
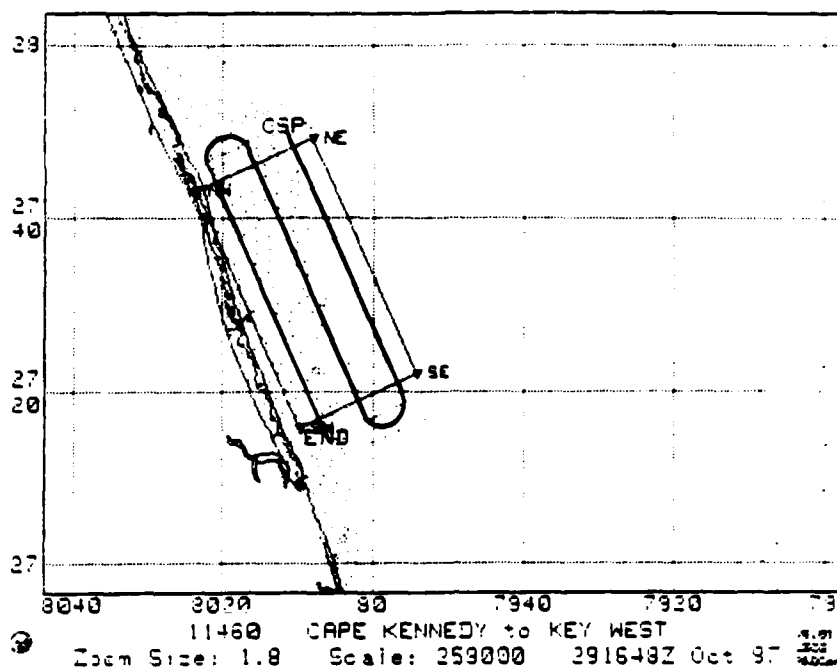


Figure 1-1. Exercise Area

A. FLIGHTS WITHIN TARGET AREA



B. FLIGHTS BEYOND TARGET AREA

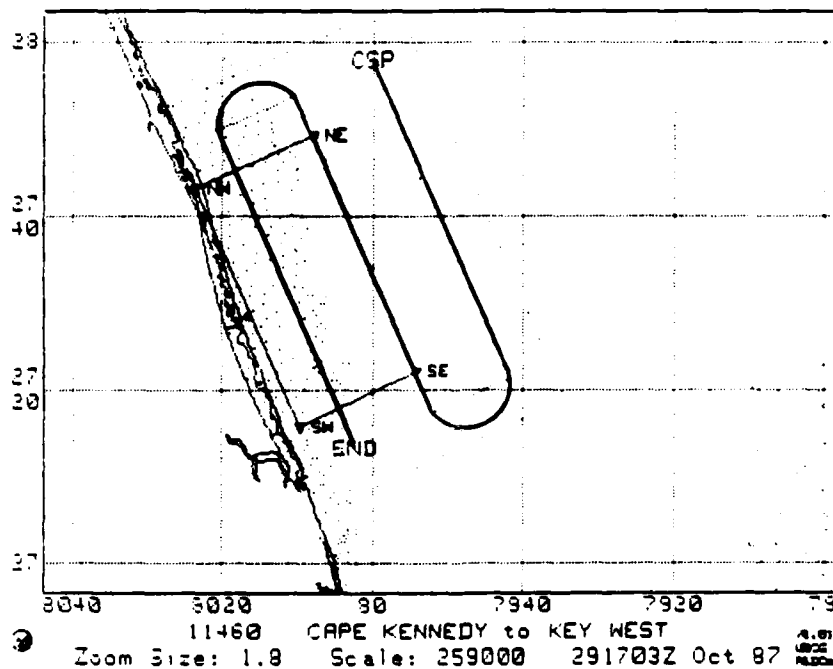


Figure 1-2. Examples of Radar Search Patterns
Conducted by the HU-25A Aircraft

Table 1-3. Radar Target Vessel Descriptions

VESSEL NAME	VESSEL DESCRIPTION	PRINCIPAL MATERIAL	DIMENSIONS l x w x h (feet)
Life Raft	6-person Switlik w/canopy	rubber/fabric	7.5 diameter 3.75 height
Life Raft	10-person Switlik w/canopy	rubber/fabric	10.5 x 7.5 x 5
Life Raft	10-person Goodrich w/canopy	rubber/fabric	9.2 diameter 5.25 height
Sea Hawk	Spacecraft cuddy cabin	fiberglass	24 x 8 x 6
Gen Too III	Trojan express cruiser	fiberglass	25 x 9.5 x 10
CG 252501	25-foot Coast Guard UTL	fiberglass	25 x 8.2 x 6
Vivant	Albin 27 trawler	fiberglass	27 x 10 x 9
R/V Oceaneer	Long Line trawler	fiberglass	34 x 13 x 7.5
Jade East	Sail Cutter	fiberglass	37 x 12 x 9
Skippers II	Pacemaker fly bridge sport fish	fiberglass	38 x 14 x 9
Lady Irene	Viking fly bridge sport fish	fiberglass	38.3 x 13.9 x 15
CG 41341	41-foot Coast Guard UTB	aluminum	41 x 13.5 x 13.2
Pete's Pride	Albin fly bridge trawler	fiberglass	43 x 14.5 x 12

altitude, and starting points were assigned to fulfill specific data collection objectives. Onboard observers recorded essential data and coordinated unit activities with the aircrew and R&D Center control personnel.

The on-scene environmental conditions were recorded by R&D Center personnel onboard the R/V Oceaneer. Environmental conditions were recorded hourly throughout the day or when the conditions changed significantly. Atmospheric and sea conditions were measured by sensors or by estimate as appropriate and recorded on an Environmental Conditions Summary (figure 1-3).

Each detection of a target by the SLAR was logged in real time by the operator on a SLAR Detection Log (figure 1-4). Each SLAR detection log entry included detection time and target location as well as radar and aircraft operating parameters. The detections for the FLAR were relayed to an onboard R&D Center observer who logged the detection time, range, and bearing on a FLAR Detection Log (figure 1-5). Aircraft and FLAR operating parameters were also recorded. Visual detections were also logged on a not-to-interfere basis for informational and backup purposes on the Visual Sighting Report Form (figure 1-6). The visual data was not used in the analysis. Each radar detection was verified during post-exercise analysis by comparing the reported detections with the locations of the target craft.

1.3.5 Tracking and Reconstruction

Target locations and aircraft positions were monitored using an automated microwave tracking system (MTS) consisting of a Motorola Falcon 492 system coupled with a Hewlett-Packard desktop computer. This system was developed by the Coast Guard R&D Center for the POD/SAR Project to provide target positioning and search track reconstruction accurate to better than 0.1 nautical miles. A detailed description of the system can be found in reference 6.

The MTS master station, for this experiment, was located at the Sea Palms Condominium, Ft. Pierce, Florida. Two fixed reference stations were located to the north and south of the master station. One was on a meteorological tower at the Florida Power and Light Co. St. Lucie Plant and the other at the Spires Condominium in Vero Beach, Florida. These locations, which facilitated line-of-sight tracking of searcher and target positions, are depicted in figure 1-1.

ENVIRONMENTAL CONDITIONS SUMMARY

SRU NAME

DATE _____

[illegible]

***Significant wave height.**

or an estimate. Indicate method used to measure each parameter.

OBSERVER

Figure 1-3. Environmental Conditions Summary Form

[illegible]

DISPLAY MODE: NORM / FULL RES.

Figure 1-4. SLAR Detection Log

AIRCRAFT/BOAT NO.	SEARCH START TIME	SEARCH SPEED
RESPONDER CODE	SEARCH END TIME	SPEED

[illegible]

PPI Setup/System Operating Mode:			
CEP - ON / OFF	DISPL STAB - REL / NORTH / GND		
FREQ - FIXED / AGLE	MODE - SEARCH / WX		
PULSE - SHORT / LONG	FTC - ON / OFF		

FLAR OPERATOR

RECORDER:

Figure 1-5. FLAR Detection Data Log

DATE _____
SEARCH _____
SPEED _____
ALTITUDE _____

DATE _____
SEARCH _____
SPEED _____
ALTITUDE _____

AIRCRAFT/BOAT NO. _____
RESPONDER CODE _____

SEARCH START TIME	SEARCH END TIME	SEARCH DURATION
-------------------	-----------------	-----------------

[illegible]

RECORDER:

Figure 1-6. Visual Sighting Report Form

The trackline of the HU-25A often took it beyond the range of the MTS. When this occurred, the position of the aircraft, as displayed on the onboard navigation computer, was used to reconstruct the track. These positions were recorded once per minute while outside MTS coverage and were recorded as a navigation tie-in two or three times on each search leg while within MTS coverage. These positions were recorded on the Aircraft Position Log (figure 1-7). During data reconstruction all aircraft positions were converted to the MTS coordinate base.

Target and aircraft (when within MTS range) positions were recorded continuously by the computerized tracking system, displayed in real time on the CRT (as shown in figure 1-2), and recorded on a microcomputer hard disk every 15 to 30 seconds.

Recorded target and aircraft position data were used to generate an 8- by 12-inch hard copy plot of each search. Target locations were marked on these plots with letters. The aircraft tracks were plotted with a '+' to designate every fifth position fix. A hard copy chronology of the search and target craft positions was also generated to accompany the plot of each search. Using these plots and the detection logs described in section 1.3.4, accurate lateral range measurements and detection/miss determinations could be made. A target was considered an opportunity for detection on any given search leg if the aircraft passed it within the selected radar range scale distance. If a logged target detection could be correlated with the target's position, it was considered a detection. Otherwise, a miss was recorded for the target on that particular search leg. These detections and misses, along with associated search parameters and environmental conditions, were compiled into computer data files for analysis. These data files are listed in appendix A.

1.3.6 Range of Parameters Tested

The range of potentially-significant parameters tested for each sensor is shown in table 1-4. The table includes controllable aircraft/sensor parameters (time on task, altitude, range scale), environmental parameters expected to influence radar performance (wind speed and wave height), and target type/size. Search speed was held constant at 250 knots indicated air speed (IAS) for all data collection.

Although wind speeds ranged from 0 to 18 knots and wave heights ranged from 0.5 to 5 feet, it should be noted that the most severe of these conditions occurred on the first day of data collection, June 8, when wave heights were 3 to 5 feet and winds were 12 to 18 knots. During the

AIRCRAFT POSITION LOG

Aircraft No. _____

Date _____

Recorder _____

Search No. _____

RNAV Inputs Used _____

TIME (HH:MM:SS)	LATITUDE (DD-MM.M)	LONGITUDE (DDD-MM.M)	SEARCH LEG

Figure 1-7. Aircraft Position Log

Table 1-4. Range of Parameters Tested

SENSOR	TARGET TYPE	RANGE SCALE (nmi)	TIME ON TASK (hrs)	WIND SPEED (knots)	SIG. WAVE HEIGHT (feet)	SEARCH ALTITUDE (feet)
APS-127 FLAR	24- to 43-foot boats	10	0.0 to 1.9	0 to 18	0.5 to 5.0	500 to 5000
		20	0.6 to 1.9	3 to 10	1.0 to 3.0	500 to 4000
	6- to 10-person life rafts	10	0.0 to 1.8	0 to 11	0.5 to 3.0	500 to 4500
		20	0.6 to 1.9	3 to 10	1.0 to 3.0	500 to 4000
APS-131 SLAR	24- to 43-foot boats	10	0.1 to 1.8	0 to 18	0.5 to 5.0	2500 to 5000
		20	0.6 to 1.1	3 to 5.2	1.0	2500 to 4000
	6- to 10-person life rafts	10	0.1 to 1.6	0 to 10	0.5 to 2.0	2500 to 4500
		20	0.6 to 1.1	3 to 5.2	1.0	2500 to 4000

NOTE: Search speed was held constant at 250 knots IAS. Selectable FLAR and SLAR parameters not listed above were fixed at the settings listed in section 1.2.2.

remaining 7 days of data collection, significant wave heights ran 0.5 to 3 feet and winds were 0 to 11 knots.

Range scale and search altitude were the only selectable parameters varied during data collection so that statistically significant sample sizes could be generated. Other sensor parameters such as CEP, STC, FTC, and display stabilization were fixed at the settings listed in section 1.2 or optimized by the radar operators as needed.

The only potentially-significant human factor investigated for its influence on detection performance was time on task.

An additional "environmental" factor that must be considered in the data analysis is vessel traffic density. Although exact vessel counts could not be made, it was obvious from both visual and radar observations that, on all days other than 8 June, vessel traffic was heavy to extremely heavy in the search area. This traffic level may have reduced the radar operators' ability to detect marginal-strength targets due to the high reporting/recording workload it imposed on them.

1.4 ANALYSIS APPROACH

1.4.1 Measure of Search Performance

The primary performance measure currently used by SAR mission coordinators to plan searches is sweep width (W). Since this radar evaluation was intended to support improved Coast Guard SAR mission planning, W was chosen as the measure of radar search performance to be developed during data analysis. Sweep width is a single-number summation of a more complex range/detection probability relationship. Mathematically,

$$\text{Sweep Width (W)} = \int_{-\infty}^{+\infty} P(x)dx,$$

where

x = lateral range or closest point of approach to targets of opportunity (see figure 1-8), and

P(x) = probability of detection at lateral range x.

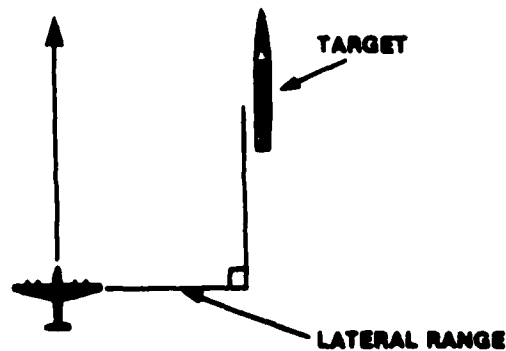


Figure 1-8. Definition of Lateral Range

Figure 1-9 shows a typical $P(x)$ curve as a function of lateral range. In figure 1-9, (x) is the lateral range of detection opportunities.

Conceptually, sweep width is the numerical value obtained by choosing a value of lateral range less than the maximum detection distance for any given sweep so that scattered targets that may be detected beyond the limits of W are equal in number to those that may be missed within those limits. Figure 1-10 (I and II) illustrates this concept of sweep width. The number of targets missed inside the sweep width distance is indicated by the shaded portion near the top middle of the rectangle (area A); the number of targets sighted beyond the sweep width distance out to maximum detection range (R_D) is indicated by the shaded portion at each end of the rectangle (areas B). Referring only to the shaded areas, when the number of targets missed equals the number of targets sighted (area A = sum of areas B), sweep width is defined. A detailed mathematical development and explanation of sweep width can be found in reference 7.

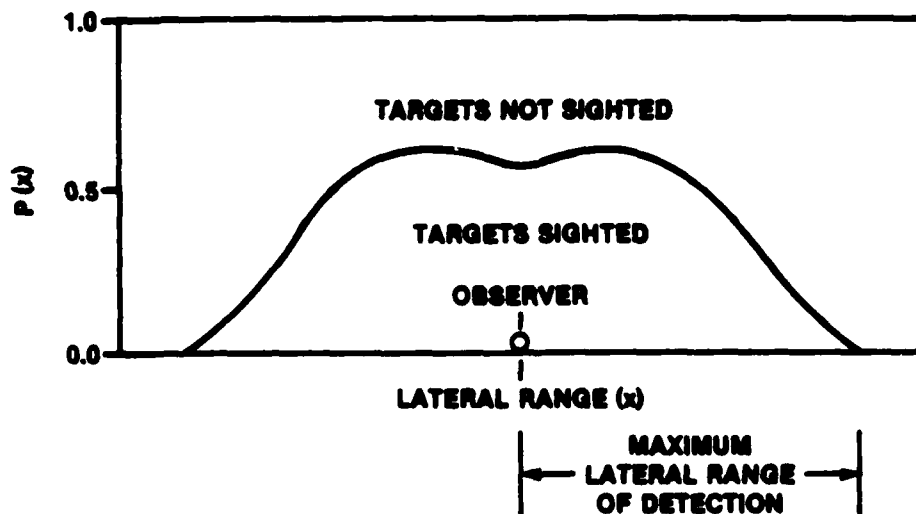


Figure 1-9. Relationship of Targets Detected to Targets Not Detected

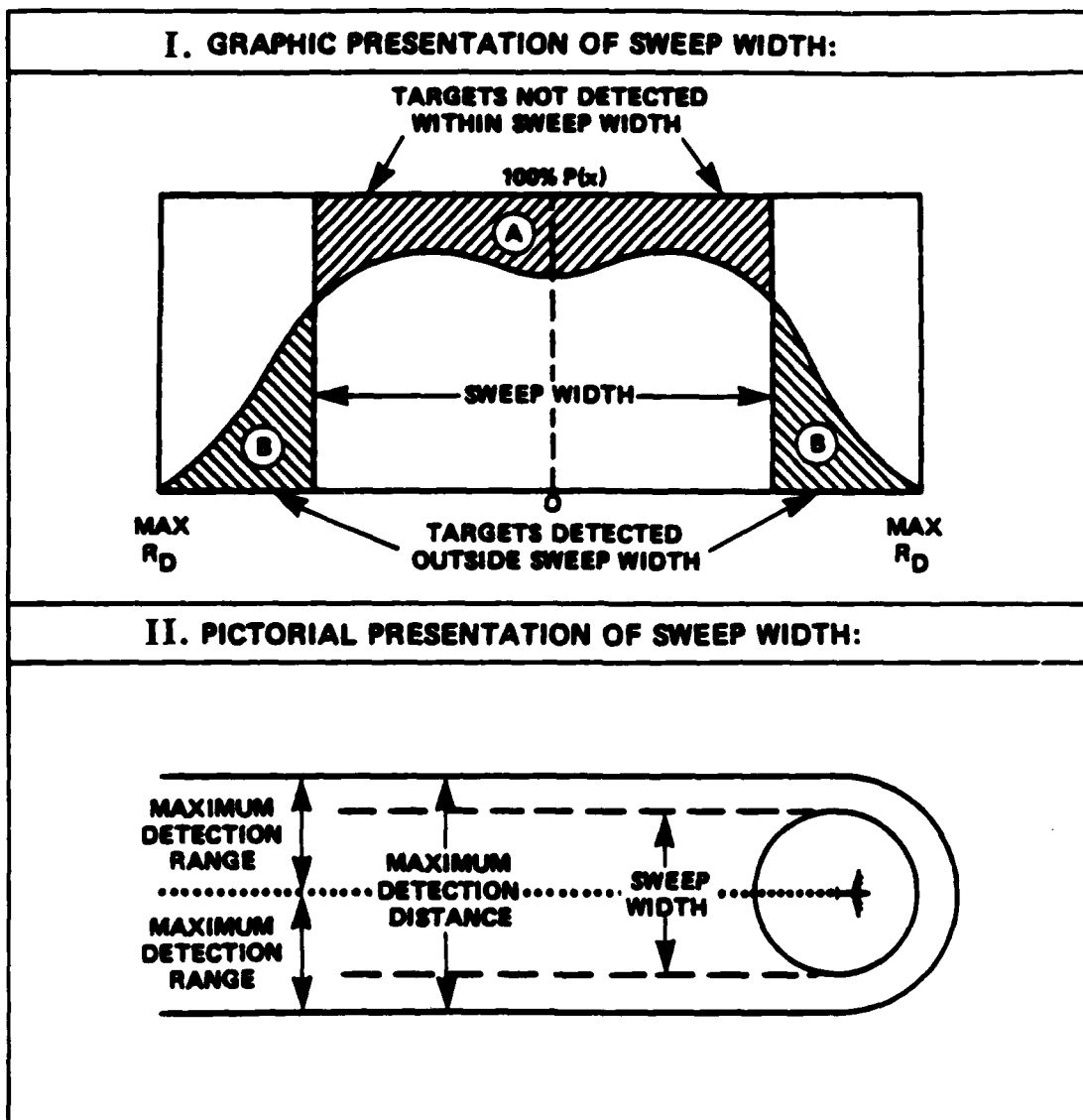


Figure 1-10. Graphic and Pictorial Presentation of Sweep Width

1.4.2 Analysis of Search Data

Three primary questions were addressed in the analyses of FLAR and SLAR detection data.

1. What target-, sensor-, platform-, and environment-related parameters exerted significant influence on the detection performance of the two radars?
2. What are the FLAR and SLAR sweep width estimates for various combinations of significant parameters identified during step 1?
3. What are the combined FLAR/SLAR sweep widths for various combinations of significant parameters identified during step 1?

1.4.2.1 Development of Raw Data

During data reconstruction, detection and closest point of approach (CPA) ranges for each target opportunity were determined by referring to logs kept by the observers and radar operators onboard the search aircraft and to MTS-generated position/time plots for each search. When the time, range, and relative bearing of a contact reported by the radar operators agreed with the MTS plot, a target detection was recorded. Actual detection ranges were measured on the MTS plot directly from the aircraft's trackline position at the time of contact to the target position. CPA (lateral) ranges were measured from the target to the nearest point on the aircraft's trackline. Similarly, any targets that passed within the selected FLAR or SLAR range scale limit and were not detected were recorded as a "miss". This reconstruction procedure was applied to each radar independently so that separate FLAR and SLAR data bases were developed. Each leg of a search pattern was considered a new set of target detection opportunities.

The lateral range, environmental conditions, target type, time on task, and other search parameters of interest were recorded along with the detection/miss indicator. A separate raw data file was developed for each search day, which included all valid target detections and all misses that met the above criterion. These data files were entered into a VAX 11/780 computer for analysis. Copies of these raw search data files are included in appendix A.

1.4.2.2 LOGODDS Multivariate Regression Model

The influence of interactions among the primary search parameters of interest was investigated using a sophisticated binary, multivariate regression analysis technique (LOGODDS).

The linear logistic (LOGODDS) model was selected as an appropriate analysis tool for fitting POD/SAR Project search data where the dependent variable is binary (i.e., detection/no detection). The LOGODDS model is useful in quantifying the relationship between independent variables (x_i) and a probability of interest, R (in this case the probability of detecting a target). The independent variables (x_i) can be continuous (e.g., range, wave height, wind speed) or binary (e.g., high/low altitude, SRU type 0 or 1). The LOGODDS model has been used with great success in previous POD/SAR Project visual search performance analyses. It was used in the FLAR/SLAR analysis because of its proven analytical power to identify significant search parameters and to quantify their influence on target detection probability. For reasons that will be explained shortly, the LOGODDS model was not used to fit lateral range curves to most of the FLAR and SLAR detection data.

The equation that the LOGODDS model uses for target detection probability is:

$$R = \frac{1}{1 + e^{-\lambda}}$$

where:

- $\lambda = a_0 + a_1x_1 + a_2x_2 + a_3x_3 \dots$,
- $a_i =$ constants (determined by computer program), and
- $x_i =$ independent variable values.

The LOGODDS model has the following advantages over other candidate models/techniques.

1. The model implicitly contains the assumption that $0 \leq R \leq 1.0$. A linear model does not, unless the assumption is added to the model (and then computation can become very difficult).
2. The model is analogous to normal-theory linear models; therefore, analysis of variance and regression implications can be drawn from the model.

3. The model can be used to observe the effects of several independent or interactive parameters that are continuous or discrete.
4. A regression technique is better than non-parametric hypothesis testing, which does not yield quantitative relationships between the probability in question and the values of independent variables.

The primary disadvantages of the LOGODDS model are:

1. For the basic models, the dependent variable (R) must be a monotonic function of the independent variables. This limitation became significant during the FLAR/SLAR data analysis because the lateral range versus target detection probability relationships usually contained a maximum and were therefore not monotonic.
2. The computational effort is substantial, requiring use of computer resources at the mini-mainframe level.

Appendix A of reference 8 provides a more detailed description of the LOGODDS model.

Variables (in addition to lateral range) included in the LOGODDS data analysis for this experiment were those that had demonstrated a significant influence on AN/APS-127 FLAR and AN/APS-135 SLAR search performance during previous experiments (references 1, 3, and 5). Additional variables that might be expected to influence radar search performance were also considered in the analysis. The variables evaluated were:

1. Wind speed
2. Significant wave height*
3. Search altitude
4. Range scale
5. Target type and size
6. Time on task

*Significant Wave Height is defined in reference 9 as the height an experienced observer will give when visually estimating the height of waves at sea.

Controllable variables other than those listed above, (such as search speed and FLAR display stabilization mode) were either held constant or adjusted as required by the sensor operators to achieve optimum small-target detection performance. Such variables were not considered in the data analysis.

1.4.2.3 Least-Squares Curve Fits

Inspection of the raw data for many target/sensor/range scale combinations indicated that the monotonic curve shape to which the LOGODDS model is constrained would not adequately represent the observed radar detection performance as a function of lateral range. Figures 1-11 and 1-12 illustrate the problem encountered. Whereas the LOGODDS model attempts to fit a monotonically increasing or decreasing S-shaped lateral range curve similar to those illustrated in figure 1-11, the raw data in most cases indicated that the unimodal, or peaked, lateral range curve shape depicted in figure 1-12 was more appropriate.

In order to fit a lateral range curve to the detection data that exhibited unimodal response, an appropriate fitting function had to be identified. Through literature research and some trial and error, it was found that the function

$$P(x) = \frac{A^C}{[(x - B)^2 + A^D]} ,$$

where A, B, C, and D are regression variables and x is lateral range, could be fitted satisfactorily to all of the unimodally-behaved data sets using Marquardt's least-squares regression method (see reference 10). This technique was used to develop many of the lateral range curves and sweep widths that appear in chapter 2.

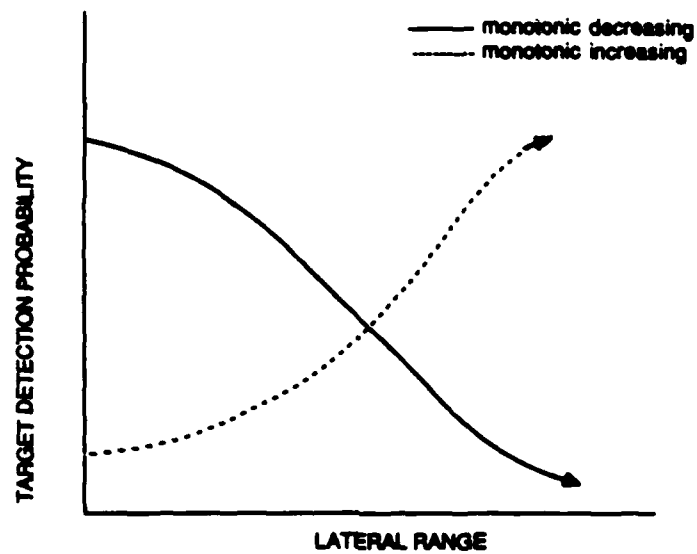


Figure 1-11. S-Shaped Curves

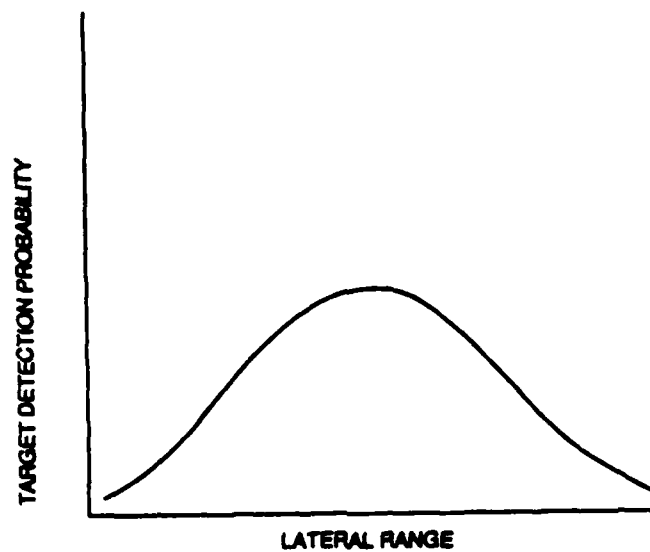


Figure 1-12. Unimodal Curve

Although necessary to accommodate the unimodal curve shapes, the least-squares regression method described above is a less satisfactory means of analyzing detection data than the LOGODDS regression method. Specifically, the least-squares method has the following limitations that LOGODDS does not.

1. The least-squares technique fits a function to a single, independent variable only (lateral range in this case), instead of to multiple parameters of interest. The effects of other parameters cannot be identified or quantified.
2. The binary detection/miss data must be binned into lateral range intervals, each of which should contain a reasonable number of detection opportunities, before being input to the regression model.
3. The least-squares regression variables (A, B, C, and D) have no physical significance relative to the detection process: they simply serve to adjust the fitting function's response to the independent variable lateral range.

The limitations described above required that the detection data be pre-analyzed using the LOGODDS regression model to identify variables, other than lateral range, that exerted significant influence on target detection probability. This could be done because, even though detection probability demonstrated unimodal response to the lateral range parameter, a monotonic response could still be expected relative to other parameters such as search altitude, target type, and wave height. Variables identified as significant during this LOGODDS pre-analysis were stratified into meaningful levels to create data subsets that were, in turn, binned on lateral range. Finally, the x-y pairs of lateral range and target detection probability obtained in this manner were input to a computerized, least-squares regression program along with reasonable starting estimates for the regression variables A, B, C, and D. Using this three-step process, lateral range curve functions were developed for various combinations of sensor, range scale, target type, search altitude, and environmental conditions.

1.4.2.4 Sweep Width Calculations

The lateral range curve functions obtained using the procedures described in sections 1.4.2.2 and 1.4.2.3 were integrated over appropriate radar range scale limits to obtain single-sensor sweep widths.

For FLAR sweep widths, the following procedures were used.

1. 10-nmi Range Scale. The applicable least-squares fitting function was integrated over the limits 0 to ± 10 nmi to obtain W.
2. 20-nmi Range Scale (boat targets). Since no data were collected at ranges less than 6 nmi, a multi-step process was used to estimate W as follows:
 - a. The lateral range curve was assumed to have the same general shape as it did on the 10-nmi range scale.
 - b. An estimate of the lateral range curve "peak" location for the 20-nmi range scale was obtained by determining the peak location as a percentage of range scale for the 10-nmi range scale curve fits. This value was determined to be 34 percent, which translates to 6.8 nmi for the 20-nmi range scale.
 - c. The target detection probability at 0 lateral range was estimated by assuming the percentage drop from peak value was the same as for the 10-nmi range scale.
 - d. W was computed by integrating the applicable LOGODDS lateral range curve fit over the limits ± 6.8 to ± 20 nmi (i.e., where data existed) and adding to this the trapezoidal areas between lateral ranges 0 and ± 6.8 nmi formed by the extrapolation process described in steps a through c.

Data collected on the 20-nmi FLAR range scale indicated that life raft detection was negligible at lateral ranges beyond 10 nmi and no sweep width estimate could be made.

For SLAR sweep widths, the following procedures were used.

1. 10-nmi Range Scale. The applicable least-squares or LOGODDS fitting function was integrated over the limits ± 0.8 to ± 10 nmi. The SLAR blind zone was assumed to extend ± 0.8 nmi to both sides of the aircraft, which yields a conservative sweep width estimate for altitudes of 2500 to 4500 feet.
2. 20-nmi Range Scale. Insufficient data were collected for sweep width estimation.

Combined FLAR/SLAR sweep widths were estimated for the 10-nmi range scales by combining the applicable lateral range curve functions as described below.

1. The combined target detection probability P_C assuming completely independent sensors was computed at 0.1-nmi lateral range increments over the interval 0 to 10 nmi. The equation for this is:

$$P_C(\text{independent}) = 1 - \{[1 - P(\text{FLAR})] [1 - P(\text{SLAR})]\}.$$

2. The higher value of $P(\text{FLAR})$ and $P(\text{SLAR})$ was determined at each 0.1-nmi lateral range increment. This represents the assumption of complete correlation between sensors; that is, if the "weaker" sensor detects a particular target at lateral range x , the "stronger" sensor will also surely detect that same target at lateral range x . This higher of two probabilities can be expressed as:

$$P_C(\text{correlated}) = \text{MAX} [P(\text{FLAR}), P(\text{SLAR})]$$

for each lateral range increment.

3. Since the actual degree of correlation between the FLAR and SLAR sensors is indeterminate, a reasonable estimate of combined sensor target detection probability at lateral range x is given by the "Vassel Average" (reference 11) of the two values described above:

$$P_C(X) = \frac{P_C(\text{independent}) + P_C(\text{correlated})}{2}.$$

After the combined FLAR/SLAR lateral range curves were obtained as described above, combined-sensor sweep widths were obtained by numerical integration using Simpson's Rule.

CHAPTER 2

TEST RESULTS

2.1 INTRODUCTION

A total of 1,128 valid sensor-target interactions were reconstructed from the experiment. Data quantities are categorized by sensor, range scale, and target type in table 2-1. Data quantities in table 2-1 pertaining to the 10-nmi SLAR range scale reflect elimination of targets occurring within the assumed 0.8-nmi blind zone to either side of the aircraft.

Table 2-1. Number of Searcher/Target Interactions

RADAR SYSTEM	LIFE RAFT TARGETS		BOAT TARGETS	
	10-nmi Range Scale	20-nmi Range Scale	10-nmi Range Scale	20-nmi Range Scale
AN/APS-127 FLAR	224	59	412	120
AN/APS-131 SLAR	83	15	185	30

2.2 DETECTION PERFORMANCE

Sections 2.2.1 through 2.2.3 present results of the APS-127 FLAR, APS-131 SLAR, and combined FLAR/SLAR analyses of detection performance. Lateral range curve fits and sweep width estimates are provided for each sensor/target/search parameter combination analyzed.

2.2.1 AN/APS-127 FLAR Detection Performance

2.2.1.1 FLAR Detection of Life Rafts

Figures 2-1 and 2-2 depict the raw detection data and least-squares fitted lateral range curves for FLAR detection of life rafts when the 10-nmi range scale was used. Significant wave height was the only search variable in the data set that was found during LOGODDS regression analysis to exert significant influence on target detection probability. Figure 2-1 provides the lateral range curve for significant wave heights less than 2 feet, and figure 2-2 provides the lateral range curve for 2- to 3-foot significant wave heights.

Inspection of the two lateral range curves indicates that detection performance against these small targets degraded markedly with even a small increase in sea return. It should be noted that only a small data set was collected in the higher sea conditions, resulting in a rather uncertain lateral range curve fit (the 90-percent confidence limits are extremely wide). Although the 500-foot search altitude was not tested at the higher sea condition during this experiment, it is likely that the effects of sea return would have been reduced had the lower altitude been used. Preliminary research reported in reference 3 indicated that the APS-127 FLAR achieved marginal small target detection capability in rough seas using 300- and 500-foot search altitudes, but was unable to detect the targets using a 1000-foot search altitude under the same conditions.

Figure 2-3 illustrates the raft detection performance achieved when using the 20-nmi range scale of the APS-127 FLAR. The data indicate negligible raft detection capability over the 9- to 20-nmi lateral range interval tested. No data were collected at lateral ranges less than 9 nmi because of limitations on available experiment time. There is no reason to expect that the 20-nmi range scale would have provided better life raft detection performance than the 10-nmi scale at lateral ranges less than 9 nmi.

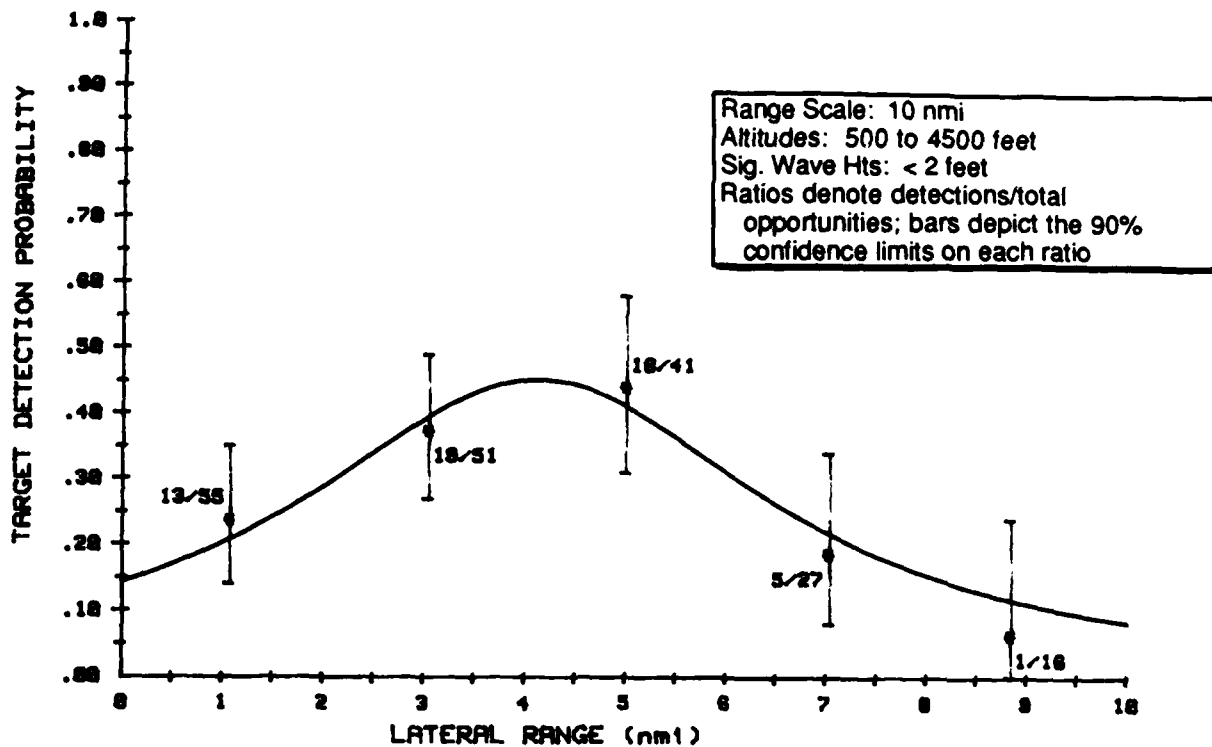


Figure 2-1. APS-127 FLAR Detection of Life Rafts
 (10-nmi range scale; seas < 2 feet)

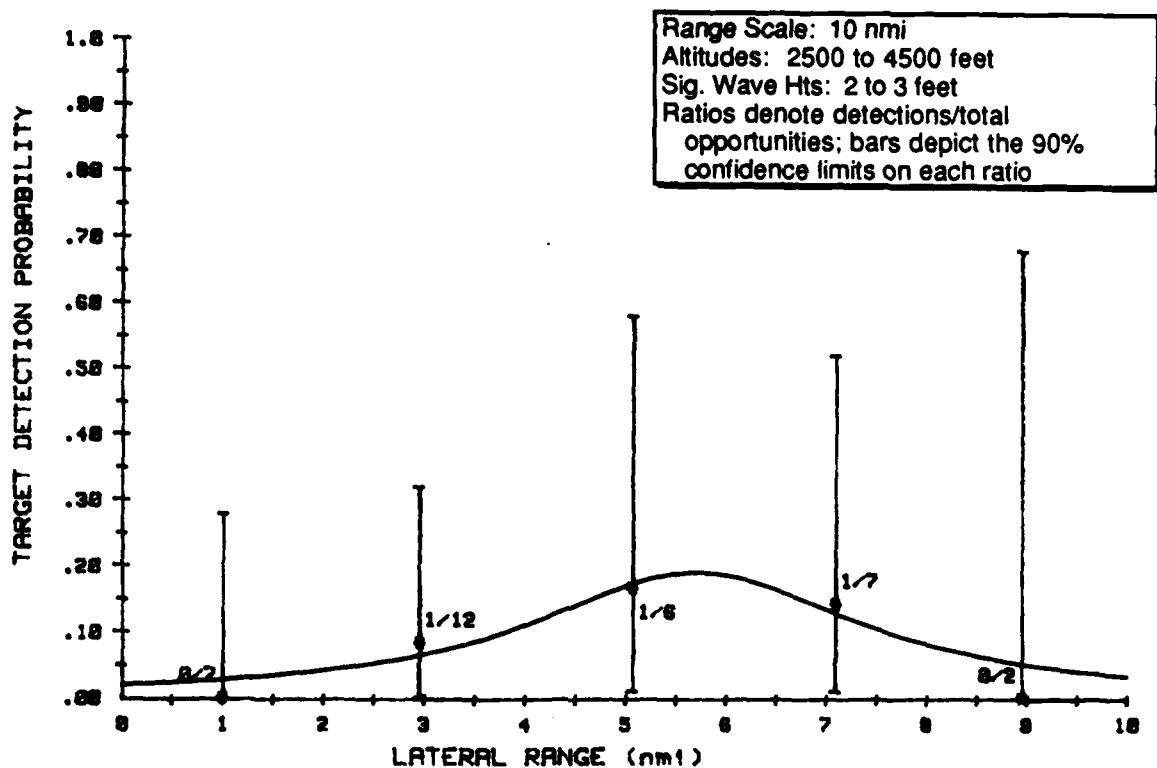


Figure 2-2. APS-127 FLAR Detection of Life Rafts
 (10-nmi range scale; seas 2 to 3 feet)

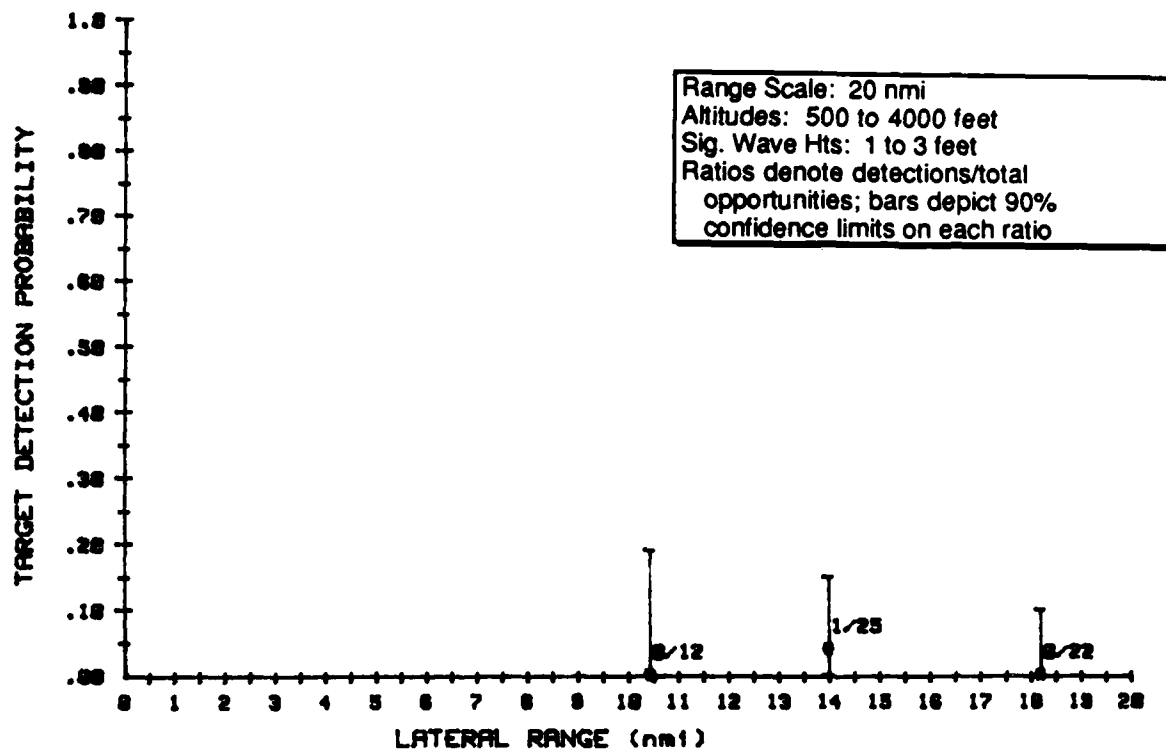


Figure 2-3. APS-127 FLAR Detection of Life Rafts
 (20-nmi range scale; all data)

2.2.1.2 FLAR Detection of Boats

Figures 2-4 through 2-6 depict the raw detection data and least-squares fitted lateral range curves for FLAR detection of 24- to 43-foot boats when the 10-nmi range scale was used. Significant wave height and search altitude were the search variables found during LOGODDS regression analysis to exert significant influence on target detection probability. Figure 2-4 provides the lateral range curve for significant wave heights less than 2 feet when a 500-foot search altitude was used. No data were collected at the 500-foot search altitude for significant wave heights of 2 feet or more.

Figures 2-5 and 2-6 provide lateral range curves for significant wave heights less than 2 feet and 2 to 5 feet, respectively when 2500- to 5000-foot search altitudes were used. Comparison of figures 2-5 and 2-6 indicates that a moderate increase in sea return resulted in approximately a 30-percent reduction in boat target detection probability near the middle of the 10-nmi lateral range curve. Near the inner and outer limits of the 10-nmi curve, target detection probability was not affected by the increase in sea return.

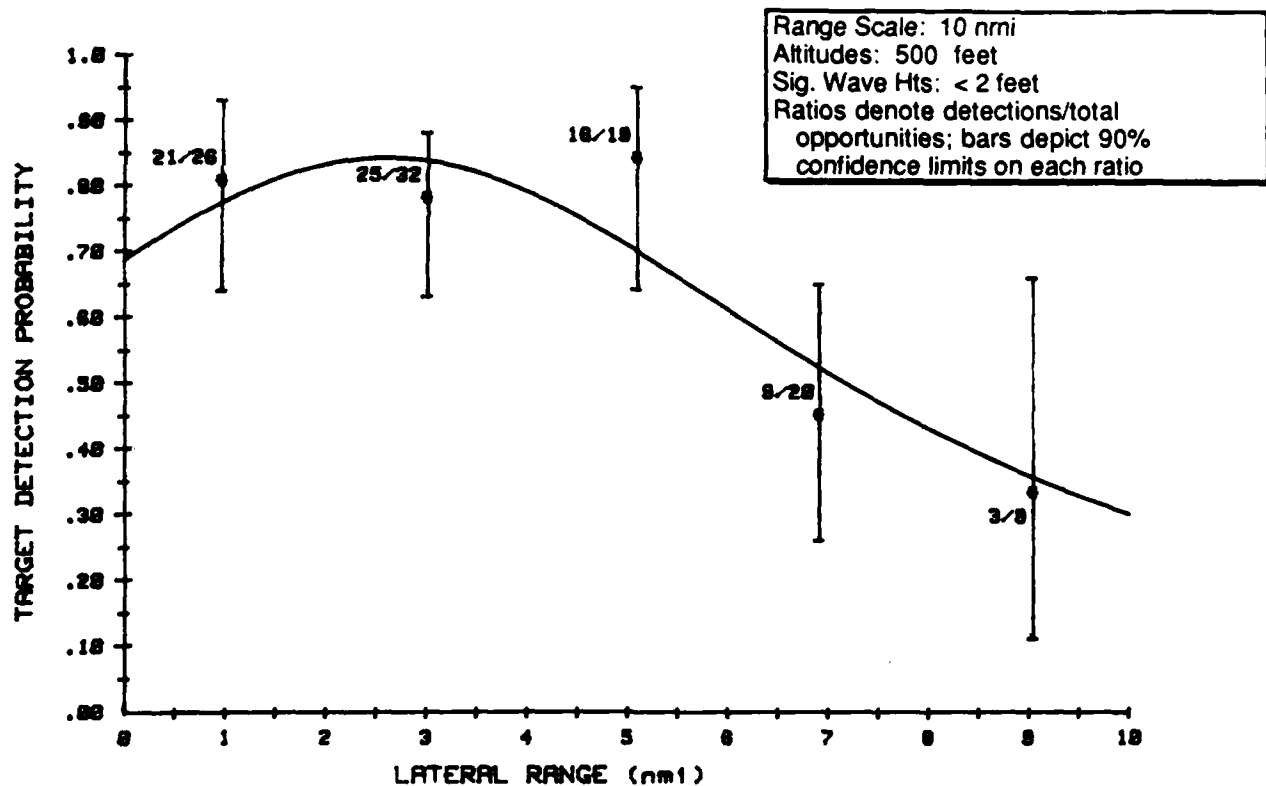


Figure 2-4. APS-127 FLAR Detection of 24- to 43-foot Boats
 (10-nmi range scale; seas < 2 feet; 500-foot altitude)

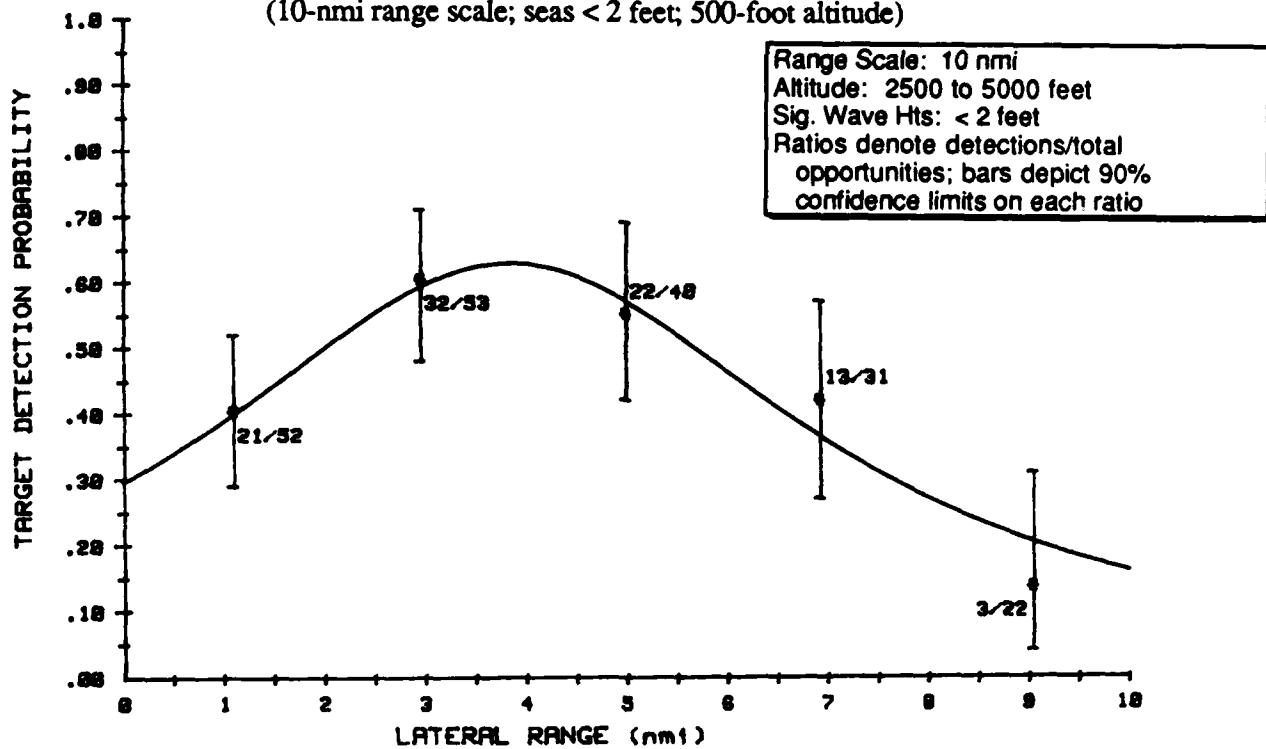


Figure 2-5. APS-127 FLAR Detection of 24- to 43-foot Boats
 (10-nmi range scale; seas < 2 feet; 2500- to 5000-foot altitudes)

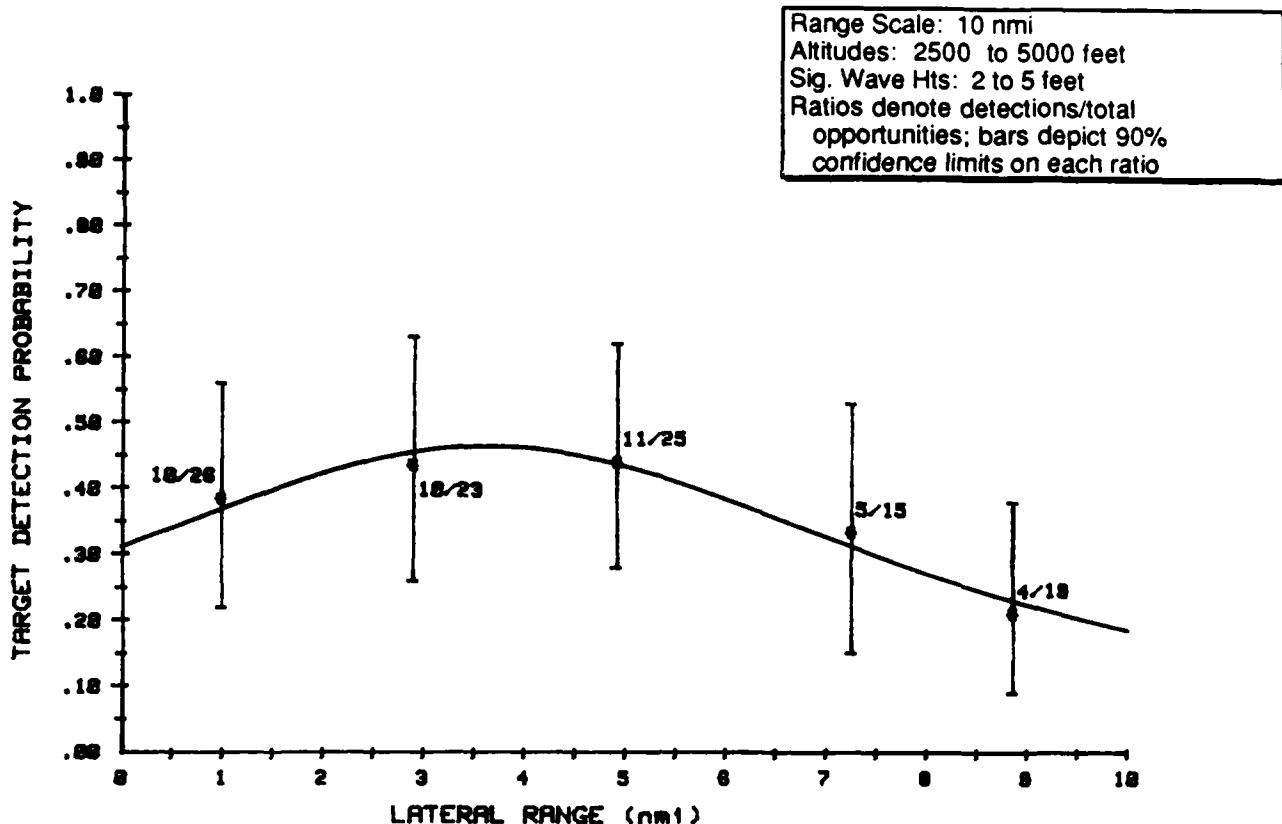


Figure 2-6. APS-127 FLAR Detection of 24- to 43-foot Boats
(10-nmi range scale; seas 2 to 5 feet; 2500- to 5000-foot altitude)

A possible explanation for the change in lateral range curve shape exhibited in figures 2-5 and 2-6 is illustrated in figure 2-7. When seas are relatively calm (less than 2 feet, for example), sea return appears only within a mile or two of the aircraft on a properly adjusted PPI display. This sea return, shown as a shaded area in figure 2-7, occurs because at close range the transmitted radar signal strikes the ocean surface at near-normal angles of incidence, causing much of the signal to be reflected back to the antenna. As range from the aircraft increases, the angles of incidence become shallower and the transmitted signal is reflected away from the aircraft. As ocean waves become steeper, more of the radar signal is reflected back to the antenna and sea return is received over the entire display range. As the FLAR operator adjusts display thresholds to reduce sea return, weaker targets may be lost. In addition to the sea return area that varies with sea state and operator adjustments, a baffle area exists aft of the aircraft that is permanently blanked by the fuselage. For the AN/APS-127 FLAR, this baffle area consists of a 120-degree sector centered at 180-degrees relative bearing as shown in figure 2-7.

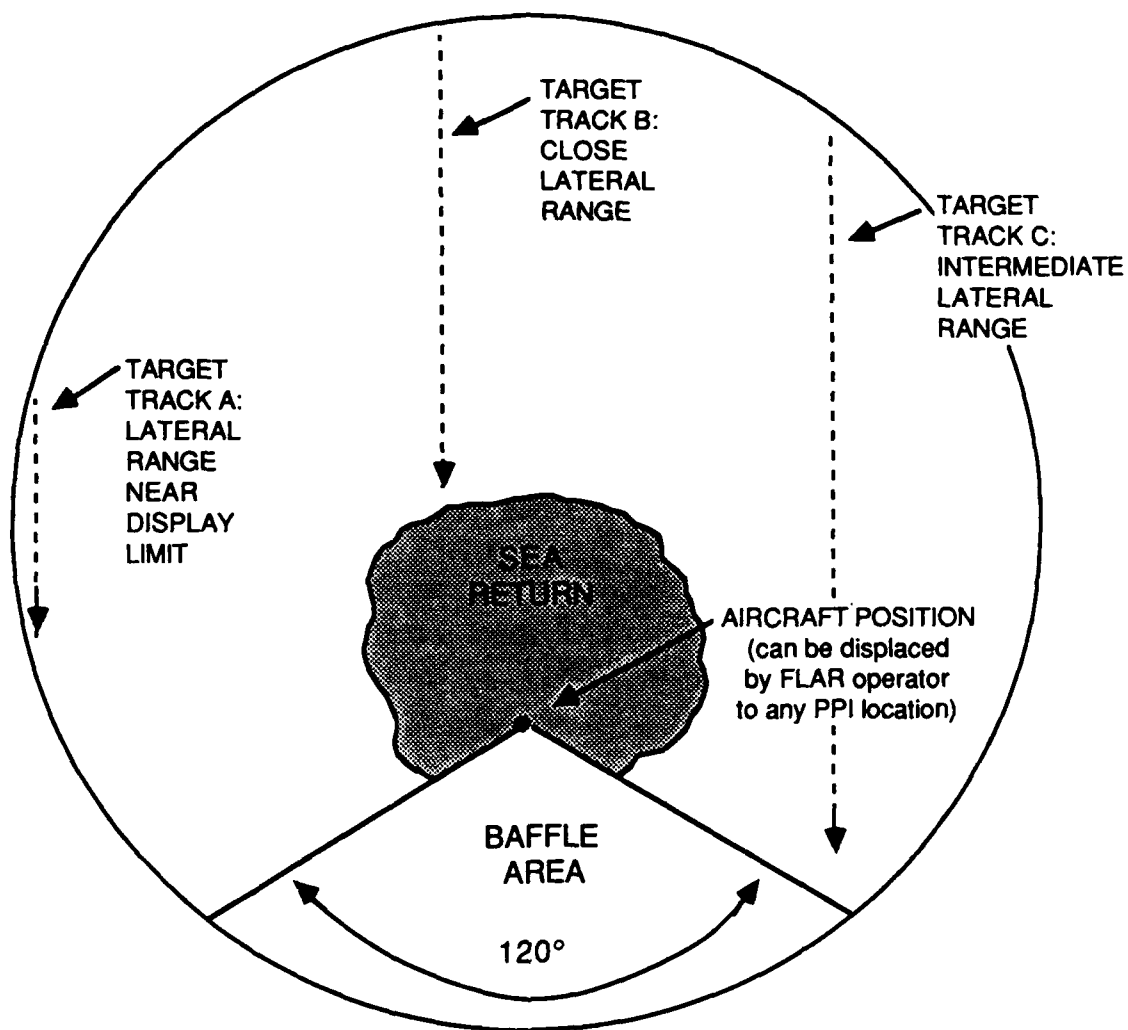


Figure 2-7. Target Tracks Relative to AN/APS-127 FLAR PPI Display

The effects of sea return and baffling, plus the circular shape of the PPI display, combine to create a great deal of variation in the time that a particular radar contact is visible to the operator. In figure 2-7, target tracks A, B, and C illustrate the possibilities. Target track A illustrates that even a strong target will be visible to the FLAR operator only briefly if it is passed at a lateral range close to the FLAR range scale limit. This effect is due to the circular shape of the PPI display and is independent of target strength. A similar situation exists for targets that are passed close-aboard (target track B). In this case, the target is visible only until it becomes masked by sea return. Weak targets will be more easily lost in sea return than strong targets. Aft of the aircraft, the target cannot be redetected because it is in the baffle area. Finally, it can be seen that targets passed at lateral ranges near the middle of the range scale, as illustrated by target track C, are exposed to the operator for the longest possible time.

It is probable, then, that only the strongest radar targets were detected consistently near the inner and outer limits of the 10-nmi FLAR range scale. These targets were probably not susceptible to masking by light-to-moderate sea return, which would explain why target detection probabilities near 0 and 10 nmi remained unchanged from figure 2-5 (seas < 2 feet) to figure 2-6 (seas 2 to 5 feet). The FLAR operator probably noticed the strong targets during their brief exposure even when many other radar contacts were present (a typical situation during the experiment). Weaker radar targets were probably detected most frequently in seas less than 2 feet at intermediate lateral ranges, where they received maximum exposure time on the FLAR display. When significant wave height increased to 2 feet or more, the weaker targets were probably eliminated even at intermediate lateral ranges, which would cause the flattened lateral range curve shape depicted in figure 2-6.

Figures 2-8 and 2-9 depict the raw detection data and LOGODDS lateral range curve fits for FLAR detection of 24- to 27-foot boats and 34- to 43-foot boats, respectively, when the 20-nmi range scale is used. A nominal 2-foot significant wave height was assumed for both LOGODDS curve fits. Significant wave height and boat size (24 to 27 feet versus 34 to 43 feet) were the search variables found to exert significant influence on target detection probability during LOGODDS regression analysis. Search altitude was not found to exert a significant influence on target detection probability as it was when the 10-nmi FLAR range scale was used. Conversely, boat size was found to be a significant parameter in this data set but was not identified as a significant parameter in the 10-nmi range scale data set. Closer examination of the two data sets reveals a likely explanation for this response.

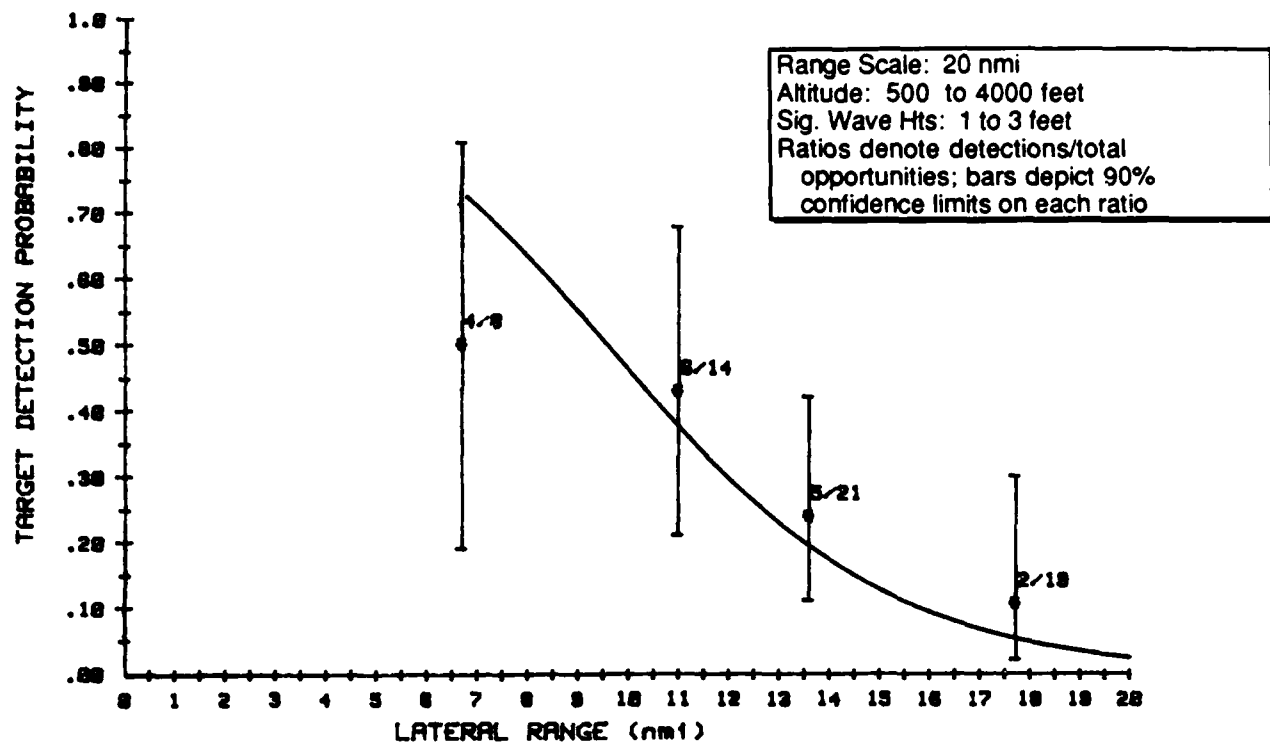


Figure 2-8. APS-127 FLAR Detection of 24- to 27-foot Boats
(20-nmi range scale; all wave heights and altitudes combined)

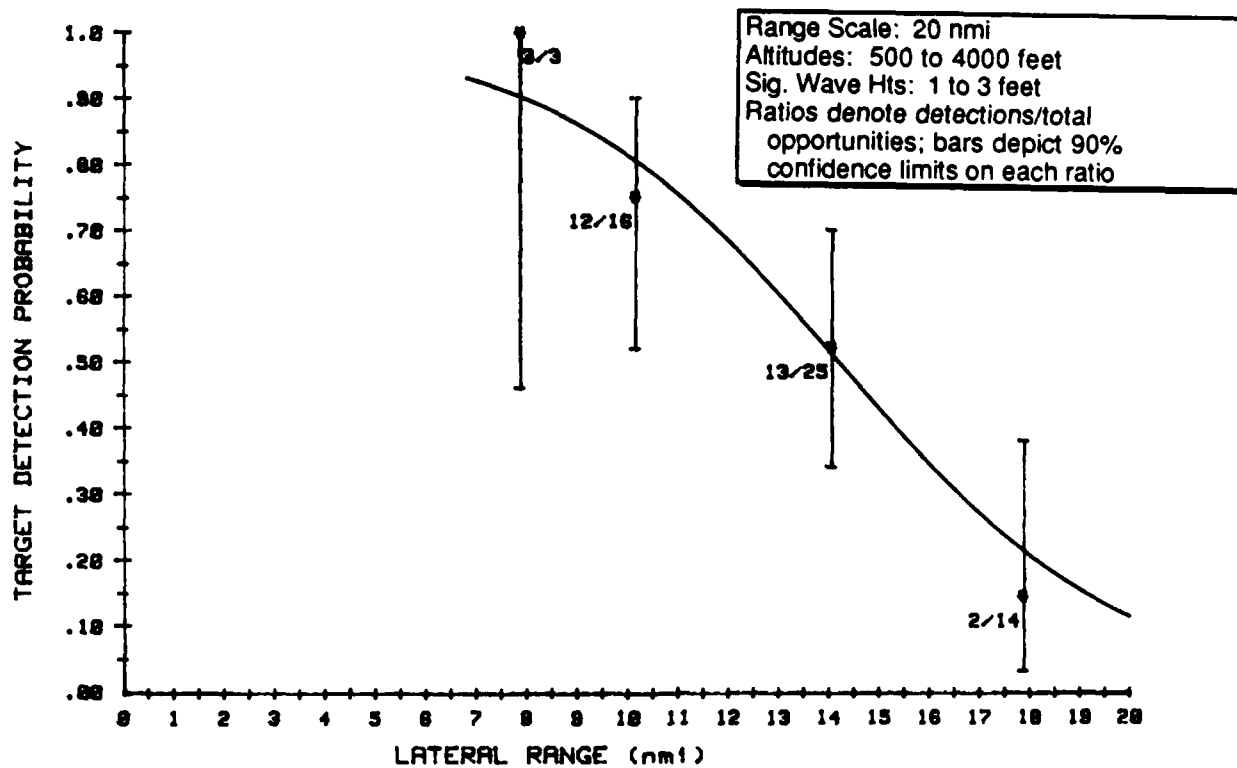


Figure 2-9. APS-127 FLAR Detection of 34- to 43-foot Boats
(20-nmi range scale; all wave heights and altitudes combined)

In the boat target/10-nmi range scale data base, 24- to 27-foot boats comprised only 10 percent (42 of a total 412) of the detection opportunities. This may not have been sufficient for a statistically significant difference in target detectability to be identified even if such a difference did, in fact, exist. Similarly, in the boat target/20-nmi range scale data base, only about 6 percent (7 of 120) of the detection opportunities occurred at 500-foot search altitude. Again, this was probably not sufficient for a statistically significant difference in detection performance to be identified even if such a difference did, in fact, exist. Thus, it is likely that boat size and search altitude both have a significant influence on FLAR sweep width, but the data set is not yet robust enough to quantify this influence for both range scales.

Inspection of figures 2-8 and 2-9 also reveals that no data were collected using the 20-nmi range scale for lateral ranges less than 6 nmi. Limited experiment time and resources dictated that testing of the outer half of the 20-nmi range scale be emphasized. As described in section 1.4.2.4, the remainder of the lateral range curve for the 20-nmi range scale was approximated to obtain sweep width values.

2.2.2 AN/APS-131 SLAR Detection Performance

2.2.2.1 SLAR Detection of Life Rafts

Figure 2-10 depicts the raw detection data and least-squares lateral range curve fit for SLAR detection of life rafts when the 10-nmi range scale was used. None of the search variables evaluated in the LOGODDS regression analysis were found to exert a statistically significant influence on life raft detection probability. This result is not surprising in light of the narrow range of significant wave height and search altitude represented in the data set.

The APS-131 SLAR was designed to be a high-altitude, wide-area surveillance radar; thus, it was not tested at the 500-foot altitude. Based on a 1985 test of the APS-135 SLAR using alerted operators and an analog film display (reference 5), the 2500- to 4000-foot search altitude was expected to yield much better life raft detection performance than is indicated by figure 2-10. During the earlier experiment, detection probabilities of 60 to 80 percent were achieved with 10-person life rafts. The use of unalerted operators, high operator workload (including real-time target logging), and the introduction of the MPD video display vice a film display are potential

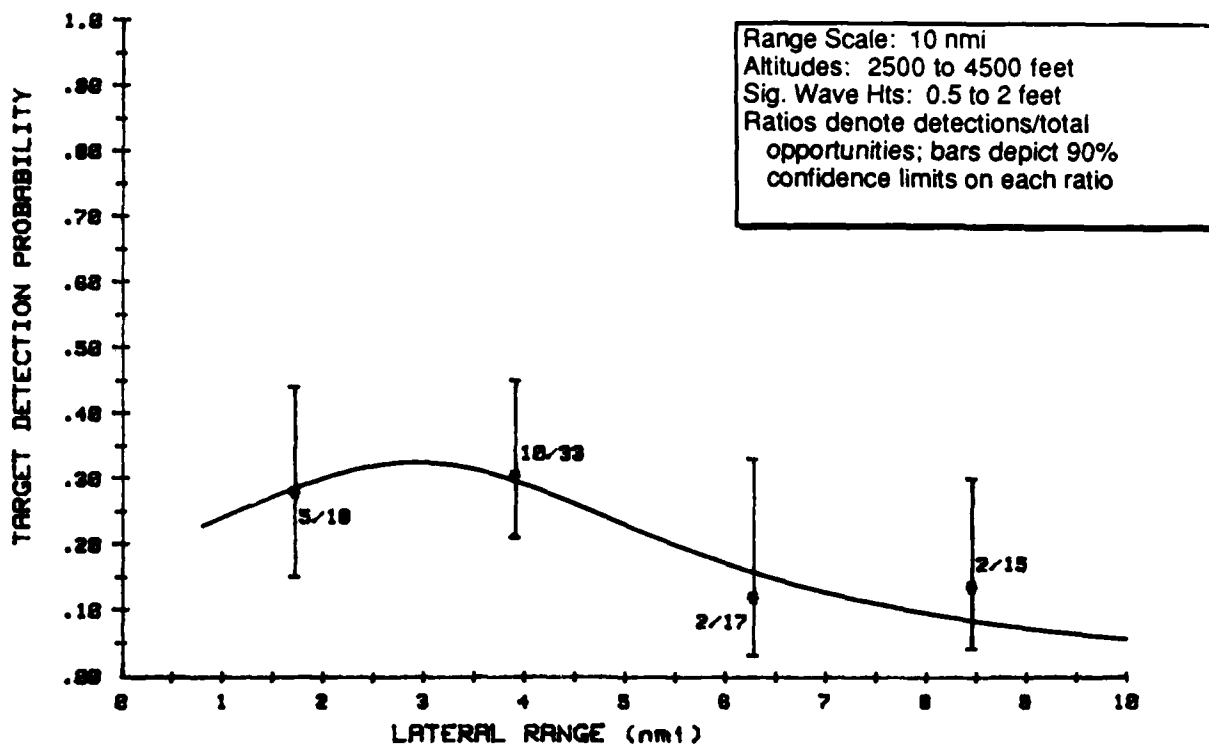


Figure 2-10. APS-131 SLAR Detection of Life Rafts
 (10-nmi range scale; all data)

factors in explaining this degradation in SLAR detection performance. Additional data collection would be required to better identify the cause of the degraded detection performance and to investigate the effect of using a 500-foot SLAR search altitude for small targets.

When the 20-nmi SLAR range scale was tested, none of the 15 life raft target opportunities were detected. While this is a small data set, it suggests that using the wider swath width is ineffective for detecting small search objects such as life rafts.

2.2.2.2 SLAR Detection of Boats

Figure 2-11 depicts the raw detection data and LOGODDS lateral range curve fits for SLAR detection of 24- to 43-foot boats when the 10-nmi range scale was used. As with the life raft targets, none of the search variables evaluated in the LOGODDS regression analysis exerted a statistically significant influence on boat detection probability.

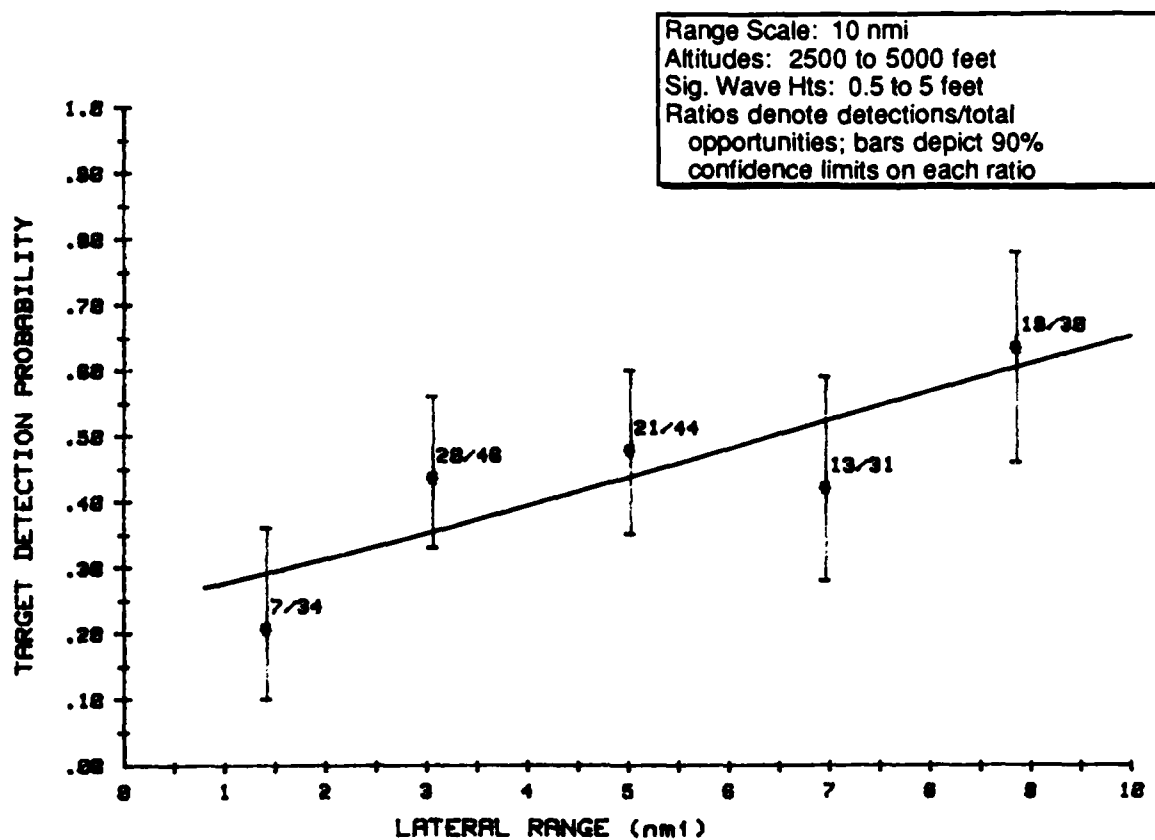


Figure 2-11. APS-131 SLAR Detection of 24- to 43-foot Boats
 (10-nmi range scale; all data)

The most notable feature of the lateral range curve in figure 2-11 is that target detection probability increases steadily with lateral range, implying that the 10-nmi scale does not accommodate the full range of SLAR capability to detect 24- to 43-foot boats. Surprisingly, however, figure 2-12 illustrates that relatively poor detection performance was achieved against boat targets when the 20-nmi range scale was used. In this limited data set, only 3 of 30 targets were detected at ranges from 6 to 20 nmi. No detections were made beyond 12 nmi. The most likely explanation for this apparent contradiction is the circumstances under which the 20-nmi range scale data were collected. All of the 20-nmi scale data were collected during the third week of the experiment. During this period, the SLAR operator was frequently distracted from the search task by SLAR component overheating and videotape recorder failures. It is likely that, with these distractions and the high target densities that existed within the search area, a fair evaluation of the 20-nmi SLAR range scale was not achieved. Collection of a completely new data set appears warranted.

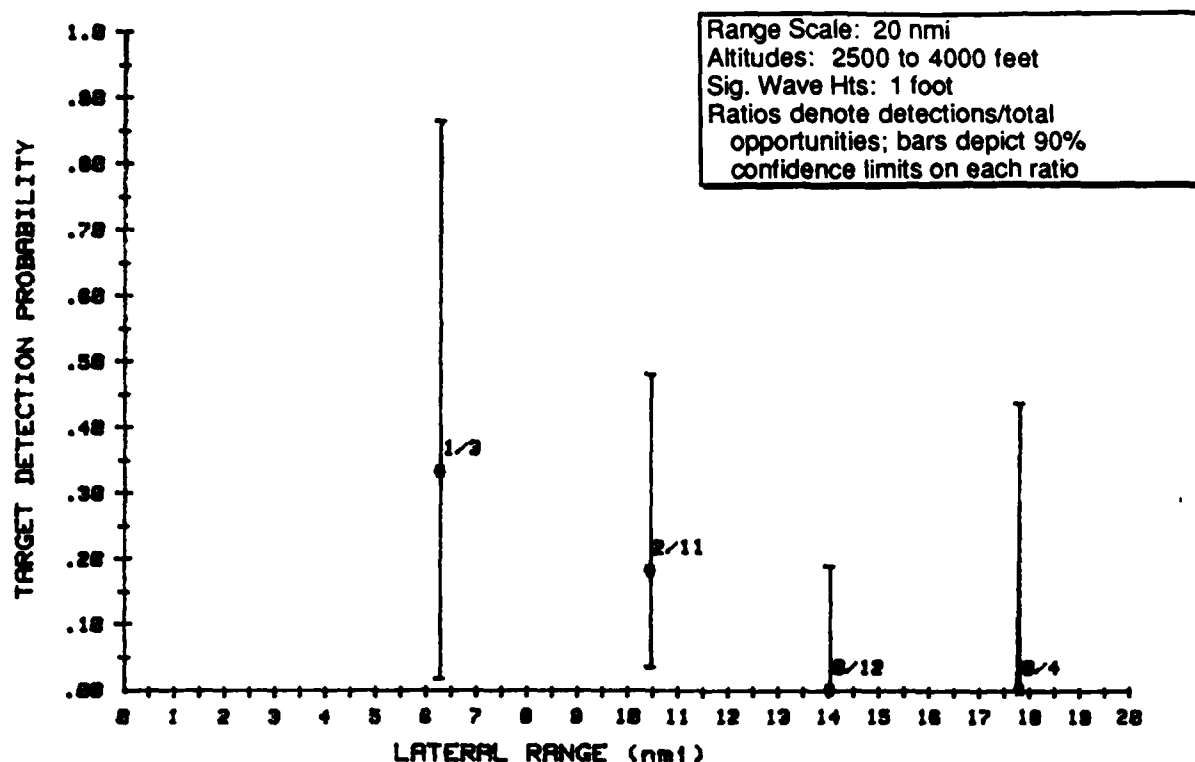


Figure 2-12. APS-131 SLAR Detection of 24- to 43-foot Boats
(20-nmi range scale; all data)

2.2.3 Combined FLAR/SLAR Detection Performance

To obtain combined sensor sweep widths, lateral range curves for the 10-nmi FLAR and SLAR range scales were combined as described in section 1.4.2.4. Sufficient data were available from both sensors to generate combined lateral range curves for raft and boat targets at low and moderate significant wave heights (< 2 feet and 2 to 5 feet for boats; 2 to 3 feet for rafts) when 2500- to 5000-foot search altitudes were used. The four combined lateral range curves are shown in figures 2-13 through 2-16.

The notch-shaped portions of the curves in figures 2-13 through 2-16 reflect the effect of the SLAR blind zone. From 0 to 0.8 nmi, only the APS-127 FLAR was assumed to contribute to target detection probability. The vertical beam pattern of the SLAR is such that its blind zone extends to each side of the aircraft a distance approximately equal to the search altitude. Using a 0.8-nmi blind zone is equivalent to assuming a search altitude of approximately 4800 feet. This value is a conservative representation of the blind zone limits for the data collected.

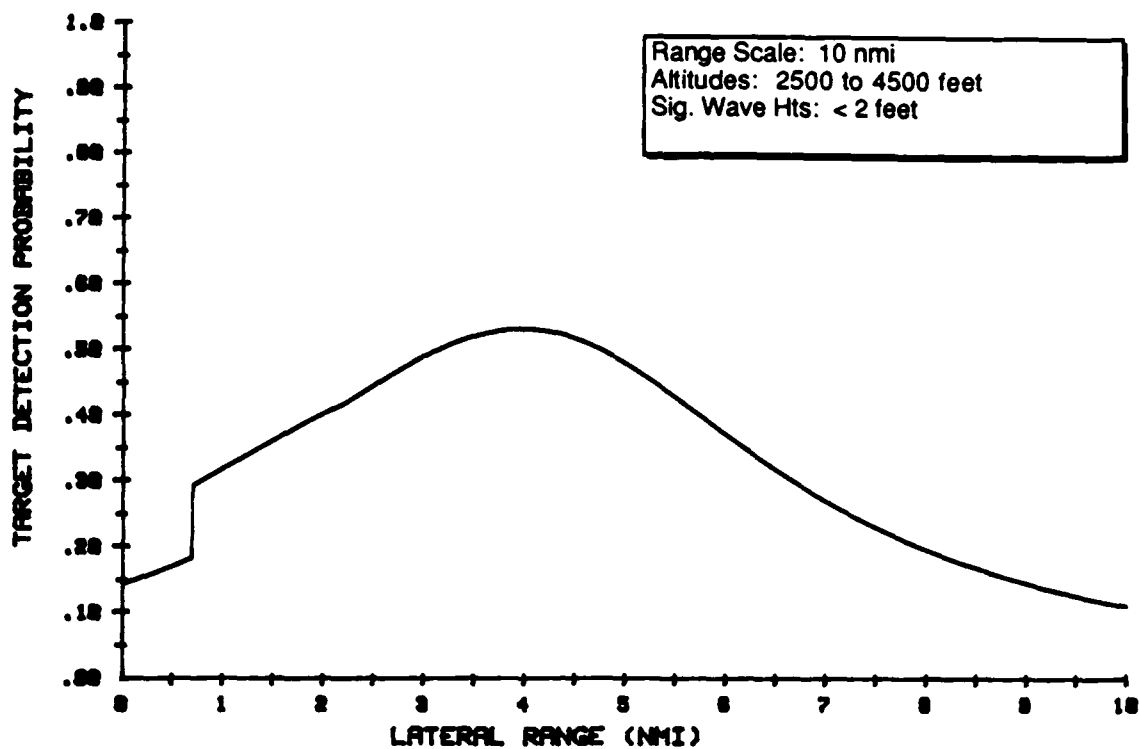


Figure 2-13. Combined FLAR/SLAR Detection of Life Rafts
(10-nmi range scale; seas < 2 feet; 2500- to 4500-foot search altitudes)

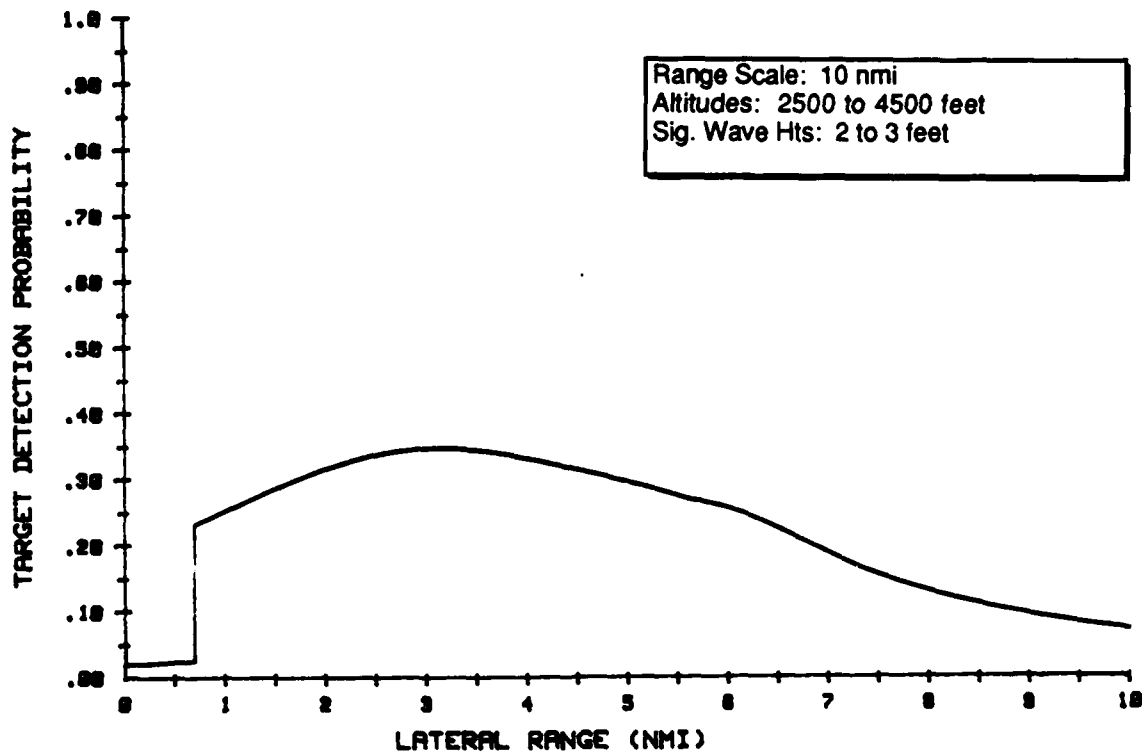


Figure 2-14. Combined FLAR/SLAR Detection of Life Rafts
(10-nmi range scale; seas 2 to 3 feet; 2500- to 4500-foot altitudes)

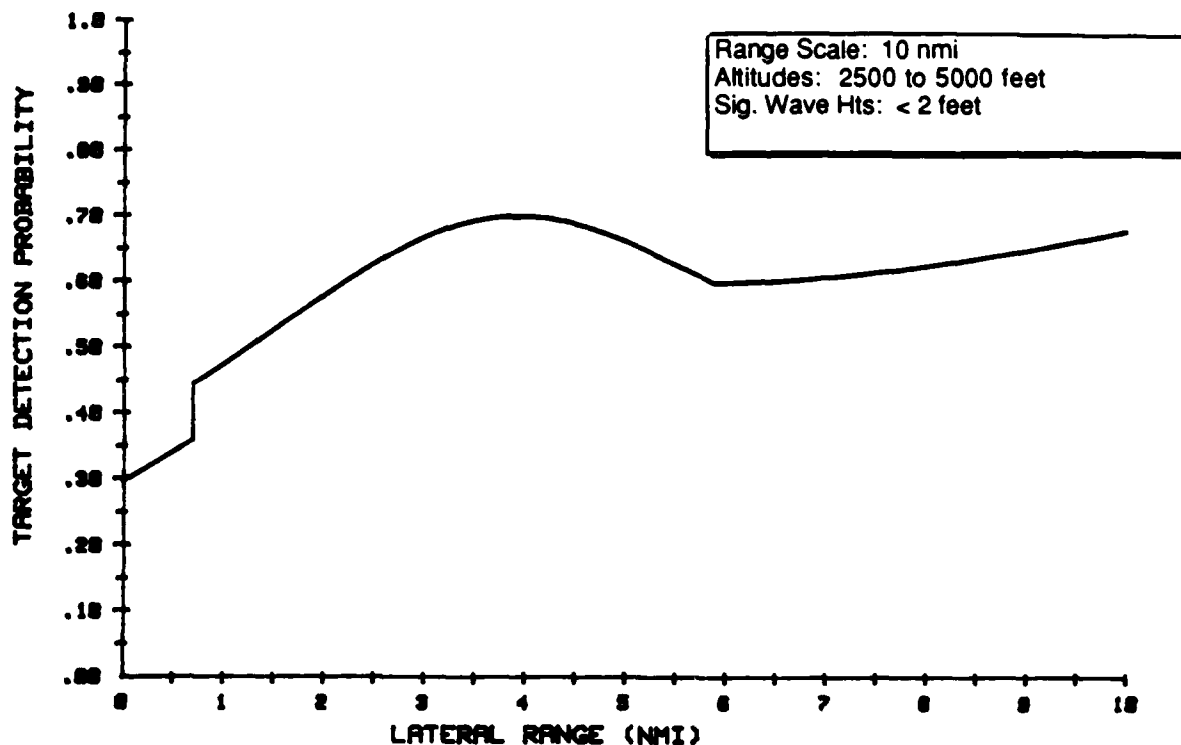


Figure 2-15. Combined FLAR/SLAR Detection of 24- to 43-foot Boats
(10-nmi range scale; seas < 2 feet; 2500- to 5000-foot search altitudes)

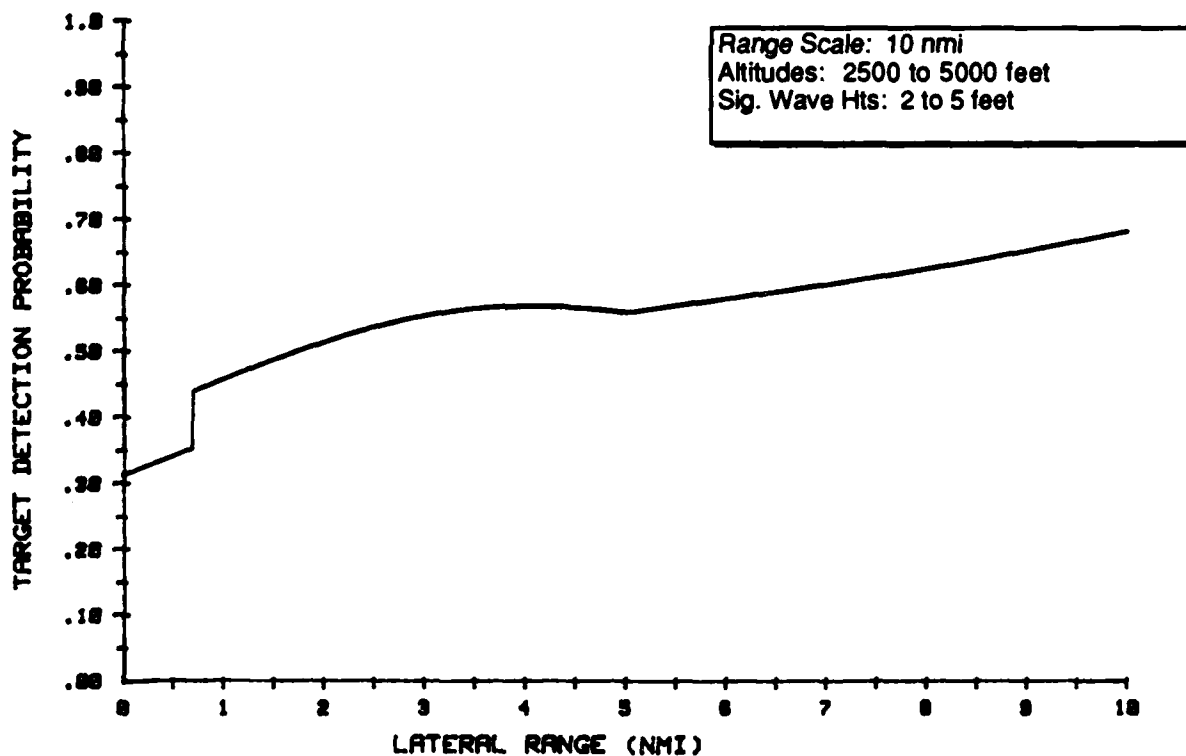


Figure 2-16. Combined FLAR/SLAR Detection of 24- to 43-foot Boats
(10-nmi range scale; seas 2 to 5 feet; 2500- to 5000-foot search altitudes)

Inspection of figures 2-13 and 2-14 indicates that, with life raft targets, the detection performance of the two sensors varies similarly with lateral range. This yields lateral range curves that are similar in shape to those for the individual sensors. Thus, the FLAR and SLAR supplement each other when searching for weak radar targets. Figures 2-15 and 2-16 indicate that while SLAR supplements the FLAR in detecting boats at ranges up to about 5 nmi, it also complements the sharp dropoff in FLAR detection performance at ranges from 5 to 10 nmi.

2.3 TIME ON TASK EFFECTS

In past POD/SAR project studies, time on task was found to exert a significant influence on visual search performance (references 3 and 6). This experiment was the first in which unalerted sensor operators were used to collect radar search performance data. Although no consistent time on task effects were identified during LOGODDS regression analysis of the FLAR and SLAR detection data, operator comments concerning eye fatigue and heavy target reporting workloads prompted a closer look at this parameter.

Time on task is defined by the POD/SAR Project team as time spent actually performing the search task. It does not include such activities as pre-flight preparations, transit to the search area, or between-search breaks within the same sortie. To investigate the time on task parameter, the FLAR/10-nmi range scale/boat target data set was selected for analysis. With 412 target detection opportunities, this data set offered the largest sample size and widest range of time on task values of any available data subset. Time on task values in this data set ranged from 0.0 to 1.9 hours.

Figure 2-17 illustrates the results of sorting the selected data into 0.5-hour time on task bins. The data indicate that target detection probability improved after the first half-hour of searching, remained at a relatively high level from 0.5 to 1.5 hours, and then deteriorated in the 1.5- to 2.0-hour period. The shape of the curve is unimodal, which explains why the LOGODDS regression analysis method (which assumes a monotonic response) was unable to identify a significant time on task effect.

The low target detection probabilities achieved during the first half-hour of search are somewhat surprising. One would assume that operator performance would start at a high level and subsequently degrade with operator fatigue as was reported for visual search in reference 6.

AN/APS-127 FLAR
 Range Scale: 10 nmi
 All data included
 Ratios denote detections/total
 opportunities; bars depict 90%
 confidence limits on each ratio

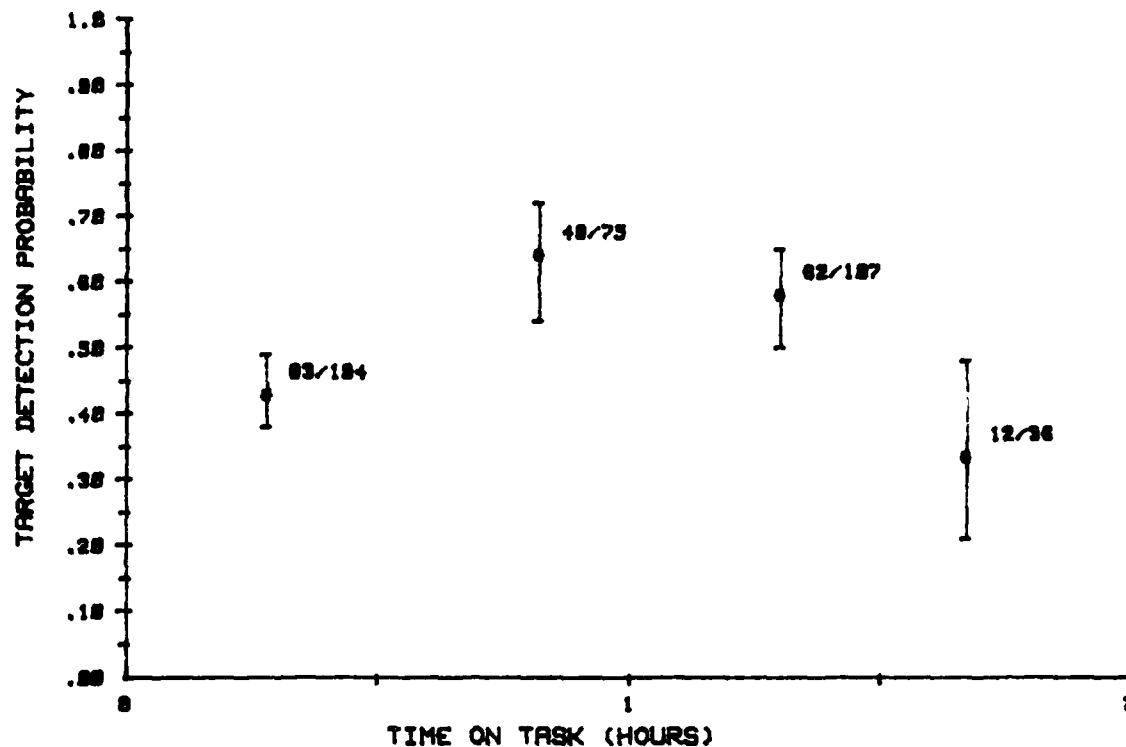


Figure 2-17. Effect of Time on Task on Target Detection Probability

The most likely explanation for this initially-low detection performance seems to be operator distraction. Once the HU-25A aircraft is airborne, the radar operators perform a number of tasks in addition to actually monitoring their displays for targets. These tasks include establishing radio guards; initializing navigation, sensor, and display/recording subsystems; and fine-tuning sensors and displays to optimize their performance. Transit time to the exercise area was usually only about 5 minutes, with the result that many of the above-described initialization tasks were still in progress when searches began. These necessary but distracting activities may well account for the initially-low target detection probability illustrated in figure 2-17.

CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

3.1 CONCLUSIONS

3.1.1 AN/APS-127 FLAR Detection Performance

Based on the analyses presented in section 2.2.1, the following conclusions are drawn concerning AN/APS-127 FLAR detection performance:

1. The AN/APS-127 FLAR provides a useful detection capability against life raft targets when the 10-nmi range scale is employed. Use of the 20-nmi range scale provides no improvement in detection performance and may degrade detection capability at lateral ranges less than 10 nmi.
2. The AN/APS-127 FLAR provides a useful detection capability against 24- to 43-foot boats when either the 10- or 20-nmi range scale is used.
3. Target detection performance of the AN/APS-127 FLAR is significantly better when seas are less than 2 feet than when seas are 2 to 5 feet.
4. Data collected using boat targets and the 10-nmi range scale indicate that a 500-foot search altitude provides significantly better detection performance than 2500- to 5000-foot search altitudes. Use of the 500-foot search altitude is especially important when seas are greater than 2 feet because higher altitudes tend to enhance sea return (see references 3 and 12).
5. Data collected using boat targets and the 20-nmi range scale indicate that 24- to 27-foot boats are significantly less detectable than 34- to 43-foot boats. This conclusion could not be supported with data collected using the 10-nmi range scale because the smaller boat size was not well-represented in that data.

3.1.2 AN/APS-131 SLAR Detection Performance

Based on the analyses presented in section 2.2.2, the following conclusions are drawn concerning AN/APS-131 SLAR detection performance:

1. The AN/APS-131 SLAR provides a useful detection capability against life raft targets when the 10-nmi swath width is used. Use of the the 20-nmi swath width does not appear to be advisable with these targets (0 of 15 targets were detected during the experiment), but additional data would be required to provide statistically-valid conclusions.
2. The AN/APS-131 SLAR provides a useful detection capability against 24- to 43-foot boats when the 10-nmi swath is used. No conclusions can be drawn concerning the 20-nmi swath width until a more extensive data set is obtained.
3. Within the limits of the data set collected, significant wave height and boat target size did not exert a statistically significant influence on SLAR detection performance. The influence of search altitude was not addressed during this evaluation because excellent results had been obtained using 2500- to 4000-foot altitudes during previous research (reference 5).
4. Due to the limited quantity and questionable quality of the SLAR data collected, operational SLAR sweep widths will not be promulgated pending collection of additional data.

3.1.3 General

The target detection performance of Coast Guard FLAR/SLAR operators appears to be influenced by time on task in two ways:

1. During the first half-hour of a flight, operator detection performance may suffer from distractions associated with equipment initialization/adjustment and collateral duties such as communications and navigation chores.

2. After approximately 1.5 hours of time on the search task, operator detection performance appears to degrade due to psychological and/or physiological fatigue.

3.2 RECOMMENDATIONS

The following recommendations are made concerning HU-25A electronic search planning and tactics based upon the results of analyses presented in chapter 2.

3.2.1 AN/APS-127 FLAR Searches

1. The sweep widths provided in table 3-1 should be used by Coast Guard search planners to represent the FLAR search performance of HU-25A aircraft. These sweep width values may represent a lower bound on operational values because of the intense target reporting workload experienced during the experiment. However, the 5.4-nmi life raft sweep width obtained for seas less than 2 feet during this experiment compares favorably with the 5-nmi sweep width estimate provided in reference 13. The latter estimate was computed from data that were collected using alerted FLAR operators who had few extraneous targets to contend with. Thus, the sweep width values in table 3-1 should be considered accurate unless shown to be too conservative by future data collection.
2. AN/APS-127 operators should keep the sweep origin near the bottom of the PPI display when searching in the preferred Ground Stabilized mode. This practice will maximize exposure time for targets that pass close aboard.
3. When target echoes are difficult to distinguish from sea return, AN/APS-127 searches should be conducted at the lowest altitude consistent with safety of flight operations. When higher search altitudes must be used due to weather, air traffic, or the operating requirements of other onboard sensors/systems, degraded sweep width estimates should be used where available.

Table 3-1. Sweep Widths for AN/APS-127 FLAR

RANGE SCALE (nmi)	TARGET TYPES	SEARCH ALTITUDES REPRESENTED (feet)	SIGNIFICANT WAVE HEIGHTS REPRESENTED (feet)	SWEEP WIDTH (nmi)
10	6- to 10- person life rafts	500 to 4500	< 2	5.4
			2 to 3	1.8
	24- to 43-foot boats	500	< 2	12.8
			2 to 5	10.8 ¹
		2500 to 5000	< 2	8.5
			2 to 5	7.2
20	6- to 10-person life rafts	500 to 4000	1 to 3	nil ²
	24- to 27-foot boats	500 to 4000	< 2	23.2 ³
			2 to 3	9.7 ³
	34- to 43-foot boats	500 to 4000	< 2	31.1 ³
			2 to 3	17.4 ³

NOTES

1. Extrapolated value only. No data were collected at this altitude/wave height.
2. Based upon data collected at lateral ranges between 9 and 20 nmi only. Some detection capability may exist at closer ranges, but this capability was not evaluated during the experiment due to time limitations.
3. Based upon data collected at lateral ranges between 6 and 20 nmi only. Contribution of sensor performance at closer ranges was estimated as described in section 1.4.2.4.

3.2.2 AN/APS-131 SLAR Searches

1. Based on analyses presented in reference 5, 2500- to 4000-foot search altitudes should be used in lieu of an 8000-foot search altitude when searching for life rafts or 24- to 43-foot boats with the AN/APS-131 SLAR.
2. The SLAR overheating problems experienced during this evaluation should be investigated and alleviated, if possible, to improve sensor reliability.

3.2.3 Combined FLAR/SLAR Searches

1. When both sensor operators are FLAR- and SLAR-qualified, they should consider exchanging positions near the midpoint of a search sortie. This practice might serve to diminish the operator performance degradation experienced after approximately 1.5 hours' time on task.

3.2.4 General Recommendations

1. Sufficient time should be provided prior to commencing search for electronic sensor operators to initialize and adjust their equipment. Collateral operator duties other than the search task should also be completed prior to commencing search. These tasks can usually be completed while en route to the search area, but extra lead time may be required when short transits are involved.

3.2.5 Recommendations for Future Research

1. Additional data should be collected using the 20-nmi range scale of the AN/APS-127 FLAR against 20- to 45-foot boat targets. Special emphasis should be placed on obtaining some of the detection opportunities at lateral ranges less than 10 nmi.
2. Additional data should be collected using the 20-nmi swath width of the AN/APS-131 SLAR against 20- to 45-foot boats and life rafts.

3. Additional data should be collected using the 10-nmi range scale of the AN/APS-127 FLAR against raft and boat targets. Specifically, the 500-foot search altitude should be evaluated in 2- to 5-foot seas.
4. The FLAR and SLAR sensors should be further evaluated against boats in seas greater than 4 feet.
5. The detection performance of longer SLAR range scales should be investigated against appropriate SAR targets when resources become available.

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APPENDIX A

RAW DATA

This appendix contains raw data files for the AN/APS-127 FLAR and the AN/APS-131 SLAR in chronological order. The following is a key to the format of the raw data files.

1. AN/APS-127 Forward Looking Airborne Radar (FLAR):

Column 1: Detection (1 = yes, 0 = no)

Column 2: Lateral Range (nautical miles)

Column 3: Time on Task (hours)

Column 4: Range Scale (nautical miles)

Column 5: Clutter Envelope Processor (CEP) (1 = on, 0 = off)

Column 6: Fast Time Constant (FTC) (1 = on, 0 = off)

Column 7: Stabilization (STAB) (1 = ground, 2 = heading, 3 = north)

Column 8: Wind Speed (knots)

Column 9: Significant Wave Height (feet)

Column 10: Altitude (feet)

Column 11: Search Speed (knots)

Column 12: Target Identification Number

0	= 6-Person Switlik Life Raft
1	= 10-Person Goodrich Life Raft
2	= 10-Person Goodrich Life Raft
3	= 10-Person Switlik Life Raft
4	= Sea Hawk
5	= Gen Too III
5:1	= CG 252501
6	= Vivant
7	= Oceaneer
8	= Jade East
9	= Skippers II
10	= Lady Irene
11	= Pete's Pride
12	= CG 41341

2. AN/APS-131 Side Looking Airborne Radar (SLAR):

Column 1: Detection (1 = yes, 0 = no)

Column 2: Lateral Range (nautical miles)

Column 3: Time on Task (hours)

Column 4: Range Scale (nautical miles)

Column 5: Wind Speed (knots)

Column 6: Significant Wave Height (feet)

Column 7: Altitude (feet)

Column 8: Search Speed (knots)

Column 9: Target Identification Number

- 0 = 6-Person Switlik Life Raft
- 1 = 10-Person Goodrich Life Raft
- 2 = 10-Person Goodrich Life Raft
- 3 = 10-Person Switlik Life Raft
- 4 = Sea Hawk
- 5 = Gen Too III
- 5.1 = CG 252501
- 6 = Vivant
- 7 = Oceaneer
- 8 = Jade East
- 9 = Skippers II
- 10 = Lady Irene
- 11 = Pete's Pride
- 12 = CG 41341

0	6.40	1.50	10.00	0.00	0.00	1.00	10.00	2.00	2500.00	250.00	2.00
0	5.10	1.50	10.00	0.00	0.00	1.00	10.00	2.00	2500.00	250.00	11.00
0	0.00	1.50	10.00	0.00	0.00	1.00	10.00	2.00	2500.00	250.00	9.00
1	3.80	0.00	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	9.00
1	2.30	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	8.00
1	2.30	0.20	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	10.00
1	5.50	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	8.00
1	1.60	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	7.00
1	3.00	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	11.00
1	0.20	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	9.00
0	4.20	0.40	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	9.00
1	2.40	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	7.00
1	1.20	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	10.00
0	0.00	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	11.00
0	5.20	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	7.00
0	2.00	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	3.00
0	3.60	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	1.00
0	0.40	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	2.00
0	5.30	0.10	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	10.00
0	1.50	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	3.00
0	0.30	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	1.00
0	2.80	0.30	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	2.00
0	9.50	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	8.00
0	6.80	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	11.00
0	5.40	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	3.00
0	3.60	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	1.00
0	6.80	0.50	10.00	0.00	0.00	1.00	8.30	1.50	2500.00	250.00	2.00
1	6.40	1.20	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	7.00
1	5.00	1.20	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	10.00
1	4.20	1.40	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	9.00
1	2.50	1.50	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	11.00
0	9.60	1.00	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	10.00
0	8.30	1.20	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	9.00
0	9.20	1.20	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	3.00
1	7.50	1.20	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	1.00
1	3.10	1.40	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	1.00
0	6.30	1.40	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	2.00
0	4.90	1.40	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	3.00
1	2.30	1.40	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	7.00
0	6.50	1.40	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	11.00
0	0.30	1.60	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	9.00
0	1.10	1.60	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	3.00
1	1.70	1.60	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	7.00
0	2.60	1.60	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	2.00
0	6.00	1.60	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	8.00
0	3.00	1.60	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	10.00
0	0.50	1.70	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	1.00
0	7.00	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	10.00
0	1.80	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	8.00
0	1.90	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	2.00
0	5.30	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	1.00
0	3.70	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	3.00
0	6.40	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	7.00
0	2.20	1.80	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	11.00
0	4.20	1.90	10.00	0.00	0.00	1.00	11.00	1.50	4500.00	250.00	9.00
0	9.40	1.50	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	8.00
0	0.50	1.50	10.00	0.00	0.00	1.00	9.00	1.50	4500.00	250.00	10.00

0	3.70	1.20	10.00	0.00	0.00	1.00	10.00	1.50	500.00	250.00	11.00
0	9.60	1.20	10.00	0.00	0.00	1.00	10.00	1.50	500.00	250.00	9.00
0	6.40	1.20	10.00	0.00	0.00	1.00	10.00	1.50	500.00	250.00	10.00
1	0.30	1.30	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	8.00
1	4.00	1.40	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	11.00
1	4.90	1.50	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	9.00
1	6.00	1.50	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	12.00
1	3.20	1.50	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	2.00
1	4.90	1.50	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	8.00
1	3.50	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	10.00
1	2.60	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	7.00
1	3.00	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	3.00
1	1.10	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	12.00
1	0.00	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	9.00
0	9.80	1.40	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	9.00
0	6.40	1.30	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	10.00
0	7.50	1.40	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	7.00
0	1.90	1.40	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	2.00
0	4.00	1.40	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	1.00
0	7.10	1.40	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	3.00
0	1.00	1.60	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	1.00
0	2.00	1.50	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	3.00
0	1.50	1.60	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	10.00
0	1.20	1.50	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	11.00
0	2.50	1.60	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	7.00
0	6.00	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	1.00
0	8.20	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	2.00
0	6.20	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	11.00
0	10.00	1.70	10.00	0.00	0.00	1.00	4.40	1.50	500.00	250.00	8.00
1	5.70	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	10.00
1	2.30	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	8.00
1	7.00	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	7.00
1	3.00	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	11.00
1	2.60	1.40	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	11.00
1	1.60	1.50	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	7.00
1	3.00	1.50	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	8.00
1	4.40	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	10.00
1	1.40	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	9.00
0	3.50	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	1.00
0	1.20	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	2.00
0	6.40	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	3.00
0	8.70	1.30	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	9.00
0	3.40	1.40	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	9.00
0	4.20	1.50	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	2.00
0	1.90	1.50	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	1.00
0	1.00	1.50	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	3.00
0	0.50	1.50	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	10.00
0	7.30	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	11.00
0	9.00	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	2.00
0	6.60	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	1.00

0	3.30	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	3.00
0	7.80	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	8.00
0	3.30	1.60	10.00	0.00	0.00	1.00	4.00	1.50	500.00	250.00	7.00
1	0.50	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	9.00
1	5.20	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	11.00
0	1.70	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	3.00
1	6.10	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	8.00
1	3.00	0.90	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	10.00
1	0.30	0.90	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	8.00
0	3.50	1.00	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	3.00
1	4.30	1.00	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	7.00
1	0.10	1.00	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	11.00
1	5.70	1.00	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	9.00
1	4.80	1.10	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	11.00
1	4.10	1.10	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	8.00
1	9.10	1.10	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	7.00
0	0.90	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	7.00
0	7.00	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	2.00
0	4.70	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	1.00
1	2.20	0.80	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	10.00
0	1.70	1.00	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	2.00
0	0.70	1.00	10.00	1.00	0.00	1.00	9.00	1.50	500.00	250.00	1.00
0	3.10	1.20	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	2.00
0	5.40	1.20	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	1.00
0	8.30	1.20	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	3.00
0	7.90	1.20	10.00	0.00	0.00	1.00	9.00	1.50	500.00	250.00	10.00
1	3.00	0.00	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	11.00
1	1.30	0.00	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	2.00
1	1.50	0.20	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	10.00
1	6.50	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	1.00
1	8.20	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	8.00
1	4.00	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	10.00
1	6.10	0.70	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	9.00
0	8.90	0.00	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	9.00
0	3.60	0.10	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	1.00
0	6.50	0.10	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	3.00
0	7.80	0.10	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	7.00
0	1.80	0.10	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	8.00
0	6.50	0.10	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	10.00
0	2.90	0.20	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	8.00
0	3.50	0.20	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	2.00
0	1.20	0.20	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	1.00
0	1.70	0.30	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	3.00
0	2.80	0.20	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	7.00
0	1.80	0.30	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	11.00
0	4.00	0.30	10.00	0.00	0.00	1.00	6.00	1.50	4000.00	250.00	9.00
0	1.30	0.40	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	9.00
0	7.00	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	11.00
0	3.60	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	3.00
0	8.80	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	2.00
0	2.50	0.50	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	7.00
0	9.50	0.60	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	10.00
0	7.90	0.70	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	7.00
0	3.80	0.70	10.00	1.00	0.00	1.00	6.00	1.50	4000.00	250.00	3.00

CG2118	15	JUNE 87	FLAR	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	11.00
1	1.90	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	11.00
1	2.10	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	3.00
1	5.00	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	1.00
1	1.00	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	7.00
1	5.10	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	8.00
1	3.50	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	11.00
0	4.20	0.50	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	10.00
1	4.90	0.50	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	1.00
1	5.80	0.50	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	7.00
0	0.20	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	2.00
0	4.20	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	7.00
0	0.00	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	8.00
0	4.20	0.10	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	10.00
0	3.10	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	3.00
0	0.40	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	1.00
0	5.20	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	2.00
0	0.70	0.30	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	10.00
0	7.90	0.50	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	3.00
0	9.90	0.50	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	8.00
0	8.40	0.50	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	11.00
0	9.30	0.70	10.00	0.00	0.00	0.00	1.00	2.00	1.00	2500.00	250.00	10.00
1	3.10	0.80	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	1.00
1	4.00	0.80	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	7.00
1	6.10	0.90	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	3.00
1	3.00	0.90	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	10.00
1	6.40	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	10.00
1	2.00	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	8.00
1	1.80	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	2.00
1	3.20	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	11.00
0	8.20	0.90	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	2.00
0	8.10	0.90	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	8.00
0	6.60	0.80	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	11.00
0	3.90	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	3.00
0	6.90	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	1.00
0	6.00	1.10	10.00	0.00	0.00	0.00	1.00	0.00	1.00	500.00	250.00	7.00
1	3.30	1.20	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	11.00
1	1.80	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	11.00
1	2.20	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	1.00
1	1.20	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	7.00
1	0.80	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	3.00
1	2.60	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	8.00
1	3.00	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	2.00
1	1.80	1.50	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	10.00
1	4.00	1.60	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	7.00
0	6.10	1.20	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	7.00
0	2.30	1.20	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	8.00
0	7.10	1.20	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	1.00
0	2.00	1.20	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	2.00
0	4.10	1.20	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	3.00
0	7.70	1.60	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	8.00
0	7.00	1.60	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	11.00
0	3.20	1.60	10.00	0.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	10.00

0	2.90	1.60	10.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	1.00
0	8.00	1.60	10.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	2.00
0	5.90	1.60	10.00	0.00	0.00	1.00	0.00	1.00	4000.00	250.00	3.00
1	5.10	0.00	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	1.00
1	3.50	0.00	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	7.00
1	0.70	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	8.00
1	4.10	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	8.00
1	2.80	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	3.00
1	5.00	0.20	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	2.00
1	0.20	0.20	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	1.00
1	4.90	0.20	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	11.00
1	6.70	0.40	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	7.00
1	4.50	0.40	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	10.00
0	0.10	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	11.00
0	2.10	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	3.00
0	0.10	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	2.00
0	5.90	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	10.00
0	0.90	0.10	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	10.00
0	1.40	0.20	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	7.00
0	9.30	0.40	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	8.00
0	8.00	0.40	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	3.00
0	5.00	0.40	10.00	0.00	0.00	1.00	7.90	1.50	4000.00	250.00	1.00
1	7.30	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	10.00
1	4.30	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	3.00
1	3.20	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	8.00
1	2.10	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	2.00
1	1.60	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	11.00
1	5.40	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	7.00
1	3.80	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	11.00
1	0.10	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	7.00
1	3.20	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	2.00
1	2.10	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	8.00
1	1.10	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	3.00
1	2.20	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	10.00
1	7.00	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	8.00
1	5.00	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	7.00
1	8.20	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	2.00
1	8.70	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	11.00
0	7.30	1.00	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	1.00
0	1.90	1.20	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	1.00
0	2.90	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	10.00
0	6.00	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	3.00
0	3.10	1.40	10.00	0.00	0.00	1.00	8.60	1.50	500.00	250.00	1.00
1	8.30	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	11.00
1	4.70	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	7.00
1	7.20	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	8.00
1	2.70	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	10.00
1	2.10	0.70	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	10.00
1	0.90	0.80	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	3.00
1	0.30	0.80	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	7.00
1	3.00	0.80	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	2.00
1	2.10	0.80	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	1.00
1	3.40	0.80	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	11.00
1	1.60	0.90	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	11.00

1	7.00	0.90	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	2.00
1	5.30	0.90	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	7.00
1	3.00	0.90	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	8.00
1	4.20	0.90	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	3.00
1	7.20	1.00	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	10.00
0	8.10	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	2.00
0	3.00	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	1.00
1	5.90	0.60	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	3.00
1	7.10	0.80	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	8.00
0	7.10	1.00	10.00	0.00	0.00	1.00	9.40	1.50	500.00	250.00	1.00

0	2.40	0.20	10.00	0.00	0.00	1.00	5.00	1.00	4000.00	250.00	0.00
0	0.20	0.20	10.00	0.00	0.00	1.00	5.00	1.00	4000.00	250.00	1.00
0	1.90	0.10	10.00	0.00	0.00	1.00	5.00	1.00	4000.00	250.00	10.00
0	3.90	0.40	10.00	0.00	0.00	1.00	5.00	1.00	4000.00	250.00	1.00
0	8.90	0.40	10.00	0.00	0.00	1.00	5.00	1.00	4000.00	250.00	1.00
1	5.00	0.50	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	3.00
1	6.40	0.50	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	1.00
1	3.90	0.70	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	7.00
1	2.80	0.70	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	11.00
1	1.70	0.70	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	0.00
1	2.10	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	7.00
0	7.50	0.50	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	8.00
0	8.60	0.50	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	0.00
1	3.20	0.50	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	11.00
0	0.30	0.70	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	10.00
0	5.30	0.70	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	1.00
0	7.70	0.80	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	3.00
0	1.40	0.80	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	8.00
0	4.60	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	10.00
0	2.00	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	1.00
0	2.90	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	0.00
0	0.50	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	7.00
0	6.60	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	11.00
0	0.40	0.90	10.00	0.00	0.00	1.00	6.00	1.00	4000.00	250.00	10.00
1	5.60	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	3.00
1	4.70	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	8.00
1	2.20	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	3.00
1	1.30	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	0.00
1	3.90	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	7.00
0	0.40	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	11.00
0	2.40	1.20	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	1.00
0	5.30	1.10	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	10.00
0	0.70	1.10	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	0.00
0	1.30	1.00	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	1.00
0	7.30	1.10	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	3.00
1	0.30	1.30	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	7.00
1	5.30	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	8.00
1	1.20	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	7.00
1	4.00	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	11.00
1	6.30	1.70	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	10.00
1	2.10	1.70	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	8.00
1	4.60	1.70	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	8.00
0	5.60	1.40	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	7.00
0	3.10	1.40	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	10.00
0	0.60	1.40	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	1.00
0	3.80	1.30	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	0.00
0	1.30	1.30	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	7.00
0	7.70	1.40	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	11.00
0	0.60	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	10.00
0	2.00	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	1.00
0	4.40	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	3.00
0	2.90	1.50	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	10.00
0	7.10	1.70	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	0.00
0	9.60	1.70	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	3.00
0	9.10	1.70	10.00	0.00	0.00	1.00	6.00	1.00	2500.00	250.00	11.00

0	13.30	1.10	20.00	0.00	0.00	1.00	4.80	3.00	2500.00	250.00	5.00
0	12.80	1.00	20.00	0.00	0.00	1.00	4.80	3.00	2500.00	250.00	5.10
0	9.50	1.00	20.00	0.00	0.00	1.00	4.80	3.00	2500.00	250.00	2.00
0	11.50	1.00	20.00	0.00	0.00	1.00	4.80	3.00	2500.00	250.00	0.00
0	13.80	1.00	20.00	0.00	0.00	1.00	4.80	3.00	2500.00	250.00	3.00
0	17.10	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	6.00
0	17.40	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	8.00
0	12.60	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	7.00
0	15.40	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	11.00
0	10.70	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	4.00
0	18.10	1.20	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	5.00
0	17.50	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	5.10
0	14.40	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	2.00
0	16.40	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	1.00
0	18.80	1.30	20.00	0.00	0.00	1.00	4.80	3.00	500.00	250.00	3.00
1	0.10	0.20	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	6.00
1	3.40	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	7.00
1	0.10	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	11.00
1	2.90	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	5.00
1	2.10	0.40	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	5.00
1	5.10	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	11.00
0	1.50	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	7.00
0	7.10	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	8.00
0	5.00	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	11.00
0	4.90	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	6.00
0	0.70	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	4.00
0	8.10	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	5.00
0	7.00	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	3.00
0	2.90	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	1.00
0	4.90	0.10	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	0.00
0	2.10	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	1.00
0	4.10	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	4.00
0	2.60	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	8.00
0	0.30	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	0.00
0	2.20	0.30	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	3.00
0	8.40	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	7.00
0	2.10	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	8.00
0	5.10	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	6.00
0	9.10	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	4.00
0	7.20	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	1.00
0	5.20	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	0.00
0	2.90	0.50	10.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	3.00
1	9.30	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	4.00
1	13.30	0.90	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	7.00
0	13.10	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	0.00
0	11.10	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	1.00
0	15.30	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	3.00
0	9.90	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	7.00
0	16.30	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	8.00
0	13.40	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	11.00
0	13.00	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	6.00
0	16.40	0.60	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	5.00
0	16.60	0.80	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	0.00
0	14.60	0.80	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	1.00

0	19.00	0.90	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	3.00
0	20.00	0.90	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	8.00
0	16.70	0.80	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	11.00
0	16.70	0.90	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	6.00
0	12.90	0.90	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	4.00
0	19.70	0.80	20.00	0.00	0.00	1.00	9.90	2.50	4000.00	250.00	5.00
1	8.00	0.90	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	4.00
1	8.50	0.90	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	7.00
0	9.70	1.00	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	1.00
0	11.70	1.00	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	0.00
0	14.00	0.90	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	3.00
0	15.00	0.90	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	3.00
0	12.00	1.00	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	11.00
0	11.70	0.90	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	6.00
0	15.10	1.00	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	5.00
0	15.00	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	1.00
0	17.10	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	0.00
0	19.50	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	3.00
0	13.90	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	7.00
0	17.20	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	11.00
0	17.10	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	6.00
0	13.40	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	4.00
1	7.60	1.20	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	4.00
1	8.10	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	7.00
0	9.30	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	1.00
0	11.40	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	0.00
0	13.70	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	3.00
0	14.40	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	8.00
0	11.70	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	11.00
0	11.30	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	6.00
0	14.60	1.30	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	5.00
0	14.20	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	1.00
0	16.40	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	0.00
0	18.70	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	3.00
0	13.40	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	7.00
0	12.70	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	8.00
0	16.70	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	11.00
0	16.40	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	6.00
0	12.70	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	4.00
0	12.40	1.50	20.00	0.00	0.00	1.00	6.40	3.00	4000.00	250.00	5.00
1	7.90	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	11.00
0	14.00	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	8.00
0	10.90	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	6.00
0	7.30	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	4.00
0	14.40	1.70	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	5.00
0	9.00	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	1.00
0	10.90	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	0.00
0	13.30	1.60	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	3.00
0	13.70	1.80	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	7.00
0	16.80	1.80	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	11.00
0	16.80	1.90	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	6.00
0	13.40	1.90	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	4.00
0	14.70	1.90	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	1.00
0	16.80	1.80	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	0.00
0	19.20	1.90	20.00	0.00	0.00	1.00	9.40	2.50	2500.00	250.00	3.00

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1	3.90	0.00	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	11.00
1	5.20	0.00	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	0.00
1	1.20	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	7.00
1	1.30	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	4.00
1	4.60	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	6.00
1	6.10	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	8.00
1	2.70	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	0.00
1	1.40	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	0.00
1	0.20	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	11.00
1	3.30	0.30	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	5.00
1	2.60	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	5.00
1	6.00	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	11.00
1	2.40	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	3.00
1	3.50	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	8.00
1	5.40	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	6.00
1	8.60	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	7.00
1	7.30	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	4.00
0	7.60	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	5.00
0	3.00	0.10	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	3.00
0	2.20	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	1.00
0	1.10	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	7.00
0	2.20	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	6.00
0	4.10	0.20	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	4.00
0	0.60	0.30	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	1.00
0	4.90	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	0.00
0	7.00	0.50	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	1.00
0	8.60	0.60	10.00	0.00	0.00	0.00	1.00	3.80	0.50	4000.00	250.00	4.00
1	9.30	1.50	20.00	0.00	0.00	0.00	1.00	5.00	1.00	2500.00	250.00	7.00
1	11.40	1.50	20.00	0.00	0.00	0.00	1.00	5.00	1.00	2500.00	250.00	11.00
1	16.00	1.70	20.00	0.00	0.00	0.00	1.00	5.00	1.00	2500.00	250.00	7.00
1	13.90	1.70	20.00	0.00	0.00	0.00	1.00	5.00	1.00	2500.00	250.00	7.00
1	17.30	1.70	20.00	0.00	0.00	0.00	1.00	5.00	1.00	2500.00	250.00	6.00
0	10.30	1.50	20.00	0.00	0.00	0.00	1.00	5.00	1.00	2500.00	250.00	1.

1	14.20	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	11.00
1	17.30	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	5.00
1	11.10	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	4.00
1	15.20	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	7.00
1	18.10	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	8.00
1	15.90	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	6.00
0	12.50	0.90	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	1.00
0	13.40	1.00	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	0.00
0	14.70	1.00	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	3.00
0	17.30	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	1.00
0	18.50	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	0.00
0	19.60	1.20	20.00	0.00	0.00	0.00	1.00	3.00	1.00	4000.00	250.00	3.00
0	6.00	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	4.00
1	13.10	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	8.00
1	10.30	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	7.00
1	9.10	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	11.00
1	12.20	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	5.00
1	14.00	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	11.00
0	11.00	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	6.00
0	14.60	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	3.00
0	12.40	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	1.00
0	13.40	1.30	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	0.00
0	16.70	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	7.00
0	18.90	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	8.00
0	18.30	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	6.00
0	13.30	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	4.00
0	17.00	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	5.00
0	18.60	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	1.00
0	19.30	1.50	20.00	0.00	0.00	0.00	1.00	3.00	1.00	2500.00	250.00	0.00

SLAR 10 JUNE 1987

1	3.00	0.10	10.00	10.00	2.00	2500.00	250.00	7.00
1	4.30	0.50	10.00	10.00	2.00	4500.00	250.00	7.00
1	7.90	0.70	10.00	10.00	2.00	4500.00	250.00	7.00
1	7.30	0.10	10.00	10.00	2.00	2500.00	250.00	9.00
1	4.60	0.70	10.00	10.00	2.00	4500.00	250.00	10.00
1	8.70	0.90	10.00	10.00	2.00	4500.00	250.00	10.00
1	7.00	0.10	10.00	10.00	2.00	2500.00	250.00	12.00
1	4.40	0.70	10.00	10.00	2.00	4500.00	250.00	12.00
1	9.20	0.90	10.00	10.00	2.00	4500.00	250.00	12.00
1	1.30	0.10	10.00	10.00	2.00	2500.00	250.00	1.00
0	1.40	0.10	10.00	10.00	2.00	2500.00	250.00	8.00
0	2.70	0.10	10.00	10.00	2.00	2500.00	250.00	11.00
0	6.50	0.10	10.00	10.00	2.00	2500.00	250.00	10.00
0	4.60	0.10	10.00	10.00	2.00	2500.00	250.00	2.00
0	2.90	0.10	10.00	10.00	2.00	2500.00	250.00	3.00
0	9.30	0.50	10.00	10.00	2.00	4500.00	250.00	8.00
0	5.50	0.50	10.00	10.00	2.00	4500.00	250.00	11.00
0	0.70	0.50	10.00	10.00	2.00	4500.00	250.00	9.00
0	0.60	0.50	10.00	10.00	2.00	4500.00	250.00	10.00
0	0.80	0.50	10.00	10.00	2.00	4500.00	250.00	12.00
0	3.20	0.50	10.00	10.00	2.00	4500.00	250.00	2.00
0	6.50	0.50	10.00	10.00	2.00	4500.00	250.00	1.00
0	5.00	0.50	10.00	10.00	2.00	4500.00	250.00	3.00
0	9.00	0.70	10.00	10.00	2.00	4500.00	250.00	11.00
0	4.30	0.70	10.00	10.00	2.00	4500.00	250.00	9.00
0	6.90	0.70	10.00	10.00	2.00	4500.00	250.00	2.00
0	8.60	0.70	10.00	10.00	2.00	4500.00	250.00	3.00
0	8.40	0.90	10.00	10.00	2.00	4500.00	250.00	9.00
1	8.50	1.40	10.00	10.00	2.00	2500.00	250.00	7.00
1	4.10	1.60	10.00	10.00	2.00	2500.00	250.00	8.00
1	9.00	1.60	10.00	10.00	2.00	2500.00	250.00	11.00
1	5.10	1.60	10.00	10.00	2.00	2500.00	250.00	9.00
1	4.90	1.40	10.00	10.00	2.00	2500.00	250.00	10.00
1	8.70	1.10	10.00	10.00	2.00	2500.00	250.00	12.00
1	4.50	1.40	10.00	10.00	2.00	2500.00	250.00	1.00
1	9.20	1.20	10.00	10.00	2.00	2500.00	250.00	9.00
1	5.30	1.40	10.00	10.00	2.00	2500.00	250.00	12.00
1	6.30	1.60	10.00	10.00	2.00	2500.00	250.00	1.00
0	8.80	1.20	10.00	10.00	2.00	2500.00	250.00	9.00
0	9.60	1.40	10.00	10.00	2.00	2500.00	250.00	11.00
0	7.70	1.40	10.00	10.00	2.00	2500.00	250.00	2.00
0	9.30	1.40	10.00	10.00	2.00	2500.00	250.00	3.00
0	0.00	1.60	10.00	10.00	2.00	2500.00	250.00	9.00
0	0.30	1.60	10.00	10.00	2.00	2500.00	250.00	10.00
0	0.80	1.60	10.00	10.00	2.00	2500.00	250.00	12.00
0	3.20	1.60	10.00	10.00	2.00	2500.00	250.00	2.00
0	5.00	1.60	10.00	10.00	2.00	2500.00	250.00	3.00
1	5.20	0.10	10.00	8.30	1.50	2500.00	250.00	9.00
1	3.80	0.10	10.00	8.30	1.50	2500.00	250.00	8.00
0	2.30	0.10	10.00	8.30	1.50	2500.00	250.00	11.00
0	0.90	0.10	10.00	8.30	1.50	2500.00	250.00	10.00
0	5.30	0.10	10.00	8.30	1.50	2500.00	250.00	1.00
0	0.40	0.10	10.00	8.30	1.50	2500.00	250.00	1.00

0	3.60	0.10	10.00	8.30	1.50	2500.00	250.00	2.00
0	2.00	0.10	10.00	8.30	1.50	2500.00	250.00	3.00
1	8.30	0.40	10.00	9.00	1.50	4500.00	250.00	9.00
1	6.40	0.40	10.00	9.00	1.50	4500.00	250.00	7.00
1	5.00	0.50	10.00	9.00	1.50	4500.00	250.00	10.00
1	6.00	0.90	10.00	9.00	1.50	4500.00	250.00	8.00
0	9.60	0.20	10.00	9.00	1.50	4500.00	250.00	10.00
0	2.50	0.90	10.00	9.00	1.50	4500.00	250.00	11.00
0	2.60	0.90	10.00	9.00	1.50	4500.00	250.00	1.00
0	0.50	0.90	10.00	9.00	1.50	4500.00	250.00	2.00
0	1.10	0.90	10.00	9.00	1.50	4500.00	250.00	3.00
0	1.70	0.80	10.00	9.00	1.50	4500.00	250.00	7.00
0	0.30	0.80	10.00	9.00	1.50	4500.00	250.00	9.00
0	3.00	0.90	10.00	9.00	1.50	4500.00	250.00	10.00
0	7.50	0.40	10.00	9.00	1.50	4500.00	250.00	2.00
0	9.20	0.40	10.00	9.00	1.50	4500.00	250.00	3.00

BAR 15 JUNE 1987

1	3.50	0.30	10.00	2.00	1.00	2500.00	250.00	11.00
1	5.10	0.30	10.00	2.00	1.00	2500.00	250.00	8.00
1	5.80	0.50	10.00	2.00	1.00	2500.00	250.00	7.00
1	4.90	0.50	10.00	2.00	1.00	2500.00	250.00	1.00
1	4.20	0.50	10.00	2.00	1.00	2500.00	250.00	10.00
1	8.40	0.50	10.00	2.00	1.00	2500.00	250.00	11.00
1	9.90	0.70	10.00	2.00	1.00	2500.00	250.00	8.00
0	4.20	0.10	10.00	2.00	1.00	2500.00	250.00	7.00
0	0.00	0.10	10.00	2.00	1.00	2500.00	250.00	8.00
0	1.90	0.10	10.00	2.00	1.00	2500.00	250.00	11.00
0	4.20	0.10	10.00	2.00	1.00	2500.00	250.00	10.00
0	2.10	0.10	10.00	2.00	1.00	2500.00	250.00	3.00
0	0.20	0.10	10.00	2.00	1.00	2500.00	250.00	2.00
0	5.00	0.10	10.00	2.00	1.00	2500.00	250.00	1.00
0	1.00	0.30	10.00	2.00	1.00	2500.00	250.00	7.00
0	0.70	0.30	10.00	2.00	1.00	2500.00	250.00	10.00
0	3.10	0.30	10.00	2.00	1.00	2500.00	250.00	3.00
0	5.20	0.30	10.00	2.00	1.00	2500.00	250.00	2.00
0	0.40	0.30	10.00	2.00	1.00	2500.00	250.00	1.00
1	1.80	1.10	10.00	0.00	1.00	4000.00	250.00	11.00
1	2.60	1.10	10.00	0.00	1.00	4000.00	250.00	8.00
1	1.20	1.10	10.00	0.00	1.00	4000.00	250.00	7.00
1	3.00	1.10	10.00	0.00	1.00	4000.00	250.00	2.00
1	4.00	1.20	10.00	0.00	1.00	4000.00	250.00	10.00
1	5.90	1.20	10.00	0.00	1.00	4000.00	250.00	3.00
1	7.70	1.20	10.00	0.00	1.00	4000.00	250.00	8.00
0	6.10	0.80	10.00	0.00	1.00	4000.00	250.00	7.00
0	2.30	0.80	10.00	0.00	1.00	4000.00	250.00	8.00
0	3.30	0.90	10.00	0.00	1.00	4000.00	250.00	11.00
0	4.10	0.80	10.00	0.00	1.00	4000.00	250.00	3.00
0	2.00	0.80	10.00	0.00	1.00	4000.00	250.00	2.00
0	7.10	0.80	10.00	0.00	1.00	4000.00	250.00	1.00
0	1.80	1.10	10.00	0.00	1.00	4000.00	250.00	10.00
0	0.80	1.10	10.00	0.00	1.00	4000.00	250.00	3.00
0	2.20	1.10	10.00	0.00	1.00	4000.00	250.00	1.00
0	4.00	1.20	10.00	0.00	1.00	4000.00	250.00	7.00
0	7.00	1.20	10.00	0.00	1.00	4000.00	250.00	11.00
0	8.00	1.20	10.00	0.00	1.00	4000.00	250.00	2.00
0	2.90	1.20	10.00	0.00	1.00	4000.00	250.00	1.00
1	0.10	0.00	10.00	7.90	1.50	4000.00	250.00	11.00
1	4.10	0.20	10.00	7.90	1.50	4000.00	250.00	3.00
1	5.00	0.40	10.00	7.90	1.50	4000.00	250.00	1.00
0	3.50	0.10	10.00	7.90	1.50	4000.00	250.00	7.00
0	0.70	0.10	10.00	7.90	1.50	4000.00	250.00	8.00
0	5.90	0.10	10.00	7.90	1.50	4000.00	250.00	10.00
0	2.10	0.10	10.00	7.90	1.50	4000.00	250.00	3.00
0	0.10	0.10	10.00	7.90	1.50	4000.00	250.00	2.00
0	5.10	0.10	10.00	7.90	1.50	4000.00	250.00	1.00
0	1.40	0.20	10.00	7.90	1.50	4000.00	250.00	7.00
0	4.90	0.20	10.00	7.90	1.50	4000.00	250.00	11.00
0	0.90	0.20	10.00	7.90	1.50	4000.00	250.00	10.00
0	2.80	0.20	10.00	7.90	1.50	4000.00	250.00	3.00
0	5.00	0.20	10.00	7.90	1.50	4000.00	250.00	2.00
0	0.20	0.20	10.00	7.90	1.50	4000.00	250.00	1.00
0	6.70	0.40	10.00	7.90	1.50	4000.00	250.00	7.00
0	9.30	0.40	10.00	7.90	1.50	4000.00	250.00	8.00
0	3.00	0.40	10.00	7.90	1.50	4000.00	250.00	3.00

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1	4.30	0.30	10.00	0.00	1.00	2500.00	250.00	1.00
1	1.30	0.30	10.00	0.00	1.00	2500.00	250.00	8.00
1	8.20	0.30	10.00	0.00	1.00	2500.00	250.00	10.00
1	5.70	0.30	10.00	0.00	1.00	2500.00	250.00	5.10
1	2.40	0.30	10.00	0.00	1.00	2500.00	250.00	0.00
1	6.10	0.50	10.00	0.00	1.00	2500.00	250.00	8.00
1	3.20	0.50	10.00	0.00	1.00	2500.00	250.00	10.00
1	0.60	0.50	10.00	0.00	1.00	2500.00	250.00	7.00
1	5.00	0.50	10.00	0.00	1.00	2500.00	250.00	3.00
1	0.80	0.50	10.00	0.00	1.00	2500.00	250.00	5.10
1	2.10	0.50	10.00	0.00	1.00	2500.00	250.00	11.00
1	4.30	0.70	10.00	0.00	1.00	2500.00	250.00	1.00
0	4.20	0.30	10.00	0.00	1.00	2500.00	250.00	7.00
0	2.90	0.30	10.00	0.00	1.00	2500.00	250.00	11.00
0	0.30	0.30	10.00	0.00	1.00	2500.00	250.00	3.00
0	0.00	0.50	10.00	0.00	1.00	2500.00	250.00	1.00
0	2.50	0.50	10.00	0.00	1.00	2500.00	250.00	0.00
0	5.00	0.70	10.00	0.00	1.00	2500.00	250.00	7.00
0	6.70	0.70	10.00	0.00	1.00	2500.00	250.00	11.00
0	1.60	0.70	10.00	0.00	1.00	2500.00	250.00	10.00
0	3.60	0.70	10.00	0.00	1.00	2500.00	250.00	5.10
0	9.30	0.70	10.00	0.00	1.00	2500.00	250.00	3.00
0	6.90	0.70	10.00	0.00	1.00	2500.00	250.00	0.00
1	4.50	0.80	10.00	1.00	1.00	4000.00	250.00	5.10
1	3.30	0.80	10.00	1.00	1.00	4000.00	250.00	10.00
0	6.00	0.80	10.00	1.00	1.00	4000.00	250.00	7.00
0	7.70	0.80	10.00	1.00	1.00	4000.00	250.00	11.00
0	5.30	0.80	10.00	1.00	1.00	4000.00	250.00	1.00
0	7.80	0.80	10.00	1.00	1.00	4000.00	250.00	0.00

CG2118	24	JUNE 1987	SLAR
1	3.90	0.20	10.00
1	2.70	0.30	10.00
1	2.20	0.30	10.00
1	2.20	0.30	10.00
1	4.10	0.30	10.00
1	2.60	0.60	10.00
1	2.40	0.60	10.00
1	3.60	0.60	10.00
0	1.30	0.20	10.00
0	6.10	0.20	10.00
1	4.60	0.20	10.00
0	1.30	0.20	10.00
0	7.30	0.10	10.00
0	3.00	0.20	10.00
0	5.10	0.20	10.00
0	7.60	0.20	10.00
0	0.20	0.30	10.00
0	3.40	0.30	10.00
0	1.00	0.30	10.00
0	0.60	0.30	10.00
0	1.30	0.30	10.00
0	8.70	0.60	10.00
0	6.00	0.60	10.00
1	5.40	0.60	10.00
0	8.60	0.60	10.00
0	7.10	0.60	10.00
0	5.00	0.60	10.00

3.80	0.50	4000.00	250.00	11.00
3.80	0.50	4000.00	250.00	8.00
3.80	0.50	4000.00	250.00	4.00
3.80	0.50	4000.00	250.00	7.00
3.80	0.50	4000.00	250.00	3.00
3.80	0.50	4000.00	250.00	5.00
3.80	0.50	4000.00	250.00	3.00
3.80	0.50	4000.00	250.00	8.00
3.80	0.50	4000.00	250.00	7.00
3.80	0.50	4000.00	250.00	8.00
3.80	0.50	4000.00	250.00	6.00
3.80	0.50	4000.00	250.00	4.00
3.80	0.50	4000.00	250.00	5.00
3.80	0.50	4000.00	250.00	1.00
3.80	0.50	4000.00	250.00	0.00
3.80	0.50	4000.00	250.00	3.00
3.80	0.50	4000.00	250.00	11.00
3.80	0.50	4000.00	250.00	5.00
3.80	0.50	4000.00	250.00	6.00
3.80	0.50	4000.00	250.00	1.00
3.80	0.50	4000.00	250.00	0.00
3.80	0.50	4000.00	250.00	7.00
3.80	0.50	4000.00	250.00	11.00
3.80	0.50	4000.00	250.00	6.00
3.80	0.50	4000.00	250.00	4.00
3.80	0.50	4000.00	250.00	1.00
3.80	0.50	4000.00	250.00	0.00

062118 26 JUNE 1987 SLAR

1	3.60	0.10	10.00	2.00	1.00	2500.00	250.00	11.00
1	1.50	0.30	10.00	2.00	1.00	2500.00	250.00	5.00
1	1.80	0.50	10.00	2.00	1.00	2500.00	250.00	3.00
0	4.80	0.10	10.00	2.00	1.00	2500.00	250.00	7.00
0	7.60	0.10	10.00	2.00	1.00	2500.00	250.00	8.00
0	5.00	0.10	10.00	2.00	1.00	2500.00	250.00	6.00
0	0.80	0.10	10.00	2.00	1.00	2500.00	250.00	4.00
0	6.80	0.10	10.00	2.00	1.00	2500.00	250.00	5.00
0	6.10	0.10	10.00	2.00	1.00	2500.00	250.00	1.00
0	7.10	0.10	10.00	2.00	1.00	2500.00	250.00	0.00
0	8.30	0.10	10.00	2.00	1.00	2500.00	250.00	3.00
0	0.40	0.30	10.00	2.00	1.00	2500.00	250.00	7.00
0	2.40	0.30	10.00	2.00	1.00	2500.00	250.00	8.00
0	1.70	0.30	10.00	2.00	1.00	2500.00	250.00	11.00
0	0.10	0.20	10.00	2.00	1.00	2500.00	250.00	6.00
0	4.50	0.30	10.00	2.00	1.00	2500.00	250.00	4.00
0	0.90	0.30	10.00	2.00	1.00	2500.00	250.00	1.00
0	1.90	0.30	10.00	2.00	1.00	2500.00	250.00	0.00
0	5.70	0.50	10.00	2.00	1.00	2500.00	250.00	7.00
0	2.80	0.50	10.00	2.00	1.00	2500.00	250.00	8.00
0	6.70	0.50	10.00	2.00	1.00	2500.00	250.00	11.00
0	5.40	0.50	10.00	2.00	1.00	2500.00	250.00	6.00
0	9.70	0.50	10.00	2.00	1.00	2500.00	250.00	4.00
0	3.60	0.50	10.00	2.00	1.00	2500.00	250.00	5.00
0	4.20	0.50	10.00	2.00	1.00	2500.00	250.00	1.00
1	3.10	0.50	10.00	2.00	1.00	2500.00	250.00	0.00
0	3.20	0.50	10.00	2.00	1.00	2500.00	250.00	3.00
1	6.60	0.60	20.00	5.20	1.00	2500.00	250.00	4.00
1	11.20	0.80	20.00	5.20	1.00	2500.00	250.00	4.00
0	10.70	0.60	20.00	5.20	1.00	2500.00	250.00	7.00
0	13.60	0.60	20.00	5.20	1.00	2500.00	250.00	8.00
0	9.50	0.60	20.00	5.20	1.00	2500.00	250.00	11.00
0	11.20	0.60	20.00	5.20	1.00	2500.00	250.00	6.00
0	12.50	0.60	20.00	5.20	1.00	2500.00	250.00	5.00
0	14.70	0.60	20.00	5.20	1.00	2500.00	250.00	3.00
0	12.40	0.60	20.00	5.20	1.00	2500.00	250.00	1.00
0	13.50	0.60	20.00	5.20	1.00	2500.00	250.00	0.00
0	15.60	0.80	20.00	5.20	1.00	2500.00	250.00	7.00
0	18.40	0.80	20.00	5.20	1.00	2500.00	250.00	8.00
0	14.30	0.80	20.00	5.20	1.00	2500.00	250.00	11.00
0	16.00	0.80	20.00	5.20	1.00	2500.00	250.00	6.00
0	19.70	0.80	20.00	5.20	1.00	2500.00	250.00	3.00
0	17.40	0.80	20.00	5.20	1.00	2500.00	250.00	1.00
0	18.50	0.80	20.00	5.20	1.00	2500.00	250.00	0.00
0	17.50	0.80	20.00	5.20	1.00	2500.00	250.00	5.00
0	10.50	0.90	20.00	3.00	1.00	4000.00	250.00	7.00
0	13.20	0.90	20.00	3.00	1.00	4000.00	250.00	8.00
0	9.30	0.90	20.00	3.00	1.00	4000.00	250.00	11.00
0	11.00	0.90	20.00	3.00	1.00	4000.00	250.00	6.00
0	6.20	0.90	20.00	3.00	1.00	4000.00	250.00	4.00
0	12.40	0.90	20.00	3.00	1.00	4000.00	250.00	5.00
0	14.60	0.90	20.00	3.00	1.00	4000.00	250.00	3.00
0	13.50	0.90	20.00	3.00	1.00	4000.00	250.00	0.00
0	12.40	0.90	20.00	3.00	1.00	4000.00	250.00	1.00
0	15.30	1.10	20.00	3.00	1.00	4000.00	250.00	7.00

0	18.10	1.10	20.00	3.00	1.00	4000.00	250.00	8.00
0	14.20	1.10	20.00	3.00	1.00	4000.00	250.00	11.00
0	16.00	1.10	20.00	3.00	1.00	4000.00	250.00	6.00
1	11.10	1.10	20.00	3.00	1.00	4000.00	250.00	4.00
0	17.30	1.10	20.00	3.00	1.00	4000.00	250.00	5.00
0	19.60	1.10	20.00	3.00	1.00	4000.00	250.00	3.00
0	17.40	1.10	20.00	3.00	1.00	4000.00	250.00	1.00
0	18.40	1.10	20.00	3.00	1.00	4000.00	250.00	0.00
0	10.30	0.90	20.00	3.00	1.00	2500.00	250.00	7.00
0	13.10	0.90	20.00	3.00	1.00	2500.00	250.00	8.00
0	9.10	0.90	20.00	3.00	1.00	2500.00	250.00	11.00
0	11.00	0.90	20.00	3.00	1.00	2500.00	250.00	6.00
0	6.00	0.90	20.00	3.00	1.00	2500.00	250.00	4.00
0	12.20	0.90	20.00	3.00	1.00	2500.00	250.00	5.00
0	12.50	0.90	20.00	3.00	1.00	2500.00	250.00	1.00
0	13.50	0.90	20.00	3.00	1.00	2500.00	250.00	0.00
0	14.70	0.90	20.00	3.00	1.00	2500.00	250.00	3.00