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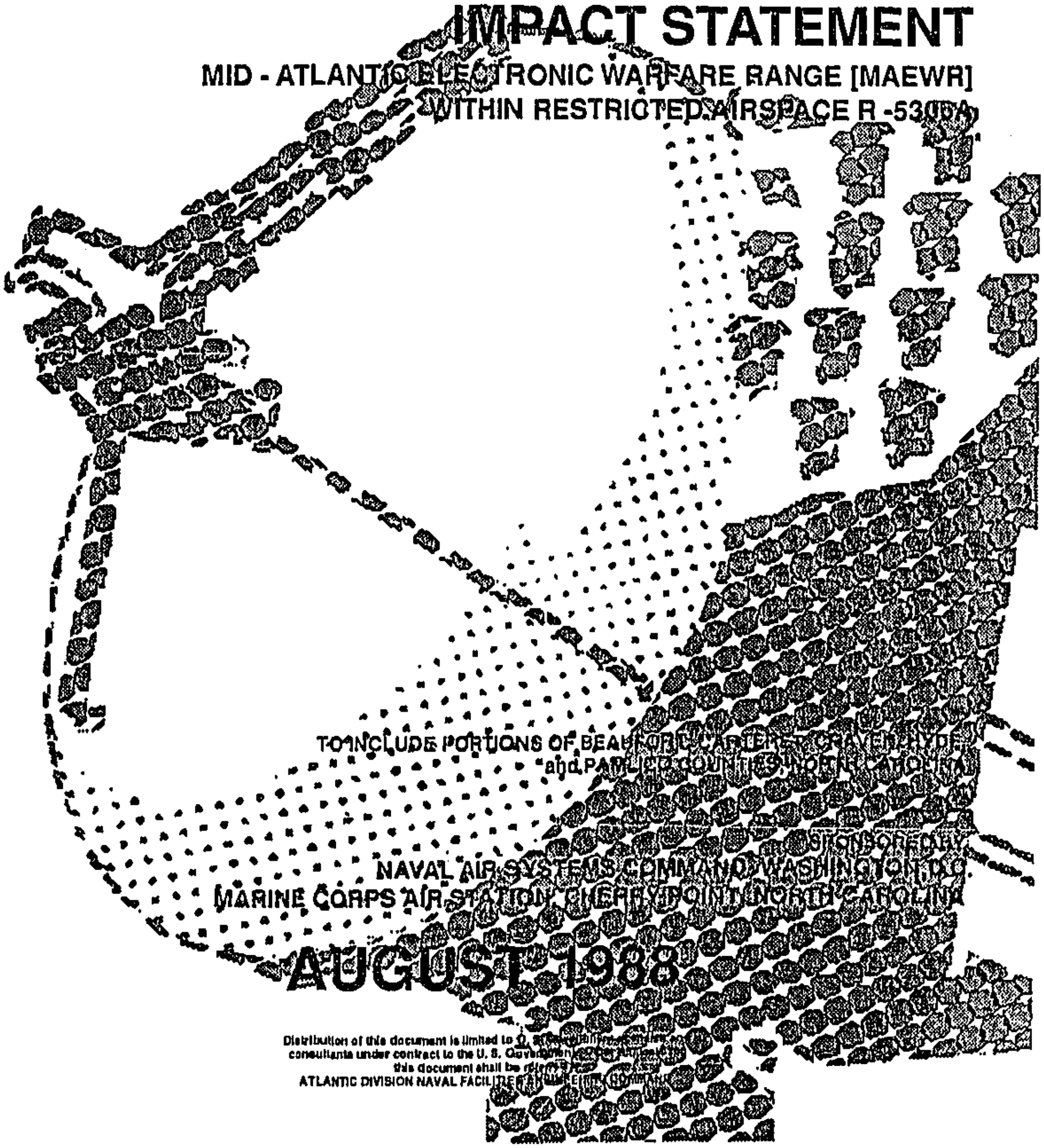
AIRCRAFT NOISE SUPPLEMENT TO DRAFT ENVIRONMENTAL IMPACT STATEMENT

MID - ATLANTIC ELECTRONIC WARFARE RANGE [MAEWR] WITHIN RESTRICTED AIRSPACE R-5306A



TO INCLUDE PORTIONS OF BEAUFORT, CARTERET, CRAVEN, HYDE, and PAMLICO COUNTIES, NORTH CAROLINA

SPONSORED BY:
NAVAL AIR SYSTEMS COMMAND, WASHINGTON, D.C.
MARINE CORPS AIR STATION, CHERRY POINT, NORTH CAROLINA

AUGUST 1988

AIRCRAFT NOISE SUPPLEMENT

TO

DRAFT
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PREFACE

The Draft Environmental Impact Statement for the proposed Mid Atlantic Electronic Warfare Range was distributed during the first week of June. The DEIS indicated that an update to the 1974 noise analysis for the BT-11/Piney Island range was being prepared as part of a MCAS Cherry Point AICUZ update. The following information incorporates that published in the DEIS and that provided in the "Aircraft Noise Survey for Mid Atlantic Electronic Warfare Range/BT-11 North Carolina" prepared by the firm of Harris Miller Miller & Hanson Inc.

NOISE OVERVIEW

Noise can generally be defined as unwanted sound, noticeably unpleasant sound, or any sound that interferes with one's hearing.

The duration of a noise event often has as much affect on the perception of noise by a receptor as does the level of sound. For example, although the exposure to the sound of a low level jet can be equated to familiar noise sources, the effects on an individual of an unanticipated nearby low level flight are more probably better described as startling than annoying; the sound or arousal effects are overridden by the "surprise" effect of the unanticipated noise.

The effects of noise on humans has been investigated by both observation and experiment during research to establish industrial noise exposure criteria. This research found that noise levels above 71 decibels (A scale) (71 dBA) can produce a series of temporary changes in human physiology (e.g. increased heart and respiration rates, increased blood pressure, muscular contractions, etc.) or if the exposure is continual or of long duration permanent shifts in hearing threshold or even complete hearing loss. And while it is generally agreed noise exposure does not produce psychological illness, the sleep interference and other physiological effects can result in behavior responses caused by the disturbance.

Interference with sleep has been found to occur as the background noise level exceeds about 35 dBA. The probability that a subject will be awakened by background noise increases to 31 percent as the noise level reaches 71 dBA. Although individuals show wide variation in their propensities to awaken or for their sleep to be disturbed short of awakening, older people in general, are more susceptible to sleep disturbances from high noise levels than are younger people.

Noise interference with speech communications also is well documented. For noise levels up to 47 dBA, satisfactory speech communication is possible in a normal voice level up to 32 feet. Above this level, people tend to raise their voices approximately four dB with each additional 11 dB of background noise. This problem is aggravated by fluctuations in background noise.

These factors combine to create 'annoyance," which also may be associated with the deterioration in ability to concentrate, to judge, and to perform well. The degree of annoyance depends upon the characteristics of the noise the population exposed to it, time of day, weather conditions, activity level, whether people are indoors or out, types of structure, etc; all affect the response. Similarly, the sensitivity of individuals to noise, the degree of community organization and perception of the value of the noise generators (primarily economic) also determine how strongly the exposed population will respond to the noise and the strength of their opposition to the noise.

AIRCRAFT NOISE DESCRIPTORS

As our level of knowledge about noise and types of noise (impact, blast, aircraft, etc.) increased, a series of measurements and descriptors evolved. For example, the decibel (a logarithm of the ratio-of sound pressure levels measured in micropascals) was "improved" by adding alphabetical weighting scales. The scale that most closely simulates the response of the human ear is the A scale, and is the one most commonly used. In the case of aircraft noise, three primary descriptors evolved, they are Composite Noise Rating (CNR), Noise Exposure Forecast (NEF) and Average Day/Night Sound Level (Ldn).

In the late 60's, the Composite Noise Rating (CNR) was the first attempt to define noise impacts from aircraft operations around airports and airbases. Noise contours were developed by connecting equal perceived noise levels (PNL's) measured in units of PNdB. The frequency distribution of the noise was analyzed as a perceived noise level based on a person's anticipated subjective response to the noise. Aircraft were grouped into ten categories and a general noise footprint for that group was provided. There was a single flight group for landings and take-offs, and many military maneuvers (Break approaches, Touch and Go's, etc.) were undefined and were left to the computer modeler to determine their results. Additional dB penalties were applied for nighttime operations, ground runups, etc. The major drawback of the CNR method was its inability to measure the noise unit (PNdB); it could only be calculated by the model. Next, Noise Exposure Forecase (NEF) was used to describe aircraft noise. NEF was based upon EFFECTIVE perceived noise levels measured in EPNdB. NEF improved upon CNR by correcting for the duration of the sound and for any pure tones that were present in the noise signal. As with CNR, EPNdB also could not be measured. Also comparing aircraft noise levels to community noise levels or other noise sources was impossible.

In the mid 70's, a methodology was developed that both measures aircraft noise and allows for comparisons of all noise sources, Average Day/Night Sound Level (Ldn) is the descriptor used in nearly all AICUZ studies. Ldn uses 24-hour average sound levels, as well as altitude aircraft power settings, airspeed and noise levels from each aircraft performing each mission. Unlike CNR or NEF, the unit of measurement for LDN is the DB(A). This unit which is easily measurable, allows field verification of predicted measurements and fine tuning of the model.

In summary, the current methodology for predicting the noise at a receptor for air operations measures sound level in decibels, and uses the A scale because it simulates the frequency response of the human ear. Ldn is the descriptor and it is derived by using 24 hour average sound levels, with nighttime operations (10:00 p.m. to 7:00 a.m.) weighted by a factor of 10 decibels and evening operations (7:00 p.m. to 10:00 p.m.) weighted by a factor of 3 Ldn. Ldn also allows field verification of predicted noise contours because the system uses dBA's for measurements.

this is CNEL

As knowledge of sound and its effects increased, so did regulation of noise. The Noise Control Act of 1972 (as amended) required Federal agencies and state and local governments to develop measures to control the harmful effects of noise on people. The Department of Defense initiated the Air Installations Compatible Use Zones (AICUZ) program to protect the public's health, safety, and welfare and to prevent civilian encroachment from degrading the operational capability of military air operations. The AICUZ program recommends land uses which will be compatible with noise levels, accident potential and flight clearance requirements associated with military flights and airfields. The Navy's implementing directive for the AICUZ Program (OPNAVINST 11010.36A) requires preparation of a noise study, based on aircraft operations, to define noise exposure contour. The contours are then used to define noise exposure areas.

For land use planning purposes, the noise exposure area is divided into three noise zones. Noise Zone 1 is essentially an area of no impact. Noise Zone 2 (Ldn 65-75) is an area of moderate impact where some land use controls are needed. Noise Zone 3 (Ldn 75 and above) is the most severely impacted area and requires the greatest degree of compatible use controls. In addition to the noise zones, areas of concern may be defined where noise levels are not considered to be objectionable (less than Ldn 65, e.g.), but land use controls are recommended; e.g., areas under flight tracks used for repetitive pattern work.

Land use compatibility information and general guidance, by land uses typically found adjacent to BT 11 has been excerpted from the instruction and is shown below in Table 1.

TABLE 1

SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES

LAND USE	NOISE ZONES/DNL LEVELS IN LDN						
	1		2		3		
NAME	0-55	55-65	65-70	70-75	75-80	80-85	85+
Residential							
Household units							
Single units; detached	Y	Y*	25[1]	30[1]	N	N	N
Group quarters	Y	Y*	25[1]	30[1]	N	N	N
Residential hotels	Y	Y*	25[1]	30[1]	N	N	N
Mobile home parks or courts	Y	Y*	N	N	N	N	N
Transient lodgings	Y	Y*	25[1]	30[1]	35[1]	N	N
Other residential	Y	Y*	25[1]	30[1]	N	N	N
Manufacturing							
Lumber and wood products (except furniture); manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
Transportation, communication and utilities							
Motor vehicle transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
Aircraft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
Marine craft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
Highway & street right-of-way	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
Automobile parking	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	Y	25[5]	30[5]	N	N
Utilities	Y	Y	Y	Y[2]	Y[3]	Y[4]	N

TABLE 1

SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES (Continued)

LAND USE	NOISE ZONES/DNL LEVELS IN LDN						
		1	2			3	
NAME	0-55	55-65	65-70	70-75	75-80	80-85	85+
Cultural, entertainment and recreational							
Cultural activities (including churches)	Y	Y*	25*	30*	N	N	N
Nature exhibits	Y	Y*	Y*	N	N	N	N
Recreational activities (incl. courses, water recreation)	Y	Y*	Y*	25*	30*	N	N
Resorts and group camps	Y	Y*	Y*	Y*	N	N	N
Parks	Y	Y*	Y*	Y*	N	N	N
Other cultural, entertainment and recreation	Y	Y*	Y*	Y*	N	N	N
Resource production and extraction							
Agriculture (except livestock)	Y	Y	Y8	Y9	Y10	Y10,11	Y10,11
Livestock farming and animal breeding	Y	Y	Y8	Y9	N	N	N
Agricultural related activities	Y	Y	Y8	Y9	Y10	Y10,11	Y10,11
Forestry activities and related services	Y	Y	Y8	Y9	Y10	Y10,11	Y10,11
Fishing activities and related services	Y	Y	Y	Y	Y	Y	Y

NOTES FOR TABLE 1

1. a. Although local conditions regarding the need for housing may require residential use in these zones, residential use is discouraged in DNL 65-70 and strongly discouraged in DNL 70-75. The absence of viable alternative development options should be determined and an evaluation should be conducted prior to approvals indicating that a demonstrated community need for the residential use would not be met if development were prohibited in these zones.

   b. Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB (DNL 65-70) and 30 dB (DNL 70-75) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels or vibrations.

c. NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. Measures that reduce noise at a site should be used wherever practical in preference to measures which only protect interior spaces.

2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

5. If project or proposed development is noise sensitive, use indicated NLR; if not, land use is compatible without NLR.

6. No buildings.

7. Land use compatible provided special sound reinforcement systems are installed.

8. Residential buildings require a NLR of 25.

9. Residential buildings require a NLR of 30.

10. Residential buildings not permitted.

11. Land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

KEY TO TABLE 1

Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR (Noise Level Reduction)	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of attenuation into the design and construction of the structure.

KEY TO TABLE 1 (Continued)

Y* (Yes with restrictions)	Land Use and related structures generally compatible; see notes 2 through 4.
25*,30* or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.
DNL	Day-Night Average Sound Level.
Ldn	Mathematical symbol for DNL.

BT-11/PINEY ISLAND NOISE LEVELS

a. Historical Background

In 1974, as a result of a proposal to open Atlantic Field as a Forward Training Facility (FTF) for the AV8 aircraft, an AICUZ footprint for OLF Atlantic was prepared. As an adjunct to that document, noise contours for BT-11 also were prepared. At that time, BT-11 had five scored targets: A barge target in Rattan Bay, 500 and 800 feet bullseyes, a strafing target and a mobile land target. Nearly 70% of the use of BT-11 in 1974 was by A-6 aircraft with the majority of the remaining use by the then relatively new AV-8s. Use of the range was determined to be approximately 20 days per month, and weapons delivery and divided between guidance system and visual at 80 to 20 percent respectively for A6's. The AV8's bombing deliveries were all visual (10° dive (30%), 30° dive (50%) and 45° dive (20%). Vertical descriptions are shown in Table 2.

TABLE 2

TYPICAL 1974 BT-11 EXERCISES BY AIRCRAFT

Delivery	Pattern	Aircraft	Downwind Altitude (Maximum)	Altitude Over Target (Minimum)
Visual	10° Dive	A-6	3,000 ft	1,000 ft
	35° Dive	A-6	8,500 ft	1,000 ft
	45° Dive	A-6	9,500 ft	1,000 ft
Visual	10° Dive	AV-8	3,500 ft	400 ft
	30° Dive	AV-8	8,000 ft	1,800 ft
	40° Dive	AV-8	12,000 ft	2,000 ft
Visual	Straight	A-6	1,000 ft	1,000 ft
	Diving	A-6	5,000 ft	1,000 ft
	High Loft	A-6	3,000 ft (I.D. pass) 6,000 ft	1,000 ft (I.D. pass) 200 ft
Visual	Strafing	AV-8	3,500 ft	100 ft

Even in 1974, more flight patterns than previously described existed. However, those described were the most frequently used and were considered to provide an overall picture of the normal BT-11 activity patterns.

Figure 1 depicts the flight paths primarily utilized against BT-11's 1974 target configuration. The CNR contours defining the various zones shown on Figure 2 were developed by TRACOR, Inc. in August 1974. They were the result of analysis of the flight patterns, operations, type of aircraft, power settings and actual noise measurements of aircraft utilizing the targets.

The AICUZ study found that severe noise area (CNR 3) was for the most part within the limits of Piney Island. And although large areas of CNR 2 overlay a sizeable land area Down East, these areas were primarily wetlands, water and open space. A part of the CNR 2 area also was located over portions of Sea Level and Atlantic. Based on the AICUZ land use compatibility matrix, these rural residential areas were for the most part compatible with the noise zone. Future residential development in those areas also was determined to be compatible with the AICUZ provided a Noise Level Reduction (NLR) factor was applied to future construction.

For purposes of general comparison, and certainly not precise numerical translations, the CNR noise zone three, which lies nearly totally within Piney Island would equate to an Ldn of 75 or greater, and CNR 2, the area underlying the flight paths of the aircraft would range between an Ldn of 65 to 75.

While most of the 1974 flight paths are still current, targets have been added (See Appendix A for Figure 44 of the DEIS) and the mix of aircraft type and missions has changed significantly over the last decade. The BT-11/Piney Island Complex therefore, was included in the AICUZ update prepared by Harris, Miller, Miller and Hanson for the Naval Facilities Engineering Command, Washington, D.C.

As will be seen, the majority of operations do not occur "down on the deck" i.e. below 500 feet, even immediately above the targets, with the exception of strafing, some visual delivery of ordnance exercises and specific LAT (Low Altitude Training) exercises.

Low Altitude (high speed (subsonic)) Training (LAT) is a part of the syllabus of every Department of Defense pilot. The basic level of LAT is independent, uncontested "cross country" flying. This training is accomplished along established Military Training Routes that crisscross the country and are marked on all aeronautical charts. Other low level training (e.g. "opposed" transit) is accomplished in Special Use Airspace (Restricted Areas or Military Operating Areas). Some low level routes terminate within restricted areas to allow a combination of training scenarios (e.g. transit and interception, transit and weapons delivery). Two of these routes VR 1043 and VR 1046 terminate within R-5306 A above BT-11. VR 1043 enters the restricted area near the southwest corner in the vicinity of Williston, and VR 1046 enters the restricted area's western boundary about 9 miles northeast of Grantsboro. During peak LAT periods when these routes are heavily utilized the opportunities for the populace to be exposed to high noise levels (See Table 3) increases significantly.

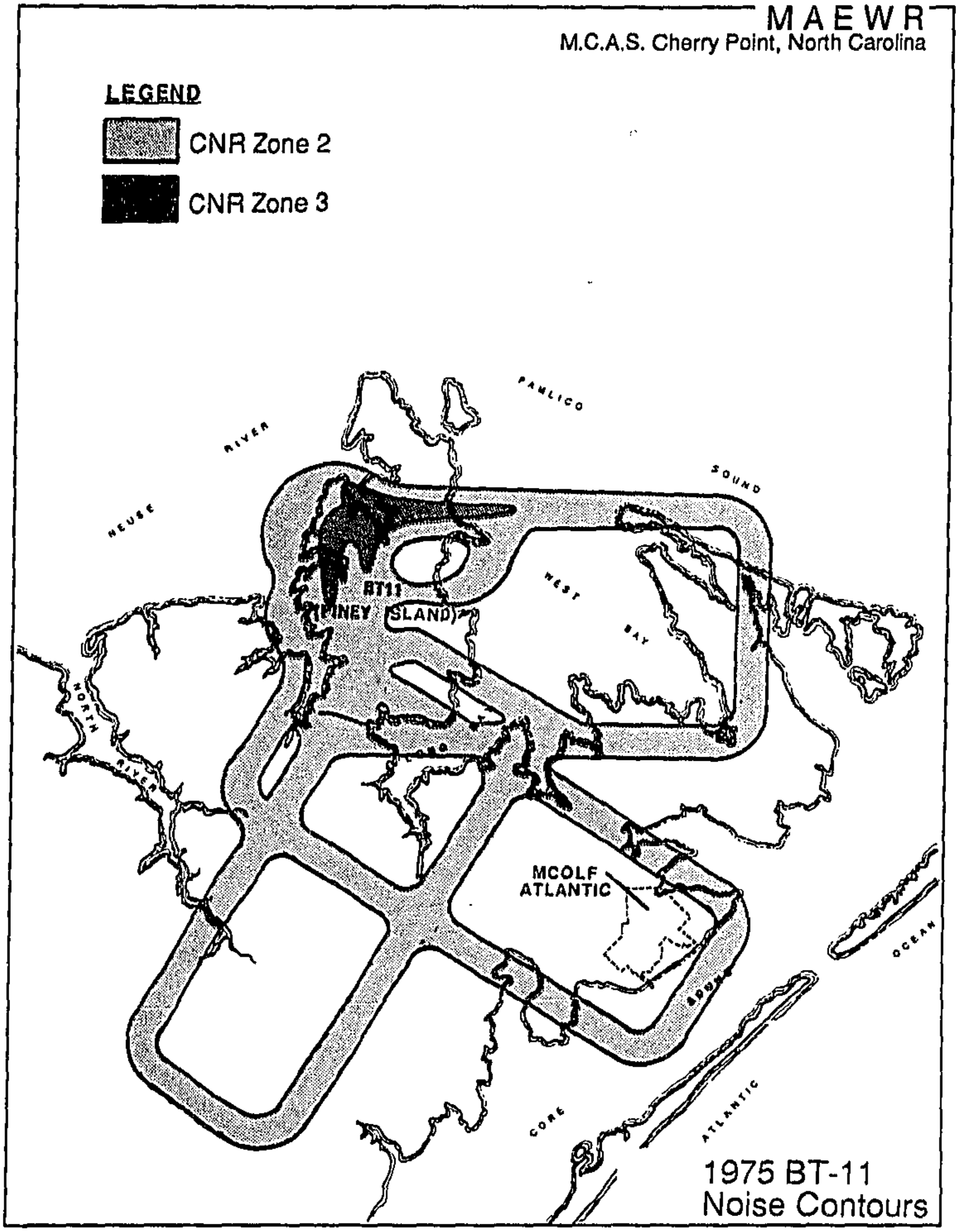

MAEWR
M.C.A.S. Cherry Point, North Carolina
LEGEND
CNR Zone 2
CNR Zone 3
PAMLICO
SOUND
NEUSE
RIVER
NORTH
RIVER
BT11
(PINEY ISLAND)
WEST
BAY
MCOLF
ATLANTIC
OCEAN
ATLANTIC
CORE
SOUND
1975 BT-11
Noise Contours

figure 1

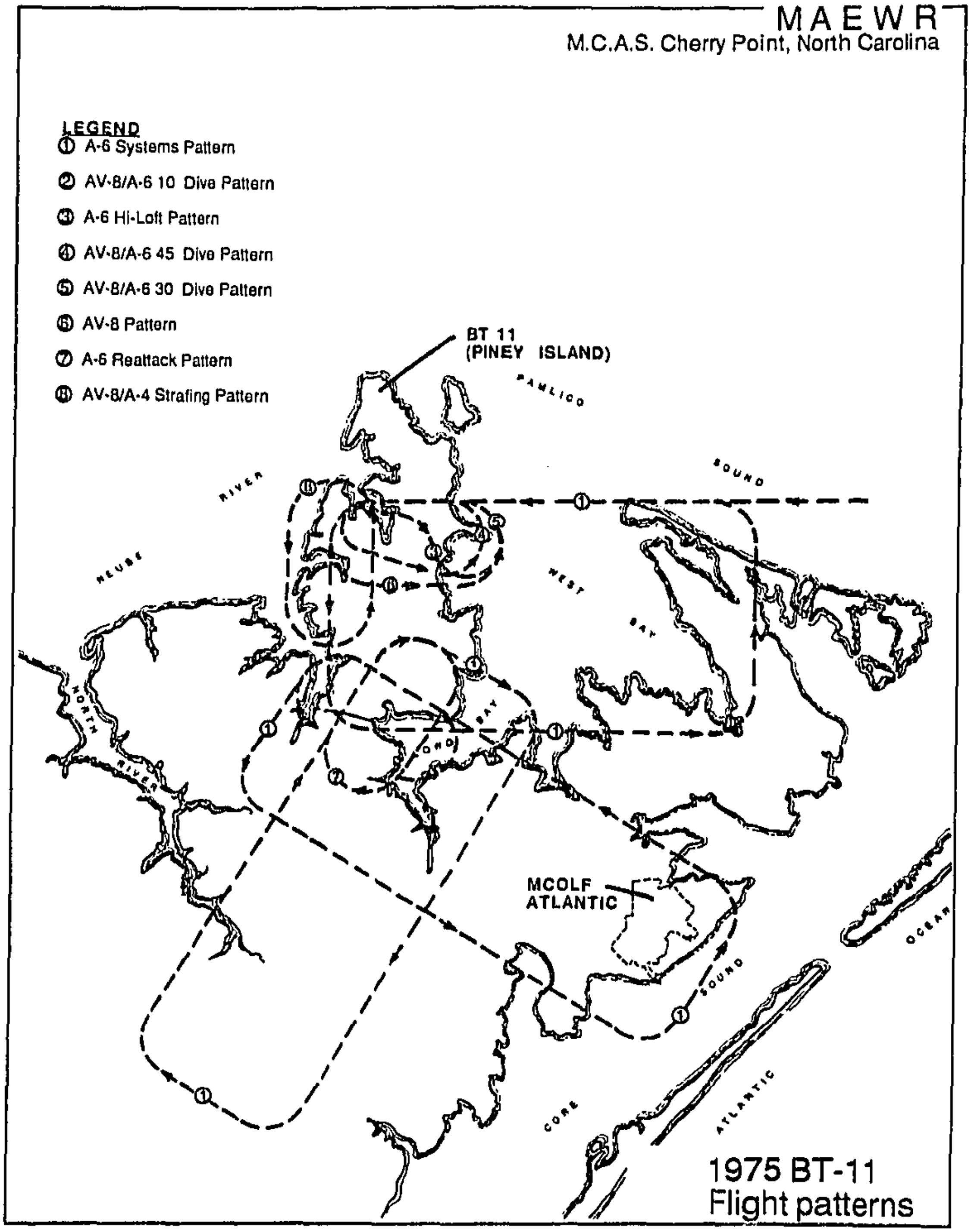

MAEWR
M.C.A.S. Cherry Point, North Carolina
LEGEND
① A-6 Systems Pattern
② AV-8/A-6 10 Dive Pattern
③ A-6 Hi-Loft Pattern
④ AV-8/A-6 45 Dive Pattern
⑤ AV-8/A-6 30 Dive Pattern
⑥ AV-8 Pattern
⑦ A-6 Reattack Pattern
⑧ AV-8/A-4 Strafing Pattern
BT 11
(PINEY ISLAND)
PAMLICO
SOUND
NEUSE
RIVER
WEST
BAY
NORTH
RIVER
MCOLF
ATLANTIC
CORE
SOUND
ATLANTIC
OCEAN
1975 BT-11
Flight patterns

figure 2

Operational procedures for R-5306 A prohibit low altitude flyover of densely populated areas and the wildlife areas, and the majority of operations not on the targets occur at higher altitudes. However, some low level operations are scheduled and do occur over land and water within the area. Whenever these flights affect the underlying populace, a complaints procedure is in effect at Cherry Point to investigate and determine the offending aircraft. If the noise incident is a result of pilot error, steps are taken to prevent further incidents.

TABLE 3

SINGLE EVENT
SEL VALUES OF R-5306 A USER AIRCRAFT

Aircraft Type	Power Setting (%)	Speed kts	SEL @ 1000 ft dBA	SEL 500 ft dBA
AV-8	87	420	103.2	107
A-4	89	420	92.1	107
A-6	97.5	420	107.9	109
F-18	93.5	420	110.3	@115

b. Current Noise Levels at BT-11/Piney Island

The noise analysis for the proposed MAEWR uses historical aircraft operations data and estimates of future operations to compute existing noise exposure around BT-11 and future noise exposure that would result with the MAEWR operational.

The Ldn values derived from the study are for a typical busy 24-hour period reflecting an average of operations over the course of a full year. This was done to obtain a stable representation of the noise environment, free of fluctuations in wind direction, temperature, aircraft performance, and total activity, any one of which can influence noise exposure levels significantly from one day to the next. The accumulation of noise computed in this manner provides a quantitative tool for comparing overall noise environments.

Methodology

Two major computer programs were used in the preparation of the noise contours for BT-11. Both were developed under contract to the U.S. Air Force which serves as the lead Department of Defense agency for aircraft noise modelling.

OMEGA 10 is used to generate the SELs required to describe the noise of individual aircraft operations. Engine power settings, airspeeds, and environmental conditions are input to Omega 10; the output is a curve of SEL versus slant distance to the aircraft under the given conditions.

Together with a standard military aircraft data base, known as NOISEFILE 4.4, OMEGA 10 provides the noise data for each specific aircraft operation modelled at a given facility. These data can then be checked by noise measurements during operations to assure accurate modelling of local operations. For this study, the AV8 and A6 aircraft noise levels were based on a combination of OMEGA 10 developed levels and extensive field measurements made at MCAS Cherry Point and other Marine and Navy facilities. The F16 aircraft noise was developed solely from OMEGA 10 data.

The final computation of noise exposure values for the BT-11 operations was accomplished with NOISEMAP 5.2. This program computes Ldn values at individual grid points using the SEL noise data (from OMEGA 10 and from measurements), number and type of aircraft operations, flight tracks flown by the aircraft and aircraft flight profiles (aircraft power, speed and altitudes).

Aircraft Types

To assess the noise effects of the proposed MAEWR, it was necessary to compute the total sound exposure produced on an average day by aircraft that use BT-11. The scheduling office at MCAS Cherry Point provided detailed use data for the six months of May 1986 through October 1986. Additional information included type of activity (DIVBM or bombing practice at BT-11 and ACM or aerial combat maneuvers), the time spent in the restricted area, the number of aircraft in each squadron flight using the area and which target was used.

Table 4 which presents the percentage use of the restricted area by aircraft type, demonstrates that to determine aircraft sound exposure within the restricted area, it is necessary to examine only three aircraft types: AV8, A6 and F16. All other aircraft either use the area too infrequently or are too quiet to contribute significantly to the total sound exposure. Table 5 presents detailed use data for these three principal aircraft types.

TABLE 4

PERCENT USE OF RESTRICTED AREA BY AIRCRAFT TYPE

Aircraft Type	Percent Use
A10	2.8%
A4	1.6%
A6	18.4%
A7	1.6%
AV8	55.7%
F14	0.3%
F15	0.1%
F16	7.5%
F18	1.1%
F4	2.7%
Other[1]	8.3%
TOTAL	100.0%

[1] Includes primarily helicopters, KC130's and OV10's

TABLE 5

USE OF RESTRICTED AREA BY PRINCIPAL AIRCRAFT TYPES

		AIRCRAFT TYPE AV8	A6	F16
1. Percent of Total Restricted Area Fights		55.7%	18.4%	7.5%
2. Total Monthly Flight = 564.8				
3. Hence, Total Monthly Flights by Aircraft		314.6	103.9	42.4
4. Percent of Flights that do:	Bombing	36.3%	38.4%	85.0%
	ACM	63.7%	61.6%	15.0%
5. Number of Monthly Flights:	Bombing	114.2	39.9	36.0
	ACM	200.4	64.0	6.4
6. Average Planes per Flight:	Bombing	2.0	2.0	4.0
	ACM	2.5	1.7	4.7
7. Planes per Month:	Bombing	230.7	79.8	144.0
	ACM	499.0	109.5	29.7
8. Planes per DAY:	Bombing	10.6	3.7	6.6
	ACM	23.0	5.1	1.4
9. Minutes in Restricted Area:	Bombing	32.8	45.6	25.6
	ACM	35.9	39.3	27.5

It should be noted that in Table 5 Lines 6 and 7 convert number of flights into number of planes, using detailed counts of planes per flight for bombing and ACM work. Assuming 52 weeks per year of use, and five days per week, the monthly numbers of line 7 are changed into daily numbers in line 8. (Days per month - (52x5)/12 - 21.67.) Thus, for modelling purposes, 10.6 AV8s, 3.7 A6s and 6.6 F16s were assumed to use BT-11 for bombing practice on a typical day. All use of BT-11 occurs between the hours of 0700 and 2200 local.

Target use determines the aircraft flight tracks for their "runs". Scheduling data provided a breakdown by target type, and detailed analysis yielded estimates of percent use. Table 6 summarizes this analysis.

If, the numbers of Table 5 are used to estimate how many planes use bombing targets during a two month period a discrepancy is apparent. For example, Table 5 gives 230.7 AV8's doing bombing per month or 461.4 in two months, (Table 6 line 5). But during May and October, only 404 planes used these three targets, or 87.6% of the expected number. Facility personnel were questioned about these discrepancies, and their responses are summarized in Table 7. This table provides information on estimated significant use of all targets.

TABLE 6

TARGET USE BY PRINCIPAL AIRCRAFT TYPES

		AIRCRAFT TYPE AV8	A6	F16
1. Planes Using Targets May & Oct:	Barge	104	44	126
	500 Bull	250	8	28
	800 Bull	50	4	22
2.	Totals	404	56	176
3. Percent Use of Targets:	Barge	25.7%	76.6%	71.6%
	500 Bull	61.9%	14.3%	15.9%
	800 Bull	12.4%	7.1%	12.5%
4.	Total	100.0%	100.0%	100.0%
5. Planes Computed to Use Targets During Two Months (2 x line 7, Table 2)		461.4	159.6	100.0%
6. Percent Accounted for by May & Oct Data (Line 2 divided by line 5)		87.6%	35.1%	61.1%

TABLE 7

ESTIMATED USE OF ALL TARGETS

TARGET	AV8	A6	F16
A. North Guns	3%	13%	20%
B. Inert Tow Convoy	2%	9%	*
C. Simulated Convoy	*	2%	*
D. Barge	23%	28%	44%
E. PT Boat	3%	*	1%
F. 500 Foot Bullseye	54%	5%	10%
G. Straffing Banner	*	*	*
H. 800 Foot Bullseye	11%	2%	8%
I. Simulated Train	*	*	3%
J. SAM Site	2%	9%	11%
K. Simulated Airstrip	2%	16%	*
L. Simulated Fuel Farm	*	9%	3%
M. Mobile Land Target	*	5%	*
N. SEPTAR	*	2%	*
O. Trimaran	*	*	*
P. Alast	*	*	*
TOTAL	100%	100%	100%

*Less than 1% of total use

These uses were interpreted to mean that the bulk of run ins are reasonably modelled by assuming that they are directed at the central portion of the island.

Ingress/Egress Tracks

Figure 3 presents the primary ingress and egress corridors. The six routes shown are the two military training routes VR1046 from the northwest and VR1043 from the south, two routes from MCAS Cherry Point, labelled River and Canal, and two overwater routes labelled Northeast and Southeast. Table 8 presents the percent use of these routes by aircraft type and Figure 3 gives the actual modelled numbers of operations in each route for each aircraft type.

TABLE 8

ESTIMATED USE OF INGRESS/EGRESS ROUTES

INGRESS/EGRESS ROUTE		AIRCRAFT TYPE AV8	A6	F16
River	Ingress	30%	20%	
	Egress	40%	30%	
Canal	Ingress	30%	20%	
	Egress	40%	30%	
VR1046	Ingress	10%	15%	45%
	Egress	5%	10%	45%
VR1043	Ingress	10%	15%	40%
	Egress	5%	10%	40%
Southeast	Ingress	10%	15%	15%
	Egress	5%	10%	15%
Northeast	Ingress	10%	15%	
	Egress	5%	10%	
TOTAL	Ingress	100%	100%	100%
	Egress	100%	100%	100%

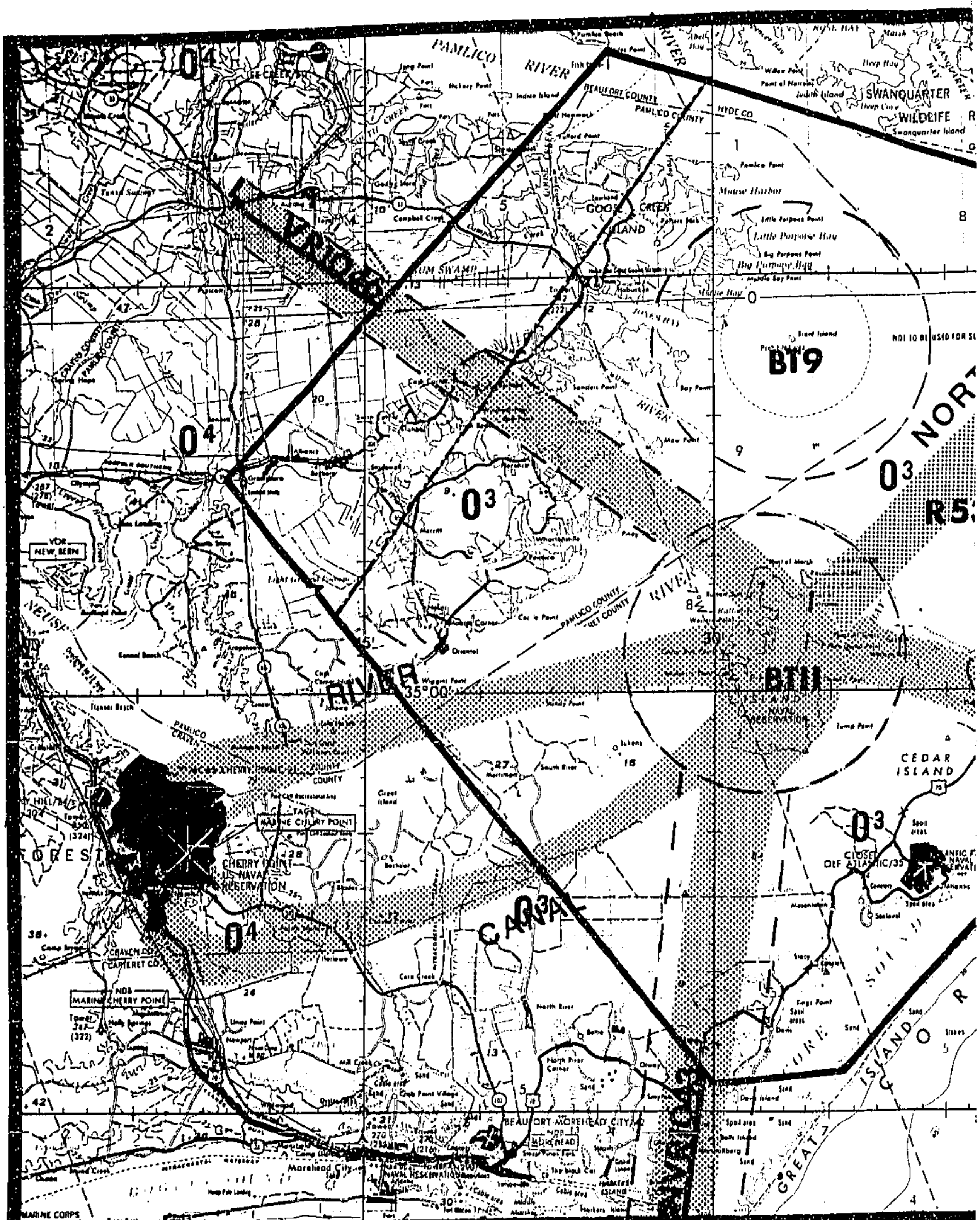
Flight Profiles

Flight profiles, though always a simplification of the actual speeds, altitudes and powers flown, are adequate to provide realistic estimates of the noise produced. Flight profiles by aircraft type, are presented in the following tables for each of the aircraft missions.

FIGURE 3

MID-ATLANTIC ELECTRONIC WARFARE RANGE

INGRESS/EGRESS ROUTES



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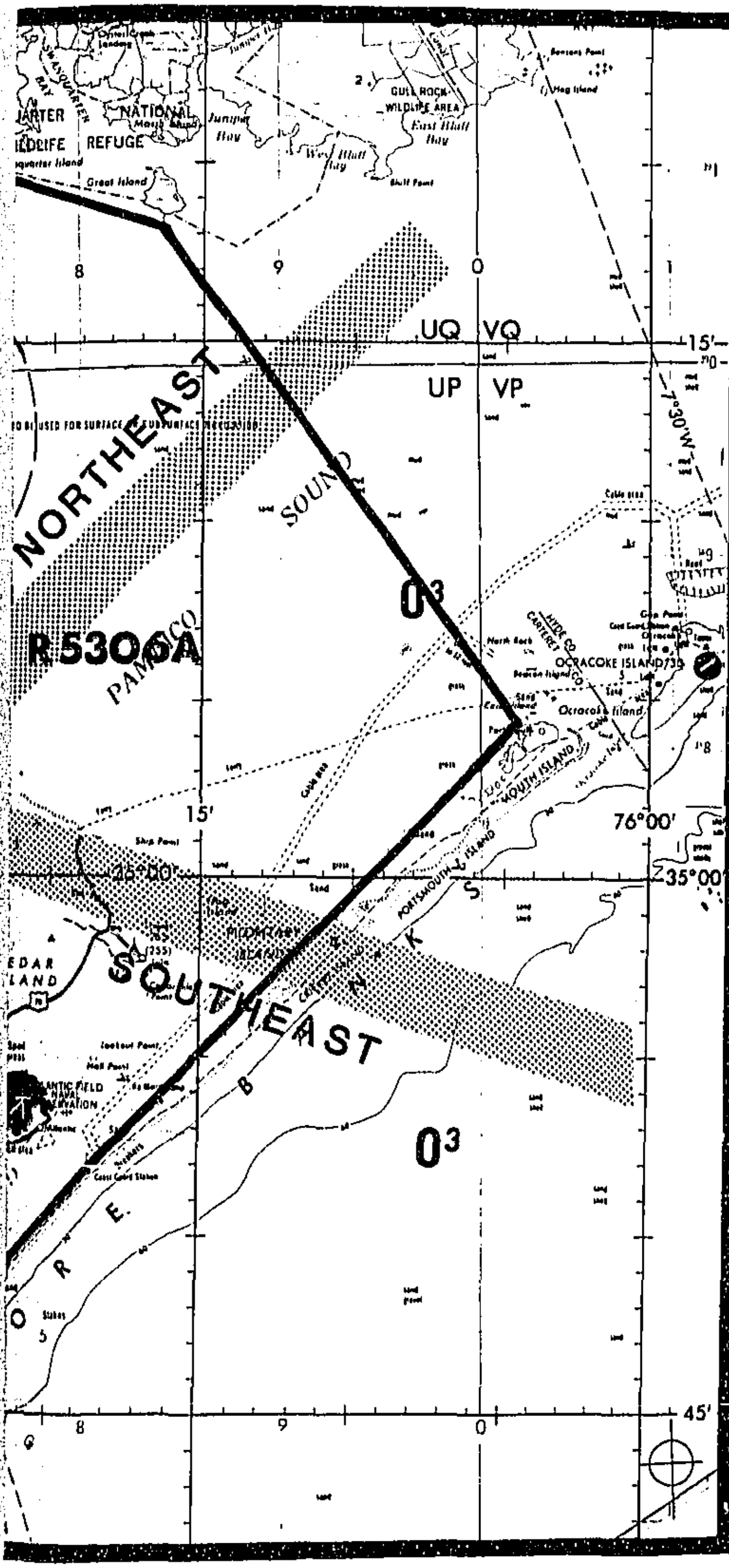

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 3

INGRESS/EGRESS ROUTES

Route	Modelled Ingress/Egress Operations		
	AV8	A6	F16
VR1043	1.59	0.93	5.28
CANAL	7.42	1.85	--
RIVER	7.42	1.85	--
VR1046	1.59	0.93	5.94
NORTHEAST	1.59	0.93	--
SOUTHEAST	1.59	0.93	1.98
TOTAL*	21.20	7.42	13.20

*Total is twice the number of aircraft using the MAEWR

NORTH

NAUTICAL MILES

0 5 10

Base Map:
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TABLE 9

AV8 DIVE BOMBING

Location		Distance from Target (miles)	AGL (feet)	Speed (Kts)	Power (Percent)
Start of run in					
	10^{o}	2 1/2 - 3	2,500	450	60
	30^{o}	2 1/2 - 3	9,500	500	60
	45^{o}	2 1/2	14,000	500	60
Bottom Out					
	10^{o}	1/2	200	450	60
	30^{o}	1	3,500	500	60
	45^{o}	3/4	4,500	500	60
Climb Out & Pull					
	10^{o}	1/2 Past Target	to 2,500	400	Military*
	30^{o}	1/2	9,500	350	Military
	45^{o}	1/2	14,000	350	Military
Down Wind					
	10^{o}	2 Abeam	2,500	400	85
	30^{o}	2	9,500	350	85
	45^{o}	2	14,000	350	85

* Military - Maximum throttle without use of after burner if so configured.

TABLE 10

POP UP

Location		Distance from Target (miles)	AGL (feet)	Speed (Kts)	Power (Percent)
Start of Run in					
	AV8	@ IP	200	480	95
	A6	6	500	450	Military
	F16	7	750	450	90
Pop up					
	AV8	3	to 2,000	480	Military
	A6	4	to 2,500	450	Military
	F16	4 1/2	to 5,000	450	Military
Dive					
	AV8	2	to 200	450	93
	A6	2 1/2	to 600	450	94
	F16	1 1/2	to 800	500	90
Bottom Out					
	AV8	1/4	200	400	85
	A6	1/2	600	450	90
	F16	1/4	800	500	90
Climb Out					
	AV8	1/2 Past Target	to 1,500	400	Military
	A6	overhead target	to 1,500	350	90
	F16	overhead	to 3,000	350	Military
Down Wind					
	AV8	2 Abeam	1,500	450	93
	A6	2 Abeam	1,500	350	90
	F16	3 Abeam	3,000	350	85
Turn to Run in					
	AV8	Abeam IP	down to 200	450	Military
	A6	6	down to 500	450	Military
	F16	7	to 700	450	90

TABLE 11

LEVEL DELIVERY

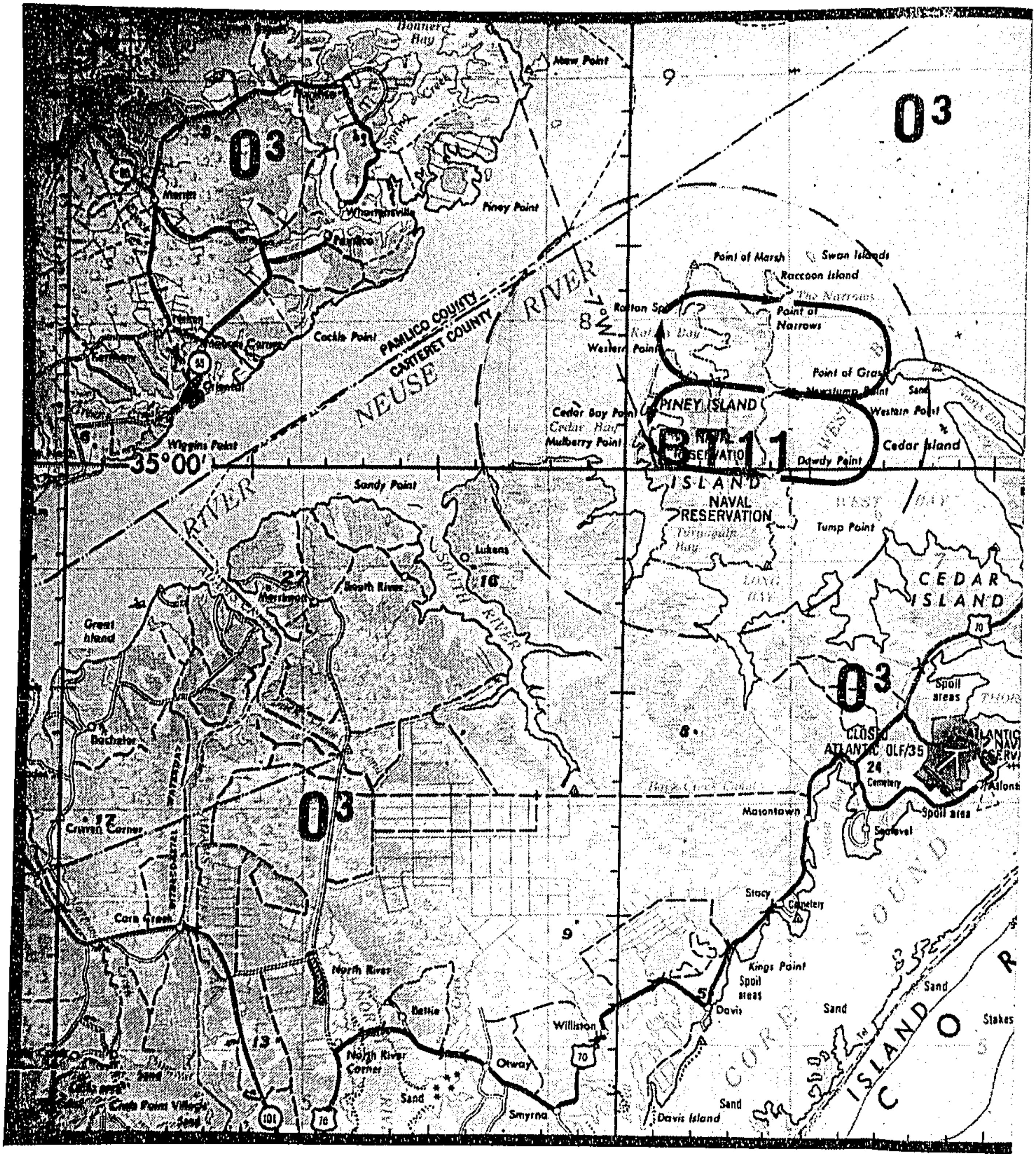
Location		Distance from Target (miles)	AGL (feet)	Speed (Kts)	Power (Percent)
Start of Run in					
	AV8				
	A6	6	500	450	Military
	F16	7	750	450	90
Climb Out					
	AV8				
	A6	over target	to 1,500	350	90
	F16	over target	to 3,000	350	Military
Down Wind					
	AV8				
	A6	2 Abeam	1,500	350	90
	F16	3 Abeam	3,000	350	85
Turn to Run in					
	AV8				
	A6	6	down to 500	450	Military
	F16	7	to 750	450	90

TABLE 12

A6 30° DIVE

Location	Distance from Target (miles)	AGL (feet)	Speed Kts	Power (Percent)
Start of Run in	2 1/2	9,000	300	80
Bottom Out	3/4	2,500	450	80
Climb Out	overhead target	to 9,000	300	Military
Down Wind	3 Abeam target	9,000	300	80

Figures 4 through 15 present the primary bombing run tracks for the three types of aircraft. These tracks were derived though interviews with pilots of each aircraft type and, though not including all types of runs, represent the majority of missions/runs by these aircraft.



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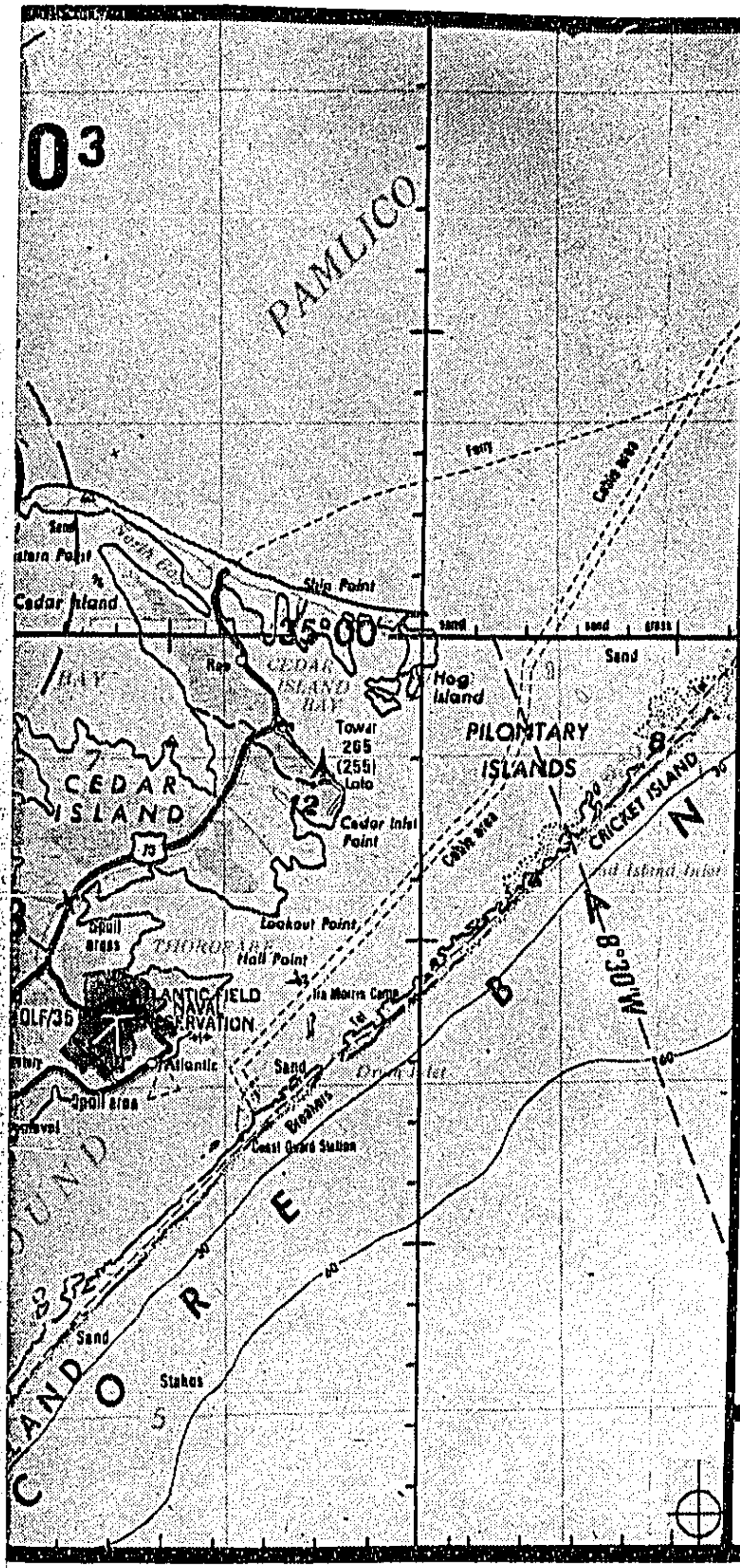

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 4
AV8 PATTERNS FOR 10°, 30°, 45° DIVES

Type of Dive	Modelled Daily Operations	
	Left Turn	Right Turn
10°	42.79	10.70
30°	70.69	17.67
45°	19.63	4.91

NORTH

NAUTICAL MILES

0 5

Base Map:
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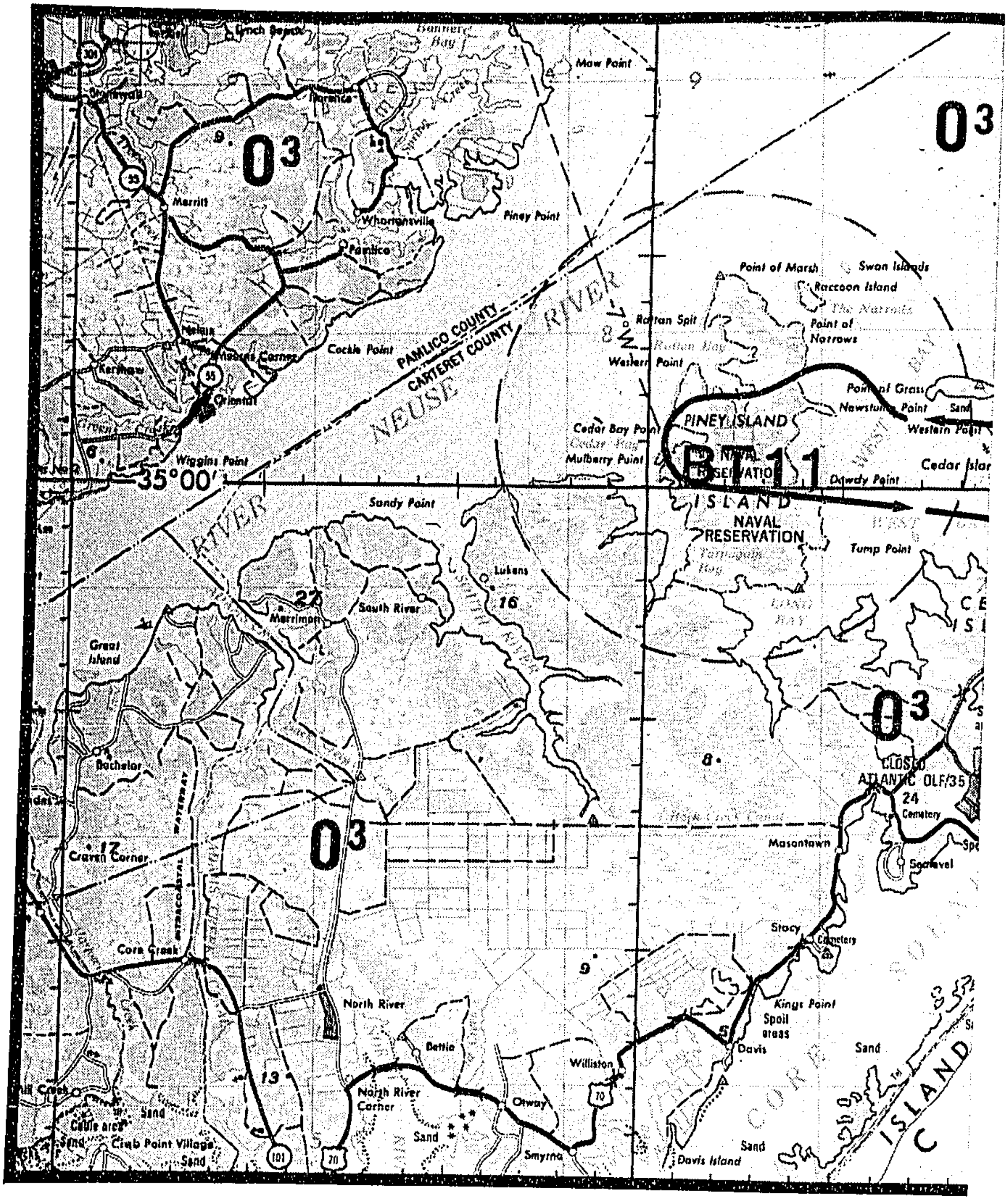

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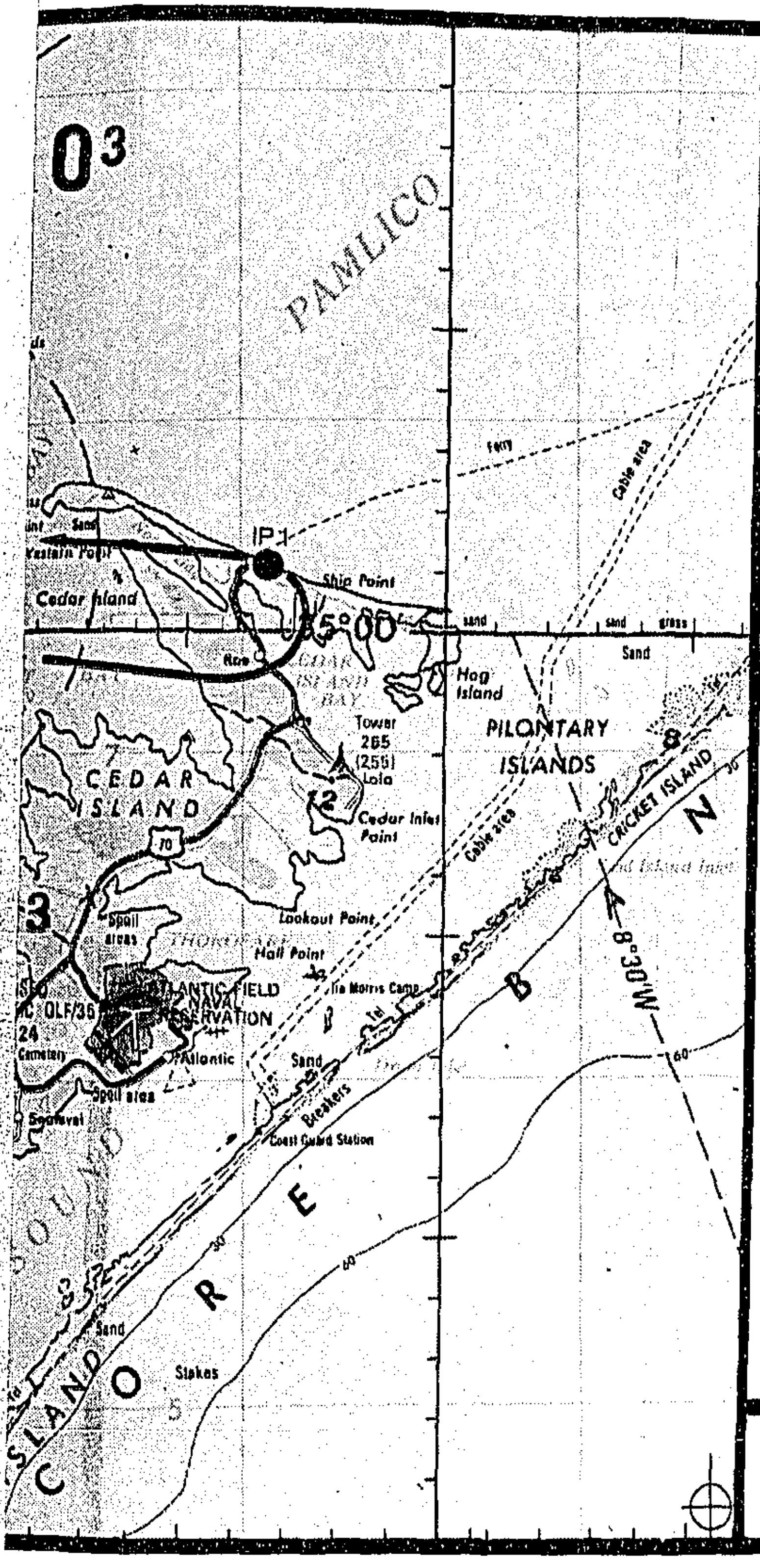

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 5
AV8 POP UP RUN IN FROM IP #1

Modelled Daily Operations	3.77

NORTH

NAUTICAL MILES

0 5

Base Map:
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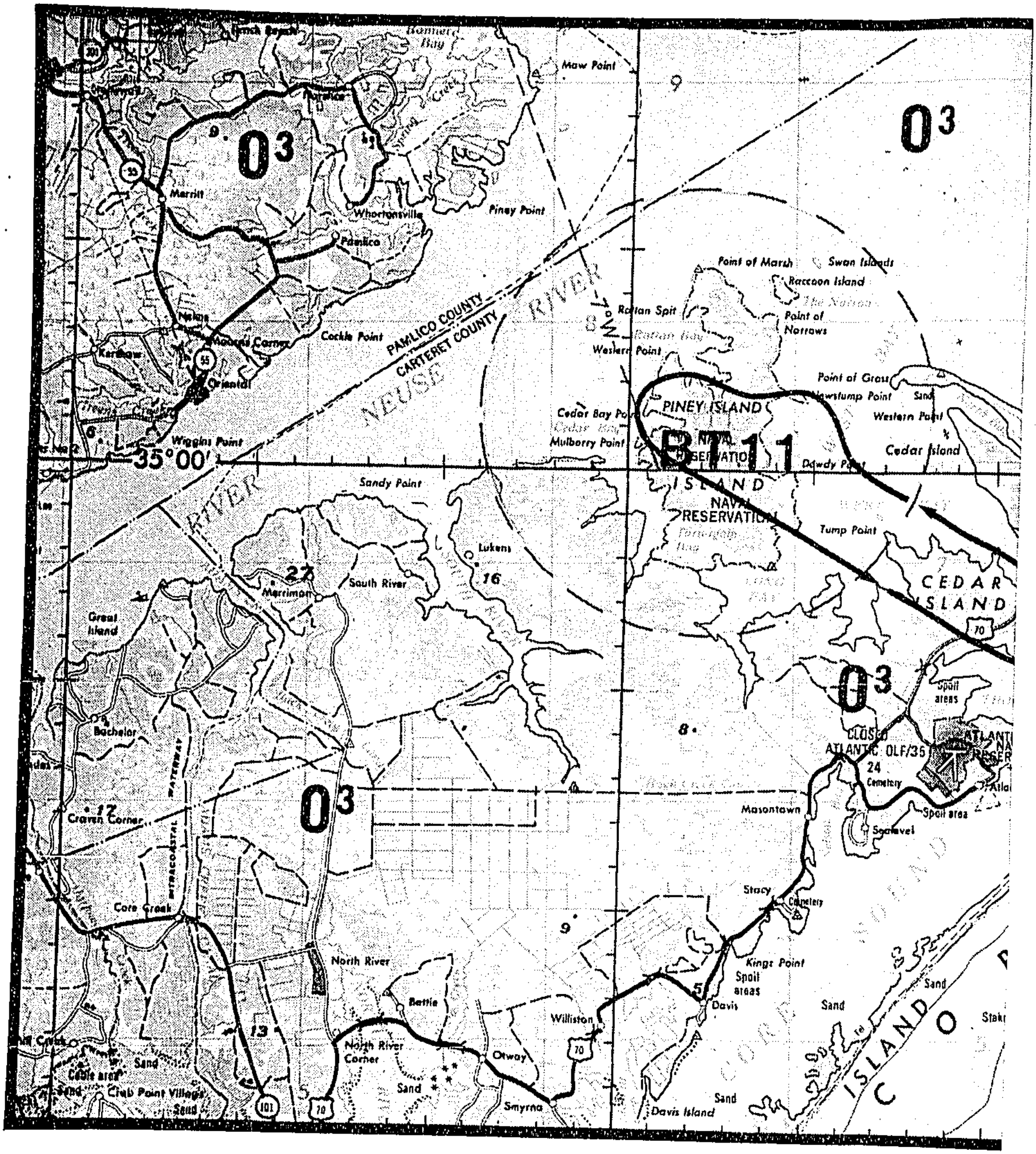

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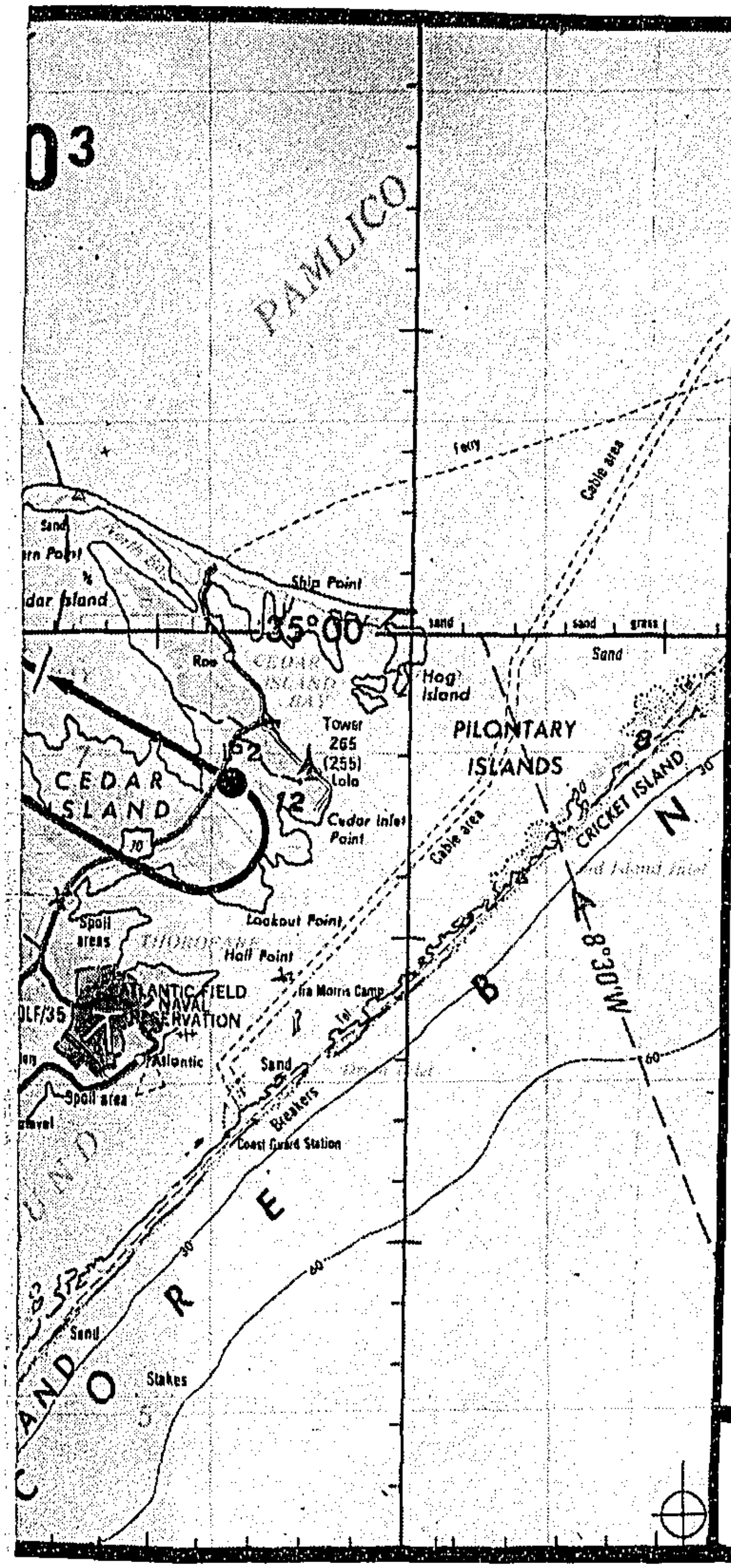

MID-ATLANTIC
ELECTRONIC
WARFARE RANGE

FIGURE 6
AV8 POP UP RUN IN FROM IP #2

Modelled Daily Operations	1.75

NORTH

NAUTICAL MILES

0 5

Base Map:
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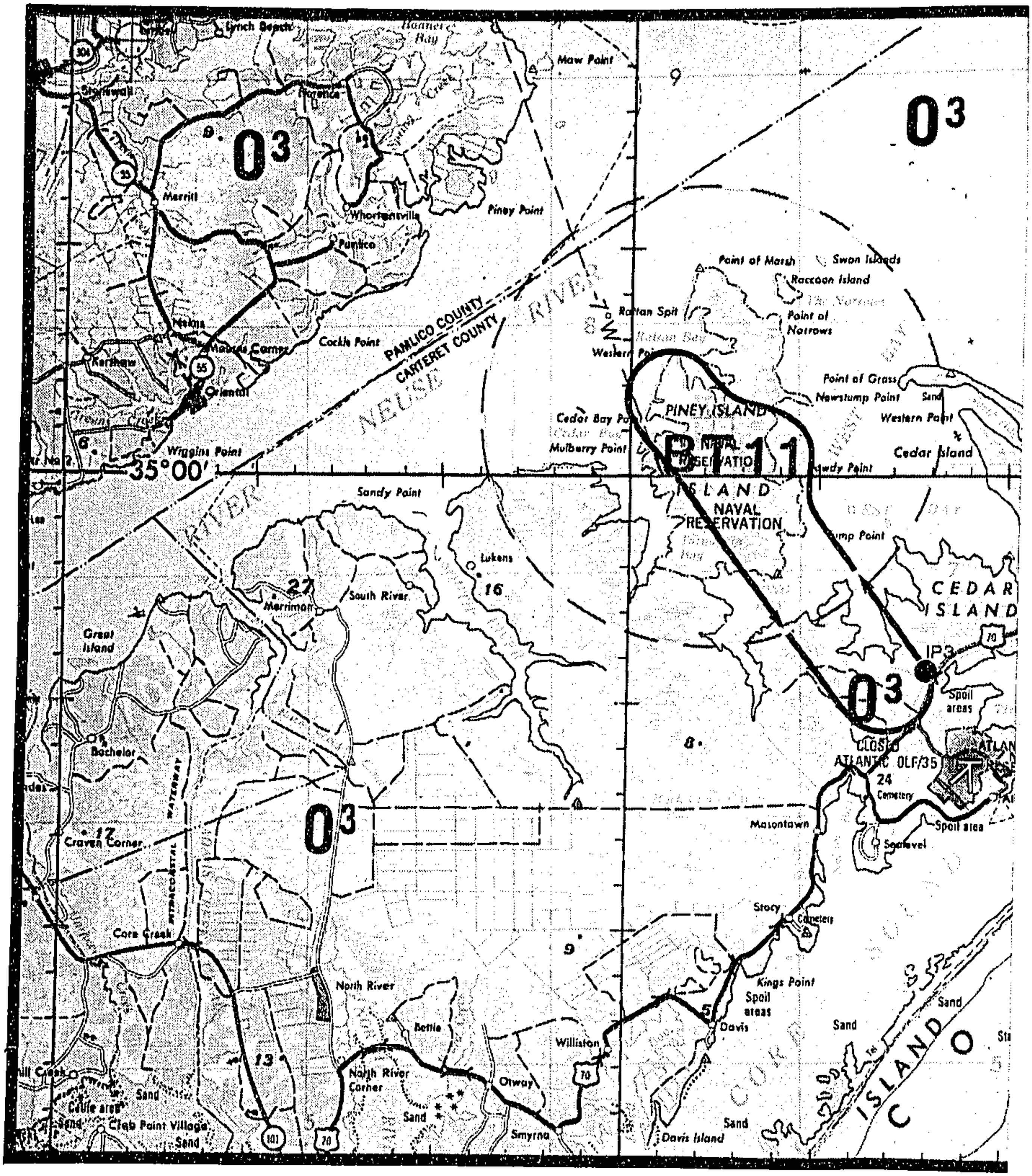

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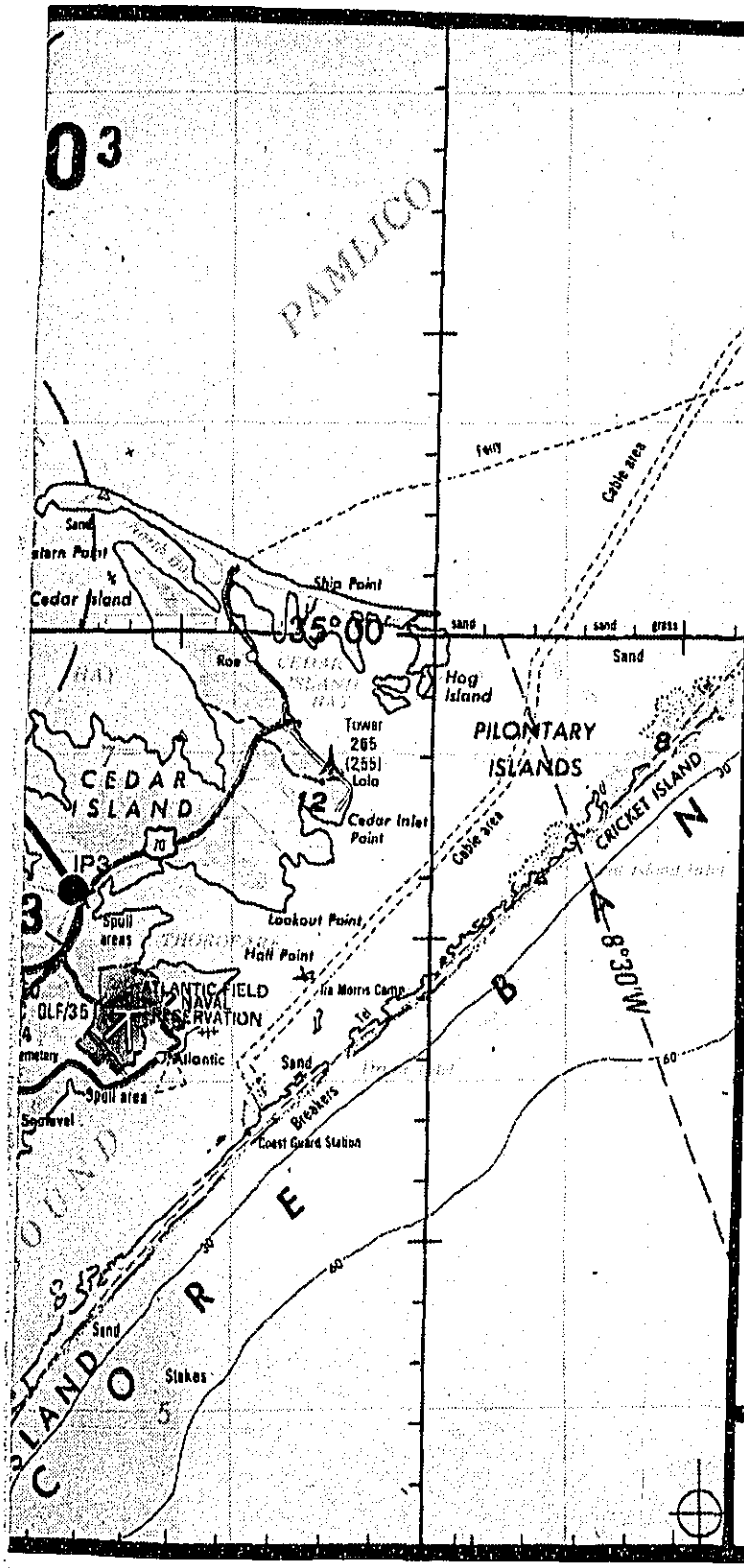

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 7

AV8 POP UP RUN IN FROM IP #3

Modelled Daily Operations	0.93

NORTH

NAUTICAL MILES

0 5

Base Map:
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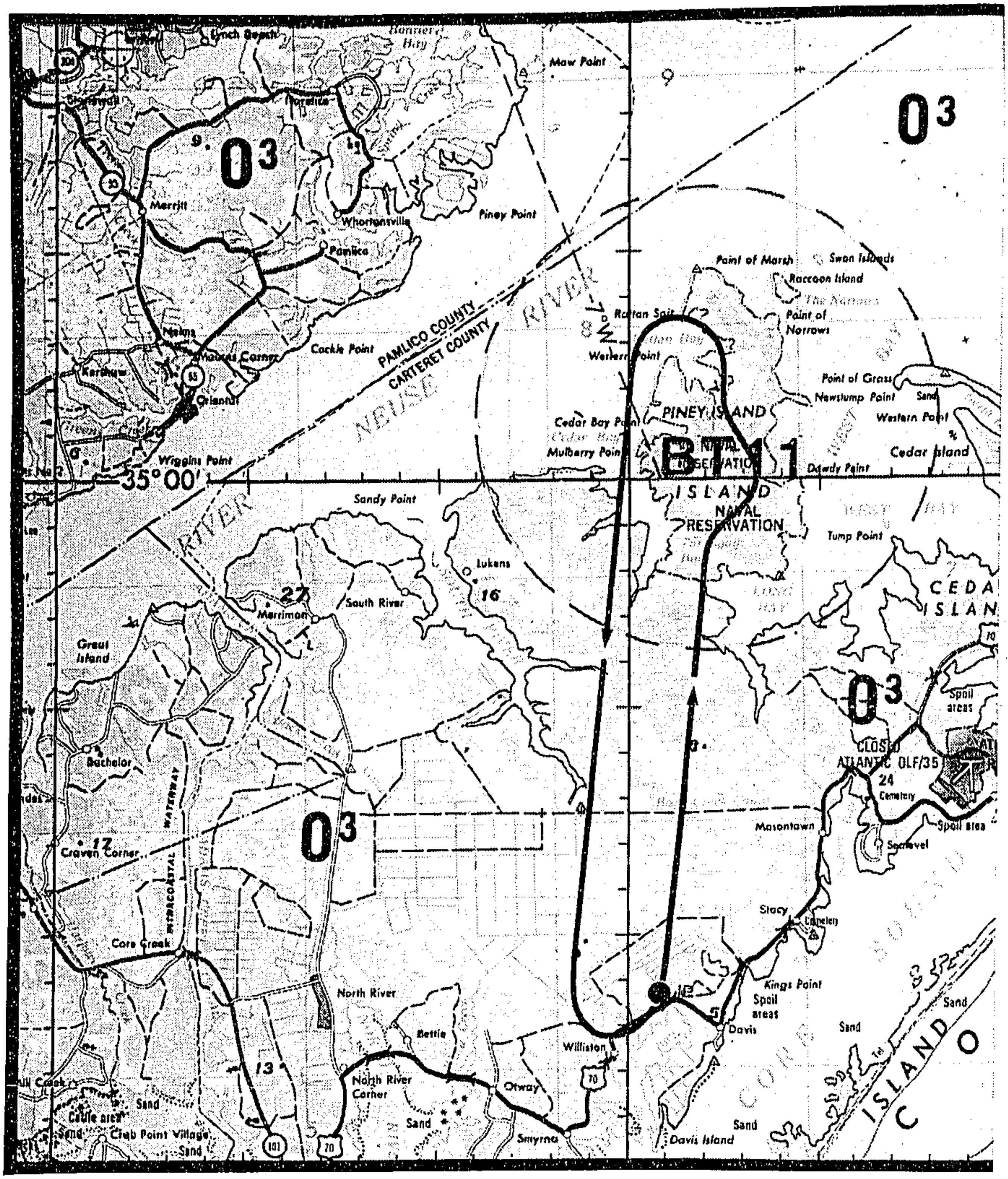

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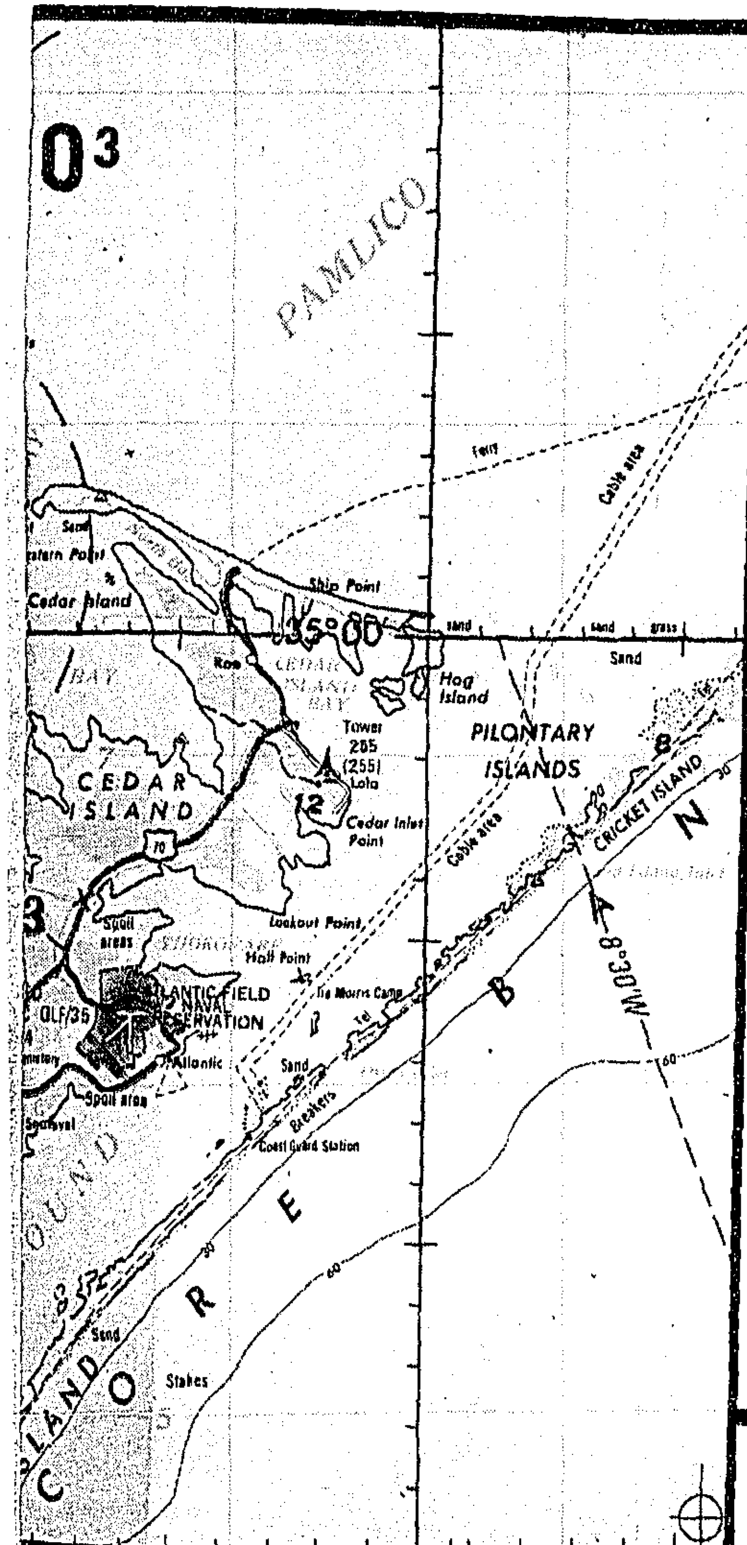

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 8
AV8 POP UP RUN IN FROM IP #4

Modelled Daily Operations	0.32

NORTH

NAUTICAL MILES

0 5

Base Map:
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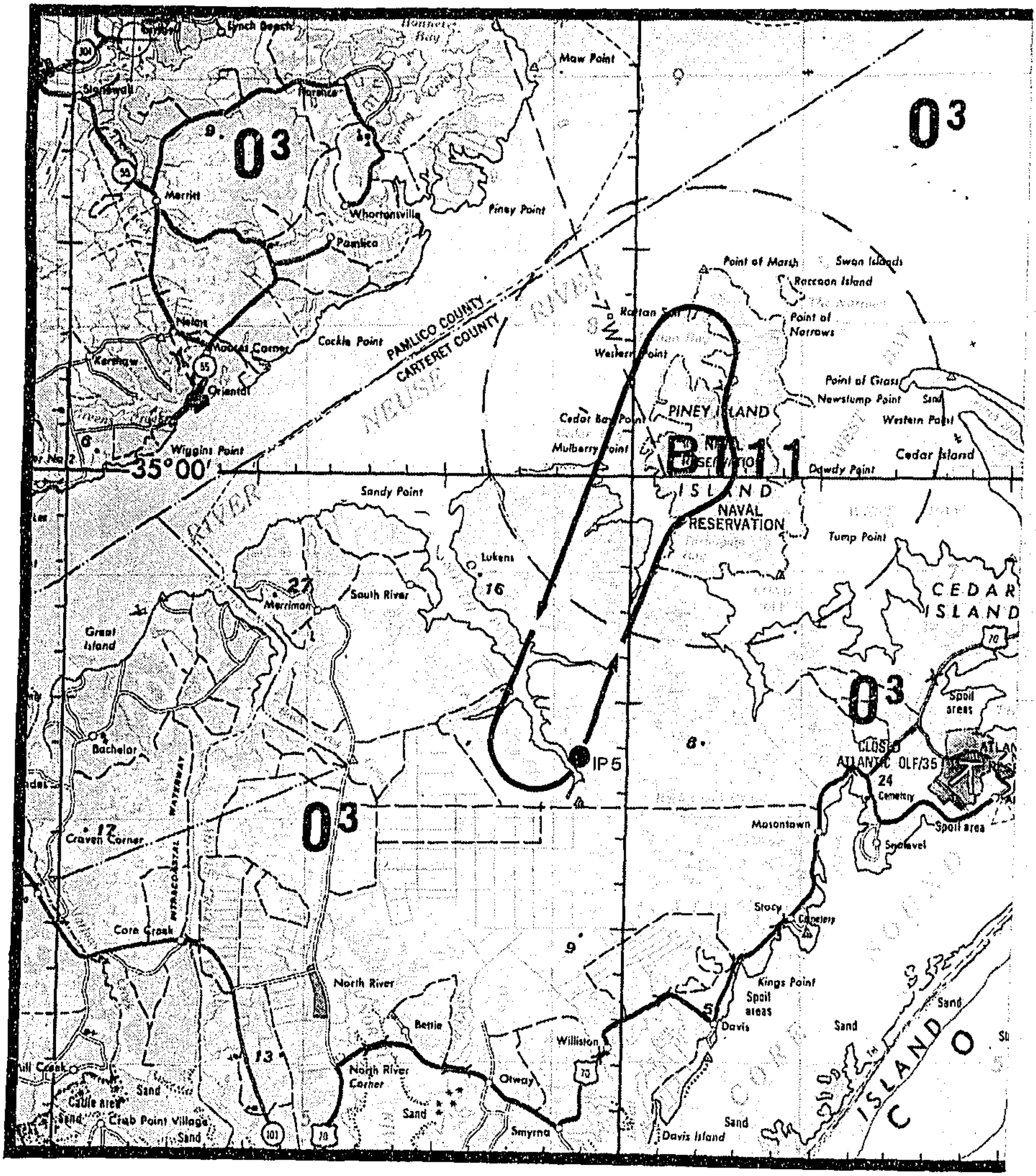

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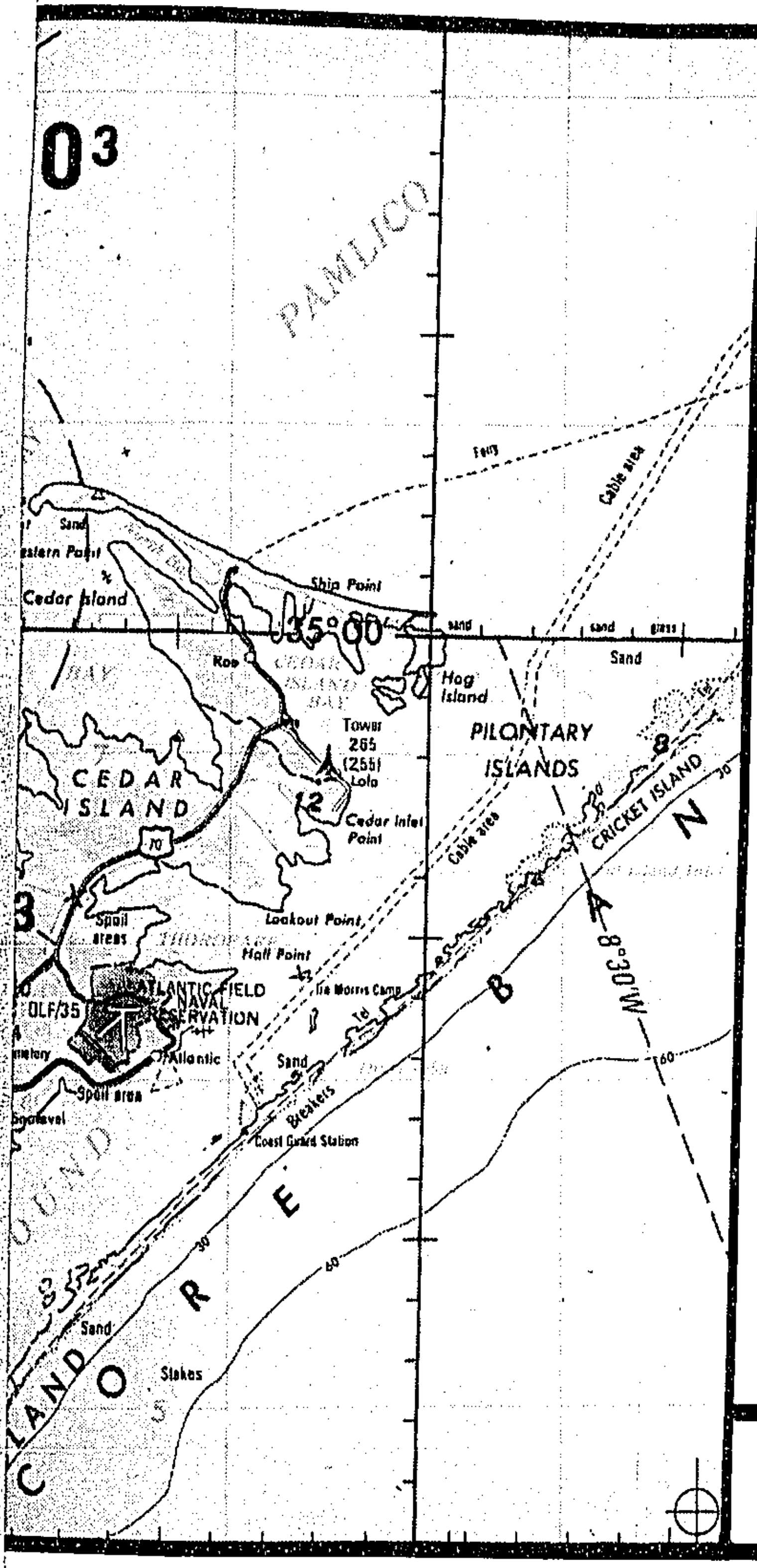

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 9

AV8 POP UP RUN IN FROM IP #5

Modelled Daily Operations	0.84

NORTH

NAUTICAL MILES

0 5

Base Map:
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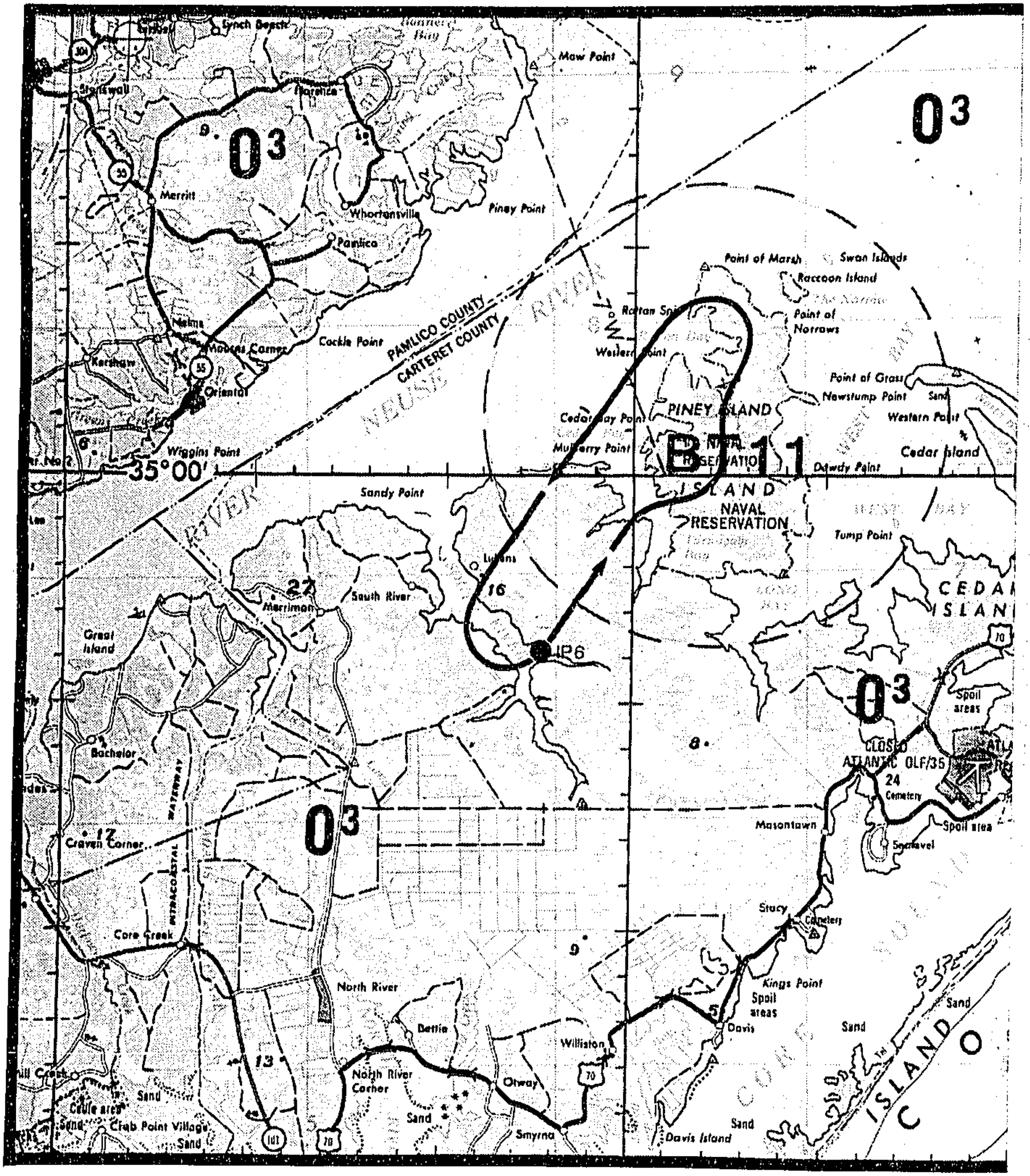

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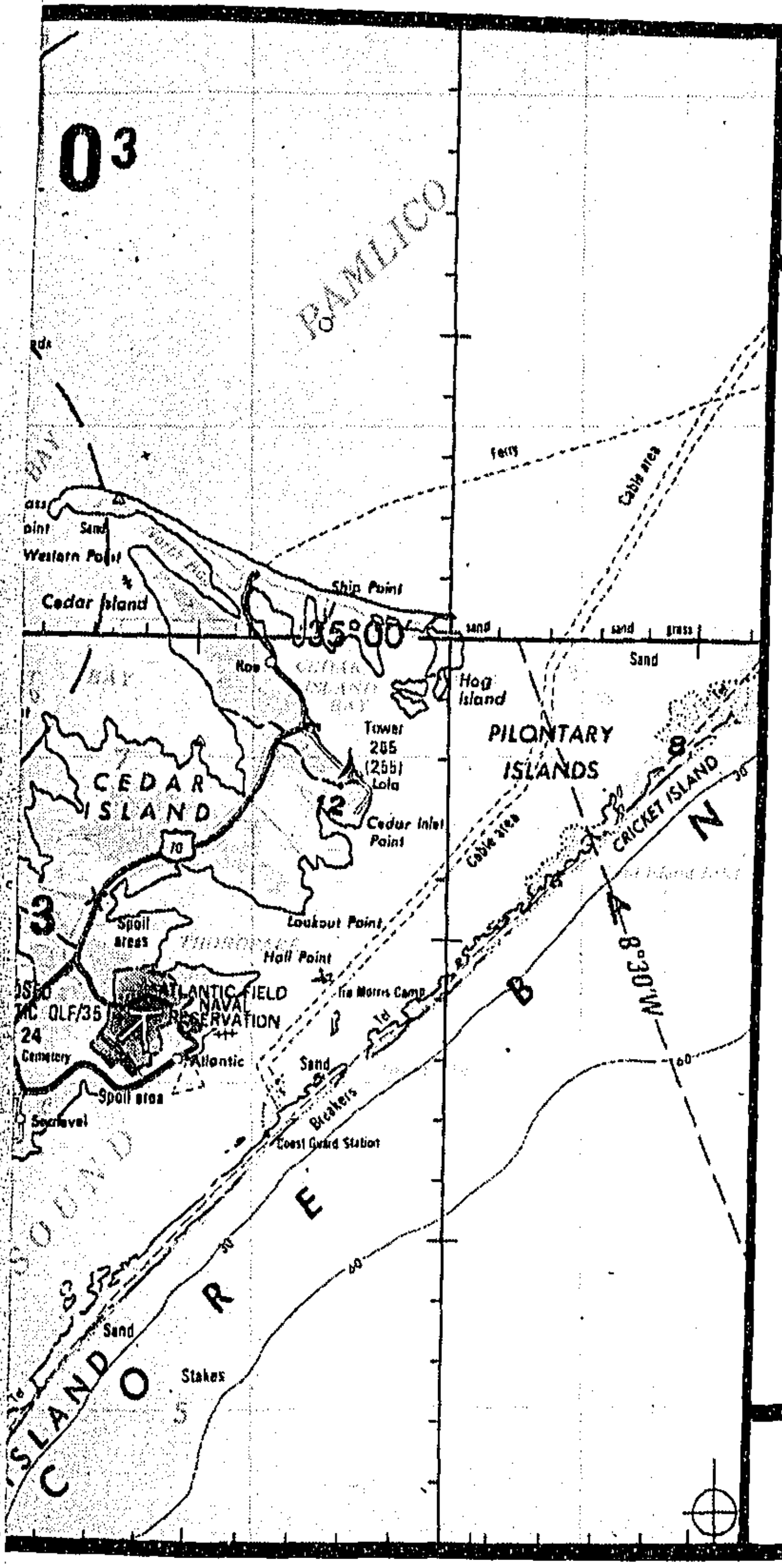

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 10
AV8 POP UP RUN IN FROM IP #6

Modelled Daily Operations	1.47

NORTH

NAUTICAL MILES

0 5

Base Map:
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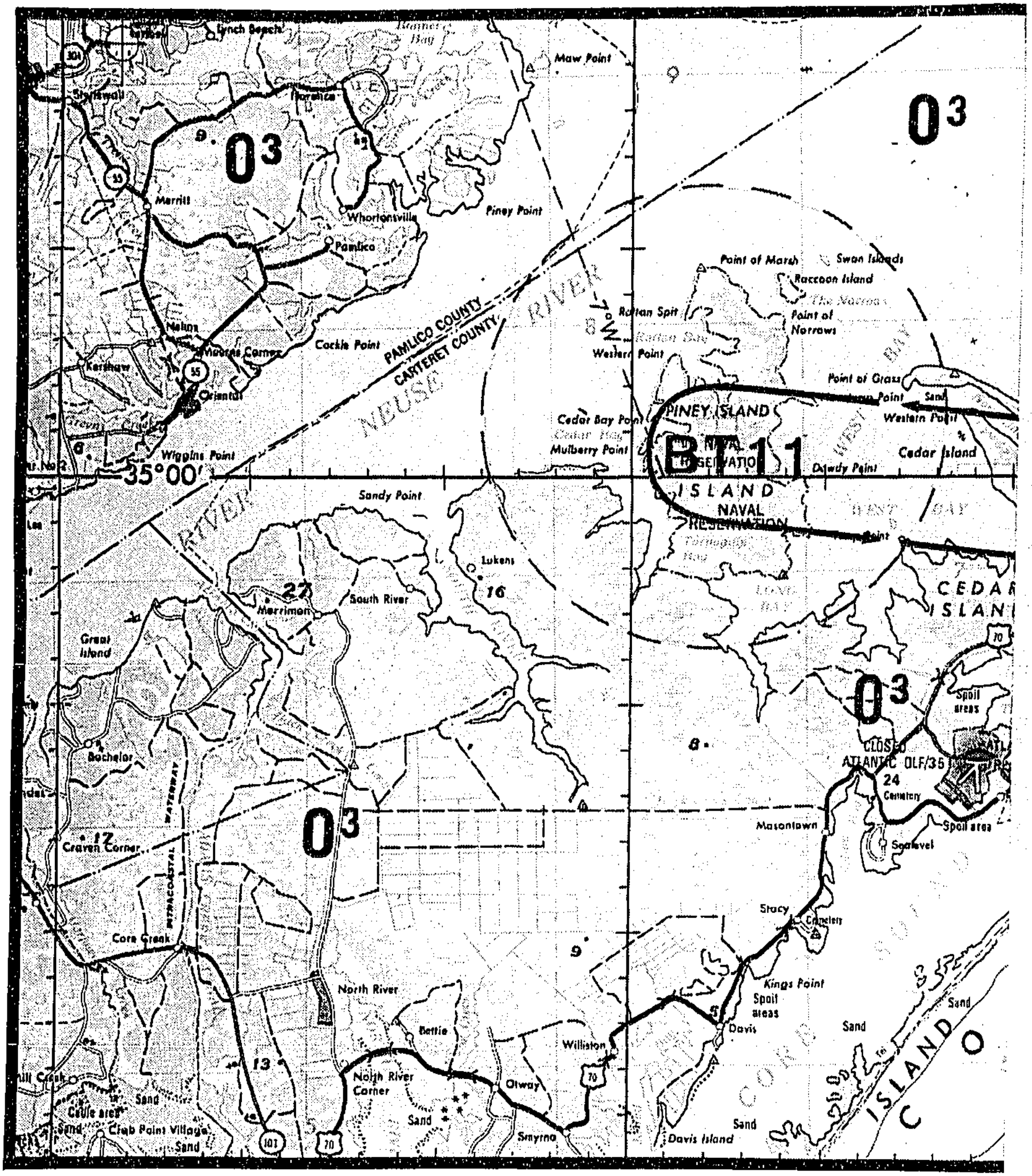

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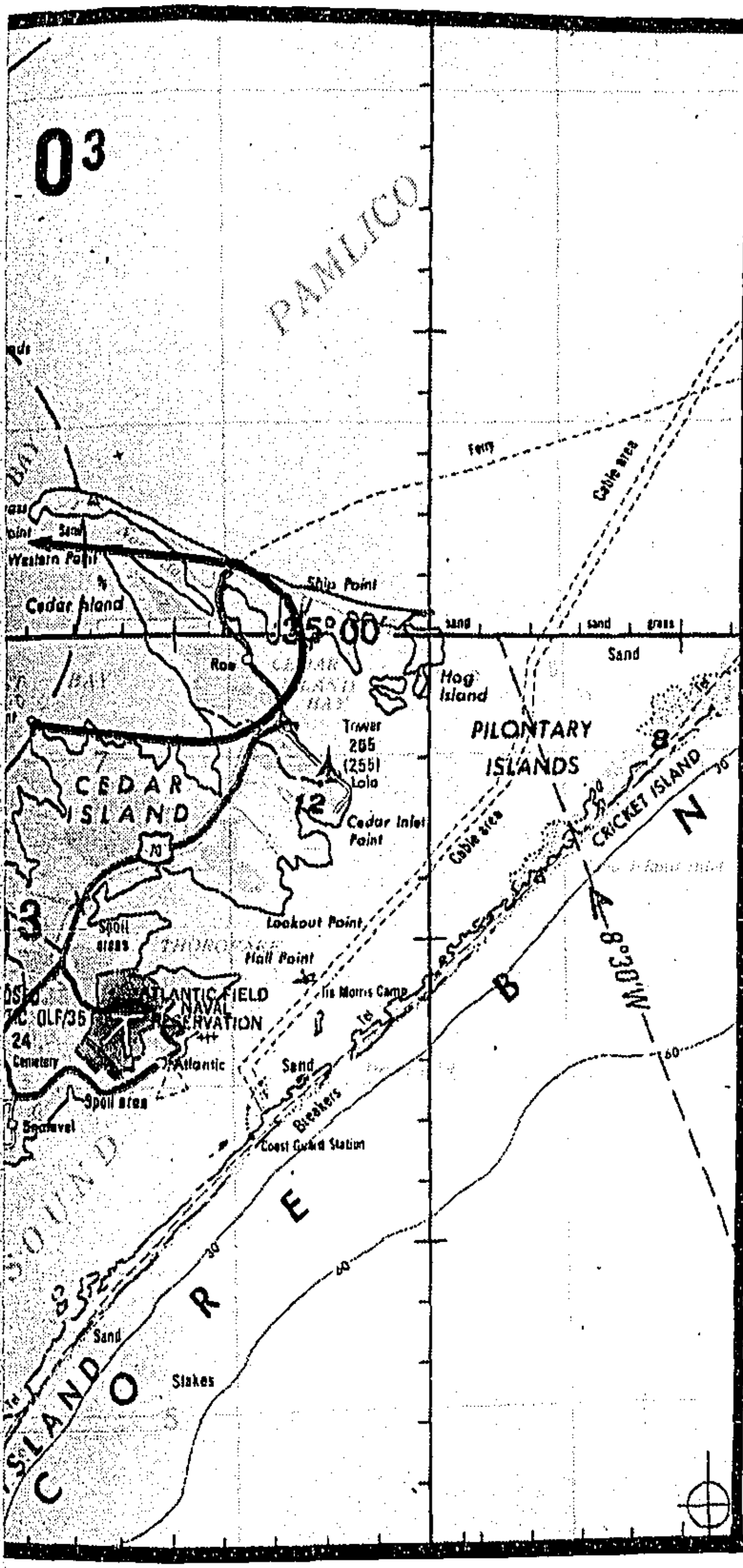

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 11
A6 LEVEL DELIVERY

Modelled Daily Operations	30.79

NORTH

NAUTICAL MILES

0 5

Base Map:
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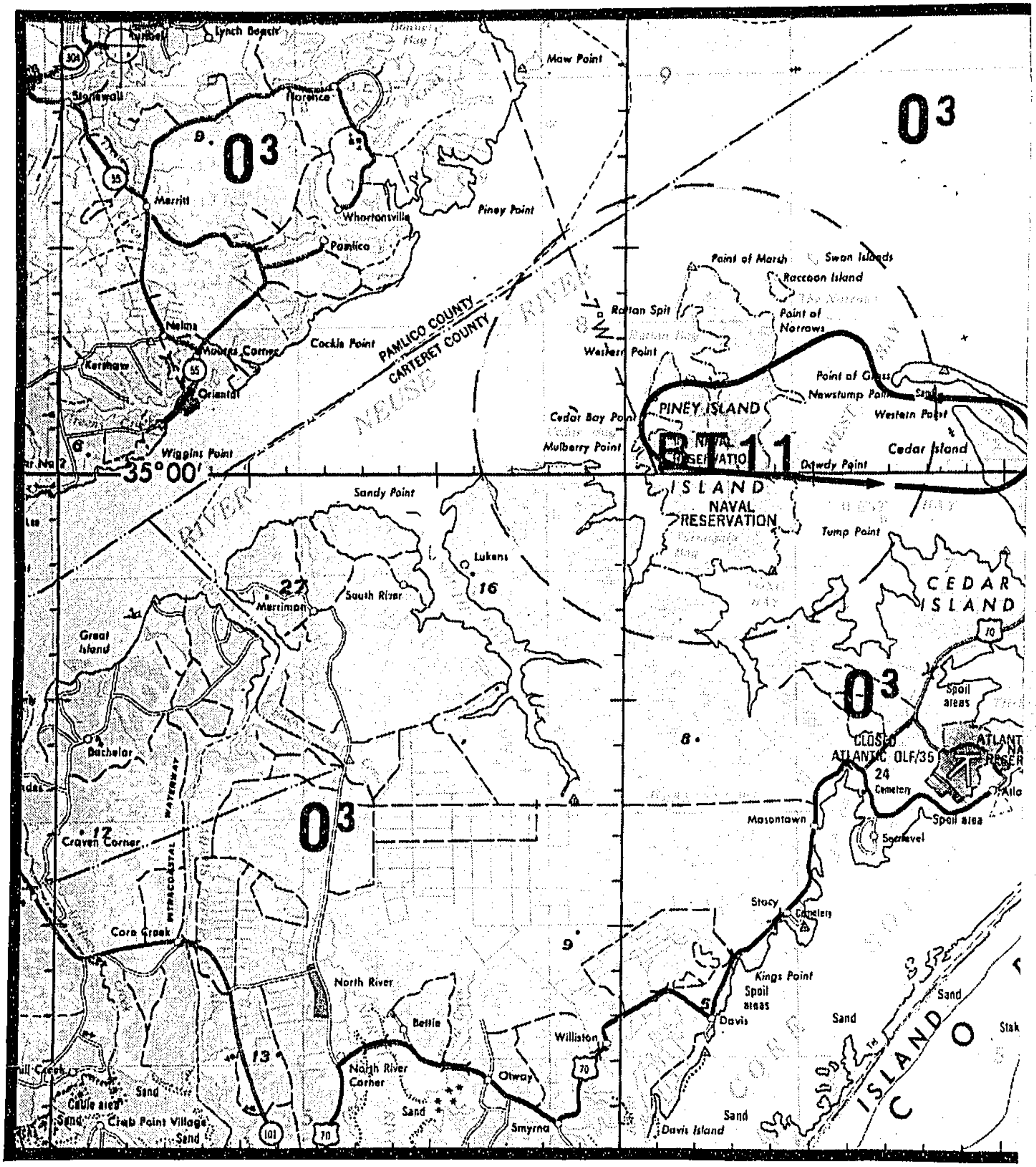
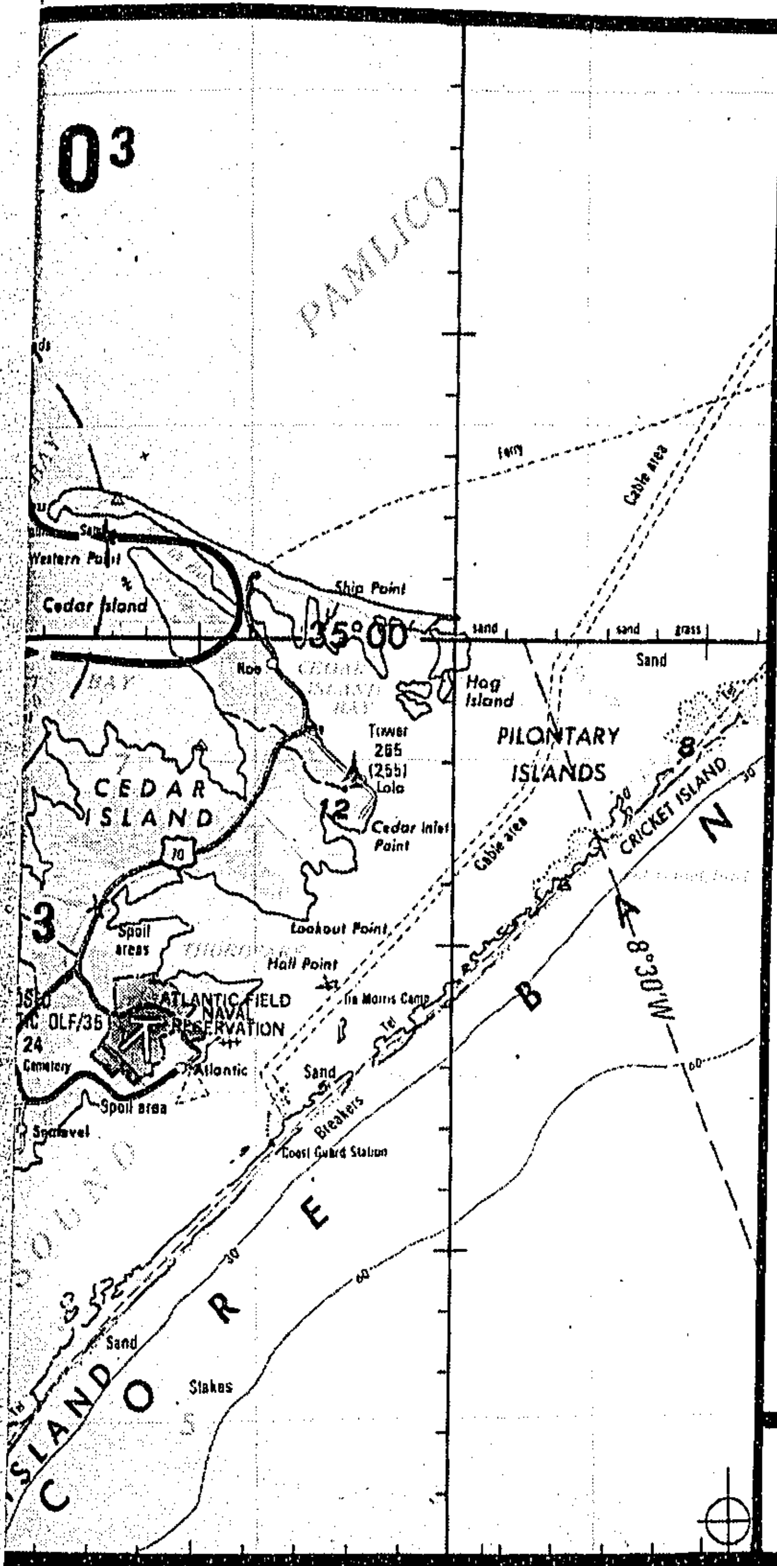


Lynch Beach
Maw Point
Stonewall
Florence
0^3
Merritt
Whortonsville
Piney Point
Pamlico
Nelson
Moores Corner
Cockle Point
PAMLICO COUNTY
CARTERET COUNTY
NEUSE RIVER
Kershaw
Oriental
Wiggins Point
35°00′
Point of Marsh
Swan Islands
Raccoon Island
Rattan Spit
Point of Narrows
Western Point
Point of Glass
Newstump Point
Western Point
Cedar Bay Point
Mulberry Point
PINEY ISLAND
R-T11
NAVAL RESERVATION
Cedar Island
Dowdy Point
ISLAND
NAVAL
RESERVATION
Sandy Point
Tump Point
Lukens
CEDAR
ISLAND
Merrimon
South River
Great Island
Spoil areas
Bachelor
CLOSED
ATLANTIC OLF/35
Cemetery
Spoil area
Masontown
Sealevel
Craven Corner
INTRACOASTAL WATERWAY
Stacy
Cemetery
Core Creek
Kings Point
North River
Spoil areas
Davis
Bettie
Williston
North River Corner
Otway
Sand
Cattle area
Crab Point Village
Smyrna
Davis Island
ISLAND



MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 12
A6 POP UP RUN IN

Modelled Daily Operations	11.76

NORTH

NAUTICAL MILES

0 5

Base Map:
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Defense Mapping Agency

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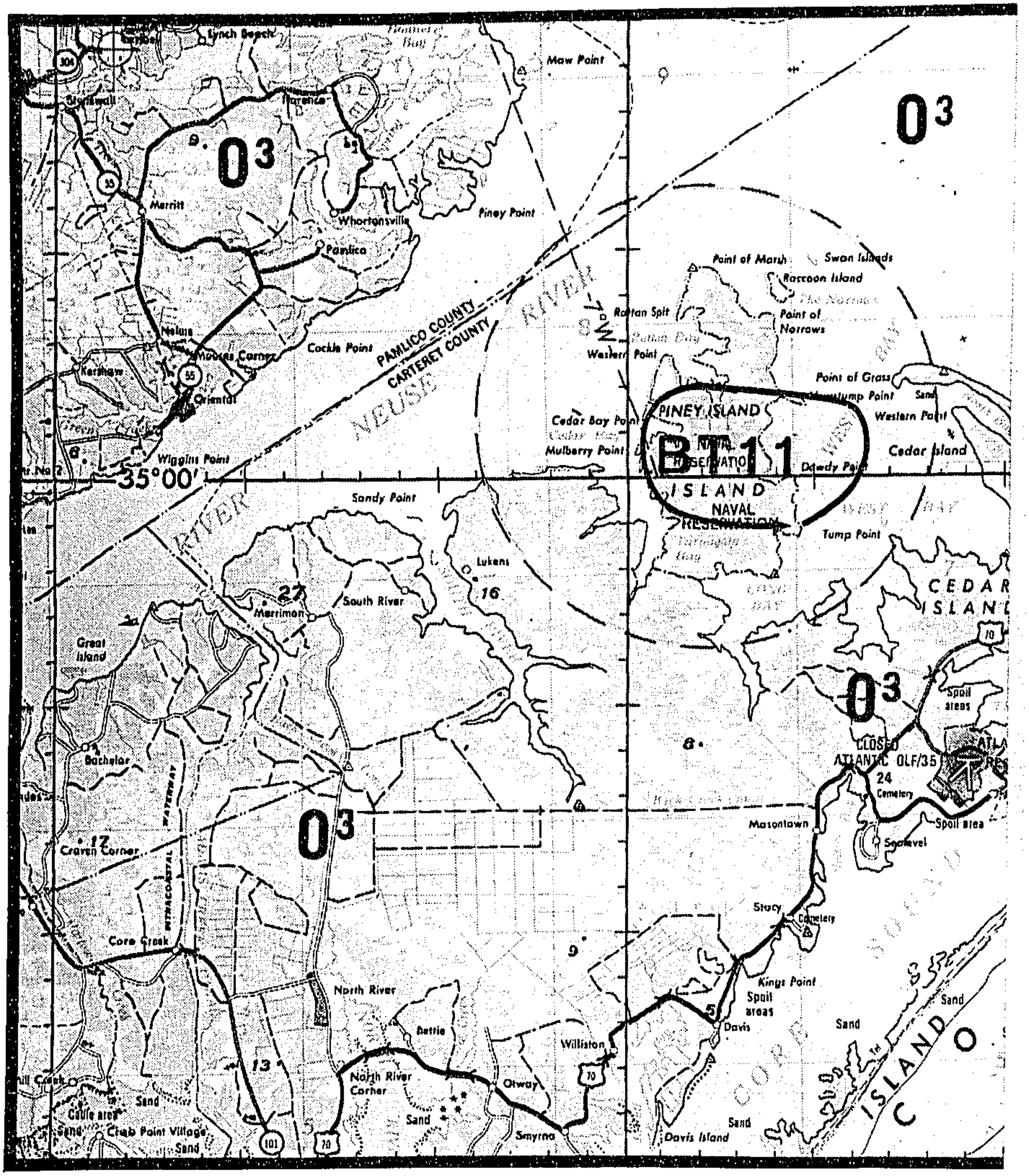

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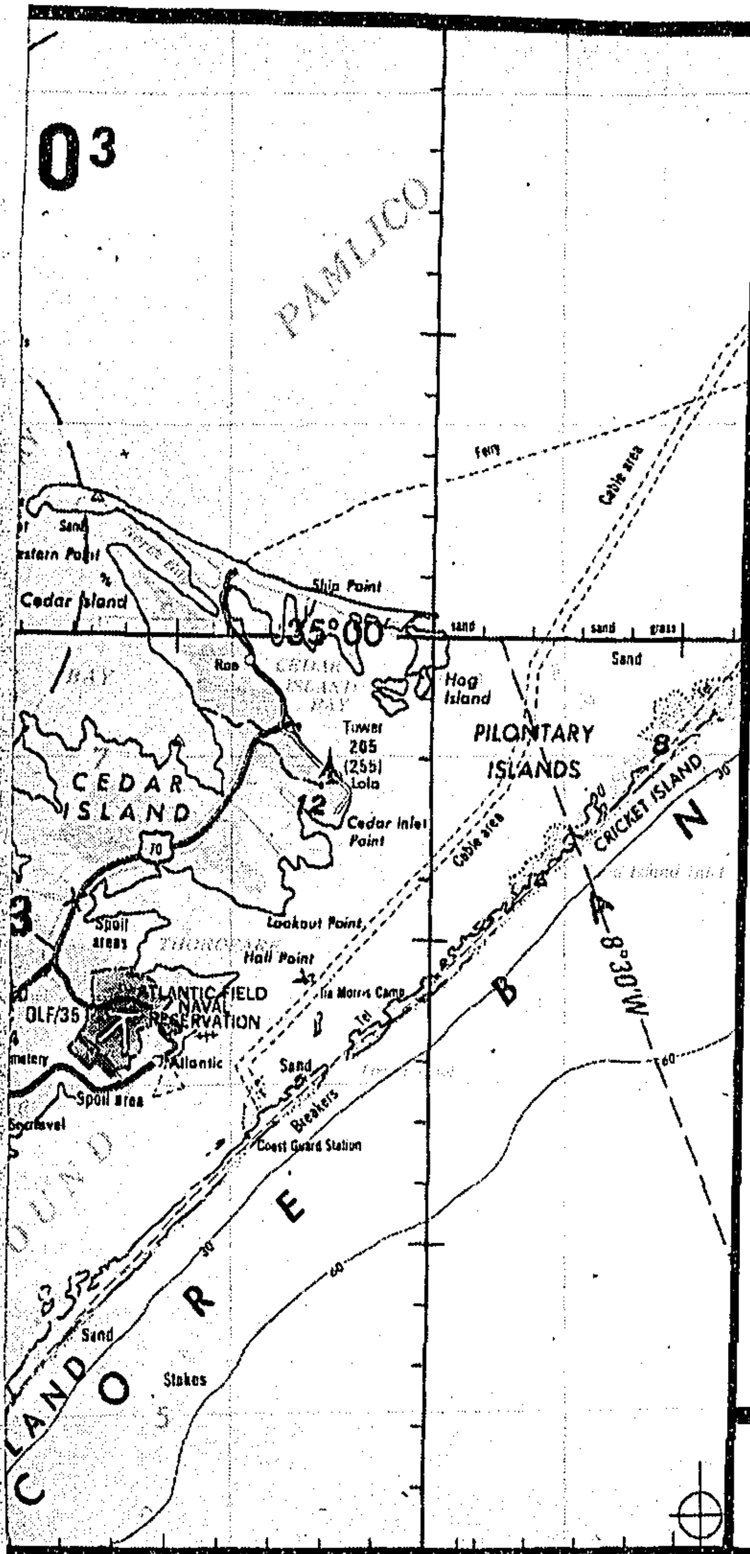

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 13
A6 30° DIVE

Modelled Daily Operations	24.45

NORTH

NAUTICAL MILES

0 5

Base Map:
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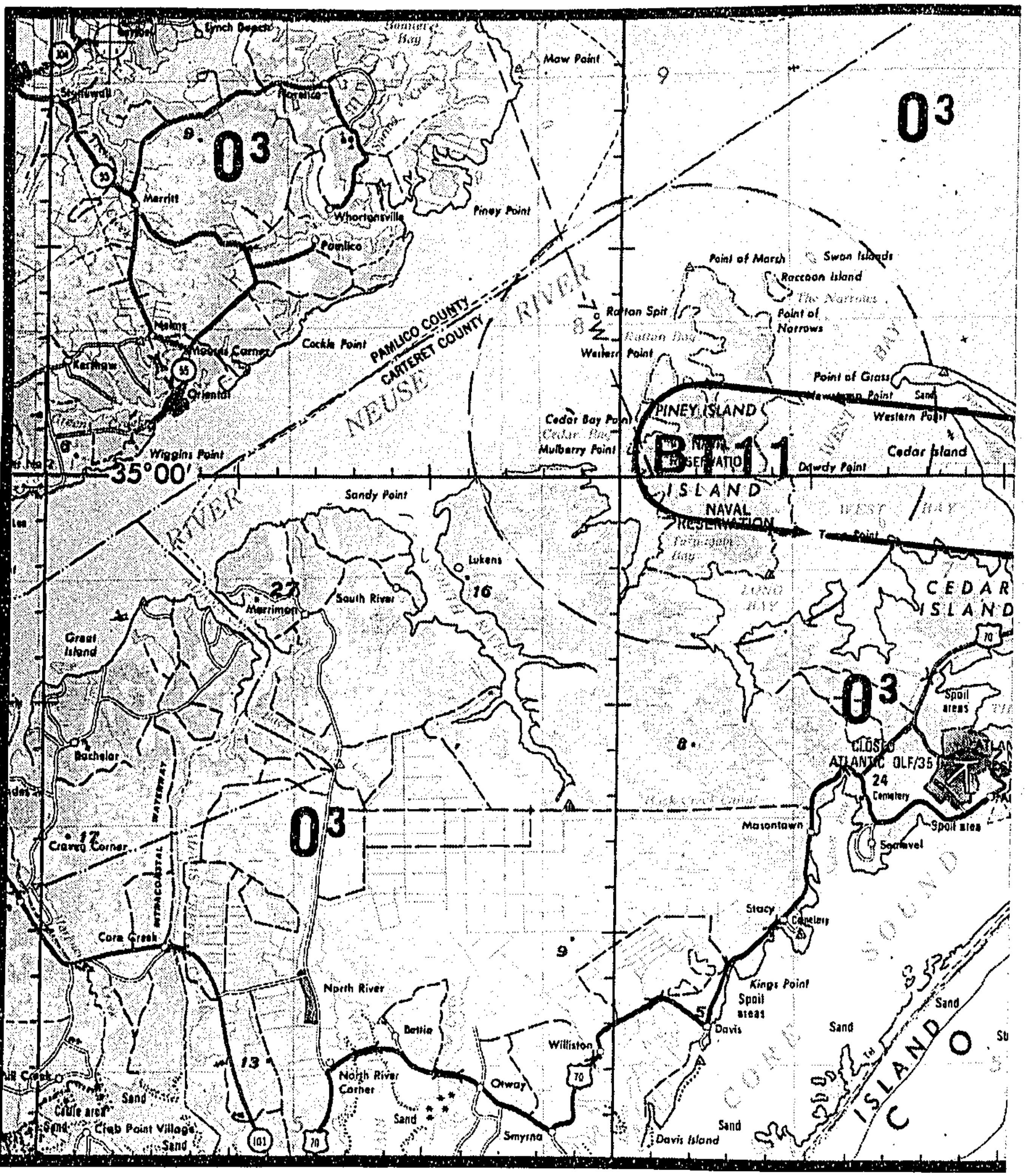

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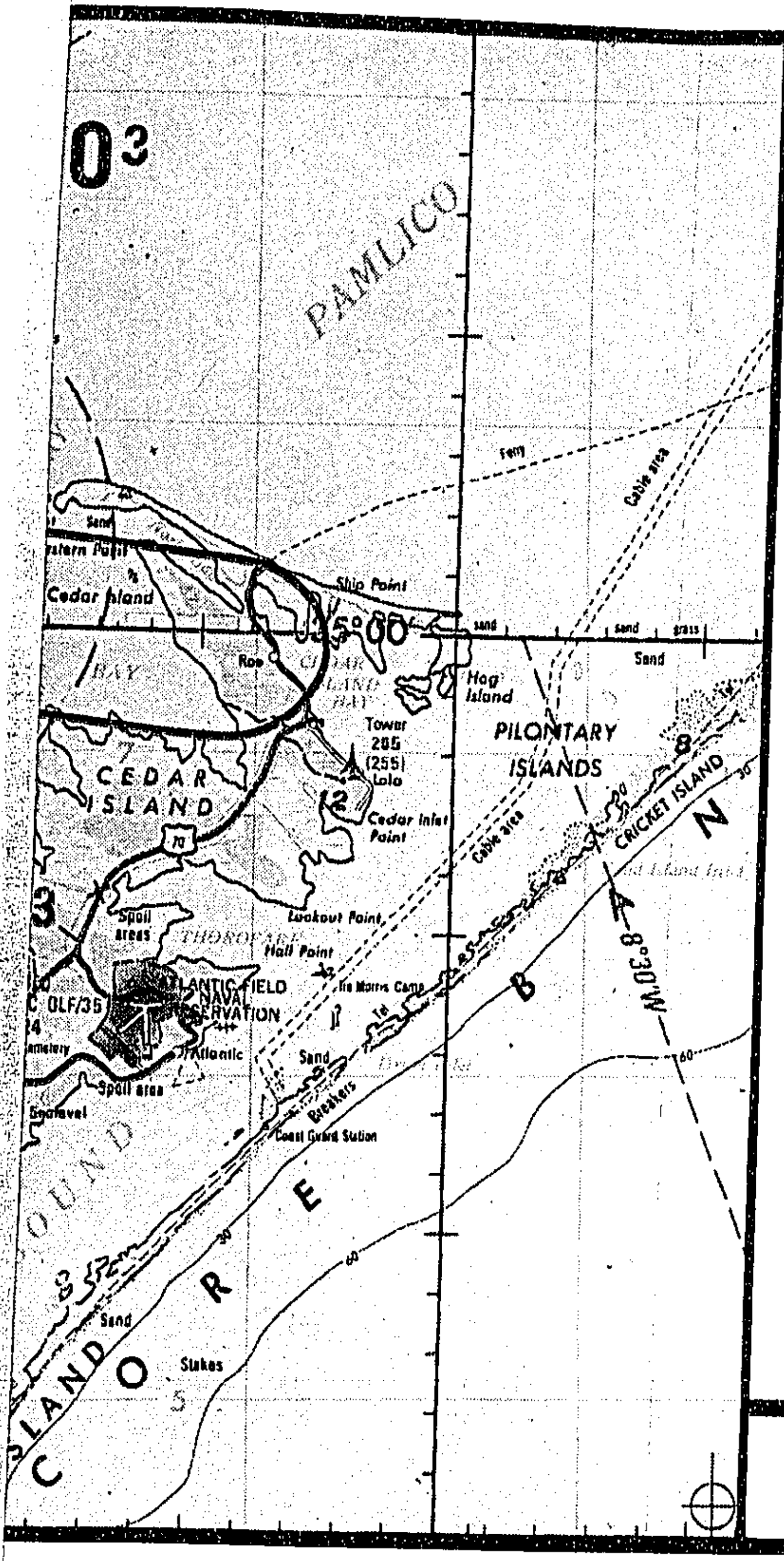

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 14
F16 LEVEL RUN IN

Modelled Daily Operations	23.93

NORTH

NAUTICAL MILES

0 6

Base Map:
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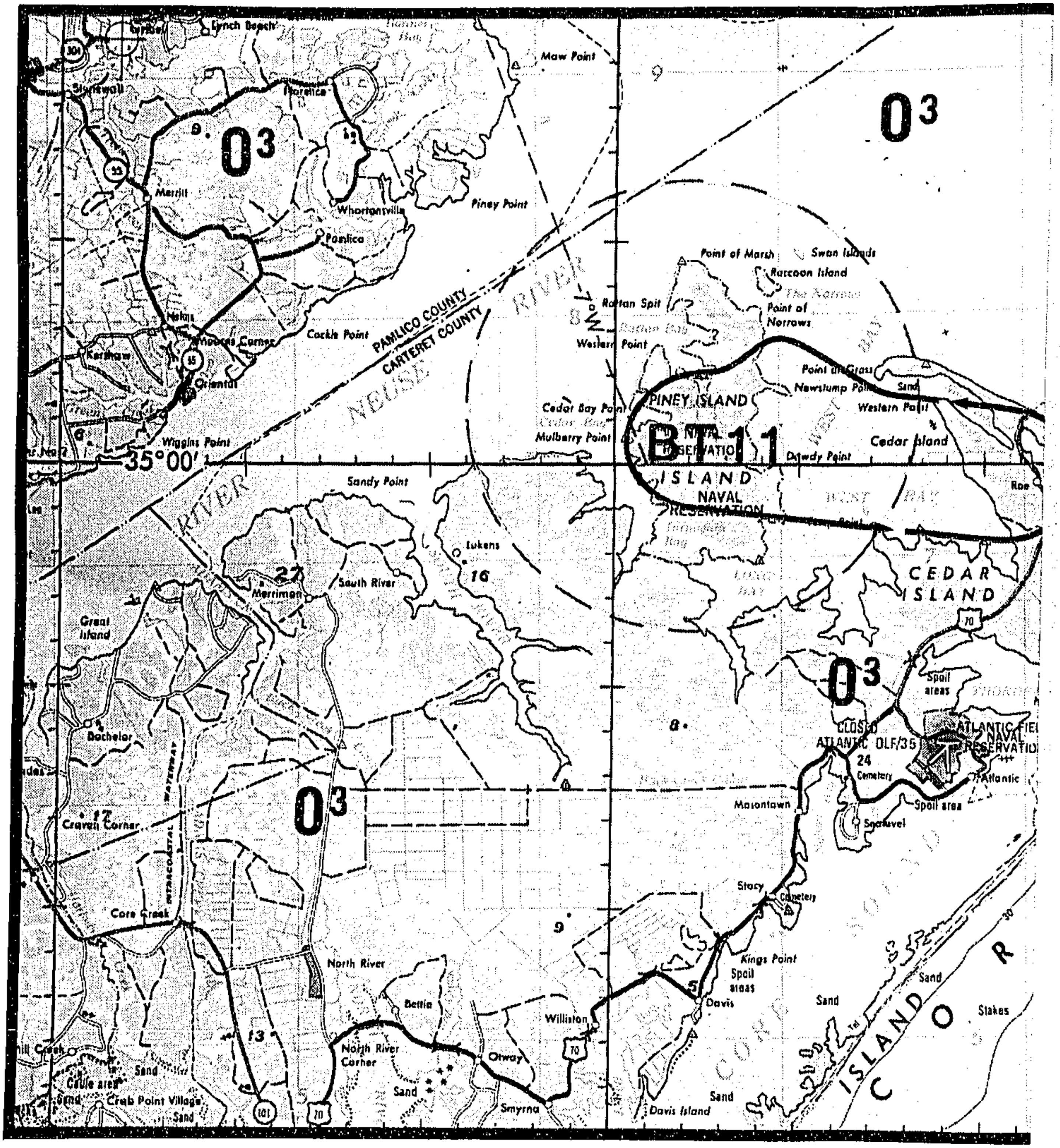
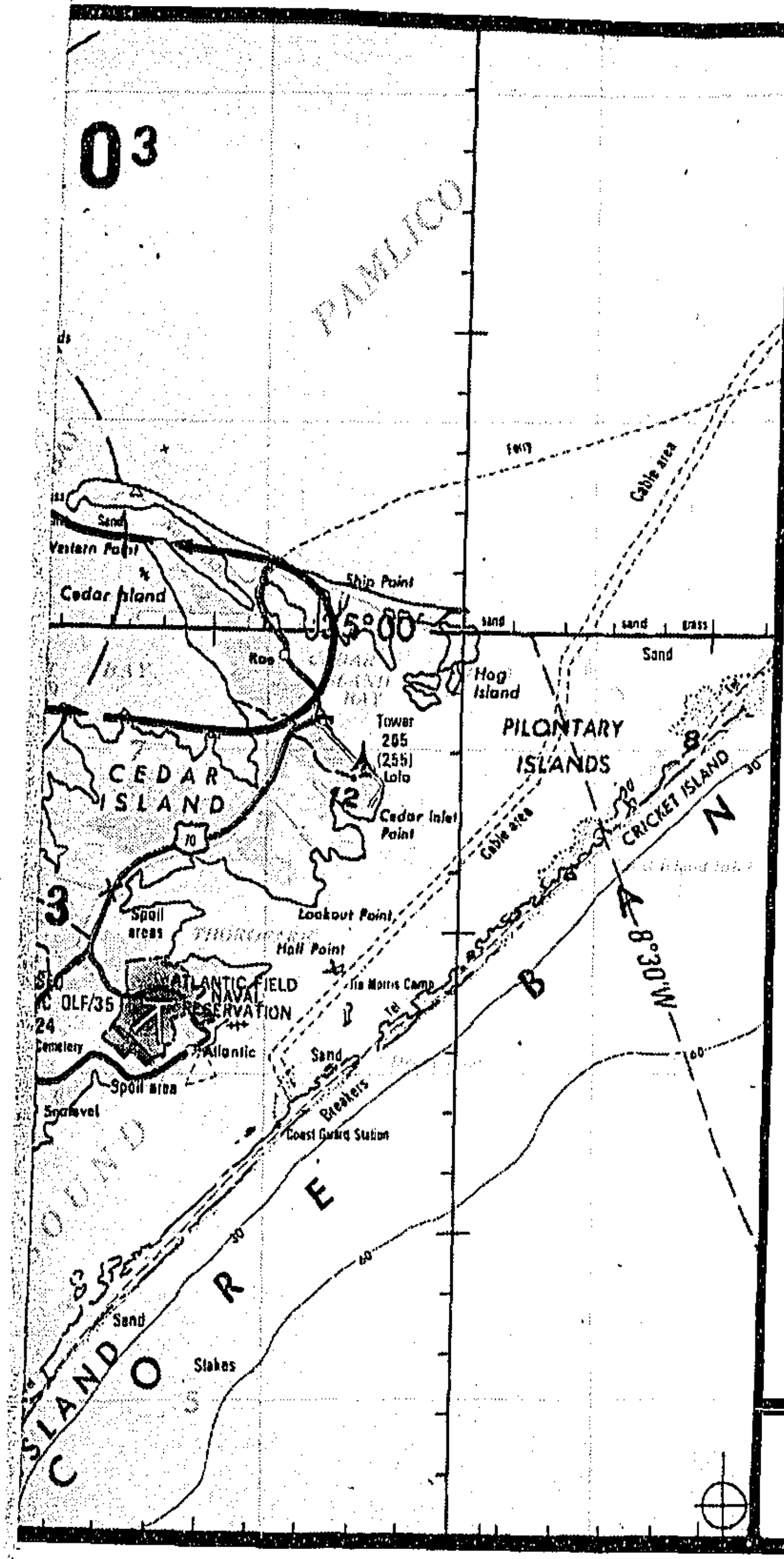


0³
0³
0³
0³
BT11
Lynch Beach
Stonewall
Florence
Merritt
Whortonsville
Piney Point
Pamlico
Maw Point
Cockle Point
PAMLICO COUNTY
CARTERET COUNTY
NEUSE RIVER
Nelson
Kershaw
Oriental
Wiggins Point
35°00′
Point of Marsh
Swan Islands
Raccoon Island
Rattan Spit
Point of Narrows
Western Point
Point of Grass
Newstump Point
Western Point
Cedar Bay Point
Mulberry Point
PINEY ISLAND
NAVAL RESERVATION
Dowdy Point
Cedar Island
CEDAR ISLAND
Sandy Point
Lukens
Merrimon
South River
Great Island
Bachelor
Craven Corner
INTRACOASTAL WATERWAY
Core Creek
North River
Bettie
North River Corner
Otway
Smyrna
Williston
Davis
Kings Point
Spoil areas
Stacy
Cemetery
Marshallberg
Sea Level
Spoil area
Atlantic
CLOSED ATLANTIC OLF/35
ATLANTIC FIELD NAVAL RESERVATION
Crab Point Village
Cattle area
Sand
Davis Island
Stakes
CORE SOUND
ISLAND



MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 15
F16 POP UP RUN IN

Modelled Daily Operations	23.80

NORTH

NAUTICAL MILES

0 5

Base Map:
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Table 13 presents mission usage for the run ins shown on Figures 4 through 15. The percentages were derived by examination of the numbers of run-ins of each type required by the AV8B pilot training manual and from comments provided by MCAS Cherry Point personnel. Only the bombing run ins have been included for computation of the noise exposure, since other types of missions account for a relatively small percent of the total activity.

TABLE 13

MISSION USAGE

Activity	AV8	Percent A6	F16
Dives			
10^{0}	28	0	0
30^{0}	46	30	0
45^{0}	12	0	0
Level Delivery	0	50	50
Pop ups	8	20	50
Other (Strafing)	6	0	0

Table 14 shows percent use by AV8's of the various Initial Points (IPs) for pop up run ins

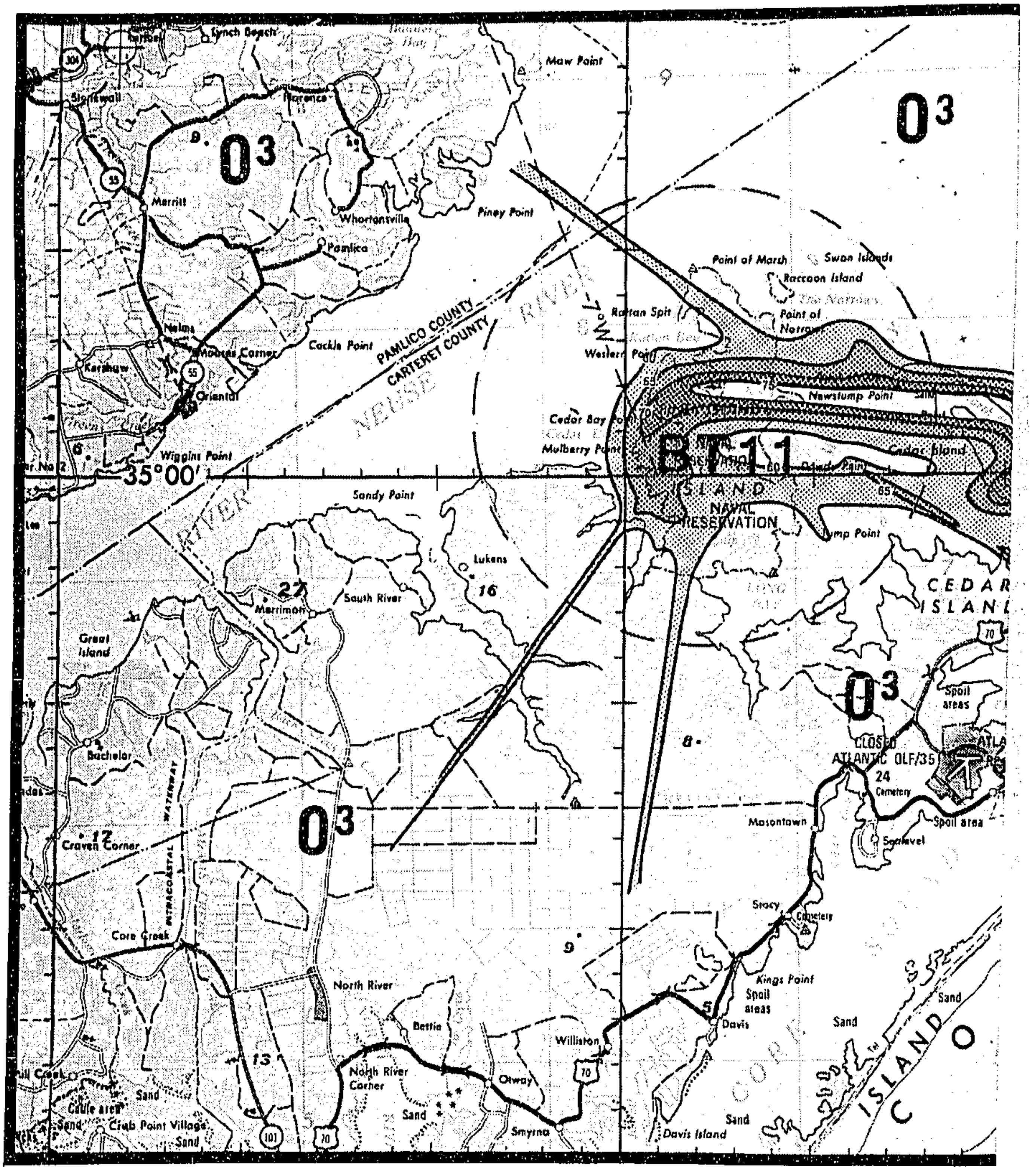
TABLE 14

USE OF INITIAL POINTS

No. 1	40%
No. 2	20%
No. 3	10%
Subtotal	70%
No. 4	5%
No. 5	10%
No. 6	15%
Subtotal	30%
TOTAL	100%

Noise Footprint

The data provided in the previous sections were translated into NOISEMAP input, and Day-Night Average Sound Level, Ldn, contours were computed. Figure 16 presents these contours at the map scale of the previous figures. Figure 17 depicts the same contours at a scale that permits easier identification of geographic reference points on the land area. These contours represent the "basecage" i.e. the noise exposure contours that exist today without installation and operation of the MAEWR. They show the community of Roe in Noise Zone 1 (less than 65 Ldn); the area between Roe and Goodwin Hills to the ferry landing in Noise Zone 2 (Ldn 65-75). The figure also shows that those areas underlying the low level routes VR1043 and VR1046 also lie within Noise Zone 1 (less than 65 Ldn).



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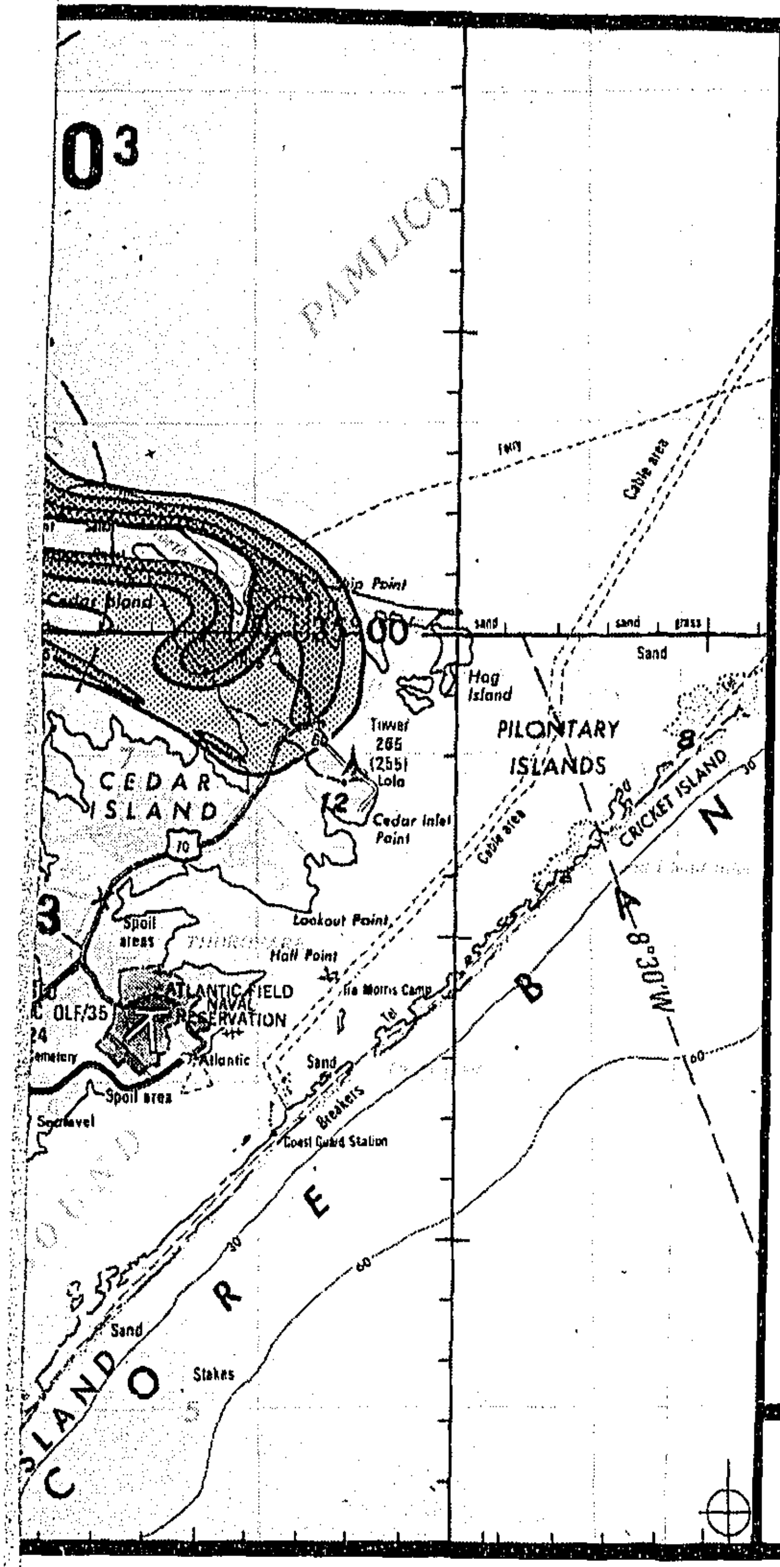

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 16
BASE CASE Ldn CONTOURS

- Ldn 60-65
- Ldn 65-70
- Ldn 70-75

NORTH

NAUTICAL MILES

0 — 5

Base Map:
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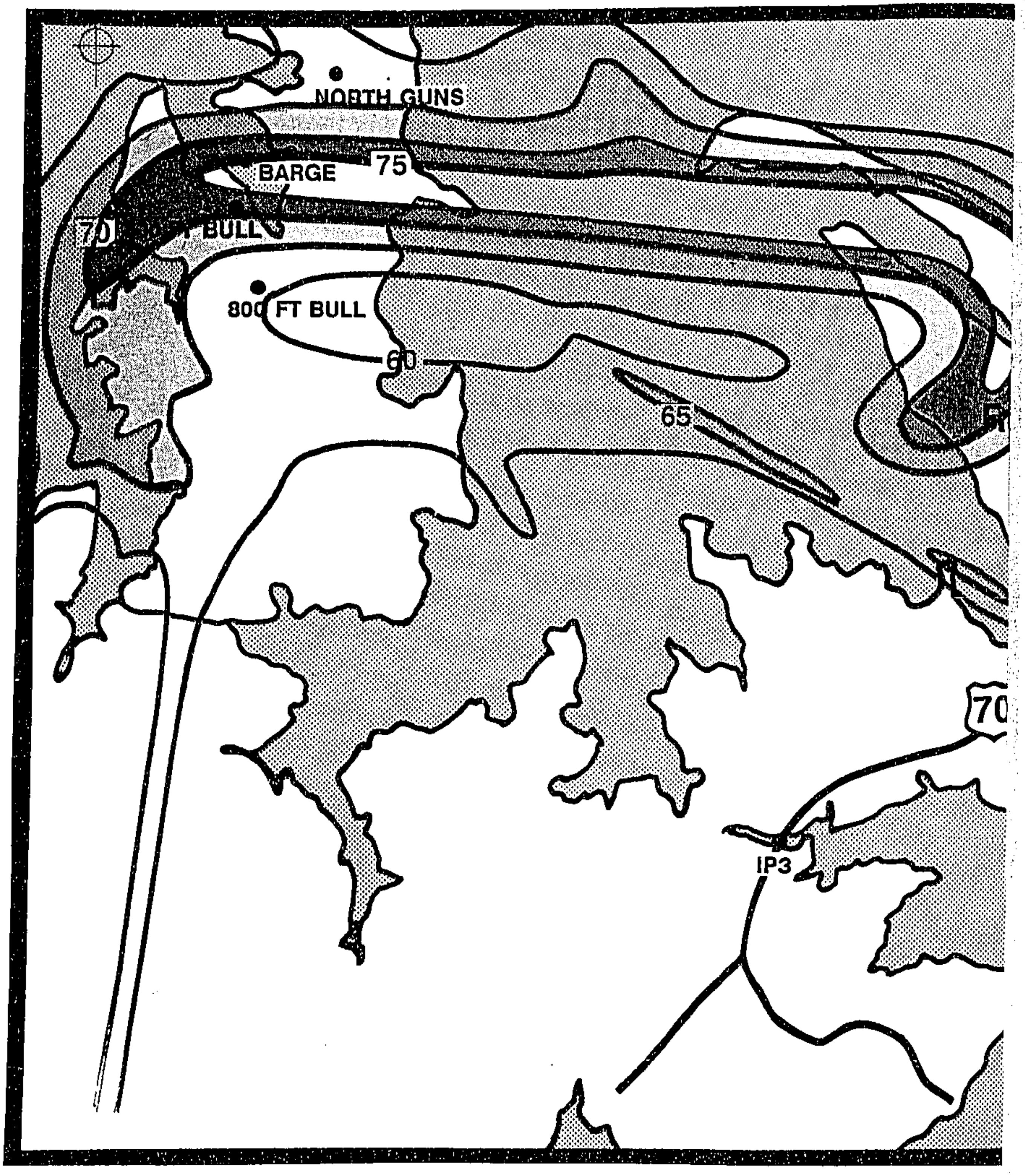

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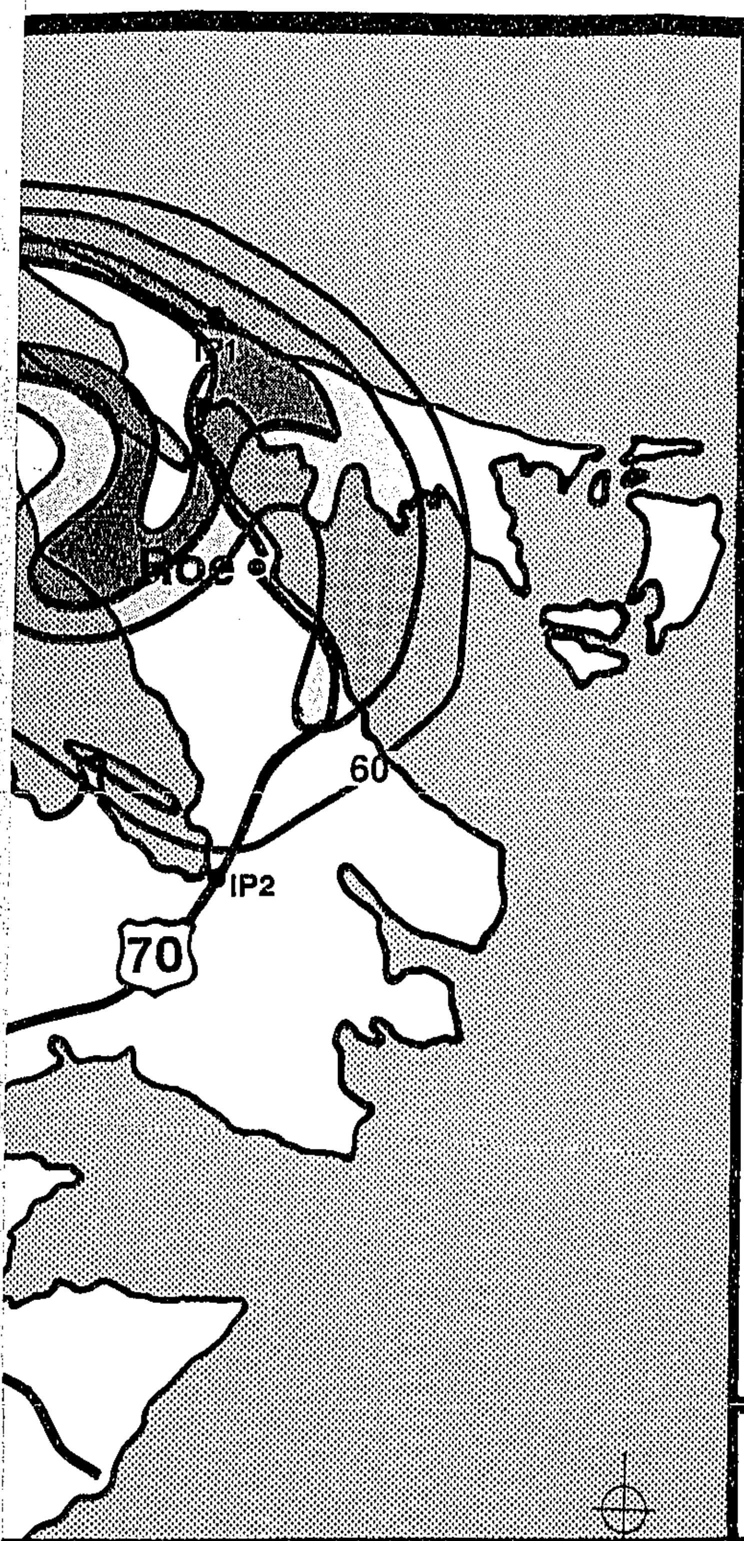

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 17
BASE CASE Ldn CONTOURS

- Ldn 60-65
- Ldn 65-70
- Ldn 70-75

NORTH

NAUTICAL MILES
0 1.25 2.5

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NOISE EFFECTS OF MAEWR

The establishment of the MAEWR and the projected increased operating hours of 2 to 4 hours per week are expected to generate an average of eight additional sorties per week. It is unlikely that total sorties will increase further due to the finite number of day/night hours, weather conditions and the number of aircraft that can effectively use the target at one time.

By the early 1990's Marine sorties (AV8) are expected to nearly remain the same, and Air Force sorties (F16) will be reduced by up to 50%. The Navy sorties will increase by the amount the F16 sorties decrease and by the additional eight sorties per week. For modelling purposes, these changes are incorporated as shown in Table 15.

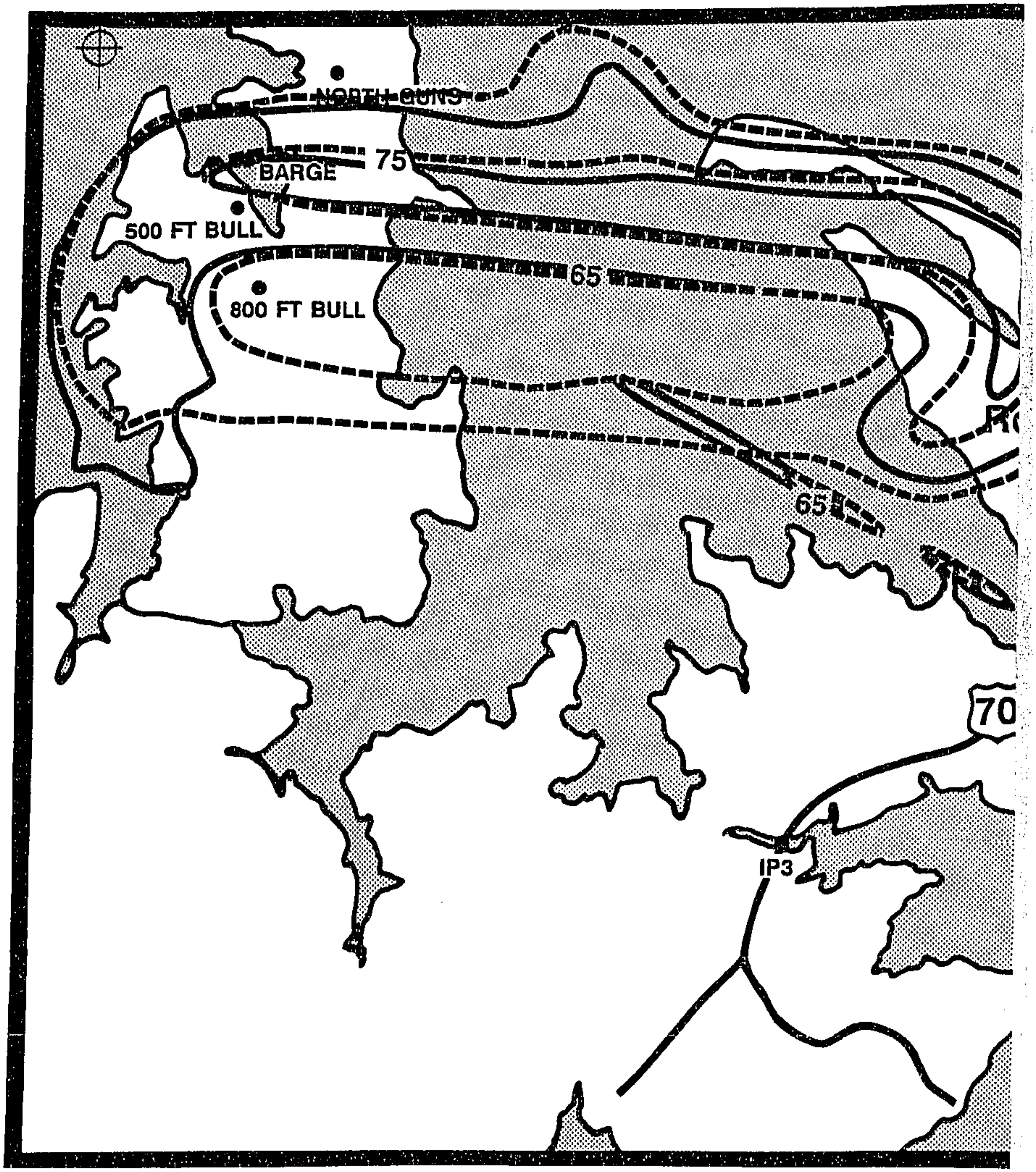
TABLE 15

DAILY AIRCRAFT USE OF BT-11

AIRCRAFT	BASE CASE	W/ MAEWR
AV8	10.6	10.6
A6	3.7	8.6
F16	6.6	3.3
TOTAL	20.9	22.5

F16 use is halved; A6 use is increased by the 3.3 aircraft per day decrease in F16s, and by the additional 8 aircraft per (5 day) week or 1.6 per day. If these additional aircraft all made bombing runs, some change in the contours is expected. To estimate this maximum change in Ldn contours, all F16 operations were halved, and all A6 operations were increased by 8.6 divided by 3.7 or by a factor of 2.32 to compute new "with MAEWR" contours. These new contours are shown in comparison with the Base Case contours in Figure 18. Figure 19 depicts the areas of increase or decrease in Ldn over land areas east of BT-11. In general, changes of 1 dB or less should be considered as insignificant, while changes of 2 dB to 3 dB may be noticeable. Changes of 5 dB would be noticeable and probably considered significant. This analysis shows no increase in levels of more than 3 dB. It should be noted that to obtain a "worst case" analysis, the results of Figures 18 and 19 assume all additional sorties do bombing runs. However, it is likely that the projected increase in sorties will be offset by a number of support aircraft flying at higher altitudes and never approaching closer to the targets than 5 to 10 miles. The number of aircraft actually "bombing" will probably decrease once the MAEWR is operational.

In summary, the general effect of the MAEWR operations on the populated areas along highway 70 is a overall slight decrease in noise levels for the Down East populace. The level of reduction, however, probably will be imperceptible to most if not all people.



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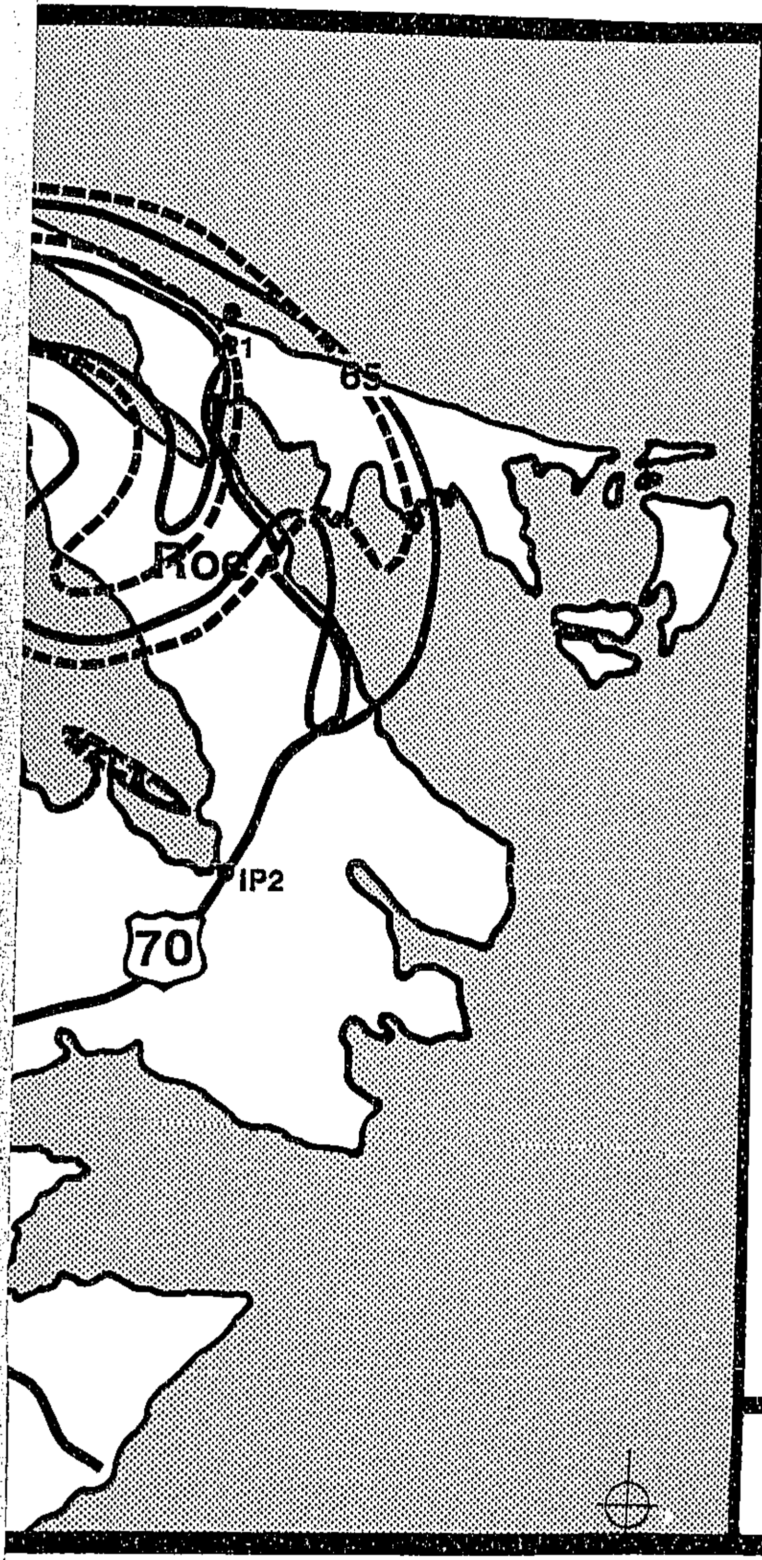

MID-ATLANTIC ELECTRONIC WARFARE RANGE

FIGURE 18
Ldn CONTOURS COMPARED

BASE CASE

WITH MAEWR

NORTH

NAUTICAL MILES

0 1.25 2.5

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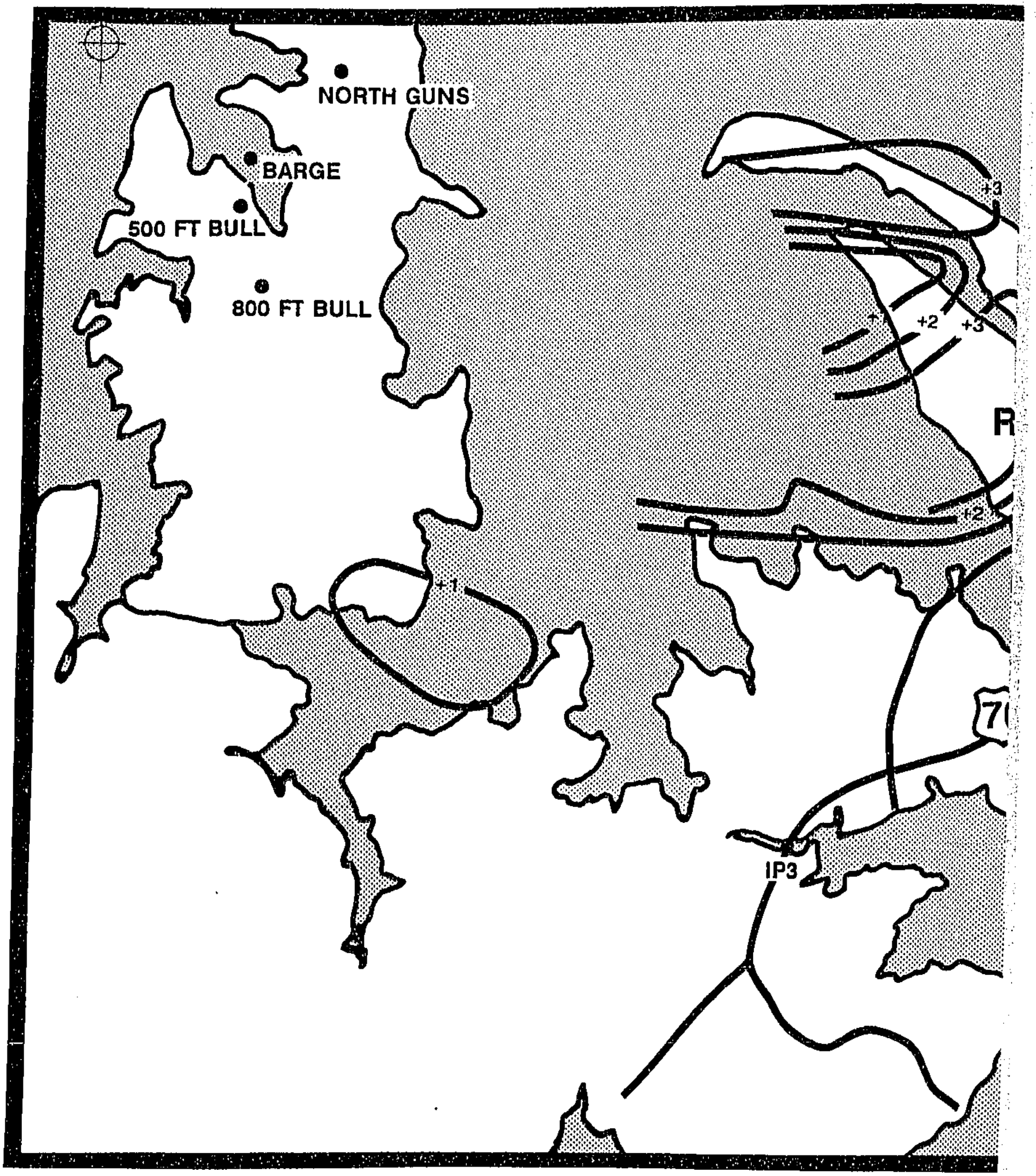
Lexington, Massachusetts 02173



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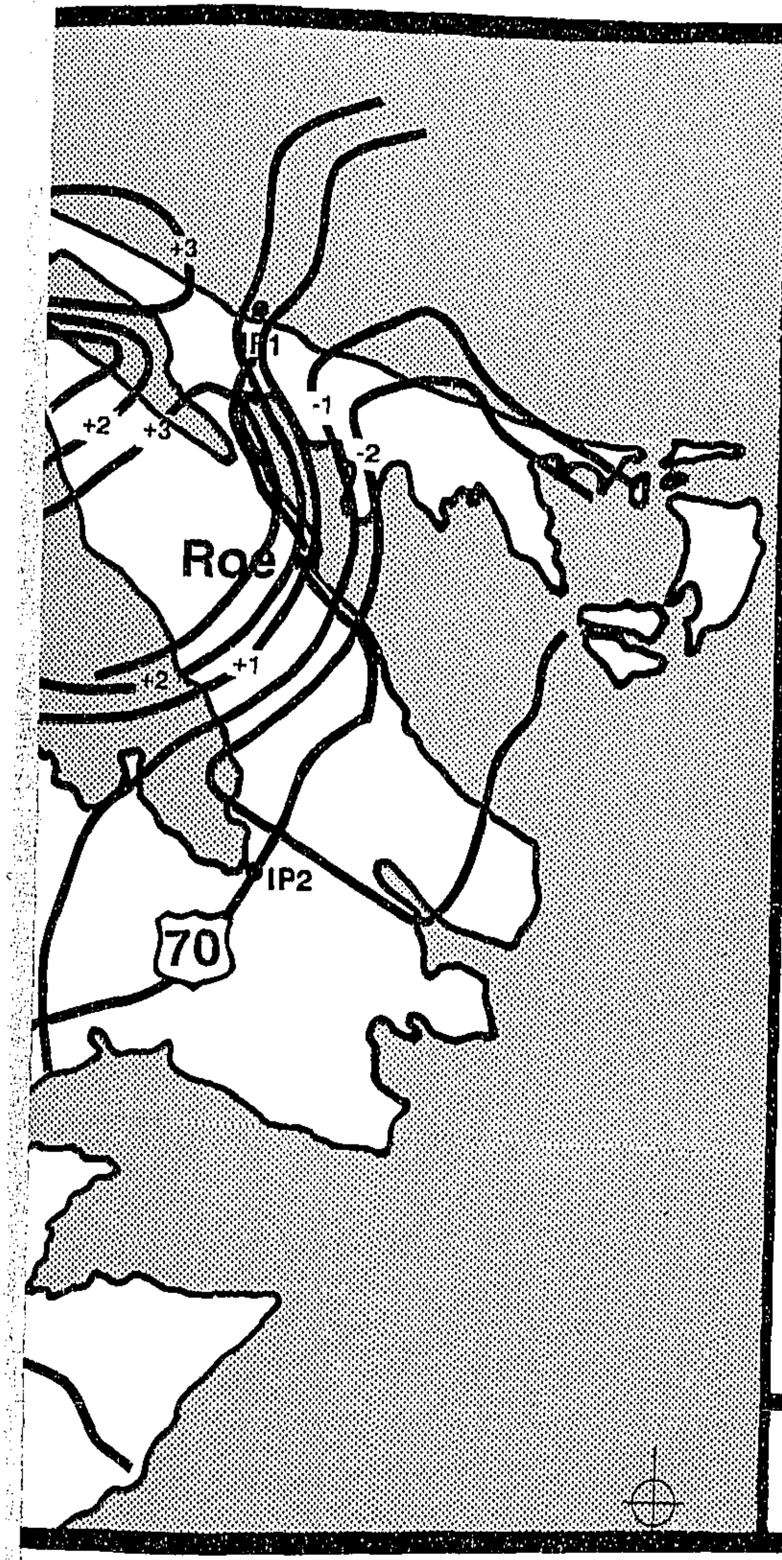

MID-ATLANTIC
ELECTRONIC
WARFARE RANGE

FIGURE 19
CHANGES IN Ldn
OVER POPULATED
AREAS CAUSED BY
MAEWR OPERATIONS

NORTH

NAUTICAL MILES
0 1.25 2.5

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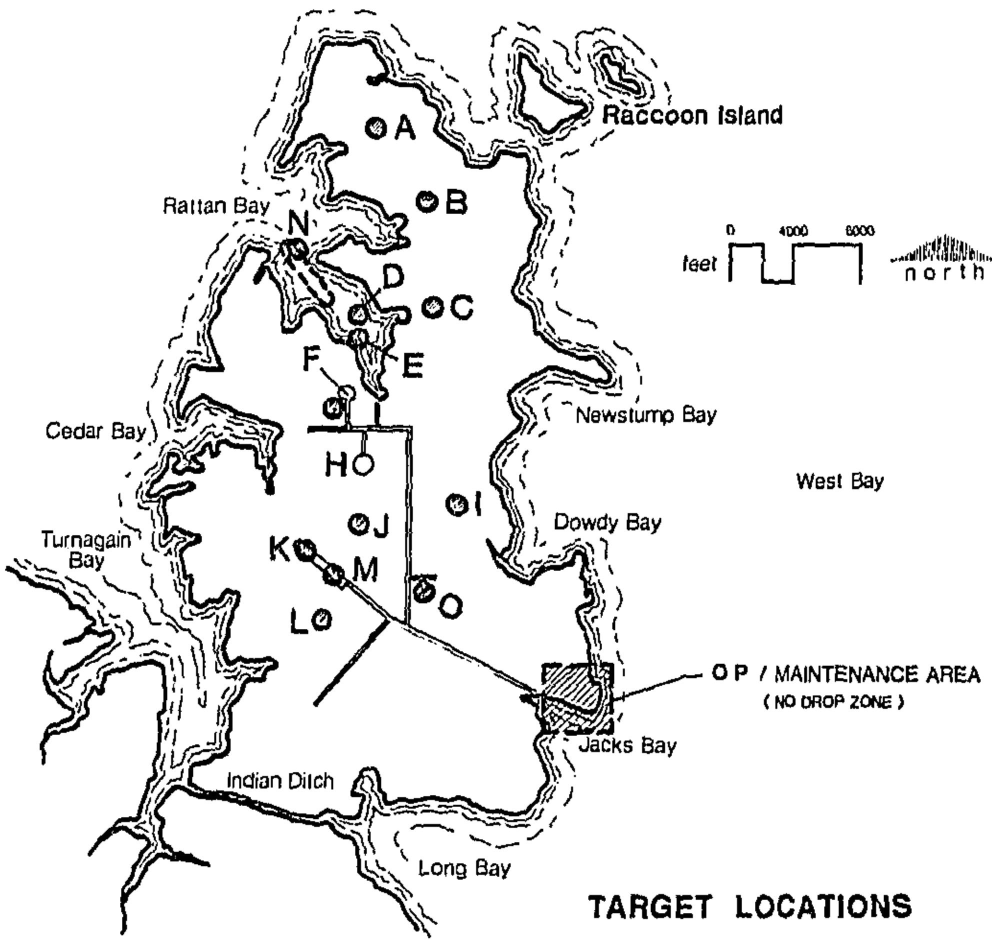
429 Marrett Road
Lexington, Massachusetts 02173

APPENDIX A

MAEWR
M.C.A.S. Cherry Point, North Carolina



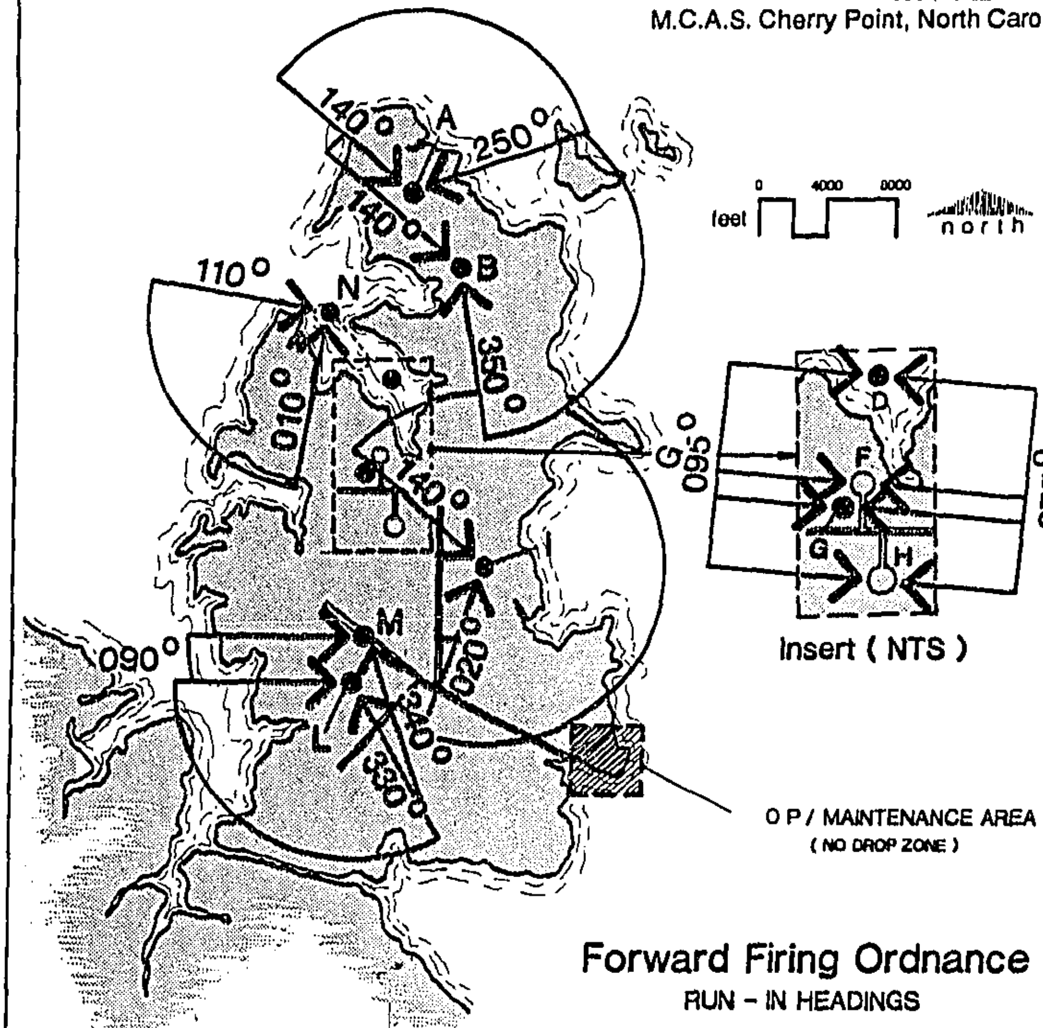
TARGET LOCATIONS

A	NORTH GUNS	I	TARGET TRAIN
B	INERT TOW TARGET CONVOY	J	SIMULATED S.A.M. SITE
C	SIMULATED CONVOY	K	MOVING TARGET COURSE
D	BARGE	L	SIMUILATED FUEL FARM
E	P.T. BOAT	M	SIMULATED AIRFIELD OPS / REVETMENT
F	500 ft. BULLSEYE	N	SEPTARS
G	STRAFFING BANNER	O	ALAST
H	800 ft. BULLSEYE		

BT-11 / Piney Island
Target Locations

MAEWR

M.C.A.S. Cherry Point, North Carolina



A	NORTH GUNS	I	TARGET TRAIN
B	INERT TOW TARGET CONVOY	L	SIMULATED FUEL FARM
D	BARGE	M	SIMULATED AIRFIELD OPS / REVETMENT
F	500 ft. BULLSEYE		
G	STRAFFING BANNER		
H	800 ft. BULLSEYE		

BT-11 / Piney Island
Forward Firing Ordnance
RUN - IN HEADINGS