AD NUMBER
AD315382
CLASSIFICATION CHANGES
TO: **UNCLASSIFIED**
FROM: **CONFIDENTIAL**
LIMITATION CHANGES
TO: **Approved for public release; distribution is unlimited.**
FROM: **Distribution authorized to U.S. Gov't. agencies only; Test and Evaluation; OCT 1959. Other requests shall be referred to Army Electronic Warfare Department, Electronic Proving Ground, Fort Huachuca, AZ.**
AUTHORITY
usaepg ltr, 10 jan 1980; usaepg ltr, 10 jan 1980

AD- 315382

SECURITY REMARKING REQUIREMENTS

DOD 5200.1-R, DEC 78

REVIEW ON 28 OCT 79

EXCLUDED

FROM GENERAL CLASSIFICATION SCHEDULE
IN ACCORDANCE WITH
INFORMATION SECURITY PROGRAM REGULATION

DATED - JULY 1972

DOD 5000.1R & EXECUTIVE ORDER 11652
(EXECUTIVE ORDER 10501 AMENDED)

BY

Defense Documentation Center
Defense Supply Agency
Cameron Station
Alexandria, Virginia 22314

DEC 1972

[redacted]

(10)

USAEPG-SIG 920-144

TEST PLAN

EVALUATION OF LIGHTWEIGHT S-BAND CARCINOTRON JAMMER, AIRBORNE INSTALLATION (U)

TASK NR 33-58-0053

U.S. ARMY ELECTRONIC PROVING GROUND
FORT HUACHUCA, ARIZONA
OCTOBER 1959

[redacted]

TEST PLAN
EVALUATION OF LIGHTWEIGHT S-BAND CARCINOTRON JAMMER,
AIRBORNE INSTALLATION (U)

Task Nr 33-58-0053

AUTHORITY

(U) These tests will be performed as a part of Task Nr 33-58-0053 of the USAEPG Technical Program. Authorization is contained in CSigO COP FY 59, Para 2a(6)(a)3 and CDOG Para 842f, SIGCCD 56T4.

OBJECTIVE

(U) The objective of these tests is to provide data for evaluation of the Lightweight S-Band Carcinotron Jammer, Airborne Installation against ground-based radar.

APPROVAL

(U) This plan has been reviewed and approved.

WALTER E. LOTZ, JR.
Colonel SigC
Chief, Electronic Warfare Department

October 1959
Electronic Warfare Department
U. S. Army Electronic Proving Ground
Fort Huachuca, Arizona

FOREWORD (U)

This test plan for the evaluation of the Lightweight S-Band Carcinotron Jammer, Airborne Installation employed against ground-based radar has been prepared by the Electronic Warfare Department (EWD) as a part of Task Nr 33-58-0053 of the U. S. Army Electronic Proving Ground (USAEPG) Technical Program. The plan prescribes the types of tests to be conducted and the methods of execution, and will serve as a guide for test personnel in preparing for and conducting the operational field tests. This test represents the initial evaluation at USAEPG of radar jamming equipment utilizing the hunt-lock-on carcinotron principle.

FOREWORD (U)

This test plan for the evaluation of the Lightweight S-Band Carcinotron Jammer, Airborne Installation employed against ground-based radar has been prepared by the Electronic Warfare Department (EWD) as a part of Task Nr 33-58-0053 of the U. S. Army Electronic Proving Ground (USAEPG) Technical Program. The plan prescribes the types of tests to be conducted and the methods of execution, and will serve as a guide for test personnel in preparing for and conducting the operational field tests. This test represents the initial evaluation at USAEPG of radar jamming equipment utilizing the hunt-lock-on carcinotron principle.

ABSTRACT

(U) The tests included in this plan are intended to evaluate the effectiveness of the Lightweight S-Band Carcinotron Jammer, Airborne Installation.

~~(C)~~ The bench tests will check the operating and performance characteristics of the equipment. The L-20 mounted installation will be used against the AN/MPQ-10A, a mortar-locating radar, and against the AA Fire Control System M-33 acquisition radar. These tests will determine the best type of modulation and the effective jamming area and range against these radars.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

I. GENERAL

1. (U) TEST PLAN OUTLINE

The tests to be conducted are grouped under the following major headings:

a. Bench Test

b. Field Tests

2. (C) DESCRIPTION OF EQUIPMENT

The Lightweight S-Band Carcinotron Jammer, Airborne Installation* consists of four major units: cabinet, remote antenna position indicator, antenna system, and power unit.

The cabinet contains all electronic equipment, the major parts of which are the power panel, the indicator chassis, and the rf chassis. Two rf chassis are furnished with the set, one to cover the frequency range from 2.5 to 3.1 kmcs and the other for operation between 3.0 and 4.0 kmcs.

The remote antenna position indicator is a small control box installed in the cockpit to indicate antenna position and to permit the pilot to control the antenna rotation.

The antenna system consists of a transmitting horn and a receiving horn stacked one above the other and rotated together in azimuth by a drive motor controlled from either the antenna control panel on the cabinet or from the remote antenna position indicator. Rotation is normally through a 180-degree arc, with the 90-degree position being dead astern.

The yoke carrying the two horns projects from the bottom of the aircraft with a fiberglass windshield partially surrounding the assembly to protect it from the slipstream.

---

*The Lightweight S-Band Carcinotron Jammer, Airborne Installation, will be referred to hereafter as the Jammer.

The power unit installed in the L-20 is an inclosed lightweight, 4-kw, gasoline-powered engine and generator. It was fabricated by the Electronic Defense Laboratory of Mountain View, California, under Task Order Nr EDL-15.

a. Principle of Operation

This set is capable of searching across two bands (2.5 to 3.1 kmcs or 3.0 to 4.0 kmcs). After searching for and locating a victim signal, the jammer locks on and transmits a jamming signal at this frequency. To discriminate between received signals, the set is able to analyze the pulse repetition frequencies (prf) of all signals and reject those that do not fall within preselected limits. If the signal upon which the set has locked on changes, the equipment will automatically change its frequency to follow the victim signal.

A Carcinotron, backward-wave magnetron in a plug-in rf head is used as the rf generator, for both a transmitter and a local oscillator for the receiver. When used as a transmitter, the Carcinotron can be frequency modulated with low frequency noise (10 to 50 kcs), high frequency noise (50 to 500 kcs), or both.

b. Physical Characteristics

The physical characteristics of the Jammer are shown in table I.

Table I. (U) Physical Characteristics

Component	Height (in.)	Width (in.)	Length (in.)	Weight (lbs)
Cabinet	25-7/8	25	14	160
Power unit	19	18-1/2	13-1/2	170 (wet)
Antenna system	--	--	--	25
Remote antenna position indicator	6	6	2	3
Miscellaneous equipment	--	--	--	20
		TOTAL		378

c. Technical Characteristics

The major technical characteristics of the Jammer are shown in table II.

Table II. (C) Technical Characteristics

Description	Characteristic
Frequency range	2.5 to 4.0 kmcs in 2 bands Band 1: 2.5 to 3.1 kmcs Band 2: 3.0 to 4.0 kmcs
RF power output	200 w
Modulation	Low frequency fm and high frequency fm - either separately or simultaneously - up to 1.5-mcs deviation
Antenna	Two identical 45-degree horns, one for transmitting and one for receiving, rotatable 180 degrees in azimuth, fixed in elevation with beam axis, approximately 20 degrees below horizontal
Receiver sensitivity	-30 dbm with noise modulation but without time-sharing lookthrough; -45 dbm without noise modulation and without time-sharing lookthrough; -45 dbm with noise modulation and with time-sharing lookthrough
Scan rate	1 megacycle per second per second
PRF analyzer range	500 to 2,000 pps
Receiver bandpass	2 mcs (approximate)
Power requirements	115 v, 400 cps, 3 phase at 2.7 kw supplied by a gasoline engine driven generator

II. TEST REQUIREMENTS

3. (U) RESPONSIBILITY

a. The project officer will insure that all arrangements necessary for conducting the tests have been made. Requests for support will be submitted in accordance with paragraph 3, section II, of the "Reference Handbook for Project Engineers."

b. Any major deviation from the test procedures outlined in this plan will be approved by the Chief, Systems Division. Details of all changes will be recorded.

4. (U) TABLES OF REQUIREMENTS

Requirements for the tests in terms of time, personnel, and equipment are shown in tables III, IV, and V.

Table III. (U) Tentative Time Schedule

Test	Estimated working days
Bench	3
Field tests (air)	23
TOTAL	26

Table IV. (U) Personnel Requirements

Type of personnel	Number	Source
Project officer	1	EWD
Project engineer	1	EWD
Field engineer	1	EWD
Jammer operating team	2	EWD
Pilot	1	Post
AN/MPQ-10A team	2	72d Sig Bn
M-33 operating team	2	72d Sig Bn

Table IV. (U) Personnel Requirements (Cont)

Type of personnel	Number	Source
Security guard	As required	Post
Driver	As required	72d Sig Bn
Communications team	3	72d Sig Bn
Mortar crew	1	72d Sig Bn
Human factors personnel	1	EWD
Photographer	1	Post

Table V. (U) Major Items of Equipment

Description	Nomenclature	Quantity
Electronic countermeasures (ECM) equipment	Lightweight S-Band Carcinotron Jammer	1
Radar Set	AN/MPQ-10A	1
AA Fire Control Radar	AA FCS M-33	2

5. (U) CHECKLIST FOR PROJECT OFFICER

Following is a checklist of necessary requirements and arrangements for the use of the project officer:

a. Request the use of sites for each test.
b. Provide for personnel and equipment.
c. Arrange for frequencies and types of transmissions.
d. Obtain vehicles and drivers.
e. Obtain POL requirements.
f. Furnish water and lunches for personnel at test sites.
g. Provide data sheets.
h. Obtain topographical maps for recording site locations.
i. Provide for individual safety precautions.
j. Arrange for flight course and other airborne requirements with Libby Army Airfield Operations.
k. Arrange for briefing of pilots for coordination of tests.
l. Record equipment operating time, maintenance required, and modifications.
m. Provide for proper recording of data to include: time and duration of tests, all pertinent electrical parameters, meteorological data, and physical data.

n. Arrange for briefing all personnel on daily scheduled testing.
o. Insure that personnel are acquainted with the necessary cables to operate the equipment.
p. Contact the EWD Security Officer with regard to security of test sites.
q. Provide for necessary communications facilities and triggering lines.
r. Provide for fire protection.

III. BENCH TEST

6. (C) TEST 1, EQUIPMENT CHECK

a. (U) Purpose

The purpose of test 1 is to determine the operating characteristics of the Jammer, and to familiarize personnel with these characteristics.

b. (U) Time Required

Three days will be required for the completion of this test.

c. (C) Procedure

(1) Check the power unit and run it for 30 minutes. Inspect all external hose connections and wiring for leaks and proper fit.

(2) Turn the ECM equipment on and allow it to warm up. Check the receiver and panoramic indicator with an HP 616A signal generator. Use steps of 500, 700, 1,000, 1,500, and 2,000 pps on the HP 616A to check the lower panoramic scope for proper prf reading. Use these same readings to insure proper operation of the prf select switch. Switch an HP 616A in frequency and prf to determine whether the receiver follows to the proper limits. Take a minimum detectable signal (MDS) reading with the ECM equipment in the receive position. Then, with the transmitter on, take MDS readings with HF and LF noise radiations.

(3) Take readings on the HP 616A to determine what strength of input signal is necessary for the ECM equipment to lock on, and at what dbm signal strength the lock-on feature is lost. Determine this during the receive cycle, with the transmitter on, and for each modulation.

(4) Follow the procedure described below for the bench test of the rf chassis.

(a) Connect the transmitter output to a dummy load. Use a frequency of 2.86 kmcs.

(b) Set the transmitter on frequency with the HP 616A.

(c) Use a spectrum analyzer to monitor the output of the transmitter. Take photographs of the spectrum analyzer scope for all modulations. Measure the bandwidth.

(d) Check the frequency drift of the output signal at 5-minute intervals.

(e) Take power output readings at 100-mcs intervals across both rf chassis.

(f) Take VSWR measurements of the rf system at 100-mcs intervals on both chassis.

(g) Determine the rf losses of the transmission line.

(h) Record five consecutive times for the cycle from reception of the signal until the Jammer is on frequency and transmitting.

d. (U) Data Required

The following data will be required:

(1) All data as required on the test 1 data sheet.

(2) Project officer's log.

(3) Comments by operator.

Test 1 Data Sheet (U)

Date_____ Location_____

Chassis nr	Frequency	Power out	VSWR	Cable loss (db)	Lock-on threshold (dbm)	MDS (dbm)

IV. FIELD TESTS

7. (C) TEST 2, RECEIVER CAPABILITY

a. (U) Purpose

The purpose of test 2 is to investigate the receiver capabilities of the Jammer.

b. (U) Time Required

Four days will be required for the completion of this test.

c. (C) Procedure

(1) The L-20 aircraft will fly at 3,000 feet. Figure 1 shows the flight and location plan.

(2) Site the AN/MPQ-10A with an unobstructed view to the front and instruct the crew to track target simulator TS-155/UP. At the discretion of the project officer, the flights will begin at a great enough distance from the radar so that initial intercept will be possible only by bearing and range indications (except flights 6, 7, and 8). Record the time and azimuth to the radar upon initial intercept. Record also any blank or low-signal area spaces which indicate intercept of various portions of the lobe patterns. Track the aircraft on the M-33. Furnish stop watches to the aircraft and target radar crews and synchronize the time with the M-33 radar crew. Insure communications between the M-33 radar site, the aircraft, and the target radar site.

(3) The flight 1 route will be approximately 5 miles from the target radar at a speed of 90 knots. Attempt to intercept and lock on the signal from the target radar with the ECM equipment receiver. Follow this procedure for flights 2 through 5 at the distances shown in fig. 1.

(4) The flight 6 route will begin 5 miles from the radar and will proceed directly away from the radar-to-target line to determine the direct-line distance of intercept capability.

(5) The flight 7 and 8 routes will be parallel to flight 6 but 5 miles to each side of the target radar. Set the radar in 800-mil sector scan.

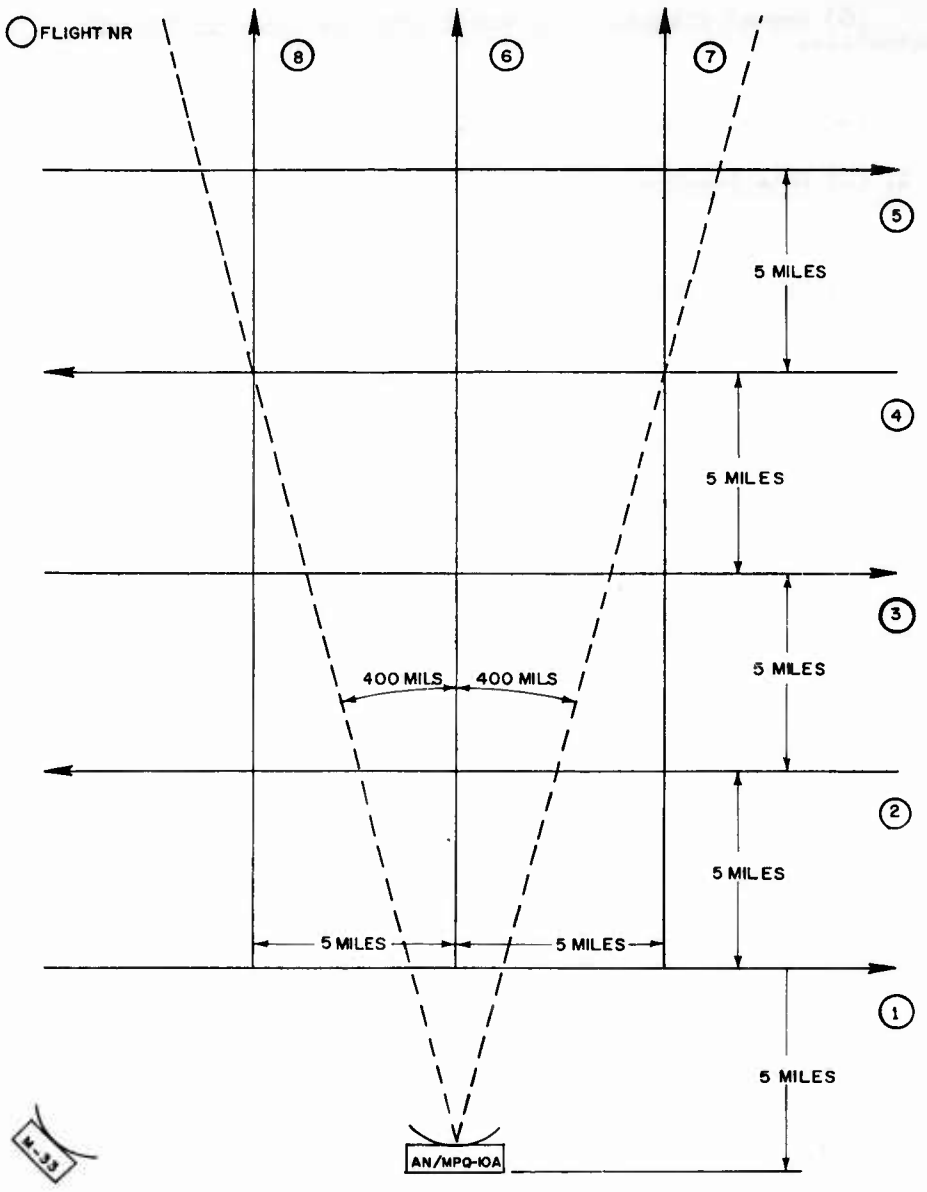

Fig. 1. (U) Flight and location plan for test 2

(6) Repeat flights 1, 2, and 3 with the radar in 800-mil sector scan.

(7) Repeat the procedures described in subparagraphs 2 through 4 at altitudes of 2,000, 1,000, and 500 feet.

d. (U) Data Required

The following data will be required:

(1) All data as required on the test 2 data sheet.

(2) M-33 plot.

(3) Project officer's log.

(4) Comments by the ECM operator and radar operator.

8. (C) TEST 3, EFFECTIVENESS AGAINST A MORTAR-LOCATING RADAR

a. (C) Purpose

The purpose of test 3 is to determine the jamming effectiveness of the Jammer against Radar Set AN/MPQ-10A.

b. (U) Time Required

Five days will be required for the completion of this test.

c. (C) Procedure

(1) Figure 2 shows the flight and location plan for this test. The aircraft will fly at 3,000 feet. The results of the previous intercept test will determine the lengths of the flight paths. The target radar crew will track a target simulator TS-155/UP and an M-33 radar will keep the plane on the proper flight path. Record the plot of the flight path.

(2) The flight 1 route will be 5 miles from the target radar. When the aircraft is at a distance of 5 miles from the radar-target line it will jam with the antennas positioned port or starboard on the side toward the radar. Note the azimuth of the aircraft to the target radar when the radar breaks track. The flight will proceed and jamming will continue until the mortar locator tracks the target again. Record the azimuth of the aircraft to the radar when the on-track signal is given. Repeat flight 1 in the opposite direction (flight 2).

(3) Repeat the procedure described in subparagraph 2 with the transmitter in the auto-mode. Note the time when the transmitter comes on after intercept and lock on has been accomplished. Repeat this run in both directions.

Test 2 Data Sheet (U)

Date_____
Weather_____
Radar freq_____
Jammer freq_____

Target radar coord_____
Target coord_____

Flight nr	Time of intercept	Az to radar	Time signal list	Az to radar	Remarks

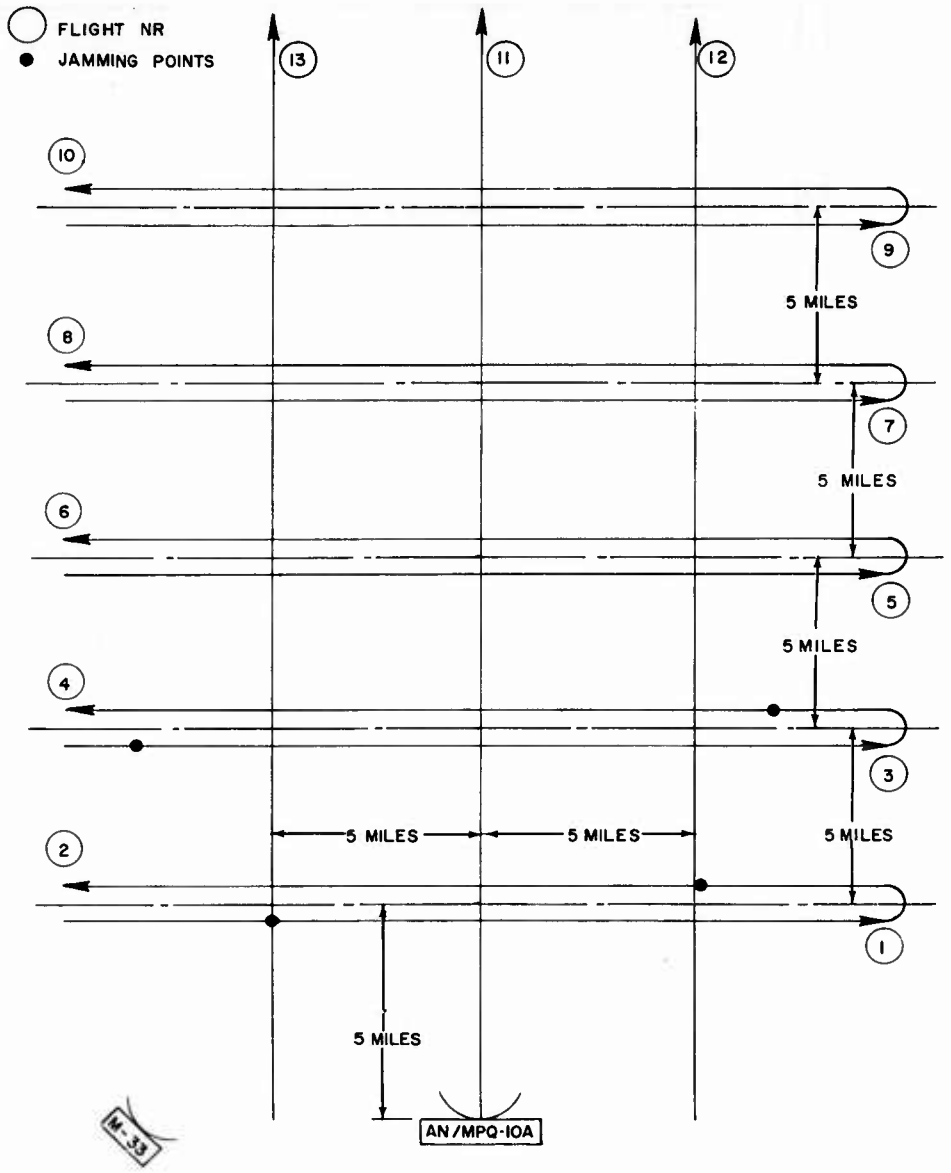

Fig. 2. (U) Flight and location plan for test 3

(4) For flights 3 through 10, repeat the procedures in subparagraphs 2 and 3 increasing the distance between the aircraft and radar by 5 miles on alternate flights. Continue these flights up to a distance of 25 miles or until the jamming is no longer effective. Rerun the flight path at the greatest distance with the operator attempting to orient the antennas directly at the radar.

(5) The flight 11 route will begin over the radar and proceed directly away from the radar, jamming continuously until the target radar again acquires the target simulator signal.

(6) Flight 12 and 13 routes will be 5 miles to each side of the radar and parallel to flight 11. Keep the antennas of the jammer, located in the aircraft, in line with the radar as much as possible. Continue jamming until the radar is again on track.

(7) Repeat the entire procedure at altitudes of 2,000, 1,000, and 500 feet.

d. (U) Data Required

The following data will be required:

(1) All data as required on the test 3 data sheet.

(2) M-33 plot.

(3) Project officer's log.

(4) Comments by ECM operator and radar operator.

9. (C) TEST 4, EFFECTIVENESS AGAINST A TRACKING RADAR

a. (U) Purpose

The purpose of test 4 is to determine the effectiveness of the Jammer against a tracking radar (AN/MPQ-10A).

b. (U) Time Required

Four days will be required for completion of this test.

c. (C) Procedure

(1) Figure 3 shows the flight and location plan for this test. The aircraft will fly at 3,000 feet. The target radar will track the aircraft throughout the entire flight.

Test 3 Data Sheet (U)

Date_____
Weather_____
Radar freq_____
Jammer freq_____

Radar coord_____
Target coord_____
M-33 coord_____

Flight nr	Mode (auto or manual)	Jammer on time	Az radar to aircraft (jammer on)	Az radar to aircraft (track broken)	Az radar to aircraft (track regained)	Maximum jamming distance	Remarks

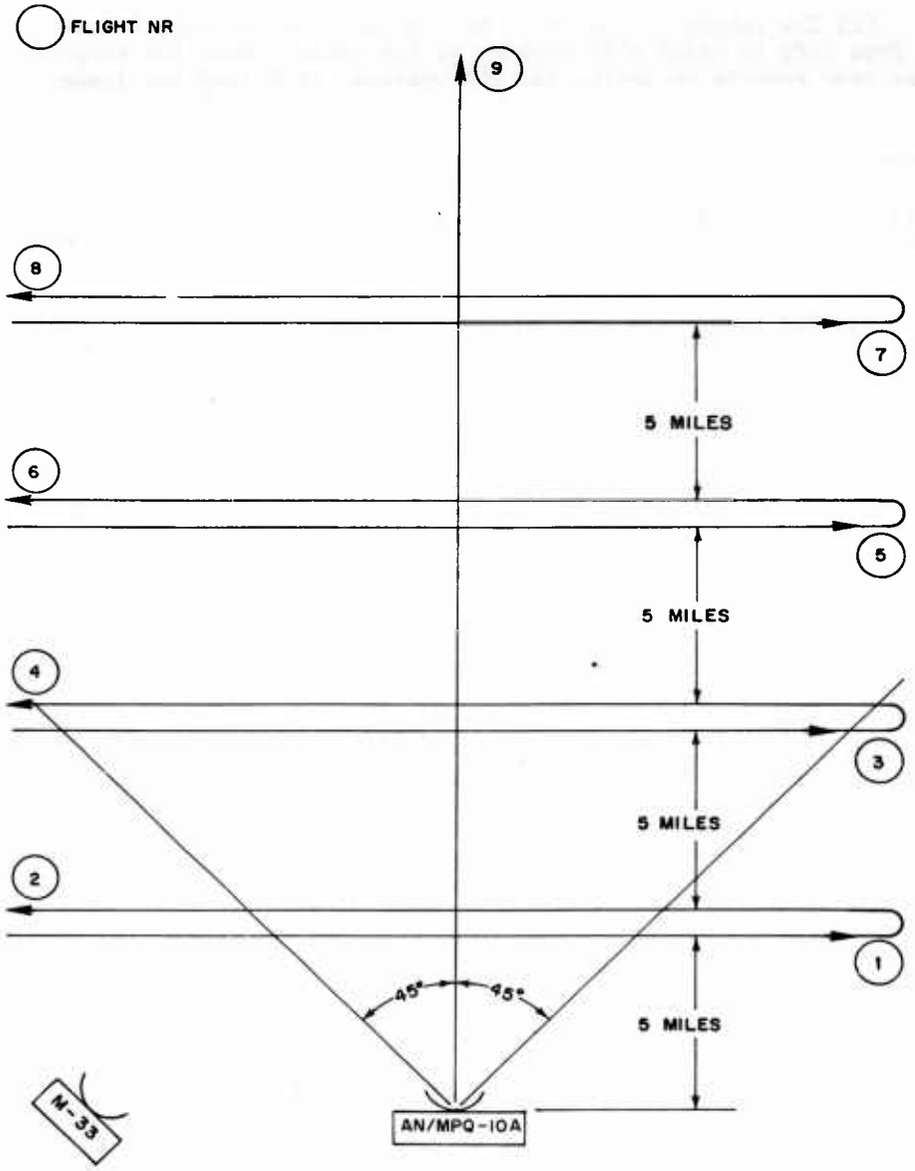

Fig. 3. (U) Flight and location plan for test 4

(2) The flight 1 route will be 5 miles from the target radar and from left to right with respect to the radar. When the target radar crew reports on track, the ECM operator will turn the jammer on. Record any time lag between jammer turn-on and a break in track. Record the azimuth from radar to aircraft with respect to the center line of the flight at the instant of on-track, jammer on, and track broken. The radar crew will attempt to track through the jamming until the plane reaches an azimuth 45 degrees to the right of the center line. At this time, the radar operator will give the command "jammer off."

(3) The radar crew will continue tracking as the aircraft proceeds along the flight course and turns to start flight 2. The ECM operator will place the jammer in auto-mode and as the aircraft returns from right to left, the operator will report when the jammer comes on. At this time, take azimuth readings from the radar set. Record azimuth readings when the jamming is effective.

(4) For flights 3 through 9, repeat the procedures described in subparagraphs 2 and 3 at 10, 15, and 20 miles from the target radar.

(5) The flight 9 route will begin over the radar and proceed along the center line. When the radar crew reports on track, the ECM operator will jam continuously until track is regained through the jamming or until the aircraft is out of radar range.

(6) The project officer will determine the distance from the target radar for the next flight. The ECM operator will begin jamming at a distance away from the radar so as to have no jamming effect, and continue jamming until the jamming is no longer evident on the radar scope. The ECM operator will attempt to orient the antennas toward the radar. Record the jamming condition on the scope at 5-degree intervals throughout the flight.

(7) Repeat the entire procedure at altitudes of 2,000, 1,000, and 500 feet.

d. (U) Data Required

The following data will be required:

(1) All data as required on test 4 data sheet.

(2) M-33 plot.

(3) Project officer's log.

(4) Comments by ECM operator and radar operator.

Test 4 Data Sheet (U)

Date _____
Weather _____
Jammer freq _____

Radar coord _____
M-33 coord _____
Radar freq _____

Flight nr	Az radar to aircraft (time on track)	Az radar to aircraft (jammer on time)	Az radar to aircraft (jamming effective)	Az radar to aircraft (jammer off)	Distance before track regained	Remarks

10. (C) TEST 5, JAMMING EFFECTIVENESS AGAINST AN ACQUISITION RADAR

a. (U) Purpose

The purpose of test 5 is to determine the jamming effectiveness of the Jammer against the M-33 surveillance radar.

b. (U) Time Required

Four days will be required for the completion of this test.

c. (C) Procedure

(1) Figure 4 shows the flight and location plan for this test. The aircraft will fly at 3,000 feet. Keep the acquisition antenna in the scanning mode during all flights.

(2) Flights 1, 2, and 3 will be at a 10-mile range from the target radar to determine the most effective modulation. The ECM operator will use respectively, fm high-frequency jamming, fm low-frequency jamming, and a combination of both, for the three flights.

(3) Using the most effective modulation, the pilot will begin flight 4 at a range of 15 miles and the ECM operator will jam when intercept and lock-on are accomplished. The project officer will determine the length of this jamming run and the following runs. Take jamming condition readings at 5-degree intervals. The radar crew will attempt to tune away from the jamming through the radar's entire frequency range.

(4) Repeat the procedure described in subparagraph 3 beginning at 20 miles from the radar and continuing at 5-mile intervals until jamming is no longer effective. Take photographs of the jamming condition on the M-33 PPI scope.

(5) Repeat the procedures described in subparagraphs 1 through 4 at altitudes of 2,000, 1,000, and 500 feet.

d. (U) Data Required

The following data will be required:

(1) All data as required on the test 5 data sheet.

(2) Project officer's log.

(3) Comments by ECM operator and radar operator.

(4) M-33 plot.

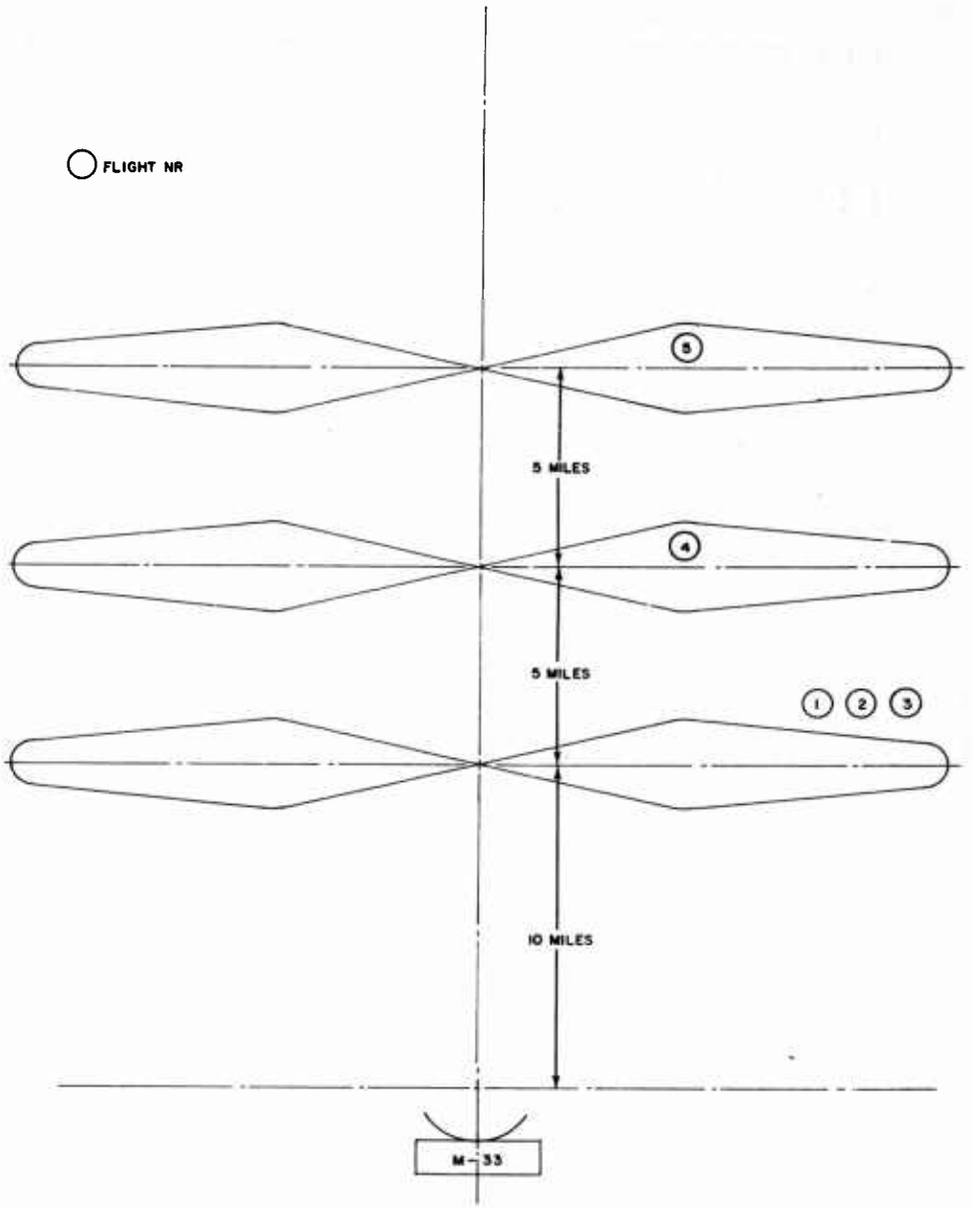

Fig. 4. (U) Flight and location plan for test 5

Test 5 Data Sheet (U)

Date_____
Weather_____
Jammer freq_____

Radar coord_____
Aux M-33 coord_____
Radar freq_____

Flight nr	Modulation used	Condition of jamming	Range	Photo nrs	Remarks

11. (C) TEST 6, INTERFERENCE WITH FRIENDLY RADARS

a. (U) Purpose

The purpose of test 6 is to determine the interference to friendly radars caused by the Jammer.

b. (U) Time Required

Two days will be required for this test. The test may be performed in conjunction with previous tests.

c. (C) Procedure

(1) The aircraft will fly each flight at 3,000 feet and then at 2,000, 1,000, and 500 feet. Figure 5 shows the flight and location plan for this test. Use the M-33 acquisition radar and the AN/MPQ-10A as friendly radars. Site the radars in order to avoid mutual interference. The AN/MPQ-10A crew will intercept and track target simulator TS-155/UP.

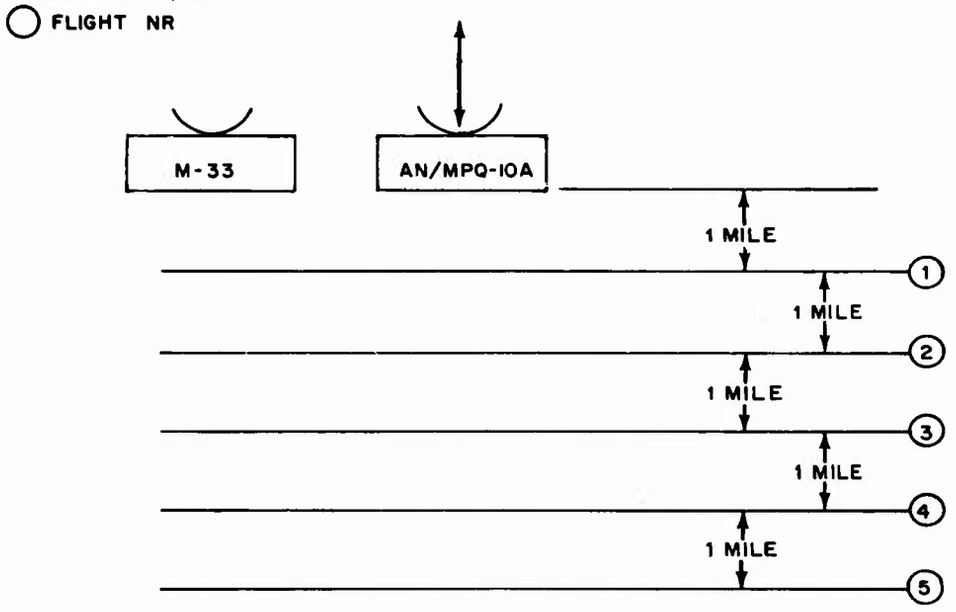

Fig. 5. (U) Flight and location plan for test 6

(2) The flight 1 route will be 1 mile behind the radar set. The ECM operator will tune the jammer to the frequency of the

Test 6 Data Sheet (U)

Date _____
Weather _____
Jammer freq _____

Radar coord _____
Radar coord _____
Aux M-33 coord _____
Radar freq _____
Radar freq _____

Flight nr	Target radar nomenclature	Jamming effectiveness	Range	Remarks

AN/MPQ-10A and, when the flight is repeated, the operator will turn on the M-33 acquisition radar frequency. The ECM operator will attempt to maintain jammer antenna orientation in the direction of the ground radar. Permit the ECM equipment to lock on and transmit. Record the AN/MPQ-10A tracking capability and the jamming condition on the M-33.

(3) For flights 2, 3, etc., repeat the procedure described in subparagraph 2 at 1-mile intervals until interference is negligible. Take readings of the jamming on the M-33 scope, using a 0 through 5 scale. Take photographs of the scopes to show jammed portions.

d. (U) Data Required

The following data will be required:

(1) All data as required on the test 6 data sheet.

(2) Project officer's log.

(3) Comments by ECM operator and radar operator.

12. (C) TEST 7, JAMMING EFFECTIVENESS AGAINST A MORTAR-LOCATING RADAR (AN/MPQ-10A) IN DEFILADE

a. (U) Purpose

The purpose of test 7 is to determine the jamming effectiveness of the Jammer against the AN/MPQ-10A when the radar is placed in a 50-mil defilade.

b. (U) Time Required

Four days will be required for the completion of this test.

c. (C) Procedure

(1) The AN/MPQ-10A will be sited in a 50-mil defilade with an azimuth of approximately 180 degrees (see fig. 6). Exact measurements of the defilade will be made at 100-mil azimuth increments.

(2) With the jamming antenna pointed to the rear of the aircraft, flights 1, 2, and 3 will start at the radar site and fly away from the radar at altitudes of 3,000, 2,000, 1,000, and 500 feet, respectively. The jammer will be on during the entire flight until the project officer determines that jamming is no longer effective.

(3) A target simulator elevated to 150 mils will provide a tracking capability. Jamming effectiveness will be determined by the radar's ability to maintain track of the simulator signal.

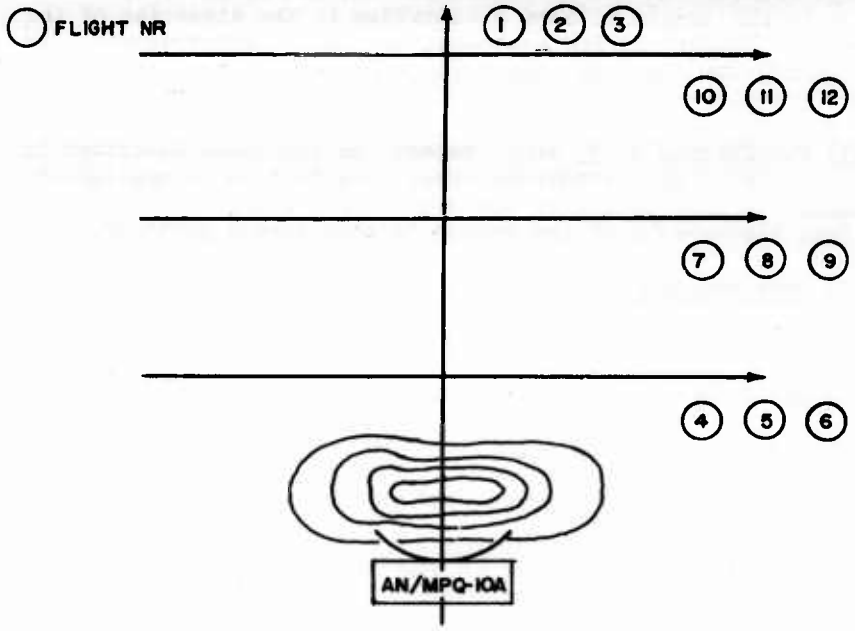

Fig. 6. (U) Flight and location plan for test 7

(4) Flights 4 through 12 will be flown perpendicular to the radar at 5-mile intervals at the altitudes given in subparagraph 2. All flights other than 4, the antenna will be oriented either to the left or to the right so that it faces toward the radar. On flight 4, the operator will attempt to maintain antenna orientation directly toward the radar. Careful note will be made by the radar operator of the azimuth when jamming becomes ineffective due to the defilade.

d. (U) Data Required

The following data will be required:

(1) All data as required on test 7 data sheet.

(2) Azimuth (mils) against defilade elevation.

(3) Equipment log.

(4) Comments by radar operator.

Test 7 Data Sheet (U)

Date _____
Weather _____

Radar coord _____
Radar freq _____

Flight nr	Altitude (ft)	Distance from radar	Azimuth start (mils)	Azimuth end (mils)	Remarks

V. MAN-MACHINE COMPATIBILITY

13. (U) TEST 8, MAN-MACHINE COMPATIBILITY

a. (U) Purpose

The purpose of test 8 is to determine the extent of man-machine compatibility in the operation of the Jammer.

b. (U) Time Required

This test will be performed concurrently with other tests.

c. (U) Procedure

(1) Human engineering personnel will conduct preliminary observations of the setup and operation of the jammer, in order to gain familiarity with the equipment, and will devise an Observer's Record Form and an Interview Record Form on the basis of these observations. Both forms will be semi-structured, permitting systematic, preplanned inquiry of man-machine relationships in all aspects of field use of the jammer covered by associated tests.

(2) Human engineering personnel will then observe man-machine relationships with each of several operators and record appropriate observations made of each operator on a separate Observer's Record Form. At the conclusion of every observation period, each operator will be interviewed independently, and his comments will be recorded on a separate Interview Record Form. Evaluation of the equipment will be based on data obtained through use of these forms.

d. (U) Data Required

The following data will be required:

(1) Separate observation information on the performance of each operator as required by the Observer's Record Form.

(2) Separate interview information from each operator as required by the Interview Record Form.

UNCLASSIFIED