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FINAL REPORT
RADAR BEACON AS AIR REFUELING RENDEZVOUS AID
PROJECT 66-2

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FINAL REPORT

RADAR BEACON AS AIR REFUELING RENDEZVOUS AID

PROJECT 66-2

15 September 1966

DETACHMENT 1

1129TH USAF SPECIAL ACTIVITIES SQUADRON

P.O. BOX 882, LAS VEGAS, NEVADA

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FOREWORD

This is the final report of the A-12 Air Refueling Beacon test conducted under the authority of the Commander, Det 1, 1129th USAF Special Activities Squadron, P.O. Box 882, Las Vegas, Nevada. Testing was done from 2 February to 31 August 1966. Project priority is 66-2. Security classification is SECRET.

i

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ABSTRACT

The beacon installation and test was initiated to provide an additional rendezvous aid for air refueling the A-12 aircraft from a KC-135 tanker. Objectives of the test were to determine the operational capabilities and limitations of the beacon as installed in the A-12 aircraft. Tests indicate the KC-135 will receive the beacon return an average of about 150 miles range. The primary limitation to the beacon as a rendezvous aid is the inability of the KC-135 to receive the beacon with the A-12 in the tankers stern position. The beacon is a simple reliable piece of equipment that allows the tanker to position itself with greater accuracy in order to complete the rendezvous with the A-12 for air refueling. The negligible weight of the installed beacon (less than five pounds) has no effect on A-12 performance. Recommend its installation in all A-12 aircraft.

SECRET

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TABLE OF CONTENTS

Cover Page

Foreword i

Abstract ii

Table of Contents. iii

Introduction 1

Objective. 1

Description of Equipment 1

Test Methods and Limitations 2

Test Results 2-3

Test Conclusion and Recommendations. 3

Distribution List. 4

Review and Approval. 5

iii
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INTRODUCTION

1. In the past, difficulties have been experienced with the operation of the ARC-50 as the primary rendezvous aid for A-12 air refueling. The test was initiated to determine if a beacon installation would assist in the rendezvous of the A-12 with the KC-135.

OBJECTIVE

2. The test objective was to determine the operational capabilities and limitations of the beacon installation in A-12 aircraft when used as an air refueling rendezvous aid with the KC-135 tanker.

DESCRIPTION OF EQUIPMENT

TEST ITEM

3. Original tests were run using the Motorola SST-133X beacon mounted in the hatch with a Motorola slotted array (referred to as the "STUB") antenna which protruded about 2" out of the hatch. Midway through the test program the Motorola SST-181X beacon became available and was used until test completion. A comparison of the two beacons reveals the following:

	<u>SST-133X</u>	<u>SST-181X</u>
Power output	350-400 Watts	500 Watts
Receiver Sensitivity	-66 DBM	-73 DBM
Bandwidth (To 3 DB points)	8 MCS	12 MCS

Late in the program a LAC developed flush antenna became available and was used in aircraft No. 129 and 131 to test completion. The beacon was used in conjunction with the KC-135 APN-59 radar operated in the beacon mode.

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TEST METHODS AND LIMITATIONS

TEST PROCEDURE

4. Test procedure was to install and operate the beacon on all refueling sorties that were not scheduled for EWS activity. The test installation allowed only beacon operation for EWS or air refueling but not both. Beacon pickup ranges were obtained from 903rd Air Refueling Squadron, Beale AFB.

ACCURACY OF DATA

5. The accuracy of the data obtained should correspond closely to what could be expected on normal operational sorties as all tests were conducted as part of operational training flights.

TEST RESULTS

6. The initial calculated performance of the 133X beacon with the stub antenna indicated a pickup range of up to 200 N.M. could be expected. Early tests gave a wide variation in contact ranges, from no contact at all to pickup ranges of about 180 N. miles. Analysis of the problem revealed that a good percentage of the tanker radars were off design frequency (9375 MCS) by 18 to 20 MCS. This effectively put the radars out of the receiver passband of the beacon, and performance was generally unsatisfactory. This problem was resolved through the cooperation of the 903 ARS operation and maintenance personnel. Magnetron tubes that vary appreciably from 9375 MCS are now rejected for operational use. The introduction of the 181-X beacon with its greater bandwidth also helped alleviate this problem. This combination provided fairly consistent pickup ranges in excess of 150 N.M. except in the 60° cone at the tanker stern where the radar antenna is blocked by the KC-135 fuselage.

7. LAC has recently developed a flush antenna which is more aerodynamically desirable than the stub antenna. Antenna patterns of this installation are not quite as good as the stub antenna especially to the A-12 side positions. Installation of this antenna was made in aircraft #129 and 131 and testing has indicated comparable pickup ranges provided the A-12 is headed toward the tanker as is normally done during rendezvous. Pickup ranges drop off rapidly to the A-12 side

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positions but this does not appear to be a serious operational deficiency at this time.

TEST CONCLUSION AND RECOMMENDATIONS

8. Test results indicate the beacon installation to be highly reliable in operation with pickup ranges of about 150 miles under normal A-12 descent flight conditions prior to air refueling. The KC-135 tanker receives accurate A-12 position information from the beacon return which allows more accurate tanker positioning for rendezvous. With a failure of all other rendezvous aids, the beacon will allow rendezvous under weather conditions of 3 miles or greater visibility. Recommend installation of the Motorola SST-181X beacon in all A-12 aircraft with the flush mounted LAC developed antenna.

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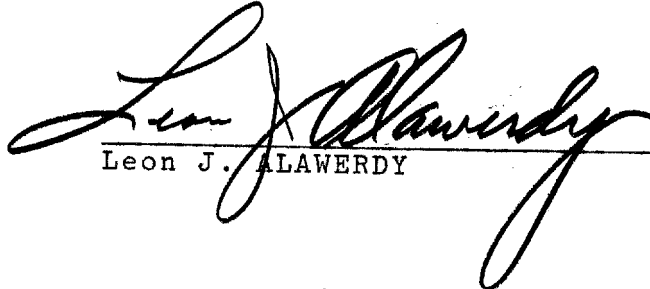
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