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DATE: 1 Feb 1967

NAVAL AIR TEST CENTER TECHNICAL REPORT

FINAL REPORT
CARRIER SUITABILITY TESTS
OF
THE MODEL A-6A AIRCRAFT

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by

Lt J. E. Ramsey, USN
Mr. W. R. Dixon

Test and Evaluation

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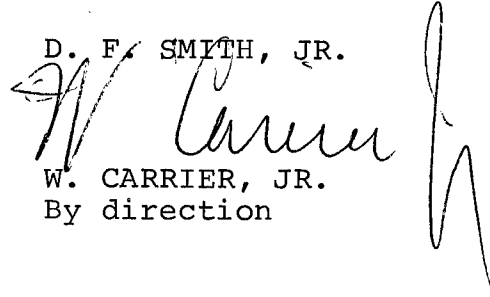
A32320001
RSSH-44-361
FT-9R-67
1 Feb 1967

From: Commander, Naval Air Test Center
Patuxent River, Maryland 20670
To: Commander, Naval Air Systems Command
Subj: NATC Technical Report FT-9R-67, Carrier Suitability
Tests of the Model A-6A Aircraft, Final Report;
transmittal of
Ref: (a) AIRTASK A32320001/201 1/F012-01-12 of 28 Jul 1966
(b) BUWEPS Problem Assignment RSSH-44-361 of 8 Dec 1964
(c) NATC Report of Test Results FT2222-02R-65 of
18 Jan 1965
(d) NATC Report of Test Results FT2222-20R-65 of
16 Mar 1965
(e) NATC Report of Test Results FT2222-011R-65 of
27 May 1965
(f) NATC Report of Test Results FT2211-45R-65 of
13 Jul 1965
(g) NATC Report of Test Results FT-25R-66 of 8 Mar 1966

1. Reference (a) authorized the Commander, Naval Air Test Center to perform flight test and evaluation of aircraft as assigned. Reference (b) requested that the Commander, Naval Air Test Center conduct carrier suitability tests of the A-6A aircraft.

2. References (c) through (g) were interim reports of the problem assignment. This report completes the problem assignment.

D. F. SMITH, JR.


W. CARRIER, JR.
By direction

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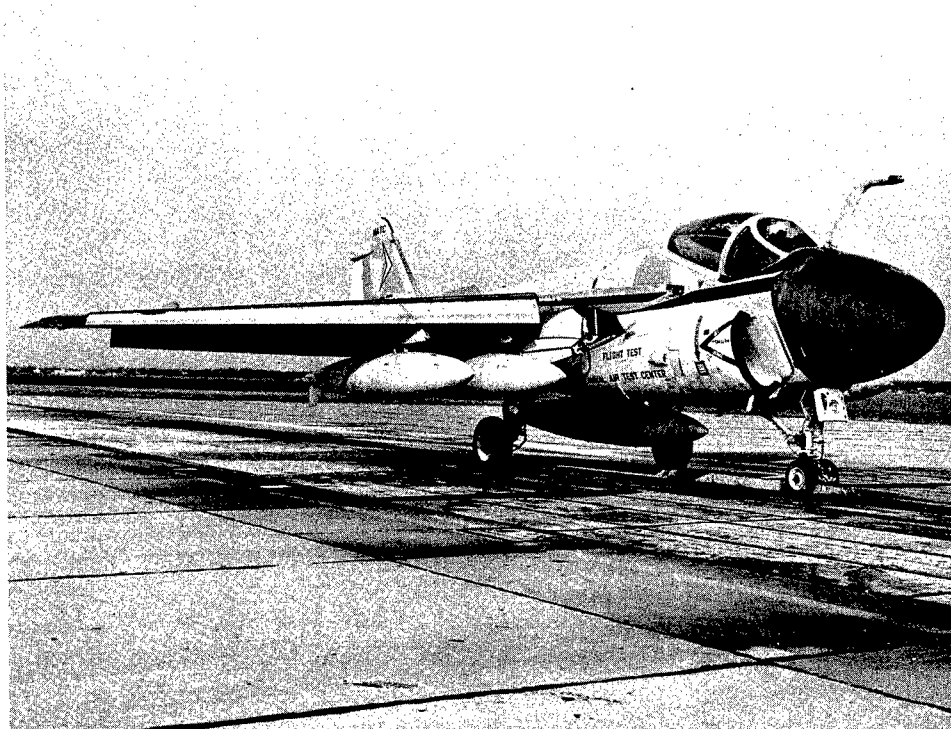
NAVAL AIR TEST CENTER
U. S. NAVAL AIR STATION
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1 Feb 1967

CARRIER SUITABILITY TESTS
OF THE MODEL A-6A AIRCRAFT
FINAL REPORT

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ABSTRACT

Launching the A-6A aircraft from the H-8 hydraulic catapult is feasible. Eight launches were conducted from the H-8 catapult and no aircraft deficiencies were observed. Launching the A-6A above 40,000 lb gross weight from the H-8 catapult is considered impractical because of the relatively high wind over the deck required.

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INTRODUCTION

BACKGROUND

1. Problem Assignment RSSH-44-361 was established to complete the carrier suitability evaluation of the A-6A airplane. The carrier suitability evaluation was to include the following items: (a) various externally mounted stores, (b) Approach Power Compensator (APC), (c) single engine approach, (d) asymmetrical arrested landing limits, (e) crosswind limits, (f) nose tow catapult hardware modifications, (g) J-52 P8 engine, (h) short airfield for tactical support (SATS) equipment and (i) investigations of other problems resulting from fleet experience. Certain areas of this evaluation are being conducted under separate AIRTASK/Problem Assignments and are listed in references 1 through 3. Interim results conducted under this problem assignment were reported in references 4 through 8.

PURPOSE

2. This report contains the results of tests conducted to determine the feasibility of operating the A-6A airplane from H-8 hydraulic catapults and completes the problem assignment.

DESCRIPTION OF TEST AIRPLANE

3. The A-6A airplane is a two-place, all-weather, multiple-mission, attack airplane designed to operate from shore bases and aircraft carriers.

4. The test airplane, BuNo 149482, was structurally and aerodynamically representative of a production airplane except that wing-tip speed brakes were not incorporated. The test airplane differed from a production airplane in that some electronic equipments were removed and ballast substituted. An 18-channel oscillograph and test measuring equipment were installed.

SCOPE AND METHOD OF TESTS

5. Tests were conducted in accordance with the procedures contained in reference 9. The tests were accomplished in two flights and a total of eight launches were made from the H-8 catapult. Airplane loading consisted of five empty Aero 1D (300 gallon) drop tanks. Methods used to obtain test data and the associated accuracies of the data are presented in Appendix II.

CHRONOLOGY

6. The chronology of the tests is as follows:

- a. Problem Assignment Established - 8 Dec 1964
- b. First Interim Report - 18 Jan 1965
- c. Second Interim Report - 16 Mar 1965
- d. Third Interim Report - 27 May 1965
- e. Fourth Interim Report - 13 Jul 1965
- f. Fifth Interim Report - 8 Mar 1966
- g. A-6A/H-8 Compatibility Tests - 30 Nov - 1 Dec 1966

RESULTS AND DISCUSSION

7. Data for all H-8 launches are tabulated in Appendix IV. The H-8 catapult lacks the capacity required to impose limit tow loads on the airplane. Time histories of longitudinal acceleration and tow link axial load during the initial portion of the catapult stroke for representative low and high pressure steam catapult launches and a typical H-8 catapult launch at 4,000 psi (launch number 7) are presented for comparison in Appendix III. The nose strut of the test airplane was not instrumented and nose gear loads were undetermined. However, the dynamics of the nose strut at tension bar release were comparable to those observed during steam catapult launches.

8. During the sixth launch, the trail bar was not retained by the catch-plates and stopped approximately 20-25 ft away from the lead-in track. The reason for this deficiency is unknown but may have been caused by a slight misalignment of portions of the deck ramp.

9. No airplane deficiencies were noted. The effect of H-8 catapult launches on electronic equipments in fleet configured airplanes could not be determined because ballast was installed in place of some electronic equipments in the test airplane. The effects of H-8 catapult tow loads on the electronic equipments are not anticipated to be any more severe than for steam catapult launches.

10. Launching the A-6A airplane from the H-8 catapult is feasible. However, launching the A-6A airplane above 40,000 lb gross weight is considered impractical because of the high wind over the deck required. The A-6A airplane requires approximately 25 kt wind over the deck at 40,000 lb for H-8 launches 10 kt above the minimum end airspeed. Launching the A-6A airplane at this gross weight would necessarily restrict total internal fuel to 9,000 lb (full fuselage fuel) and in-flight refueling would be required for tactical use of the airplane.

CONCLUSIONS

11. Launching the A-6A airplane from the H-8 hydraulic catapult is feasible (paragraph 10).

12. Launching the A-6A airplane from the H-8 catapult is considered impractical because of the relatively high wind over the deck required for launches above 40,000 lb gross weight (paragraph 10).

REFERENCES

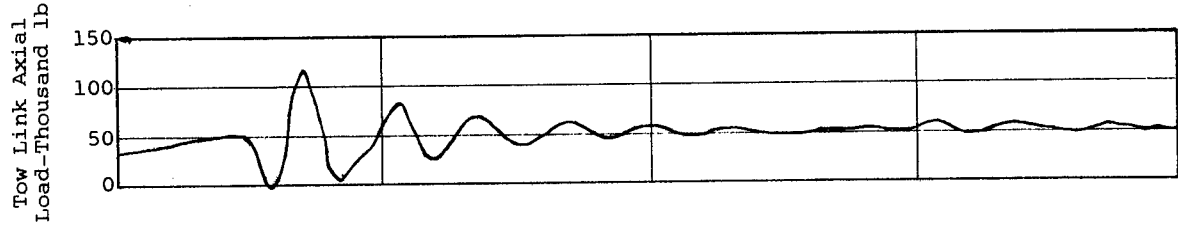
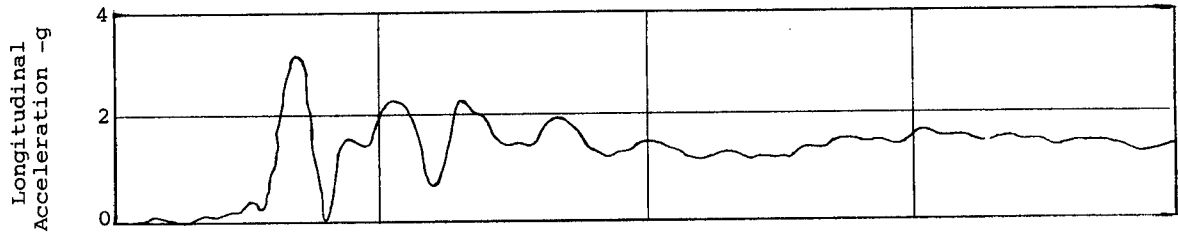
1. AIRTASK A34533903, Problem Assignment 14F of 9 Dec 1965, A-6A APC Flight Evaluation
2. AIRTASK A32320001, Problem Assignment RAD3322-523 of 10 Dec 1965, A-6A Performance and Carrier Suitability with J-52-P-8 Engines
3. AIRTASK A32320001, Problem Assignment RSSH-44-434 of 16 Jun 1965, Aircraft Suitability with SATS Catapults and Arresting Gear Systems
4. NATC Report of Test Results FT2222-02R-65 of 18 Jan 1965
5. NATC Report of Test Results FT2222-20R-65 of 16 Mar 1965
6. NATC Report of Test Results FT2222-011R-65 of 27 May 1965
7. NATC Report of Test Results FT2211-45R-65 of 13 Jul 1965
8. NATC Report of Test Results FT-25R-66 of 8 Mar 1966
9. NAVWEPS Technical Manual 51-35-501 of 15 May 1963

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METHODS USED TO OBTAIN TEST DATA
AND THE ASSOCIATED ACCURACIES OF
THE DATA

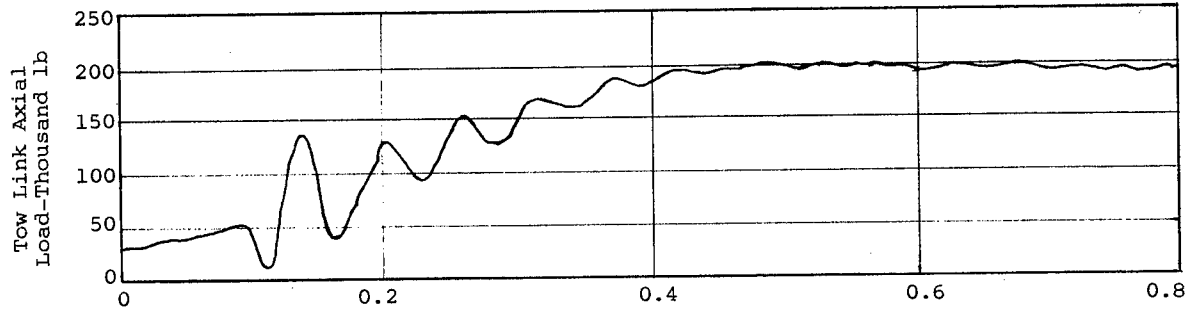
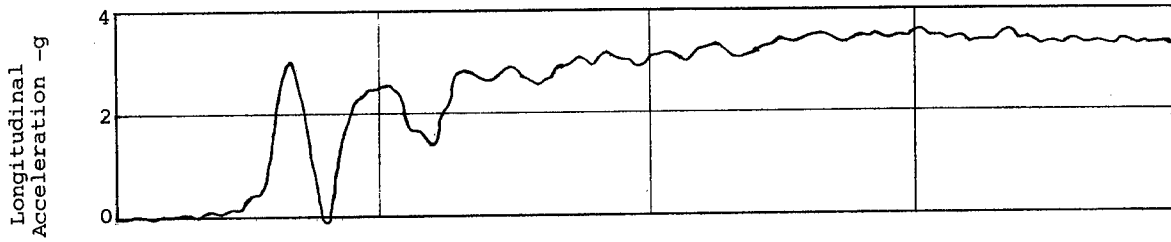
<u>Item</u>	<u>Method</u>	<u>Accuracy (\pm)</u>
	<u>Calculated Data</u>	
Aircraft gross weight	Add indicated fuel weight to basic airplane weight	300 lb
	<u>Airplane Instrumentation</u>	
Aircraft loads and load factors	Strain gages and accelerometers	10% of full scale (0.5 g)
	<u>External Instrumentation Data</u>	
Catapult endspeed	Mechanical trips	1 kt
	<u>Observed Data</u>	
Catapult off-center spotting distance		2 in.

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LOW PRESSURE STEAM CATAPULT LAUNCH

See Note 1



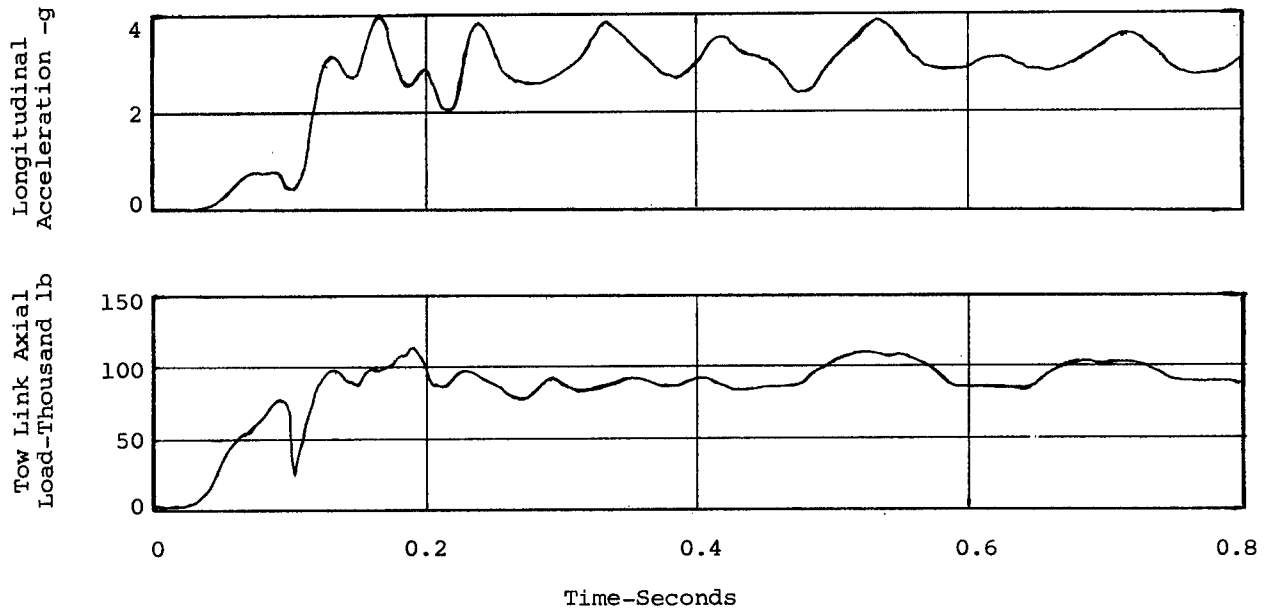
Time - Seconds

HIGH PRESSURE STEAM CATAPULT LAUNCH

See Note 2

EA-6A Airplane
BuNo 148618

TIME HISTORIES OF LONGITUDINAL ACCELERATION
AND TOW LINK AXIAL LOAD FOR STEAM CATAPULT LAUNCHES



H8 CATAPULT LAUNCH

See Note 3

- Notes:
1. C13 Catapult in CVA-63; Gross weight - 36,900 lb; Catapult pressure - 110 psi; Catapult endspeed - 81 kt.
 2. C11-1 Catapult in CVS-16; Gross weight - 54,500 lb; Catapult pressure - 480 psi; Catapult endspeed - 116 kt.
 3. H-8 Catapult at NATC; Gross weight - 29,200 lb; Catapult pressure - 4,000 psi; Catapult endspeed - 100 kt.

A-6A Airplane
BuNo 149482

TIME HISTORIES OF LONGITUDINAL ACCELERATION AND
TOW LINK AXIAL LOAD FOR H-8 HYDRAULIC CATAPULT LAUNCHES

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LAUNCH NUMBER	1	2	3	4	5	6	7	8
AIRPLANE LOADING	FIVE	EMPTY	AERO	1D (300 gal)		DROP	TANKS	
AIRPLANE GROSS WEIGHT	35,200	34,900	34,500	31,400	31,200	30,800	29,200	28,900
LAUNCH CONDITIONS								
OFF-CENTER AT MAIN WHEELS (in)	0	0	0	0	4L	8R	9J	10R
CATAPULT PRESSURE (psi)	3,500	3,500	3,500	4,000	4,000	4,000	4,000	4,000
CATAPULT ENDSPEED (kt)	89	89	90	98	98	98	100	100
TOW LINK AXIAL LOAD (1000 lb)	106.0	108.0	109.0	116.6	114.6		112.6	118.7
LOAD FACTORS AT AIRPLANE CG						No		
PEAK LONGITUDINAL	3.3	3.2	3.3	3.5	3.6	Instr.	4.0	3.7
PEAK NORMAL	2.7	2.6	2.4	3.1	3.3		3.6	3.0
REMARKS	First					Trail		
	Launch					Bar		
	of Day					Missed		
						Catch		
						Plates		

A-6A Airplane
BuNo 149482

CATAPULT LAUNCHING TABULATED DATA
H-8 CATAPULT AT NATC

UNCLASSIFIED

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DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

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