

USAAEFA PROJECT NO. 74-20



HOT BRICK III AIRWORTHINESS EVALUATION OV-1D AIRPLANE

FINAL REPORT

DONALD F. MACPHERSON JR PROJECT OFFICER/ENGINEER JAMES S. REID CW4, AVN US ARMY PROJECT PILOT



「「「「「「ない」」のないで、「ない」のないで、

NOVEMBER 1974

Approved for public release; distribution unlimited.

UNITED STATES ARMY AVIATION ENGINEERING FLIGHT ACTIVITY EDWARDS AIR FORCE BASE, CALIFORNIA 93523

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

DISCLAIMER NOTICE

The findings of this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

DISPOSITION INSTRUCTIONS

Destroy this report when it is no longer needed. Do not return it to the originator.

TRADE NAMES

The use of trade names in this report does not constitute an official endorsement or approval of the use of the commercial hardware and software.

REPORT DOCUMENTATION PAG	E READ INSTRUCTIONS
LEPORT HUMBER	BEFORE COMPLETING FORM
USAAFFA JEOMETRIC -74-26	(γ)
A TITLE (and full mer the second seco	ENER OF REPORT & PERIOD COVERED
HOT DRIVE TH ADDRODTHINGS FUALT	FINAL REPORT
OV.ID AIRPLANE	ATION Section IS
OTTE AIRCEARE	LICANTE A DO INT HUNSEN
7 AUTHOR(E	USAAEFA PROJECT NO, 74-20 8. CONTRACT OR GRANT NUMBER(*)
DONALD F. MACPHERSON, JR. JAMES S. REID	
PERFORMING ONGANIZATION NAME AND DURESS	AREA & WORK UNIT NUMBERS
US ARMY AVIATION ENGINEERING FLIGE EDWARDS AIR FORCE BASE, CALIFORNIA	AT ACTIVITY 93523 NA
1. CONTROLLING OFFICE NAME AND ADDRESS	12 MERONY DATE
US ARMY AVIATION ENGINEERING FLIGH	IT ACTIVITY / NUV
EDWARDS AIR FORCE BASE, CALIFORNIA	87 12
14 MONITORING AGENCY NAME & ADDRESS(I different from	Cantrolling Office) 18. SECURITY CLASS. (of this report
	UNCLASSIFIED
	NA
Approved for public release; distribution unlin	mited.
Approved for public release; distribution unlin	nited. ck 20. 11 dillerent from Report)
Approved for public release; distribution unlin DISTRIBUTION STATEMENT (of the obstrace entered in Block	mited. ck 20. If dillerent from Report)
Approved for public release; distribution unlin Distribution statement (of the obstrace entered in Bloc SUPPLEMENTARY NOTES	nited. ck 20, if different from Report)
Approved for public release; distribution unlir 7 DISTRIBUTION STATEMENT (of the obstract entered in Bloc 8 SUPPLEMENTARY NOTES Period covered: 11 - 22 February 1974 17 July - 7 August 1974	nited. ck 20, 11 different from Report)
Approved for public release; distribution unlin 7 DISTRIBUTION STATEMENT (of the obstract entered in Bloc 8 SUPPLEMENTARY NOTES Period covered: 11 - 22 February 1974 17 July - 7 August 1974 9 KEY WORDS (Continue on reverse side if necessary and ident	nited. ck 20. If different from Report) ://y by black number)
Approved for public release; distribution unlir DISTRIBUTION STATEMENT (of the obstract entered in Block SUPPLEMENTARY NOTES Period covered: 11 - 22 February 1974 17 July - 7 August 1974 Stary WORDS (Continue on reverse side if necessary and identified HOT BRICK III airworthiness evaluation Flight characteristics	nited. ck 20. If different from Report) "Ify by block number; Infrared countermeasure device Structural and handling qualities
Approved for public release; distribution unlir ⁷ DISTRIBUTION STATEMENT (of the obstract entered in Bloc ⁸ SUPPLEMENTARY NOTES Period covered: 11 - 22 February 1974 17 July - 7 August 1974 ⁹ REY WORDS (Continue on reverse elde if necessary and iden: HOT BRICK III airworthiness evaluation Flight characteristics OV-1D (Mohawk) airplane	rited. (k 20. If different from Report) (Ify by block number) Infrared countermeasure device Structural and handling qualities Low-speed high gross weight regime
Approved for public release; distribution unlir 7 DISTRIBUTION STATEMENT (of the obstract entered in Block 8 SUPPLEMENTARY NOTES Period covered: 11 - 22 February 1974 17 July - 7 August 1974 17 July - 7 August 1974 HOT BRICK III airworthiness evaluation Flight characteristics OV-1D (Mohawk) airplane	rited. (k 20. If different from Report) (Ify by block number) Infrared countermeasure device Structural and handling qualities Low-speed high gross weight regime
Approved for public release; distribution unlir DISTRIBUTION STATEMENT (of the obstract entered in Block SUPPLEMENTARY NOTES Period covered: 11 - 22 February 1974 17 July - 7 August 1974 KEY WORDS (Continue on reverse side if necessary and identified HOT BRICK III airworthiness evaluation Flight characteristics OV-1D (Mohawk) airplane AMERACT (Continue on reverse side If necessary and identified The United States Army Aviation E airworthiness evaluation of the OV-1 HOT BRICK III infrared countermeasu at Fort Rucker, Alabama, and from Air Force Base, California. During the flown. Structural and handling qualities	nited. (k 20. If different from Report) (Ify by block number) Infrared countermeasure device Structural and handling qualities Low-speed high gross weight regime (fy by block number) (ingineering Flight Activity conducted an ID (Mohawk) airplane isodified with a ure device from 11 to 22 February 1974 17 July to 7 August 1974 at Edwards e test program 20 productive hours were tests were conducted, with emphasis placed

.

409 (25

UNCLASSIFIED SELUBITY CLASSIFICATION OF THIS PAGE "Mon Dole Enford)

20. Abstract

' on the low-speed high gross weight regime. Structural testing was limited to flutter tests of the wing store that contained the 150-gallon fuel drop tank modified with the HOT BRICK III device, the wing at the HOT BRICK III store station, and the right wing tip. Handling qualities tests included a stall investigation, determination of control margins with high asymmetric loads, single-engine minimum trim and control airspeeds, and static lateral-directional stability. Other tests included takeoff performance and an airspeed system calibration. A large discrepancy existed between the takeoff performance data presented in the operator's manual and that obtained with the test aircraft. If the data from this evaluation are representative of the OV-1D, then a deficiency exists, in that the takeoff performance data presented in the operator's manual is extremely optimistic, Four shortcomings were associated with operating the OV-1D airplane at the heavy gross weight in the all-stores (E) configuration. The contribution of the HOT BRICK III device to these shortcomings is minimal. The handling qualities of the OV-1D HOT BRICK III airplane are similar to the standard OV-1D airplane in the all-stores (E) configuration. An adequate stall warning should be provided. Further testing should be accomplished to provide accurate takeoif performance data.

المحاص ومعمد المحران الروان

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE(Then Date Entered)

PREFACE

During the OV-1D HOT BRICK III testing the aircraft was maintained by personnel from the United States Army Aviation Test Board, Fort Rucker, Alabama. Additionally, the following United States Army Aviation Engineering Flight Activity personnel provided significant contributions to the test.

> CPT Robert N. Ward, Aeronautical Engineer 1LT Richard D. Becker, Automatic Data Processing Officer SP4 Paul R. Bonin, Aeronautical Engineering Assistant Kathleen M. Dorris, Aeronautical Engineering Technician Walter S. Hall, Electronics Technician Dean S. Smith, Aircraft Mechanic

DEDICATION

an we have a single static to be a second

....

This report is dedicated to the memory of Major Frederick D. Daniloff and Captain Kenneth F. Schrantz Jr, who were fatally injured on 22 February 1974 during the conduct of this evaluation.



OV-1D Airplane, US Army Serial Number 69-17000.

TABLE OF CONTENTS

Page

INTRODUCTION

the company property for particular a serie france

Background	•	•	•	•	•	•	•	•	•	·	•	•	•	•	•	•	•	•	•	•	•	•	22
Description	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	2
Test Methodolog	У	•	•		•	•	•	•	•	•	•	•	•	:	•	•	•	•	•	•	•	•	4

RESULTS AND DISCUSSION

ł

	General Takeoff Performance Handling Qualities Control Margins Static Lateral-Directional Stability Dual-Engine Stalls Single-Engine Control Margins Single-Engine Minimum Control Flight Flutter Tests	Airsp	• • • • • • • • • • • • • •		· · ·	• • • • •	· · · · · · · · · · · · · · · · · · ·		• • • • •	• • • • • • • • •	5 7 7 9 10 10
CON	CLUSIONS General Deficiency and Shortcomings Specification Compliance	· ·	 	• •	•••	•	• ·	•••	•	•	13 13 14
REC	OMMENDATIONS	•••			• •		•	• •		•	15
A. B. C. D. E.	References	ethod	 	• • •	• • • • • •	• • •	•	• • • •	• • •	• • • • •	16 17 19 25 30

DISTRIBUTION

INTRODUCTION

BACKGROUND

1. The HOT BRICK III is an active infrared countermeasure (IRCM) device developed by Sanders Associates (SA) and is installed on the OV-1D airplane in a modified Sargent-Fletcher 150-gallon external fuel tank. As a subcontractor to SA, Grumman Aerospace Corporation (GAC) modified an OV-1D airplane to accept the device and conducted a limited airworthiness evaluation. The United States Army Aviation Systems Command (AVSCOM) requested the United States Army Aviation Engineering Flight Activity (USAAEFA) to conduct airworthiness verification tests on the OV-1D/HOT BRICK III system (ref 1, app A). The original test airplane (SN 69-17018) crashed during conduct of the evaluation by USAAEFA at Fort Rucker, Alabama, in February 1974. A second airplane (SN 69-17000) was modified and the tests were completed at Edwards Air Force Base, California, in August 1974.

TEST OBJECTIVE

2. The objective of this evaluation was to identify any airworthiness problems or flight characteristics changes in the aircraft caused by installation of the HOT BRICK III system. The test data will serve as a basis for a safety-of-flight release for HOT BRICK III system testing.

DESCRIPTION

3. The test airplanes were production OV-1D's (SN's 69-17018 and 69-17000), modified to accept the HOT BRICK III system. A detailed description of the OV-1D airplane is contained in the operator's manual (ref 2, app A). Appendix B gives a detailed description of the test aircraft external equipment.

4. The HOT BRICK III is an open loop IRCM device utilizing a mechanically mounted IR source. The IR transmitter assembly is coupled with a modulator assembly and is mounted on a modified 150-gallon external fuel tank. The IR source consists of a ceramic radiating element heated by the combustion of JP-4 fuel. The fuel for the equipment is drawn from a 15-gallon fuel tank mounted inside the modified 150-gallon fuel tank. The system requires 28 volts direct current (VDC) and is operated from the pilot control box (PCB) located in the cockpit. The HOT BRICK III device is further described in appendix B.

5. The OV-1D/HOT BRICK III airplane was tested in two external stores configurations which are presented in table 1. Table 2 defines the various airplane configurations used during the HOT BRICK III tests.

	Stores Loading						
Configuration	Station	Store					
	1						
	2						
	3	150-gallon drop tank					
B, with HOT BRICK III	Fuselage						
	4	150-gallon drop tank with HOT BRICK III					
	5						
	6	-					
	1	ALQ-67 fuse jammer					
	2						
~*	3	150-gallon drop tank					
E, with HOT BRICK III	Fuselage	APS-94 SLAK ¹					
	4	150-gallon drop tank with HDT BRICK III					
	5	LS-59A flasher pod					
	6	ALQ-80 radar jammer					

Table 1. External Stores Test Configurations.

. .

ć.,

•

and it conserves destine a construction of a second second second

¹SLAR: Side-looking airborne radar.

.

Configuration	Symbol	Landing Gear Position	Flap Position (deg)	Power
Takeoff -	то	Down	15	Takeoff
Cruise	CR	Up	Zero	For level flight
Power approach	РА	Down	45	For level flight

Table 2. Airplane Test Configurations.

TEST SCOPE

6. The OV-1D/HOT BRICK III test program was conducted at Fort Rucker, Alabama, from 11 to 22 February 1974 and at Edwards Air Force Base, California, from 17 July to 7 August 1974. Nineteen test flights were conducted, with a total of 20 hours. Testing was conducted primarily in the all-stores (E) configuration at a gross weight of 18,000 pounds, an aft center-of-gravity (cg) location (29 percent mean acrodynamic chord) (MAC) and at pressure altitudes of 7500 and 14,000 feet. The evaluation was performed within the limitations of the operator's manual as modified by the safety-of-flight release (ref 3, app A). The results of the test were compared with the information contained in the appropriate sections of the operator's manual. In addition, compliance with the appropriate sections of military specification MIL-F-8785(ASG) (ref 4) was determined.

TEST METHODOLOGY

7. Engineering flight test techniques used during this evaluation are discussed briefly in the Results and Discussion section of this report and in appendix D. Appendix C contains listings of the test instrumentation, the parameters that were recorded on magnetic tape, and those displayed on the pilot panel. An airspeed calibration was accomplished using radar space positioning (figs. 1 and 2, app C). Data analysis m thods are also presented in appendix D.

RESULTS AND DISCUSSION

GENERAL

An evaluation of the OV-1D HOT BRICK III airplane was performed to 8. determine the airworthiness of the OV-1D airplane when modified with the HOT BRICK III device. Structural and handling qualities tests were conducted, with emphasis placed on the low-speed high gross weight regime. Structural testing was limited to flutter tests of the wing store that contained the 150-gallon fuel drop tank modified with the HOT BRICK III device, the wing at the HOT BRICK III store station, and the right wing tip. Handling qualities tests included a stall investigation, determination of control margins with high asymmetric loads, single-engine minimum trim and control airspeeds, and static lateral-directional stability. Other tests included takeoff performance and an airspeed system calibration. A large discrepancy exists between the takeoff performance data presented in the operator's manual and that obtained with the test aircraft. If the data from this evaluation are representative of the OV-1D, then a deficiency exists, in that the takeoff performance data presented in the operator's manual is extremely optimistic. Four shortcomings were associated with operating the airplane at heavy gross weights in the all-stores (E) configuration. The contribution of the HOT BRICK III device to these shortcomings is minimal. The handling qualities of the OV-1D/HOT BRICK III airplane are similar to the standard OV-1D in the all-stores (E) configuration. An adequate stall warning should be provided. Further testing should be accomplished to provide accurate takeoff performance data.

TAKEOFF PERFORMANCE

9 Takeoff performance testing was not a part of the original test program. During initial takeoffs, poor performance was encountered with the test aircraft. For this reason, takeoff performance was evaluated for the all-stores (E) configuration with HOT BRICK III and approximately 18,400 pounds gross weight. The distances were estimated by aligning the airplane opposite a runway-remaining marker and observing the closest marker at liftoff and when at 50 feet, as indicated by the radar altimeter. These markers were spaced at 1000-foot intervals along the runway and distances were estimated to the nearest 500 feet. The pilot technique and procedure used for takeoffs and climbs were those presented in chapters 3 and 14 of the operator's manual. A large discrepancy between the takeoff performance data presented in the operator's manual and that obtained during the conduct of this evaluation existed. During this evaluation, the test aircraft required approximately twice as much takeoff distance than that presented in the operator's manual. In addition, rotation to takeoff pitch attitude at the recommended airspeed could not be achieved. The minimum rotation airspeed was approximately 10 knots calibrated airspeed (KCAS) greater than recommended.

10. The degraded takeoff performance of the test aircraft was initially attributed to substandard engine performance. An analysis of engine performance revealed discrepancies between the torquemeters and engine test stand power available after overhaut (app D). From this analysis, it was concluded that the torquemeters were inaccurate and the engines were developing specification power. Other factors which may here contributed to the degraded takeoff performance are as follows:

a. Above-normal roughness of the propeller blades due to high operating time (1010 hours) and being painted with low reflective lacquer (FSN 8010-083-6588).

t Above-normal roughness of the fuselage caused by application of low reflective lacquer (FSN 8010-083-6588).

c. Increased drag caused by wing stores (the contribution of the HOT BRICK III device to this increase is considered minimal).

d. The high gross weight requires higher takeoff airspeed and therefore a longer takeoff distance.

e. The right tire was deformed by high asymmetric weight distribution of the wing stores and this deformation increased rolling resistance (photos A and B).

f. Additional control surface and trim deflections required by the high asymmetric weight and drag of the wing stores.



Photo A. Right Main Tire.



Photo B. Left Main Tire.

11. The reason for the discrepancy between the takeoff performance of the test aircraft with that presented in the operator's manual could not be determined. If the takeoff performance obtained during this evaluation is representative of the OV-1D airplane, then the presentation of extremely optimistic high gross weight and ambient temperature takeoff performance data in the operator's manual is a deficiency and, if relied upon, could result in takeoff accidents. Further testing is required to verify/provide accurate takeoff performance data for inclusion in the operator's manual. In addition. if the takeoff performance noted is verified through additional testing, it is a shortcoming, and takeoff performance should be improved.

HANDLING QUALITIES

Control Margins

12. Lateral control margin tests were conducted in the CR and PA configurations to determine the minimum trim airspeed and lateral control margin with an asymmetric wing loading. The normal loading in the all-stores (E) configuration with the HOT BRICK III device installed results in 620 pounds more weight (140,800 in -1b total aircraft moment) on the right wing than on the left wing. In the event of a right wing fuel transfer pump failure, a 1520-pound (307,300 in.-1b total aircraft moment) right-wing-heavy condition is possible with the left drop tank empty (except for trapped fuel) and the right drop tank full. The variation of minimum trim airspeed with an asymmetric load is shown in figure A and in figure 1, appendix E. The control margins at various airspeeds for symmetrical and maximum asymmetrical fuel loads are shown in figures 2 through 5.



13. After determining the minimum trim airspeed to be 155 KCAS for the CR configuration and 136 KCAS for the PA configuration at the 1520-pound asymmetric load condition, airspeed was decreased to a target airspeed of 97 KCAS in the PA configuration. Approximately 30 percent of aileron control remained at this airspeed. A left lateral force of only 5 pounds was required to maintain wings level at 97 KCAS.

14. Landings were easily accomplished with a 1200-pound (247,545 in.-lb total aircraft moment) right-wing-heavy condition using an approach airspeed of 120 knots indicated airspeed (KIAS) and approximately 100 KIAS touchdown airspeed. The discussion in the operator's manual on operations with high asymmetric wing loadings is satisfactory for the OV-1D/HOT BRICK III airplane. The lateral control margins and lateral trim capability of the OV-1D/HOT BRICK III airplane were satisfactory with asymmetric wing loads of up to 1520 pounds.

Static Lateral-Directional Stability

15. The static lateral-directional stability of the OV-1D/HOT BRICK III airplane was evaluated in the TO, CR and PA configurations at airspeeds from 86 to 138 KCAS and the conditions listed in paragraph 6. The test results are presented in figures 6 through 12, appendix E. The static lateral-directional stability was essentially unchanged from previous results presented in the Army Preliminary Evaluations (refs 5 and 6, app A). Although the pedal position gradient was approximately linear, lightening of the pedal forces was apparent at low airspeeds in the PA configuration. This slightly increased the pilot effort required to establish and maintain a steady-heading sideslip. Within the scope of this test, the static lateral-directional stability is satisfactory.

Dual-Engine Stalls

16. Stall characteristics were evaluated in the all-stores (E) configuration with HOT BRICK III at 18,000 pounds gross weight in the TO, CR, and PA configurations at an aft cg. Altitude effects on the stall airspeed (V_S) were evaluated by performing the stall series at two altitudes: 7500 and 14,000 feet pressure altitude. The test technique was to trim for level flight at approximately 1.2V_S, obtained from the operator's manual for the test configuration. Then airspeed was slowly decreased at a rate of 1 knot per second or less until achieving a stall. Stall was defined by a mild uncontrollable nose-down pitching motion. A comparison of the test data with the stall airspeeds from the operator's manual is presented in table 3 and in figure 13, appendix E. Time histories of the stalls are presented in figures 14 through 16.

	Gross	Pressure	Calibrated Stall Airspeed (kt)					
Configuration	(1b)	(ft)	Test Data	Operator's Manual				
TO	17,930	7600	77.5	77				
10	17,860	14,020	77.5	76.5				
CD	18,050	8180	85.5	85				
CK	18,110	14,860	87.5	85.5				
DA	17,860	7740	71.0	72				
FA	17,590	15,000	72.5	71				

Table 3. Dual-Engine Stall Airspeed.

17. Control effectiveness about all three axes during the approach to the stall was excellent. The stall was characterized by a mild nose-down pitching with no tendency to roll. Stall recovery was easily accomplished by releasing the back pressure on the control stick. The stalls occurred without warning.

18. The lack of stall warning on the OV-1D/HOT BRICK III airplane would be hazardous, especially during a short field landing approach and obstruction takeoff, where a stall could result. The lack of stall warning is a shortcoming and fails to meet the requirements of paragraph 3.6.3 of MIL-F-8785(ASG). Stall warning should be incorporated to provide the crew with an adequate cue to approaching the stall angle of attack.

Single-Engine Control Margine

19. The single-engine control margins were evaluated in the TO, CR, and PA configurations at the conditions listed in paragraph 6. The variation of trim and control position with airspeed is presented in figures 17 through 22, appendix E. The critical trim control for all test conditions was the rudder trim. The airspeed at which full trim was required in the CR configuration for either propeller feathered was approximately 145 KCAS. For the TO and PA configurations, this airspeed was approximately 140 KCAS for the left propeller feathered and 150 KCAS for the right propeller feathered. At 120 KIAS in the TO and PA configurations, approximately 30 to 40 pounds pedal force was required with either propeller feathered and approximately 2 pounds left aileron force was required with the right propeller feathered. Within the scope of this test, the OV-1D/HOT BRICK III airplane single-engine control margins are satisfactory.

Single-Engine Minimum Control Airspeed

20. The single-engine minimum control airspeed (VMC) was evaluated in the TO, CR, and PA configurations at the conditions listed in paragraph 6. A comparison of the VMC from the test data with the data from the operator's manual is presented in table 4 and in figures 23 through 25, appendix E. Time histories of the approach to VMC for the three airplane configurations at the two test altitudes of 7500 and 14,000 feet are presented in figures 26 through 32.

21. The VMC was defined by stall for all configurations tested. The stalls were relatively mild, but without warning. For all configurations, the stall airspeed was higher with the right propeller feathered; therefore, the right engine is the critical engine in the all-stores (E) configuration with HOT BRICK III. Previous testing without HOT BRICK III had indicated that the left engine would be critical; however, the increase in asymmetric load and drag caused the change. Adequate control existed about all three axes approaching the stall, except in the CR configuration with the right propeller feathered. For this configuration, full left aileron control was required at the stall. Stall recovery was accomplished by releasing the control stick back pressure and reducing power on the operating engine. There was no tendency toward poststall gyrations.

Configuration	Propeller Feathered	Gross Pr Weight Al (1b)	Pressure Altitude	Calibrated Minimum-Control Airspeed (kt)					
			(11)	Test Data	Operator's Manual				
		17,800	8120	87.5	96				
TO	Leit	17,800	13,580	89.5	98.5				
10	10 Right	17,760	7820	\$2.5	Not available				
		17,680	14,640	94.5	Not available				

Table 4. Single-Engine Minimum-Control Airspeed.

22. The lack of cues to the approaching V_{MC} and the stall at V_{MC} without warning is a shortcoming. As discussed in paragraph 18, lack of stall warning would be hazardous during the approach to a landing and obstruction takeoff. This condition is further aggravated by the higher stall airspeeds for the single-engine configuration. Adequate stall warning should be provided.

23. During the evaluation to determine V_{MC} for the PA configuration with the left propeller feathered, a rudder force reversal was encountered. In this configuration, approximately 110 pounds of right pedal force were required just prior to the single-engine stall airspeed. At this point, the pedal force required changed to a 50-pound left pedal force. This characteristic would increase pilot workload in an emergency situation. The rudder force reversal in the PA configuration with the left propeller feathered is a shortcoming.

24. During the single-engine testing, it was apparent that the OV-1D airplane does not have a single-engine capability at 18,000 pounds gross weight for the conditions tested. In the event of an engine failure at the high gross weight, the fuel drop tanks (including the HOT BRICK III device) may have to be jettisoned. Jettison of HOT BRICK III would mean the loss of IRCM protection. Single-engine performance should be improved.

FLIGHT FLUTTER TESTS

25. Tests were conducted at 5000 feet pressure ...litude to determine the flutter characteristics of the OV-1D/HOT BRICK III airplane in configurations B and E. The method of excitation was a lateral stick pulse (rudder and longitudinal stick pulses did not produce adequate excitation). The test results are presented in figures 33 through 40, appendix E. In configuration B, the damping ratio was

reduced at airspeeds above 260 KIAS. Testing was terminated at 300 KIAS when damping ratios reduced to 0.04 at two locations (right wing tip forward and HOT BRICK III aft). In configuration E, the damping ratio remained above 0.05 at all airspeeds tested (up to 330 KIAS) except for the forward end of the HOT BRICK III tank in the vertical direction. At this location, the damping ratio was decreased to 0.04 at 330 KIAS. In both configurations, there were no flutter problems encountered and the OV-1D/HOT BRICK III exhibited satisfactory flutter characteristics for normal flight conditions up to the airspeeds tested.

CONCLUSIONS

GENERAL

26. The following conclusions were reached upon completion of testing:

a. The OV-1D airplane used during this evaluation exhibited substantially degraded takeoff performance as compared to the operator's manual. The reason for this discrepancy could not be determined within the scope of this test.

b. The handling qualities and performance of the OV-1D airplane have not been significantly changed by installation of the HOT BRICK III device.

c. The right engine inoperative is the critical engine in the all-stores (E) configuration.

d. One apparent deficiency associated with the operator's manual was noted and four shortcomings were identified with the airplane in the all-stores (E) configuration.

DEFICIENCY AND SHORTCOMINGS

27. The following apparent deficiency associated with the operator's manual was identified. If the takeoff performance obtained during this evaluation is representative of the OV-1D airplane, then the takeoff performance chart presented in chapter 14 is extremely optimistic and, if relied upon, could result in takeoff accidents (para 11).

28. The following shortcomings with the OV-1D/HOT BRICK III airplane in the all-stores (h) configuration were identified:

a. Apparent inadequate takeoff performance at an 18,400-pound gross weight (para 11).

b. Lack of stall warning at high gross weights (para 18).

c. Single-engine minimum control airspeed occurs at the stall airspeed without adequate cues to the approaching stall (para 22).

d. A rudder force reversal occurs in the PA configuration when approaching a stall with the left propeller feathered (para 23).

SPECIFICATION COMPLIANCE

29. Within the scope of this test, the OV-1D/HOT BRICK III airplane failed to meet the requirement of paragraph 3.6.3 of MIL-F-8785(ASG), in that the approach to stall was not accompanied by a stall warning, which should occur between 1.05 and 1.15 times the stalling speed in the CR configuration and between 1.05 and 1.10 times the stalling speed in the PA configuration (para 18).

RECOMMENDATIONS

30. The apparent deficiency identified during this evaluation must be corrected (para 11).*

31. The shortcomings should be corrected (paras 11, 18, 22, and 23).

32. Further testing is recommended to provide accurate takeoff performance data (para 11).

33. Adequate stall warning should be provided (paras 18 and 22).

34. Single-engine performance should be improved (para 24).

And a President and an or of the second second

APPENDIX A. REFERENCES

1. Letter, AVSCOM, AMSAV-EFT, 30 October 1973, subject: Test Request for OV-1D/HOT BRICK III Evaluation.

2. Technical Manual, TM 55-1510-204-10/5, Operator's Manual, OV-1D Aircraft, February 1970.

3. Letter, AVSCOM, AMSAV-EF, 4 February 1974, subject: Safety-of-Flight Release for OV-1D/HOT BRICK III.

4. Military Specification, MIL-F-8785(ASG), Flying Qualities of Piloted Airplanes, Amendment 2, 17 October 1955.

5. Final Report, USAASTA, Project No. 68-43, Army Preliminary Evaluation, Production OV-1D (Mohawk), March 1970.

6. Final Report, USAASTA, Project No. 70-03, Army Preliminary Evaluation II, Production OV-1D (Mohawk), Performance and Handling Qualities, March 1971.

APPENDIX B. DESCRIPTION

The test aircraft were production OV-1D airplanes, serial numbers 69-17018 1. and 69-17000, modified to accept the HOT BRICK III stores and controls described below. The HOT BRICK III system is an open loop IRCM set utilizing a mechanically mounted IR source (fig. 1). The IR transmitter assembly is coupled with a modulator assembly and is mounted on a modified 150-gallon fuel tank (fig. 2). The IR source consists basically of a ceramic radiating element heated by the combustion of JP-4 fuel with ambient air. Both combustion and cooling air are drawn from a common inlet mounted on the pod shell. A flow control valve maintains an approximately constant mass flow through the combustor, regardless of flight airspeed or altitude. A fuel group pumps and regulates the fuel supply. The fuel for the equipment is drawn from a 15-gallon fuel tank mounted inside the modified 150-gallon fuel tank. The small internal tank is filled from the larger tank as long as there are more than 100 gallons of fuel in the large tank. When the fuel level of the large tank drops below 100 gallons, there is still sufficient fuel for the system in the small tank. With the modified 150-gallon fuel tank the maximum fuel available to the engines is 135 gallons from that tank.

2. The physical characteristics of the OV-1D/HOT BRICK III system are as follows:

Device Physical Dimensions

Basic diameter (no scoops)	17.2 in.
Overall length (no scoops)	4 6 in.
Device Basic Weights	
Device	230 ІЬ
Device fuel tank and fuel	128 lb
Modified External Stores	
Overall length	178.25 in.
Weight of modified stores	140 Іб
Weight of ballast	164 lb
Weight empty	534 lb
Weight of fuel (JP-4)	971 Ib
Weight loaded	1505 lb
Weight increase loaded	+382 lb
(HOT BRICK store vs standard	
150-gallon drop tank)	











APPENDIX C. INSTRUMENTATION

GENERAL

8

1. Instrumentation for the OV-1D/HOT BRICK III airplane was installed, calibrated, and mainteined by personnel of the Test and Evaluation Command (TECOM) at Fort Rucker, Alabama, and by USAAEFA at Edwards Air Force Base, California.

TESTING AT FORT RUCKER

2. During testing accomplished at Fort Rucker, the instrumentation listed below was installed. The instrumentation package used an oscillograph recorder. Supplemental data were obtained from standard cockpit indicators and voice recording. In addition, photo coverage from the chase aircraft was provided.

Cockpit

3. The existing ship's system instruments were used during this test to record engine and flight data. In addition, a panel-mounted maneuvering accelerometer was installed. These instruments were calibrated prior to the test by TECOM. A cussette voice recorder was used to record pilot qualitative comments.

Instrumentation Package

4. Parameters recorded were coordinated with TECOM to minimize instrumentation changes after the USAAEFA tests. The following parameters were required for the USAAEFA tests:

HOT BRICK III Device:

High-frequency modulation Low-frequency modulation Combustion indication Combustion temperature Run indication Fault indication Ignition indication

Aircraft Flutter Tests:

HOT BRICK store normal acceleration forward HOT BRICK store normal acceleration aft HOT BRICK store lateral acceleration forward Left wing tip normal acceleration forward Right wing tip normal acceleration forward Right wing tip normal acceleration aft Center-of-gravity normal acceleration Correlation counter

TESTING AT EDWARDS AIR FORCE BASE

5. During testing at Edwards Air Force Base, the following instrumentation was installed. A magnetic tape recorder was installed in the aircraft. A boom was mounted on the SLAR antenna extending approximately 5 feet forward from the nose of the SLAR (photo 1). Angle-of-sideslip and angle-of-attack vanes and a high-speed pitot-static tube were mounted on the boom. The parameters recorded and/or displayed together with the location are listed below.



Photo 1. SLAR Mounted Airspeed Boom.

2C

Pilot Panel

Airspeed (boom) Altitude (boom) Angle of sideslip Angle of attack Center-of-gravity normal acceleration Elevator trim position Aileron trim position Rudder trim position Left engine output shaft torque Right engine output shaft torque

Magnetic Tape

Airspeed (boom) Altitude (boom) Free air temperature Control positions: Longitudinal stick Lateral stick Pedal Control forces: Longitudinal stick Lateral stick Pedal Control surface positions: Elevator Left outboard aileron Center rudder Aircraft attitude: Pitch Roll Aircraft angular velocity: Pitch Roll Yaw Angle of attack Angle of sideslip Acceleration: Center-of-gravity normal Center-of-gravity lateral Engine gas producer speed (left and right) Engine power turbine speed (left and right) Engine exhaust gas temperature (left and right) Time Pilot event

6. Calibration of the boom-mounted pitot-static system was accomplished by use of the National Aeronautics and Space Administration's radar space positioning equipment. The airspeed system position error is presented in figures 1 and 2.



FIGURE NC E AIRSPEED CALIBRATION OV-10 USA \$/N 69-17000 STORE CONFIGURATION E WITH HOTBRICK III

SLAR MOUNTED BOON BYSTEM RADAR METHOD



APPENDIX D. TEST TECHNIQUES AND DATA ANALYSIS METHODS

TEST TECHNIQUES

Takeoff Performance

1. Takeoff performance tests were conducted from a concrete runway. Distances were estimated by aligning the airplane opposite a runway-remaining marker and observing the closest marker at liftoff or at 50 feet on the airplane radar altimeter. These markers were spaced at 1000-foot intervals along the runway and distances were estimated to the nearest 500 feet. During the takeoff roll, altitude and ambient temperature were recorded from the aircraft's standard service indicators. The pilot technique and procedure used for takeoff and climb-out were those presented in chapters 3 and 14 of the operator's manual.

Control Margins

2. Control margins were evaluated with asymmetric loads of full fuel in both drop tanks: the left drop tank half full, right drop tank full; left drop tank one-quarter full, right drop tank full; and left drop tank empty (except for trapped fuel), right drop tank full. In the CR configuration, airspeeds of approximately 115 to 185 KCAS were evaluated. In the PA configuration, airspeeds of approximately 95 to 150 KCAS were evaluated.

3. The aircraft was trimmed at the desired conditions in level unaccelerated flight or maximum-power descending flight, starting at the maximum airspeed for each test and decreasing in approximately 10-knot increments. The airspeed at which full aileron trim was required was noted.

Static Lateral-Directional Stability

4. Static lateral-directional stability tests were conducted by trimming the aircraft at the desired airspeed in zero sideslip. Power, airspeed, trim settings, and aircraft ground track were held fixed. Sideslips were increased incrementally, both left and right, up to the flight envelope limits.

Stalls

5. Stall characteristics tests were conducted by trimming the aircraft at approximately 1.2VS (determined from the operator's manual) in level flight for the desired condition. The stall was approached at an airspeed reduction of less than 1 knot per second. After the stall occurred, the back pressure on the stick was reduced and for dual engines the aircraft was allowed to fly out of the stall. For single-engine stalls, the power on the operating engine was also reduced, recovery made, and power on both engines increased.

Single-Engine Control Margins

6. The single-engine control margin tests were conducted with either engine at idle and the propeller feathered. The aircraft was stabilized at incremental airspeeds between approximately 150 and 120 KCAS. At each stabilized airsperd, all control

forces were trimmed to zero, or maximum trim used, while maintaining steady-heading flight. The airspeed at which full trim was required was noted. These tests were accomplished for wings-level and for 5 degrees of bank toward the operating engine.

Single-Engine Minimum Control Airspeed

7. The single-engine minimum control airspeed tests were conducted by stabilizing the airplane at the desired conditions using military power and then reducing power on the desired engine to idle and feathering the propeller. The airspeed was decreased at a maximum rate of 1 knot per second while maintaining constant heading and wings-level until a single-engine stall occurred. The critical engine was determined by conducting tests with either the left or right propeller feathered.

Flight Flutter

8. Flight flutter tests were conducted by stabilizing the airplane at the desired conditions and attempting to excite the flutter mode, using a lateral stick pulse. Data were recorded for several seconds to enable an analysis to be made.

DATA ANALYSIS METHODS

Takeoff Performance

9. The estimated takeoff performance was compared with data obtained from tigure 14-11 of the operator's manual at the altitude, ambient temperature, gross weight, and height above the runway encountered during each test. The power available was assumed to be equal to or in excess of the minimum power available as contained in the engine model specification. This assumption was substantiated by the method explained in the Power Available section.

Power Available

10. Power available from the engines installed in the test aircraft was evaluated to determine if the aircraft was a suitable sample for this test. Shaft horsepower was obtained from the aircraft torquemeters at a variety of test conditions using the torquemeter calibration from the engine test run after overhaul.

11. The gas producer speed and the shp were referred to sea-level, standard-day static conditions using the following expressions:

$$\frac{N_1}{\sqrt{\theta_t}} \text{ and } \frac{SHP}{\delta_t \sqrt{\theta_t}} = \frac{SHP_t - \Delta SHP}{\delta_t \sqrt{\theta_t}}$$
(1)

Where:

 $N_1 = Gas$ producer speed

- SHP = SHP corrected for ram
- Δ SHP = Ram correction
 - = SHP available at test true airspeed
 - SHP available at zero airspeed (based on power available versus true airspeed obtained from the OV-1D APE II report (USAASTA Project No. 70-03, April 1972)
- δ_t = Pressure at test altitude/sea-level pressure
- θ_t = Absolute temperature at test altitude/absolute sea-level, standard-day temperature

The referred values for each engine were plotted and a curve faired through the respective data. These curves were compared with curves obtained from the engine test stand run after overhaul for the respective engine. This comparison for the No. 2 engine is presented in figure 1.



12. This figure shows that the engine was apparently developing 300 to 400 shp less than during the test stand run. To verify this, a lift-drag polar was calculated from the data obtained during the airspeed position error calibration in the cruise configuration, using the following equations:

$$C_{L} = \frac{L}{1/2 \ \rho \ V_{T}^{2} \ S}$$
(2)

and

1

$$C_{\rm D} = \frac{\rm D}{1/2 \ \rho \ V_{\rm T}^2 \ \rm s}$$
(3)

Where:

 C_L = Lift coefficient

 $C_D = Drag$ coefficient

- L = Lift (assumed equal to gross weight (lb))
- D = Drag (1b)

 ρ = Air density (lb-sec²/ft⁴)

 V_T = 1 rue airspeed (ft/sec)

S = Wing area (ft²)

$$D = i' = \frac{THP \ 550}{V_T}$$
 (4)

(5)

Where:

$$T = Thrust (lb)$$

THP = Thrust horsepower

THP =
$$\eta$$
 SHP_t

Where:

 $\eta =$ **Propeller efficiency**

The propeller efficiency was obtained from the propeller efficiency chart for the 53C51/7125-6 propeller including the blocking effect of a T-53 engine but not including compressibility corrections for high tip speed conditions.
13. A comparison of the calculated lift-drag polar based on engine torquemeter readings was made with a lift-drag polar contained in the APE II performance report for the same conditions, except without the HOT BRICK III device. This comparison is presented in figure 2.



FIGURE NO. 2

14. Figure 2 shows that a considerable increase in performance (*ie*, less power required for a given gross weight and airspeed) is indicated when basing power on the engine torquemeter. Also shown on figure 2 is a lift-drag polar calculated from the data obtained during the airspeed position error calibration in the cruise configuration, using power based on the engine test stand run after overhaul and gas producer speed. This power was obtained in the following manner. The gas producer speed recorded in flight was referred to sea-level, standard-day conditions. This referred gas producer speed was used to enter a plot of referred gas producer speed versus referred shp derived from the engine test stand run after overhaul to obtain referred shp. Shaft horsepower at the test conditions was determined from referred shp using the following equation:

$$SHP_{t} = \left(\frac{SHP}{\delta\sqrt{\epsilon}}\right) \left(\delta_{t} \sqrt{\theta_{t}}\right) + \Delta SHP$$
(6)

1

This shp was then used to calculate the drag coefficient using equations 3 through 5 $_{40}$ before.

15. The comparison of the calculated lift-drag polar based on gas producer speed and the engine test stand run with the APE II performance data showed a slight increase in power required for the test aircraft. When considering the increased drag of the HOT BRICK III device and the decrease in power available with the engines installed in the aircraft, the comparison seemed reasonable. It was therefore assumed that the engines in the test aircraft were developing the appropriate power and should be representative.

Flight Flutter

16. The oscillations at each flutter instrument location, resulting from the lateral stick pulse, were reduced to damping ratio using the ratio-of-maximums method. The first 0.4 second following the stick pulse apparently contained effects of aileron movement and was not used in determining damping ratio.

APPENDIX E. TEST DATA

1

INDEX

Figure

Figure Number

Minimum Trim Airspeed	I
Control Margins	2 through 5
Static Lateral-Directional Stability	6 through 12
Dual-Engine Stalls	13 through 16
Single-Engine Control Margins	17 through 22
Single-Engine Minimum Control Airspeed	23 through 25
Single-Engine Stalls	26 through 32
Flight Flutter	33 through 40





- ----

	· · · · · · · · · · · · · · · · · · ·		مار میں میں اور		 		
a company and a sub-second second	1-1-1-1-1-1		PF NO. 1				
	1	CONTRO	L HARGINS	ing and the second s			
			eren ander eren er eren ander	•• •••••••••••••••••••••••••••••••••••			مريد مريد شخص مريد
		. 0Y-10 USA	8/3 59-1700			1 I	
- Andreas and an	ETPH	E CONFIGURE	INN E WITH H	IT BRICK III		i arren	مسيدة برسرس
	LEFT OF	OP THE ENPT	Y - RIGHT DR	P TOWN FILL			
CRU	RE CONFIGURAT	ION.					
E tank i EKON	AR MELGAL: 1730 19.0 PERCENT M	9138 (m	PALOD	381: HL11 (1832. 78 110 (7940 17.8 5	WE 21 PG (*		د د به به د د
and a second sec		سيدود و ال			1	••• ·••• ••••	یستر≏د دینهاند. دمارید: م
مستجمع مساجعهم	بالاستجابة ليست	i i i	an a			ul ula.	a para para para para para para para pa
				and the states of			i se di se i
n tanàna amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'ny fisiana amin'n	· · · · · · · · Ø · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	دلانستان ست استند ا	an shaan in an ar	hand - p		مى بۇرىمۇ ب ر
n an an an an an ann an an an an an an a	a a c an anna a chuir anna a	a shi ta sh ara i				و در به د د درست و د	
	· · ·	85	÷ -		r La state de la		,
and the second		- 88 - 88 -	····· • • •		•	and a state	الحالية بنط
and the second sec		82	4 · .	· · · · · · · · · · · · · · · · · · ·			•
and a product mean work		ă III		· · · ·			· • •
and a second	· · · · · · · · · · · · · · · · · · ·	-E	ع میصد بر ایو رام ارکانداند.			-	,
and a second			· · · · · · · · · · · · · · · · · · ·	1 · ·	· • • • • •		s 1
	· · · · · · · · · · · · · · · · · · ·	E	· · · · · · · · · · · · · · · · · · ·		,		
an a sa s	 	ua -20			 	- 	· · ·
		žë 👘	· • 1	· •			1
د و و اد در مرزمهاند. د	all a service service services of		يو مندين در ويو و. ا	دىمىيە مەلمەرمە مەلمەرد. ب	· · · · ·		• • • • • • •
	արտաստեր՝ ում ՅՈւսա ր		e ne daare en		NEL	ي ۲۰۰۰. محمد در د	
5	5		·	ELEVATOR	a +7, ⇒5	· ·	
	2 20-	··· 2··· 20-	يتمر المانية بسر	AILEBON	*. ±15	· · ·	
			ين ع رستين جي سيريني	RUCUL A			
	1	101					
							· · ·
	8		r i r F Fright State	•		•	ала Саларана Саларана
HILE VALL		Runor	μ τ τ μ μ μ μ μ μ μ μ μ μ μ μ μ			•	• • • • • •
		-10-	• • • • •				
		-10 -10	· · · · · · · · · · · · · · · · · · ·	D		••	
	-10- 	-10 -10 -19	· · · · · · · · · · · · · · · · · · ·			••• •••	
		0 10 10 10 10 10 10 10 10 10 10 10 10 10				••• ••	
		-10 -10 -10 -10 -10 -10 -10 -10 -10 -10					
		10 10 10 10 10 10 10 10 10 10 10 10 10 1					· · · · · · · · · · · · · · · · · · ·
	10- 11- 10- 11- 10- 10- 10- 10- 10- 10-	10 10 10 10 10 10 10 10 10 10 10 10 10 1					
	10- 11- 10- 11- 10- 10- 10- 10-						
Process Proces	10 11 11 10 10 10 10 10 10 10						
Contraction of the second seco							· · · · · · · · · · · · · · · · · · ·
HITROL FORCE FOLLING F	10 11 11 10 10 10 10 10 10 10						
Contract Fronce Contract Fronce FFILE FRIN FDB FFILE FRIN FDB FFIL	-10 -10 -10 -10 -10 -10 -10 -10 -10 -10						
Control Fronce Control Fronce Control Fronce France 61 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10- 10- 10- 10- 10- 10- 10- 10-						
Control Fonce Control Fonce Filther Fi							
Control Fonce Control Fonce Finance 61 61 61 61 61 61 61 61 61 61 61 61 61	-10 -11 -10 -10 -10 -10 -10 -10 -10 -10						
Control Force Control Force Firsh Force Fi							
11 - Control Fonce Control Fonce 11 - Founds 11 - Founds 11 - Lundither 11 - Lundither 1	-10 -10 -10 -10 -10 -10 -10 -10 -10 -10			Full CONTROL T LONGITUDIN	BÁVLL AL + 12.7 IN		
11 - 1 11 - 1				Full CONTROL T LONGITUDIN LATER PED	BÁVLL AL - 12.7 IN AL - 7.7 IN		
ION - CONTINCT FOR - UNIT STREPT - PUNCE - PUN	10 11 10 10 10 10 10 10 10 10			Full CONTROL T LONGITUDIN LATER PED	RAVEL AI = 12.7 IN AI = 12.7 IN AI = 7.7 IN		
a Extreme to the second to the	10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 12 13 14 15 16 17 18 18 11 11 12 13 14 <th></th> <th></th> <th></th> <th>BAVEL AI - 12.7 IN AL - 13.4 IN AL - 7.7 IN</th> <th></th> <th></th>				BAVEL AI - 12.7 IN AL - 13.4 IN AL - 7.7 IN		
POBITION - CONTROL FORTE POBITION - CONTROL FORTE POBITION - CONTROL FORTE POBITION - CONTROL FORTE POBITION	10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 11 11 11 11 11 11 11 11 11 11 11 11 11 11 12 13 14 15 15 16 17 18 19 11 11 12 13 14 14 15 16 17 18 18 19 11 10 11 11 12 13 14 14 15 <th></th> <th></th> <th>FULL CONTROL T LONGITUDIN LATER PLD</th> <th>RAVIL AI - 12.7 IN AI - 7.7 IN</th> <th></th> <th></th>			FULL CONTROL T LONGITUDIN LATER PLD	RAVIL AI - 12.7 IN AI - 7.7 IN		
A FIGH EXTREME TO THE FULL A	10 11 10 10 10 10 10 10 10 10				RAVIL AI - 12.7 IN AI - 7.7 IN		
ACT FIOR CONTROL FOR TON					RAVIL AI - 12.7 IN AI - 7.7 IN		
CONTROL POBLITION - CONTROL FORT - UNIT INCIPAL FLOW - CONTROL FLOW - UNIT INCIPAL FLOW - UNIT INCIPA	10 10 10 10 10 10 10 10 10 10				RAVIL AI - 12.7 IN AI - 7.7 IN		
CONTROL POBLITION - CONTROL TORIC FIRTH FDBJ INCRAL FION EXTRONE - CONTROL TORIC FIRTH FDBJ INCRAL FION EXTRONE - CONTROL TORIC - UNIT 10.000 - 00 - 00 - 00 - 00 - 00 - 00 - 0	10 0 11 10 12 10 13 0 14 10 15 0 10 10 11 10 10 10 11 10 10 10 11 10 10 10 11 10 10 10 11 10 10 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 12 10 13 10 14 10 15 10 16 10 17 10 18 10 19 10 10 <				BAVIL AI - 12.7 IN AI - 7.7 IN		
CONTROL POBITION - CONTROL TORICE FIRTH FDBJ ANCHES, FTON EXTRONE - CONTROL FIRTH FIRTH FDBJ ANCHES, FTON EXTRONE - CONTROL FIRTH FIRTH FIRTH FDBJ ANCHES, FTON EXTRONE - CONTROL FIRTH	10 10 10 10 10 10 10 10 10 10				EAVIL AI - 12.7 IN AI - 12.7 IN AI - 7.7 IN C 140 140		
10 CONTROL POBLITION CONTROL POBLIC UNIT POBLIC	10 10 10 10 10 10 10 10 10 10 11 10 11 10 11 12 13 14 13 14 15 15 16 17 18 19 11 11 11 12 13 14 15 16 17 18 19 10 11 11 12 14 15 16 17 <th></th> <th></th> <th></th> <th>EAVIL AL - 12.7 IN AL - 12.7 IN AL - 7.7 IN C 140 140</th> <th></th> <th></th>				EAVIL AL - 12.7 IN AL - 12.7 IN AL - 7.7 IN C 140 140		

	ILI:	LT	ITTT.	TT	1 -1-1		· · · · ·	T : '	TT	T - -	1		1	1	r ;	.			भाषाः	•
	┥╴┝╼╋╺╋					Īū	aune		4			<u>i †</u>	1	ļ.,		€	1 .	4 4	r =	
	 + -		↓		1	<u>iant</u>	OL.	MAR	Ái ns	L	I	<u> </u>					•••••••• {			
	+++	-+	<u> </u> <u>+</u> <u>+</u> -		1	- <u>+</u> -+	<u></u>		•		ļ	<u>∔</u> -i -	1.÷	ļ		≀. ┝┈┷┷┙		; ;		
-	111	1 · ·	1 1 4 ! }	. et o		10 10			H170	00			1:	1			÷ .		• · • ·	
	• • • • • •			- 4- 4 94 - 1 9				1. 6.		рыц ;		# #1	.	•••••••••			(-	•	:	
· · · · · · ·	++	444				Mar I	RI COL	1	i io	80	 	• :	1	† • •	-	⊧	<u> </u>	+ : · ·	4 7	
; • •	4 - 1.1.	4		i.		1 2.	1	1.2	4			7 +						1.		
• · · •	الم الم الحمد الج		R. MPPR.M	NCH. C	DINF 1 DUR	a ţ10	4	İ	.	• ••	ļ., .	L.	↓ . +							
1 17 2		P.0. 0		1:174 Maint		1 -	+	1 -	PRES	aure		I TUO	Ľ 72	þa. E	Ľ	·		· <u>-</u> ·		
•	7 · · · · ·						1.		THE	-418	. ITA	P -14	- 5 . X	CI C			ŕ	÷	فبالأخع	L.
	•	1		1. : •••		1	1:	T _		·• - 1	•		4 4	-		-	i -		·	
	• •	1		ļ. I.			TT	1.	1 .	:			•• •			,	4	• • ··	دیملا ما ده. ا	
an in an an an an	÷				i−i−i →	┝╇┷	┿┿		+	i		**************************************	•				:	; • •		
	1 1 1	+	i .	i		1	- 1	··· •	1							4		1		
~ 4		÷	•	1			† ·	.			TVIC		HE S	IAL				.	!	
	•	1					1	1	• • •	• •	• •		1		- ;		÷		2	
	: 1 •	1.			38		N.					∲ 2	• • • •		1	• • •	- <u>-</u> -			: - -
	• • • • •	• - •	··· · • · ··· ·			+0-		>									• 	. .		
	1	: •	• •	;	2		1 ·	į . `	-		:		į .							. 1
••••••••••••••••••••••••••••••••••••••	• • • • •		· •··		- -	- + - D -	1		∔ -• -1 1	L						- •	• •	• • • • •		·
 	• • • • •			1	, 1 50 − 1	1	1	1 .	• • • •	• • •						•	r		•	· -
· · · ·	. i	1	- T-+		.	*18	T	1.1	ţ ;				·	ь й ! й	· ;				ئ	
• ['] -•-	• • • •	•		• • •	<u> </u>		ļ .	• •				۱ 	• i		•••	• •				•••
• •	•	÷.	ł		. <u>2</u>														·	
		+		• • •		-30-	J	kum a	, † •			· ;	·				~			
					• • •	1.	1 :	• •	•				•		÷					
	<u>.</u>	1.1	Ę	; ≫ 1	=		1	4	<u></u>	•••• ••••• •	- 14	C) #4						••••	في سر ا	
				+ 90-			1	 	• • • • • • •			All	ERONE	• • • •	. 72	· .	•		. •	
	: .		· · · · · ·].					Ri	ODER	11	L	• • •••••				• • • •
ᆕᆕᆕᆑᇕ	i de inc	3 ₩4		- 10 -	• • • • •	+10-	∳	:	+ •	•								_	· · · · · ·	
i ji	2	-	一方	: .	- ·		1		1					1					- 1	- I
				-	5	•	1								-				•••	
E E E	5 ° E ° °	•	Ţ, Ē.	9 -		. 0-		i			-								· · ·	-
		• • • •			KUDDE	-10-		• 					-				,		·	-
		· •		-10-	VIDDE N	-10-		• 								• · · · ·	, , .	•	· • •	-
		• • • • • • • • • • • • • • • • • • •		-10- -10-		-10- -10-	••••••••••••••••••••••••••••••••••••••	• •							۔ ، ،		· · ·		· • •	
		• • • • • • • • • • • • • • • • • • •	Ert BILER	-10-		-10-	• • • •	• •									· - ·	•	· • •	
				-10-	Let't KUDDER	-10-		•									· - ·	•	·	
		6 10 10 		-10-		+10- +20- +30-	· · · · · ·	• • • • • • • • • •									, , . , . , .	•	·	
			MILER .	-10- -20- -20- -30-	Mutopera	-10- -10- -20- -50-		δ								- , , , , , , , , , , , , , , , , , , ,	, , .	· · · ·	·	
		6 16 16 	alour LEPT	-10- -20- -20- -20-	Ri avr	-10- -29- -30- 160-		har ar 								· · · · · · · · · · · · · · · · · · ·	· · · ·		· · ·	
		6 10 16 	Di alour	-10- -20- -20- -20- -20-	Richard Ruchard	-19- -19- -29- -50- 160-		· · · · · ·									· · · · ·	· · · ·	· · · ·	
		6 10 15 	ULIX ALONT LEFT ALLEN	-10- -20- -20- -20- -20- 20-		-10- -20- -30- 160- 100-		beer en e </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>· · · · · · · · · · · · · · · · · · ·</td> <td>· · · · · · · · · · · · · · · · · · ·</td> <td></td> <td>· · · ·</td> <td></td>								· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · ·	
		6 - -10 - -18 - - 	arith Alent (Err	-10- -20- -20- -20- -20- -20- -20- -20-		-10- -20- -20- 160- 160- 100-												· · · · · · · · · · · · · · · · · · ·	· · · ·	
		6- 18- 		-10- -20- -20- -20- -20- -20- -20- -20-		-19- -19- -29- -50- 160- 50- 50-														
		6- 18- 18- 	I Tame at 12	-10- -20- -20- -30- - 20- - 10- -		-10 -10 -29 - 50 - 160 - 160 - 160 - 160 - 160 -												· · · · · · · · · · · · · · · · · · ·		
			Lurtae artick alout	-10- -20- -20- -20- -20- -10-		-10 -29 -50 -50 - 160- 50 - 66 - 9 -												· · · · · · · · · · · · · · · · · · ·		
			Transa artick alone	-10- -20- -20- -20- -20- -10- -10- -29-	rr Refer	-19- -19- -50- 50- 50- -50- -50-											· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		
			LETTER STER	-10- 20- 20- 20- 20- 20- 20- 20- 20- 20- 2		-19- -19- -50- -50- -50- -50- -50-												· · · · · · · · · · · · · · · · · · ·		
			LET'T LETTER STICK	-10- 20- 20- 10- 10- 10- 29- 29-	Left Rear	-19- -19- -50- 50- 50- -50- 100-												· · · · · · · · · · · · · · · · · · ·		
			ar strick atom	-10- 20- 20- 10- 10- -10- -10- -10- -10-	LEFT - LE	-10- -29- -50- 560- 560- -50- 100- 100-														
			and the strict at the strict a	-10- -10- -10- -20- -10- -10- -10- -10-	Left f													· · · · · · · · · · · · · · · · · · ·		
			Larran arciv	-10- -10- -10- -20- -10- -10- -10- -10-	Radia Contraction of the second	0- -10- -20- -50- -50- -50- -50- -50- -50- -5												· · · · · · · · · · · · · · · · · · ·		
			La niger Larran arciv alont	-10- 10- 20- 20- 10- 10- 10- 10- 10- 10- 10- 10- 10- 1												· · · · · · · · · · · · · · · · · · ·				
			stick allower Larran stick alower	-10- 10- 20- 20- 10- 10- 10- 10- 10- 10- 10- 10- 10- 1																
			a stick at our light at our lig	-10- -10- -20- -20- -10- -10- -10- -10-																
			The strict allowed at the strict allowed at the strict at	-10- -10- -0- -0- -1																
Rou. Poeritier - Frankright - Poeritier - Frankright - Poeritier - Frankright - Poeritier - Frankright - Fran			ATTER STLES ALON ALON ALON ALON ALON ALON ALON ALON	-10- -10- -0- -10- -10- -10- -10- -10-																
Service Position - Contract - Con			LATERS STICE ALONG	-10- -10- -10- -10- -10- -10- -10- -10-																
Control. PostTable -			LAT LATER. STLER. STLER. STLER. STLER. STLER. STLER.	-10- -10- -10- -10- -10- -10- -10- -10-																
Control Position - Control - Contro			LET LATER. STICE STORE STICK ALOUT	-10- -10- -10- -10- -10- -10- -10- -10-																
			LATTER STICE STICE AS A STICK AS	-10- -10- -10- -10- -10- -10- -10- -10-																
			Larten artistication artistication artistication artistication artistication artistication artistication artist	-10- -10- -10- -10- -10- -10- -10- -10-																

	rigne m. S	
	CONTROL MARGINS	
b ++++++++++++++++++++++++++++++++++++	BY-11 1100 8/16 08-17000	
	STORE CONFIGNATION & METH HOT MICK III	
- faith of it for a start where a		
		a national and the second s
POW	I APPROACH CONFIGURATION	and a second as
	IN WEIGHT 17100 LA E Fry I - PREASURE ALFITUDE 7860 FT.	
	BAZ FERLERI ING	and an
	A i la companya ang ang ang ang ang ang ang ang ang an	
		استاد به دارید در در ایند این معموم د در از این
	a manage a set and the set of the	الآن (
har far grand and a second		استندار الماري الماري الماري الماري الماري الم
		م السريان المادي معاملين الدي
and a second		
	ter - Landa per a statistica de la construcción de la construcción de la construcción de la construcción de la	an a
		1
- Ariana ang sa		
		اليون و ياد و مانيون اليون و ياد و مانيون
	SO FULL IKIN IKAVEL	ogi anom on torrorana St
	AILERON = +15	×
8	RUDDER # 115	
Es s		a ana ana ana ana ana ana ana ana ana a
and an annual state of the second state of the	I million and the second se	يستعمد الأرابية الجام أجادته
		anana (° an an ar an an an an a
	10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 11 10 10 12 10 10 13 11 11 14 11 11 15 11 11 11 11 11	
	10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 11 10 10 12 10 10 13 10 10 14 10 10 15 10 10 10 10 10 11 10 10 12 11 11 13 11 11 14 11 11	
	10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 11 10 10 12 10 10 13 10 10 14 10 10 15 10 10 10 10 10 11 10 10 12 11 11 13 11 11 14 11 11	
	10 10 11 10 12 10 13 11 14 11 15 11 16 11 11 11 12 11 13 11 14 11 15 11 16 11 17	







.





Company of the second



بالمراجع والمراجع

5

~ **~****



43

.

1	1 1 1	د. استو با در مساله	i i i i i i i i i i i i i i i i i i i				
• • • • • • • • • • • •		· · ·	i i i i i i i i i i i i i i i i i i i	-			2 4 5 2 2 4 5 2 4 5 4 5 4 5 4 5 4 5 4 5
: ·							
1	··· · · · · · · · · · · · · · · · · ·	n ▶ kontratiĝis t				الله مع معدي من الأبير شامية والمراجع والمراجع الأبير الم	
	··· •	i ser e conservation de la conserva	•• • • • • • •				
· · · ·		• • • •		1979 - 1994 - 1995 - 19		tra cale a la construir de la c	
* • • • • • • • • •			· · · · · · · · · · · · · · · · · · ·		H		
، به ۲۰	. 1.						
 Experimental 			· · · · · · · · · · · · · · · · · · ·	ۇسى يىرىغۇ مەمۇرىيىسى ،	Å.		
	<u>Š</u>						
· · · ·		<u> </u>	it E				
	Ř	HOR H			5 1 1		
ୁ ସୁ କୁ	ē	5235		5 X			
X X	.	. 5785	F2	5/\1			
1 2 E	ģ			V			
200	V						
N N P I	Ă						
ad E	0						
3-10-1	Ľ		· · · · · · · · · · · · · · · · · · ·				
35 2 9	- u	tigge	ğž s ssa	· · · · · · · · · · · · · · · · · · ·			
e n e f		LEER	44				
L I I I				ء ۾ موجو ۽ مرجو ۽			
		•		a da di ara. Ang j			
W T F							= 3
130	. 				a de la compañía de l Esta de la compañía de		t a haard d
2 2	۹. ۱		20				
, D ğ							
sa 🦆	۲ ۵		• -				
	Ī	0040			· · · · · ·		
	5				and and a second se		
ter en							
							i la contra
					· · · ·		
		5 · •·• •					
; , 1							
	· ·	،				· · · · · · · · · · · · · · · · · · ·	1
	· · · ·	e e er e e e e e e e e e e e e e					
					(/ , 🌡 , jaj.		3-
	• • • • • • •						
Bar Bar Baran					A G TTA		

ş

PICHE NO. 14

DV-ID USA S/M 59-17000 STORE CONFIGURATION E MITH NOT BRICK 111



.

FIGURE NO. 15 OURL ENGINE STALL

DV-ID UBA S/N 89-17000 STORE CONFIGURATION E NITH HOT BRICK 111





\$

	14	1			an a that the	TT.		E		1.1	TT.		11.	1		1.1	1		1	· ••••••	ريون) ا شومي
		-		OTN		. fu						<u>.</u>	. <u>i</u>			-+- -	+-				,
a de la construcción de la const	,	ن الم المعد مدين					¥		SUL.		PTV 1					17		за .	•	1	-
			, ,		. IV-	10 U	A 8/		-170	00	4	÷ . ·	4	÷ .	•			1			
	•	4	•-•	SIGE		IGUR	LION	μ κ. Ι	ULTH.	HRT.	MI	X .11	بد	••• • •	nga Loopen I	i dan ke ilan. B	÷	• •	÷ č		
i hini ya sa	1		LER	T. PROPI	1178	FEATH	ERE C		E DEG	REEL	RIG	HT. I		+	. t 4	1 1		1. 			
	!) Tokati				+	1	i.	1	ŧ.	1		4	1	1.4.	+ 5	L	· •	ł		
		APRIL.		TI 18000		*			PEES			TE TE	2 71	10 P	aina far M∎ri i	+	7-	÷		ي. بر	-
ALC: L. A.		26.2	1.A. P7.2	cialit in	.			ļ.	-		TE	ę. 17		CG. C					· • •		
			• • • •			. .			<u>.</u>			4.4.		; .: 		* • • • • •			: '		· -
				-	· · · ·	[]	+	<u> </u>	1	1		<u></u>		1	<u>+</u>	1	17		• • •		
-					and i 🔺		i	<u> </u>	• •	۱ . جــــــــــــــــــــــــــــــــــــ	Ļ.,	<u> </u>	<u>+</u> -	i.	<u>.</u>				- 		
	- 1 -	1		-	ىلەر بىر. مەر		÷ -		1. 1.	<u>†</u> -	TAIL	i 5 86)	DTE	TÄLL	1.1		* 1	÷	11		
					.35		T				1	1 1))						5		
				-+++	- 훓낢.	- 29-	f	A	i	÷	ļ	<u> </u>	÷	<u>.</u>	÷	1. 	š., .	·· ·	• • •		-
1 4 1 2		· · ·		، او منابع	₩.	1.10.			ુષ્પ્ર	.4		\$	1	•		1					
	• •		r ·	1.1	ġ .		[]							`	- - -	¥					
	• • • • • • •	i i i i i i i i i i i i i i i i i i i			- E			f	<u> </u>		ـــر. مــر د يذ •				\$	+	i		۳- " ,	,	
i de la construcción de la constru La construcción de la construcción d	مسمنہ جار ہ	ا : محمد محمد		• • • • • •		1.0-		† •i			: ••	1 In	•••••• •••••	* . • .	• · · ·		:			ال ال محمد الحمارية	• • •
	1	, 	- 14 g		a MS	•••••	. .					1 ·	• •-	·		-		• .	ŧ	: •	
1 · · · · · · · · · · · · · · · · · · ·	• •			-j j	22	+20-	1		j		\$					9	2. man 1	\$.		- -	-
					. <u>20</u> .	-30-	L	-	ļ	1 4	• •	<u>.</u>	••••••••••••••••••••••••••••••••••••••				: 				
	•		i di kara							: .	FUL	FI FN	N TR	IVEL	 	2		•			
		157	. E					[<u> </u>			ALL	ERON	e el	L TA	1 1	1. 4 	5			
1		- 10-		20		- 20-				ļ	i i		DOCR	<u>- 1</u>	L		• • ~	ų			
	;	: . I	1					•		t '	1 · • 🌰		-			÷.,	•				
	ă i	1			. <u> </u>		1		- ·	1 1			4 - -		L						
1 ···· 23·	X -			- 0-	: 🗄	+ •-			-	.	-		110				• •			• ••	-1
	3				<u>.</u>											· ·	• •	÷.	· ·	•••	
j 📕		-	•		÷ .			.					L .					5			
ing an an an ar an ar an ar an ar an ar an	3	-10-	F	-20		+60-					, · ·	i Na ini Secola N				1		1 - F		• •	-
↓	8	-15-	5	-30 L	. <u>5</u>	-90-	L				 						یں۔ ایت سط	.į.,			
•					11						• •		į.,	4 - F		t ·	5	•			•
м. н. н.	1	ື້	, H	30]	Ē	100						• •••			• • •	1) ; .	**	• •		1
1.1.1.1.1.1	₩ ² -	20-		1 20-		100-			5.7							•	: .	4. •	,		-
	E.												4 1	,	5 - 5 7 - 5 - 5		:	÷ .		11	
28	1	•••	Ē		e 1		.			-		-			,		1	į.			1
		· -• +	· ·]	è⊷∎∳ -	• • • • • • • • • • • • • • • • • • •	÷-•		• • •	·		•				.) ;	* •				-
1. E 7.	2	-10-	- 2	-10-	E				د و در معمد اما		 	- ۱ ا				• • • • •					-
.8	9		5		ł	1	· · .		1		1		.								
	∃ <u>a</u> ∵	-29-	: E	+80-	· ' '	100			•		· ··· · ·					•	:	•			1
in min	2	-90-			- E .	150		• []					ا سفت م		, 	* • •		÷۰.	•		
			i I		1 5			ļ			ENT-	CONT	Dra 1							. •	ļ
	ΪĘ.	17	5	197	5	171					, 1996 (s. 1997) 1. (1997)	ONGI	TUDIN	AL. =	12.7	18.	ه. د	. •	÷.	- : *	-1
	5	: 10-		· •• •			• ;			ي. <	1		LATER	AL. * :	13,4	1#.			• •	أسر	-{
I E	Ë				1						-		. PLU	ni. ≜`	7.1	1977	•		•	¢	-
Ed			Ē				E.								•		7			* • •	1
		: .● {	- 1	- 7	1	}∙ •-		-								•	K	•	••	·	
			5			1			· • •	• •	Q		i da			· 		* * • •	: .		
	ŝ.		3				- 1												· .		
	32	· • •	E	┼╌┡╉	-	**		1		· • • • •			•			1 -		1	1.	3. *	4
	2	+ 0+	3		9	+ + +	_						_		, 		Pran y] 	4	4	
	1 ·	1 - 1	••	$\left \cdot \right $				0 1	0 10	0 11	0.11	11	0.14	0 11	0 : L	10 11		1	1 0	÷	~1
	• •	1.1			e netonien E d	1	ا جدید ا ا		C		ATE		hire			n	∳÷ i	÷ • •	?		* 1
أست المست		لم سع در	-	des in hud	kind maha		i.u.d					العدية. المريقة الم				hinken			e 1.	. S. Ja	: احب



. مر

48

. . . .

.

	Flant m. H
	I HOLE ENGINE CONTROL MERSING
	BH-13 LIAR 8/5 88-17000
	ATABE CONFIDURATION, E WETH HAT BELCK LIT
	LEFT PRODUCTS FRANKLER - S BECRETS SLOW AND I I I I I I I I
CRUI	BE CONFIGNERIA
	B.B PERCENT MAC PRET ALL TEMP 17 4 DEG C
	╵┉╷╶┟╶╧┉╉╌╗╶┨╍╢┊╊┚╝╷╞╴┽╌╊╍╲┉┠╵╪╍╏╍╬┽╡╶╴╋╴╏╍╋╍╧╫╋╍╈╍╋╵═╓┥╴┥╶┥╸┪╶┊╶╢╴╋┊┊╶┿╶╬╍╢┍
	╎ ┍╡╡╵┥╋╘┥╋╗┥╡┊ ╞┉┱╸ <u>╘</u> ╞╌╞╶╞╶╞╶╋╋┿╈╈╈╧╦╬╴╗╋╸╦╋╴╦╋╴╦╋╴╦╋╶╋╸╝╋
for a second second	
·	<u>╪┉┉╞┉┉┥┉╺</u> ╪┉ ┋ ┈╔╪╈ ╒╡ ╓╴╪┉┉╞┉╴┢┊┊╵┈╵╫╵╴┉┉┯╋┉┈╬┉╺╅┉╄┉╸┊╺╡╺┿╍╄┉╸╞╺
	La L
	<u>▋▁▋▁▋_₽▋Ţ</u>
	┪╺╴╫ <mark>╘╶┙╡╪╸╅╶╢</mark> ╞╴ ╞╪╕╅╶╌┽ ┙┥╋┯╬╼╋┯╬╴╋╍╬╌╋╼╋╓╖╔╌╸╋╶╔╴╣╺╸╞╌╌╗╶╴╝╴╶┙
2	
	a ser a s
8	
	a a the second
	The state of the second st
	na an brann a brain a mar a can an a
	a the fight the state of the first of the state of the st
· [4] · [2] · [4] · [4]	a se a companya da ana ana ana ana ana ana ana ana ana
() 154 월 () 1	
法管理部 遭上于时	
2	
	1 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
and a strange of the second second second	harren bei an
- 한테이 한 번 번 한 1 1 1 1 1	

1 1	1	T	-1-	TT	\mathbf{T}	1-1-1			r		•	+ -				····	***				.			
17	Ť	-		t L	1-1-	1 : F			1-	į :		ι.			+ +-	1	↓			L		÷	• •	
	T				tt.	+++		THE C		1.71.0			20		<u></u>	<u> </u>	┢╌┷╍			L., .	ś. ż.	• y	÷	4 4- 4
	1	11	•	ΤT		1 1	· 🕂 🕴		<u>کہ ۲</u>	144 L	<u>K.</u> (PH L	<u>ior</u>	100	(124)	1	÷			È	• • •		:	· -
E.,	1			T				- +	n na s	tina. N≊iuali	 1986 - 1986 - 1	and and	1 1. 		+	<u> </u>				÷	•	• • • •	· · ·	*
	_ <u>.</u>	÷ 1				1.1		-	1				17 A A 4 12 Th	MOT			181			1		÷ •	1	
L L	+	1.4		1	1 2	1.1										**	•	` · ·			•			•
-		·•		1 L	غ ـ ف		104 P	STR	0	TERI	HE DE	D	à Ìm	-	in in	71.8	-		-	• • •	1 •	•		• •
F	÷			1.1	1 -	1 + 1	1	i l			1	Į .	F _	1			[]]					•	~ •	† —
				4	CON	LAC. CO	ng ting			• •		÷			i	<u></u>) 			÷ .
1-1	· •	÷.,		ŧ		IN HEL	omi. 18	229. L				1	PREA		ALT.	110	E 18	ia. 21	L	- .				
1		h	÷	÷			CLOW				÷.	÷ -	PRC1	i, Ria	. 	P 13	.a. 2	C# C	i :	· .				
++	·~+	. [*	+	İ	+ + +	· + †		3		; • · ·	÷ •		4 + -	÷ 4									: -
		f		1		<u>+</u> +	·				* *	<u>ــــــــــــــــــــــــــــــــــــ</u>		+	<u>+</u> ∔					 .	•	-		
	Ţ		1		1 1	TTT.	<u> </u>				† 7	• -	ŧ. t	‡ ·+ ·	ŧ +	!- - 1	ŧ.	1						
E	7			IT	1	1		1 1	•	r - -		1	<u>†</u> -	1	÷	÷	•		- 14-14				-	<u>م</u> م
	1			Ι.,							1 *	1			TATE	-		1 7861			•	1		с. <u>с.</u> 4
	ł		· ·	• -	1 .	1			1	30		: · ·	1	t	1.000		1 1	-	لد ، م					••
	- -	- 4		.	÷	1 - 1						·	· ·	1							•			
÷.				1 -	:		!	1 5	8				1 .	7	i			•~ • • •						
		•		1	į	<u>با</u>		?	₩,	-+8-		į.		: A .	• • •								•	•
ł	÷	;		I L	1 .	• I	• •	1		••		;		;	1				• • •					
	•	- +		÷	÷	·		+				1 - 4	, ,./.	L	• •• • •••				• Č					
}		:	••	• •	ŧ۰	·	;	5	. i		1		• .÷	į .	1.	: ;			. 1					
	- 	• · •	→	+ -+	⊷ _⊷	÷	n di n	·+··· b		-18-		ł _	.	+	• - - • - *	، بعد ا					· .			. 1
1	٢	•	·	ŧ۰.	ŧ -	1	· · ·	1	ž,			í		ŧ		3			,					
1-		• 🔫	-• -	+	1	• - • - 4	• • • • •	- 2		-20-	• •	•	۰. ا	÷		•- • •	•		- <u>-</u>					
	' '	٠. ١	٠	:	+	1 ·	•	: a	8		•		• •	t ·	<u>،</u>		•							
1		1		*- • 1	* *		···· •· •·	4	₩ ;	-99-			••••	2 . 44 . 1	∔	·····	· · · · · · · · · · · ·		أمح					
<u> </u>	- i -	1		i.		•••••		1 1			•			1	1 	1. те:	Гас тай	aver t						. 1
1.	1	· ;	,		1.0	1 5		T	È			1	•	1	A B 300	SI FI	17.14 VATOR	ања. 1 - 1	_6					· · • • •
4-	÷					L 2			Ē.,	-						A	END	- 11	s -a.	. :				1
i i	- 2	E i		4			, ,		« :	•••		•		÷.,		R	DOCE	- 1	5		-	• • •		
	- 2			e	÷-#-	i	· - 10		- ,	10-					• •	.								
1	- 5	19				1	· ·		1							'			• •					
	- 2	: =			Ţ 🔮 .	1 4	···· • •	1 8	• •		• • •	•	• •• •	• •	🕈				•		***			·
		•	2			1 1	• •	1 3				•	•		- 3	•	• • •							1
1	Ē	Ĩ				Ι -	+10	1 –	•	-19-		• • •	• • -	• • •	•••;	ι.	• •	X						
		- •		•				1.1		-		•							2					,
				1		i 5				••]			,	· · · ·			• • • •				•••	•		4
	• •	٠		Æ .	+15-	1.3	l. . 30	1.2	3 :			•		احد د ا										:
+ -	•		•	i -	1	• • •	. •	. 🗬						i	;				•			, , ,	• •	
		+	.	-	+ 30-	1 . >	.* - : 36	1-	_ 1	50-					· • i	1 _1	-		•					
ł	• •	• •		; 5			i 1		5						1			1						- 1
j	+ •	; †	- ' 0	•	• 60 -	2	} - ; 80	4 4		99-		• •		÷ - •			• • •	له م	;	*				•
	2	ί.	j E		,			1 : :			·			:	. ,		. 1	5						
	12		2		; •• •	1 2	· · · • •	1 1	-	-	•				ه جه	¦ …†		• •		· ,	-	• • •	• •	
L	1.4	I.	1		1.		-	ند. 1									+	1		•		-		· i
1.	1	2			۱ . .								-			-	7		•	~ ;			-	4
	· 🖥		- 5		-10-		+19	1 2	•	-						-		. i		- 1				1
ł.	ុឝ		Ĩ		ł	3	• •	1 1			. :			Q										
1. •		- 4		x	-89 -		+20	4 • 4	1	-00	•			٠٩.,	. <u>.</u>	,		. .	i					
	• •	• •		3	•		1 · ·	1 1					•	· 1		• •	i	. *						ł
	:	•	•••		-88 -	الستانية الع ر	: +00	4 - 1	1	80 -	• • •		i		• • •	- : :	- 41-11	•	+	- 4		.		4
 		ł	<u>;</u> ;;	i			. !	1 - 1	• •	<u> </u>			-	. 1	: میں		<u> </u>	• •		:		· .		4
				î İ	• ₩ "	[]]	* ***	1 🗍 🛙	z 1	71	• • • • • •				r 184.		ињ. 14 тис	NEL.	i i i i i		• • •	• - •	•	- 1
1.	•	4				. 8											I WUJE		1Z.I	1			•	1
	• •				48-								• •						13 4	20				í.
	• • •				10-		- \$\$ -	1 2	•	. 1	. :		. :	. 1	• • •	•	7 00		13.4	ЦА ін	• •			
					10-	т. Д			- 1				• •			• • • • • •	.700	N. 4	13.4	18 18.	•			
					10				-	•			• •		-	• • • • • •			13.4	18 18	•••			
					10- 0-		 		-	•	· • •		• • • •	·		· • • • • •	.		13.4	In In. .				
					10- 0-					•	-	•	: . ! !	·			-1		13.4	18 18				- 4
		TA THE DODO		· · · · · · · · · · · · · · · · · · ·	10- 0-	ITTER RELEASE	· · · •			•		•	, , , , , , , ,				P []		13.4	in . .	-			
	International Activities	DEL THE DODE			10- 0- . 0-	LATTER STITE				•		•	• • •			-	P 0		13.4 7.7 0 •					
		POER THE DOUGH			•	A LATER BILL				•••		• •	•	2			P		13.4 7.7					
					•	IN LATER. SLIP.								4 4	- 8							· · · · ·		
		HOCK THE DODE			•				5					4									· · · · ·	
		HORN THE DOUDE			•									A A		1							· · · · · ·	
														4 4 1	0.11 0.11	0 12								

ĩ

.

١

F : I	****					····· •	1		1	1 7 1				· · · ·		1				4 1		4	- 1° 4
		ļ	L	ļ			++	44	1	1.1			+ -	┝╺╪╺╢	$\left - \right = \left - \right $	h 4	┟╺┿╼┤	h de d		ŧ	¥:		التنفر الم
			1.i-			1	+		110	ine.	10. I			£ == 1		L		م بند	h an ta an	÷	÷	£ nationa	-
	1 4 - 4 - 10		1	1 1 1		E	ING	ΕĒ	IGI	E C	DXI		1	<u></u>	L -]	·			÷ 4	I	1	ساب ا	<u>i</u>
· .	1. j	<u>i.</u>	1		·····		1		L		-						Ļ	hand a	f		÷.	k nike na	
	÷	1		1.1.1			in a	Mr-1	p. 136	a 1/	N 119	-170	DO	t al e			ł		1		£		
L		<u> </u>	4	114		. STI	ane. I	CONF.	CU10	TIM	. E. M	LTH I	HOT.		K.11	I	المشم ا				4		
		1 . 1	1	1!	1 	14.1		3 p.	į	i	ŧ			i + 1		L	i			i ng P	-	ł	
	1			1		TIPE	irei.	LER I	EAD	ER ZD	. z. 8	OCG	PEP 1	110	11. N	hiji	÷				¥?	k	
	<u>.</u>	1	1	1	. 1.1		1	i i A pri			1.1			1.3		\$ • • • •	ķ		: : • •		÷	1.1.1	
				POWER	L BEER	DACH	cine.	1 2012	TIM	È	ه . د منبع مدمد					 	ر : منهونهم	k . de . e		i		1	i dana
				CRORE	NP1G	HT 18	280:		1	1	t	PRES	BURE	ALT.	1 110	E 80	60 F	Ľ	<u>.</u>	1.	÷	ί	4. 40. ang ang
-		1	†	CG 21		RCFNT	inor	T	1 :			THE	ate	TZD	2.17	0.0	60. C	-	5	in mar	1 · · ·	for a disease	f
	÷	4	-						Ţ	T.										1.1.	1.5		
F : -	÷	f	1 * -	1771	1	t trin	1.	1 1	TT	1								1		1 1	• •	£	11
			÷	+	·		11			17-					1					T. T.	[
	1. 1. 1.	ŧ÷.		1-1-1	7 1	<u></u>	1		13	4		1	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	11					1		17		
<u>├</u>	÷			+	· -+		+	-+	+	1		n and new								1	1	1	
F	\$ i	t ita	+ * -	t	ing a start a start a start a start a start a start a start a start a start a start a start a start a start a s A start a start a start a start a start a start a start a start a start a start a start a start a start a start a		+ +		1	1	t		11. 1	TATI	NFM	TF S	TALL		1	1	1.19	** · ·	1
<u></u>		÷	+				-+		+88-	t		laan ahaa ahaa T	.			1. 1	1	++++ + +			i burundu nin E	r a s éan T	1.11
	1 -	÷ 4.	÷	: + i	;			gs	4			۹.	4 ·	4 · • - 4	• •		1	· · · ·	1	4 4	£1.1	1 1) (°)
F	.	÷	+	÷			· ÷}	8 <u>0</u>	- 80 -	t	· ^		ŧ	•				•		• -	÷	ب محمد ما الله م	متسيم م ا
· \$, . , .	; , ~		· • •		با به الم	4 -	gğ.	1	F	₽ ``	<	f 🕆 '	i • :	4 (, i .	1 1		ŗ.	;		•= :	a in
		÷	4	• ~ ~ ~				I	+10-	+	÷		t	ه - به - به				•	i ya		• • • • •	. .	y in
ţ	1 11	i in	1 -		<u>.</u>			g	4	ł	l		-	-			ų į	i -	÷ .	$e_{ij}(t)$	•		а. н. е.
	; 1								-0-	.		÷	` •						ب	j			4 m
ι.	1	, , , ,	į	1 : 1			4 1	E .	. .	i		į	ļ	1	i -	6. s - s	ŧ .	e	4 ¥	; ` .			÷ .
L		1	1	1	!		الجنب أيت		4.0.	.	<u>.</u>		4	استو جنو		÷	ļ		Ì		÷	, . .	÷
1	1	1		1.1			.: 'i	5 a -		t · .	4 4 4	1 .	ŧ	i		i i Friti		• • •		:	- 2		į : .
Ľ			1	(۱ الحديث ال	_		ye	Lea.	L		1 4	1		<u> </u>	.	į	1 Se 1 mer	+				
-				1		. !		문날		1.	1.1	(÷	۱ ,	• • •	L	4 - 44	÷		: .	e	. ·		
Ѓ (1.17	· *	1		1 1	- 2		L	سيريط			: 	1. Hani - 1.	ŧ.,) 	1	4		-		r karan
	i i ne i			1			1		-00	4 .	1		1	FUL	TRI	N TRA	WEL	1	; •				•
1	•	111	j				1	1		F			1		ELEY	ATOR	e +7,	-5	1 	1.			
+ ·	• • • • • • • • • • • • • • • • • • •	م مؤ ، سروه		* ** 1			17		00.	T					ALL	ÊRÛN	P 115	i	i i	1	1		i
ţ		1 .		1.1	ă			<u>.</u>	1	T ·			÷ .		84	DDER	i il	1		· 		•	; * = * -
			- \$	10-			1	- 	. D .							A	1	•	1.				
1	۰ 8 -		•						1.1			i	711	;					1			,	
- ~·	·2.	6 '' a	d	· •	• •		1	а Ант тас т 1 — 1 — 1	10	1 🖀	** ** **	**** * 	· · · ·			t in the second s	1	• • • •	• • • •				
•		: [8	5 - E	1	M .	<u>†</u>		2		•				• • •		÷ ۴				
f	23	5-5		- 9-	1	0	1	H ~~~~		†	ан на н С	;	• •	1			9 '	.	*				•
P •	1		4		=			5	4	h	• •		ι ι		4 · · ·	т. .		1 A A A		1	•		
***	· 2	5 J. E			🛋		.	M	- 18 -		المتعام م		- مە	ہ ہ ہو		÷	for ear		4 1. 1	÷			·
i						,						·		•			1						
		•			•		1.	4				, :			• •	•	i .						
34 -147 - 15				-10-	, 		, , , , , , , , , , , , , , , , , , ,		+20		• •	. : . . .	 	* * - #: * *	• 1: • • • • • •	ه مرجعه	¦. ∳	; • • • • •		:	£ .		•••
100000 - 13 1		• • •	1	-10-		 20	, - , - , - , - , - , - , - , - , - , -	ET.	-20					· · ·	• 1: • • • • • • • • • • •	ء جار ج	∔ . ♣ ∃ :	: 	+ !	: }	1 . 1		
1000 (S) 4 1 2 2 2 2 2		• • •	- 	-10-		-29		5	-20-		 			• • • • • • •	• • • • • • • • • • • • • • • • • • •	ء ماري م المحمد ا	1 . •			:	2 2 *		
Manue 15 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	• •	• • •	12-04	-18-	13	-29		5	+20-		1 1 1	; ; 		· · ·	• 1: •	± ★ ₹		-	• !	· • •	1		
λου 15 β 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	• •	• • • • •		-19- +18-		-29 -30			+80			, , , , , , , , , , , , , , , , , , ,			• 1. •	9 4 - 21 - 1 2 4 - 4 - 1 - 1 4 4 - 1 - 1 - 1 4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	1 . 1 . 1 . 1 . 1 . 1 . 1 . 1 .		- 	· · · · · · · · · · · · · · · · · · ·	2		· •
10000 15 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	• •	• •		-10- +15-	11 11 11	-29 -30		MT LEFT	+20-		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · ·			4 1: 4	* * * * * *				n an an an an an an an an an an an an an	1		
1000 15 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	• •		Land Thur	-19- -18- -18-		-29 -30		Ilont LEFT	-20		· • • • • • • • • • • • • • • •	,			• 1: • • • • • • • • • • • • • • • • • • •	9 4 - 21 - 1 5 - 4 4 - 21 - 21 4		5 	· · · · · · · · · · · · · · · · · · ·		±	•	· •
1				-19- -18- -18- - 90-	erent LET	-29 -59 -50 -29			-20 -80 160			· · · · · · · · · · · · · · · · · · ·				2 			· · · · · · · · · · · · · · · · · · ·		2 - 2 - 2 - 4 	•	
				+10- +15- - 30- + 20-		-29 -59 -50 -50 -50			+20 +80 160			· · · · · · · · · · · · · ·				* * * * * * * * * * * * * * * * * * *					2 - 2	· · ·	•
				-10- +15- - 20- - 10-	TICK BIOHT	-29 -30 -50 -20 -19		RIGHT LEFT	-20 -80 160 100												· · · · · · · · · · · · · · · · · · ·		•
				-10- +18- -10- -10- -19-	BTICK BIGHT	-29 -39 30 29		RIGHT LEFT	-20 -80 160 100												2		· · ·
				-10- +15- -20- -10- -10-	R STICK RIGHT	-29 -30 -30 -19			-20- 160- 100- 100-														· · · · · · · · · · · · · · · · · · ·
				-10- -18- -18- -18- -10- -10-	THE STICK STORY	-29 -50 -50 -19			-20- 80- 80- 80- 80-												ξ γ. φ φ φ φ φ φ φ φ φ φ φ φ φ φ φ φ φ φ φ	a de la companya de la compa	· · · · · · · · · · · · · · · · · · ·
	Contrag. Participation			-10- -10- -10- -10- -10-	NIZAM. STICK ALONI				-20- -80- 150- 100- 80- 80-														· · · · · · · · · · · · · · · · · · ·
	Contrad. Protoc			-19- -18- -29- -19- -19- -19-	LATZAM STICK SIGHT	10			-20- 150- 100- 60- 60-													a Barola Barola Barola	· · · · · · · · · · · · · · · · · · ·
				-19- -18- -18- -19- -19- -19- -19- -19-	TT LATER. STICK SIGNT	99- 96- 92 19 19 1- 1- 10 -			- 20 - 80 - 100 - 100														· · · · · · · · · · · · · · · · · · ·
				-10- -18- -90- -10- -10- -10- -10- -10- -10-	LATERN STICK RENT				-20 -80 100 80 -80 -100														· · · · · · · · · · · · · · · · · · ·
				-19- -18- -18- -18- -19- -19- -19- -19-	LEFT LATEM BUILD BUGHT				- 20 - 90 - 90 - 90 - 90 - 90 - 90 - 90 - 9														
				-19- +18- -19- -19- -19- -19- -19- -19- -19- -	LATEM STICK STORE				+60 150 150 100 160														
				-19- -19- -19- -19- -19- -19- -19- -19-	I LEFT LATERN BRICK BRANT	-29 -30 -30 -10 10 10 10 10 10 			+ 20 + 60 + 60 + 60 + 60 + 60 + 60 + 60 + 6														
				-10- +15- -10- -10- -10- +20- +20- +20- +10-	LATTAR STATE STATE	-10			+20 +60 +60 +60 +60 +60 +60 +60 +60 +60 +6							RoL							
				-19- -19- -19- -19- -19- -19- -19- -19-	alant Latton. Brits Alant				+00 100 100 100 100 100							ROL							
				-10- -10-	A DIMONT			RI ONT	+20 +60 +50 +60 +60 +60 +60 +60 +60 +60 +60 +60 +6							Rol							
				-10- -10- -10- -10- -10- -10- -10- -10-	LICE AND REAL PRODUCTION AND REAL PRODUCTION AND REAL PRODUCTION AND REAL PRODUCTION AND REAL PRODUCTION AND RE											ROLEITUSI	н н н н н н н н н н н н н н						
				-10- +18- -20- -10- -10- -20- -10- -20- -10- -20- -10- -20- -2	ATICA MANT ATTAM STICK STOCK				+20 +60 +60 +60 +60 +60 +60 +60 +6							ROL	на на на на на на на на на на на на на н						
				-10- +18- +18- +20- 10- +20- +20- +20- +20- +20- +20- +20- +2	L STICK STORE STICK STICK STORE				+ 60							ROL IVUDI LATE PE							
				-10- -10-	THE STICK STORE STICK STORE											RoL							
					STILL ST									ELAL		ROL	ана на						
				-10- -10-	LATTIME BYLICE AND A BYLICE BYLICE BYLICE			renar in loss								Rol ITUDI	на на на на на на на на на на на на на н						
					LATTON STATUS LATTON STATUS STATUS												ан на на на на на на на на на на на на н						
				-10- +16- 20- 10- +20- +20- +20- +20- +20- +20- +20- +2	LATCHE BILLE BILLE LATCHE BILLE BILLE											ROL	ана на						
					LATTOR STICK STATE STICK STICK STICK											ROL							
					LATTOR STICK MATTAL STICK STICK									EUL		RoL LATE PE							
					LATTON STATE AND STATE AND STATE S												ана на						
					LATTON BYICK BANK BYICK BYICK BYICK BYICK BYICK												Т						

				Π	T			++	TI	7	LŢ	T			1.:			11				T	Т		T	· • • •	··· }	
		T	1				•	·∳⊷∿		LANK	L.L	EN	F16 1918	ire E i	. 188. 2011	22. 201	-		TM		1-	-		-1	4 	∲ . ∳	. ند ب	
				-∔ -∔ 					-+-+	+			2 100	L L				,	TH	L	11		\$	- 	•		•	
	+	++						+	- 41	ORE.		11			/ E	8)-13 비해 134	noor: I Jurg	i i T.A	: tic	. 1			ŧ		•	ł	4	. ~
		1	1	44	ة		+	his		; 102)		29.2	YAT		. : m _								+	:	· ·		· • ·	
		د د نو جنب	-+	+				• •	i Nam	-					1	-	i		- 1. 1	- 1 -1	4 4	H .,		÷	• •	<u>*</u> ~		· .
		+ -	ł	1	-			1 04	1, 17	-	4	.	-	••••••••••••••••••••••••••••••••••••••		me		i . NZ (THE	1			1.	<u>-</u>	÷		
	F.	+ +		Ţ							∎ ∔ - }	-+	-4		+ -	PRO	E A	IA; 1	Ent	- 11	ţ.		¢.,	1	-,	۰ ۲		, ,
		÷	t-			+	-+	÷	÷	- 	-+-	-	-Ll	- .	÷	÷	· • •	· • •	4	··	<u>+</u> +		د. ب				*	
	<u> </u>				•-				+ -	1.	- 4 - 1	- 1 ▲	1	۲ ••		<u>†</u>	+ :	_	; 1	••			ŧ	• :	·•		•	
		• : • -		 .	ار ا				t.:	ţ.	,	i.			•	; -	· .	÷		••••			-		••	• - •	• •	• ··
	· ·		; .	•	: !	ſ	•	1	T		35	+1 -	• 1	••••) :	1	• • ⊀	- 83 1		建 門	HE.	STALL				• •	• • • •	
		•	4.		Ī	•···••••••••••••••••••••••••••••••••••		• • • •	• •		88		10-	• ••••	ي. L	÷ • -	• -			- • -				••••	-	:		-
		•		+-					• •		7 2 2	- +1	10-					1	; 		f 		1	+	·			
			<u>.</u>	•••• • •	• -	•••	+ +		<u>.</u>			•	1			•	2	-	: مربعہ							•	•	'n
	• • •	-	: • • •	• 	· ·	: - :-			i .							l	Ī	1	-					1			·· ·	
			ţ.,	÷	•	•				1	5 		•1			ŧ -		·•• ·	•	••• •	- • -	1	- -	• ••				
							i e e la La La	• • • •	∲⊷ ~~s		l.	÷	•	•	· · ·	;			-1	- 4	-+-	.	÷	~		- •	<u>.</u>	
ł	 	•••	4 	+	•	‡	4 -1	~			-9 .	-+0	-		· • •	↓ · ► ·	ł÷	.		<u> </u>	•••• •	! ·	۔ او ست ک	:			,	
	• • ••	·· .	;		1	6-T		 ⊨ 4	- 88 -	· · ·			●-+				4	FI	u'ı	RIN	TRA	WEE	•		•			,
	· · ·		_								He l						1		. 1	111	TOR	• • 1	ļ	5	••		•	•
1		ž		4				K ;			, K		1	-	• •			•	•	Riji	. KOM XÆx	- 71 1	5. 5					
	,			ž		•1		•,	19-		1 -	1	•			•			•	··· ·		~			н .			
ĺ	-	23			- 1 -	•	Ē	•	•		ł	- (•		,			•						•	•			
,		È.		d	- ÷-	•+		· · · •	-10-							. 1	l :	1	·***	i			1	•				
	· · ·		i		-			3							,			•	•-		4	F	•	t.	•••		-	•
		1	• •	į			Ē				1		1	•••	•		-+		• •	- •	• • •	• • •		. •	• ,			
					+1	• • •	·	•	- 66 ;	-	.	+81	. .	4		·		-	ъ. т.	· ;	••	• • •		•	-			
	• •		• • •	E	· + 🎗	7		Ē,	•1	٠	Ĕ.	+56	7	٠		· +		ŧ.	1.		•			:				
	· · · · ·		ž	F.		+			80-	•	8 2	-	4			•		1.						i				
-			_ . E		-++	4	<u>d</u>		••+			- 						1	4	i	. +			ł		,		
	- 1 1]]	1	t.:	1.			•				1		;	· į	1		1		Ť	~ I	••• •	•• -	1	• •	*	• •	
			ġ					-	T	-		11 (1	1	• •	. q ,	• • ••• •••			-	-	>	-					ţ	·- ·
		1	-		- 11	7.	Ę	- +4 	•	- K	•	-50	1	•		 i			یسیا. ۴	-	1			+ ;	-	•	•	
-	- 4 j		· • •	5	+86	4	-	+	⊳ †	\$	F	100	+-	• •			•••••	ba	i -	. † .	· • ~ •	_ t	•••		:	;	1	•
	•	۰.		2	+=	4	. 9	-	• 1		9	150	1	-		, 	• - •			;	. !	;		ţ		•		
	• •	• •	• •	• •	1.1			• •		1	•	↓ ″ • ■		*		ł	t		1.	t Takes	+			ب -	۱.,	•	•	•
	ا مىلە م	, <u>1</u>				Ŀ	1						Γ		•	-		1764	1 ON		. . 19: 1 0	UMEL. K. P	12.1	i ii		··· ·	1	
	i i					T	°₹ ∡	1	•1	- 1	2	•	† '	~r 1	1 1 •	- •	•		<u>ا</u>	T.A	17. M PE M		13 4	1 IN 1 74	•	٠	. ·	
		8	-	алы. 		1	9.	• :	•†	• •		- -	ŧ٠		•	•	۰.			1		•	• • •	ا ء ،	,	s.,		
	2	1	-	-	i e	4 -			•	z		•	↓.	1	•	: !	•			i	-	··•••		•		•	•	
			E	-	† - ●	4 1	Į,	، + -	•	<u>.</u>				, ,	<u>9</u> 4 -		- · ·	ار م 		+			,	•				,
			1	 	; ; +			1		•	•			1		- [+ + 		اب م ا	Ļ	-		•	ί	+	.4 4	:1	- 1
	18		; -	.			F	t		- 1 - 4			17	E		⊷ ∔	••••• + ;			i	1	+ L.		+ +-	+ .	•		• •
	 :	T.	T	- 1 -	17	11	T			:†	1 .			t	5		-			1		-			1	مۇرى	, 	•
•	+-+	Ť	Ħ		t +-	$\pm\pm$	++	-	+-	+- ∔-	-		++	Ŧ		FT.	• • • -		,₩. <u>4</u> 			ᆒ	1	.1	10	160	8.00	1
-		1	1.1	1	1 1	IT	r-†	- 1 · I	· • • · ·	t: †*	11	1 1 -	* ~+•	÷.,	. !					(Indi		ال أسر الأ		- C	1	Г ''		*

				Î		
	THERE			S NGH		
	TON IR GEA LER FEA					
in for a second se		n a na gulanna a ∰ada. An an		ng ng ng ng ng ng ng ng ng ng ng ng ng n	9	
		1000				
			an a s s a an an Alaiste an an an an an Alaiste an an an an an an			E
23 0NTR 7-170 TH NO 1ATIOI						
			1 00/00	· · · · · · · · · · · · · · · · · · ·		
A LINE						
F.G.		· · ·				
ENGI DV-11 CONF	tunnn					
3	£ 3 Q m 2 4		ر المراجع التي المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع br>محمول المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع ا			
					اند از میکند به مدرود از گههمهای مهارد ایند در از از از میکند به مدرود از میکند به مدرود از میکند و میکند و می	
		X	х т	· · · · · ·		
	• • • • • • • • • • • • • • • • • • •		р. 1.1			
	e e a a	- <u>-</u>				

.



......

		.	· · ·			 									
	ATHE REI	ATHERE		• • • • • • • • • • • • • • • • • • •	· · · · ·	- - - - -		• • • •	• • • • • • • • • •			· · · · · · · · · · · · · · · · · · ·			
• • • • • • • • • • • • • • • • • • •	NTION LLER PE		•							STALL -	5				
	NT COM	PROPE	•					· · · · · · · · · · · · · · · · · · ·	5 *					8	
ROLAIR 200 TERKKI 10 N	FLIG.	Left Rich				· · · · ·	in de la constante							£	
0 25 4Cont 469-170 4174 MO	n TUDE							• • •				· · ·	1		·· 9 × :
ALURE NO	SSURE AL	13500 1960 6860					•• • •	e.						5	# LHDI3
FIG CINE 7 CINE 7 CINE 7 CINE 10 CINE					• .		* * *			• • •					056 W
PILE EN	μų į		BTALL	•	•		а 191	:	• • •	y - 15	• • • • •	· · · · ·			U U
ON O	DEM D	0 0 0	INED BY	•				• • • •		« , , , , , , , , , , , , , , , , , , ,	••• • • •••			-	ар (с. 1916)
· · · · · ·	-		V _{MC} DES	ŗ	· ·	., .	, , , ,	. = '		ç .	5			2	
		•	NOTE:	×				. •				 		=	
			£							\$				2	
•						870	N7 - C	33 4	821V	da.	V) 1	1743	:	1 •	

•

•

FIGURE NO. 24

BY-ID UAN SAN BA-17000 STORE CONFIGURATION E MITH NOT DATOX III

51

Ĩ

-

THUCHEF CHAFTGUANTION BROND INCIDET 17900 LD CH 20.8 FENCENT NAC

TRIM ALREPTED TOR KENNE FREE AIR TENT 16-6 DEB C





FIGHT NO. 24 CONTINUES

FIGURE NO.27 BINGLE ENGINE BIRLL BY-10 UAN S/N 00-17000 STORE CUNFIQUENTION E NITH NOT BRICK [[]

RIGHT PROPERTY FEATHERED

!!

Ĩ

THEORY CONTRANTICE MARKS NETRICE 1790 LB Ch 89.8 PERCENT MIC

TRIM ALAPPED 146 NOM PACK ALA TOP 15-5 860 C





FIGURE NO. 27 CONTINUES

Ż

FIGURE NO. 20

•~

BV-ID USA S/N 69-17000 STORE CONFIGURATION E WITH HOT BAICK III

BOLID BYORT LONG LINE DAGN BASH LETT PROPELLER FEATWEARD

CRUISE CONFIGUENTION OROSS NEIGHT 10020 LB CG 29.1 PERCENT MAC

TRIM MIRBPEED 144 KCMB FREE MIR TEMP 16-0 DEG C



^ •

FIGURE NO.28 CONTINUED





FIGURE NO. 24 BINGLE ENGINE STALL

BY-ID USA S/M 69-17000 STORE COMPISURATION E MITH MOT BRICK 111

RIGHT PROFELLER PERTHERED

ij

2

1

51

CAULTER CONFIGURATION DOODS HELGHT 17400 "B CG 20-1 PERCENT ND.

TRIM AIRDFEED 144 KCAS PREE AIR TEMP 2-5 DEG C





FIGURE NO. 24 CONTINUED

.

٩X

in 🐁 🚓 I So Weath and


BY-10 UAN 8/N 66-17000 BYENE CONFIGURATION E MITH NOT BRICK 111

COLONIAL VOLLARY TAN

]]

ĪI

33

Paulto Approaction Configuration Brans Methyl 1790 (a Co 20.0 Percent Mec

TRIM ALMANZED 100 KCMB PNEC AIA TENY 17.6 DED C





FIGURE NO. SO CONTINUED

-8 3 -3 Ż 60 52 54 66 4 Ì -9 -9 3 7 4 Ę 40 42 Ť. Ì -8 1 TRIM RIMATED 125 KCMS FREE RIR TENP 3.6 DEG C -8 4 2 **BECONDS** BY-ID UNK K/M 69-17000 CONFIGUENTION E WITH NOT BRICK 111 9 -2 1 . LUT PRPELLER FERTICIED FIGHE NO. 31 æ 3 -3 CONTINUES CONTINUES ŧ 12 14 16 お見上 PARCE APPROACH CONTIGUES ONNEE HCLOHE 17000 LB CG 254.5 PCINCUE AND LULAGRUENDA MEYER Ŷ .9 8 ġ ò 97 2 83 8 ġ • 8 2 ė ÷ ş]] 14018 1421 11013 TTAL THEIR 1431 1034 THOIL . 22 Ŕ ģ ÷. 88 . Å ģ 10-7 ò ġ . . ĨI 11011 1137 LEFT AIGHT LEFT AIGHT RIGHT AIGHT ş 8 2 2 ģ ä R 8 ġ Ż . THU HOLE HOLE 中心見 T NI BTTCK HOLIA 014 197 - 020 / 020 9590559 5000 055506052 9590559 5000 055505155 THENER LING EXTREME 87





. . ..

.* .

- manufacte higher and a second of the second

الرارد تركيف وتقريه

20.00

ي جود



ý

Ě

FIGURE NO. BZ

and the second

See mi Server



FIGURE NO. 3.2 CONTINUES



54.4

¢1





•





			· ·		• • •		•			en en		£7.45	• •	nî îşira.	<u> .</u>	÷.	ŧ., 1	i	, <u>.</u>	• • • • • • • • •	464.57	
.' • ••			•	•				•						•••		1		••••			· *	•
: :									• ··	. .	• • •	••	** *	· · ·	- · · · i •		i	•	••	•	• • •	
									٠		•••		•		•		•			٨	•	
											7		•• •	-	• = _ : :					ſΪ	•	
										· •			\$		•		:					
		•,		•				:						÷	•• •••	•	:					
				•											,							
- ••				• ·			•		•		•						:	•.		12		
• •			L.														: •					
		•							•					•••	ί.	· • •	•			1		
;	1			<i>:</i> .										ł								
8 - 11 1	•	-	•	Ļ	- 1										. 4	.		٠		0		
		×.		5						T				,						H H		
		2 .															•					
		H															•					
		ξ.		5						1	•									0		
		HF I	5 1	6												•	•			3		•
		5-1								1											ħ	
4	2			•									•								ž	
Ē) 1	ž								a					Ļ	•				•		
K L	: 2	2	- 7	Ž						7					٦	6				3		
	5	-																		•	- 3	
															· ·						- ¥	
i i i	٢Ş.																			_		
	0	G																		¥.		
K H a		Š		•						1										Ń	ĩ	
	5	3	Ľ	2						ł												
223	Ŭ (5		2						1										<u>~</u>	Ģ	
مر	g	생경	1 3	ź						Þ)				2	5	
* 0	0	Ĭ								1					Ī					ił	ũ	
	F	Γ	2							1											õ	
2			0	7						ł											2	
Q	1	,		K.						1										8		
				Ł					o	6						•				2	3	
			2	ľ								•			- T	.					Ę	
		1		ç																	۲ ۲	
		₹	ŏ	S							•							•	1	9	5	i
			<u>ل</u> ه (1		۵.	•
		74 C		[•										Ĭ	
,			<u>i</u> j	5					0							0		4	÷ ľ	•	ž	4
		X T							l t	9	-	¢		<u>,</u>	1	9		•	Ľ	9		
		U	4	1															i ľ	2		
		-						•	÷.		_ 1										•	
		•																				
								•												•		- 1
								-	2	2	5	ō				 		~	<u>ل</u> ر	ž		•
	•						Ċ	Ď		ō		-			•	-		*4	U			1
	,					,	(Dum	911	i my	rā.		(Bp	13 2:	2 M C	ine		4				
			•							·	۲	-										-
	•	•			4					а ,	f	• ••		، ،		· •	.н				، ، ،	 ~{
				•	-			1				; ;	;						·	. .	• • •	1
• • •	1 4	2 A 4																• •			× + ,	

1

7

Way in the

.



FIGURE NO 37 FLIGHT FLUTTER OV-ID USA 4/464- 17018 BTORE CONFICURATION 5 N.TH HOT BRICKIT

The state of the

FRESEURE ALTITUD (FT) 5000
(PERCENT MAC)
GE085 MEIGHT (68) 16000

SEUSOR LOCATION HOT BRICK TANK FORMARD VERTICAL



1

	STORE CONFIG						
	ICHT (PERC	USA 9/469-	1. Stat	CKU		•	1
		CG Fut HAC)	PRESSURE (F	ALTITUDE		•	
E O O UVR 5 N	DING ION : NOILD	K TANK FORM	MRD LATER	. 4		· ·	•
STAR 2	 	•	•		•	• • •	• •
STAN 21		Γ Γ • • • • • •			· · · · · · · · · · · · · · · · · · ·		
N CUNH SN				· • •	*		,
	vi observa i rađenja glava.		-	•	•		
	•	· · · · · · · · · · · · · · · · · · ·		سرع • •	 •	· . • . 	1997 - 1997 - 14 a. -
	0				Ð.	- - -	1
6 du v						an an an an an an an an	
9 9 9 9 9							
e Iw) J	•	· · · · · · · · · · · · · · · · · · ·			· · · ·	1,2,1,2 1,2,2,2,2 1,2,2,2,2,2 1,2,2,2,2,	
							1
				Ð	00	ρ	
· · · · · · · · · · · · · · · · · · ·				،، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ، ،	-	 	
							-
		8					

ia inatan renta 🕯 🛔

Í

٠.



OV-ID USA 4469-1706

	PRESSURE ALTITUDE (ET) 5000
CONFIGURATIONEN	CG (PBRCENT MAC) 24
STORE	10000 MEIGHT (LB) 16000

SE 4304 LOCATION: RIGHT MING AT STATION 4 AFT VERTICAL



Ť	•	. : :				in in the second second second second second second second second second second second second second second se		
•		-	· · · ·					
1019 S			· · · · · · · · · · · · · · · · · · ·					2
•	· · ·	 						
•		**************************************				n a la ministra de conserva-		0
	10K		17 - 1 - 4 - 7 - 4 					
		1	· · · ·					
		TIC		ant a single of a	n an an gun an ang ang an Dia an tinang ang ang	مید تحدید از دارد. در افراد از در ا		ă -
		***	· · ·					, sig
		Ca .				· · · · · · ·		
		J¥						
オコン	j.	4	1 * .					
214	2 "X 1 t	12						
		21		a antonia 1970 - Alexandria 1970 - Alexandria Alexandria 1970 - Alexandria Alexandria		2 - 2 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4		
		HT				e i Si i Anan di ingana	n gran territoria. A secondaria de la compositionalitation de la composition de la composition de la composition de la composition A secondaria de la composition de la composition de la composition de la composition de la composition de la comp	
ò	}				· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · · ·		i i i i
		NOIL	• • •			α ^τ ι δια 1	The second second second second second second second second second second second second second second second se	
n Line yn ywereg en de		DCA	•					<u>و</u> ۲
•		RO .						- 0 I
•		3 3 4	ب د بر د م ۱		т. Г . об т.			`-^ 9`
•	Ű		···· · · · ·					a <i>c</i> :
								2
		·	•	0.0		•	+ # 0	5 .
×			· · · ·	OFRA SHIP		(5H) YO	N 300'3# 4	
	· .		• • •					· ·

. -

٠

فليرد بالمعا

DISTRIBUTION

Director of Defense Research and Engineering	2
Assistant Secretary of the Army (R&D)	1
Chief of Research and Development, DA (DAMA-WSA)	3
US Army Materiel Command (AMCPM-UA, AMCPM-SE-TM,	
AMCRD-FQ, AMCSF-A, AMCQA)	14
US Army Aviation Systems Command (AMSAV-EQ)	12
US Army Training and Doctrine Command (USATRA DOC/CDC LnO,	
ATCD-CM)	22
US Army Test and Evaluation Command (AMSTE-RG, USMC LnO)	3
US Army Electronics Command (AMSEL-VL-D, AMSEL-WLA, AMSEL-WLN)	3
US Army Forces Command (AFOP-AV)	ł
US Army Armament Command (SARRI-LW)	2
US Army Missile Command	1
US Army Munitions Command	1
Hq US Army Air Mobility R&D Laboratory (SAVDL-D)	2
US Army Air Mobility R&D Laboratory (SAVDL-SR)	1
Ames Directorate, US Army Air Mobility R&D Laboratory (SAVDL-AM)	2
Eustis Directorate, US Army Air Mobility R&D Laboratory (SAVDL-EU-S	Y) 2
Langley Directorate, US Army Air Mobility R&D Laboratory (SAVDL-LA) 2
Lewis Directorate, US Army Air Mobility R&D Laboratory (SAVDL-LE-D	D) 1
US Army Aeromedical Research Laboratory	1
US Army Aviation Center (ATZQ-DI-AQ)	1
US Army Aviation School (ATST-AAP, ATST-CTD-DPS)	3
US Army Aviation Test Board (STEBG-PR-T, STEBG-PO, STEBG-MT)	4
US Army Agency for Aviation Safety (FDAR-A, IGAR-MS/Library)	2
US Army Maintenance Management Center (AMXMD-MEA)	1
US Army Transportation School	ł
US Army Logistics Management Center	1
US Army Foreign Science and Technology Center (AMXST-CB4)	1
US Military Academy	3
US Marine Corps Development and Education Command	2
US Naval Air Test Center	ļ

a Norranda a	1994 - The Angelow and Angelow and a second		
247 24			
-			
5			
;	US Air Force Aeronautical Systems Division (ASD-ENEDP)	1	
	US Air Force Flight Dynamics Laboratory (TST/Library)	1	
	US Air Force Flight Test Center (SSD/Technical Library D	() () () () () () () () () () () () () (
	US Air Force Special Communications Center (SUR)	1	•
	Department of Transportation Library	2	
	US Army Grumman Plant Activity	2	•
	Beech Aircraft Corporation	5	
	Grumman Aerospace Corporation	5	
	AVCO Lycoming Division	5	
	Sanders Associates	5	
	Sargent-Fletcher Company	5	
		e	
	United Aircraft of Canada Ltd	2	

• ;

· · ·

.