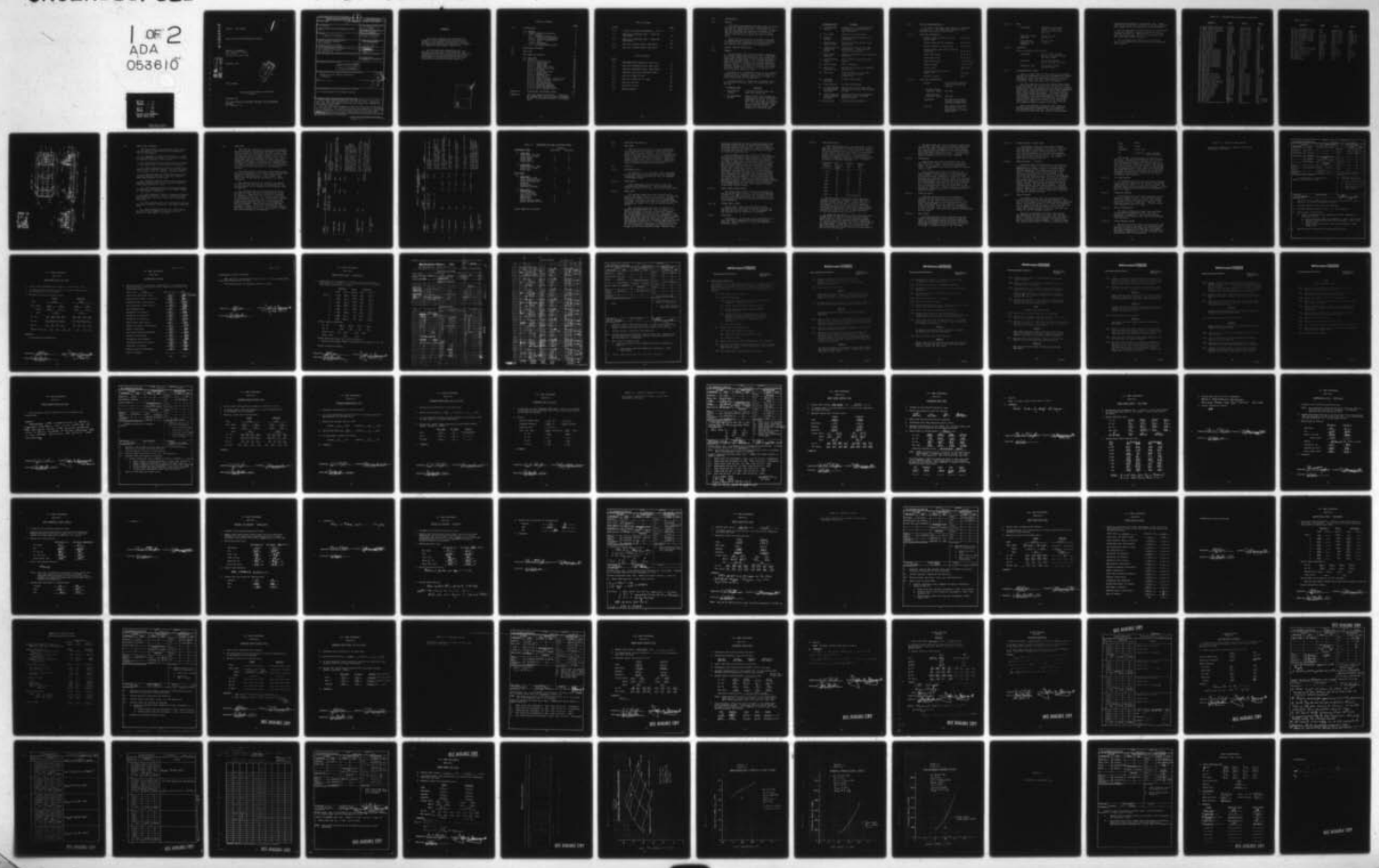
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LACV-30 TEST AND DEMONSTRATION REPORT

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U. S. Army Logistic Air Cushion Vehicle

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the test data and analysis of all acceptance and type tests performed on the LACV-30-1 and -2 vehicles. The tests were performed as specified in Contract No. DAAK02-75-C-0149 dated 7 March 1975.

All test data were accepted by the U.S. Army prior to delivery of the vehicles. Two corrective actions were required on the LACV-30-1, installation of a new horn and addition of bow pre-loaders to maintain pressure on the front landing pads during swing crane operation.

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ABSTRACT

This report presents the test data and analysis of all acceptance and type tests performed on the LACV-30-1 and LACV-30-2 vehicles. The tests were performed as specified in Contract No. DAAK02-75-C-0149 dated 7 March 1975.

All test data were accepted by the U. S. Army prior to delivery of the vehicles. Two corrective actions were required on the LACV-30-1, installation of a new horn and addition of bow pre-loaders to maintain pressure on the front landing pads during swing crane operation.

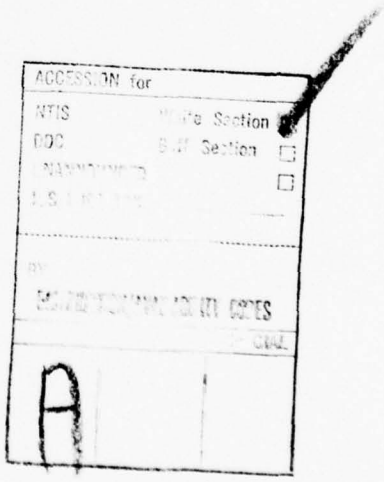


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1.0 INTRODUCTION

1.1 GENERAL

This Test and Demonstration Report for the LACV-30 Air Cushion Vehicle fulfills the requirement of Contract No. DAAK02-75-C-0149. This report includes all the acceptance and type tests performed on the LACV-30-1 and LACV-30-2 vehicles as part of the vehicle demonstration program and proof of design tests.

Where possible, vehicle performance estimates are presented for comparison to measured test data. Contractor's tests performed but not specified in the contract are presented in the Appendices.

1.2 GENERAL VEHICLE DESCRIPTION

1.2.1 GENERAL

The Bell Model 7467 LACV-30 (Lighter, Amphibian Air Cushion Vehicle-30-Ton Payload) is a fully amphibious, high speed craft planned to meet projected Army needs as identified in the Required Operational Capability Document (ROC). It is a high mobility vehicle capable of transporting military cargo payloads in the 25 to 30 short ton category (including MILVANS) primarily in support of the logistics over-the-shore (LOTS) mission involving operations over water, marginal areas and land.

The LACV-30 is a hardened version of the standard commercial Bell "Voyageur" Model 7380 ACV which is in production and already operating in a number of remote area cargo haul applications.

To provide the U. S. Army with an optimum craft, the following hardening items are included in the LACV-30:

Hardening Item	Provides
1. Longitudinal Stretch	Increased payload weight and deck area capability
2. Air Management System	Longer engine life (intake air filtration to remove sand/water). Improved quality air to cabin. More lift fan output for cushion air. APU power take-off availability provides 15 VAC. High intake stack minimizes water ingestion in the surf zone.

	Hardening Item	Provides
3.	Load-Spreader Pallets	Loading of U. S. Army-specified tracked and wheeled vehicles and containers.
4.	Surf Fence	Improved surf transition.
5.	Uprated Engines	Increased payload and/or craft performance.
6.	Improved Propeller Blades	Increased payload and/or craft performance.
7.	Communications/ Navigation System	Compatibility with U. S. Army requirements. Night and low visibility operations.
8.	Cabin Soundproofing	Improved habitability for intensive operations.
9.	Cargo Securing System	Fast, effective cargo tie-down System
10.	Anchor System	Craft anchoring
11.	Cabin Air Conditioning	Heating and cooling for improved habitability
12.	Deck Winch	Cargo handling. Craft self-retrieval and improved gradeability.
13.	Auxiliary Equipment	To Army requirements
14.	Craft Marking	To Army requirements
15.	Bow Ramp System (Ground Support Equipment)	Roll-on/roll-off of specified tracked and wheeled Army vehicles and MHE
16.	Craft Fendering (Ground Support Equipment)	Improved craft skirt protection during operations alongside container ships
17	Swing Crane	Self-unloading capability

1.2.2 VEHICLE CHARACTERISTICS

A 3-view of the Model 7467 LACV-30 is provided in Figure 1.1. The following subsections give leading particulars of the vehicle.

1.2.2.1 PRINCIPAL DIMENSIONS

Overall length (without optional swing crane)	76 ft 3 in
Overall beam (skirts inflated)	36 ft 8 in
Overall height on landing pads	21 ft 6 in
Overall height from skirt hemlines (hovering)	24 ft 8 in
Cargo deck length	51 ft 6 in
Cargo deck width	32 ft 6 in
Cargo deck height	3 ft 11.5 in
Cushion Height	4 ft 0 in
Cushion area	2061 sq ft
Cushion pressure at gross weight 1g	55.8 psf
Reserve buoyancy	155%

1.2.2.2 POWER AND TRANSMISSION

Engines	2 UACL/Pratt & Whitney Twin Pac ST6T-76 gas turbines
Maximum rating (std day) (each)	1850 SHP
Normal rating (std day) (each)	1400 SHP
Propellers	Two Hamilton Standard 3-blade variable pitch (HSD Model 43D50-363)
Lift Fan	Two Bell/British Hovercraft Corp., 7 ft. centrifugal, 12-bladed, fixed pitch

1.2.2.3 FUEL

Fuel Types	Standard turbine fuel either Jet A-1, JP-4, JP-5, or light diesel fuel oil
Main fuel usable capacity	1,272 U.S. Gal. (15,450 lb)
Fuel Ballast Emergency fuel capacity	294 U.S. Gal. (5,400 lb)

1.2.2.4 ELECTRICAL

Starter Generators per Twin Pac

Powerplant	Two (4 total) Gearbox driven b rushless 28 VDC, 200 amps (each)
Batteries	Two nickel-cadmium 28 VDC, 40 amp hr (each)
Generator (APU)	One gearbox driven 115 VAC, 400 H.

1.2.3 INSTRUMENTATION SYSTEM

The U. S. Army follow-on Development Test Program for LACV-30-2 employed an analog instrumentation system capable of recording 76 multiplexed channels of data on magnetic tape. The data were capable of being time-coded, voice-annotated, and event-marked.

The major portion of this data acquisition system is pallet mounted and installed on the fore deck just below the cabin. The pallet contains the tape recorder, multiplexes, signal conditioners, amplifiers, converters, patch panel, time code generator, power distribution panel, and attitude/rate gyros. The system controls and displays (time, oscillograph, and visual meters) are located in the cabin and manned by the navigator. Primary power (28 vdc and 115v 400H AC) is supplied from the craft electrical system to the pallet and distributed. Table 1.1 is a listing of parameters with range and type of sensor to be used.

Data were gathered in land and water tests as required by specific development test objectives. All parameters are recorded. The patch panel is utilized to provide the test engineer with selected

information pertinent to a particular test. These data can be "quick look" reviewed to verify attaining test conditions and to determine trend information.

The test engineer is provided with an "Event Mark" control to identify a specific data point on all recorded information. Additionally, the test engineer maintains a detailed log in time code of all tests and significant occurrences.

The Instrumentation System was installed by BAT and its operation verified during the Contractor Test Program.

TABLE 1.1. INSTRUMENTATION PACKAGE ON LACV-30-2

	PARAMETER	RANGE	SENSOR	ERROR
1.	Power Turbine Temperature	0-1300°F	Engine Pickup	±10°
2.	Power Turbine Temperature	0-1300°F	Engine Pickup	±10°
3.	Power Turbine Temperature	0-1300°F	Engine Pickup	±10°
4.	Power Turbine Temperature	0-1300°F	Engine Pickup	±10°
5.	Gas Generator RPM	0-105%	Engine Pickup	±.5%
6.	Gas Generator RPM	0-105%	Engine Pickup	±.5%
7.	Gas Generator RPM	0-105%	Engine Pickup	±.5%
8.	Gas Generator RPM	0-105%	Engine Pickup	±.5%
9.	Power Turbine RPM	0-100%	Engine Pickup	±.5%
10.	Power Turbine RPM	0-100%	Engine Pickup	±.5%
11.	Power Turbine RPM	0-100%	Engine Pickup	±.5%
12.	Power Turbine RPM	0-100%	Engine Pickup	±.5%
13.	Engine Torque	0-70 psi	Engine Pickup	±1.0 psi
14.	Engine Torque	0-70 psi	Engine Pickup	±1.0 psi
15.	Engine Torque	0-70 psi	Engine Pickup	±1.0 psi
16.	Engine Torque	0-70 psi	Engine Pickup	±1.0 psi
17.	Air Intake Temperature	-70 +200°F	IC Couple	±4°F
18.	Air Intake Temperature	-70 +200°F	IC Couple	±4°F
19.	Air Intake Temperature	-70 +200°F	IC Couple	±4°F
20.	Air Intake Temperature	-70 +200°F	IC Couple	±4°F
21.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
22.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
23.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
24.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
25.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
26.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
27.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
28.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
29.	Engine Bay Temperature	0-400°F	IC Couple	±4°F
30.	Fuel Flow	0-5 GPM	Potter	±.025 GPM
31.	Fuel Flow	0-5 GPM	Potter	±.025 GPM
32.	Fuel Flow	0-5 GPM	Potter	±.025 GPM
33.	Fuel Flow	0-5 GPM	Potter	±.025 GPM
34.	Propeller Blade Angle	±25°	Potentioneter	±.5°
35.	Propeller Blade Angle	±25°	Potentioneter	±.5°
36.	Forward Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
37.	Forward Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
38.	Rear Trunk Pressure	0-120 psf	Press. Xducer	±.84 psf
39.	Peripheral Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
40.	Peripheral Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
41.	Keel Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
42.	Stab. Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
43.	Stab. Trunk Pressure	0-100 psf	Press. Xducer	±.7 psf
44.	Rear Trunk Pressure	0-120 psf	Press. Xducer	±.84 psf
45.	Cushion Pressure	0-75 psf	Press. Xducer	±.5 psf
46.	Cushion Pressure	0-75 psf	Press. Xducer	±.5 psf
47.	Cushion Pressure	0-75 psf	Press. Xducer	±.5 psf
48.	Cushion Pressure	0-75 psf	Press. Xducer	±.5 psf
49.	Pitch Attitude	±60°	Gyro	±.5°
50.	Roll Attitude	±60°	Gyro	±.5°
51.	Roll Rate	±60°/sec	Gyro	±.6 - 1.2°/sec
52.	Pitch Rate	±60°/sec	Gyro	±.6 - 1.2°/sec
53.	Yaw Rate	±60°/sec	Gyro	±.6 - 1.2°/sec
54.	C.G. Acceleration Vertical	±5g	Accelerometer	±.04g

TABLE 1.1 (Cont'd)

PARAMETER	RANGE	SENSOR	ERROR
55. C.G. Acceleration Long.	±5g	Accelerometer	±.04g
56. C.G. Acceleration Lateral	±5g	Accelerometer	±.04g
57. Bow Acceleration Vertical	±10g	Accelerometer	±.075g
58. Air Management Pressure	0-.5 psi	Press. Xducer	±.0035 psi
59. Air Management Pressure	0-.5 psi	Press. Xducer	±.0035 psi
60. Air Management Pressure	0-.5 psi	Press. Xducer	±.0035 psi
61. Air Management Pressure	0-.5 psi	Press. Xducer	±.0035 psi
62. Air Management Pressure	0-.5 psi	Press. Xducer	±.0035 psi
63. Air Management Pressure	0-.5 psi	Press. Xducer	±.0035 psi
64. Air Speed	0-100 MPH	Anemometer	±1 MPH
65. Wind Direction	±170°	Vane	±2.0°
66. Puff Port L	ON/OFF	Switch	---
67. Puff Port R	ON/OFF	Switch	---
68. Air Management Temperature	0-250°F	IC Couple	±4°F
69. Air Management Temperature	0-250°F	IC Couple	±4°F
70. Strut Load Port L/H	15K psi	Strain Gage	±.3K psi
71. Strut Load Port R/H	15K psi	Strain Gage	±.3K psi
72. Strut Load Stbd. L/H	15K psi	Strain Gage	±.3K psi
73. Strut Load Stbd. R/H	15K psi	Strain Gage	±.3K psi
74. Time Code	----	----	---
75. Intercom	----	----	---
76. Event Marker	----	----	---

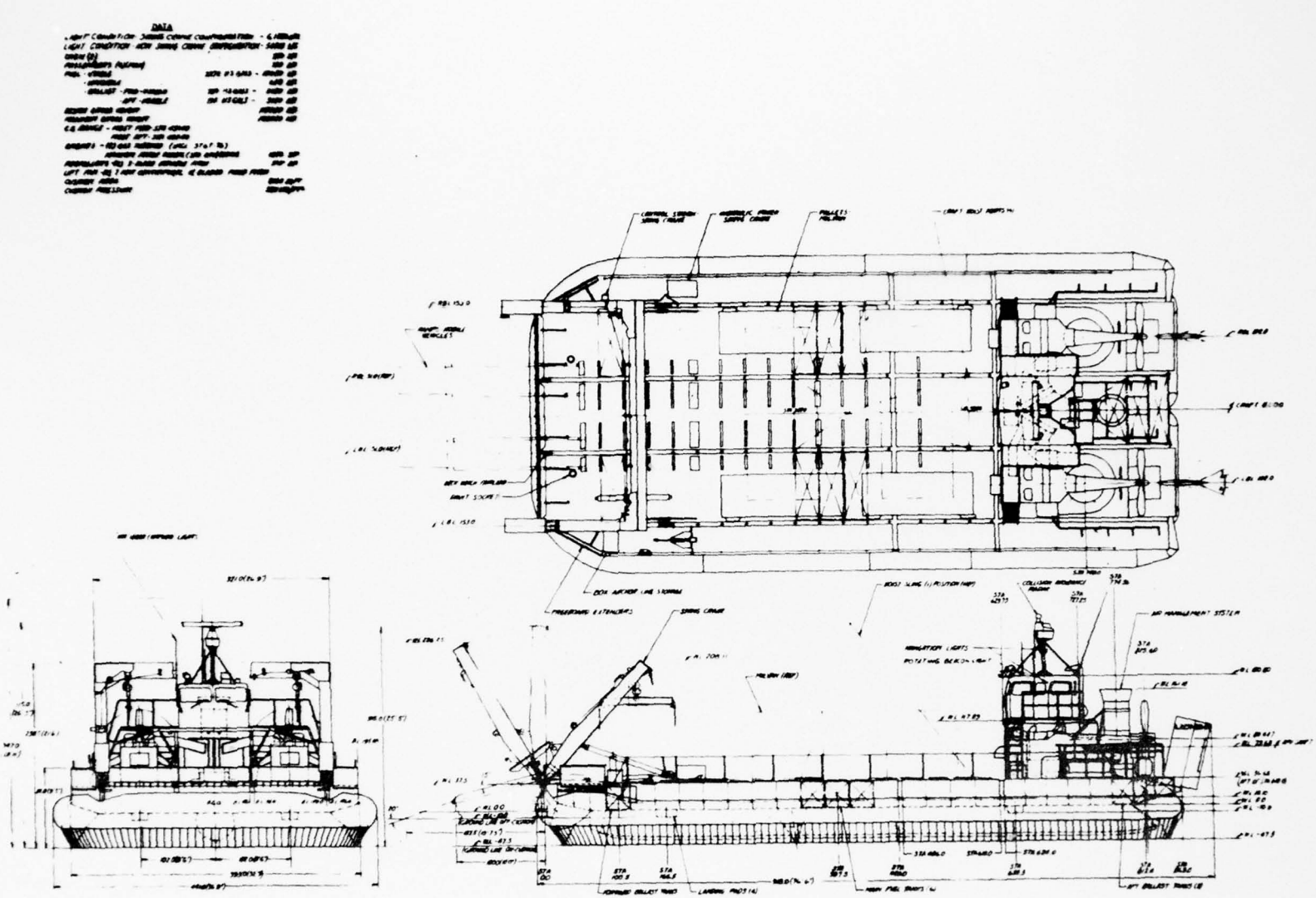


FIGURE 1.1. 3 VIEW AND GENERAL ARRANGEMENT - LACV-30

2.0 APPLICABLE DOCUMENTS

The specifications and documents listed below are the basis for the LACV-30 Test Program and vehicle performance.

(a) Contract No. DAAK-2-75-C-0149, U. S. Army Mobility Equipment Research and Development Center, Ft. Belvoir, Virginia, 7 March 1975.

(b) United Aircraft of Canada Limited, "Installation Manual ST6T-76 Twinned Turboshaft Engine."

(c) Pratt and Whitney Aircraft of Canada Ltd., ST6T-76 Twin Turboshaft Engine - Specific Operating Instructions," Part No. 3028241, 27 October 1975.

(d) Hamilton Standard "Model Specification for 43D50-359 Controllable Pitch Propeller Assembly," Model Specification No. MS 5088.

(e) Hamilton Standard "Model Specification for 43D50-363 Controllable Pitch Propeller Assembly," Model Specification No. 5122.

(f) Bell Aerospace Company "Technical Proposal for LACV-30-2 Instrumentation System (TECOM) Report No. 7467-953007, June 1975.

(g) Bell Aerospace Company "Calibration Requirements Summary LACV-30-2, Contract DAAK02-75-C-0149 Mod P00003 Data Item C001" Report No. 7467-956008, March 1976.

(h) Bell Aerospace Textron, "LACV-30 Pre-Delivery Water Test Program," Report No. 7467-958006, February 1978.

(i) Bell Aerospace Textron "U.S. Army Lighter ACV LACV-30 P/N 4-099001-1, Operating Manual," Report No. 7467-954001, 9 May 1977.

3.0 TEST PLAN

The LACV-30-1 vehicle was tested in three phases. The first phase of testing was performed at the Bell Aerospace plant in Grand Bend, Ontario, Canada. The initial tests were performed overwater with a vehicle configuration which included volutes in both lift fan plenums and the lengthened Voyageur skirt system. These tests were the pre-delivery water tests performed on Lake Huron. The tests were performed under contract No. DAAK02-75-C-0149 Mod. No. P00007 CLIN No. 0006. The pre-delivery test results are presented in the report listed as 2.0(h) in the preceding section.

The second phase of testing was performed at the BAT facility adjoining the Niagara Falls International Airport in Wheatfield, N. Y. The modified skirt system was installed prior to these tests. The final phase of testing was performed at Ft. Story, Virginia.

The LACV-30-2 vehicle was tested in two phases, the first at the BAT facility in Wheatfield, N. Y., and the second at the Aberdeen Proving Grounds (APG) in Maryland.

The proposed type and acceptance tests to be performed on both vehicles are presented in Tables 3.1 and 3.2. These tests are outlined in Contract No. DAAK02-75-C-0149 which is listed as Item 2.0(a) in the preceding section. The actual tests performed on both vehicles are presented in Table 3.3. The swing crane acceptance test was only performed on LACV-30-1 because a swing crane was not installed on the LACV-30-2. Other tests performed but not included in Tables 3.1 and 3.2 are the skirt surveys and cabin contamination tests. The results of these tests are presented in the Appendix.

TABLE 3.1. TYPE AND ACCEPTANCE TESTS
(OVER LAND)

*	TEST	(WT. AND L.C.G.)	SPEED (MPH)	SURFACE	METHOD
A	Hover	60,000 lb., mid 115,000 lb., mid		Smooth Concrete	On cushion; record hover height and trim attitudes.
A	SPEED RUNS	Any	30 - limit	Any	Surveyed course; distance/time up and down wind; increments of 5 mph
T	Maneuvers	Any	Safe	Any	Figure - 8 turns.
T	Obstacles	Any	Safe	Dirt	Negotiate prepared obstacle course consisting of hump varying from 1 to 3 ft. over length and 8 foot deep ditch varying in width from 3 to 6 feet over length. Courses from minimum to maximum.
T	Prop Reversal Stop	Any	25	Any	Stop by propeller reversal at speeds of 10, 15, 20 and 25 mph.
A	Swing Crane	Any		Smooth Concrete	Off cushion resting on landing pads with the engines at idle and APU operating to provide engine combustion air and electric power.

*A - Acceptance
T - Type

TABLE 3.2. TYPE AND ACCEPTANCE TESTS
(OVER WATER)

	*TEST	LOADING (WT. AND L.C.G.)	SPEED (MPH)	WAVE HEIGHT	METHOD
A	Hover	60,000 lb., mid 115,000 lb., mid	0	Calm	On cushion, record hover height and trim attitudes.
T	Thrust Calibration	60,000 lb., mid	0	Calm	On and off cushion; tether aft. Using load cells, measure static Propeller Thrust at 70, 80, 90, 95 and 100%.
A	Speed Runs	Any	30 - Limit	18 in.	Surveyed course; distance/time. Up and down wind runs; increments of 5 mph.
T	Crash Stop	Any	30 - Limit	18 in.	Simulated engines (2) failures in 5 mph steps.
T	Manuevers	Any	30 - Limit	12 in.	Figure -8 turns at increasing entry speeds; 5 mph step.
T	Spin Out	Any	30 - Limit	6 in.	Simulated critical engine failure in 5 mph steps.
T	Safe Operating Limits	All	AS req'd.	30 in.	To be determined. Progressive envelope expansion from Calm Water with optimum loading to limit wave height at maximum safe speed at fwd. L.C.G.

*A - Acceptance
T - Type

TABLE 3.3. COMPLETED TYPE AND ACCEPTANCE TESTS

ACCEPTANCE TESTS	VEHICLE LACV-30-1	LACV-30-2
a) OVER LAND		
HOVER WITH FULL LOAD	X	X
HOVER WITH NO LOAD	X	X
GROUND SPEED	X	X
SWING CRANE	X	*
SYSTEM RUN-IN	X	X
b) OVER WATER		
HOVER WITH FULL LOAD	X	X
HOVER WITH NO LOAD	X	X
SPEED RUNS	X	X
TYPE TESTS		
a) OVER LAND		
CABIN NOISE LEVEL	X	X
SKIRT PRESSURE SURVEY	X	X
CABIN CONTAMINATION		X
OBSTACLE		X
MANEUVERING	X	
PROPELLER REVERSAL	X	
b) OVER WATER		
THRUST LOADING		X
AIR CONDITIONING		X
CABIN NOISE LEVEL	X	
MANEUVERING	X	
SAFE LIMITS	X	
ENGINE FAILURE CRASH	X	
ENGINE FAILURE SPINOUT	X	

*SWING CRANE NOT INSTALLED

4.0 TEST DATA AND ANALYSIS

4.1 TEST DATA

The test data for all the required acceptance and type tests are presented in four tables, two test phases for each vehicle. The initial test phase on the LACV-30-1 vehicle is not discussed here since it has been reported separately. Tables 4.1 and 4.2 present LACV-30-1 test data for tests performed at BAT and Ft. Story, Virginia. Tables 4.3 and 4.4 present LACV-30-2 test data obtained from tests at BAT and Aberdeen Proving Ground .

4.2 ANALYSIS

4.2.1 ACCEPTANCE TESTS

The analysis of the acceptance tests performed on the test vehicles is presented in the following subsections, where possible test data is compared to estimated values.

4.2.1.1 HOVER TESTS

Hover acceptance tests for both of the test vehicles were satisfactory. Both vehicles were tested with full and no load, on land and over water.

4.2.1.2 SPEED RUNS

The overland speed runs were required to be made in the speed range of 25 to 35 mph. The LACV-30-1 vehicle was tested at BAT and attained an average indicated air speed of 43.5 mph and a ground speed of 35 mph. The LACV-30-2 vehicle attained an average indicated air speed of 45 mph and ground speed of 36 mph.

The overwater speed test for the LACV-30-1 vehicle was performed at Ft. Story, Virginia. The vehicle attained a calibrated airspeed of 53 mph at a gross weight of 76,000 pounds. The power output of the ST6T-76 Twin Pac was 1701 horsepower. The power output was obtained using the TOP and N_2 readings taken during the test and inputting the data into the equation obtained from the Engine Operating Instructions listed in Section 2.0. The maximum speed of the LACV-30-1 with swing crane is presented in Figure 4.1 as a function of horsepower and average wave height for the test condition shown. The sea state

condition during the test was estimated as less than sea state 1 which means the average wave height was somewhere between 0 and 0.8 feet. The cross plot of 53 mph and 1701 horsepower in Figure 4.1 indicates an average wave height of 0.43 feet which basically verifies the speed attained.

The overwater speed test of the LACV-30-2 was performed at Aberdeen Proving Grounds. The comparison of estimated to average speed obtained in the test is shown in Figure 4.2. The average test speed of 42.5 mph is well below the predicted value of 51 mph for a 1200 horsepower lift fan and propeller input. The test data indicate that the speed runs were performed with a 2 mph cross wind. Although the cross wind is not significant, the variation of output horsepower for each Twin Pac is. According to the test data it appears that one Twin Pac was producing 1277 horsepower and the other 1121 horsepower which could indicate that propeller thrust was being used to control vehicle heading. The low power level for the test was due to operating the vehicle with uncompensated T7 limits. The vehicle engine normally operates with cmmpensated T7 limits which for the values of T7 recorded during the test would normally indicate higher power output levels.

4.2.1.3 SWING CRANE LOADING TESTS

The swing crane loading tests were performed at BAT on the LACV-30-1 vehicle. The test is presented in Table 4.1. The swing crane was accepted with the provision that bow pre-loaders be installed to maintain pressure on the front landing pads during swing crane operation.

4.2.1.4 SYSTEM RUN-IN TESTS

System run-in tests were performed on both vehicles at BAT. The only discrepancy occurred in the LACV-30-1 vehicle where it was recommended that the existing horn be replaced and rechecked.

4.2.2 TYPE TESTS

The analysis of the type tests performed on the test vehicles is presented in the following subsections. Where possible test data are compared to estimated values.

4.2.2.1 CABIN NOISE LEVEL

Cabin noise level tests were performed on both vehicles, the LACV-30-1 overland and water, and the LACV-30-2 overland only. Noise spectra in octave bands were measured at crew stations of the LACV-30 at full power, with the craft both stationary on cushion and at maximum speed. Significant data obtained is compared below with "Steady-State Noise Limits for Personnel Occupied Areas", Category D in Table 2 of MIL-STD-1744A(MI).

Octave Band Center Frequency	Cat. D 8 Hr. Exposure (db)	Underway MCP (db)	Underway MAP (db)
125	96	94	99
250	89	91	94
500	83	84	89
1000	80	82	88
2000	79	75	81
4000	79	66	71
8000	81	63	69
db(A)	85	84-Computed-90	

The above shows the highest levels measured; underway at maximum continuous power (MCP) and at maximum available power (MAP), a power setting limited to five (5) minutes to prevent damage to the engines. Note that the prevailing full speed operation underway at MCP (2800 eshp) closely agrees to Category D standards which permits unprotected exposure for eight hours and is based primarily on hearing conservation priorities.

To judge the compatibility of the short duration higher levels at MAP, the Walsh-Healy Act safety regulations on industrial noise exposure equates db(A) sound level with exposure time by permitting a 5 db(A) increase in noise level with a 50% reduction in time exposed. Therefore, the noise measured at MAP (3700 eshp) is acceptable for a four (4) hour continuous exposure; engine operating limits restrict MAP to five (5) minutes.

The data taken with craft stationary (1600 eshp) is generally less than that experienced underway at MCP. At the lower frequencies, the decibel level is slightly above the underway cases most probably due to propeller blade pass noise at the effective zero pitch angle required to hover. Average levels measured comply with the specified standard.

4.2.2.2 MANEUVERING

Maneuvering tests were performed with the LACV-30-1 at Ft. Story. Turn radii on land were small, 15 ft. and 20 ft. in upwind and downwind tests. No estimates have ever been made for turning radii on land.

The overwater tests were performed for two entry speeds, 40 and 30 mph, at a gross weight of 76,000 pounds. The comparison of predicted with test data is shown in Figures 4.3 and 4.4. The turning radii obtained from the tests were estimated The turning radius for an entry speed of 40 mph was in good agreement with predicted as shown in Figure 4.3. The turning radius for an entry speed of 30 mph was substantially lower than predicted as can be seen in Figure 4.4. Further testing at other test conditions would be required to substantitate the predicted values.

4.2.2.3 OBSTACLE TESTS

Obstacle crossing tests were performed at Aberdeen Proving Grounds using the LACV-30-2 vehicle. In the ditch crossing test the ditch measured 10 feet wide at the crossing point. The ditch crossing speed was an indicated air speed (IAS) of 22 mph. The second obstacle crossed was a three-foot high step. The test was performed at an IAS of 33 mph. The vehicle performed satisfactorily in both tests.

4.2.2.4 SAFE LIMITS

The safe operating limits overwater were performed to demonstrate that the vehicle would not "plow in" at selected speeds and yawed conditions. Tests were performed with the LACV-30-1 vehicle at entering yaw angles of 0 and 30 degrees at an IAS of 45 mph. No adverse behavior was recorded.

4.2.2.5 ENGINE FAILURE -"CRASH STOP"

"Crash stop" tests were performed overwater with the LACV-30-1 vehicle at Ft. Story. The tests were performed to demonstrate vehicle conditions with the loss of power from both engines. The tests were performed at a yaw angle of 0 degrees at a cut-off IAS of 40 mph and at a 30 degree yaw angle at a cut-off IAS of 45 mph. The vehicle exhibited no adverse behavior.

4.2.2.6 ENGINE FAILURE - "SPINOUT"

"Spinout" tests were performed on the LACV-30-1 vehicle at Ft. Story. The tests were performed to demonstrate the vehicle under a simulated engine failure condition with optimum trim from a target speed of 10-50 mph. The selected engine to be cut was at the discretion of the operator. The tests were performed at a yaw angle of 0 degrees at a cut-off IAS of 40 mph and a yaw angle of 30 degrees with a cut-off IAS of 30 mph. After engine cut-off the vehicle yawed in the direction of the cut-off engine and sideslipped until the operator took corrective action. The estimated maximum roll angle incurred during the test was 25 degrees. The corrective action taken by the operator for restoring vehicle control was to reduce power on the opposite engine. The recovery action successfully corrected the unusual vehicle attitude.

4.2.2.7 THRUST LOADING

The thrust loading test was performed at APG with the LACV-30-2 vehicle hovering overwater. The vehicle was tethered to a government furnished measuring device to determine thrust of the 43D50-363 propeller over a range of engine settings. Due to the inability of maintaining the vehicle normal to the tether point, the values obtained in the test were not considered to be the maximum available.

The test was repeated overland. The vehicle was tethered at the stern to a GFE thrust measurement van which was used to determine the net forward force. A bridle on the starboard side restrained the vehicle from lateral movement. A total of seven test points were obtained. The test conditions were:

T_{AMB} = 80°F

V_{WIND} = 4 MPH

BAROMETER = 29.95 inHg

W_G = 85,000 Lb. (empty MILVAN's placed on deck)

The results of the analysis are presented in Table 4.5. The predicted propeller data provided by Hamilton Standard has a minimum Cp value of 0.07, therefore no comparison to predicted can be made for the first three test points. Test points 4, 5 and 6 indicate that the resulting performance of the propellers was within 10% of the predicted, while the test point 7 was within 3% of predicted. No angles of attack were recorded during the test, therefore cushion thrust effects have not been included in the analysis.

4.2.2.8 AIR CONDITIONING

Air conditioning tests were performed overwater on the LACV-30-2 vehicle at Ft. Story. The outside temperature was 101°F. At the end of the test, 30 minutes later, the cabin temperature dropped to 78°F. The test results were satisfactory and accepted by the U. S. Army.

4.2.2.9 PROPELLER REVERSAL

The overland stop tests were performed on the LACV-30-1 vehicle at BAT. The propeller reverse thrust was used to stop the craft. The stopping time from an IAS of 45 mph was 56 seconds. The stopping distance was 1600 feet. The test results were accepted by the U. S. Army.

4.2.2.10 CABIN CONTAMINATION

The cabin contamination tests were performed on the LACV-30-2 vehicle at BAT. The data is presented in Appendix A. The measured noxious fumes were in allowable limits and were acceptable for habitation.

4.2.2.11 SKIRT PRESSURE SURVEY

The skirt pressure survey was performed at BAT on both of the test vehicles. The tests were not required as part of the acceptance test program. The report presenting the test data and results is presented in Appendix B to provide a complete data package for both of the vehicles.

TABLE 4.1. LACV-30-1 TESTS AT BAT

THIS TABLE CONSISTS OF A SERIES OF TEST PLANS FOLLOWED BY TEST DATA.

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-1		OPER. NO. A1-0218		
ACV CREW		NO CHASE AIRCRAFT		**TEST CONDITIONS**		
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF**	**LAND**
Operator	D. Hall			WEIGHT	115,000	TBD
Co-Operator	G. Yaeger			FUEL	See Loading 4	
U.S.A. Obs.	J. Sargent			C.G.	-	-
	H. Woods	INSTRUMENTATION PLAN NONE		BALLAST	-	-
	L/C Pope	SETUP NO.	AMEND NO.	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	C. Stauffer	UHF	121.7	WIND		
TEST DIRECTOR	"	UHF-FM	6	TEMP		
FINAL GO-NO GO AUTHORITY	"	VHF-FM	TBD	RECORD ABOVE DATA		

CRAFT CHANGES SINCE LAST OPERATION

Air Management Instrumentation removed (less pressure taps).

TEST PURPOSE

A. Demonstration to U.S. Army for acceptance:
   1. Hover with full load.
   2. System run-in tests
   3. Cabin noise level (stationary)

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C. L. Stauffer		J Sargent

TEST PROCEDURE

I. Position craft on BAC concrete ramp north of production hangar. restrain as required for wind and slope.

II. Perform Operator Inspection IAW Checklist.

III. Perform normal pre-start, start, etc. IAW Checklists.

IV. Raise craft in hover mode

   A. Conduct acceptance tests (DAAK02-75-C-0149, Attachment I, Pages 10 and 11).

      1. Hover with full load per Attachment I (Ref. Item 9(A)2)A.
      2. Perform system run-in tests per Attachment 2 (Ref. Item 9(A)3)A & B).
      3. Obtain cabin noise level data per Attachment 3 (Ref. Item 9(A)5)

V. Secure craft as required for cargo handling tests.

U.S. ARMY ACCEPTANCE

LACV-30-1

LAND HOVER WITH FULL LOAD

1. Verify craft configured per Loading 4 (115,000 lb. G.W.).

2. In cushion mode, trim and perform a 15 minute demonstration at N_2 maximum (91% N_2 minimum).

3. Manually record the following data:

	START					COMPLETE				
Time	1530					1640				
Fuel (Fwd)	54%		54%			54%		54%		
(Main)	80%		75%			75%		75%		
(Aft)		52%					52%			
T_7 (°C)	405	465	450	420		405	465	450	420	
N_1 (%)	85.5	89.0	86.5	86.0		85.5	89.0	86.5	86.0	
N_2 (%)	91	91	91	91		91	91	91	91	
Torque (psi)	18	18	16	18	18	18		16	18	

COMMENTS:

All operations satisfactory.

COMPLETED G. C. Yeager
BAC

VERIFIED Paul Mueller
BAC QUALITY

ACCEPTED John J. Sargent
U.S.A. REPRESENTATIVE
19 Feb 96

U.S. ARMY ACCEPTANCE

LACV-30-1

SYSTEM RUN-IN TESTS

1. Starting concurrent with Hover (Attachment 1) and continuing off cushion for a total of one hour, functionally operate the following systems:

Start Time 1530 Complete Time 1640

	BAC	U.S.A.
Puff Ports (20 cycles each)		(19 Feb 76)
Cabin Heaters (Both, Lo and Hi)		
Windshield Heat (Continuous)		
Air Conditioner (Vent & Cool)		
APU (Generator On)		
AN/URC-80 (4 Contacts)		
AN/URC-46 (4 Contacts)		
AN/PRC-94 (4 Contacts)		
RMHS System (Continuous)		
AN/ASN-43 Compass (Continuous)		
Radar (Continuous)		
Fuel Trim (To/From Transfers)		
Engines (Continuous)		
Propellers (As Required)		
Windshield Wipers (4 Cycles)		
Spotlight (4 Cycles)		
Running Lights (Continuous)		
Horn (4 Blasts)		

DISCREPANCIES AND DISPOSITION:

RMHS operative; needs repeat Compass Swing. Will be accomplished during BAC tests at Fort Storey.

Existing horn will be replaced; recheck as above.

COMPLETED _____
BAC

VERIFIED _____
BAC QUALITY

ACCEPTED _____
U.S.A. REPRESENTATIVE
19 Feb 76

U.S. ARMY ACCEPTANCE

LACV-30-1

CABIN NOISE LEVEL - STATIONARY

1. Concurrent with Attachment 1, conduct survey with engines at full power (N_2 maximum). Using an Octive-Bad Noise Analyzer, record noise levels at ear level.

	Operator		Freq.	Passenger	
	(Raw)	(Corr.)	(Hertz)	(Raw)	(Corr.)
Band 1	48	48.9	16000	48	48.9
2	60	60	8000	60	60
3	61	58	4000	60	57
4	68	68.2	2000	67	67.2
5	74	74	1000	73	73
6	82	81.8	500	82	81.8
7	92	92	250	94	94
8	125	125.7	125	105	105.6

Record engine parameters.

N_1 (%)	85.5	89.0	86.5	86.0
N_2 (%)	91	91	91	91
Torque (psi)	17	18	16	18
Prop. Pitch	-5		-5	

Record Model and Serial No. of Test Equipment.

General Radio Model 1558AP Octave Band Noise Analyzer, S/N 732.

Attach Calibration Sheets.

COMPLETED _____ BAC

VERIFIED _____ BAC QUALITY

ACCEPTED _____ U.S.A. REPRESENTATIVE

MAC 1976

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CALIBRATION PROCEDURE NUMBER Q0644

REVISION

CALIBRATION DATA SHEET

NOMENCLATURE	MANUFACTURER	MODEL NO.
OCTAVE BAND NOISE ANALYZER	GEN. RADIO	1558-AP
FILE NO. 32600S3	TECH. S.R. MITROWSKI	CALIBR. DATE 5-19-75

CALIBRATION EQUIPMENT

FILE NO.			
	VTVM	ATLANTIC	300
1050002	VTVM	HP	400D
1910003	DECADE ATTEN	GR	1454
2580002	OSC	HP	205AG
	OSC	HP	200CD
2050003	COUNTER	BERKELEY	7370
3250021	AC RESPONSE	GR	1554B
3010001	GRAS SHELL ADAPTOR	GR	995-2.3
	MICROPHONE	GR	

CALIBRATION DATA

PARA./ STEP NO.	FUNCTION TESTED	MEASUREMENT DATA			TOLERANCES	
		NOMINAL	MEASURED	CORRECTED		
	BAND LEVEL DB					
	OUTER DIAL / INNER DIAL					
	POS	STO SET			±1.0DB	
	50 (6) 1	90	Tuning			
	60 (5) 1	80	-0.1			
	70 (4) 1	70	-0.2			
	80 (3) 1	60	-0.1			
	90 (2) 1	50	-0.1			
	100 (1) 1	40	REF 0 DB			
	(1) 110	30	-0.1			
	(1) 120	20	-0.1			
	(1) 130	10	-0.1			
	(1) 140	0	-0.1		±1.0DB	
	METER CHECK					
	OUTER DIAL / INNER DIAL	STO SET				
	POS 4 (OUT) 2:4 (OUT)	45	-5.0			
	(4) (4)	44	-4.0			
	(4) (4)	42	-2.0			
	(4) (4)	40	REF 0			
	(4) (4)	38	+2.0			
	(4) (4)	36	+4.0			
	(4) (4)	32	+8.0			
	(4) (4)	30	+10.0			
	(4) (4)					

FILE NO. 32600S3

PROCEDURE NO. Q0644

CALIBRATION DATA

GR 1558 AC3

PARA. STEP NO.	FUNCTION TESTED	MEASUREMENT DATA NOMINAL	MEASURED	CORRECTED	TOLERANCES	
	BAND PASS DBL	FREQ				
	½ LOW CUTOFF	11.15	>30 db		> 30 DB	
	LOW CUTOFF	22.3	-3.0		3.5 DB	± 1DB
	31.5 CENTER Q	31.5	1.0 db		± 1 DB	
	HIGH CUTOFF	44.6	2.5 "		3.5 DB	± 1DB
	2X HIGH CUTOFF	89.2	>30 "		> 30 DB	
	½ LOW	22.3	>30 db		> 30 DB	
	LOW	44.6	-3.0 "		3.5 DB	± 1DB
63	CENT FREQ	63	-0.8 "		± 1 DB	
	HIGH	89.2	-2.6 "		3.5 DB	± 1DB
	2X HIGH	178.4	>30. "		> 30 DB	
	½ LOW	44.6	>30 db		> 30 DB	
	LOW	88.4	-2.6 "		3.5 DB	± 1DB
125	CENT FREQ	125	+0.7 "		± 1 DB	
	HIGH	177	-3.0 "		3.5 DB	± 1DB
	2X HIGH	354	>30. "		> 30 DB	
	½ LOW	88.4	>30 db		> 30 DB	
	LOW	177	-2.2 "	*	3.5 DB	± 1DB
250	CENT FREQ	250	0.0 "		± 1 DB	
	HIGH	354	-3.0 "		3.5 DB	± 1DB
	2X HIGH	707	>30. "		> 30 DB	
	½ LOW	177	>30 db		> 30 DB	
	LOW	354	-2.2 "	*	3.5 DB	± 1DB
500	CENTER	500	-0.2 "		± 1 DB	
	HIGH	707	-4.0 "		3.5 DB	± 1DB
	2X HIGH	1414	>30 "		> 30 DB	
	½ LOW	354	>30 db		> 30 DB	
	LOW	707	-2.8 "		3.5 DB	± 1DB
1000	CENTER	1000	0.0 "		± 1 DB	
	HIGH	1414	-4.0 "		3.5 DB	± 1DB
	2X HIGH	2828	>30. "		> 30 DB	
	½ LOW	707	>30 db		> 30 DB	
	LOW	1414	-2.0 "	*	3.5 DB	± 1DB
2000	CENTER	2000	+0.2 "		± 1 DB	
	HIGH	2828	-3.0 "		3.5 DB	± 1DB
	2X HIGH	5656	>30. "		> 30 DB	
	½ LOW	2828	>30 db		> 30 DB	
	LOW	5656	-4.5 "		3.5 DB	± 1DB
4000	CENTER	4000	0.0 "		± 1 DB	
	HIGH	5650	-3.2 "		3.5 DB	± 1DB
	2X HIGH	11320	>30. "		> 30 DB	
	½ LOW	5656	>30. db		> 30 DB	
	LOW	11310	-2.8 "		3.5 DB	± 1DB
16000	CENTER	16000	+0.9 "		± 1 DB	
	HIGH	22620	-3.0 "		3.5 DB	± 1DB
	2X HIGH	45200	>30. "		> 30 DB	
	½ LOW	1414	>30 db		> 30 DB	
	LOW	2828	-1.6 "	*	3.5 DB	± 1DB
4000	CENTER	4000	+0.8 "		± 1.0 DB	
	HIGH	5656	-3.0 "		3.5 DB	± 1DB
	2X HIGH	11320	>30. "		> 30 DB	

* LIMITED USE

BELL AEROSPACE ACV TEST PLAN	TYPE: LACV-30-1	OPER. NO.: A2-0219

ACV CREW		NO CHASE AIRCRAFT		TEST CONDITIONS		
CREW POSITION	NAME	TYPE A/C	CREW		TAKEOFF	LAND
Operator	Hall			WEIGHT	Not applicable	
Co-Operator	Yaeger			FUEL		
Crew	Finch			C.G.		
"	Greenspan	INSTRUMENTATION PLAN		BALLAST	See Loading 4	
U.S.A. Obs.	J. Sargent	SETUP NO.	AMEND NO.	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	Stauffer	Not Required		WIND		
TEST DIRECTOR	"			TEMP		
FINAL GO-NO GO AUTHORITY	"			RECORD ABOVE DATA		

CRAFT CHANGES SINCE LAST OPERATION

NONE

TEST PURPOSE

A. Demonstration to U.S. Army for acceptance:

1. Off load 2 MILVANS with swing crane.

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C. L. Stauffer		J. Sargent

TEST PROCEDURE

I. Position craft on BAC concrete ramp. In the event of adverse weather, hangar craft on North Side of Flight Test Hangar. (In hangar, external 400 hertz power to be used in lieu of APU.)

II. Perform Operator Inspection IAW Checklist.

III. Perform sections of normal pre-start, start, etc. required for APU (Generator On) operation. Man the operators position for periods when APU is operating.

IV. With craft on landing pads:

A. Conduct acceptance tests (DAAK02-75-C-0149, Attachment I, Page 11)

1. Swing crane off-load MILVANS per Attachment 1 (Ref. Item 9(A)6).

V. Secure craft and prepare for taxi tests (A3-0220).

B. Swing Crane Operations

The LACV-30 will be off cushion resting on its landing pads with the engines at idle and the APU operating to provide engine combustion air and electrical power. Observe precautions in Chapter 2, Section 3. The basic functions and sequence are as follows:

(1) The crewmen exit the cabin.

(2) Unlash the MILVANS.

(a) Slide the lock and pull handle on tensioner assembly to open position.

(b) Remove beaded assembly from tensioner.

(c) Remove beaded assembly from the MILVAN corner fitting.

(d) Remove tensioner assembly from the cargo tiedown fitting by removing the screw pin from the shackle and removing the shackle from the deck fitting. Reinstall the screwpin.

(e) Stow all lashings.

(3) Unlash load spreader pallets.

(a) Slip lines from the bollard.

(b) Unhook the line from pallet "D" ring.

(c) Stow all lines.

(4) Unlash chain hoists and lifting beams, stow lashings.

(5) Pull pins on outboard surf fence struts, swing forward and stow and repin. Install surf fence locks between surf fence sections.

(6) Pull swing crane transportation stow pins.

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(7) Engage tow chain in pallet chain fitting (2 forward pallets) and pin in position. Place tail of chain on pallets. Raise pallet tierod to UP position.

(8) Start hydraulic power unit.

WARNING

KEEP HANDS AND FEET CLEAR OF MOVING CHAIN, PULLEY, TIEROD AND HYDRAULIC ACTUATOR, ASSURE PALLETS AND CHAIN DO NOT SNAG OR JAM DURING FORWARD MOVEMENT.

(9) Operate swing crane forward. The two forward pallets and MILVAN will move forward approximately 13 ft.

WARNING

KEEP HANDS AND FEET CLEAR OF MOVING OR ROTATING EQUIPMENT.

(10) Operate swing crane aft, disengage pin and chain from both pallets, replace in, and simultaneously pull the port and starboard chain aft keeping the chain under tension and free of obstructions.

(11) Stop the crane when the limit blocks are aft of the pallet tow chain fittings.

(12) Re-engage tow chains in the pallet tow fittings. The nylon limit block must be forward of the tow fitting and as close to the fitting as possible with an equal number of links between fittings and limit blocks port and starboard. Replace pin. Place tail of chain on pallets.

WARNING

IF, DUE TO POSITION OF MILVAN ON PALLET, THE TIEROD WILL HIT THE SURF FENCE STRUTS — REMOVE THE TIEROD AND STORE ON FWD. DECK.

(13) Operate swing crane to position the front edge of MILVAN at guide mark on deck.

(14) Position swing crane to VERTICAL POSITION.

(15) Disengage chain from pallet tow fitting both sides. Replace pin.

(16) Attach snatch block from winch swing crane to jack assembly.

(17) Unlock jack and lower to ground.

(18) Repeat for opposite jack.

(19) Rotate jack pad 90 degrees. Jack swing crane tierod end to top of lateral support fitting.

(20) Repeat for opposite jack and secure winch.

(21) Operate swing crane to full aft position, simultaneously pulling the tow chain aft keeping the chain under tension and free of obstructions.

(22) Lower chain fall and lifting beam to top of MILVAN and engage beam hooks in MILVAN. Raise chain-fall to pretension the hooks.

CAUTION

BE CERTAIN BOW TRUNK SKIRTS ARE UNDER THE CRAFT SO TRAILER DOES NOT RUN OVER THEM.

(23) Move tractor/trailer into position.

WARNING

ENSURE THAT THE TOW CHAINS DO NOT CATCH ON PALLETS, CURBS. TIEDOWN FITTINGS OR THE HOIST HAND CHAIN DOES NOT ENGAGE THE SURF FENCE.

(24) Operate swing crane to lift MILVAN from the deck to the trailer.

(25) Lower chain fall and position MILVAN on trailer. Use tag lines if required.

(26) Disengage beam hooks from the MILVAN and operate chain hoist to raise the beam back up to position.

When only one MILVAN is to be unloaded, proceed to step 45. If a second MILVAN is to be unloaded, proceed as follows:

(27) Operate swing crane to aft position simultaneously pulling the tow chains aft keeping tension on the chains and free of obstructions.

NOTE

TRAILER CAN BE MOVED OUT.

(28) Remove pallet tierods and place on fwd deck.

(29) Attach pallet tiedown ropes to "D" rings of pallets and position pallets to center of deck.

(30) Engage tow chain in pallet chain fitting (2 aft pallets) and pin in position. Place tail of chain on pallets. Raise pallet tierod to UP position.

WARNING

KEEP HANDS AND FEET CLEAR OF MOVING CHAIN, PULLEY, TIEROD AND HYDRAULIC ACTUATOR. ASSURE PALLETS AND CHAIN DO NOT SNAG OR JAM DURING FORWARD MOVEMENT.

(31) Operate swing crane forward. The two pallets and MILVAN will move forward approximately 13 ft.

WARNING

KEEP HANDS AND FEET CLEAR OF MOVING OR ROTATING EQUIPMENT.

(32) Operate swing crane aft, disengage pin and chain from both pallets, replace pin, and simultaneously pull the port and starboard chain aft keeping the chain under tension and free of obstruction.

(33) Reengage tow chains in pallet chain fittings and pin in position. Place tail of chains on pallets.

WARNING

KEEP HANDS AND FEET CLEAR OF MOVING CHAIN, PULLEY, TIEROD AND HYDRAULIC ACTUATOR. ASSURE PALLETS AND CHAIN DO NOT SNAG OR JAM DURING FORWARD MOVEMENT.

CAUTION

ASSURE THE PALLET TIEROD IS IN THE UP POSITION AND OBSERVE THAT TIEROD AND MILVAN TRAVERSE THE TWO PALLETS ON CENTER OF DECK.

(34) Operate swing crane forward.

WARNING

KEEP HANDS AND FEET CLEAR OF MOVING OR ROTATING EQUIPMENT.

(35) Operate swing crane aft, disengage pin and chain from both pallets, replace pin, and simultaneously pull the port and starboard chain aft keeping the chain under tension and free of obstructions.

(36) Stop the crane when the nylon limit blocks are aft of the pallet tow chain fittings.

(37) Re-engage tow chains in the pallet tow fittings. The nylon limit block must be forward of the tow fitting and as close to the fitting as possible with an equal number of links between fittings and limit blocks port and starboard. Replace pin. Place tail of chain on pallets.

(38) Operate swing crane to position the front edge of MILVAN at guide mark on deck. As the pallets/MILVAN moves forward observe the tierod assembly in the lateral support fitting. If the rod assembly moves out of the supporting fitting, adjust the jacks to lower the tierod assembly back into position.

(39) Operate swing aft, disengage chain from pallet tow fitting both sides. Replace pin and pull tow chains aft.

(40) Lower chain fall and lifting beam to top of MILVAN and engage beam hooks in MILVAN. Raise chain fall to pretension the hooks.

CAUTION

BE CERTAIN BOW TRUNK SKIRTS ARE UNDER THE CRAFT SO TRAILER DOES NOT RUN OVER THEM.

(41) Move tractor/trailer into position.

WARNING

ENSURE THAT THE TOW CHAINS DO NOT CATCH ON PALLETS, CURBS OR TIEDOWN FITTINGS.

(42) Operate swing crane to lift MILVAN from the deck to the trailer.

(43) Lower chain fall and position MILVAN on trailer. Use tag lines if required.

(44) Disengage beam hooks from the MILVAN and operate chain hoist to raise the beam back up to position.

(45) Operate the swing crane to the vertical position simultaneously pulling the chains aft. Keeping tension on the chains and free of obstruction.

NOTE

MOVE THE TRAILER OUT.

(46) Raise the jack pads and repin the tierods in the lateral support fitting, both sides.

(47) Attach the winch hook to the jack and hoist to the stow position and latch onto the gantry.

(48) Repeat for opposite jack and secure winch.

(49) Reposition and repin surf fence struts. Remove surf fence locks and stow.

(50) Operate swing craft aft simultaneously pulling the chains aft. Keeping tension on chains and free of obstructions.

(51) Attach pallet tiedown ropes and manually pull aft pallets to position as marked on deck.

(52) Repeat for the fwd pallets.

(53) Secure the chain hoists and lift beams.

(54) Lash pallets to deck with 4-150070-33 rope assemblies.

(55) Reposition the pallet tierods between the aft pallets and between the fwd pallets.

(56) Secure the tow chains.

U.S. ARMY ACCEPTANCE

LACV-30-1

SWING CRANE MILVAN OFF-LOAD

The acceptance tests as defined in this attachment were accomplished.

COMMENTS:

Accepted with understanding that a hydraulic actuation will insure contact of the forward skids with ground surface when a fully loaded MILVAN (44,800 lbs) is over center, forward, to prevent load runaway.

COMPLETED C. J. Sanders
BAC

ACCEPTED John J. Sargent
U.S.A. REPRESENTATIVE
19 Feb 76

VERIFIED Fred Mueller 2/19/76
BAC QUALITY

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-1		OPER. NO. A3-0220		
ACV CREW		**CHASE AIRCRAFT** NO		**TEST CONDITIONS**		
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF**	**LAND**
Operator	Hall			WEIGHT		TBD
Co-Operator	Yaeger			FUEL	Loading	No. 5
U.S.A. Obs.				C.G.	-	-
		INSTRUMENTATION PLAN None		BALLAST	0	0
		SETUP NO.	**AMEND NO.**	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	Stauffer	VHF	121.7	WIND		
TEST DIRECTOR	"	VHF-FM	P 55.85 S 85.55	TEMP		
FINAL GO-NO GO AUTHORITY	"	UHF-FM	6	RECORD ABOVE DATA		

CRAFT CHANGES SINCE LAST OPERATION

MILVANS and associated hardware removed.

TEST PURPOSE

A. Demonstration to U.S. Army for acceptance:

1. Hover with no load.
2. Maneuvering (8's).
3. Speed Run (25-35 mph)
4. Prop Reversal Stop from $\geq$ 25 mph.

TEST ENGINEER C. J. Stauffer	OPER. IN COMMAND	APPROVAL J. Hargett

TEST PROCEDURE

I. Position craft on BAC concrete ramp north of Production Hangar. Restrain as required for wind and slope.

II. Perform Operator Inspection IAW Checklist.

III. Perform normal pre-start, start, etc. IAW Checklists.

IV. Operate craft and systems as required:

A. Conduct acceptance tests (DAAK02-75-C-0149, Attachment I, Page 11)

1. Hover without load per Attachment 1 (Ref. Item (9)(a)2)a)
2. After release of restraints, taxi to preselect area on NFIAP. Maneuver (8's) per Attachment 2 (Ref. Item (9)(a)2)c)
3. Perform speed runs per Attachment 3 (Ref. Item (9)(a)2)b)
4. On any 25 mph run, accomplish stop using full propeller reversal per Attachment 4 (Ref. Item (9)(a)2)e).

V. Return to BAC Ramp and secure craft.

U.S. ARMY ACCEPTANCE

LACV-30-1

OVERLAND HOVER WITHOUT LOAD

1. Verify craft configured per loading 5 (≃85,000 lb. G.W.).

2. In cushion mode, trim and perform a 15 minute demonstration at N_2 maximum (91% N_2 minimum).

3. Manually record the following data:

	START				COMPLETE			
Time	1,342				1,357			
Fuel (Fwd)	55%		55%		55%		55%	
(Main)	65%		65%		65%		65%	
(Aft)		48%				48%		
T_7 (°C)	405	460	450	430	405	460	450	430
N_1 (%)	85.0	87.5	87.0	86.0	85.0	87.	87.	86.
N_2 (%)	91	91	91	91	91	91	91	91
Q (psi)	22	22	21	25	22	22	21	25

COMMENTS:

COMPLETED C. L. Stafford BAC ACCEPTED [signature] 20 Feb 76 U.S.A. REPRESENTATIVE

VERIFIED Fred Mueller 2/20/76 QUALITY

U.S. ARMY ACCEPTANCE

LACV-30-1

OVERLAND MANEUVERING (8's)

1. Determine wind direction in the test area.

2. At a safe maneuvering ground speed (5 to 10 mph) perform "8" approximately up and down wind.

3. Record time through each (2) 360°.

Upwind 15 Secs. Downwind 20 Secs.

4. Record wind direction 260 Velocity 5 mph.

5. As practicable, record turn radii.

Upwind 15 Ft. Downwind 20 Ft.

6. COMMENTS:

COMPLETED C. J. Stauffer 20 FEB 76
BAC

ACCEPTED [signature] 20 FEB 76
U.S.A. REPRESENTATIVE

VERIFIED Fred Mueller 2/20/76
BAC QUALITY

U.S. ARMY ACCEPTANCE

LACV-30-1

OVERLAND SPEED RUNS (25 TO 35 mph)

1. Determine wind direction in the Test Area.

2. Record Wind Direction 260, Velocity 5 mph.

3. On wind dependent course selected, perform two reciprocal runs at speed from 25 to 35 mph (estimated).

4. Record IAS, ground speeds attained and measurement method (pacer, time/dist., other).

	IAS (mph)	GS (mph)	Method
Run 1	42	37	Time Distance
Run 2	45	33	" "
Average	43.5	35	" "

5. COMMENTS:

COMPLETED C. T. Shuffler BAC ACCEPTED Margaret T. 20 Feb 76 U.S.A. REPRESENTATIVE

VERIFIED Fred Mueller 2/20/76 BAC QUALITY

U.S. ARMY ACCEPTANCE

LACV-30-1

OVERLAND STOP ($\geq$25 mph)

1. In conjunction with "OVERLAND SPEED RUNS" (Attach. 3), perform a stop from any attained speed over 25 mph using normal propeller reversal techniques.

2. Record

Attained Speed (mph)	45	IAS	37	GS
Stopping Distance	1,600	Ft.	Scale	(Method)
Stopping Time	56	Sec.		
Inst. Obs. (Av.)	RUN	(Reference	STOP	(Max.)
T_7 (°C)	450		450	
N_1 (%)	-		-	
N_2 (%)	92		92	
Q (psi)	34		36	

3. COMMENTS

COMPLETED C. L. Stauffer 20 Feb 76
BAC

ACCPETED [signature] 20 Feb 76
U.S.A. REPRESENTATIVE

VERIFIED Fred Mueller 2/20/76
BAC QUALITY

TABLE 4.2. LACV-30-1 TESTS AT FT. STORY

THIS TABLE CONSISTS OF A SERIES OF TEST PLANS FOLLOWED BY TEST DATA.

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-1		OPER. NO. A1- 0114 (1477)		
ACV CREW		NO **CHASE AIRCRAFT**		**TEST CONDITIONS**		
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF**	**LAND**
Operator	D. Hall			WEIGHT	76,000	
Oper. Nav.	Msgt R. Layman			FUEL	As Noted	
Obs.	Lt. R. Lindsey			C.G.	447	
Obs.	C. Pond	**INSTRUMENTATION PLAN** OCTAVE BAND ANAL.		BALLAST	Nine	
Obs./C.O.R.	G. Sargent	**SETUP NO.** N/A	**AMEND NO.** N/A	ALT SETTING	30.14	
		RADIO FREQ.		PRESS ALT	S.L.	
TEST ENGINEER	C. Stauffer	URC-80	VRC-46	WIND	L/V	
TEST DIRECTOR	C. Stauffer	P	P	TEMP	135F	
FINAL GO-NO GO AUTHORITY	C. Stauffer	S	S	Sea State	< 1	

CRAFT CHANGES SINCE LAST OPERATION

1. Corrected STBD Rear Roll Nozzle by replacing height probe pump. Also changed selector valve

Fuel Quantity	P	S
F	5%	12.5
M	35	35
A	42.5	

TEST PURPOSE

I. Water hover (15 minutes)
II. Speed runs (30-50 mph)
III. Cabin Noise Level (V max.)
IV. Maneuvering 8's (30-50 mph)
V. Safe Limits
VI. Engines failure/crash stop (30-50 mph)
VII. Engine failure/spinout (30-50 mph)

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
Chas J. Stauffer	D. Hall	G. Sargent COTR

TEST PROCEDURE

Normal start, etc. in accordance with Procedures and Checklists. Proceed to a suitable water test site agreeable to the C.O.R.

NOTE: Sea states are critical for the demonstration; SS < 1 is optimum, SS < 2 is acceptable, SS < 3 is limiting.

Conduct Acceptance and Type Tests (Ref.: DAAK02-75-C-0149, Exhibit I, Pages 10 and 11).

I. Water hover per Attachment I (Ref. Item (9)(a)1)b) - Acceptance)

II. Speed runs per Attachment II (Ref. Items (9)(a)1)d) - Acceptance)

III. Cabin noise level per Att. III (Ref. Item (9)(a)5) - Type

IV. Maneuvering 8's per Att. IV (Ref. Item (9)(a)1)f) - Type

V. Safe limits per Att. V (Ref. Item (9)(a)1)a) - Type

VI. Crash stop per Att. VI (Ref. Item (9)(a)1)e) - Type

VII. Spin out per Att. VII (Ref. Item (9)(a)1)g) - Type

Engine Start 0900
Lift Off 0910
Depart Area 0912 (for Ft. Stay)
Arrive Ft Stay 1008 (98 Knots Average)

Local @ Ft Stay
To 1100

U.S. ARMY ACCEPTANCE

LACV-30-1

WATER HOVER WITHOUT LOAD

1. Record craft weight 80,000 lbs. 447 l.c.g.

2. In cushion mode, trim and perform a 15 minute hover demonstration into the wind.

3. Manually record the following data:

	Start				Complete			
Time	0915				0930			
Sea State	<1				<1			
Heading	140				135			
Wind/Vel.	4V				4V			
% Fuel (Fwd.)	5	12.5			5	12.5		
(Main)	35	35			32.5	32.5		
(Aft)	42.5				42.5			
N_2 (%)	95	95	95	95	95	95	95	95
TOP (psig)	22	24	24	23	23	25	24	23

COMMENTS:

Completed Chuck Stuffle Accepted [signature]
U.S.A. Representative

Verified CIS for
BAC Quality

U.S. ARMY ACCEPTANCE

LACV-30-1

OVERWATER SPEED RUNS

1. Proceed to the selected operating area.

2. Record environmental data off cushion.

+30°	<1	L/V	76,000
OAT (°C)	Sea State	W/V	G.W. (lbs.)

3. Hover into the wind and trim as required.

4. Accelerate thru hump observing engine limits.

5. Continue acceleration to full speed (30 - 50 mph target) with ballast trim as required for maximum performance.

6. Record data at maximum speed (53mph CAS).

T_7 (°C)	580	595	590	575
N_1 (%)	99	100	100	100
N_2 (%)	95	95	95	95
TOP (psi)	52	51	52	52

Limiting Parameter/Value #2 EGT 595

NOTE: Speed obtainable may be a function of Sea State and/or Gross Weight. Maximum permissable speeds, CAS (mph) = IAS - Wind Speed are: SS1 = 60, SS2 = 45, SS3 = 35.

7. If practicable, timed runs should be made in near calm water over a measured course. Upwind and downwind passes should be made if the head/tail wind component is greater than 5 mph. Record pertinent data below:

W/V	Heading	Dist.	Time	Speed
L/V	160	1N.M	1.12 EAN	53K

7. Cont'd.

NOTE: If used, record craft data in Item 6.

8. COMMENTS:

DATA Taken by MSgt R. Layman

Completed [signature] Accepted [signature]
U.S.A. Representative

Verified C I S for
BAC Quality

U.S. ARMY ACCEPTANCE

LACV-30-1

CABIN NOISE LEVEL - FULL SPEED

1. Concurrent with Attachment A1-II, conduct a survey with engines at full power and craft at full speed. Obtain noise data at ear level.

2. Record reference data:

T_7 (°C)	520	540	545	520
N_1 (%)	91	94	92	94
N_2 (%)	95	95	95	95
TOP (psi)	43	45 (corr.)	43	43

5 No. of Crew | <1 SS | +1 OAT (°C) | 42 IAS (mph)

3. Record Octave Band Analyzer data:

Freq. (hz)	A Operator Raw	A Operator Corr.	A Passenger Raw	A Passenger Corr.
16,000	61	66	62	68
8,000	63	69	60	65
4,000	66	71	68	71
2,000	75	81	77	83
1,000	82	88	83	89
500	84	89	85	90
250	91	94	93	99
125	94	99	96	101

NOTE: A is at MAX. CONT. Power (Normal)
B is at MAX. Power (5 minute limit

4. Record model and S/N of Test Equipment.

Octave Band Noise Analyzer
General Radio Corp Type 1568-P S/N 732

5. Attach calibration sheets.

N/A

Completed C. T. Stanfa Accepted _____
U.S.A. Representative

Verified C. T. Stanfa
BAC Quality

U.S. ARMY ACCEPTANCE

LACV-30-1

MANEUVERING (8's) - OVER WATER

1. Proceed to the selected operations area.

   NOTE: If practicable, maneuvers should be made near buoys so that turning radii can be estimated. Alternately, distances can be measured by radar.

2. Demonstrate maneuvering by performing Figure 8's at two speeds (IAS) as determined in BAC tests to be safe in the existing sea and wind conditions (30 - 50 mph target entry).

3. Record data as follows:

	Pattern 1	Pattern 2
Sea State	<1	<
W/V	L/V	L/V
Radii (Up wind)	1500	400
(Down wind)	—	—
Method	ESTIMATED (Radar, other)	
Average N_2 (%)	95	90
Maximum TOP (psi)	46	42
Entry Speed (IAS)	40	30

4. Comments:

Completed Charles T. Saffer Accepted _____
U.S.A. Representative

Verified C.L.Sh
BAC Quality

U.S. ARMY ACCEPTANCE

LACV-30-1

SAFE OPERATING LIMITS (WATER)

1. Proceed to the selected operations area.

2. Based on BAC tests under similar water and wind conditions, demonstrate that the craft will not "Plow In" at selected speeds in straight and yawed conditions (over water).

3. Record the following data:

	Yaw Angle = 0	Yaw Angle = 30 (Enter)
Sea State	<1	<1
W/V	4V	4V
Av. N_2 (%)	95	95
Av. TOP (psi)	48	48
Entry Speed (IAS)	45	45

4. Record any adverse behavior.

None

NOTE: "Plow In" is primarily encountered at high speeds over calm water where craft pitch trim is bow down. If requested and practicable, trim ballast may be moved forward to a condition proven safe in BAC tests for the foregoing demonstration.

5. Record fuel quantities (%) demonstrated:

Forward	0	0
Main	12	15
Aft	30	—

6. Comments:

Completed Chas F. Stauffer Accepted _____
U.S.A. Representative

Verified C. F. Stauffer
BAC Quality

U.S. ARMY ACCEPTANCE

LACV-30-1

ENGINES (2) FAILURE - "CRASH STOP"

1. Proceed to the selected operations area.

2. Based on BAC tests under similar water and wind conditions, demonstrate the craft under simulated engines (2) failure conditions with optimum trim from a target speed of 30-50 mph.

3. Record pertinent data.

	Yaw Angle = 0	Yaw Angle = 30 (Enter)
Sea State	<1	<1
W/V	4/V	4/V
"Cut" IAS	40	45
Time to Stop	9	15
Entry N_2 (%)	95 Av.	95 Av.
Entry TOP (psi)	44 Av.	48 Av.

4. Record craft behavior.

No adverse behavior

5. Record fuel quantities (%) demonstrated:

Forward	0	0
Main	20	20
Aft	30	—

6. Comments:

Stop in 9 sec; estimated 50 yds.

Completed _____ Accepted _____
U.S.A. Representative

Verified _____
BAC Quality

U.S. ARMY ACCEPTANCE

LACV-30-1

ENGINE (1) FAILURE - "SPINOUT"

1. Proceed to the selected operations area.

2. Based on BAC tests under similar water and wind conditions, demonstrate the craft under simulated engine (1) failure conditions with optimum trim from a target speed of 30-50 mph. Selected engine to be cut is at operator's discretion; corrective action is allowable.

3. Record pertinent data:

	Yaw Angle = 0	Yaw Angle = 30 (Enter)
Sea State	<1	<1
W/V	4/V	4/V
"Cut" IAS	40	30
Entry N_2 (%)	95 Av.	95 Av.
Entry TOP (psi)	48 Av.	44 Av.

4. Record corrective action.

Reduced power on opposite side

5. Record craft behavior.

Yaw in direction of cut, side lip until corrective action is taken. Estimate roll angle to failure = 25°.

6. Record fuel quantities (%) demonstrated.

Forward	0	0
Main	20	30
Aft	30	

7. Comments:

Completed C. J. Stafford Accepted J. Ramos
U.S.A. Representative

Verified C. J. Stafford
BAC Quality

BELL AEROSPACE ACV TEST PLAN	TYPE LACV-30-1	OPER. NO. A2- 0113 (1977)

ACV CREW		NO CHASE AIRCRAFT		TEST CONDITIONS		
CREW POSITION	NAME	TYPE A/C	CREW		TAKEOFF	LAND
Operator	D. Hall			WEIGHT		
Oper. Nav.	R. Laymon			FUEL	As Noted	
OBS/MERAD	LT. R. Lusby			C.G.	See Load Sht	
Obs/TECOM	C. Perno	INSTRUMENTATION PLAN NONE		BALLAST	STA 447 40,000	
Obs./C.O.R.	J. Bryant	SETUP NO. N/A	AMEND NO. N/A	ALT SETTING	30.09	
		RADIO FREQ.		PRESS ALT	S.L.	
TEST ENGINEER	C. Stauffer	URC-80	VRC-46	WIND	270/12	
TEST DIRECTOR	C. Stauffer	P 16	P	TEMP	+25°F	
FINAL GO-NO GO AUTHORITY	C. Stauffer	S 8	S	Sea State	1	

CRAFT CHANGES SINCE LAST OPERATION

Delivery Configuration Less:
1. ECT. Wiring, Std Power Mods
2. Windshield Washer Inoperative
3. Port Nav. Light Out

	F	M	A
Fuel: P	20	62.5	42.5
S	25	62.5	

TEST PURPOSE

I. Water hover with full load (115,000 lb. G.W.) for 15 minutes.

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C. Stauffer	D. Hall	

TEST PROCEDURE

Normal start, etc. in accordance with Procedures and Checklists. Proceed to a suitable water test site agreeable to C.O.R.

Conduct Acceptance Test (Ref: DAAK02-75-C-0149, Exhibit I, Page 11).

I. Water hover per Att. I (Ref. Item (9)(a)b).

Engine Start – 1140
Lift off – 1147 on 1/13/77

Notes: 1. P.S. 3+4 Flame Out on rapid power reduction.
2. P.S. 4 repeated at shore departure. Resa. Pwr.
3. P.S. 4 No Ng Control

S/D 1218 To T/S P.S. 4.

L.O. – 1336 on 1/13/77

U.S. ARMY ACCEPTANCE

LACV-30-1

WATER HOVER WITH LOAD

1. Record craft weight 116,000 lbs. 445 l.c.g.

2. In cushion mode, trim and perform a 15 minute hover demonstration into the wind.

3. Manually record the following data:

	Start				Complete			
Time	1350				1405			
Sea State	<1				<1			
Heading	330				330			
Wind/Vel.	140/10				140/10			
% Fuel (Fwd.)	20	25			10	10		
(Main)	62.5	62.5			50	50		
(Aft)	42.5				70			
N_2 (%)	94	94	94	94	94	94	94	94
TOP (psig)	48	49	47	47	48	49	47	47

COMMENTS:

Also speed runs; average with Max Cont Power 33mph. R. Laughing used radar Target distance/Time.

Completed C. J. Stauffer Accepted _____
U.S.A. Representative

Verified C. J. Stauffer
BAC Quality

NOTE: May not be required since hover overland conducted at 115,000 G.W.

TABLE 4.3 LACV-30-2 AT BAT

THIS TABLE CONSISTS OF A SERIES OF TEST PLANS FOLLOWED BY TEST DATA.

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-2		OPER. NO. A1-0409		
ACV CREW		NO **CHASE AIRCRAFT**		**TEST CONDITIONS**		
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF**	**LAND**
Operator	D. Hall			WEIGHT	Loading	006-2
Co-Operator	G. Yaeger			FUEL	(attached)	
U.S.A. Obs.	J. Sargent			C.G.		
		INSTRUMENTATION PLAN #1		BALLAST		
		SETUP NO.	AMEND NO.	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	C. Stauffer	UHF	121.7	WIND		
TEST DIRECTOR	"	UHF-FM	6	TEMP		
FINAL GO-NO GO AUTHORITY	"	VHF-FM	TBD			

CRAFT CHANGES SINCE LAST OPERATION

TEST PURPOSE

A. Demonstration to U.S. Army for acceptance:

1. Hover with full load.
2. System run-in tests
3. Cabin noise level (stationary)

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C. Stauffer	D. Hall	J. Sargent

TEST PROCEDURE

I. Position craft on BAC concrete ramp north of production hangar. Restrain as required for wind and slope.

II. Perform Operator Inspection IAW Checklist.

III. Perform normal pre-start, start, etc. IAW Checklists.

IV. Raise craft in hover mode.

A. Conduct acceptance tests (DAAK02-75-C-0149, Attachment 1, Pages 10 and 11).

1. Hover with full load per Attachment I (Ref. Item 9(A)2)A.
2. Perform system run-in tests per Attachment 2 (Ref. Item 9(A)3)A & B.
3. Obtain cabin noise level data per Attachment 3 (Ref. Item 9(A)5).

U.S. ARMY ACCEPTANCE

LACV-30-2

LAND HOVER WITH LOAD

1. Verify craft configured per Loading.
2. In mushion mode, trim and perform a 15 minute demonstration at N_2 maximum (91% N_2 minimum).
3. Manually record the following data:

	START				COMPLETE			
Time	1440				1455			
Fuel (FWD)	(P) 60		(S) 63					
(Main)	60		65		SAME			
(Aft)	25							
T_7 (°C)	570	540	480	460				
N_1 (%)	93.0	93.5	89.5	88.5				
N_2 (%)	91	91	91	91.5				
Torque (psi)	27	27	20	20				

COMMENTS:

COMPLETED G.F. Yaeger BAC ACCEPTED [signature] U.S.A. REPRESENTATIVE

VERIFIED Jack Mueller 4/9/70 BAC QUALITY

U.S. ARMY ACCEPTANCE

LACV-30-2

SYSTEM RUN-IN TESTS

1. Starting concurrent with Hover (Attachment 1) and continuing off cushion for a total of one hour, functionally operate the following systems:

Start Time 1445 Complete Time 1545

	BAC	U.S.A.
Puff Ports (20 cycles each)	YES	S
Cabin Heaters (Both, Lo and Hi)	YES	
Windshield Heat (Continuous)	YES	
Air Conditioner (Vent & Cool)	YES	
APU (Generator On)	YES	
AN/URC-80 (4 Contacts)	YES	
AN/URC-46 (4 Contacts)	NO	
AN/PRC-94 (4 Contacts)	YES	
RMHS System (Continuous)	YES	
AN/ASN-43 Compass (Continuous)	NO	
Radar (Continuous)	YES	
Fuel Trim (To/From Transfers)	YES	
Engines (Continuous)	YES	
Propellers (As Required)	YES	
Windshield Wipers (4 Cycles)	YES	
Spotlight (4 Cycles)	YES	
Running Lights (Continuous)	YES	
Horn (4 Blasts)	YES	

DISCREPANCIES AND DISPOSITION:

COMPLETED G.E. Yeager
BAC

ACCEPTED
U.S.A. REPRESENTATIVE

VERIFIED Ted Mueller 4/9/76
BAC QUALITY

U.S. ARMY ACCEPTANCE

LACV-30-2

CABIN NOISE LEVEL - STATIONARY

1. Concurrent with Attachment 1, conduct survey with engines at full power (N_2 maximum). Using an Octive-Bad Noise Analyzer, record noise levels at ear level.

	Operator		Freq.	Passenger	
	(Raw)	(Corr.)	(Hertz)	(Raw)	(Corr.)
Band 1	0	____	]6000	0	____
2	58	____	8000	58	____
3	64	____	4000	64	____
4	66	____	2000	68	____
5	74	____	1000	78	____
6	84	____	500	88	____
7	98	____	250	98	____
8	102	____	125	106	____

Record engine parameters.

N_1 (%)	93.0	93.5	89.5	88.5
N_2 (%)	91.0	91.0	91.0	91.5
Torque (psi)	27	27	20	20
Prop. Pitch	0		0	

Record Model and Serial No. of Test Equipment.

General Radio Model 1558AP Octave Band Noise Analyzer, S/N 732.

Attach Calibration Sheets.

COMPLETED _____ ACCEPTED _____
BAC U.S.A. REPRESENTATIVE

VERIFIED _____ 4/9/76
BAC QUALITY

LACV-30 #2, VOYAGEUR #006
2ND TEST WEIGHT AND BALANCE

	Weight	Longitudinal Arm	Moment
Basic Weight LACV-30 #2 Voyageur #006 From LACV-30 #1 Actual Weight	51859	488.4	25328000
Test Instrumentation	(536)		(322906)
Instr. Package Install. Craft Attitude	34	439.5	14943
Instr. Package Install. Data Acquisition	484	613.8	297079
Flex. Conduit for above	10	690.0	6900
Control Install. Cabin Data Acquisition	8	498.0	3984
Revised Basic Weight	52395	489.6	25650906
Load Spreaders - Fwd	1106	299	330694
Load Spreaders - Aft	958	483	462714
Lashings - MILVAN - Fwd	428	390	166920
Tee Hooks	152	658	100016
Sub-Total Weight	55039	485.3	26711250
Crew	360	653	235080
Passengers	360	716	257760
Unusable Fuel	650	397.5	258375
Cargo - MILVAN #3610	4745	390	1850550
- Ballast	14331	390	5589090
Operating Weight	75485	462.4	34902105
Fuel - Fwd 73% (5103)	3748	100.5	376674
- Main 85% (14755)	12543	397.5	4985843
- Aft 12% (4849)	590	810.5	478195
Gross Weight	92366	441.1	40742817

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-2		OPER. NO. A2-0409		
ACV CREW		NO **CHASE AIRCRAFT**		**TEST CONDITIONS**		
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF**	**LAND**
Operator	Hall			WEIGHT	Loading	006-2
Co-Operator	Yaeger			FUEL	(Attached)	
U.S.A. Obs.				C.G.		
		INSTRUMENTATION PLAN #1		BALLAST		
		SETUP NO.	**AMEND NO.**	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	Stauffer	VHF	121.7	WIND		
TEST DIRECTOR	"	VHF-FM	P 55.85 S 85.55	TEMP		
FINAL GO-NO GO AUTHORITY	"	UHF-FM	6			

CRAFT CHANGES SINCE LAST OPERATION

TEST PURPOSE

A. Demonstration to U.S. Army for acceptance:

1. Hover with no load.
2. Speed Run (25 - 35 mph)

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C Stauffer	D Hall	John J Sargent

TEST PROCEDURE

I. Position craft on BAC concrete ramp north of Production Hangar. Restrain as required for wind and slope.

II. Perform Operator Inspection IAW Checklist.

III. Perform normal pre-start, start, etc. IAW Checklists.

IV. Operate craft and systems as required:

A. Conduct acceptance tests (DAAK02-75-C-0149, Attachment I, Page 11):

1. Hover without load per Attachment 1 (Ref. Item (9)(a)2)a).
2. Perform speed runs per Attachment 2 (Ref. Item (9)(a)2)b).

V. Return to BAC Ramp and secure craft.

U.S. ARMY ACCEPTANCE

LACV-30-2

OVERLAND HOVER WITHOUT LOAD

1. Verify craft configured per loading.

2. In cushion mode, trim and perform a 15 minute demonstration at N_2 maximum (91% N_2 minimum).

3. Manually record the following data:

	START	COMPLETE
Time		
Fuel (Fwd)		
(Main)	SEE A/	
(Aft)		
T_7 (°C)		
N_1 (%)		
N_2 (%)		
Q (psi)		

COMMENTS: Mr. Saigint was satisfied with previous results; therefore repeat of test was not necessary.
C. F. Schiller
4/9/76

COMPLETED G. P. Yaeger BAC

ACCEPTED [signature] U.S.A. REPRESENTATIVE

VERIFIED [signature] 4/9/76 QUALITY

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U.S. ARMY ACCEPTANCE

LACV-30-2

OVERLAND SPEED RUNS (25 TO 35 mph)

1. Determine wind direction in the Test Area.

2. Record Wind Direction 345, Velocity 10 mph.

3. On wind dependent course selected, perform two reciprocal runs at speed from 25 to 35 mph (estimated).

4. Record IAS, ground speeds attained and measurement method (pacer, time/dist., other).

	IAS (mph)	GS (mph)	Method (Time/Dist)
Run 1	35	30	SCALED EAST TO WEST
Run 2	55	12	SCALED WEST TO EAST
Average	45	36	SCALED (AVERAGE)

5. COMMENTS:

COMPLETED _____ ACCEPTED _____
BAC U.S.A. REPRESENTATIVE

VERIFIED _____ 4/9/76
BAC QUALITY

TABLE 4.4. LACV-30-2 AT APG

THIS TABLE CONSISTS OF A SERIES OF TEST PLANS
FOLLOWED BY TEST DATA.

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-2		OPER. NO. A1-0914	
ACV CREW		NO **CHASE AIRCRAFT**		**TEST CONDITIONS**	
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF** / **LAND**
Operator	D. Hall			WEIGHT	75,000# / 73,000
Oper. Nav.	C. Stauffer			FUEL	See A1-1
Obs 1	Capt Temples			C.G.	433
Obs 2	F Wuelle	INSTRUMENTATION PLAN APG		BALLAST	As Required
Obs./C.O.R.	J. Sturgeon Outside	SETUP NO.	AMEND NO.	ALT SETTING	0
		RADIO FREQ.		~~PRESS ALT~~ BARO	30.34" hg
TEST ENGINEER	C. Stauffer	URC-80	VRC-46	WIND	18 kt / 2
TEST DIRECTOR	C. Stauffer	P	P	TEMP	30.4°C / 31.0°C
FINAL GO-NO GO AUTHORITY	C. Stauffer	S	S	Sea State	Calm

CRAFT CHANGES SINCE LAST OPERATION

AMS Complete
Two Mil Wands

TEST PURPOSE

I. Water hover (15 minutes)
II. Speed runs (30-50 mph)
III. Obstacles (wall & ditch)
IV. Net Thrust Measurements
V. Air Conditioning Functional Test

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C. Stauffer	Doug Hall	

TEST PROCEDURE

Normal start, etc. in accordance with Procedures and Checklists. Proceed to a suitable water test site agreeable to the C.O.R.

NOTE: Sea states are critical for the demonstration; SS < 1 is optimum, SS < 2 is acceptable, SS < 3 is limiting.

Conduct Acceptance and Type Tests (Ref.: DAAK02-75-C-0149, Exhibit I, Pages 10 and 11).

I. Water hover per Attachment I (Ref. Item (9)(a)1)b) - Acceptance)

II. Speed runs per Attachment II (Ref. Items (9)(a)1)d) - Acceptance)

III. Obstacles per Attachment III (Ref. Item (9)(a)2)d) - Type)

IV. Net thrust per Attachment IV (Ref. Item (9)(a)1)c) - Type)

V. Air conditioning per Attachment V (Ref. Item (9)(b)7) - Acceptance)

U.S. ARMY ACCEPTANCE

LACV-30-2

WATER HOVER WITHOUT LOAD

1. Record craft weight 75,000 lbs. 433 l.c.g.
2. In cushion mode, trim and perform a 15 minute hover demonstration into the wind.
3. Manually record the following data:

	Start				Complete			
Time	1450				1510			
Sea State	Calm				Calm			
Heading	115				120			
Wind/Vel.	L/V				L/V			
% Fuel (Fwd.)	85	85			85	85		
(Main)	30	25			30	25		
(Aft)	0				0			
N_2 (%)	82	81	82	82	82	82	81	82
TOP (psig)	14	16	14	16	15	16	15	16

COMMENTS:

None

Completed C. L. Stuffle

Verified Fred Mueller
BAC Quality

Accepted R. J. Sargent
U.S.A. Representative

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U.S. ARMY ACCEPTANCE

LACV-30-2

OVERWATER SPEED RUNS

1. Proceed to the selected operating area.

2. Record environmental data off cushion.

30.4	Calm	180/2	25,000
OAT (°C)	Sea State	W/V	G.W. (lbs.)

3. Hover into the wind and trim as required.

4. Accelerate thru hump observing engine limits. OK sea.

5. Continue acceleration to full speed (30 - 50 mph target).with ballast trim as required for maximum performance.

6. Record data at maximum speed (45 mph CAS). 42 mph N 45 mph Plow

T_7 (°C)	590	586	600	580
N_1 (%)	98	99.6	95	95.5
N_2 (%)	90	90	90	90
TOP (psi)	40	42	36	36

Limiting Parameter/Value Trim Attitude

NOTE: Speed obtainable may be a function of Sea State and/or Gross Weight. Maximum permissable speeds, CAS (mph) = IAS - Wind Speed are: SS1 = 60, SS2 = 45, SS3 = 35.

7. If practicable, timed runs should be made in near calm water over a measured course. Upwind and downwind passes should be made if the head/tail wind component is greater than 5 mph. Record pertinent data below:

W/V	Heading	Dist.	Time	Speed
L/W	245	2 n.m.	3.2	38K (44mph)
H/V	060	2 n.m	3.4	35.5 (41mph)

7. Cont'd.

NOTE: If used, record craft data in Item 6.

8. COMMENTS:

1. Item 7, 2nd run had gentle pleu-up prior to completion.

2. Speed runs were not at MAXIMUM POWER due to uncompensated T/O limits.

Completed C. L. Stauffer

Verified Fred Mueller
BAC Quality

Accepted L. J. Sargent
U.S.A. Representative

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US ARMY ACCEPTANCE
LACV-30-2

OBSTACLES

1. Record craft weight 78,000 lbs and 438.0 l.c.g.

2. With N_2 at maximum and power as required, negotiate a ditch (approximately 6 ft wide by 9 ft deep) and vertical obstacle (3 ft maximum height).

3. Manually record the following data:

	DITCH				STEP			
TIME	9/14/76 1530				9/15/76 1445			
HEADING	180				360			
WIND/VEL	L/V				09 V 12			
N_1 (%)	98	98	98	98	99	99	100	100
N_2 (%)	90	90	90	90	96	95	95	95
T_7 (°C)	600	600	600	600	630	630	630	630
TOP (psig)	42	42	41	40	38	41	42	40

COMMENTS:

IAS 22 mph
Engine Readings
Are Approximate

IAS 33 mph

COMPLETED Charles L. Scruff

ACCEPTED John J. Sargent
US Army Representative

VERIFIED Fred Mueller
BAT QUALITY

Note: Measured 10 foot wide ditch AT
Crossing point.

Total Time for 2 operations = 1.0 hrs.

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US ARMY ACCEPTANCE
LACV-30-2

NET THRUST MEASUREMENT

1. Record craft weight 78,600 lbs and 440 l.c.g.

2. On water, tether the craft to a government furnished thrust measuring device using a bridle attached to bow (and stern) tow fittings.

3. At target shaft speeds (N_2) of 60 and 95%, measure reverse and forward thrust. Record data in attached sheet (Test Nos. A thru D).

COMMENTS:

Due to inability to maintain craft normal to tether boat, the values obtained are not considered to be the maximum possible. Test will be repeated on land ops 9/8/76

COMPLETED [signature]

VERIFIED Fred Mueller
BAT QUALITY

ACCEPTED John J. Sargent
US Army Representative

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9/13/76

TEST DATA RECORDING LOG	OPERATION NO.	A1-IV	SHT 2 OF 2

TEST NO.	INST	POWER PLANT 1	2	3	4	REMARKS
A	T7					Reverse thrust off cushion
	N1					Target = 60%
	N2					Measured thrust = 5400 lbs
	TOP					
	PP	+23.5		-23.5		
	W/V	ASI RDG		HEADING		
B	T7					Reverse thrust on cushion
	N1					Target = 95%
	N2					Measured thrust = [illegible] lbs
	TOP					
	PP	-23.5		-23.5		
	W/V	ASI RDG		HEADING		
C	T7					Forward thrust off cushion
	N1					Target = 60%
	N2					Measured thrust = 2300 lbs
	TOP					
	PP	+23.5		+23.5		
	W/V	ASI RDG		HEADING		
D	T7					Forward thrust on cushion
	N1					Target = 95%
	N2					Measure thrust = [illegible]
	TOP					
	PP	+23.5		+23.5		
	W/V	ASI RDG		HEADING		
	T7					W/V 150/2 Hdg 230 START STOP
	N1					TIME 1115 1210
	N2					TEMPERATURE 15.6°C 16.0°
	TOP					BAROMETER 30.13 30.13
	PP					SEA STATE Calm Calm
	W/V	ASI RDG		HEADING		

US ARMY ACCEPTANCE
LACV-30-2

AIR CONDITIONER PERFORMANCE

1. In conjunction with any previous tests, determine the performance of the air conditioner (Target: 85°F maximum effective temperature at outside temperature of 125°F).

2. Manually record the following data (30 minute period):

	START	STOP
TIME (AIR CONDITIONER)	1425	1455
OUTSIDE AIR TEMPERATURE	101F°	101°F
CABIN TEMPERATURE:		
LEFT FRONT	101	78
RIGHT FRONT	101	78
LEFT REAR	101	78
RIGHT REAR	101	78
AVERAGE	101	78

COMMENTS:

Thermometer in Air Conditioner cooled in 10 minutes to 42°F.

COMPLETED Charles L. Stauffer ACCEPTED [signature]
US Army Representative

VERIFIED Fred Mueller
BAT QUALITY

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BELL AEROSPACE ACV TEST PLAN	TYPE: LACV-30-2	OPER. NO.: S - 0916

ACV CREW		CHASE AIRCRAFT		TEST CONDITIONS		
CREW POSITION	NAME	TYPE A/C	CREW		TAKEOFF	LAND
Operator	D. Hall			WEIGHT	N/A	
				FUEL		
				C.G.		
		INSTRUMENTATION PLAN: APG		BALLAST		
		SETUP NO.: A	AMEND NO.: 2	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	C. Bardak	N/A		WIND		
TEST DIRECTOR	C. Bardak			TEMP		
FINAL GO-NO GO AUTHORITY	C. Stauffer					

CRAFT CHANGES SINCE LAST OPERATION

1. Loaded MILVANS replaced with Empty
2. Instrumentation patched as noted

NOTE: Exhaust Collectors not installed

TEST PURPOSE

1. Overland Thrust Measurement
2. Partial Propeller Broadband Vibration Survey
3. Exhaust Collector Vibration Survey

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
		C. L. Stauffer

TEST PROCEDURE

A. Tether craft at stern to CFE Thrust Measurement Fan. Attach bridle on Stbd side to restrain lateral movement

B. Perform normal pre-operational, start, etc. procedures

C. With Prop Control set for 0 effective Thrust, step up N_2 from minimum to maximum in 2-3% increments. Voice Annotate magnetic tape.

D. Set N_2 at 95%. Advance β for TOP sets of approximately 5% to limit conditions. Manually record data on attached sheets.

E. At MAP, reduce N_2 in 2-3% increments to minimum. Voice Annotate magnetic tape.

F. Secure operations. Record Ambient data.

TEST DATA RECORDING LOG	OPERATION NO.	5-0916	SHT 1 OF 2

TEST NO.	INST	POWER PLANT 1	2	3	4	REMARKS
	T7	510	490	500	490	All with $N_2 \simeq 95\%$
	N1	87.8	90	87.6	87.2	
	N2	95.5	95.2	95.5	95.2	
	TOP	22	23	22	22	
	PP	≃ −5.5°				Set 0 Effective Thrust
	W/V		ASI RDG		HEADING	
	T7	510	520	520	510	
	N1	90.5	91.5	89	89.2	
	N2	95	94.5	95	94.8	
	TOP	25	26	25	25	Target 25% TOP
	PP	Adj		Adj		
	W/V		ASI RDG		HEADING	
	T7	530	520	530	530	
	N1	92.3	92.7	91.2	91.4	
	N2	94.3	94	94.5	94	
	TOP	30	30	30	30	Target 30% TOP
	PP	Adj		Adj		
	W/V		ASI RDG		HEADING	
	T7	550	540	570	560	
	N1	94.8	96	93.4	93.4	
	N2	93.5	93.2	93.7	93.3	
	TOP	35	36	35	35	Target 35% TOP
	PP	Adj		Adj		
	W/V		ASI RDG		HEADING	
	T7	570	550	600	580	
	N1	96	97	96	96	
	N2	97	97.4	95	95.5	
	TOP	40	40	40	40	Target 40% TOP
	PP		Adj	Adj		
	W/V		ASI RDG		HEADING	

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TEST DATA RECORDING LOG	OPERATION NO.		SHT ___ OF ___

TEST NO.	INST	POWER PLANT 1	2	3	4	REMARKS
	T7	600	580	640	610	
	N1	98.5	99.8	98.5	98.5	
	N2	92.3	92	92	91.7	
	TOP	45	46	45	46	TARGET 45% TOP
	PP	As Rqd				
	W/V	ASI RDG	HEADING			
	T7	625	610	640	640	To limit power conditions
	N1	100	101.5	78.5	99	
	N2	81	80	78.5	77.5	
	TOP	53.5	53.5	53.5	53.5	
	PP	+ 23.5°		+ 23.5°		As measured on Shutdown
	W/V	ASI RDG	HEADING			
	T7					As Req.
	N1					
	N2					
	TOP					
	PP					
	W/V	ASI RDG	HEADING			
	T7					
	N1					
	N2					
	TOP					
	PP					
	W/V	ASI RDG	HEADING			
	T7					
	N1					
	N2					
	TOP					
	PP					
	W/V	ASI RDG	HEADING			

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Cal. Vs (from Negative)

0 = −0.037 V

4 = +12.07 V = 10820 lb = 5183.7 lb/volt } Avg 5135.2 lb/volt

3 = +1.03 = 5450 lb = 5307 lb/volt

TEST DATA
(SOP MP 70-6)

DATE: 16 Aug 76

SHEET NO. _____

LACV-30 Rotary Pull on Land

	Torque	Time		Volts	Pull lb				
	25 psi	1355		0.448	2480				
				0.465	2590				
				0.465	2530				
	30 psi			0.577	3170				
				0.645	3710				
				.663	3600				
	35 psi			.850	4610				
				.847	4540				
				.863	4430				
	40 psi	1400		1.00	5330				
				1.02	5430				
	45 psi			1.12	5940				
				1.13	6000				
				1.14	6040				
	MAX Reads			1.15	6100				
				1.18	6250				
		↓			6330	MAX ON OSCILLOSCOPE			
	MAX Reads			1.04	6530				

STEAP-MT FORM 247, 1 May 74 (Edition of 29 Aug 69 may be used.)

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BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-2		OPER. NO. A2-		
ACV CREW		NO **CHASE AIRCRAFT**		**TEST CONDITIONS**		
CREW POSITION	**NAME**	**TYPE A/C**	**CREW**		**TAKEOFF**	**LAND**
Operator	D. Hall			WEIGHT	115,000	
Oper. Nav.				FUEL A 100	F 78 M 59	F 78 M 59
				C.G.	439.5	
		INSTRUMENTATION PLAN APG		BALLAST	50,000 MIDSHIP STA 273 + 457	
Obs./C.O.R.		SETUP NO.	AMEND NO.	ALT SETTING	0	
		RADIO FREQ.		PRESS ALT BARO	30.16 "hg	
TEST ENGINEER	C. Stauffer	URC-80	VRC-46	WIND	030/4	
TEST DIRECTOR	C. Stauffer	P	P	TEMP	23.7°C	
FINAL GO-NO GO AUTHORITY	C. Stauffer	S	S	Sea State	< 1'	

CRAFT CHANGES SINCE LAST OPERATION

TEST PURPOSE

I. Water hover with full load (115,000 lb. G.W.) for 15 minutes.

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
C. L. Stauffer	Doug Hall	J. J. Sargent

TEST PROCEDURE

Normal start, etc. in accordance with Procedures and Checklists. Proceed to a suitable water test site agreeable to C.O.R.

Conduct Acceptance Test (Ref: DAAK02-75-C-0149, Exhibit I, Page 11).

I. Water hover per Att. I (Ref. Item (9)(a)b).

NOTE: Open items from Test A1 may be added by reference to this operation.

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U.S. ARMY ACCEPTANCE

LACV-30-1

WATER HOVER WITH LOAD

1. Record craft weight 115,000 lbs. 439.5 l.c.g.

2. In cushion mode, trim and perform a 15 minute hover demonstration into the wind.

3. Manually record the following data:

	Start		Complete	
Time	1545		1609	
Sea State	2-1		2-1	
Heading	293		293	
Wind/Vel.	030/6		030/4	
% Fuel (Fwd.)	40	40	40	40
(Main)	60	60	60	47
(Aft)	97		90	
N_2 (%)	92	93	90	93	85	86	82	86
TOP (psig)	40	42	42	42	17	16	18	16
	PWR				HOVER			

COMMENTS:

AUGMENTOR @ 1200
600°C 101 N_2, 92 N_2, 42 TOP - PAS stopped in 10 minutes
WATER 40' or above
Time to 10 knots (SNWD) 1:47 sec = 19.2 mph

Completed C. L. Stuffle Accepted L. J. Sargent
U.S.A. Representative

Verified C. Ross
~~BAC Quality~~

TABLE 4.5 - THRUST LOADING

Condition	$H.P._{TOT}$	$H.P._L$	$H.P._P$	C_P	Net Force/Prop Lbs.	Aero Drag Lbs.	Mom. Drag	Thrust Lbs.	C_T	C_T Pred.	% Pred.
Hover Test Point											
1	734	547	184	0.0206	0	19.9	45.4	32.7	0.0020	NA	-
2	828	536	286	0.0325	1265		44.9	1297.4	0.0796	NA	-
3	972	513	445	0.0527	1830		43.9	1861.9	0.1172	NA	-
4	1139	509	617	0.0736	2295		43.7	2326.8	0.1470	0.166	88.6
5	1285	497	771	0.0937	2688		43.1	2719.5	0.1742	0.1962	88.8
6	1448	481	948	0.1154	2997		42.4	3028.1	0.1974	0.226	87.3
7	1467	297	1148	0.224	3113	19.9	32.2	3133.0	0.2758	0.287	96.1

$H.P._L$ Calculated

$H.P._P = 0.98\ (H.P._{TOT} - H.P._L)$ $\eta_p = 0.98$ Used in all predicted calculations

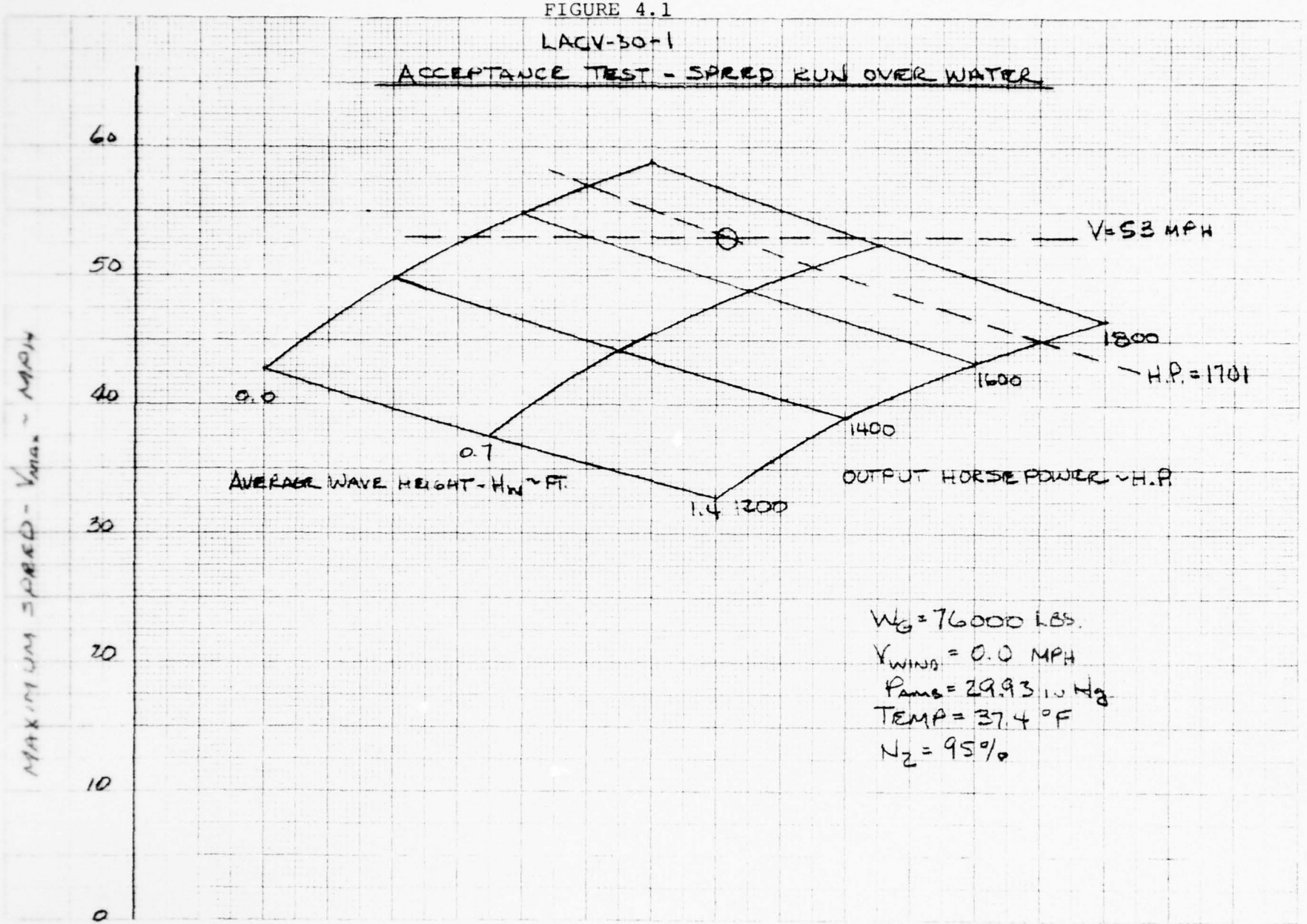
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K+E 10 TO 1 INCH 5 X 5 INCHES KEUFFEL & ESSER CO MADE IN U.S.A. 46 1323

FIGURE 4.1

LACV-30-1

ACCEPTANCE TEST - SPEED RUN OVER WATER



W_G = 76000 LBS.
V_{WIND} = 0.0 MPH
P_{AMB} = 29.93 in Hg
TEMP = 37.4 °F
N_Z = 95%

FIGURE 4.2

LACV-30-2

ACCEPTANCE TEST - SPEED RUN OVER WATER

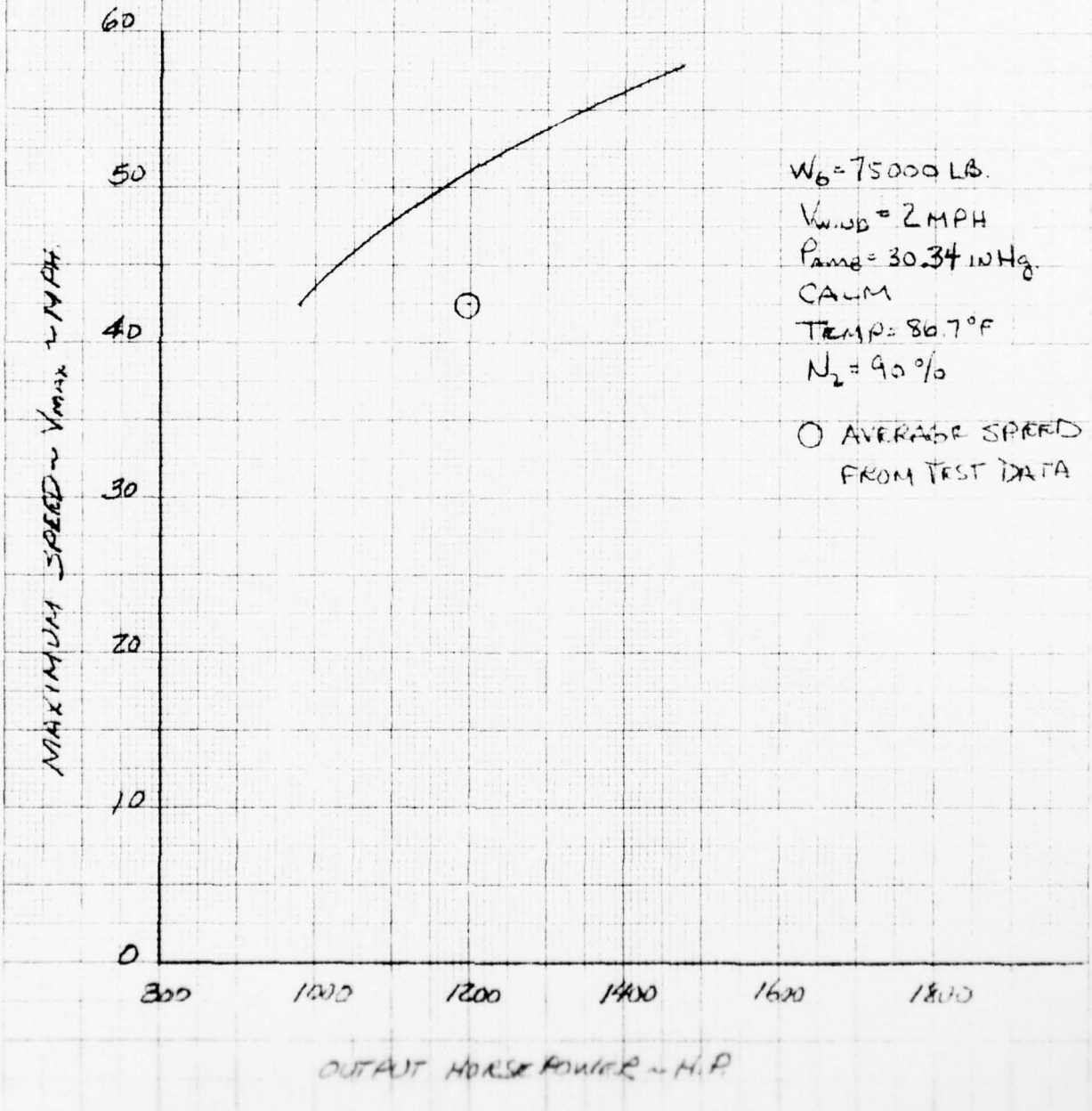
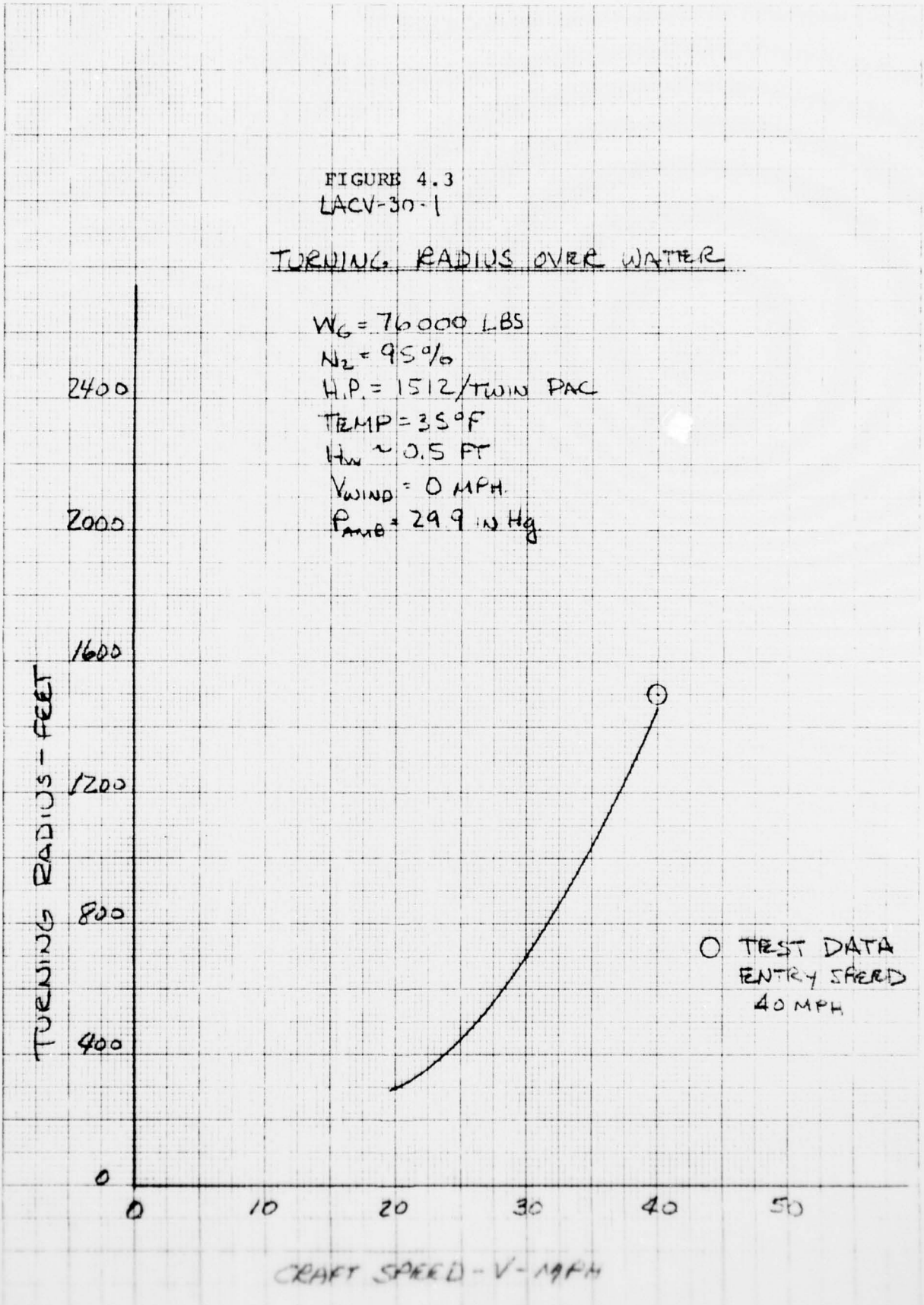
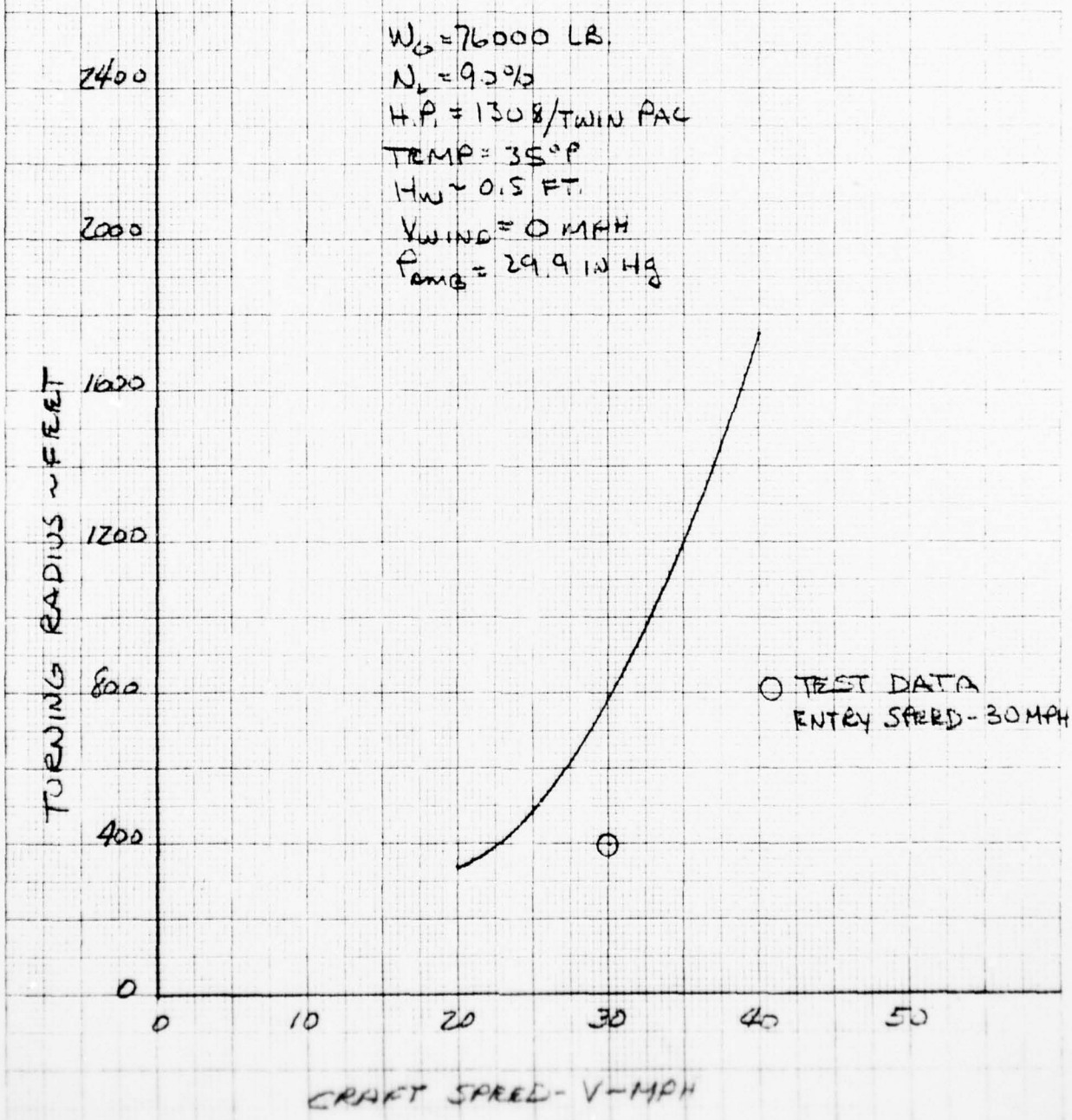


FIGURE 4.3
LACV-30-1



K&E 10 X 10 TO THE INCH
KEUFFEL & ESSER CO
46 1323

FIGURE 4.4
LACV-30-1
TURNING RADIUS OVER WATER



APPENDIX A

CONTRACTORS' ACCEPTANCE TESTS

BELL AEROSPACE ACV TEST PLAN		TYPE LACV-30-2		OPER. NO. S2- 0410	
ACV CREW		NO CHASE AIRCRAFT		91,000 lb. TEST CONDITIONS	
CREW POSITION	NAME	TYPE A/C	CREW		TAKEOFF / LAND
Operator	G. Yeager			WEIGHT	91,000 / 89,000
Oper. NAV	R. Towers			FUEL	See Load. #2
Inst.	E. Schiffmacher			C.G.	440
Engr.	R. Speth	INSTRUMENTATION PLAN		BALLAST	
		SETUP NO.	AMEND NO.	ALT SETTING	29.96
		RADIO FREQ.		PRESS ALT	590'
TEST ENGINEER	M. Laszewski	Not Required		WIND	030/30
TEST DIRECTOR	M. Laszewski			TEMP	+49°C / +57°
FINAL GO-NO GO AUTHORITY	G. Yeager				

CRAFT CHANGES SINCE LAST OPERATION

TEST PURPOSE

I. Skirt pressure survey at 91,000 lb. G.W.

II. Cabin contamination sampling.

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
Signed	Signed	

TEST PROCEDURE

Position craft on selected concrete ramp. Perform standard checklists. Tether craft at stern.

I. Conduct skirt pressure survey in accordance with Attachment I (M. Laszewski's IOM).

II. During the above test, sample cabin atmosphere at breathing level for noxious and toxic fumes using sampling kit provided by Safety Engineering. Record data on Attachment II.

CABIN CONTAMINATION

(Tethered - Max. Power)

A. Craft Configuration:

TT (°C)	490	460	460	490
N_1 (%)	96.2	96.5	96.3	96.0
N_2 (%)	95	95	96	95
TOP (psi)	27	27	25	25

Air Conditioner: OFF

Heater: OFF

Cabin Vents: CLOSED

B. Environment:

OAT (°C): +47°C Baro. (in. Hg): 29.32

Wind Direction: 050° Craft Heading: 230°

Wind Velocity: 20 mph

C. Samples:

Fumes	Measured (ppm)	Limit (ppm)
Carbon Monoxide	20	50
Carbon Dioxide	3500	5000
Nitrogen Dioxide	Unmeasurable	5
Sulfur Dioxide	Unmeasurable	5
Unburned Hydrocarbons	50	Various

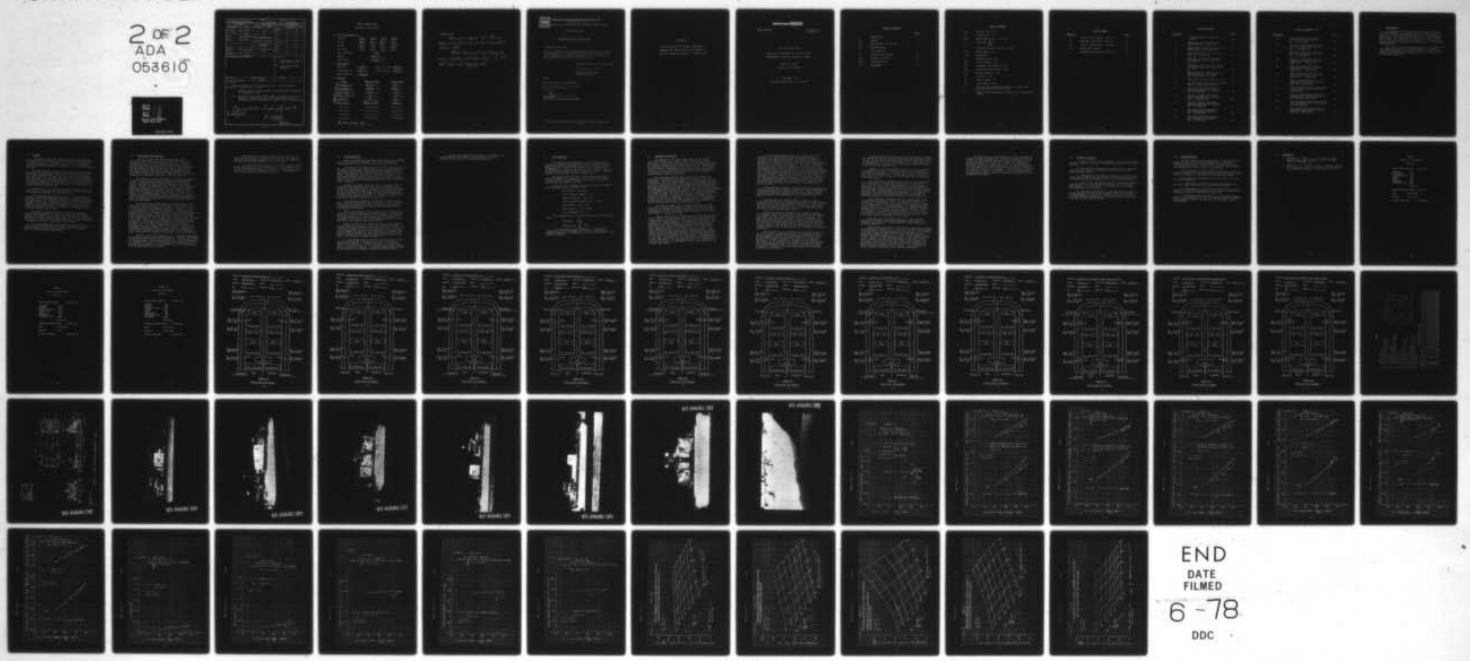
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OBSERVATIONS:

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AD-A053 610 BELL AEROSPACE TEXTRON BUFFALO N Y F/G 1/3
LACV-30 TEST AND DEMONSTRATION REPORT.(U)
FEB 78 M M LASZEWSKI DAAK02-75-C-0149
UNCLASSIFIED 7467-928009 NL

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BELL AEROSPACE ACV TEST PLAN	TYPE LACV-30-2	OPER. NO. S2-0410

ACV CREW		NO CHASE AIRCRAFT		91,000 lb. TEST CONDITIONS		
CREW POSITION	NAME	TYPE A/C	CREW		TAKEOFF	LAND
Operator	G. Yeager			WEIGHT		
Oper. NAV	R. Towers			FUEL		
Inst.	E. Schiffmacher			C.G.		
Engr.	R. Speth	INSTRUMENTATION PLAN		BALLAST		
		SETUP NO.	AMEND NO.	ALT SETTING		
		RADIO FREQ.		PRESS ALT		
TEST ENGINEER	M. Laszewski	Not Required		WIND		
TEST DIRECTOR	M. Laszewski			TEMP		
FINAL GO NO GO AUTHORITY	G. Yeager					

CRAFT CHANGES SINCE LAST OPERATION

TEST PURPOSE

I. Skirt pressure survey at 91,000 lb. G.W.

II. Cabin contamination sampling.

TEST ENGINEER	OPER. IN COMMAND	APPROVAL
Signed	Signed	

TEST PROCEDURE

Position craft on selected concrete ramp. Perform standard checklists. Tether craft at stern.

I. Conduct skirt pressure survey in accordance with Attachment I (M. Laszewski's IOM).

II. During the above test, sample cabin atmosphere at breathing level for noxious and toxic fumes using sampling kit provided by Safety Engineering. Record data on Attachment II.

Copied DATA – Informally sent To J. Sargent.

C. Stauffer
7/1/76

CABIN CONTAMINATION

(Tethered - Max. Power)

A. Craft Configuration:

T_5 (°C)	490	480	460	440
N_1 (%)	98.2	98.5	98.3	96.0
N_2 (%)	95	95	95	95.5
TOP (psi)	27	27	25	25
Air Conditioner		OFF		
Heater		On *		
Cabin Vents		CLOSED		

B. Environment:

OAT (°C)	+9°C	Baro. (in. Hg)	29.96
Wind Direction	195°	Craft Heading	210°
Wind Velocity	20 mph		

C. Samples:

Fumes	Measured (ppm)	Limit (ppm)
Carbon Monoxide	30-40	100
Carbon Dioxide	3500	5000
Sulfur Dioxide	2-3	5
Nitrogen Dioxide	0	5
Benzene	0	10
Gasoline	Trace to 80	200

* One heater Lo

OBSERVATIONS:

This WAS A repeat Test. Previous Measurements Showed similar but incomplete Func DATA.

Note That Tests for Aldehydes WAS reactive, not definitive; i.e., did not define the Types present.

WIRECO WR WIRE ROPE

WIRE ROPE CORPORATION OF AMERICA, INC.

Fabricated Products Division

609 North 2nd Street • P. O. Box 288 • Saint Joseph, Missouri 64502 • 816/233-0287 • Telex 42546

September 19, 1975

CERTIFICATION OF PROOF TEST

To Whom It May Concern:

This is to certify that the 22 ton capacity adjust-a-leg wire rope assembly sold and shipped to The Caldwell Company Incorporated of Rockford, Illinois on their purchase order number 10353, file number 43753, have been proof tested to 84,000 pounds with legs vertical.

WIRE ROPE CORP. OF AMERICA, INC.

D. Giannattasio, Manager
Fabricated Products

DG:sb

Subscribed And Sworn To Before Me

This 19th Day Of Sept., 1975

Notary Public
My Commission Expires March 7, 1979

APPENDIX B

1976 IR&D REPORT 7467-928002 "COMPARISON OF MEASURED AND PREDICTED HOVER PERFORMANCE OF LACV-30 VEHICLES AT BATNFO" 31 DECEMBER 1976

Bell Aerospace TEXTRON

Division of Textron Inc.

Post Office Box One
Buffalo, New York 14240
716/297-1000

1976 IR&D FINAL REPORT

COMPARISON OF MEASURED AND PREDICTED HOVER PERFORMANCE OF LACV-30 VEHICLES AT BATNFO

PROJECT NO. 21508

REPORT NO. 7467-928022

31 DECEMBER 1976

PRINCIPAL INVESTIGATOR: M. LASZEWSKI

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LIST OF SYMBOLS

AG	Air Gap - in. or ft.
B_C	Cushion beam - ft.
EAG	Equivalent Air Gap - in. or ft.
F	Froude No. $\frac{V}{\sqrt{gL_C}}$
g	Acceleration due to gravity - ft/sec^2
H.H.	Heave height - in.
H.P.	Horsepower
L_C	Cushion length - ft.
N_F	Lift Fan Speed - RPM
P_B	Peripheral bag pressure - PSF
P_{AB}	Anti-bounce bag pressure - PSF
P_C	Cushion pressure - PSF
Q	Flow rate - CFS
S_C	Cushion area - ft^2
W_G	Gross weight - lbs.
δ	Ratio of test barometric pressure to standard day sea level pressure (29.92 in.Hg)
θ	Ratio of test temperature to standard day temperature (59^oF)

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I. INTRODUCTION

The purpose of the hover tests on the LACV-30-1 and LACV-30-2 vehicles was to obtain trunk and cushion characteristics for a number of gross weights and lift fan speeds for comparison to test data obtained from the Stretched Voyageur Model Tests. The comparison of full scale to model would be used to evaluate the accuracy of model data if necessary to obtain test scale factors for future model tests of comparable configurations.

This report includes a description of both vehicles, test instrumentation and data reduction techniques. Results are presented and compared to calculated values obtained from a computer program which uses model test data as the basis for lift system performance.

II. SUMMARY

The purpose of the 1976 IR&D program was to perform full scale craft tests, evaluate the test results and correlate them with model test data. The initial task in the program was to perform hover tests of the full scale LACV-30-1 and LACV-30-2 vehicles at the Bell Aerospace Flight Test Facility in Wheatfield, New York.

The most extensive testing was performed on the LACV-30-1 where data was obtained for corrected gross weights of 83,678, 94,302 and 116,000 pounds. The lift fan speeds tested ranged from 930 to 980 RPM. All test data were corrected to standard day conditions for correlation and comparison. Instrumentation problems voided the test results obtained from the 83,678 pound gross weight condition. The LACV-30-2 test was performed for a corrected gross weight of 93,820 pounds and corrected lift fan speeds of 845, 907 and 955 RPM.

Analysis of the full scale test results indicate that the LACV-30 has a larger than predicted cushion footprint area with a corresponding reduction in cushion pressure.

The peripheral bag pressures measured in the tests were compared to predicted values obtained from a computer model of the lift system. The increased cushion area was used to calculate the predicted values. The use of immediate side deck pressure adjacent to the lift fan discharge area provided the best correlation to predicted values. A complete set of updated lift system performance predictions based upon the measured cushion area is included in this report.

The LACV-30 vehicle exhibited the same characteristic drop in bow bag pressure as seen on the Voyageur (002) craft; however, it appears that the addition of the stretch section resulted in a larger pressure drop from stern to bow bag pressure. The results of the 1/7.5 stretched Voyageur model tests indicated a negligible difference in peripheral bag pressure.

It is recommended that a continual monitoring of full scale data from the LACV-30 and Voyageur Vehicles be performed and the results incorporated into the computer lift system model for future design considerations.

III. TEST PROGRAM AND VEHICLES

The hover flight test program performed at Bell Aerospace in Wheatfield, New York, involved the use of two test vehicles, the LACV-30-1 and the LACV-30-2. The two vehicles are similar to the configuration shown in Figure 1. The configurations tested included volutes in both lift fan plenums, modified stern seal and surf fence. The volutes and new stern seal installations were the outgrowth of the Stretched Voyageur Model test program performed in the ACV Laboratory at Wheatfield, New York. The LACV-30-1 vehicle had a swing crane mounted on the bow as shown in Figure 1.

The LACV-30-1 vehicle was tested in January and February of 1976 at three gross weights; 82,000, 92,000 and 116,000 pounds. Instrumentation problems, described in the next section, voided the results of the 82,000 pound test gross weight. However, the unusually large movement of ballast fuel required to keep the craft in level trim was noted at that weight and resulted in a change in the test program. In the light weight condition the vehicle was tested in only one position on the hangar apron; facing south. In order to investigate the ballast trim effect it was recommended in future tests to rotate the vehicle 180 degrees to establish whether the uneven ground plane or the vehicle itself necessitated ballast fuel trim adjustment.

The second gross weight tested was 92,000 pounds. The test weight was obtained by increasing the fuel on board and increasing the ballast weight in the MILVAN mounted on the deck. A weight breakdown is presented in Table I. Figures 2, 3 and 4 are photographs of the test configuration. Four tests were performed, two lift fan speeds at each of the two vehicle positions, facing south and north. After the test, a survey of the test site or cushion footprint area was made to determine the slope of the apron surface. The northern area of the test site was found to be level. This area is covered by the forward cushion compartments of the vehicle when the vehicle is pointed north and covered by the aft cushion compartments when the vehicle is pointed south. The slope at the southern end of the test site was higher, varying in angle from 1 to 3 degrees. Changes in ground slope will cause vehicle movement due to varying air gap, a shifting of ballast fuel to trim the craft in an attempt to keep it level would be required to minimize fore and aft movement.

The final test of the LACV-30-1 was to have been performed at the design gross weight of 115,000 pounds. However, 1000 pounds of additional fuel was put into the tanks for a final gross weight of 116,000 pounds. A weight breakdown for the test configuration is presented in Table II. The procedure was the same as in the previous test performed at 92,000 pounds, two lift fan speeds for each vehicle position on the apron.

The LACV-30-2 vehicle was tested in April 1976. The test site was changed to a concrete ramp between the Chemistry Building and the runway approach area. The concrete ramp was surveyed to determine the best area for the test.

The test program was limited to one gross weight, 92,000 pounds, and three lift fan speeds for one vehicle position, due to the limited availability of the vehicle. The weight breakdown for the test is presented in Table III. Photographs of the vehicle are presented in Figures 5, 6 and 7.

IV. INSTRUMENTATION

All instrumentation was simple and direct visual readings were taken by the test engineer. The visual readings were recorded directly into data sheets for each specific run.

The intent of the program was to measure cushion pressures, bag and anti-bounce bag pressures and heave heights throughout the entire trunk system. The pressures were measured using an open ended tube which was inserted into the cushion and bag areas. The measuring stations are indicated in Table IV. The open ended probe was used in areas where low velocities were predicted and where dynamic pressures were expected to be negligible. These pressure readings represent both local total and static pressure.

In the first test of the LACV-30-1 at a gross weight of 82,000 pounds, Magnehelic gages were used to determine the pressures. Upon completion of the test the gages were returned to the Instrumentation Laboratory where it was discovered that the zero reading on all the gages had drifted significantly. The gages were reset to zero before a calibration could be made to correct the measured test data. No attempt was made to analyze the data for inclusion in this report.

The pressure readings in the remaining tests were read with a hand held pressure probe attached to a U-Tube marometer containing King indicating liquid. Corrections due to test temperature conditions were provided for data analysis by the instrumentation personnel.

Metal rods located at four corners of the vehicle were installed to provide deck heave height readings. Readings were taken with the craft resting on the landing pads in the power off condition and after trunk inflation at the specified lift fan speed. The intent of the heave height measurement was to determine cushion height and air gap height.

After two tests of the LACV-30-1 vehicle, gross weights of 82,000 and 92,000 pounds, it was felt that heave height measurements alone could not be used to determine air gap height. A calibrated wedge was used in the remaining tests to measure the gap between the bottom of the fingers and the ground. The wedge is shown in Figure 8. The gap measurements were read at stations 220 and 695 for both port and starboard sides of the craft. The stations are shown in Table IV.

It also became evident after the first two tests of the LACV-30-1 vehicle that the cushion area of the vehicle is larger than predicted. A cushion footprint of the LACV-30-1 vehicle at a gross weight of 116,000 pounds was obtained using chalk to outline the cushion. A cushion footprint was obtained for all three lift fan speeds during the LACV-30-2 tests.

Outside air temperature and barometric pressure were recorded on the data sheets. These data were used for normalizing test data to standard day conditions.

V. DATA REDUCTION

The bag and cushion pressure data were reduced by correcting the manometer readings for the test temperature and applying the proper conversion from inches of water to pounds per square foot. The two stern heave height readings were increased by 0.7 inches to account for the difference in deck height between the bow and stern measuring locations. The step decrease in deck height occurs at station 624.

The reduced data for each of the eleven tests are presented in Tables IVa through IVk. The data shown includes, P_B, bag pressure, P_{AB}, anti-bounce bag pressure, P_C, cushion pressure and AG, measured air gap.

For analysis the reduced data was corrected to standard day conditions, in the following form:

Bag Pressure $\sim P_B/\delta \sim$ PSF

Lift Fan Speed $\sim N_F/\sqrt{\theta} \sim$ RPM

Cushion Pressure $\sim P_C/\delta \sim$ RPM

Bag-to-Cushion pressure ratio $\sim P_B/P_C$

Gross Weight $\sim W_G/\delta \sim$ LBS.

Heave Height $\sim$ H.H. $\sim$ inches

Air Gap Height $\sim$ AG $\sim$ FT

The predicted hover characteristics include the following items:

$$\text{Horsepower} \sim \frac{\text{H.P.}}{\delta \sqrt{\theta}}$$

$$\text{Cushion Flow} \sim \frac{Q}{\sqrt{\theta}} \sim \text{CFS}$$

θ is the ratio of test temperature to standard day temperature of 518.9° Rankine and δ is the ratio of test barometric pressure to standard day barometric pressure of 29.92 inches of mercury.

VI. DISCUSSION OF RESULTS

The purpose of the hover flight tests on the LACV-30 full scale vehicle was to obtain trunk characteristics for comparison to predicted values obtained from a computer program. The computer program was developed using Stretched Voyageur model test data for determination of lift system losses. The program titled, VOYLSV3, calculates the total system air flow and distribution of flow, equivalent air gap (EAG), power requirements and pressures throughout the system. Details of the entire program can be found in reference 2.

The Stretched Voyageur model test data indicated the difference in peripheral bag pressure from stern to bow to be negligible. Therefore the average of all trunk pressure was used to determine the lift system losses from lift fan plenum to the side deck or peripheral bag. The computer program calculates one peripheral bag pressure and assumes that both lift fans provide the same bag pressure and flow. The air gap, which is the cushion flow discharge area between the bottom of the fingers and the ground is calculated using the sum of cushion flow from the peripheral and stability bags. The stern bag flow is a separate calculation and is not included in the air gap calculation because it is assumed to exhaust to atmosphere. The program has the capability to account for loss of flow due to leakage area. Because the leakage area was set to zero for this study, the calculated air gap is actually the so-called "equivalent air gap."

The cushion pressure (P_C) is calculated directly from input vehicle weight and cushion geometry. Since it is a major parameter in the program, cushion geometry must be correctly established in order to obtain a valid comparison of full scale test results to predicted values.

Figure 9 presents the variation of effective and measured cushion areas as a function of lift fan speed. The effective cushion area is defined as the test gross weight divided by the average test cushion pressure. The measured cushion areas were obtained from actual footprints of the vehicle at four test conditions. The initial design assumption of cushion area as shown in Figure 9 was for a cushion length (L_C) of 67.2 feet and a cushion beam (B_C) of 31.3 feet. As can be seen in the figure the test results indicate that the LACV-30 has a larger cushion area than previously assumed. The measured footprints varied in length from 69.8 to 70.5 feet and in width from 32.5 to 33.5 feet. For comparison to test results, a cushion length of 70.5 feet and beam of 33.5 feet were used to calculate predicted performance. The resultant cushion area is indicated by a solid line in Figure 9 and appears to be a good average of all the test data shown.

The stretched Voyageur model data indicated that the average of all peripheral bag pressures could be used to calculate lift system performance. An attempt was made to correlate the computed values with test data by averaging the peripheral bag pressures for each full scale test. The LACV-30-1 results for the 92,000 gross weight (or a corrected weight of 94,302 pounds) are shown in Figure 10. The solid line is the calculated values of bag and cushion pressures using the model test pressure loss of 0.5 to account for loss in pressure between the lift fan plenum and side bag. The average test bag pressures show a considerable disagreement with the predicted values. To determine if this discrepancy could be due to a small change in the loss coefficient, the coefficient was arbitrarily increased until agreement was reached. As shown in Figure 10, the test data shows good agreement with the calculated values only when the anticipated pressure loss coefficient is increased by a factor of three.

The flight test results for the corrected gross weight of 116,000 pounds shown in Figure 11 exhibit the same characteristics as those obtained in the lighter weight test. Again, average peripheral bag pressure aggrees with the calculated value only when the pressure loss coefficient is increased from 0.5 to 1.25.

The LACV-30-2 test results shown in Figure 12 for a corrected gross weight of 93,820 pounds exhibits the same characteristics as the test results shown in Figure 10. Based upon the results obtained from both vehicles it is quite apparent that the use of average bag pressure from the full scale craft does not correlate with the predicted values.

The pressure losses included in the computer program were obtained from 1/7.5 scale model tests where the peripheral bag pressure variation from stern to bow was negligible. The full scale test data shown in Table IV does not indicate the same trend. The test data indicates a decrease in bag pressure with increasing distance away from the lift fan discharge area. The pressure drop from stern to bow is approximately 15 percent. Of some concern is the stretched trunk system drop in bag-to-cushion pressure ratio at the bow and its relationship to plow-in tendencies.

The results of a trunk system pressure survey performed on the full scale Voyageur, craft 002, are presented in Table V. The data taken in June of 1972 indicates no significant change in bag pressure along the side deck. However, the bow bag pressure does drop an average of 7 percent for a majority of the tests. It can therefore be concluded that the addition of the stretch section resulted in a larger than expected pressure drop in the peripheral bag. This loss in pressure also makes it difficult to predict lift system performance using average peripheral bag pressures.

A more significant pressure that can be used for estimating lift system performance is the side bag pressure measured in the vicinity of the lift fan plenum discharge area. Here the pressure is only affected by the lift fan output and the obstructions in the discharge area and does not include losses which occur downstream of the fan discharge area.

Figures 13, 14 and 15 present flight test values obtained by averaging the most aft readings in the port and starboard peripheral bag sections. The center line of the 7 foot diameter lift fan is at station 740. The readings as shown in Table IV were taken at station 695 which is in the area of flow discharge to the side bag.

The predicted or computed values shown in the figures were calculated using the model test pressure loss coefficient of 0.5 to account for loss in pressure between lift fan plenum and side bag. The flight test results for the corrected weights of 94,302 pounds, 116,000 pounds and 93,820 pounds show good agreement with the calculated values of bag pressure. The correlation indicates that a modification should be made to the computer program to include a bow pressure calculation to account for downstream pressure losses and variation in total cushion flow.

The comparison of measured air gap and predicted values is presented in Figures 16 and 17 for corrected weights of 116,000 and 93,820 pounds. Only a limited amount of test data is available since air gap measurement using a calibrated wedge was introduced late in the test program. The computer program assumes level ground and uniform flow exiting from the bottom of the fingers with no leakage between fingers or corners of the trunk system. In reality the ground at the test site is uneven and efforts to keep the craft level resulted in variable exit flow areas around the periphery of the cushion.

The data shown in Figures 16 and 17 are the average of the gap measurements taken during the tests. Their general agreement with predicted values demonstrate satisfactory lift system performance.

Heave height measurements, the distance from ground to deck, are presented in Figures 18, 19 and 20 for corrected cross weights of 94,302 pounds, 116,000 pounds and 93,820 pounds. The predicted value was calculated using the sum of the predicted air gap, theoretical cushion height of 47.5 inches and deck height of 37.5 inches. The heave height reading for the no-gap condition should be 85.0 inches. All the test data shown in the three figures show a divergent trend with the predicted with decreasing lift fan speed. Factors which influence heave height readings are uneven ground at the test site and variation of peripheral bag shape with bag-to-cushion pressure ratio. The measured air gap is a better indication of lift system performance.

The test results can be considered to have validated the computer program, provided that the side bag pressure adjacent to the lift fan discharge area is used for bag pressure and an increased cushion area (2315 ft^2) is used. For future prediction purposes, the calculated lift system performance over the range of vehicle weights from 70,000 to 120,000 pounds and lift fan speeds from 695 to 1000 RPM are presented in Figures 21 through 25 as part of this report. The predicted performance includes total cushion flow ($Q/\sqrt{\theta}$), side bag pressure (P_B/δ), bag-to-cushion pressure ratio, air gap (AG) and total required horsepower ($H.P./\delta\sqrt{\theta}$).

VII. SUMMARY OF RESULTS

1. The full scale tests indicated a larger than predicted cushion footprint area with a corresponding reduction in cushion pressure.

2. The average peripheral bag pressure did not correlate with predicted values of bag pressure obtained from a lift system computer program.

3. Correlation of peripheral bag pressure with predicted values was obtained using the average of port and starboard side bag pressures measured adjacent to the lift fan discharge area.

4. The air gap measurement using the calibrated wedge was more indicative of lift system performances than the measured heave height at the deck level. The measured air gap heights were comparable to the predicted.

5. The LACV-30 exhibited the same characteristic drop in bow bag pressure as seen on the Voyageur (002) craft; however, it appears that the addition of the stretch section resulted in a larger decrease in bag pressure with increasing distance away from the lift fan discharge area.

VIII. RECOMMENDATIONS

The full scale test data indicated a 15 percent pressure drop from stern to bow in the peripheral bag. Stretched Voyageur model test data, which is the basis for predicting lift system performance, indicated the difference in peripheral bag pressure from stern to bow to be negligible.

The discrepancy in trunk system characteristics must be resolved in order to establish prediction techniques where vehicle growth is obtained by stretching the existing seal system.

The following recommendations are being made to improve our design capability:

1. A continual monitoring of static bag pressure data from full scale craft such as the LACV-30 and Voyageur.

2. Incorporation of the full scale data into the computer program to include bow bag pressure calculations accounting for downstream losses and variations in total flow.

3. An attempt should be made using the stretch Voyageur model to determine model to full scale relationship with regards to bag shape and pressure distribution and establish areas of discrepancies.

IX. REFERENCES

1. Laszewski, M. & Watt, C. S., "Stretched Voyageur Model Testing," Bell Aerospace, Report No. 7467-927001, 31 December 1974.

2. Bissell, J. R., "VOYLSV3 - A Digital Computer Program for Evaluating ACV Type Lift/Seal System Performance," Bell Aerospace, Report No. 7467-927013, May 1976.

TABLE I

LACV-30-1 TEST WEIGHT

TEST NO. 2

BASIC CONFIGURATION		58,072 LBS.
LASHINGS	475	
AFT PALLET	945	
PALLET TIE BAR	85	
MILVAN	4745	
CREW	360	
PASSENGER	360	
UNUSEABLE FUEL	650	
	7620 LBS.	
OPERATING WEIGHT EMPTY		65,692 LBS
FUEL	12,583 LBS.	
BALLAST	13,725 LBS.	
FLIGHT CONDITION		92,000 LBS.

TABLE II

LACV-30-1 TEST WEIGHT

TEST NO. 3

BASIC CONFIGURATION		58,240 LBS.
LASHINGS	950	
PALLETS	2008	
PALLET TIE BARS	170	
MILVANS (2)	9345	
CREW	360	
PASSENGERS	360	
UNUSEABLE FUEL	650	
	13,843 LBS.	
OPERATING WEIGHT EMPTY		72,083 LBS.
FUEL	18,546 LBS.	
BALLAST	25,371	
FLIGHT CONDITION		116,000 LBS.

TABLE III

LACV-30-2 TEST WEIGHT

TEST NO. 1

BASIC CONFIGURATION		51,859 LBS.
LASHING	428	
PALLET	2064	
PALLET TIE BAR	170	
MILVAN	4745	
CREW	360	
PASSENGERS	360	
UNUSEABLE FUEL	650	
TEE HOOKS	152	
	8929 LBS.	
OPERATING WEIGHT EMPTY		60,788 LBS.
FUEL	16,881 LBS.	
BALLAST	14,331 LBS.	
FLIGHT CONDITION		92,000 LBS.

VEHICLE LACV-30-1 Facing North (1)

TIME 10:00 a.m. OAT/BARO 21°F/29.17 DATE: 1/30/76

WEIGHT 92,000 lbs. WIND

N_2 91% FAN RPM 905

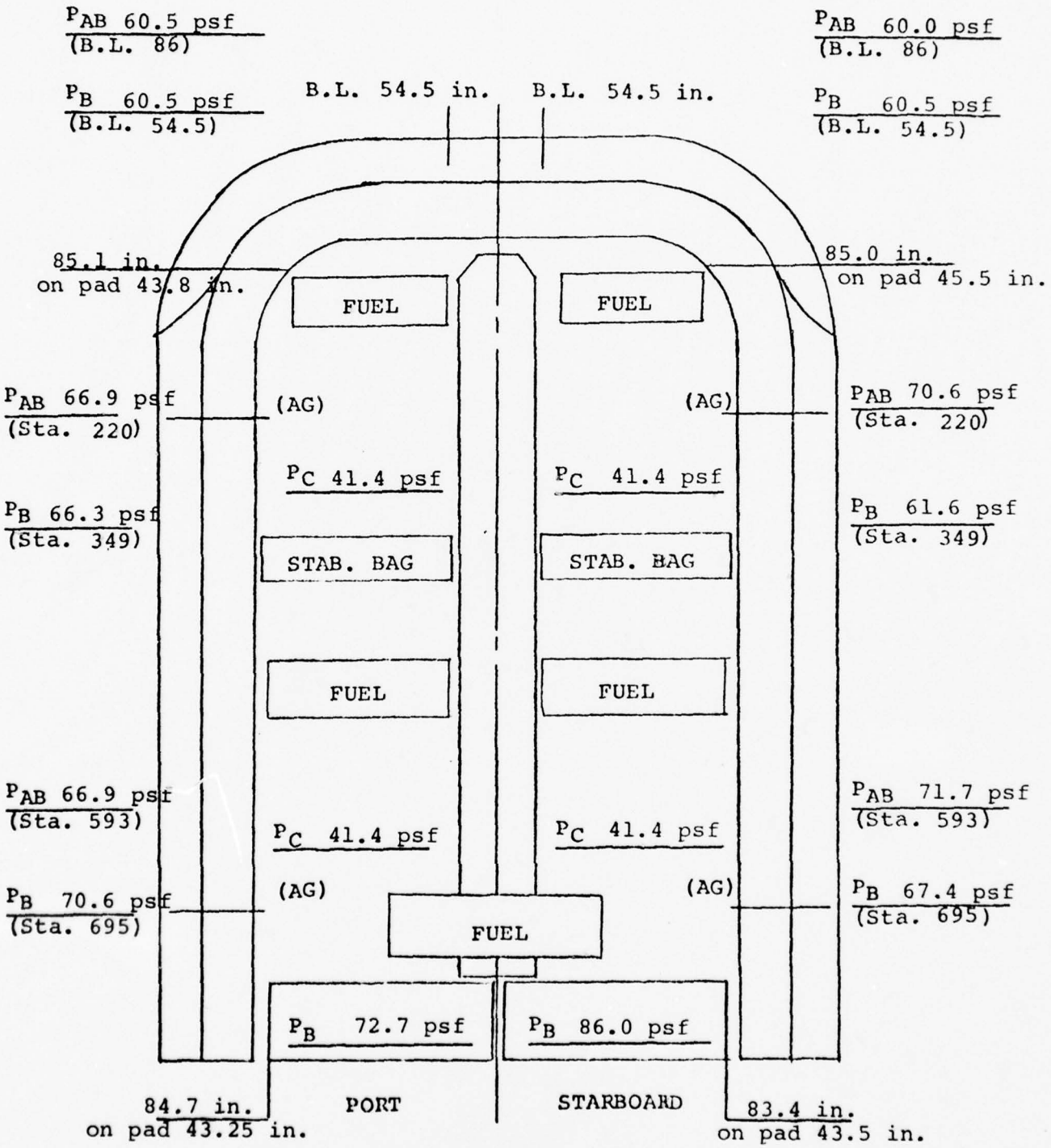


TABLE IV a

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing North (2)

TIME 11:00 a.m. OAT/BARO 21°F/29.17 DATE: 1/30/76

WEIGHT 92,000 lbs. WIND

N_2 93.5% FAN RPM 930

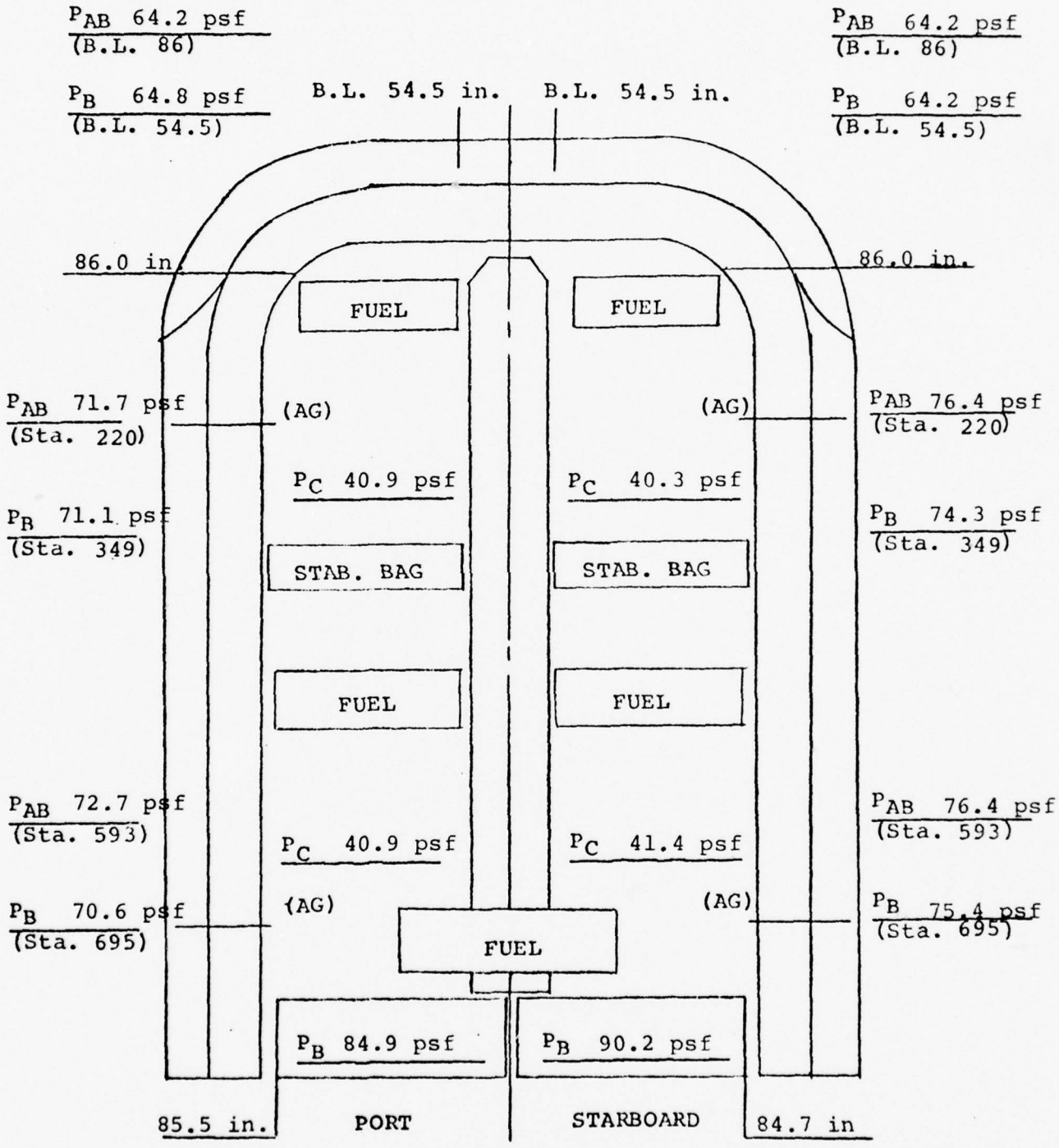


TABLE IV b

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing South (3)

TIME 2:30 p.m. OAT/BARO 23°F/29.17 DATE: 1/30/76

WEIGHT 92,000 lbs. WIND

N_2 91% FAN RPM 905

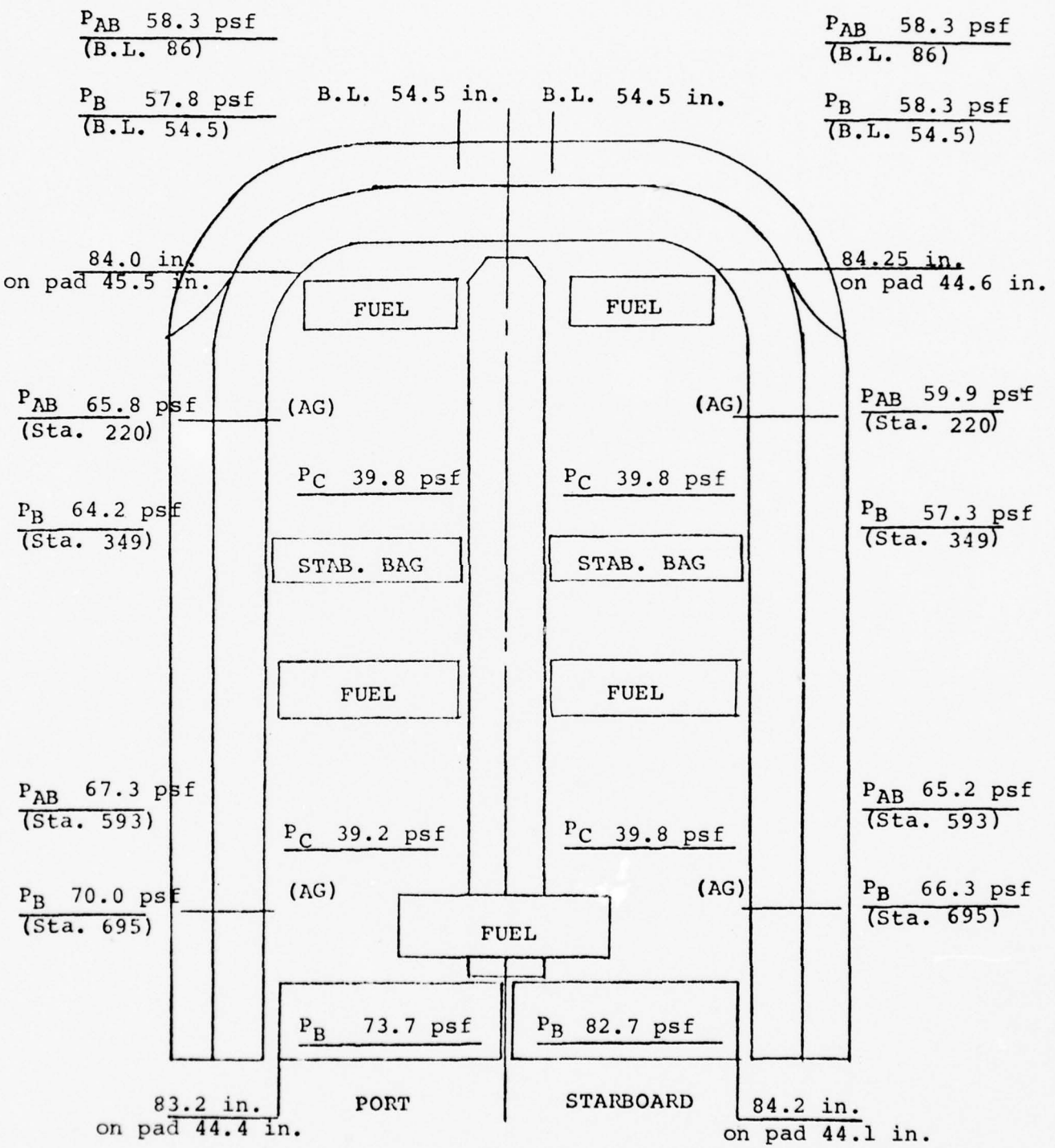


TABLE IVc

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing South (4)

TIME 3:30 p.m. OAT/BARO 23°F/29.17 DATE: 1/30/76

WEIGHT 92,000 lbs. WIND

N_2 95.8% FAN RPM 953

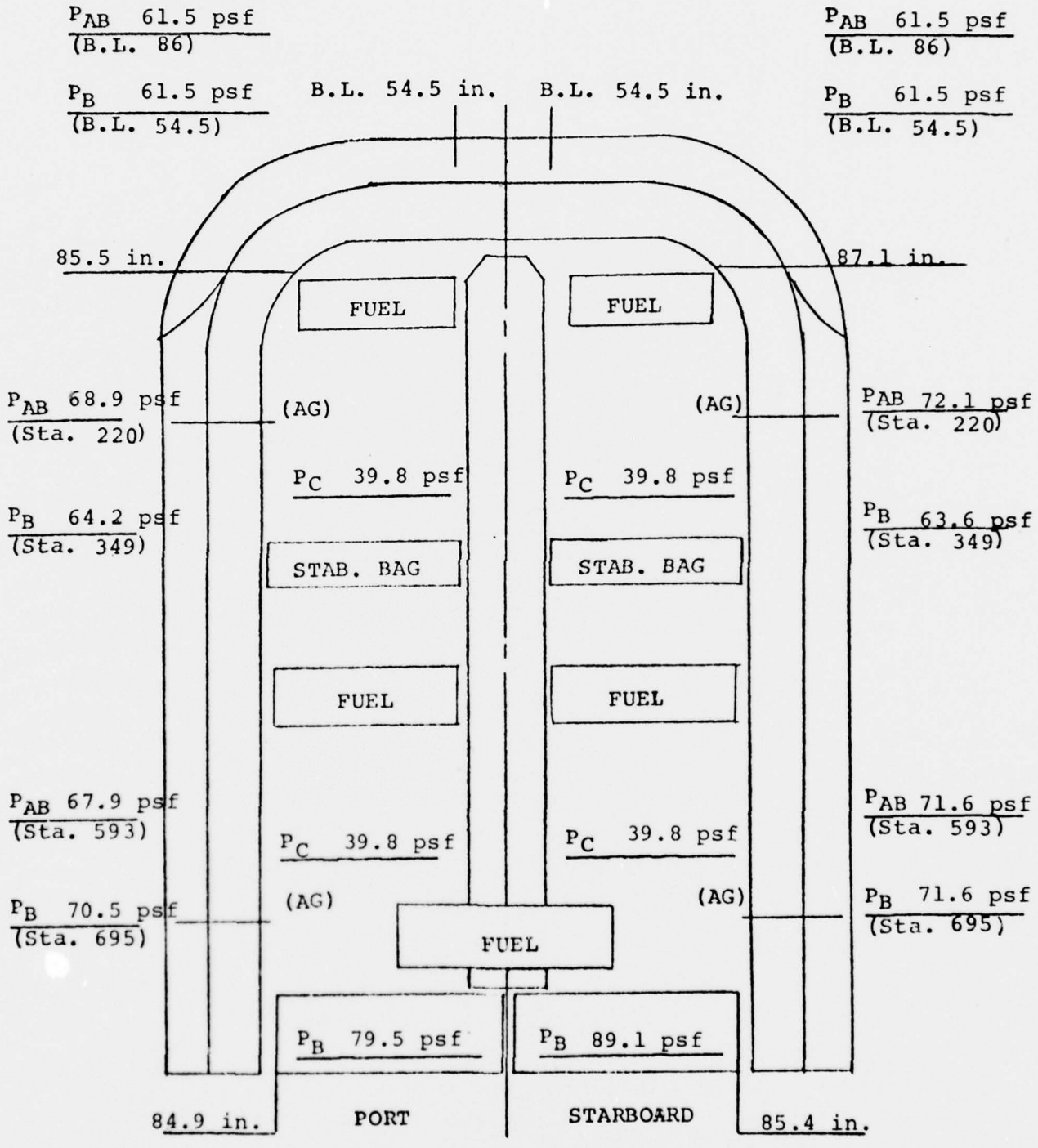


TABLE IV d

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing South (1)

TIME 11:00 a.m. OAT/BARO 32°F/29.93 DATE: 2/14/76

WEIGHT 116,000 lbs WIND

N_2 91% FAN RPM 905

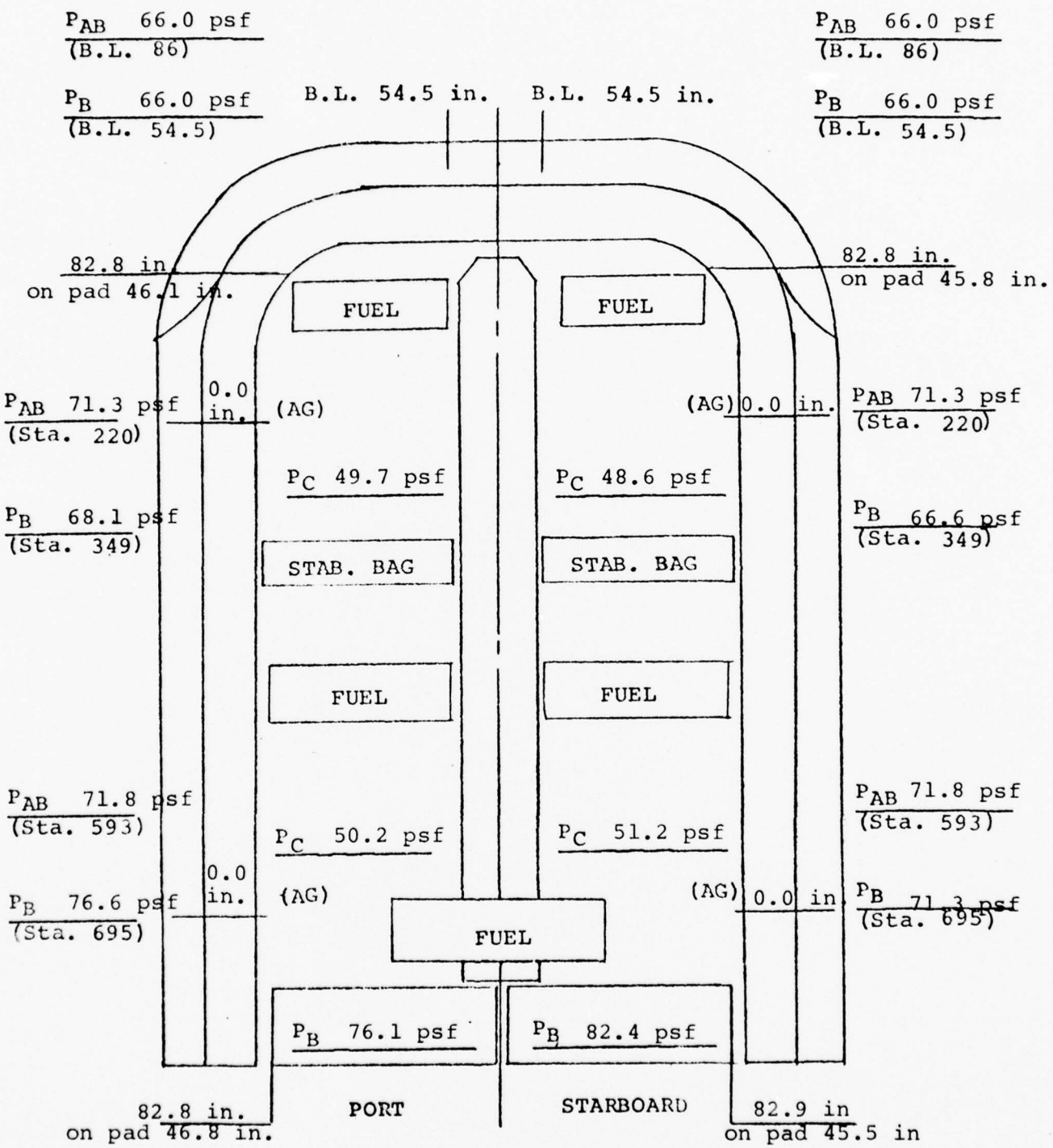


TABLE IV e

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing South (2)

TIME 11:20 a.m. OAT/BARO 32°F/29.93 DATE: 2/14/76

WEIGHT 116,000 lbs. WIND 8 mph 320 deg.

N_2 95% FAN RPM 945

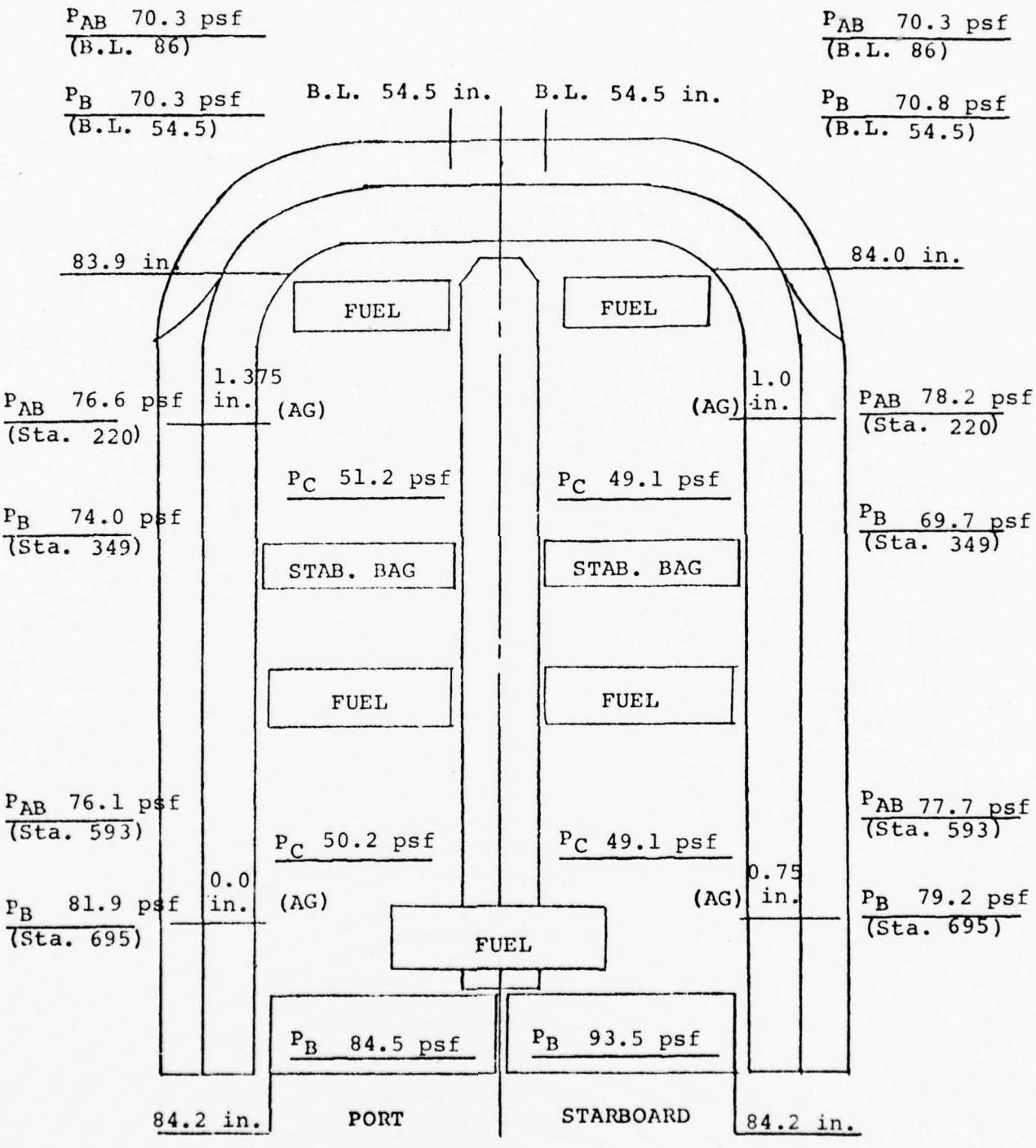


TABLE IVf

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing North (3)

TIME 1:34 p.m. OAT/BARO 32°F/29.93 DATE: 2/14/76

WEIGHT 116,000 lbs WIND

N_2 91% FAN RPM 905

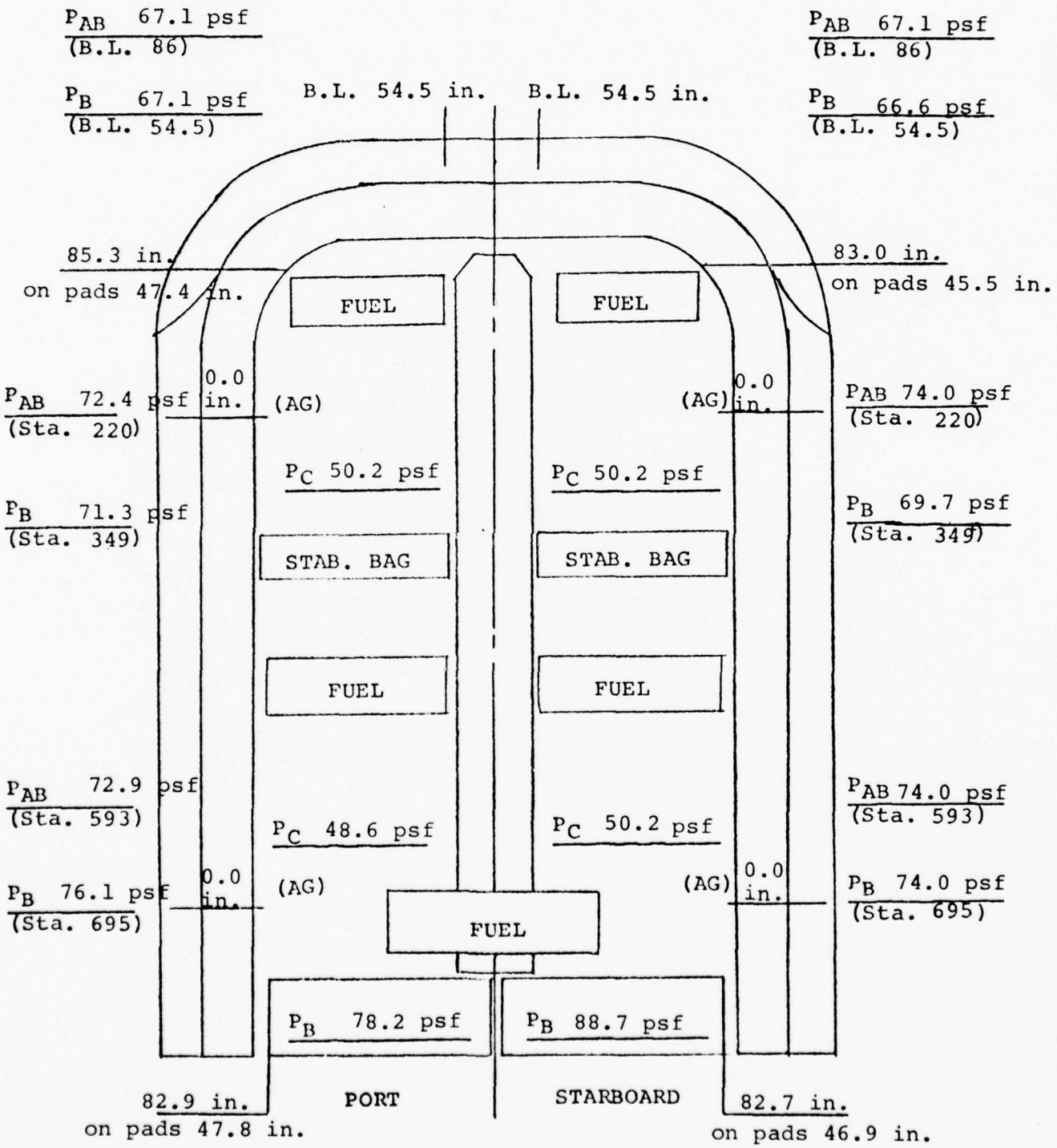


TABLE IVg

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-1 Facing North (4)

TIME 2:00 p.m. OAT/BARO 32°F/29.93 DATE: 2/14/76

WEIGHT 116,000 lbs. WIND

N_2 96.25% FAN RPM 957

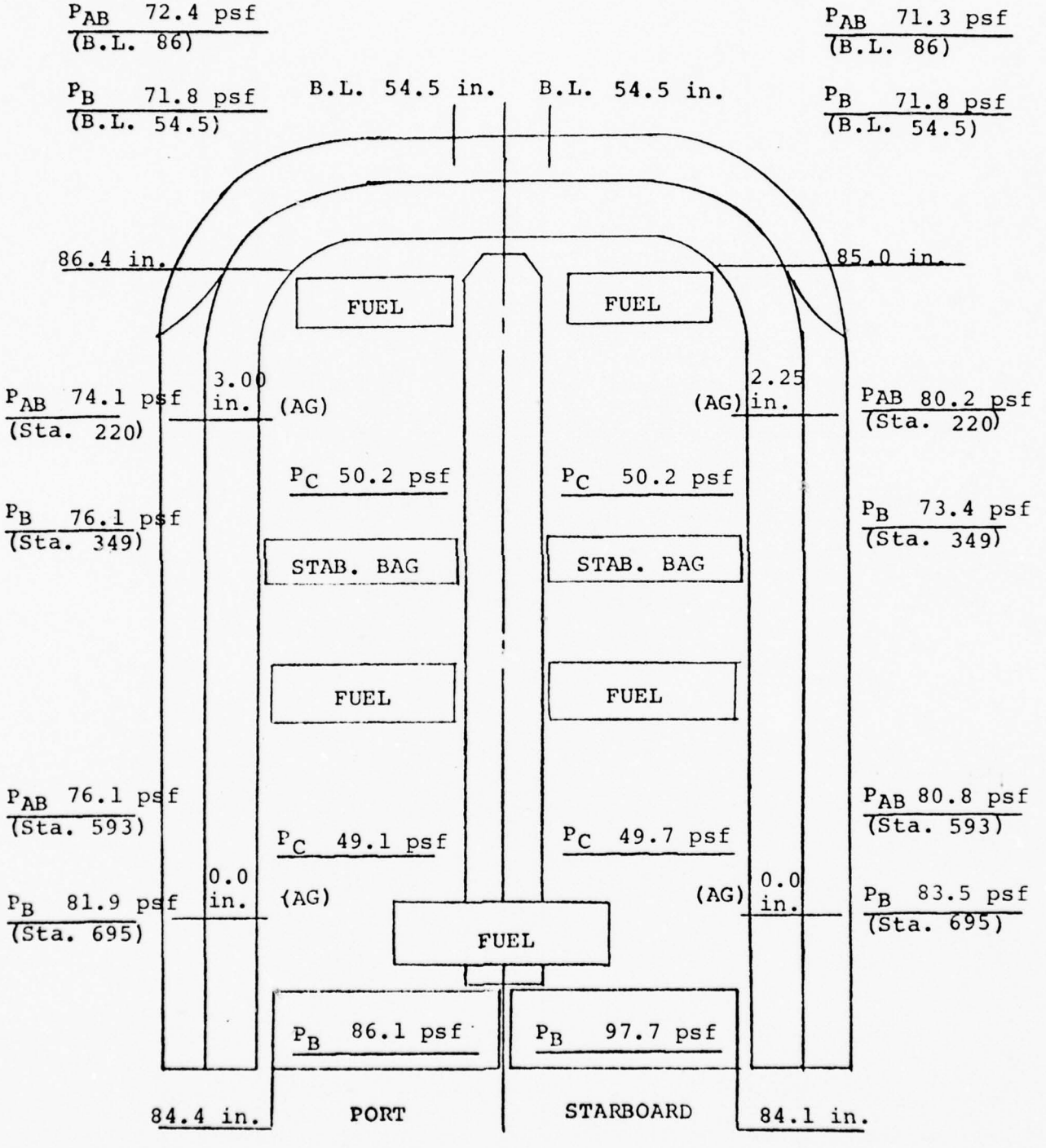


TABLE IV h

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-2 on concrete ramp towards airport

TIME 1:00 p.m. OAT/BARO 49°F/29.32 DATE: 4/10/76

WEIGHT 92,000 lb. WIND

N_2 95% FAN RPM 945

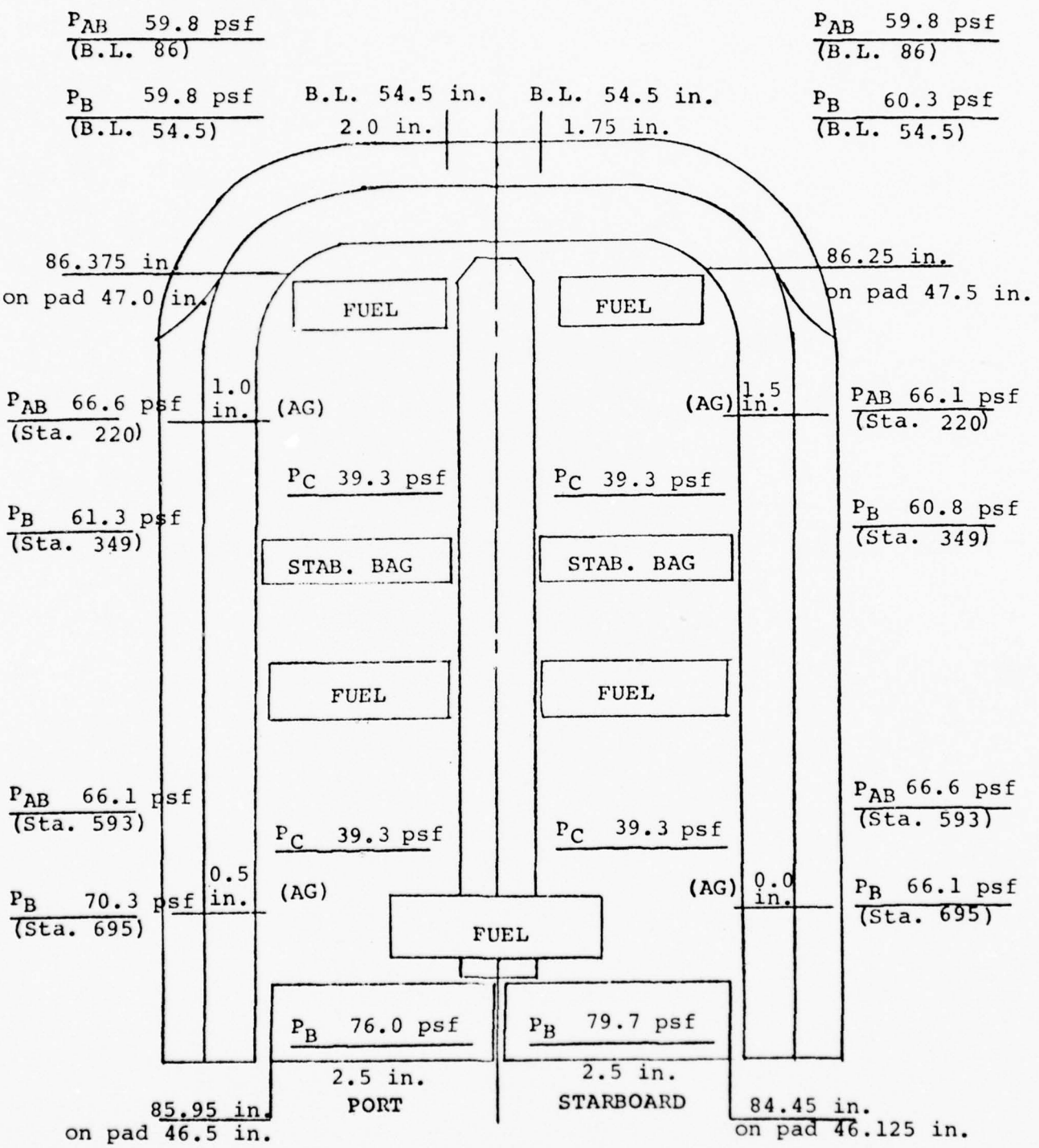


TABLE IV i

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-2 on concrete ramp towards airport

TIME 1:55 p.m. OAT/BARO 57°F/29.32 DATE: 4/10/76

WEIGHT 92,000 lbs. WIND

N_2 90% FAN RPM 905

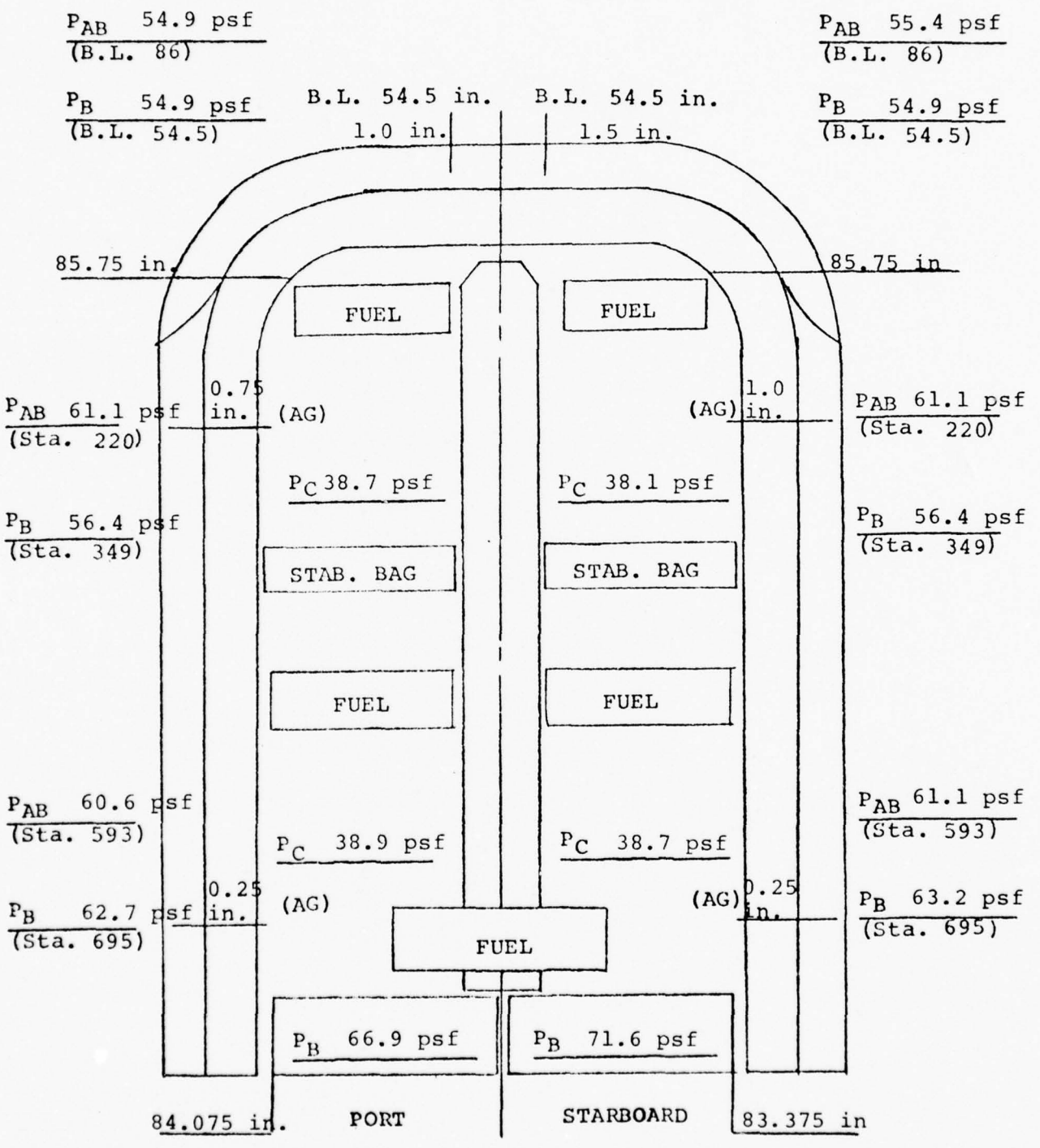


TABLE IV j

STATIC TEST RUN SUMMARY

VEHICLE LACV-30-2 on concrete ramp towards airport

TIME 2:30 p.m. OAT/BARO 57°F/29.32 DATE: 4/10/76

WEIGHT 92,000 lbs. WIND

N_2 85% FAN RPM

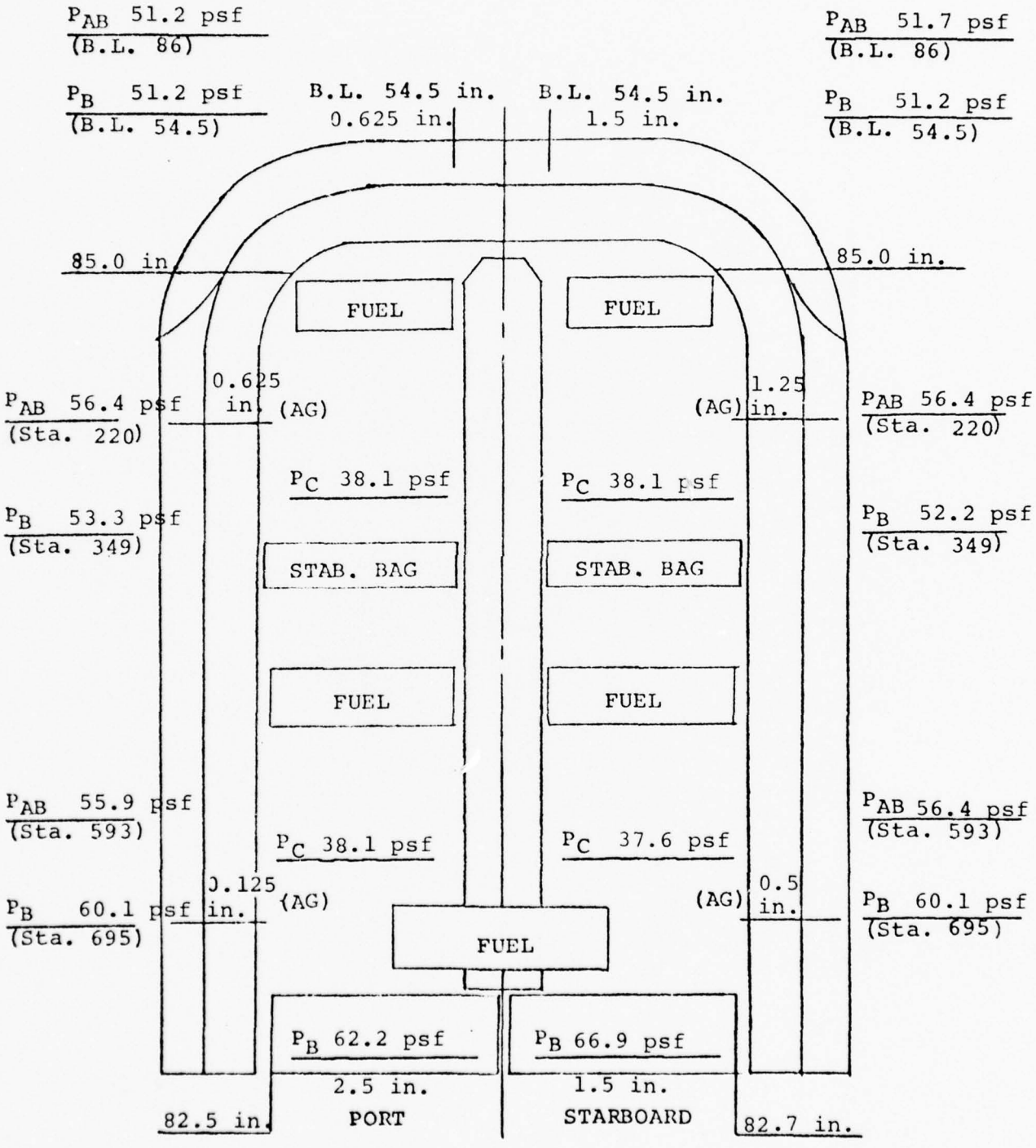
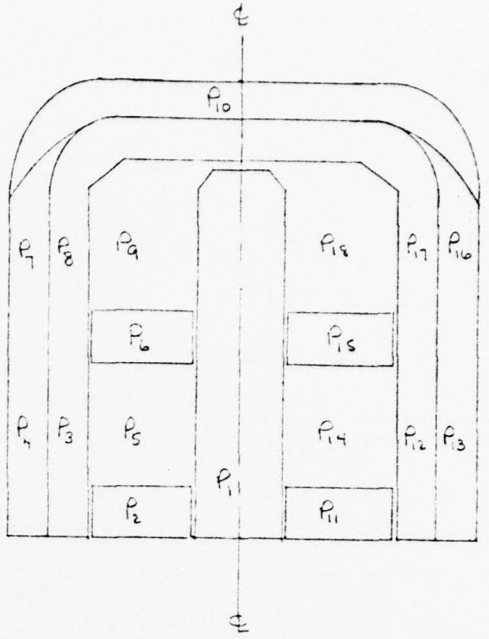


TABLE IV k

STATIC TEST RUN SUMMARY

TABLE V

P_1 CENTER KEEL PRESSURE
P_2 PORT REAR TRUNK PRESSURE
P_3 PORT AFT INNER PERIPHERAL TRUNK PRESSURE
P_4 PORT AFT OUTER PERIPHERAL TRUNK PRESSURE
P_5 CUSHION PRESSURE
P_6 PORT STABILITY TRUNK PRESSURE
P_7 PORT FORWARD OUTER PERIPHERAL TRUNK PRESSURE
P_8 PORT FORWARD INNER PERIPHERAL TRUNK PRESSURE
P_9 CUSHION PRESSURE
P_{10} BOW TRUNK PRESSURE
P_{11} STBD. REAR TRUNK PRESSURE
P_{12} STBD. AFT INNER PERIPHERAL TRUNK PRESSURE
P_{13} STBD. AFT OUTER PERIPHERAL TRUNK PRESSURE
P_{14} CUSHION PRESSURE
P_{15} STBD. STABILITY TRUNK PRESSURE
P_{16} STBD. FORWARD OUTER PERIPHERAL TRUNK PRESSURE
P_{17} STBD. FORWARD INNER PERIPHERAL TRUNK PRESSURE
P_{18} CUSHION PRESSURE



VOYAGEUR 002 STATIC TEST JUNE 1972

CRAFT WEIGHT (LB)	N_2 (%)	T_{AMB} (°F)	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}	P_{12}	P_{13}	P_{14}	P_{15}	P_{16}	P_{17}	P_{18}
45,000	90	65	60.3	62.9	54.6	58.7	24.0	53.1	59.3	55.1	26.6	51.5	68.1	56.7	59.8	26.5	53.1	59.8	56.7	38.1
49,600	90	49	61.1	63.7	55.9	61.1	31.2	54.1	59.8	57.2	31.2	53.3	67.6	54.6	62.4	31.2	54.1	64.4	57.2	31.2
64,000	90	55	65.0	70.2	59.8	65.0	34.8	59.8	65.0	62.4	39.0	62.4	72.8	62.0	65.0	33.0	59.8	66.0	60.0	39.0
78,000	90	65	66.6	70.2	65.0	66.6	42.0	62.4	66.3	64.4	45.5	60.9	71.5	61.1	67.6	42.6	62.4	65.0	65.0	45.5
78,000	90	80	65.0	65.0	59.8	62.4	41.6	65.0	62.4	61.1	46.8	57.2	70.2	61.1	63.7	44.2	65.0	63.7	62.4	46.8
88,000	90	80	67.6	64.0	65.5	65.5	46.8	64.0	67.6	65.5	51.0	62.9	74.9	64.5	68.6	49.4	65.0	69.7	60.0	52.0

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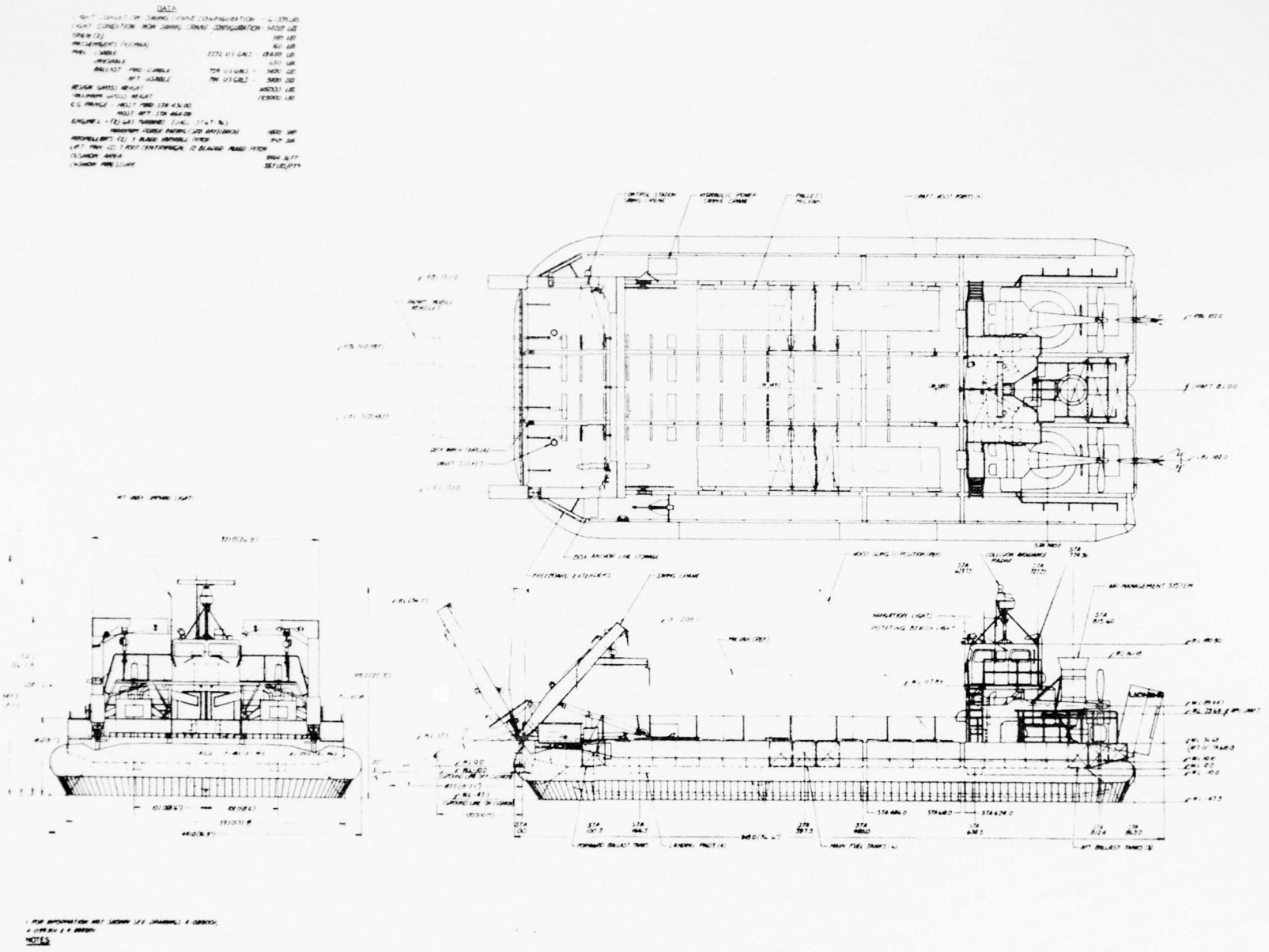


FIGURE 1. 3 VIEW AND GENERAL ARRANGEMENT – LACV-30

FIGURE 3. TURBOSHAFT VERSION OF XCV-20-1 ON LIFTING PLATFORM, W_{TO} = 92,000 LBS.

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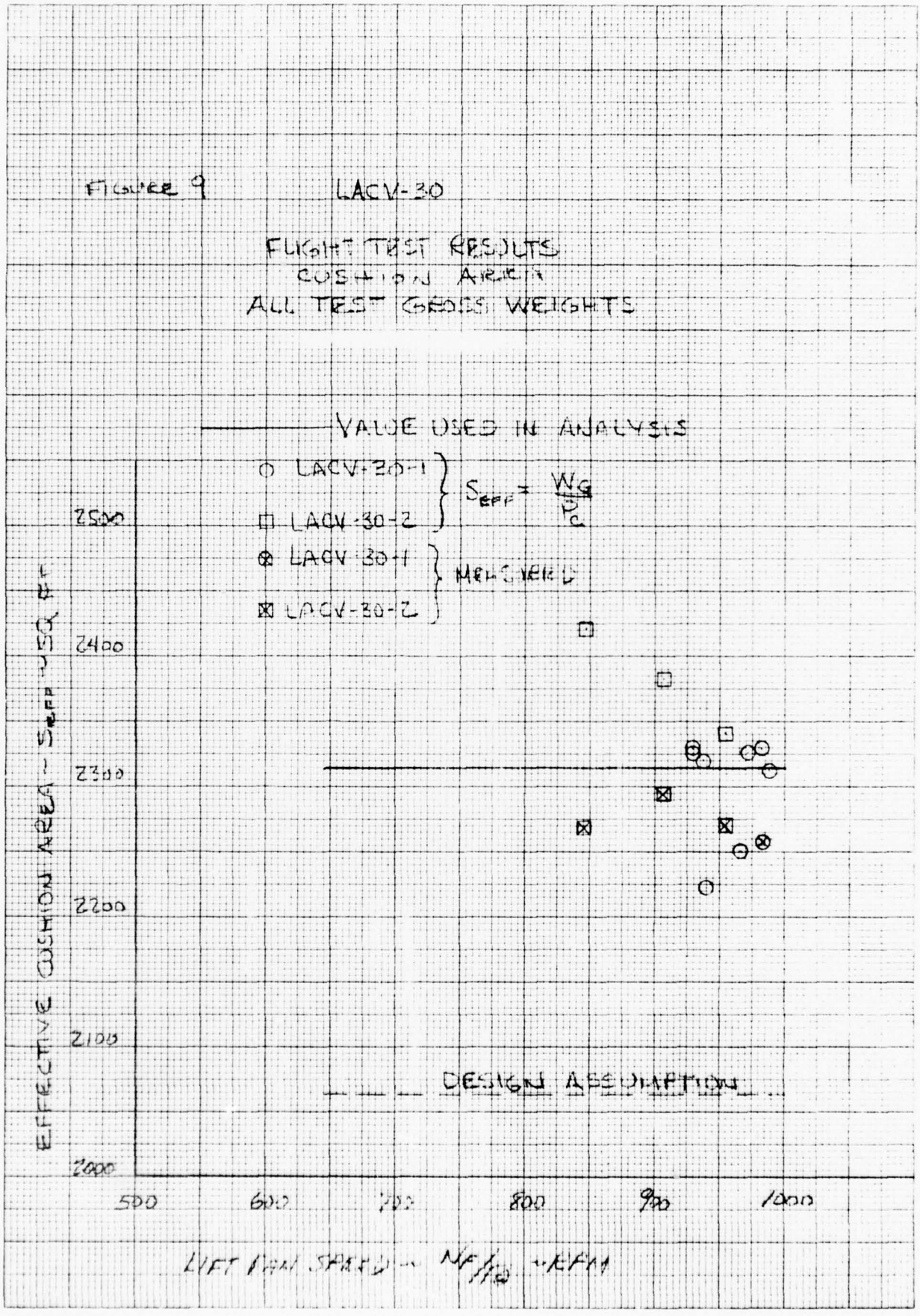
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FIGURE 6. STARBOARD VIEW OF LACV-30-2 VEHICLE ON CONCRETE RAMP,
d_c = 24,000 LBS., h_2 = 90%

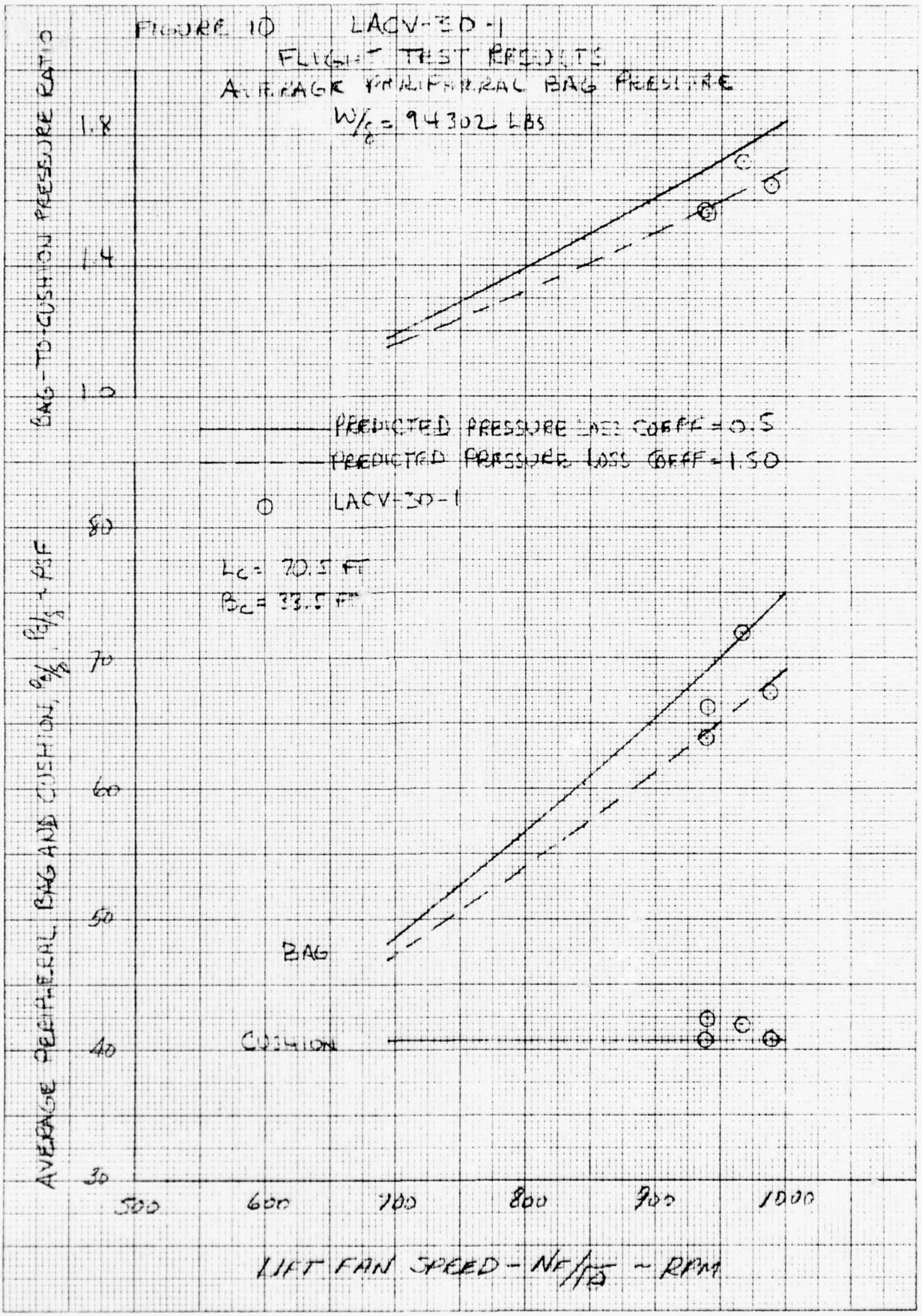
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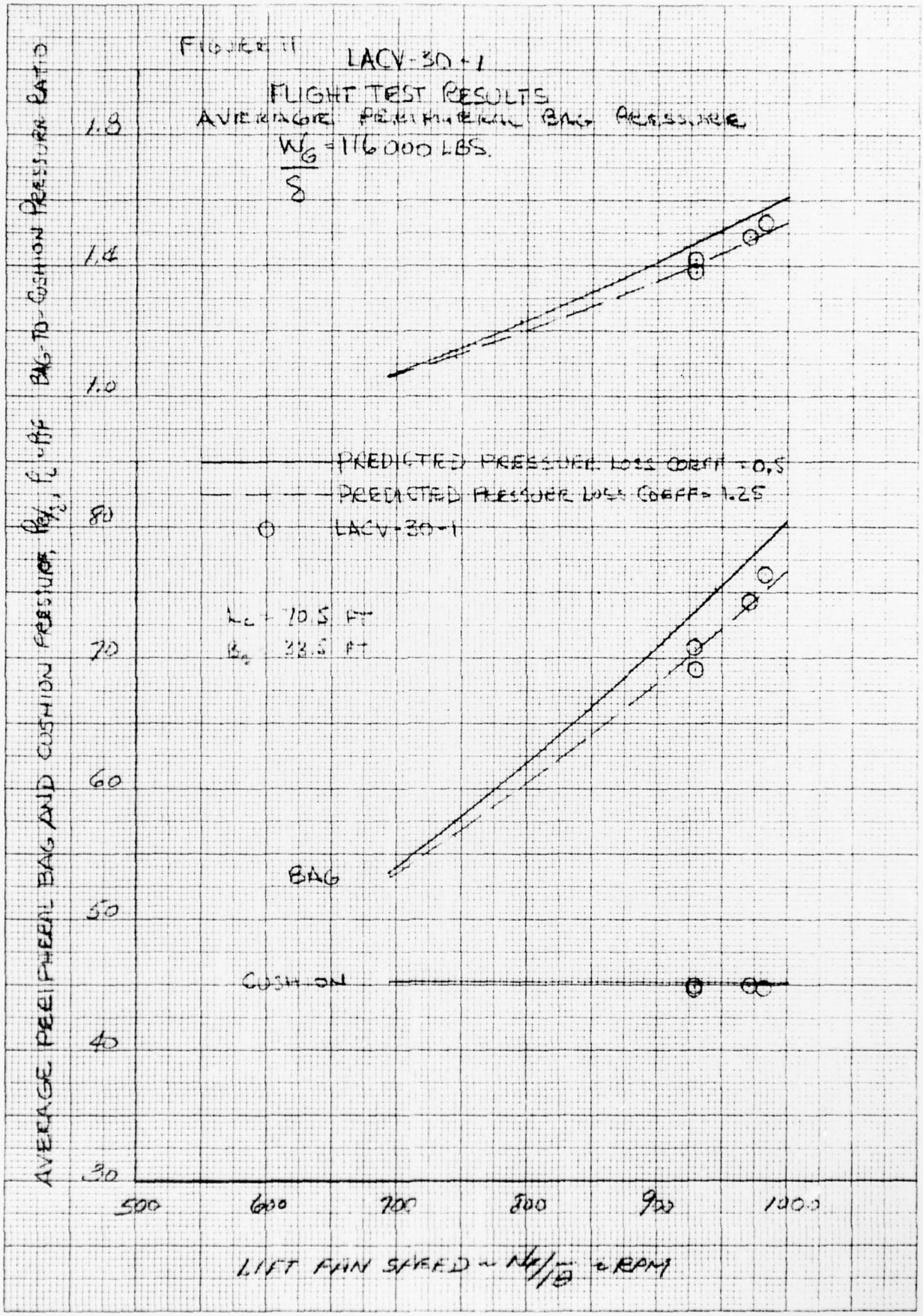
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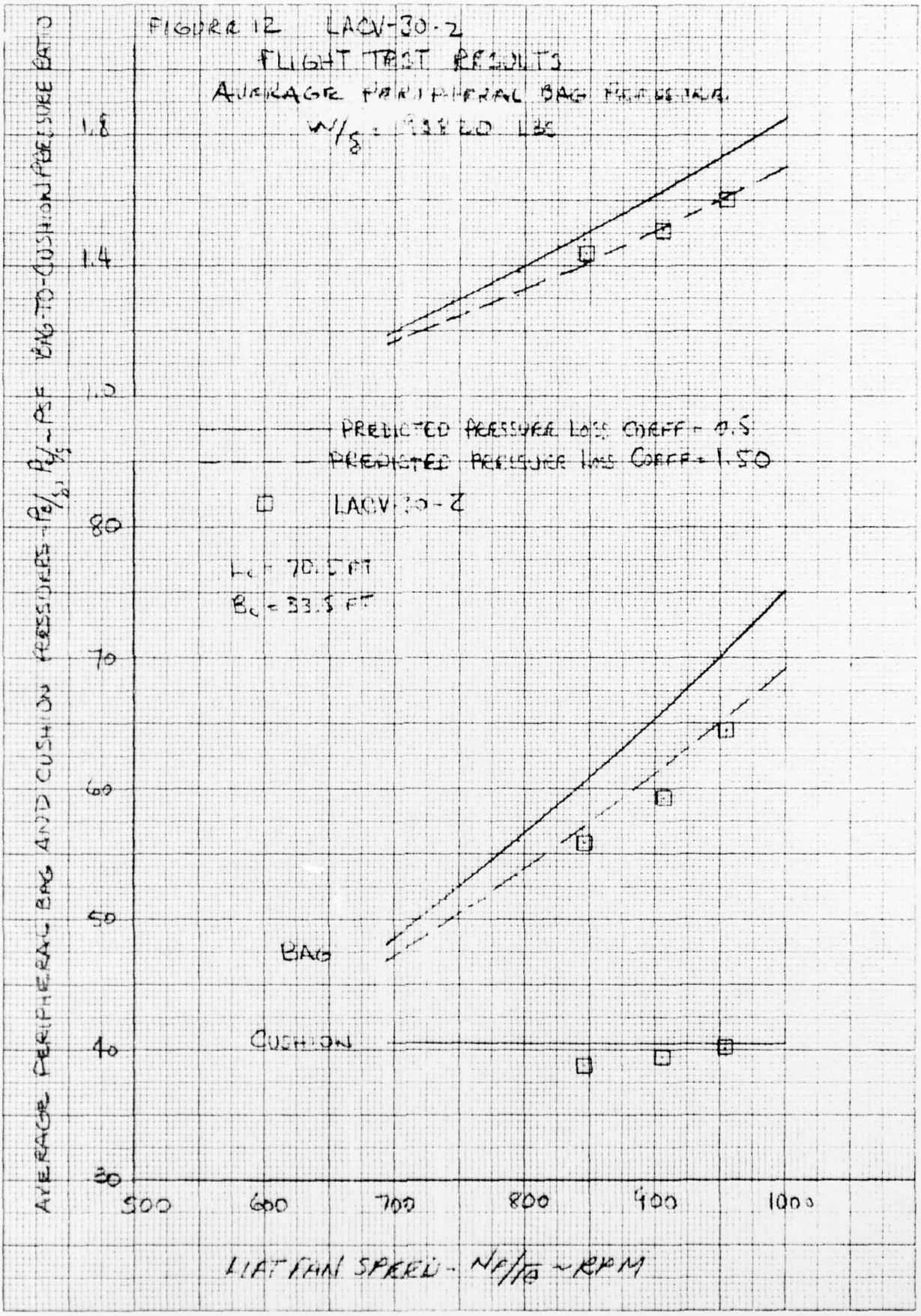
46 1323
K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



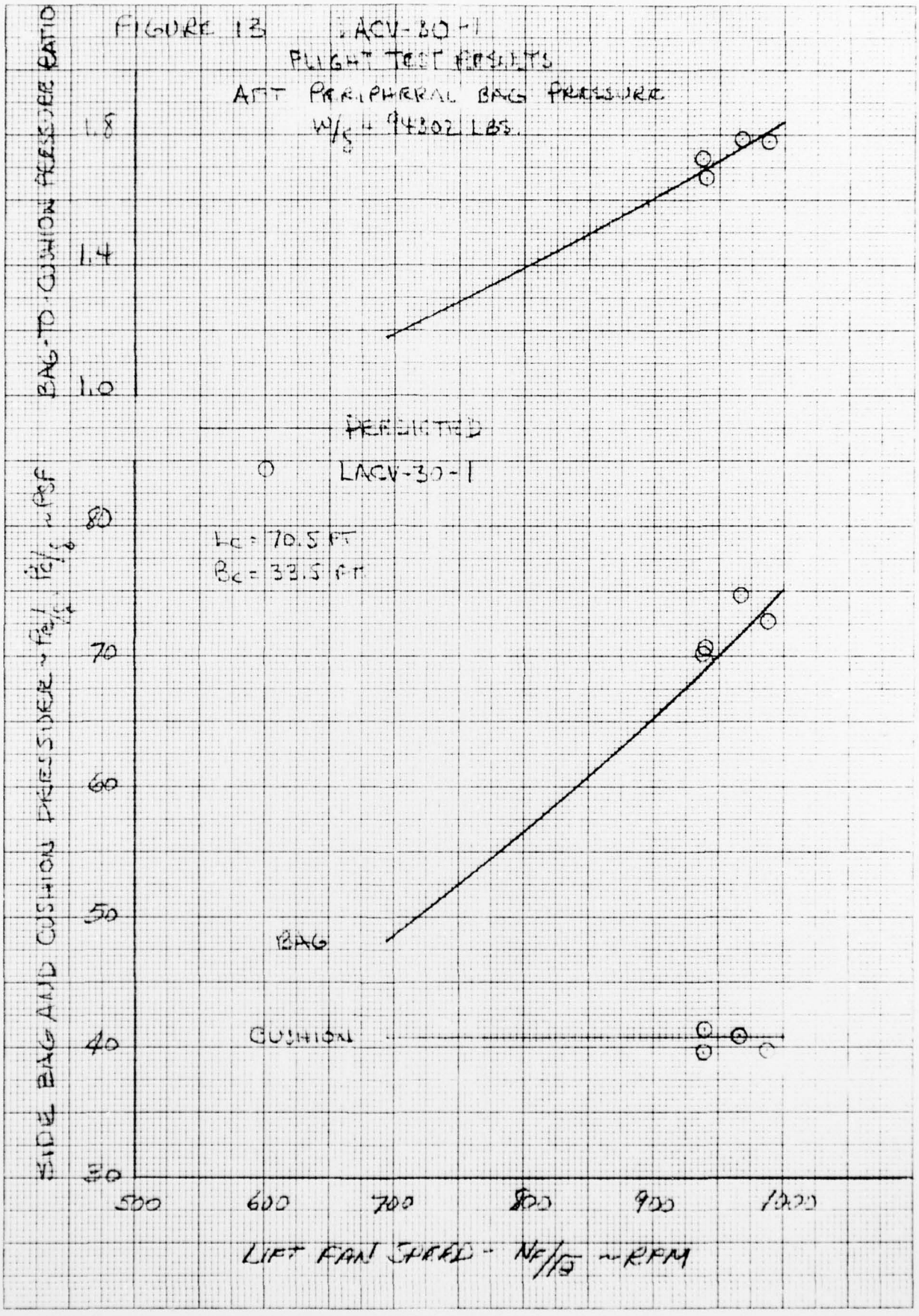
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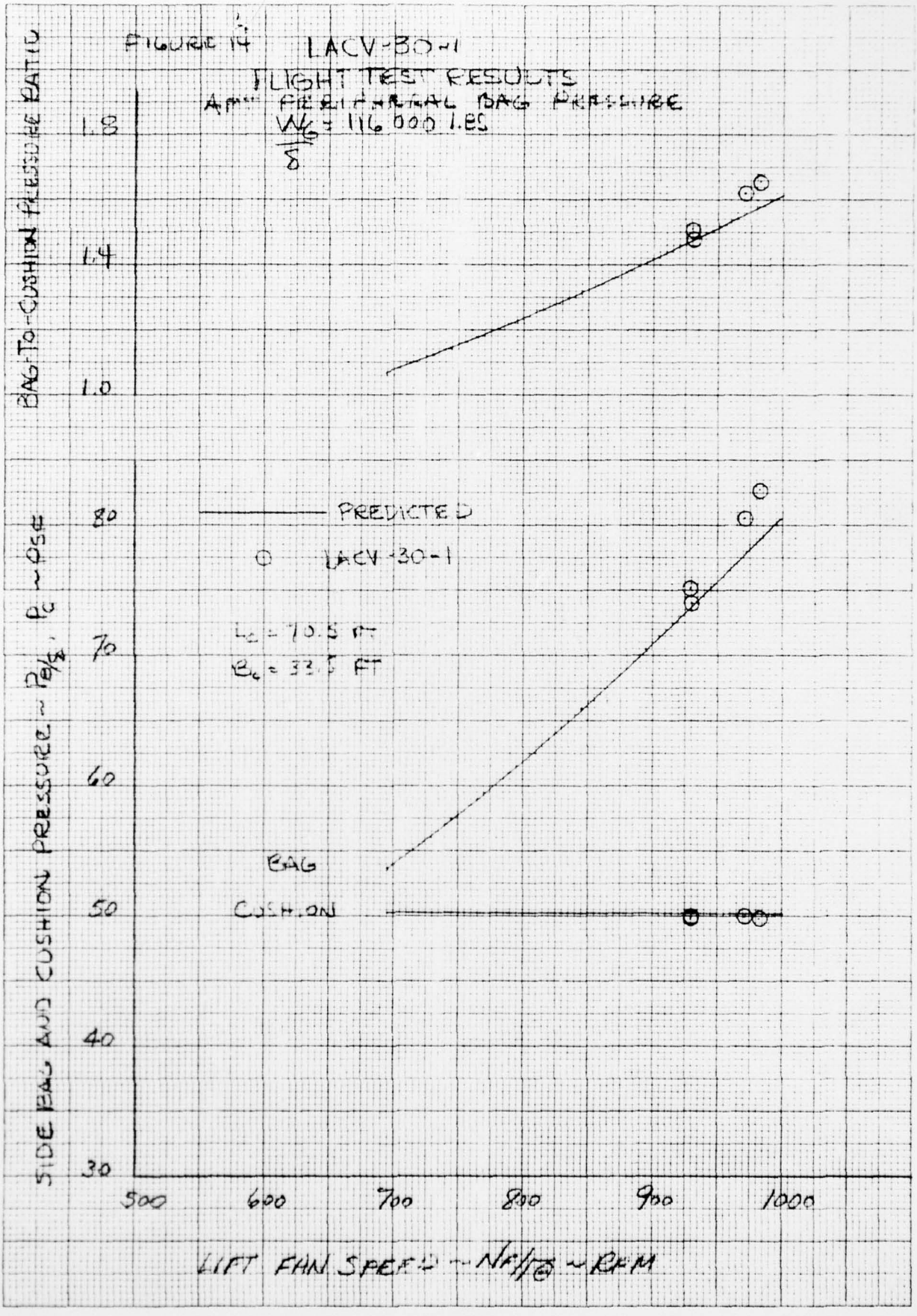
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46 1323



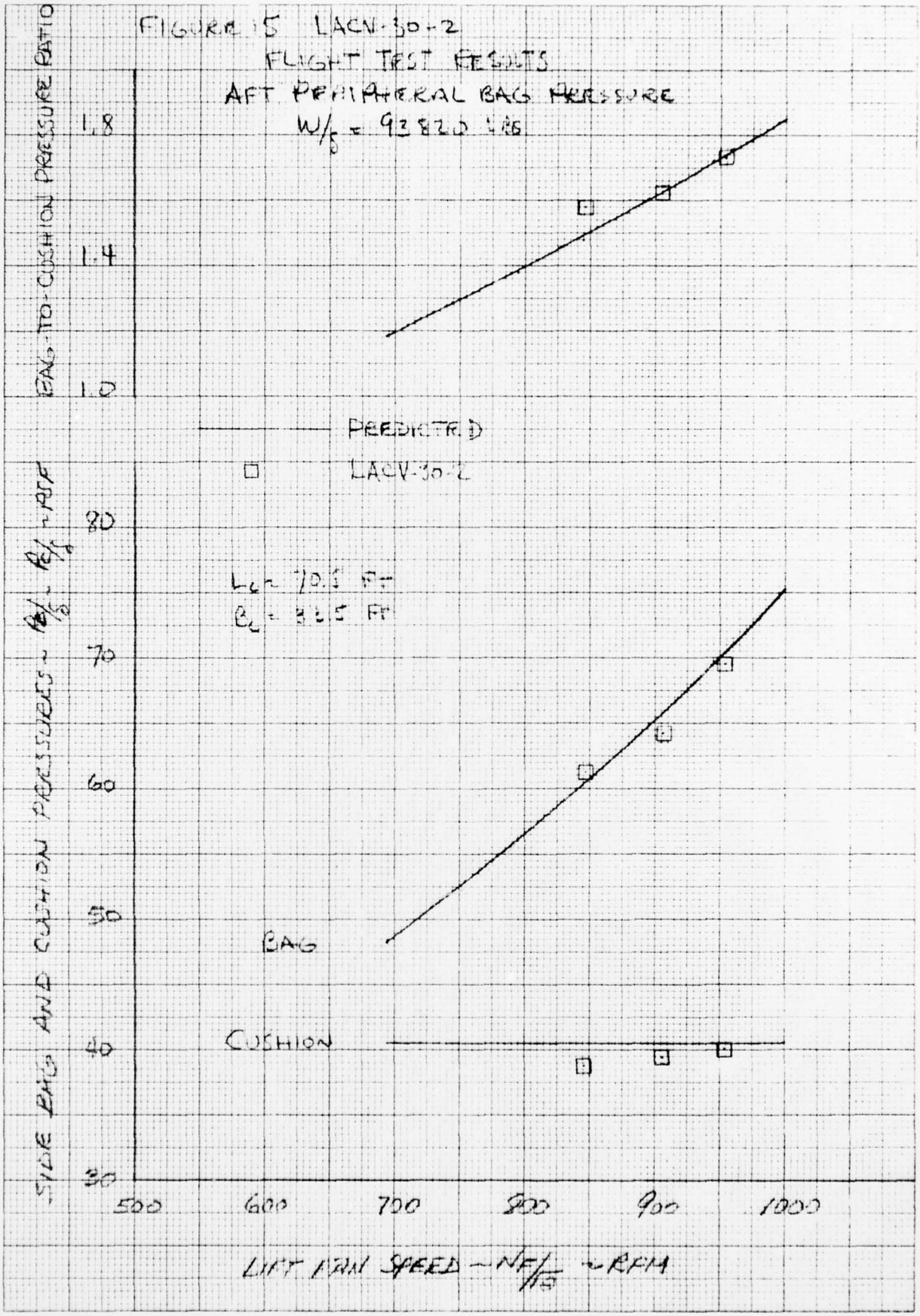
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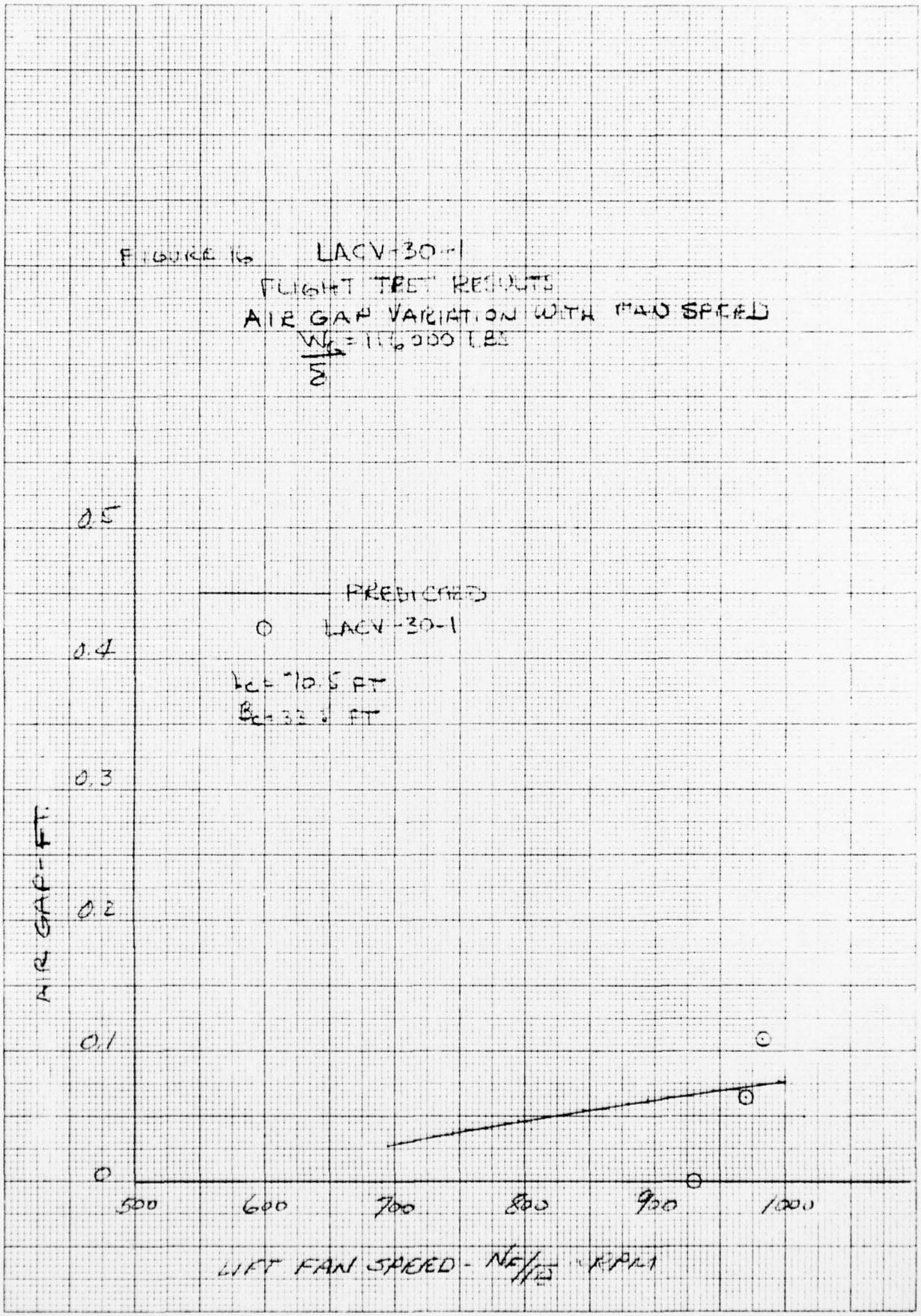
46 1323
K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO MADE IN U.S.A.



46 1323
K+E 10 X 10 TO 5 INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

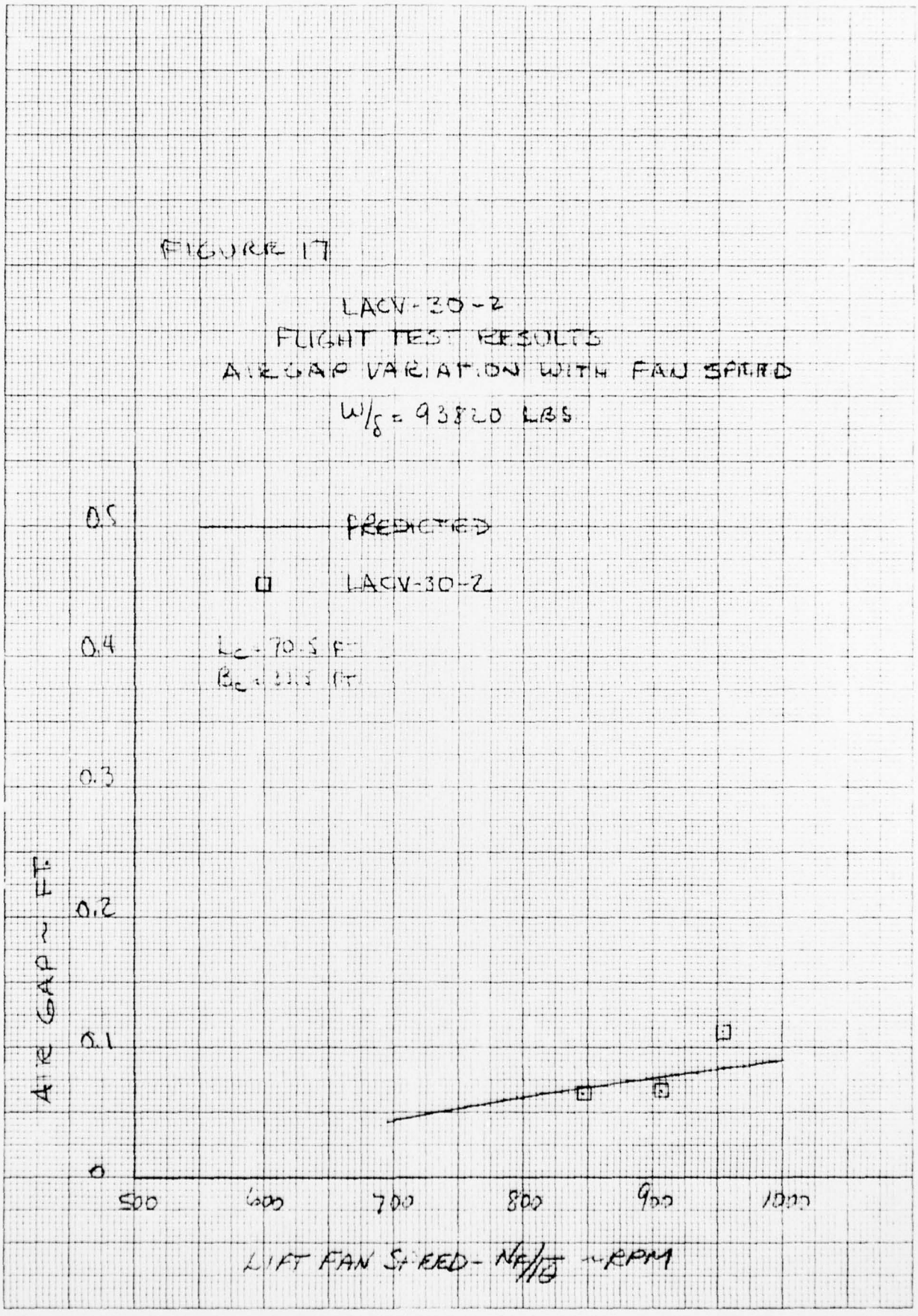


46 1323
K·E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

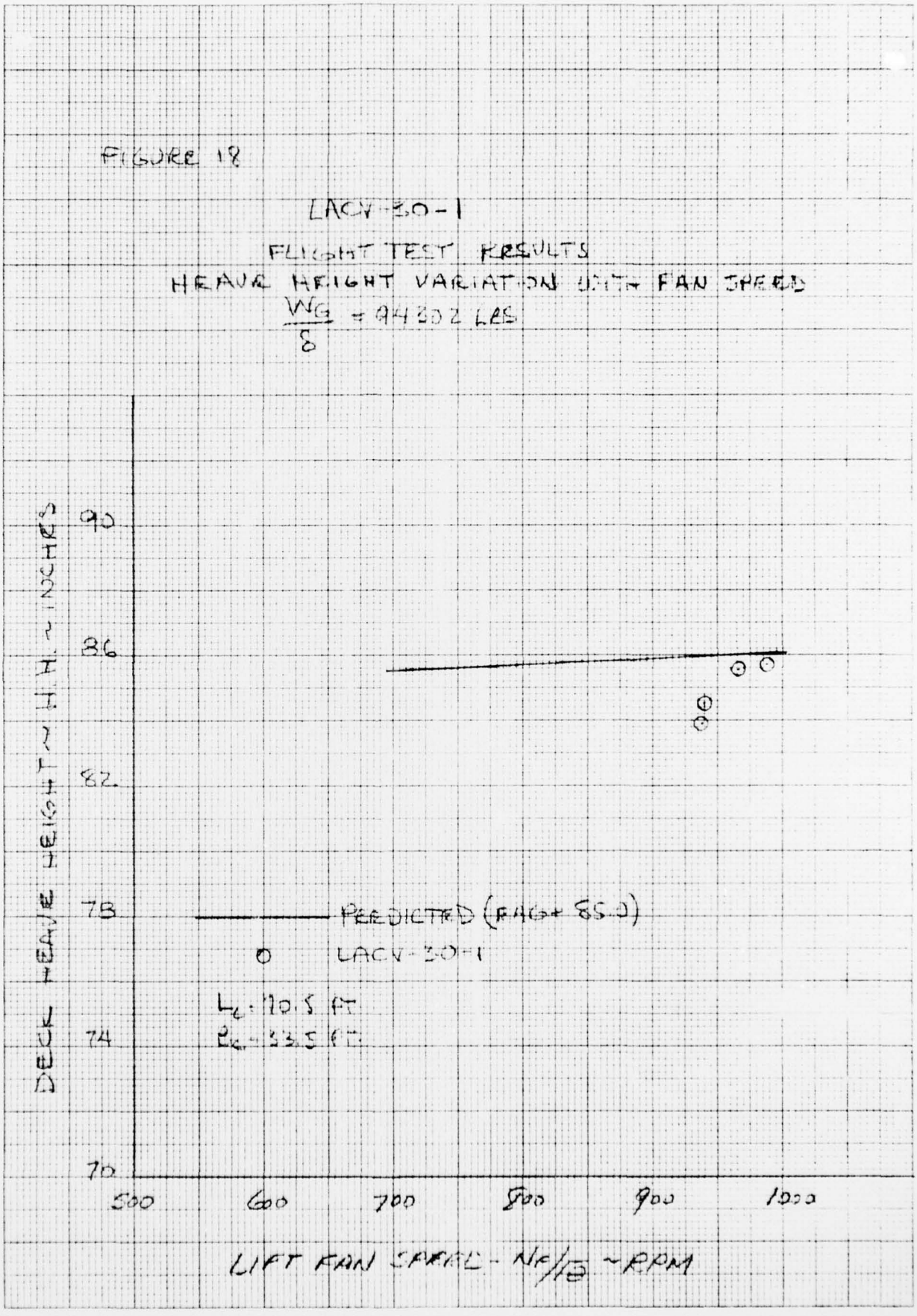


K•E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO MADE IN U.S.A.

46 1323



46 1323
K&E 10 X 10 TO ½ INCH 5 X 7 INCHES
KEUFFEL & ESSER CO MADE IN U.S.A.



46 1323
KE 10 X 10 TO 5 INCH 5 X 7 INCHES
KEUFFEL & ESSER CO MADE IN U.S.A.

46 1323

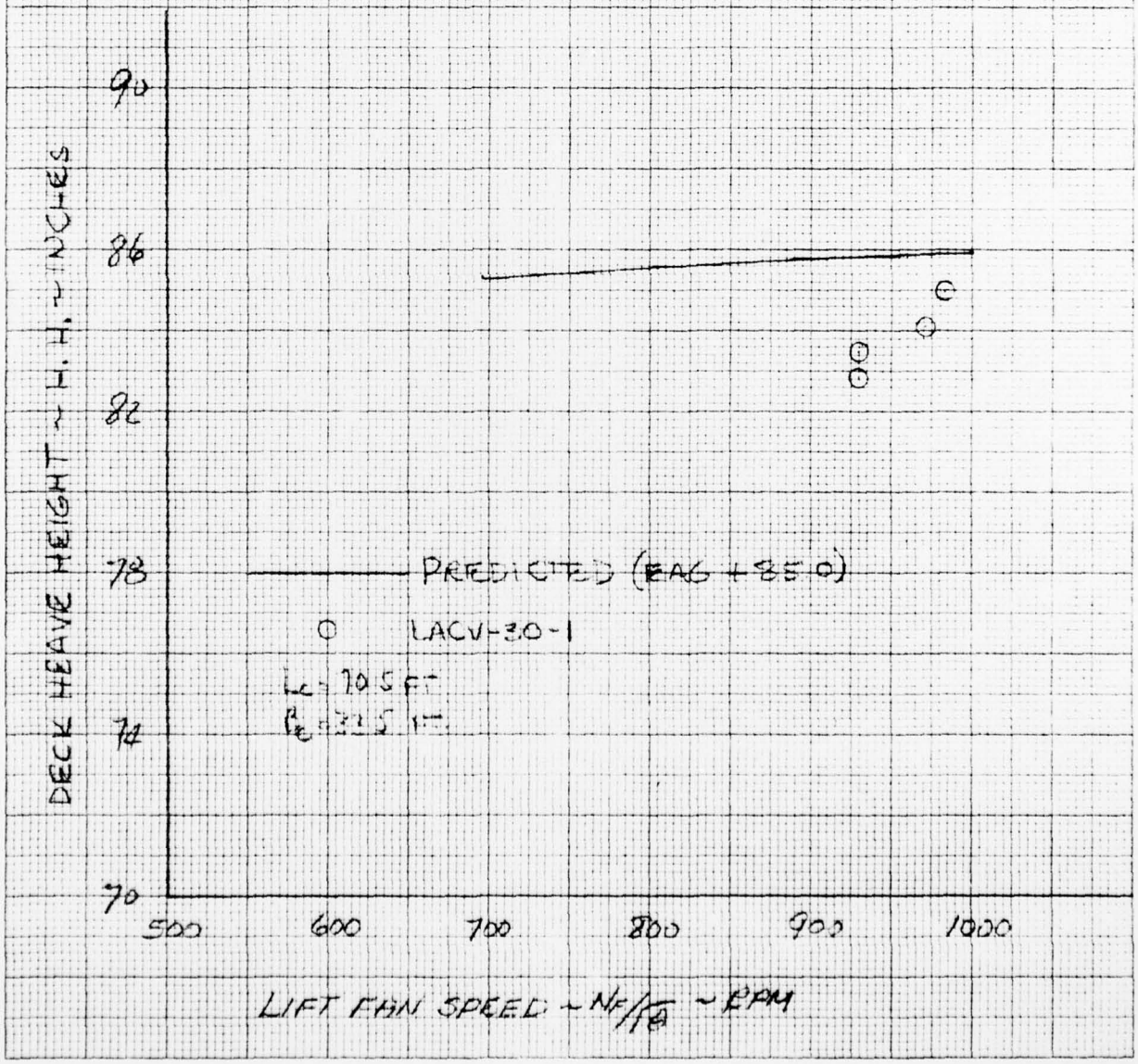
K&E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

FIGURE 19 LACV-30-1

FLIGHT TEST RESULTS

HEAVE HEIGHT VARIATION WITH FAN SPEED

$\frac{W_G}{S}$ = 11.6000 LBS.



46 1323
K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO MADE IN U.S.A.

FIGURE 20 LACV-30-2

FLIGHT TEST RESULTS

HEAVE HEIGHT VARIATION WITH FAN SPEED

$W/_\delta$ = 93820 LBS

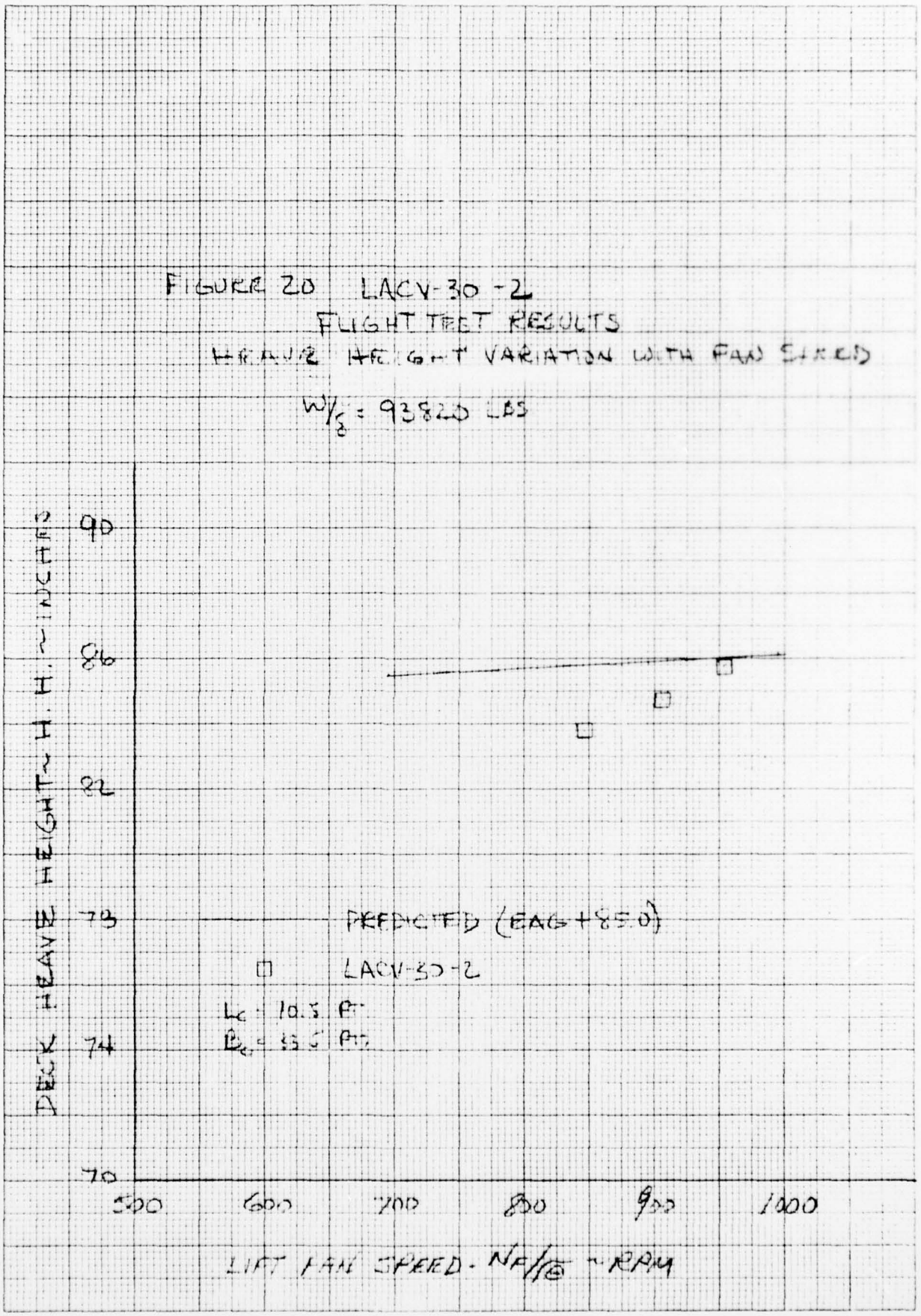
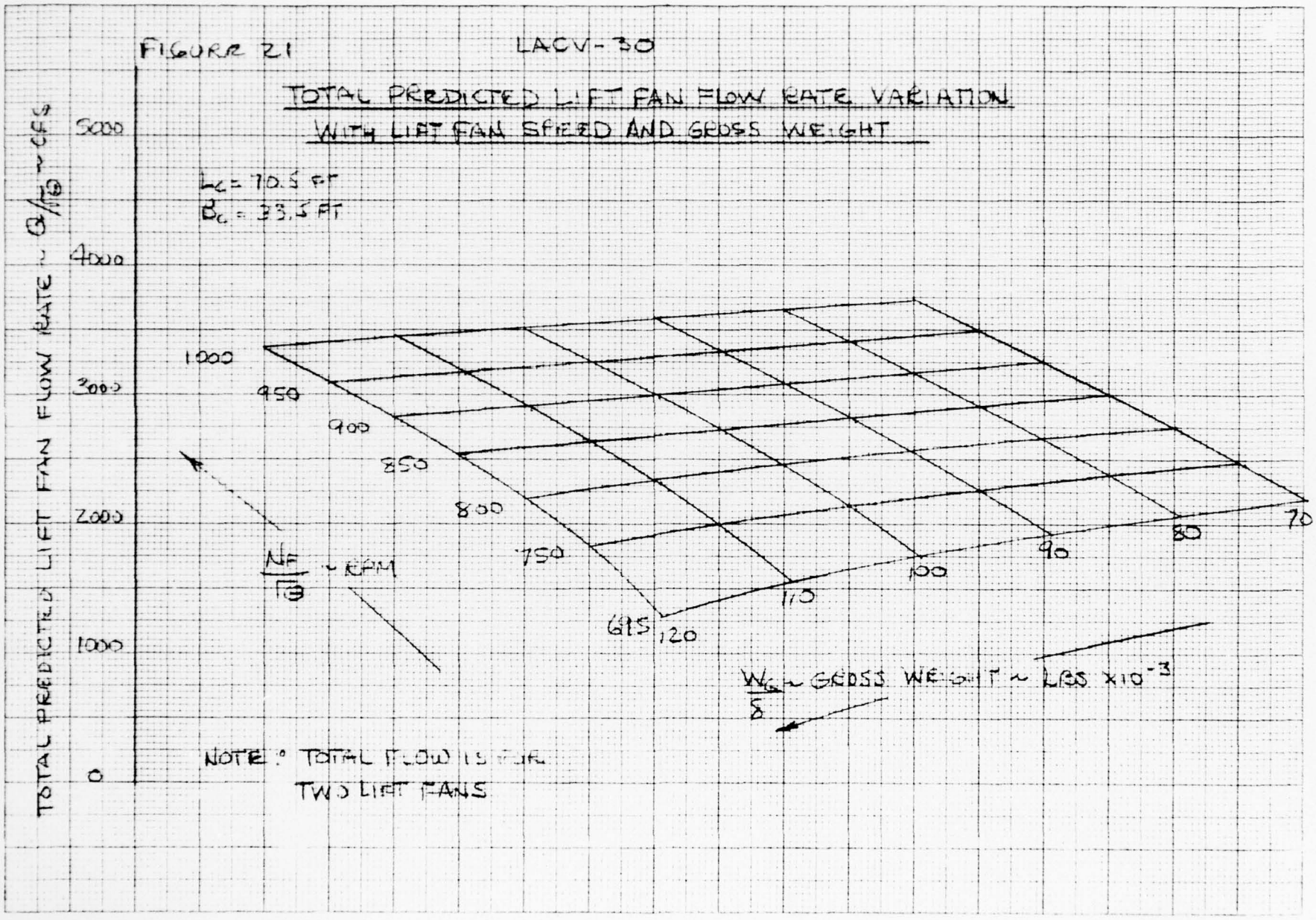


FIGURE 21 LACV-30

TOTAL PREDICTED LIFT FAN FLOW RATE VARIATION WITH LIFT FAN SPEED AND GROSS WEIGHT

L_c = 70.5 FT

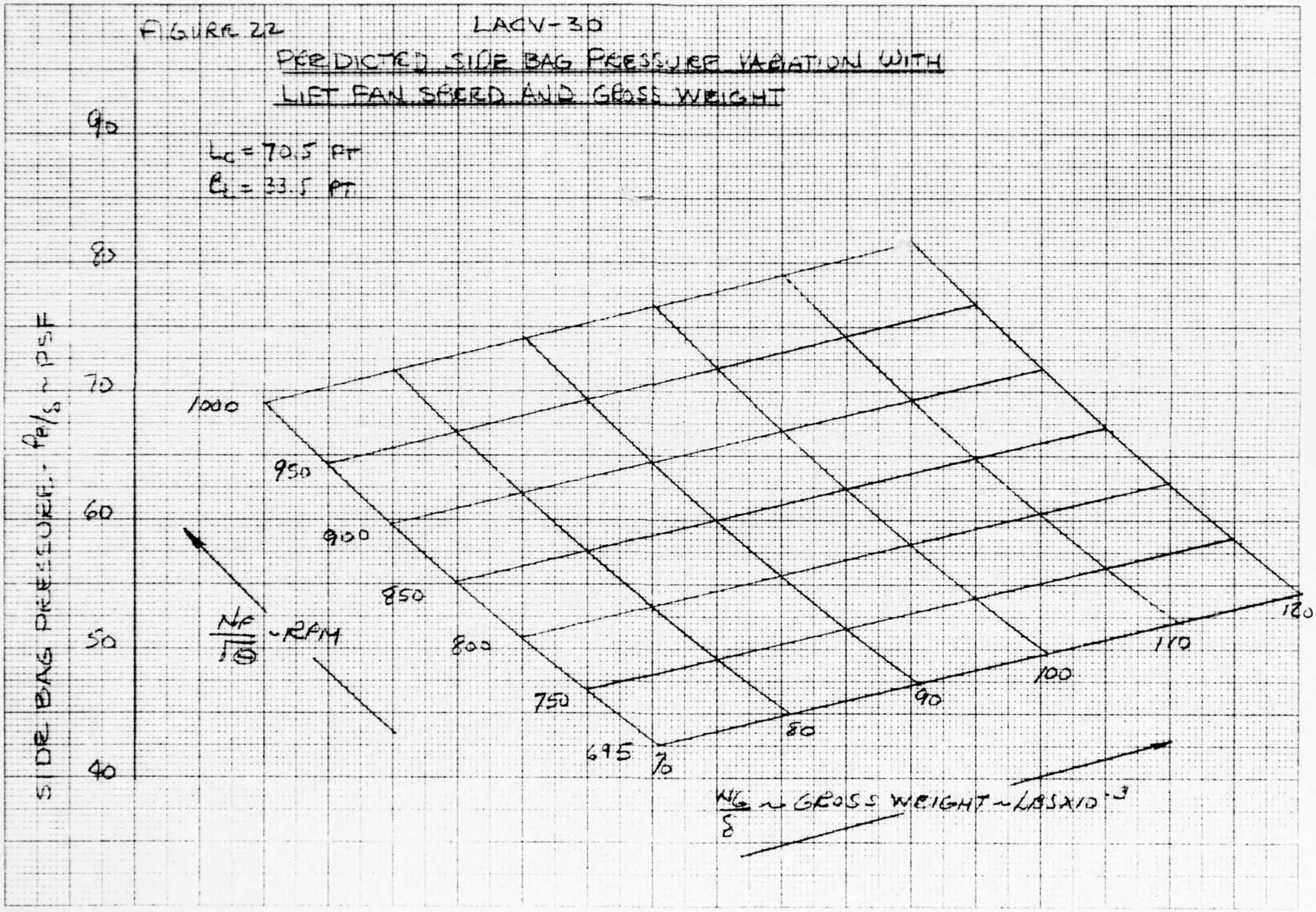
B_c = 33.5 FT



NOTE: TOTAL FLOW IS FOR TWO LIFT FANS

FIGURE 22 LACV-30

PREDICTED SIDE BAG PRESSURE VARIATION WITH LIFT FAN SPEED AND GROSS WEIGHT



K·E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

FIGURE 23 LACV-30

PREDICTED BAG-TO-CUSHION PRESSURE RATIO VARIATION WITH LIFT FAN SPEED AND GROSS WEIGHT

L_c = 70.5 FT
B_c = 33.5 FT

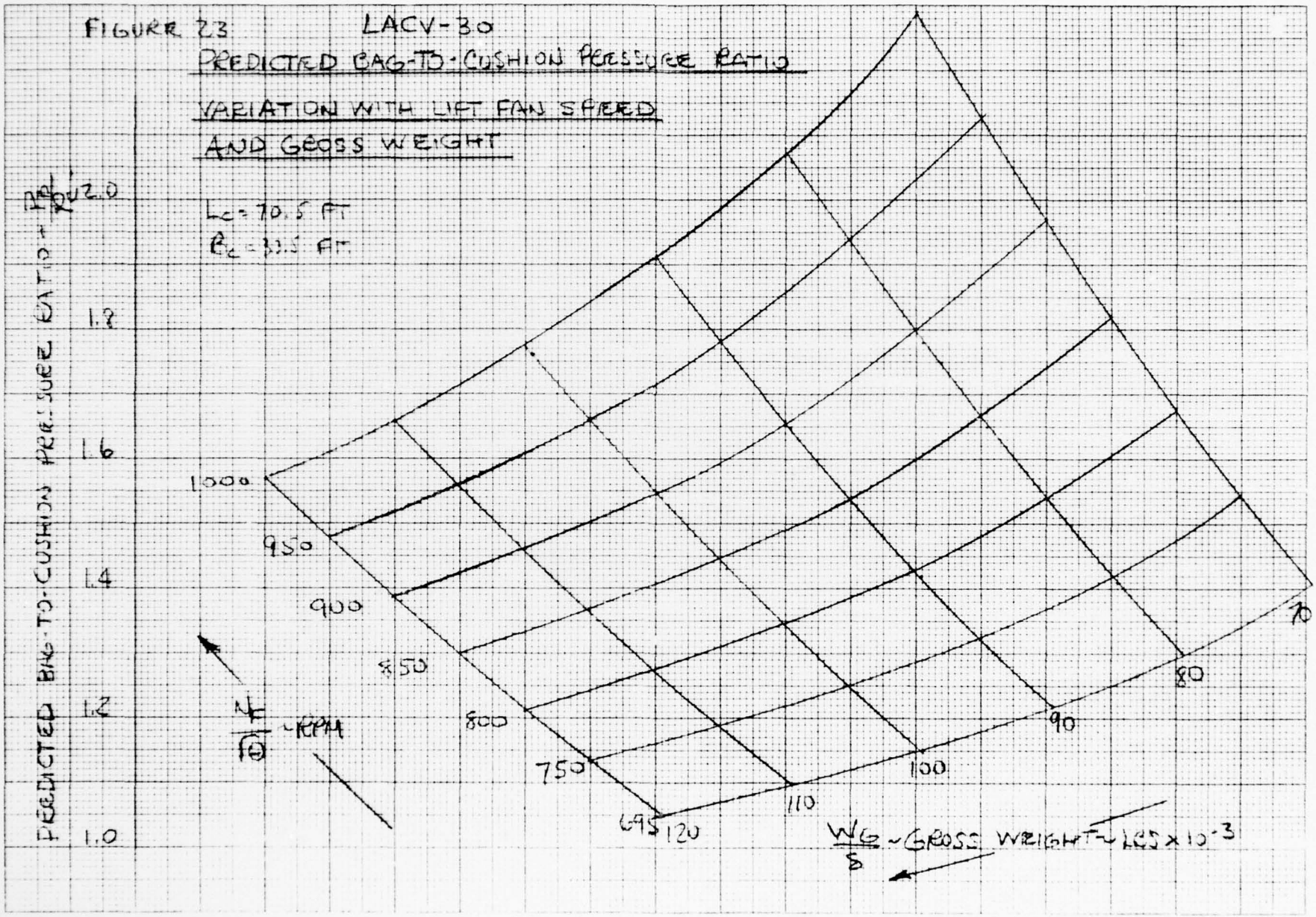
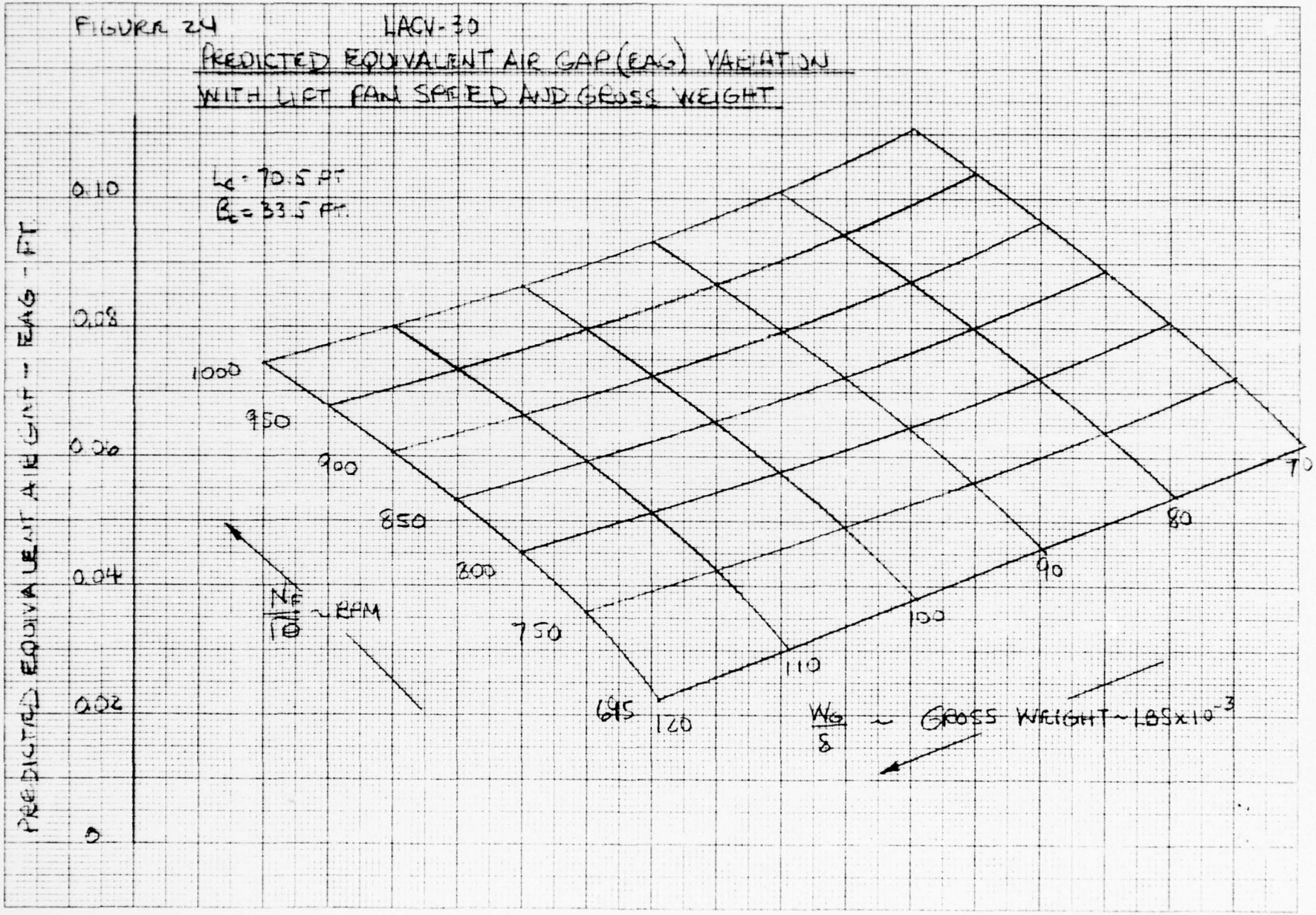


FIGURE 24 LACV-30

PREDICTED EQUIVALENT AIR GAP (EAG) VARIATION WITH LIFT FAN SPEED AND GROSS WEIGHT



K&E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

FIGURE 25 LACV-30

TOTAL PREDICTED LIFT FAN HORSEPOWER VARIATIONS WITH LIFT FAN SPEED AND GROSS WEIGHT

