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# U. S. NAVAL AIR TEST FACILITY (SI)

LAKEHURST, NEW JERSEY

Report No. NATF(SI)-EI-114

3 May 1965

EVALUATION OF ALL AMERICAN ENGINEERING COMPANY'S  
MODEL 44B-2 ARRESTING GEAR WITH  
DEADLOADS AND AIRCRAFT

BUREAU OF NAVAL WEAPONS  
PROBLEM ASSIGNMENT NUMBER RSSH-03-170/204/1



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(SHIP INSTALLATIONS)  
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1. Introduction: An evaluation program of the All American Engineering (AAE) Company's Model 44B-2 arresting gear was conducted with deadloads at the Recovery Systems Track Site (RSTS) No. 5 of the U. S. Naval Air Test Facility (Ship Installations) (NATF(SI)), U. S. Naval Air Station, Lakehurst, New Jersey, as authorized by reference (a). The purpose of the deadload test program, financed by AAE (reference (b)), was to determine the basic performance characteristics of the arresting gear. Following these tests, further evaluation tests were conducted with the A-4B and F-104G aircraft, at the runway site of NATF(SI) as authorized by reference (c).

## 2. Description and Configuration

a. The Model 44B-2 arresting gear has a designed energy-absorption capacity of 68 million foot-pounds and a maximum runout of 1,000 feet. In its present configuration, as described below, the arresting gear is capable of absorbing the energy of five consecutive maximum-energy arrestments or ten maximum-energy arrestments in one hour.

b. The port and starboard arresting-gear units (see Figure 1) each consist of two basic components: the energy absorber and the retraction system.

(1) Energy Absorber: The energy absorber is composed of a 44-inch-diameter cylindrical drum that contains a nine-vaned rotor (33 inches in diameter) keyed to a vertical shaft and immersed in a solution of 60% ethylene glycol and 40% water. Eight stator blades are welded to the bottom of the drum and eight to the removable cover plate. The vertical rotor shaft extends through the cover plate and is keyed to a tape reel.

(2) Tape and Tape Reel: The tape reel has an outer diameter of six feet and an inner diameter of 18 inches, which consists of a 12-inch hub and a 3-inch collar. An 8-inch-wide x 0.356-inch-thick x 920-foot-long uncoated nylon purchase tape is reeved on the tape reel and threaded through a deck-edge sheave located 17 feet from the tape reel.

### (3) Retraction System

(a) Electrical: A follower attached to the upper tape-reel flange bears up against a spring-loaded cam, mating the retraction system to the arresting system, and is used for retracting and pre-tensioning the system. System pre-tensions range from 1,500 to 2,000 pounds. During an arrestment, a tape tension of 5,000 pounds is needed to trip the cam and uncouple the retraction system from the arresting system. The spring-loaded cam (see Figure 2) is mounted to a sprocket and connected, through a drive chain, to a gear-reduction box which is



driven by a 20-horsepower electric motor. The retraction and pre-tensioning is accomplished by operating an ON-OFF electrical switch on the shell covering the retraction system. To retract a 1,000-foot purchase tape and to pre-tension the system takes approximately three minutes.

(b) Mechanical: A capstan is connected to the upper flange of the tape reel in order that mechanical retraction of the system may be accomplished in the event of failure of the electric retraction system. The arresting gear can then be retracted by wrapping rope around the capstan and pulling with a vehicle. Retracting both units through the use of a capstan can be accomplished within approximately ten minutes.

(4) Tight Tape Wrap: A roller, shown in Figure 3, is utilized to obtain a tight tape wrap. By means of a winch, a 600- to 1,200-pound load is applied to the roller, which forces the roller against the tape, pressing the tape to the stack.

c. The arresting-gear was configured to a deck-sheave span of 225 feet, with a 17-foot split from the sheave to the tape reel (both port and starboard). The following deck pendants were used:

(1) Deadload tests - 115- and 150-foot-long x 1-inch-diameter, nonrotating, hemp-core deck pendants, and

(2) Aircraft tests - 135-foot-long x 1-inch-diameter, non-rotating, hemp-core deck pendants.

d. The energy absorber and retraction system are mounted on a steel plate that is anchored to the deck by three deadmen and ground stakes. The deck-edge sheaves are anchored to the deck by three deadmen. The above-ground height of the energy absorber and the retraction motor is 22 and 32 inches respectively.

### 3. Test Results and Analysis

a. Deadload Tests: Fifteen arrestments of various-weight deadloads were conducted at RSTS No. 5 and are summarized below:

| Deadload<br>Weight<br>(Lb) | No. of<br>Events | Range                     |                                                | Purchase-<br>Tape<br>Tension*<br>(1,000 Lb) | Deck-<br>Pendant<br>Length<br>(Ft) |
|----------------------------|------------------|---------------------------|------------------------------------------------|---------------------------------------------|------------------------------------|
|                            |                  | Engaging<br>Speed<br>(Kn) | Arresting-<br>Hook Axial<br>Load<br>(1,000 Lb) |                                             |                                    |
| 20,000                     | 7                | 116 - 185                 | 29.5 - 66.8                                    | 14.6 - 35.5                                 | 115/150                            |
| 24,000                     | 1                | 172                       | 60.8                                           | 34.2                                        | 150                                |

\* Measured by three-sheave tensiometers.

| Deadload<br>Weight<br>(Lb) | No. of<br>Events | Range                     |                                                |                                             |                                    |
|----------------------------|------------------|---------------------------|------------------------------------------------|---------------------------------------------|------------------------------------|
|                            |                  | Engaging<br>Speed<br>(Kn) | Arresting-<br>Hook Axial<br>Load<br>(1,000 Lb) | Purchase-<br>Tape<br>Tension*<br>(1,000 Lb) | Deck-<br>Pendant<br>Length<br>(Ft) |
| 30,000                     | 3                | 141 - 169                 | 42.0 - 63.8                                    | 21.0 - 31.3                                 | 150                                |
| 40,000                     | 4                | 123 - 169                 | 34.0 - 75.0                                    | 16.8 - 33.0                                 | 150                                |

\* Measured by three-sheave tensiometers.

(1) The use of different-length pendants during arrestments of the 20,000-pound deadload did not result in any significant difference in arresting-gear performance.

(2) Both arresting-gear units two-blocked during all events with the 40,000-pound deadload; the arresting-hook loads at time of two-blocking were negligible, and caused deadload walkbacks of less than 100 feet. Wet purchase tapes were used during two events with this deadload (158- and 169-knot engaging speeds), and resulted in no significant variations in arresting-hook loads and purchase-tape tensions.

(3) For the 15 deadload events, the working limit of the purchase tapes was set at 55,000 pounds and the working strength of the pendant was set at 46,000 pounds.

(4) Appendix A is a tabulation of all pertinent data. Plots of maximum arresting-hook axial load and purchase-tape tension versus engaging speed are presented in Figures 4 and 5 respectively.

b. Aircraft Tests: Eleven arrestments of the A-4B and F-104G aircraft were conducted at the runway site and are summarized below:

| Aircraft |                |                  | Range                     |                                                |                                            |                                    |
|----------|----------------|------------------|---------------------------|------------------------------------------------|--------------------------------------------|------------------------------------|
|          |                |                  | Engaging<br>Speed<br>(Kn) | Arresting-<br>Hook Axial<br>Load<br>(1,000 Lb) | Purchase-<br>Tape<br>Tension<br>(1,000 Lb) | Deck-<br>Pendant<br>Length<br>(Ft) |
| Type     | Weight<br>(Lb) | No. of<br>Events |                           |                                                |                                            |                                    |
| A-4B     | 15,000         | 4                | 113 - 138                 | 16.9 - 33.8                                    | 12.2 - 21.0                                | 135                                |
| F-104G   | 17,000         | 7                | 114 - 173                 | 20.9 - 58.0                                    | 14.0 - 30.4                                | 135                                |

#### (1) Results

(a) Inspection of the A-4B aircraft after each arrestment indicated that the arresting hook was impacting the aircraft fuselage; however, the impacts were mild and no aircraft damage was observed.

(b) The F-104G aircraft fuselage was damaged during these tests. Although the hook-impact area on the aircraft occurs at the center of the parachute door, the damage inflicted was observed fore and aft of this point. This damage consisted of buckling of the parachute door outer surface and internal damage on the door frame and pulley assembly (see Figure 6). The aircraft parachute door used during these tests had been reinforced. (Note: Based on later tests with the M-21G arresting gear, there is a strong indication that the arresting-hook snubber assembly of this aircraft was not functioning properly during the above tests.)

(c) Appendix B is a tabulation of all pertinent data. Plots of maximum arresting-hook axial load and purchase-tape tension versus engaging speed are presented in Figures 7 and 8 respectively.

## (2) Aircraft Performance

(a) The following pilot technique was used during all aircraft arrestments:

1. Maintain throttle setting needed to obtain the required engaging speed until wire pick-up.
2. Reduce throttle setting to idle after wire pick-up is assured and maintain at this position for the remainder of the arrestment.
3. When the aircraft speed is reduced to a speed comparable to a taxi speed, apply brakes until aircraft is completely stopped.

(b) The energy-absorption characteristics of the arresting gear, that is, the retarding torque, is proportional to the arrested vehicle's speed; therefore, the technique described above was used to prevent two-blocking of the arresting gear. This method proved to be satisfactory.

(c) At the conclusion of each aircraft arrestment, assistance was needed to disengage the pendant from the aircraft hook. This was accomplished with the A-4B aircraft by cautiously retracting the arresting gear, thereby moving the aircraft backward; and then, by stopping the retraction, the aircraft would roll away from the pendant. The shape of the F-104G aircraft made this method impractical because of possible aircraft damage; therefore, the pendant was removed by connecting a vehicle to the tape connector by means of a rope and pulling on the tape until the tape became slack. When the tape was slack, the pendant was manually removed from the hook.

(d) Pilot comments for all arrestments of both aircraft were favorable. No yaw was noticed at any time, and the maximum final OFF-CENTER distance of the aircraft varied by less than 10 feet from the wire pick-up position. The deadload tests at RSTS No. 5 verified this negligible OFF-CENTER tracking characteristic.

c. Deck-Pendant Service Life: Nine 1-inch-diameter deck pendants were used during the 26 arrestments conducted for this program. The following table gives pertinent pendant information and the reason replacement was required:

| <u>No. of Engagements<br/>on Deck Pendant</u> | <u>Highest<br/>Engaging<br/>Speed<br/>(Kn)</u> | <u>Reason for Replacement</u>                         |
|-----------------------------------------------|------------------------------------------------|-------------------------------------------------------|
| 5                                             | 185                                            | 5 broken wires                                        |
| 1                                             | 145                                            | Deadload guides cut through pendant                   |
| 3                                             | 171                                            | Internal damage of pendant indicated                  |
| 5                                             | 169                                            | 2 broken wires and excessive number of flat spots     |
| 2                                             | 172                                            | Completion of deadload tests                          |
| 2                                             | 125                                            | Bolter - A-4B aircraft arresting hook speared pendant |
| 0                                             | -                                              | Bolter - A-4B aircraft arresting hook speared pendant |
| 7                                             | 154                                            | Considered unacceptable for further use               |
| 2                                             | 175                                            | Completion of aircraft tests                          |

d. Arresting-Gear Maintenance: The arresting gear required no major maintenance during this program.

(1) The following minor maintenance was required prior to aircraft tests:

(a) Three gallons of arresting-gear fluid was added to each unit.

(b) Approximately one quart of fluid was added to the fluid couplings located between the electric retraction motor and the gear-reduction box.

(c) The nylon purchase tapes were reversed; that is, the loops that were connected to the pendant were reversed and connected to the tape-reel hubs. This was performed because of the excessive amount of purchase-tape wear experienced during the deadload tests at RSTS No. 5, which was caused by the terrain over which the purchase tapes traveled during an arrestment.

(2) When required during the test program, a coating of GACO was painted on those areas of the purchase tapes where excessive wear was occurring.

4. Comparison of Various Emergency Arresting Gears: The performance of the Model 44B-2 arresting gear indicates that it may be a highly-desirable replacement for emergency arresting-gear systems now in use. In support of this statement, the comparisons contained on the following pages are presented for the Model 44B-2, E-5-1, E-14-1, and E-27 arresting-gear systems. The comparison information was extracted from the following sources:

a. E-27 - NATF(SI) report number NATF(SI)-EI-110 of 20 Nov 1964, subject: Aircraft Compatibility with Single E-27 (BAK-9 Pit Installation) Emergency Arresting Gear.

b. E-14-1 - NATC report number 1 of 20 Dec 1960, subject: Evaluation of the E-14-1 "Water Squeezer" Runway Emergency Arresting Gear with Airplanes, Report No. 1, Final Report; and NATF(SI) ltr 4210/ANB:jas of 5 Feb 1965, subject: Service-life evaluation of swivels for the E-14-1 emergency arresting gear.

c. E-5-1 - NATF(SI) report number NATF-E-1049, SUPPL A, of 12 Apr 1962, subject: Evaluation of the E-5-1 Emergency Chain Arresting Gear Performance with Piloted Aircraft.

d. 44B-2 - This report; extrapolated from tabulated test data, in Appendixes A and B. F-8 and A-3 aircraft test data, extrapolated from deadload test data, in Appendix A.

Performance

| Type<br>Aircraft | Engaging-Speed Limit (Knots) |               |                           |
|------------------|------------------------------|---------------|---------------------------|
|                  | <u>E-27</u>                  | <u>E-14-1</u> | <u>E-5-1</u> <u>44B-2</u> |
| A-3              | 130                          | 160           | 152    177                |
| A-4              | 160                          | 168           | 162    180                |
| F-8              | 160                          | 154           | 162    180                |

NOTE: Figure 9 of this report presents these engaging-speed limits in bar-graph form.

Purchase-Tape Service Life

| <u>E-27</u>                                                                                                           | <u>E-14-1</u>                                                                       | <u>E-5-1</u>                                                                           | <u>44B-2</u>                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Maximum of 20 arrestments. Figure 10 of this report provides tape replacement and replacement criteria for this gear. | Cable and swivel inspected after 10 arrestments, and replaced after 20 arrestments. | Report NATF-E-1049 Supplement A states a maximum of 28 arrestments before replacement. | Because of past performance of similar tapes used on TM-24 arresting gear, the anticipated service life is 50 arrestments. |

Installation

|                                                                                                                                    |                                                                                                                                                                                                                                                                     |                                                                                                                                 |                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gear is installed in deep pit on side of runway with fairlead tubes under runway. Deck sheaves are mounted on each side of runway. | Two ditches are needed, one on each side of runway, 5-ft wide, approx 5-ft deep, and 920-ft long, which contain 920 feet of programmed tubes. Three concrete pits are incorporated around each tube assembly. Deck-edge sheaves are mounted on each side of runway. | A concrete pad is needed on each side of runway to anchor the pre-tension system. Retention "hooks" are bolted into the runway. | Arresting gear and deck-edge sheaves are secured to ground by deadmen and ground stakes. If pits are needed, the size of the gear allows for small pits. |
|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

| <u>Retraction Time</u>                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <u>E-27</u>                                                                                                                                                                                                                                                                                                                                                                                                                      | <u>E-14-1</u>                                                                                                                                                                                                                                                                               | <u>E-5-1</u>                                                                                                                                                                                                        | <u>44B-2</u>                                                                                                                     |
| 3 to 4 minutes.                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 minutes.                                                                                                                                                                                                                                                                                  | Approximately 20 minutes.                                                                                                                                                                                           | 1 to 2 minutes.                                                                                                                  |
| <u>Maintenance</u>                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                                                  |
| <p>A great deal of maintenance is required; this includes:</p> <p>a. Repair of hydraulic leaks.</p> <p>b. Frequent replacement of brake-selector valves, shuttle valves, and re-wind shear pins.</p> <p>c. Balancing of the hydraulic system so that the programmed hydraulic pressure is the same on both units.</p> <p>d. Frequent replacement of friction brakes, particularly after a series of high-energy engagements.</p> | <p>Little maintenance is required; this includes:</p> <p>a. Periodic disassembly and inspection of swivels.</p> <p>b. Filling each unit with additional arresting gear fluid every 2 or 3 arrestments.</p> <p>c. Replacement of shear pins in pre-tension system after each arrestment.</p> | <p>Little maintenance is required; this includes:</p> <p>a. Replacement of shear pins in pre-tension system after each arrestment.</p> <p>b. Tightening of anchoring system after approximately 50 arrestments.</p> | <p>Little maintenance is expected; this includes:</p> <p>a. Filling each unit with additional arresting gear fluid each day.</p> |

## 5. Conclusions

a. In its present configuration, the AAE Model 44B-2 arresting gear can arrest the F-104G aircraft at engaging speeds up to 170 knots without exceeding either the aircraft's designed maximum deceleration or arresting-hook axial load limit.

b. The engaging-speed limit for the A-4 aircraft is extrapolated as being in excess of 170 knots.

c. No aircraft damage was incurred when testing with the A-4 aircraft. Because all A-4 testing was conducted below a speed of 140 knots, no definite conclusions can be made as to the extent of aircraft fuselage damage that can be expected during high-speed arrestments.

d. The deadload test results indicate that all Navy aircraft up to a gross weight of 40,000 pounds can be arrested at speeds in excess of 160 knots without exceeding design limitations if the landing techniques described in paragraph 3b(2)(a) are used.

## 6. Recommendations

a. Further deadload testing with the Model 44B-2 arresting gear should be conducted in order to obtain data for a complete evaluation of arresting-gear/deadload performance.

b. The Model 44B-2 arresting gear should be considered as a replacement for the emergency arresting-gear systems now being used at shorebased installations.

## 7. References

(a) BUWEPS msg 102054Z of Mar 1964

(b) AAE ltr CA-1065 of 10 Sep 1964

(c) BUWEPS ltr RSSH-30/3:KEG of 27 Jan 1965



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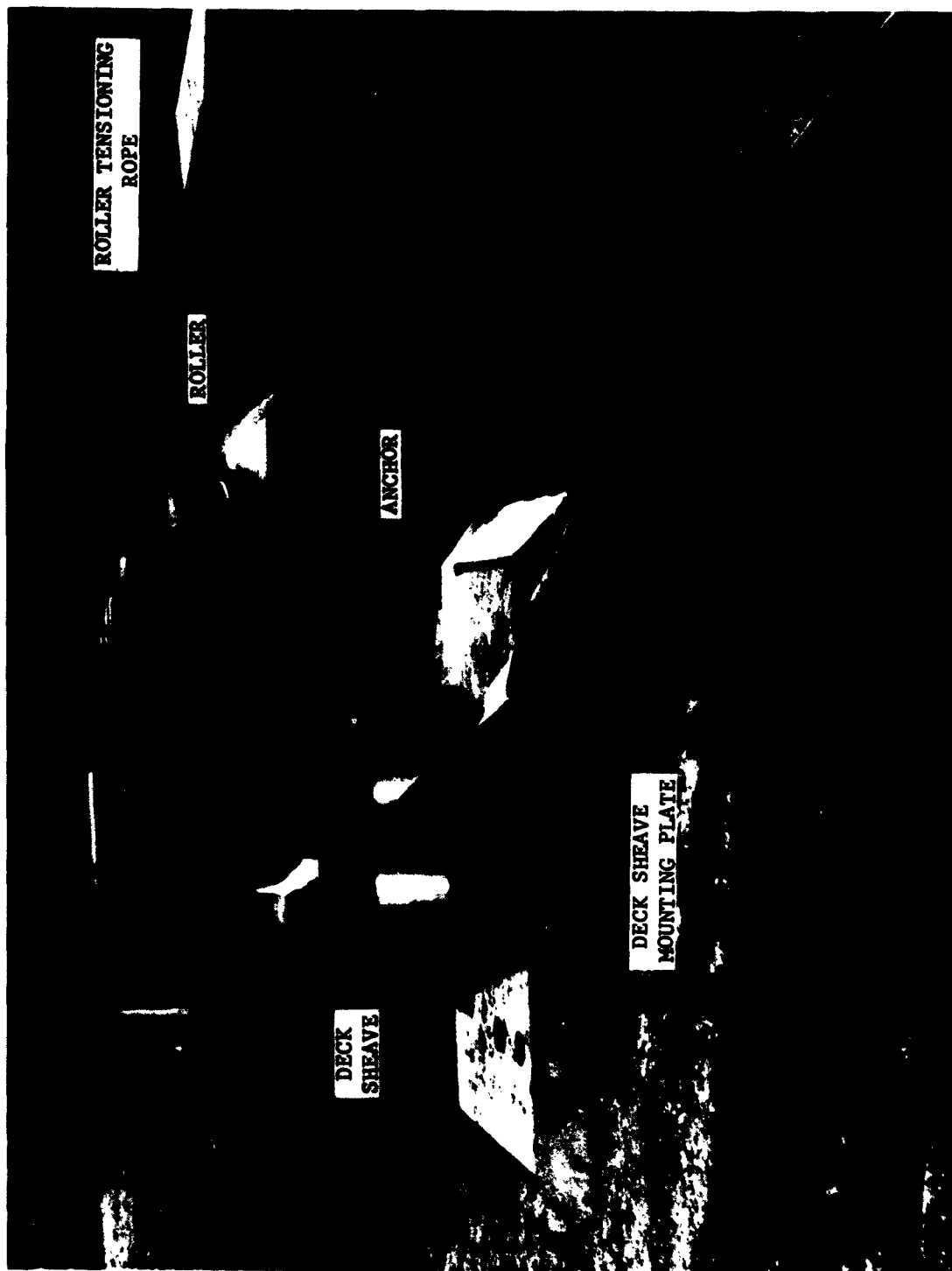


Figure 1 - View of AAE Model 44B-2 Arresting-Gear Unit - Port

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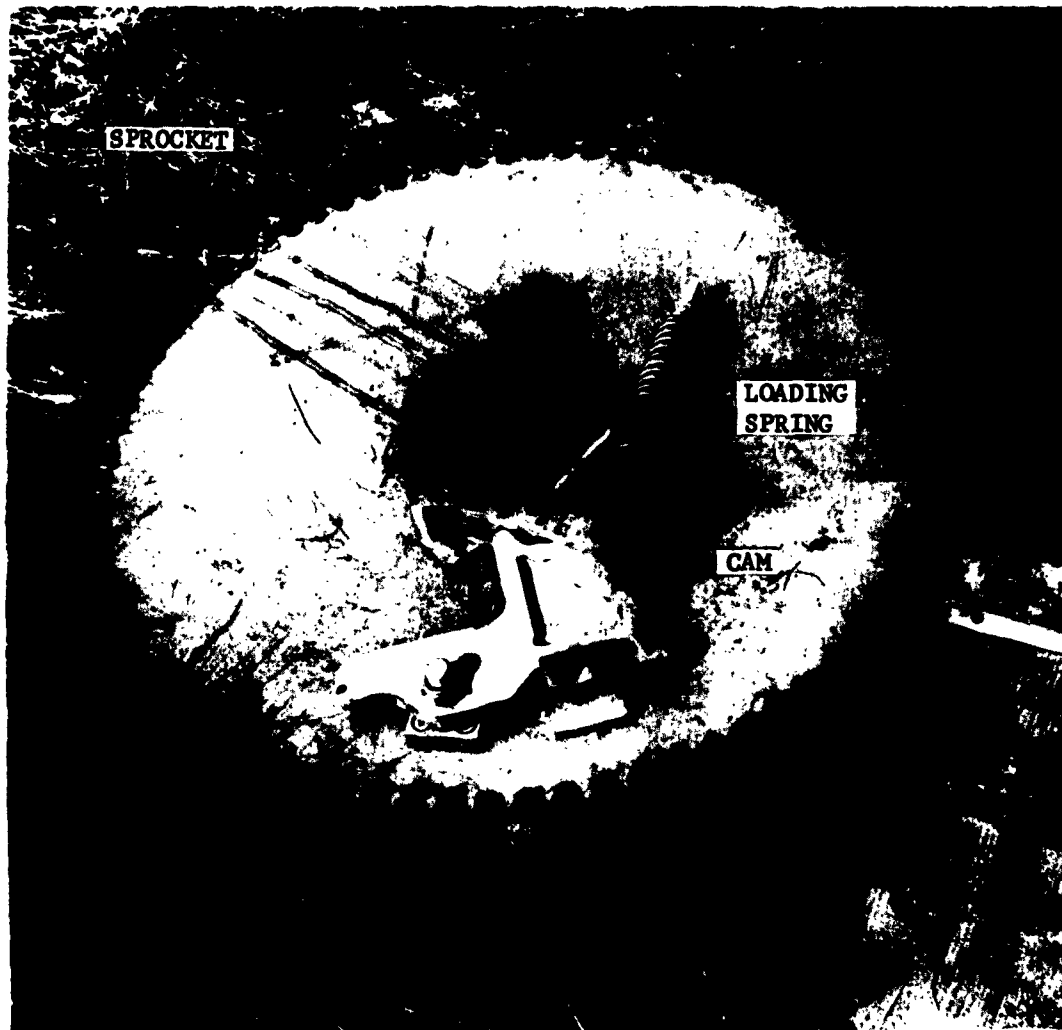


Figure 2 - Retract Cam in Unloaded Position (AAE Model 44B-2  
Arresting Gear)

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Figure 3 - View of AAE Model 44B-2 Arresting-Gear Unit Showing Retract  
Roller in Unloaded Position

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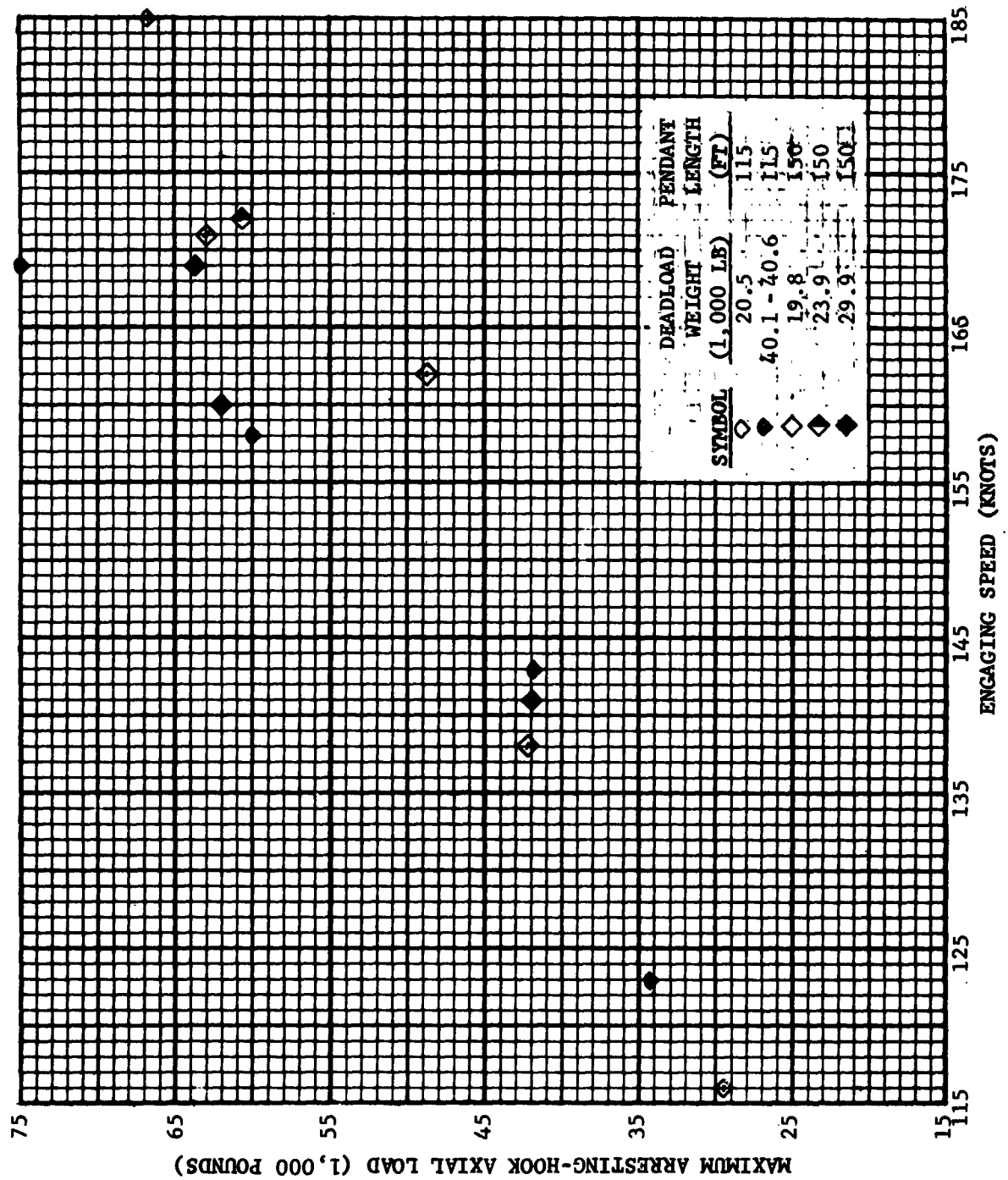


Figure 4 - Maximum Arresting-Hook Axial Load versus Engaging Speed - Deadload Arrestments (AAE Model 44B-2 Arresting Gear)

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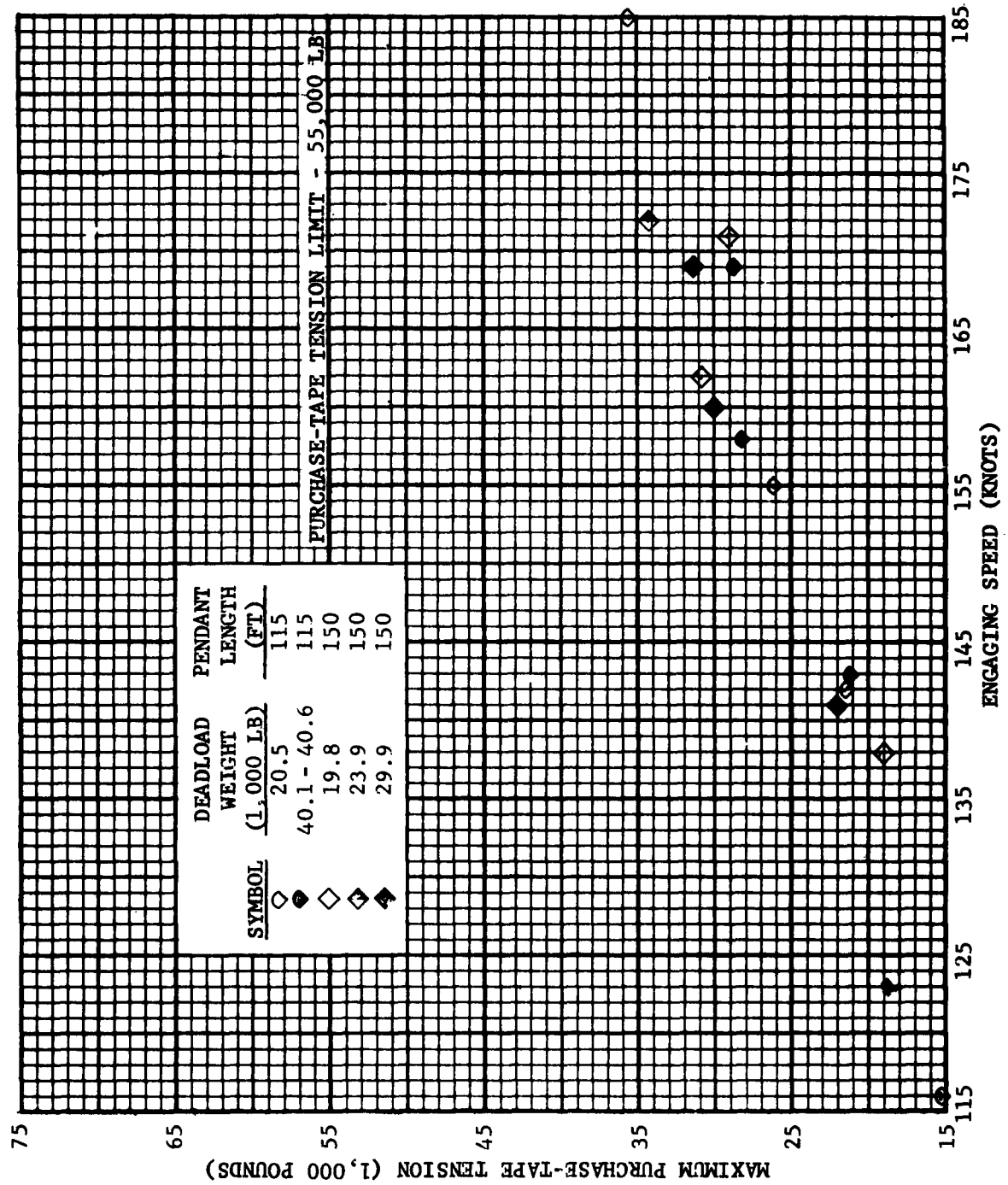


Figure 5 - Maximum Purchase-Tape Tension versus Engaging Speed - Deadload Arrestments (AAE Model 44B-2 Arresting Gear)

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Figure 6 - View of Damage to the F-104G Aircraft Parachute Door Resulting from  
Arresting-Hook Impact during AAE Model 44B-2 Arresting-Gear Tests

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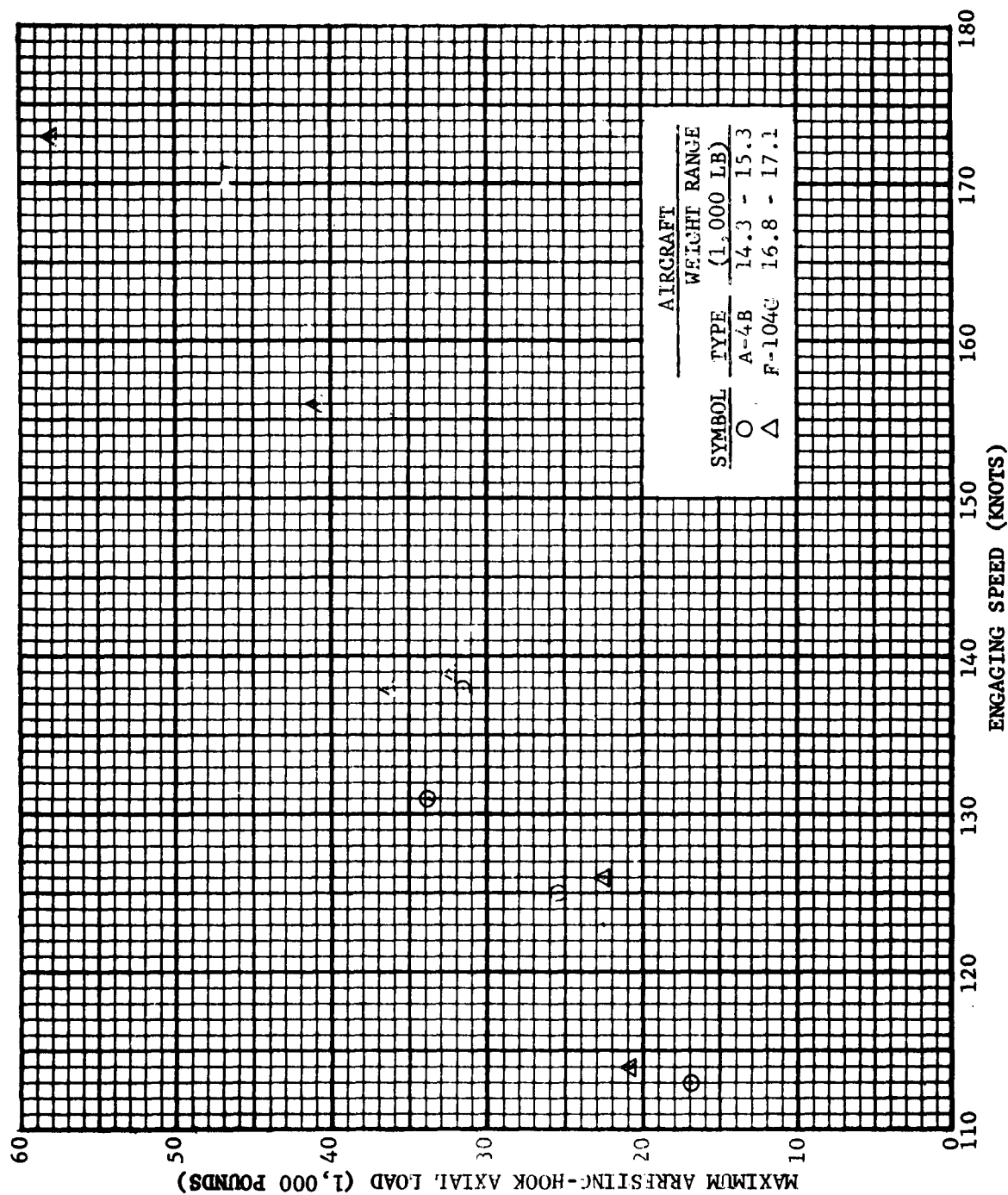


Figure 7 - Maximum Arresting-Hook Axial Load versus Engaging Speed - Aircraft Arrestments (AAE Model 44B-2 Arresting Gear)

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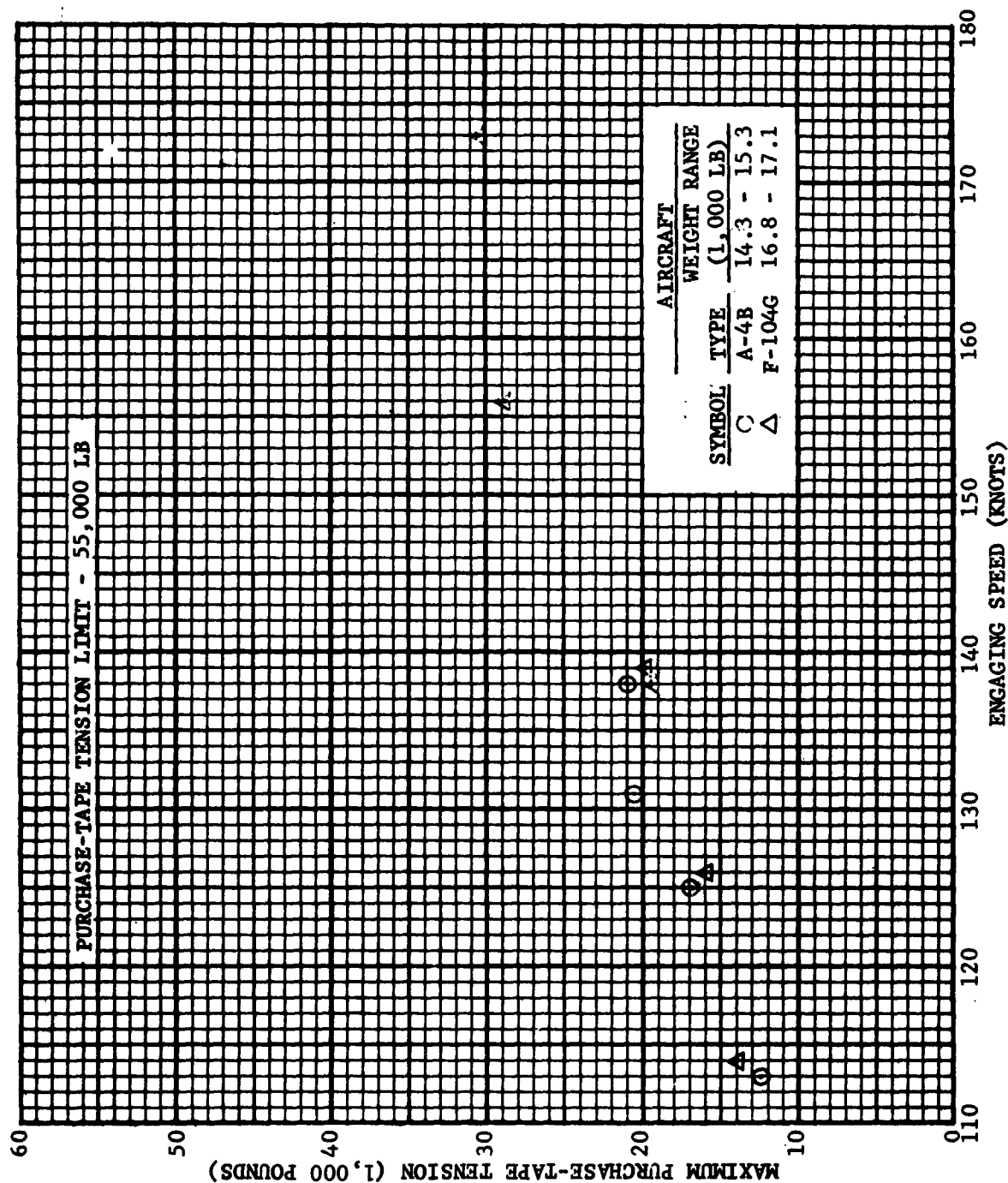


Figure 8 - Maximum Purchase-Tape Tension versus Engaging Speed - Aircraft Arrestments (AAE Model 44B-2 Arresting Gear)



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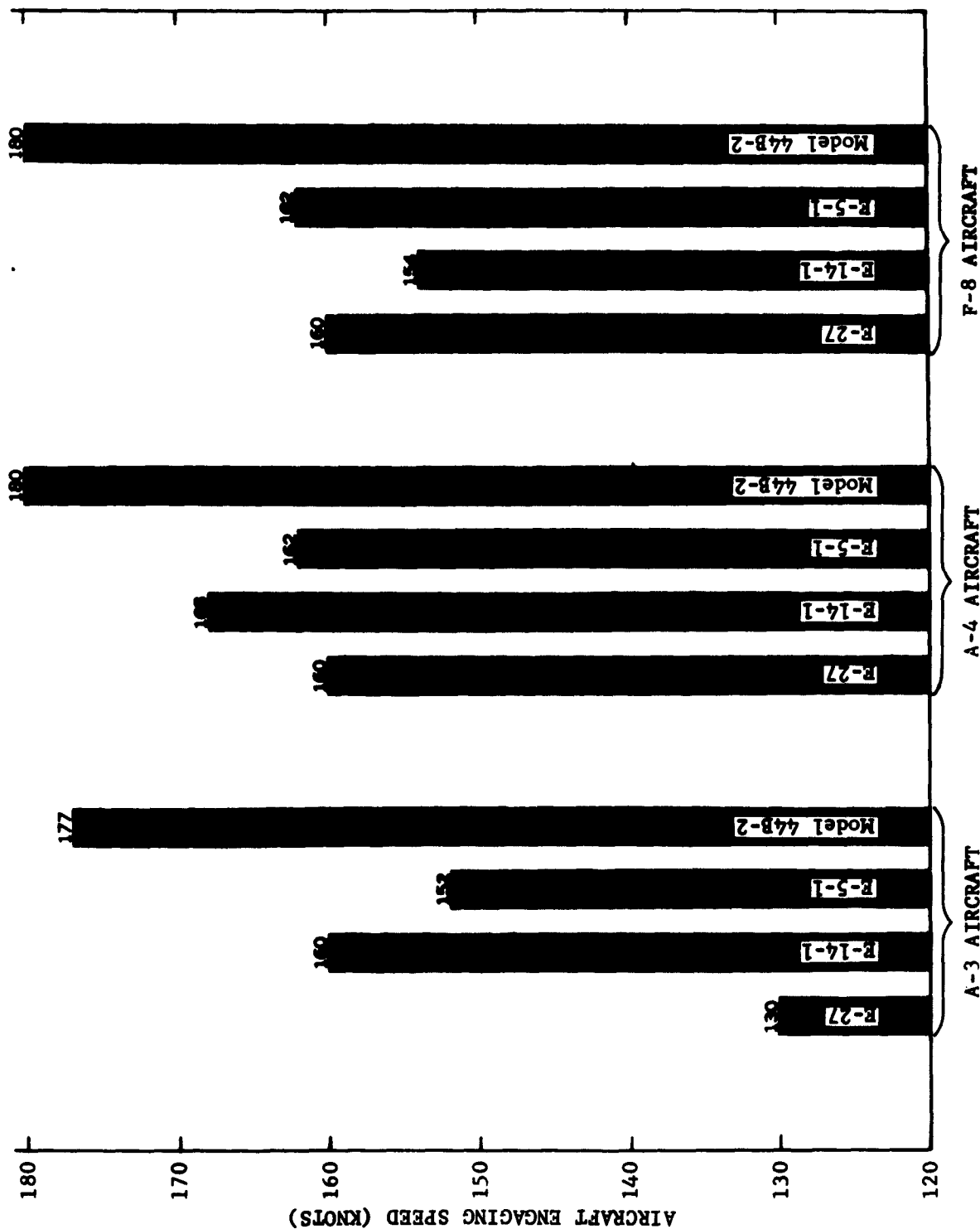


Figure 9 - Bar Graph of Aircraft Engaging-Speed Limits on Various Emergency Arresting Gears (AAE Model 44B-2 Arresting-Gear Evaluation)

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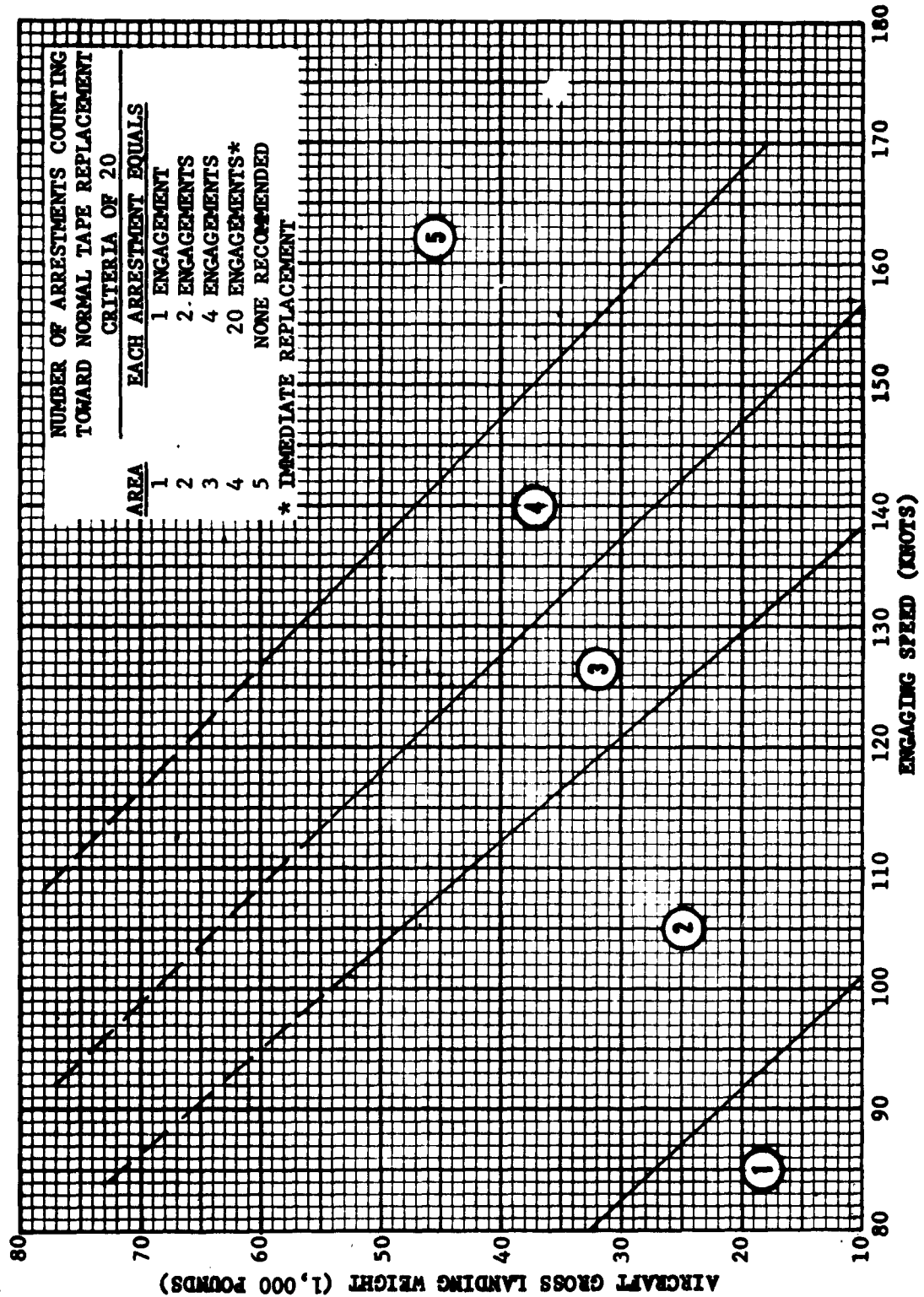


Figure 10 - Purchase-Tape Replacement Criteria for the E-27 Single-Engine Pit Installation (AAE Model 44B-2 Arresting-Gear Evaluation)

## APPENDIX A - DEADLOAD TEST DATA; AAE MODEL 44B-2 ARRESTING GEAR

| Date           | Event |    | Deadload |       | OFF-CENTER Distance (Ft) |      | Engaging Speed (Kn) | Maximum                    |        |                                | Remarks |                                                   |
|----------------|-------|----|----------|-------|--------------------------|------|---------------------|----------------------------|--------|--------------------------------|---------|---------------------------------------------------|
|                |       |    |          |       |                          |      |                     | Purchase-Tape Tension (Lb) |        | Arresting-Hook Axial Load (Lb) |         | Long. Decel (G)                                   |
|                |       |    |          |       |                          |      |                     | Port                       | Stbd   |                                |         |                                                   |
| 1964<br>30 Nov | 1385  | 1  | 20,506   | 840   | 0                        | 0    | 116                 | 15,200                     | 14,600 | 29,500                         | NV      | 115-ft x 1-inch-diameter pendant                  |
| "              | 1386  | 2  | "        | 860   | 0                        | 10 P | 142                 | 19,000                     | 21,400 | NV                             | 1.45    | Arresting-hook load not recorded                  |
| 1 Dec          | 1387  | 3  | "        | 868   | 0                        | 3 P  | 155                 | 24,000                     | 26,100 | NV                             | NV      | Arresting-hook load and Deceleration not recorded |
| "              | 1388  | 4  | "        | 885   | 0                        | 7 P  | 185                 | 31,300                     | 35,500 | 66,800                         | 3.18    |                                                   |
| "              | 1389  | 5  | 40,622   | 975   | 0                        | 6 S  | 123                 | 16,800                     | 18,700 | 34,300                         | 1.00    | Both units two-blocked                            |
| "              | 1390  | 6  | "        | -     | 0                        | -    | 145                 | B O L T E R                |        |                                |         | New Pendant prior to event - DL guides cut pend.  |
| 1965<br>6 Jan  | 1438  | 7  | 19,824   | 860   | 0                        | 9 S  | 138                 | 17,300                     | 19,100 | 42,200                         | 1.90    | 150-ft pendant                                    |
| "              | 1439  | 8  | "        | 880   | 0                        | 6 S  | 162                 | 27,100                     | 30,900 | 48,900                         | 2.62    |                                                   |
| "              | 1440  | 9  | "        | 890   | 0                        | 14 S | 171                 | 28,700                     | 29,000 | 63,000                         | 3.39    |                                                   |
| 7 Jan          | 1441  | 10 | 29,931   | 955   | 0                        | 0    | 141                 | 22,000                     | 21,000 | 42,000                         | 1.41    | New 150-ft pendant                                |
| "              | 1442  | 11 | "        | 973   | 0                        | 3 S  | 160                 | 30,000                     | 26,000 | 62,000                         | 1.84    |                                                   |
| "              | 1443  | 12 | "        | 978   | 0                        | 3 P  | 169                 | 29,500                     | 31,300 | 63,800                         | 2.22    |                                                   |
| "              | 1444  | 13 | 40,102   | 995   | 0                        | 3 P  | 143                 | 20,400                     | 21,100 | 41,900                         | 1.15    | Both units two-blocked                            |
| 8 Jan          | 1445  | 14 | "        | 1,005 | 0                        | 3 S  | 158                 | 27,600                     | 28,100 | 60,000                         | 1.40    | Both units two-blocked; wet purchase tapes        |
| "              | 1446  | 15 | "        | 1,005 | 0                        | 4 S  | 169                 | 33,000                     | 28,700 | 75,000                         | 1.975   | Both units two-blocked; new 150-ft pendant        |
| "              | 1447  | 16 | 23,922   | 950   | 0                        | 3 S  | 172                 | 31,200                     | 34,200 | 60,800                         | 2.53    |                                                   |

## APPENDIX B - AIRCRAFT TEST DATA; AAE MODEL 44B-2 ARRESTING GEAR

| 1965<br>Date | Event |      | Aircraft |                | Engaging Speed<br>(Kn) |        |      | Maximum       |        |                                       |                       | Remarks |                                                      |  |
|--------------|-------|------|----------|----------------|------------------------|--------|------|---------------|--------|---------------------------------------|-----------------------|---------|------------------------------------------------------|--|
|              |       |      |          |                |                        |        |      | Purchase-Tape |        | Arresting-<br>Hook Axial<br>Load (Lb) | Long-<br>Decel<br>(G) |         |                                                      |  |
|              | Site  | Proj | Type     | Weight<br>(Lb) | Runout<br>(Ft)         | SPN-12 | Film | FAS           | Port   |                                       |                       |         | Stbd                                                 |  |
| 3 Feb        | 05    | 01   | A-4B     | 15,300         | 700                    | 113    | 121  | 121           | 121    | 12,400                                | 12,200                | 16,900  | 1.14                                                 |  |
| "            | 06    | 02   | "        | 14,800         | 705                    | 125    | 125  | 155           | 16,900 | 16,900                                | 25,400                | 1.62    |                                                      |  |
| 4 Feb        | 07    | 03   | "        | 14,300         | 770                    | 131    | 131  | 150           | 20,600 | 18,500                                | 33,800                | 2.10    |                                                      |  |
| "            | 08    | 04   | "        | 14,800         | 775                    | 138    | 134  | 162           | 21,000 | 20,800                                | 31,600                | 1.99    |                                                      |  |
| 5 Feb        | 09    | 05   | F104     | 17,100         | 770                    | 114    | 113  | 112           | 14,000 | 14,000                                | 20,900                | 1.07    | vibration in nosewheel                               |  |
| "            | 10    | 06   | "        | 17,100         | 728                    | 123    | 126  | 125           | 15,700 | 16,000                                | 22,700                | 1.7     | at pick-up                                           |  |
| 6 Feb        | 11    | 07   | "        | 17,100         | NV                     | 142    | 138  | 142           | 18,500 | 19,500                                | 36,400                | 1.95    | Slight buckling of para-<br>chute door               |  |
| "            | 12    | 08   | "        | 16,800         | 738                    | 136    | 139  | 145           | 16,700 | 19,900                                | 3,500                 | 1.69    | Damage to parachute door<br>increasing               |  |
| "            | 13    | 09   | "        | 17,100         | NV                     | NV     | 156  | 164           | 23,800 | 28,800                                | 41,000                | 1.80    | Acft had partial loss of<br>elec - nosewheel shimmed |  |
| "            | 14    | 10   | "        | NV             | NV                     | 137    | NV   | 137           | 19,500 | 21,600                                | NV                    | NV      |                                                      |  |
| 9 Feb        | 17    | 11   | "        | 17,100         | 850                    | NV     | 173  | 164           | 30,400 | 28,800                                | 58,000                | 3.02    |                                                      |  |

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| <b>DOCUMENT CONTROL DATA - R&amp;D</b><br><small>(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                     |                                                                                                                                                       |
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| <b>1. ORIGINATING ACTIVITY (Corporate author)</b><br>U. S. Naval Air Test Facility (Ship Installations)<br>U. S. Naval Air Station<br>Lakehurst, New Jersey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                     | <b>2a. REPORT SECURITY CLASSIFICATION</b><br><b>UNCLASSIFIED</b><br><b>2b. GROUP</b>                                                                  |
| <b>3. REPORT TITLE</b><br>EVALUATION OF ALL AMERICAN ENGINEERING COMPANY'S<br>MODEL 44B-2 ARRESTING GEAR WITH DEADLOADS AND AIRCRAFT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                     |                                                                                                                                                       |
| <b>4. DESCRIPTIVE NOTES (Type of report and inclusive dates)</b><br>Final report                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |                                                                                                                                                       |
| <b>5. AUTHOR(S) (Last name, first name, initial)</b><br><br>Cocco, N.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                     |                                                                                                                                                       |
| <b>6. REPORT DATE</b><br>3 May 1965                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>7a. TOTAL NO. OF PAGES</b><br>19 | <b>7b. NO. OF REFS</b><br>7                                                                                                                           |
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| <b>10. AVAILABILITY/LIMITATION NOTICES</b><br><br>Available through BUWEPS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                                                                                                                                                       |
| <b>11. SUPPLEMENTARY NOTES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                     | <b>12. SPONSORING MILITARY ACTIVITY</b><br><br>Bureau of Naval Weapons (Dept of the Navy)                                                             |
| <b>13. ABSTRACT</b><br><br>A program was conducted for the evaluation of AAE Model 44B-2 arresting-gear performance. The arresting-gear performance during arrestments of 20,000- to 40,000-pound deadloads proved to be highly satisfactory, and testing was continued with A-4 and F-104G aircraft. The arresting-gear performance results from this limited program indicate it to be a desirable replacement for emergency arresting-gear systems now being used. The Model 44B-2 is compared to the three most widely-used emergency arresting gears now in use at military installations. Areas compared are energy-absorption capabilities, maximum allowable aircraft engaging speeds, maintainability, reliability, and installation. |                                     |                                                                                                                                                       |

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| 14. KEY WORDS                                                                                          | LINK A |    | LINK B |    | LINK C |    |
|--------------------------------------------------------------------------------------------------------|--------|----|--------|----|--------|----|
|                                                                                                        | ROLE   | WT | ROLE   | WT | ROLE   | WT |
| RECOVERY EQUIPMENT<br>ARRESTING GEAR (EMERGENCY)<br>PERFORMANCE<br>EVALUATION<br>DEADLOADS<br>AIRCRAFT |        |    |        |    |        |    |

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