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### AUTHORITY

NAVAIR ltr 16 Jul 1974
INTRODUCTION

1. The Mark 7 Mod 1, as normally utilized in the fleet, is reeved with 1-3/8-inch-diameter 6 x 25 FW LLRS (Filler Wire, Lang Lay Round Strand) purchase cables. In an effort to increase the service life, 1-1/2-inch-diameter 6 x 25 FW LLRS purchase cables were reeved into the engine. Recent tests at the Naval Air Engineering Center (NAEC) with the larger cable indicated a significant increase in fatigue life when compared to the standard 1-3/8-inch-diameter purchase cable; however, before an extensive fatigue test program could be undertaken, it was necessary to determine the effects, if any, the larger diameter cable would have on arresting-gear performance.

2. A total of 80 arrestments of A-3, A-4, F-4, and F-8 aircraft were conducted at the centerline and the 20-foot-to-port OFF-CENTER engaging positions. Ten of the A-4 arrestments were made with the sheave dampers inoperative in order to investigate aircraft arresting-hook/pendant dynamics. Similar data with 1-3/8-inch-diameter wire rope is not available in this configuration for comparative purposes.
3. The configuration of the Mark 7 Mod 1 arresting gear on a 95-foot deck span with sheave dampers installed was in accordance with reference (a) except for the following:

a. 1-1/2-inch-diameter purchase cable, and

b. Modified deck- and anchor-cable fittings to connect the purchase cable to the 1-3/8-inch-diameter pendant, and to standard anchors.

TEST RESULTS AND DISCUSSION

4. Pertinent information from the aircraft arrestments conducted at the RALS is as follows:

<table>
<thead>
<tr>
<th>Number of Events</th>
<th>Aircraft Type</th>
<th>Aircraft Weight Range (1,000 lb)</th>
<th>Off-Center Engaging Position</th>
<th>Engaging Speed Range (Kn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>F-8*</td>
<td>21.3 - 21.8</td>
<td>0</td>
<td>100 - 128</td>
</tr>
<tr>
<td>15</td>
<td>A-3#</td>
<td>48.2 - 50.1</td>
<td>0</td>
<td>82 - 117</td>
</tr>
<tr>
<td>2</td>
<td>&quot;#</td>
<td>48.7 - 49.2</td>
<td>20 P</td>
<td>102 - 106</td>
</tr>
<tr>
<td>10</td>
<td>A-4*</td>
<td>12.4 - 14.3</td>
<td>0</td>
<td>81 - 123</td>
</tr>
<tr>
<td>22</td>
<td>&quot;#</td>
<td>13.0 - 14.5</td>
<td>20 P</td>
<td>88 - 110</td>
</tr>
<tr>
<td>7†</td>
<td>A-4</td>
<td>14.4 - 12.9</td>
<td>0</td>
<td>89 - 107</td>
</tr>
<tr>
<td>3†</td>
<td>&quot;#</td>
<td>13.2 - 12.7</td>
<td>20 P</td>
<td>88 - 105</td>
</tr>
<tr>
<td>10</td>
<td>F-4*</td>
<td>30.8 - 33.0</td>
<td>0</td>
<td>92 - 113</td>
</tr>
<tr>
<td>5‡</td>
<td>&quot;</td>
<td>31.1 - 32.0</td>
<td>0</td>
<td>82 - 101</td>
</tr>
</tbody>
</table>

* Aircraft weight setting + 250 pounds
† Sheave dampers inoperative
‡ Single weight setting - 40,000 pounds

Every effort was taken to ensure that the aircraft engines were at MRT at pendant pickup.

5. The data presented in enclosures (1) through (4) also contain curves of normal engine data as reported in reference (b). These curves were drawn through the upper portion of the normal data. It is evident from these enclosures that the critical or limiting parameters (arresting-hook axial load, longitudinal deceleration, purchase-cable tension, and engine cylinder pressure) are comparable between the 1-3/8-inch and 1-1/2-inch cable values as long as the sheave dampers are operating. There is, therefore, no apparent reduction in engaging-speed limits of the A-3, A-4, F-4, and F-8 aircraft when using 1-1/2-inch-diameter purchase cables.
6. Ten A-4 aircraft arrestments were conducted with the sheave dampers inoperative to investigate aircraft arresting-hook/pendant dynamics. Time histories of arresting-hook axial load and cable tension obtained with operating sheave dampers had a pronounced dip or decay at approximately 0.4 second after pendant pickup. It was theorized that inoperative sheave dampers would aggravate the dip, thereby causing the arresting hook to shed the pendant. The dip was aggravated by inoperative sheave dampers, however, there was no shedding of the pendant.

7. There are no apparent adverse effects on the fairlead or engine sheaves after 80 arrestments.

8. The single-weight-setting phase of the F-4 test program was performed as a support service for NAEC.
CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

9. The Mark 7 Mod 1 when received with 1-1/2-inch-diameter wire rope, does not reduce the ON-CENTER engaging-speed limits of the A-3, A-4, F-4, and F-8 aircraft for the weights tested as long as the sheave dampers are operating. (Paragraph 5)

10. Based on a very limited test program, no adverse effects were detected in either the fairlead or engine sheave systems. (Paragraph 7)

RECOMMENDATION

11. An extensive fatigue test program should be made on 1-1/2-inch-diameter cable.

B. F. Kolace
By direction

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Figure 2 - Composite Graph of 30,000- to 55,000-lb Aircraft Tests Showing
Minimum Parameters versus Engaging Speed (Mark 7 and 8 Arresting-System
System Housed With 1-1/2 in. x 25 ft LLS Purchase Cable and
1-3/8-in.-Diameter Jacquard)
Figure 3 - Composite Graph of 20,000- to 22,000-Pound F-8 Aircraft Tests Showing Maximum Parameters versus Engaging Speed (Mark 7 Mod 1 Arresting-Gear System Reved With 1-1/2 x 6 x 25 FW LLRS Purchase Cable and 1-3/8-Inch-Diameter Deck Pendant)

NOTES
ALL EVENTS CONDUCTED AT NORMAL WEIGHT SETTINGS.
REFERENCE CURVES FROM REPORT NATF-EN-1094.
Figure 6 - Composite Graph of 15,000 to 30,000-Foot Aircraft Tests Showing
Maximum Parameters versus Takeoff Speed (Mark 7 Mod 1 Arresting Gear
System Armed with 350/3 x 3.5 ft LARS Purchase Cable and
1.5/8-inch Diameter Exit Pinion)