Compatibility between Military Aircraft and Ejected Stores: the NATO Perspective and Methodology

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Compatibility between Military Aircraft and Ejected Stores: the NATO Perspective and Methodology

Contents

• Background
• Weapons-Suspension
• Engineering Work
• Documentation
• Future Developments
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Introduction

- Military Aircraft carry and release weapons
- Weapons interoperability
- Store Certification requirement
- NATO Military Standards
Background

• Early stages
• Store Certification requirement
• Vietnam War – F-4 Phantom
• F-16 multirole aircraft
• NATO Procedures
Weapons - Suspension

- Bombs
- Smart Bombs
- Missiles
- Pylons/Racks/Multiple Racks
- Launchers
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**Engineering Work**

- **Electrical Interfaces**
  - Software requirements
- **Structural Loads**
- **Environmental Analysis**
- **Drag & Performance**
- **Ballistics**

<table>
<thead>
<tr>
<th>Fit &amp; Mechanical Function</th>
<th>Electromagnetic Environment Effects</th>
<th>Flutter</th>
<th>Flying Qualities</th>
<th>Store Separation</th>
<th>Safe Escape</th>
</tr>
</thead>
</table>

**ANALYSIS + TESTING**

**OPERATIONAL REQUIREMENTS** → **OPERATIONAL CLEARANCE**

- Configurations
- Flight Limits
- Procedures
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Engineering Work

Analysis
+ Ground Tests
+ Flight Tests
+ Documentation = Ejected Store Certification
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Engineering Work - Analysis

• Physical Fit and Mechanical Interface Analysis

• Aerodynamic Analysis
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Engineering Work - Analysis

• Structural Integration Analysis

• Avionics Integration

• Environmental Analysis
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Engineering Work - Analysis

• Flying - Handling Qualities Analysis
• Safe Separation Analysis
Ground Tests

• Physical Fit and Functional Tests

• Static Ejection Test
Ground Tests

- Ground Vibration Test (GVT)
- Wind Tunnel Tests
- Environmental Tests
Flight Tests

- Instrumentation
- Flight Test Plan
- Flight Test Execution
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Flight Tests - Instrumentation

- Sensors
- Data Acquisition
- Monitors
- Cameras
Flight Tests - Test Plan

• Specification of test points/techniques to be used for envelope clearance

• Risk Assessment
Flight Tests - Execution

- Briefing
- Test Points
- Techniques
- Debriefing
Flight Tests - Execution

• Flutter Analysis
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Flight Tests - Execution

• Handling-Flying Qualities Analysis
Flight Tests - Execution

• Safe Separation
Analysis - Ballistics
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Documentation

• Flight Test Report

• Technical Order Update
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Documentation- Flight Test Report

- Flight Test Report

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Configuration</th>
<th>Scope</th>
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### Documentation - Technical Order Update

**Stores Limitations**

<table>
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<tr>
<th>OPSTOPS</th>
<th>LINE</th>
<th>TRAINING</th>
<th>STATION LOADING</th>
<th>LOOKING FORWARD</th>
<th>CARRIAGE</th>
<th>EMPLOYMENT ON SELECTIVE JETTISON</th>
<th>JETTISON</th>
<th>FUEL</th>
<th>ECONOMY</th>
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**Remarks:**
1. Line 2(1.1.): After release of MK.12. CARRIAGE MAX ACCEL. G limits are ±0.75G ±0.35G (β3→β1) SYM and ±0.51G ±0.6G (β1→β0) ROLL.
2. Line 2(1.2.): After release of MK.12. CARRIAGE MAX ACCEL. G limits are ±0.5G ±0.3G (β3→β1) SYM and ±0.3G ±0.4G (β1→β0) ROLL.

• New Flight Envelope
Future Developments

- UAS

- Airworthiness Regulations
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Cranfield University Alumni Event and Defense Education Conference
1st June 2017, Athens, Greece