
Qualification and Replacement M113 0.3 second delay initiator (Cessna A/T-37)



NSN: 1377-00-222-9062

IHEOTD CAD/PAD IPT

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Overview

- **Issue/Background**
- **Engineering Analysis/Plan**
- **T-37 M113 Design Overview**
- **T-38 MG48 Dual Delay Overview**
- **Device Comparison/Analysis**
- **Fit Check**
- **Item and System Testing**
- **Final Actions For Release to Service**
- **Conclusion/Summary**
- **Questions**



Issues/Background

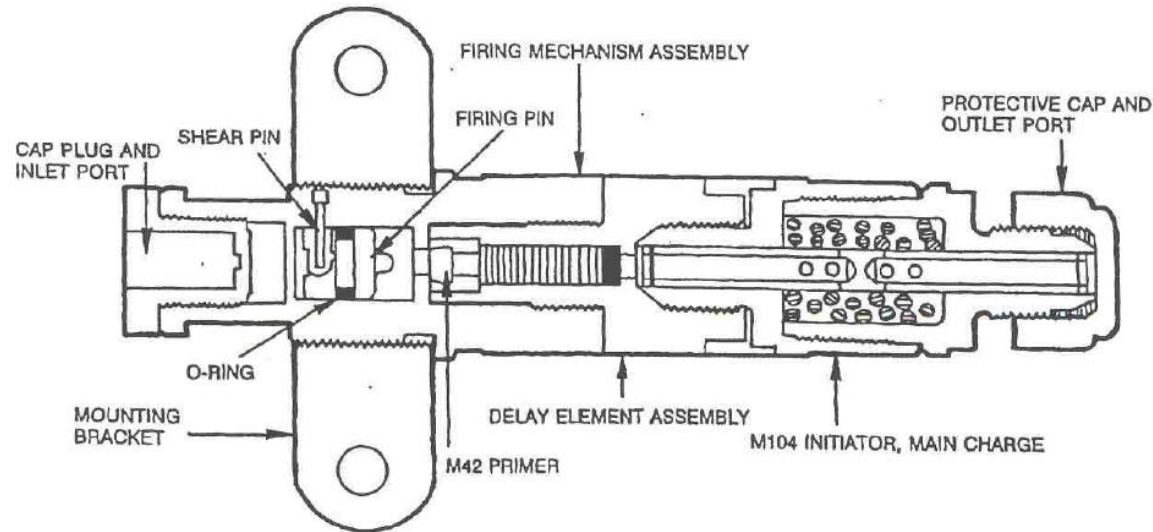
- Routine procurements occasionally lead to various challenges
 - Obsolete materials and ingredients
 - Energetic material attributes, suitability and processing issues
 - Older/outdated drawing packages
 - Manufacturing expertise or techniques that are lost over the years
 - Infrequent procurements & low buy quantities can drive pricing
 - Overriding schedules & other priorities
 - Limited customer budget(s)
- This project encountered, and overcame all of these issues through a structured approach & collaboration at HAFB & IH!



Engineering Analysis/Plan

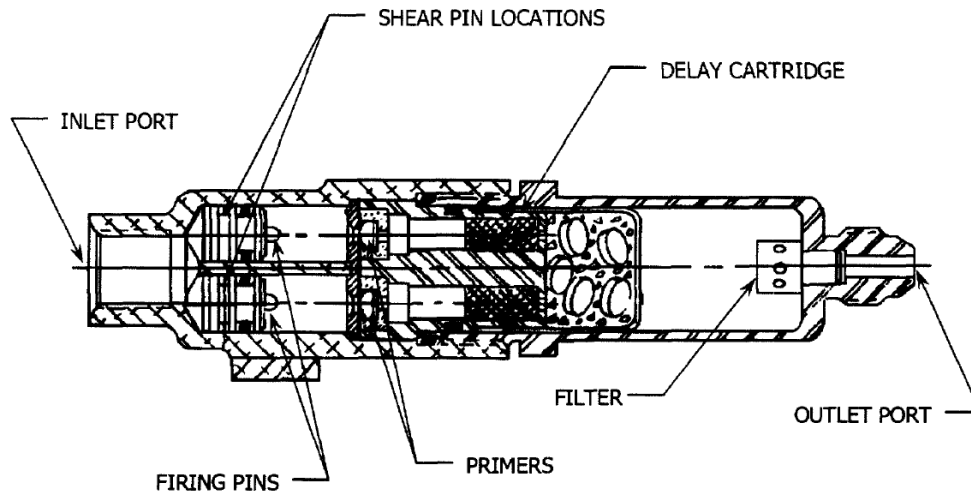
- Structured Engineering Approach Applied to Problem
 - Design replacement feasibility conducted (comparison of A to B)
 - Dimensions, Performance Requirements
 - System Requirements Review
 - Environmental Requirements
 - Qualification Matrix
 - Critical Interfaces
 - Fit Check on Aircraft/Seat
 - Breadboard/System Initiation Tests
 - Service Release process
 - TO updates

A/T-37 M113 Time Delay Design



- Gas input
 - Actuation pressure = actuate w/M3A2 (550 – 1450 psig)
- 0.30 second delay
 - 0.30 ± 0.15 seconds @ Hot/Cold
 - 0.30 ± 0.05 seconds @ Ambient
- Gas output
 - M104 initiator (300 psi minimum)
 - 6.5 in³ closed bomb or 15 ft hose + 0.62 in³ bomb

F-5/T-38 MG48 Dual Delay Design



- Gas input
 - Actuation pressure (400 – 600 psig)
- 0.30 second delay
 - 0.25 – 0.38 seconds @ all temps
- Gas output
 - 500 – 1750 psig
 - 15 ft. hose + 0.50 in³ bomb





Comparison Analysis

<i>M113 to 1139-5/6161100 (MG48) Comparison</i>		
	M113	MG48
Unit cost	~\$3350	~\$360
Shelf/service life (months)	(246/222)	(84/72) / (60/36)
Total length	4.42 in (max)	4.68 in (max)
Max height	1.48 in	1.14 in
Input port to center of mount holes	1.0 in	1.06 in
Input port to bracket back edge	1.29 - 1.30 in	1.31 in
Bracket hole spacing	2.25 ± .005 in	2.25 + .005 in
Mounting hole diameter	0.259 - 0.267 in	0.255 - 0.262 in
Bracket thickness	0.25 in	0.125 in



Comparison Analysis

<i>M113 to 1139-5/6161100 (MG48) Comparison</i>		
	M113	MG48
Output pressure		
6.5 in³ bomb	300 psi (min)	423-1480 psi*
5.5 in³ hose/bomb	355 psi (min)*	500-1750 psi
Acutation pressure		
6.0 in³ hose/bomb	550-1450 psi**	
1 ft hose		400-600 psi
Delay time		
Hot/cold	0.30 ± 0.15 sec	0.25-0.38 sec
Ambient	0.30 ± 0.05 sec	0.25-0.38 sec

*Calculated equivalent

** Typical output from M3A2 initiator

Fit Check

- 17 May 2011 - Davis-Monthan AFB seat shop
- Good clearance and fit for initiator and all hoses and connectors
- Mounting bolt grip too long
 - Replacement bolt recommended for use with T-38 MG48 and M113 initiators
 - Eliminates mounting slop
 - Part Number NAS428-4A7





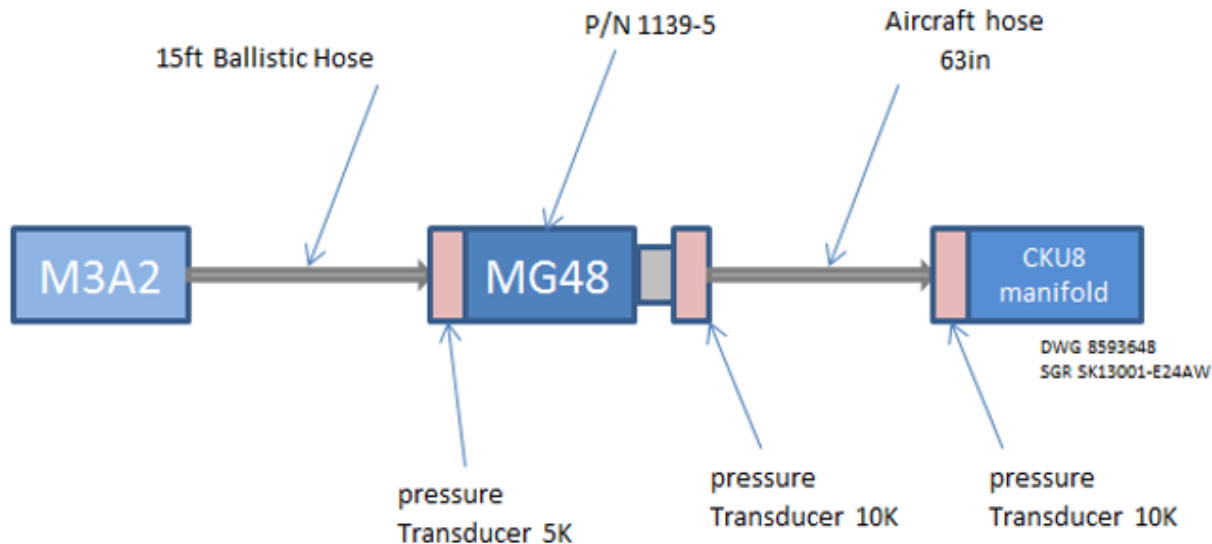
Hill AFB 582 MMXS/MXDTA Test

- Dec 2011 - T-38 MG48 test in M113 LAT configuration
 - 6.5 in³ closed bomb (actual LAT bomb from Indian Head)
 - Initiated with M3A2 initiators
- T-38 MG48 output pressure nearly double that of M113

	Initiation Pressure (psig)	Delay Time (ms)	MG48 Output Pressure (psig)	Typical M113 Output Pressure (psig)
Limits (M113)	M3A2	150-450	>300	>300
Max	647.5	360.7	1034.4	621
Min	483.5	280.0	798.4	428
Average	556.1	319.2	903.7	504

Indian Head System Testing

- Breadboard test of existing aircraft hoses, elbows and CKU-8 catapult breech to prove system can withstand increased output pressure of the T-38 MG48 initiator
 - 9 firings across -65F, Ambient, +200F
 - System initiation pressures ranged 4,452 psi to 5,425 psi
 - No evidence of burst, leakage, erosion or hot spots





Final Actions for Release to Service

- 28 Aug 2014 - *Type IV Release to Service signed*
 - Type IV release indicates that a previously qualified Cartridge has demonstrated acceptable performance for use in a new application
- 26 Sep 2014 Proven Aircraft Chief Engineer formal approval
- 22 Oct 2014 T.O. 1T-37B-4 & 1A-37B-4 update submitted
- Hill AFB CAD/PAD Call letter updated



Conclusion/Summary

- Project emerged out of necessity to find solution
- “Outside of the Box” solution already existed
- System Requirements Review identified “suitable alternate”
- Fit check and system testing proved out solution viable
- Type IV Release to Service coordinated with aircraft SPO
- Issue resolved for future Foreign Military Requirements!

Questions?

