

Development of a Hover Test Bed at the National Hover Test Facility



Edwina Paisley
Multiple Kill Vehicle
Lockheed Martin Space Systems Company

**Authors: Jason Williams ¹, Olivia Beal ², Edwina Paisley ³, Randy Riley ³,
Sarah Reeves ³, Kevin Mapes ³**

¹ Missile Defense Agency

² Air Force Research Laboratory

³ Lockheed Martin Space Systems Company

Approved for Public Release
07-MDA-3888 (10 OCT 07)

Material cleared for public release can be reused in its original form any time, any place. Any updating, changing or combining of previously cleared material will form a new document that requires the material be re-submitted for a new public release clearance. Please re-submit any new material with the past clearance documentation. A marked copy of the document indicating where new information is placed will help speed the review.

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE 01 NOV 2008		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Development of a Hover Test Bed at the National Hover Test Facility				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Missile Defense Agency				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM202644. AIAA Missile Sciences Conference Held in Monterey, California on November 18-20, 2008, The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Agenda

Multiple Kill Vehicle

- **Multiple Kill Vehicle Program Description**
- **Major Segments: Carrier Vehicle, Kill Vehicle, and Payload Adapter**
- **MKV-L Program Milestones**
- **Hover Test Overview**
- **Reactivation of the National Hover Test Facility**
- **Plans/Procedures/Processes**
- **MKV-L (Pathfinder-1) Overview**
- **Demonstration & Validation of the Hover Test Bed**
- **Video**
- **Summary**



Program Description

Multiple Kill Vehicle

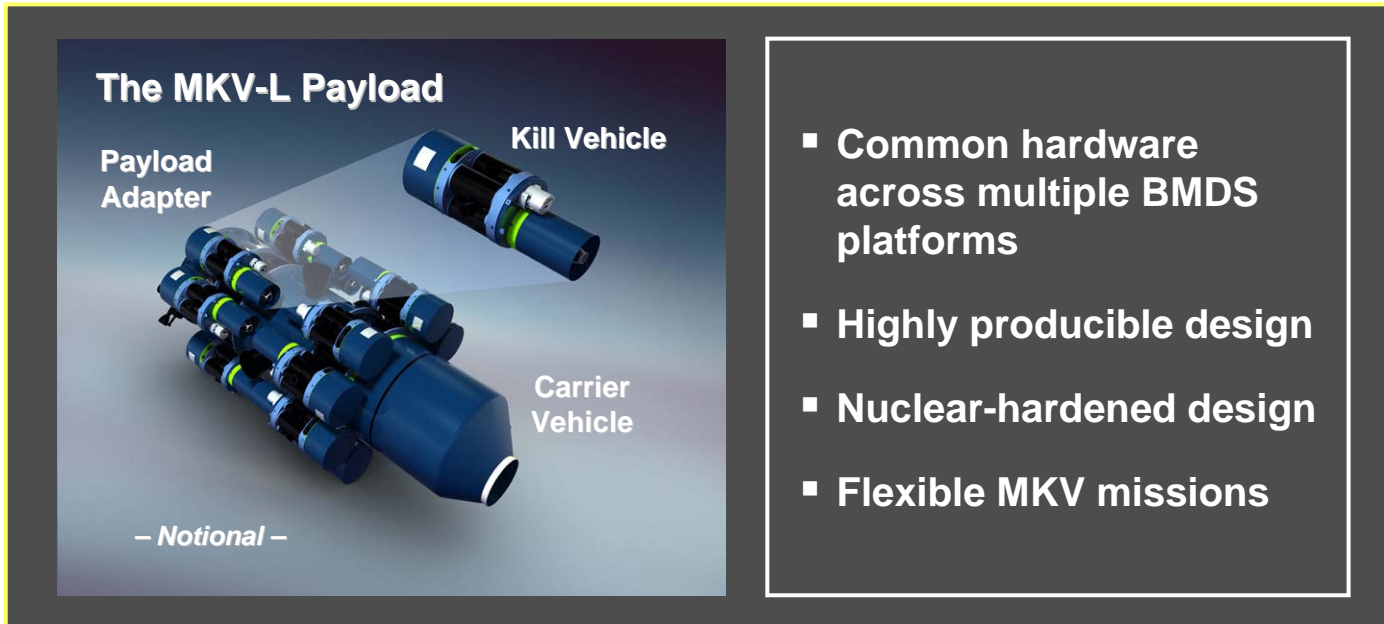
- **First payload designed to destroy multiple threat objects with a single interceptor**
 - **Lowest cost-per-kill solution for current and future threats**
 - **Destroys multiple credible objects – both lethal threats and countermeasures**
 - **Integrates into the BMDS architecture**
 - **Common to multiple basing platforms**
 - **Leverages extensive industrial base experience**

The Multiple Kill Capability for Ballistic Missile Defense



Major segments: Carrier Vehicle, Kill Vehicle and Payload Adapter

Multiple Kill Vehicle



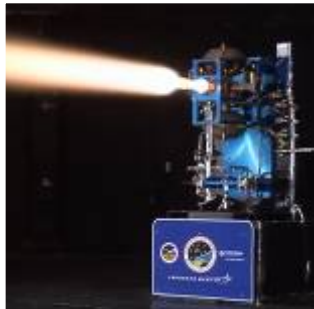
- **Carrier vehicle assesses the threat set, deploys and assigns kill vehicles, manages the engagement, and can act as a kill asset or observer**
- **Carrier vehicle and kill vehicles intercept lethal threat objects and credible countermeasures**
- **Payload adapter interfaces carrier vehicle with weapon systems**



MKV-L Program Milestones

Multiple Kill Vehicle

- End-to-end simulation demonstration: December 2007
- Seeker captive carry key performance event #1: December 2007
 - Carrier vehicle hot fire test: August 2007
- Engagement management testbed demonstration: May 2008
- MKV-L divert thruster tests: July 2008



Carrier Vehicle Hot Fire Test



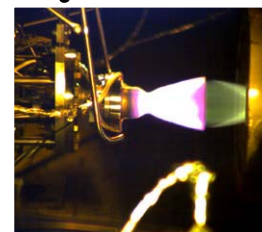
CV Divert Thrust Chambers



Kill Vehicle Hot Fire Test



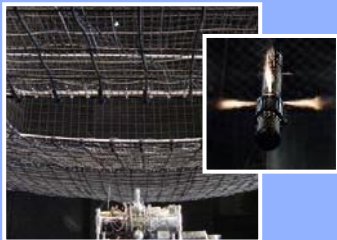
Kill Vehicle Divert Test



Divert Thruster Tests



Seeker Captive Carry Mirrors



National Hover Test Facility Hover Testbed

- Carrier vehicle telescope/focal plane integration: Summer 2008
- Hover test bed operational: Fall 2008
- Captive carry seeker test: Summer 2009



Captive Carry Test

**Multiple Kill Vehicle technologies maturing
Successful hardware component testing and demonstrations**



Hover Test Overview

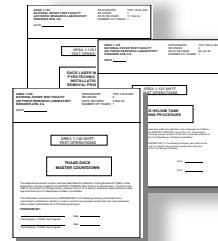
Multiple Kill Vehicle

- **Purpose:** The Hover Test Bed serves as a test asset for the Missile Defense Agency for static and hover tests of increasing size and complexity

Hover Test Bed (HTB)



National Hover Test Facility and Operational Safety Services



Plans, Procedures, & Repeatable Processes



Qualified and Trained Personnel

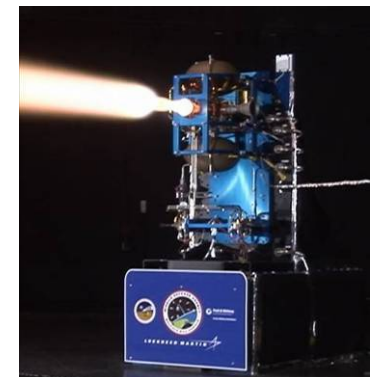


Special Test Equipment (STE) and Ground Support Equipment (GSE)

**MKV-L Hover Test Vehicle (HTV)
October 2008**



Carrier Vehicle DACS Static Hot Fire Test



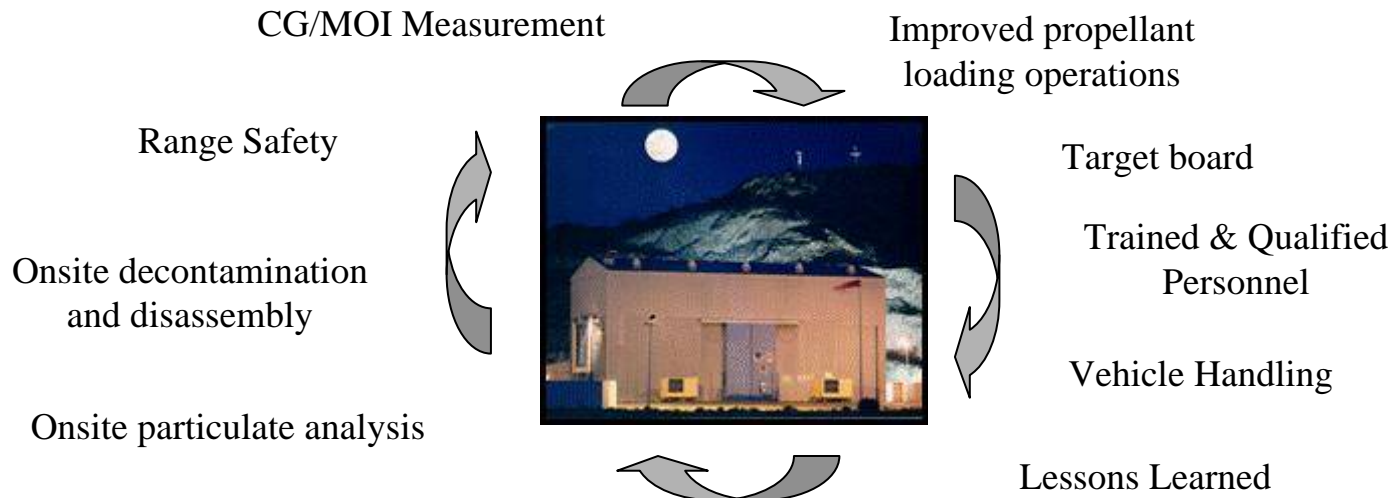
07-MDA-3888 (10 OCT 07)



Reactivation of the National Hover Test Facility

Multiple Kill Vehicle

- **Developed as a test bed for missile defense kinetic energy weapons in 1988**
 - **Short-term deactivation between 2004 and 2006**
 - **Reactivated in January 2007 to support MKV-L Static DACS firing and other future MDA activities**
- **Existing capabilities enhanced and new capabilities added**
 - **Resources for end-to-end handling of test article**

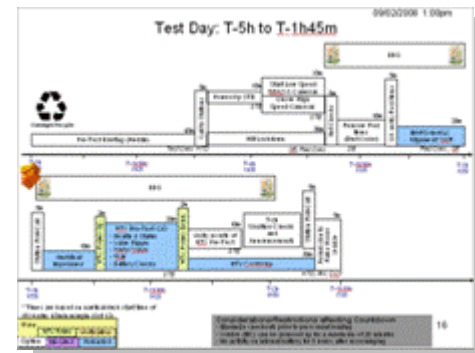




Plans/Procedures/Processes

Multiple Kill Vehicle

- Repeatable plans, processes, and procedures for future static and hover tests
- Standardized test bed interfaces facilitates contractor-supplied test or support equipment integration
 - Test articles accommodated in a “Plug-and-Play” environment

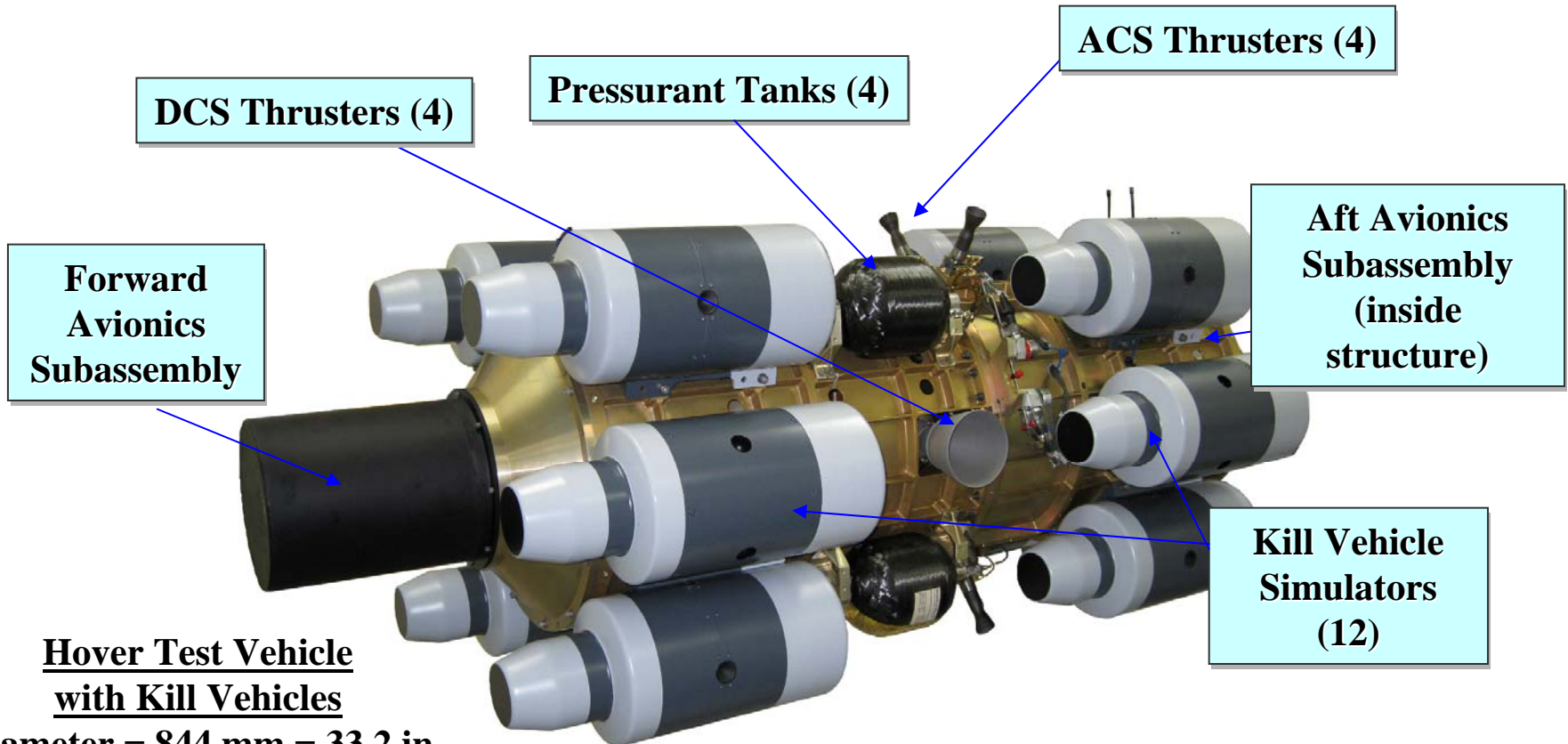
A screenshot of a complex spreadsheet, likely a test plan or schedule, with multiple columns and rows of data.

Repeatable processes help ensure Mission Success



MKV-L Pathfinder-1 Overview

Multiple Kill Vehicle



Hover Test Vehicle
with Kill Vehicles

Diameter = 844 mm = 33.2 in

Length = 1640 mm = 64.6 in

Mass = ~ 211.3Kg = 464.9 lb

Validates the Capabilities of the Hover Test Bed



Demonstration and Validation of the HTB

Multiple Kill Vehicle

- Validation of the Hover Test Bed encompasses the lifecycle of a test article
 - Receipt and processing of test article through post-test decontamination and disassembly
- Define and implement standard facility interfaces
- Foster a continuous learning process incorporating all lessons learned to improve the testbed capability

Integration of Special Test Equipment and Ground Test Equipment

Propellant, Ordnance & Pressurant Operations

Test Telemetry Monitoring & Video Capture

Range Safety

Requirements/ Capabilities Definition

CG/MOI Measurement

Executive & VIP Viewing Capability

Target Operations

Decontamination & Disassembly



Video

Multiple Kill Vehicle





Summary

Multiple Kill Vehicle

- **Validated a critical test bed resource for kinetic energy weapon testing for the Missile Defense Agency through the design, development and test of the Hover Test Vehicle**
- **Defined full-spectrum capabilities of the test bed to support end-to-end processing of static and hover vehicles of increasing complexity and size**
- **Collected lessons learned to aid in the enhancement of existing capabilities to provide better value for future test activities**

**The Hover Test Bed is ready to support the needs of
Missile Defense**