MIT
Science, Technology, and
Global Security Working Group

Briefing to the National Research Council Committee on An Assessment of Concepts and Systems for U.S. Boost-Phase Missile Defense in Comparison to Other Alternatives

Theodore A. Postol
Professor of Science, Technology, and National Security Policy, Massachusetts Institute of Technology
Voice: 617 253-8077; e-mail: postol@mit.edu

George N. Lewis
Associate Director, Peace Studies Program, Cornell University
Voice: 607 255-8914; e-mail: gnl3@cornell.edu

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Washington D.C.
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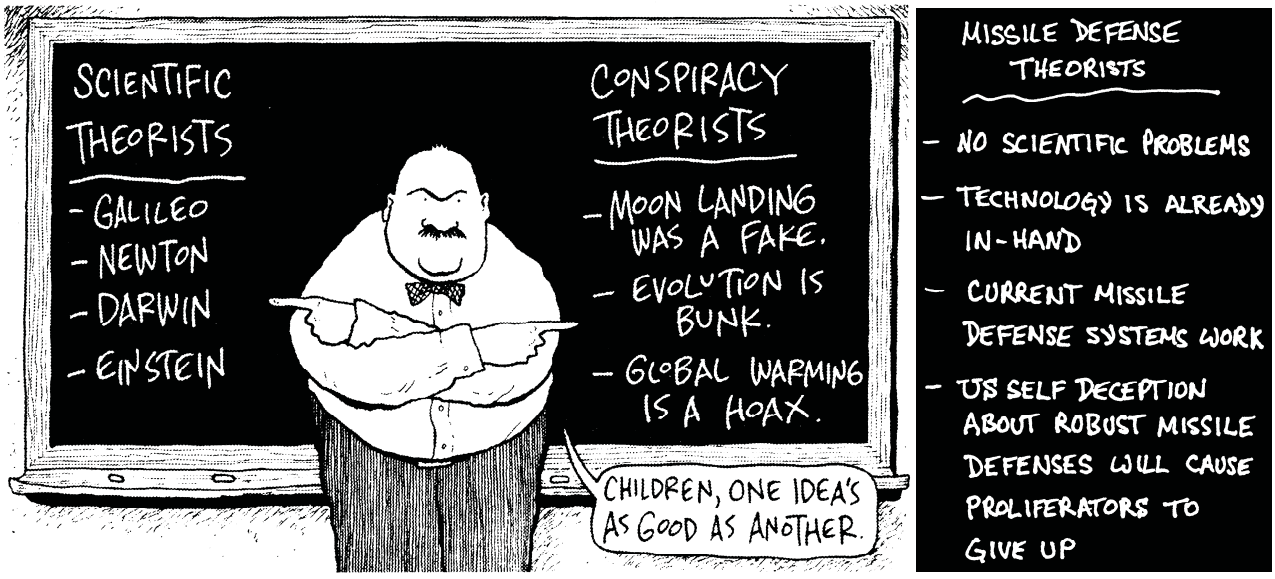
A National Defense Strategy Based on Provably False Assumptions

- **Assumptions Used by the DoD for GMD Performance Cannot Possibly be Known Hence, Actual Performance of the GMD is Unknowable**
- **The Record of "Proven Reliability" of the Navy's SM-3 Interceptor Actually Shows that the SM-3 Will Be Highly Unreliable in Actual Combat Conditions**



Tony Auth Philadelphia Inquirer, Universal Uclick

Main Points to be Made in This briefing (1 of 3)

- North Korea is only one successful flight test away from demonstrating an ICBM that would be able to deliver a nuclear warhead to almost anywhere in the Continental United States.
- Since the United States is building the wrong missile defense-systems to deal with this,It cannot be ruled out that the United States *might* eventually become vulnerable to nuclear-armed coercion.
- This potential future problem can be addressed as there are definitely boost-phase missile defense-systems that could provide for the strategic continental defence of the United States from *both* North Korean and Iranian long-range ballistic missiles.
- However, under current conditions, Boost-Phase ballistic missile defense systems will never be developed or built, as the Pentagon remains solely focussed on building unworkable exo-atmospheric missile defenses.
- Unless there is a serious evaluation of the true shortcomings of these exo-atmospheric defenses, they will remain the centerpiece of the Pentagon's ballisitc missile defense program, and bureaucratic politics will guarantee that there will be no money for the development of far more capable, reliable, and robust boost-phase missile defenses.
- There is also a very serious problem with the technical competence of upper level management in the Missile Defense Agency and elsewhere in the Pentagon.

Main Points to be Made in This briefing (2 of 3)

- This is manifest in the record of one technically naïve missile defense solution being substituted for another.
- For example, the adoption of post-boost phase missile defenses under the naïve belief that it takes time to deploy countermeasures after rocket motor shutdown. This reveals a startling lack of technical sophistication among managers at MDA.
- There is also a problem with the approach of political leadership to this problem, which has inadvertently encouraged repeated misrepresentations in the missile defense program by not holding individuals accountable for false statements they have and continue to make.
- In summary, none of the actions needed to get proper management into the missile defense program will be solved unless individuals and organizations are held accountable for misinformation that is being disseminated.
- It is ridiculous to call the missile defense testing that has been conducted to date by the Pentagon realistic.
- Even in orchestrated experiments, the systems fail catastrophicly when anything unexpected happens (Note Ronald Kadish's statement when the canister carrying the large balloon failed to open in the IFT-6).
- In the FTG-06, the scene recognition system of the Sea-Based X-band radar failed because of a trivial *unplanned* event when a rocket motor unexpectedly expelled *small* pieces of debris.

Main Points to be Made in This briefing (3 of 3)

- The SM-3 failures and the FTG-06 failure are simply another manifestation of the GMD and SM-3s profound vulnerabilities to decoys.
- This vulnerability was covered up in 1997 and 1998 when the IFT-1A and IFT-2 proof-of-concept experiments showed that the GMD could be fooled by a subset of the decoys flown in those experiments.
- It is now more than ten years later and the GMD has still not been tested against these decoys.
- Before the Gulf War of 1991 Patriot had a record of 17 successes out of 17 intercept tests. In the Gulf War of 1991 the actual intercept rate, defined as destruction of SCUD warheads, was almost certainly 0 out of 44.
- Most recently, the SM-3 has been misrepresented to the President as a "proven and reliable" missile defense system. In fact, the Pentagon's own data shows the opposite.
- The Pentagon's test data instead shows that the SM-3 is fragile and brittle, and unlikely to perform in combat at a level much higher than that allowed by chance.
- SM-3 Block IA kill vehicle will be even more vulnerable to countermeasures than the already fragile and vulnerable GMD kill vehicle, as the SM-3 kill vehicle cannot measure the temperature of objects (see MIT Lincoln Laboratory IR data).

What Needs to Be Done

- No sound technical decisions in missile defense will be possible unless there are science-based assessments of the true capabilities of missile defense systems.
- It is the responsibility of the technical community to stop playing political games with the truth.
- The community needs to confront the fact that strategic boost-phase ballistic missile defenses, which actually could provide for the strategic defense of the continental United States, will never be developed unless the truth about the fundamental limitations of exo-atmospheric defenses is addressed.
- The abysmal failure of the Pentagon to establish realistic standards for testing missile defense systems must be vigorously addressed and corrected.
- Real tests of the GMD and SM-3 systems must be done against simple realistic decoys of the kind that were flown in the IFT-1A and IFT-2 in 1997 and 1998.
- Unless the informed technical community takes responsibility as advisors to the nation, the next time the nation depends on missile defenses, one can only hope it will not be against nuclear-armed ballistic missiles.

Important Consequences of the Current Failures to Properly Address the Real Technical Issues Associated with Exo-Atmospheric Missile Defenses

- North Korea is only one successful flight test away from demonstrating an ICBM capable vehicle that could range the entire Continental United States. The United States could become vulnerable to such an ICBM threat, because it is building the wrong missile defense-systems to deal with it.
- There are definitely *boost-phase* missile defense-systems that could provide for the strategic continental defence of the United States from ICBM attack from North Korea and Iran.
- However, the new missile defense strategy de-emphasizes these defense-systems in favor of unproven, unworkable, and far more expensive systems.
- This failure to emphasize workable systems in favor of unworkable systems is a consequence of years of misrepresentations and coverups by the Missile Defense Agency, which has not been forcefully addressed by the nation's political leadership.
- One consequence of these failures is that the US is poised to deploy systems that are easy to defeat, which will likely fail to deter, or actually stimulate, ballistic missile proliferation.
- If the current emphasis on exo-atmospheric systems continues without the imposition of proper testing statndards and oversight, we can expect with near certainty that proliferators like North Korea and Iran will introduce highly effective countermeasures against these systems.
- These proliferators could, and likely would, sell these countermeasures to client states.

Important Additional Costs that are not Offset by Benefits Due to the Ongoing Failures to Properly Address the Real Technical Issues Associated with Exo-Atmospheric Missile Defenses

- The United States could damage its relations with allies and friends by pushing on them false and unreliable solutions to a real security problem.
- The United States will antagonize both Russia and China with massive defense deployments that have the appearance of being designed to be "flexibly" adaptable to deal with Russian and Chinese strategic forces.
- The negative effects of a costly and energetic US program that appears to be aimed at blunting Russia's strategic retaliatory strike forces will sow distrust of the US within the Russian government and will create significant barriers to future arms reductions efforts.
- If arms reductions efforts with Russia come to a halt, this will have serious adverse effects on Russian and US efforts to maintain the viability of the Nonproliferation Treaty of 1968, which is already under considerable pressure due to the US-India Nuclear Deal.

Basic Issues to Be Discussed in this Briefing

1. Important aspects of the nations new nuclear strategy, laid out in the Nuclear Posture Review (NPR), rests on conclusions from the Department of Defense's Ballistic Missile Defense Review (BMDR), released in February 2010.
2. The BMDR claims that all the fundamental technical problems associated with current missile defense systems have been solved.
3. This translates into the conclusion that the United States is now and for the foreseeable future able to defend itself from limited ICBM attacks.
4. It also translates into a conclusion that the United States can build sufficiently reliable and robust ballistic missile defenses that it will cause potential adversaries to deemphasize their reliance on ballistic missiles as instruments of intimidation.
5. However, as will be shown in this briefing, there are no new material facts to support any of the claims in the BMDR that suggest that the United States is now in a position to defend itself from limited ICBM attacks or that any of the fundamental unsolved problems associated with high-altitude ballistic missile defenses have been solved.
6. In fact, as this briefing will show, the most recent ballistic missile defense flight-test data released by the Department of Defense and the most recent failed test of the ground-based missile defense system in January show quite the opposite.

Relevant Information About the Arms Control Today Article and the Associated White Paper Being Provided to the Committee

- The PDF and printed versions of the Arms Control Today article includes copies of critical endnotes that contain powerful additional information that substantially expands upon the article's content.
- The associated White Paper (which NRC information control was not provided to the Committee until today) contains a substantial amount of highly relevant additional information that could not be put into the original article because of space considerations. Endnote 1 in the Arms Control Today article refers to the White Paper.
- An expanded search of Missile Defense Agency documents show that they contain quite a bit of evidence that the Missile Defense Agency has not been accurately representing the record of accomplishments in ballistic missile flight tests.

An Inappropriate Security System that is Designed to Inhibit National Research Council's Investigation

Materials for the National Research Council Committee were sent by e-mail on May 5. After one week (May 12) I found out that the most informative part of the transmitted Committee materials had not been distributed.

The reason was that the National Research Council information system had the following questions:

1. The White Paper is unclassified; however, is it non-restrictive? Can it be released for unlimited distribution? If so, then the White Paper will be placed in the Public Access File that is associated with this study. (By the way, I checked for the White Paper on the Internet, but I did not find it.)
2. In regard to the unclassified MIT Lincoln Laboratory slides that are Figures 4, 5, 6, and the title page of Eric Evans' brief (shown in the reference section), I need to know what process was used to vet these slides so that they are unclassified, non-restrictive, and public releasable for unlimited distribution.

Relevant Information in this Briefing About Issues Discussed in the Arms Control Today Article and the Associated MIT White Paper

Misrepresentation of the SM-3 System as "Proven"

1. The Article and White Paper show that the Department of Defense's owned ballistic missile defense flight test data contradicts the technical conclusions of the Ballistic Missile Defense Review.
2. In particular the two papers show that when the SM-3 interceptor was tested against rockets carrying warheads, and some times rockets not carrying warheads, the SM-3 kill vehicle almost always failed to hit the warhead section. This means that the warhead would not have been destroyed in 8 to 9 out of 10 intercept tests that were called successful by the Missile Defense Agency.
3. In testimony before the Congress in 1992 the Army was questioned about the greater than 90% intercept rate it had earlier claimed for the Patriot missile in the Gulf War of 1991. The army explained that its claims were not false because it defined intercept as an event where "a Patriot and a stud test in the sky." The same misleading statements about what constitutes successful intercepts are again being made by the Missile Defense Agency – this time with regard to the results of the SM-3 ballistic missile flight tests.

Relevant Information in this Briefing About Issues Discussed in the Arms Control Today Article and the Associated MIT White Paper

FTG-06 Failure and Its Relation to Vulnerabilities in the SM-3 Block IA Interceptor

4. The two papers explain how the most recent Ground-Based Missile Defense test on January 31, 2010, the FTG-06, failed because the defense-system encountered a special circumstance where it could not recognize the difference between the mock warhead and chunks of debris that were unexpectedly expelled by the spent rocket motor that launched the mock warhead.

5. They then explain how an adversary could intentionally create credible false targets that would without exception defeat the Ground-Based Missile Defense System in all circumstances.

6. The infrared and radar data released by MIT Lincoln Laboratory and discussed in the White Paper explains how chunks of debris that were unexpectedly expelled from a rocket motor in the FTG-06 caused the total collapse of the "scene recognition" process that is supposed to select the warhead from the cloud of deployment debris.

7. The MIT Lincoln Laboratory data shows that the SM-3 block IA kill vehicle will never be able to discriminate between a warhead and debris of the type encountered from the rocket motor in the FTG-6.

8. This is because the SM-3 Block IA kill vehicle cannot measure the temperature of the debris. This vulnerability will be eliminated with the Block IB kill vehicles and beyond, because these kill vehicles can observe targets in two wavelength bands, allowing them to distinguish hot objects from cooler near-room temperature objects.

Relevant Information in this Briefing About Issues Discussed in the Arms Control Today Article and the Associated MIT White Paper

Misrepresentations of GMD Proof of Concept Tests as Successful When in Fact they Failed

9. The two papers explain that the IFT-1A and IFT-2 experiments, performed more than 10 years ago, failed to demonstrate that the Ground-Based Missile Defense kill vehicle could discriminate between 0.6 m diameter balloons and cone shaped decoys because the infrared signals from these objects were essentially indistinguishable from the infrared signals from the warhead.

10. I have quite a lot of data on the IFT-1A and IFT-2 experiments I could share with the Committee if it wants to obtain information about the unambiguous failure of these critical proof-of-concept missile defense experiments and to analyze the implications for these failures for the current missile defense program.

11. The data shows that the Missile Defense Agency misrepresented the experiments to Congress as an unambiguous success when in fact the experiments failed.

Failure of Political Leadership to Hold Pentagon Officials Accountable When They Have Been Caught Lying or Turning a Blind Eye to Fraud

12. Two of the three most senior people involved in the IFT-1A and IFT-2 fraud, Lester B. Lyles and Keith Englander, hold high-level positions in the Pentagon in spite of their involvement in misrepresenting these critical proof-of-concept experiments as successes when in fact they failed.

13. One of them, Lester B. Lyles, was appointed by the Undersecretary of Defense for Acquisition, Technology and Logistics, Ash Carter, to be Vice Chair of the Defense Science Board.

14. Ash Carter was on the MIT Lincoln Laboratory Oversight Board when questions were being raised about Lincoln's role in this fraud. In spite of the substantial publicity and documentary evidence of fraud, he took no steps to investigate.

Relevant Information in this Briefing About Issues Discussed in
the Arms Control Today Article and the Associated MIT White Paper

Failure of the Pentagon to Set Proper Standards for What is Realistic Testing

15. The two papers describe how the Missile Defense Agency removed the credible subset of IFT-1A and IFT-2 decoys from all subsequent flight tests.

16. At that time, the New York Times published (attached after the endnotes in the file containing the article) a detailed and comprehensive article explaining how the Missile Defense Agency had rigged all of the then planned future flight tests by removing these decoys from all subsequent missile defense tests.

17. The Missile Defense Agency responded to the New York Times exposé by claiming that these decoys would be re-introduced into missile defense flight tests later in the testing. There is a very extensive public record of discussions with the press about the intention to fly against these decoys at a future time.

18. However, ***more than 10 years later***, after the Ground-Based Missile Defense has been declared by the Ballistic Missile Defense Review as being able to defend the United States, **the Ground-Based Missile Defense system has still not been tested against these decoys.**

19. **This lack of realistic testing is scandalous and an issue of overwhelmingly importance that needs to be addressed.**

A Short Summary of Incidents of Misrepresentation in the Missile Defense Program

The Missile Defense Agency: A Culture of Misrepresentation and a Repeated History of Being Caught

Other Concrete Examples

- The IFT-1A and IFT-2 demonstrated the capability to discriminate against decoys
- Failure of FTG-06 does not indicate any fundamental problems
- Failure to inform the President that the FTG-06 has profound implications for the SM-3 Block IA – it demonstrates the SM-3 Block IA is fundamentally vulnerable to small heated objects
- False claims that the European Defense System will make it possible to defend Japan from an Iranian ICBM attack.
- False Claims that GMD interceptors launched from Alaska can be used to defend Japan from an Iranian ICBM attack.
- False claims that the Russians are misrepresenting the possibility that interceptors placed in Poland can "theoretically" engage Russian ICBMs.
- False claims that the European Midcourse Radar will make it possible for the European Missile Defense to defend the United States and Northern and Western Europe from long-range ballistic missile attack.
- False claims to Congress that discrimination capabilities have been demonstrated. (Kadish and Lyles' statements to Congress. Kadish's statement on 60 Minutes II).

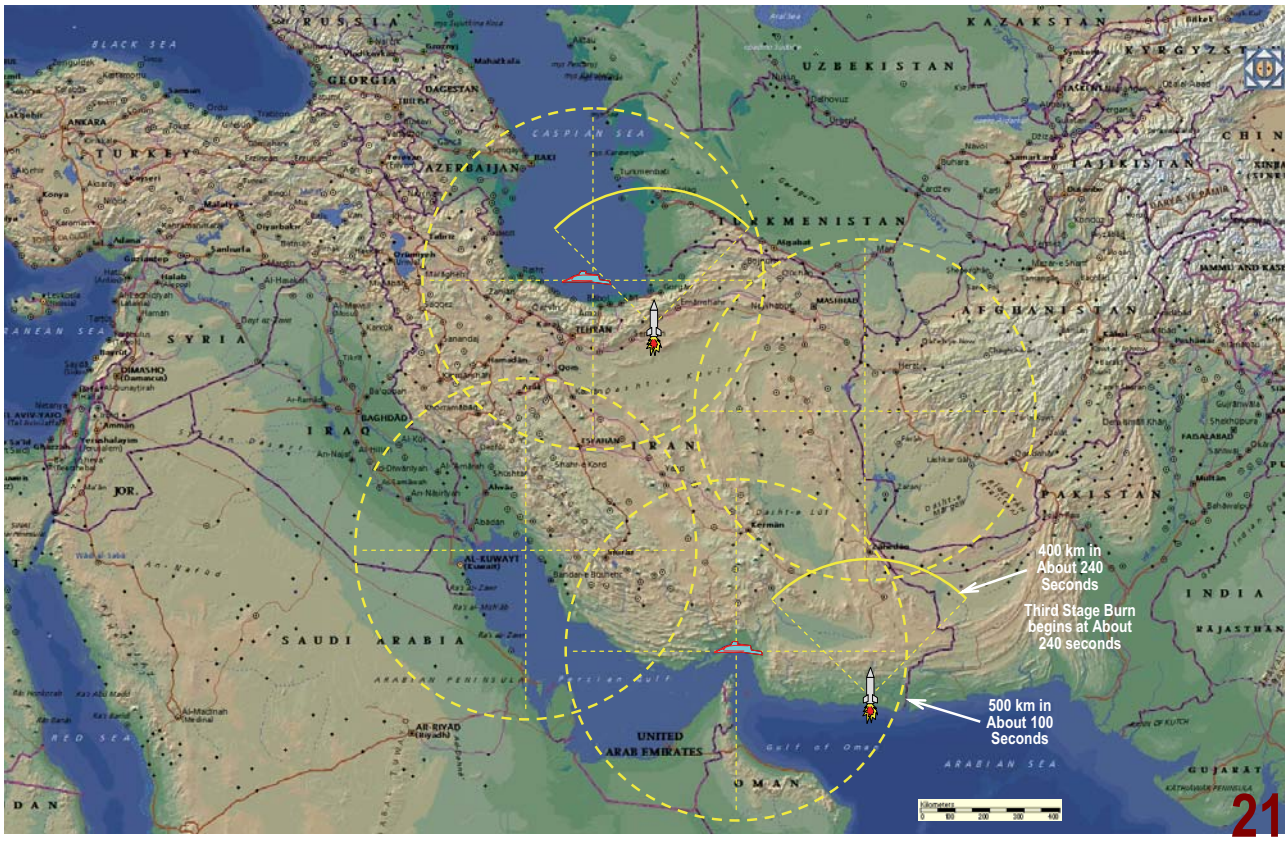
Question: What are the implications for the future accuracy of information about missile defense systems when there are so many people with a history of making false claims still involved with the Pentagon and the program?

What Are the Prospects for Building a Reliable, Robust, and Intimidating Boost-Phase Ballistic Missile Defense that Could Defend the Continental United States from Strategic Nuclear-Armed ICBM Attack?

ICBM Attack Corridors from Iran to the United States

Coverage Against Unha-2 – Like Large Liquid Propellant with 240 Second + Burn is Possible

5 km/sec Interceptor, ~500 km range in about 100 seconds, Unha-2 Ballistic Missile gets to about 400 km in about 240 seconds



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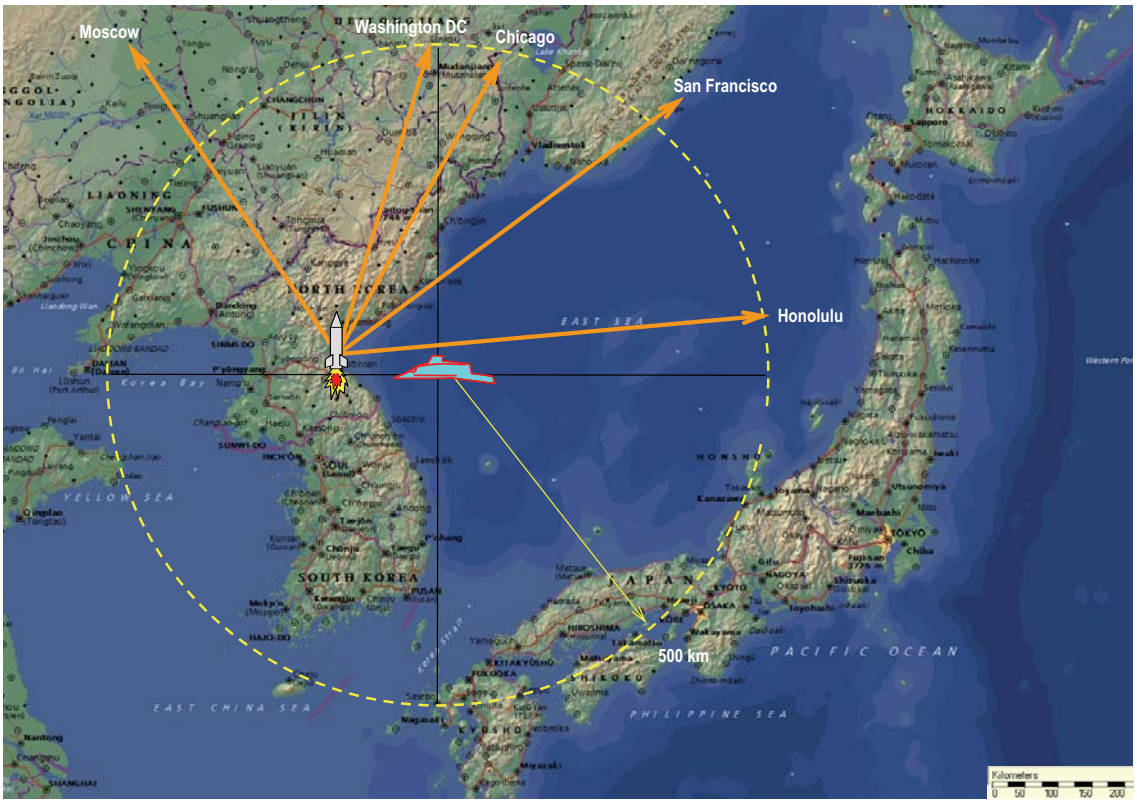
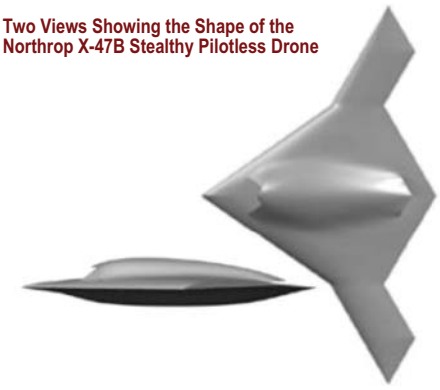


Stealthy Drone That Carries a Payload of 4500 pounds, Which Is More Than Enough to Accommodate Two 2000 pound Interceptors, or a Single Heavier Interceptor

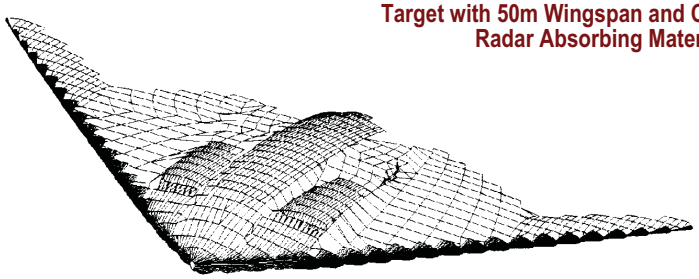
Two Views Showing the Shape of the Northrop X-47B Stealthy Pilotless Drone

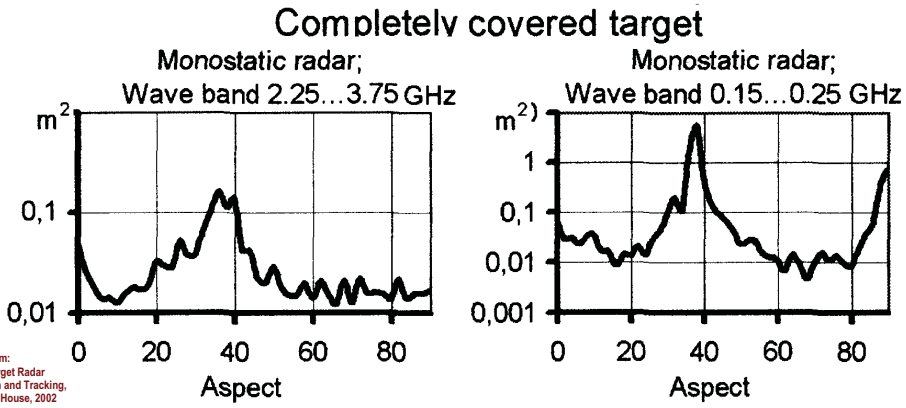


This particular drone can carry a payload of 4500 pounds, which is more than enough to accommodate two 2000 pound interceptors, or a single heavier interceptor. The heavier interceptor might be more desirable for situations where an interceptor burnout speed in excess of 5 km/s is desired. Smaller interceptors would probably have burnout speeds of perhaps 4 to 4 1/2 km/s. These lower burnout speeds may well be adequate.

Estimate of the Radar Cross Section of a 50 Meter Wing Span B-2 Like Aircraft

Target with 50m Wingspan and Covered with Radar Absorbing Material

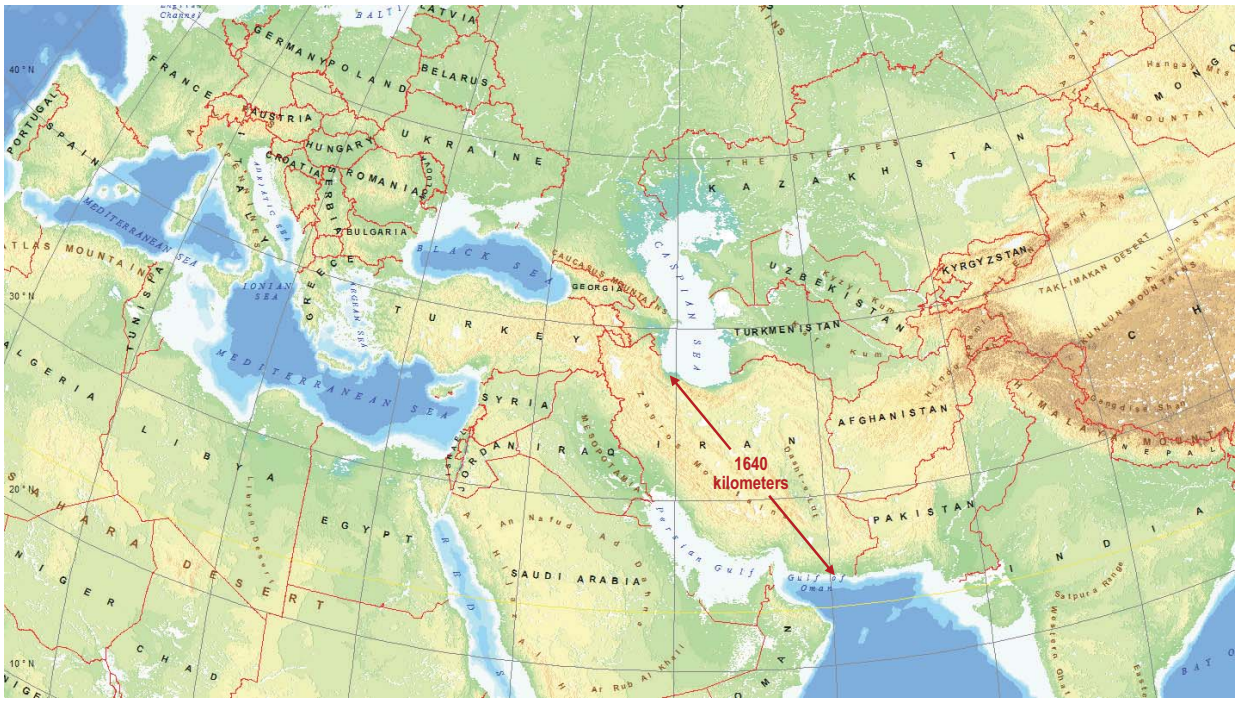




Radar cross section estimates from: Computer Simulation of Aerial Target Radar Scattering, Recognition, Detection and Tracking, Yakov D. Sherman, Editor, Artech House, 2002

Radar cross-sections that are less than 0.01 m² are certainly achievable. Such small radar cross-sections require not only that the aircraft have a shape that does not strongly reflect radar signals, but it also requires that the aircraft be covered with radar absorbing material. A bare skinned version of this aircraft would have a small radar cross-section, but it would still be roughly 10 times larger relative to a similarly shaped aircraft constructed with radar absorbing materials.

Iran is a Large Country, But Not Large Enough to Make It Easy to Test Long Range Missiles



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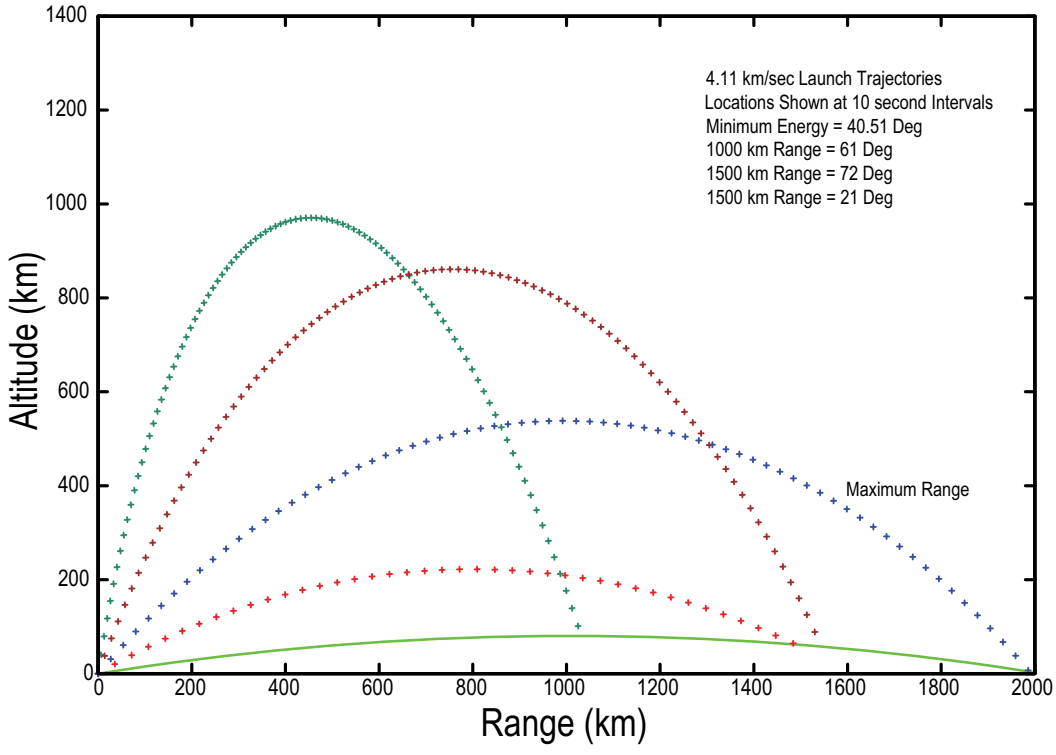
Reports of Testing of the 2,000 Kilometer Range Sejjil-2 Ballistic Missile on Lofted Trajectories Are Easily Explained If Iran Wants to Test Only Within Its National Boundaries

Examples of Test Trajectories that Can Be Flown by a 2,000 Kilometer Range Ballistic Missile



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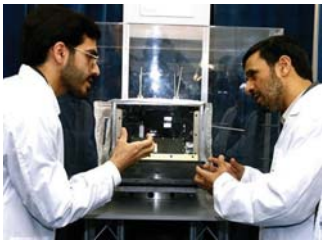
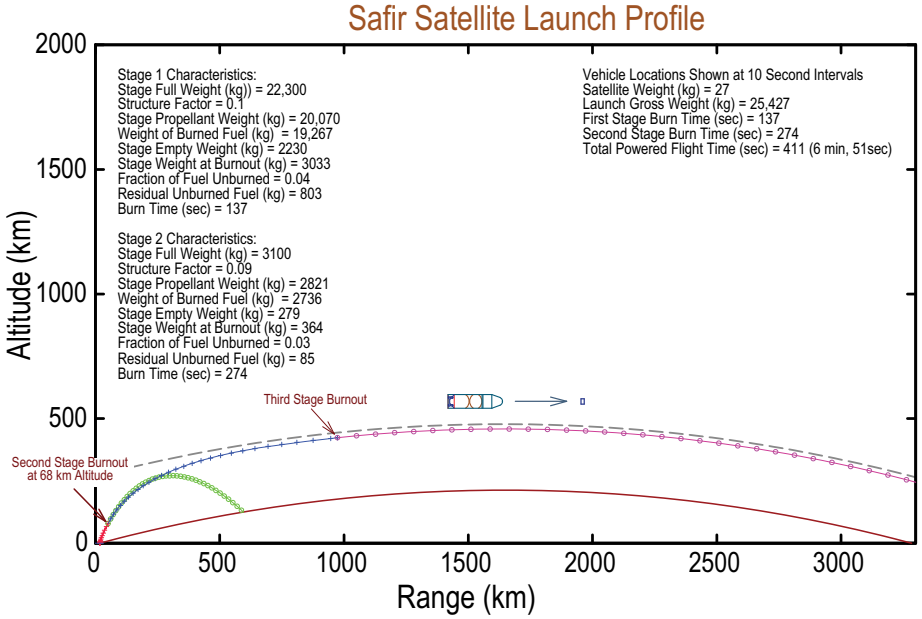
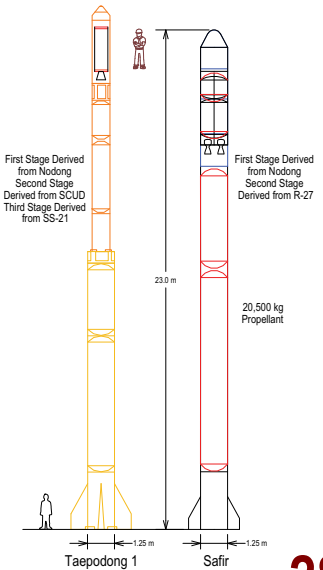
Iran's Launch of a 27 Kilogram Satellite on February 2/3, 2009 Was Obviously Chosen to Not Overfly Adjacent Countries

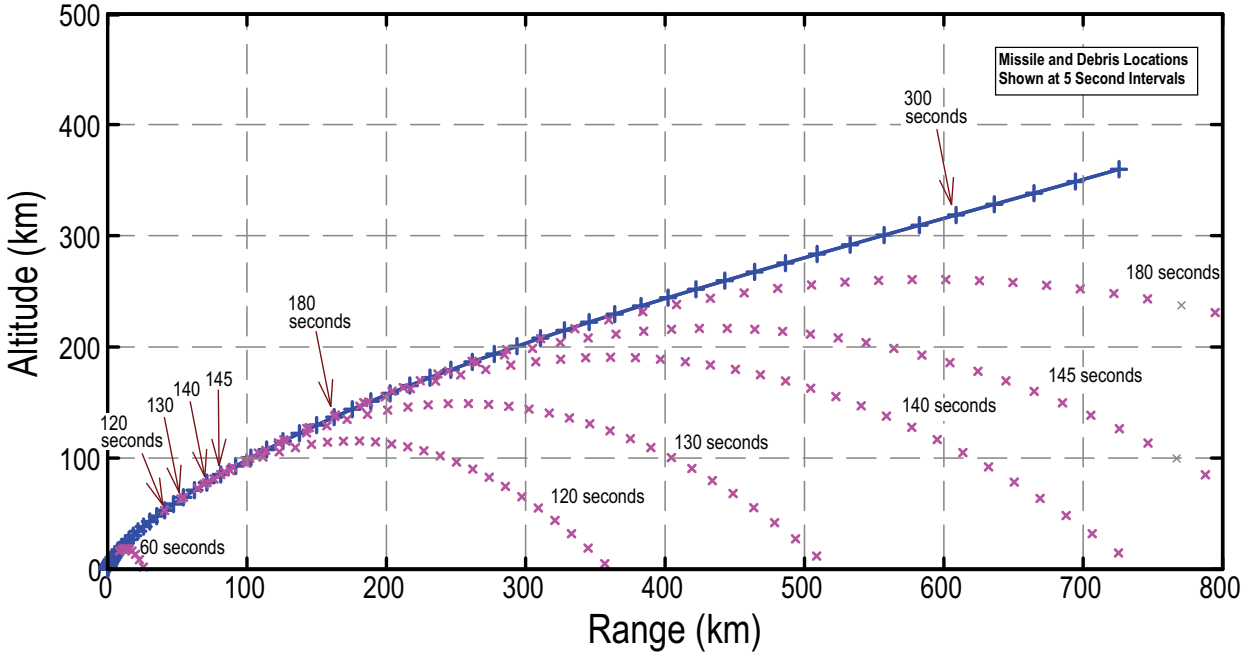
The First Stage of the Iran's Satellite Launch Vehicle Fell Well Within Iran's Borders and the Second Stage Went Into Orbit with the Small Satellite



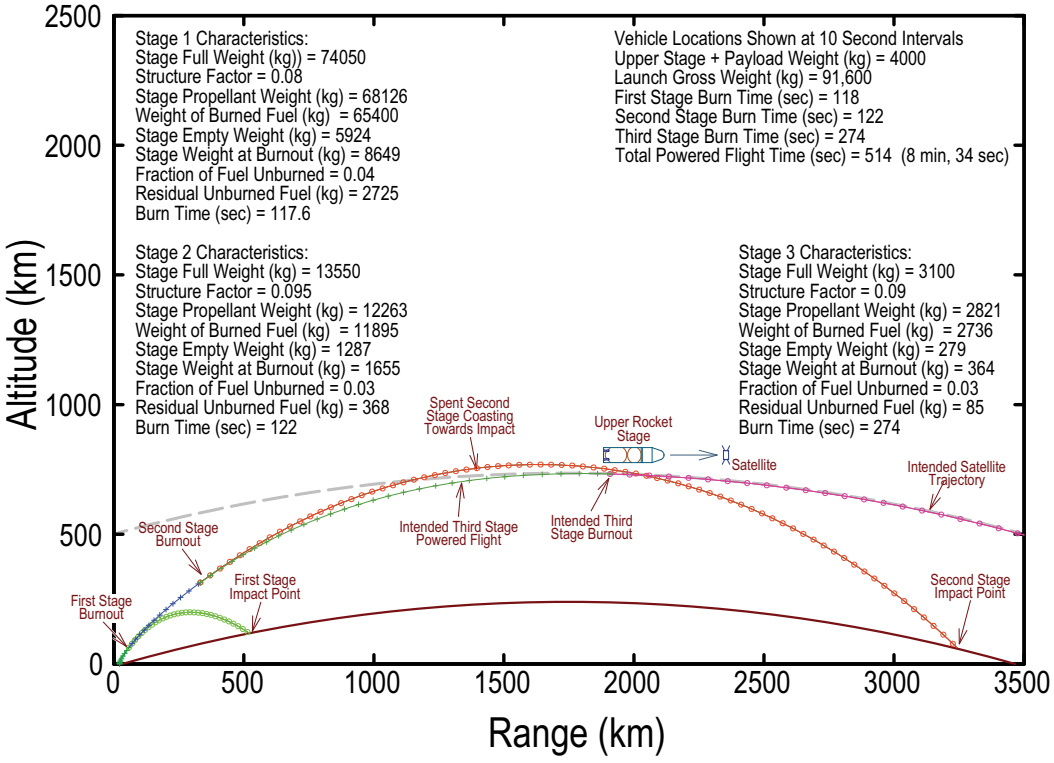




Powered Flight Profile of Large Liquid Propellant ICBM



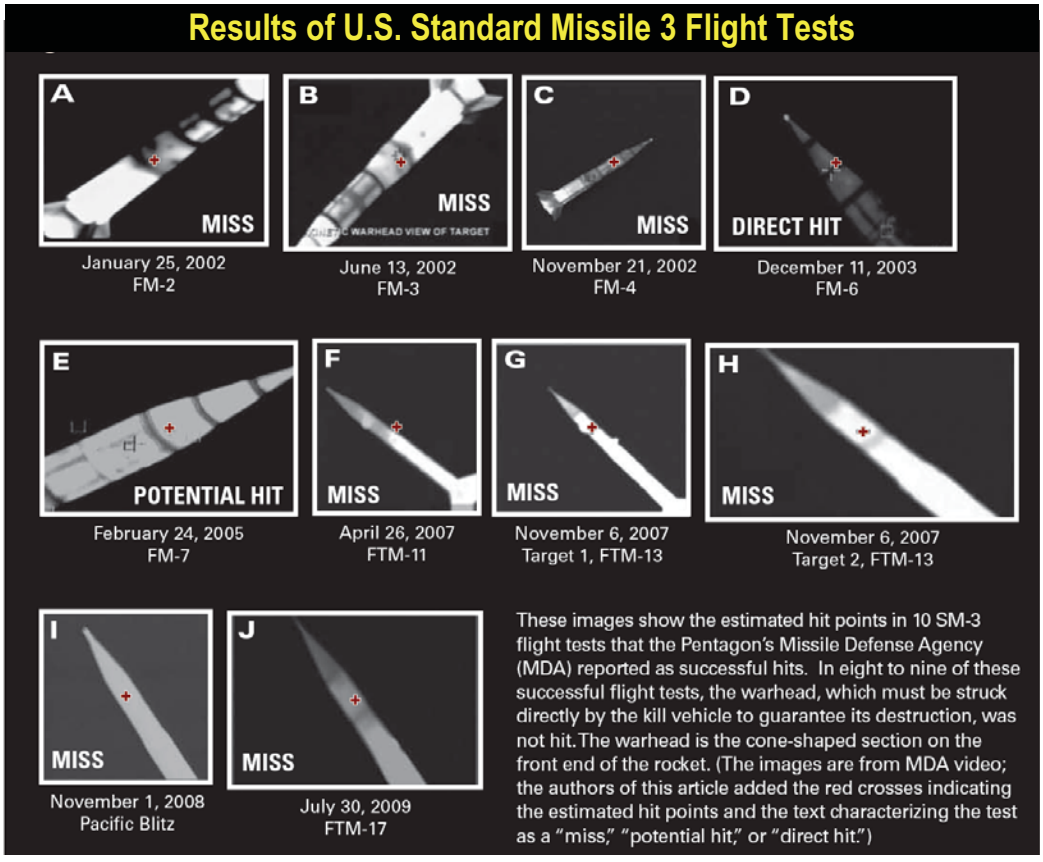
Expected and Actual Flight Outcomes Associated with the North Korean Satellite Launch Attempt of April 4/5, 2009



Most Recent MDA Misrepresentation
The SM-3 is a "Ballistic Missile Defense System [that] has demonstrated 20 hit-to-kill *intercepts* [italics added] out of 24 at sea firing attempts." **

** MDA Fact Sheet, November 24, 2009 09-MDA-5060

Results of SM-3 Flight Tests Derived from MDA's Published Video Data



Most Recent Concrete Example

Misrepresenting the SM-3 system test results to the press, and almost certainly to the President and the Secretary of Defense.

"There were subsequent views not publicly released to preclude potential adversaries from seeing exactly where the target was struck, so the authors were basing their assessment on incomplete information," Rick Lehner, a spokesman for the agency, told AOL News.

May 15, 2010, *MIT Gadflies Take Aim at Obama Missile Defense Plan*, Sharon Weinberger,

http://www.aolnews.com/nation/article/mit-gadflies-take-aim-at-obama-missile-defenseplan/19477831

Incidents of Repetitive Misrepresentations by the Missile Defense Agency – (FM-6)

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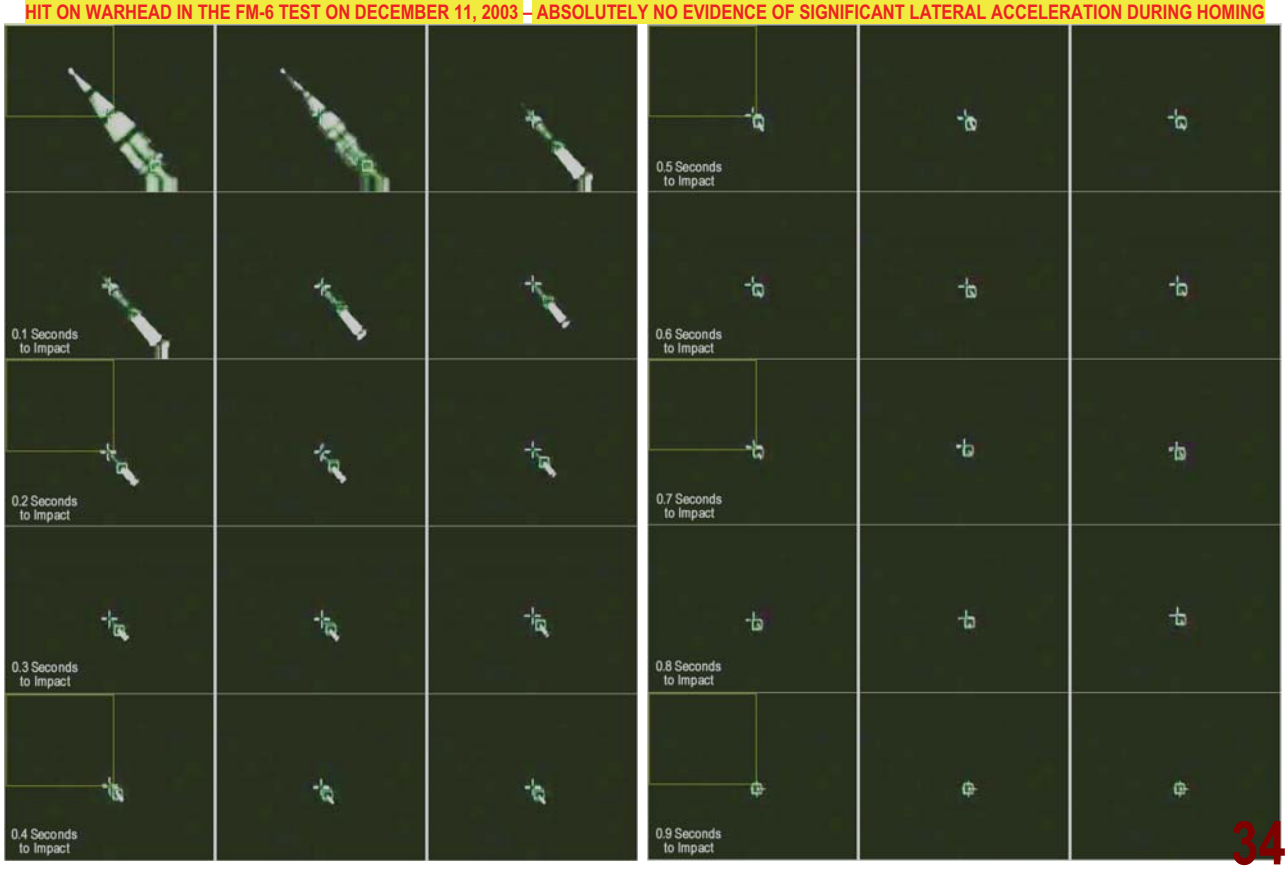
HIT ON WARHEAD IN THE FM-6 TEST ON DECEMBER 11, 2003 – ABSOLUTELY NO EVIDENCE OF SIGNIFICANT LATERAL ACCELERATION DURING HOMING



Credible Evidence of Repetitive Lying by the Missile Defense Agency – (FM-6)

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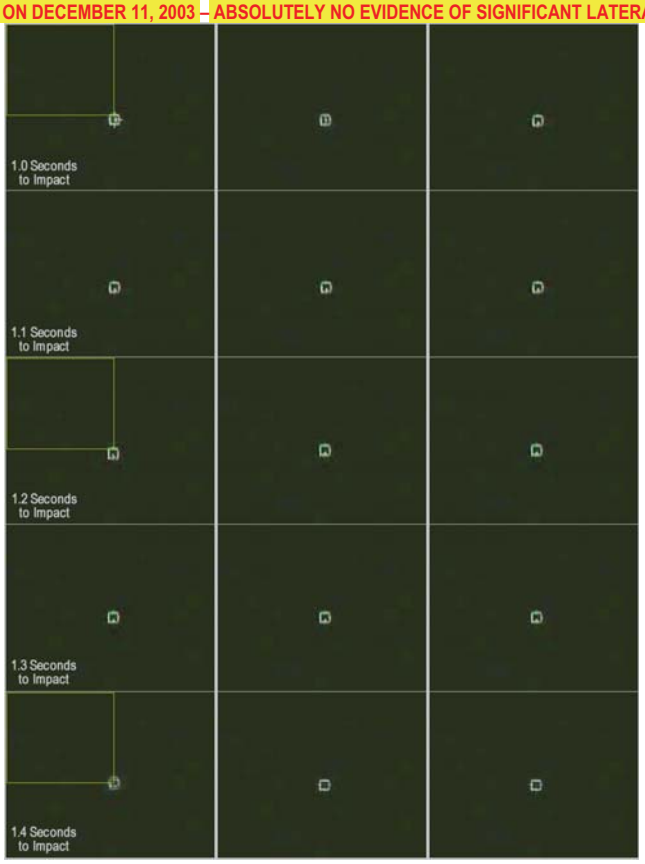

Credible Evidence of Repetitive Lying by the Missile Defense Agency – (FTM-11)

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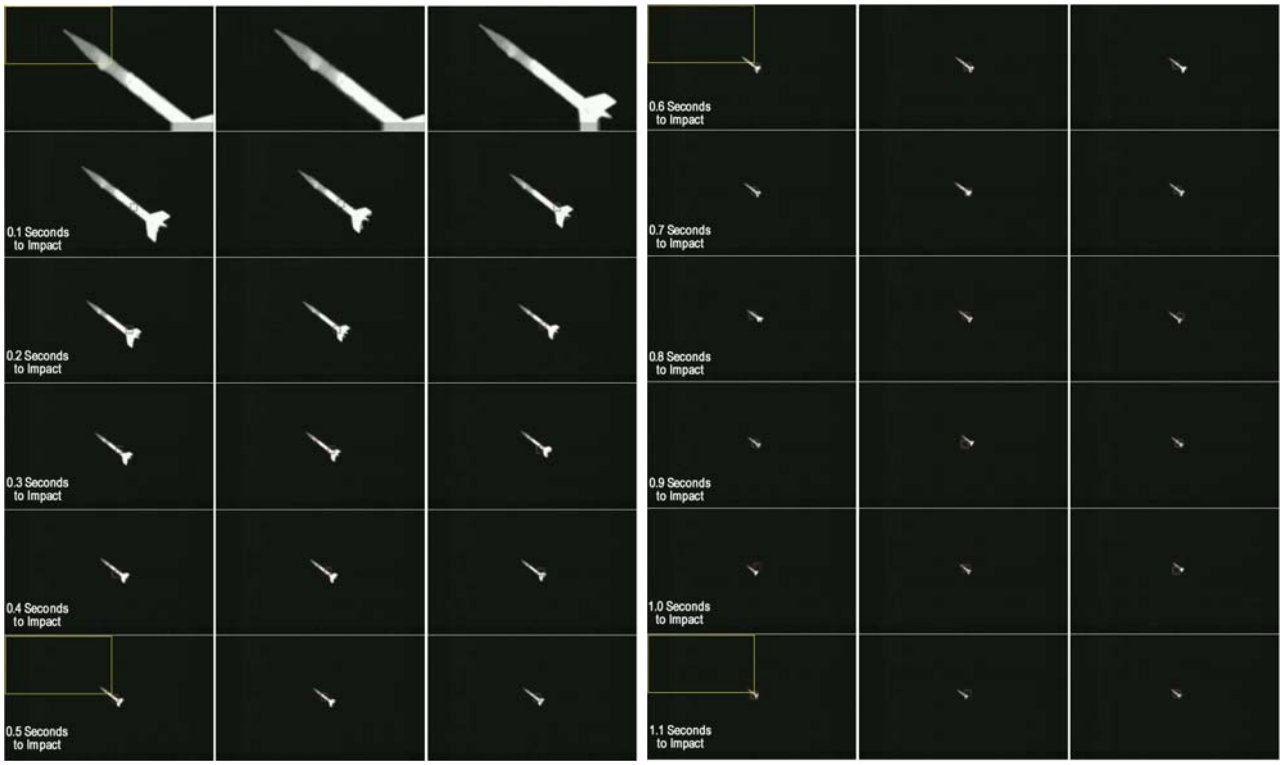
WARHEAD MISS IN THE FTM-11 TEST ON DECEMBER 7, 2006 – ABSOLUTELY NO EVIDENCE OF SIGNIFICANT LATERAL ACCELERATION DURING HOMING



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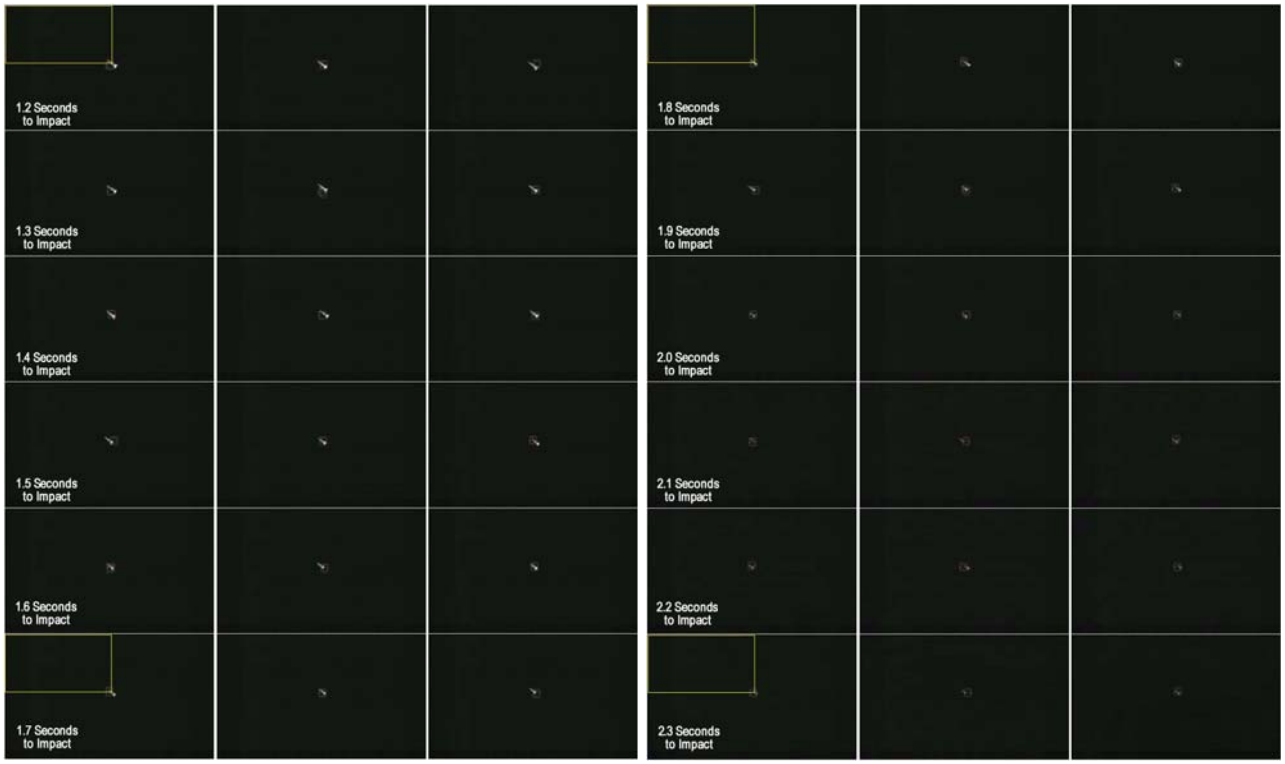
WARHEAD MISS IN THE FTM-11 TEST ON DECEMBER 7, 2006 – ABSOLUTELY NO EVIDENCE OF SIGNIFICANT LATERAL ACCELERATION DURING HOMING



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Lateral Accelerations Required to Shift the Impact Point 1 Meter Within 1/30th of a Second

$$\text{Distance} = \frac{\text{acceleration} \times \text{time}^2}{2} = \frac{a\,t^2}{2}$$

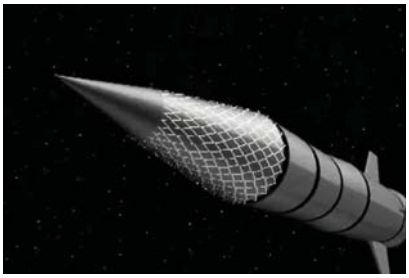
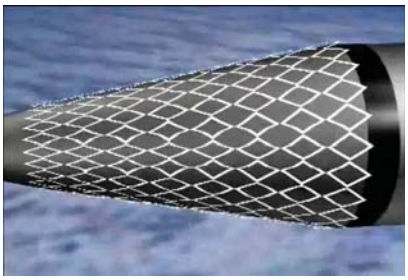
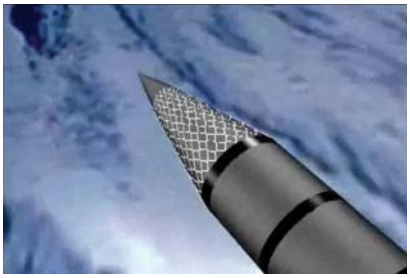
$$\text{acceleration} = \frac{2D}{t^2} = \frac{2 \times 1}{0.033^2} = 1800 \text{ m/sec}^2$$

$$\text{Acceleration in Gs} = \frac{a}{g} = \frac{1800 \text{ m/sec}^2}{9.8 \text{ m/sec}^2} = 184\,G$$

$$\text{Required Rocket Thrust (Tonnes)} = \frac{1800\,\text{m/sec}^2 \times 25\,\text{kg}}{1000\,\text{kg/Tonne}} = 45\,\text{Tonnes} \approx$$

3 Times the Thrust of a SCUD-B Rocket Motor

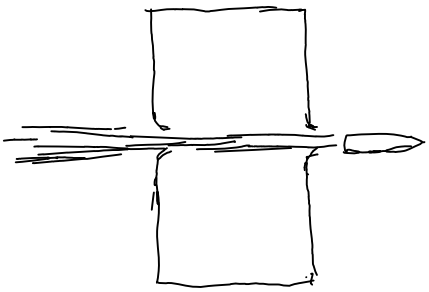
Video Animation Images Used by Missile Defense Agency to Describe the Instrumentation Used in the FM-6 Flight Test to Determine If Warhead Was Hit

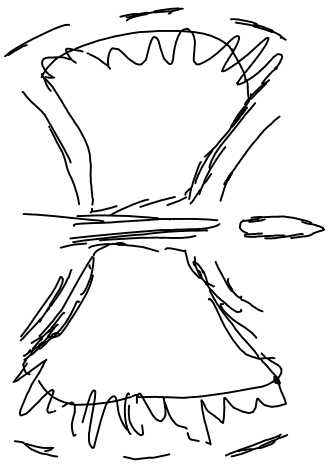

FM-6 – Only Direct Hit on Warhead

Other Problems with the Homing Process
The Kill Vehicle Must Hit the Warhead to Destroy It

Bullet Passes Through an Empty Container

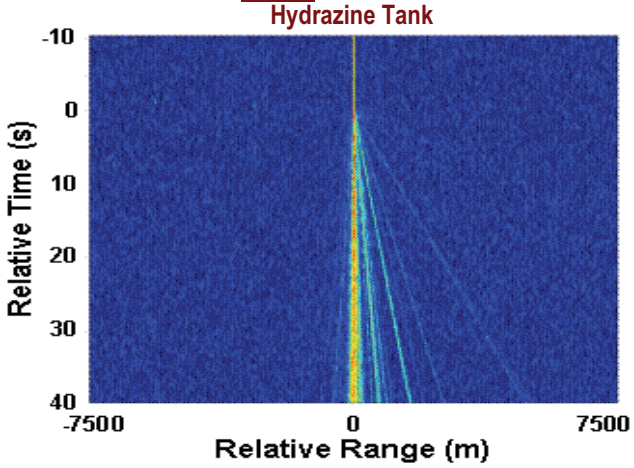


Bullet Creates A Shock as It Passes Through the Material in a Filled Container

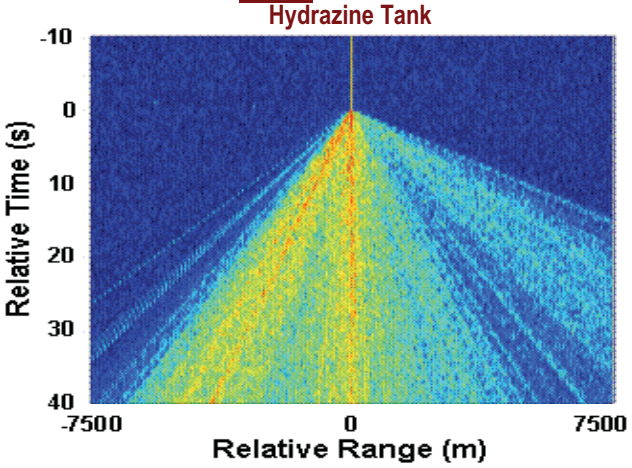


Predictions Made by the Missile Defense Agency for a Hit on US Satellite 193 that Misses and Hits a Full Hydrazine Tank in the Satellite

Predicted Infrared Image for a Kill Vehicle Hit that *Misses* the Satellite's Hydrazine Tank



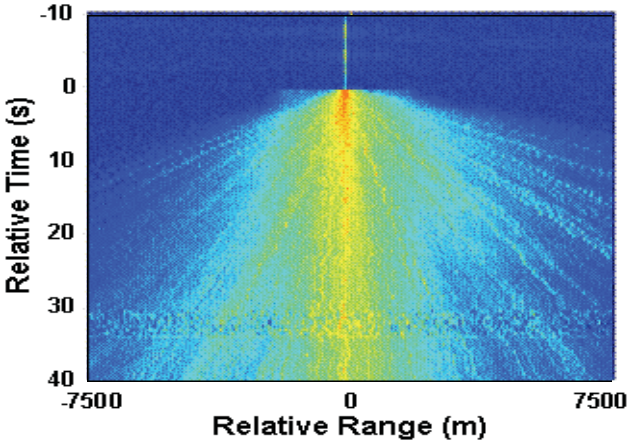
Predicted Infrared Image for a Kill Vehicle Hit that *Strikes* the Satellite's Hydrazine Tank



41

Actual Infrared Image of the Kill Vehicle Hit on US Satellite 193

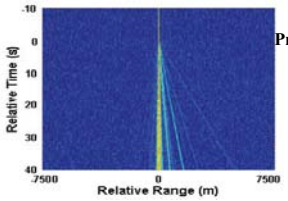
Actual Infrared Image for the Kill Vehicle Hit that *Struck* the Satellite's Hydrazine Tank



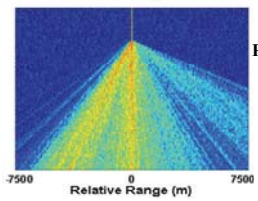
42

Real World Event
Satellite Intercept – 20 FEB 08

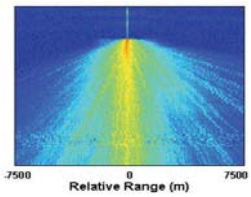
- **Objective**
  - Protect against potential loss of life due to uncontrolled reentry of ~ 5,400 lb (2,450 kg) satellite
  - Destroy ~ 1,000 lbs (450 kg) hydrazine fuel tank
- **Preparation**
  - 3 Standard Missiles-3 (SM-3), radars and system software extensively modified to enable intercept
- **Engagement**
  - 1 SM-3 launched by USS Lake Erie northwest of Hawaii
  - Successful intercept occurred ~153 miles (250 km) above the earth verified by 3 different phenomenlogies



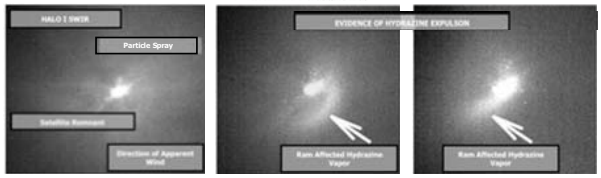
Predicted Radar Image Non-Lethal Intercept



Predicted Radar Image Of Lethal Intercept



Screen Capture Of Actual Intercept



- **Post Intercept**
  - Analysis (as of 25 FEB 08) shows vast majority of intercept debris has already burned up upon reentering the Earth's atmosphere, or will do so shortly – there have been no reports of debris landing on earth
  - The 3 Aegis ships have already been reconfigured to support BMD mission

Truth or Consequences?

A RESPECTFUL SUGGESTION TO PRESIDENT OBAMA

The President should ask the Secretary of Defense, Robert Gates; the Undersecretary of Defense, Ashton Carter; the MDA Director, General Patrick O'Reilly; and the MDA Director for Engineering, Keith Englander, if they can verify the accuracy of Lehner's statement.

If they cannot verify the accuracy of Lehner's statement, the President should find who was involved in generating this false claim.

Once identified, these individuals should be fired.

What Caused the Failure of the X-Band Radar in the FTG-06 Test of the Ground-Based Missile Defense System?

45

Briefing on Theater Missile Defense Technology Provided to Military Officers Visiting the MIT Security Studies Program in 1999 for Command School Training

MIT Lincoln Laboratory
244 Wood Street
Lexington, MA 02420-9108

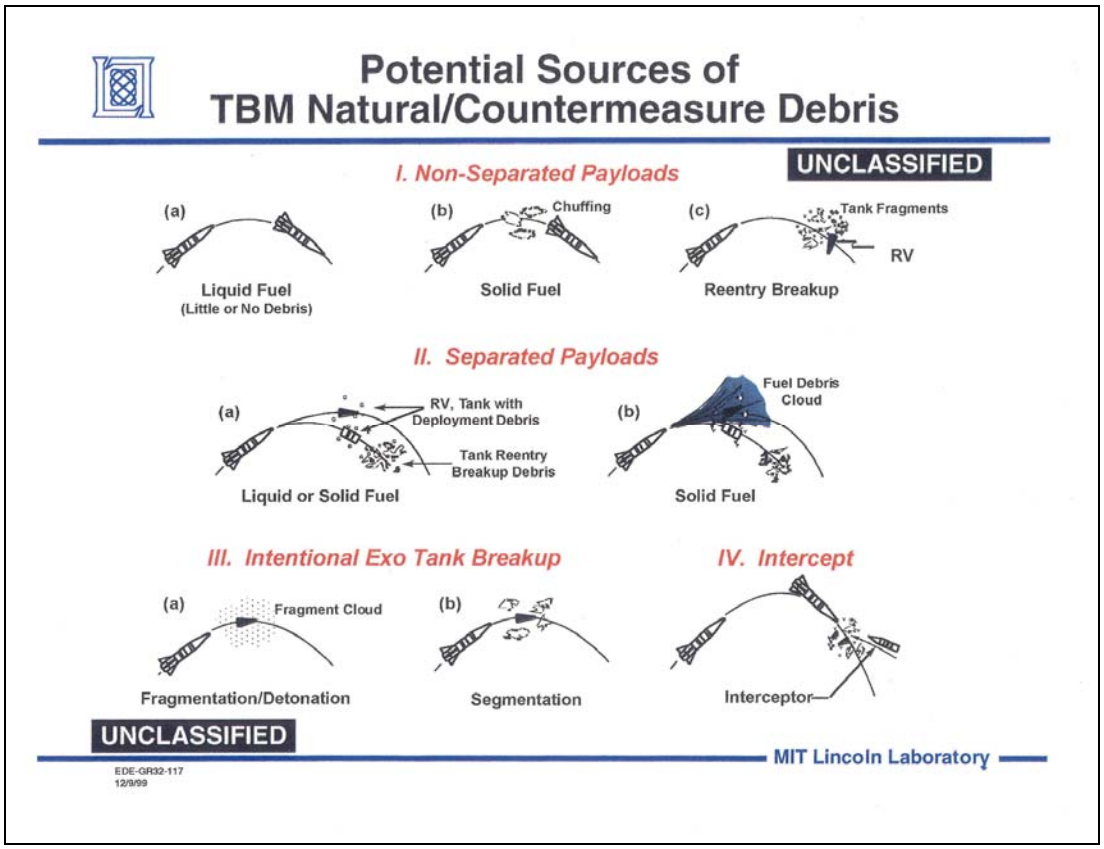
Missile Defense Technology
(Can BMD Systems Work?)

Eric D. Evans
MIT Lincoln Laboratory

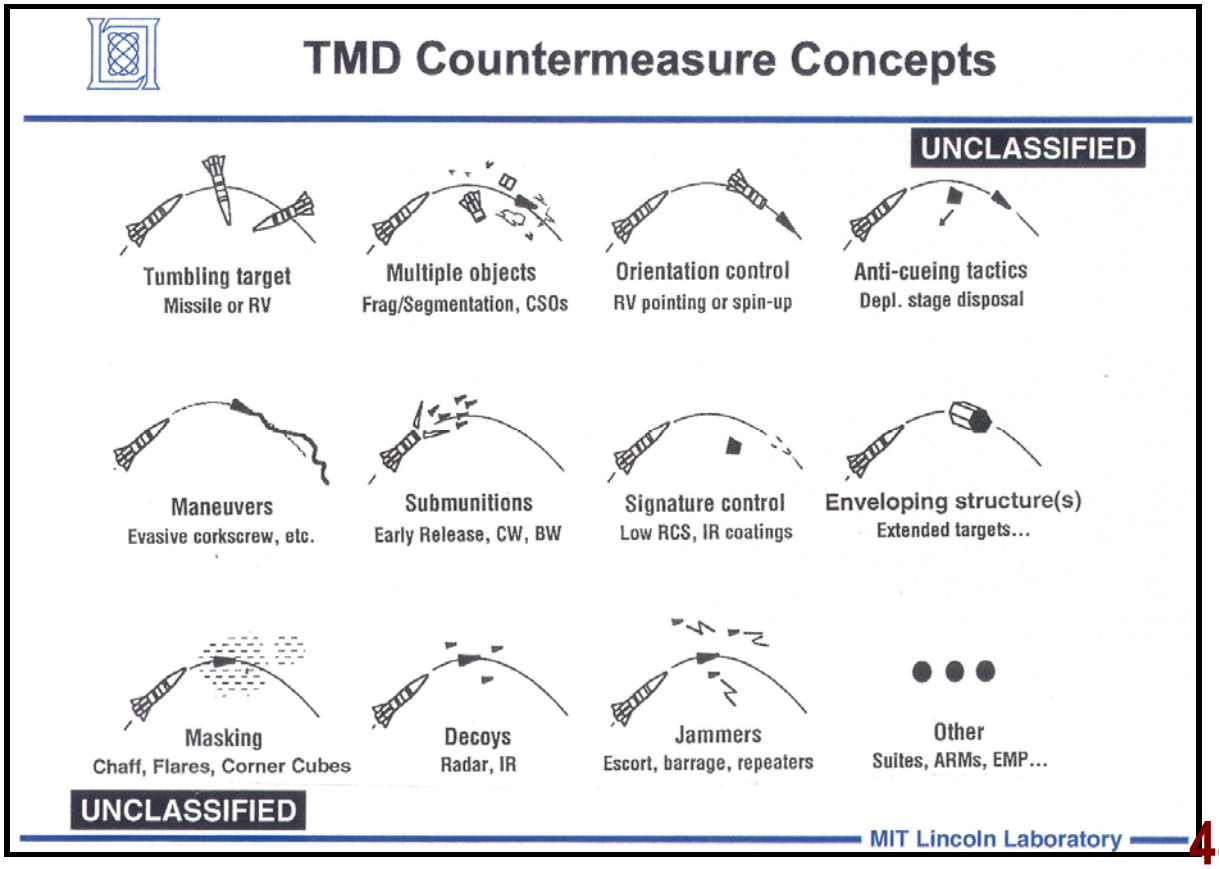
Mini DTS Course

10 December 1999

46



Briefing on Theater Missile Defense Technology Provided to Military Officers Visiting the MIT Security Studies Program in 1999 for Command School Training

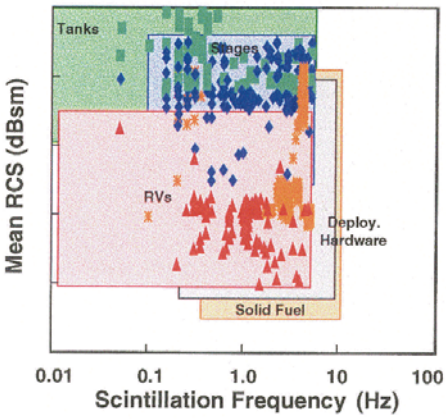


Radar Discrimination Capabilities

UNCLASSIFIED

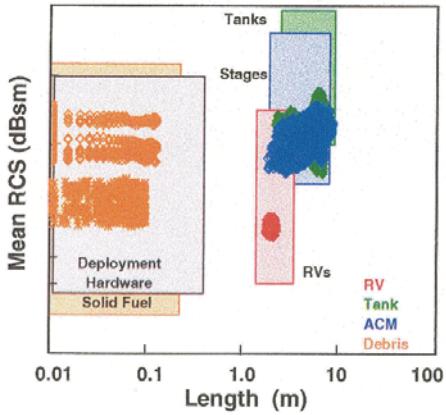
Narrowband

Mean Unresolved RCS vs Scintillation Frequency



Wideband

Mean Unresolved RCS vs Length



UNCLASSIFIED

EDE-GR32-114
12/9/99

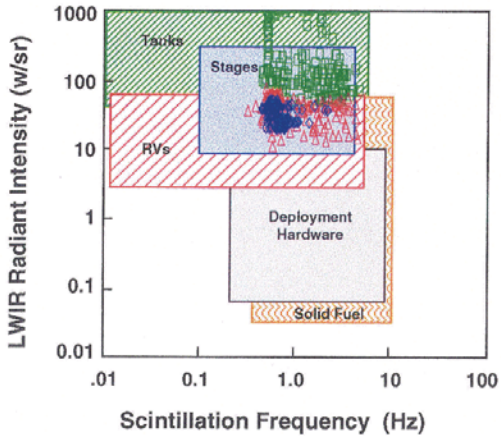
Briefing on Theater Missile Defense Technology Provided to Military Officers Visiting the MIT Security Studies Program in 1999 for Command School Training

IR Seeker Discrimination Capabilities

UNCLASSIFIED

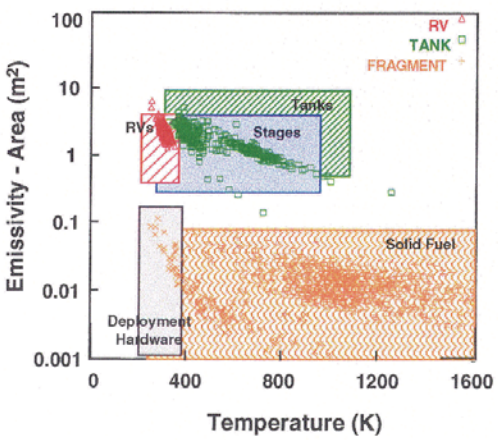
One - Color IR Seeker

Metrics: Mean IR Signature Scintillation Rate



Two - Color IR Seeker

Metrics: Emissivity - Area Temperature

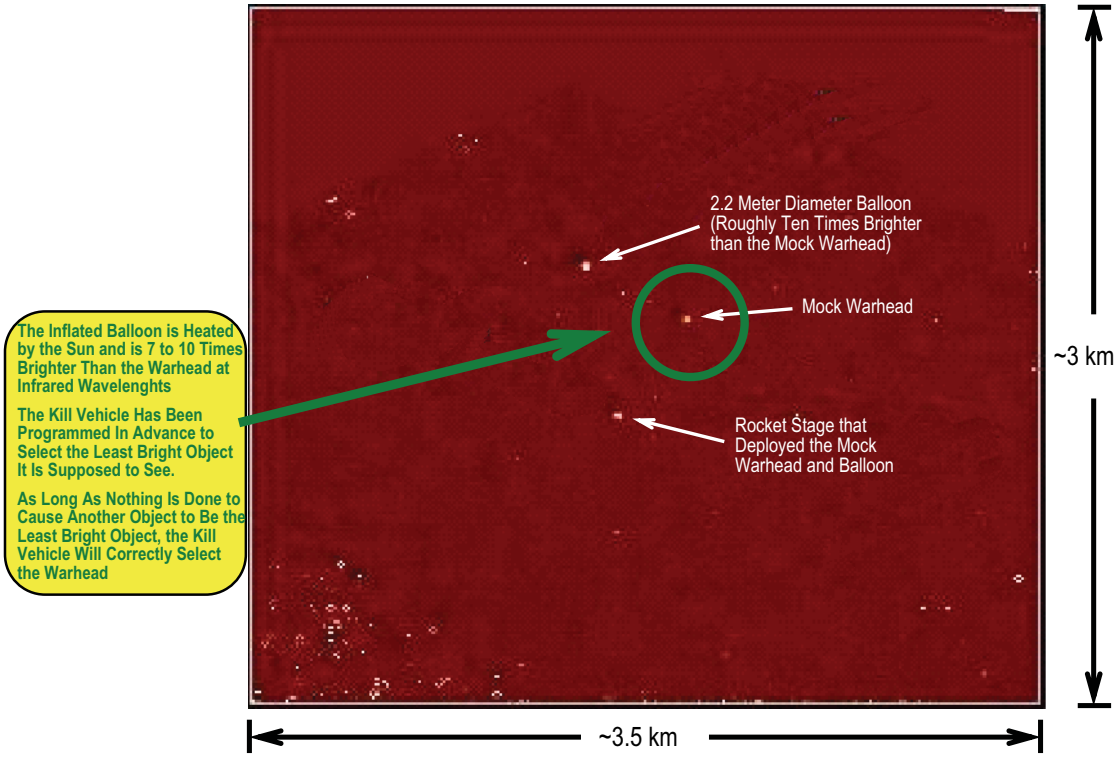


UNCLASSIFIED

EDE-GR32-115
12/9/99

IFT-6 Target Complex as Seen By Distant Approaching EKV

Range of Observed Target Complex ~ 230 – 250 km for FOV 1 – 1.5º



The Inflated Balloon is Heated by the Sun and is 7 to 10 Times Brighter Than the Warhead at Infrared Wavelenghts

The Kill Vehicle Has Been Programmed In Advance to Select the Least Bright Object It Is Supposed to See.

As Long As Nothing Is Done to Cause Another Object to Be the Least Bright Object, the Kill Vehicle Will Correctly Select the Warhead

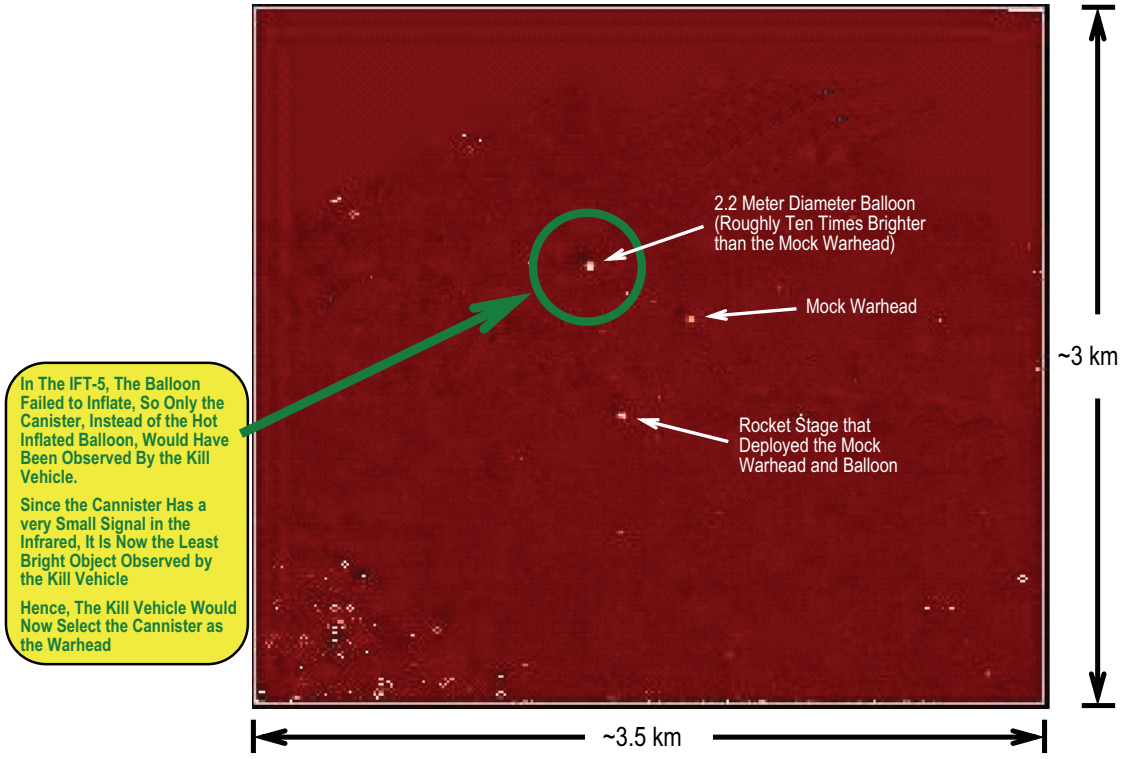
Statement Indicating that Top Management of the Ballistic Missile Defense Organization Knew About the Discrimination Problems Identified in the IFT-1A Experiment

"So the decoy is not going to look exactly like what we expected. It presents a problem for the system that we didn't expect,"

Statement of
Lieutenant General Ronald Kadish,
Director of the Ballistic Missile Defense Organization,
while being filmed by 60 Minutes II after learning that
the 2.2 meter balloon misdeployed (did not inflate properly)
during the IFT-5 experiment

IFT-6 Target Complex as Seen By Distant Approaching EKV

Range of Observed Target Complex ~ 230 – 250 km for FOV 1 – 1.5º

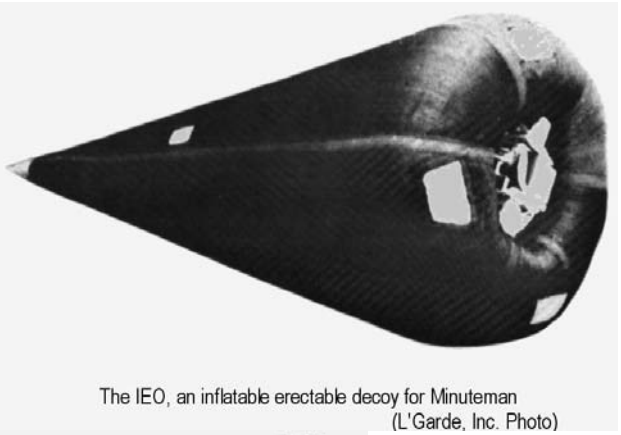


The Kill Vehicle Must Determine If a Ballon Contains a Warhead or If the Balloon Is Empty!

Balloons that Have Been Flown in Space

These Could Be Used as Decoys
or to Surround Warheads Disguising Them as Balloons

The Kill Vehicle Must Determine Which of These Are Warheads and Which are Decoys from 500 Kilometers Range!



The IEO, an inflatable erectable decoy for Minuteman
(L'Garde, Inc. Photo)

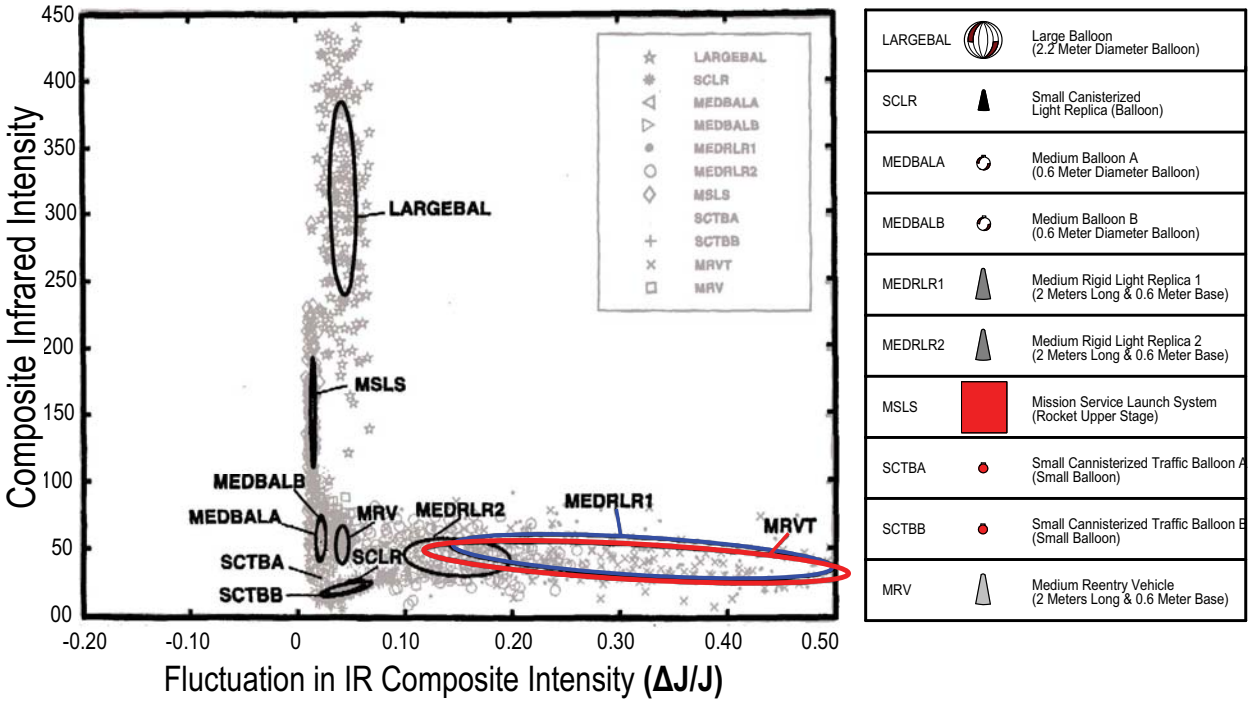
Mk 12A Minuteman III Reentry Vehicle

Objects Flown in the IFT-1A and IFT-2 NMD Tests

LARGEBAL		Large Balloon (2.2 Meter Diameter Balloon)
SCLR		Small Canisterized Light Replica (Balloon)
MEDBALA		Medium Balloon A (0.6 Meter Diameter Balloon)
MEDBALB		Medium Balloon B (0.6 Meter Diameter Balloon)
MEDRLR1		Medium Rigid Light Replica 1 (2 Meters Long & 0.6 Meter Base)
MEDRLR2		Medium Rigid Light Replica 2 (2 Meters Long & 0.6 Meter Base)

MSLS		Mission Service Launch System (Rocket Upper Stage)
SCTBA		Small Cannisterized Traffic Balloon A (Small Balloon)
SCTBB		Small Cannisterized Traffic Balloon B (Small Balloon)
MRV		Medium Reentry Vehicle (2 Meters Long & 0.6 Meter Base)

Expected Brightness and Fluctuation in the Brightness of the Objects in the IFT-1A and IFT-2 NMD Tests



$$J_{Composite} = a_1 \int_{\lambda_1}^{\lambda_2} J(\lambda)\, d\lambda + a_2 \int_{\lambda_3}^{\lambda_4} J(\lambda)\, d\lambda$$

57

False Claim that Ground-Based Missile Defense Interceptors Based in Poland Would Be Able to Defend Japan from ICBMs Launched from Iran

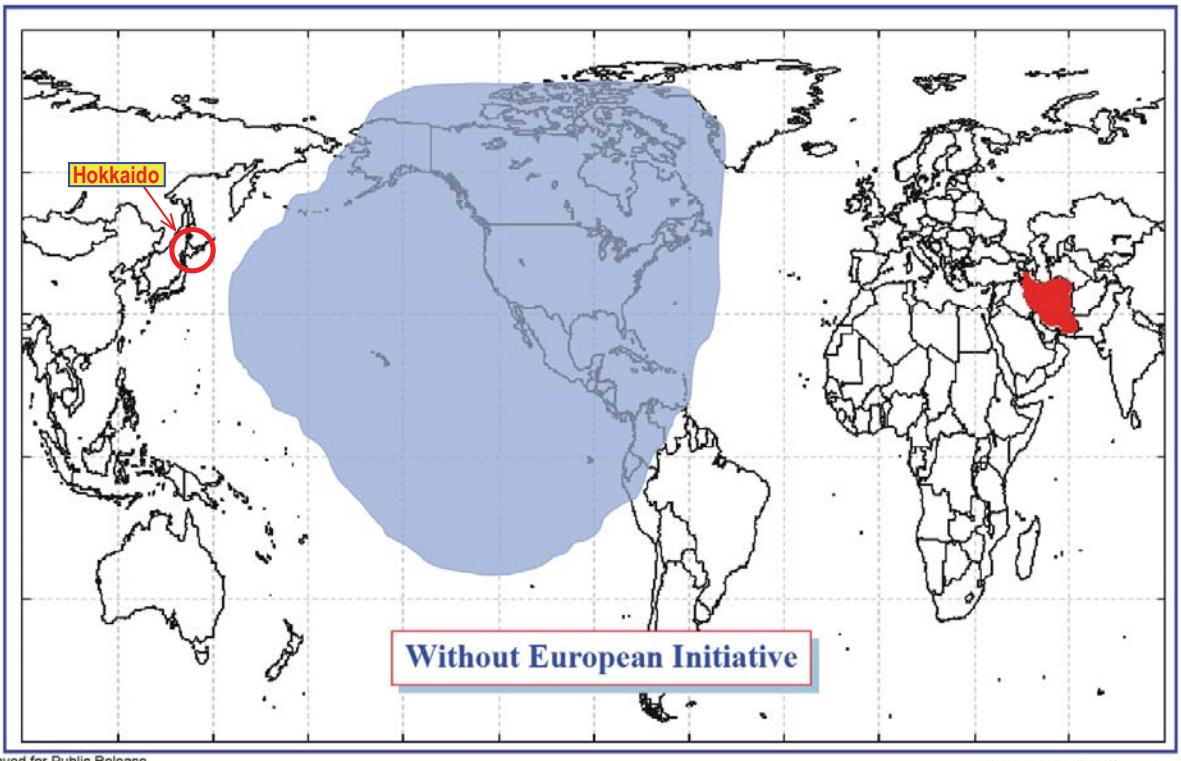
58

Which of These Two MDA Contradictory Claims Are True?

The Missile Defense Agency Needs to Tell Us Which of Their Contradictory Statements Are True

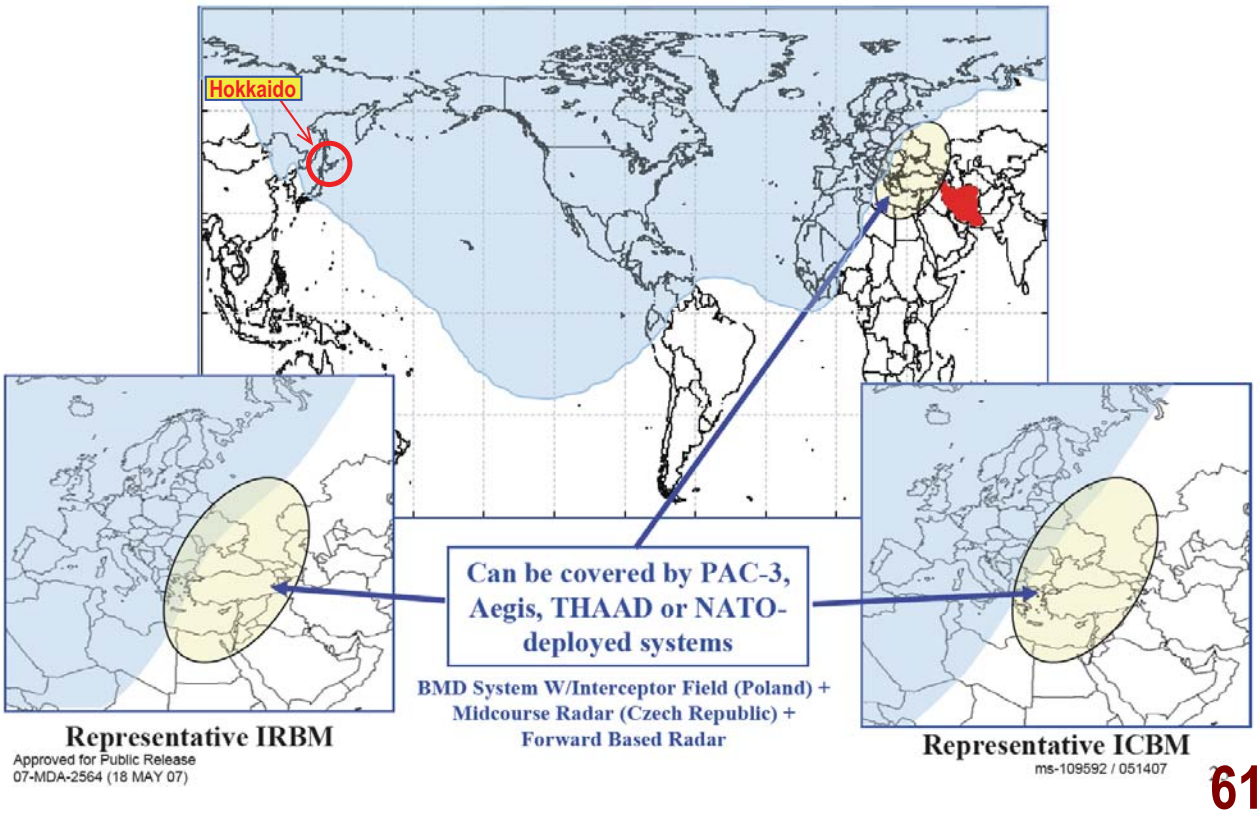
- If the Poland-Based Ground-Based Interceptors (GBI) are fast enough to defend Japan from Iranian long range ICBMs, then the GBIs are more than fast enough to intercept Russian ICBMs.
- Alternatively, if the Poland-Based Ground-Based Interceptors are not fast enough to intercept Russian ICBMs, than they are certainly not fast enough to defend Japan from Iranian long range ICBMs.

Ballistic Missile Coverage Against Long-Range Iranian Missiles



ms-109592 / 051407

Capability Provided Versus Iranian Intermediate To Long-Range Ballistic Missiles



61

Missile Defense Agency Slides Showing Additional Defense-Coverage of Hokkaido, Japan with Interceptors from the Polish Launch Site

Relevant Observations:

- Radar in Czech Republic Not Used
- Intercept Achieved with FBX or Adjunct Radar Tracking from Eastern Turkey
- Interceptor Speed 40% Faster Than 6.3 km/sec Speed Claimed by US administration
- HOWEVER, MDA CONTINUES TO REVISE AND CHANGE ITS STATEMENTS ABOUT THE CHARACTERISTICS OF THE POLISH-BASED INTERCEPTORS

62

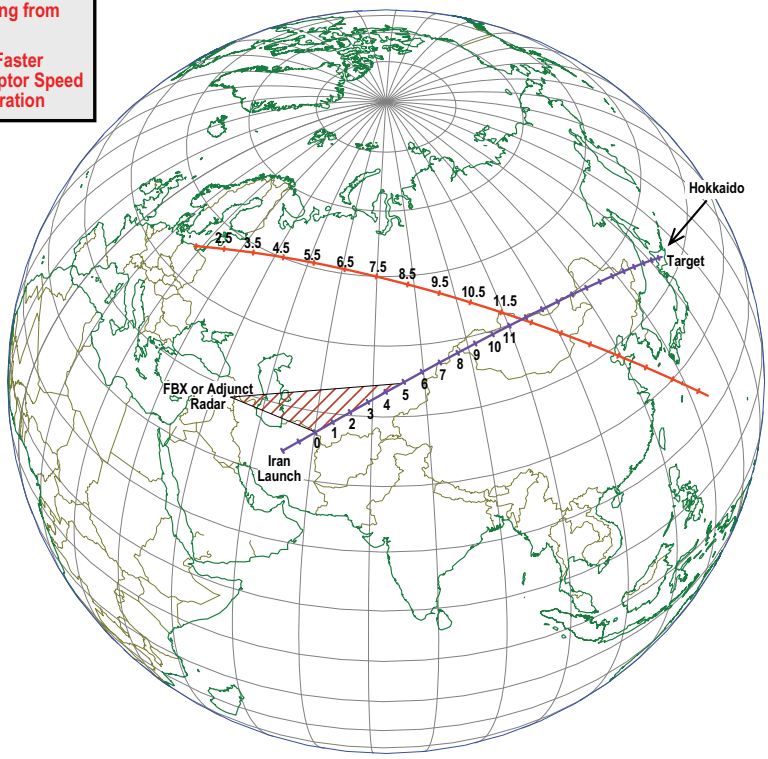
Missile Defense Agency Statement About the Poland-Based Interceptor Characteristics Revised to Explain Original Claim of 6.3 km/sec Burnout Speed

Relevant Observations:

- Predicted Interceptor Burnout Speed Drops from 9.4 km/sec to 7.5 km/sec
- Interceptor Can No Longer Achieve Defense-Coverage of Japan, As Claimed by Missile Defense Agency
- Interceptor Speed Still 20% Higher Than 6.3 km/sec Speed Originally Claimed by US administration
- Interceptor Still fast Enough to Achieve Intercepts Against Russian ICBMs, Although Only for Trajectories Towards the East Coast of the US
- Hence, Defense Coverage Claimed by Missile Defense Agency Must Be Wrong!

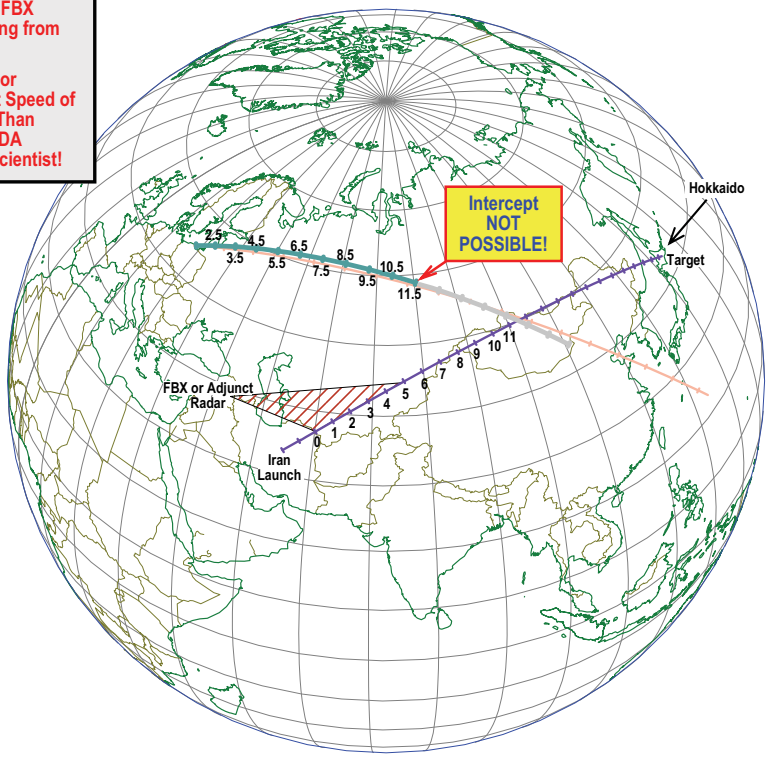
Notional Intercept Trajectory for 9.4 km/sec Interceptor Launched from Poland

- Radar in Czech Republic Not Used
- Intercept Achieved with FBX or Adjunct Radar Tracking from Eastern Turkey
- Interceptor Speed 40% Faster Than 6.3 km/sec Interceptor Speed Claimed by US administration

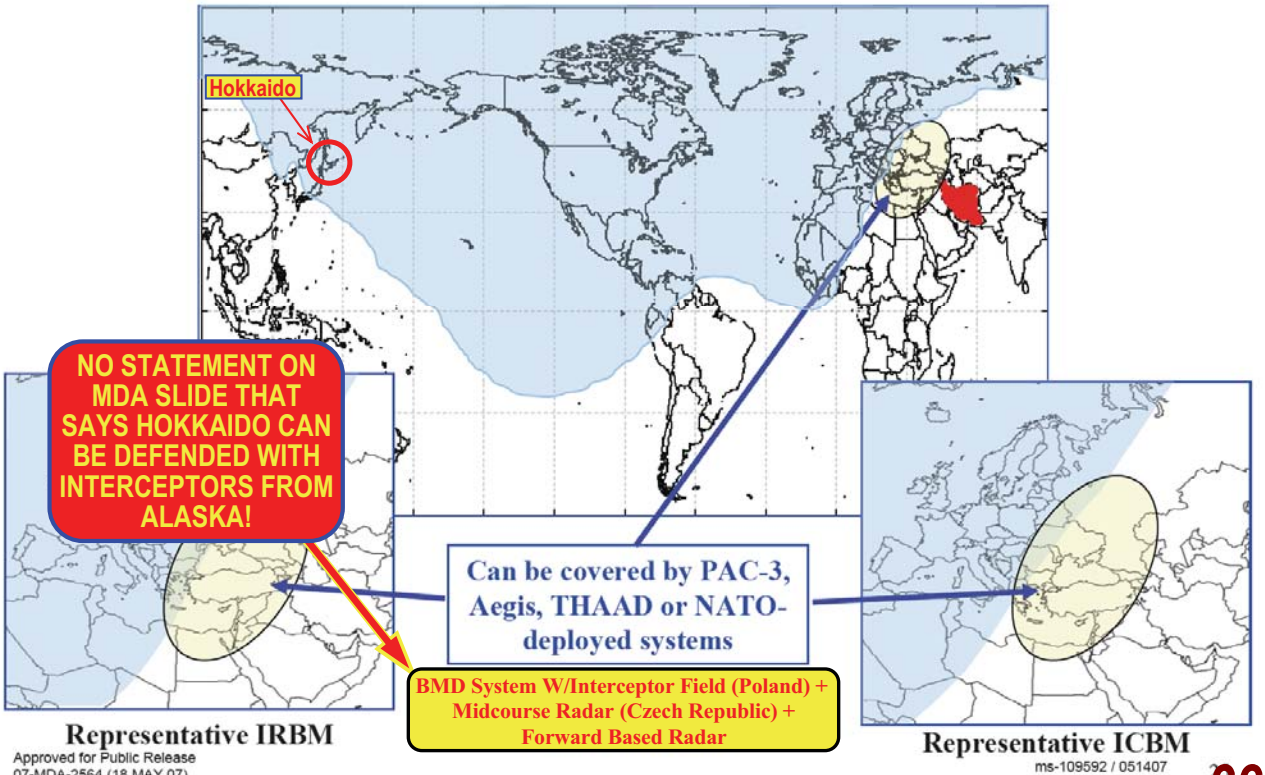


Revised Interceptor Characteristics Indicates
Defense-Coverage Claimed by Missile Defense Agency Must Be Wrong!

- Radar in Czech Republic Not Used
- Intercept Achieved with FBX or Adjunct Radar Tracking from Eastern Turkey
- REVISED MDA Interceptor Parametrs Give Burnout Speed of 7.5 km/sec, 15% Faster Than Originally Claimed by MDA Spokesman and Chief Scientist!



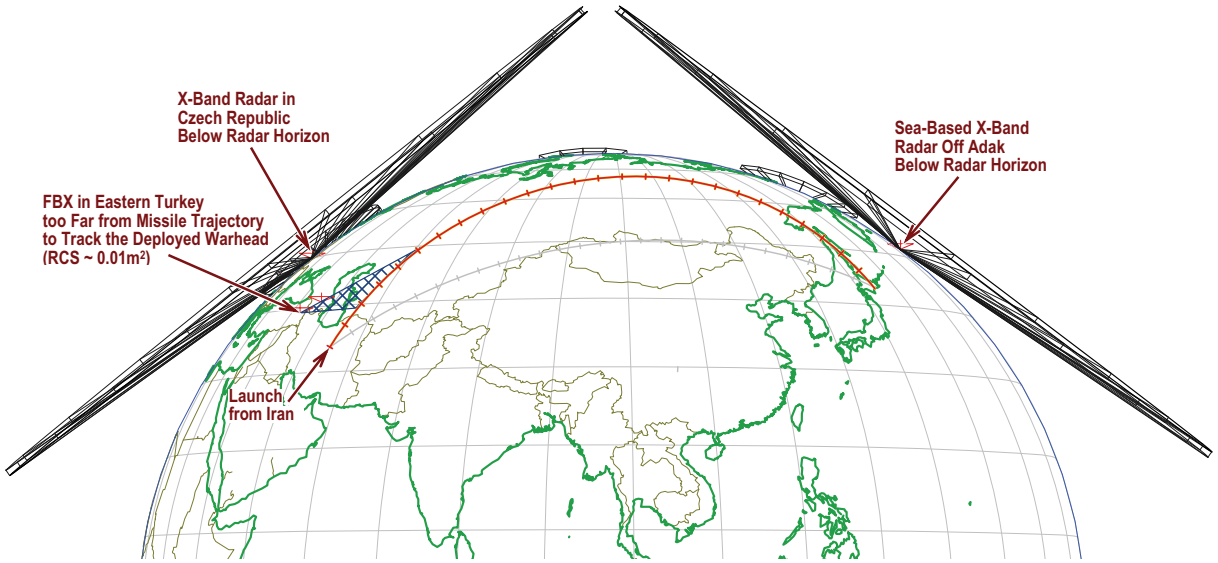
Capability Provided Versus Iranian Intermediate To Long-Range Ballistic Missiles



Approved for Public Release
07-MDA-2564 (18 MAY 07)

False Claims Made in Presentations to European (and Japanese?) Allies by Missile Defense Agency that US Proposed European Missile Defense Can Defend Northern Japan

NO PLAUSIBLE WAY FOR DEFENSE SYSTEM TO OBTAIN PRECISION TRACKING DATA NEEDED TO GUIDE INTERCEPTORS FROM ALASKA!



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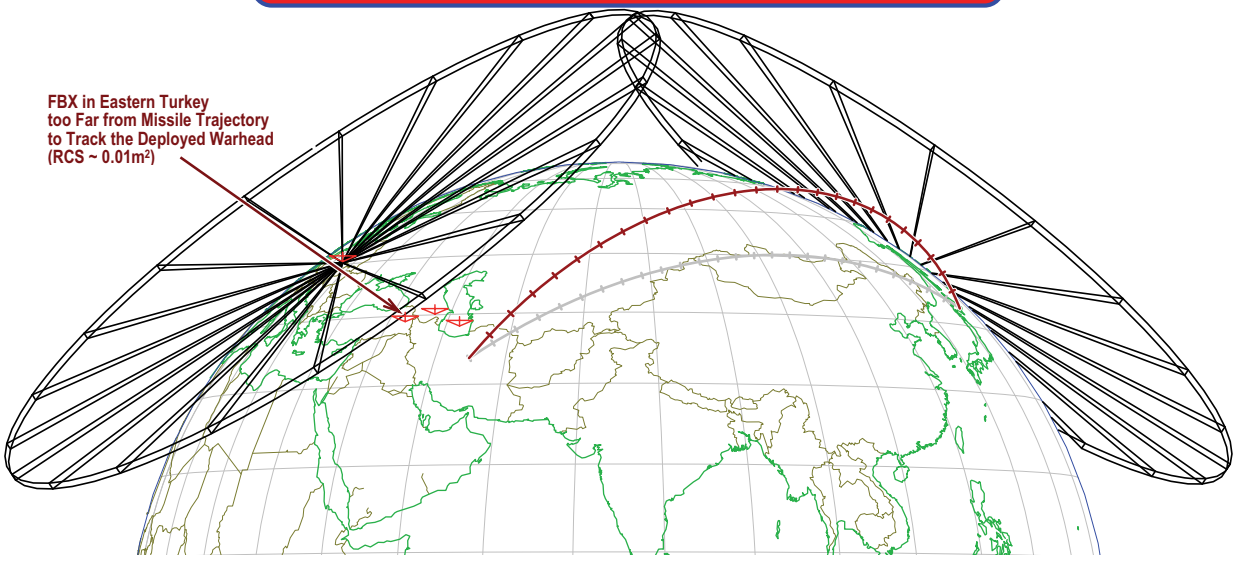

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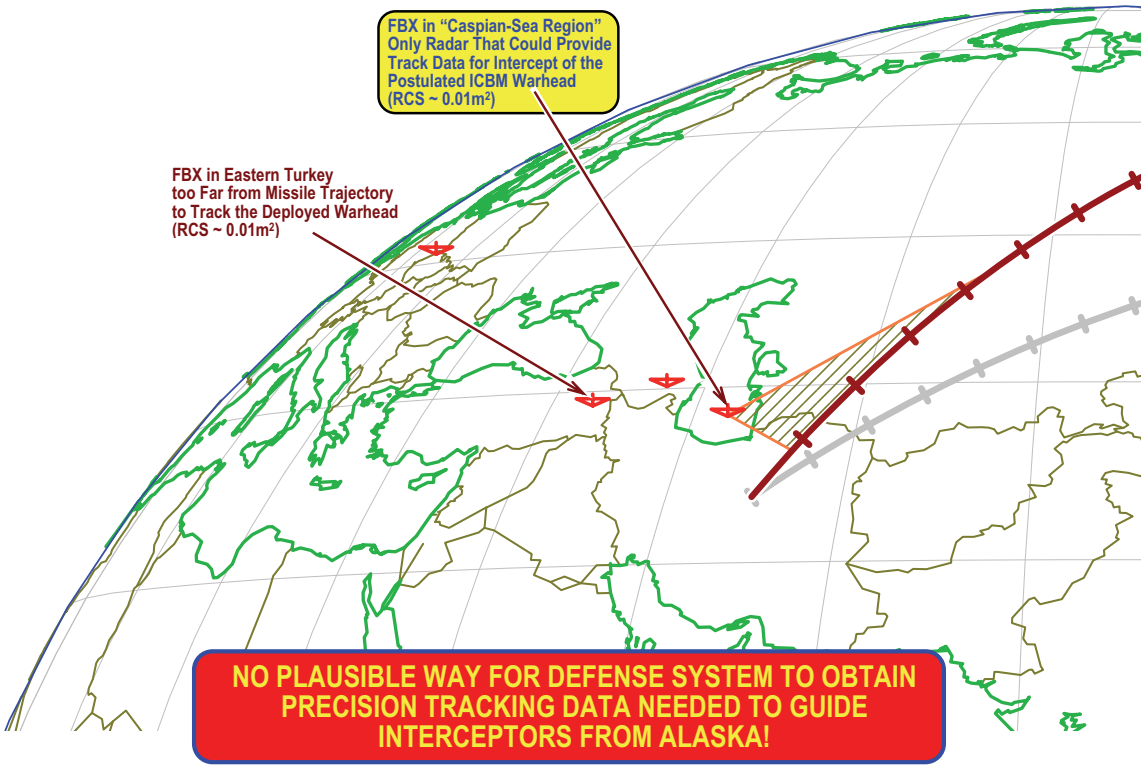


69

False Claims to European Allies that Ground-Based Missile Defense Interceptors in Poland are Not Fast Enough to Engage Russian ICBMs

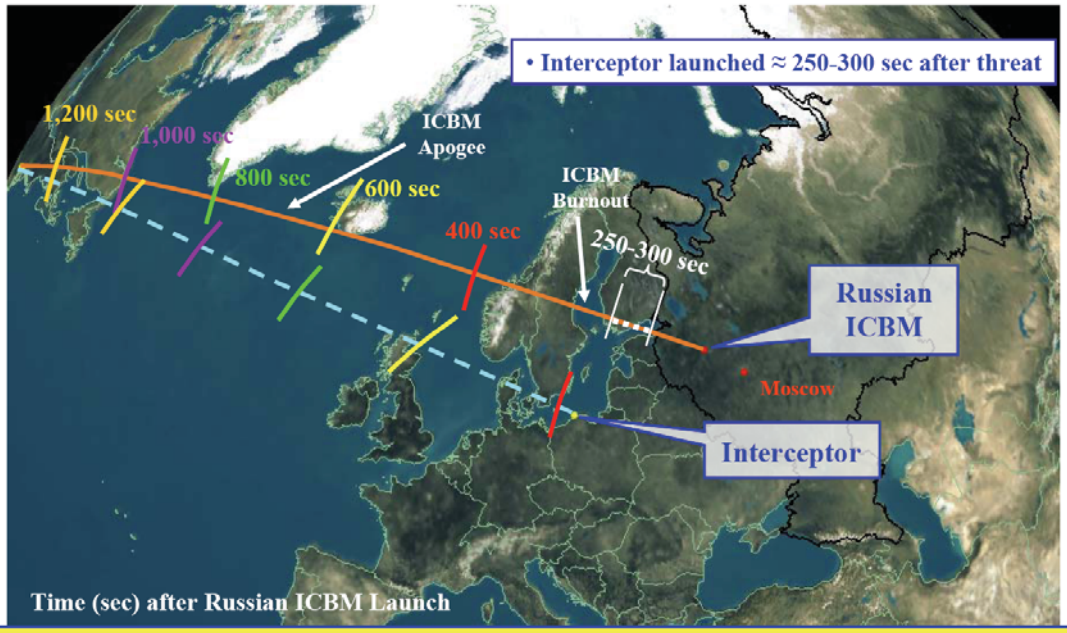
70

Which of These Two MDA Contradictory Claims Are True?

The Missile Defense Agency Needs to Tell Us Which of Their Contradictory Statements Are True

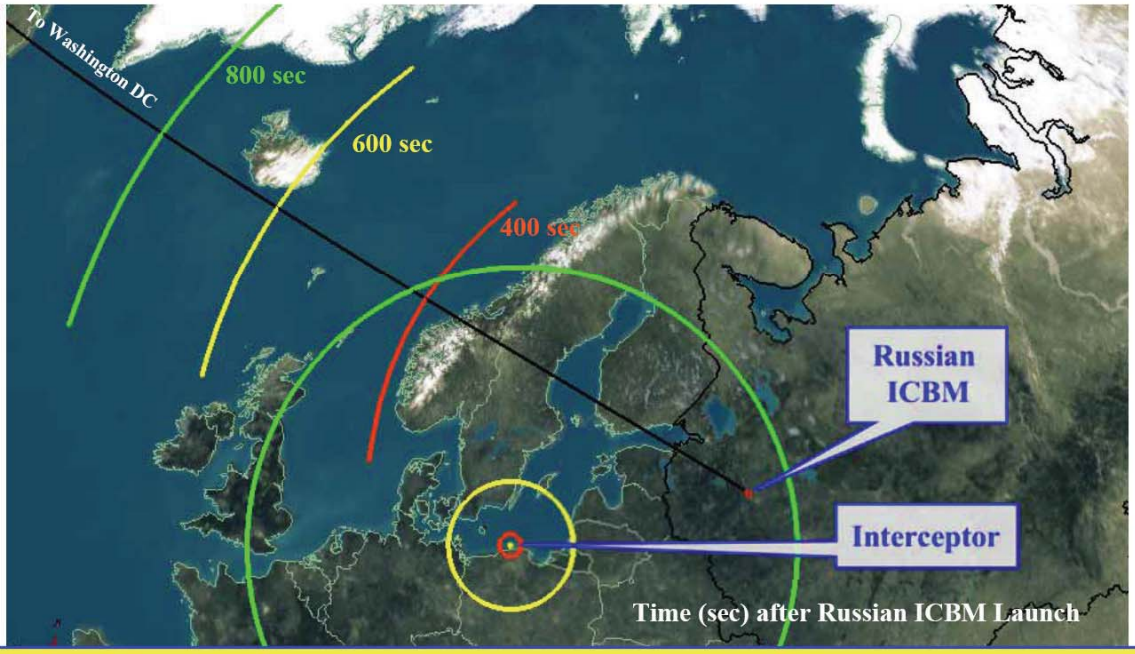
- If the Poland-Based Ground-Based Interceptors (GBI) are fast enough to defend Japan from Iranian long range ICBMs, then the GBIs are more than fast enough to intercept Russian ICBMs.
- Alternatively, if the Poland-Based Ground-Based Interceptors are not fast enough to intercept Russian ICBMs, than they are certainly not fast enough to defend Japan from Iranian long range ICBMs.

Interceptors Cannot Catch Russian Missiles



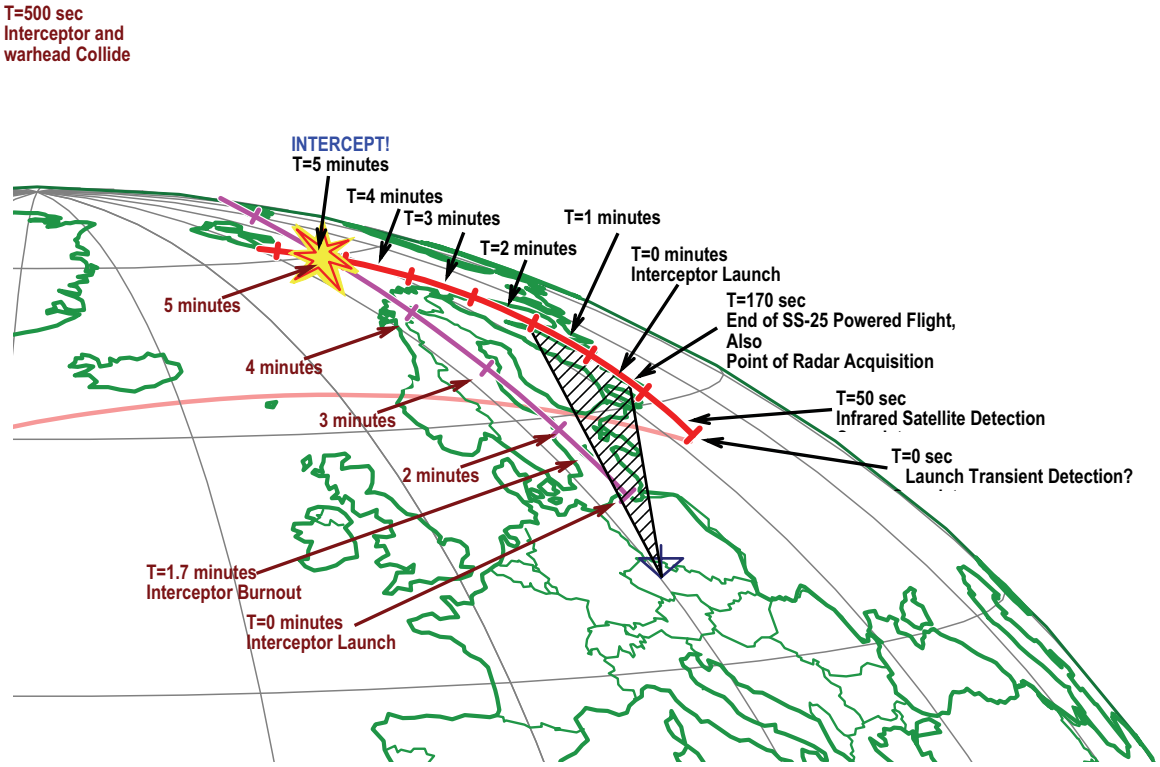
U.S. European Interceptor Site Cannot Affect Russian Strategic Capability

Interceptors Cannot Catch Russian Missiles

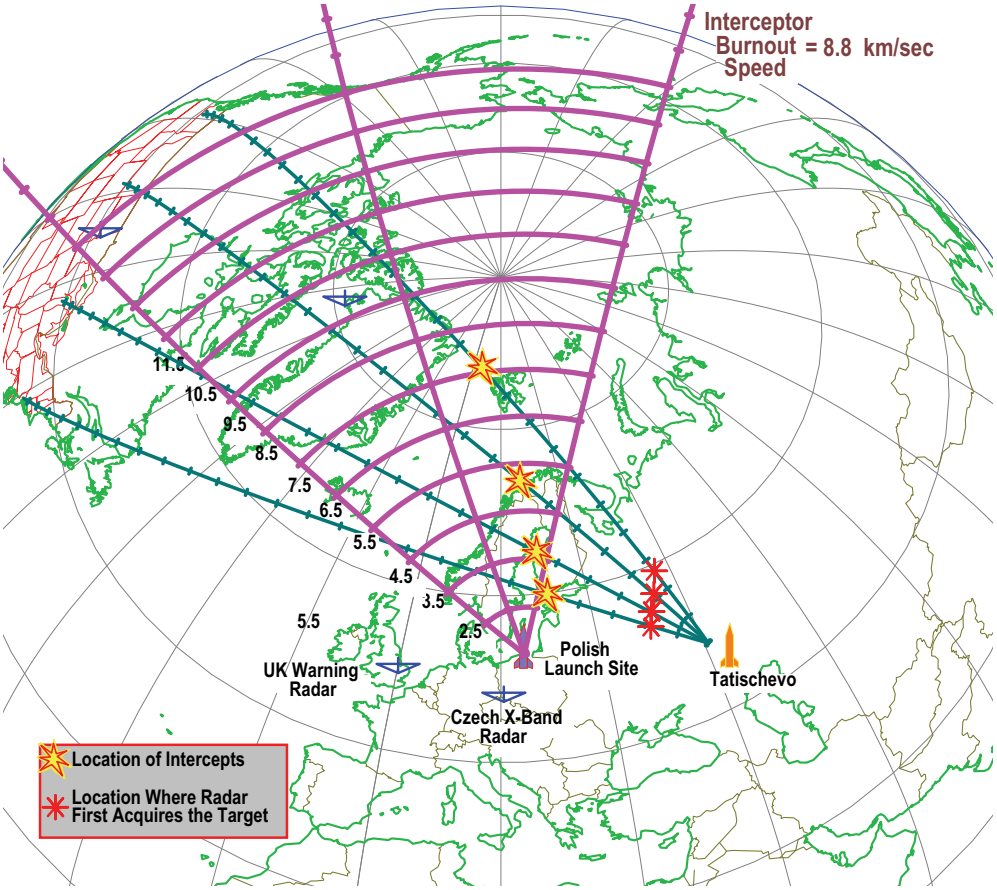


U.S. European Interceptor Site Cannot Affect Russian Strategic Capability

Engagement Event Timeline for Engagement of SS-25 from Vypolzovo with 2-Stage Missile Defense Interceptor



Ability of Polish-Based Interceptors to Engage Russian ICBMs from Tatischevo

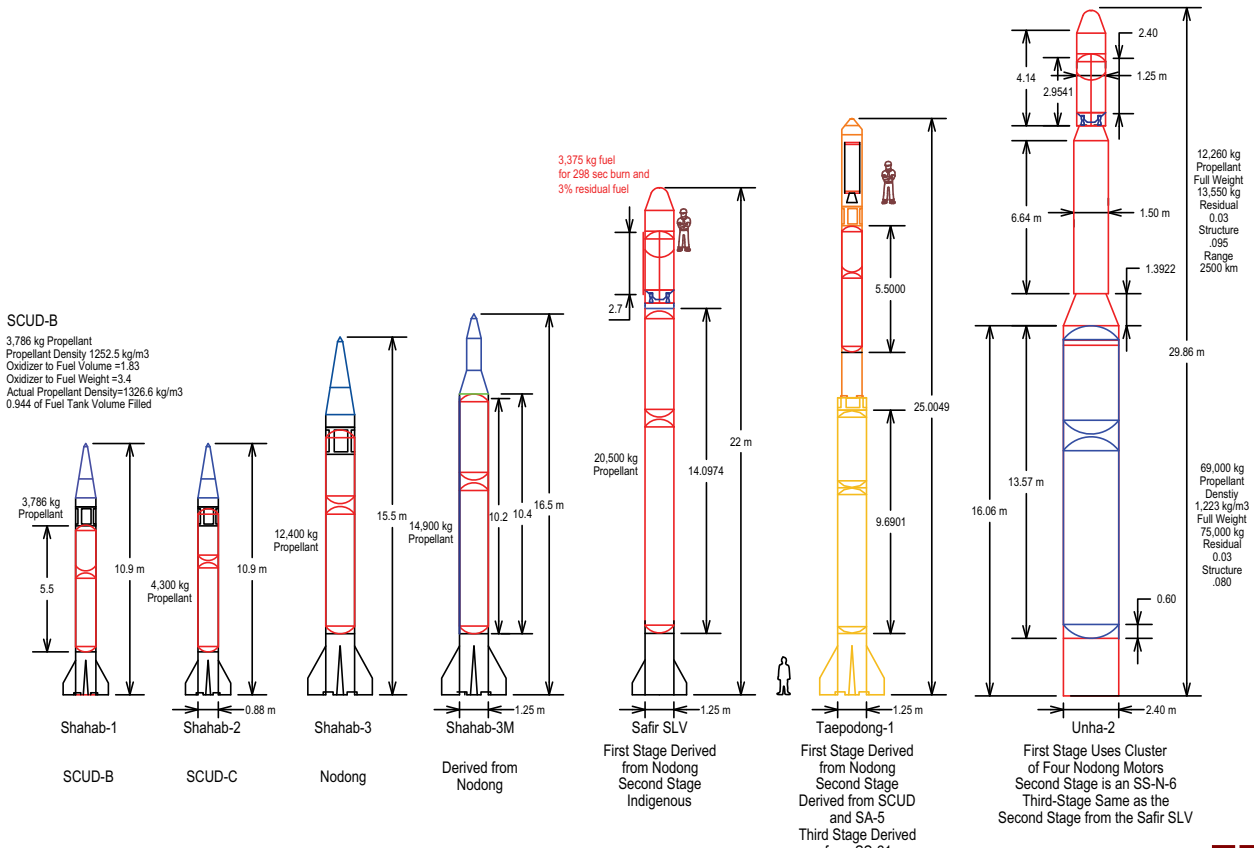


75

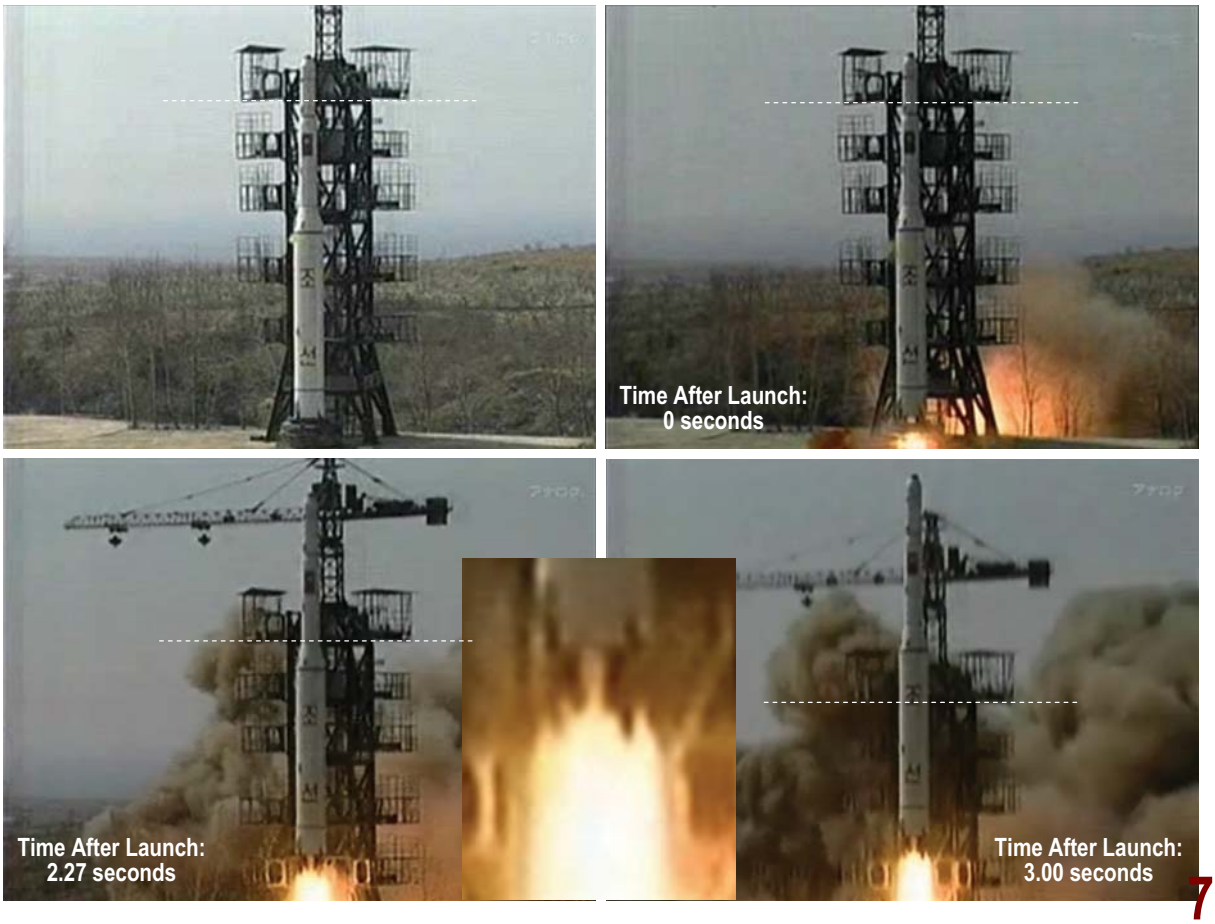
The North Korean Unha-2 Space-Launch Vehicle

76

The Evolution of Iranian and North Korean Rocket Vehicles



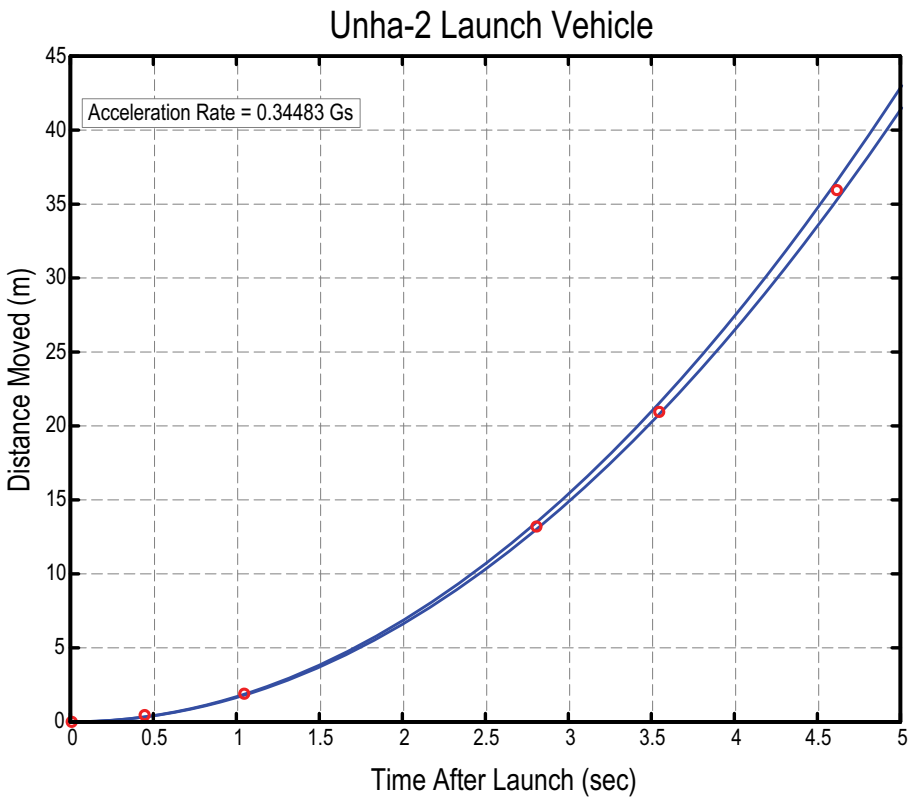
Video Frames Showing the Initial Acceleration at Launch of the Unha-2



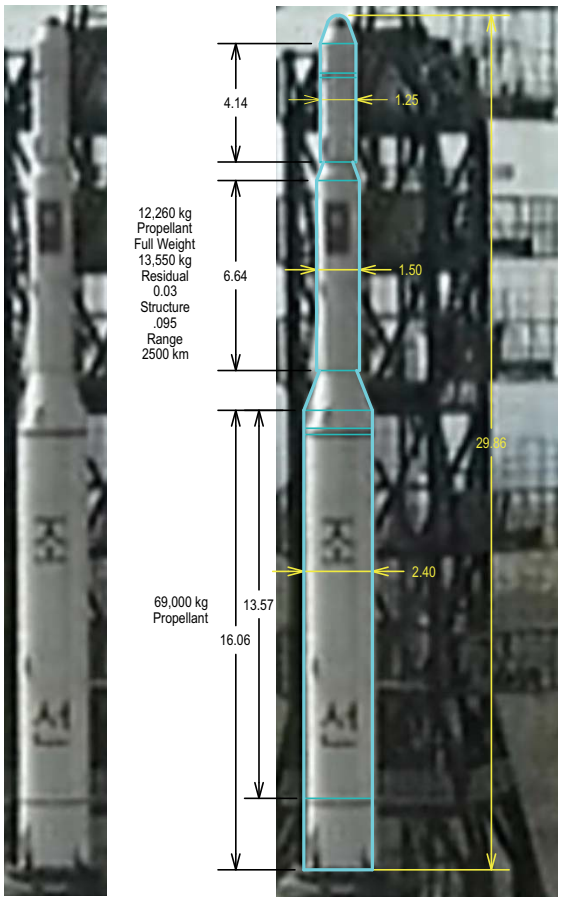
Apparent Mock Up of Cluster of Four Nodong Rocket Motors Displayed by Iran, Possibly Replicating Motor Assembly from the North Korean Unha-2 First Stage

Source: Composite of two video frames constructed from http://www.youtube.com/watch?v=nZoNdf6hlII&feature=player_embedded#

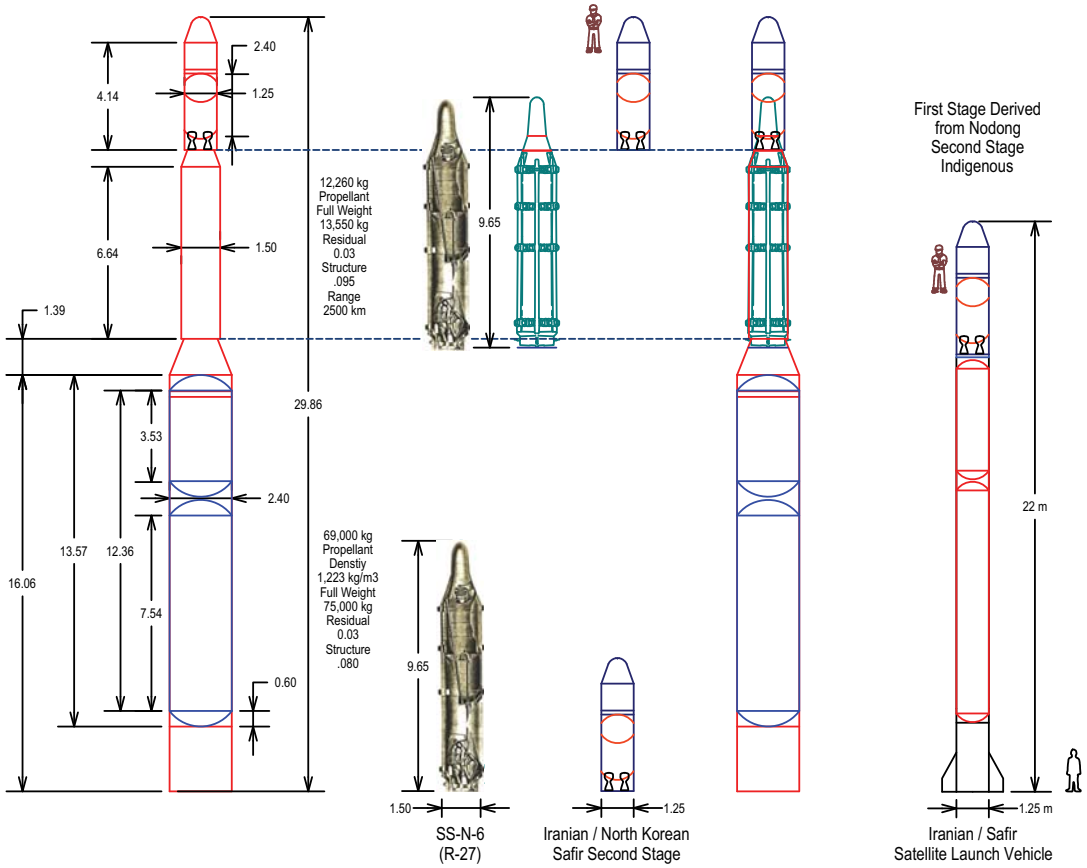
Observed Acceleration at Launch of the Unha-2



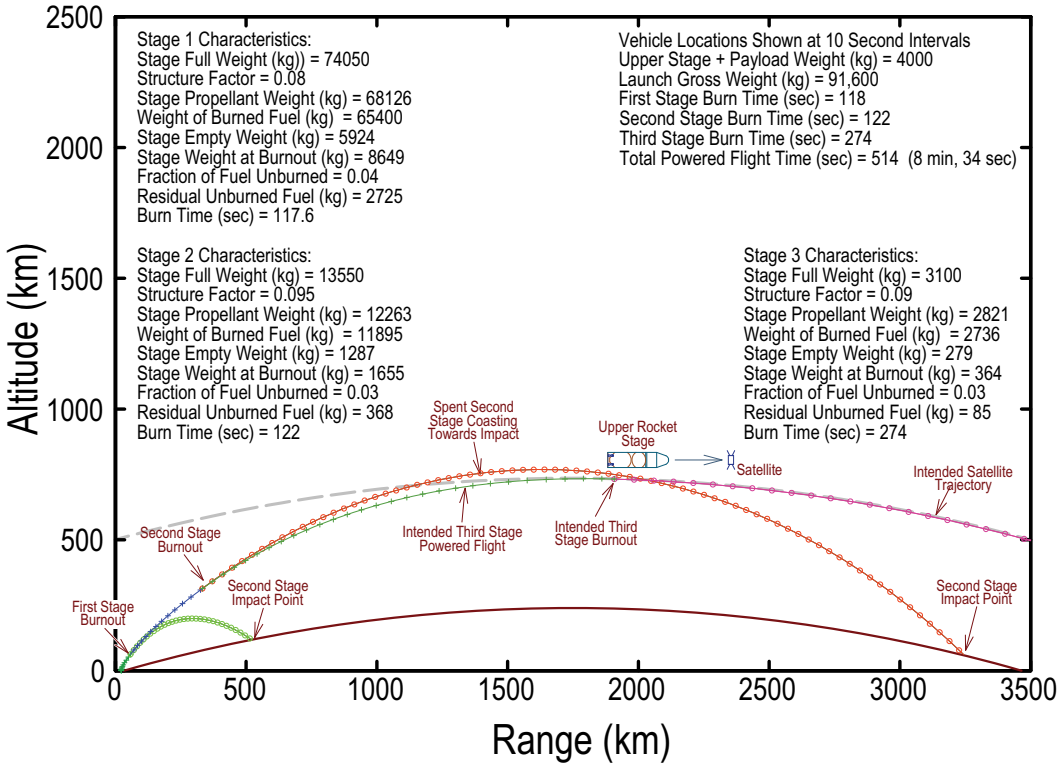
Estimated Dimensions of the Unha-2 Launch Vehicle



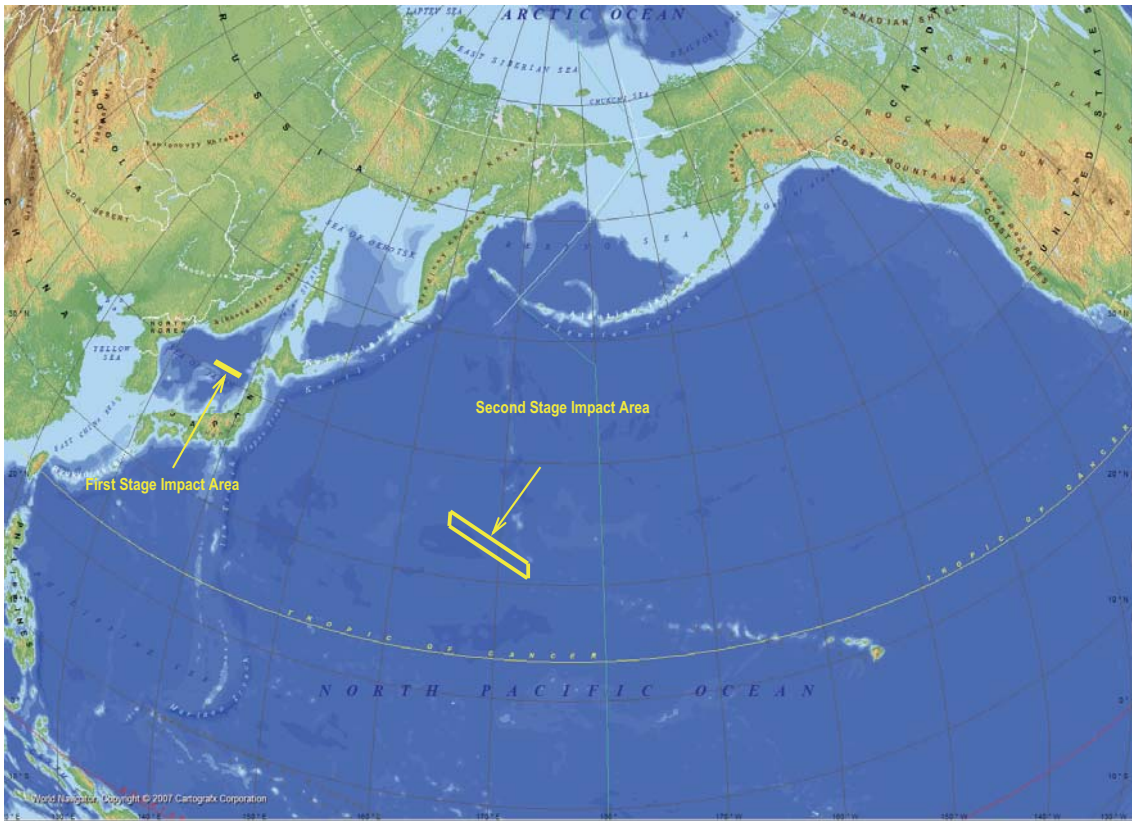
Rocket Components that *Might* Have Been Used to Construct the North Korean Unha-2



Expected and Actual Flight Outcomes Associated with the North Korean Satellite Launch Attempt of April 4/5, 2009

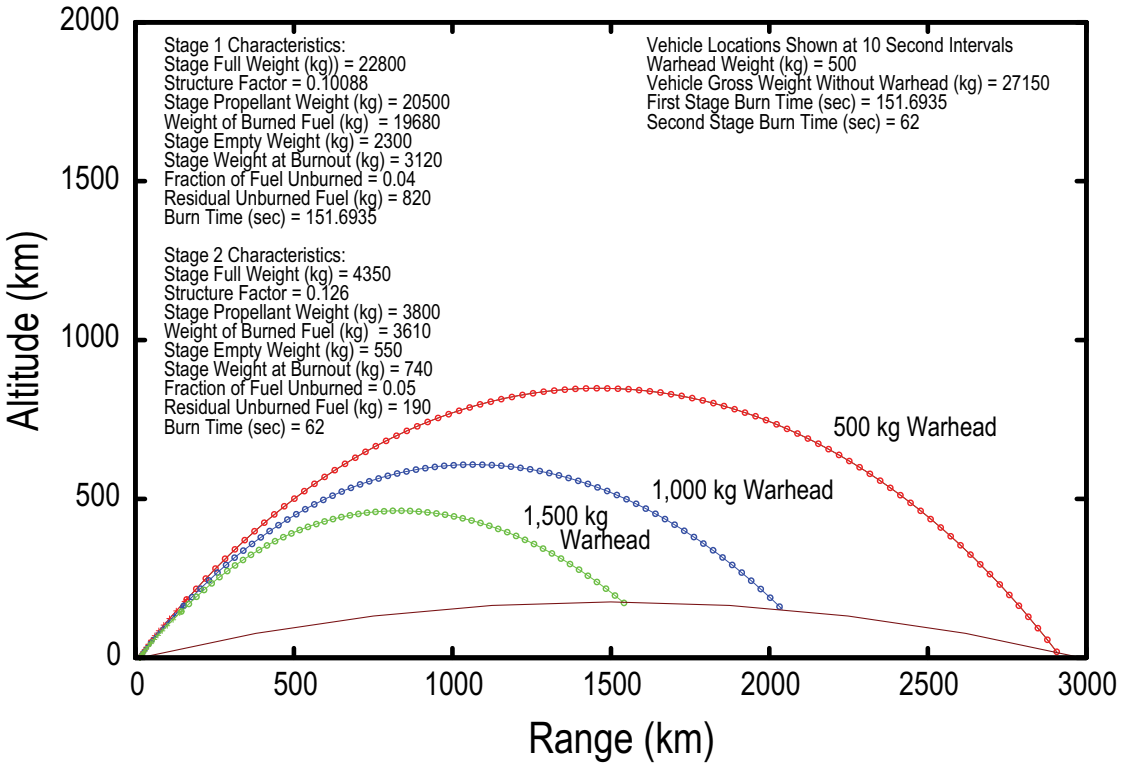


Announced Safety Keep-Out Zones for the North Korean Satellite Launch of April 4/5, 2009



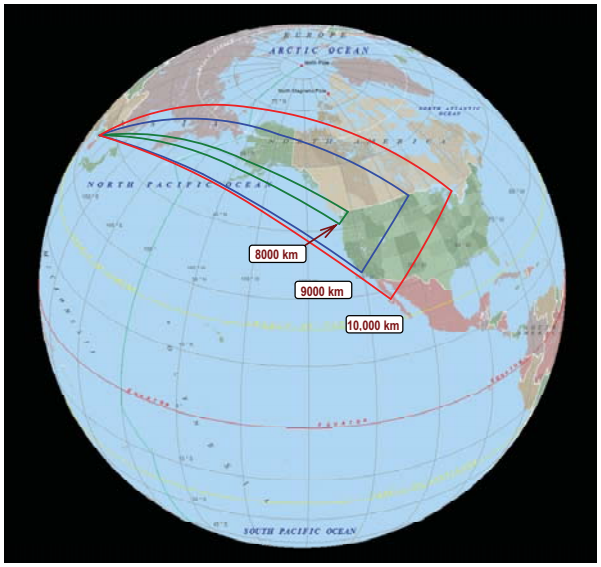
First Stage Impact Range = 500 to 700 km
Second Stage Impact Range = 3,150 to 4,000 km

Powered and Free-Flight Profile of *Notional* Safir Ballistic Missiles Carrying Different Payloads

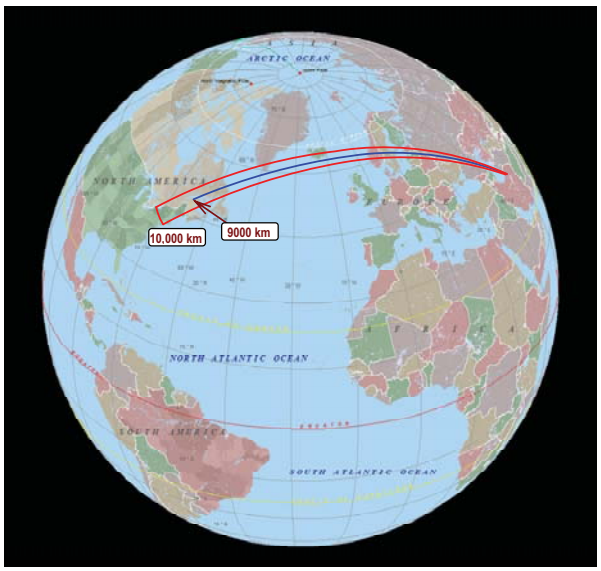


Strategic Great-Circle Distances From Iran and Korea to Parts of the United States

North Korea to the US

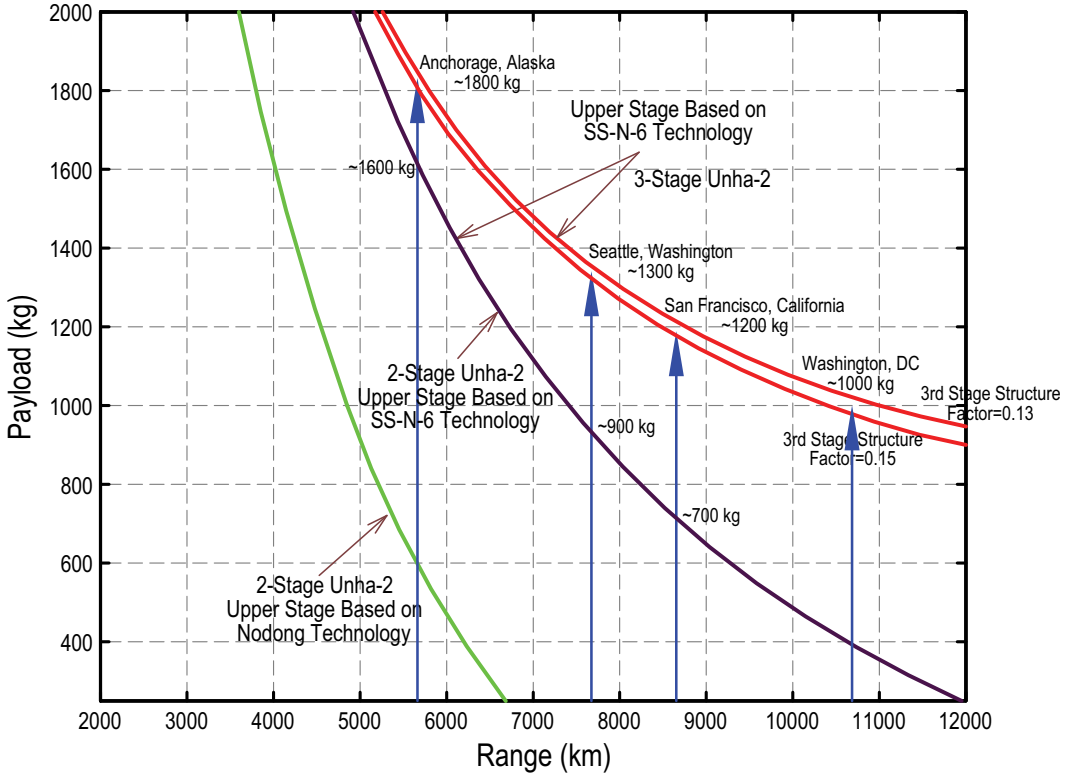


Iran to US



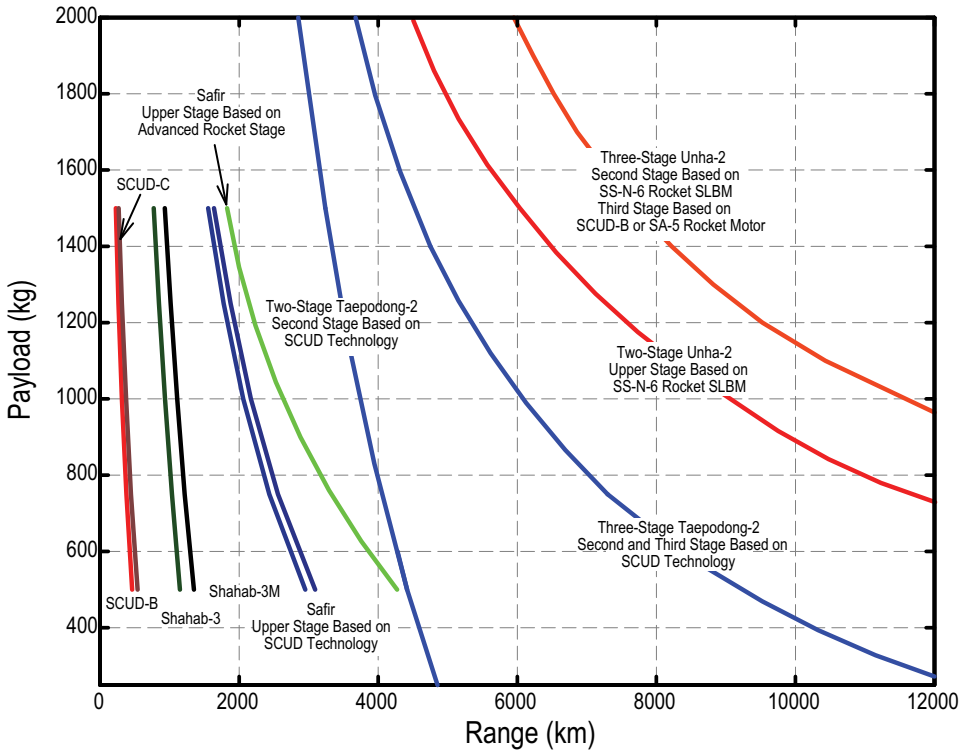
Range-Payload Capabilities of Two and Three Stage Variants of the North Korean Unha-2

Range versus Payload of Two and Three-Stage Unha-2 Variants



Range Versus Payload for Iranian and North Korean Ballistic Missiles

Range Versus Payload of Two and Three Stage Taepodong-2 Ballistic Missiles and the SCUD-B, SCUD-C, Shahab-3 and Shahab-3M, and Safir




LIVE | زنده
همزمان با سی و یکمین سالگرد پیروزی انقلاب اسلامی
رونمایی از دستاوردهای بومی فناوری فضایی کشور
IRINN
AP
blast kills civilians, 4 foreigners in NW Pakistan

89


LIVE | زنده
IRINN
AP
hi: Iran has no problem with its neighbors

90

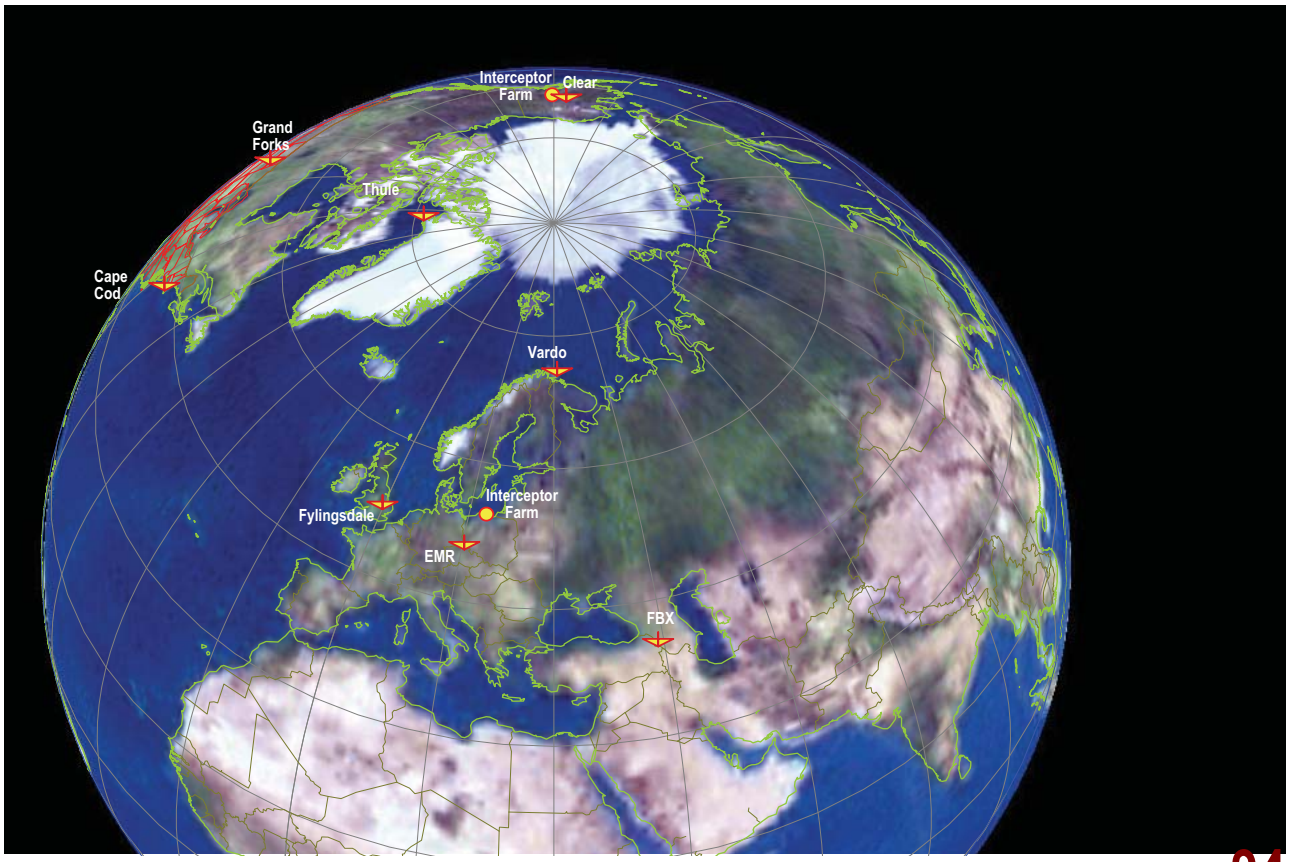
91

RIranian Simorgh Space Launch Vehicle

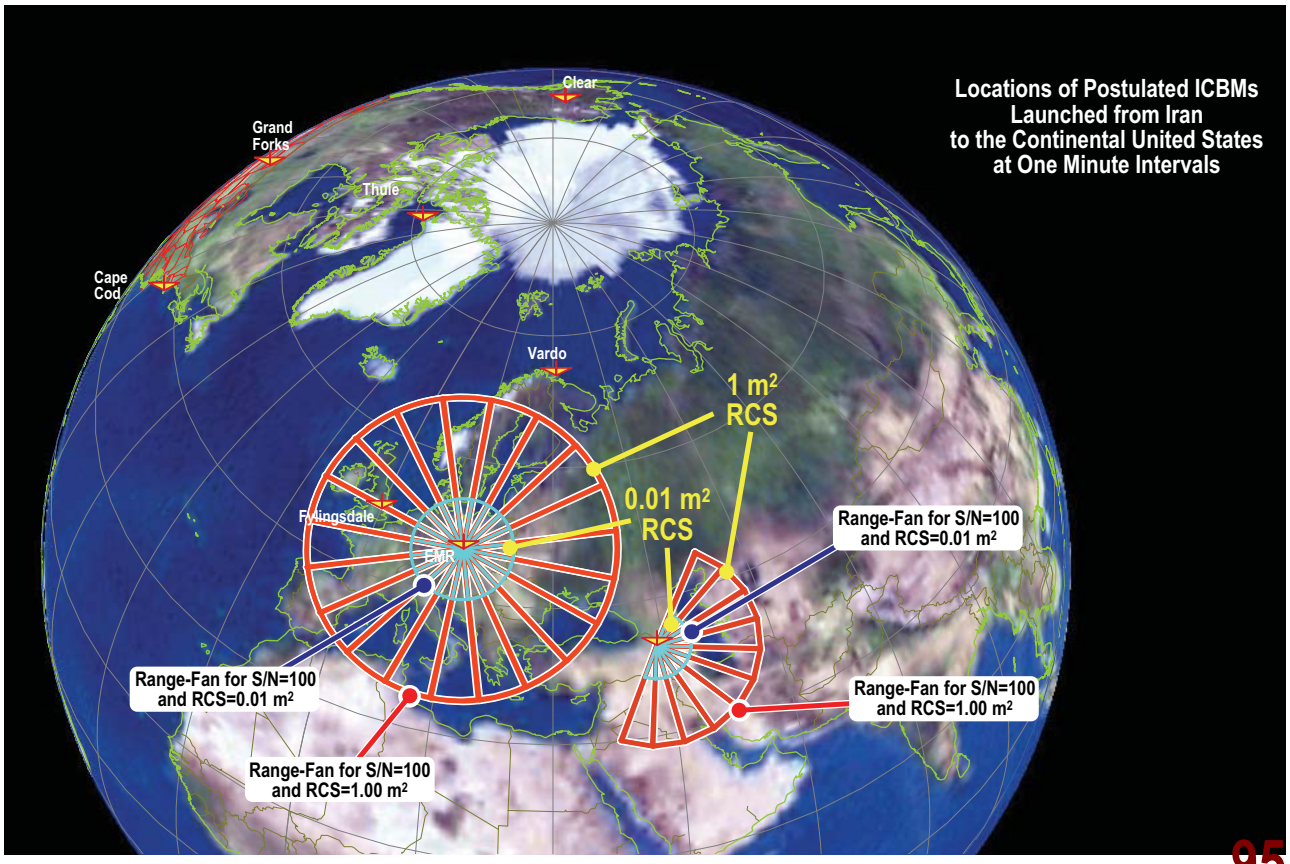
92

The MDA's False Calims About the Range and Discrimination Capabilities of the European Midcourse Radar

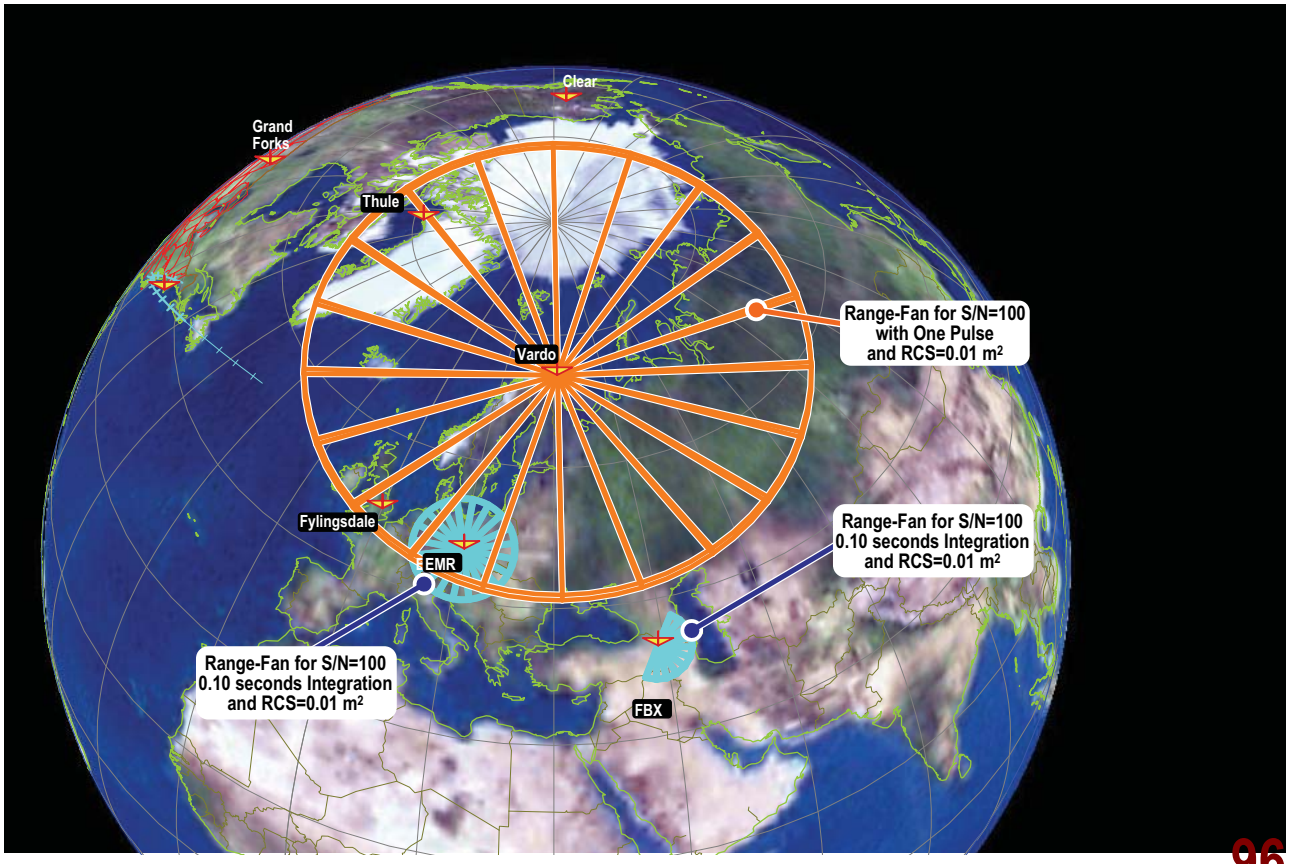
Locations of Radars Associated with European and US Missile Defenses



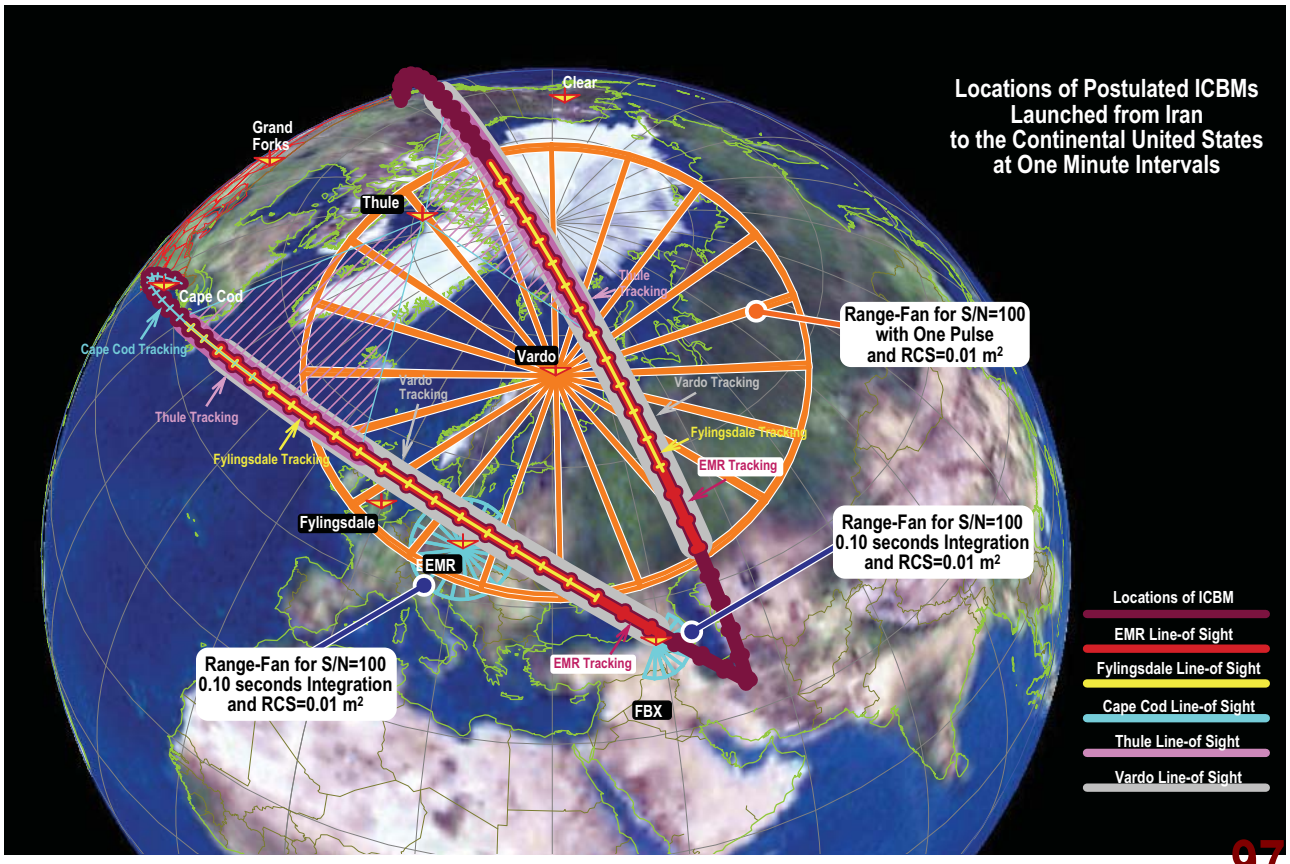
Radar-Range Fans for US Proposed EMR and FBX Missile Defense Radars



Radar-Range Fans for Vardo and US Proposed EMR and FBX Missile Defense Radars

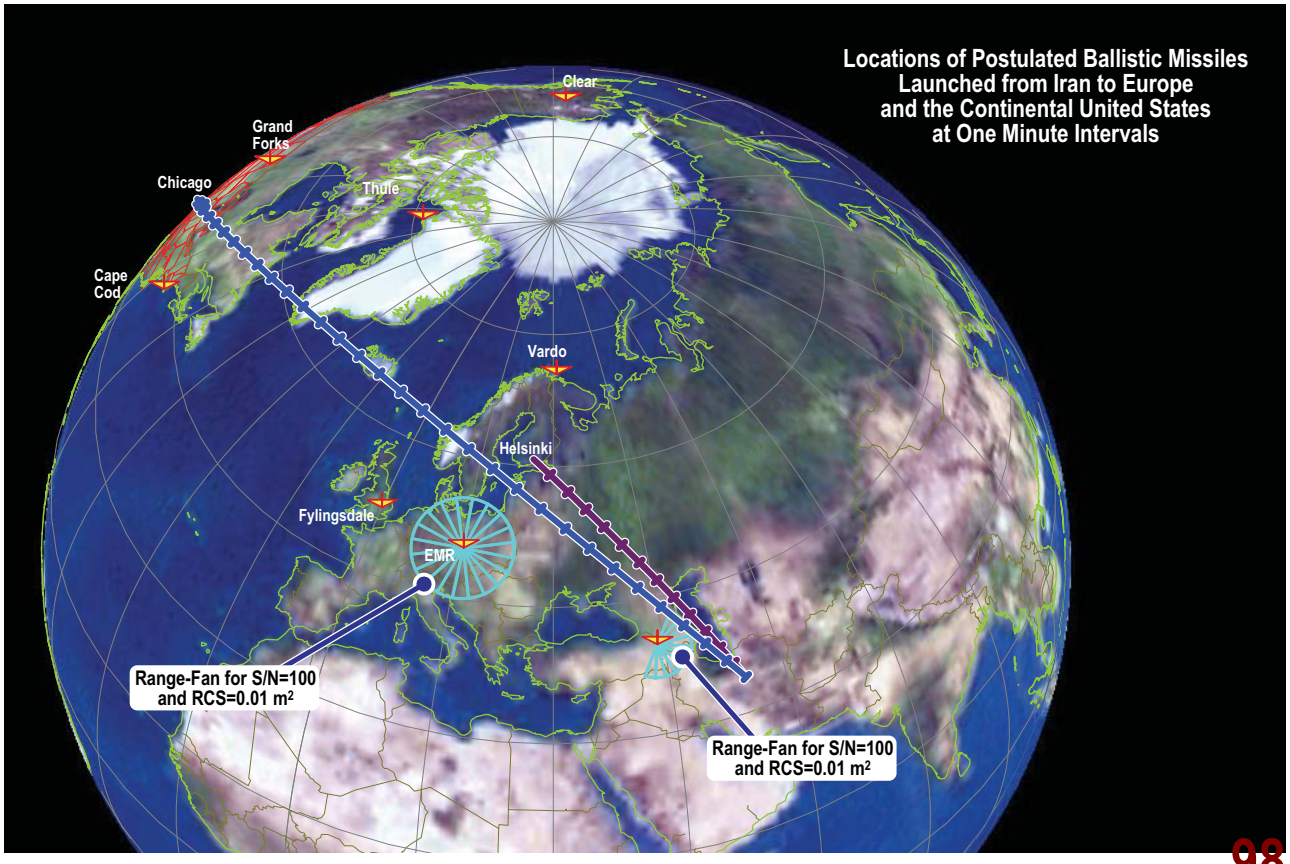


Radar-Range Fans for Vardo and US Proposed EMR and FBX Missile Defense Radars



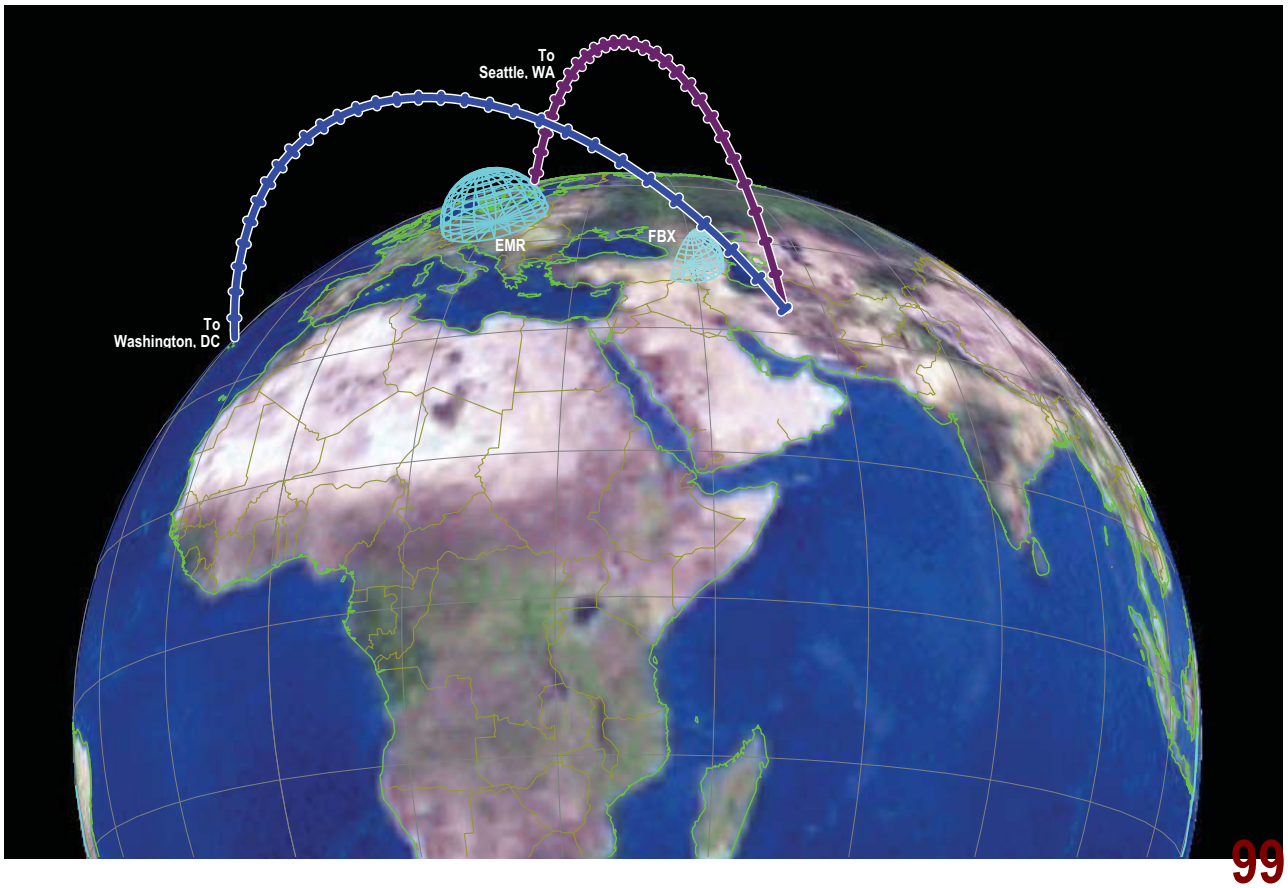
97

Discrimination Ranges that Could Actually be ACHIEVED by the EMR and FBX Radars

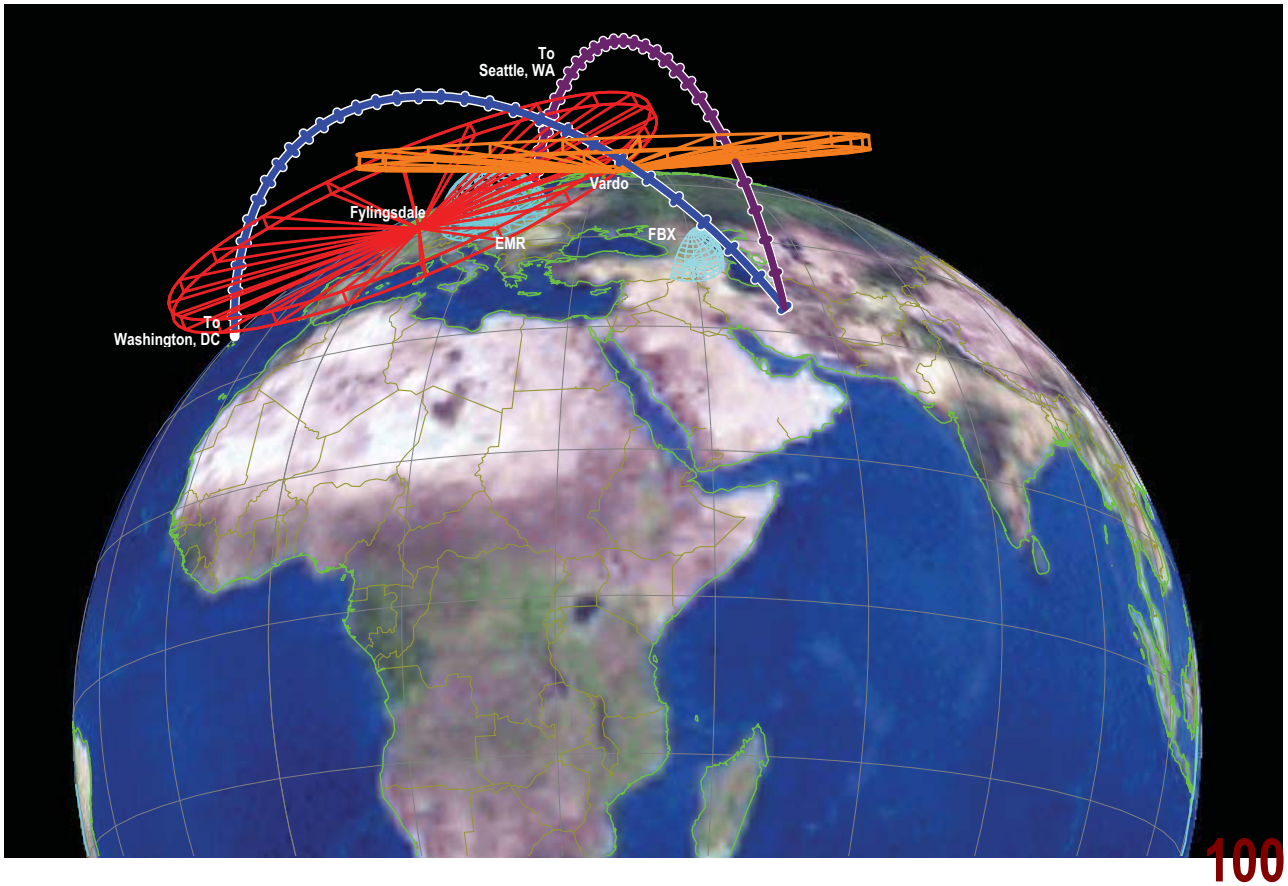


98

Discrimination Ranges that Could Actually be ACHIEVED by the EMR and FBX Radars

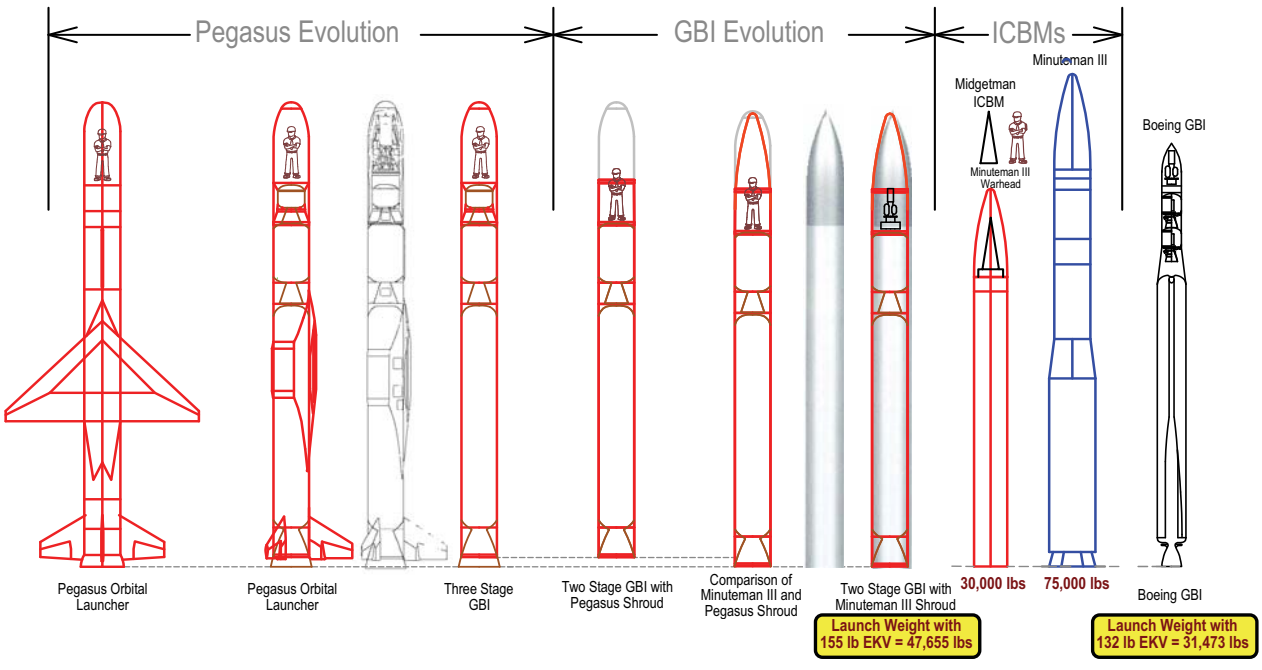


Discrimination Ranges that Could Actually be ACHIEVED by the EMR and FBX Radars



Ground-Based Interceptor: Missile Defense Agency Claims It Achieves 6.3 km/sec Carrying a Payload of 120 – 130 kg, Pegasus Parameters Indicate a 6.3 km/sec Burnout Speed with a Roughly 900 – 1000 kg Payload

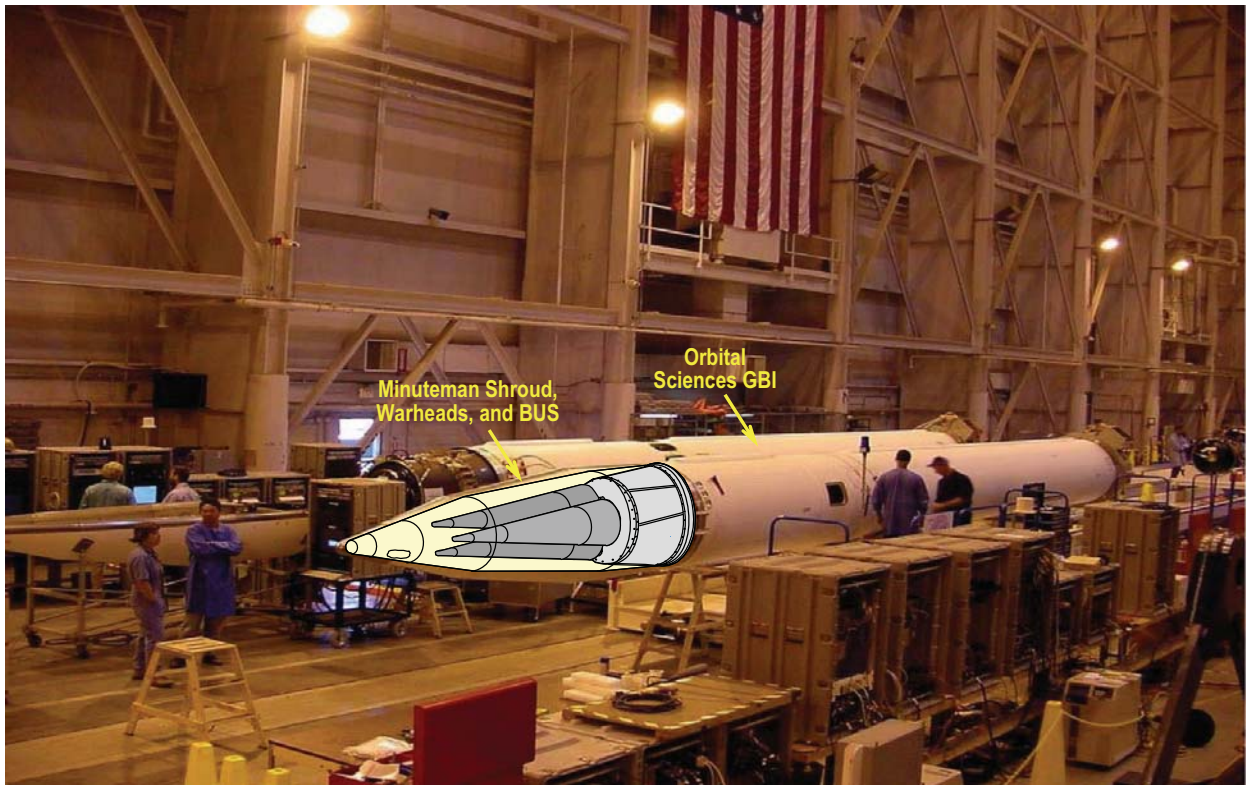
Evolution and Comparison of Launch Vehicles, ICBMs and the GBI Interceptor



Ground-Based Interceptor
Achieves 8.5 to 8.7 km/sec Carrying a Payload of 220 to 155 lbs

103

The Ground-Based Interceptor
Can Carry a Full Minuteman III BUS and Three Warheads to 6,000+ Kilometers



104

False Claims to European Allies About the "Theoretical" Capabilities of the Europe-Based Missile Defense Components

Concerns Expressed by the Russians

Engagement With Russia

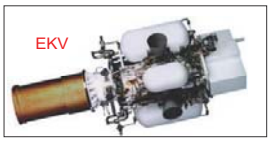
- March 17, 2006 (Washington): Bilateral Defense Commission Meeting. Under Secretary of Defense Edelman and General Mazurkevich, Chief of the Main Directorate for International Cooperation
- April 3, 2006 (Moscow): Briefing of Russian officials by U.S. Embassy (Moscow) on DOD decision to resume consultations with Poland regarding the site of U.S. missile defense assets
- November 3, 2006 (Moscow): Dr. Cambone, Lt Gen Obering, DASD Green, Russian Minister of Defense Ivanov, Chief of General Staff Gen-Col Baluevskiy, Gen-Col Mazurkevich
  - Russians did not acknowledge Iran emerging threat as a rationale for deployment of U.S. missile defense assets
  - Believe Russia is real target
  - Russians "portrayed" lack of understanding and confusion on technical aspects of a deployed missile program and proposed architecture.
  - U.S. committed to following-up with technical discussions to Russian counterparts
- January 29, 2007 (Moscow): Strategic Dialogue Meeting. Under Secretaries Joseph and Deputy Foreign Minister Kislyak
  - Ambassador re-committed that U.S. will follow-up with technical briefings/explanations regarding U.S. missile deployment
- February 9, 2007 (Seville): Secretary Gates and Minister of Defense Ivanov during NATO-Russia Council Ministerial meeting

U.S. Has Offered Future Event Establishing Technical Experts Meeting (Spring 2007)

Interceptors are Modified Ground-Based Interceptors

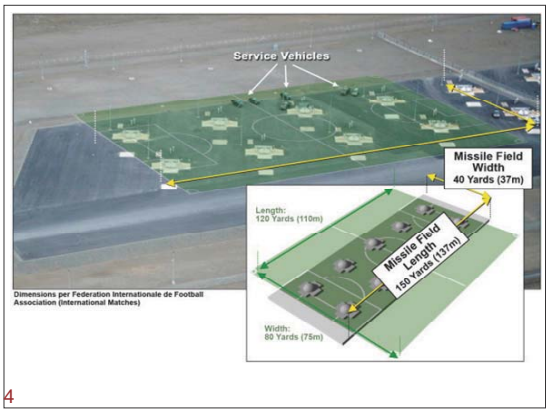
2 Stage Instead of 3 Stage
47,385 lbs versus 49,150 lbs
Both variants are 51 Feet Long

The interceptors planned for Poland are nearly identical to the three-stage interceptors based in the U.S. except that they are a two-stage variant that is quicker, lighter, and better suited for the engagement ranges and timelines for Europe. The silos that house the ground-based interceptors have substantially smaller dimensions (e.g., diameter and length) than those used for offensive missiles, such as the U.S. Minuteman III ICBM. Any modification would require extensive, lengthy, and costly changes that would be clearly visible to any observer.



The ground-based interceptors are comprised of a booster vehicle and an exoatmospheric kill vehicle (EKV). Upon launch, the booster flies to a projected intercept point and releases the EKV which then uses on-board sensors (with assistance from ground-based assets) to acquire the target ballistic missile. The EKV performs final discrimination and steers itself to collide with the enemy warhead, destroying it by the sheer kinetic force of impact.

Future European Missile Site – Size Comparison



4

The Constantly Changing Stories from the Missile Defense Agency

(1 of 2)
Technical Properties of the Poland-Based Two-Stage Interceptors

Four Contradictory Sets of Characteristics Describing the Performance of the Ground-Based Interceptor

1. **Burnout Speed = 6.3 km/sec**
2. **Stage Full and Empty Weights Provided to the Associated Press by Colonel Rick Lehner, Spokesman for the Missile Defense Agency.**
3. **Full and Empty Weights Plus I_{SP} for Stages 1 and 2 in "Response to Postol" (Still Gives 7.5 km/sec Interceptor! – Interceptor Upper Stage Loses 600 lbs of Propellant Relative to Commercial Rocket, Motor casing Becomes 600 lbs Heavier, Lower Rocket Stage Motors 5% Less Efficient Than Commercial Version)**
4. **Full and Empty Weights Plus I_{SP} for Stages 1 and 2 from Taurus and Pegasus Commercial User's Manuals Gives 8.9 km/sec Interceptor Burnout Speed.**

(2 of 2)
Multiple and Changing Explanations of How Defended Areas Are Expanded by the Addition of European Defense Components

(EMR in Czech Republic, Two-Stage Interceptors in Poland, and FBX at Unspecified Location)

1. Addition of Interceptors in Poland Makes It Possible to Defend Hokkaido, Japan!
2. 6.3 km/sec Interceptor Not Fast Enough to Defend Hokkaido! (Roughly 9 km/sec is Needed).
3. Czech Radar Could Play No Role in Defense of Hokkaido!
4. Alaska Radars Could Play No Role in Defense of Hokkaido!
5. Postol "Misinterpreted" Missile Defense Agency Slides! Interceptors from Alaska Are Used to Defend Hokkaido!
6. Forward-Based X-Band Radar Might Be Able to Provide Tracking for Interceptors If It Is Deployed in the *Caspian Sea*!

Details Associated with the Contradictions and False Claims Being Made By the US Missile Defense Agency About the Two-Stage Poland-Based Interceptor

Data from Press Statements by Spokesman and Chief Scientist for the Missile Defense Agency, Colonel Rick Lehner and Mr. Keith Englander Provided Stage Weights for the Orbital Sciences Two-Stage Ground-Based Interceptor

STATEMENTS MADE BY MDA TO THE PRESS:
Launch Weight = 47,400 lbs
First Stage Weight = 37,800 lbs
Second Stage Weight = 9,500 lbs
Kill Vehicle Weight = 155 lbs
Burnout Speed = 6.3 km/sec

ANALYTIC RESULTS:

- Assumptions:
  The shroud weighs 200 lbs, and the Pegasus-derived rocket motor fuel weights and specific impulses are exactly those from the *AIAA International Reference Guide to Space Launch Systems*.
- Expected Launch Weight of GBI = 37,800 + 9,500 + 155 + 200 = 47, 655 lbs.
- The vehicle weight stated by Lehner is 47,400 lbs)
- If one assumes a vehicle with a Launch Weight of 49,730 lbs, a payload of 2075 + 155 = 2230lbs, the burnout speed is 6.30 km/sec.
- The same vehicle carrying a 155 lb payload achieves a burnout speed of 9.37 km/sec.
- If the vehicle payload is 255 lbs, to accommodate a 100 lb vibration isolation and mounting adapter, (and/or endo/exo heatshield protection for EKV) the burnout speed is then 9.11 km/sec

CONCLUSION
US Interceptors will have sufficient speed to engage all Russian ICBMs launched from West of the Urals against all targets in the continental United States

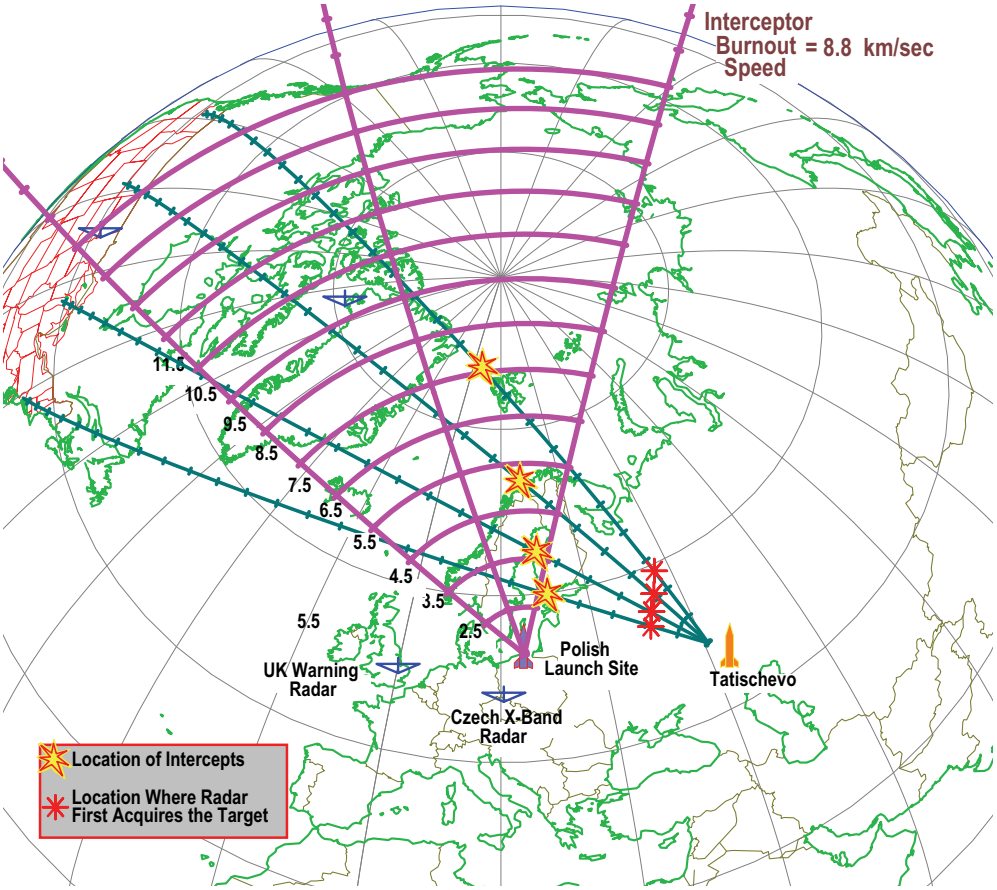
Data on Ground-Based Interceptor Launch Gross Weight, Stage Weights and Burn Times Provided by MDA Spokesman, Rick Lehner, and MDA Chief Scientist, Keith Englander

Orion 50SXLG Rocket Motor						
Source	Full Weight (lbs)	Propellant (lbs)	Empty Weight (lbs)	Burn Time (sec)	I_{sp} (sec^{-1})	Length (m)
Taurus	??	33,120	??	68.4	285	8.94
Pegasus	36,195	33,140	3055	68.3	293	10.27
MDA-1	37,800	35,480	2,320	70	??	??
MDA-2	37,800	34,398	3,402	70	270	??

Orion 50XL Rocket Motor						
Source	Full Weight (lbs)	Propellant (lbs)	Empty Weight (lbs)	Burn Time (sec)	I_{sp} (sec^{-1})	Length (m)
Taurus	??	8,655	??	69.4	289	3.11
Pegasus	9,566	8,649	917	69.8	290	3.11
MDA-1	9,500	8,680	820	70	??	??
MDA-2	9,500	8,075?	1,425?	70	289	

Two-Stage GBI Launch Weight = 21,400 kg (47,400 lbs)
GBI Carries No Ballast

Ability of Polish-Based Interceptors to Engage Russian ICBMs from Tatischevo

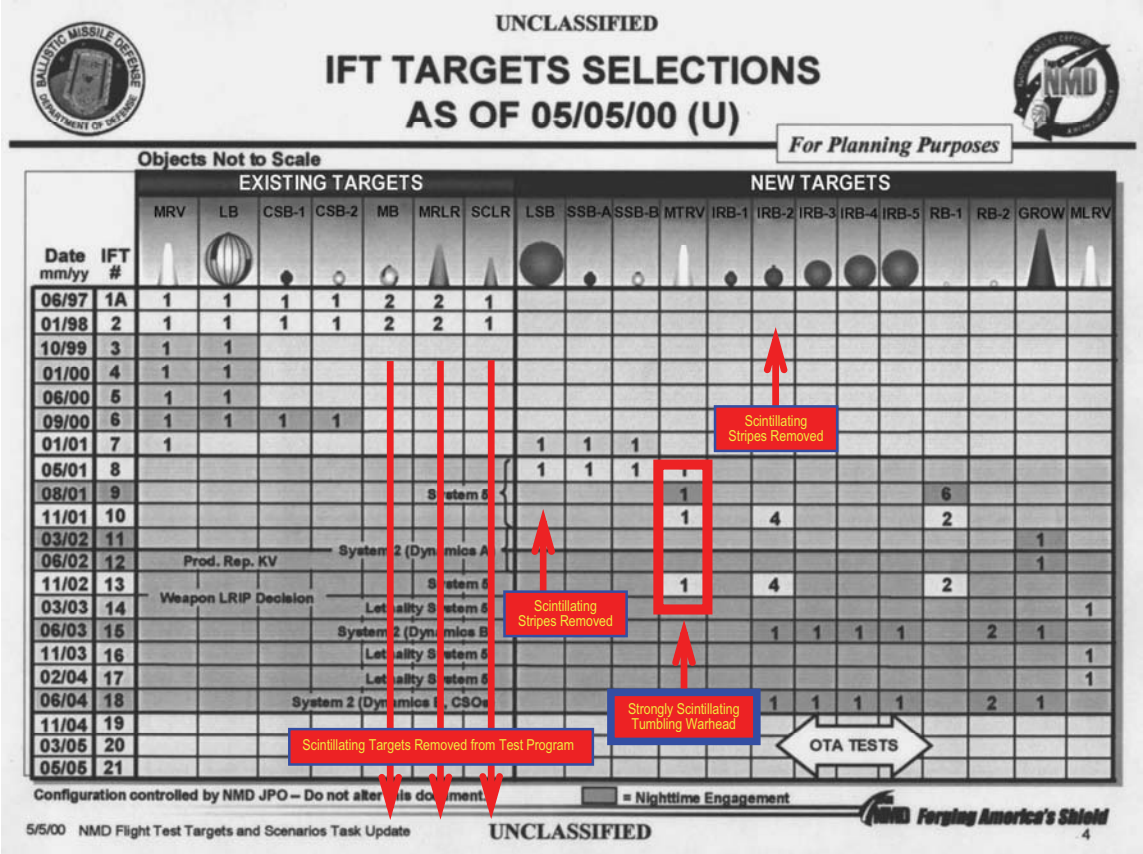


113

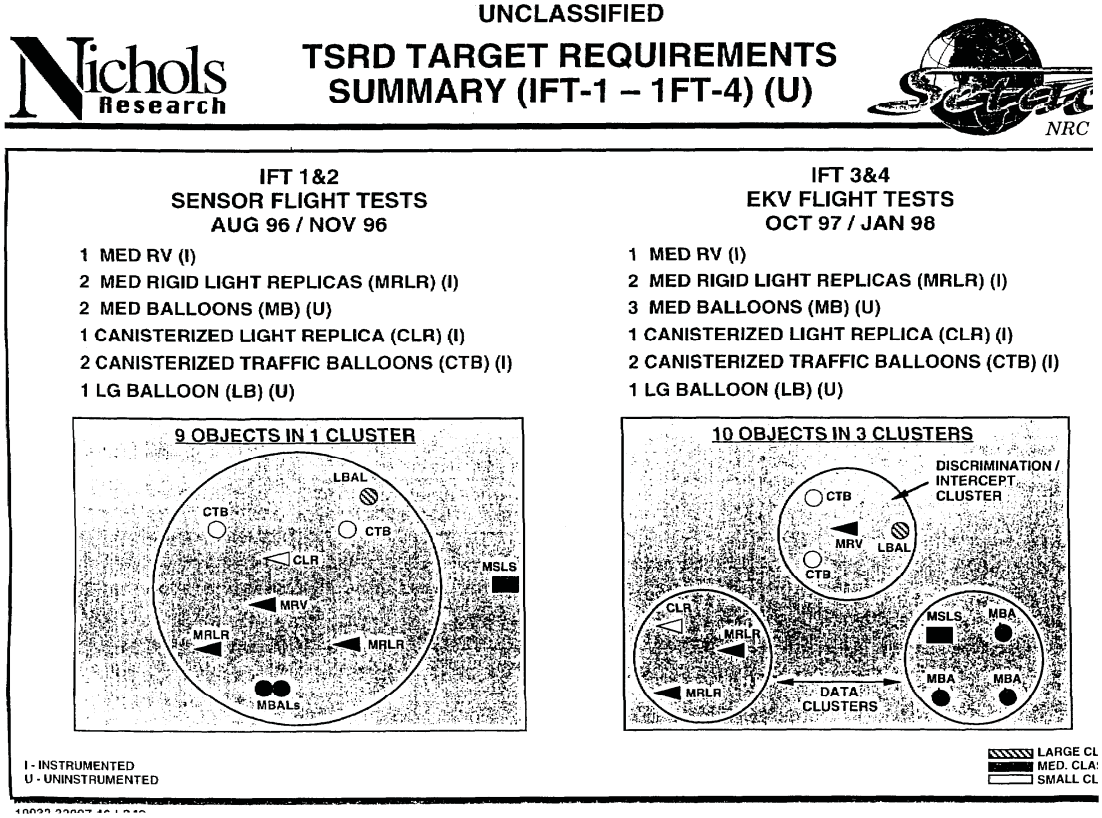
The Record of Initial Integrated Flight (IFT's) Tests 1A Through 9

114

Rigging of the Test Program to Avoid the Simplest of the Baseline Threats



Original Plans to Fly Ten or More Objects in IFT-3 and IFT-4 Experiments



NMD Flight Test Program Viewed with Respect to the Results of the IFT-1A Experiment

UNCLASSIFIED

IFT TARGETS SELECTIONS AS OF 05/05/00 (U)

For Planning Purposes

Objects Not to Scale

Date mm/yy	IFT #	EXISTING TARGETS							NEW TARGETS										
		MRV	LB	CSB-1	CSB-2	MB	MRLR	SCLR	LSB	SSB-A	SSB-B	MTRV	IRB-1	IRB-2	IRB-3	IRB-4	IRB-5	RB-1	RB-2	GROW	MLRV
06/97	1A	1	1	1	1	2	2	1													
01/98	2	1	1	1	1	2	2	1													
10/99	3	1	1																		
01/00	4	1	1																		
06/00	5	1	1																		
09/00	6	1	1	1	1																
01/01	7	1							1	1	1										
05/01	8								1	1	1	1									
08/01	9						System 5					1						6			
11/01	10											1		4				2			
03/02	11							System 2 (Dynamics A)												1	
06/02	12	Prod. Rep. KV																		1	
11/02	13						System 5					1		4				2			
03/03	14	Weapon LRIP Decision				Lethality System 5															1
06/03	15					System 2 (Dynamics B)								1	1	1	1		2	1	
11/03	16					Lethality System 5															1
02/04	17					Lethality System 5															1
06/04	18				System 2 (Dynamics B, CSOs)									1	1	1	1		2	1	
11/04	19														OTA TESTS						
03/05	20																				
05/05	21																				

Configuration controlled by NMD JPO – Do not alter this document. = Nighttime Engagement

NMD Forging America's Shield

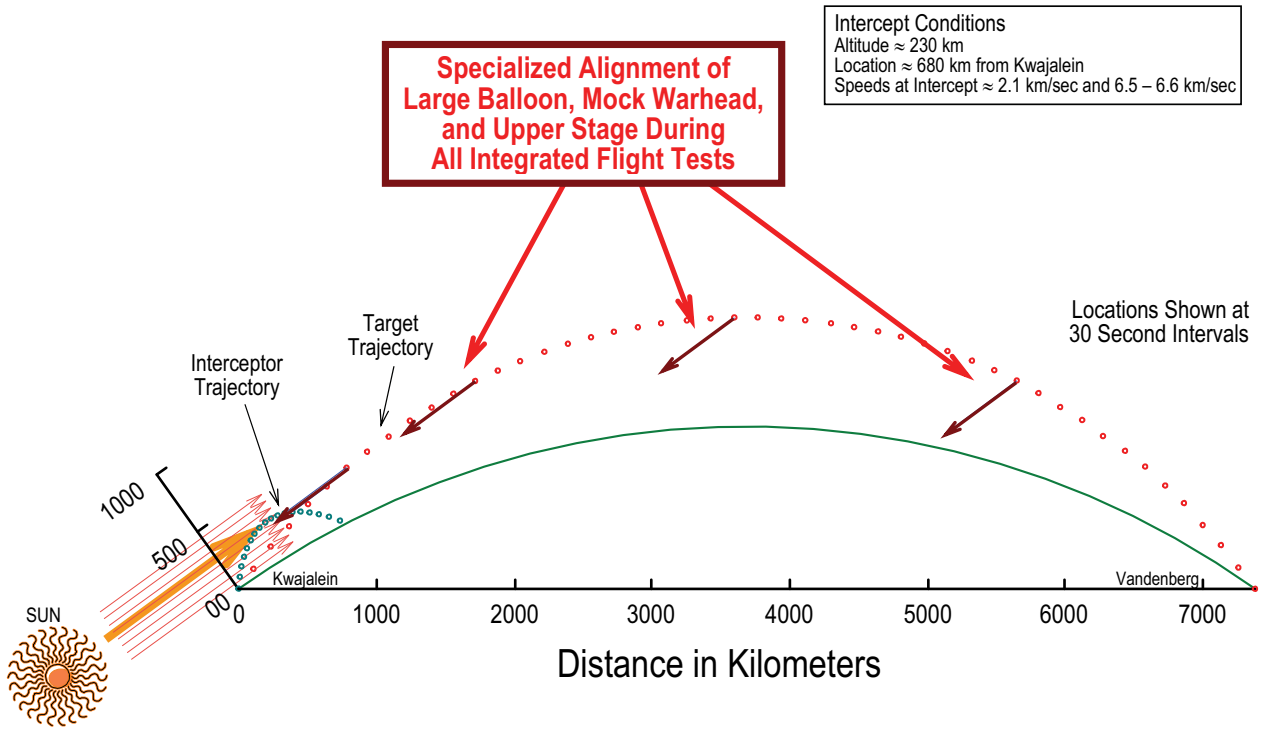
5/5/00 NMD Flight Test Targets and Scenarios Task Update

UNCLASSIFIED

4

Flight Path Conditions of IFT-1A Through IFT-10 Experiments

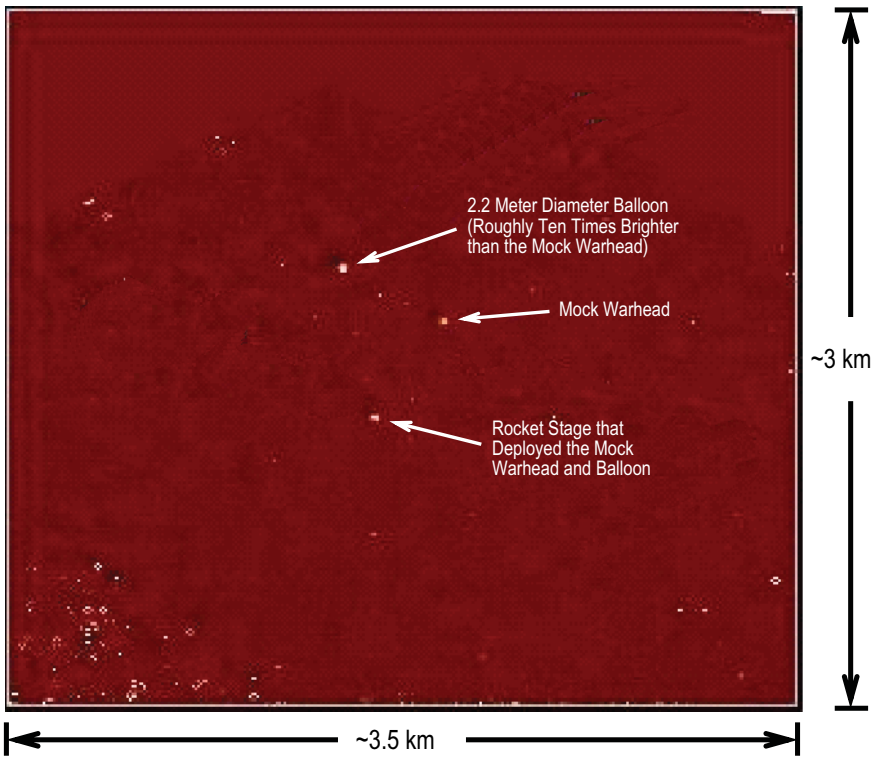
Actual Geometry of the IFT-1A Through IFT-9 Experiments



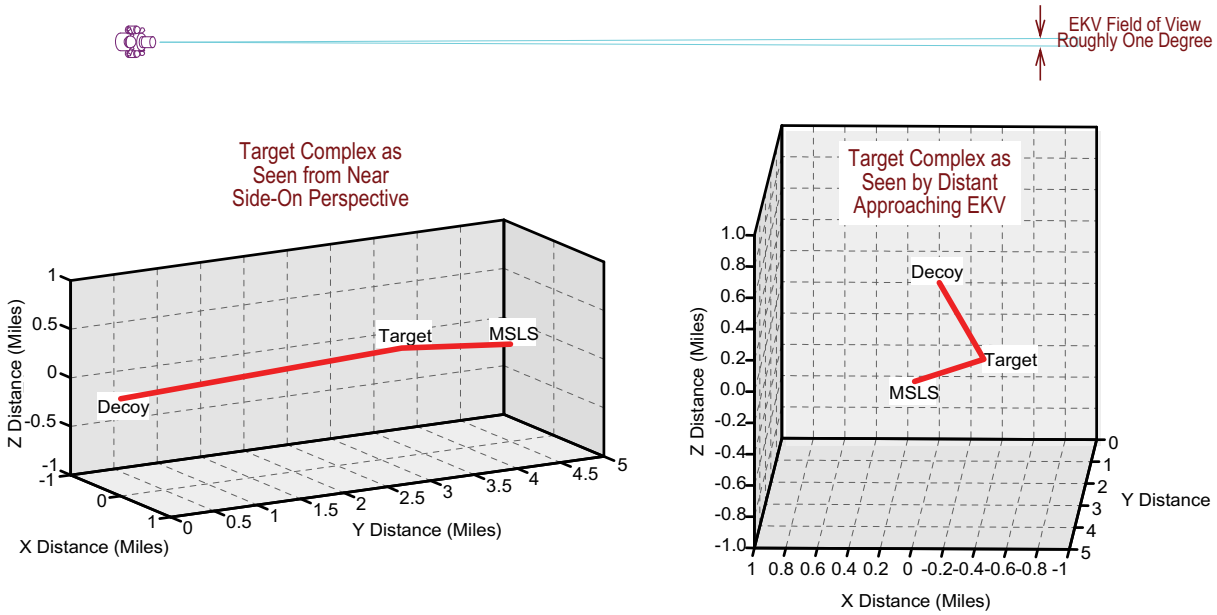
* Integrated Flight Test-10 failed, but was supposed to be an attempt to demonstrate an intercept at night

IFT-6 Target Complex as Seen By Distant Approaching EKV

Range of Observed Target Complex ~ 230 – 250 km for FOV 1 – 1.5º



Actual Location of Objects in the IFT-6 Target Complex



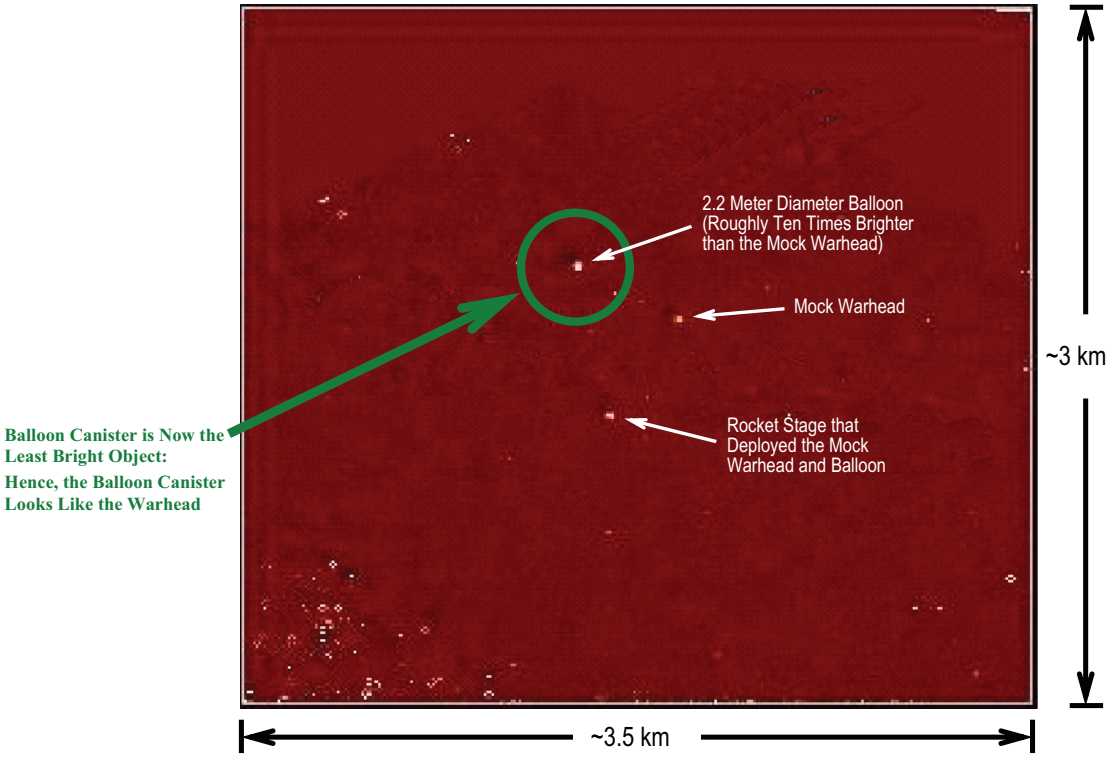
Statement Indicating that Top Management of the Ballistic Missile Defense Organization Knew About the Discrimination Problems Identified in the IFT-1A Experiment

"So the decoy is not going to look exactly like what we expected. It presents a problem for the system that we didn't expect,"

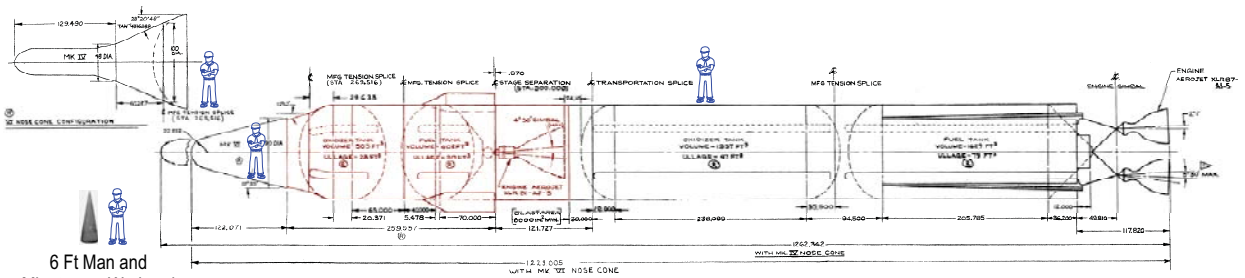
Statement of
Lieutenant General Ronald Kadish,
Director of the Ballistic Missile Defense Organization,
while being filmed by 60 Minutes II after learning that
the 2.2 meter balloon misdeployed (did not inflate properly)
during the IFT-5 experiment

IFT-6 Target Complex as Seen By Distant Approaching EKV

Range of Observed Target Complex ~ 230 – 250 km for FOV 1 – 1.5º



False Targets Cloud Created in Army Ballistic Missile Development Agency Test Using a Titan II ICBM on January 10, 1975, Signature of Fragmented Tanks (SOFT),



Titan II outboard configuration.
© July 1960. The Martin Co., Denver.