

Missile Proliferation in the Middle East – an Overview

Robert H. Schmucker

- Countries of interest
- Missile programs analyses
- Dominating activities
- Conclusion

Coping with Regional Conflicts and Global Proliferation Risks
Looming Crisis in the Middle East and the Role of Missile Defense

Arbeitskreis Raketenabwehr der HSFK/AFB und VDW

Berlin, November 22, 2004

ME-Countries Possessing Ballistic Missiles (2004)

- **Egypt**
- **Iran**
- **Iraq (activities before 2003)**
- Libya (activities terminated)
- Saudi Arabia
- **Syria**
- United Arab Emirates
- Yemen

Status and Information Characterization

- **Information mostly based on guesses, circle citation, “leaking” intelligence**
- **Capabilities often falsely assessed**
- **Diverging information on individual countries**
 - **Missile types**
 - **Missile numbers**
 - **Launcher numbers**
 - **Indigenous activities/production**
 - **Proliferation**

Major Missile Activities in Egypt

- **Missile/satellite launcher program end of 50s**
 - **Driven by foreign experts**
 - **7 years w/o significant results**
- **Condor/Badr 2000/Vector in the 80s**
 - **Cooperation Argentina-Egypt-Iraq**
 - **Development in Argentina**
 - **Egypt mainly transshipping institution to Iraq**
 - **10 years w/o significant results**
 - **Program termination – continuation in Egypt?**
- **Additional programs – situation unclear**

Egypt's Ballistic Missile Situation

- **Missile arsenal**
 - Frog 7 – operational (below MTCR-limit)
 - **R-17/Scud B – source SU: operational/ageing**
 - **Scud C – source KN: operational/ageing**
 - **Project T – status unclear**
 - **Condor/Vector – activities unclear**
 - **Modern missiles – no reliable information**
- **Insignificant results of indigenous activities – missile production, development**
- **Proliferation key for missile availability**

Iraq's Ballistic Missile Situation (before 2003)

- **Missile arsenal/activities**
 - RE w/o success (Scud B/...)
 - Scud B-based systems – destroyed (1991)
 - **Al-Fatah – operational**
 - **Al-Samoud 2 – operational**
 - Long range missiles – planned
- **No visible Al-Fatah/Al-Samoud dev program**
- **Support/proliferation scope unclear**
- **Iraq ideal place for proliferation research!**

Iraq's Al-Samoud 2

- **Design supported by foreign experts**
- **Key component procurement**
 - **Guidance system**
 - **SA-2-engine (equipped with c/o devices)**
 - **Sources unclear**
- **Development/production activities**
 - **40 tests – invisible for UNSCOM/UNMOVIC**
 - **Production line built up**
 - **App. 120 missiles manufactured**
- **System possibly designed for future M-11-use**
- **Activities significantly supported by proliferation/...**

Syria's Ballistic Missile Situation

- **Missile arsenal**
 - Frog 7 – operational
 - SS-21 – operational
 - **R-17/Scud B – sources SU/NK: operational**
 - **Scud C – source NK: operational**
 - M-9 – negotiations with PRC/no deliveries
 - **Scud D – source NK: availability unclear**
- **Insignificant results of indigenous activities – missile production, development**
- **Proliferation key for missile availability**

Iranian Missiles

impr



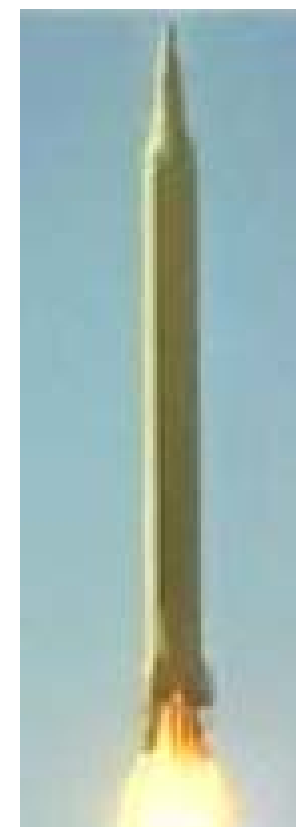
Shahab 1



Shahab 3

Shahab 2

Shahab 3-



Fateh 110

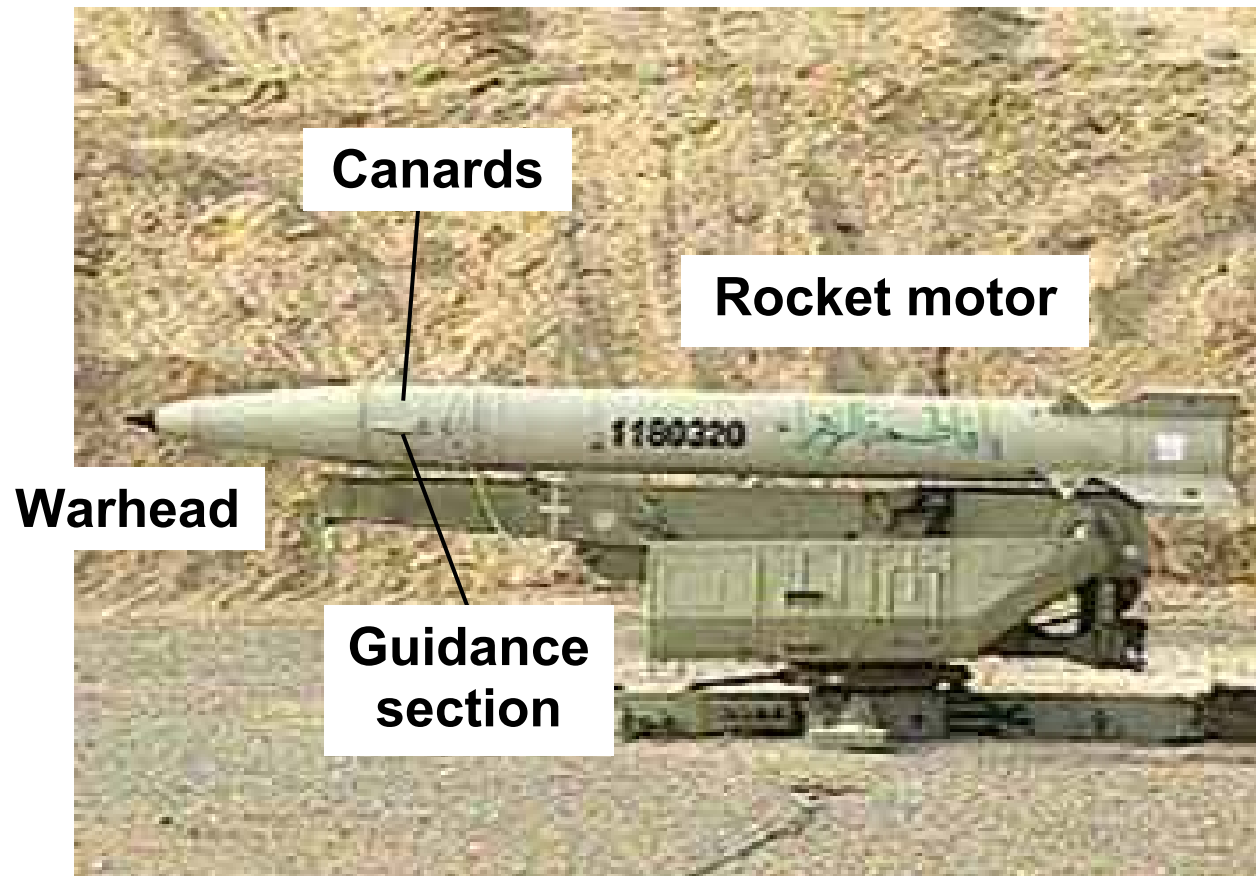
Iran's Ballistic Missile Situation

- **Missile arsenal**
 - Zelzal 2 – indigenous, operational (below MTCR-limit)
 - Fateh 110 – indigenous dev (below MTCR-limit)
 - **Shahab 1 – operational**
 - **Shahab 2 – operational**
 - **Shahab 3 – production preparation/
improvement program**
 - Shahab 4 – existence/status unclear
- **Significant supported indigenous activities**
- **Proliferation key factor for progress**

Iran's Missile Programs (Status 2004)

Missile	Launches in Iran		Remarks
	all	malfunctions	
Fateh 110	app. 15	unknown	
Shahab 1	100	-	procured from NK – “war of the cities”
Shahab 2	few		procured from NK
Shahab 3	9	4	production initiation ?
Shahab 3 improved	2 ?	1 – 2 (?)	
Shahab 4	-	-	

Iran's Fateh 110



Fateh's Gyro (Product of Iran's AIO)



Fateh 110 Program Aspects

- **Artillery rocket w launch phase stabilization**
- **Indigenous system –
foreign support/proliferation not required**
- **Relatively simple system, moderate performance**
- **Program purpose**
 - **Experience w indigenous guided missiles**
 - **Infrastructure, equipment built up
plus gradual expansion**
 - **Training in technology, development, production**
 - **Reduction of foreign dependence**

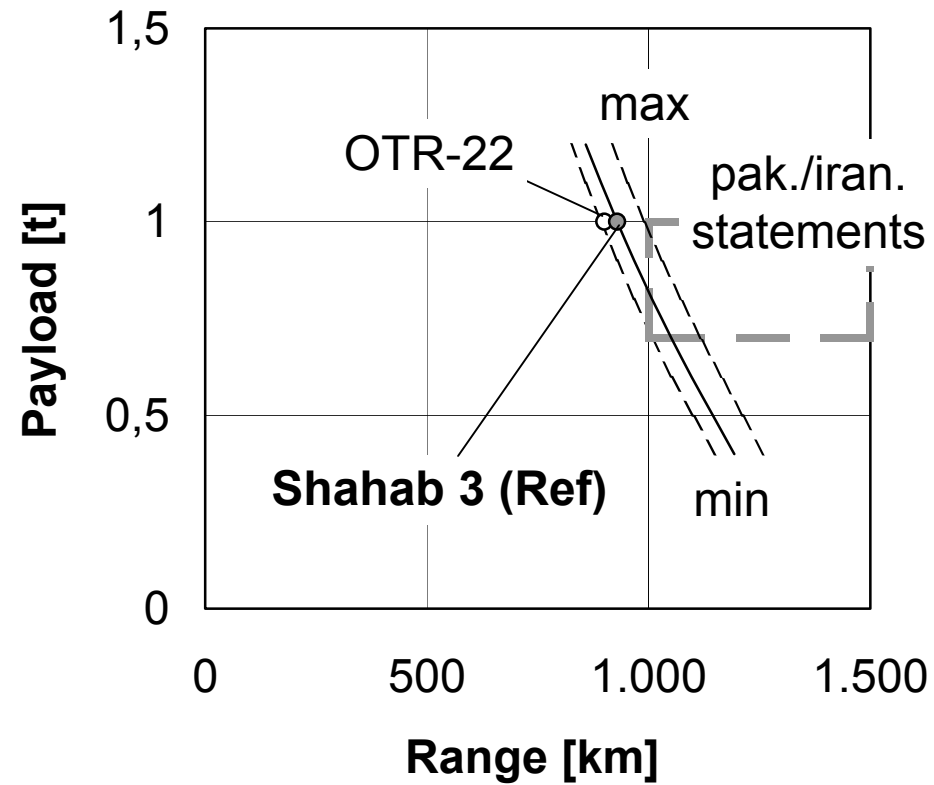
Shahab 1/2

- **Shahab 1: Iranian's name for R-17 (R-300)/Scud B**
- **Shahab 2: Iranian's name for Scud C**
- **Missiles procured from NK**
 - **R-17/Scud C missiles from former SU**
 - **App. 200 to 300 missiles**
 - **Few (app. 10) launchers**
- **Status of missile production in Iran unclear**

Shahab 3

- **MRBM originating from Soviet Union – designator possibly R-15/R-19**
- **(near) operational missile**
- **Procurement from North Korea**
- **Support/training by Russian experts**
- **Indication for license production line installation in Iran**
- **Range extension program**

Shahab 3 Throw Weight Performance



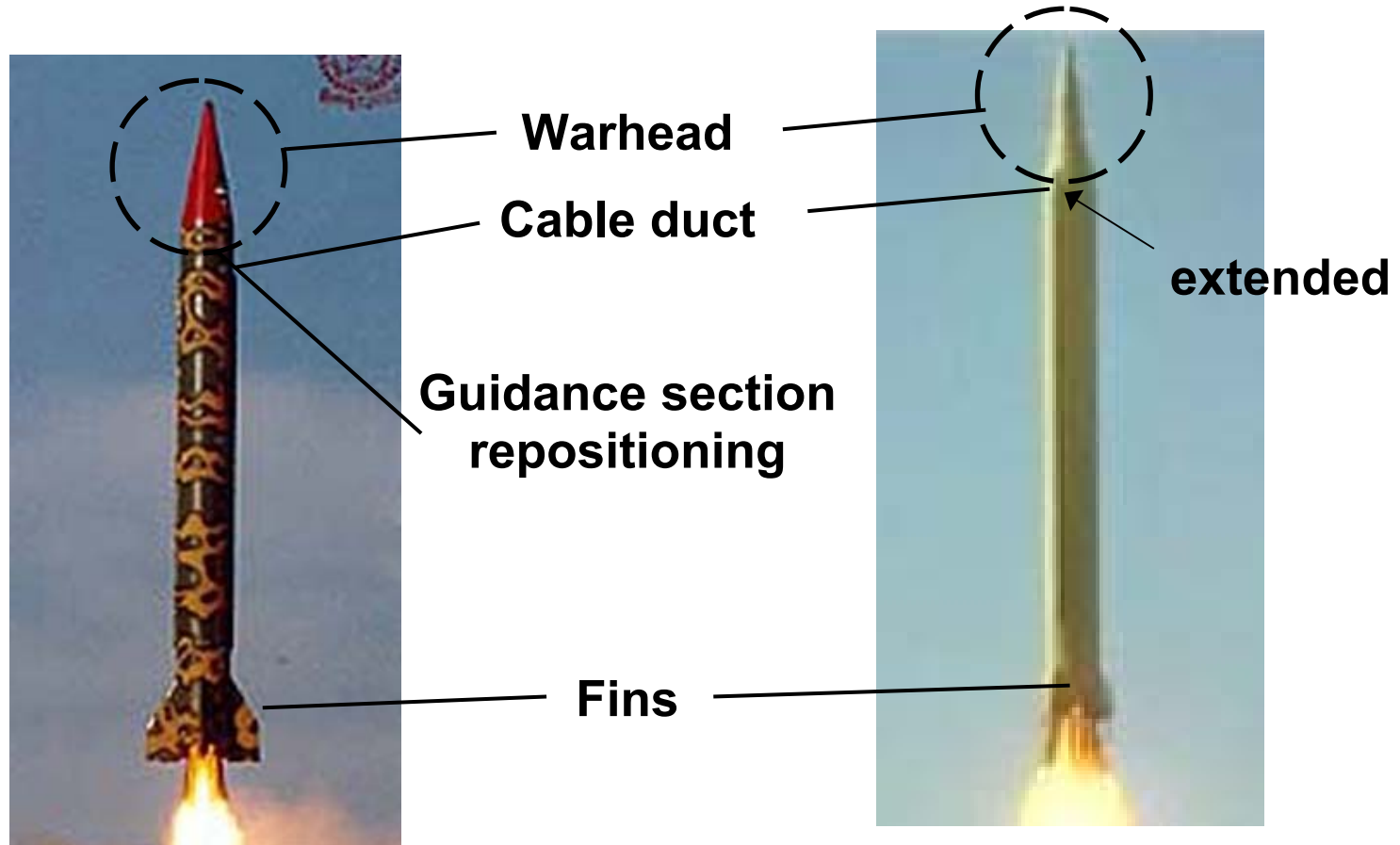
Iran's Shahab 3 Extension Program

- **Range increase to 1.300 km/possibly beyond**
- **Improved penetration of Arrow defense shield**
- **Warhead compatibility with WMD**
- **Independence of foreign support/proliferation**

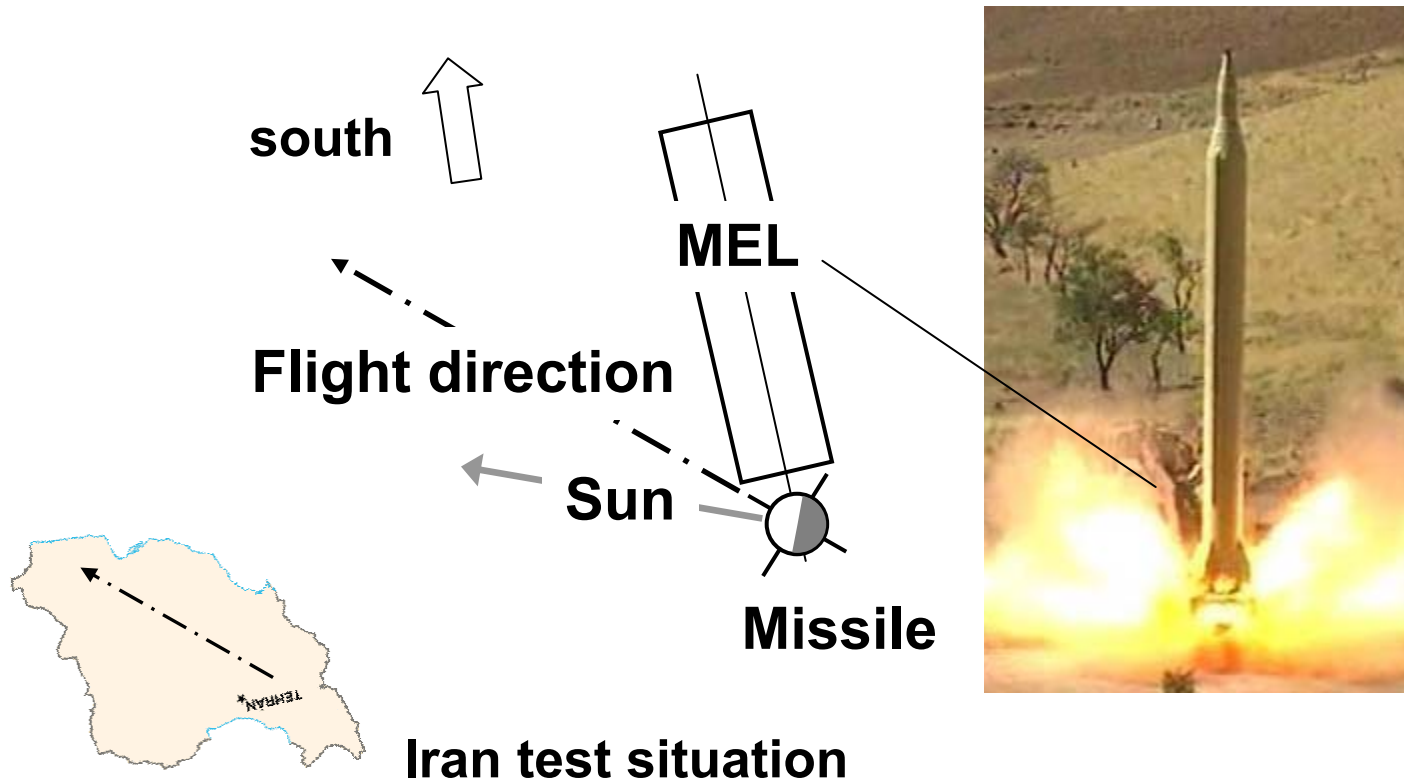
Iran's Performance Improved Shahab 3



Shahab 3 Configuration Comparison



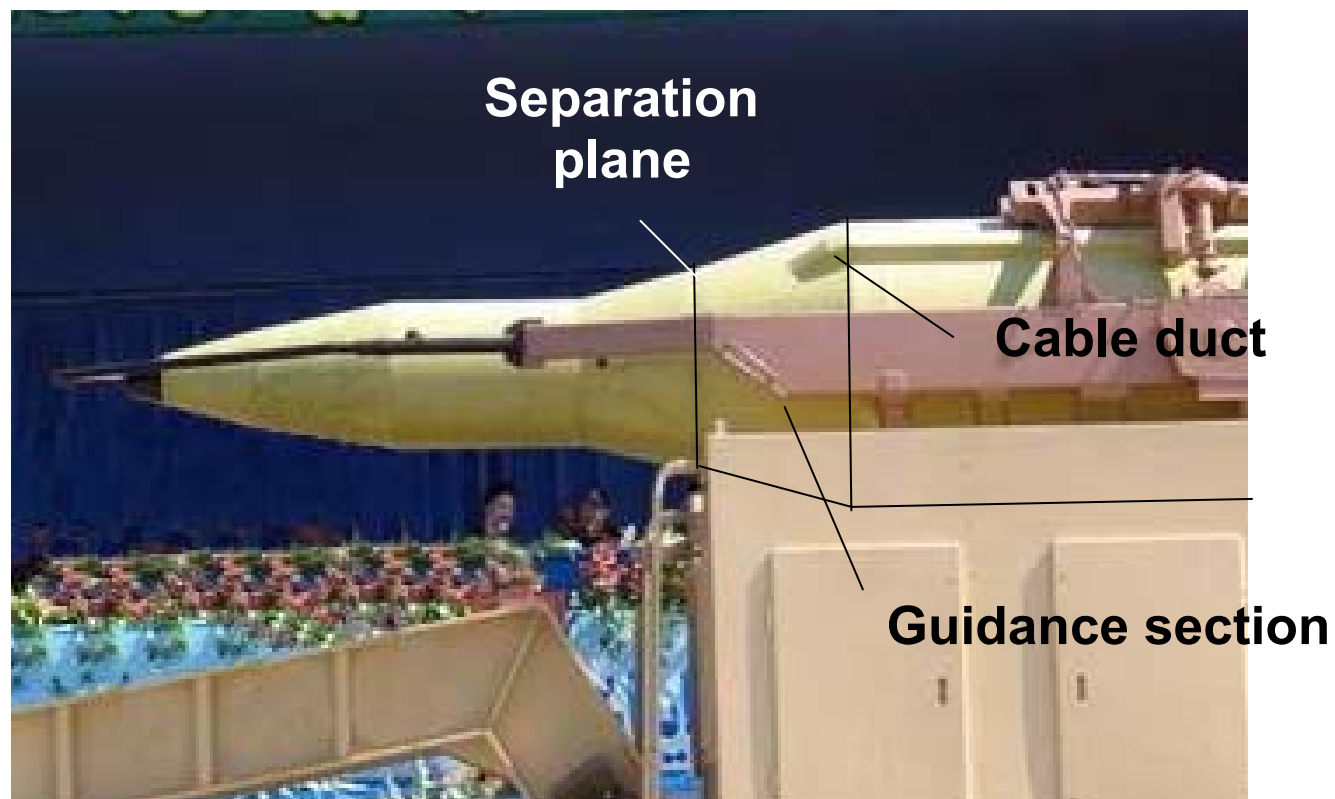
Shahab 3 Launch (August 11, 2004)



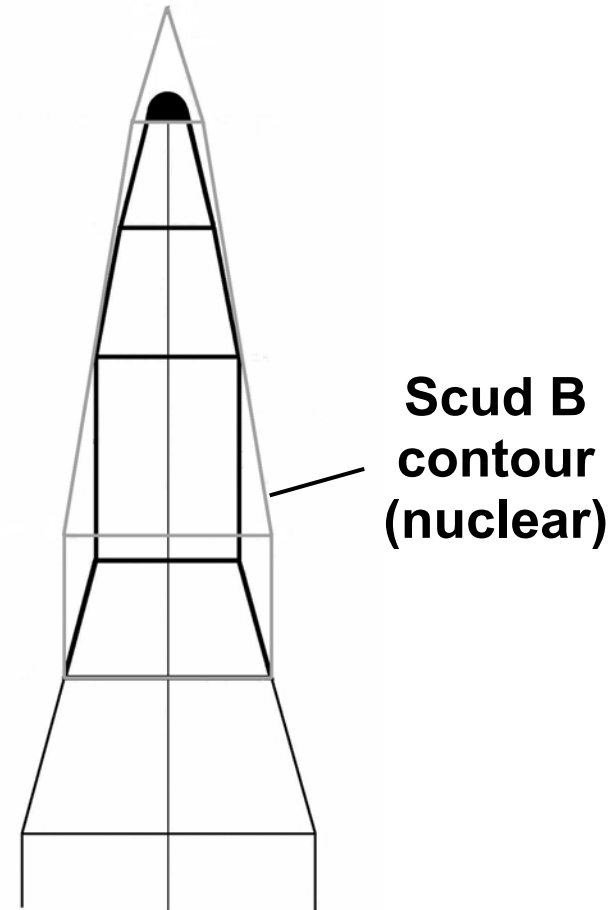
Iran's Shahab 3 Performance Improvement Activities

- **Alternate warhead configuration**
- **Typical re-entry vehicle design**
- **Propellant tank extension**
- **Fin size reduction – new guidance concept**
- **Guidance replacement/repositioning**
- **No significant length increase**
- **Original engine**

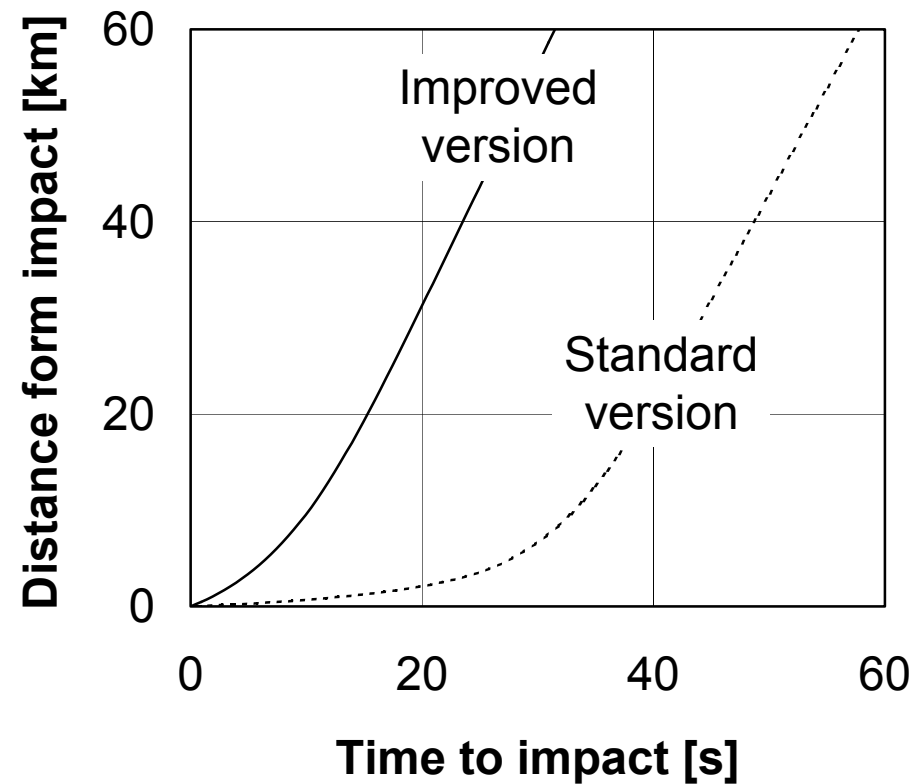
Improved Shahab 3 Warhead/Re-entry Body



Warhead Comparison Improved Shahab 3 – Scud B



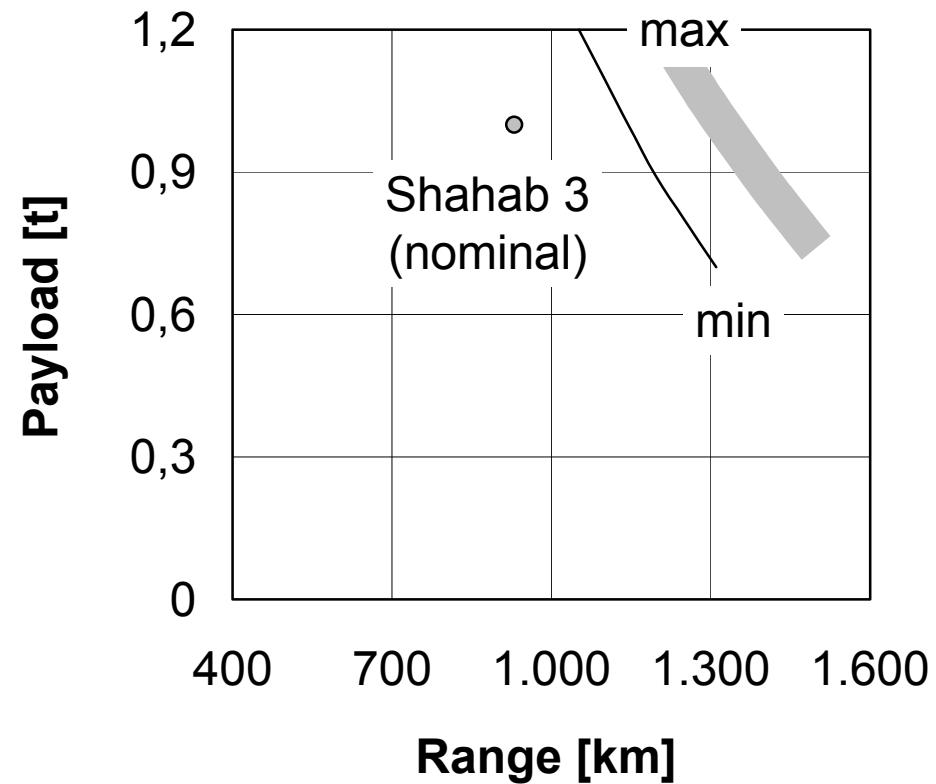
Approach Kinematics of New Warhead (0,7 t)



Range/Performance Extension Potential

- **Empty wet mass reduction (driving factor)**
 - **Payload**
 - **Propellant residuals**
 - **Propellant reserves (operational limit)**
 - **Airframe design/material (prop. tanks, fins, pressure tank, ...)**
 - **Modern (lightweight) guidance**
- **Propellant mass increase - net mass replacement by propellant**

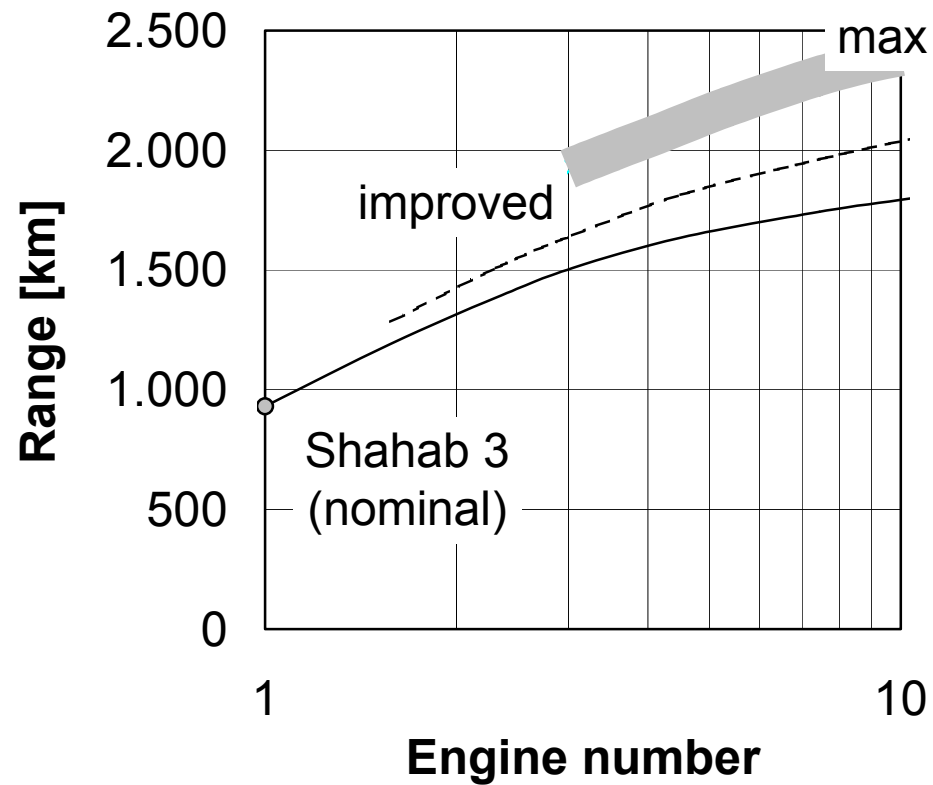
Improved Shahab 3 Potential Range Spectrum



Range Extension Beyond 1.300 km

- **Shahab 3 range limited to app. 1.300 km**
- **Beyond 1.300 km larger missile required – Shahab 3 thrust level insufficient**
- **Engine clustering perfect means**
- **Range of more than 2.000 km within reach**
- **Technology/production equipment sufficient**
 - **Engines from Shahab 3 production line**
 - **Guidance from production line**
- **Foreign support for re-entry vehicle sensible**
- **Progress easily visible – testing!**

Range w Clustered Shahab 3 Engines (1 t Payload)



Iran's Missile Programs Assessment

- **Fateh 110 – training for indigenous Iranian activities**
- **Liquid missiles (Shahab) dominant**
 - **Present situation: mainly procurement (systems, components, ...)**
 - **Production lines – status ?**
 - **Shahab 3**
 - **Training/support from Russia/...**
 - **improvement program – modification/testing (malfunctions!)**
- **Proliferation/support key factor for success – efforts for slow transition to autonomy**

Conclusion

- **Proliferation key for ME countries missiles arsenals**
- **Solid rockets era for indigenous activities**
- **Liquid missiles dominating**
 - **Procurement – objective license**
 - **No indigenous program**
 - **(Supported) performance improvement**
- **Long range systems in early state – not yet operational**
- **Proliferation from Russia/PR China decisive – North Korea mainly for transshipment**
- **Slowly growing autonomy – „Box of Pandora” open**
- **Non-proliferation important and necessary – what means for success?**

Proliferation Routes to Middle East

