

# MISSILE PROLIFERATION

Dr. Jeffrey Lewis

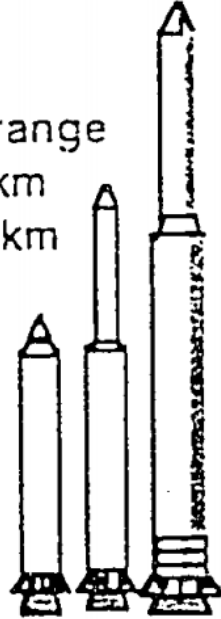
September 23, 2021

How it started ...

## Ballistic Missile Proliferation: North Korea

- Developing new missiles:

No Dong = 1,000 km range  
Taepo Dong I  $\geq 3,000$  km  
Taepo Dong II  $\geq 3,000$  km

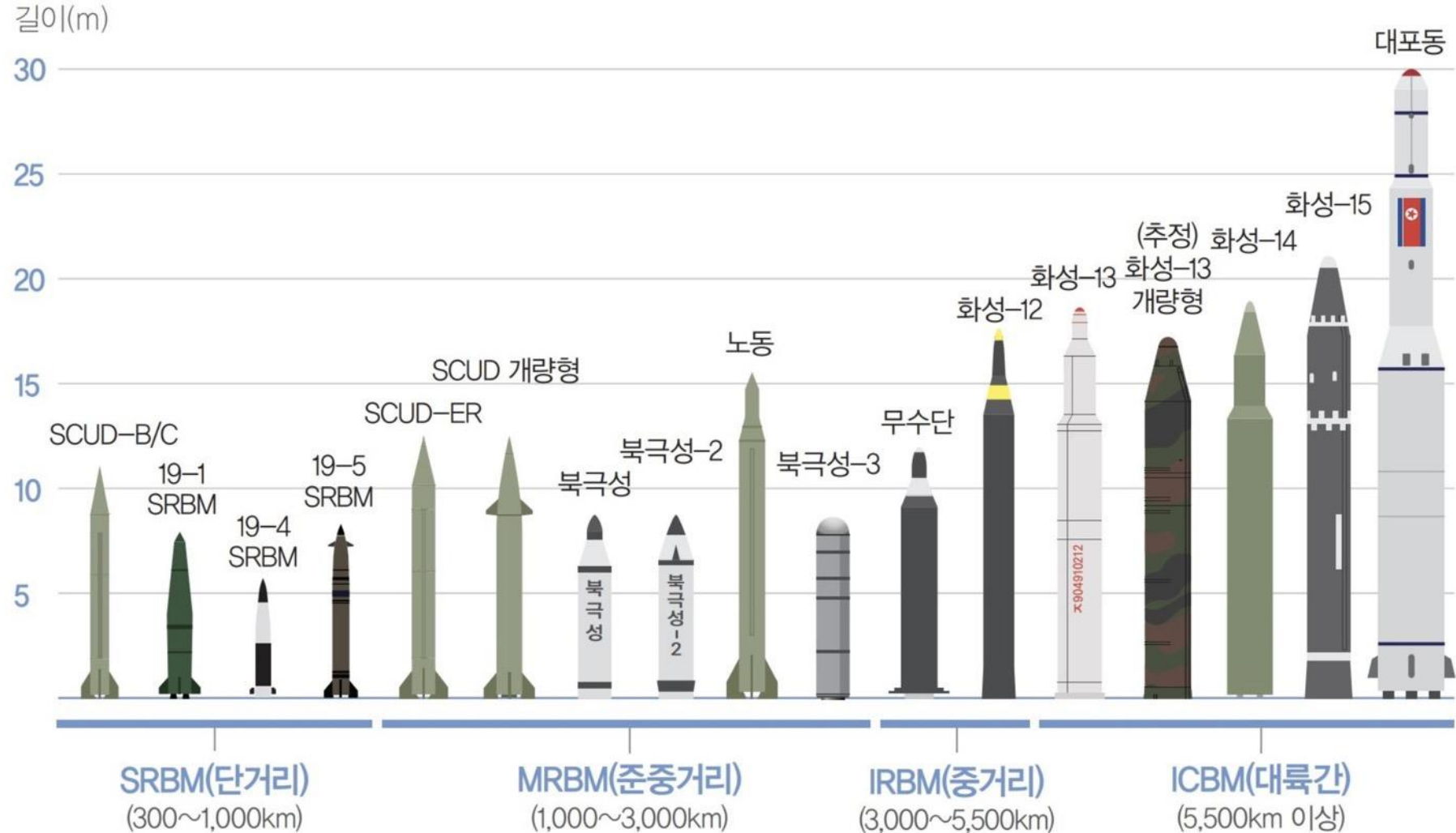


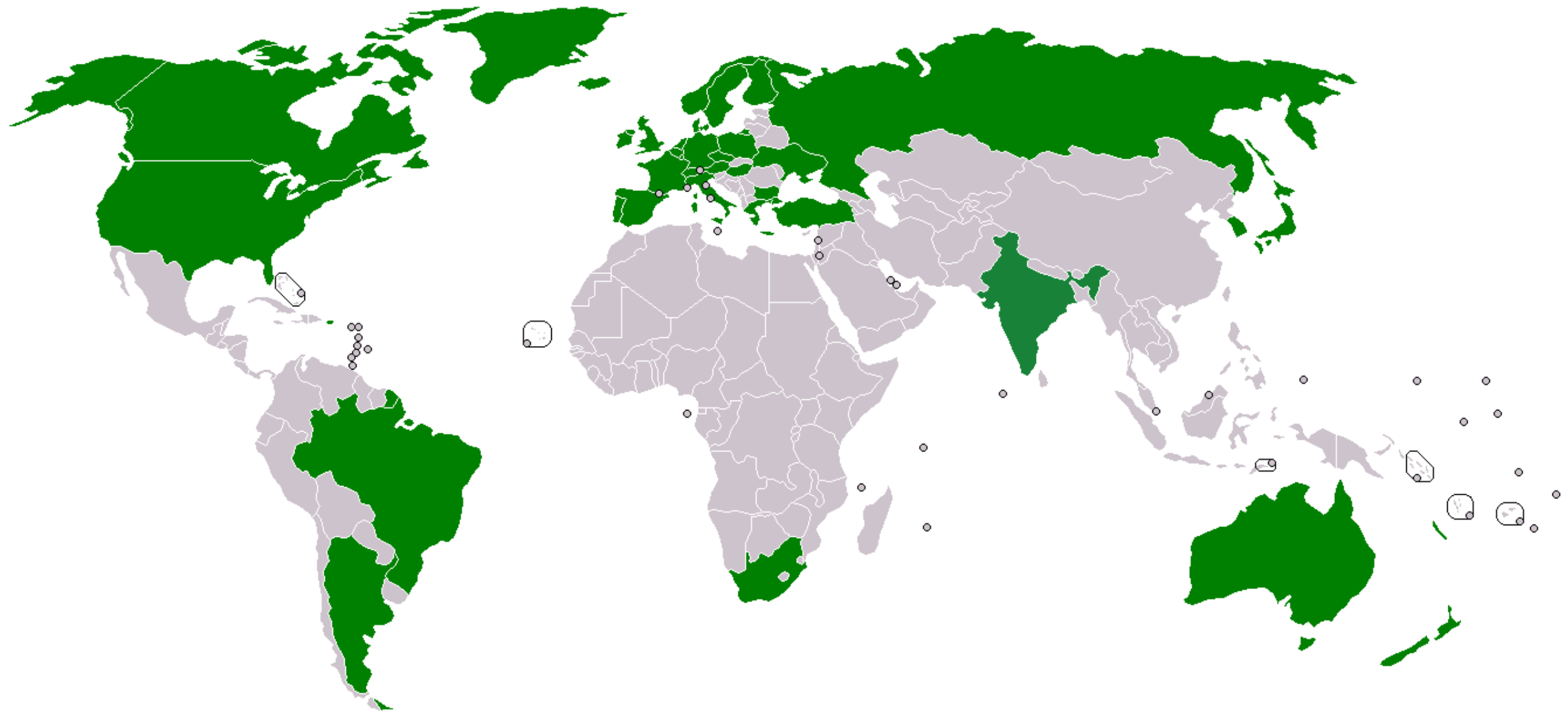
- Can carry chemical, biological, and nuclear warheads

- Potential sales to Iran, Libya and other Middle East states

How it's going ...

[도표 1-9] 북한이 개발 또는 보유 중인 탄도미사일 종류





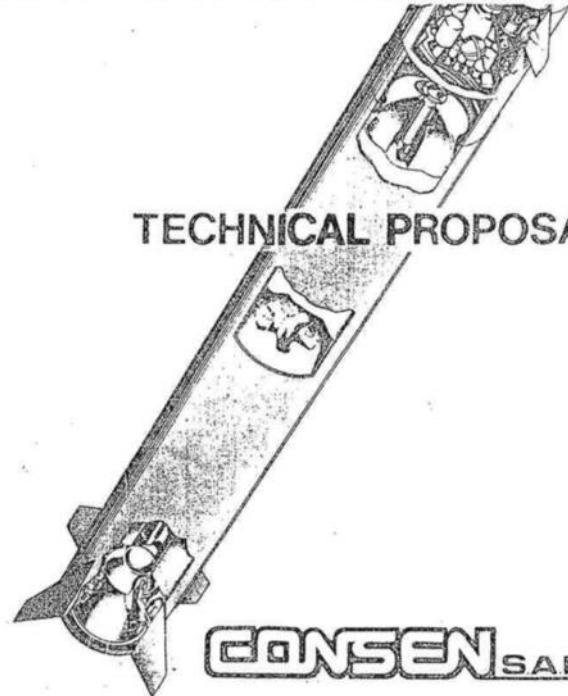
The MTCR was founded in 1987 by the members of the G-7. Today there are 35 members.

## MTCR CATEGORY I

- ◆ **Scope:** unmanned capability to deliver 500KG to 300 KM
- ◆ **Complete systems**
  - Rockets: Ballistic Missiles, Space Launch Vehicles, Sounding Rockets
  - Air Vehicles: Cruise Missiles, Target and Recon Drones



# THE CONCEPT DEFINITION & OUTLINE PLANNING FOR SUBS. DEVELOPMENT, FABRICATION AND F. TESTING OF A BALLISTIC TYPE MISSILE



TECHNICAL PROPOSALS

**CONSEN** SAM

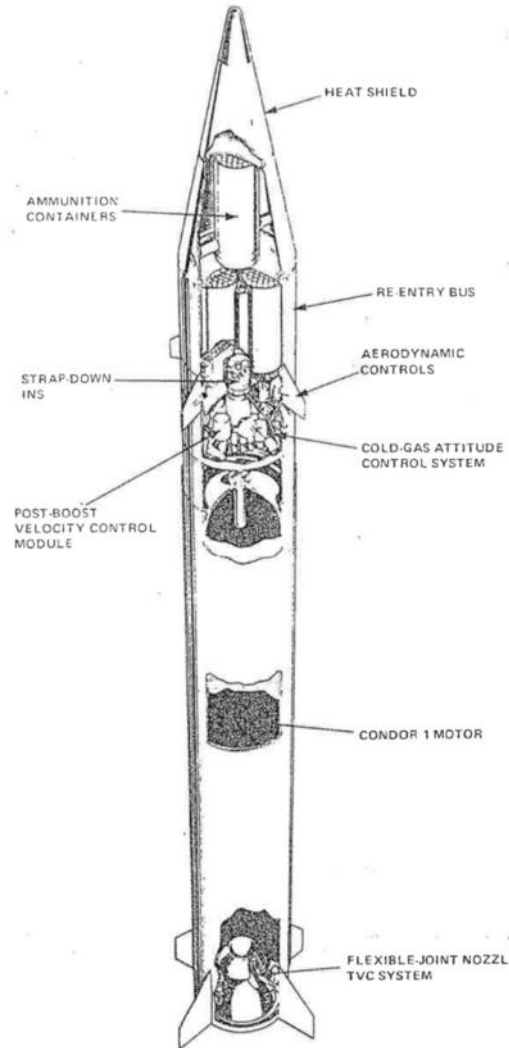
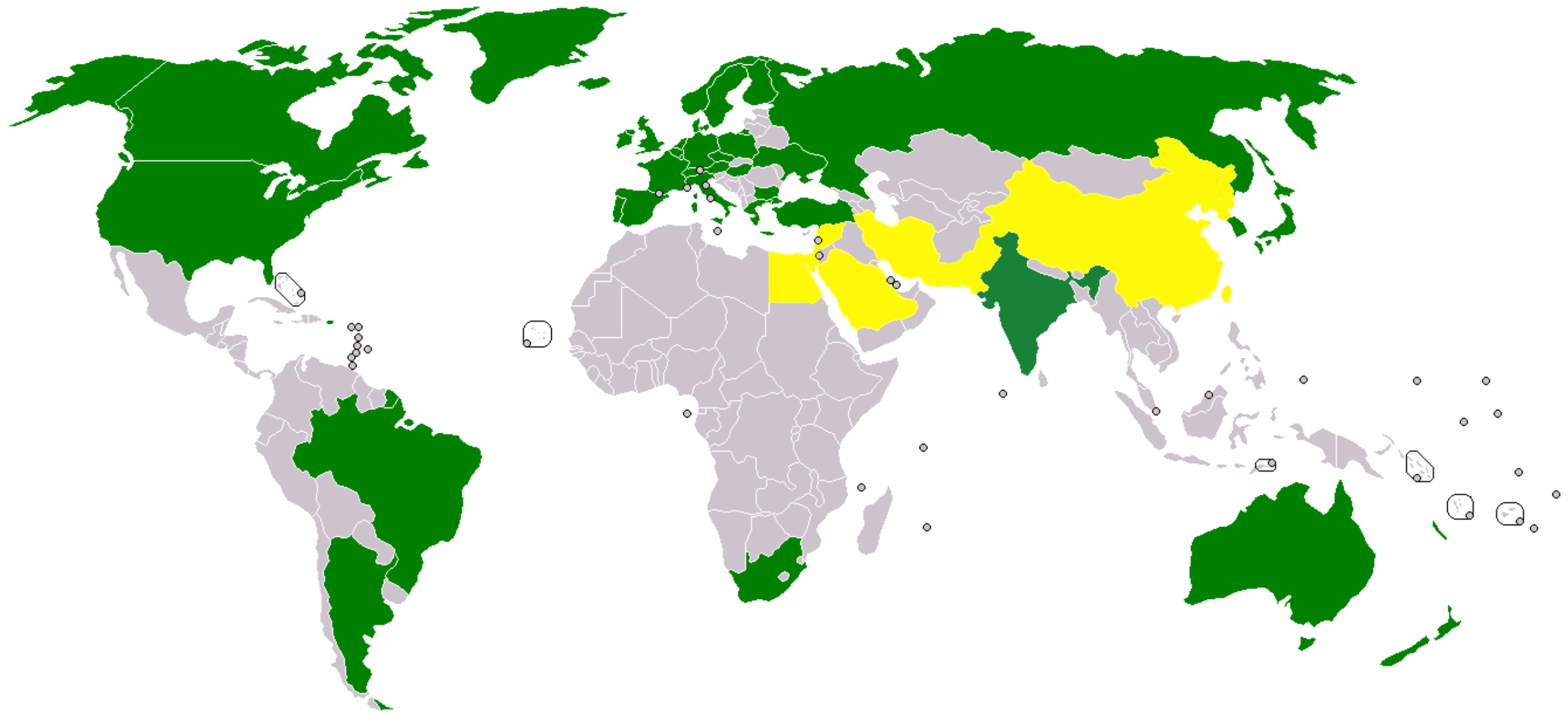


Fig. 1 Schematic Representation of Vehicle





In addition to the 35 members of the MTCR, there are nine additional countries with some level of domestic infrastructure to produce ballistic or cruise missiles.





## Deep in the Desert, Iran Quietly Advances Missile Technology



An Iranian facility 25 miles from Shahrud, Iran, where missiles testing is believed to be taking place. David Schmerler/Center for Nonproliferation Studies; Imagery via Planet Labs Inc.

By Max Fisher

May 23, 2018

When an explosion [nearly razed](#) Iran's long-range missile research facility in 2011 — and killed the military scientist who ran it — many Western intelligence analysts viewed it as devastating to Tehran's technological ambitions.



Department of Justice

U.S. Attorney's Office

Southern District of New York

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Thursday, November 14, 2019

## Iranian Businessman Sentenced To 46 Months In Prison For Violating U.S. Sanctions By Exporting Carbon Fiber From The United States To Iran

Geoffrey S. Berman, the United States Attorney for the Southern District of New York, and John C. Demers, the Assistant Attorney General for National Security, announced that BEHZAD POURGHANNAD was sentenced yesterday to 46 months in prison for participating in a conspiracy to export carbon fiber from the United States to Iran between 2008 and 2013. POURGHANNAD pled guilty on August 29, 2019, before United States Magistrate Judge Paul E. Davison. United States District Judge Vincent L. Briccetti imposed the sentence.

Manhattan U.S. Attorney Geoffrey Berman said: "Behzad Pourghannad conspired to circumvent U.S. export controls on carbon fiber, a substance with numerous military and aerospace applications. The significant sentence Pourghannad received should send a message that such violations, which threaten our national security, will incur stiff penalties."

Assistant Attorney General John Demers said: "Pourghannad falsified shipment documents and used front companies to export carbon fiber to Iran in violation of U.S. sanctions. Carbon fiber is used by the Iranian regime to further its nuclear, military, and aerospace programs. We continue to thwart the efforts of the Iranian regime to evade our sanctions and work steadfastly with our international partners to investigate, prosecute and bring sanctions violators to justice."





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**CNN EXCLUSIVE**

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Middlebury Institute of  
International Studies at Monterey  
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节点文献

### 捷联惯导系统的数据采集技术及初始对准研究

#### Research of Data Collecting Technique and Initial Alignment in Strapdown Inertial Navigation System

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【导师】 孙枫；  
【作者基本信息】 哈尔滨工程大学， 导航、制导与控制， 2002， 硕士

【摘要】 捷联式导航系统是惯性导航系统中的一种，它与平台式导航系统相比具有体积小、重量轻、成本低、可靠性高的特点，是今后惯性导航系统的发展方向。本论文的研究工作是以某项国家重大基础安全项目的部分研究内容为背景，以SIMU-123捷联惯性测量组件为基础，对捷联惯导系统中的两项关键技术进行初步的探讨，为进一步深入研究奠定基础。主要完成的工作如下：1. 捷联式惯导系统的数据采集电路的设计及相关采集软件开发。数据采集电路是惯性仪表和导航计算机之间的通讯接口。同时又由于数据采集系统是导航计算机与外界联系的一个界面，所以它又必须具有一定的抗干扰能力，它不仅是导航计算机的数据通讯接口，也是导航计算机的干扰隔离面。本文从系统的原理、器件的选取、硬件的设计及软件的开发到调试运行，介绍了完成捷联惯导系统的12通道高速数据采集系统的研制过程。从该采集系统的使用情况来看，证明该系统的原理及设计是切实可行的，并且完全满足捷联式惯性导航系统的要求。本着软件编程模块化的原则，在DOS环境下采用C语言编程，开发的数据采集程序模块，为以后嵌入整个系统程序中奠定基础。2. 捷联式惯导系统初始对准方法的研究。初始... [更多](#)

【Abstract】 Strapdown INS is a type of Inertial Navigation Systems. Compared with Platform INS, Strapdown INS has the advantages of low volume, low weight, low cost and high reliability. Strapdown INS leads the trend of INS. The thesis stems from part of a certain national key fundamental security project, and, based on SIMU-123, deals with two key techniques of Strapdown INS in order to pave the way for further research. Main work done is as follows: 1. Design of data-collecting electronic circuit of the ... [更多](#)

【关键词】 捷联惯导系统； 数据采集； 初始对准；  
【Key words】 Strapdown INS； data collecting； initial alignment；

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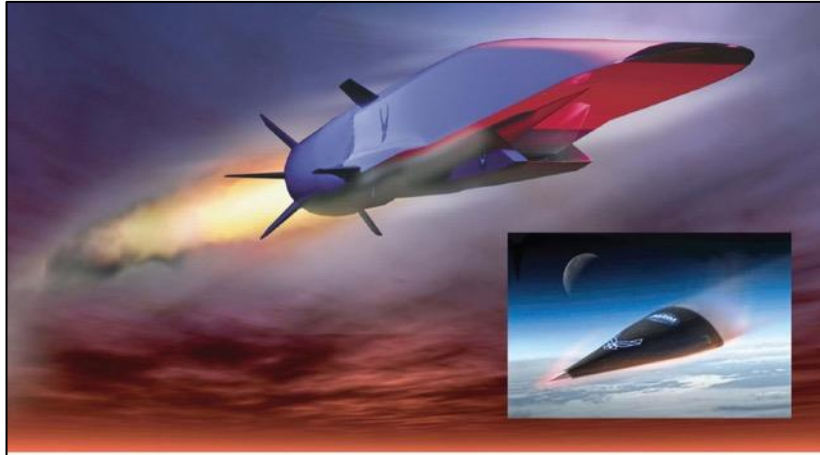




**Table 1**

**Design and performance parameters of small gas turbine engines [8, 11, 12, 15, 16, 21]**

<b>Manufacturer</b>	<b>Model</b>	<b>Thrust [kN]</b>	<b>RPM</b>	<b>Pressure Ratio</b>	<b>TIT [° C]</b>	<b>SFC [(kg/s)/kN]</b>	<b>Thrust/ Weight</b>	<b>ST [kN.s/kg]</b>
<b>Turbomeca</b>	Arbizon III	3.70	-	5.5	-	-	3.28	0.62
	Arbizon IIIB2	4.02	33000	5.85	816	0.032	3.56	0.67
	Arbizon IIID	4.16	33000	5.85	816	0.031	3.69	0.70
<b>Williams International</b>	F107-WR-101	2.83	-	13.8	954	0.019	4.37	0.46
	F107-WR-400	2.67	-	13.8	954	0.019	4.17	0.43
	F112-WR-100	3.30	-	-	954	-	4.61	-
<b>Microturbo</b>	TRI 60-1	3.50	-	3.7	1010	0.033	7.28	0.60
	TRI 60-2	3.70	-	3.8	1010	0.036	-	0.60
	TRI 60-5	4.20	-	4.1	1010	0.037	8.08	0.65
	TRI 60-20	5.40	-	6.3	1010	0.032	-	-
	TRI 60-30	5.70	-	6.3	1010	0.029	9.53	0.70
<b>Teledyne CAE</b>	J403-MT-400	4.00	-	5.5	-	0.037	7.70	-
	J402-CA-400	2.90	41200	5.6	-	0.034	6.43	0.66
	J402-CA-700	2.80	40400	5.5	-	0.034	5.60	0.65
	J402-CA-701	3.20	42000	6.2	-	-	-	-
	J402-CA-702	4.20	41500	8.5	-	0.029	6.85	0.68
<b>Motor Sich</b>	MS 400	3.92	-	-	-	0.024	4.70	-
<b>HAL</b>	PTAE-7	3.72	29500	4.65	-	0.033	5.83	0.56
<b>Mitsubishi</b>	TJM4	2.84	-	6.7	-	0.032	5.19	-



# Hypersonic Missile Nonproliferation

Hindering the Spread of a New Class  
of Weapons

Richard H. Speier, George Nacouzi, Carrie A. Lee, Richard M. Moore



# Penaid Nonproliferation

Hindering the Spread  
of Countermeasures Against Ballistic  
Missile Defenses

Richard H. Speier, K. Scott McMahon, George Nacouzi