

Project Mindset – Powering the Nation’s Development

*Inaugural Address in
One Day Conclave on
Project Mindset – The Key to Competitiveness*

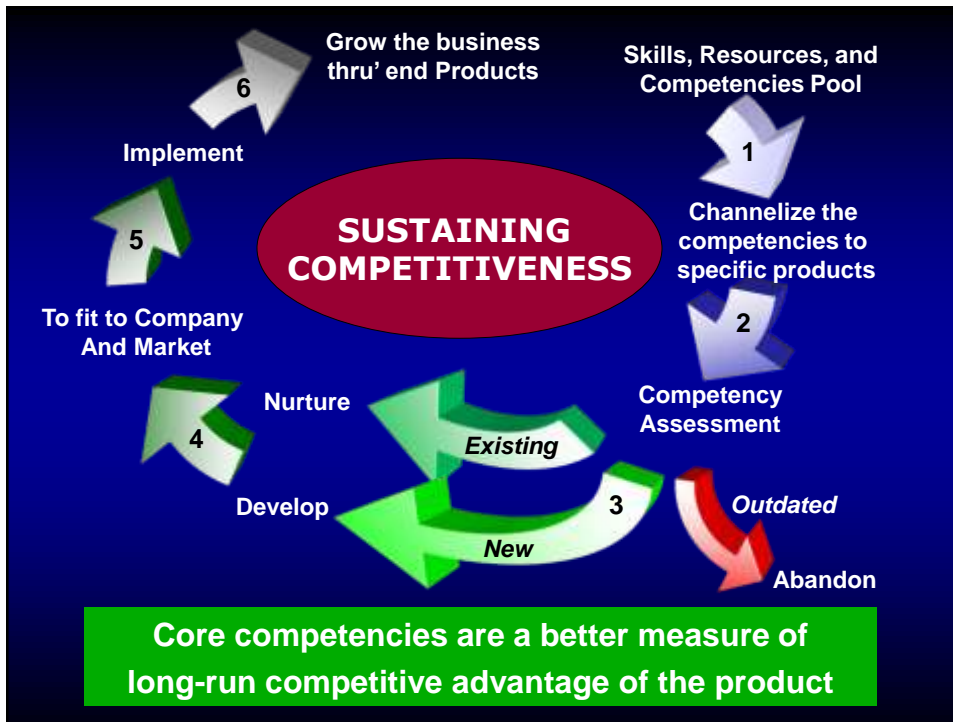
BY

Dr. A. SIVATHANU PILLAI

Former Chief Controller (R&D) DRDO
Founder CEO&MD, BrahMos Aerospace
Visiting Professor, Indian Institute of Science

11 November 2014



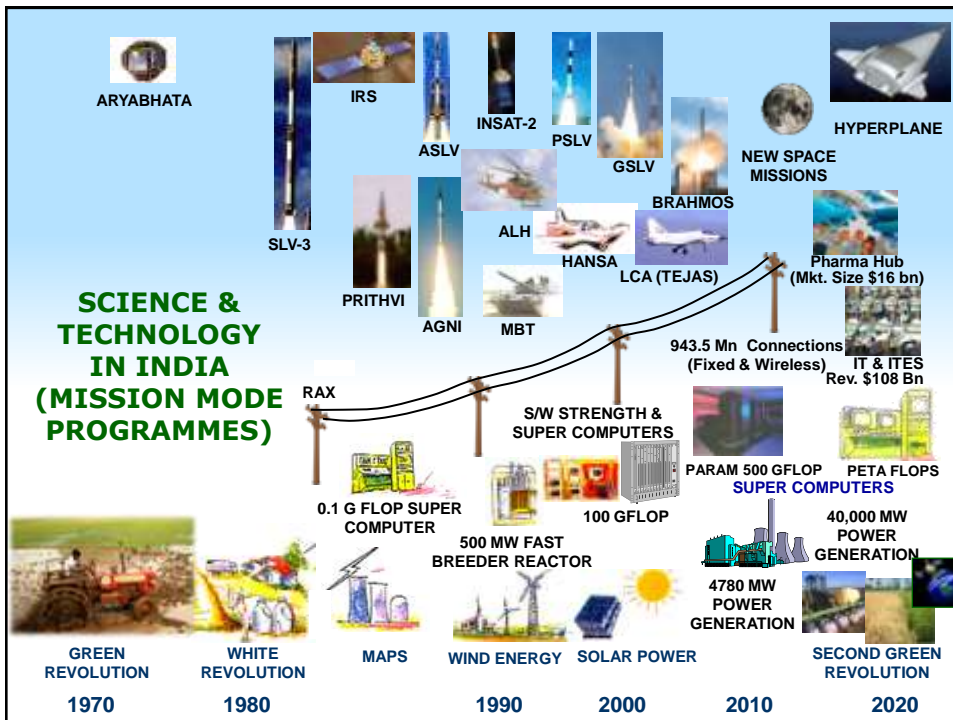
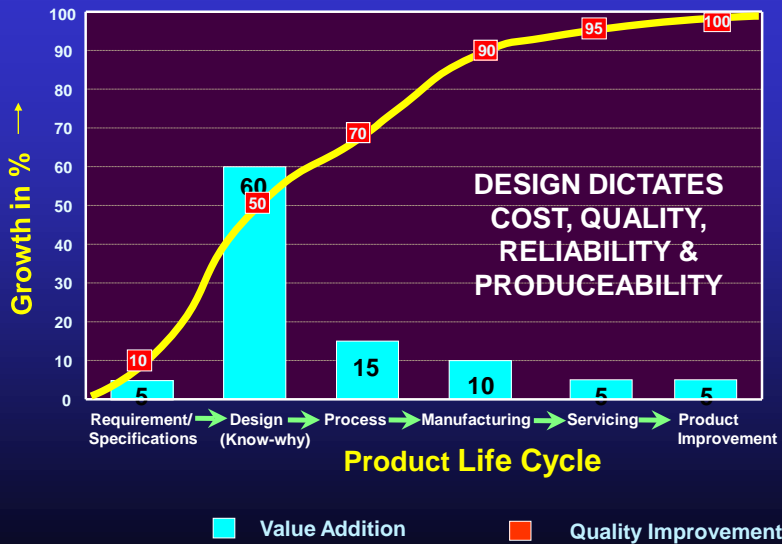


CORE COMPETENCE

Skills, characteristics and assets that make the Organization unique from competitors.

It fuels innovation, creative thinking and leadership to achieve competitive advantage to the organisation in formulating products for the future.

ENHANCING COMPETENCIES BY DESIGN KNOWLEDGE



EVOLUTION OF NUCLEAR INDIA



H.J. Bhabha

1/3rd of World Reserves of Thorium in India



KOODANKULAM

URANIUM SUPPLY FROM NSG





POKHRAN II, PEACEFUL NUCLEAR EXPLOSION

NUCLEAR WEAPON STATE

NUCLEAR POLICY

- NO FIRST USE
- NO USE AGAINST NON-NUCLEAR COUNTRIES
- MINIMUM CREDIBLE DETERRENT



Accelerator Driven System (ADS)



FUEL REPROCESSING PLANT

POWER GENERATION

PRESENT 4780 MW

BY 2020 40000 MW



FAST BREEDER TEST REACTOR



PRESSURISED HEAVY WATER REACTOR

- NUCLEAR AGRICULTURE, FOOD IRRADIATION
- WATER MANAGEMENT
- NUCLEAR MEDICINE
- SPIN-OFF TECHNOLOGIES (SUPER COMPUTER, ROBOTIC SYSTEMS etc.)

Present 2020

WORLD'S FIRST WAR ROCKET

TIPU'S WAR AGAINST BRITISH (SRIRANGAPATNA 1792)



Indian rocket barrage defeats British cavalry attack in 1792



- IRON CASE
- 2 KG GUN POWDER
- LENGTH : 250 MM
- DIAMETER : 60 MM
- GUIDER : SWORD BLADE (1 M LONG)
- RANGE : 1.0 KM

BIRTH OF ROCKET SCIENCE



Royal Artillery Museum, Woolwich (Original Rockets used in War)


INDIA'S SPACE INITIATIVE BY A GREAT VISIONARY LEADER



FATHER OF INDIAN SPACE PROGRAMME




ATK-6




Symphony
STEP




SLV




SLV SYN




1st launch of Nike Apache on 21st Nov 1963




ROHINI-75 Rocket




SITE Programme



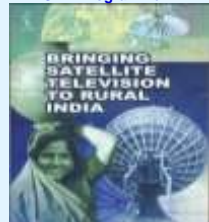
Dedicating TERLS to World



Magnetic Equator (THUMBA)



Space activities started in St. Mary Magdalene Church, Thumba (1963)




BRINGING SATELLITE TELEVISION TO RURAL INDIA




10 YRS SPACE PROFILE

DIRECTIONS FOR THE FUTURE

Space is the potential resource for the development of India




Dr. Sarabhai



Prof. Dhawan


INDIA'S SPACE PROFILE




EVOLUTION OF LAUNCH VEHICLES

Sounding Rockets | SLV-3 First Sat. Launch Vehicle | ASLV | PSLV | GSLV | GSLV MARK II

1960s | 1970s | 1980s | 1990s | 2000s | 2010s




Moon Mission (Chandrayaan-1)



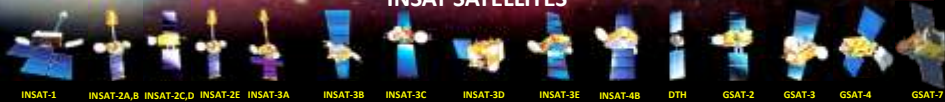
Mars Mission

REMOTE SENSING



Bhaskara | RS-D1 | IRS-1A/1B | IRS-P2 | IRS-P3 | IRS-1C/1D | IRS-P4 | IRS-P6 | MEGHA TROPICS | IRS-P5 | CARTOSAT-2A | OCEANSAT | CARTOSAT-2B | RISAT-1 | IMS-2A

INSAT SATELLITES



INSAT-1 | INSAT-2A,B | INSAT-2C,D | INSAT-2E | INSAT-3A | INSAT-3B | INSAT-3C | INSAT-3D | INSAT-3E | INSAT-4B | DTH | GSAT-2 | GSAT-3 | GSAT-4 | GSAT-7

- Self-Reliance in launch vehicles & satellites
- Cost effective launch vehicle service
- Space Tech. applns. for national development
- Capability to launch multiple satellites
- Satellite Recovery capability for re-entry mission
- Global competitive space power

MARS ORBITER MISSION



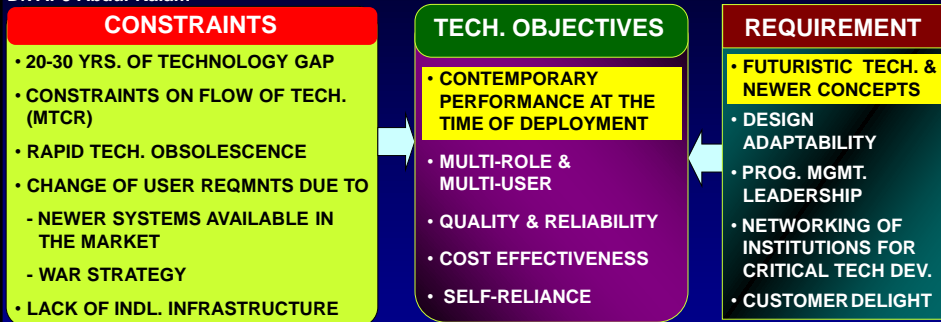
PAYLOAD (15 kg)	PRIMARY OBJECTIVE
Lyman Alpha Photometer (LAP)	Escape processes of Mars upper atmosphere through Deuterium/Hydrogen
Methane Sensor for MARS (MSM)	Detect presence of Methane
Martian Exospheric Composition Explorer (MENCA)	Study the neutral composition of the Martian upper atmosphere
MARS Colour Camera (MCC)	Optical imaging
TIR imaging spectrometer (TIS)	Map surface composition and mineralogy



Dr. APJ Abdul Kalam

EVOLUTION OF INDIA AS A MISSILE POWER

(IGMDP - JULY 1983)



PRITHVI (SRBM)



AGNI (IRBM)



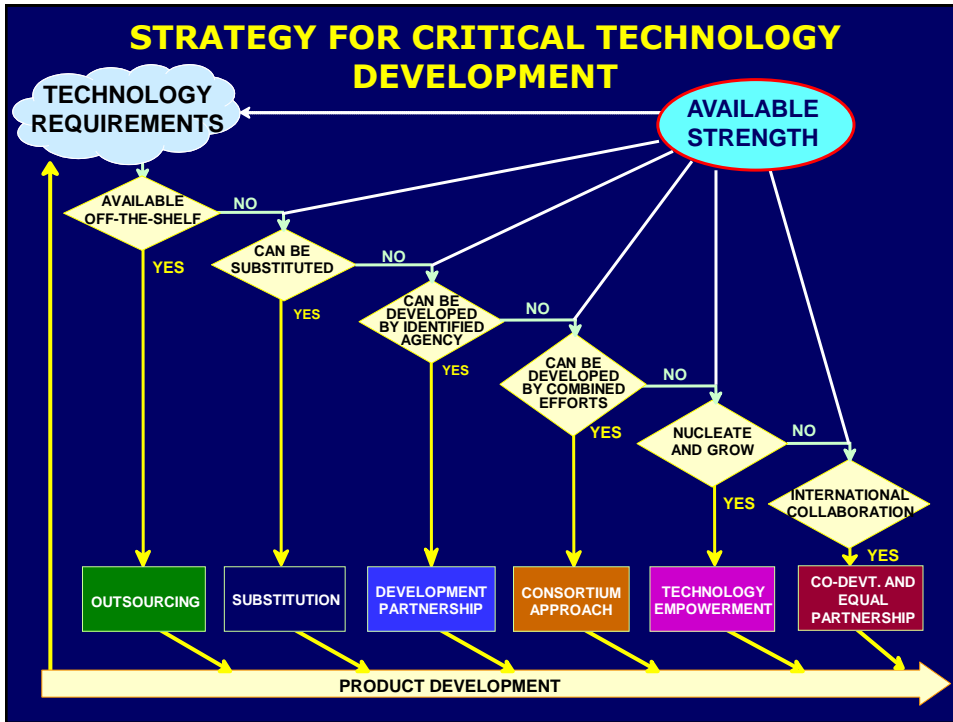
NAG (3RD GEN. ATGM)



AKASH (AREA DEFENCE SYS.)



TRISHUL QUICK REACTION, AIR DEFENCE MISSILE



AGNI PROGRAMME

Agni II

L (m)	20
Dia (m)	1
Launch Wt (T) (Incl. Payload)	16
Range (km)	2000

Agni III

L (m)	16.7
Dia (m)	2
Launch Wt (T) (Incl. Payload)	48.3
Range (km)	3500

Agni V

L (m)	17.5
Dia (m)	2
Launch Wt (T) (Incl. Payload)	50
Range (km)	5000

Agni I

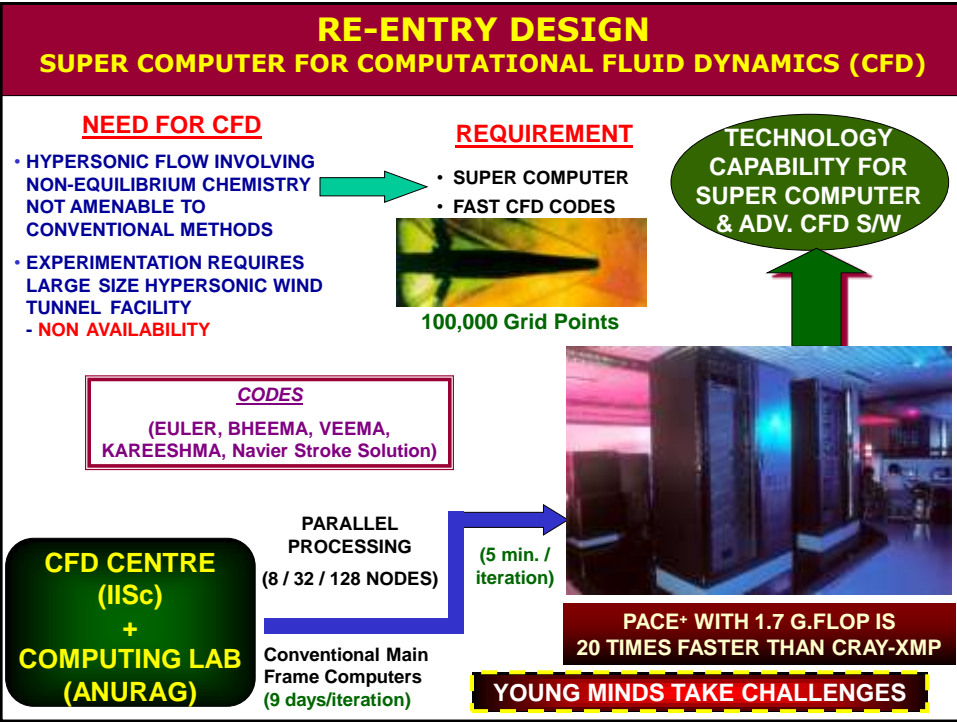
L (m)	15
Dia (m)	1
Launch Wt (T) (Incl. Payload)	12
Range (km)	700

Agni IV

L (m)	20
Dia (m)	1
Launch Wt (T) (Incl. Payload)	17
Range (km)	3000

AGNI-V

Range: 5,000km



REALISATION OF CRITICAL TECHNOLOGIES



RE-ENTRY / CFD



SUPER COMPUTER



SEEKER



IMAGE PROCESSING



C-C NOSE TIP



ANUSIG



ANUPAMA PROCESSOR



COMPONENTS & DEVICES



Phased Array Radar



CERAMIC RADOME MATERIALS / COMPOSITES



3D CAR



RL GYRO



GUIDANCE & CONTROL



GATEC



SITAR

TECHNOLOGY DENIED IS TECHNOLOGY GAINED. MTCR COMBATED
..... Many More

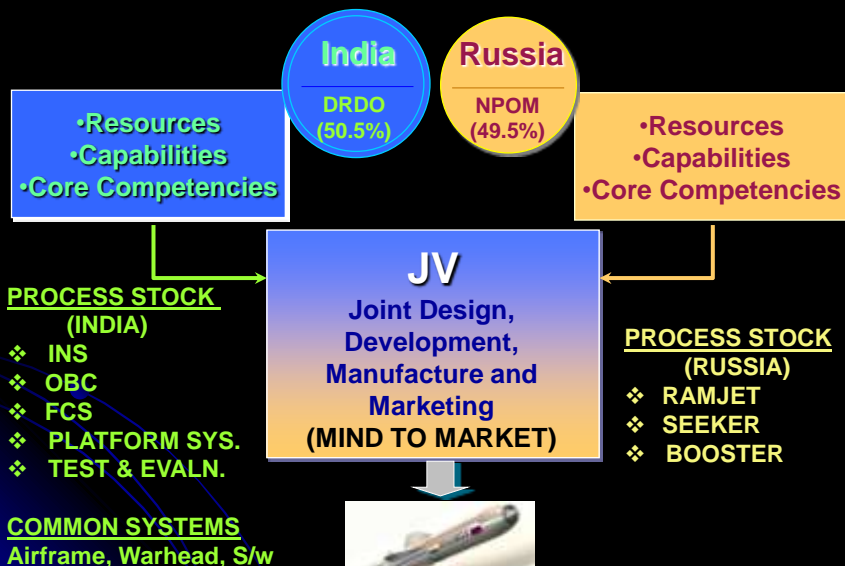
FORMATION OF BrahMos JOINT VENTURE

- JV formed thru' an IGA on 12th Feb 1998 with DRDO & NPOM as Shareholders with authorised capital of \$250 million at the ratio of 50.5:49.5.



- Tripartite Agreement signed between DRDO, NPOM & BrahMos identifying the share of work & Process Stocks based on the core technological strength

TECHNOLOGY COLLABORATION PARTNERSHIP



BRAHMOS UNIVERSAL MISSILE SYSTEM

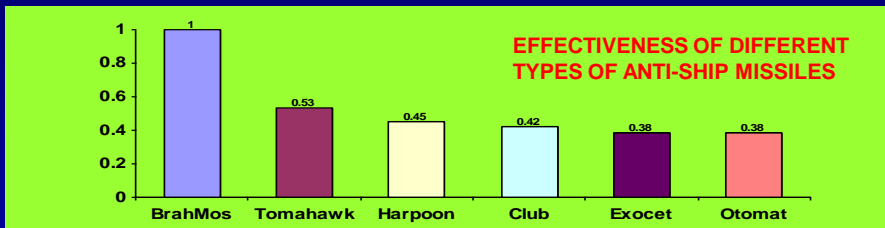
<h3>MULTI PLATFORM</h3>  Aircraft  Silo  Submarine  Vertical Launch  Mobile Autonomous Launcher  Inclined Launch  Naval Warship	 <p>SPECIFICATION Range : 300 Km Speed : 3 Mach</p>	<h3>MULTI TARGET</h3>  Frigate  Corvette  Command Centre  Ammunition Dump  Railway Yard  Airbase  Bridges
<h3>MULTI TRAJECTORY</h3>  <p>High altitude trajectory Low altitude trajectory 290 km</p>		
<h3>DIVERSE ENVIRONMENT</h3> <ul style="list-style-type: none"> - SNOW/MOUNTAIN - DESERT - TROPICAL 		

BRAHMOS

<h3>NAVAL VERSION</h3>  Inclined Launch  Vertical Launch  U/W Launch <p>Launch from Surface Ship Sea to Sea Sub Sea to Sea System Installed in 8 Ships Sea to Land Land to Sea</p> <p>READY FOR DEPLOYMENT</p>	<h3>AIR VERSION</h3>  <p>DEVELOPMENT COMPLETED</p>  Nose Cap  Fins  Booster  Launcher <p>FLIGHT TRIALS IN 2014</p>
<h3>ARMY VERSION</h3>  BRAHMOS BLOCK II Land Target with manoeuvring and target-seeking capability  BRAHMOS BLOCK III High manoeuvring and target-seeking capability  Steep Dive Capability Established <p>Applications: Land to Land Desert Warfare and Urban Warfare Applications: Land to Land Mountain Warfare Surgical Strike Capability</p> <p>2 REGIMENTS OPERATIONAL</p> <p>READY FOR DEPLOYMENT</p>	

TOMAHAWK Vs. BRAHMOS

	TOMAHAWK	BRAHMOS
Speed	0.8 Mach	2.8 Mach
Time to hit the target	1 unit	1/3 rd (Faster engagement)
Kinetic Energy	1 unit	9 times. (High Destructive Power)
Target Dispersion (Moving targets)	1 unit	1/3 rd (Probability of hit is high)
Reaction Time	1 unit	1/3 rd (Pierces the Defence)
Universality	Nil	Same system for sea & land targets
Salvo	3 sec	2.5 - 3 Second interval on multiple targets (Land and Sea)



BRAHMOS – WORLD LEADER IN CRUISE MISSILE FAMILY

BrahMos Missile Industry Complex A Blend of Public – Private Enterprises

DRDO – System Engg, Missile integrn, Flight Testing
L&T, Mumbai – Radome, Composite Airframe, Canister, Launcher, FCS
G&B, Mumbai - Metallic Airframes, Pneumo-Hydraulics, Mobile Autonomous Launcher
HAL, Hyd. & Korwa – INS
Ananth Tech – OBC, MIU, PCM Encoder
Astra M/W – Transmitter
Data Patterns – FCS, COE
ECIL, Hyd – Commn. Eqpt. & MCP
BHEL – Launcher
BEML – Vehicles
OFB/DRDO – Warheads, Propellants, Pyros
BATL – Pneumatics, Control, Airframes, Booster, Integration
HEB, Trichy – Batteries

INDUSTRIAL GAIN

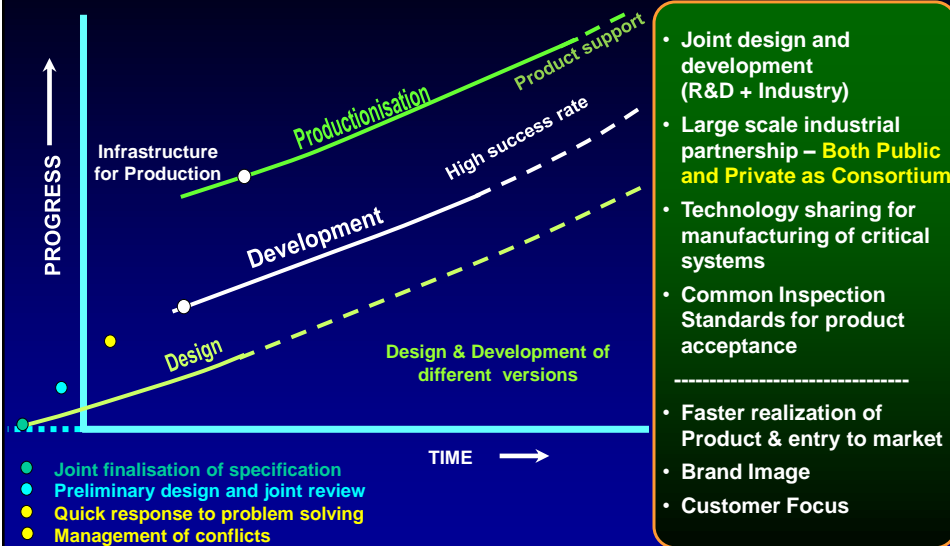
- Participation of Consortium of Pub. and Pvt. industries
- Cutting edge manufacturing technologies & processes
- Expertise in precision manufacturing
- High quality & reliable systems/subsystems mfg.

Human Resources:
20000 Specialists
Industries : > 205

INTEGRATION COMPLEXES

DELIVERIES TO USER (ARMY, NAVY & AIR FORCE)

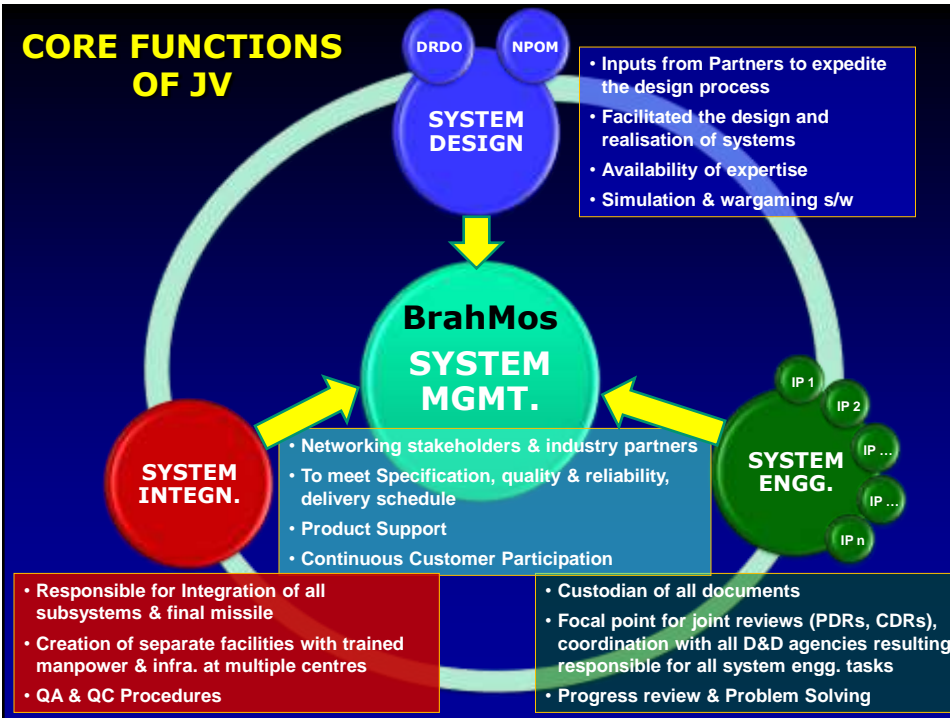
CONCURRENT DESIGN, DEV. & PRODUCTIONISATION - NETWORKING INDUSTRIES & COMPETENCIES



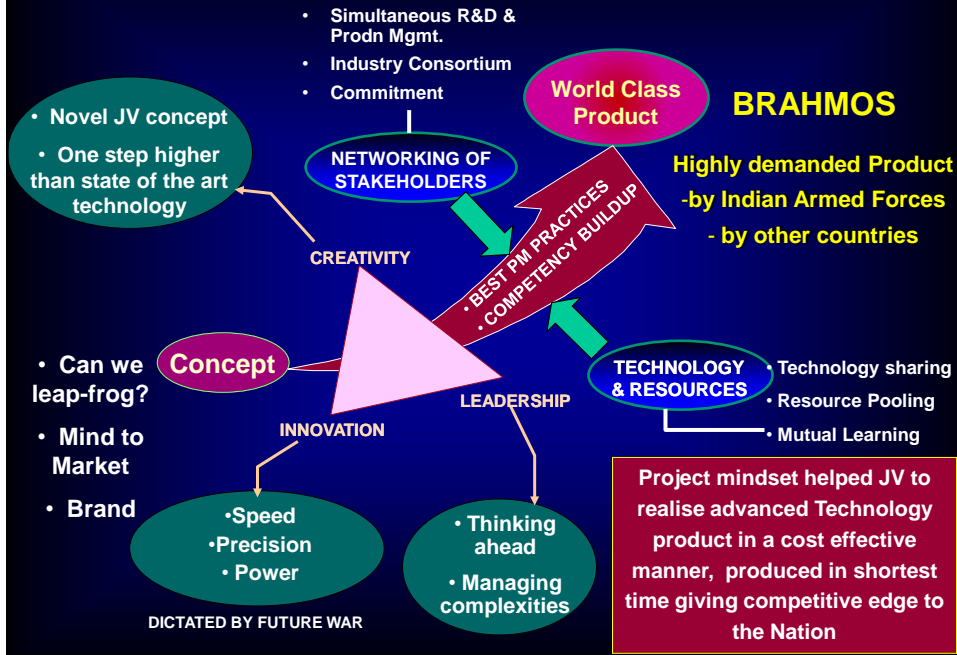
- Joint design and development (R&D + Industry)
 - Large scale industrial partnership – **Both Public and Private as Consortium**
 - Technology sharing for manufacturing of critical systems
 - Common Inspection Standards for product acceptance
-
- Faster realization of Product & entry to market
 - Brand Image
 - Customer Focus

Brand image, timely delivery and perceived quality are three game-changers in maintaining competitiveness

CORE FUNCTIONS OF JV



BRAHMOS - GLOBALLY COMPETITIVE PRODUCT

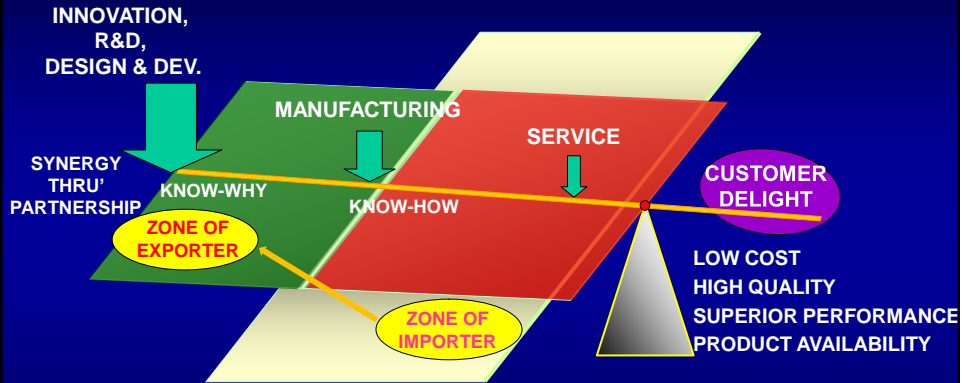


INDIA - RUSSIA JV BrahMos – A ROLE MODEL



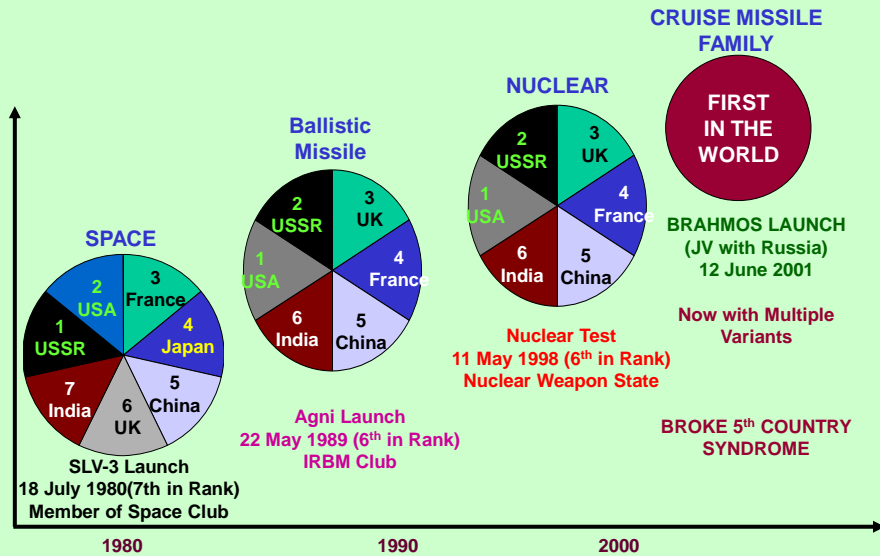
COMPETITIVE EDGE

PRODUCT LEADERSHIP THROUGH INNOVATION



PM PRACTICES HELPED JV TO LEAP-FROG IN TECHNOLOGY COMPETENCE TO OVERTAKE DEVELOPED COUNTRIES

GROWTH TRAJECTORY OF INDIA'S STATUS IN STRATEGIC SECTOR



MISSILE POWER

LONG RANGE BALLISTIC MISSILES



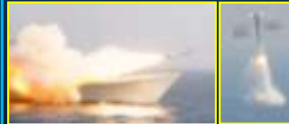
700 TO 5000 KM

SHORT RANGE BALLISTIC MISSILES



300 TO 700 KM

CRUISE MISSILE (STRIKE WEAPON)



BRAHMOS

LAND TO LAND
 LAND TO SEA
 SEA TO SEA
 SEA TO LAND
 UNDERWATER
 AIR TO GROUND

AIR DEFENCE



BALLISTIC MISSILE DEFENCE



TACTICAL MISSILES



BRAHMOS

Venturing into the Hypersonic World

...where Speed is the POWER!

There is nothing like a dream to create the future.

SUDHARSHAN CHAKRA

LEADER MUST HAVE NOBILITY IN ACTION



Prof. Satish Dhawan
Chairman, ISRO

SLV-3 E-01
(10 Aug 1979)

1st stage performed as planned & 2nd stage control system failed

REASON

Solenoid valve did not close resulting in RFNA Leaking. Absence of colour monitor resulted non identification of red fumes

LESSON

Requirement of clean, dust-free environment during assembly of control components & systems
Increased tools for observation at launch pad

Took full responsibility for the failure
Attended the press conference without PD



SLV-3 E-02
(18 Jul 1980)

2nd flight was total success placed Rohini Satellite in the orbit

LESSON

Strict Quality Control & QA Procedures based on Master Quality Assurance Plan, T&E and Systematic checkout at every stage ensured good performance

To convey success, press conference was attended by PD

LEADER MUST HAVE COURAGE TO TAKE DECISIONS



Indira Gandhi



Nuclear Test 1974



Nuclear Tests 1998



PV Narasimha Rao & AB Vajpayee



- Preparations were ready for tests in 1995 on orders from Shri PV Narasimha Rao
- Tests could not be carried out due to international pressure
- In 1996, Shri Rao, PM calls Shri Vajpayee, PM Designate and tells him about the details and advised Shri Vajpayee to go ahead with the tests
- Both the leaders considered **NATION** is bigger than them

LEADER WITH PASSION TRANSLATES VISION TO REALITY - WHITE REVOLUTION



**VARGHESE KURIEN
SCIENTIFIC &
PROFESSIONAL MGMT.
THAT ESTABLISHED
DIRECT LINKAGE
BETWEEN PRODUCER
AND CONSUMER**

- ACHIEVED SELF SUFFICIENCY IN MILK PRODUCTION THRO' COOPERATIVE MOVEMENT
- LARGEST PRODUCER OF MILK IN THE WORLD (140 mn. tonnes)
- LARGEST POPULATION OF CATTLE IN THE WORLD
- FUTURE OF INDIAN DAIRY INDUSTRY: To establish long term export that benefit dairy industry:
 - maintain the current growth rate of milk production
 - remain globally competitive



LEADER MUST HAVE TRANSPARENCY & INTEGRITY IN ACTIONS



E. Sreedharan



World Class Metro Rail System for Delhi

Phase I Network	-	65 kms Length (58 stations)
Phase II Network	-	124.63 kms Length (85 Stations)
Project Cost	-	Rs.19,131 Crs
No. of Passengers	-	2 million (10% of Delhi Population)
Land Availability	-	Smooth Land Acquisition

Project Executed in time without any difficulty to the people/transportation

VISIONARY LEADER WHO TURNED INDIA AN INDUSTRIAL NATION




- FOUNDER OF STEEL INDUSTRY IN INDIA, BANKING, POWER AND MANY OTHERS
- ESTABLISHED INDIA'S MOST ADVANCED SCIENCE INSTITUTE (IISc)
- GUIDED THE DESTINY OF INDIA'S LARGEST BUSINESS HOUSE




NOW: TATA STEEL BUYS CORUS




INDIA - A STEEL GIANT




INDIA'S PROSPERITY DYNAMICS

PROSPERITY & STRENGTH

GREAT SCIENTIFIC THOUGHTS & KNOWLEDGE

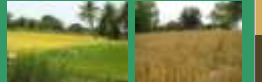


Astronomy, Algebra, Atomic theory, Aviation, cosmology, medical etc




INDUS CIVILIZATION

- Sc. Thoughts
- Knowledge
- Civilization
- Society
- Agriculture
- Happiness

AGRICULTURE AGE




PERIOD OF SUCCESSIVE INVASIONS






Alexander Babur British

INDUSTRIAL AGE - REVOLUTION IN WEST



KNOWLEDGE TECHNOLOGY



KNOWLEDGE AGE

INFO. AGE (Services)

Thrust for Industry Growth

Economy Revival (1991)

Rich Availability of:

- Natural Resources
- Biodiversity
- 580 mn Youth

Developed Status

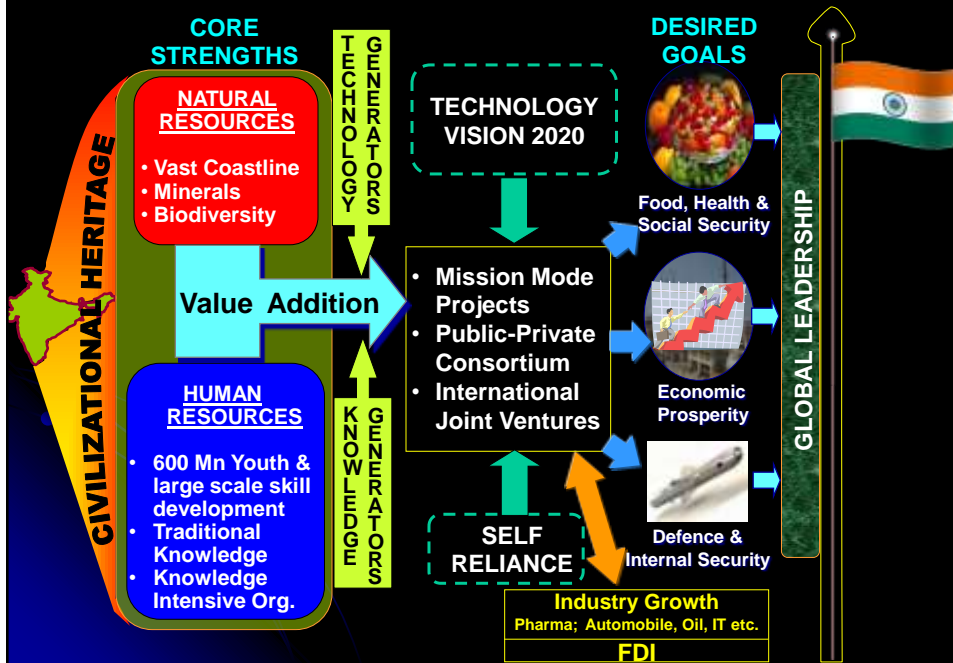
~ 5000 yrs 1947 2000 2020

INDEPENDENT INDIA

18



Project Mindset Can Transform INDIA A Global Leader



PROJECT MINDSET BLOSSOMS

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