



# Torpedo & Directed Energy Weapons Indian Navy Perspective



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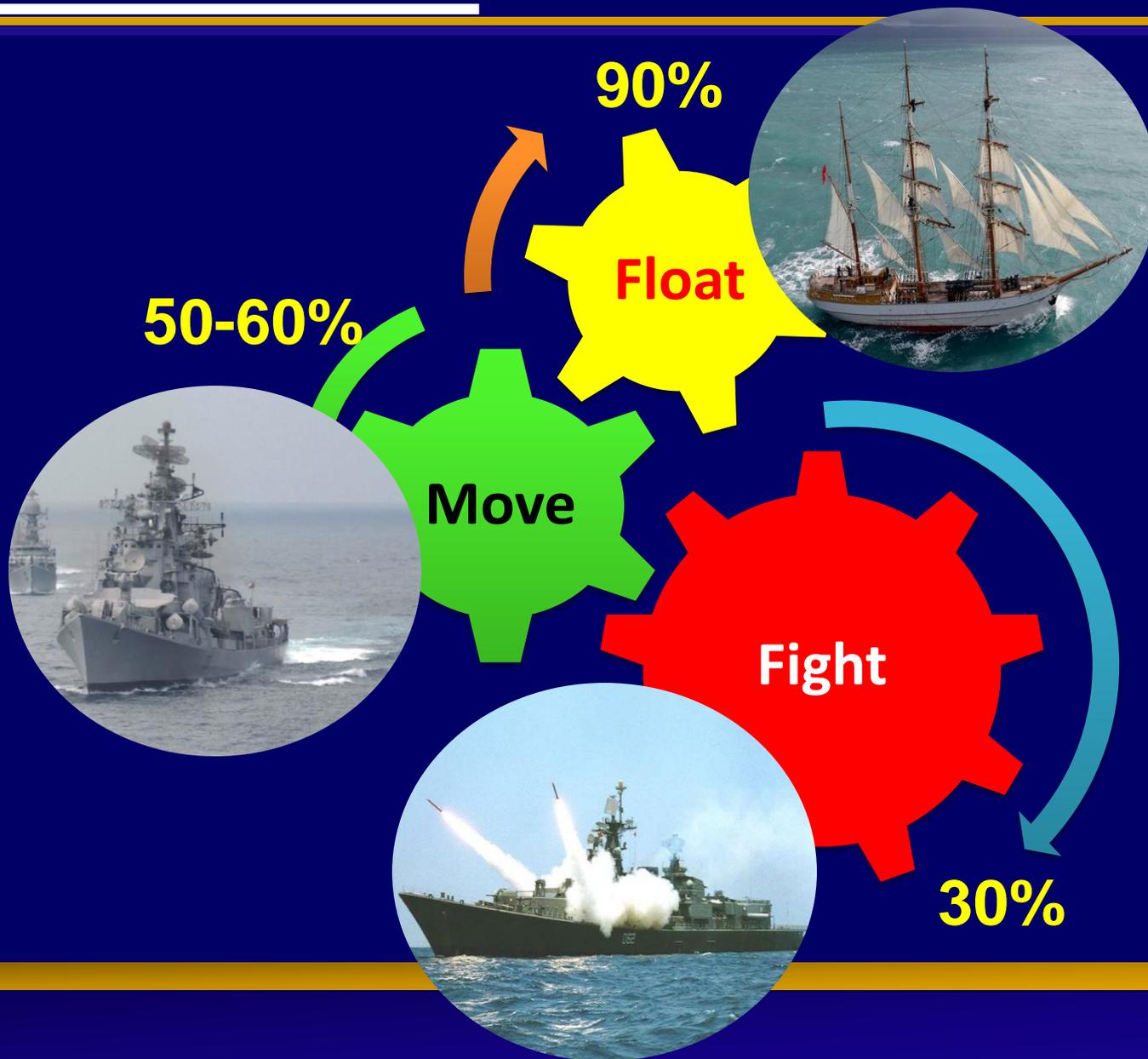


**IN** supporting  
Indigenisation

**IN**  
Indigenisation  
Plan 2015-30

Maritime Cap  
Perspective  
Plan

# Self-Reliance



# Scope



- Torpedo & Directed Energy Weapons
  - Technological advancement
  - Availability
- QRs for Torpedo & DEWs
- Way Ahead



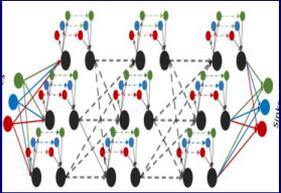


# **Advancement in Torpedo Technology**



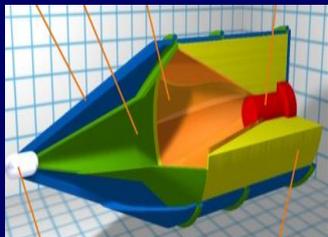
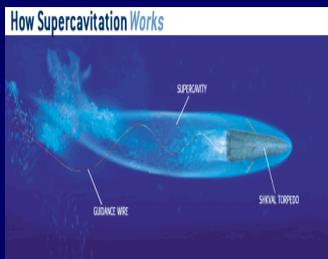
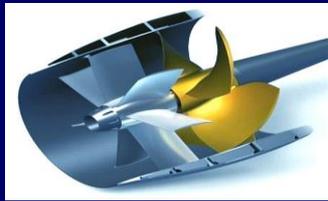
## Advancement in Torpedo Technology Contd...

- Broadband sonar, multi-beam & INS
- Multi target tracking capability
- S/W based & high speed sig processing
- Re-programmable S/W & search pattern
- ACCM features
- Digital servo and retractable controls





## Advancement in Torpedo Technology Contd...

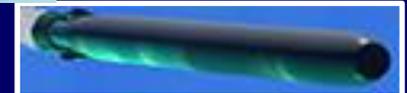


- Al-Ag<sub>2</sub>O, Li-ion & Cu-Ni batteries
- Brushless motor & pump jet propulsion
- Semi open/close loop thermal propulsion
- Super-cavitation propulsion
- Tandem shaped charge insensitive W/H



# Advance Torpedoes

<u>Torpedo</u>	<u>Origin</u>	<u>Speed (Kts)</u>	<u>Range (Kms)</u>
Black Shark Adv	Italy	18- 50	>50
DM2 A4 Sea Hake	Ger	50	> 50
A244S MOD-3	Italy	36	13.5
Flash Black	Italy	50	20
F21 HWT	France	25-50	> 50
Spearfish HWT	UK	40	48
Torpedo (2000)	Swed	40	> 40
MU-90	Eutorp	50	23
MK 48 ADCAP	USA	55	38
MK 54	USA	28 -43	12
Shkval E	Russia	> 200	7 - 10
UGST	Russia	50	40





## Torpedoes in Indian Navy

	Torpedo	Origin/ Country
A244S	 A black torpedo with white markings and the text 'A-244S MOD.3' in red and white.	Italy
AT1ME	 A green torpedo with a yellow band near the tail.	Russian
MK 54	 A yellow and black torpedo with a white band near the tail.	USA
TAL MK-I	 A black torpedo with a red and yellow band near the tail, mounted on a yellow stand.	India
53-65 KE	 A green torpedo with a red and white band near the tail.	Russian
CET 65 E	 A green torpedo with a red and white band near the tail.	Russian
TEST 71ME	 A green torpedo with a yellow band near the tail.	Russian
SUT	 A grey torpedo with a white band near the tail.	Germany
Varunastra	 A red torpedo with white text 'VARUNAstra' and 'NSTL-DRDO'.	India

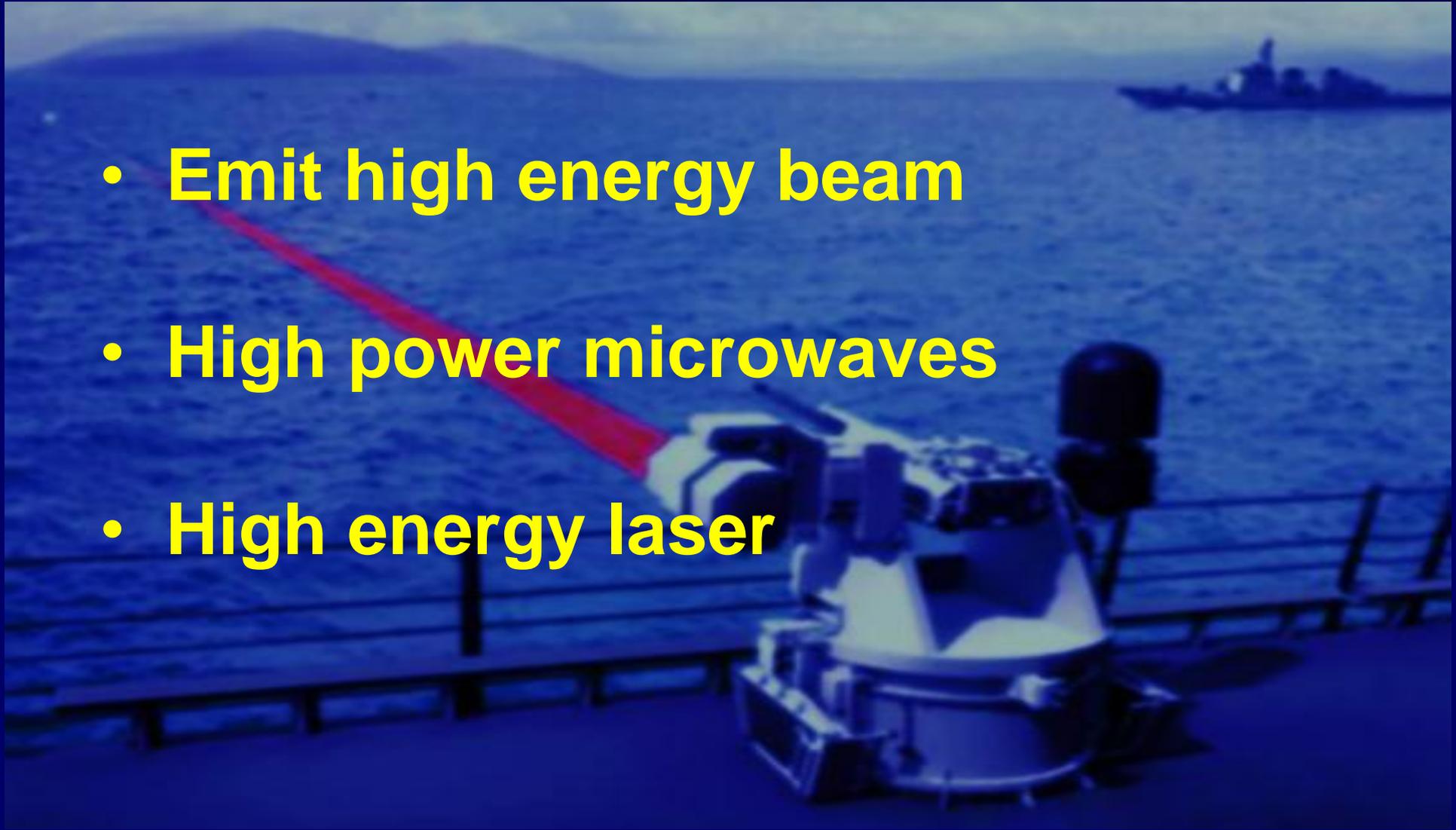
An aerial photograph of a large blue naval vessel, possibly a submarine, on the surface of the ocean. The ship is positioned in the upper left quadrant of the frame. A large, dark blue arrow-shaped graphic points from the left towards the right, centered over the ship. Inside this arrow, the words "Directed Energy Weapons" are written in a bold, white, sans-serif font, arranged in two lines. The background is a deep blue sea with some whitecaps visible.

# **Directed Energy Weapons**



# Directed Energy Weapons

- **Emit high energy beam**
- **High power microwaves**
- **High energy laser**





## DEW Advantages

- High Speed of Engagement
- Effective for Defensive/Offensive Role
- Immunity from Gravitation Constraints
- Space Requirement – Limited
- Effective against Moving Air Targets
- Minimal Collateral Damage
- Low Marginal Cost per Shot



# DEWs from Sea, Air & Land Platforms



HE Laser  
Mobile  
Demon-  
strator  
**(USA)**



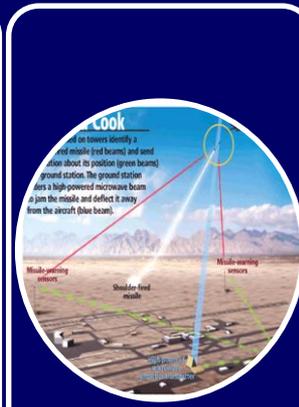
Electro-  
mag Rail  
Gun  
**(USA)**



Active  
Denial  
System  
**(USA/  
Israel)**



Airborne  
Ballistic  
Laser  
**(USA)**



Vigilant  
Eagle  
**(USA)**



Laser  
Weapon  
System  
**(USA)**



# DEWs in Indian Navy



DEWs not as potential destroyer



10 KW HEL demonstrated by DRDO



Work in progress for 25 KW HEL



Develop 100-500 KW HEL

An aerial photograph of a large blue ship, possibly a naval vessel, sailing on the open sea. The ship's hull and superstructure are visible against the dark blue water. A large, dark blue arrow-shaped graphic is overlaid on the image, pointing to the right. Inside this arrow, the text "Qualitative Requirements (QRs)" is written in white, bold, sans-serif font.

# **Qualitative Requirements (QRs)**



# QRs for Torpedoes

<u>Requirement</u>	<u>Remark</u>
Speed	Upto 55 Knot with variable speed
Range	Upto 40 Kms
Battery	Mg-Cu <sub>2</sub> Cl <sub>2</sub> , Al-Ag <sub>2</sub> O & Li-ion batteries
Propulsion	Gas turbine, brushless motor & super-cavitation
Warhead	Tandem insensitive munition W/H & prox EBW fuze
Guidance	CBASS & improved signal processing algorithm
Launch I/ P	Tactical S/W algorithm with target data & upgrades
Control	Intelligent digital controllers & actuators
Camouflage	ACCM features



# QRs for DEWs

- 10-25 KW for non-lethal engagement
- 100-500 KW against:-
  - Missile
  - Rocket
  - Aircraft
  - UAVs

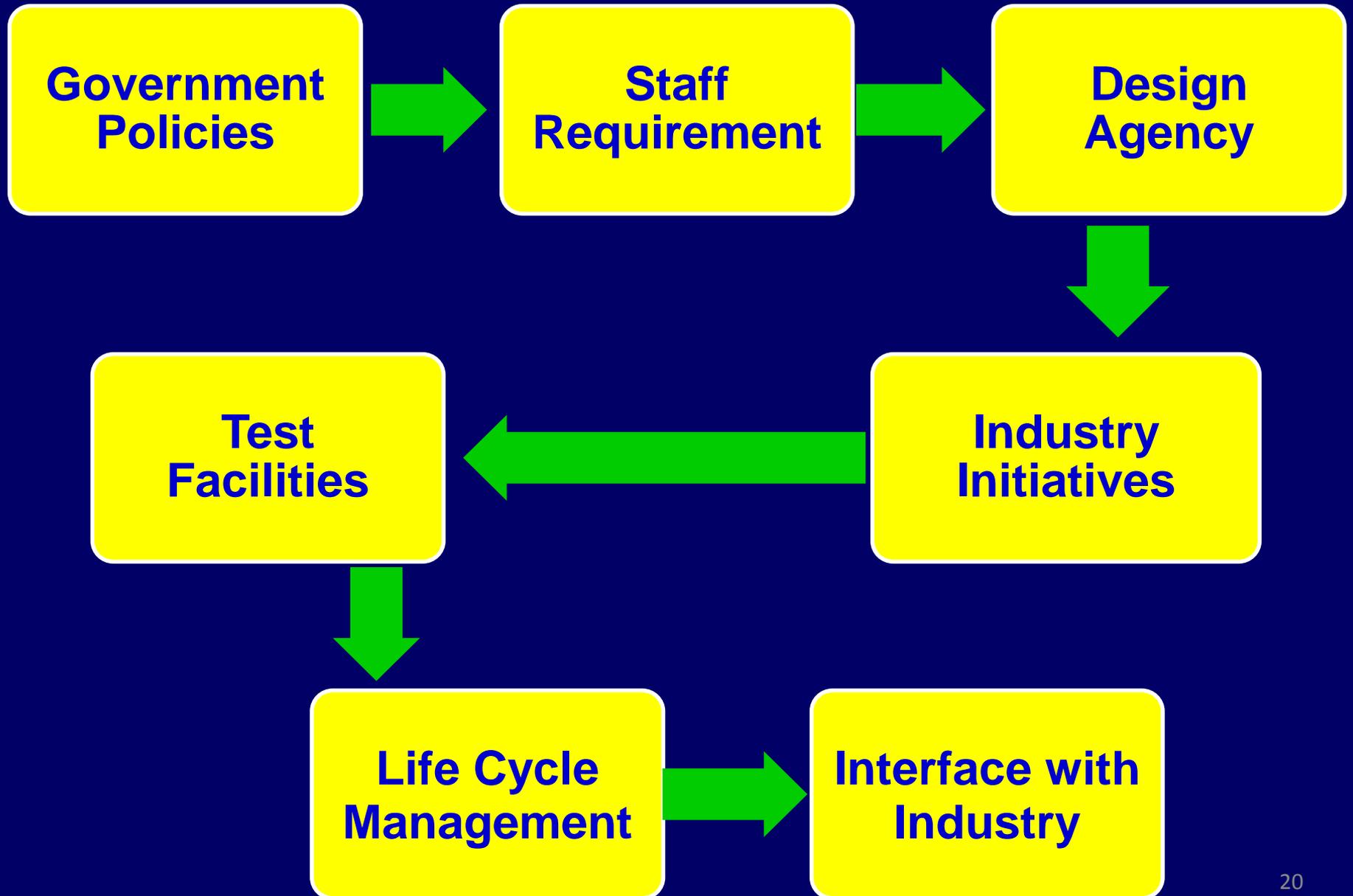
An aerial photograph of a large blue ship moving across the ocean, leaving a white wake. A dark blue arrow-shaped graphic is overlaid on the image, pointing to the right. Inside the arrow, the text "Way Ahead" is written in a bold, white, sans-serif font.

**Way Ahead**

# Joint Venture

<u>Requirement</u>	<u>Scope for Designers &amp; Industry</u>
<u>Torpedo &amp; Sub-systems</u>	
<b>Mech Parts, W/H &amp; Prop</b>	Al-Mg alloy, FRP & nano materials, IM, Mg-Cu, Al-Ag <sub>2</sub> O & Li-ion batteries, brushless motor, GT, pump jet & supercavitation prop
<b>Guidance &amp; Control</b>	Sonar imaging & det, CABSS, PCBs, tgt wake seeking, mag anomaly det & super quantum induction device homing, adv accl & sensors.
<b>Process Control</b>	Adv sig processing, tact S/W algorithm for tgt data, friendly forces positions, sound profile & mid-course upgrade, dig ctrl & actuator
<b>Miscellaneous</b>	Fibre optic cable, gene, invertor, shaft, bearing, gear box, bottle, gyro, pump, valve, fastener, cable, pipe, dynamic seal, loc & rec aids
<u>Directed Energy Weapons</u>	
<b>DEW Systems</b>	Ship borne 25-500 KW using High Power Microwaves or Lasers for non-lethal & lethal engagement

## Way Ahead....





# Conclusion

- Govt promulgated various major policy guidelines
- *IN* “Indigenisation & MCPP”
- Harnessing knowledge base, infrastructures for “**Make in India**” prg under “**FIGHT**” category
- DEWs identified as core mil technology requirement
- Opportunities for strategic partnership



**Thank You**

