



 **AUTONOMOUS VEHICLES -**   
**NAVAL APPLICATIONS**





# INTRODUCTION



**DULL, DIRTY AND  
DANGEROUS MISSIONS**





# SCOPE



- Introduction
- Types of Autonomous Vehicles
- Major Components
- Roles
- Desired Capabilities
- Opportunities – Indian Industry
- Future Plans
- Conclusion



# ***Maritime & Coastal Surveillance***



- ✓ ***IN*** the first to deploy in SE Asian region for Maritime ops
- ✓ ***Autonomous Vehicles*** deployed as Force Multipliers
- ✓ ***Instrumental*** in transforming Naval Operational Philosophy



# TYPES



## ➤ UNMANNED AERIAL VEHICLE

- ✓ MICRO AND NANO
- ✓ HIGH AND MEDIUM ALTITUDE LONG ENDURANCE SYSTEMS
- ✓ UNMANNED COMBAT AERIAL VEHICLES



## ➤ UNMANNED MARINE VEHICLE

- ✓ UNDERWATER UNMANNED VEHICLE (ROV, UUV & AUV)
- ✓ UNMANNED SURFACE VEHICLE



## ➤ UNMANNED GROUND VEHICLES

- ✓ CUSTOM BUILD UGVs
- ✓ APPLIQUE SYSTEMS





# MAJOR COMPONENTS - UAV



## ➤ FIXED COMPONENT

- AIRFRAME / BODY
- PROPULSION SYSTEM
- CONTROL SYSTEM

## ➤ FLEXIBLE COMPONENT

- SENSORS/ ROLE EQUIPMENT
- WEAPON SYSTEM





# MAJOR COMPONENTS - AUV / UUV



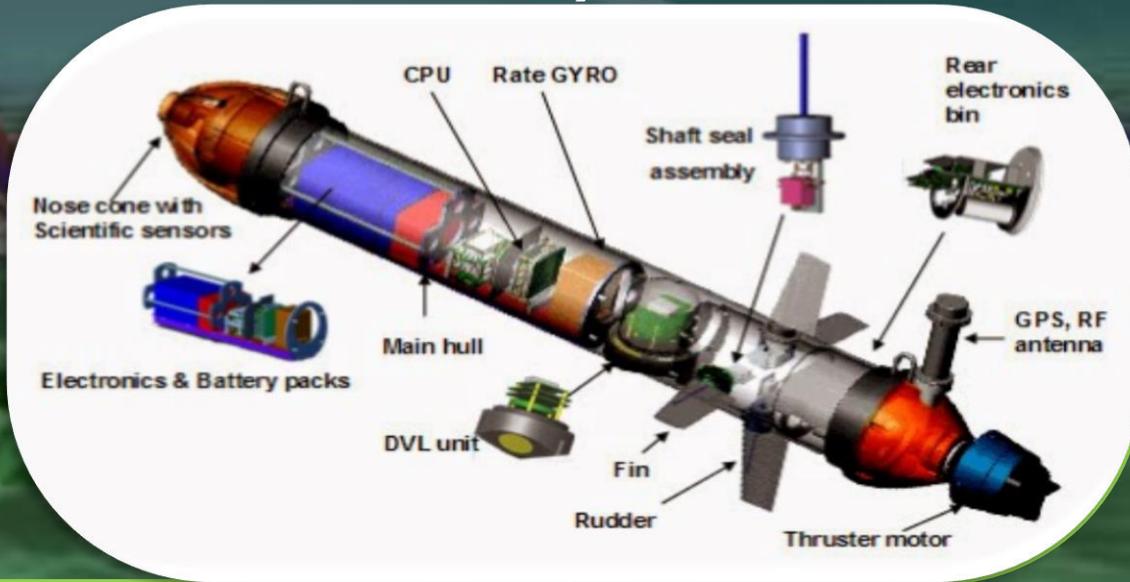
## ➤ Sub Systems AUV

➤ Sensors (SSS, Bottom profilers, Camera, Multi Beam Echo Sounders)

➤ Navigation (Acoustic, Inertial)

➤ Propulsion

➤ Power





# ROLES



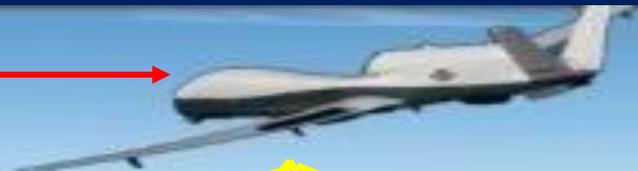
- ISR MISSIONS
- OVER THE HORIZON TARGETING
- PROBE & SECTOR SEARCH
- BATTLE DAMAGE ASSESSMENT



- HARBOUR SECURITY & MINE MITIGATION
- COASTAL & HYDROGRAPHICAL SURVEY
- ANTI SUBMARINE WARFARE
- ARMED



# ISR/NCW GRID



HALE UAV/ BAMS



SHIP BASED UAV



MALE UAV



USV



UUV



ROV



# DESIRED CAPABILITIES



# DESIRED CAPABILITIES



- **STEALTH AND LOW RCS COMPOSITE STRUCTURES**
- **INTEGRATION OF VAST ARRAY OF SENSORS**
- **MINIATURISATION OF SENSORS AND PAYLOADS**
- **HIGH BANDWIDTH SATELLITE DATA LINK NETWORKS**
- **AUTONOMOUS ADAPTIVE FLIGHT CONTROL CAPABILITY**
- **SATELLITE CONTROL AND LONG ENDURANCE**



# DESIRED CAPABILITIES



- REAL TIME INTELLIGENCE WITH ENGAGEMENT ACCURACY
- AUTO TARGET RECOGNITION AND HIGHER RESOLUTION
- IMPROVED SELF PROTECTION CAPABILITY
- ELINT PAYLOADS - HIGHER GEO LOCATION ACCURACY
- IED DETECTION & HYPER-SPECTRAL PAYLOADS
- VR BASED REALISTIC TRAINING SIMULATOR





# TECHNOLOGIES



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## ➤ High End

- ✓ Reliable Propulsion System
- ✓ Miniaturization of capable sensors/payloads
- ✓ Autonomous Adaptive Flight Controls

## ➤ Medium End

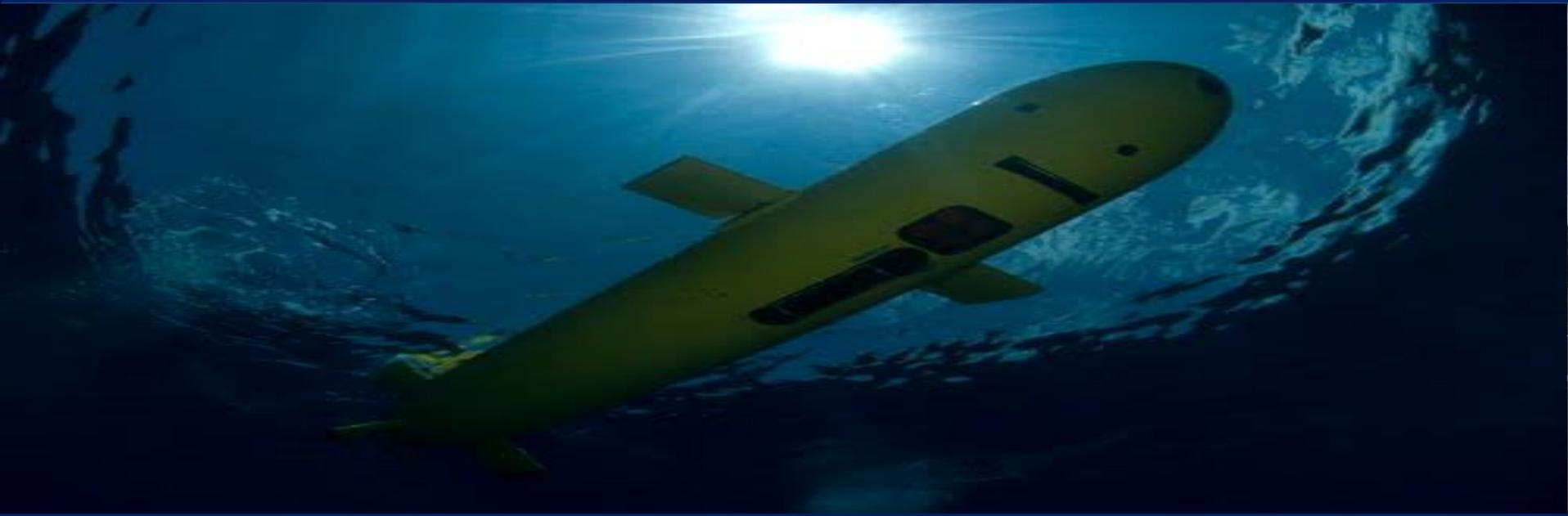
- ✓ Integration of Sensors
- ✓ Ground Control/ Support Centers
- ✓ Mission Management Systems

## ➤ Low End

- ✓ Modular Air frame Structures
- ✓ Assembly / Integration using COTS equipment



# OPPORTUNITIES FOR INDIAN INDUSTRY





# OPPORTUNITIES



- **Huge opportunities view high anticipated demands**
- **Indian Industry highly capable**
- **DRDO labs spearheading R&D efforts**
- **Private industry also developing indigenous Autonomous Vehicles**
- **Actively supported by DPSUs.**





# OPPORTUNITIES



- Leverage domain expertise of MSMEs
- Progress strategic projects with Industry participation
- Adopting ISRO model for greater Industry participation
- Target key technologies in domains of expertise



# OPPORTUNITIES



- Target key technologies in domains of expertise
- Utilizing Off Sets
- TOTs with JVs
- Participating in Life Cycle Sustenance – ROH Centres.



# OPPORTUNITIES – MAKE IN INDIA INITIATIVES



- Buy (Indian) & Buy and Make (Indian)
- Private firms as Strategic Partners
- Opportunities to avail defence offset obligations
- Utilizing FDI initiatives in Defence Sector
- India as a Manufacturing hub
- Generate intellectual capital and not remain only Assemble in India
- Leverage Indian defence orders for exports



# FUTURE PLANS





# FUTURE PLANS



- Naval Rotary UAVs (NRUAV)
- Ship- Borne UAVs
- Remotely Operated Vehicle, UUVs & AUVs
- Medium Altitude Long Endurance UAVs (MALE)
- High Altitude Long Endurance UAVs (HALE)
- Broad Area Maritime Surveillance UAV



# CONCLUSION



- LOW COST, ADAPTIBLE, EASY TO MAINTAIN & EFFECTIVE STRATEGIC ASSET
- NETWORK CENTRIC GRID & FASTER DECISION MAKING
- INTEGRAL PART OF NAVAL OPERATIONS
- IMMENSE OPPORTUNITIES FOR PRIVATE INDUSTRY
- GREAT EXPORT POTENTIAL
- FUTURE GROWTH LIMITED BY OUR IMAGINATION



***THANK YOU***



