

## **COMBAT & ELECTRONIC SYSTEM:**

- a. **Sensors – Above & Underwater Sensors (Nav Radars, Echo Sounder, Speed Log, Wind Sensors/ Anemometer, Temperature, Humidity).** Above water and underwater sensors including navigational aids are considered paramount requirements for safe navigation/ other critical information at sea/ congested waters. Above water sensors are required to provide all information above the sea surface and include Navigational/ Surveillance Radars, wind speed & direction sensors including temperature and humidity measuring sensors. Underwater sensors are used to provide all critical information related to depth, speed, underwater surveillance and target information. These sensors include Echo Sounders, speed logs and sonars etc. All information regarding above and underwater sensors is also utilized in Combat Management Systems and firing of critical weapons.
- b. **Communication Systems (HF, VHF, UHF, Software Defined Radios (SDRs), SATCOM).** Communication Systems are considered as backbone in all kinds of warfare especially in Maritime domain. Naval ships while performing operations at sea critically require effective communication systems for real time situational awareness, coordination, updates, tasking and feedback purposes. In order to ensure reliable and effective communication at sea, various kinds of communication systems as per requirement/ role are provided i.e. HF, VHF, UHF, SDRs and SATCOM etc. Moreover, naval ships operate worldwide and also coordinate with air and sub-surface platforms: hence, require all kinds of communication systems.
- c. **IR Systems.** Thermal-infrared imaging is used extensively for military and civilian purposes. Military applications include target acquisition, surveillance, night vision, homing, and tracking. Popular IR systems include FLIR (Forward Looking Infrared Radiometer) andIRST (Infra-Red Search & Track) systems. The sensors installed in FLIR cameras use detection of infrared radiation, emitted from a heat source. An IRST system detects and tracks objects which give off infrared radiation such as jet aircraft and helicopters.
- d. **Optical Systems.** Modern naval forces are expected to operate in a wide range of operational conditions and against an extensive range of potential threats. The threats above the surface can vary from large ships to small rubber boats and canoes, airborne threats as well as land-based forces in littoral operations. In a number of these scenarios, radar tracking must be supplemented by optical tracking. In order to complement radar sensing applications, an optical tracker provides additional functions such as target detection, target identification and intent detection at the visual level. A tracker for

the maritime environment is an optical system that performs the automatic tracking of an above water target. Local industry may consider development of such system.

e. **Training Systems.** Due technological advancement, contemporary techniques / methods are used and regularly updated to train the HR. In PN, training systems are used for conducting various courses/ modules to personnel during their training and while they are deployed on various specified duties. PN is in need to improve domain expertise and targeted training aspects. To achieve this, active participation of local industries is required to propose new ways/means for training PN personnel both at training establishments and onboard ships.

f. **Computer Based Training (CBT).** Computer Based Training (CBT) system is used for providing training in a programmed way through computer. It eases the instructors to conduct the training sessions in very smooth and organized manners. CBTs are used for training of officers and personnel in related fields. It is considered as one the most effective tool/ technique to give quality training. The trainees practically see the working and operations of critical systems and associated hazards/ results. Hence, requirement exists to develop CBTs of various systems being acquired utilizing contemporary softwares/ tools.

g. **Simulators.** The simulators are generally replica of original systems and can be effectively utilized while saving life of original systems. Simulators are very useful for safe and quick training of various complex/ hybrid systems. By using relevant simulators, trainees get a chance to practically learn and freely operate the systems. They can simulate scenarios in various operating conditions including practical failure drills/ hazards. Simulators are a continuation requirement and local industry can play its role.