Futurology of Electronic Warfare Systems for IR. IRAN's Fast Crafts

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ABSTRACT:
Manned and unmanned fast crafts, like unmanned aerial vehicle (UAV), are of interested weapon systems and will be paid attention in future offensive and defensive doctrine. This novel case, needs innovation in different areas like armament, navigation, communication and especially electronic warfare. Communication, radar and optical electronic warfare subsystems are necessary for increasing survivability and success in future missions. In this article wee perform future study of electronic warfare subsystems for fast crafts.

KEYWORDS: Fast Crafts, Electronic Warfare, Survivability, Road Map, Futurology.

1. INTRODUCTION

Till previous decade, using manned fighters was the first option of military forces for offensive and defensive actions. But due to relatively high cost in affording and maintenance and also novel war approach, unmanned aerial vehicles have got attention by military forces for intelligence, surveillance and reconnaissance (ISR) operations [1]. In maritime missions, developing crafts and especially fast crafts have become of more interest sea and oceans due to their especial conditions and environments. In middle east, because of geostrategic situation od Persian Gulf and Hormoz canyon, exploitation of fast crafts has got important position in Iranian navy. Thanks to velocity and agility of fast crafts against ships, preemptive potential ae well as reduced action power of enemy navy is reached. So it is necessary to act for amplifying and developing the ability of these systems to increase mission power, by integrating them to novel subsystems such as navigation, communication, radar, optics, network and electronic warfare. In the following we investigate the proposed subsystems in the field of electronic warfare, and also exploring the available roadmaps of other countries to draw a futuristic horizon for future IR. Iran fast crafts. Our investigation has been done based on monitoring and watching global technological and scientific mobility in other countries

2. POSITIONING SYSTEMS PERFORMANCE IMMUNITY

Because of developments in science and technology of jammer systems, jamming in navigation and positioning systems have become more important. GPS jammers by making spot, barrage and sweep noises, make the receivers saturated thus the platform cannot find its position and fails in passing the waypoints. Spoofer sends fake GNSS signals to receiver and cheat them so they may deviate and be forced to landing in enemy area. Several anti-jamming technologies have been developed such as GPS anti jamming technology (GAJT) and ADA system. So, it seems that fast crafts should take into account these threads and have counter measures against them.

3. INFRARED STEALTH AGAINST AERIAL INFRARED SEARCH SYSTEM

Fast crafts should be protected against detection by aerial search and track systems based on infrared signatures. If detected, their velocity and position are estimated and feed to fire control systems. Then they may be tracked and hit. Thus, temperature, cover and shape of the power plant (motor) in stealth and infrared countermeasures are important design parameters. SkyWard which is named IRST, provides up to date capabilities in search and track of infrared signatures [2]. This product is made by Leonardo company and is shown in Fig. 1.

Fig. 1. Infrared Sand Track System for Aerial and Maritime Applications.

4. SURFACE STEALTH AGAINST SEA-BASED AERIAL SEARCH SYSTEM

Fast crafts should be protected against detection and tracked by optical radars. If detected, their speed and position is extracted and fed to fire control sites and thus might be tracked, locked and hit. So, color and shape of them are important design parameters. VIDAR is the first world optical radar for visual detection and ranging in maritime applications [3]. This system automatically detects things on the surface of sea and ocean passively and provides detail information of target (Fig. 2). It is produced by Sentient company which is the Australian defense cooperator.

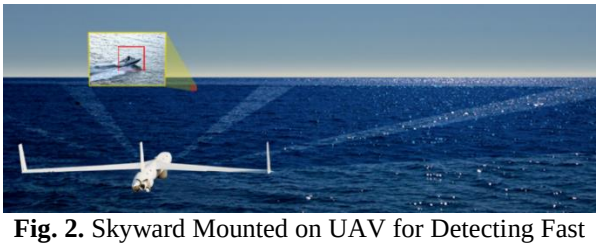


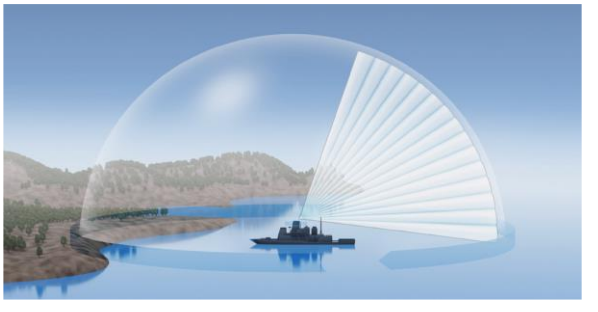
Fig. 2. Skyward Mounted on UAV for Detecting Fast Crafts.

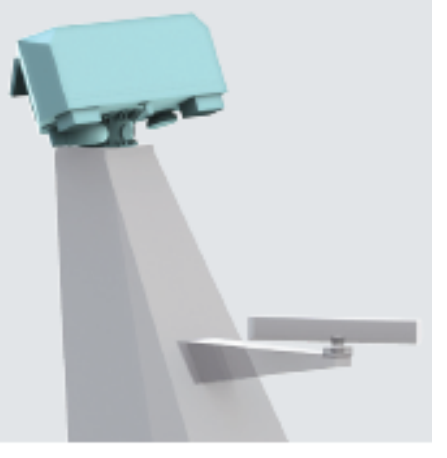
5. COMMUNICATION AND RADAR JAMMERS MOUNTED ON FAST CRAFTS

Because of high agility in fast crafts, it is possible to design and mount suitable communication and radar jammers to make interference in performance of ships. Fast crafts can get near the ships and move circularly or linearly around them and provide effective jamming.

6. MARITIME SURVEILLANCE RADAR FOR SURFACE CRAFTS

Surveillance radar is responsible for protecting and increasing survivability of surface crafts by searching the air and surface to find the threats. They can provide early warning and on-time decision making. SAAB company has designed some types of these radars such as Sea Giraffe 1X, Sea Giraffe AMB and Sea Giraffe 4A [4]. Typical type of these radars is depicted in Fig. 3. it seems that these radars are needed in future for intelligence, surveillance and combat (fire control) missions.





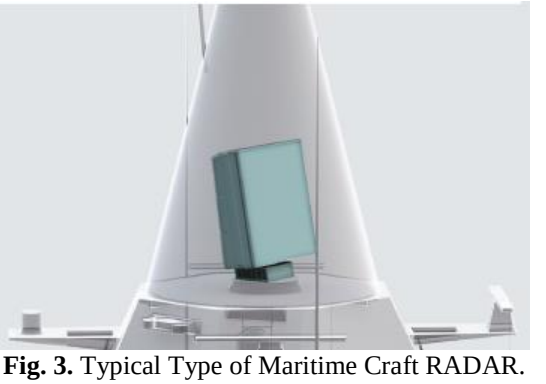


Fig. 3. Typical Type of Maritime Craft RADAR.

7. LASER RANGE FINDER

Based on operational environment of fast crafts which is sea surface with high level of humidity, one of the systems that can improve the performance is laser range finder. SAAB company has provided Vidar, Heimdall and Odin with high performance accuracy [4]. Using these systems can increase accuracy and precision of missions in future. A typical production is depicted in Fig. 4.

Fig. 4. Typical Maritime Laser Range Finder for Fast Crafts.

8. MARITIME LASER WARNING

One of the threats for fast crafts are laser threats and laser designators. To prevent these type of threats, one should perform early warning thus the platform can do counter measures (for example maneuvering or smoke). For surface crafts carrying expensive systems such as radar, fire control system and SIGINT, it is inevitable to make use of early warning systems (laser, radar, infrared). In Fig. 5 a typical product is shown.

Fig. 5. Maritime Laser Warning for Surface Crafts.

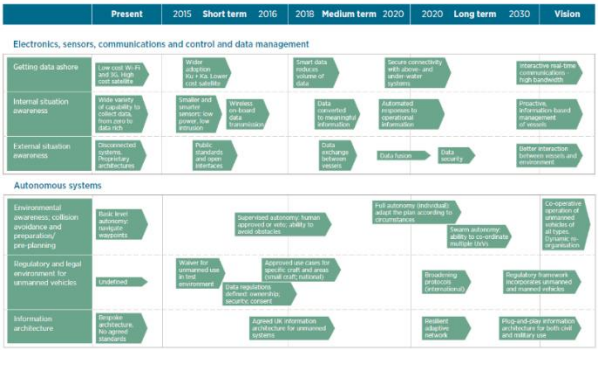
9. ELECTRO-OPTICAL FIRE CONTROL DIRECTOR

One of the novel systems in surface crafts is electro-optical fire control director. Its task is observation, target detection, tracking and electro-optically fire control. The advantage of this system is stand-alone operation capability. SAAB company has designed and produced an advanced, light weight low power of this system for use in surface crafts. A typical system is shown in Fig. 6 [4].

Fig. 6. Electro-Optical Fire Control Director (SAAB Company).

10. FAST CRAFTS ROADMAP

One of the main activities in achieving to science, technology and novel systems, is road mapping by drawing logical horizons and patterns. As an example we can mention to France strategic roadmap, entitled future crafts [5]. Also England maritime industries has provided maritime technology roadmap which is partially depicted in Fig. 7 [6]. This roadmap, provides visions, future study and enablers of maritime technology for different parts of structure, navigation, electronic, communication, motor and for near future and long future till 2030. The same work has to be done for IR. Iran maritime fast crafts.



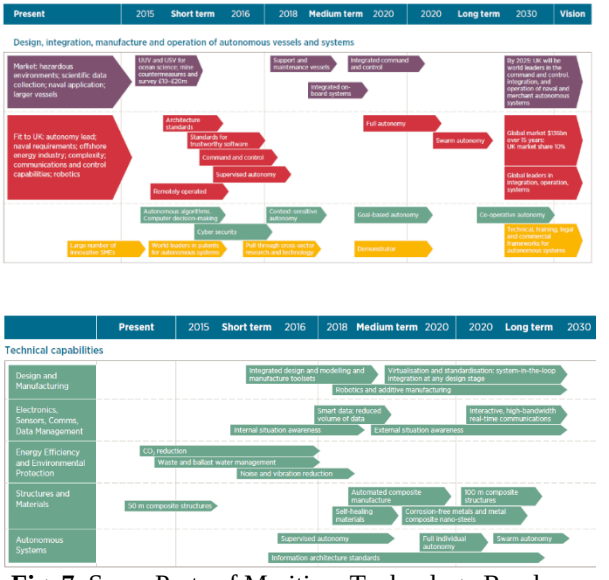


Fig. 7. Some Parts of Maritime Technology Roadmap Related to England Maritime Industries.

11. JOINT MISSION (GROUPING) OF FAST CRAFTS WITH UAVS

By integrating UAVs and fast crafts, we can take advantage of both air and surface simultaneously and making a competitive benefit in war field. UAVs can monitor and search the war filed from the sky and send the information to command and control stations as well as fast crafts, and help to create the electronic order of battle (EOB) more precisely. Also it can help to real-time or near real-time situational awareness and indirect navigation of fast crafts to victim or safe area. This issue has been pursued for fighter s and UAVs entitled group flying. This technology has developed by Textron Systems and is named Synthurian [10]. It seems that the same concept will be developed in near future for grouping fast crafts, ships, UAVs and even underwater platform.

12. UNMANNED FAST CRAFTS

Based on novel wars (for example mosaic war), changing the current fast crafts to unmanned will be of the future trends to reduce human costs and performing suicide mission against enemy. By using artificial intelligence and network centric operations, it is possible to get the speed of action and innovation and reduce the potential of threats.

13. IMMUNE COMMUNICATION AND NETWORKING

Communication systems of fast crafts should have higher degree of immunity and safety as well as low probability of intercept and jamming. Thus techniques such as frequency hopping and direct sequence spread spectrum, encryption and codding must be considered. At a higher level, networking between command and control stations and fast crafts based on satellite or non-satellite should be considered. All of these actions are done to provide an immune communication environment and increasing survivability and success in missions. Id communications are intercepted, there is high probability of failure in mission. SAAB company has developed a typical immune communication system and networking for surface crafts named tactical integrated communication which is depicted in Fig. 8.

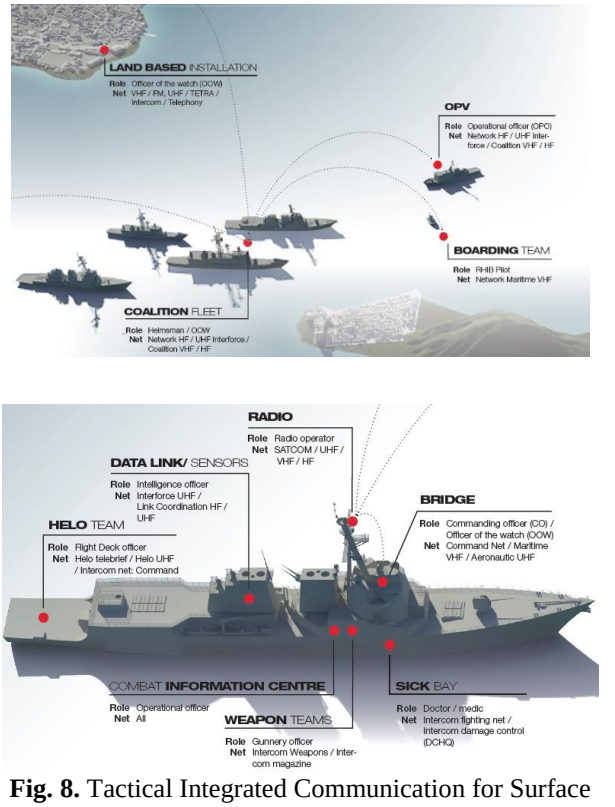


Fig. 8. Tactical Integrated Communication for Surface Crafts (SAAB).

14. CONCLUSION

In this paper we explored IR. Iran future needed electronic warfare systems for fast crafts. Novel and up to date systems were studied and England maritime technology roadmap was partially mentioned. It is seen that countries having defense technologies, have developed horizons, visions and roadmap in the field of surface crafts. Thus because of geostrategic situation od Persian Gulf and Hormoz canyon, it is strongly necessary to consider the aforementioned issues and develop native visions and roadmap to enable smart decision making for military forces and improve electronic attack (EA), electronic protect (EP), electronic support (ES), survivability and mission success.

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