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Aeromag Asia

DRDO: Golden Saga of Success

DRDO
Golden Saga of Success

The Defence Research and Development Organisation (DRDO) is celebrating the Golden Jubilee of its service to the nation this year. Since its inception in 1958, DRDO has grown multi-dimensionally from a humble beginning and is today a major technology generator for the nation effectively meeting the requirement of developing and fielding defence systems to the Services and paramilitary forces. DRDO now has a proven competence to produce a wide range of highly strategic defence equipment and technologies for the Indian armed forces.

DRDO has not only attained self-reliance in strategic defence weapons and delivery systems which no country is willing to part with, but has also provided the country with an array of tactical battlefield systems like Light Combat Aircraft (Tejas), Main Battle Tank (Arjun), family of missile such as Agni, Prithvi, Akash, Nag and BrahMos with capability of delivery of different payloads to varying ranges. The recent successful launch of Agni III and Interceptor missile technologies developed by DRDO has taken India to an elite club of developed nations having similar capability.

DRDO's other success story has been the development of a series of radars, electronic warfare systems, secured communication, sonars, torpedoes and armaments. Most of them have been inducted into the Armed Forces. Specialized materials relevant to defence applications have also been indigenously developed including composites, armor for battle tanks, titanium sponge and special steel for naval weapon platforms. The life support technologies developed by DRDO have helped to improve the operational efficiency of the troops in extremes of environmental and operational conditions. In the current global political scenario, Nuclear-Biological-Chemical defence also has assumed a great significance. DRDO has achieved a significant level of self-reliance in this area.

Defence Minister AK Antony with Dr. M. Natarajan, Scientific Advisor to Defence Minister and DRDO Chief.

The defence spin-offs in civil sector and the DRDO societal missions have immensely benefited the society at large. After 50 years of commitment towards self-reliance in defence, the DRDO community feels that it should consolidate all that have been achieved and also present how it will organise itself for the coming decades through the year-long Golden Jubilee programme. This endeavour will provide a unique opportunity to showcase its achievements and core competencies. It will create greater awareness of DRDO's tangible and intangible contributions to nation building among the scientific and technological organisations, academia, industry, foreign partners, as well as educate the general public and media and attract talent into DRDO fraternity. This will involve a series of events including conferences, workshops, exhibitions, short films / documentaries, compendiums etc. This year-long programme will help break all existing barriers and generate goodwill and better understanding with partners. The all important rapport with the armed forces has to increase manifold as also the collaboration among the DRDO labs and production centres.

The Year 2008 will herald a new chapter in the history of DRDO to reflect its rich heritage and look back with pride on the past achievements. It is also the time to plan for challenges ahead and highlight future aspirations. A new spirit and a sense of optimism is evident in the DRDO family today. DRDO will put in whole-hearted efforts to match the new global ecosystem. The organisation pledges to transform itself into a highly cohesive, responsive and adaptive business house. In this era, DRDO is on its way towards expanding avenues in International activities including joint ventures and exports.

Cut delays, involve industry
Antony

Defence Minister AK Antony inaugurated the year-long Golden Jubilee celebrations of the Defence Research and Development Organisation (DRDO) at the DRDO Bhawan, New Delhi on January 9. Excerpts from his inaugural speech:

It is gratifying to note that DRDO has emerged as a strong Science and Technology force to reckon with, having a strength of about 30,000 knowledge workers serving in 50 laboratories located along the length and breadth of our country. An organisation which had a modest beginning with a mission to advise the Services in Defence Technologies today has evolved to ensure the strategic defence as well as provide state-of-the-art Tactical Weapon Systems. No nation will be willing to part with strategic defence technologies. DRDO has, therefore, played the crucial role in providing the strategic defence to our country with suitable delivery systems.

Tactical systems such as Main Battle Tank (Arjun), Light Combat Aircraft (Tejas), a family of radars, electronic warfare systems, sonars, torpedoes, armaments and missiles have also been successfully developed and many of them are being delivered to our armed forces. The recent success of DRDO in launch of Interceptor Missile and Agni-III has taken our country to the elite club of a few developed nations with similar capability.

I am glad to know that DRDO has achieved appreciable level of self-reliance in NBC defence technologies and a large quantity of these products are already delivered to the defence forces. Life support technologies and products developed by DRDO have significantly enhanced the health and operational efficiency of our soldiers operating in extremes of environmental and operational conditions. These include high altitudes over the Himalayas, deserts of Western borders, underwater, aerospace and Low Intensity Conflict environments. Some of the specialised materials such as composites, armour, titanium, sponge and AB steel have now been indigenously developed for various military applications.

The nation is proud of DRDO and its significant contributions. I would like to congratulate and thank the scientists and staff of DRDO for the 50 years of dedicated service to the nation. The high level of confidence and the strong determination for greater contributions are palpable as you enter the Golden Jubilee year, 2008.

Golden Jubilee is an important milestone in the history of any organisation such as DRDO. It provides an opportunity to take stock and showcase the accomplishments as well as to analyse the shortcomings to find ways to overcome them. A criticism against DRDO has been that there has been 'time and cost over-run' in many projects. I fully appreciate that a developing country like India, which did not even have a car of its own design till recently, ventured to develop complex systems such as MBT, LCA, Missiles and EW system. These efforts are to be seen in an ambience where Industry support in prototype development or system integration was meagre and support from the academia for seeding new science and technologies inadequate. DRDO has built the tacit knowledge and capability for system integration within the country. When they venture to make the next version of the weapon systems/platforms in future, such delays must be minimised with proper project management and strong review mechanisms.

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I am fully convinced with my analysis of the defence acquisition, problems with regard to life cycle support in respect of imported equipment and other issues related to imported systems. India must strengthen its indigenous R&D and manufacturing capabilities. Government of India is fully committed to enhance the self-reliance index through indigenous design, development and production. The international market forces certainly will offer resistance to our endeavours. DRDO, the Defence Services and the industries – both Public and Private sector – will have to work as a team with a stake holder spirit towards the goal and face the challenge in global competition and make our Defence Industries vibrant and contribute to increased acquisitions from within India. Private sector industries should strengthen their R&D capability and quality assurance in manufacturing, thereby contributing in this mission of self-reliance. Innovation is the key for development. DRDO as well as our industries should promote innovation at the national level.

I am glad to know that M. Natarajan, Scientific Advisor, is making serious effort to bring corporate culture in DRDO both at Head Quarters and in the laboratories. His initiative to develop a detailed business plan for each laboratory, as well as perspective plan for Science and Technology roadmap for the next 15 years in important disciplines is a welcome step to face the emerging challenges. DRDO may also look at potentials of offset policy to leverage new technologies during acquisition process. Joint Ventures in R&D with other countries may increase in the global economy.

The Government is committed to providing ample incentives to make scientific profession more attractive and improve the quality of life of our scientists in their workplace and living ambience. I am hopeful of a positive outcome, which will ameliorate the problem of attrition of scientists from DRDO. The media support to DRDO will also serve as yet another source of motivation. I am happy to know that DRDO has established a formal mechanism within the organisation to share information with the media. Science and Technology is the key for development and hence the Government is fully committed to promote Science and Technology in a big way during the Eleventh Plan. DRDO will also be strengthened as part of this plan.

On this happy occasion, I once again congratulate all the members of DRDO fraternity on their significant contributions to the mission of nation-building through R&D endeavours. "

DRDO to focus on new vistas in International activities

M. Natarajan, Scientific Advisor to Defence Minister and DRDO Chief, spoke at the launch of the Golden Jubilee celebrations of the Defence Research and Development Organisation (DRDO) in New Delhi. Excerpts from his speech:

"DRDO is entering its Fiftieth year of dedicated service towards nation building. Since its inception in 1958, DRDO has grown multi-dimensionally, and having established a sound ecosystem and supported by a large pool of committed manpower, we have today a proven competence to produce strategic and state-of-the-art tactical military hardware and related technologies in diverse disciplines covering Aeronautics, Missiles, Naval Systems, Armament and Combat Engineering, Electronics, Materials and Life Sciences.

Some recent successes have added a feather in the cap of this organisation. The missile launch test of the LCA was the first step in the weaponisation of this state-of-art combat aircraft. This was quickly followed up by flights with drop tanks including transfer and litening pad. The development program has involved the maximum number of national agencies and is truly a national endeavour. The second was the successful test launch of Agni-3, our Intermediate Range Ballistic missile. The third major success was the successful test launch of the Interceptor missile – the first step towards setting up a missile shield for the country. These achievements have propelled India into an elite club of technologically advanced countries of the world.

DRDO has also a number of other achievements to its credit. In the field of Aeronautics, apart from the successful LCA program is the development of Unmanned Aerial Vehicles Lakshya and Nishant, the modular avionics suites for imported combat aircrafts. Secondly, the Indian missile showcase consists of almost every conceivable missile viz, the strategic Agni and Prithvi, the surface to air missile, Akash, the anti-tank missile, Nag, and the supersonic Cruise missile, Brahmos. The Electronics systems category has seen the successful development of a variety of radars for every platform and service, the critical Electronic warfare programs of Samyukta and Sangraha, in addition to development in Communications, networking and information security. Land warfare systems like the MBT Arjun, armament systems like Pinaka, the rocket launching system, have been some of the other notable achievements. While on the Naval side the development of sonars and torpedoes for the Services have been the major highlights. Material science development has seen the indigenous development of armours, naval steel and titanium sponge. Life sciences labs have produced critical systems for defence like NBC systems and protection systems for the man behind the machine.

In the coming decade DRDO will focus on the development of futuristic technologies relating to systems

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like Multi-role Fifth Generation Fighter Aircraft, Integrated Surveillance, Unmanned Combat Air Vehicles, Air to Air Missiles Astra, Hypersonic vehicles, Airborne EW, Multi-Sensor Data Fusion, Active Phased Array Multi-Function radar, Unmanned Ground Vehicles, Autonomous Underwater Vehicles etc.

The all important rapport with the Services has to increase manifold as also the collaboration among the DRDO labs and production centres. The three involved agencies should close ranks to work as a team and strive for self-reliance in defence technologies. There must be a strong sense of owning the system by all the agencies. DRDO and the production agencies must now demonstrate rather than assure the user services in delivering projects in given time-frame. The way ahead is to increasingly involve the private sector corporations and business leaders in production of major defence equipments. The participation of our academia must also grow. It must actively play its designated role of seeding futuristic defence technologies and take up directed basic research in their colleges and universities.

After 50 years of our commitment towards self-reliance in defence, we hope to consolidate all that have been achieved so far and organise ourselves for the coming decades. As part of our aspirations for the next decade, we intend to give a business orientation to our operations. We will focus on new vistas in International activities including joint venture, international collaboration and exports. The joint ventures will have to be encouraged to bring in the transfer to 'sunrise' technologies into the country. We are conscious of the need to effectively disseminate successes and create greater awareness of DRDO's tangible and intangible accomplishments. We have to make an impact on society and the country's scientific community in order to attract and retain best talents. In addition, the right ambience in terms of adequate flexibility of operation, autonomy, financial and managerial responsibilities will have to be offered to our scientists. Besides advanced training, career and self development needs of the scientists have also to be met. We will strive for the same.

The Golden Jubilee events will include International Conferences, Exhibitions, Panel Discussions, launching of DRDO Chairs, inauguration of DRDO Centres of Excellence, Special Awards, publishing of DRDO Compendium etc at HQ level. At the lab-cluster levels, there will be a chain of events like Lab-Cluster Conferences, Open Competitions for students, International Workshops, Lab Awards, publishing of Souvenirs etc.

The Jubilee Year 2008 will herald a new chapter in the history of DRDO to reflect its rich heritage and look back with pride on the past achievements. It is also time for all of us to plan for challenges ahead and highlight future aspirations. A new spirit and a sense of optimism are evident in the DRDO family today. Of course, we have to put in our best efforts whole-heartedly to match the new global ecosystem. The organisation pledges to transform itself into a highly cohesive, responsive and adaptive business house.

Win-Win Solution for Army's High Altitude Light Helicopter

The Indian Army has been endeavouring to purchase a large number of high-altitude high-performance helicopters since the Kargil conflict. Early attempts to import the helicopter from Eurocopter were thwarted by HAL. They could prove that although of an older design, Cheetah, made by them, could have comparable performance with the Ecuriel Eurocopter. Actual flight trials conducted in the high-altitude Himalayan region by both Cheetah and Ecuriel testified in HAL's favour and the import proposal was scrapped.

Subsequently HAL undertook to upgrade the Cheetah with a more powerful engine to provide the Army with a high-altitude high-performance helicopter. This has been accomplished since then. However, the Foreign Lobby pressure for import continued, and based on a tender the Eurocopter military variant AS550 Fennec and a Bell 407 were short-listed and finally the Eurocopter AS550 Fennec was selected. Recently the Defence Ministry scrapped the contract for import citing some procedural lapse.

Whatever be the reasons for this scrapping of the contract, it is an opportunity for all concerned to work together to meet the Army's need. It is a fact to be noted that neither the AS550 Fennec nor the Bell 407 helicopter is designed for our requirements in the high altitude border area.

HAL's re-engined Cheetah, which already holds a world record, will be an ideal immediate solution. This helicopter is now upgraded with a more powerful engine and HAL has already supplied a few helicopters and everyone seems to be agreeing on their better performance. It would be desirable for the Army to place orders with HAL for the Cheetal (upgraded Cheetah) to meet their immediate requirements for the next two-three years and persuade HAL to take up the development of high-altitude high-performance helicopters in collaboration with a risk sharing partner.

In fact HAL had already made the conceptual design of a very high altitude helicopter, the LOH, and the specifications of the same are far superior to what is proposed to be imported. With the technologies developed, such a helicopter can become a reality in four-five years. This period could perhaps be further reduce by outsourcing considerable amount of work to private sector industries in India with considerable capabilities and IT-enabled design and manufacturing facilities in aerospace. Partnership with established helicopter design and manufacturing firms from overseas on a cost and work sharing basis could also be beneficial.

For this, HAL and Indian private sector industries must be proactive and play a vital role. They should urge the Government not to re-tender for a sub-standard imported helicopter.

The design and development of a really superior high-performance high-altitude indigenous helicopter with the HAL in the lead and in partnership with Indian and overseas industries is the most desired option. It is in the interest of building on our competence, emerging as a leader in helicopter design and development and being in a position to continue to meet the needs of the armed forces. This option will also be beneficial to partners including the user. Growth through partnership and synergizing our strength for better performance to make a superior product will benefit all.

Briefs

Appointments in Safran

Emeric d'Arcimoles is named Executive Vice President, International Affairs, Safran with effect from April 1, 2008.Emeric d'Arcimoles started his career at the Group with the technical support department at Snecma's Corbeil plant in 1974. In March 2001 he was named Chairman and CEO of Turbomeca, as well as taking charge of Microturbo in March 2007.

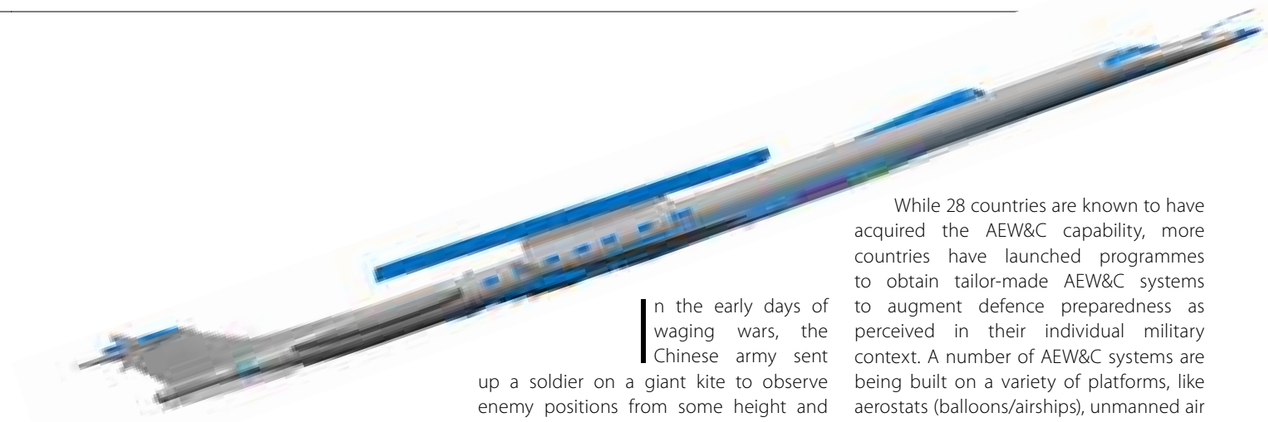
Olivier Andries is named Executive Vice President, Strategy, effective March 1, 2008. After holding various positions at the treasury department of the DRIRE (regional industry, research and environment directorate), Andries joined the French Minister of Economy and Finance's cabinet in 1993 as industrial advisor. In 1995 he joined the Lagardère group as vice president, strategy, coordinating several merger and acquisition projects. In 1998 he was named special advisor to Jean-Luc Lagardère, and he played a decisive role in the launch of the A380. He joined Airbus in 2000 as director of product policy, then was successively named vice president, marketing and price policy and director of the A330/A340 program.

Esperia Astronauts visit Turin

The seven astronauts on the Space Shuttle Discovery for the "Esperia" mission, Pamela Melroy, George Zamka, Scott Parazynski, Stephanie Wilson, Doug Wheelock, Paolo Nespoli and Clay Anderson, delivered Node 2/Harmony to the International Space Station and have now returned to the laboratories where the Node was originally manufactured, at Thales Alenia Space in Turin. The STS 120 mission (named Esperia in honor of Italy) was launched last October from the Kennedy Space Center at Cape Canaveral. Italy played a lead role in the mission: in addition to providing Node 2, Italian astronaut Paolo Nespoli participated in the mission on behalf of the European Space Agency.

With the installation of Node 2, the Space Station becomes truly International. It also required extensive and unplanned extravehicular activities, including the repair of a solar panel (Solar Array SE). This is a key to making full use of the two scientific laboratory modules, Columbus from Europe and Kibo from Japan, which will be added to the ISS on future missions. For more than 30 years Turin has been a world centre of excellence for the construction of space infrastructures. Thales Alenia Space's Turin facilities have manufactured more than half of the International Space Station's pressurized modules, the habitable part of the space station.

Node 2 is a critical structure linking the Space Station's different scientific laboratories. ESA chose Italian space agency ASI to manage development of this node, including the Thales Alenia Space-led production team. The Multiuse Pressurized Logistic Modules (MPLM), named Leonardo, Raffaello and Donatello, were also built in Turin on behalf of ASI. Working for ESA, Thales Alenia Space's Turin facilities built Node 3 (which the astronauts visited in the clean room at Thales Alenia Space), the Automatic Transfer Vehicle (ATV), which will transport fuel, air and water to the International Space Station, a large part of the Columbus scientific laboratory for research in microgravity environments and the Cupola, a special "observation window" for the station. The Columbus laboratory and the ATV cargo vessel are scheduled for launch early this year, and both were in large part built by Thales Alenia Space's Italian teams in Turin



Sentinel of the Indian Air Space

Dr S Christopher
Director, Centre for Airborne Systems, Bangalore

In the early days of waging wars, the Chinese army sent up a soldier on a giant kite to observe enemy positions from some height and the air-borne observer continually shouted down his alerts to the commander on the ground, who then quickly ordered the countermoves to his troops.

This clever 'Air-borne Early Warning and Control' (AEW&C) concept has come a real long way since then – thanks to the technology explosion in the fields of Radar and Communication Engineering. With its ability to sense the war situations in air-to-air and air-to-surface, all-weather, day and night deployments, the modern AEW&C system has come to be regarded as a powerful 'Force Multiplier' in today's military tactical operations. The prime functions of the AEW&C system are three, viz., sensing the threat scenario, providing early warning to the friendly forces and enabling initiation and execution of counter-measures and counter-threats, all in real-time. Actually, the most important facet of the AEW&C system is that it has the potential to stop a war even before it gets around to be started!

While 28 countries are known to have acquired the AEW&C capability, more countries have launched programmes to obtain tailor-made AEW&C systems to augment defence preparedness as perceived in their individual military context. A number of AEW&C systems are being built on a variety of platforms, like aerostats (balloons/airships), unmanned air vehicles, helicopters and fixed-wing aircraft - both big and small. While a good number of systems are operational, the efforts continue to build a variety of systems that are at various stages of development and production all over the world.

The Indian AEW&C

The Indian Defence Research and Development Organisation (DRDO) have launched an AEW&C programme that is focussed on the needs of the Indian Air Force. The Centre for Air-Borne Systems (CABS) of the DRDO that is tasked with the development of the system is pursuing the programme with participation of multiple work-centres from within DRDO as well as Industries in the Public and Private Sector.

The Indian AEW&C system will detect, identify and classify threats present in the surveillance area and act as a Command and Control Centre to support Air Defence operations. The system with its multiple Communication and Data Links can alert and direct fighters against threats while providing 'Recognizable Air Surface Picture' (RASP) to commanders at the Ground Exploitation Stations (GES) that are strategically located. The AEW&C system can thus support Air Force in offensive strike missions and assist Forces in the tactical battle area. What is more, the AEW&C system also comprises Electronic and Communication Support Measures that can intercept and counter unfriendly radar transmissions and communication signals.

Primary Surveillance Radar

The primary sensor for the AEW&C will be an Active Electronically Steered Array Radar with a normal detection range and an extended range against a target Radar Cross Section (RCS) of the fighter class of aircraft. Two radiating planar arrays assembled back-to-back and mounted on top of the fuselage in a Dorsal Unit (DoU) will provide coverage on either side of the DoU. The important modes of operation of

the system are the sea surveillance and the air surveillance. The sensor has the abilities to search, track-while-scan, priority tracking, high performance tracking, etc. In priority tracking, the targets will be placed in full track mode even if it crosses the primary surveillance area. In high performance tracking, additional measurements will be made to improve the tracking accuracies. Utilising the active aperture technology, the radar provides a fast-beam agile system that can operate in several modes concurrently.

Secondary Surveillance Radar

The Secondary Surveillance Radar (SSR) system, or the Identification Friend or Foe system, determines whether the target detected by the Primary Radar is a 'friend' or 'foe'. The interrogator emits a message querying the target in a particular sector. Replies from the target are automatically associated with the Primary Radar detections. This information is then used by the AEW&C system to identify locations of friendly and unfriendly aircraft in the area and deal with them appropriately.

Mission Communications System (MCS)

The Mission Communications System provides Air-to-Air V/UHF voice and data channels. It also provides for integrated control of all on-board communication sets and intercom for the entire mission Work Station Operators as well as the flight crew. The communication channels have in-built ECCM features as well. The various segments of the total operational system in the air and on the ground would have a multi-service standardized data link structure that enabled communication among the AEW&C Systems, other AWACS aircraft, the Fighter/Interceptor aircraft and the Ground Exploitation Systems..

Electronic Support Measure (ESM) and Communication Support Measure (CSM)

The ESM and CSM systems will support suppression of hostile air defences. This will be achieved by performing the surveillance of the environment for detection and identification of hostile emitters of both communication and non-communication types.

Towards this, the ESM system operates over a wide range of frequencies with complete coverage of 360° in azimuth and -15° to 5° in elevation. The ESM thus provides the bearing and the location of the hostile emitters to augment the Primary Radar performance. The system is capable of analysing and identifying the emitter characteristics with a frequency accuracy of 1 MHz and a directional accuracy of 2° (rms). An easy search method to scan through the database library of 3,000 emitters would also be a feature of the ESM. The system also has the capability to record and save the data for post-flight analysis. The CSM system shall intercept the communication signals and perform the required analysis for in-flight operations. It additionally records the signals on-board for post- flight analysis.

Self Protection System (SPS)

The AEW&C system will have a Self Protection sub-system. The SPS shall consist of Radar Warning Receiver (RWR), Missile Approach Warning system (MAWS) and Counter Measures Dispensing System (CMDS). The RWR function will be augmented by the ESM and will consist of the Warner Library and Display. The MAWS will be a passive UV based system and, augmented with the RWR, will give necessary warning to the pilot to appropriately activate the CMDS. It provides the essential displays to the pilot and helps in the activation of the CMDS as well as adoption of escape maneuvers for self-protection.

Mission System Controller (MSC)

The Mission System Controller will integrate the information from all the above-mentioned sensors. Its functions include system controls, mission modes, functional control logic, redundant array of independent disks (RAID), database management, integrity function, multi-sensor data fusion, health monitoring, time synchronization, bus control and other housekeeping functions. In addition, MSC will carry out the intercept control functions. MSC will interface with the DHDS system for all operator control and display features.

Data Handling and Display System DHDS)

DHDS will facilitate mission system operators to interface with the AEW&C system. The AEW&C system will have Operator Work Stations for Surveillance, Interception, and ESM & CSM functions. All the consoles can be reconfigured as required. In general, menus, displays and other presentation logic can be performed by each console. The consoles also help in planning of the mission with communication information handling, weather data handling, mission data preparation and handling.

Data Links

The AEW&C system will be capable of interoperating with other AEW&C systems, fighters, and AWACS aircraft in the air and other early-warning and air-defence systems on the ground. The data from the Radar, ESM and CSM can be down linked to the ground stations and the tactical control data up-linked to the AEW&C system. To this end, the AEW&C system will communicate to the Ground Exploitation Stations through 'C'- Band Data Link and SATCOM. The Data Links will operate with two voice channels.

Aircraft Platform

The Aircraft platform to house the AEW&C System should have the matching flight performance attributes to facilitate that the Mission System tasks are performed effectively during the operational missions. To facilitate extended operations, the endurance of the aircraft can be augmented by an In-Flight Refuelling system

Conclusion

The AEW&C System will boost the Air Force's Air Operations Capability. The System is multi-disciplinary and complex and is projected to be designed, developed, tested, certified and inducted into service in an optimal timeframe.

Indigenous development of the Indian AEW&C means three things to the Nation: (i) Air Force is getting a system that costs a fraction of the price of a comparable system in the world market, (ii) the indigenous capabilities being generated in terms of technologies and infrastructure will be an assurance against technology denials by big-brother nations and (iii) the 'feel good' factor of becoming one among the select group of Nations who really have the wherewithal to make a machine of this kind.

The adversaries of India should soon be nervous even to warn their forces, 'Keep off and keep quiet, the Indian AEW&C is on the prowl', as they would know that the Indian AEW&C would be watching, sensing and listening to whatever happens in its domain! Globally speaking, it seems possible that AEW&Cs around the planet Earth can bring about a World Without War, or, nip the war in the bud, if ever someone thoughtlessly triggered one.