We intend to develop airships: Dr. Tamilmani

Dr K Tamilmani was recently appointed as the Chief Controller (R&D) (Aeronautics) of Defence Research and Development Organisation.

Graduate in Aeronautical Engineering at MIT, Chennai, Dr Tamilmani served as the Director, Centre for Air Borne Systems (CABS) before being appointed as the Chief Executive (Airworthiness), CEMILAC .

He is recipient of many awards and honours for his work including the 'DRDO outstanding contribution award' in recognition of rotodome modification and flight testing of HAL HS 748 aircraft. He also received the 'Prof VM Ghagte Award' for his contributions to the indigenous Air Borne Early Warning (AEW) programme by the National Aeronautical Society of India (AeSI).

Dr. Tamilmani shares his thoughts in this exclusive interview to Aeromag Asia.

Dr. K. Tamilmani
Chief Controller (R&D) (Aeronautics) DRDO

How was the year 2012 – 13 been for DRDO vis-à-vis aeronautics field and what are highlights?

The year 2012 – 13 has been good for Aeronautic Labs in DRDO. LCA-Tejas completed its 2000th flight and had more than 200 flights during the last year itself. It also underwent hot and cold weather and weapon release trials. Tejas also participated in the Operation 'Iron Fist'. During 'Iron Fist' the aircraft performed well with accurate weapon release to target. Last year also witnessed the maiden flight of LCA Navy Aircraft.

In the area of Airborne Early Warning and Control System (AEW&C), India received two modified platform from M/s. Embraer, Brazil. The aircraft underwent the first block of flights successfully. Both the aircraft have now been equipped with various mission systems such as Primary Radar, Identify Friend or Foe (IFF), Electronic Support Measure (ESM), Communication Support Measure (CSM), etc. The flights with mission systems will begin shortly.

In the field of Unmanned Aerial Vehicles (UAV), the Army has inducted four Nishant aircraft. The development of Medium Altitude Long Endurance UAV Rustom-2 has been progressing well. DRDO has also developed the Advanced Pilotless Target Aircraft 'Lakshya-2' to meet the new requirements of the user and the same was demonstrated.

The medium size aerostat "AKASHDEEP" underwent endurance trials along with the Electro-Optic payload and demonstrated its capabilities.

In the field of Electronic Warfare, DRDO has developed and demonstrated 'Self Protection Suite' for Mi-17 helicopter. A modified 6-antenna Radar Warning Receiver (RWR) solution for Su-30 aircraft has also been successfully demonstrated.

In the current financial year, what's the thrust and goals?

The current year will witness the completion of IOC of LCA Tejas and flights of LCA-Navy from the Shore Based Test Facility. This facility will simulate the aircraft take-off from an Aircraft Carrier.

AEW&C aircraft will undergo flight trials with all mission systems on-board for full flight envelope and will demonstrate its performance as per User's requirements.

In the field of UAV, the MALE UAV Rustom-2 will undergo its maiden flight. DRDO has initiated a project for development of Low Cost Expendable Aerial Target – 'Abhyas', which also undergo flight this year.

EW suite for LCA and Mig-29 will also be flight tested.

What are the new initiatives in the pipeline?

DRDO is taking various projects in the field of aeronautics. Based on success of LCA, we are taking up development of Advanced Medium Combat Aircraft (AMCA) for which feasibility study is underway.

The Government of India has also sanctioned Airborne Warning and Control (AWACS-India) programme to develop a bigger airborne warning and control system with enhanced range, endurance and coverage.

Development of Large Size Aerostat for surveillance and Controlled Aerial Delivery Systems (CADS) for delivering higher pay loads has also been initiated.

DRDO is also planning to initiate R&D initiative on 'High Temperature Materials and Coating'; which is a back bone for any aeronautical system, especially engine. This initiative is planned to be taken up along with the academia and other departments like CSIR and DST.

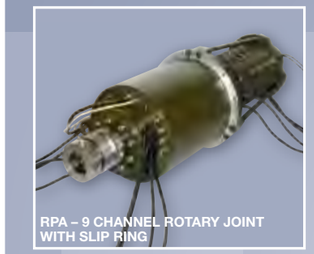
Could you talk about potential for joint ventures, collaborations and tie-ups in the area of aeronautics?

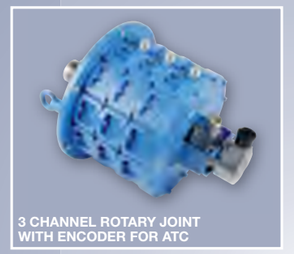
One of the crucial area for collaboration would be the 'Propulsion system' for various types of flying platforms, be it Gas Turbine Engine for AMCA, Piston Engine for UAVs or Turbo Shaft engines for helicopters.

Could you discuss DRDO's road map and vision in regards to Aeronautics?

In the area of UAVs, our road map is to make India self-reliant. We are focused towards development of various kinds of UAVs such as Micro UAVs, Mini UAVs, Medium Altitude Long Endurance (MALE) UAV, High Altitude Long Endurance (HALE), Rotary UAV and Solar powered UAVs. In the area of Electronic Warfare, we intend to provide the Radar Warning Receivers, Jammers, Dual Color Missile Warning Systems for all the platforms being used by IAF. Development of engines for propelling various aircraft is also our vision. In case of Lighter-than-Air systems we intend to develop Airships to meet the future needs of our services.

SPINNER || HYBRID ROTARY JOINTS


RPA – 9 CHANNEL ROTARY JOINT WITH SLIP RING


3 CHANNEL ROTARY JOINT WITH ENCODER FOR ATC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SPINNER GmbH
ads@spinner-group.com
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Contactless Digital Data Transmission with Ethernet Interface

It is now a long established standard in the mobile communications arena for manufacturers to install active components directly into the antenna. More recently, producers of radar systems have been motivated to incorporate more and more into the antenna as the need for more technically sophisticated solutions becomes more and more ubiquitous. The benefit? A huge increase in system efficiency and enhancement to the integrity of the signal.

For radar rotary joints, this means that the traditional RF modules for the diff erent frequency bands are being replaced by diverse media couplers, power current paths and signal transmission paths. The media couplers are used to create a cooling circuit with a liquid medium and, if required, for the ventilation and/or depressing of the RF line sections with dry air. The power current is primarily necessary for supplying the radar amplifiers, which often achieve an output rating of several 100 kW. In addition to this, antenna heating systems are also supplied with it. The electrical signals from and to the active antenna equipment are transmitted either optically via a multi channel fiber optic rotary joint, by a slip ring or by means of a contactless coupler.

The optical rotary joint has the disadvantage, however, that it requires the central inner bore of the overall system. This disadvantage is not shared by our new contactless signal transmission module. Depending on requirements, an inner bore of randomised diameter (keyword hollow shaft) can be realised.

The actual signal transmission between the stator and rotor unit occurs electromagnetically in the context of which the signal to be transmitted is digitally modulated.

As now standard in all areas of the technology, Ethernet is also used as the standard interface for data transmission in the radar fi eld. This is the reason that SPINNER has confi gured the newly developed module as a contactless Ethernet coupler (Ethernet module). This coupler is called module, because it has its own bearing support. This module is freely scalable in its diameter. Through stacking, it can also be confi gured to create a multi channel design. The primary advantage of the contactless solution is naturally its wear-free operation. Another advantage compared with a contactbased design, however, is that the maximum data rate is not infl uenced by the size of the module.

Dual Channel Ethernet Module

That's why the Ethernet module also consistently supports Gigabit Ethernet regardless of the dimensions. The intelligent electronics (Ethernet subassembly) recognise the Ethernet standard of the connected devices automatically, and adjust themselves accordingly. It is therefore unimportant as to whether a device is connected with 10 Base-T (10 Mbit/s) or Fast Ethernet (100 Mbit/s) or Gigabit Ethernet (1 Gbit/s), the transmission works without requiring intervention of the user. The subassemblies on the stator and rotor side require an external power supply of a nominal 24 VDC, or optionally 12 VDC.

A wide range of diagnostics functions are integrated in the electronics as well as a sophisticated functional surveillance system. During initial operation in factory, this information is evaluated in order to ascertain and ensure the quality. Prior to delivery, every module is subjected to a "Burn In". The subsequent evaluation of the diagnostics information and a test of the LAN interface according to RFC2544 are required for approval for delivery. This means a high degree of reliability is guaranteed throughout the entire lifetime of the Ethernet module.

Spinner GmbH, Munich, Germany +49 89 12601 1160,
www.spinner-group.com info@spinner-group.com

Ethernet Channel Characteristics	
Supported Ethernet Standards	10BASE-T (IEEE802.3 Clause 14) 100BASE-TX (IEEE802.3 Clause 25) 1000BASE-T (IEEE802.3 Clause 40) Auto negotiation provided to select Ethernet standard and full/half duplex mode automatically
Ethernet Frame Loss Ratio According to RFC2544/ Corresponding Bit Error Rate	≤ 1 x 10^{-9} *) / BER ≤ 1 x 10^{-12}
Supply Voltage	21.6 V DC to 28.0 V DC V; 0 V is connected to Case Ground internally
Current Consumption, typ. / max.	0.33 A / 0.5 A @ VCC = 24 V
Applied Regulations and Standards	EMC Directive 2004/108/EC EN 55022:2010 (Class B), EN 55024:2010
*) Measured @ 1 Gbit/s with 64 byte frames at 99% channel utilization while 800 s measurement time	

Ethernet Subassembly, Rotor Side, Small Version