



## Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

### **INDIAN AEROSPACE INDUSTRY AND PROGRESSIVE TECHNOLOGY ENHANCEMENT**

*Gp.Capt. Vivek Kapur, Senior Fellow, CAPS*

India's aircraft industry has been in operation since December 1940 when Hindustan Aircraft Ltd. (HAL) was established in Bangalore.<sup>i</sup> Over the past seventy five years, for a variety of reasons, HAL has carried out predominantly license production programs, such as those to build the American Curtis Hawk fighter, British Percival Prentice trainer, Vampire jet fighter, Gnat light fighter, and Hawker Siddeley HS-748 "Avro" transport aircraft, Jaguar strike fighter, and the Hawk advanced jet trainer; the Soviet MiG-21 supersonic fighter, MiG-27 ground attack fighter, and the Sukhoi Su-30MKI multi-role fighter; German Dornier Do-228 light transport aircraft; French Alouette-II and Alouette-III light helicopters. Alongside these license production programs HAL also designed and built the HT-2, India's first domestically designed and manufactured powered aircraft, a number of light aircraft such as the Krishak, Pushpak and Basant, the HPT-32 basic trainer, HJT-16 "Kiran" jet trainer that continues in service even today, the HF-24 "Marut" fighter and is currently manufacturing the Light Combat Aircraft (LCA) ""Tejas"" and the Advanced Light Helicopter (ALH) "Dhruv" and its variants such as the Light Combat Helicopter (LCH).<sup>ii</sup> HAL has also been involved in development of avionics in India for use on a variety of aircraft. The development of these indigenous aircraft can be attributed in part to the knowledge gained through carrying out manufacture under license of foreign aircraft designs.

#### **Background**

The license manufacture of the British Jaguar strike fighter gave HAL, which was renamed Hindustan Aeronautics Ltd. In the mid-1960s an insight into advanced western navigation and weapon



## Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

delivery systems in form of the Jaguar's Navigation and Weapons Aiming Sub System (NAWASS).<sup>iii</sup> After an examination of this British system Indian engineers applied their new knowledge to work out better system architectures using off the shelf components sourced from various European manufacturers. This new system the Display Attack Ranging Inertial Navigation (DARIN)<sup>iv</sup> system was used to upgrade Indian Jaguar aircraft and is now in its third iteration as the DARIN-III.

### Current Situation and Future Prospects

The DARIN system uses components including ring laser gyros sourced from Europe.<sup>v</sup> When the DARIN system was first integrated import of the components was considered as best due to economies of scale and the inability of Indian industry to make these components in the country. Over time more platforms have commenced to use the DARIN system or its component parts thus leading to better economies of scale. At the same time Indian industry has come to a stage where it is able to manufacture more items to the required quality. In such a situation better control over more components of an advanced navigation system such as the DARIN becomes more feasible. It is reported in the press that HAL has obtained a license to manufacture and provide maintenance support for critical components of the DARIN system such as the SAGEM Sigma 95N laser gyro navigation system.<sup>vi</sup> Such license manufacture could be expected to allow HAL greater flexibility in manufacturing DARIN and equivalent systems for myriad application in India, both in the aircraft and other parts of the aerospace domain. Precise navigation systems have application in the space and marine domains also. Over time offshoots of such technology could find application in equipment designed for other domains as well. In view of the experience that HAL has had with license manufacture of aircraft leading to design and development of its own aircraft it is not unreasonable to expect HAL and associated agencies to, through license manufacture of the SIGMA 95N ring laser gyro (RLG) system to graduate towards their own innovative designs of similar equipment with similar or superior performance. Such internalisation of high technology equipment bodes well for the future of the Indian aerospace industry.

For such a situation to fructify, HAL would require to expend considerable effort into internalising the knowledge gained through license manufacture of the SIGMA 95N system. Such



## Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

internalisation of knowledge is not possible without tasking dedicated teams to work on fully understanding specific parts of the entire system till they are completely familiar with the technology and confident enough to strike out on their own to develop similar equipment. Given the importance of having control over technology used by the armed forces and other critical Government departments, the armed forces themselves as well as the Government could be expected to support such knowledge internalisation fully without any reservations. A steady strategy of acquiring advanced technology in a phased manner should in the medium term enable Indian industry to take on ever more complicated tasks successfully. These could be system development, new platform design and development or upgrade application to older platforms as has been done with the Jaguar and MiG-27ML aircraft. In the long term this technology absorption could lead to development of cutting edge equipment for use by the Indian state or even for export.

### **Conclusion**

Since its formation HAL has carried out a large number of manufacture under license projects to build aircraft for use in India, this experience led to learning that in turn played a role in design and development of indigenous aircraft such as the HF-24 “Marut”, HJT-16 “Kiran”, HPT-32 “Deepak”, LCA “Tejas” and ALH “Dhruv”. In the course of license manufacture Indian industry was able to examine advanced avionics and develop its own architecture for better performance than that delivered by the examined avionics system. This led to the DARIN in three variants. The commencement of manufacture under license of advanced SAGEM SIGMA 95N laser ring gyro inertial navigation systems could be reasonably be expected to provide a further impetus to the indigenous avionics industry and its internalisation of advanced technology with possible future application in myriad fields including space and marine applications. For this to happen HAL and other agencies involved in development of avionics in India would require making a concerted effort to upgrade their capabilities through close examination of the latest equipment being built under license in the country. An organisation-wide desire to upgrade capabilities is a prerequisite for this. The Government’s “make in India” campaign should provide the required top level direction for this effort to be put in.



# Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

*(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])*

-----XXXXXXXX-----

<sup>i</sup> Hal-india.com, "our history", [http://www.hal-india.com/Our%20History/M\\_111](http://www.hal-india.com/Our%20History/M_111), accessed on 02 March 2015.

<sup>ii</sup> Ibid

<sup>iii</sup> Vishal Rathod, "Indian Air Force DARIN upgrades for SEPECAT Jaguar", <http://www.defenceaviation.com/2011/12/indian-air-force-darin-upgrades-for-sepecat-jaguar.html>, accessed on 02 March 2015.

<sup>iv</sup> Ibid.

<sup>v</sup> Ibid.

<sup>vi</sup> Richard Tomkins, "Indian company to produce Sagem navigational system", [http://www.gpsdaily.com/reports/Indian\\_company\\_to\\_produce\\_Sagem\\_navigational\\_system\\_999.html#](http://www.gpsdaily.com/reports/Indian_company_to_produce_Sagem_navigational_system_999.html#), accessed on 02 March 2015.