

Potential of Indian Composites Industry in Aerospace and Defence

A critical Review

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The composites materials are having great demand in aerospace and defence industry. Their penetration is increasing day by day, as in year 1975 composites usage was merely 3% but at present it has huge 50% uses by Boeing 787 while Airbus A350 XWB uses 25% by weight. Light weight, fuel saving quality, reduced number of assemblies, low CTC, high resistance to fatigue are major drivers for composites materials' penetration in aerospace and defence industry. The aerospace market consists of military and civil aviation, in their basket primary and secondary composites components comes such as fuselage, wings, radomes, interior parts, fairings, nacelles, trust-reversers and others. All the composites components used in aerospace are depicted in fig 1, and fig 2 shows composites applications in defence industry. Defence has fibre reinforced composites components also such as bullet proof jackets, domes, helmets, shelters, armour vehicle, and more.

The composites shipment in Indian aerospace and defence industry was only 220.8 MT and INR 416.4 cr by volume and value respectively for fiscal year 2008, which represents only 8% of the total composites applications. The same is depicted in figures 3, 4, and 5. Ample opportunities are left to captivate this market by fabricator/molder, designer, and raw materials suppliers. Composites business is booming in Indian aerospace and defence market, fueled by record demand for aircraft and by

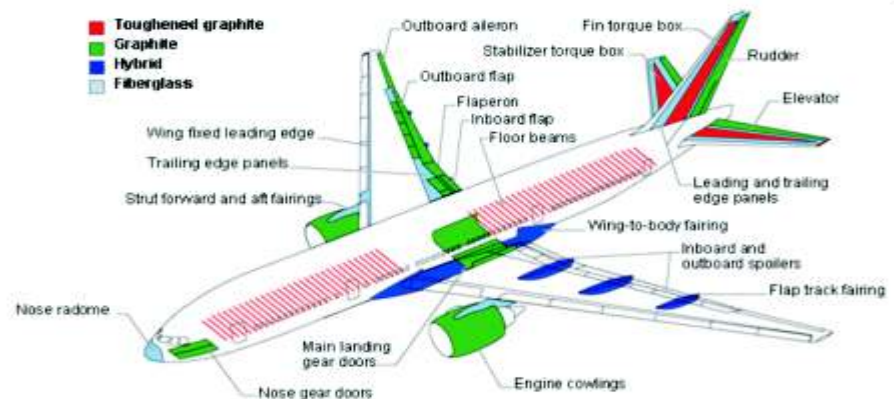


Fig 1: Primary and secondary composites structure for Aerospace

advances in weapon systems that are remaking military capabilities. India is one of the world's biggest arms importers, which holds around 20 percent of the defence industry market but has the potential to grow significantly. Global aerospace composites market is moving towards India with the lower costs and quality deliveries being the major key drivers. In the future India will be a major hub for aerospace/defence composites components just as automobile market. The Indian defence market is very large. However it is completely dominated by the public sector. This is bound to change and the government has taken several steps to open up this sector to Indian industry. Today nearly a dozen global aerospace majors are looking to source from the country's sole high-end composites maker in the private sector.

One decade ago, no one was supplying composites parts for government based organization ISRO,

HAL and NAL; they all had in-house manufacturing facility. Now ISRO and HAL are outsourcing composite components to the private sector. Tata Advanced Materials Ltd (TAML) is the critical composites end products supplier (Started in 2003) to national aerospace entities such as ISRO for solar panels and yokes for satellites and launchers and advanced light helicopters (ALH) for HAL (Started in 2005). TAML has recently signed an MoU with the advanced composites division of National Aerospace Laboratories, for its manufacturing centre for the products designed by them.

Light combat aircraft Tejas and ALH have about 60 percent and 40 percent less weight respectively than traditional spacecraft or aircraft due to composites components. New generation aircraft such as Boeing 787 and Airbus A380 are reportedly increasing their use from 10 percent to nearly 50 percent in planes, from

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interiors, seats, floorboards, to wings and engines. The high performance matrix such as epoxy, phenolics, cyanate ester, BMI, PEEK, PS are used whereas as reinforcement glass fibres, carbon fibres are used along with prepregs. One technology that is playing a growing role in both industries is composites, typically carbon or glass fiber-reinforced thermosets and thermoplastics and multi-material laminates like aluminum mesh and glass fiber. These materials are essential to the performance, longevity and life-cycle applications.

The TAML has also defence products like bullet proof vests, rigid composite armour and composite lattice structures for masts, composite antenna reflectors, mobile containers, telecom shelters, and others. TAML is the largest manufacturer of bullet proof vests for the Indian Army, having supplied more than 160,000 out of their total procurement of 200,000 vests. TAML has technological collaboration with CPE Oy, a Finnish company, to manufacture innovative 360° bullet proof vests.

Post Kargil, the demand of bullet proof vests has been increasing with the terrorist attacks and safety concerns of army personnel being the critical drivers. The Kevlar, Aramid, and polyolefin based fibres are used for the manufacturing of bullet proof vest, and the major raw materials suppliers are DuPont (Kevlar), Honeywell (Spectra), and DSM (Dyneema). TAML design and manufacture lightweight composite parts for the Indian main battle tank, Arjun and transportation containers for the Prithvi and Akash missile systems, launcher tubes for the Pinaka missile system.

TAML has contracts with Boeing for the 787 Dreamliner programme, with Pratt & Whitney (P&W) for critical jet engine components, and with Goodrich for interior parts for the



Fig 2: Composites Applications in defence industry, Source: MKU

Airbus. Recently TAML has finalized an agreement with Saab Aerostructures. They have also supplied parts that go into first class and business class seats on the Boeing 767 and 777 airplanes. These were supplied to BE Aerospace, the largest manufacturer of seating systems in the world. Apart from that, TAML has exported vests and helmets to Sri Lanka, Algeria and Nepal.

Godrej Aerospace is actively engaged for the manufacturing of specialized product for aerospace and defence industry and recently it has made critical applications for Agni Missiles; and also the production of hardware and subsystems for cryogenic rocket engines. Godrej Aerospace is proud that India's First Cryogenic Thrust Chamber is manufactured in-house and this Engine is planned to be used in launching Geo Synchronized Satellites at 36,000 kms away from the Surface of the earth by ISRO's Geo Stationary Launch Vehicle (GSLV) Rocket.

MKU, a Kanpur based company is engaged in the manufacturing of body armours, helmets, armour plates,

ballistic shields, de-mining suit, military vehicles, and unmanned aerial vehicle systems (UAVS) which goes to defence industry. It has domestic as well as overseas market.

Bhopal based Permal Wallace also has specialized products for defence sector applications in Military, Navy and Air Force. Valet High Tech Composites Private Limited, a Chennai based firm is actively engaged in space, aerospace and defence products..

In 2009, government of India passed new policy that allows domestic firms to bid for large defence contracts and Indian defence companies will gain access to a potential \$100 billion market over the next 10 years. Under the new policy, the government will allow domestic companies to bid for key projects on their own and local companies will be free to bid for projects involving tanks, artillery and aircrafts. Earlier they were not invited by the government to bid for big government defence projects and were left to supplying locally made non-combative equipment for the defence forces. This will boost foreign

countries' technology independence and encourage private defence companies to enter the arms market. The new policy will provide more opportunities to heavyweight Indian companies such as Tata Motors, Mahindra and Mahindra, Ashok Leyland and Larsen and Toubro.

It is estimated that over the next ten years, the total budgetary provision for capital acquisition is likely to reach \$100 billion for this sector. This move can also save costs and help us turn India into a major production hub in the near future. In 2009, Hindustan Aeronautics Limited (HAL) and Boeing signed an agreement to work together for the production of flaperons for the Boeing's 777 series of commercial jetliners. The 777 flaperon is a highly complex composite assembly that is instrumental in controlling the airplane's maneuverability during flight.

The commercial aviation sector is booming with great pace in India than anywhere else. Low fares and low budget airlines are driving this growth.

Maintenance, repair and overhaul (MRO) will be the next future market segments of the Indian Aerospace and Defence industry. The key drivers are usage statistics and fleet age.

Taneja Aerospace and Aviation Limited, has recently signed an agreement with Air Works Commercial MRO Services (P) Limited for setting up an Airfield

and MRO business. TAAL has DGCA maintenance approval under CAR 145 for maintenance of Cessna Jet and other light transport aircrafts.

Market Leaders

The market leaders in aerospace / defence market in India are:

- Tata Advanced Materials Ltd (TAML)
- HAL
- Taneja Aerospace and Aviation Limited(TAAL)
- Godrej Aerospace
- MKU Private Limited
- Parmali Wallace
- Kineco Private Limited and
- Valet Hightech Composites Private Limited.

SWOT Analysis

Strength: Strong Indian aerospace and defence industry, especially in the design and production of aircraft / defence components.

Weakness: Stringent testing and qualification procedures, long lead time and long-product cycles.

Opportunity: The government support and new policy for aerospace and defence industry with the fastest growing commercial aviation sector and low budget airlines.

Threat: New entrant especially the overseas player.

Steps needed to be taken by India government:

- Increase transparency and clear-cut policy
- Having long-term contracts

instead of short-term • Leverage of India's buying power as well as offsets policy like railways, shipping and capital goods sector • Reduce business time, since dealings with defence industry takes long time to get finalized. Any entrant will have to be prepared to invest and wait out for a long period • Emphasize on higher value chain.

Great potential exists for Indian composites market in aerospace and defence industry. New players are venturing into this business such as LOHIA Group, and others.

In India, Boeing has collaborations with several institutions for development of aerospace technology. It has a tie-up with Indian Institute of Science (IISc) for research in aerospace materials, structures and manufacturing technologies. It collaborates with IIT-Kanpur for integration of passive and active radio frequency identification (RFID) technology, and with National Aeronautical Laboratory (NAL) for development of computational fluid dynamics (CFD) tools and testing aircraft landing gear.

Boeing has a partnership with Hindustan Aeronautics Limited (HAL) for developing advanced low-cost manufacturing processes for polymer matrix composite structures. Boeing is part of the Aerospace Network Research Consortium (ANRC), comprising IISc, Wipro and HCL, which

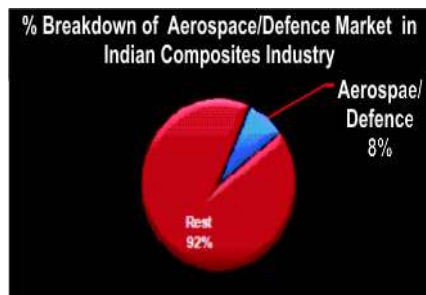


Fig 3: Market Share of Aerospace/Defence Industry in Indian Composites Market

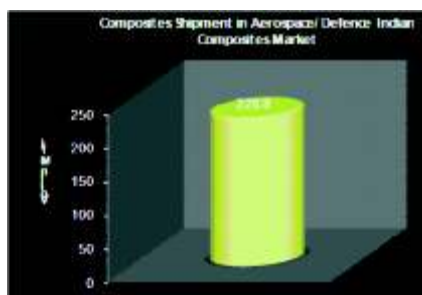


Fig 4: Composites Shipment (Vol: MT) in Aerospace/Defence Indian Composites Market

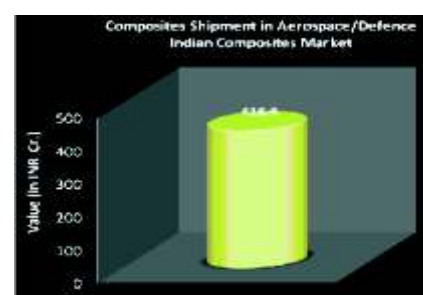


Fig 5: Composites Shipment Value: (INR Cr.) in Aerospace/Defence Indian Composites Market

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is developing innovative solutions for aerospace networks.

Boeing has also tied up with Tata Motors Tal Manufacturing Solutions (TALMSL), which will build floor beams using titanium and composite materials for Boeing 787.

US Sikorsky Aircraft is looking at making India the hub to cater to the requirements of the South Asian market after forming a joint venture with the Tata Group to manufacture helicopter cabins in India. European aircraft manufacturer Airbus Industry has plans to establish manufacturing base in India in the next three-four years following a strong presence in areas such as engineering, research, design and training. Airbus expects an expenditure of about \$ 1 billion in India over the next 10 years provided it

gets right partners and projects. As part of its globalisation plan, the company plans to build up to 20% of aero-structures and 30% of engineering sub-contracting offshore by 2020.

Tata Advanced System Limited (TAS), a unit of the Tata group, is expected to invest \$ 200 million for helicopter manufacturing unit at the Aerospace Special Economic Zone (SEZ) in Adibatla village near the Hyderabad international airport. TAS had collaboration with Israel Aerospace Industries to set up a surveillance systems facility also at the SEZ, and would be the focal point for a large number of high-tech activities. The government of India has also taken good initiative to establish composites hub for aerospace and defence sector with Government Offset and PPP

Policies helping private and public sector to invest in Indian aerospace sector. An investment of \$ 600 million will be made by industries in the Aerospace and Precision Engineering Special Economic Zone at Adibatla, Ranga Reddy district, Andhra Pradesh.

European Aeronautic Defence and Space Company (EADS), the parent of Airbus is exploring possibilities to set up a helicopter assembly unit in India. A high-level delegation recently visited India to assess the possibility of setting up a manufacturing facility in the country.



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