Aerospace Supply Chain

Opportunities for India Suppliers

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The aerospace industry continues to be challenged by increasing competition and cost pressures as well as rising energy costs, high raw material prices and a weak US Dollar though the last factor has eased a bit with the weakening rupee.

To combat these challenges, airframe manufacturers, aerospace OEMs and Tier 1 suppliers are leveraging the advantages arising from the globalisation of the aerospace supply chain. They are adapting to these challenges by outsourcing more and more elements of technology, design and component/sub-assembly manufacture.

For the aerospace supply chain, this is an opportunity as well as a threat. It is an opportunity for those suppliers who can innovate, adopt high level technologies, implement best practices and invest in change – such suppliers will win larger amounts of work from their customers. Those suppliers who cannot do this, could find themselves out of favour of the airframe manufacturer/OEMs' supply chain.

Typical Aerospace Supply Chain

For successful players, coordination and integration of supply chain practices and processes are becoming increasingly important, and requires lots of attention. Traditionally the large aircraft manufacturer would define and specify exactly what their Tier 1 suppliers should produce for them. The airframe manufacturers would do the total aircraft design, and give their suppliers detailed specifications and drawings for the manufacture of sub structures and sub systems. This is changing. Airframe manufacturers and Tier 1 suppliers have become large scale integrators ("super integrators") and coordinators of airplane production. New strategies adopted by the aerospace industry to achieve this include greater dependence on Tier 1s, increased risk sharing by suppliers, adoption of low cost region suppliers, increased aero structures outsourcing, and an increased transparency in their aircraft programme plans and schedules.

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There is more focus on systems integration, less internal production capability, and a desire to work with a lesser number of Tier I primes, and significant reduction in direct dealings with Tier 2 and Tier 3 suppliers (except when developing such suppliers in low cost regions like India). Some examples of this happening have been studied by management consulting company AeroStrategy (www.AeroStrategy.com) – they describe how Embraer had about 350 suppliers for their EMB 145 aircraft, of which four were risk sharing, compared to 38 suppliers for the EMB 170/190, of which 16 were risk sharing.

Similarly, Rolls Royce had about 250 suppliers for their Trent 500 engine, which went down to 140 suppliers for the Trent 900, 75 suppliers for the Trent 1000, and it is estimated that there would be only around 25 to 35 suppliers for the engine being developed for the next generation single aisle/narrow body (the Boeing 737 RS or the Airbus NSR).

Airbus's Power8 initiative, which aims to improve financial returns, reduce cycle times and increase overall efficiency, also incorporates changes in supply chain. Airbus has initiated plans to shift from seven, mostly national centres of excellence, to four transnational centres of excellence.

Airbus senior management has publically stated that they are reshaping and consolidating their existing supply base, and building a network of strong Risk Sharing Partners to Tier 1 suppliers.

For example, EADS's E2S (Engineering Supplier Synergy) programme reduced EADS' more than 2000 engineering services suppliers, to just 28, of which four are from India. The aim is to turn Airbus into an extended enterprise, and it is expected that the A350 XWB will draw on this new business model, as Airbus assigns larger work packages to Tier 1 suppliers. Airbus has stated that about 50 per cent of aero structures work will be outsourced to risk-sharing partners, and this is expected to help address launch aid and political issues.

Boeing's 787 development is another example of leveraging a global supply chain, with aero structures work being done in Japan, larger amounts of fuselage work being outsourced to American aero structures Tier 1s, and avionics development and testing being outsourced to India through Boeing's systems Tier 1 suppliers.

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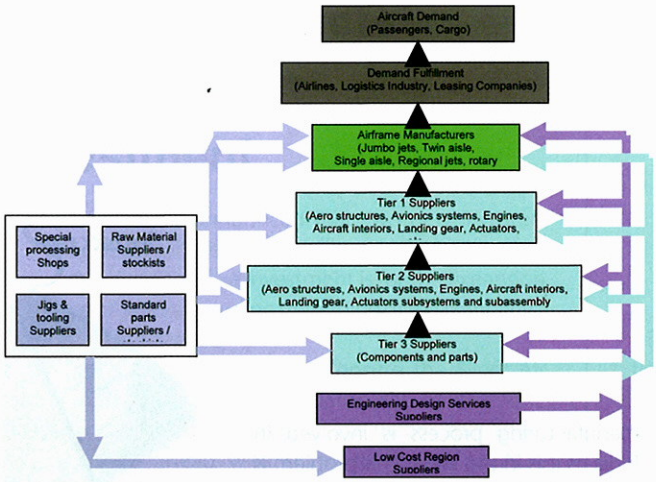
However, increased outsourcing gives rise to tensions and conflicts between established practices and the need to change these practices. Internal resistance to such changes, for various reasons ranging from perceived loss of job security (and thereby loss of income) to loss of control on the development process (and thereby loss of control on a programme schedule) gives rise to conflicts.

The recent strike by Boeing machinists is an example of such a conflict. Senior management in airframe manufacturer/OEM companies need to navigate these hurdles in order to successfully leverage global supply chains. One important message to give the existing employees in their organisations (substantiated with data, policy implementation proof, etc.) is that outsourcing work is good. For example, outsourcing would actually mean more job security for existing workers, since in periods of downturn, it would be the contractors/outsourced work that would be removed/stopped first, thus protecting the in-house workforce.



In addition, information should be shared with the employees about the lack of younger aerospace engineers in the system, thereby creating the potential of a vacuum in aerospace engineering workforce when the existing workforce retires (this is a demographic shift that is causing major concern in the western world). Also, market information should be shared with them, showing the buying patterns of aircraft worldwide, and indicating the high growth areas.

The logic used could go like this: India and China are buying the largest number of planes, and so these countries will play a larger role in the development of the planes, due to offset obligations and the need for airframe manufacturers to be seen as playing a significant role in the high-tech industrialisation of these countries.

Lastly, argument has to be made that globalisation of the supply chain would make the airframe manufacturer more competitive, and hence will enable more planes to be sold, and hence would help in the sustenance and growth of the company. But one must admit, it is far easier to expound the above arguments on paper, than it is to actually convince an existing employee base that globalisation and outsourcing is good for most people concerned.

The existing realities and relationships within an organisation are much more complex, and it requires an imaginative and sensitive mind to be aware of the power plays and insecurities involved. Thus, suppliers need to be aware of this, and must take into account all of this when making a pitch for outsourcing. Also, it helps if in addition to the traditional stakeholders like Senior Management, Engineering and Procurement within an organisation who get involved in outsourcing decision, the HR (Human Resources) department also gets involved.

In the present competitive global market, major investments have to be made to enhance the innovative steps regarding design, technology and operations. These huge investments cannot be carried by airframe manufacturers alone. Therefore those high technology suppliers who are able to invest in change are taken on board as risk-sharing partners with the airframe manufacture. This requires an organisation-wide expansive learning process followed by development of a whole new network of next level (Tier 2/3) partners. It is a strategy that will involve major changes in aircraft production. The airframe manufacturer therefore will no longer tell the partners what to do. They will instead search the global market for the most capable and reliable suppliers as risk-sharing partners.

The capacity of an aerospace supplier to appreciate, process and absorb external knowledge and learning from past and present experiences, is important, when it comes to winning a position as a risk-sharing partner to an airframe manufacturer.

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As a result of globalisation, airframe manufacturers and OEMs have a richer portfolio of supplier alternatives than earlier. Three key regions--East Asia (including China & India), Eastern Europe, and Latin America, are coming up as locations where labor intensive aerospace work can be done at lower costs. Aero structures work is increasingly viewed as non-core for aircraft OEMs. Most OEMs are not competitive in aero structures because of high labour costs and a broad array of suppliers. As a result, they are pursuing aero structures outsourcing on new aircraft programmes, particularly in the air transport and rotary wing segments. Training and developing low cost region companies is a relatively low cost expenditure for the Tier 1 suppliers and the airframe manufacturer, compared to dealing with western labor costs.

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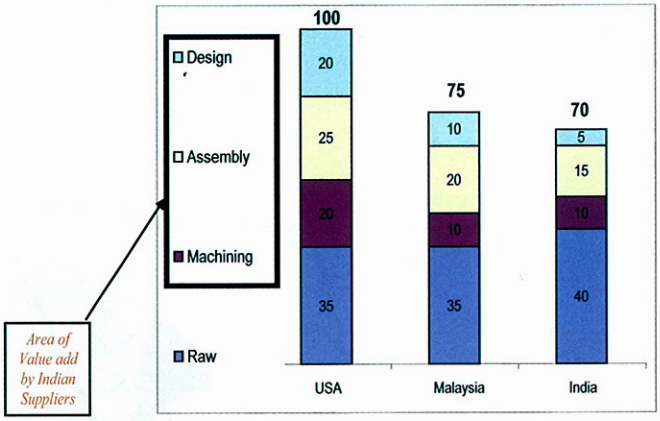
For players in the aerospace supply chain, the capacity to engage into these processes and benefit from them is highly dependent on a company's position in the supply chain. Small, low technology western suppliers do not usually have the financial capacity to redesign their operations significantly. These companies are facing competition from the suppliers in the low cost regions like India.

The above gives rise to opportunities for companies in India (outside of HAL) who aspire to become players in the aerospace supply chain. Companies who can provide engineering design services ranging from CAD (drafting, detailing and modeling), CAE (finite element analysis, computational fluid dynamics, simulation and flight physics), electrical wiring/harness design, technical publications, manufacturing engineering, avionics design, testing and integration, etc. will find buyers for their services, provided they also have the necessary process discipline that certifications like AS9100, DO178B and DO254 compliance provide.

Excellent configuration management, IP security and integrity guarantee are some of the other things that aerospace OEMs and Tier 1s will look for, in India-based companies. But the most important factor would be aerospace domain knowledge. Given the level of domain knowledge that exists in services companies in India today, especially in mechanical engineering and avionics, a reasonably high level of work does get outsourced to India.

However, OEMs and Tier 1s do not farm out very high level / complexity in large volumes to India currently – they prefer that such work is done by existing Tier 1 companies in the West who then use Indian companies for further subcontracting, and provide



the domain knowledge, guidance and hand holding necessary to ensure smooth execution of the work. For Indian suppliers to go higher up the value chain in design services, they need to have delegated authority signatories / direct engineering representatives (DERs) on board who can sign-off on designs. For this, they need to implement EFQM (European Foundation for Quality Management) systems, get EASA and FAA approved processes, etc. They need to have people with enough high level domain knowledge on board. While HAL, NAL and DRDO organisations are a source of such people, Indian suppliers should also look at tapping the pool of aerospace chief engineer profile people from the USA, the UK, France, Germany, etc. who would be retiring from their existing jobs, but willing to work on a part time / consultancy basis, thus imparting their tribal knowledge to younger engineers. QuEST Global Engineering is one such company that provides engineering design services using such people.

But design work can only save some money due to labour arbitrage, because it is a one time activity. For OEMs and Tier 1s to really benefit from low cost regions, service provider companies in these regions need to help OEMs and Tier 1s save money by doing design in such a way, so as to save costs in manufacturing, either through reduction of material costs, reduction in machining operations, using lesser number of parts, reducing assembly costs, etc.

Since manufacturing is a repeated activity (i.e. multiple components/sub assemblies need to be manufactured from the same design), there will be a higher quantum of savings from manufacturing. By getting aerospace work done in India, aerospace OEMs and Tier 1s can derive as much as 50 per cent cost savings on engineering design. This can directly be attributed to the difference in cost of engineering design labour between the West and India.

But the quantum of savings can be increased by outsourcing machining related activities, special processing and assembly related activities. In order to deliver cost savings in these areas, engineering design companies in India need to be very familiar with the nuances of aerospace manufacturing.

In addition, companies need to be able to understand how replacement of operations that were automated in the West, can be replaced by skilled labour in India. Being in a low cost region does not provide any advantage as far as the acquisition cost of machines and automation equipment is concerned – a special purpose machine costs the same in India as in the US.

Similarly, the raw material would cost the same in both regions (probably a bit more in India due to the logistical requirements). Thus it limits the savings potential when the same machining or manufacturing process is involved in India as it is in the West. This problem is accentuated by very high levels of cost of capital (currently at around 14%) in India.

Hence, the key to achieve higher savings in manufacturing costs, is to explore the possibility of how the initial/ upfront capital expenditure costs can be reduced, and how the labour content can be increased. The opportunity for the aerospace industry therefore, is to look at accomplishing this in India. This can be achieved in India by de-automation, rather than by automation - the exact opposite of what happened in the West.

If one were to breakup/strip down the manufacturing processes, and study what previously automated activities could be replaced by labour without compromising on quality, thereby doing away with some machines and equipment and thus saving capital investments, the potential cost savings could be as high as 20% - 30% in the total cost of manufacturing. This is one of the principles used by QuEST Global Manufacturing to deliver value in aerospace machining to its customers.

For example, one of the products currently outsourced to QuEST Global for manufacturing, required a $1,000,000 flexible transfer line which needed auto-loading and transfer automation based on the original manufacturing process. QuEST Global substituted the elements of auto loading and transfer automation with manual loading and transfer. This reduced the capital expenditure by more than $500,000. This in effect increased the potential manufacturing cost savings and rendered the project economically viable for offshore outsourcing.

An important point to be noted, is that the substitution of automation with labour must be supported by streamlining of systems and practices, ensuring the appropriate levels of skilled labor with the right knowledge is put to the task, etc. This involves extensive training, strict adherence to standard operating procedures and quality consciousness. The initial cost of this effort can be high due to the learning curve, and this can reduce the saving potential for the first year of operations, but it delivers higher savings in the subsequent years. Further cost savings can be achieved by doing the process design in such a manner as to take into account the new de-automated manufacturing process.

In summary, the current way that the global aerospace supply chain is evolving, gives rise to tremendous opportunities for players in India, who would benefit by spending their efforts to increase the size of the pie (opportunity) available, by adding capacity and capabilities in order to service the potentially available business.

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