ALH Dhruv and the Indian Helicopter Industry
Unrealised Potential, Promises and Challenges

M. Matheswaran[*]

For more than half a century, independent India's aircraft manufacturing has been dominated by, and entirely limited to, Hindustan Aeronautics Limited (HAL). The helicopter, in particular, was seen almost exclusively as a platform of military utility. Therefore, other than the defence forces, paramilitary and a few state governments, civilian use of helicopters was almost unheard of until recently. Commencing from the 1990s, awareness about the utility of helicopters for civilian use increased rapidly due to its widespread use by political parties during elections. Due to the rapid growth of Indian economy in the last two decades, and the resulting growth in urbanisation and industrialisation, the Indian aviation environment has blossomed into a huge market with a huge potential to absorb a large number of helicopters in multiple applications. In the next decade-and-a-half (by 2030), India would require nearly 1,000 helicopters for its defence and paramilitary forces. The civilian market for helicopters, both in the government and private sectors, is likely to absorb nearly 2,000 helicopters. This is a huge potential that can be exploited by the Indian industries, both private and public, provided they move aggressively with technically oriented strategies to create appropriate competencies.

* The author is the former Deputy Chief of Integrated Defence Staff (DCIDS) for Policy, Plans and Force Development, at Headquarters, Integrated Defence Staff, in the Ministry of Defence. He is also a former Commandant of the prestigious flight test centre, Aircraft and Systems Testing Establishment (ASTE), at Bangalore.

ISSN 0976-1004 print

Journal of Defence Studies, Vol. 11, No. 1, January–March 2017, pp. 5–20

The HAL's helicopter manufacturing began with the production of Alouette III and Lama, French light helicopters, under licence from Aerospatiale. The Alouette was named Chetak and is used in significant numbers by all three services and the paramilitary forces. The Lama, called Cheetah, is used mainly by the army, primarily for high-altitude operations as well as observation and fire direction duties for the artillery. The Cheetah, although extremely limited with its payload capability, has been the workhorse for army's support requirements at Siachen, the world's highest battlefield.

Helicopter Manufacturing in India

Although HAL's Bangalore division had commenced assembling Alouette helicopters in the 1960s, its formal helicopter division came into existence in 1970. Since 1972, it has produced these helicopters under licence. Over the years, HAL has incorporated minor modifications to cater to Indian environmental conditions. Chetak and Cheetah helicopters have been shouldering the light helicopter duties for the Indian armed forces for more than four decades. The HAL's helicopter division has produced 336 Chetaks and 246 Cheetah helicopters so far, and has overhauled more than 200 helicopters of both types. While manufacturing division is located at Bangalore, the maintenance, repair and overhaul (MRO) of these helicopters is done at the Barrackpore division near Kolkata. This experience of manufacturing and overhaul of more than 700 helicopters has provided a strong engineering foundation and enabled HAL to acquire capability to design, develop and manufacture its own light helicopters. In effect, the helicopter division is the most compact and well-balanced division of HAL. With such strong experience and foundation, HAL continues to be well poised to emerge as a major manufacturer of world-class helicopters, provided it addresses some of its critical weaknesses in the management of its supply chain and excessive import dependency. These have afflicted its indigenous product—the advanced light helicopter (ALH)—with reliability issues from what otherwise is a fine product.

ALH Beginnings: Design Consultancies

The desire for indigenous helicopter development began early even as the first licence-produced helicopters were being delivered. An indigenously designed and produced light helicopter project was first proposed by the

C. Subramaniam Committee on Aeronautics in 1969. Following this, India entered into a 10-year agreement with Aerospatiale of France for the design of a single-engine ALH, the first prototype of which was to fly in 1982. Based on its operational experience, particularly in the Himalayas, the Indian Air Force (IAF) felt that safety and reliability of twin-engine configuration was essential and, hence, in 1977 it asked the government to change the ALH into a twin-engine aircraft. The IAF's recommendation was accepted by the government in 1979 despite the fact that HAL had nearly completed a single-engine design. This led to termination of the contract with Aerospatiale in 1981, and the government had to pay $4 million in cancellation fees. In 1984, a new seven-year design collaboration contract with Messerschmitt-Bolkow-Blohm (MBB) of West Germany was signed and work began from scratch.

This 1979 change was crystallised in the IAF–Indian Army requirements specified in the Air Staff Requirement (ASR) 2/79. The naval requirement, specified in the Naval Staff Requirement (NSR) AO/4721/1978, was released in 1985. The intention was to have a single platform that could meet the requirements of all three services. As subsequent developments showed, this was impractical simply for the fact that the span of operational envelope covered performance at 6 kilometre (km) altitude to sea level. Besides, the naval requirements demanded some capabilities unique to the naval environment. These would have entailed contradictory pulls on the design process. The ASR and NSR, by themselves, were well crafted with futuristic vision on technology and performance. The IAF and the Indian Army needed a helicopter that could land at 6 km pressure altitude with a payload of 200 kilogram (kg) plus a large fuel load. While the primary role was as a utility helicopter, additional roles for follow-on variants included armed and reconnaissance roles that included a wide range of weapons and sensors. The agility and manoeuvrability requirements were fairly challenging. Naval roles included anti-submarine and anti-surface warfare, search and rescue (SAR), troop carriage and a capability to change roles in quick time. Since storage space is a critical factor on ships, blade folding requirement was absolutely essential.

It was essential that India got the right partner to jump-start its design capabilities in the aeronautical sector and in this respect, German involvement in Indian aircraft design proved to be momentous. Dr Kurt Tank of Messerschmitt was engaged by HAL in the late 1950s to head India's first fighter programme, HF-24 Marut. Kurt Tank and his team of German engineers were singularly responsible for setting up the aircraft design bureau in HAL. In less than a decade, the series production HF-24 began entering service with the IAF. Before he left a decade later, Kurt Tank had left a legacy of 250-man-strong design team for HAL, with good work culture and design experience. This was helpful in transitioning part of the manpower to establish a viable helicopter division with a reasonable design department. However, it was necessary to go in for collaboration with a well-established foreign original equipment manufacturer (OEM) when undertaking India's first helicopter design and development project. Therefore, in 1984, HAL entered into an agreement with Germany's MBB to act as a design consultant and collaborative partner for the programme for a period of seven years that was further extended by three years.

Beginning in 1984, MBB played a leading role in the design and development of the ALH prototype. The first prototype flew in 1992. However, MBB's contract was not renewed in 1994, which led to its abrupt departure at a crucial juncture when flight tests were just getting underway. This being the first major helicopter project for HAL, the absence of the original collaborator was to prove costly in terms of development time frames and escalation in costs. The concept of using a consultant or partner is quite inexplicable in India, as shown in many projects. It seems to emanate from false bravado that we can handle the project from now on, as the basic design has been achieved. Nothing is more foolhardy and penny-wise, pound-foolish as subsequent events in the ALH programme show.

The departure of MBB at a critical juncture left the HAL design engineers, with no previous experience, to face a whole lot of problematic design issues. Obviously, this resulted in an iterative approach to finding design solutions that required extended and repetitive testing, resulting in long delays. Besides, in the absence of access to long-accumulated research database, some of our solutions may not have been robust or best. The fault lies in India's approach to design consultancy or partnership. We invariably fail to take a global approach with a view to market the product globally, so that the partner remains for the complete business strategy. Contrast MBB–HAL partnership with that of the earlier MBB–Kawasaki partnership. The latter jointly designed, developed and produced the BK-117 (which provided the origin and inspiration for the ALH) that went on to become fairly popular in the world market. India's problems in ALH with respect to reliability and maintenance issues could be ascribed to this critical decision of delinking MBB at a crucial time of its development phase.

ALH: Combination of MBB Design and Indigenous Effort

The ALH's origin can be traced to MBB's well-proven helicopters, Bo-105 and BK-117. When MBB was contracted for design consultancy and collaboration, it was on the basis of its rich experience in the design and manufacture of helicopters. The constituents of MBB—Messerschmitt, Bolkow and Blohm + Voss—came together with individual competencies to create a major integrated aerospace firm in Europe with significant design experience. In the early 1960s, Bolkow had developed the hingeless rotor system. In 1964, it began work to develop a twin-engine, light, multi-purpose helicopter that was to become Bo-105. The development test programme of the Bo-105 was broken down into stages as it comprised new designs and technologies: new airframe, new rotor system and a new engine. Its rotor system was the revolutionary hingeless, rigid rotor system that was a pioneering innovation in helicopters. It enabled exceptional manoeuvrability to make Bo-105 the first helicopter that could perform aerobatics. The Bo-105 entered series production in 1970 with the new entity, MBB. The main production lines were in Germany and Canada; and as export demand increased, additional manufacturing lines were established in Spain, Indonesia and the Philippines. A total of 1,406 Bo-105 helicopters had been produced until 2001, when its derivative EC-135 replaced its production.

The Bo-105 was reputed for its high levels of manoeuvrability. Its most significant design feature was its rotor blades and rotor head. The rotor system was entirely hingeless, with the rotor head consisted of a solid titanium block to which the four blades were bolted; the flexibility of the rotor blades worked to absorb movements typically necessitating hinges in most helicopter rotor designs. The rotor blades were made from reinforced plastic–glass fibre composite material; its flexibility of the main rotor allowed for active elements other than rotor pitch changes to be removed, thereby greatly simplifying maintenance and extending blade lifespan. As a result, the Bo-105 achieved excellent reliability of its rigid rotor system. In fact, in over six million operating hours across the fleet, there were a total of zero failures. The Bo-105's agility and responsiveness was attributed to its rigid rotor design.

Derivative Developments: Bo-105 to BK-117 to ALH

The success of the Bo-105 was an important milestone in the history of the helicopter industry, particularly for MBB, West Germany and the Western world. It gave a jump-start to the helicopter sector in view of the success of its unique and revolutionary rigid rotor system. The Bolkow-designed rigid rotor was flight-tested for more than 1,000 hours on Alouette II. Adapted for both civil and military applications, Bo-105 was the first light twin-engine helicopter in the world to enter commercial service. Multi-role in true sense of the word, the Bo-105 was produced in more than 25 versions and used in both civil and military sectors, performing in a wide range of missions—from rescue missions to anti-tank combat. The Bo-105 and its rigid rotor design went on to inspire many derivatives. As MBB merged into European Aeronautic Defence and Space Company (EADS) to form Eurocopter (later Airbus Helicopter), it developed an advanced glass cockpit derivative of the Bo-105, called EC-135, which is now in widespread use.

In the late 1970s, MBB joined hands with Japan's Kawasaki to develop a scaled-up derivative of the Bo-105, called BK-117. It proved to be a very successful model and was produced in many countries. Through technological cross-breeding with EC-135, the BK-117 evolved into the modern EC-145. The BK-117, weighing 3.2 tons, had a more refined airframe compared to the Bo-105 and was designed to carry eight to 10 passengers. Its rotor system was similar to the Bo-105, but with larger blades (made of carbon composites instead of fibre glass) and two-blade composite tail rotor. In 1985, MBB displayed a combat version, designated BK-117 A-3M. In the late 1980s, MBB flew a composite fuselage BK-117 under a German technology demonstration programme. In the early 1990s, Kawasaki also flew an advanced technology demonstrator, the 'BK-117-P5', with a 'fly-by-wire' control system.

The BK-117 was a product of the successful partnership between MBB of Germany and Kawasaki of Japan. The work shares and joint development responsibilities were well defined. Costs were shared equally, with MBB developing the rotors (based on the rigid rotor system of Bo-105), tail boom, flight controls and hydraulic system and Kawasaki developing the landing gear, airframe, main transmission and minor components. The partnership produced successful sale of 443 helicopters in the international market before giving way to the development of its derivative, EC-145. Different versions of these helicopters were powered by both Allison and Turbomeca turboshaft engines.

For India, ALH was the first indigenous helicopter project. Till then, HAL had had no design experience in helicopters. It was, therefore, a very sensible and correct decision to go in for an experienced OEM to partner its indigenous design project. The MBB had been a pioneer in rigid rotor design of helicopter. In fact, its experience of Bo-105/EC-135 and BK-117/EC-145 series of helicopters made it the most successful designer and manufacturer of rigid rotor, light helicopters in all roles. These projects, in particular the earlier BK-117 involving MBB and Kawasaki, exemplified the successful business venture of the partnership of two major firms on a helicopter project. In the development of BK-117, MBB had the lead role and was responsible for the core design of the rotor system, while Kawasaki took on the supporting role. The business venture, with equal partnership, made the programme a huge success. The same model was replicated, involving the German, French and Japanese companies, in the success of more modern derivatives, EC-135 and EC-145. The HAL–MBB partnership should have been on a similar model but like many other projects, the Indian decision to limit the involvement of MBB to design consultancy and collaboration to the prototype stage made sure that the project suffered from an incomplete approach to its strategic and business case.

Indigenisation of ALH

The ALH design, with MBB assistance, began in 1984 and the first prototype was ready in 1992. As mentioned earlier, HAL had no previous experience in design and development in the helicopter sector. So, as this was their first design venture, and in accordance with fairly futuristic requirements of the IAF and Indian Army for an agile helicopter, the design consultant brought in their well-proven rigid rotor experience into the design of the ALH. Indian operational requirements tend to be unique in the world, primarily due to the conditions that exist here. Most platforms and propulsion units, both fixed wing and rotary wing, tend to be designed for performance in average conditions across the world. India's 'hot and high' requirements become more challenging and expensive to design. Light helicopters for Indian military need to operate efficiently at altitudes well above 20,000 feet (6 km) in Himalayan ranges, as well as in hot temperatures of 45 degrees Celsius in the deserts of Rajasthan. Manoeuvring agility in Himalayan valleys, even for utility helicopters, is an important requirement, and hence, the ASR was a well-thought-out one.

At 5.5 tons with a passenger capacity of 12–14, the ALH was a significantly large platform as compared to the 3.2 ton BK-117 or the 2.7 ton Bo-105. Hence, the redesign of the rigid rotor system by MBB had to cater for higher control power requirements and more power from its propulsion units. It is only natural that even with all their experience, MBB and HAL should have visualised significant levels of teething problems to be ironed out during the development phase. But getting rid of MBB in 1994, at the most critical juncture of ALH development, meant HAL designers had to deal with the multitude of teething problems all by themselves, resulting in enormous time delay and escalation in development costs. While it is creditable that HAL designers managed to overcome almost all the challenges, this was, however, not the most intelligent thing to do. In the bargain, the users have continued to battle with serious maintenance and reliability problems. More importantly, it has had a seriously adverse impact, as the Ecuador experience shows, on the export potential of the ALH.

In 1997, Stephen David wrote in *India Today* that the ALH, despite its massive cost overruns and time delays, was indeed a major achievement. His statement, 'though it is India's, if not Asia's, first *de novo* designed helicopter, it is not "indigenous" in Indian sense of the term, but a collaborative effort of HAL and specialists from MBB, who built the Eurocopter, which the ALH resembles', puts the ALH development in the correct perspective. He quotes Dr Valluri, former Director of National Aeronautics Laboratory (NAL), 'it was the MBB that did all the work for the ALH that you see today. They prodded the Indian designers to work on the multi-purpose work horse helicopter.'

There is, however, no ambiguity that the ALH is a major indigenous milestone and that this was possible only through collaboration with a major OEM like the MBB. The Comptroller and Auditor General (CAG) report of 2009 puts it clearly:

> The collaboration agreement was necessitated as the Company was developing the helicopter for the first time with no prior experience, to develop the helicopter with contemporary technologies available with only selected OEMs and to develop new technologies like Rotor, Transmission, Vibration Isolation Systems, etc. in-house instead of borrowing the technologies and systems.

Poor planning, changing parameters and termination of the collaboration agreement contributed to development problems and consequent slippages in deadlines, resulting in the project being extended well over 20 years. The costs, originally estimated at Rs 23 crore in 1972, escalated to Rs 450 crore by the time the first prototype was ready in 1992. The CAG report indicates that Rs 1,541 crore had been spent up to September 2009.

Faulty decisions with respect to development process of the ALH cost the programme significantly in terms of time, cost and production efficiency, as pointed out by the CAG. The collaboration agreement provided for achievement of 13 milestones that included development of five prototypes; full development and certification of the utility version; and design freeze of the utility version before commencement of production. The termination of the agreement in 1995 short-circuited this process. The CAG observed that non-renewal of this agreement impacted on development as various technologies such as Anti-Resonance Vibration Isolation System (ARIS), Automatic Flight Control System (AFCS) and retractable landing gear were yet to be developed, validated and integrated. As a result, certification of the five basic prototypes that were to be completed by 1994 got delayed to March 2002 for the military version, and to October 2003 for the civil version. Thus, the decision not to extend the collaboration agreement in 1995 and the decision to go in for Limited Series Production (LSP) in 1999 even when prototypes were being flight-tested (1992–2003) and certified were premature as a large number of design-related problems began to afflict the users during the first decade.

ALH: A Good Design Marred by Poor Programme Management

From the Indian perspective, the ALH incorporated many new concepts and technologies. The excellent manoeuvrability demonstrated by the ‘Sarang’ aerobatic team amply exhibits the ALH’s performance agility, even though it may fall short in few other operational requirements. Much of the challenging performance requirements were addressed through new technologies brought in by MBB. Advanced technologies brought in by MBB were related to the rotary system, which incorporated the main rotor control system rods routed inside the main rotor shaft. The MBB also brought in its revolutionary composite four-blade, hingeless, fibre elastomer lager (FEL) main rotor consisting of only few parts with a composite hub and titanium centrepiece. Similarly, the design for main gear box (MGB), ARIS, etc., were innovative designs that were introduced but needed the strength of the experienced collaborator during the flight testing and consolidation phase.

Commencing LSP, without the design freeze at the end of prototype development and certification, under so-called 'concurrent engineering' was driven more by concerns over long delay in the programme rather than a well-thought-out engineering decision. As a result, the induction of the helicopter into user service was premature. Production engineering and design for maintenance had not matured adequately and lacked consolidation. These were the main reasons for the series of maintenance and reliability problems faced by the users. IDS problems were frequent and had to be replaced very often. The MGB failures were frequent and reflected serious safety issues. Excessive vibrations in the tail rotor led to a redesign of the tail rotor in 2006, which incorporated new materials in addition to changes in design methodology.

In 2010, the IAF and the Indian Army reported suboptimal performance of the IDS that led to non-compliance in high-altitude performance as well as vibration-related problems. It was observed first in 1997, during flight tests to top speed, that vibration-related problems emanated from the rigid rotor design that was yet to mature. Absence of the OEM, MBB, after 1995 put paid to hopes of design changes in the IDS to address the problem. As a result, top speed was limited to 250 km per hour as against the requirement of 280 km per hour. While problems related to IDS, MGB, engine power, excess weight, etc., have been addressed to a large extend in Mk III version, major issues with respect to top speed and vibrations remain unresolved.

Performance, Safety and Reliability

As brought out earlier, the hingeless, rigid rotor design has made the ALH a very agile and highly manoeuvrable aircraft. While this is a positive quality, it also brings with it certain associated risks. The ALH manoeuvrability, in terms of rate of roll, is significantly high. A negative result of this is the cyclic control saturation problem in a left turn. The ALH has had more than 16 accidents within the first decade of its operations. Many of these accidents have linkages to manoeuvring into high-risk zone. In February 2007, during display team Sarang's rehearsal, one of the aircraft crashed killing one of the pilots instantly. The second pilot sustained serious injuries, went into a coma and died four years later. Investigations established the cause as cyclic control saturation in a left-hand turn at low altitude from which the aircraft could not recover.

The issue of lateral cyclic control saturation or limit was experienced during developmental flight tests as early as 1994. The HAL designers attempted to resolve this through change in the lateral cyclic control rigging. In spite of the maximum possible lateral rigging adjustment, it was clear that the problem continued to persist, and this was observed in development flight number 109 of PT-A in June 1997. Any further solution would have required major design change that would have called for major delays and increased costs, which HAL was not prepared to incur. Besides, it would have necessitated original design house's (MBB) involvement. Net result was that the problem was ignored till a major accident brought the issue to the fore.

The HAL's approach to addressing cyclic control saturation was to implement stabilisation mode and a warning system that would alert the pilot of an approaching manoeuvre limit that could lead to a control saturation problem. Both approaches were more of warning signals than preventive solutions. A preventive solution would have called for a major design change in the rotor head. As a logical business strategy, HAL has adopted ALH's core rotor head design for its follow-on derivatives, light combat helicopter (LCH) and light utility helicopter (LUH).

The LCH, being a combat helicopter, would necessarily be prone to risks associated with aggressive manoeuvring. This was pointed out by IAF's flight testing agency, Aircraft and Systems Testing Establishment (ASTE), as a major safety issue. It was pointed out that these helicopters, especially LCH, would need to carry out aggressive manoeuvres close to the ground. Apart from control saturation risks, the blades and transmission would also be subjected to higher loads during these manoeuvres. This caution was also sounded by a Eurocopter test pilot, based on similar experiences. The Tiger Helicopter, designed by M/s Eurocopter, with main rotor design similar to that of the ALH was facing a similar problem. The helicopter underwent a major design change in its main rotor head during its prototype development; it was modified to incorporate a preconing angle of 2.5 degrees to prevent high fatigue loading during aggressive manoeuvring.

Cyclic control saturation problem was probably the main reason for Chile government changing its mind on its selection of ALH a few years ago, thus impacting ALH's export potential. The HAL's export of seven ALH helicopters to Ecuador was again marred by the loss of four helicopters, after which Ecuador cancelled the contract in 2015.

While survival in accidents is well proven by its excellent crashworthy design, poor maintenance reliability on account of supply chain problems and safety issues related to control margin issues continue to hamper the realisation of the full potential of the ALH. All of these issues again point to poor programme management.

Supply Chain Management, Import Dependency and Impact on Export

Poor project management has resulted in lack of reasonable indigenous sources for critical components and aggregates. This has come in for a very adverse comment by the CAG, which observes that production rates, maintainability and product support have become weak areas, impacting on operational reliability of the platform. The CAG has observed that as against the programme's stated objective of 50 per cent indigenisation by 2008, ALH was still dependent on imports to the extent of 90 per cent.

More importantly, heavy import dependency leads to adverse impact on export performance. First, cost competitiveness becomes marginal as it relates only to labour cost. As 90 per cent of the products and materials are imported, assured supplies will need significant order of quantity and lead times to ensure smooth supply. It also creates strategic vulnerabilities. The case of Myanmar is a striking example, where Amnesty International used ALH's import dependency for critical parts to raise issues with supplier countries in order to block India's export of the helicopter to Myanmar in 2007. Ruthless competitive nature of the export markets brings in added pressure on HAL by interfering with import-dependent supply chain. Ecuador case is an example of this problem. Ecuador has consistently raised the issue of high cost of maintenance and poor product support. It is evident that both these problems are manifestation of excessive import dependency and the lack of supply chain control. Figure 1 indicates the level of import dependency for the ALH.

Conclusion

The ALH, Dhruv, is basically an excellent helicopter from design and performance perspectives. HAL has delivered more than 100 ALHs to the IAF and the Indian Army, as well as a few exports. There is likely to be further delivery of at least 150 more Mk III and Mk IV versions of the ALHs. The fleet, however, continues to suffer from maintenance and safety-related problems and poor product support. Much of these stem from poor programme strategy and management, inadequate development of indigenous supplier base, excessive import dependency for critical items and materials and lack of effective design and technology control.

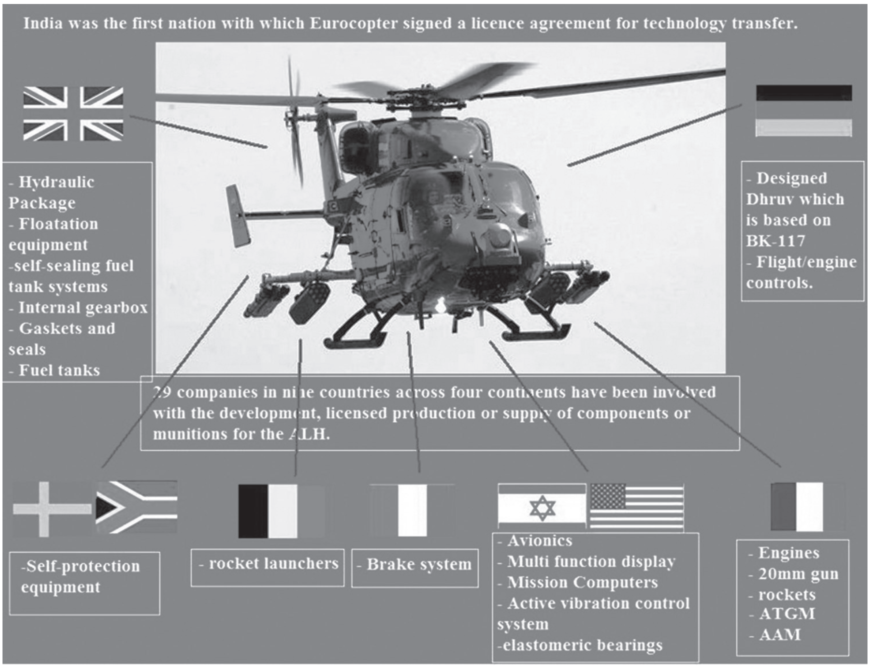

Figure 1 Import Dependency of ALH Project

These issues have hampered export prospects of the ALH seriously. The HAL has used ALH core design as the basis of the development of its other helicopters, LCH and LUH. Many of these issues, unless addressed holistically, will continue to afflict these products as well. These issues and possible remedies are summarised next.

Design Consultancy and Collaboration

The ALH programme commenced with Germany's MBB as the design collaborator. The MBB provided the core design for ALH. India's aviation projects have been hampered by an approach of part-time consultancy, as is evident from other projects. Invariably, many of the projects have suffered due to discontinuities in consultancy and poor knowledge management. Most successful projects in the world are based on a risk-sharing model between the partners or collaborators. This implies that unless technology partner is involved equally in risk sharing and marketability of the product, his accountability for the success of the design is questionable. This, precisely, is the major cause of problems associated with ALH.

Some lessons can be learned from the successful partnership between MBB and Kawasaki in developing BK-117. The ALH and its derivatives have a huge export potential, and can become even better success stories, provided Indian aerospace decision makers recognise the above-mentioned issues. The ALH continues to face design-related problems, which impact on its reliability and safety. To effectively address these issues, control saturation in particular, it will require the involvement of the OEM in a risk-sharing model.

Supply Chain Management and Import Dependency

Most critical components are of foreign design, and continue to be imported. These should be, as a first step, manufactured and serviced within the country through micro, small and medium-sized enterprise (MSME) ecosystem development. Unless this is done, it will be difficult for HAL to address effectively the complaints of cost, poor product support and reliability. This should be followed by increasing indigenisation levels in the helicopter to at least 50 per cent level. This is critical for realising export competitiveness.

Manufacturing and MRO

The HAL is already looking at outsourcing much of the helicopter manufacturing and MRO to the private sector. Although a late development, this is a welcome step. Effectiveness of this process depends on the extent of outsourcing. About 70–80 per cent of the manufacturing and entire MRO should be outsourced to the private sector. This would enable HAL to focus on final assembly, system integration, flight testing and quality control. It will also enable better knowledge management and design-related solutions.

Export and Certification

Helicopter market for civil applications is growing enormously the world over. Civil market acceptability is driven by high standards of safety and reliability. The Federal Aviation Administration (FAA) and European Aviation Safety Agency (EASA) certifications have become the norm all over the world for civil aircraft acceptability, so much so that even Russian and Chinese aerospace industries have embraced this norm while promoting their products. The ALH's EASA certification is yet to materialise, even after four years of effort. Civil certification has an indirect impact on the export potential of the military versions as well.

Larger Helicopter Business and Technology Strategy

In 2014, the author advised the then chairman that it would be wise for HAL to also establish an alternate technology line of helicopters to improve its capacity and capability. The suggested aircraft was the Russian LUH Ka-226, whose main characteristic was its contra-rotating rotor system. This would add variety to HAL's helicopter capabilities and knowledge base. It would be extremely important for HAL, in order to derive maximum benefits for itself and the country, to strike a risk-sharing partnership on the Ka-226 project for a global business case. If this is not done, it could tie HAL into an all too familiar inward-looking licence production trap.

If HAL aspires to become a world-class aerospace major, ALH and its derivatives offer the best scope. However, this will not be possible unless the current problems of certification, quality control, design-related safety issues and ease of maintenance issues are addressed. This may call for a radical change in HAL's approach to business strategy and programme management. The concept of risk-sharing partners must be examined seriously and put into practice. In an ideal situation, if all issues are resolved and right partnerships are established, HAL could become a global helicopter major that has two lines of helicopters with exceptional technologies: the rigid rotor design ALH and its derivatives in one line; and the Ka-226 series based on the proven contra-rotating rotor design.

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