International Seminar

Heli Power India-2018

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Military Day

FUTURE OF VERTI LIFT IN COMBAT

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Owing to constraints of space, we are able to report only the inaugural session in this report. The rest of the coverage of the sessions will be published in the next issue.

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President RWSI

It gives me great pleasure to extend a warm welcome to all the participants at the ‘8th Heli - Power India International Seminar’ organized by the Rotary Wing Society of India. It is indeed a great privilege to welcome this distinguished gathering of professionals and stakeholders of the Rotary Wing aviation in India and abroad.

In keeping with the requirement of the armed forces, state of the art Attack Helicopter Apache 64E and Heavy Lift Helicopter Chinook 47F are likely to be inducted into the Indian Military from next year. As more helicopters, approximately 1000 plus helicopters are likely to be inducted in the coming decade, an appropriate theme has been chosen for today as ‘Verti-Flight in Combat’.

In respect of combat potential, Mobility and Firepower sets the tempo of war for it provides the capacity to move and support a military force without the limitations of terrain. The possessor of these capabilities can seek out the enemy, pursue him and surprise him by applying fires and volume of force at the place and time of his choosing. What better platform and weapon system than the Verti-Flight which provides this capability to a military force.

The object of the Seminar is to provide a platform to helicopter operators, users, manufacturers, government agencies and professionals to share and exchange the latest information on some of the aspects related to employment of next generation verti-flight platforms & systems in India which will be of immense benefit to the Industry especially the tiltrotor platforms. In this context the seminar will also look at VTOL UAVs which will play critical role in future conflicts.

We also welcome our guest speakers from India and abroad and thank them for agreeing to share their knowledge and expertise with us. We are indeed honoured to have with us several distinguished delegates from the military and Para military services, central and state governments and stakeholders of the Industry.

The focus during the Seminar will be on the increasing roles played by military helicopters in combat support in future conflicts especially with emerging technologies and enhanced capabilities. Its ability to operate at short notice from locations close to tactical area with little or no infrastructure and its ability to integrate with the other arms is helping these assets to emerge as weapon systems of the future.

Use of helicopters in armed forces now ranges from high to low intensity conflicts including counter terrorism.

As Nature of future wars and conflicts in the Indian subcontinent will be short, swift and intense with deeper and wider combat zones, judicious use of helicopters especially attack helicopters can be crucial and decisive in the outcome.

With the proposed induction of the next generation Attack helicopters such as Apache AH-64, Indigenously manufactured Light Combat Helicopter, weaponized version of Dhruv -Rudra, Medium Heavy helicopters such as Chinooks & Mi-17V, Light Observation Helicopter (LOH) like Kamov-226T and Sea borne helicopters with mission-oriented platforms, Indian Armed forces will have some of the finest tools of war, it has ever had.

To utilize the maximum combat potential of these verti-flight platforms, we need to develop sound doctrines with organizations capable of performing required missions. Helicopters being maintenance intensive, to meet requirement for maintenance and product support at various formation levels during hostilities would require the development of infrastructure for first line, second line and repair activities, and associated product support.

The scope of such deliberations could be very vast indeed. Besides well thought of doctrines we need to have in place clearly defined command and control structure during hostilities and effective communication between the helicopters and the defined command and control center.

For the crew to exploit the increased complexity of the next generation machines, we need to have a well thought out comprehensive training programmes to ensure crew achieve high degree of proficiency in operating available target acquisition, designation and weapon delivery systems.

On behalf of Members of RWSI, I wish to one again thank the Esteemed Panelists and distinguished participants for sparing their valuable time to participate in the event. We are also grateful to the Sponsors for helping us organize the event.
Theme Address by Lt. Gen B.S Pawar President RWSI (Northern Region)

Introduction
Ever since the development and flight of the first practical helicopter, the VS-300 in 1943 by Igor Sikorsky, the father of modern helicopter, thousands of man-hours and billions of dollars have been spent on improving the helicopter design to make it fly farther and faster. However, due to the engineering and aerodynamic constraints related to helicopters, the design approaches over the years have not yielded any significant results. This is even though helicopters have been utilized in every conflict situation as their presence on the battlefield has been deemed essential including their logistical applications. The spill sport is the rotor system which imposes inherent limitations on speed because of its design. Most of the rotary-wing machines today are limited to speeds of approximately 180 knots at the top end and a range of around 350 Nautical Miles. Concerted efforts have been made by major helicopter giants like Bell, Sikorsky, Boeing and Airbus to overcome this ‘Limiting Factor’ over the last two decades, but have achieved limited success – The upgrades have only helped marginally – AH 64E, Black Hawk, Chinook etc.

The development of various experimental models as technology demonstrators by Airbus X3 and Sikorsky X2 co-axial compound helicopter, wherein the main emphasis was on increasing speed and load carriage capacity, are pointers in this direction. While many of these designs go well beyond the tried and tested rotor and propeller system that has defined generations of helicopter technology, the gains have again been limited. While Airbus X3 TD with two propellers on the sides of the craft to stabilize the helicopter and remove the need for a tail prop, has demonstrated enhanced speed and acceleration, it is Sikorsky’s X2 TD which has generated interest and shown great potential for development. It has contra - rotating rotors and a clutched propeller at the back, allowing for huge increases in speed. This X2 technology has facilitated the development of the ‘S-97 Raider’ stated to be a lightning fast ‘Armed Aerial Scout Helicopter’, capable of achieving speeds in the range 250 knots. Interestingly, the X2 technology is also applicable to the US Army’s Joint Multi Role/Vertical Lift initiative whose target date is 2030. But finally, if the designer must rely on a rotating blade to provide most of the lift for the rotorcraft, retreating blade stall will produce a barrier to top speed, efficiency and range - hence the only way to overcome this problem was to look at the concept of merging the attributes of a helicopter with a fixed-wing aircraft. This meant that during cruise flight, the aircraft should rely on a wing to produce the lifting force and the rotors must morph from providing all the lift while in the hover, to producing all the propulsive force in wing-borne cruise flight – in other words the Tilt-Rotor Concept. To make this concept a reality has been one of the greatest challenges faced by aeronautical engineers and aerodynamicists since the advent of modern helicopters.

Tilt-Rotor Development
The first recognized model of a tilt rotor is the I-G single seat tilt-rotor with a centrally mounted Lycoming O-290 piston engine. This was developed in 1952 by some less known Pioneers in the US, as part of a military contract. While the I-G crashed in 1955, it was able to carry out some flights where the prop-rotor drive shafts had been tilted to within 10 degrees of the horizontal airplane mode. This vehicle therefore is recognized as the first to explore transition from vertical flight to wing-borne airplane flight. This was closely followed by the design and development of the Model XV-3 by Bell Helicopters, again through military funding. The XV-3 was similar in configuration to the I-G, with the Pratt & Whitney R-985 piston engine centrally mounted in the fuselage, excepting that the aircraft was almost three times the weight of the Model I-G. This model faced a lot of problems related to rotor instability and heavy airframe vibrations, factors responsible for the crash of the XV-3 during a flight in October 1956. The company made several modifications to the existing XV-3 model and finally successfully completed the first full transition from helicopter to airplane mode in December 1958. The XV-3 was also instrumental in defining flight control systems in this new breed of flying machine. Tilt-rotors that followed the XV-3 broadly copied its flight control systems, albeit with more and more levels of sophisticated automation. The XV-3 had certainly proved that the concept of the tilt-rotor was achievable, but it was only able to achieve a speed of 115 knots, a marginal increase over most conventional helicopters of that time - however, the flame for the tilt -rotor concept had been lit, generating a keen interest in the Helicopter Industry and the American Military who had funded these programs and were keen on its success.

Encouraged by the XV-3 and subsequent experimentation and research into aero-elasticity by NASA, wind tunnel tests of large prop-rotors by Bell Helicopter and Boeing and further research into flight control systems by Vought Aeronautics, NASA and the Army Air Mobility Research and Development Laboratory initiated the Tilt-Rotor Research Aircraft project in 1971. In April 1973, Bell Helicopter was selected to design and build two tilt-rotor research aircraft for a target cost of $26.5 million and the designation XV-15 was allocated to the project. The first prototype of XV-15 was officially rolled out in 1976 at Bell’s Fort Worth facility, Texas. Because of its relatively small size, the aircraft lent itself well to ground-running tests both in helicopter and airplane mode. Extensive tests were carried out on the XV-15 and it made its first brief hop in May 1977, in a profile that maintained all loads at the minimum values. The flight envelope of the XV-15 was expanded cautiously under direction from NASA and the second prototype of XV-15 carried out the first transition to wing-borne flight in July 1979. What followed over the next 20 years was arguably one of the most successful flight-test career of any NASA X-plane (Tilt-Rotor). The XV-15 proved the tilt-rotor concept could be turned into a practical aircraft with varied military
and civil applications. The most significant development was its participation and performance at the Paris Air Show in 1981, where it became the show stopper leaving the industry, the military and the public spell bound and arousing the interest of several participating countries.

**V-22 Osprey**

Despite the XV-15 funding by the US army, it was the US Marine Corps which took the lead by looking at the tilt-rotor as the most suitable aircraft to replace its aging fleet of CH-46 Sea Knights and CH-53D Sea Stallions. Accordingly, in 1982, a request for proposal was issued under the project name Joint Services Vertical Lift and Experimental (JVX). It was the Bell-Boeing collaboration which took on the contract in 1983, which spelt out the parameters to be achieved - the aircraft should be able to fly at 250 knots, at altitude of 25000 feet, carry 24 fully armed soldiers and operate from the ship decks.

The first prototype JVX, now the famous V-22 Osprey flew at Bell’s research facility at Fort Worth on March 1989 and completed the first full transition to airplane mode in September 1989. The flight test phase of the V-22 Osprey lasted 16 years and was dogged by numerous technical difficulties and accidents including budgetary constraints. Despite this the first deliveries of V-22 Osprey were made to the Marine Corps in 2005. The V-22 has a speed of 275 K, range of 200 NM, ceiling of 26000 ft and carry 24 combat troops. The V-22 has since flown more than 400,000 hours in various combat theatres including Iraq and Afghanistan and is ideal for maritime operations, capable of operating out of aircraft carriers and assault ships. One of its defining features is its capability for air to air refueling. There are approximately 500 V-22 Osprey’s operating in the US Military - FLEW in 2006 during airshow.

**Civil Programmes**

Since its inception, the tilt-rotor was predicted to have civilian as well as military applications, so it was no surprise that in 1996, Bell-Boeing announced its intention to produce a civil tilt-rotor design. This was the Bell Boeing 609 (BB609) design based on experience with the XV-15 and the V-22 Osprey. The two-crew aircraft was designed to carry nine passengers and have a maximum speed of 275 knots over a range of 750 nm. However, in 1998 Boeing withdrew from the program and Augusta, a participant in the European Future Advance Rotorcraft project (EUROFAR), formed a joint venture with Bell to develop what was renamed as the BA609 (Bell-Augusta). The first prototype flew in March 2003 at Bell’s Fort Worth facility. By October 2008, two prototypes had logged 365 hours in both airplane and helicopter mode and in 2009 it successfully demonstrated a dual engine failure in cruise flight. However, with Bell’s focus shifting to military applications of the tilt-rotor and with its ongoing ambitious V-280 Valor project, Agusta-Westland formally purchased Bell’s share in the project and renamed it as the AW609. Flight testing was halted in October 2015 after the second AW609 prototype crashed during a high-speed test flight, killing both the pilots. Testing resumed in April 2016 and the third prototype joined the program in May 2016 to carry out icing trials. The fourth prototype is in final production, and with orders already pouring in from several countries the AW609 program appears to be making a recovery and is aiming for certification in early 2019 with deliveries expected to commence in 2020 – several countries have already shown an interest in the AW609.

**Future Developments**

V-280 Valor Bell having concentrated on its military programs, has now successfully flown its V-280 Valor, part of the US Military’s Joint Multi Role technology demonstrator/Future Vertical Lift programme, in collaboration with Lockheed Martin. In December 2017 the Bell V-280 tilt-rotor took to the sky under its own power for the first time, paving the way for starting the long and rigorous flight-testing program. The V-280 is expected to have a speed of 280 knots and combat radius of 2100 NM. According to Bell Helicopters the Valor is designed to revolutionize Vertical Lift for military aviation and represents a transformational aircraft for all the challenging missions envisaged. With twice the speed and range of conventional helicopters, the Valor is likely to offer force commanders unmatched operational capability to self-deploy and execute a multitude of vertical lift missions currently unachievable in one aircraft. The Bell V-280 Joint Multi Role Technology Demonstrator is one possible path to a productionize Future Vertical Lift Solution. Meanwhile the V-22 Osprey fleet is expanding rapidly driving the tilt-rotor to a level of maturity that was a distant dream when the XV-15 took to the skies.

In the civil domain Agusta Westland now Leonardo Helicopters, is planning to fly its next-generation civil tilt-rotor in 2021. The 20-passenger rotorcraft which is much larger than the in development nine-seater AW609, is in the conceptual design stage, with a cruise speed expected to be close to 300 knots. Leonardo believes that a pressurized tilt-rotor fills the gap between helicopters and turboprops in terms of speed and altitude, the latter allowing flight above the weather. The new contender in this race is the XTI Aircraft Company, which is well advanced with its TriFan 600, a hybrid-electric VTOL –capable aircraft with its first flight expected this year and certification flights planned in 2020 – it is expected to enter production in 2022. XTI’s TriFan 600 is the largest of all electric and hybrid-electric concepts announced to date. Like other companies XTI had its challenges in the early stages of development, since it came up with the conceptual design of TriFan 600. However, the XTI could face competition from Leonardo’s AW609 tiltrotor as well as other electric VTOL aircraft that have begun flying.

**Conclusion**

Aerospace history is marked by the introduction of new technology changing forever the way we. In military aviation it also greatly impacts the way we fight wars. Tilt-Rotor technology has therefore not only revolutionised Vertical Lift but will also impact battle fighting. Platforms like the V-22 Osprey have already proved their mettle in operations in Iraq, Afghanistan and Libya. Its capability to maritime capability is already well known. With the V-280 Val or on track as part of the future Vertical Lift Program of the US Military - the future belongs to the TILTROTOR.
### Challenges In Indigenous Development

**Wg Cdr Unni Krishna Pillai (Retd)**  
Chief Test Pilot (Rotary Wing), HAL

#### Need For Indigenous Development
- Unique Nature Of Terrain In The Sub-continent.
- Quick Adaptations To Changing User Requirements.
- Large Economic Benefits.
- Diplomatic Tool For Increasing Our Area Of Influence Across The World.

#### Indigenous Helicopters

With induction of **185 Dhrus** since 2001, **76 Rudras** since 2014 & **179 LCH** starting this year, India can claim to have succeeded in meeting it’s helicopter requirements of upto 6 ton class with indigenous designs.

#### Flow Chart For Design & Development

- ASR/NSR/GSQR
- Design Features
- Technology to be used
- Consultancy required
- Short falls in requirements
- Induction & Design Improvements

#### D & D Ecosystem
- For any one wanting to develop aircraft the first challenge is to set up the required eco system for it. this ecosystem is complex and can not be erected overnight.
- The necessary guidance to setting the ecosystem at HAL was given by MBB.
- The ecosystem has a variety of components, where loss of even one will cause a system failure.

#### Ground Testing
- The next piece in the eco system is the ground tests.
- Ground testing is a niche activity where the elaborate test rigs are made to mimic the flight loads on the component.
- Improper GT may result in flight component failure.
- The life of a component is decided based on the ground tests carried out.

#### Flight Test Instrumentation
- The next piece in the eco system that is flight test instrumentation.
- Again a niche activity where each of the critical components like MR & TR blades, hubs, gear boxes, structure etc. are elaborately instrumented and the loads are telemetered down and recorded.
- Every flight is closely monitored by a team on ground and the pilot is warned if a parameter is going beyond limits.
- This approach allows for a very controlled opening of the aircraft envelope.

**ECOSYSTEM**

**Ecosystem**
Challenges seen in the Development of Dhruv Helicopter
The 3 ASR’s Dictating the Design Features & Technology on ALH
- 20,000 ft., OGE hover requirement.
- The agility requirement of 3.5 g.
- 95 percentile crash worthiness.

Technology Used To Meet The Asr
- Hingeless main rotor
- Hingeless & bearingless tail rotor
- Integrated Dynamic System (MGB design)
- Crash worthiness in structural design

Technology to meet the 3.5 G agility requirement
Hingeless main rotor
- High control response (agility)
- Stability /flyability
- High altitude cruise
- Less maintenance

Drawbacks
- High 4/rev rotor vibrations – aris & avcs
- Strong gyroscopic cross coupling causing control saturation – control engineering

Tail Rotor Blades
- Light & very powerful (90 deg/sec).
- Very few moving parts hence less maintenance.
- Failure mitigating rugged design

Main Gear Box Design
Dhruv MGB - Unique Features
- A squat gearbox allows more cabin volume.
- Fewer rotating parts

Conventional planetary MGB increased number of rotating gears and bearing.
- A two stage bevel gear system has substantially reduced number of parts.
- Probability of gear box major failure like jamming due to tooth failure is remote.
- Good dry run capability due to favourable heat dissipation due empty space within the gearbox.

Crash Worthiness in Design
- Force transmitted to occupant do not exceed human tolerance limit of 14.5 g.
- Structure around occupant remains substantially intact to provide livable volume during crash (upto 15% allowed).
- Fuel containment
  
  Self sealing Break away couplings
  Crash resistant tank material

Figure 5. Energy management system

“Dhruv” at the highest helipad in the world (Sonam) – 19500 Feet

H/C Design & Development in India
- ALH DHRUV – MK1, MK2 & MK3
- RUDRA - Weapons Integrated
- LCH – Dedicated Attack Helicopter
- LUH – 3 ton class light utility
- IMRH – 12 ton class
<<FUTURE OF VERTI-LIFT IN COMBAT>>

Indian Multi-Role Helicenter (IMRH)

LUH - Features

LUH is a 3 Ton class Single Engine Helicopter

IMRH – Features & Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Features</th>
<th>Performance</th>
</tr>
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<tbody>
<tr>
<td>Max AUW</td>
<td>12500 kg</td>
<td>Under sizing load</td>
</tr>
<tr>
<td>Power plant</td>
<td>2 X 1650 KW</td>
<td>3500 kg</td>
</tr>
<tr>
<td>Seating</td>
<td>&gt; 24 Pax</td>
<td>Max Speed</td>
</tr>
<tr>
<td>Cockpit</td>
<td>LAND with IFD</td>
<td>250 kmph</td>
</tr>
<tr>
<td>Controls</td>
<td>Fully powered with 4 axis AFCS</td>
<td>Cruise Speed</td>
</tr>
<tr>
<td>Landing gear</td>
<td>Tripod retractable</td>
<td>Service Ceiling</td>
</tr>
<tr>
<td>Main &amp; Tail rotor</td>
<td>5 bladed &amp; 4 bladed (Articulated – Hph Cylindrical)</td>
<td>Ferry range (with fuel load)</td>
</tr>
<tr>
<td>Transmission</td>
<td>2 X 1650 KW – 30 mks dry run</td>
<td></td>
</tr>
<tr>
<td>Growth Margin</td>
<td>10% on AUW</td>
<td></td>
</tr>
<tr>
<td>Provisions</td>
<td>Weapon Aeronal Mission Sys</td>
<td></td>
</tr>
</tbody>
</table>

Size Comparison - Contemporary MLH

IMRH Navy – Stowed Configuration

Stowed Dimensions (L x W x H): 13.93 m x 4.95 m x 4.8 m

Conclusion

- After US, EU & Russia, India was next to achieve self sufficiency in D&D of helicopters.
- For Design & Development an entire ecosystem is required, which needs nurturing & growth thru new design challenges.
- India has taken 30 years to establish such a system.
- This capability is not just an HAL asset but a national one.
- Hence we need to preserve and nurture it.
A View from Naval Aviation by Commodore AN Pramod Commodore Directorate of Aircraft Acquisition, Naval HQs

Good Morning to you all
At the outset, on behalf of Rear Admiral Asthana, NM, ACNS(Air), may I thank the Rotary Wing Society of India for extending the Invitation and the International Helicopter Safety Team for organising this event.

I consider it as an honour and privilege to interact with such an august gathering. In the next 15 minutes I would present the Naval perspective on the subject under the heads as shown:-
(a) Introduction
(b) Role and Operational Challenges to Naval Helicopters
(c) Strategic Partnership Model
(d) Conclusion

As you all are aware, Aviation plays a vital role in a multi-dimensional Navy like ours. The air elements are the eyes, ears and teeth of a naval force at sea. Over the years, the role of Naval Aviation has steadily expanded to include all facets of naval operations. During the last year alone, our aircraft flew in excess of 38,000 hrs, achieving several significant milestones. They have operated as far away as the upper reaches of the Himalayas in the North, La Reunion in the Southern Hemisphere and from the Malacca, Sunda Straits and Hawaii in the East to the Suez Canal in the West.

Role of Naval Helicopters
The Indian Navy, being a vital instrument of India’s maritime policy is required to operate as a multidimensional force capable of undertaking the full range of maritime operations across the entire spectrum of conflict.

Therefore, the next generation helicopters would be required to undertake missions ranging from Low Intensity Maritime Operations to a full fledged conflict. I shall now dwell upon few of the roles and operational challenges faced by helicopters in the maritime domain.

Anti-Piracy Operations. The Indian Navy has been actively engaged in safeguarding merchant shipping in the area around the Gulf of Aden. Since 2008, 60 warships have undertaken Anti-piracy patrols, escorted 3315 merchant ships and have stopped 40 attempted piracy attacks. Each ship embarks an integral helicopter to provide a swift response to the emerging threats. Experience has shown that these pirates are well armed. Therefore, the helicopters require to have speed, stealth, firepower, as well as, adequate self-protection against small arms and shoulder launched missiles.

Another important capability that these helicopters require is the ability to operate in dark night conditions at sea and therefore, must be NVG compliant. Whilst, the Chetak helicopters do not have this capability, its replacement, the Naval Utility Helicopter would have adequate self protection and be NVG capable.

ASW Operations. The Indian Ocean Region has steadily seen an increase in the deployment of both conventional and nuclear submarines. Due to the hydrological conditions, submarines have a distinct advantage over ships. Integral ASW helicopters are the ideal platforms for employment in the ASW search and attack role and therefore are aptly known as the ‘Hunter Killers’. Due to its mobility, stealth and immunity to submarine attack, a helicopter is best suited to sanitise the area in close proximity to the Fleet. However, the future submarines are going to be quieter, and would have the ability to dive deeper. This would require the helicopters to be equipped with advanced sensors and potent ASW weapons to counter both conventional and nuclear submarines. The Navy is in the process of acquiring such cutting edge technologies for its future helicopters.

AEW Operations. Airborne Early Warning is an inescapable requirement to operate in a multi-threat environment, predominantly air threat. In the absence of an integral carrier-borne fixed wing capability, the Indian Navy is dependent on the Kamov 31 helicopters for AEW surveillance. The helicopter’s early warning radar coupled with the datalink enables seamless transmission of all surface and airborne targets to the Fleet and operational centres ashore. This gives the Fleet adequate early warning of an impending attack. The advance warning provided by the AEW helicopter provides the planners at sea the flexibility to maintain the carrier borne AD fighters in either Deck Launched Interceptor or combat air patrol role. The Kamov 31 coupled with the Mig 29K fighters is a potent combination providing adequate protection, as well as, strike capability to the Fleet.

Troop Carrying Capability. To augment our sea lift capability, the Indian Navy plans to induct new Landing Platform Docks (LPD) in the near future.

These would require Heavy Lift helicopters to operate from their decks to provide the vertical envelopment capability during amphibious operations, as also CASEVAC and logistic support during HADR missions. The Indian Navy plans to induct Heavy Lift helicopters for these ships in the near future.

ASuW/Over The Horizon Targeting. Another important role is to provide targeting data to the ships. With the advent of long range weapons onboard ships, the Navy today is capable of undertaking targeting of enemy ships at extended ranges. Helicopters, with advanced radars, ESM, LR EO/IR and datalink capabilities are the ideal platforms to facilitate exploitation of the maximum ranges of these weapons. Further, these helicopters need to be armed with suitable anti-ship missiles to be able to undertake independent anti-surface vessel operations, if the tactical situation warrants.

Humanitarian Assistance and Disaster Relief Operations. In addition to the military role, helicopters are ideally suited for disaster relief operations, where the terrain and nature of calamity prevents any other means of transportation to operate in the affected areas. The same was amply demonstrated during the Kerala floods recently.
Special Requirements of Naval Helicopters.

There are certain special requirements of helicopters that operate in the harsh marine environment. They require engines that are more efficient at sea level and airframes that are resistant to corrosion. They need to have a wheeled undercarriage capable of withstanding high rates of descent for operations onboard a ship. The other requirements include a deck lock system, as well as, expeditious folding of the blades and tail pylon for compact storage, emergency flotation gear and a traversing system for housing helicopters in the ship’s hangar. All these requirements make the naval helicopter a complex platform and invariably narrows the choice of helicopters/manufacturers to a mere two or three platforms in each weight category.

Commonality of Platforms/Equipment

This uniqueness has led the leading navies to gravitate towards ensuring commonality of platforms and equipment. For example, the US Navy has been incrementally transitioning to the Lockheed Martin’s MH 60 R for its ASW requirements and the MH 60S for its special ops role. Similarly, the UK MoD has placed an order for 70 Future Lynx helicopters, 30 for the Navy and 40 for the Army. Commonality of equipment and weapons is also equally important. For example, the US Navy has Mk 54 lightweight torpedoes as its ASW weapon on all its ships and aircraft. Further, it has opted for the sonobuoys which can be deployed from and monitored by fixed wing ASW aircraft like the P8I as well as ASW helicopters.

The Indian Navy regularly exercises with the navies from across the globe wherein helicopters operate from ships of friendly foreign navies. Some of the exercises that have been institutionalised over the past 2 decades include Ex RIMPAC off Hawaii, Ex Malabar with the US Navy & Japanese Maritime Self Defence forces, Ex Konkan with the UK Navy, Ex Varuna with the French Navy, Ex Indira with the Russian Navy, Ex Simbex with the Singapore Navy and many more.

With the increased need for multinational forces to operate together to tackle various maritime challenges against state and non-state actors, it is important to have equipment and sensors which support inter-operability.

Strategic Partnership Model

Naval Utility Helicopter. As you all are aware, AoN has been accorded recently for procurement of 111 Naval Utility Helicopters as a replacement for the existing fleet of Chetak helicopters. With the aim of promoting indigenous helicopter manufacture, the Naval Utility Helicopter procurement will be progressed through the Strategic Partnership Model.

The helicopter will be twin-engined, in the 5 ton category and would be capable of operating from majority of ships of the Indian Navy.

Naval Multirole Helicopter. The NMRH programme would follow in the wake of the NUH programme. The Naval Multi-Role Helicopter (NMRH) would be in a medium weight category and would have similar roles as that of the MRH. This project would be for over 100 helicopters in the ASW and Special Operations variants. These helicopters too would be made in India in line with the Make in India initiative.

Takeaways from the SP Model

The SP Model necessitates that a large component of the helicopter be indigenous. The Indian Navy has been a frontrunner in the field of indigenisation and stands firmly committed to promoting the government’s ‘Make in India’ initiative. The tenets of SP Model, ie ToT and Indigenous Content, aims at infusing the Indian industry with technology. It would also provide an opportunity for the Indian private sector to contribute towards manufacture of aviation components. Apart from component manufacture, SMEs can also contribute with focused research, innovation, development and production of individual systems and components. To facilitate SMEs entry into the Indian defence Industry, a proactive approach from the potential integrators and large companies is required so that the potential of SMEs may be fully tapped. It is hoped that the SP Model would provide that impetus.

MRO Opportunity

Another area of opportunity is in the field of Maintenance, Repair and Overhaul of aircraft, as these costs far exceed that of manufacturing and procurement in the long term. MROs are not just critical for expanding capacity for new fleet inductions but they contribute immensely in facilitating life cycle extensions and Mid Life Upgrades for the existing fleet whilst keeping the operational costs in check. This field too has a large potential to grow in the near future.

I would like to highlight once again that Naval Aviation, especially its helicopter fleet, is poised for an unprecedented growth in the next 15 years. Helicopters of the future would require to have contemporary cutting edge technology. It is therefore, incumbent to induct the latest and the best platforms. The impetus by the Government on ‘Make in India’ would enable acquisition of niche technology and production of highly capable platforms. The SP model has an immense potential for greater participation of the Indian industry in the aviation sector. Towards this, synergy between all stakeholders including the Armed Forces, DRDO, PSUs and private industries is vital to develop a vibrant aircraft industry in the country.

Thank You.
A View from Army Aviation by Lt Gen Kanwal Kumar VSM Director General, Army Aviation

1. Good morning ladies and gentlemen. It is my privilege to be addressing this August gathering on a topic that is close to all of us and is the future of Combat Aviation.

2. “Air power is defined as the ability of a nation to assert its will through the medium of Air. It includes both civil and military aviation, existing and potential. In modern sense, air power which has evolved into aerospace power is defined as the product of aerospace capability and aerospace doctrine”.

3. The above definition clears one misconception about Airpower i.e. Airpower encompasses, all platforms that use the medium of Air, and **brings to fore the importance of transport and helicopters in Combat**. Therefore helicopters were, are, and will always remain relevant as long as airpower is being used in Combat and Combat like situations.

4. Before I speak about the future, let me talk about the relevance of Vertical lift in Combat, and Combat like situations in the past, i.e., a little bit of historical perspective. The August gathering is well aware about our assistance to Sri Lanka in 1987 as part of IPKF. The terrain in North and NE province of Sri Lanka, where Armed Forces operated was akin to what we have in quite a few parts of our country. The Aviation support provided by and to the Armed forces within the Area of responsibility of IPKF was primarily by the Vertical lift platforms, these platforms were most optimally used for all the possible roles that the machines are designed for. Keeping in mind their importance, it was these assets that were located there while the other assets moved up and down from the main land.

5. During OP Vijay, in 1999, once again it was Vertical lift platforms that formed a major part of the total Air power that was used. The terrain and geography enabled exploitation of the capability of the Vertical lift platforms. It was once again the Helicopters that carried out all possible roles and their employment was exploited to the hilt.

6. Coming on to the Army’s point of view, for the employment of these work horses in the future, the August gathering in this seminar is well familiar with the attributes of helicopters that make it suitable for employment with the ground forces. I would like to dwell a bit on the physical and operational environment that Army Aviation operates in. Perhaps nowhere else in the world, forces operate in an environment that presents varied terrain from deserts with temperature up to plus 50°C to super high altitude areas with temperatures close to minus 50°C, to the jungle/forested Areas in the NE. This unique terrain spectrum itself is enough to challenge both man and machine which operate beyond their normal limits. The terrain restricts the choice of platforms/systems at the time of acquisition that can operate in the complete range. Add to these the operational environment and its own set of challenges to include 24x7 operations and operations across the full spectrum.

7. Keeping in mind the future battle field, the dense AD environment, and the requirement of keeping the combat force cohesive at the time of application, **there has to be a shift from the thought of Airborne to Air assault force**, which means a **helicopter delivered force** at the point of need. For air to ground fire support for friendly forces engaged in close combat, helicopters have an advantage in terms of manoeuvrability, lethality and also the ability to bypass obstacles and move to position of advantage, therefore their contribution in BAS will increase.

8. Army Aviation is an integral member of the combined Arms Team with a vision to provide combat, combat support and combat service support capabilities across the full spectrum of operations to all field commanders. Its inherent versatility, manoeuvre advantage and effectiveness in battle will influence all dimensions of the future battle space. With the procurement of the Attack Helicopters and other advanced helicopters on the horizon, Army Aviation will possess some of the finest tools of war. The Army Aviation and the ground forces are developing, adapting doctrines and, creating organisations for effective employment of helicopters in TBA to their full potential.

9. Army Aviation has set for itself a vision to grow into a full fledged combat arm, capable of providing integral recce and surveillance, combat lift and combat fire power capability to a field force commander. **It extends the operational reach, generates options and expands the capability of the ground forces commander in the third dimension.** Operations of this kind throw up challenges of technical, tactical and doctrinal kinds. Full scale conventional operations will dictate bias for concentrated employment of Aviation units while fourth generation warfare will necessitate employment of detachments at various geographically separated locations for quick response to small team operations.

10. The rapid operations growth of Army Aviation, keeping in pace with the ongoing modernisation and capability development of the army, will mean that the eqpt profile of Army Aviation is undergoing a huge change. The present fleet of Chetak/Cheetah will be replaced with state of the art helicopters capable of 24x7 operations. ALH have already given a major boost to the tactical lift capability of Army Aviation. This will be enhanced many times over with 10-12 tonnes category TBSH. Fire power that was limited to a few LANCER helicopters is undergoing a major enhancement with more capable platforms to include the Apache, ALH (WSI) i.e. Rudra and the LCH. **These inductions will result in qualitative and quantitative enhancement of Army Aviation’s capabilities in the TBA.** While its potency will increase manifolds, the battle field environment will throw up all types of challenges in its gainful employment.

11. By virtue of being light, the reconnaissance and
observation helicopters do not cater to enhanced survivability. Additionally owing, to their task these helicopters would take to sky for longer durations in the TBA. Requirement to remain low and yet fulfil its task of observation and surveillance over a large area both by day and night for sustained duration would be the biggest challenge for light helicopters.

12. Utility Helicopters capability gets severely restricted by either temperature or altitude and often by both. Thus equipping the helicopter to enhance survivability or retain capability to lift load in acceptable tactical configuration poses the greatest challenge for these unsung work horses of the TBA. In order to drop men or equipment, the utility helicopter is expected to carry out landing operations to include hover OGE/hover IGE or actual touchdown.

13. With the induction of combat helicopters in, Army Aviation, the challenge for us is to capitalise on the quality of equipment. Our prolonged operation with the ground forces has prepared us well to take on the forthcoming challenges. When operating as integral part of combat group and combat commands IFF would pose a great challenge, to the helicopters. For successful and efficient employment of helicopters FARRP operations and ASM would also need to be made foolproof.

14. Successful employment of Army Aviation for sustained operations will require a solid technological, technical and logistical support. An ideal helicopter to undertake operations in challenging environment must be agile, manoeuvrable, must have great endurance and range, must be loaded with next generation sensors to enhance survivability in TBA and enable successful multiple target engagement.

15. In a network centric TBA of the future this platform must have the capability to acquire, handover and takeover targets from multiple and varied ground based and airborne platforms like UAV, fixed wing aircraft, helicopters etc.

16. Given the terrain and operational environment ruggedisation of both on board equipment and GSE/GHE along with fast moving logistical chain to ensure availability of spares, fuel and ammunition will lead to optimum exploitation of these machines.

17. Training and modern next generation equipment to enhance capability and survivability can help to mitigate the problem and overcome the challenges that I mentioned before. While training is in house where in necessary steps have been taken to enhance capacity and capability, development of simulators will be of immense help.

18. I intend touching briefly on the expectations that the Army has from the “Helicopter Industry” towards developing next generation equipment and systems especially keeping in mind the increased role that helicopters will have in future conflict. Government’s ushering in of ‘Make in India’ policy has coincided with the long pending requirement of augmenting/replacing helicopter fleet of the services and emerging helicopter market in the civil sector in view of UDAN. This provides an ideal opportunity for private sector to step in helicopter production, MRO, training activities. For long our indigenous helicopter industry has remained import oriented. While imports cannot be wished away overnight, they severely impose financial and time penalties. Identification of critical technology areas both for R&D and absorbing TOT for indigenous production by private industry in fields of materials, radars, simulators, sensors, avionics etc and creating a right atmosphere to iron out policies and procedures would go a long way in capability building of the services in particular and the Nation in general.

19. Ladies and Gentlemen, in the past 10-12 minutes I have tried to put across the perspective as regards Future Vertical Lift in Combat. The Air arm of the Army will play an important role in Combined Arms environment in future combat and with additional acquisitions this role will keep increasing and as said earlier helicopter are and will continue to play a major role in future Combat.

“Happy landings and Jai Hind”

Address by the Chief Guest Air Marshal Raghunath Nambiar AVSM VM & Bar

After thanking the organizers for inviting him to participate, Air Marshal Raghunath Nambiar PVSM AVSM VM & Bar VSM and ADC felt it was a great honour for him being a fixed wing pilot who has been particularly fond of flying the helicopter to be invited to participate in the event. He was also proud of the fact to have 400 hours of helicopter flying and has enjoyed every moment of it.

Talking about Helicopter Operations from the Indian Air Force perspective, he said the IAF has the largest operator of Helicopter fleet in India with over 500 helicopters and 36 units. In comparison, he said that there were only 31 fighter squadrons.

Citing the fact that there were several types of helicopters operating in the IAF including some of them from 1965 vintage and some of them from the very latest. In addition to these (twelve) types, we have five more types which were likely to be inducted in the next 1 - 3 years’ time. He therefore felt that the IAF a few varieties of helicopters with a wide spectrum of capabilities over any terrain under any conditions - day and night.

He felt that this capability has been built through a lot of effort and hard work by many rotary wing aviation professionals past and present. He lauded it as a great achievement on the part of IAF’s helicopter fleet.

The helicopters in the Indian Air Force have been use in a plethora of ways-including Air Maintenance for the Army which involves operating in some of the highest terrains in the world.

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He further said that the Helicopter fleet of the IAF have been operating as seen recently in disaster flood relief operations in Kerala. Any operation that required vertical lift, the Indian Air Force was with them and have operated safely and with a lot of dedication and effort.

The Helicopter fleet has since 2009 or so has been supporting the Central Armed Police Forces in anti Naxal operations and has been transporting men and material as required. Our Helicopter operations are not restricted to India alone. We have received and fulfilled requests for UNITED NATIONS requirements in the past.

Talking about the future of the Helicopter fleet of the IAF, he said that the IAF is in the process of replacing the Cheetah by the induction of the Kamov 226. In addition, he said that the IAF will be procuring Light Utility Helicopters (LUH) as soon as it completes the flight tests and is ready for production. As far as the (attack) segment goes, he said that the IAF will be inducting the APACHE shortly in the next one year followed by the LCH. He said that the IAF have already placed the orders for 15 LCH and will be inducted as soon as they are ready for induction. He also mentioned that the Mi 35-Helicopters will be phased out in the next 3 to 5 years.

In the medium wing segment, he was happy that the IAF are doing exceedingly well as the IAF have Mi 17 variants both of which have been upgraded, a hundred of them. They also have 136 versatile Mi 17 V 5 helicopters in their inventory and will be getting another 12-14 more in the future. In the heavy lift category, he said that there were just a few helicopters of MI 26 Helicopter variant which are being supplemented by the Chinooks which are expected to be inducted by March 2019. Since 15 of them are being inducted, it will give the IAF great capability in the heavy lift segment. With the types of helicopters available in the various segments, he said the future looks very bright.

He further said,” We are looking for speed, we are looking for range. We are looking for agility and endurance. At the same time, we are looking for safety. Our operations to a large extent have been in the rotary wing domain have been undertaken under Visual Flight Rules (VFR). In future we are looking for a capability which allows us to fly under Instrument Flight Rules (IFR) in the weather which we have over the Indian subcontinent … to a large extent. That’s the capability which we should be focusing on in the future. I am confident, with the technologies that are being developed, we will be able to achieve far more than what we are capable today. At the end I would once again like to thank the Rotary Wing Society of India for having me here on stage this morning”.

Thank you, Jai Hind!

Vote of Thanks by Gp Capt MK Labroo, Secretary General, RWSI

Warm greetings, Ladies and Gentlemen, At the end of the Inaugural Session, Gp Capt MK labroo, Secretary General, RWSI while conveying the Vote of Thanks, expressed gratitude of the Governing Council to all the participating member delegates.

He expressed RWSI’s gratefulness to Air Marshal Raghunath Nambari AVSM, VM & BarDeputy Chief of Air Staff, IAF for accepting the request to be the Chief Guest at Inaugural function and delivering thoroughly absorbing, thought-provoking and very educative Inaugural address at the International Seminar.

He then thanked AVM K Sridharan VM(G), President RWSI for his welcome address and the interesting Key Note addresses by the following professionals respectively: Lt Gen BS Pawar, PVSM, AVSM, former Dir Gen, Army Aviation on the “Future of Vertical Lift Technology (VLT) in Combat; Wg Cdr Unni Pillai, CTP(RW) & ED Helicopter Division, HAL, on “Challenges faced in Indigenous Design & Development of Helicopters” ; Cmde AN Promod, Commodore Dte Gen, Naval Procurement on “A view from Naval Aviation” ; and Lt General Kanwal Kumar, VSM, Dir Gen, Army Avn, Indian Army, who provided a “A view from the Army Aviation.

We are grateful to the delegates from Indian Army, Navy, Air Force, Coast Guard, BSF, ARC, MOCA, DGCA, AAI, BCAS, HAL, PHL, GVHL, Helicopter Manufacturers, Operators, RWSI Corporate members, Governing Council & Life Members, foreign delegates, for their active participation in this Seminar.

The Ser Gen then thanked the members from Print and electronic media for covering the proceedings of the Seminar.

He conveyed profuse thanks to all Prime Sponsors namely, BellTextron, L3 Technologies, Leonardo Helicopters, GVHL; Co-sponsors, Kaman Charters, Airbus Helicopters, Cobham and Boeing Aircraft; Associate Sponsors Reliance Industries Ltd, Heligo Charters Pvt Ltd, Transocean and British Gas; Lunch sponsors, Pawan Hans Ltd and Bharat Forge, whose kind contributory support made it possible for RWSI to hold the 8th Heli-Power International Seminar.

The Sec Gen also expressed his deep gratitude to Air HQ & HQ WAC, IAF, Naval HQ, Army Aviation HQ, Coast Guard, BSF and other Paramilitary Forces for sparing most of their Officers & OR’s from Helicopter Stream posted at forward locations. He thanked profusely the HQ WAC, PMC Akash Officers’ Mess, PMC Camaro Officers’ Mess for providing RWSI with the Auditorium, Accommodation, Catering, Security and Medical facilities during the entire event. Lastly, he conveyed the President RWSI’s special thanks goes to AOA, Air HQs IAF for his graciousness to host the lunch on 06 Sep 2018.

Jai Hind

Balance of Coverage of the Presentations made at the seminar will be published in the next issue.