

In the first of a two-part series on India's indigenous aerospace industry, *Business Standard* traces HAL's pioneering research and development

From fighters to copters, how R&D powers HAL's Himalayan-altitude flight

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Despite the unsettled global geopolitical climate, Hindustan Aeronautics (HAL) grew by 11 per cent during the year ending March 31, 2024, recording its highest-ever turnover of ₹29,810 crore.

"As of March 31, 2024, the company's order book stands over ₹94,000 crore, with additional major orders expected during 2024-25," said HAL Chairman and Managing Director C B

Ananthakrishnan, speaking exclusively to *Business Standard* in Bengaluru.

In addition to a giant ₹48,000 crore Ministry of Defence (MoD) order for 83 Tejas Mark 1A fighters, HAL's production lines will soon be humming with another MoD order for 97 Tejas Mark 1A fighters, worth an estimated ₹65,000 crore.

HAL's Nashik facility also expects lucrative work from the Indian Air Force (IAF), whose fleet of Sukhoi Su-

30MKI fighters is due to undergo mid-life upgrades. With 272 Sukhoi-30s scheduled to receive a ₹130-140 crore avionics, radar, and mission computer upgrade, HAL calculates this translates into business worth ₹38,000 crore. While the IAF's fighter fleet generates lucrative orders, HAL's sustained, long-term income will come

from the design, development, manufacture, overhaul, and upgrade of a family of helicopters designed for deployment on India's 21,000-foot-high Himalayan frontier with Pakistan and China.

Ananthakrishnan explained, "HAL has very specific strengths and capabilities, developed over the years. Our unique

strength is being present there from end to end, from the design and development stages through the entire life cycle of the aircraft."

"We are involved in design and development, through limited series production, series production of the aircraft, and the complete repair,



**JETTING
AHEAD**
PART-I



Hindustan Aeronautics' production lines will soon be humming with another Ministry of Defence order for 97 Tejas Mark 1A fighters

upgrade, and overhaul of the aircraft. This is what HAL is offering today," said the HAL chief.

Central to HAL's business generation plans are nine research and development (R&D) centres, which report to the design complex. The first is the Aircraft R&D Centre, which works on start-up engines for fixed-wing aircraft such as the Hindustan

Turbo Trainer-40 and the Tejas Light Combat Aircraft (LCA).

Next, the design complex oversees the Rotary Wing R&D Centre and the Aero Engine R&D Centre, both located in Bengaluru, which handle R&D into aero engines.

"We have handled many small engines such as the start-up engine for the Tejas LCA. This is a separate R&D

centre with its general manager."

A fourth R&D centre is the Mission and Combat Systems R&D Centre (MCSR&DC) in Bengaluru.

The MCSR&DC spearheaded the Darin-II upgrade for the IAF's Jaguar deep penetration strike fighter. They have also completed the Mirage 2000 upgrade, which will be followed by the 'glass cockpit' of the Light Combat Helicopter and the Dornier 228's mission management system, which has been operationally deployed by the Coast Guard.

Fifth, the design complex oversees the Strategic Electronics R&D Centre in Hyderabad, which researches software-defined radios, mission computers, and electronic warfare systems. A sixth R&D centre, based in Lucknow, is the Aircraft Systems R&D Centre, which researches hydraulics, electrical systems, brakes and pads, lights, and fuel systems.

A seventh R&D centre in Korwa, near Amethi, manufactures avionics such as flight data recorders and crash data recorders.

Ananthakrishnan says that HAL was able to retrieve the data from the

recent Tejas aircraft crash mainly due to this centre's work.

"We also have an (eighth) R&D centre at Nashik called the Aircraft Upgrade R&D Centre. Much of what we received from the Russians 25 years ago is outdated. Life cycle support is a big issue with Russian aircraft. So we are undertaking a major Sukhoi-30 upgrade programme, in which we will completely replace the fighter's mission computers, radar, avionics, etc.," says Ananthakrishnan.

This R&D centre has deep expertise in the MiG-29 and Sukhoi-30 systems. It also integrates new weapons on the Sukhoi-30, such as the Astra air-to-air missile and the BrahMos cruise missile. Each of HAL's multiple R&D centres specialises in its domain but operates under the control of the design complex.

The post of HAL's R&D chief — officially designated director (engineering and R&D) — is one of the most respected and influential in India's aerospace ecosystem.

Next: An integrated approach to developing helicopters