Govt looks to plug gaps in engine tech expertise, lines up buys worth ₹1.5 trn

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New Delhi, 20 February

The Ministry of Defence (MoD) has discerned a gap in Indian self-reliance in the fields of aeronautical, marine and land systems engines. Statements from senior Indian officials, and a growing number of tie-ups between Indian defence firms and foreign original equipment manufacturers (OEMs) on engines points to a growing focus on this field.

Addressing a seminar at Aero India 2023 on February 14, Defence Minister Rajnath Singh said it was time to ensure that Indian aircraft fly with indigenously-developed engines.

"The MoD is working on the details of indigenous manufacturing of aero-engines to provide a new fillip to the aerospace sector and achieve complete self-reliance," Singh said at the seminar.

Over the coming decade, India's military is poised to buy close to a thousand engines for fighter aircraft alone — 228 engines for 114 multi-role fighter aircraft (MRFA), 83 engines for as many Tejas Mark 1A fighters, 126 for Tejas Mark 2 fighters, 294 engines for 147 twin-engine Advanced Medium Combat Aircraft (AMCA) and 117 engines for 57 twin-engine Multi-Role Carrier Borne Aircraft (MRCBF).

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The rough cost of engines for each fighter aircraft amounts to 20-30 per cent of the ticket price of the fighter. An existing acquisition that provides an indication of the cost of such engines is a ₹5,375-crore contract with General Electric (GE) for 99 GE F-404IN engines.

That puts the cost of each engine at ₹55 crore. All the other engines are more modern, more powerful and therefore more expensive than the GE F-404IN engines. Assuming a rough cost of ₹75 crore for each of those engines, the MoD's aero-engine purchase bill will amount to at least ₹75,000 crore. Given the need for periodic overhauls and upgrades, its life cycle expenditure will comfortably double to ₹1.5 trillion over the coming decade.

In addition to these are the hundreds of aero-engines needed for an anticipated fleet of unarmed airborne vehicles (UAV), which are the new face of war. UAV engines would be lighter and cheaper than fighter aircraft engines, since they are not required to power such high-performance aircraft.

The DRDO's first high-performance autonomous vehicle will be the Unmanned Combat Aerial Vehicle .(UCAV). This banks on a positive outcome of the Kaveri engine project — which was the DRDO's unsuccessful bid for an engine for the Tejas. The Kaveri's 50 kiloNewtons (kN) thrust will suffice for the UCAV, but it does not have the performance and reliability to power the Tejas.

The first potential foreign OEM partner to have thrown its hat into the ring is British firm, Rolls-Royce, which has offered to partner the DRDO in designing and developing an engine for the AMCA, which will form the backbone of the IAF's fifth-generation fighter fleet in about a decade. But for now, Rolls-Royce is alone in offering to co-develop a high-performance aero engine with Indian partners.

The relationship with French firm Safran (earlier called Snecma) has been vitiated after four fruitless years of discussions on cooperating to uprate the Kaveri. Snecma was unwilling to share key technologies, such as those of single crystal blades and high temperature materials needed for the engine's combustion chamber.

The DRDO already has significant material technology, such as nickel alloys, that can withstand temperatures of up to 1,400-1,500 degrees Kelvin. These temperatures are created in the engine's "hot end", while generating 80-90 kN of power.

Nor does India have the facilities needed for developing advanced aerospace products. There is only one wind tunnel in the country, the almost six decade old one in the National Aeronautics Laboratory.

US engine makers, such as Pratt & Whitney and GE, were unwilling to share the IP that might result from a co-creation project. Washington and New Delhi were discussing co-development of a fighter engine under the Defence Trade and Technology Initiative (DTTI), but the American firms decided against sharing IP.

Other than Rolls-Royce, engine OEMs were interested mainly in maintenance repair and overhaul (MRO) of existing engines.