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CSIR-NAL Unveils Three Indigenous Micro and Small Gas Turbine Engines

25 August 2026 · SCIENCE & TECH

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CSIR-NAL Unveils Three Indigenous Micro and Small Gas Turbine Engines

25 August 2026 · 5 min read ·

✓ Every fact web-verified against primary sources

*CSIR-National Aerospace Laboratories unveiled three indigenously developed gas turbine engines, the **NJ-05, NJ-50 and NJ-100**, on August 25, 2026 at the SSB Auditorium, CSIR Headquarters, New Delhi. The engines are intended for unmanned aerial vehicles, drone interceptors and compact missile systems.*

THE THREE ENGINES

ENGINE	THRUST	INTENDED APPLICATION
NJ-05	5 kgf	Small UAVs, expendable platforms
NJ-50	50 kgf	Drone interceptors, loitering munitions
NJ-100	100 kgf	Compact missile systems, larger unmanned platforms

Thrust here is measured in **kgf**, or kilogram-force. The **5 to 100 kgf band** is precisely the segment in which India has been most dependent on imported micro-turbines.

The unveiling was attended by **Air Marshal Tejinder Singh, Chief of Integrated Defence Staff to the Chairman, Chiefs of Staff Committee (CISC)**, as Chief Guest. The scientific team was led by **R. Prathapanayaka**.

WHY SMALL ENGINES ARE A STRATEGIC PROBLEM

Propulsion is the hardest node in aerospace self-reliance. India has indigenised airframes, radars and avionics far faster than engines, for reasons that are physical rather than organisational:

- **High-temperature materials.** Turbine blades operate above the melting point of the alloys they are made from, surviving only through single-crystal casting, internal cooling channels and thermal barrier coatings.
- **Test infrastructure.** Engine development requires altitude test beds and long-endurance running, which are expensive and scarce.

- **Iteration cycles.** Engine maturation is measured in thousands of running hours, not in design revisions.

Why the 5 to 100 kgf Band Matters Now

Drone warfare has changed the arithmetic. The requirement has shifted from a small number of exquisite platforms to **large numbers of cheap, attritable, engine-hungry systems**. Loitering munitions and drone interceptors are consumed in use, which means each one consumes an engine. An import-dependent supply of small turbines becomes a binding constraint on how a conflict can be fought, and a supplier's export-control decision becomes an operational constraint on India.

INSTITUTIONAL BACKGROUND

CSIR-NAL

ATTRIBUTE	DETAIL
Established	1959 (moved to Bengaluru in 1960)
Headquarters	Bengaluru
Distinction	India's only civilian aerospace research laboratory
Parent body	Council of Scientific and Industrial Research

Known CSIR-NAL programmes include the **HANSA-3 and HANSA-NG** trainer aircraft, the **SARAS** light transport aircraft, and the **CNM-5**.

CSIR

The **Council of Scientific and Industrial Research** was founded in **1942** and is headquartered in **New Delhi**. Its **President is the Prime Minister** and its **Vice-President is the Union Minister of Science and Technology**. It is one of the world's largest publicly funded research organisations, running a national network of laboratories.

The Wider Engine Ecosystem

INSTITUTION	ROLE
DRDO's Gas Turbine Research Establishment (GTRE), Bengaluru	Developer of the Kaveri engine
Aeronautical Development Agency (ADA)	Tejas and AMCA programme management
HAL, with Safran	Helicopter engine partnership
CSIR-NAL, Bengaluru	Civilian aerospace research; micro and small turbines

The **Kaveri** engine is the canonical example of India's engine difficulty. Developed for the Tejas, it did not meet the thrust requirement for that aircraft, and the **Kaveri Derivative Engine (KDE)** is now targeted at the **Ghatak** stealth unmanned combat aerial vehicle.

The Chief of Integrated Defence Staff

The **Integrated Defence Staff** was created in **2001**, on the recommendation of the Group of Ministers constituted after the **Kargil Review Committee**. The CISC heads it and reports to the Chairman of the Chiefs of Staff Committee.

CRITICAL ANALYSIS

The genuine achievement. Three engines across a thrust range, rather than a single demonstrator, suggests a scalable core design rather than a one-off. That is the more meaningful signal.

The honest caution. India's record is strong on prototypes and weak on the transition to **series production and certification**. An unveiling is a design milestone, not an industrial one. The questions that determine whether this matters are: what is the production rate, who manufactures at scale, what is the certified service life, and is there a firm order pipeline?

The materials constraint remains. Indigenous design does not imply an indigenous supply chain. Single-crystal blade casting, powder metallurgy and thermal barrier coatings are capabilities held by a small number of firms globally, and an engine designed in India but dependent on imported hot-section materials is only partially indigenous.

UPSC RELEVANCE

GS Paper 3 (Science and Technology, Defence): Achievements of Indians in science and technology; indigenisation of technology and developing new technology; awareness in the field of defence technology.

Prelims focus: CSIR-NAL's founding year, location and unique status; CSIR's founding year and its President; the three engine designations and their thrust values; GTRE and the Kaveri engine; the year the Integrated Defence Staff was created.

Mains angle: Argue that **propulsion is the binding constraint on India's aerospace self-reliance**, and that the strategic significance of this unveiling lies in the specific thrust band it addresses rather than in the engineering novelty. Connect it to the shift in modern warfare toward attritable unmanned systems.

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THE ENGINES:

Unveiled: August 25, 2026, SSB Auditorium, CSIR Headquarters, New Delhi

NJ-05: 5 kgf thrust; NJ-50: 50 kgf; NJ-100: 100 kgf

Applications: UAVs, drone interceptors, compact missile systems

Team led by R. Prathapanayaka; Chief Guest Air Marshal Tejinder Singh, CISC

CSIR-NAL:

Established: 1959, moved to Bengaluru in 1960; Headquarters: Bengaluru

India's only civilian aerospace research laboratory

Programmes: HANSA-3, HANSA-NG, SARAS, CNM-5

CSIR:

Founded: 1942; Headquarters: New Delhi

President: the Prime Minister; Vice-President: Union Minister of Science and Technology

OTHER RELEVANT FACTS:

DRDO's engine laboratory: Gas Turbine Research Establishment (GTRE), Bengaluru

Kaveri engine developed for Tejas; Kaveri Derivative Engine now aimed at the Ghatak UCAV

Integrated Defence Staff created in 2001, following the Kargil Review Committee and the Group of Ministers report

Thrust unit: kgf, or kilogram-force

Sources: *IANS, CSIR, CSIR-NAL*

Source: CSIR-NAL Unveils Three Indigenous Micro and Small Gas Turbine Engines — Ujiyari.com | Free UPSC & State PCS Current Affairs

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