

Daily Defence Current Affairs

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Russia Offers India AL-51F1 Engine Expertise for AMCA Program

- India's ambitious **Advanced Medium Combat Aircraft (AMCA)** programme has received a significant boost as **Russia has offered to share its advanced AL-51F1 aircraft engine technology**. Instead of supplying a ready-made engine, Russia has proposed transferring valuable engineering expertise and design knowledge gained during the development of the **AL-51F1 (Product 30)** engine used in the **Su-57 fifth-generation stealth fighter aircraft**. This collaboration could help India overcome one of the most challenging aspects of developing an indigenous fifth-generation fighter aircraft—a powerful and reliable jet engine.
- The AL-51F1 engine represents Russia's latest generation of fighter aircraft propulsion systems. It features advanced technologies such as a **digital engine control system** and a **plasma ignition system**, which improve engine reliability, fuel efficiency, and overall operational performance. These innovations make it significantly more advanced than previous Russian fighter engines.
- The engine is capable of producing approximately **11,000 kilogram-force (kgf)** of thrust without afterburner and up to **18,000 kgf** when the afterburner is engaged. Such high thrust enables the Su-57 to achieve superior speed, agility, and manoeuvrability during air combat missions. Access to this technological expertise could significantly strengthen India's capability to develop a world-class indigenous fighter engine for the AMCA programme.
- [About AMCA](#)
- The **Advanced Medium Combat Aircraft (AMCA)** is India's indigenous fifth-generation stealth multirole fighter aircraft being developed by the **Aeronautical Development Agency (ADA)** in collaboration with **Hindustan Aeronautics Limited (HAL)**. The aircraft is expected to feature stealth technology, supercruise capability, advanced avionics, sensor fusion, and internal weapon bays, making it one of India's most advanced defence projects.
- [Importance](#)
- Strengthens India's indigenous aerospace capabilities.

- Supports the **Atmanirbhar Bharat** initiative in defence manufacturing.
- Reduces long-term dependence on imported fighter aircraft engines.
- Enhances India's future air combat capability with a fifth-generation stealth fighter.



Acceptance Tests of Indigenous MJP Waterjet Propulsion Strengthen India's Maritime Self-Reliance

- India has achieved another milestone in its journey towards defence self-reliance with the successful **Factory Acceptance Tests (FAT)** of the **indigenously developed Marine Jet Power (MJP) Waterjet Propulsion System**. The achievement marks a significant advancement in India's shipbuilding capabilities and supports the government's vision of **Atmanirbhar Bharat** in the defence sector.
- The indigenous waterjet propulsion systems will be installed in **14 Fast Patrol Vessels (FPVs)** currently under construction at **Mazagon Dock Shipbuilders Limited (MDL)**. These high-speed vessels are being developed to strengthen India's coastal surveillance, maritime security, and law enforcement capabilities.
- The waterjets have been developed under a **Transfer of Technology (ToT)** framework, allowing India to acquire critical manufacturing expertise and reduce dependence on imported propulsion systems. This technology transfer is expected to boost domestic manufacturing and create long-term indigenous capability in marine propulsion.
- A key contributor to this achievement is the newly established **Waterjet Production and Testing Facility in Goa**, inaugurated by the **Director General of the Indian Coast Guard**. This state-of-the-art facility enables India to

manufacture and test advanced waterjet propulsion systems domestically. With this facility, **India has become only the third country in the world, after the United States and South Korea, to possess such comprehensive indigenous testing and manufacturing capabilities.**

- **Key Highlights**
- Indigenous Marine Jet Power (MJP) Waterjet successfully completed Factory Acceptance Tests.
- Propulsion systems will equip **14 Fast Patrol Vessels** being built at Mazagon Dock Shipbuilders Limited.
- Developed through **Transfer of Technology (ToT)**.
- Goa facility makes India the **third nation** with indigenous waterjet manufacturing and testing capability.
- Strengthens India's maritime security and defence manufacturing ecosystem.
- **Importance**
- Promotes **Atmanirbhar Bharat** in naval defence.
- Reduces dependence on foreign propulsion technology.
- Enhances operational capability of the Indian Coast Guard.
- Strengthens indigenous shipbuilding and defence exports.

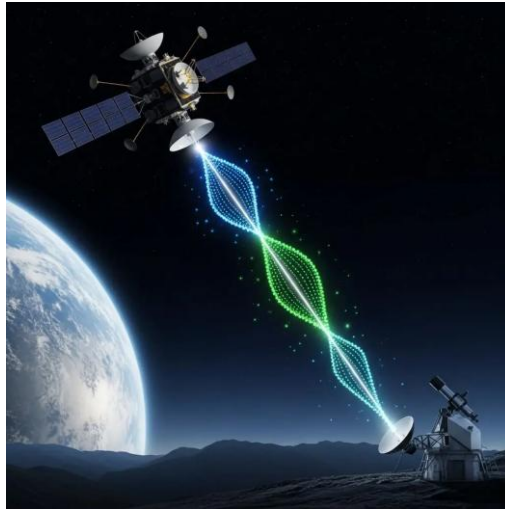


DRDO Successfully Validates Indigenous Quantum Key Distribution (QKD) System in Military Field Trials

- **India has taken a major step towards secure military communications after the Defence Research and Development Organisation (DRDO) successfully completed military field trials of an indigenous Quantum Key Distribution**

(QKD) system. Developed in collaboration with Bengaluru-based Taqbit Labs, the technology is designed to provide highly secure communication for defence and strategic infrastructure.

- **Unlike conventional encryption methods that rely on mathematical algorithms, Quantum Key Distribution uses the principles of quantum mechanics to generate and distribute encryption keys. One of its most important features is the No-Cloning Theorem, which states that an unknown quantum state cannot be copied without altering it. As a result, any attempt to intercept the communication is immediately detected, making QKD one of the most secure communication technologies available.**
- **The successful field trials demonstrate that the system is no longer confined to laboratory research but is capable of operating in real military environments. This achievement places India among a select group of countries developing quantum-secure communication networks for national security.**
- **Beyond defence applications, Quantum Key Distribution has significant civilian uses. Financial institutions, power grids, telecommunications networks, and other critical infrastructure can adopt quantum-safe communication systems to protect sensitive data from future cyber threats. The technology is particularly important in addressing the growing concern of the "Harvest Now, Decrypt Later" strategy, where cyber attackers collect encrypted information today with the intention of decrypting it using future quantum computers.**
- **Key Highlights**
- **DRDO and Taqbit Labs successfully conducted military field trials of indigenous QKD.**
- **Provides quantum-secure communication for defence networks.**
- **Uses No-Cloning Theorem for unbreakable encryption.**
- **Protects against future quantum computing cyber threats.**
- **Applications extend to banking, telecommunications, energy, and critical infrastructure.**
- **Importance**
- **Strengthens India's cyber security capabilities.**
- **Enhances secure military communications.**
- **Supports future quantum communication networks.**
- **Positions India among global leaders in quantum technologies.**



Quantum Physics

(Quan-tum Phys-ics)

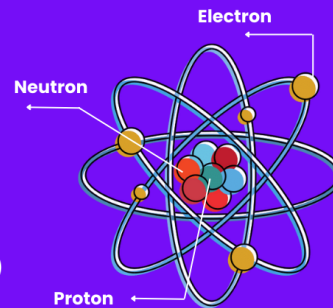
Definition:

Quantum physics is the study of particles at the atomic and subatomic levels, exploring their wave-particle duality and unique behaviors.

Planck's Equation

$$E = h\nu$$

- Where E is the energy of a photon
- h is Planck's constant (6.626×10^{-34} Js)
- ν is the frequency of the photon.



Ministry of Defence



DRDO & IIT Delhi demonstrate Quantum Entanglement-Based Free-Space Quantum Secure Communication over more than 1 km distance

Paves way for development in quantum cyber security, quantum networks & future quantum internet

India has entered into a new quantum era of secure communication which will be a game changer in future warfare: Raksha Mantri

प्रविष्टि तिथि: 16 JUN 2025 5:18PM by PIB Delhi

India has entered into a new quantum era by successfully demonstrating an experimental advancement through DRDO-Industry-Academia Centre of Excellence (DIA-CoE), IIT Delhi. The free-space quantum secure communication using quantum entanglement over a distance of more than one km was achieved via a free-space optical link established on the IIT Delhi campus.

The experiment attained a secure key rate of nearly 240 bits per second with a quantum bit error rate of less than 7%. This entanglement-assisted quantum secure communication paves the way for real-time applications in quantum cyber security, including long-distance Quantum Key Distribution (QKD), the development of quantum networks, and the future quantum internet. These efforts align with India's broader objectives to advance quantum technologies for national development.

India–UK Comprehensive Economic and Trade Agreement (CETA) Comes into Force

- The **India–United Kingdom Comprehensive Economic and Trade Agreement (CETA)** officially came into effect on **15 July 2026**, marking a major milestone in bilateral economic relations. The agreement aims to deepen trade, investment, and strategic cooperation between the two countries while creating new business opportunities and employment.
- India and the United Kingdom have set an ambitious target of increasing bilateral trade to **USD 100 billion by 2030**, compared to the present trade volume of around **USD 55–60 billion**. The agreement provides zero-duty access for several categories of Indian exports, making Indian products more competitive in the UK market.
- According to the Ministry of Commerce, the agreement is expected to promote investment, improve market access for businesses, strengthen global supply chains, and create employment opportunities in both countries.
- Current bilateral trade already reflects strong economic ties. During **FY 2025–26**, trade in goods reached **USD 25.12 billion**, while trade in services stood at approximately **USD 35.44 billion** in 2024.
- An important component of the agreement is the **India–UK Double Contribution Convention (DCC)**. Under this arrangement, Indian professionals temporarily working in the UK will not be required to contribute to the UK's social security system for up to **five years**, provided they continue contributing to India's system.
- The DCC is expected to save Indian companies over **USD 600 million annually** and benefit more than **75,000 Indian professionals** along with **900 Indian employers** operating in the UK.
- **Key Highlights**
 - CETA came into force on **15 July 2026**.
 - Target of **USD 100 billion bilateral trade by 2030**.
 - Zero-duty access for several Indian exports.
 - Double Contribution Convention prevents double social security payments.
 - Expected annual savings of over **USD 600 million**.
- **Importance**
 - Boosts bilateral trade and investment.
 - Improves ease of doing business.
 - Benefits Indian professionals and companies.
 - Strengthens India–UK strategic partnership.



India to Host Fifth BIMSTEC National Security Advisers' Meeting

- India will host the **5th BIMSTEC National Security Advisers' Meeting** in **New Delhi on 16 July 2026**, reaffirming its commitment to strengthening regional security cooperation among the member countries of the **Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)**.
- Established in **1997**, BIMSTEC brings together **Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand** to promote cooperation across areas such as security, trade, connectivity, energy, and people-to-people exchanges.
- The National Security Advisers' Meeting serves as an important platform for discussing regional security challenges. Key issues expected to feature in the meeting include **cybersecurity, terrorism, trafficking, transnational crime, satellite cooperation, and the protection of critical digital infrastructure**.
- Bangladesh, the current Chair of BIMSTEC, has confirmed its participation, with its delegation to be led by the Prime Minister's Defence Adviser, **Brigadier General (Retd.) Dr. A.K.M. Shamsul Islam**.
- India has consistently played a leading role in strengthening cybersecurity cooperation within BIMSTEC. It hosted the **First BIMSTEC Experts Group Meeting on Cyber Security** in **2022** and the **Second Experts Group Meeting** in **January 2025**, both in New Delhi. These meetings focused on developing a regional action plan for information sharing, capacity building, and coordinated responses to cyber threats.

- The upcoming meeting is expected to further strengthen regional collaboration in addressing emerging security challenges while promoting peace, stability, and resilience across the Bay of Bengal region.



REVIEW QUESTIONS

1. Russia has offered India expertise related to which aircraft engine for the AMCA programme?

- A. AL-31FP
- B. AL-41F1
- C. **AL-51F1 (Product 30)**
- D. RD-33MK

Answer: C

2. The AL-51F1 engine is primarily developed for which fifth-generation fighter aircraft?

- A. MiG-35
- B. Su-30SM
- C. Su-35
- D. **Su-57**

Answer: D

3. The indigenously developed Marine Jet Power (MJP) waterjet propulsion system will be installed in how many Fast Patrol Vessels (FPVs)?

- A. 10
- B. 12

C. 14

D. 18

Answer: C

4. With the establishment of the Waterjet Production and Testing Facility in Goa, India became the _____ country to possess indigenous testing and manufacturing capability of this scale.

A. First

B. Second

C. **Third**

D. Fourth

Answer: C

5. DRDO successfully conducted military field trials of which indigenous secure communication technology?

A. Quantum Radar

B. Quantum Sensor

C. Quantum Computer

D. **Quantum Key Distribution (QKD)**

Answer: D

6. The indigenous Quantum Key Distribution (QKD) system was developed by DRDO in collaboration with which company?

A. Tata Advanced Systems

B. Bharat Electronics Limited

C. **Taqbit Labs**

D. Infosys

Answer: C

7. Which principle of quantum mechanics ensures that quantum states cannot be copied without detection?

A. Pauli Exclusion Principle

B. Heisenberg Uncertainty Principle

C. Wave-Particle Duality

D. **No-Cloning Theorem**

Answer: D

8. The India–UK Comprehensive Economic and Trade Agreement (CETA) came into force on:

- A. 26 January 2026
- B. 1 April 2026
- C. **15 July 2026**
- D. 15 August 2026

Answer: C

9. India and the United Kingdom have set a target to increase bilateral trade to approximately _____ by 2030.

- A. USD 75 Billion
- B. USD 85 Billion
- C. USD 90 Billion
- D. **USD 100 Billion**

Answer: D

10. Under the India–UK Double Contribution Convention (DCC), Indian professionals working temporarily in the UK are exempted from paying UK social security contributions for up to:

- A. 2 Years
- B. 3 Years
- C. 4 Years
- D. **5 Years**

Answer: D

11. India hosted the 5th BIMSTEC National Security Advisers' Meeting in which city?

- A. Mumbai
- B. Kolkata
- C. Chennai
- D. **New Delhi**

Answer: D

12. Which of the following countries is NOT a member of BIMSTEC?

- A. Bhutan
- B. Nepal
- C. Thailand
- D. **Pakistan**

Answer: D

13. What is the primary principle on which Quantum Key Distribution (QKD) is based?

- A. Artificial Intelligence
- B. Classical Mechanics
- C. **Quantum Mechanics**
- D. Cloud Computing

Answer: C. Quantum Mechanics

14. Which theorem ensures that a quantum state cannot be copied without detection?

- A. Pauli Exclusion Principle
- B. Schrödinger Equation
- C. Heisenberg Uncertainty Principle
- D. **No-Cloning Theorem**

Answer: D. No-Cloning Theorem

15. Quantum Key Distribution (QKD) is mainly used for:

- A. Power generation
- B. Weather forecasting
- C. **Secure communication and encryption**
- D. Manufacturing semiconductors

Answer: C. Secure communication and encryption

16. In quantum computing, the basic unit of information is known as:

- A. Bit
- B. Byte
- C. Nibble
- D. **Qubit**

Answer: D. Qubit

17. Which quantum property allows a qubit to exist in multiple states simultaneously?

- A. Diffraction
- B. Reflection
- C. **Superposition**
- D. Refraction

Answer: C. Superposition

18. Quantum entanglement refers to:

- A. The transfer of electricity between atoms
- B. The interaction of sound waves
- C. **A phenomenon where two particles remain interconnected even when separated by large distances**
- D. The splitting of atoms during nuclear fission

Answer: C. A phenomenon where two particles remain interconnected even when separated by large distances

19. Which of the following sectors is expected to benefit from Quantum Key Distribution (QKD) besides defence?

- A. Agriculture only
- B. Tourism only
- C. Entertainment only
- D. **Banking, Telecommunications, and Energy**

Answer: D. Banking, Telecommunications, and Energy

20. Which Indian organization successfully conducted military field trials of an indigenous Quantum Key Distribution (QKD) system in collaboration with Taqbit Labs?

- A. ISRO
- B. BARC
- C. HAL
- D. **DRDO**

Answer: D. DRDO