MAYDAY CALL - SECURITY

NEWS: Recently, more than **250 people** were killed when an **Air India** plane bound for London crashed moments after **taking off from Ahmedabad**.

- **Incident**: Air India Boeing **787-8 Dreamliner** crashed on **June 12, 2025, near Ahmedabad**, shortly after takeoff for London.

- **Cause**: Under investigation by Aircraft Accident Investigation Bureau; possibilities include double engine failure, bird strike, or configuration error (e.g., flaps not extended).

- **Mayday Call**: Pilot issued a Mayday distress signal soon after takeoff; communication lost thereafter.

WHAT'S IN THE NEWS?

What is a Mayday Call?

- **Definition:** An international **distress signal** used in aviation and maritime emergencies to indicate life-threatening danger.

- **Origin:** From the French phrase **"m'aider" (help me).**

- **Usage:** Declared when an aircraft faces **imminent threats** like: **Engine failure; Fire on board; Loss of control; Structural failure**.

- **In Emergency:** Pilots say **"Mayday" three times** ("Mayday, Mayday, Mayday"), then provide **critical details** (Aircraft call sign, Nature of emergency, Current position, altitude, and intentions.

Major Civilian Air crashes over the past decades include

- **2020, Calicut (Kozhikode) Air Crash:** Air India Express Flight 1344 from Dubai crashed while landing at Calicut International Airport, killing 21 people. The aircraft **skidded off a wet runway** and broke into two.

- **2010, Mangalore Air Crash:** Air India Express Flight 812 overshot the runway at Mangalore, resulting in 158 deaths. The aircraft broke apart after falling into a gorge.

- **2000, Patna Air Crash:** A Boeing 737 on Alliance Air Flight 7412 crashed during landing at Patna, killing over 60 people. Loss of control due to pilot error was the cause.

- **1996, Charkhi Dadri Mid-Air Collision:** Saudi Arabian Airlines Boeing 747 and Kazakhstan Airlines Ilyushin Il-76 collided near Delhi, killing all 349 people on both aircraft. The cause was **pilot error and miscommunication** with air traffic control.

- **1993, Aurangabad Air Crash:** Indian Airlines Flight 491, a Boeing 737, crashed after takeoff from Aurangabad, hitting a truck and power lines, killing 55 people.

- **1991, Imphal Air Crash:** Indian Airlines Flight 257 crashed near Imphal, killing all 69 on board.

- **1990, Bangalore Air Crash:** Indian Airlines Flight 605, an Airbus A320, crashed on approach to Bangalore, killing 92 people.

- **1988, Ahmedabad Air Crash:** Indian Airlines Flight 113 crashed in Ahmedabad, killing 133.

- **1978, Bombay Air Crash:** Boeing 747 on Air India Flight 855 crashed into the Arabian Sea after takeoff from Mumbai, killing all 213 on board.

Status of Indian Civil Aviation Sector

Aspect	Details
Growth & Market Size	– **3rd-largest aviation market globally** (surpassed 350 million passengers annually). – Projected to become **2nd-largest by 2030.**
Passenger Traffic	– Historic milestone: Crossed **5 lakh passengers in a single day** (17 Nov 2024). – Domestic passenger traffic doubled since 2014 (**22.81 crore in 2024 vs. 10.38 crore pre-2014).** – **International traffic:** 64.5 million passengers (Jan–Nov 2024), 11.4% growth YoY.
Fleet Size	-700+ aircraft currently operational. -Placed orders for **over 2,000 new aircraft,**
Regulatory Reforms	– **Bharatiya Vayuyan Adhiniyam 2024**: Replaced colonial-era Aircraft Act (1934), aligns with ICAO standards. – **Protection of Interest in Aircraft Objects Bill, 2025**: Cuts aircraft leasing costs by 8–10%.
Airports & Infrastructure	– **159 operational airports** (up from 74 in 2014). – **12 new Greenfield airports operationalized** (e.g., Mopa,

	Jewar, Navi Mumbai). – **Target:** 220 airports by 2025, 300 by 2047 under UDAN. – **CAPEX**: ₹91,000 crore allocated (₹82,600 crore spent by Nov 2024).
Employment	– **4 million jobs** (direct/indirect). – **Pilot demand**: 30,000–34,000 needed in next 10–15 years. – **Gender inclusion**: 13–18% women pilots (targeting 25% by 2025).
Cargo Traffic	– **8 million MT** capacity in FY24 (10%+ annual growth). – Focus on **perishables warehousing** and streamlined customs.
FDI Policy	– **100% FDI allowed** (49% automatic route). – **Maintenance, Repair & Overhaul (MRO) sector**: 5% IGST on aircraft parts to boost global hubs.
International Recognition	-Hosted **2nd Asia-Pacific Ministerial Conference on Civil Aviation,** culminating in the **Delhi Declaration**.

Major Safety Concerns for the Aviation Sector

- **Runway Safety Issues:** Runway incursions, excursions, and confusion are frequent safety concerns.

    - Over **50% of accidents** occur during landing or takeoff phases, according to the IATA 2023 Safety Report.

    - The **Goa Air India taxiway error in 2024** highlights runway confusion. The **Kozhikode (2020) and Mangaluru (2010) crashes** were due to runway overruns, causing 179 fatalities collectively.

- **Bird Strikes:** Engine ingestion and windshield strikes can lead to **engine failures or structural damage.**

    - The **South Korea plane crash (2024)** with 179 fatalities is suspected to involve a bird strike. The famous **US Airways Flight 1549 (2009)** landed in the Hudson River after both engines failed due to bird ingestion.

- **Human Factors and Fatigue:** Fatigue among **pilots and crew** leads to impaired decision-making and safety errors.

- A survey by **Safety Matters Foundation involving 530 airline pilots in India** revealed that flight duties **exceeding 10 hour**s, frequent tail swaps, and minimal rest periods significantly contributed to pilot fatigue.

- **Controlled Flight Into Terrain (CFIT):** CFIT occurs when an **airworthy aircraft** is flown into terrain due to **pilot error or misjudgment.**

  - CFIT remains a **leading cause** of aviation fatalities globally, especially in **mountainous regions.**

  - The **Nepal crash in January 2023** killed all onboard, primarily attributed to pilot error.

- **Air Traffic Control (ATC) Challenges:** The growing air traffic globally has stressed ATC systems, requiring advanced navigation technologies and skilled personnel.

  - The **backlog in recruiting Air Traffic Controllers (ATCOs) i**n India was highlighted in a parliamentary report, emphasizing the need for **prompt procedural resolutions** to meet increasing demands.

- **Loss of Control In-Flight (LOC-I):** LOC-I involves the **inability of pilots to maintain control** due to **technical issues, adverse weather, or pilot error.**

  - LOC-I accounted for **72 fatalities globally in 2023**, according to IATA.

- **Adverse Weather Conditions:** Weather-related challenges like **wind shear, thunderstorms, and icing conditions** significantly impact flight safety.

  - Weather is cited as a contributing factor in **20% of global aviation incident**s (IATA 2023).

- **Ground Handling Errors: Improper cargo loading, ground collisions, and GSE maintenance** issues pose risks during aircraft preparation.

  - IATA noted that ground damage incidents cost the aviation industry over **$10 billion annually by 2035.**

Comparison of Aviation Safety to Other Modes of Transportation

- **Fatality Rate per Distance Traveled**

  - **Aviation**: Globally, air travel is the **safest mode of transportation** in terms of fatalities per billion passenger-kilometers.

    - For instance, the fatality rate for commercial aviation in 2023 was **0.03 fatalities per million flights**, meaning a person would need to fly daily for over **103,000 years** to encounter a fatal accident (IATA).

  - **Road Transport**: Road transport is significantly riskier. The **fatality rate for cars is 3.1 deaths per billion passenger-kilometers**, with road accidents accounting for **1.3 million deaths annually worldwide** (WHO, 2023).

- **Railways**: Rail transport has a fatality rate of **0.07 deaths per billion passenger-kilometers**, making it safer than road transport but still riskier than aviation.

About International Air Transport Association (IATA)

- An **international trade association** for the world's airlines, established in **1945 in Havana, Cuba, with 57 founding members.**

- Its mission is to **represent, lead, and serve** the airline industry.

- **Members**: IATA currently represents some **330 airlines**, comprising over 80% of global air traffic. Members include the world's leading passenger and cargo airlines.

- **Headquarters**: Located in **Montreal**, Canada.

- **Goals**: To help airlines **reduce costs and improve efficiency** by simplifying operations and boosting passenger convenience.

    - It assists airlines in operating under clearly defined norms in a **safe, secure, efficient, and cost-effective manner.**

Directorate General of Civil Aviation (DGCA):

- The DGCA is a **regulatory body** in India that is responsible for **civil aviation safety.**

- **Responsibilities:** Regulates air transport services, enforces air safety and airworthiness standards, and coordinates with the **International Civil Aviation Organization**.

- **Headquarters:** New Delhi.

Other organizations related to civil aviation in India:

- **Bureau of Civil Aviation Security (BCAS)**: Responsible for air transport safety and security

- **Airports Authority of India (AAI)**: Responsible for airport maintenance and improvements

- **Airports Economic Regulatory Authority (AERA)**: Responsible for regulating the aeronautical services and airport charges, and monitoring the performance standards of major airports

- **Aircraft Accident Investigation Bureau (AAIB)**: An organization that investigates aircraft accidents

- **Civil Aviation Safety Advisory Council (CASAC):** An advisory body that provides **safety recommendations to the DGCA** to enhance aviation safety in India.

Key Initiatives Regarding Civil Aviation Safety in India

- **DGCA Oversight and Audits (1997):** The Directorate General of Civil Aviation (DGCA) has been conducting **regular safety audits** since its establishment as the regulatory authority.

    - These audits focus on **airlines, airports, and ground handling operations** to identify and rectify systemic safety deficiencies.

- **National Aviation Safety Plan (NASP):** DGCA has published the National Aviation Safety Plan (NASP) for the period 2024–2028.

    - The NASP is a strategy for **improving aviation safety in India**, and it's aligned with the **International Civil Aviation Organization's (ICAO) Global Aviation Safety Plan (GASP)**.

    - **First edition** published for **2018-2022**.

- **Flight Duty Time Limitations (FDTL) Regulations (2011):** These regulations address pilot fatigue by enforcing **adequate rest periods and limiting duty hours.**

    - The initiative ensures **better operational safety** by minimizing human errors caused by exhaustion.

- **Wildlife and Bird Strike Mitigation (2014):** Recognizing **wildlife strikes** as a critical safety concern, the DGCA began rigorous inspections and introduced **wildlife hazard management programs** at airports to reduce bird strike incidents.

- **GAGAN (GPS-Aided Navigation System) (2015):** The **GPS-aided geo-augmented navigation system**, developed by **ISRO and AAI,** became operational to improve navigation and landing precision, especially in adverse weather conditions and challenging terrains.

- **Collaboration with IATA and ICAO:** India collaborates with international organizations like IATA and ICAO to conduct **risk-based safety audits, adopt global best practices, and implement advanced training programs** for pilots and air traffic controllers.

- **Aircraft Accident Investigation Bureau (AAIB) (2011):** The AAIB was formed to conduct **independent and thorough investigations** of aviation accidents.

    - It focuses on **analyzing causes and recommending measures** to prevent similar incidents.

International Civil Aviation Organization (ICAO)

- **Establishment:** ICAO is a specialised UN agency, created in 1944 to establish standards and procedures for global air navigation.

- **Purpose:** It promotes safe and orderly international air transport growth.

- **Chicago Convention:** The Chicago Convention is a treaty that regulates international civil aviation and created the **ICAO, a UN agency.**

  - **Signed on:** Signed on 7th December **1944 in Chicago.**

- **Membership:** 193 member countries, including **India.**

- **Headquarters: Montreal**, Canada.

Global Safety Standards in Aviation

- **ICAO Standards and Recommended Practices (SARPs), 1947:** Govern aspects of international aviation, including safety, security, navigation, and environmental protection.

  - **Adoption by India**: Fully implemented by the **Directorate General of Civil Aviation (DGCA)** since **India became an ICAO member in 1947.**

- **IATA Operational Safety Audit (IOSA): Established by** International Air Transport Association (IATA) in **2003**.

  - **Key Features**:

    - Put global industry standards for evaluating an **airline's operational management and control systems.**

    - **Mandatory** for IATA member airlines.

  - **All IATA member airlines in India** (e.g., Air India, Indigo, Vistara) are **IOSA-certified**.

- **Global Aviation Safety Plan (GASP): Established by** ICAO in **1997**.

  - Provides a global safety improvement framework, focuses on reducing runway incidents, controlled flight into terrain (CFIT), and loss of control in-flight (LOC-I).

  - DGCA developed India's **National Aviation Safety Plan (NASP)** in line with GASP goals in 2018.

- **Flight Duty and Fatigue Regulations: Set by** ICAO (**2011**).

  - Standardizes flight and duty time limitations for crew.

  - DGCA implemented **Flight Duty Time Limitations (FDTL) regulations** in 2011.

- **Pilot Training Standards: Established By** ICAO (**2012** for training reforms, **2019** for UPRT mandate).

  - Includes **upset prevention and recovery training (UPRT)**.

- Standardized **simulator training for emergencies** such as engine failures and adverse weather.

- DGCA implemented **ICAO's Upset Prevention and Recovery Training (UPRT)** standards for all Indian commercial pilots starting 2019.

- **Global Collaboration**

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  - **Aviation Safety Reporting Systems**: Programs like **ASIAS (Aviation Safety Information Analysis and Sharing)** in the USA, established **2007**, promote data-driven decision-making.

  - **Runway Safety Programs**: **GAPPRE (Global Action Plan for the Prevention of Runway Excursions)** introduced in **2021** by ICAO and IATA.

Countermeasures and Safety Mechanisms

- **Black Boxes**: Flight data recorders (FDR) and cockpit voice recorders (CVR) that store critical flight information.

  - **Purpose**: Investigators use them to determine the cause of crashes by analyzing flight data and pilot communications.

  - **Colour:** Bright **Orange** Color: Easier to locate in wreckage (**not actually black**).

  - **Types of Black Boxes**

    - **Cockpit Voice Recorder (CVR):** Records Pilot conversations; Radio communications; Engine sounds & alarms.

    - **Flight Data Recorder (FDR):** Records Altitude, speed, heading; Engine performance; Autopilot status; Control surface movements.

- **Safety Management System (SMS) in Aviation:** A **structured, organization-wide framework** that ensures aviation safety through proactive identification, assessment, and mitigation of risks.

  - **ICAO** defines **Four Pillars of SMS**

    - **Safety Policy:** A clear and consistent safety policy at the organization level.

    - **Safety Risk Management**: Identifying, assessing, and mitigating safety risks.

    - **Safety Assurance:** Monitoring and verifying that safety measures are effective.

    - **Safety Promotion:** Raising awareness and fostering a safety culture within the organization.

- **Enhanced Ground Proximity Warning System (EGPWS), 1996**:

  - Alerts pilots about terrain proximity, significantly reducing CFIT incidents.

    - Required for all commercial aircraft worldwide.

  - Mandated by DGCA for **all Indian commercial aircraft since 2002**.

- **Global Navigation and Surveillance Systems**

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  - **ADS-B (Automatic Dependent Surveillance-Broadcast)**: Introduced by ICAO in **2007** to enhance real-time aircraft tracking.

    - Fully operational in **India since 2014,** enabling real-time tracking of aircraft.

  - **GAGAN (GPS-Aided Geo-Augmented Navigation)**: Launched in India in **2015** to improve approach and landing precision.

Best Global Examples of Civil Aviation Safety

- **United States: Advanced Air Traffic Management**

  - The U.S. Federal Aviation Administration (FAA) operates the **NextGen Air Traffic Control System**, leveraging satellite-based navigation and real-time data sharing.

  - The FAA's **ASIAS (Aviation Safety Information Analysis and Sharing)** system identifies safety risks proactively by analyzing vast amounts of operational data.

- **Singapore: Runway Safety and Incident-Free Record**

  - Singapore Changi Airport employs **runway incursion prevention systems** and automated ground operations.

- **Japan: Earthquake-Resistant Airport Infrastructure**

  - Airports like Kansai International are designed to **withstand natural disasters, including earthquakes and tsunamis.**

- **South Korea: Advanced Bird Strike Prevention**

  - Deployment of **bird detection radar systems** and habitat management around airports.

- **Norway: Arctic Operations Safety**

- Specialized training and equipment for operations in **extreme Arctic conditions.**

Way Forward for India's Aviation Safety

- **Enhance Infrastructure and Technology:** Expand airport capacity and improve runway design to reduce risks of runway excursions.

  - Deploy advanced wildlife detection systems, such as radar-based bird monitoring, to mitigate bird strike incidents.

  - Invest in automation and AI-driven systems for real-time flight and ground operations monitoring.

- **Strengthen Regulatory Oversight:** Ensure **DGCA's compliance with ICAO's Universal Safety Oversight Audit Program (USOAP)** recommendations.

  - Conduct more frequent safety audits for airlines, airports, and maintenance organizations to identify risks proactively.

  - Increase the independence and resources of the **Aircraft Accident Investigation Bureau (AAIB)** for impartial and thorough investigations.

- **Adopt Advanced Safety Management Systems (SMS):** Mandate **comprehensive SMS implementation** across all airlines, airports, and ground handling services.

  - Encourage **data-sharing initiatives** like IATA's ASIAS program for predictive safety risk analysis.

  - Promote a **"Just Culture"** to encourage error reporting without fear of punitive action.

- **Focus on Pilot and Crew Training:** Expand the scope of **Upset Prevention and Recovery Training (UPRT)** and include regular simulator training for adverse scenarios.

  - Address crew fatigue with stricter enforcement of **Flight Duty Time Limitations (FDTL)**.

  - Incorporate **psychological training** to enhance decision-making under stress.

- **Collaborate with International Bodies:** Work closely with **ICAO and IATA for** continuous improvement in safety standards.

  - Leverage **international expertise to adopt best practices**, such as CFIT and LOC-I prevention programs.

  - Participate actively in global safety initiatives like **GAPPRE (Runway Excursions Prevention)** and fatigue management frameworks.

- **Learning from Global Best Practices**: India should adopt **Singapore's approach** to proactive safety management and pilot training.

  - Both **airlines and regulators** must be held **accountable** for failures.

Conclusion

India's civil aviation sector must prioritize robust safety mechanisms, advanced technology, and stringent regulatory oversight to mitigate risks during critical flight phases like takeoff and landing. By aligning with global standards and adopting best practices, India can enhance safety and sustain its growth as a leading aviation market.
Source: https://economictimes.indiatimes.com/industry/transportation/airlines-/-aviation/crashed-air-india-planes-comprehensive-check-was-due-in-december-right-side-engine-overhauled-in-march-officials/articleshow/121850011.cms?from=mdr