



Electric Vertical Take off and Landing (eVTOL) Aircraft

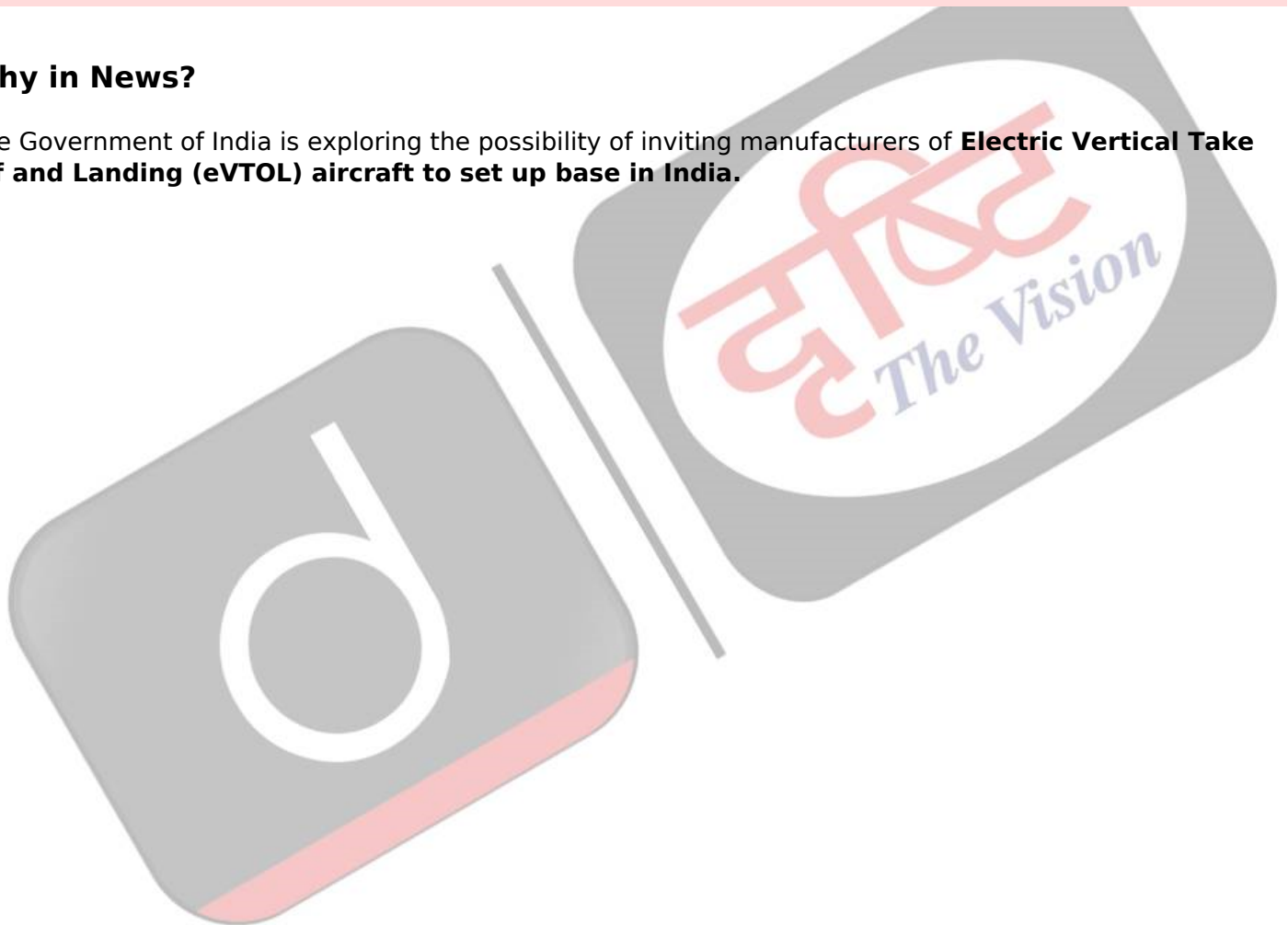
For prelims: eVTOL Aircraft, carbon-14

For Mains: Scientific Innovations & Discoveries

Why in News?

The Government of India is exploring the possibility of inviting manufacturers of **Electric Vertical Take off and Landing (eVTOL) aircraft to set up base in India.**

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What are electric aircraft?

The Union Aviation Minister while speaking at the seventh edition of the India Ideas Conclave in Bengaluru, stated that India is in 'conversation' with a number of eVTOL producers. But how are Electric Vertical Take off and Landing aircraft structured? And what are they capable of ?

Vertical Aerospace VA-X4
*Electric Vertical Take Off and Landing

Propulsion: Eight Rolls-Royce electric motors

VERTICAL

Luggage hold

V-tail with rudders

Pilot and four passengers

Front rotors

Rear vertical rotors

Take-off and landing:
Rear vertical rotors fan out, front propellers orientate vertically

Stowed

Open

Flight: Rear rotors fold into **stowed** position. Undercarriage withdraws. Front propellers tilt for forward motion

Cruise speed:	241km/h
Range:	161km
Payload:	450 kg
Wing span:	15m
Length	13m
Height:	4m

What is eVTOL Aircraft?

▪ **About:**

- An eVTOL aircraft is one **that uses electric power to hover, take off, and land vertically.**
- Most eVTOLs also use what is called as **distributed electric propulsion technology** which means integrating a complex propulsion system with the airframe.

▪ **Features:**

- In order to maximize efficiency, and to also ensure safety, there are **multiple motors.**
- This is technology that has **grown on account of successes in electric propulsion** based on progress in motor, battery, fuel cell and electronic controller technologies and also fuelled by the need for new vehicle technology that ensures **Urban Air Mobility (UAM).**
 - Thus, eVTOL is **one of the newer technologies and developments** in the aerospace industry.
- There are an **estimated 250 eVTOL concepts or more being fine-tuned** to bring alive the concept of UAM.
 - Some of these include the **use of multi-rotors, fixed-wing and tilt-wing concepts** backed by sensors, cameras and even radar. Here the key word here is **“autonomous connectivity”.**
 - Some of these are in **various test phases** and there are also others undergoing test flights so as to be certified for use.
- In short, **eVTOLs have been likened to a third wave in an aerial revolution.**
 - The first being the advent of commercial flying and the second, the age of helicopters.

How are Developments in eVTOLs being Made?

- The roles eVTOLs **adopt depends on battery technology** and the limits of onboard electric power.
- Power is **required during the key phases of flight** such as take off, landing and flight (especially in high wind conditions).
- **Weight is also an important factor.**
 - BAE Systems, for example, is **looking at formats using a variety of [Lithium batteries.](#)**
 - BAE Systems is a **British multinational arms, security, and aerospace company** based in London, England.
 - Nano Diamond Batteries is looking at **“Diamond Nuclear Voltaic (DNV) technology”** using minute amounts of **[carbon-14 nuclear waste](#)** encased in layered industrial diamonds to create self-charging batteries.
- **The use of only batteries and looking at hybrid technologies** such as hydrogen cells and batteries depending on the flight mission has been questioned by experts.
- There is even one that **uses a gas-powered generator** that powers a small aircraft engine, in turn charging the battery system.
 - But **whatever the technology,** there will be very stringent checks and certification requirements.

What are the Challenges?

- **Crash Prevention Systems:**
 - As the technology so far is a **mix of unpiloted and piloted aircraft,** the areas in focus include “crash prevention systems”.
 - These use cameras, radar, **[GPS \(Global Positioning System\)](#)** and infrared scanners.
- **Ensuring Safety:**
 - There are also **issues such as ensuring safety in case of powerplant** or rotor failure. Aircraft protection from cyberattacks is another area of focus.
- **Navigation and Flight Safety:**
 - A third area is in **navigation and flight safety and the use of technology** when operating in difficult terrain, unsafe operating environments and also bad weather.

What is the Value of the Market?

- The global market for eVTOLs was put at **USD8.5 million in 2021** and is to grow to **USD30.8 million by 2030**.
- The **demand will be on account of green energy** and noise-free aircraft, cargo carrying concepts and the need for new modes of transport.
- The **UAM market is expected to expand at a compound annual growth rate of 25%** between 2018-25.
 - By 2025, it is anticipated to be a USD74 billion market. This includes the eVTOLs market since UAM ideally focuses on the use of eVTOLs.

Source: TH

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