Electric Vertical Takeoff and Landing (eVTOL) aircraft

Why in news?

India is exploring the possibility of inviting manufacturers of eVTOL aircraft to set up base in India.

What is eVTOL?

- An eVTOL aircraft is one that uses electric power to hover, take off, and land vertically.
- Most eVTOL use distributed electric propulsion technology. Here there are multiple motors for various functions as well as to increase efficiency and ensure safety.
- Its development opens up new possibilities in various areas where aircraft with engines cannot carry out like
    - urban air mobility (UAM).
    - runway independent technological solution
    - High manoeuvrability and efficiency.

What are the developments made so far?

- Development of eVTOL is a third wave in an aerial revolution.
- Over 250 eVTOL concepts have been fine-tuned. World eVTOL Aircraft Directory lists the known designs.
- Some of these include the use of multi-rotors, fixed-wing and tilt-wing concepts backed by sensors, cameras and even radar.
- The designs are Categorised as
    - Hover Bikes/Personal Flying Devices - which are single-person eVTOL aircraft.
    - Vectored Thrust -Here a thruster is used for lift and cruise.
    - Lift and Cruise type – Here independent thrusters are used for cruise and lift without any thrust vectoring.
    - Wingless Multicopter - Here there is no thruster for cruise but only for lift
    - Electric Rotorcraft- which use a rotor, such as an electric helicopter or autogyro.
- Uses of different technologies like Lithium batteries, Diamond Nuclear Voltaic (DNV) technology battery are being experimented.
- Hybrid technologies involving hydrogen cells and batteries, gas-powered generator charging the battery system are also being tested.
- **Big players involved** - Volocopter VC1 from Germany, Opener BlackFly from the U.S, Airbus, Boeing and Lilium have developed some prototype models. Eg : Vahana Alpha One or the Airbus Vahana & CityAirbus” project by Airbus.

What are the Challenges involved?

- Its adoption depends on various factors like
    - Developments of battery technology.
    - Limit of on-board electric power.
    - Power requirement during the key phases of flight such as take-off, landing and flight
    - Weight considerations
- Crash prevention, operating in difficult terrain and bad weather conditions, safety measures in case of powerplant or rotor failure, protections from cyberattacks are other areas of focus.

How is eVTOL certified?

- The Federal Aviation Administration (FAA) and the United Kingdom Civil Aviation Authority are discussing on certification and validation of new eVTOL aircraft, their production, continued airworthiness, operations, and personnel licensing.
- The FAA plans to certify eVTOLs as powered-lift aircraft (an existing category). In future FAA will develop additional powered-lift regulations for innovation in operations and pilot training.

How will it be in India?

- Beta technologies and other EVA manufacturers have been extended an invitation to manufacture in India.
- Beta Technologies has partnered with the Blade group which has a presence in India to look at the Indian market.
- Blade is an urban air mobility company that aims to connect places that are heavily congested and also not well connected by air services.
- There is a need for document that outlines compliance for eVTOLs and also aligns frameworks to meet the standards adopted in commercial aviation, especially when it comes to safety.
- Regulatory authorities in India were asked to formulate regulations for pilotless vehicles, airworthiness certifications, and the need for a pilot's licence, implementing efficient energy management systems, onboard sensors, collision detection systems and advanced technologies such as artificial intelligence.
- The current timeline for certification with India's Directorate General of Civil Aviation is two years.
- To achieve these there is a need for a committee to spell out the guidelines for eVTOL operations and speed up the process.

Reference

https://www.thehindu.com/business/Industry/the-status-of-evtol-a-soon-to-be-reality/article65497139.ece?homepage=true

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