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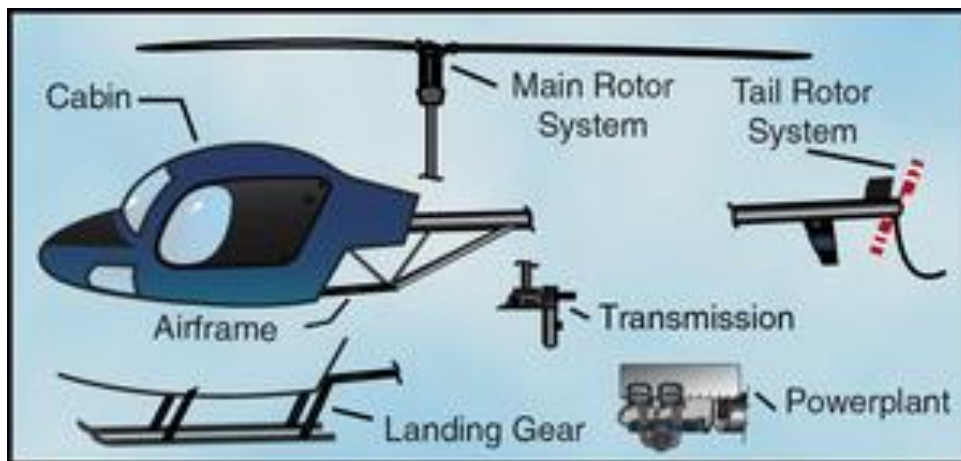


DEPARTMENT OF AEROSPACE ENGINEERING

Subject Code & Name: **23AST101 Fundamentals of Aerospace Engineering**

Topic: Components of a Helicopter and their functions

A helicopter is a complex flying machine with several key components, each performing specific functions to ensure flight capability, control, and safety. Here are the main components of a helicopter and their functions:



1. Fuselage

- **Function:** The fuselage is the main body of the helicopter, housing the cockpit, passenger cabin, cargo area, and various systems. It provides structural support and connects all other components of the helicopter.

2. Main Rotor System

- **Function:** The main rotor system generates lift and thrust. It consists of rotor blades, a rotor hub, and a swashplate assembly. The rotor blades spin to create lift, enabling vertical takeoff, landing, and hovering.

3. Tail Rotor System

- **Function:** The tail rotor counteracts the torque produced by the main rotor, preventing the helicopter from spinning uncontrollably. It provides yaw control, allowing the pilot to change the helicopter's heading.

4. Cockpit

- **Function:** The cockpit is the control center where pilots operate the helicopter. It contains flight instruments, navigation and communication equipment, and controls for the rotor systems and other functions.

5. Landing Gear

- **Function:** The landing gear supports the helicopter during takeoff, landing, and while on the ground. It can be skids, wheels, or floats (for amphibious helicopters).

6. Powerplant (Engine)

- **Function:** The engine provides the power needed to spin the rotor systems. Helicopters typically use turboshaft engines or piston engines, depending on the size and type of helicopter.

7. Transmission

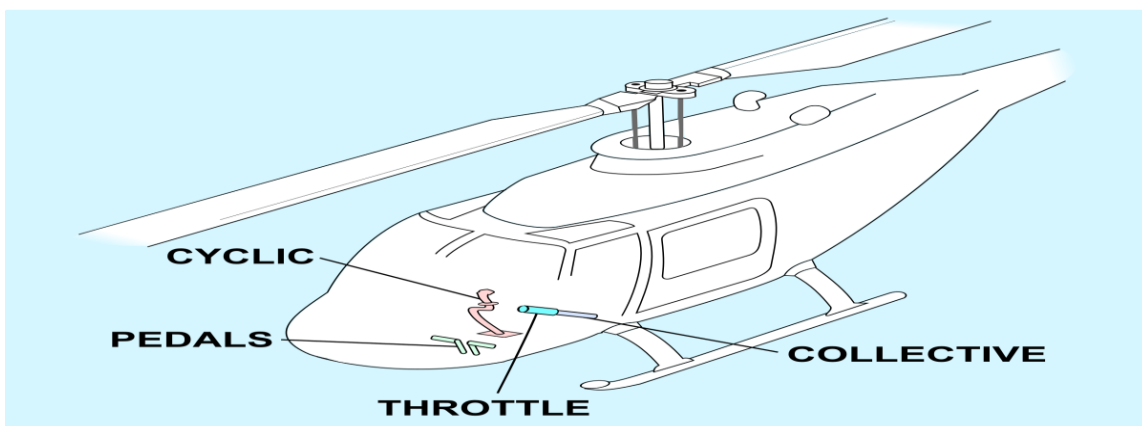
- **Function:** The transmission transfers power from the engine to the main and tail rotors. It includes gears and shafts that adjust the rotational speed and direction to suit the requirements of the rotors.

8. Swashplate Assembly

- **Function:** The swashplate assembly transmits control inputs from the pilot to the main rotor blades, allowing for changes in blade pitch and thus controlling lift and directional movement.

9. Cyclic Control

- **Function:** The cyclic control stick allows the pilot to tilt the main rotor disk in any direction, enabling forward, backward, and lateral movement of the helicopter. It adjusts the pitch of the rotor blades cyclically.



10. Collective Control

- **Function:** The collective control lever allows the pilot to change the pitch of all the main rotor blades simultaneously, increasing or decreasing lift to make the helicopter climb or descend.

11. Anti-Torque Pedals

- **Function:** The anti-torque pedals control the pitch of the tail rotor blades, adjusting the yaw of the helicopter to counteract main rotor torque and change the heading.

12. Rotor Blades

- **Function:** The rotor blades are the airfoils that generate lift. They are designed to be aerodynamically efficient and can be adjusted in pitch to control lift and thrust.

13. Tail Boom

- **Function:** The tail boom extends from the fuselage to support the tail rotor and provide structural balance to the helicopter.

14. Stabilizers

- **Function:** Some helicopters have horizontal or vertical stabilizers to enhance stability during forward flight.

15. Avionics

- **Function:** The avionics system includes all electronic systems used for communication, navigation, monitoring, and managing the helicopter's various systems. This includes radios, GPS, flight control systems, and radar.

16. Fuel System

- **Function:** The fuel system stores and manages the flow of fuel to the engine. It includes tanks, pumps, fuel lines, and fuel management controls.

Summary

Each component of a helicopter plays a vital role in its ability to fly, maneuver, and maintain stability. Understanding these components and their functions is essential for the study, design, and operation of helicopters. This intricate system of interconnected parts enables helicopters to perform unique tasks, such as vertical takeoff and landing, hovering, and precise low-speed flight.