DEPARTMENT OF AEROSPACE ENGINEERING

19ASB303 AIRCRAFT MAINTENANCE ENGINEERING

UNIT – 3 - INSPECTION

Process, Purpose & Types of Inspection

1. Introduction to Aircraft Inspection

Aircraft inspection is a critical aspect of maintenance engineering that ensures the safety, airworthiness, and operational efficiency of an aircraft. Regular inspections help in detecting and preventing failures before they lead to accidents or costly repairs.

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2. Purpose of Aircraft Inspection

The main objectives of aircraft inspection are:

1. **Ensuring Airworthiness:** Compliance with aviation safety standards.
2. **Enhancing Safety:** Identifying and mitigating potential hazards.
3. **Preventing Failures:** Detecting wear, corrosion, and fatigue.
4. **Regulatory Compliance:** Meeting aviation authority regulations (FAA, EASA, DGCA, etc.).
5. **Optimizing Performance:** Maintaining efficiency and reliability.
6. **Reducing Operational Costs:** Avoiding major breakdowns and costly repairs.

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3. Process of Aircraft Inspection

Aircraft inspections follow a systematic process to ensure thorough evaluation and compliance with safety standards. The general process includes:

Step 1: Pre-Inspection Preparation

- Reviewing maintenance logs and previous inspection reports.
- Gathering necessary tools, equipment, and checklists.
- Ensuring compliance with regulatory requirements.

Step 2: Visual Inspection

- Examining the exterior and interior components for signs of wear, cracks, corrosion, and damage.
- Checking for fluid leaks, loose fasteners, or missing parts.

Step 3: Functional Testing

- Testing avionics, control surfaces, engines, landing gear, and other systems.
- Conducting operational tests for hydraulic, electrical, and fuel systems.

Step 4: Non-Destructive Testing (NDT)

- Using advanced techniques like Ultrasonic Testing (UT), Magnetic Particle Inspection (MPI), and Radiographic Testing (RT) for hidden defects.

Step 5: Documentation & Reporting

- Recording findings, maintenance actions, and corrective measures.
- Updating logbooks and submitting reports to regulatory authorities.

Step 6: Post-Inspection Actions

- Addressing identified defects through maintenance or part replacements.
- Conducting a final verification before releasing the aircraft for operation.

4. Types of Aircraft Inspections

Aircraft inspections are categorized based on their purpose, frequency, and depth of examination.

A. Scheduled Inspections

These are routine inspections carried out at predefined intervals.

1. **Pre-flight Inspection**
   - Conducted by pilots and ground crew before every flight.
   - Includes checking fuel levels, control surfaces, lights, and general aircraft condition.
2. **Post-flight Inspection**
   - Performed after landing to detect any issues arising during flight.
   - Focuses on brake systems, fluid leaks, and exterior damage.
3. **Line Maintenance Inspection**
   - Conducted daily or at specific flight hours.
   - Includes engine oil checks, tire pressure, and hydraulic systems.
4. **A, B, C, and D Checks** (Periodic Maintenance Inspections)
   - **A Check:** Light maintenance performed every 400-600 flight hours.
   - **B Check:** More detailed, every 3-6 months.
   - **C Check:** Comprehensive, every 20-24 months.
   - **D Check:** Heavy maintenance, conducted every 6-10 years, requiring aircraft disassembly.

B. Unscheduled Inspections

These are conducted in response to unexpected failures or incidents.

1. **Unscheduled Maintenance Inspection**
   - Triggered by system malfunctions, abnormal readings, or pilot reports.
2. **Hard Landing Inspection**
   - Conducted when an aircraft experiences a hard landing to check for structural damage.
3. **Lightning Strike Inspection**
   - Performed after an aircraft is struck by lightning to assess electrical and structural integrity.
4. **Bird Strike Inspection**
   - Carried out to check for damage after an aircraft collides with birds.
5. **Emergency or Incident Inspection**
   - Conducted after accidents, severe turbulence, or emergency landings.

C. Special Inspections

These inspections focus on specific components or operational conditions.

1. **Corrosion Inspection**
   - Identifies and treats corrosion-prone areas such as wings, fuselage, and landing gear.

2. **Structural Integrity Inspection**
   - Uses NDT techniques to detect cracks and fatigue in metal structures.
3. **Avionics Inspection**
   - Evaluates communication, navigation, and flight control systems.
4. **Fuel System Inspection**
   - Ensures proper fuel flow, tank integrity, and leak prevention.

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5. Conclusion

Aircraft inspections are essential for ensuring safe and efficient operations. A well-planned inspection schedule helps in reducing risks, improving reliability, and maintaining regulatory compliance.