

AMPHIBIOUS AIRCRAFT OVERVIEW

The air transportation has experienced a rapid growth, both in military and civil Aviation sectors. The Civil aviation can generally categorized into two, namely the commercial air transport and general aviation. One important aspect of GA Sector is the amphibious aircraft i.e., air vehicle that can takeoff and lands from both ground and water. It is different from sea plane, which can only take off and land on water. Amphibious planes have been since the early age of aviation history. Numerous models of amphibious aircraft or sea planes were developed for general aviation, military and rescue.

Since an amphibious aircraft need to perform both on water and in the air, there are some operational issues that need to be carefully considered in the design process. It often required some tradeoffs between the aerodynamics and hydrodynamics performances. For instance, the fuselage now need to be designed as a hull, to be able to operate on water. However this shape is not aerodynamic efficient. The higher drag in turns reduces the rate-of-climb and cruise speed of amphibious aircraft, when using the same power as a conventional aircraft. The constant contact with the seawater requires a rigorous corrosion protection and maintenance, including the special selection of the materials and coatings used for the aircraft components. An amphibious aircraft is typically heavier than a conventional aircraft for the same mission requirements. As an alternative to the hull design, some amphibious aircraft use hydrofoils. The hydrofoils can reduce drag, and thus allows for higher rate-of -climb and cruise speed. In additional to conventional aircraft it has to be watertight, especially doors, windows and any panels to control the aircraft when there are no enough aerodynamic forces. The aircraft stability has to be ensured both during flight and when it is on water, and the aircraft must be controllable in water at all speed. Hydrostatic stability refers to the tendency of the aircraft to return to at is rest position, upon any external force that tilt to one side. Some necessary design modification includes a keel can help guide the aircraft move in a straight line, a chine can help direct the water spray away from the hull in addition to increasing the hydrodynamic lift, and spray rail can help reduce the water spray on the propulsive system, since it could be destructive to the propeller.

Pilots need special training before they can operate and fly amphibious aircraft. First they need be familiar with some nautical terms used that are not common in any conventional aircrafts. For instance, port and starboard are used instead of left and right, windward and leeward to refer to the upwind and downwind, bow and stern to refer to the nose and the bottom of the empennage, respectively. Landing on different water conditions. Moreover, the cockpit design should provide a good visibility for the pilots, especially to judge the altitude above the water.

Some potential applications for the amphibious aircraft include: (1) short-haul business aviation development to meet the demand of customized high efficiency travel service, (2) high-end seasonal tourism activities and transport to remote areas, (3) public service such as search and rescue, fire-fighting, disaster relief, and medical aid, (4) leisure and point-to point travel between residential properties, resorts, hotels, etc.

References

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