# Chapter 1.

# Flight simulators.

## 1.1.

## Basic description of flight simulators.

A **flight simulator** is a device that artificially re-creates aircraft flight and the environment in which it flies, for pilot training, design, or other purposes. It includes replicating the equations that govern how aircraft fly, how they react to applications of flight controls, the effects of other aircraft systems, and how the aircraft reacts to external factors such as air density, turbulence, wind shear, cloud, precipitation, etc. Flight simulation is used for a variety of reasons, including flight training (mainly of pilots), the design and development of the aircraft itself, and research into aircraft characteristics and control handling qualities.

Flight simulators are commonly used to maintain level of pilot training. Several different devices are utilized in modern flight training. Cockpit Procedures Trainer (CPT) are used to practice basic cockpit procedures, such as processing emergency checklists, and for cockpit familiarization. Certain aircraft systems may or may not be simulated. The aerodynamic model is usually extremely generic if present at all.

The one of main goals of training on flight simulator is to increase highly automated skills and quality execution but non-standard solutions, which are characterized by flight activity during non-standard situations during flights, the load on intellectual pilot function while performing assigned tasks kinds of aircraft.

## Types of flight simulators.

All available aircraft simulators can be divided into two main types:

* software simulators;
* training complexes.

In modern terminology, aviation simulators with a fixed cabin belongs to flight simulators. Simulators significantly differ in design depending on the destination: from mechanics and electronic equipment from the dashboard and the front part of the fuselage, designed to train pilots to computer programs PCs. Many software simulation realism is characterized as low because it does not allow the use of all the senses and is used in gaming purposes for personal computers.

Software simulators divided into procedural and comprehensive. **Procedural** aircraft simulator designed for training flight crews. This technical teaching tool that allows you to shape the skills needed in the real world. It has the following main features: simulator imitation of individual fragments of conditions of real activity pilot; the possibility of practicing in certain operations and actions of real pilot with cab equipment; the possibility of objective monitoring results of all operations, practiced on the simulator and instructor’s actions.

The procedural simulators provide training of specific actions, such as control of the aircraft, engines and aviation systems, staff, management of electronic equipment, combat use and so on. Typically, this kind of simulators are composed of display boards and instrument simulators and simulators control levers, whose boundary movements, load characteristics and tactile sensations correspond to real at all stages and modes of flight. Some devices that are closest to the operation are real.

The procedural simulators designed for working crew procedures and training for the flight. Purpose consoles, instruments and controls are generally simulated using touch monitors. For the convenience of individual panels and controls can be presented as full-size models. Additionally, depending on the amount of realized tasks, training can be divided into the following types:

1. Functional (primary) cabins, which are modeled to display information controls. They make it possible to deepen the knowledge of students-pilots of aerodynamics and aviation equipment, off procedure during the pilot operation of aircraft. Primary aviation simulators are usually the simplest, often made by the aviation units and schools. Stands and models can be considered as functional simulators.
2. Specialized training designed to prepare cadets-pilots for doing specific activities, for development of certain psychological qualities and skills of action in special cases in flight.

A **comprehensive** aviation training simulator implements similar to procedural simulator, but on advanced level and has such basic features as approaching the maximum conditions of the pilot in the simulator to the real conditions of the flight. Providing practice on the simulator in general of all tasks of a real pilot, which he carries in flight; enable objective monitoring results of all tested tasks.

An integrated simulator - the highest level of technical training to prepare flight crews and effective means of maintaining trained skills of pilots. An integrated simulator recreates real cab interior also makes it possible to work out all modes of operation of the aircraft. Simulators of highest qualification level have complete set of tools that provide adequate performance in all channels of perception cadet.