# Chapter 1.

# Flight simulators.

## 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 by low because it does not allow the use of all the senses and is used in gaming purposes for personal computers [1].

Software simulators divided into treatment 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 of the pilot. It has the following main features: simulation simulator on individual pieces of real conditions pilot; the possibility of working out certain operations and actions of real pilot of the cab; the possibility of objective monitoring results of all operations, practiced on the simulator, and actions by the instructor.

The procedural simulators provide training specific actions, such as control of the aircraft, engines and aviation systems, staff, management of electronic equipment, combat use and so on. Typically, it is composed of display boards and instrument simulators 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 - real.

The procedural simulators designed for working crew procedures and training of the flight. In the gym this purpose consoles, instruments and controls are generally simulated using touch monitors. For the convenience of individual panels and controls can be presented as a full-size models. Additionally, depending on the amount of realized tasks, training can be divided into the following types [3]

1. Functional (primary) cabins, which are models of 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. As can be seen functional simulators and models stands.

2. Specialized training designed to prepare cadets-pilots on doing specific elements 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 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; software testing in the simulator as a whole all the tasks of a real pilot, which he carries in flight; enable objective monitoring results of all the tasks tested.

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