TYPES OF LANDING SYSTEMS (ILS, VOR/DME)

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Abstract. The instrument landing system (ILS) is the most popular landing aid in the world. It is a distance-angled support system for landing in reduced visibility, while its task is the safe conduct of the aircraft from the prescribed course landing on the approach path. The aim of this study is to analyse the correctness of the ILS in simulated conditions.

Keywords: instrument landing system, flight simulator, CKAS MS5

INTRODUCTION

From the moment when people began to be transported, a major problem has been location. In the beginning, the position and the way forward were determined by the stars. Later, with the development of means of transport, many methods to determine the position in which the object is located were invented. The field of science, in this area of navigation, is defined as the science of the ways, methods and technical means of conducting moving objects according to the route, route selection, determination of the position of movable or immovable objects, and determination of errors of positions measurement.

Air navigation as a field of study covers issues, both theoretical and practical, concerning the safe and economical operation of the aircraft after embarking on the set route. Navigating the aircraft is a set of activities performed by the pilot and/or navigator to determine the geographical position of the aircraft, as well as determine and maintain the navigational flight parameters, such as rate, altitude and speed, which are necessary to operate an aircraft on the required route in the appointed time to the destination.

MATERIALS AND METHODS

ILS tests began in 1929 in the USA. The Civil Aeronautics Administration (CAA) authorized the installation of the system in 1941 at six locations. The first landing of a scheduled US passenger airliner using an ILS was on 26 January 1938, when a Pennsylvania Central Airlines Boeing 247D flew from Washington, DC, to Pittsburgh, PA, where it landed in a snowstorm using only an ILS [2]. The first fully

automatic landing using an ILS occurred in March 1964 at Bedford Airport in the UK.

An ILS operates as ground-based instrument approach system, which provides precision lateral and vertical guidance to an aircraft approaching and landing on a runway, using a combination of radio signals and, in many cases, high-intensity lighting arrays to enable safe landing during instrument meteorological conditions, such as low ceilings or reduced visibility due to fog, rain or blowing snow [3].

RESULTS AND DISCUSSION

According to Annex 10 of the ICAO, there are three categories of ILS, with the last category being the most accurate and comprising another three subclasses. The division of ILS categories is shown in Table 1.

Tab. 1

ILS categories for precision instrument approach and landing [4]

Approach category	Decision height	Runway visual range (RVR)
I	200 ft (61 m) or more	550 m (1,800 ft)
II	Less than 200 ft but more than 100 ft (30 m)	1,000 feet (300 m)
III a	Less than 100 ft but more than 50 ft (15 m)	600 feet (180 m)
III b	Less than 50 ft (15 m)	150 feet (46 m)
III c	No limitations	None

Smaller aircraft are generally equipped to only fly with a CAT I ILS. On larger aircraft, these approaches are typically controlled by the flight control system with the flight crew providing supervision. The CAT I relies only on altimeter indications for decision height, whereas CAT II and CAT III approaches use a radio altimeter to determine decision height. Furthermore, as the Category III c ILS is able to perform a precision instrument approach and landing, with no decision height and unlimited RVR, it can be claimed that this offers a fully automatic approach for landing.

The CKAS MotionSim5 flight simulation training device (FSTD) is a software- and hardware-based system that couples the reliability of modern desktop computer equipment, ona custom-built motion platform, with a cockpit that provides control devices that are identical or similar to those found on real aircraft. The CKAS MotionSim5 trainer (Fig. 1) is designed to simulate four generic types of light aircraft: a piston single-engine aircraft, such as the Cessna C172, a piston twin-engine aircraft, such as the Piper PA44 Seminole; a light twin- engine turboprop aircraft, such as the Beechcraft KingAir; and a light jet, such as the Cessna CitationJet. It is not intended to simulate a particular aircraft model, but rather to represent a typical

aircraft of each class in its handling qualities and features.

The aircraft used for the test is a twin-engine jet designed for use by up to nine people. It isvery light business jet.

All simulated aircraft are equipped with a common Garmin G1000-like avionics package. Some equipment, such as throttle quadrants or starter panels, are aircraft-specific and should be installed by the user for each particular model.

The MS5 Visual System provides a wide 200° × 40° field of view with high resolution [1]. It consists of three full-HD projectors, three high-end PCs for image generation and a screen. An additional PC is used to drive flight instruments and for general flight simulation.

The movement simulator cab is made possible by the electrical motion system with six degrees of freedom. This makes it possible to obtain a high level of accuracy in performing movement. The system tilts the hull in every possible direction at an angle of 18° and movesit by 150 mm [1].

The aim of the study was to determine the effect of weather conditions on the correct operation of an ILS system. Poznań-Ławica Airport was selected as the destination airport for the tests. It is equipped with a CAT I ILS installed on RWY28.

CONCLUSION

The work carried out in this study was dictated by the fact that the ILS is the most widely used system in aviation; indeed, every airport is currently equipped with this system. The correct operation of the system affects safety when flying or landing aircraft. As this study is far from exhaustive, however, we recommend that a complete analysis should be carried out on the impact of other factors on the operation of the ILS.

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