

Integrated information system with synthesized image of the flight environment, preventing collisions with obstacles and providing a blind landing.

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Abstract

Helicopter as a mobile all-weather and combat mean of transport should match the requirements to fly in bad weather and land in difficult conditions. In most cases the helicopter pilot should determine such landing zones from the air. One more problem of piloting a helicopter is flying at extreme low altitudes and terrain following. It was established that 70% of civil aviation accidents occurred due to the human factor. Reasons of accidents caused by the human factor in most cases are the following:

- Helicopter collision with the ground or another obstacle caused by crew's loss of spatial orientation and contact with reference points when flying at extreme low altitude, hovering, takeoff and landing under the snow or dust vortex.
- Helicopter rollover in the landing zone that was determined from the air because the approach angles exceed the allowable limits.

Analysis of aviation accidents has shown that it is necessary to improve the information control field in terms of spatial position and environment parameters and improve submission of information for the pilot's better and easy perception. Information of the spatial position must be accurate and understandable for the pilots. Improvement of pilot's situational awareness is a complex engineering and scientific task. The existing isolated information systems are not able to solve this problem. The problem can be solved through combination of different information systems in one. Examples of such systems are multi-functional compact airborne radars, lidars and optical electronic systems, etc. In addition to this it is necessary to develop methods to create optimal synthetic images by using all available sensors and information sources. Information control field should be correctly formed that the pilot can easily understand and make the right decision.

It is necessary to develop methods for automatic generation of three-dimensional image of the surrounding space and methods of automatic separation of natural objects from artificial ones. To make automatic separation of the objects by type and basis risk for the aircraft.

It should be stressed that the task of forming a synthesized image from different information systems is an engineering and computing task as well as an ergonomic task of forming a single image of the spatial position understandable for human mind. In order to solve this task it is necessary to assess psychophysiological characteristics of perception, different image combinations and forms, responsive rate, pilot's attention workload and adequacy of the information frame.

Creation of an integrated information system with synthesized image will significantly improve flight safety, reduce the pilot's workload by maneuvering at extreme low altitudes, in adverse weather conditions including dense dust and snow clouds, and landing. Analysis of the research being carried out by leading helicopter developers shows that in the near future integrated information systems with synthesized image should become an essential part of all helicopters.