Chapter 2
Development Specifics of the Tower Controller Intelligent Training System

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ABSTRACT

The activity of the tower controller is connected with the implementation of a rather complex set of measures to ensure takeoff and landing operations. In connection with this, the aviation specialist should possess the number of professional competencies, which are formed by mastering the theoretical material and consolidating it in practice. Frequently, the initial consolidation in practice is performed by using automated training systems, especially intelligent training systems are in a great demand. Therefore, this chapter is devoted to the specifics of the development of such type aviation-focused system, which are given on the example of the intelligent training system “Tower Controller.” The prototype of this system was developed at Flight Academy of the National Aviation University, Ukraine. Its key differential peculiarities are focused on major stages of the decision-making process of the tower controller instead of visualization from the tower window.

BACKGROUND


During take off engines are operated with take-off mode. There is a risk of their failure at the moment when an airplane performs take-off run, which may cause an inability to get off the ground or

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incapability to stop on a runway. That is why, there is a point during take off, at which a pilot makes the
decision whether it is better to take off or slow down. If the failure occurs after passing this point, then
take off should be done under any conditions (even with one working engine).

The next danger, which is connected with take off, is an incorrect plane balance. For take off a pilot
uses take-off configuration of an aircraft, which is based on a plane balance, calculated before a flight.
Whether this calculation is correct can be determined only after getting off the ground.

The other hazard is the crosswind. It may hinder take-off operations and take a ship down from a
runway.

A landing is also a rather complicated stage. It is caused by several factors. One of these factors is
the wind, especially the crosswind and the heading wind. It makes difficult to aviate a plane. If the wind
changes its direction or abruptly stops, then an aircraft may sharply lose an altitude and bump into the
ground.

The second factor is a visibility. Of course, it also complicates takes off, but visual cues play a much
greater role for landing. Poor visibility conditions may lead to a collision with obstacles in an area of an
aerodrome or to landing outside a runway.

The third factor is a plane balance. Centering on landing differs from centering on take off. This is
explained by fuel consumption during flight. The next factor is a coefficient of adhesion. After touching
down, there may be a risk of skidding an aircraft or other problems, connected with a surface state
of a runway.

The factors, described above, are not a complete list of those, which affect the complexity of taking
off and landing. So, all of them should be taken into account for ensuring safe flight operations.

One of the participants of take-off and landing stages is a Tower controller. He ensures (Dnipropetrovsk
regional branch, Zaporizhzhya air traffic service system, 2013):

- Aerodrome control service;
- Flight information service;
- Emergency service.

In the process of aerodrome control service, a Tower controller provides permissions for arriving and
departing crews, as well as a various pieces of information, aimed at the maintenance the discipline in
an aerodrome zone in order to prevent collisions between aircraft. Also a Tower controller interacts with
the airfield maintenance and supply service on the issue of permits for works on the airfield. The airfield
maintenance and supply service reports a Tower controller about destroyed surface of the runway, the
absence of appropriate marking, the repair work in the aerodrome working area, etc.

The purpose of flight information service is the provision of consultations and information to ensure
the safe and efficient performance of flights (Dnipropetrovsk regional branch, Zaporizhzhya air traffic
service system, 2013). For example, aircraft crew may initiate the request to a Tower controller for getting
meteorological information such as weather forecast for the aerodrome, the weather forecast for landing,
aerodrome warning, warning about wind displacement at the aerodrome and other additional information.

Emergency service is aimed at providing a comprehensive assistance to aircraft in distress (Dnipropetrovsk
regional branch, Zaporizhzhya air traffic service system, 2013). During this service, a Tower
controller not only keeps the connection with aircraft in distress but also notifies the rescue service
about the emergency.