

Automatic Landing of a High-Aspect-Ratio Aircraft without using the Thrust

This paper describes a landing procedure, the algorithms and the automatic flight control functions for the longitudinal motion of a high-aspect-ratio aircraft. The automatic landing is performed without using the thrust, regardless of prevailing wind conditions. This landing procedure is intended for emergency landing after engine failure or can be used to reduce noise in the vicinity of airports. After explaining the problem and limitations of landing an aircraft without thrust under varying wind conditions, the landing procedure is explained. The main idea is to adjust the glide path continuously according to the current wind conditions instead of using a fixed glide path. The algorithms and functions to calculate the glide slope angle, to command the glide path, and to control the aircraft are described. The control structure for the longitudinal motion is based on the principles of total energy control. As thrust control is not available, the airbrakes in combination with the elevator are used to control the airspeed and the glide path at the same time. This control algorithm is also used for the flare. A brief explanation of the used longitudinal path controls and of the flare control algorithm are given. The described algorithms and functions were designed for a CS-23 class 1 aircraft and implemented and tested in-flight in an automatic flight control system, which was developed in the project LAPAZ and integrated into the utility aircraft STEMME S15. Finally flight test results will be discussed, that indicate the validity of the algorithms.