A kinetics model of decision making and its application to an airplane accident

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Abstract

This paper reports the case study of a near-miss in 2001 and collision in 2002 concerning the basis of human error factors and system. Two Japan Airlines, Boeing 747-400D and Douglas DC10-40, were involved in a near-miss at 36,000 feet high over Japan on 31st. of January, 2001. Particular concerns are that, for one, the controllers instructed the ascending Boeing to go down, and for the other, Boeing continued to descend, contrary to the ascending instruction by the Resolution Advisories (RA) of the Traffic Alert and Collision Avoidance System (TCAS). The Boeing suddenly dove to avoid a collision causing injuries to many passengers. The Tupolev 154M, en route from Moscow to Barcelona, collided with the Boeing 757-200 cargo jet over Überlingen, Germany on 1st. of July, 2002, killing all seventy one people aboard both airplanes. Approaching each other in midair both airplanes descended: Tupolev 154M followed instructions by air traffic controller in disregard of the RA increase, while Boeing 757-200 followed instructions issued by the TCAS. A conventional kinetics model is applied to the flight data and characterized by parameters related to decision making model. The process of the hard-pressed moment and a margin for risk aversion can be shown quantitatively.

Introduction

Two Japan Airline flights: 907, Boeing 747-400D (Boeing 747) and 958, Douglas DC 10-40 (DC 10) were involved in a near-miss at 36,000 feet high over Japan on 31st. of January, 2001 (ICAO, 2001). Boeing 747, after taking off from Tokyo International Airport, ascended to the final cruising flight level of 39,000 feet (FL390) for Naha, Okinawa. Boeing 747 was instructed to descend to FL350 by Air Traffic Controllers (ATC) of Tokyo Area Control Centre (ACC) at 15:54'27" in Japan standard time (JST) because of traffic with DC 10. The pilot of Boeing 747 started to descend and continued to descend, contrary to the ascending instruction issued by the Resolution Advisories (RA) of the Traffic Alert and Collision Avoidance System (TCAS). On the contrary, DC 10, cruising at FL370 from Pusan, Korea toward Narita International Airport, started to descend following the instruction of TCAS and thus both airplanes descended. Approaching each other,