

FLIGHT DYNAMICS

IAR 99 Aircraft

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The paper is equally intended to military pilots, technical and engineering staff in charge of aircraft maintenance, researchers in the aerospace field as well as senior students of the Aerospace Engineering Faculty from civilian or military academies. Discussing the dynamic characteristics of the aircraft the book “Dynamic flight - IAR 99 Aircraft” materializes as well a brief but well documented presentation of the first product entirely made by the Romanian industry.

The paper is structured in two sections: the first one refers to general information and fundamental data while the second one deals with the flight dynamics. Part one comprises a general description of the aircraft, data on the aircraft geometry, weights, centering adjustment, inertia moments, structural data, systems, controls system. Constraints and flight ranges, minimum and maximum speed, flight level, limit of normal acceleration are shown along with the propulsion system with the suction device, the VIPER 623-41 engine and its characteristics, adjustments and limitations. Part one also comprises a chapter intended for aerodynamics showing some basic elements, lift, thrust and pitching moment. Part two is divided in several chapters as follows: unaccelerated flight performances, maneuvering characteristics, flight performance, static stability performance, dynamic stability.

Chapter **Unaccelerated flight performances** shows mission profiles and global performances with respect to mission: distance, operating range, autonomy. The take – off, climb, cruise, descent, approach and landing are also presented in this chapter.

Chapter **Maneuvering performances presents** the maneuvering coefficients, the specific excess horsepower, energetic maneuverability, turning speed along with acceleration, deceleration, dive, chandelle, turn, roll, loop, return of 180 degrees in the vertical plan with altitude gain.

Chapter **Flight qualities: introduction** presents the flight characteristics and performances along with the aircraft controllability and stability.

Chapter **Flight qualities: static stability** develops the following issues related to the static pitching stability (pitching stiffness), static directional stability (yaw stiffness), and lateral static stability (roll stiffness).

Chapter: **Flight Qualities: dynamic stability** presents the following issues: damping of incidence and lateral -directional oscillations (Dutch roll), roll convergence, non-steady slow longitudinal motion, phugoid stability, 0.

The authors combined the mathematical rigor applied to the physical models utilized to obtain the flight characteristics to an accessible enunciation of concepts and characteristics additional to the traditional ones to better define the aircraft dynamics. The paper contains results based on calculus determinations and experimental data.

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