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Generalization of Turbojet-engine Performance in Terms of Pumping Characteristics Turbofan and Turbojet Engines Generalized Simulation Technique for Turbojet Engine System Analysis Influence of Noise Control Components and Structures on Turbojet Engine Testing and Aircraft Ground Operation Transient Operating Characteristics of a Turbojet Engine when Subjected to Step Changes in Fuel Flow Photographic Studies of Preignition Environment and Flame Initiation in Turbojet-engine Combustors Designing Simplicity to Achieve Technological Improvement Emission Measurements of a J93 Turbojet Engine The Effect of Fuel Ingestion on Turbojet Engine Operation Turbojet Engine Noise Reduction with Mixing Nozzle-ejector Combinations Performance of a Turbojet Engine in Combination with an External-internal-compression Inlet to Mach 2.88 Performance Potential of an Advanced Technology Mach 3 Turbojet Engine Installed on a Conceptual High-speed Civil Transport Effect of Heat and Power Extraction on Turbojet-engine Performance Carbon Deposition of Several Special Turbojet-engine Fuels Turbojet-engine Noise Studies to Evaluate Effects of Inlet-guide-vane--rotor Spacing Investigation of the Performance of a Turbojet Engine with Variable-position Compressor Inlet Guide Vanes Experimental Investigation of an Air-cooled Turbine Operating in a Turbojet Engine at Turbine Inlet Temperatures Up to 2500 Degrees F Engine Description Performance of Basic XJ79-GE-1 Turbojet Engine and Its Components Determining Operational States of Turbojet Engines with Variable-area Tail Nozzle Turbine for a Low-cost Turbojet Engine: Design and cold-air performance NACA Conference on Turbojet-Engine Thrust-Augmentation Research Performance Potential of an Advanced Technology Mach 3 Turbojet Engine Installed on a Conceptual High-Speed Civil Transport Investigation of Acceleration Characteristics of a Single-spool Turbojet Engine Static Sea-level Performance of an Axial-flow-compressor Turbojet Engine with an Air-cooled Turbine Transient Temperature Profiles and Calculated Thermal Strains of Turbojet-engine Buckets Examination of Smoke and Carbon from Turbojet-engine Combustors Analysis of Limitations Imposed on One-spool Turbojet-engine Designs by Compressors and Turbines at Flight Mach Numbers of 0, 2.0, and 2.8 Small, low-cost, expendable turbojet engine Altitude Performance of J35-A-17 Turbojet Engine in an Altitude Chamber Inlet Noise Suppressor Performance with a Turbojet Engine as the Noise Source Crash-fire Protection System for a J57 Turbojet Engine Using Water as a Cooling and Inerting Agent Jet Noise Reduction with Micro Turbojet Engine Noise Investigations Experimental Investigation of Air-cooled Turbine Blades in Turbojet Engine Compressor-blade Vibration and Performance in a J47-23 Turbojet Engine Under Conditions of Rotating Stall The Linear Dynamics of a Turbojet Engine as Developed from the Linearized Component Equations Experimental Investigation of Air-cooled Turbine Blades in Turbojet Engine Jet Diffuser for Simulating Ram Conditions on a Turbojet-engine Static Test Stand Performance of Several Cast Nickel-base Alloys as Turbojet-engine Bucket Materials at 1650° F Sea-level Evaluation of Digitally Implemented Turbojet Engine Control Functions

An investigation of the altitude performance characteristics of an Allison J35-A-17 turbojet engines have been conducted in an altitude chamber at the NACA Lewis laboratory. Engine performance was obtained over a range of altitudes from 20,000 to 60,000 feet at a flight Mach number of 0.62 and a range of flight Mach numbers from 0.42 to 1.22 at an altitude of 30,000 feet. The performance of the engine over the range investigated could be generalized up to an altitude of 30,000 feet. Performance of the engine at any flight Mach number in the range investigated can be predicted for those operating condition a t which critical flow exits in the exhaust nozzle with the exception of the variables corrected net thrust, and net-thrust specific fuel consumption. The standard hydromechanical control system of a turbojet engine was replaced with a digital control system that implemented the same control laws. A detailed discussion of the digital control system in use with the engine is presented. The engine was operated in a sea-level test stand. The effects of control update interval are defined, and a method for extending this interval by using digital compensation is discussed. Compressor performance and turbine performance are presented in the form of performance maps at selected values of Reynolds number index; the effects of Reynolds number on performance are summarized. The effects of variable stator angle and high inlet-air temperatures on compressor performance are also shown. Over-all engine performance (net thrust and specific fuel consumption) is presented for a flight Mach number of 0.9 at rated engine conditions over a range of altitudes to illustrate performance losses resulting from decreased Reynolds number index. Smoke and carbon from turbojet-engine combustors were studied by the methods of electron microscopy, chemical analysis, and x-ray diffraction. The smoke exhausting from a combustor was found to consist of carbon black, agglomerated into soot. The carbon black had been partially burned in its passage through the flame zone. The smoke resulted from the incomplete combustion of the vaporized fuel; it was not the result of the pyrolysis of fuel droplets. The soft carbon in the dome of the combustor liner was found to consist of carbon black and soot intermixed with indeterminate complexes such as high-boiling fuel ends and partly polymerized and pyrolyzed heavy hydrocarbons. The hard carbon on the walls of the combustor liner was found to be largely petroleum coke. The coke was apparently formed by the liquid phase cracking, pyrolysis, and subsequent coking on the liner wall of fuel from the spray nozzle. Several noise suppressors consisting of combinations of mixing nozzles and ejectors were tested on two full-scale turbojet engines. Maximum sound pressure level reductions of 12 decibels and sound power level reductions of 8 decibels were obtained. The ejectors provided 3 to 5 decibels of the sound power reduction. The effects of ejector dimensions on noise suppression and engine performance were investigated. Ejector lengths of approximately 2.0 standard nozzle diameters and ejector diameters larger than 1.6 standard nozzle diameters provided the greatest additional noise reduction to that obtained with the mixing nozzles alone. The ejector can restore the static thrust loss caused by use of the mixing nozzle or can provide static-thrust augmentation. A nonlinear analog simulation of a turbojet engine was developed. The purpose of the study was to establish simulation techniques applicable to propulsion system dynamics and controls research. A schematic model was derived from a physical description of a J85-13 turbojet engine. Basic conservation equations were applied to each component along with their individual performance characteristics to derive a mathematical representation. The simulation was mechanized on an analog computer. The simulation was verified in both steady-state and dynamic modes by comparing analytical results with experimental data obtained from tests performed at the Lewis Research Center with a J85-13 engine. In addition, comparison was also made with performance data obtained from the engine manufacturer. The comparisons established the validity of the simulation technique. A maximum simulated ram-pressure ratio of about 2.4 was obtained at a simulated pressure altitude of approximately 23,000 feet. Inlet noise suppressors having perforated plate over honeycomb wall construction evaluated over range of passage heights and engine speeds using turbojet engine as noise source. Jet noise remains a significant noise component in modern aero-engines. A high-speed flow mixing with the surrounding air constitutes noise sources behind the nozzle. This book consists of two parts. The first part is to provide an overview of the aircraft noise generating sources with emphasis on the jet noise, the main technologies employed for control and reduction of aircraft noise for subsonic and supersonic jets, and finally a survey of the current applications of large-eddy simulation (LES) for predicting of the noise from single stream turbulent jets, including numerical methods for simulation of near and far field of a jet nozzle. The second part of the book describes a test rig constructed for the study of jet noise from JetCat micro turbojet engine used for unmanned aerial vehicles (UAV) to investigate the near field noise generated by turbulent high subsonic single stream jet. With the beginning of powered, manned flight, the piston engine drove a propeller or multiple propellers to provide the thrust for lift required to overcome the forces of drag and gravity for flight. As aircraft speeds gradually increased over time, the power needed to overcome the aerodynamic inefficiencies of the propeller to greater speeds and altitudes were quickly realized as a hindrance to the potential of aircraft. With the turbojet engine, this new mechanism and subsequent aerodynamic changes revolutionized aircraft to increased speeds and altitude never before achievable with a piston engine. The United States, after acquiring further and more extensive turbojet engine knowledge from the British during World War II, steadily developed the technology. In a relatively brief amount of time, the turbojet was able to power aircraft reliably beyond the speed of sound. The General Electric axial flow J79 turbojet engine generated a lasting technological innovation with the first use of production ready variable incidence stator vanes that allowed jet engines to begin to overcome compressor stall. Compressor stall can occur as air flows through the jet engines various air compressing guide and stator vanes with low air pressure building just behind a given blade. The low pressure air cell can cause damaged vanes; build to the point of causing a rotational stall which critically impedes the rotation of the engine, can migrate to the combustion chamber starving the fuel of oxygen needed for ignition, or cause the complete reversal of air flow within the engine. These events can cause minor to catastrophic engine damage or even complete engine failure. Variable incidence stator vanes were no longer static but were adjustable to allow the optimum angle of airflow around the various vanes and thus controlled the compressibility of the airflow through the engine reducing the likelihood of stalls. The use of the this variable stator design within the J79 turbojet allowed the engine to be smaller in diameter, removed complexity, and weighed considerably less than other competing turbojet engines of the time, laying the groundwork for a production run of over thirty years and speeds exceeding Mach 2, or twice the speed of sound. The purpose of this study is to analyze the General Electric J79 Turbojet engine as it relates to its contemporary turbojet engines, the aircraft it powered, and the effects for General Electric and the military powerplant industry. Additionally, the purpose of this study is to illustrate how the engine helped assist aircraft designers and their companies to satisfy Armed Forces proposals for increased speeds, payloads, systems and the missions to meet a national philosophy of deterrence of a newly perceived threat during the Cold War with the Soviet Union and her Warsaw Bloc allies. Characteristics of a basic turbojet engine consisting of compressor, combustor, and turbine can be presented in terms of pumping characteristics; that is, corrected air flow, ratio of engine-outlet to -inlet total pressure, ratio of engine-outlet to -inlet total temperature, Reynolds number index, corrected engine speed, and corrected fuel-air ratio. Such a presentation describes the engine independently of the characteristics of other elements of the propulsion system. This method of presentation also permits rapid estimation of performance of complex propulsion systems involving the basic tubojet engine. In general, with a turbojet engine operating at constant engine speed, bleeding gas from the tail pipe at constant tail-pipe-nozzle area and reduced turbine-inlet temperature caused 2.5 to 4 times as great a loss in thrust as bleeding gas at constant turbine-inlet temperature and reduced tail-pipe-nozzle area. The performance of an advanced technology conceptual turbojet optimized for a high-speed civil aircraft is presented. This information represents an estimate of performance of a Mach 3 Brayton (gas turbine) cycle engine optimized for minimum fuel burned at supersonic cruise. This conceptual engine had no noise or environmental constraints imposed upon it. The purpose of this data is to define an upper boundary on the propulsion performance for a conceptual commercial Mach 3 transport design. A comparison is presented demonstrating the impact of the technology proposed for this conceptual engine on the weight and other characteristics of a proposed high-speed civil transport. This comparison indicates that the advanced technology turbojet described could reduce the gross weight of a hypothetical Mach 3 high-speed civil transport design from about 714,000 pounds to about 545,000 pounds. The aircraft with the baseline engine and the aircraft with the advanced technology engine are described. Morris, Shelby J., Jr. and Geiselhart, Karl A. and Coen, Peter G. Langley Research Center RTOP 505-69-71-03...

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