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Aircraft Propulsion; Table of Contents; Preface to the Second Edition; Acknowledgments; Preface; Intended Audience; Motivation; Mathematical Level; Chapter Organization and Topical Coverage; Instructor Resources; Acknowledgments; Nomenclature; 1 Introduction; 1.1 History of the Airbreathing Jet Engine, a Twentieth-Century Invention-The Beginning; 1.2 Innovations in Aircraft Gas Turbine Engines; 1.2.1 Multispool Configuration; 1.2.2 Variable Stator; 1.2.3 Transonic Compressor; 1.2.4 Low-Emission Combustor; 1.2.5 Turbine Cooling; 1.2.6 Exhaust Nozzles; 1.2.7 Modern Materials and Manufacturing Techniques; 1.3 New Engine Concepts; 1.3.1 Advanced Turboprop (ATP) and Geared Turbofan (GTF); 1.3.2 Advanced Airbreathing Rocket Technology; 1.3.3 Wave Rotor Topping Cycle; 1.3.4 Pulse Detonation Engine (PDE); 1.3.5 Millimeter-Scale Gas Turbine Engines: Triumph of MEMS and Digital Fabrication; 1.3.6 Combined Cycle Propulsion: Engines from Takeoff to Space; 1.4 New Vehicles; 1.5 Summary; 1.6 Roadmap for the Second Edition; References; Problems; 2 Compressible Flow with Friction and Heat: A Review; 2.1 Introduction; 2.2 A Brief Review of Thermodynamics; 2.3 Isentropic Process and Isentropic Flow; 2.4 Conservation Principles for Systems and Control Volumes; 2.5 Speed of Sound & Mach Number; 2.6 Stagnation State; 2.7 Quasi-One-Dimensional Flow; 2.8 Area-Mach Number Relationship; 2.9 Sonic Throat; 2.10 Waves in Supersonic Flow; 2.11 Normal Shocks; 2.12 Oblique Shocks; 2.13 Conical Shocks; 2.14 Expansion Waves; 2.15 Frictionless, Constant-Area Duct Flow with Heat Transfer; 2.16 Adiabatic Flow of a Calorically Perfect Gas in a Constant-Area Duct with Friction; 2.17 Friction (Drag) Coefficient C_f and D'Arcy Friction Factor f_D ; 2.18 Dimensionless Parameters; 2.19 Fluid Impulse; 2.20 Summary of Fluid Impulse; References; Problems; 3 Engine Thrust and Performance Parameters; 3.1 Introduction; 3.1.1 Takeoff Thrust; 3.2 Installed Thrust-Some Bookkeeping Issues on Thrust and Drag; 3.3 Engine Thrust Based on the Sum of Component Impulse; 3.4 Rocket Thrust; 3.5 Airbreathing Engine Performance Parameters; 3.5.1 Specific Thrust; 3.5.2 Specific Fuel Consumption and Specific Impulse; 3.5.3 Thermal Efficiency; 3.5.4 Propulsive Efficiency; 3.5.5 Engine Overall Efficiency and Its Impact on Aircraft Range and Endurance; 3.6 Modern Engines, Their Architecture and Some Performance Characteristics; 3.7 Summary; References; Problems; 4 Gas Turbine Engine Cycle Analysis; 4.1 Introduction; 4.2 The Gas Generator; 4.3 Aircraft Gas Turbine Engines; 4.3.1 The Turbojet Engine; 4.3.2 The Turbojet Engine with an Afterburner; 4.3.3 The Turbofan Engine; 4.3.4 Ultra-High Bypass (UHB) Turbofan Engines; 4.4 Analysis of a Mixed-Exhaust Turbofan Engine with an Afterburner; 4.4.1 Mixer; 4.4.2 Cycle Analysis; 4.5 The Turboprop Engine; 4.5.1 Introduction; 4.5.2 Propeller Theory; 4.5.3 Turboprop Cycle Analysis; 4.6 Summary; References

Sommario/riassunto

New edition of the successful textbook updated to include new material on UAVs, design guidelines in aircraft engine component systems and additional end of chapter problems. Aircraft Propulsion, Second Edition is a comprehensive textbook covering aircraft gas turbine engine and rocket propulsion from the basic principles to more advanced treatments in engine components. Propulsion system integration with aircraft plays an important role in understanding propulsion and is addressed accordingly. Extensive review material and derivations are included to help the reader navigate.