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The primary purpose of this extensive test effort was to observe real-time operational characteristics associated with automotive grade fuel utilized by piston engine powered light general aviation aircraft. In fulfillment of this effort, baseline engine operations were established with 100LL aviation grade fuel followed by four blends of automotive grade fuel. A comprehensive sea-level-static test cell/flight test data collection and evaluation effort was conducted to review operational characteristics of a carburated light aircraft piston engine as related to fuel volatility, fuel temperature, and fuel system pressure. Sea-level-static test cell engines operations were conducted utilizing an AVCO Lycoming 0-320 engine connected to an eddy current dynamometer which facilitated data collection under various engine load conditions. In addition, real-time inflight performance data was obtained utilizing a Cessna 150/Continental 0-200A engine, while operating on test fuels No. 1 and No. 2 which had Reid vapor pressures of 14.4 psi and 8.0 psi, respectively. Originator furnished key words include: General Aviation, Automotive Fuel, Aviation Fuel, Vapor lock, Vapor-Liquid Ratio, Fuel Additives, Light Aircraft, Piston Engines, and Fuel Volatility.

The aim of the Liberty was to standardize aircraft engine design. The theory was to have an engine design that could be built in several sizes and thus power airplanes for any purpose, from training to bombing. The differences in sizes would be obtained by using different numbers of cylinders in the same design. A large number of other parts would also be used in common by all resulting sizes of the engine series. The initial concept called for four-, six-, eight- and 12-cylinder models. An X-24 version
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Deficiencies in established techniques of measuring aircraft thrust in flight led to the application of the gas generator method of calculating engine thrust to the XB-70-1 airplane. A series of tests on a ground static-thrust stand were performed on the airplane to establish at ground static conditions the accuracy of this method, to measure the installed thrust of the YJ93-GE-3 engine, and to determine the effect of instrumentation errors and nonuniform flows at the engine compressor face on the thrust calculation. Tests with an aerodynamically choked inlet, an opened inlet-bypass system, and varying combinations of operating engines were also conducted. Results showed that the accuracy of the gas generator method of calculating engine thrust was satisfactory.
generator method was ±2 percent for the normal operation of the XB-70-1 airplane at ground static conditions and for the upper 70 percent of the engine's throttle range. They also showed that the effect of individual instrument errors on the thrust calculation was reduced because of the large number of measurements and that abnormally high inlet flow distortion affects the thrust calculation. When corrected for inlet losses, the installed thrust of the YJ93-GE-3 engine agreed favorably with the engine manufacturer's uninstalled estimated thrust for all power settings except those at the low end.

Two engine research experiments were recently completed in Moscow, Russia using an engine from the Tu-144 supersonic transport airplane. This was a joint project between the United States and Russia. Personnel from the NASA Lewis Research Center, General Electric Aircraft Engines, Pratt & Whitney, the Tupolev Design Bureau, and IBP Aircraft LTD worked together as a team to overcome the many technical and cultural challenges. The objective was to obtain large scale inlet data that could be used in the development of a supersonic inlet system for a future High Speed Civil Transport (HSCT).

The first experiment studied the impact of typical inlet structures that have trailing edges in close proximity to the inlet/engine interface plane on the flow characteristics at that plane. The inlet structure simulated the subsonic diffuser of a supersonic inlet using a bifurcated splitter design. The centerbody maximum diameter was designed to permit choking and slightly supercritical operation.

The second experiment measured the reflective characteristics of the engine face to incoming perturbations of pressure amplitude. The basic test rig from the first experiment was used with a...
All the objectives set forth at the beginning of the project were met.

Contents:
- Producing Weather for Turbojet Engine Testing
- Some Problems Encountered in Establishing a Small Engine Icing Facility at the AEL, NAMC
- The Photoelectric Raindrop-size Spectrometer
- Measuring Techniques Under Water and Icing Conditions
- A Comparison Between the Rotating Multicylinder Method and the Oil Slide Method
- National Severe Storms Project - Objectives and Operations
- Severe Weather Flight Testing of Jet Fighter Airplanes and Engines
- Foreign Object Ingestion in Turbine Engines
- Icing Trials of the T-38 and T-39 Aircraft
- Icing Tests Conducted at NATTS, May 1960 Through May 1961
- A Resume of Simulation Techniques and Icing Activities at the Engine Laboratory of the National Research Council (Canada)
- The Effects of Bird Ingestion on Gas Turbine Engines
- Effects of Water Ingestion on Turbojet Engine Operation
- Salt Water Ingestion by Gas Turbine Engines
- The Effect of Temperature Extremes Upon the Operational Characteristics of Turbojet Engines

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COURSE OVERVIEW: Fulfilling the Army's need for engines of simple design that are easy to operate and maintain, the gas turbine engine is used in all helicopters of the Active Army and Reserve.
We designed this subcourse to teach you theory and principles of the gas turbine engine and some of the basic army aircraft gas turbine engines used in our aircraft today.

CHAPTERS OVERVIEW

Gas turbine engines can be classified according to the type of compressor used, the path the air takes through the engine, and how the power produced is extracted or used. The chapter is limited to the fundamental concepts of the three major classes of turbine engines, each having the same principles of operation. Chapter 1 is divided into three sections; the first discusses the theory of turbine engines. The second section deals with principles of operation, and section III covers the major engine sections and their description.

CHAPTER 2 introduces the fundamental systems and accessories of the gas turbine engine. Each one of these systems must be present to have an operating turbine engine. Section I describes the fuel system and related components that are necessary for proper fuel metering to the engine. The information in CHAPTER 3 is important to you because of its general applicability to gas turbine engines. The information covers the procedures used in testing, inspecting, maintaining, and storing gas turbine engines. Specific procedures used for a particular engine must be those given in the technical manual (TM) covering that engine.

The two sections of CHAPTER 4 discuss, in detail, the Lycoming T53 series gas turbine engine used in Army aircraft. Section I gives a general description of the T53, describes the engine's five sections, explains engine operation, compares models and specifications, and describes the engine's airflow path. The second section covers major engine assemblies and systems.

CHAPTER 5 covers the Lycoming T55 gas turbine engine. Section I gives an operational description of the T55, covering the engine's five sections. Section II covers in detail each of the engine's sections and major systems.

The SOLAR T62 auxiliary power unit (APU) is used in place of ground support equipment to start some helicopter engines. It is also used to operate the helicopter hydraulic and electrical systems when this aircraft is on the ground, to check their performance. The T62 is a component of both the CH-47 and CH-54.
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CHAPTER 6 describes the T62 APU; explains its operation; discusses the reduction drive, accessory drive, combustion, and turbine assemblies; and describes the fuel, lubrication, and electrical systems. CHAPTER 7 describes the T63 series turboshaft engine, which is manufactured by the Allison Division of General Motors Corporation. The T63-A-5A is used to power the OH-6A, and the T63-A-700 is in the OH-58A light observation helicopter. Although the engine dash numbers are not the same for each of these, the engines are basically the same. As shown in figure 7.1, the engine consists of four major components: the compressor, accessory gearbox, combustor, and turbine sections. This chapter explains the major sections and related systems. The Pratt and Whitney T73-P-1 and T73-P-700 are the most powerful engines used in Army aircraft. Two of these engines are used to power the CH-54 flying crane helicopter. The T73 design differs in two ways from any of the engines covered previously. The airflow is axial through the engine; it does not make any reversing turns as the airflow of the previous engines did, and the power output shaft extends from the exhaust end. CHAPTER 8 describes and discusses the engine sections and systems. Constant reference to the illustrations in this chapter will help you understand the discussion.

TABLE OF CONTENTS:
1 Theory and Principles of Gas Turbine Engines
2 Major Engine Sections
3 Systems and Accessories
4 Testing, Inspection, Maintenance, and Storage Procedures
5 Lycoming T53
6 Lycoming T55
7 Solar T62 Auxiliary Power Unit
8 Allison T62, Pratt & Whitney T73 and T74, and the General Electric T700
Examination.