

# powertek™

## Axial Flow Gas Turbine Engine

The engine is a small compact free turbine engine originally Model Number JFS100 manufactured by Allied Signal Inc. It is very easy to start. No external air source or different fuels are required.

Every safety aspect of this engine test stand has been considered and built-in; making this one of the safest designs on the market for education and testing roles.

It comprises a gas generator and an accessory drive assembly. The gas generator incorporates a centrifugal compressor, an axial flow turbine rotating unit and an ignition and combustion system. The accessory drive assembly incorporates a lubrication pump, a fuel pump, a 50% cut-out switch, a generator and an electric start motor. The engine has been modified from its original purposes as a gas turbine engine starter by removing the power recovery turbine and gear reduction unit and replacing with a custom fabricated exhaust nozzle to allow for continuous operation while not under load. The fuel control unit has been modified to allow for control of engine rpm by a Vernier throttle control. The engine has met "Military Containment Tests" with a 200 hour maintenance inspection performed.

### Data Display And Acquisition

The data display and acquisition system require a PC running Windows™ 98/XP. (Computer not supplied)

Sensors are provided to measure

### Ordering Specification

#### Installation

It is recommended that the engine test stand be installed in a dedicated test cell, fitted with exhaust extraction and sound deadening. To accomplish this the engine can be ordered with custom length electrical harness and throttle cable.

#### Electrical Requirements

Single phase electricity for the battery charger



direct thrust (from a load cell), fuel flow, engine rpm pressure at various stages of the engine and temperature at each stage of the engine. Unlike some designs that use a bending plate/strain gauge arrangement, the GDJ Axial Flow Gas Turbine Engine uses a linear bearing arrangement. This allows direct thrust readings that are more accurate.

The LabVIEW™ software calculates the thrust from the fuel flow, temperature and pressure readings

- Model PT-500-1 (110V)
- Model PT-500-2 (220V)

Specify if custom cable length is required. For example:

15' cable would be Model PT-500-1-15

An military axial flow gas turbine engine mounted on a test bed with full instrumentation and sensors suitable for teaching purposes. All start and engine switches are located in an industrial electrical enclosure with a guard to prevent accidental starting.

using the Brayton cycle formulae. This calculated thrust can be compared with the measured thrust. The software also calculates the turbine entry pressure.

The user has access to a wide range of data acquisition, graph plotting and display functions. As well as the standard graph plotting functions, a special routine has been written to display H – S diagrams (Entropy – Enthalpy diagrams) which are of particular interest in thermodynamics.

The unit is supplied with a 24V aircraft battery and a 8 gallon steel fuel tank with internal rubber bladder. The engine, battery and fuel systems are mounted on a welded and painted frame. LabVIEW™ software with National Instruments data acquisition cards.

Designed for  
Educational Investigations  
into Engineering,  
Thermodynamic &  
Environmental Principles

### Features

- Complete military axial flow Gas Turbine Engine
- **Full instrumentation and sensors** allow development of H-S diagrams
- **LabVIEW™** Data acquisition and educational software included
- **Compact Design** – Small scale equipment minimizes laboratory space needed
- **Easy Start** – Single fuel for both running and starting
- **Safety** – Use of a production military engine means full safety. Military Containment Tests have taken place for type approval. **Engine has been tested with the turbine wheel split to come apart at maximum rpm. All the pieces remained safely in the engine.**

### Educational Capabilities

- Axial Flow Gas Turbine Engine Training System, generating characteristic thrust, power and fuel consumption curves under different conditions
- Thermodynamic investigations of axial flow turbine engines, with ability to measure real time pressures, flows, temperatures and thrust

**GDJ INC.**

## Other Classroom Aids from GDJ, Inc.

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Allows students to conduct the same impulse momentum experiments that highway safety experts and automotive design engineers do.

### Engine Dynamometers

Available in Gasoline, Alternative Fuels, Diesel Internal Combustion Engines or Gas Turbine Engine. **Also available in single cylinder internal combustion engine.**

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## Engine Performance Specification

Thrust .....	50 lbs (222N)
Fuel .....	Jet A*
Exhaust Gas Temperature .....	1475°F (800°C)
Mass Flow .....	1.6 lbs/s (0.7 kg/s)
Ignition System .....	Air gap, high voltage capacitor-discharge type hermetically sealed ignition coil and igniter plug
Compressor Type .....	Single Stage Radial Outflow
Turbine Type .....	Single Stage Axial Flow
Engine RPM .....	74,000 rpm max
Engine Mount .....	Two .75" polished steel rods via 4 linear ball bearing, allowing a direct thrust reading to be obtained by a load cell

\* Can also be operated on K-1 Kerosene

## Instrumentation

- Ambient temperature
- Compressor entry temperature
- Compressor exit temperature
- Compressor entry pressure
- Compressor exit pressure
- Turbine entry temperature
- Turbine exit temperature
- Turbine exit pressure
- Nozzle exit temperature
- Nozzle exit pressure
- Oil pressure
- Oil inlet temperature
- Oil outlet temperature
- Fuel flow
- Air flow
- Shaft speed
- Thrust

## Installation Requirements

- It is recommended that the engine test stand be installed in a dedicated test cell, fitted with exhaust extraction and sound deadening.

## The following services are required:

- PT-500-1: 110V, 50/60Hz, single phase electricity supply
- PT-500-2: 220V, 60Hz, single phase electricity supply

## Essential Additional Equipment

- The user must have access to a PC running Windows™ 98/XP.
- It is recommended that the user has access to a barometer for measuring air pressure.

## Shipping Specification

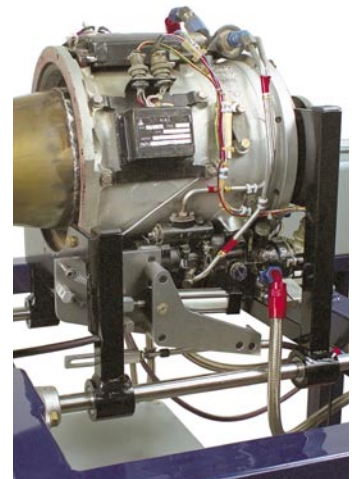
Gross Weight. 520 lbs (230 kg)

Volume: 62 cubic feet  
(1.8 cubic meter)

## Overall Dimensions

Height	60 inches
Width	55 inches
Depth	32 inches

Unlike some designs that use a bending plate/strain gauge arrangement, the GDJ Axial Flow Gas Turbine Engine uses a linear bearing arrangement.



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