

TERMINOLOGY GUIDE FOR AIRCRAFT GAS TURBINE ENGINES

Issued 8-1-60
Revised

1. **PURPOSE:** To define terms used in conjunction with aircraft gas turbine engines and their operation so that they will be clearly understood and used uniformly throughout the industry.
2. **SCOPE:**
 - 2.1 This Aeronautical Standard covers terms frequently applied to aircraft gas turbine engines and their operation but does not include names of particular parts, the latter being covered by AS 341, Drawing Title Rules and Nomenclature for Aircraft Engine Parts.
 - 2.2 The units of measurement associated with the terms are to be consistent with good engineering practice.
3. **DEFINITIONS:**
 - 3.1 **ACCESSORY:** Any self-contained mechanism required for aircraft operation or as an auxiliary for engine operation, which is actuated or supported by the engine but is not required for engine operation. Typical examples are starters, tachometer generators, and aircraft fluid power pumps.
 - 3.2 **ADDITIONAL EQUIPMENT:** Any item shipped with the engine which is neither an accessory nor a component.
 - 3.3 **AFTERBURNING:** The burning of additional fuel in the turbine exhaust of an engine to increase thrust.
 - 3.4 **ABSOLUTE ALTITUDE:** The maximum altitude at which the engine will function properly with a specified ram pressure ratio.
 - 3.5 **OPERATIONAL ALTITUDE:** The maximum altitude at which the engine will operate satisfactorily at a specified indicated air speed and have a specified controllable thrust range.
 - 3.6 **AREA:**
 - 3.6.1 **Compressor Inlet Area** - The flowpath annular area in a plane perpendicular to the engine rotor axis at the axial station defined by the first stage rotor airfoil root leading edge.
 - 3.6.2 **Engine Frontal Area** - The area based on the front view projection of the engine including engine mounted components. Includes engine mounted accessories only when so stated.
 - 3.6.3 **Exhaust Nozzle Area** - The actual area of the opening through which the exhaust gases pass out of the exhaust duct in a plane perpendicular to the mean meridional velocity vector of the exhaust gas stream. For converging-diverging exhaust nozzles, the following definitions apply:
 - (a) The exhaust nozzle throat area is defined as the minimum area through which the exhaust gases pass between turbine exit and engine exit.
 - (b) The exhaust nozzle exit area is the maximum internal area of the jet nozzle opening at the aft end of the engine.
 - 3.6.4 **Engine Inlet Area** - The net area in a plane perpendicular to the airflow path at the junction of the aircraft intake airduct and the engine front face.
 - 3.7 **AUGMENTATION:** An increase of thrust or shaft power obtained either by increasing mass flow (liquid injection) or by increasing the velocity of the turbine exhaust gases (afterburning).
 - 3.8 **CENTER OF GRAVITY:** A point normally within the envelope of the engine, at which the dry engine weight may be assumed to be concentrated.
 - 3.9 **COMPONENT:** Any self-contained mechanism, furnished as part of an engine, which is required for engine operation. Typical examples are fuel pump, power controls, and ignition equipment.
 - 3.10 **ENGINE AXES:** Geometric reference lines passing through the engine in the longitudinal, lateral, and vertical directions. (See engine coordinate system.)
 - 3.10.1 **X-Axis** - A reference line running from front to rear through the engine and coinciding with the engine centerline.
 - 3.10.2 **Y-Axis** - A reference line running horizontally through the engine at right angles to the X-axis.
 - 3.10.3 **Z-Axis** - A reference line running vertically through the engine mutually at right angles to the X and Y-axes.
 - 3.11 **ENGINE CENTERLINE:** A reference line which (a) coincides with the centerline of the engine rotor(s) in single or tandem rotor engines, or (b) is parallel to and equidistant from the individual rotor centerlines in engines of multi-gas generator types.

Section 8.3 of the SAE Technical Board rules provides that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

-2-

3.12 **ENGINE COORDINATE SYSTEM:** A position indicating system employing the X, Y, and Z-axes. The origin of the system is the point of intersection of the X-axis with a plane containing the Y and Z-axes which passes through the center of gravity of the engine. When looking from the rear of the engine, the positive directions shall be as follows:

X-AXIS - forward from the origin
Y-AXIS - to the right of the origin
Z-AXIS - below the origin

3.13 **EQUIVALENT SHAFT HORSEPOWER:** The sum of the shaft horsepower and the horsepower equivalent of the jet thrust of a turbo-prop or shaft turbine engine. For static conditions a conversion factor of 2.5 pounds of thrust per horsepower is assumed. For flight conditions the conversion factor includes an assumed propeller efficiency of 80 percent.

$$\text{Static ESHP} = \text{SHP} + \frac{F_n}{2.5}$$

$$\text{Flight ESHP} = \text{SHP} + \frac{F_n \times V_p}{261}$$

Where F_n = net thrust in pounds
 V_p = flight speed in knots

3.14 **EXHAUST GAS TEMPERATURE:** The temperature of the gases measured by temperature sensors placed in the turbine exhaust stream in accordance with the engine manufacturer's recommendations.

3.15 **MAXIMUM LENGTH:** The length of the engine including engine mounted components as measured in the direction of the X-axis from the foremost point to the farthest aft point. Includes engine mounted accessories only when so stated. A cold, or 59F measurement, and a hot, or operating temperature, measurement are normally supplied.

3.16 **POWER:**

3.16.1 **Take-off Rated Power** - The maximum equivalent shaft horsepower which the engine will deliver under specified conditions for a specified period of time. This corresponds to take-off at sea level, static conditions.

3.16.2 **Military Rated Power** - The maximum equivalent shaft horsepower which the engine will deliver under specified conditions for a specified period of time.

3.16.3 **Maximum Continuous Power** - See "Normal Rated Power".

3.16.4 **Normal Rated Power** - The maximum equivalent shaft horsepower which the engine will deliver under specified conditions continuously.

3.16.5 **Flight Idle** - The minimum power controlling condition for flight operation.

3.16.6 **Ground Idle** - The minimum power controlling condition for ground starting and ground operation. The net propeller and jet thrusts are substantially zero in this condition.

3.17 **SPEED:**

3.17.1 **Take-off Speed** - The engine rotor speed(s) obtained with the manual control lever in "take-off" position.

3.17.2 **Maximum Rated Speed** - The engine rotor speed(s) obtained with the manual control lever in the "maximum" position.

3.17.3 **Military Rated Speed** - The engine rotor speed(s) obtained with the manual control lever in the "military" position.

3.17.4 **Normal Rated Speed** - The engine rotor speed(s) obtained with the manual control lever in the "normal" position.

3.17.5 **Idling Speed** - The engine rotor speed(s) obtained with the manual control lever in the "idle" position. This is the minimum operating speed allowing satisfactory acceleration under all specified altitude and flight conditions.

3.17.6 **Ground Idling Speed** - The engine rotor speed(s) obtained with the manual control lever in the "ground idle" position.

3.17.7 **Flight Idling Speed** - See "Idling Speed".