

AEROSPACE INFORMATION REPORT

Submitted for recognition as an American National Standard

SAE AIR1850

REV.
A

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Superseding AIR1850

Twin Engine Helicopter Power Requirements

FOREWORD

Changes in this revision are format/editorial only.

1. SCOPE:

This SAE Aerospace Information Report (AIR) defines the power spectrum during normal and emergency operations of a twin engine helicopter and thereby postulates suitable power plant rating structures. This document does not address the power requirements for single engine helicopters or those with more than two engines.

2. REFERENCES:

There are no referenced publications specified herein.

3. ENGINE RATINGS:

Rating structures are used to define "time at power" which enables a helicopter to achieve its optimum performance while, at the same time, addressing issues of airworthiness and safety.

The rating structure is the means by which the engine's life consumption in service is related to its output power capability as demonstrated in the manufacturer's qualification program.

Factory engine testing to these specific ratings, which are imposed as mandatory limits on the pilot, forms a practical but approximate method of limiting the rate of engine life consumption in order to achieve acceptable in-service lives.

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4. RATING DEFINITION:

A rating is defined as a minimum power level, delivered at specified atmospheric conditions for a maximum specified time duration, without exceeding operating limits over the life of the engine. For example, a "takeoff" rating, at sea level, ISA which can be used only during that phase of flight, and is limited in duration to "x" minutes, will be restricted to the appropriate engine speed, turbine temperature and torque limits. All ratings must be demonstrated during certification and the ratings may, or may not, be demonstrated during the acceptance process.

A rating is recognized by the airworthiness authorities as a restriction for safety consideration but may sometimes be imposed by the engine manufacturer as a commercial consideration.

5. HELICOPTER ROLES:

The rest of this document considers firstly the power requirements for various operations and flight conditions of the twin engine helicopter and secondly how the engine ratings can be structured to accommodate these requirements, while giving due consideration for engine service life.

The use of helicopters is broadly summarized as follows:

TABLE 1

Operator	Role	Critical Considerations
Military & Civil	Passenger/Internal Freight Transportation	Minimum decision point in takeoff
Military & Civil	Air Sea Rescue	Prolonged Hover
	Carriage of External Load	Engine Failure in Hover
Military	Anti-Submarine Warfare Sonar Dunking	As above plus land back on ship
Military	Battlefield	Engine failure in high power maneuver. Enroute OEI at low altitude requiring maneuvering.

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5. (Continued):

The bulk of helicopter operations is made up by the conventional transport role and, therefore, could form the basis of a generalized rating structure. Other specialized uses should form an addendum or a modification to the rating structure.

The power requirements for twin engine and OEI operation in the transportation role can be stated as follows:

TABLE 2

Mode	Twin Engine Operation	Duration	OEI	Duration
Takeoff	Liftoff - accelerate to V1	5 min	Emergency power at CDP for transition.	30 s
	climb at 90-100% A/C TRX limit. After CDP accelerate V2 climbing.		Reduce power for climb or obstacle clearance.	2 min
Climb/ Cruise	60-80% A/C TRX limit.	Continuous	Power to achieve minimum of 150 ft/min ROC at 1000 ft above site. Cruise to Base	Unlimited when needed
Descent	20-0% A/C TRX limit.	Minutes	--	--
Land	Up to over 95% A/C TRX limit dependent upon technique.	Up to 30 s	Dependent on ability to off-load fuel.	Up to 1 min

TERMINOLOGY:

OEI	One Engine Inoperative
TRX	Transmission Torque Limit
CDP	Critical Decision Point
ROC	Rate of Climb
V1	1st Segment Climb Velocity
V2	2nd Segment Climb Velocity