Dry & reheated performance of current turbojet engines
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Dry & Reheated Performance of Current Turbojet Engines

SUMMARY:

This memorandum is intended to accompany the card index of current turbojet engines which has been prepared in the Engine Laboratory; in particular it describes the source of the data and the arrangement of the cards.

1.0 Introduction:

This index has been primarily designed to aid in selecting engines for military aircraft; for this reason turboprops, ramjets, and very small turbojets have been excluded. The primary source of information has been the engine brochures in the possession of the Engine Laboratory; for many American engines, it has been necessary to use only the rather unreliable data published in magazines.

2.0 Arrangement of Index:

The cards are arranged in two sections--the first contains British and Canadian engines and the second contains American engines. Within these classifications they are arranged alphabetically as to manufacturer, using the following abbreviations:

A.S.M. - Armstrong Siddeley Motors

AVRO - A.V.Roe Canada

B. - Bristol Aeroplane Company

D.H. - de Havilland Engine Co.

RR - Rolls Royce

A - Allison Division, General Motors Corp.

G.E. - General Electric Co.

P.W. - Pratt & Whitney Aircraft Division
United Aircraft Corp.

W - Wright Aeronautical Division
Curtiss - Wright Corp.

Within each manufacturer's group they are arranged alphabetically as to name and/or numerically as to mark.

3.0 Engine Data:

The two lines of the card immediately below the engine name and security level give the more important design parameters for the engine. The diameter given is that of the bare engine, i.e., with all the external accessories removed; for conventional engines this is the diameter over either the compressor inlet or else the combustion chamber. The weight given is the nominal engine weight, conforming to Engine Design Manual 25 - for British engines. The thrust, airflow, pressure ratio (P.R.), and mean jet pipe temperature (MJPT) are all given for sea level static operation at maximum r.p.m. under standard ICAN conditions.

4.0 Dry and Reheated Engine Performance
Under Sea Level Static

Under Sea Level Static Performance, the dry condition repeats the previously given thrust, and also gives the specific fuel consumption. The reheated thrust and specific fuel consumption are generally marked "Reheated to 2000°K est." meaning that no data are available for integral reheat, and that the engine's reheated performance has been estimated at N.A.E. When the engine is provided with integral reheat, the reheat temperature specified by the manufacturer is given. The calculation assumptions are given in Appendix A.

Under Flight Performance, the selected cruise condition is an aircraft Mach number of 0.9 at the tropopause (altitude of 36,000 feet) under standard ICAN conditions.

The other flight condition represents a combat condition with an aircraft Mach number of 1.5 at an altitude of 50,000 feet at maximum engine r.p.m.; both dry and reheated performance are given.

5.0 Index Maintenance:

The date on the index cards is the most recent date on the brochure employed; this is either the date of issue or the date of the most recent amendment. New cards will be issued when significant amendments or new brochures are received.

APPENDIX A

Reheat Performance Calculations:

The estimation of reheat performance has been carried out with several simplifying assumptions. The thrust boost has been computed from a simple temperature ratio factor, viz., the square root of the reheat temperature (2000°K) over the mean jet pipe temperature. The refinements introduced by a more detailed analysis would not be expected to change the calculated thrust significantly. The specific fuel consumption has been calculated assuming an 80% combustion efficiency in the reheat tailpipe, a fuel heating value of 18,600 BTU/lb., a working fluid enthalpy change as given in Table I of the Keenan & Kaye Gas Tables, and unchanged fuel and air consumption of the engine proper. It is also assumed that the mean jet pipe temperature is the same at the supersonic flight condition as under sea level static operation.