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REPRESENTATIVE OPERATING CHARTS OF PROPELLERS TESTED

IN THE NACA 20-FOOT PROPELLER-RESEARCH TUNNEL

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Langley Field, Va.

**CASE FILE
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REPRESENTATIVE OPERATING CHARTS OF PROPELLERS TESTED

IN THE NACA 20-FOOT PROPELLER-RESEARCH TUNNEL

By W. H. Gray and Nicholas Mastrocola

Extensive tests of full-scale propellers have been made in the 20-foot propeller-research tunnel (PRT) at the Langley Memorial Aeronautical Laboratory during its many years of operation. The results were usually presented in the form of charts showing thrust coefficient, power coefficient, and efficiency, each plotted separately against V/nD . The type of chart now being employed by airplane and propeller manufacturers for performance estimates consists of power coefficients plotted against V/nD with lines of constant efficiency superimposed. As a result of numerous requests to issue this type of chart directly and on a large scale, the present report has been compiled from data taken from a series of fairly recent reports. Charts are presented only for the conditions considered to be useful in present-day design (see table I), although charts covering other conditions have been developed and are available.

In the preparation of the plots presented, the data were cross-faired and do not necessarily check exactly the previously published data. The power coefficients of all dual-rotating propellers in this report represent the sum of the power coefficients of the front and rear propellers and are for the test conditions in which blade angles of the front and rear propellers were set to absorb approximately equal power at peak efficiency only.

The usual coefficients and symbols have been used and are defined as follows:

$$C_P \quad \text{power coefficient} \quad \left(\frac{\text{engine power}}{\rho n^3 D^5} \right)$$
$$C_T \quad \text{thrust coefficient} \quad \left(\frac{\text{effective thrust}}{\rho n^2 D^4} \right)$$
$$\eta \quad \text{propeller efficiency} \quad (C_T/C_P) (V/nD)$$

and

ρ mass density of air, slugs per cubic foot

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