



# ESDU PERF RP 1/2

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## **Standard British method of performance reduction for piston-engined aircraft with constant-speed propellers. Rate of climb**

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## THE PREPARATION OF THIS DATA ITEM

The work of the Engineering Sciences Data Unit on this series is monitored and guided by Technical Committees of the Royal Aeronautical Society. The Committee responsible for this particular Data Item was the Performance Committee, which first met in 1946, and has the following constitution:

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The members of staff of the Royal Aeronautical Society associated with the Performance Committee were Miss E.C. Pike and the Technical Secretary of the Society, Dr D.M.A. Leggett.

## STANDARD BRITISH METHOD OF PERFORMANCE REDUCTION FOR PISTON-ENGINED AIRCRAFT WITH CONSTANT-SPEED PROPELLERS. RATE OF CLIMB

### 1. NOTATION AND UNITS

|              |                                                                                                                                   |                 |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------|
| $A$          | aspect ratio = $b^2/S$                                                                                                            | —               |
| $b$          | aircraft span                                                                                                                     | ft              |
| $C$          | supercharger constant, defining the variation of supercharger pressure ratio with temperature (see ESDU PERF RP 1/0, Reference 1) | —               |
| $C_D$        | total drag coefficient                                                                                                            | —               |
| $C_{DZ}$     | a constant in the drag equation $C_D = C_{DZ} + KC_L^2/(\pi A)$                                                                   | —               |
| $C_L$        | lift coefficient                                                                                                                  | —               |
| $D_{100}$    | the part of the drag at 100 ft/s at sea level corresponding to $C_{DZ}$<br>(= $11.88SC_{DZ}$ )                                    | lbf             |
| $h$          | pressure height                                                                                                                   | ft              |
| $K$          | constant in the drag equation $C_D = C_{DZ} + KC_L^2/(\pi A)$ , sometimes called the “induced drag factor”                        | —               |
| $K_c$        | $0.13(KD_{100}/b^2)^{1/2}(V_i/\sqrt{\sigma})$                                                                                     | ft/min          |
| $K_W$        | $190(WK/b^2)/(V_i/\sqrt{\sigma})$                                                                                                 | ft/min          |
| $m$          | $V_i/(V_i)_{md}$                                                                                                                  | —               |
| $N_1$        | $(m^2 + 1/m^2)/2$                                                                                                                 | —               |
| $S$          | wing area                                                                                                                         | ft <sup>2</sup> |
| $T$          | air temperature                                                                                                                   | K               |
| $T_I$        | International Standard Atmosphere air temperature corresponding to test pressure height                                           | K               |
| $V$          | true airspeed                                                                                                                     | knot            |
| $V_i$        | equivalent airspeed = $V\sqrt{\sigma}$                                                                                            | knot            |
| $(V_i)_{md}$ | equivalent airspeed for minimum drag = $23.97 D_{100}^{-1/4} \left( (W/b)\sqrt{K} \right)^{1/2}$                                  | knot            |
| $v_c$        | true rate of climb                                                                                                                | ft/min          |

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