



# ESDU PERF RT 1/0

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## Performance reduction for aircraft with turbo-props. “Non-dimensional” graphical method

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## THE PREPARATION OF THIS DATA ITEM

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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.

# ESDU PERF RT 1/0

## PERFORMANCE REDUCTION FOR AIRCRAFT WITH TURBO-PROPS. “NON-DIMENSIONAL” GRAPHICAL METHOD

### 1. NOTATION AND UNITS

|                        |                                                                          |                      |
|------------------------|--------------------------------------------------------------------------|----------------------|
| $D$                    | aircraft drag                                                            | lbf                  |
| $F$                    | net jet thrust                                                           | lbf                  |
| $f_1, f_2, f_3, \dots$ | functions defined in text                                                | —                    |
| $h$                    | pressure height                                                          | ft                   |
| $N$                    | compressor speed                                                         | rpm                  |
| $N_P$                  | propeller shaft speed                                                    | rpm                  |
| $P$                    | brake horsepower supplied to propeller                                   | hp                   |
| $p$                    | pressure                                                                 | lbf/ft <sup>2</sup>  |
| $Q$                    | fuel flow                                                                | gal/h                |
| $R$                    | specific air range                                                       | n. mile/gal          |
| $T$                    | temperature                                                              | K                    |
| $V$                    | true speed of aircraft                                                   | knot                 |
| $V_i$                  | equivalent airspeed = $V\sqrt{\sigma}$                                   | knot                 |
| $v_c$                  | true rate of climb                                                       | ft/min               |
| $W$                    | aircraft weight                                                          | lbf                  |
| $w$                    | wind speed (headwind positive)                                           | knot                 |
| $\delta$               | relative pressure, $p/p_0$                                               | —                    |
| $\eta$                 | propeller efficiency                                                     | —                    |
| $\theta$               | relative temperature, $T/T_0$                                            | —                    |
| $\rho$                 | density                                                                  | slug/ft <sup>3</sup> |
| $\sigma$               | relative density, $\rho/\rho_0$                                          | —                    |
| $\phi$                 | angle between direction of flight and wind direction (0° for a headwind) | deg                  |
| $\psi$                 | engine performance parameter, defined in Section 2                       | —                    |

### Subscript

|   |                                                                                                                   |
|---|-------------------------------------------------------------------------------------------------------------------|
| 0 | denotes value at sea level in International Standard Atmosphere (ESDU 68046, Reference 1, gives numerical values) |
|---|-------------------------------------------------------------------------------------------------------------------|

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