PERFORMANCE SERIES EXAMPLES

1. **What is the density of air in the International Standard Atmosphere at a pressure height of 15000 m.**

   a. **1.224 kg/m^3**
   b. **0.194 kg/m^3**
   c. **0.010 kg/m^3**

Hint: See ESDU 77022

Answer

a. 0.194 kg/m^3

ESDU 77022 provides the relationship between density and pressure height in the International Standard Atmosphere.

2. **An aircraft travels at a true airspeed of 700 kn at a geopotential height of 10000 m in the International Standard Atmosphere.**

   At what Mach number is the aircraft flying?

   a. **1.2025**
   b. **1.5**
   c. **0.75**

Hint: See ESDU 68046

Answer

a. 1.2025

ESDU 68046 provides the relationship and various parameters necessary to determine the relationship between Mach number and true airspeed in the International Standard Atmosphere.

3. **An aircraft travels at a true airspeed of 700 kn at a geopotential height of 10000 m in the International Standard Atmosphere.**

   At what equivalent airspeed is the aircraft flying?

   a. **552.1 kn**
   b. **406.3 kn**
   c. **435.5 kn**

Hint: See ESDU 68046

Answer

b. 406.3 kn

ESDU 68046 provides the relationship and various parameters necessary to determine the relationship between equivalent airspeed and true airspeed in the International Standard Atmosphere.

4. An aircraft travels at a true airspeed of 700 kn at a geopotential height of 10000 m in the International Standard Atmosphere.

At what calibrated airspeed is the aircraft flying?

a. 425.5 kn
b. 357.5 kn
c. 453.3 kn

Hint: See ESDU 69026

Answer

c. 453.3 kn

ESDU 69026 provides the relationships necessary to determine the relationship between calibrated airspeed and true airspeed in the International Standard Atmosphere. (Reference to ESDU 68046 is also necessary.)

5. A tyre that belongs to a 2-by-2 aircraft undercarriage has a rolling resistance of 3652 N. What is the rolling resistance of all of the tyres belonging to the undercarriage?

a. 14608 N
b. 14952 N
c. 15036 N

Hint: See ESDU 05011

Answer

a. 14608 N

ESDU 05011 provides the relationship used to calculate the rolling resistance of the tyres belonging to an aircraft undercarriage, based on the rolling resistance of a single tyre from that undercarriage.

6. An aircraft takes off at a climb-away speed of 125 kn and an angle of 8.4°. What is the time taken during the climb phase for the aircraft to reach a screen height of 10.7 m? (The runway is at sea level.)

a. 1.14 sec
b. 1.25 sec
c. 0.98 sec

Hint: See ESDU PERF EG 5/1

Answer

a. 1.14 sec

ESDU PERF EG 5/1 contains the relationship for calculating the time taken during the climb phase of a take-off operation.

7. An aeroplane is flying at a pressure height of 12000 m in conditions where the outside air temperature is 225 K. What is the temperature change from ISA?

a. 10 K
b. 8.35 K
c. 12.5 K

Hint: See ESDU 77022

Answer

b. 8.35 K

ESDU 77022 contains the relationship for calculating the temperature difference from International Standard Atmosphere.

8. An aircraft is flying at a geometric height of 10000 m at a geographic latitude of +10°. What is the geopotential height?

a. 9959 m
b. 9853 m
c. 9989 m

Hint: See ESDU 77022

Answer

a. 9959 m

ESDU 77022 contains the relationship for calculating the geopotential height for a given geometric height and geographic latitude.

9. During a take-off operation, an aircraft has an unstick speed of 115 kn and a climb-away speed of 125 kn. For the still air case, the transition distance is 227.7 m. What is the transition distance if the aircraft is subjected to a headwind 5 kn?

a. 225 m
b. 218.2 m
c. 223.1 m

Hint: See ESDU PERF EG 5/1

Answer

b. 218.2 m

ESDU PERF EG 5/1 contains the relationship for calculating the transition distance during a take-off operation.

10. An aircraft tyre with a diameter of 1.050 m, and a width of 0.360 m that is inflated to an absolute pressure of 1.034×10^6 N/m^2 is rolling (unbraked) on a dry runway surface at a ground speed of 100 kn. A vertical load of 102.3×10^3 N acts on the tyre.

What is the rolling resistance of the tyre?

a. 3652 N
b. 3742 N
c. 3562 N

Hint: See ESDU 05011

Answer

a. 3652 N

ESDU 05011 contains the procedure for calculating the rolling resistance of an aircraft tyre.