

# Examining the Speed of a Space Age ship

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Using the acceleration formula from <https://forums.factorio.com/viewtopic.php?f=18&t=117809>  
(see also <https://forums.factorio.com/118009>)

ship\_parameters (generic function with 1 method)

$$acceleration = \frac{1}{60m} \left( \frac{F}{1 + m * 10^{-7}} - 750w(s^2 + s) - 10^4 \right) \quad (1)$$

drag (generic function with 1 method)

pseudothrust (generic function with 1 method)

acceleration (generic function with 1 method)

Max speed implies acceleration = 0

$$s^2 + s = \frac{1}{750w} \left( \frac{F}{1 + m * 10^{-7}} - 10^4 \right) \quad (2)$$

Write the Force term  $F/(1+m/10^7)$  as pThrust (pseudothrust)

$$s^2 + s = \frac{1}{750w} (pThrust - 10^4) \quad (3)$$

$$s = -\frac{1}{2} \pm \frac{1}{2} \sqrt{1 + \frac{4}{750w} (pThrust - 10^4)} \quad (4)$$

max\_speed (generic function with 1 method)

Ship "F.E.S. Pinafore":

Thrust:

Mass:

Width:

```
(
  thrust = 6.63331e8
  mass = 282000.0
  width = 22.0
)
```

topspeed = 197.23452547947159

Check our caluculation matches the direct copy/paste from forum:... *true*

N.B. Usually shows true, some ship values give false. Rounding error?



