

Modelling and control summaries

by Anthony Rossiter

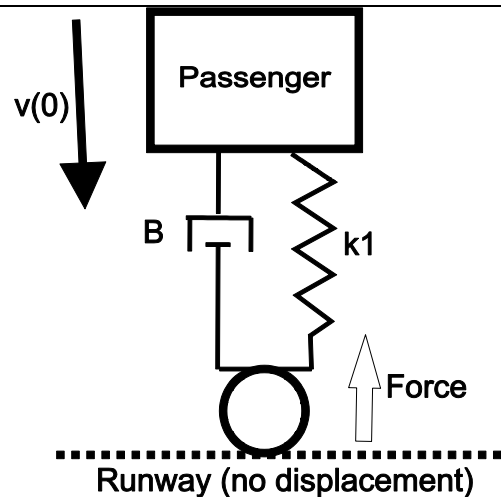
MATLAB GUIs – Aircraft landing

ASSUMPTION: Students should understand how to derive a simplified model of a mass-spring-damper system. This GUI is meant as a little bit of fun in that the challenge is to design a mass-spring-damper suspension for an aircraft to optimise the comfort of the passengers.

It is assumed that the aircraft hits the runway with a defined vertical speed and the suspension system then has to deal with this and bring the aircraft to zero vertical speed.

$$M \frac{d^2x}{dt^2} + B \frac{dx}{dt} + kx = 0;$$

$$\dot{x}(0) = v(0); \quad x(0) = 0$$



USERS are encouraged to perform sensible investigations, for example:

1. First choose sensible values for the mass, the spring constant and the damping.
2. Look at:
 - The vertical motion of the passenger.
 - The acceleration of the passenger.
3. It is the acceleration which ultimately determines passenger comfort.
4. For fighters, it is common to land with high values of $v(0)$, but obviously less so with airliners.

ILLUSTRATIONS – users will see the ‘passenger’ landing and bouncing .

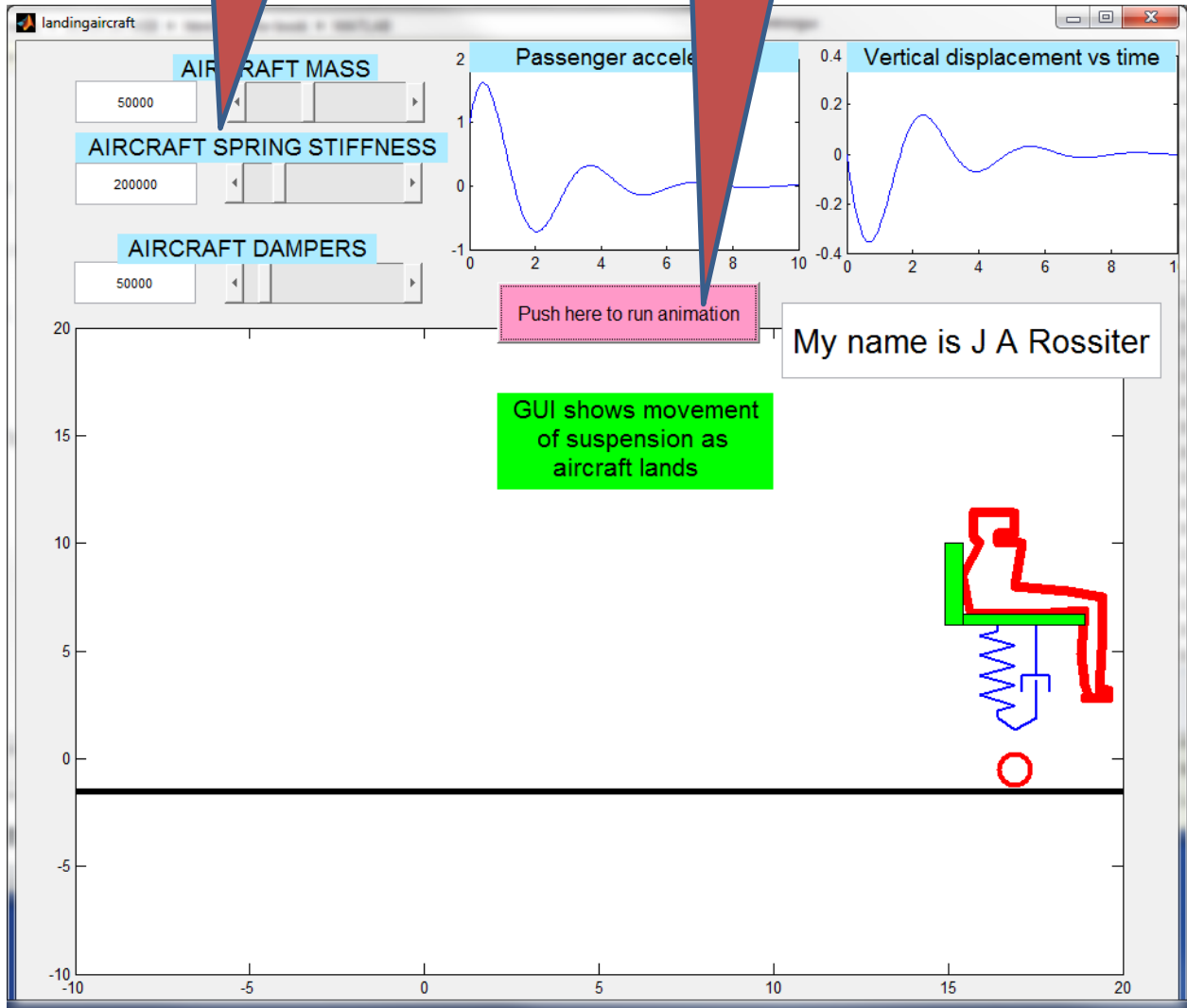
FILENAMES are landingaircraft.p, landingaircraft.fig . Both are needed!

Type >> landingaircraft to run

Operation of the GUI is illustrated below. Users select the desired values of aircraft mass, suspension damping and suspension spring and then watch the landing. You can enter your name to personalise your results for use elsewhere.

ENTER desired values

Start simulation



Push here to run animation

My name is J A Rossiter

GUI shows movement of suspension as aircraft lands