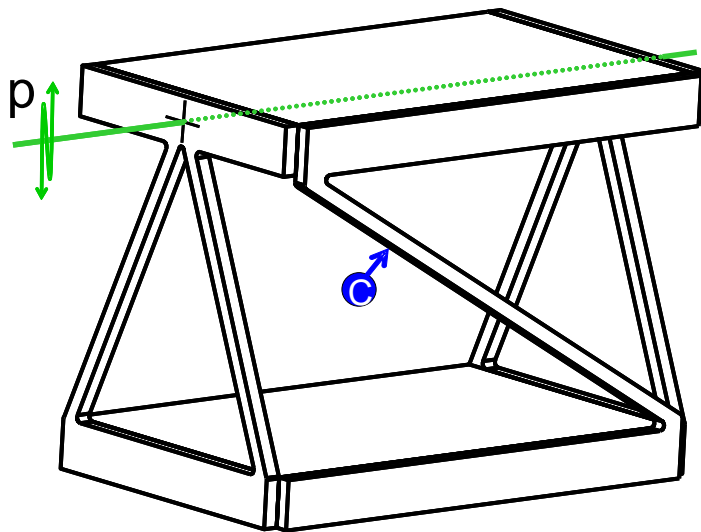


FACT and screw motions



If you are missing information that you think is important, ask Prof. Culpepper and/or research and find reasonable info to help you proceed.

Broadly, your job is to make me understand that you understand how to work with basic screw motions. You will do this by creating basic prototypes (not ultra super fancy, get the job done simply) that I (or for example a Chief Engineer) could examine to get a feel for the function, and to develop confidence that your design can work.

Charge - You are charged with building a 'gadget' that resembles topologically the image. The 'gadget' must be capable of illustrating conceptually, the utility of an instrument that can be used to provide rotation, translation and screw motions for accelerated fretting (linear, rotary and screw motions) tests. For the purpose of this exercise, be less concerned with what this interfaces with and focus on the characteristics (kinematics, stiffness, etc...) of the device. For the pitch motion, you will need to illustrate 2 screw motions, with axes that are coincident, but of pitches that differ by 3x ($p_1 \sim 3\text{mm}/5^\circ$ and $p_2 \sim 9\text{mm}/5^\circ$) over a range of 5° . You must create 2 constraints (marked "c" in the figure) that can be swapped so that the device exhibits the two different screw motions.

Materials - You'll be given:

01 Qty Polypropylene sheet for A & B - 6" x 12" x 3/4" -

McMaster: 8742K144

15 Qty 1/4"-20 cap screws x 3/4" long -

McMaster: 92949A540

15 Qty 1/4" washers -

McMaster: 90945A760

02 Qty Acrylic sheets for flexures - 12" x 12" x 1/8" -

McMaster: 8505K741

Deliverables - What you must provide on the due date:

- (a) Hardware **in finished and fully working order/no problems** that illustrates rotary, linear and the two pitch motions
- (b) 1 page (front/back, 12pt font, 1" margins) that covers:
 - (i) functional requirements
 - (ii) how you modeled performance
 - (iii) how you experimentally verified performance
 - (iv) how good your data is
 - (v) how close were predicted & real pitch values
 - (vi) what you learned/anything interesting