

STEM Workshop: Knot Tying

Lesson 10: Flight line assembly

Brought to you by the University of Maryland Balloon
Payload Program!

What is a knot?

- Slip/no slip
- Load bearing
- Semi-Temporary
- Uses?
 - Joining rope together
 - Holding things
 - Creating tension



Forces!

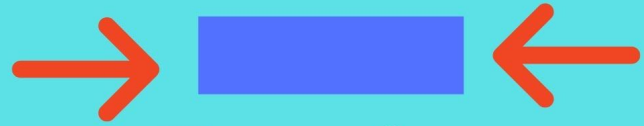
Do you remember last lesson?

What is **tension**?

What is **compression**?

What about **air resistance**... ?

Compression

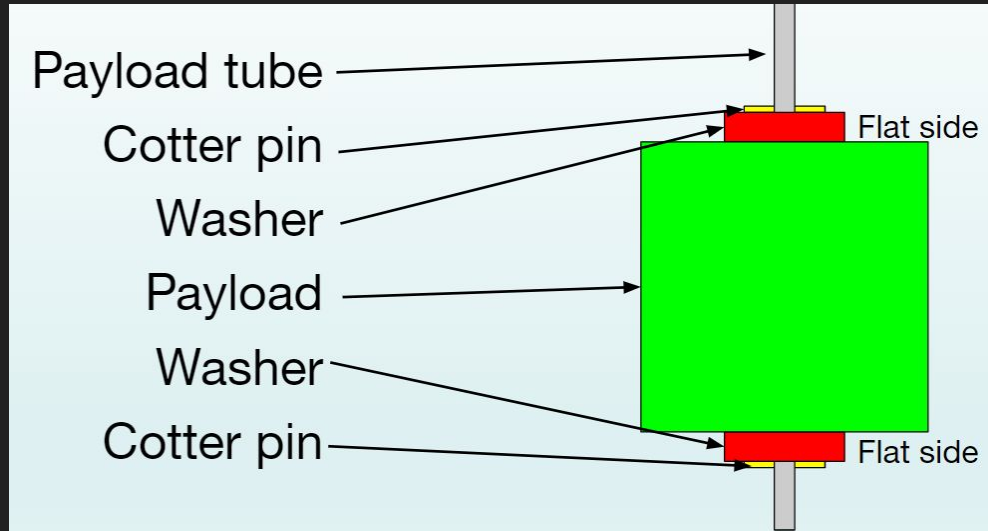


Tension



How do we use forces?

What forces do you think are acting on this box?



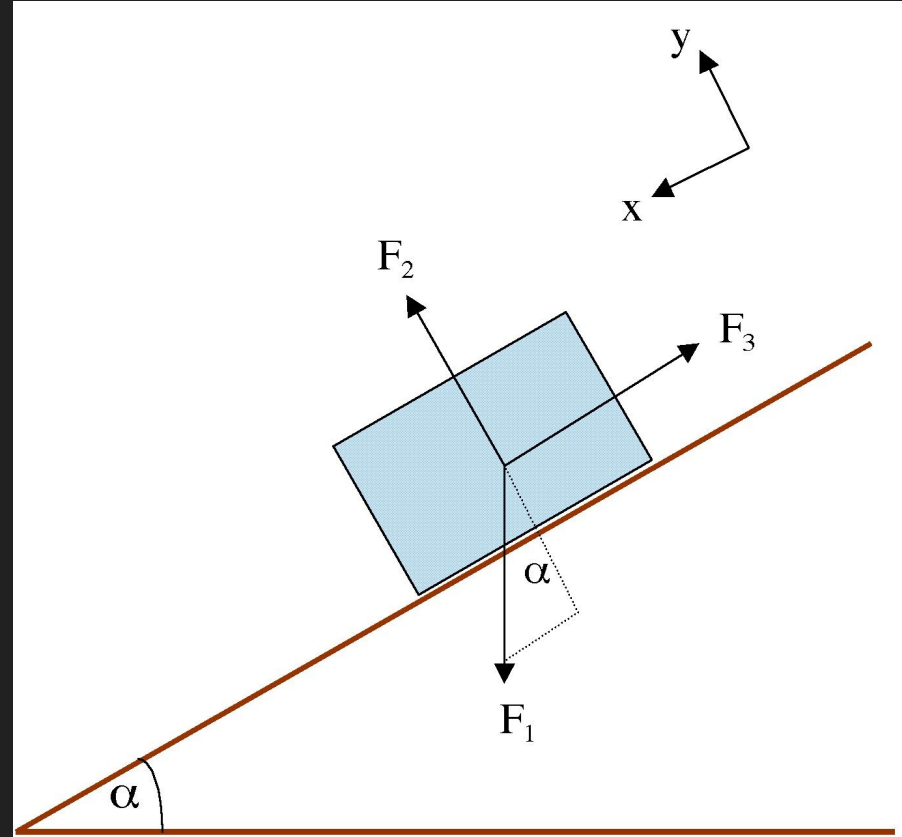
How do Engineers tell what forces act on an object?

Free Body Diagrams

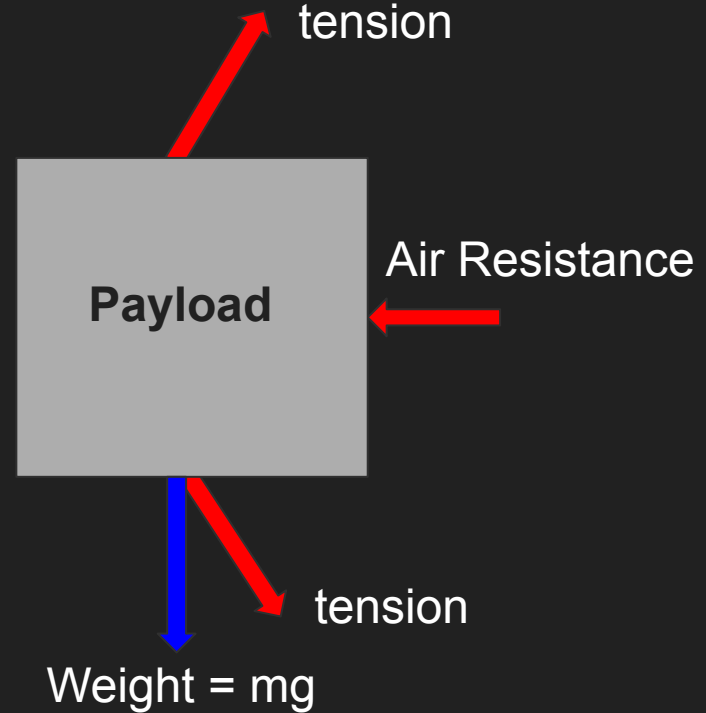
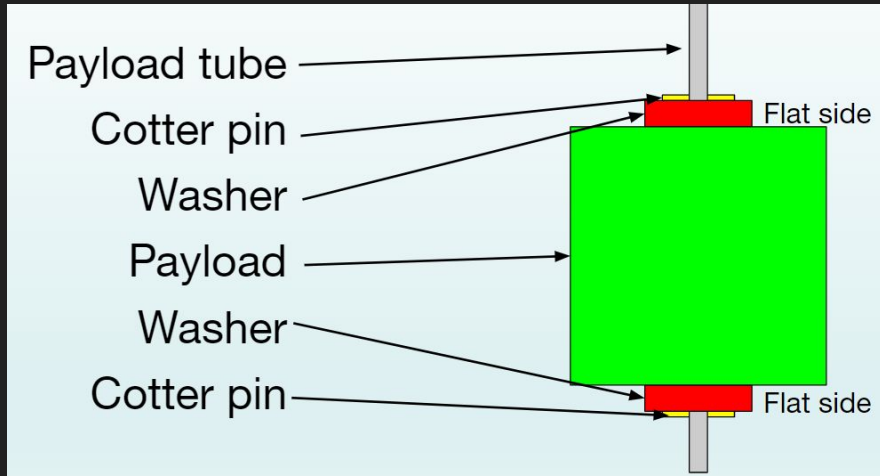
Forces drawn as arrow with magnitude(size) and direction.

Shows all forces acting on object.

Forces can be summed to net(total) force and turned into acceleration of object.



How would we draw a Free Body Diagram for our Payload?



Flight Line



Lashings

- Specific specialized knots used to attaching poles/rods
- Uses knots we learn later
- Good way of building temporary structures
- Requires things to be tight



What do you think happens when knots don't work?
What if we use the wrong knots or the knots fail?

- Load failure
- Line breaks
- Loose parts
- Break/damage parts

Practical Knots

Square Knot

Use: Joins 2 pieces of same sized rope

Pros: Easy to learn and quick to tie

Cons: Hard to untie once heavily loaded and only on same size rope

Rated?: No



Bowline

Use: Set size loop in end of rope

Pros: Sturdy yet easy to untie and can be tied one handed

Cons: May slip under weight

Rated?: No

Notes: Commonly used in rescues



Figure 8

Use: Big stopper on rope

Pros: Bigger than an overhand

Cons: Kinda annoying to untie

Rated?: No

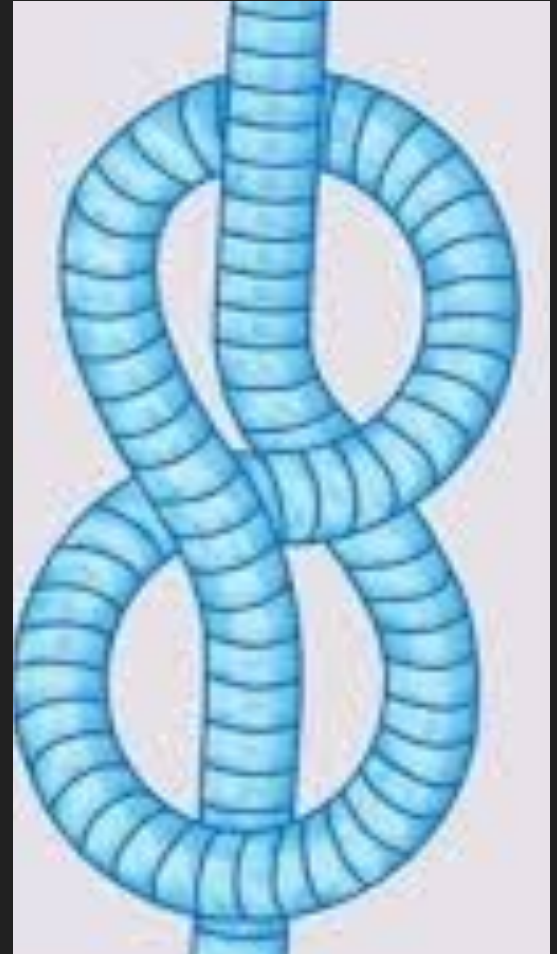


Figure 8 on a bight

Use: Loop in end of a rope

Pros: Very strong

Cons: Harder and slower to tie.

Rated?: Yes with backup

Notes: Common climbing knot



Figure 8 Follow through

Use: Loop on the end of a rope that can be placed through a closed object

Pros: Sturdy and can be tied through loops

Cons: Takes even longer to tie

Rated?: Yes with backup



Figure 8 back-up

Use: Control the tail of a figure 8 and grants it its rating

Pros: Makes the figure 8 rated

Cons: Only used with Figure 8

Rated?: Yes assuming used with figure 8



Alpine Butterfly

Use: Creates loop in the middle of rope

Pros: Super strong in all directions

Cons:

Rated?: Yes assuming used with figure 8



Sheet Bend

Use: Joining 2 pieces of different sized rope.

Pros: Lets you join different types

Cons: Slightly harder than square

Rated?: No

Notes: I will likely call this a sheep bend when talking about it



Clove hitch

Use: Quickly tie a rope to an object

Pros: Super quick to tie

Cons: Comes apart basically on its own

Rated?: No

Notes: Be careful tying around limbs as it can cut of circulation



2 half hitch

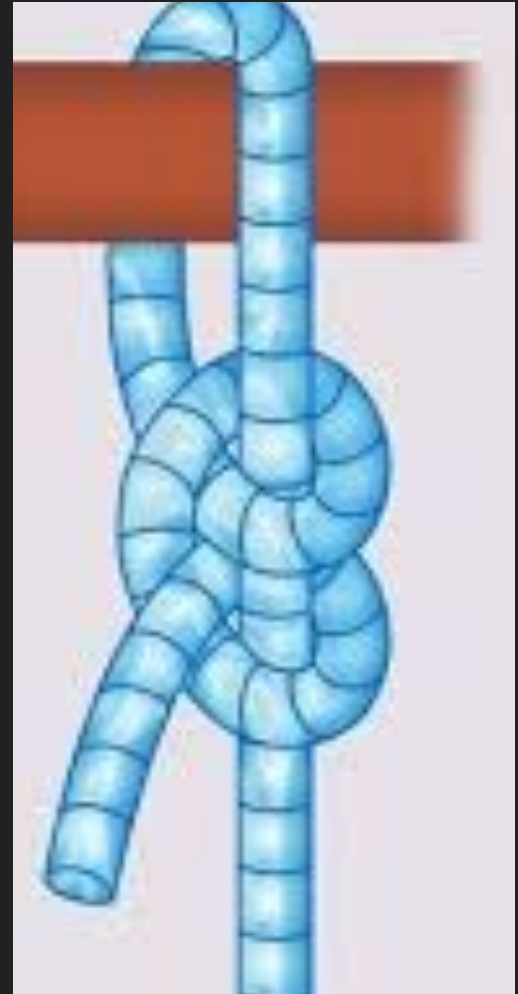
Use: Easily slide rope connection along rope

Pros: Easy to adjust

Cons: Slides on its own

Rated?: No

Notes: This is just a clove hitch around an object instead of rope



Taut line

Use: Slide rope connection along other rope

Pros: Holds better then 2 half

Cons: Slides under load

Rated?: No

Notes: useful for adjusting lengths of ropes for pulling things tight

