Some
Why Go-Arounds Go Wrong
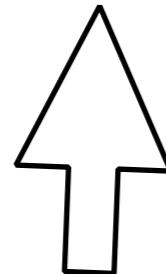
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GAPAN

# Why are Go Arounds difficult?

- Low altitude, no room for error
- High thrust, typically maximum
- Underwing engines → pitch-up
- Low speed → low aerodynamic forces
    - Thrust is (nearly) independent of speed
    - Elevator power is $\alpha(\text{speed})^2$
    - You need about twice the elevator at 140 kt you need at 200kt
- Result: large trim changes
- Conclusion: you had better know your trim system!

So Do You Understand your Trim?

- There are (at least) two basic different trim systems

- 'Conventional Trim', most basic trainers, C152, PA28 etc, but also Lockheed TriStar, Concorde

- 'Tailplane Trim', all Boeings since the 707, all DCs since DC8, all Airbus, but also Piper Cub and Mooneys

- These differences are rarely mentioned and are often simply not understood.

Conventional Trim 1

Control Column

Trim Wheel

1. Initial Condition
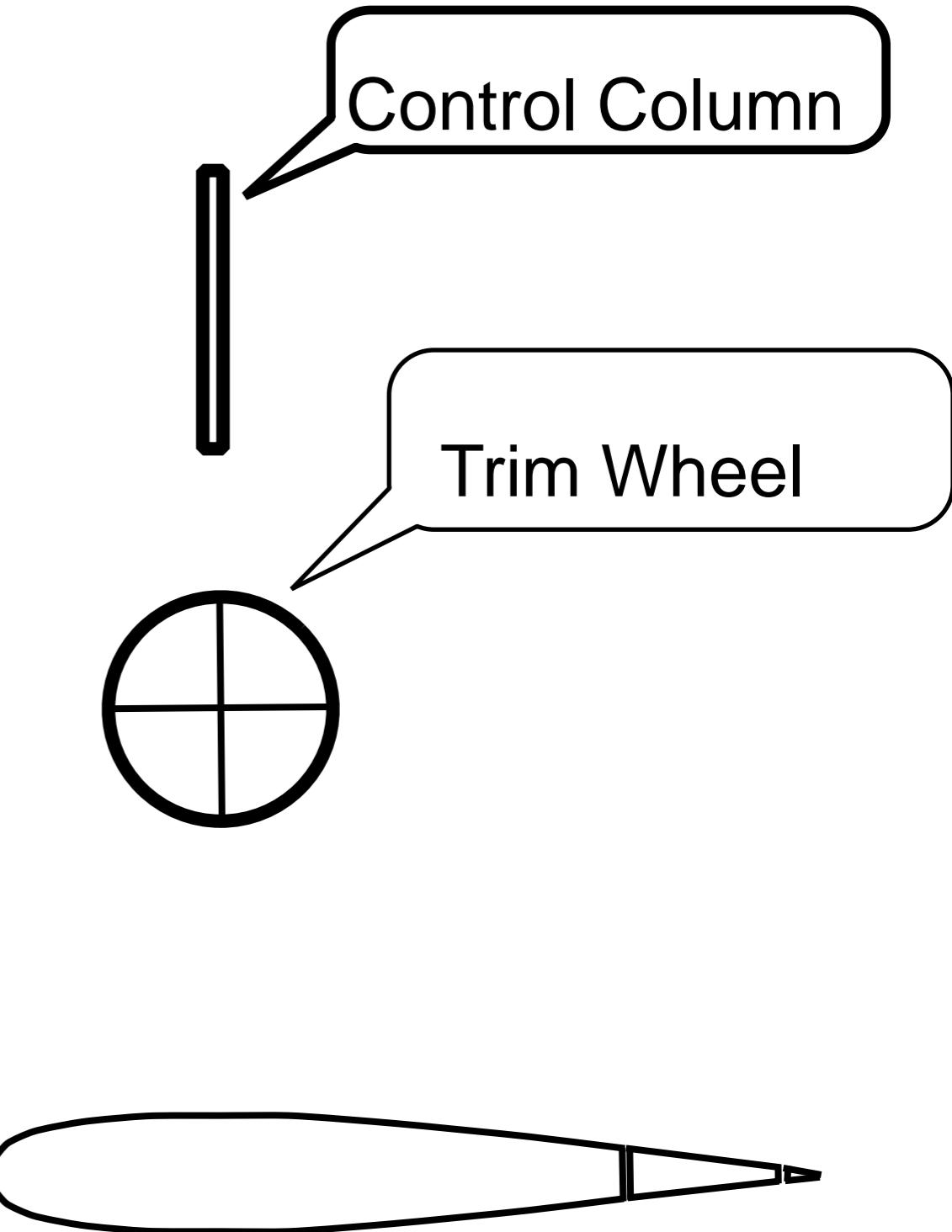
# Conventional Trim 2

1. Initial Condition

2. Nose-down elevator
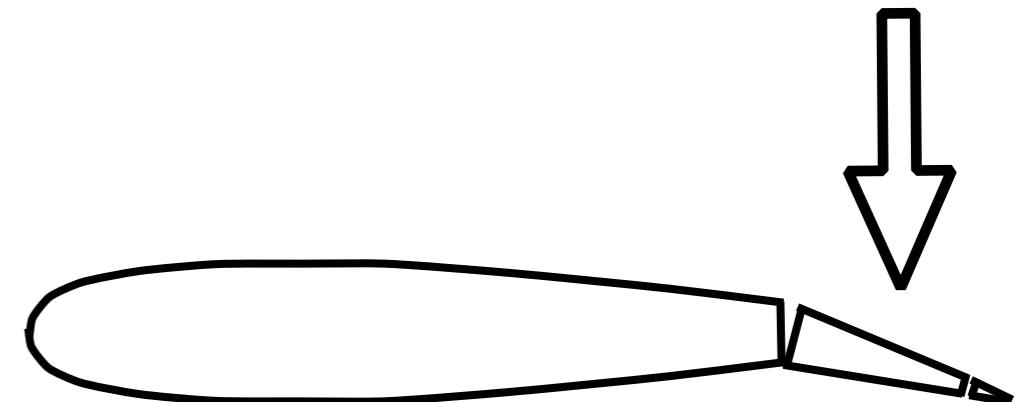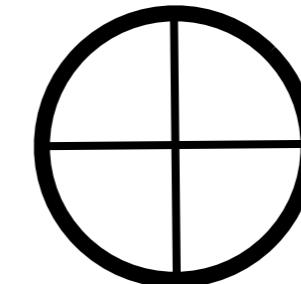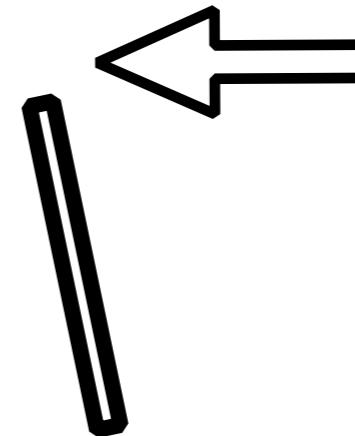
Conventional Trim 3

1. Initial Condition

2. Nose-down elevator

3. Nose-down trim

Column load is now zero

Effect of trim is to relieve load
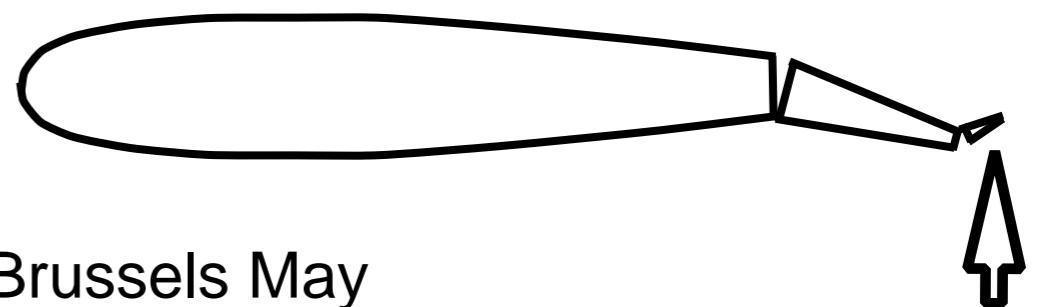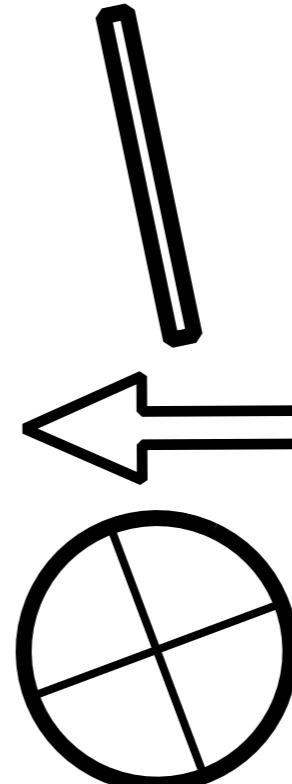
Tailplane Trim 1

1. Initial Condition
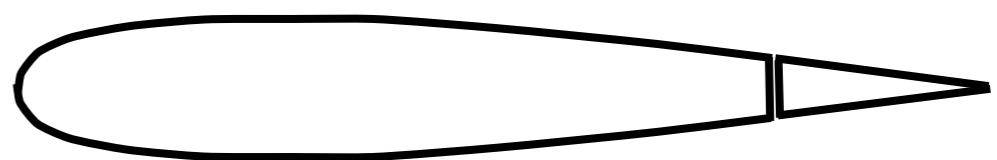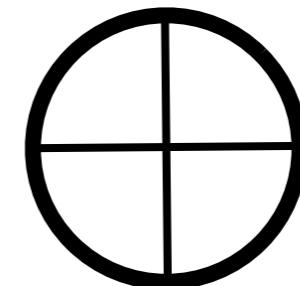
Tailplane Trim 2

1. Initial Condition

2. Nose-down elevator
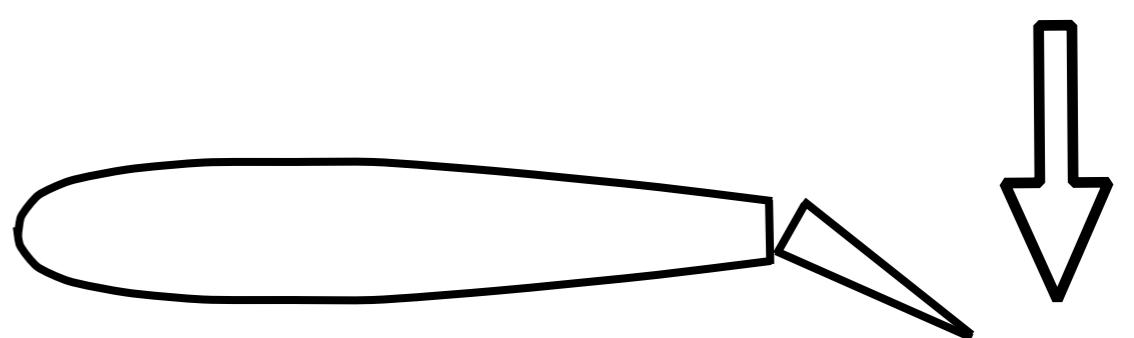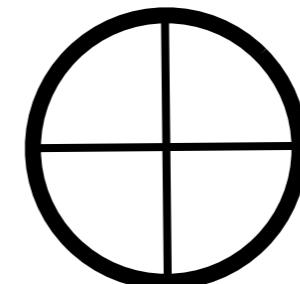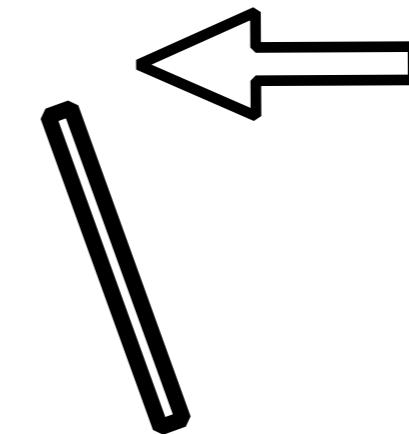
Tailplane Trim 3

1. Initial Condition

2. Nose-down elevator
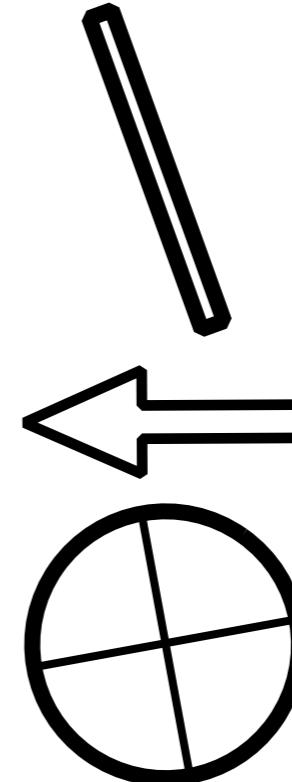
3. Start to trim

Both tailplane and elevator rotate, so to keep total tail load the same....
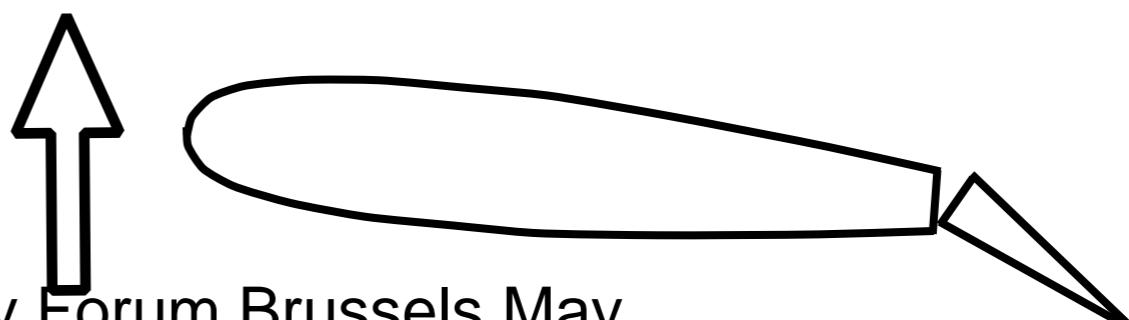
Tailplane Trim 4

1. Initial Condition
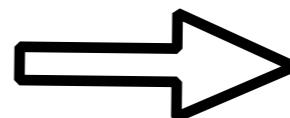
2. Nose-down elevator

3. Start to trim

Both tailplane and elevator rotate, so to keep total tail load the same....
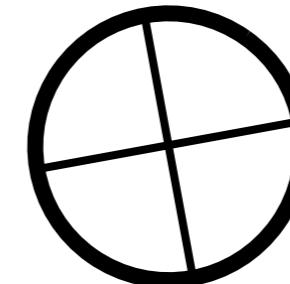
4. Start to relax column back to neutral

Tailplane Trim 5

1. Initial Condition
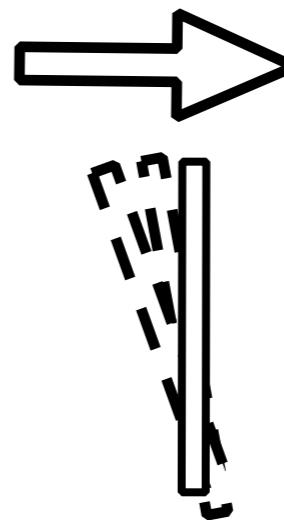
2. Nose-down elevator
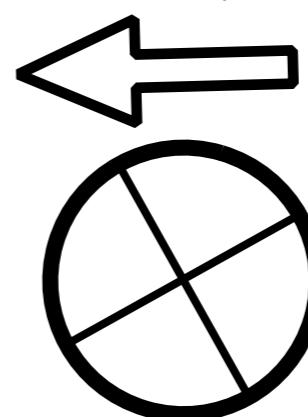
3. Start to trim

4. Start to relax column back to neutral

5. Trimming complete, column back to neutral, tailplane and elevator in line

Trim summary

Conventional	Tailplane
Column is held in position during trimming	Column has to be relaxed during trimming
Trimmed column position reflects aircraft state: Forward high speed Back Low speed	Column is always in neutral position when in trim
Trim only relieves column load	Trim does not itself relieve column load but does provide additional load path

Resulting Errors 1

- Failure to realise that if elevator is inadequate, *additional* power is available from the tailplane (if you think the trim is just there to relieve common load, you might not realise it actually provides *more* control power)

  - A300 Taipei

  - Pitch up incident B737 at Hurn

Resulting Errors 2

- Failure to note tailplane position; if it is already fully nose up (typically following autopilot disconnect at low speed), there is no way the elevator will contain the pitch up from full power from underwing engines
  - B737 Amsterdam
  - A320 Perpignan

Resulting Errors 3

- Failure to realise that loss of control in pitch is due to independent operation of the tailplane, typically due to CWS or envelope 'protection'

  - A310 upset at Orly (flap speed protection)

  - A300 accident Nagoya (inadvertent activation of go-around switches)

Resulting Errors 4

- Failure to understand the trim process itself, with resulting in severe out of phase control inputs.

  - Personal Observation

  - B757 at Oslo.

Conclusion

- Trimming which seems such a simple process is actually full of pitfalls
- Most pilots are never taught that differences exist between types, and many never figure it out for themselves
  - Possibly because they always follow up any elevator input with small trim inputs
- Go around, with its large trim changes often shows this lack of knowledge