



ELEVATING SAFETY & SECURITY WORLDWIDE

*WYVERN Wednesday Webinar*

*March 24, 2021*

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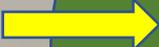
# Unstable Approaches & Go Arounds: A Systems Engineering Assessment

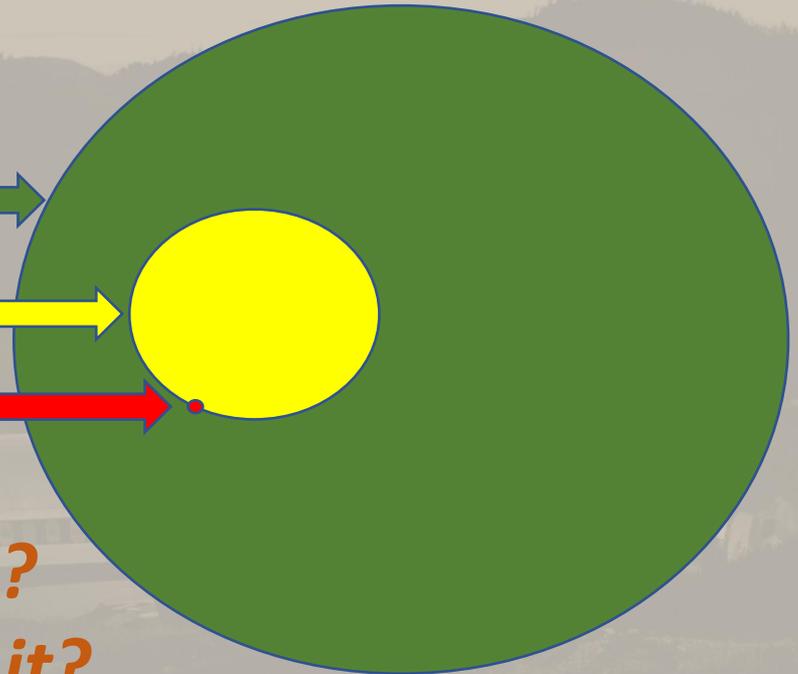
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# If we look at all the approach data\*...

*\* Based on airline data available CY 2001*

- All approaches 
- “Unstable” approaches 
- Accident approaches 



*What is the data telling us?  
And what do we do about it?*

# People and Purposes

- Passengers
- Pilots
- Managers
- Aircraft owners
- Regulators
- Analysts
- Comfortable flight
- Mission completion
- No delays
- Continued employment
- Profits
- Risk aversion
- No bad press
- Numeric performance measures

*Where do stable approaches fit in?*

# Seemingly Conflicting Goals

**Make the stable approach numbers**

**VS**

**Complete the mission (happy passengers)**

*In business, similar apparent conflict between  
quarterly sales goals  
and making customers happy.*

# Contemporary Wisdom

Stable approaches provide a numerical goal.  
Achieving this goal meets everybody's needs.\*

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*\*an exaggeration, of course*

# Approach and Landing Phases\*

*each phase success required for the next*

1. Fly to the FAF
2. Fly to see the runway (FAF to VMC)
3. Fly to the flare point (VMC break out to flare initiation)
4. Flare and touchdown (end of approach)
5. Decelerate and make desired turnoff

*\*Aircraft configuration and briefings required, of course*

# Biggest goal of stable approach?

1. Fly to the FAF
  2. Fly to see the runway (FAF to VMC)
  3. Fly to the flare point (VMC break out to flare)
  4. Flare and touchdown
  5. Decelerate and make desired turnoff
- 

# Idea: Go-Around Criterion

- Go around when it's obvious that the next phase cannot be achieved easily & safely...
- And going around is the lower risk.

Go around and stable approach are different criteria. (They weren't in CY2001)

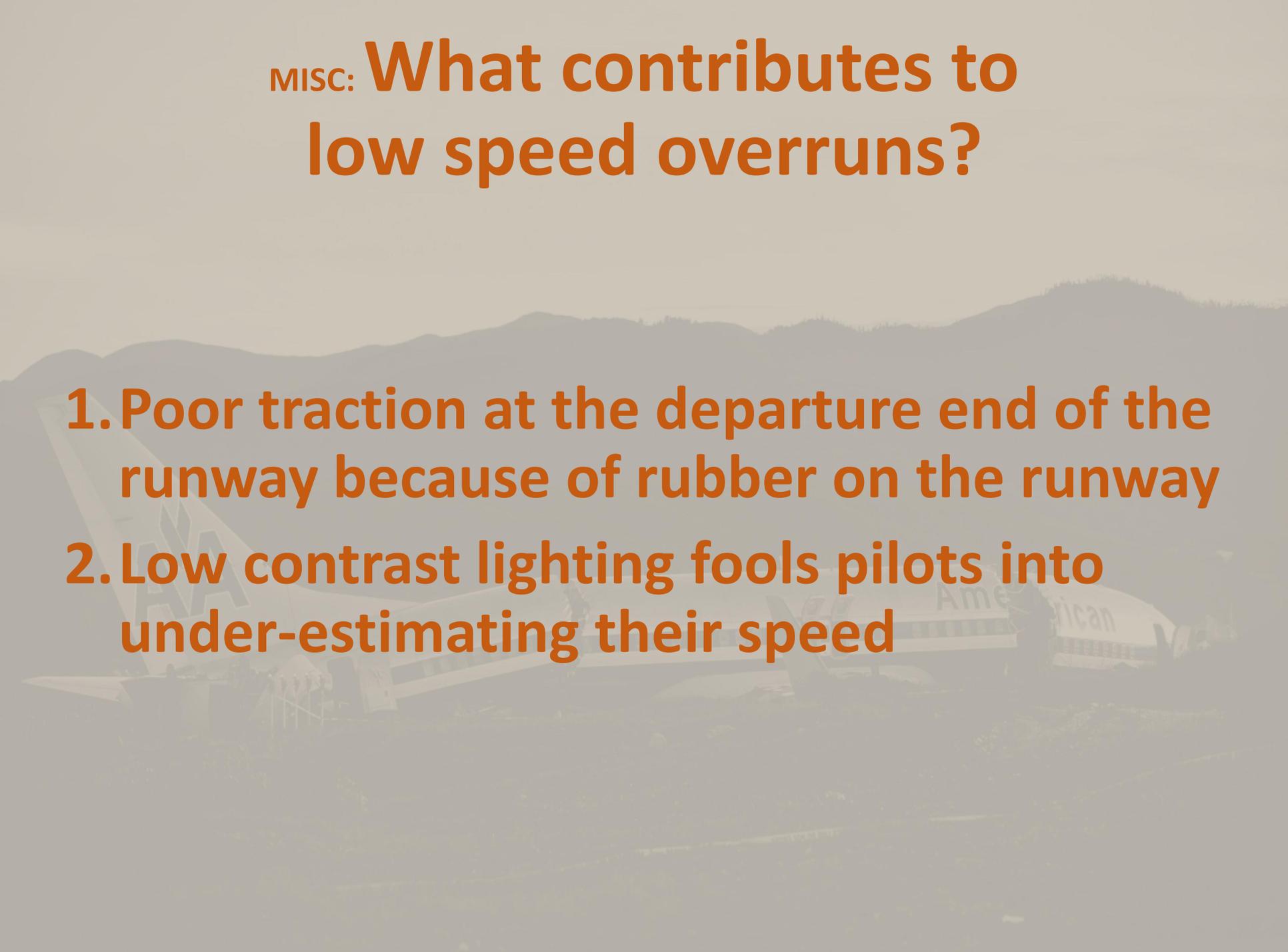
# MISC: Why are “approach” and “landing” grouped?

1. Fly to the FAF (IMC) – Instrument guidance
2. FAF to VMC – Instrument guidance
3. Final visual alignment – Judgement, visual
4. Flare and touch down – Judgement, visual, callouts
5. Deceleration and turnoff – Judgement

*Different guidance cues and techniques*

*Implications for unstable / go around?*

MISC: **What contributes to  
low speed overruns?**

- 1. Poor traction at the departure end of the runway because of rubber on the runway**
  - 2. Low contrast lighting fools pilots into under-estimating their speed**
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# MISC: Linguistic Traps

**Bad terminology hurts buy-in:**

- 1. “Stable approach” has a colloquial meaning (steady, unwavering) different from technical meaning (within tolerances).**
- 2. Runway overrun and excursion (to the side) – are they fundamentally different?**
- 3. “Unstable during landing [rollout]”**

# MISC: 300 foot G/A Decision?

1. Isn't time till flare better than altitude?
  - Longitudinal dynamics (time constant)
    - smaller aircraft respond faster
  - Slower approach speeds mean more time to for pilot to prepare for flare
2. Often there is a weather change at 300'
3. What about 200' minimums?

# MISC: **Better stable approach goals?**

- 1.  $V_{ref}$  (-5/+20): speed is okay, but maybe add speed is steady?**
- 2. Vert spd: how much fluctuation is okay?**
- 3. Long runways, slow braking for pax – late flare?**

# MISC: “Pilot Involvement Factor”

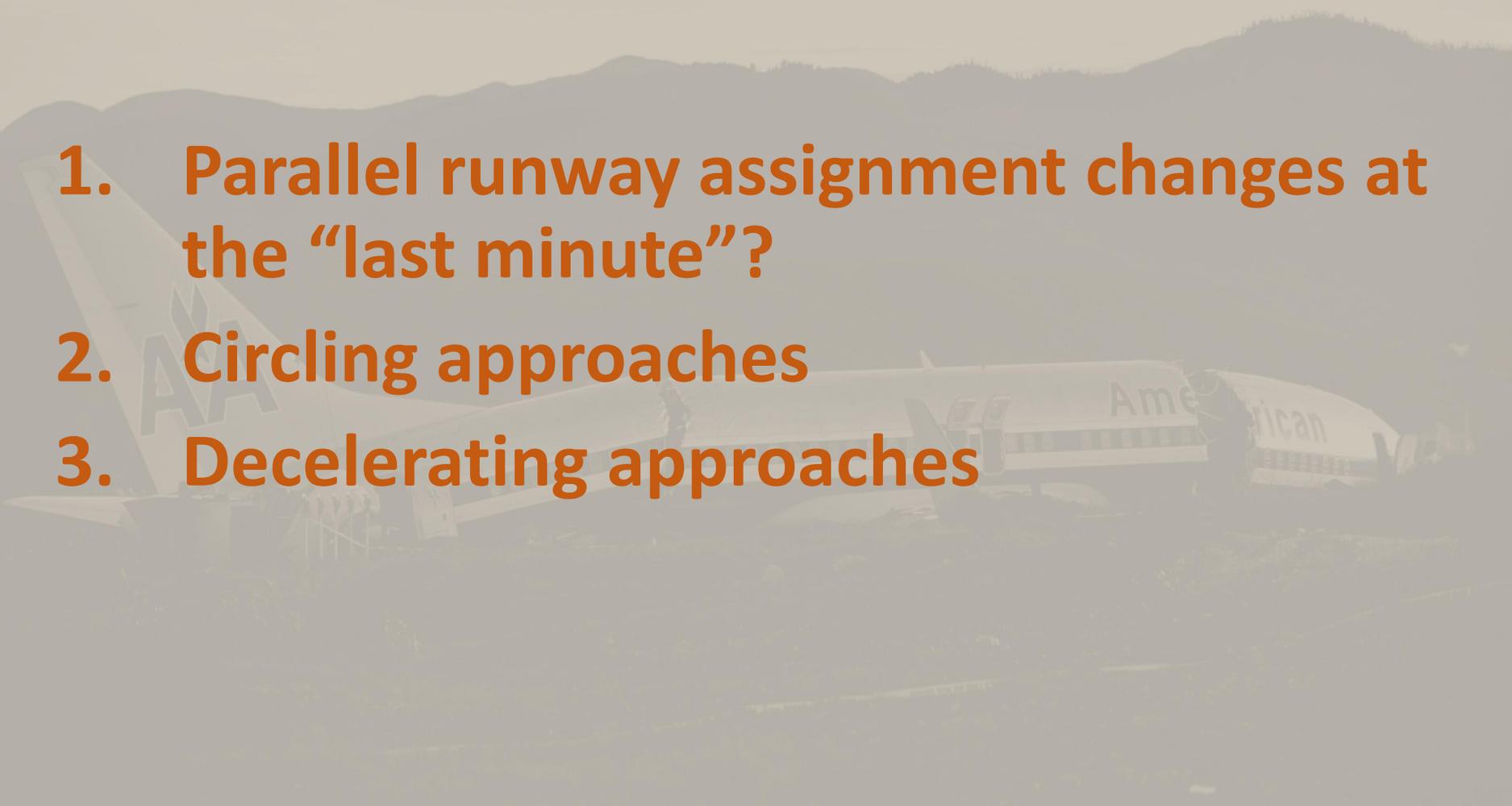
**Hypothesis: If the pilot has a good feel for the airplane, is hand-flying the approach and really tuned in to what the airplane is doing, the chances of a good landing from an unstable approach are improved.**

MISC: **Where did the 500' automated callout come from?**

- 1. The 500' unstable approach mafia could not get a 500' callout into the FARs, so they changed a TSO on mandatory equipment.**
- 2. Not all airlines bought in to the 500' callout.**
- 3. 500' callout vs minimums vs VFR**

# MISC: What about stable approaches and...?

1. Parallel runway assignment changes at the “last minute”?
2. Circling approaches
3. Decelerating approaches



## MISC: Other comments

1. Stable approach per se is not the goal, just a means toward the goal.
2. 50' TCH? In US, LPV: 28'-68'; ILS: 20'-92'
3. Make go around easy
  - Workload; somatogravic illusion; time
4. Single pilot callouts beneficial

# MISC: Expanded Envelope Exercises<sup>®</sup>

1. Developed to mitigate g/a loss of control accidents
2. Key idea: distracted/stressed pilots more likely to have accidents
3. Expanded personal flight envelopes make pilots more cognitively available
4. E3 is in the current AOPA Pilot & video

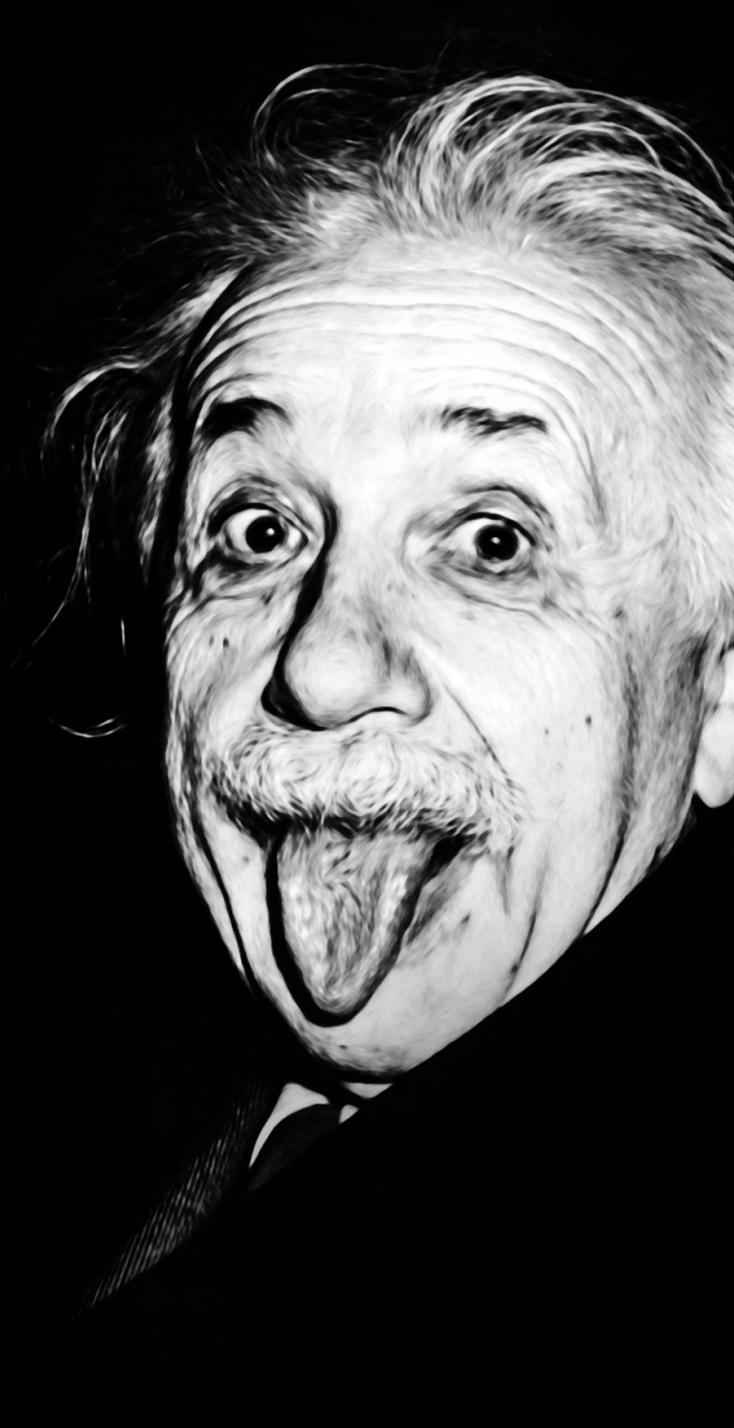


# **REF: The Myth of the Unstable Approach**

- 1. ISASI paper, 2004**
- 2. Based on a full year of Boeing IR&D**
- 3. Was hired to research unstable approach monitor concepts**
- 4. First step: ASRS narratives. Oops!**
- 5. Next step: quantitative BA FOQA data**

# Summary Ideas

1. Not all players have the same goals
2. Five phases of “approach & landing”
3. “Approach” ends at flare
4. Rwy overrun & excursion: different?
5. Linguistic traps
6. Cognitive availability



# The Age-Old Issue

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“Everything should be made as simple as possible, but no simpler.”\* *Albert Einstein*

Stable approach and go around criteria should be as simple as possible, but no simpler.

*\*Exact wording is unsubstantiated.*

# Summary Ideas

1. Not all players have the same goals
2. Five phases of “approach & landing”
3. “Approach” ends at flare
4. Rwy overrun & excursion: different?
5. Linguistic traps
6. Cognitive availability
7. Simple as possible but not too simple