BASS 2018
Go Around Decision-Making & Execution Project
Update / Next Steps

May 11th, 2018

Dr. Martin Smith, CEO Presage Group Inc.

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Outline:

- Description of the problem
- Project methodology
- Significant findings
- Main recommendations
  - Approach
  - Landing
- Operators experience

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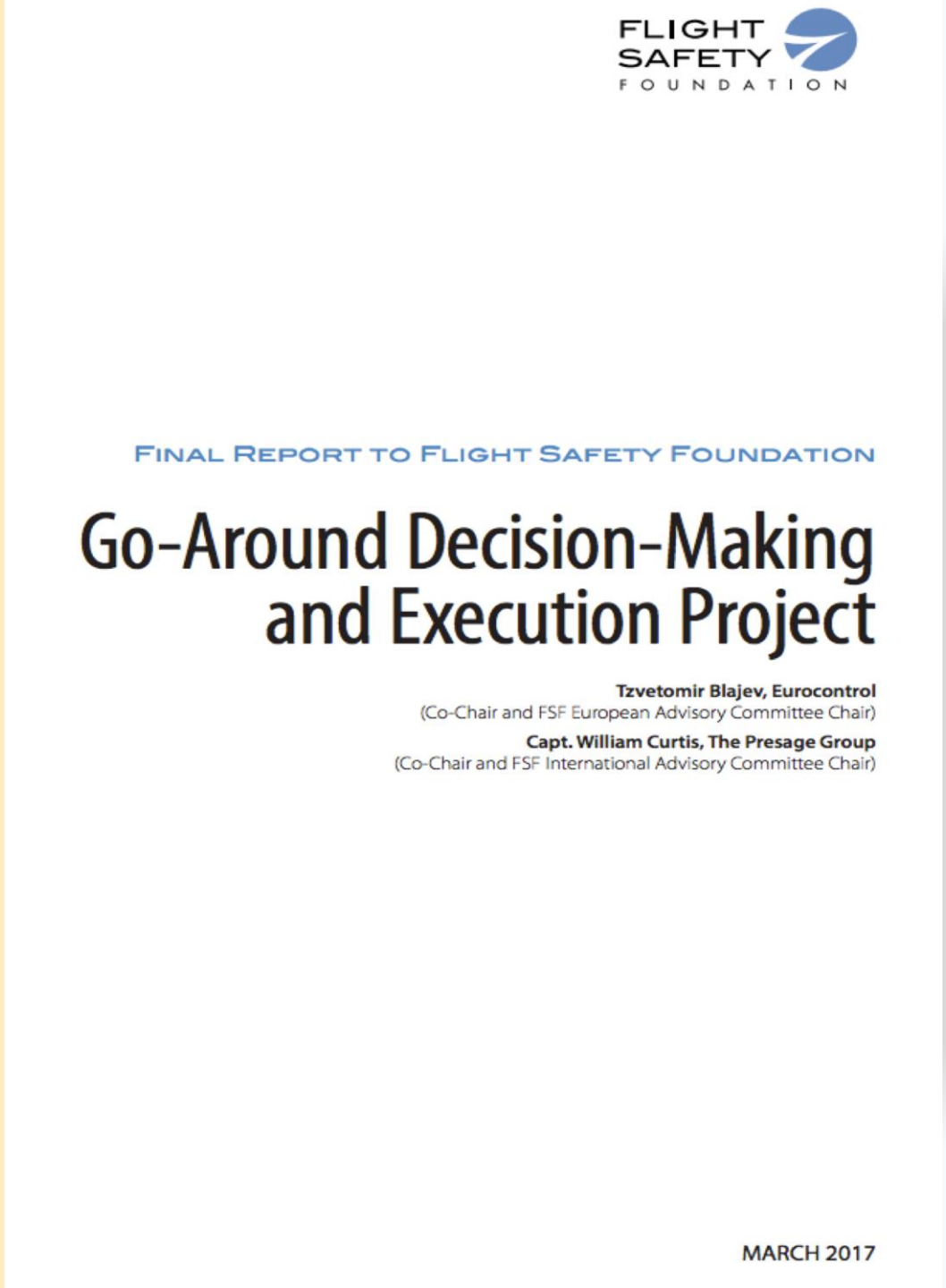
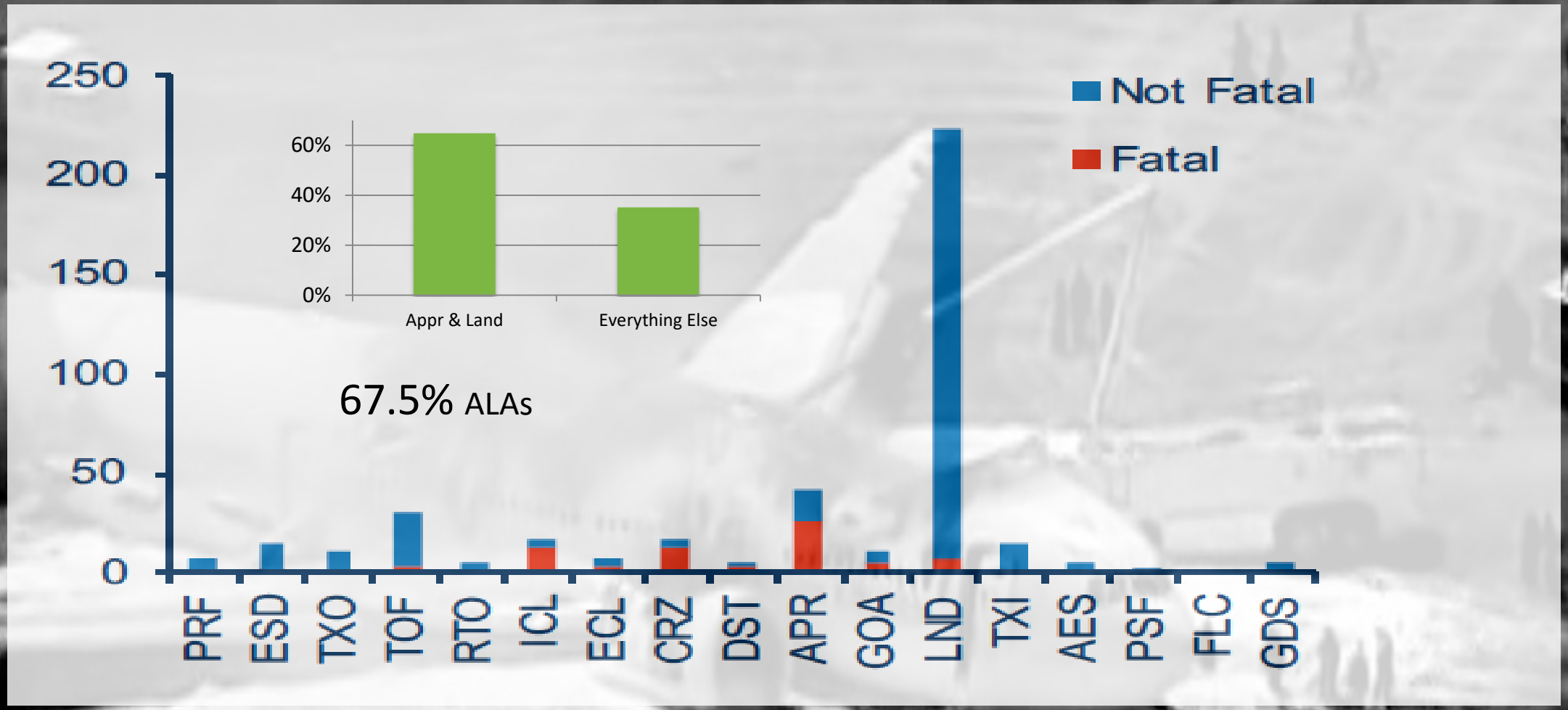
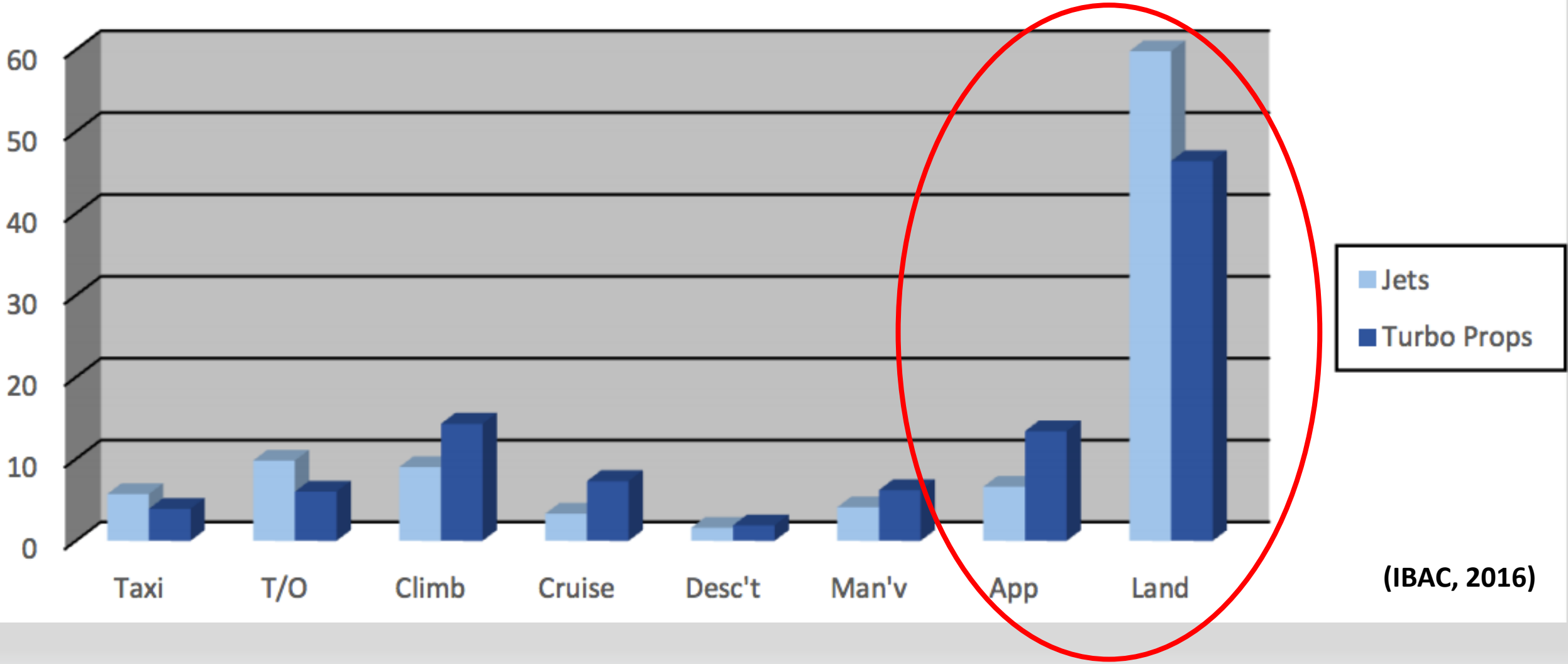


Accidents per Phase of Flight (2011-2015)



Source; IATA ACTF

Accident Summary by Phase of Flight 2011-2015



(IBAC, 2016)

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97%

Of Unstable Approaches
Continue to Land

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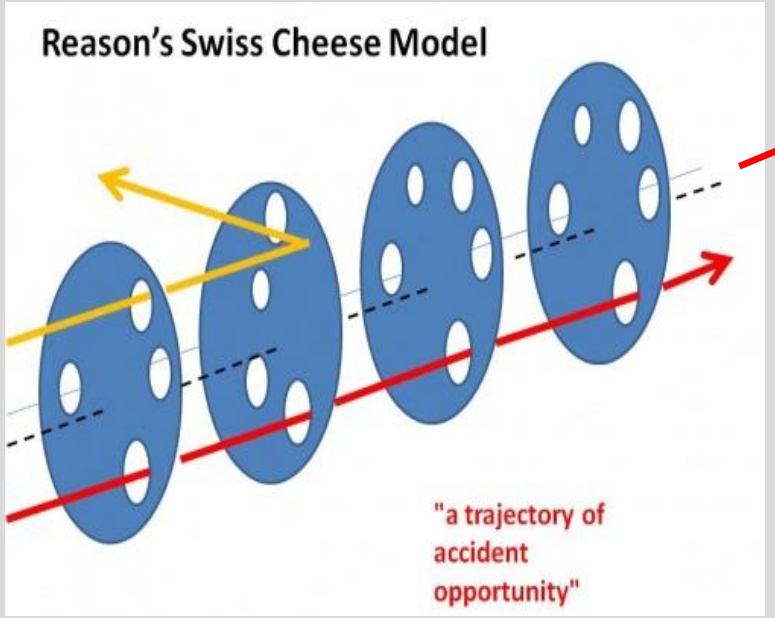
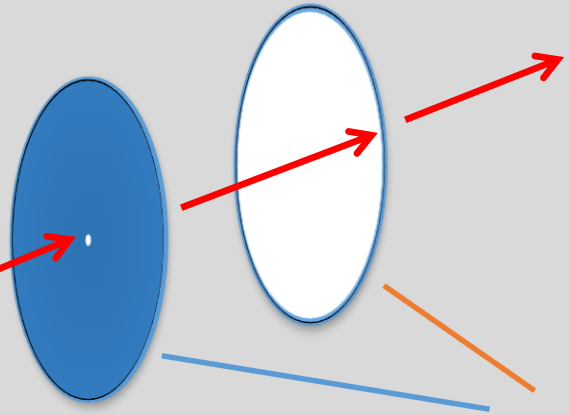
State of Industry GA Compliance Rate





Stable Approach Defense
97% Effective
What's the industry Goal?
How low is ALARP?
100%?

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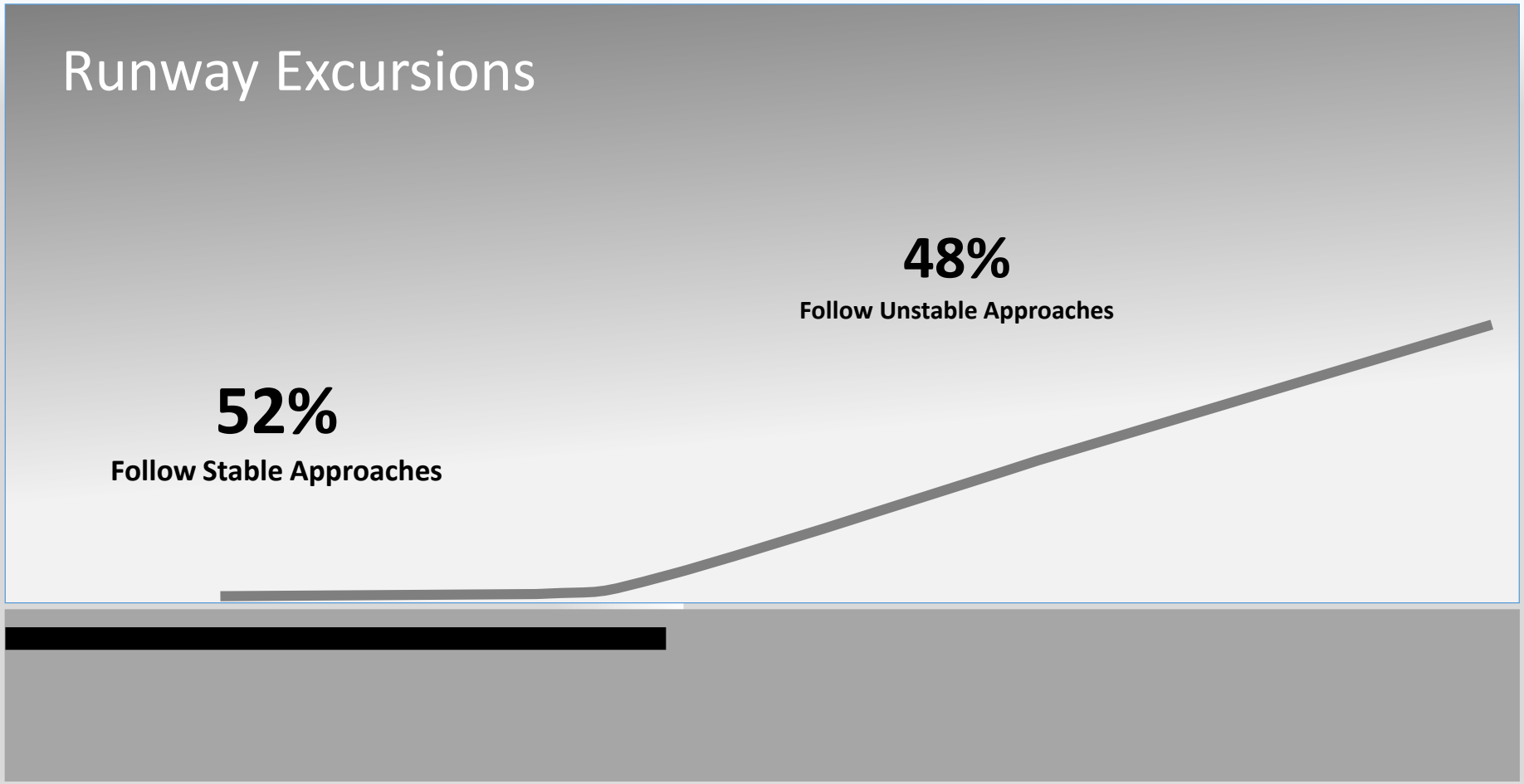
Why not just eliminate Unstable Approaches?



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FSF Study

~83% of approach and landing
accidents would have been eliminated
with the decision to go-around (FSF, Burin 2011)

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This is your meeting with the CEO discussing the flight operational risks to our C-level staff, employees & our valued customers:

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This is your meeting with the CEO discussing the flight operational risks to our C-level staff, employees & passengers:

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The Project

- Analyzed the psychology of non compliance, “why don’t we decide to go-around”
- Compared two populations: Go-around (GA) group vs. Continue Land group (CL)
- Evaluated the transfer of risk to the go-around
- Out of scope…solving unstabilized approaches – focus in on “what happens when the instability occurs”
- Global surveys conducted (pilots, managers)
  - 2380 pilots (33% of who went to site)
  - 128 managers (17% of who went to site)

…….what influences Decision Making

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Continued Research

- Over 10 airlines individually studied
- Another 11 are presently being assessed
- Same statistics

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How situational awareness plays a role in decision making

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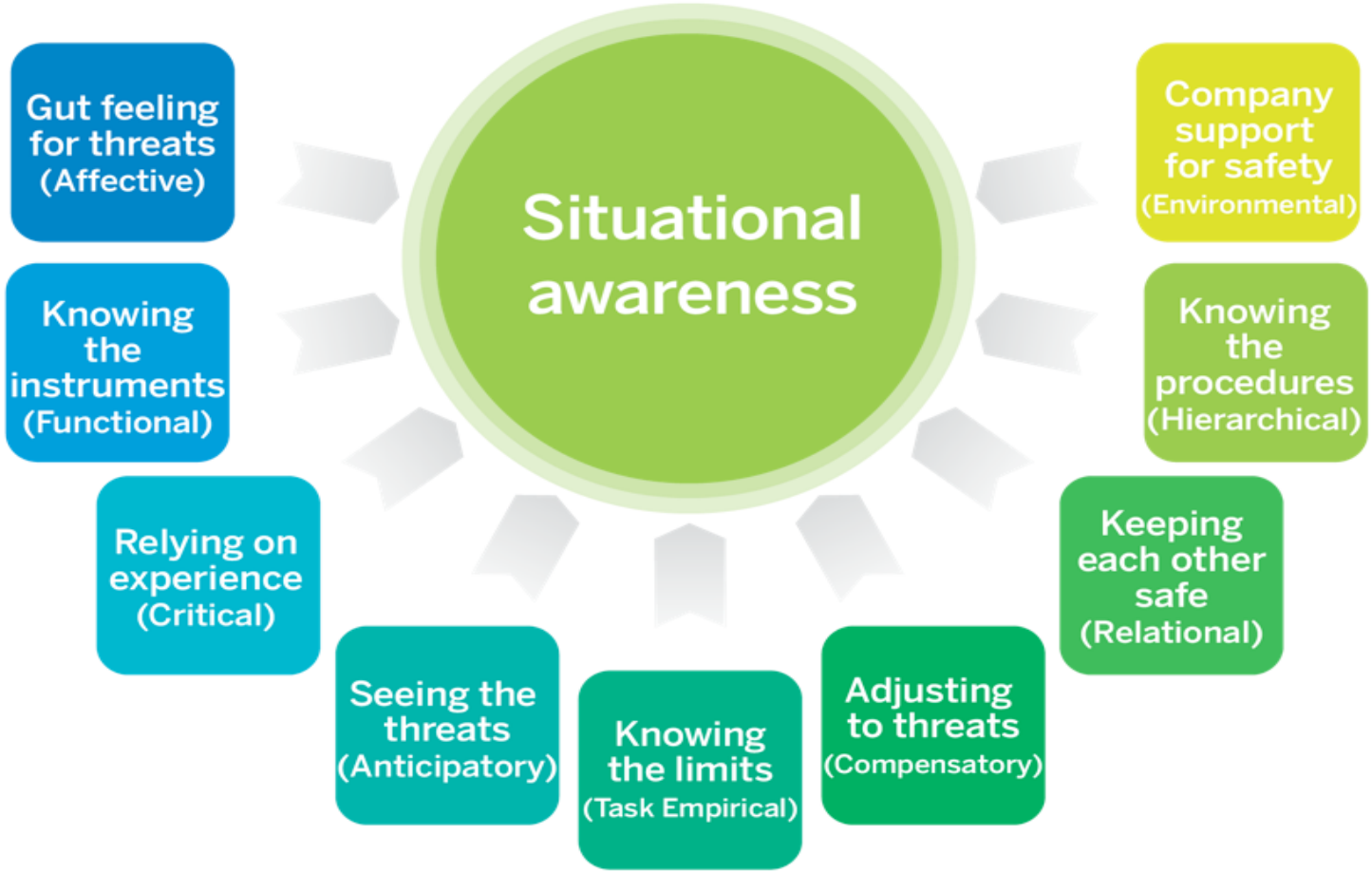
Breaking down situational awareness



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Project Findings & Recommendations

- 38 (statistically significant) findings between the GA and CL groups
- 21 GA Decision Making recommendations
- 21 GA Execution recommendations

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VP Elect Pence 737 LGA Accident

Aviation Incident Final Report

The captain later stated that he had considered calling for a go-around before touchdown but the "moment had slipped past and it was too late." He said that "there was little time to verbalize it" and that he instructed the first officer to get the airplane on the ground rather than call for a go-around. He reported that, in hindsight, he should have called for a go-around the moment that he recognized the airplane was floating in the flare. The first officer said that he did not consider a go-around because he did not think that the situation was abnormal at that time.

Automatic terminal information service (ATIS) "Bravo" was current when the first officer, who was the pilot flying, began to brief the instrument landing system approach for runway 22. The ATIS indicated visibility 3 miles in rain, ceiling 1,500 ft broken, overcast at 2,200 ft, wind from 130° at 9 knots, and that braking action advisories were in effect. The approach briefing included the decision altitude and visibility for the approach and manual deployment of the speed brakes by the captain, with the captain stating "you're gonna do these. I'm gonna do this" to which the first officer replied "[that] is correct." (The airplane's automatic speed brake module had been deactivated 2 days before the incident and deferred in accordance with the

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Mapping of the Science

Recommendation	Situational Awareness Constructs Addressed	Findings Addressed	Strategies Addressed
DMR 1	C; 1, 2, 3, 4, 5, 6, 8, 9	DMMF; 1, 2	DMS; 1
DMR 2	C; 1, 2, 3, 4, 5, 6, 8, 9	DMMF; 1, 2	DMS; 1
DMR 3	C; 1, 2, 3, 4, 5, 6, 8, 9	DMMF; 1, 2	DMS; 1
DMR 4	C; 3, 6, 8, 9	DMMF; 1, 9, 11, 12, 13	DMS; 1, 3
DMR 5	C; 1, 2, 3, 4, 5, 6	DMMF; 1, 3, 4, 6, 8	DMS; 1
DMR 6	C; 2, 6, 8	DMMF; 1, 5, 6, 7, 8, 13, 14	DMS; 1
DMR 7	C; 2, 5, 8, 9	DMMF; 1, 2, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14	DMS; 1, 3
DMR 8	C; 4, 5, 9	DMMF; 1, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14	DMS; 1, 3
DMR 9	C; 5, 7, 9	DMMF; 7	DMS; 1, 3
DMR 10	C; 4, 6, 7	DMMF; 1, 2, 6, 7, 8, 9, 11, 12, 13	DMS; 3, 4
DMR 11	C; 2, 3, 4, 5, 7, 9	DMPF; 7, 12, 13, 18, 19	DMS; 5, 6
DMR 12	C; 2, 3, 4, 5, 7, 9	DMPF; 7, 12, 13, 18, 19	DMS; 5, 6
DMR 13	C; 1, 3, 4, 7, 8	DMPF; 1, 3, 14	DMS4
DMR 14	C; 1, 2, 3, 4, 6, 7	DMPF; 2	DMS; 4, 7
DMR 15	C; 1, 2, 3, 4, 6, 7, 8,	DMPF; 2, 3, 6, 7, 8, 9, 10, 11, 14, 16	DMS; 4, 7,
DMR 16	C; 3, 4, 7, 8, 9	DMPF; 5, 13, 14	DMS; 4
DMR 17	C; 3, 4, 7, 8, 9	DMPF; 5, 13, 14	DMS; 4
DMR 18	C; 1, 2, 3, 4, 5, 6, 7, 8, 9	DMPF; 14, 15, 17	DMS; 4
DMR 19	C; 1, 2, 4, 5	DMPF; 1, 2	DMS; 7
DMR 20	C; 1, 2, 4, 5	DMPF; 1, 2	DMS; 7

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Priming the psychological pump

the

Readiness to Act

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Main Findings - Pilots

Psychology of Systemic and Chronic Non Compliance

- CL pilots scored lower on all SA components
- CL pilots communicate less during approach
- GA pilots reported by more than 4 times that someone in the flight deck prompted a go-around
- Pilots feel go-around criteria is unrealistic
- CL pilots feel discomfort in challenging other crew members
- Pilots - little disincentive for non compliance

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Main Findings – Managers

Psychology of Systemic and Chronic Non Compliance

- Management is disengaged from the issue
  - 55% stated they didn't know company's rate of compliance
- No agreement on the effectiveness of the policy
- Managers scored low on all SA components

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Recommendations:

- Re-Define Stable Approach and Go Around Requirements to be more relevant and manageable
  - Profile parameters (Approach + TDZ)
  - Energy Management parameters
  - Decision Point
  - Environmental variability

- Manage Policy Actively; tactically - day to day [pilot union involvement required?]

- Action programs for reliable execution of policy (flight Crews)
  - Develop automated stable approach monitor and alert systems
  - Develop ‘active’ communications procedures for each approach
  - Establish and publish safe landing guidelines in operations manuals
  - Develop SOPs to discuss instability factors during approach briefings prior to descent
  - Re-define the stable approach criteria and stable approach height(s).
  - Develop SOPs to state critical instability factors (briefly) just prior to approach commencement
  - Ensure UA and GA policies are clear, concise, and unambiguous, including follow up procedures for non-compliance
  - Separate the active ‘objective’ communications from the ‘decision’ communications
  - Avoid directive or suggestive calls that may compromise ongoing decision- making

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3 Legged Stool (Overview)

Effective
Go Around Policy

Awareness
Flight Crews

Manage the Policy
Managers

Policy
Believed In

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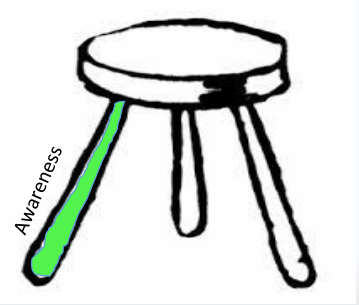
Awareness - Flight Crews



1. Install Stable Approach Monitoring & Alerting Systems
2. Active Communications during the Approach and Landing
3. Increase ‘Failure to Go Around’ and ‘ALA’ awareness
    1. Pre TOD briefing
    2. Pre Approach Briefing

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Pre Descent Approach and Landing, and Pre Approach Briefing Guidance Additions

Periodically (e.g. bi-monthly) the briefing should include overall ALA statistics;

- Industry ALA Statistics
  - ALA accidents make up approximately 65% of all accidents
  - Approximately only 3% of unstable approaches result in a go-around
  - More than 50% of runway excursions follow a stable approach
- Industry RE Statistics
  - 53% Veer Offs: 66% follow Stable approaches
    - [wind 40%] [cont. 39%],
  - 47% Overruns: 63% follow Unstable approaches
- Landing Distance Increase Rules of Thumb;
  - 250 feet/sec of floating
  - 300 feet/10 kts excess speed from Vref – dry runway
  - 500 feet/10 kts excess speed from Vref – wet runway
  - 200 feet/10 feet excess above 50 feet over threshold.

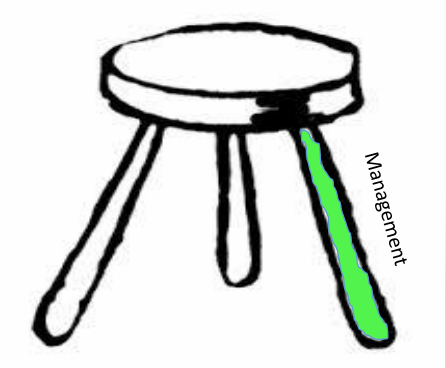
Pre TOD Briefing should include;

- Environmental ALA threats; contamination, crosswinds, tailwinds
- Go-around readiness; in addition to a normal go-around briefing heighten readiness should be discussed in the event of poor environmental conditions

Pre Approach Briefing;

- conduct a brief recap of current environmental threats, go-around readiness, and any adjustments to go-around policy procedures.

Management (process)



1. Active Oversight
    1. Increase go-around non-compliance awareness
    2. Set go-around compliance rate targets
    3. Investigate all unstable approaches and landings that continue

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Change Incentive Reporting Go Around
No Fault Go-Around Policy

3.20.14 No Fault Go-Around Policy

It is imperative that all pilots recognize the importance of stable approaches and touchdown zone precision when landing at all airports, and in particular, Billy Bishop Toronto City Airport (YTZ).

If stable approach criteria as per SOP 2.15.2 are not met and/or it appears the aircraft will not touch down within limits, a go-around should be performed. A go-around may be called by either pilot at any time during the approach, flare, and landing.

At YTZ, the main wheels of the aircraft must touch down by the end of the 1,000 ft markers (or at night at the embedded touchdown zone lights.) At all other airports, the main wheels must touch down by the end of the briefed touchdown zone limit. Should it be deemed necessary to conduct a go-around following a touchdown, advancing the power levers should result in a positive acceleration towards V_{GA}. Once a go-around or balked landing has commenced, it must be continued.

The No Fault Go-Around policy applies to ALL airports and all types of approaches in any weather conditions. Pilots are encouraged to do a go-around at any time the landing conditions are uncertain. Pilots will not be reprimanded or questioned for this action and a report will not have to be filed. If a landing is conducted following an approach flown outside the briefed stable criteria, an ASR shall be filed.

Note: As per SOP 2.16.1, planned long landings are not permitted.

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Guidance

1. Redefine Approach Go-Around criteria
    1. Better match pilot & management views
    2. Closer to SAM Systems
    3. Safe
    4. Distinguished from Stable Approach Objective
    5. Include Active Communications
2. Enhance Landing Go-Around criteria
    1. Include Active communications

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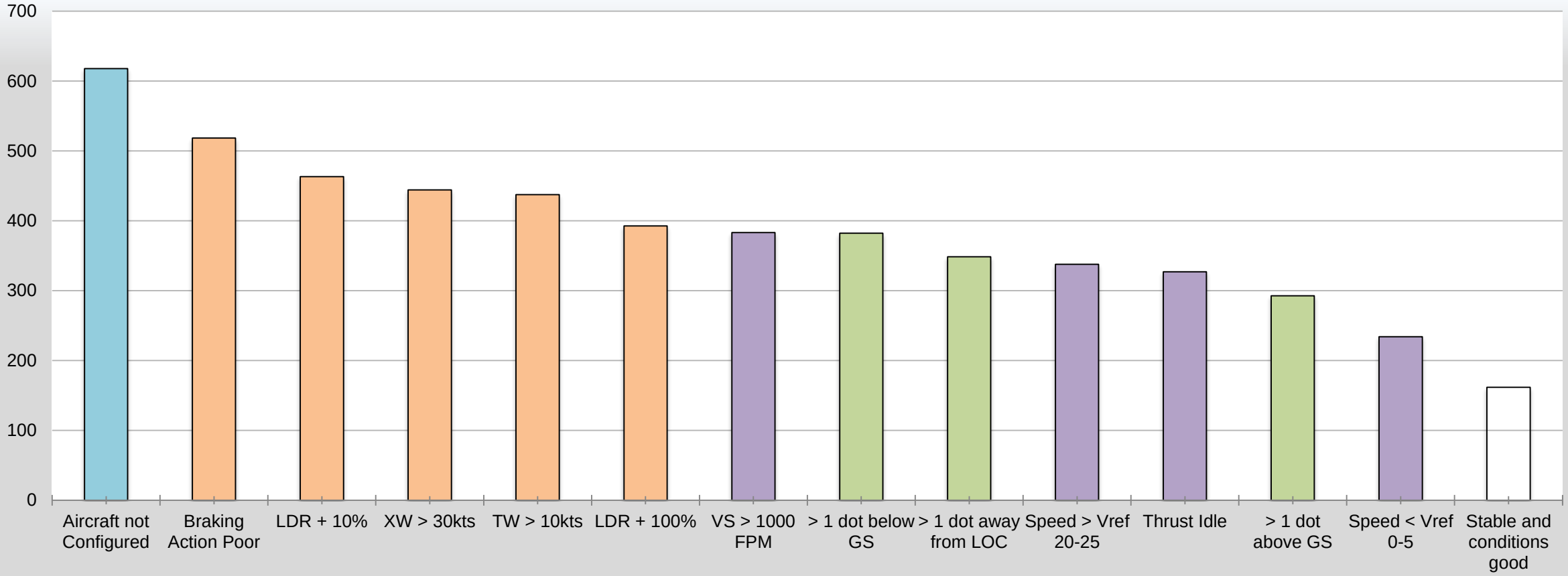
How Pilots see Go-Around Criteria



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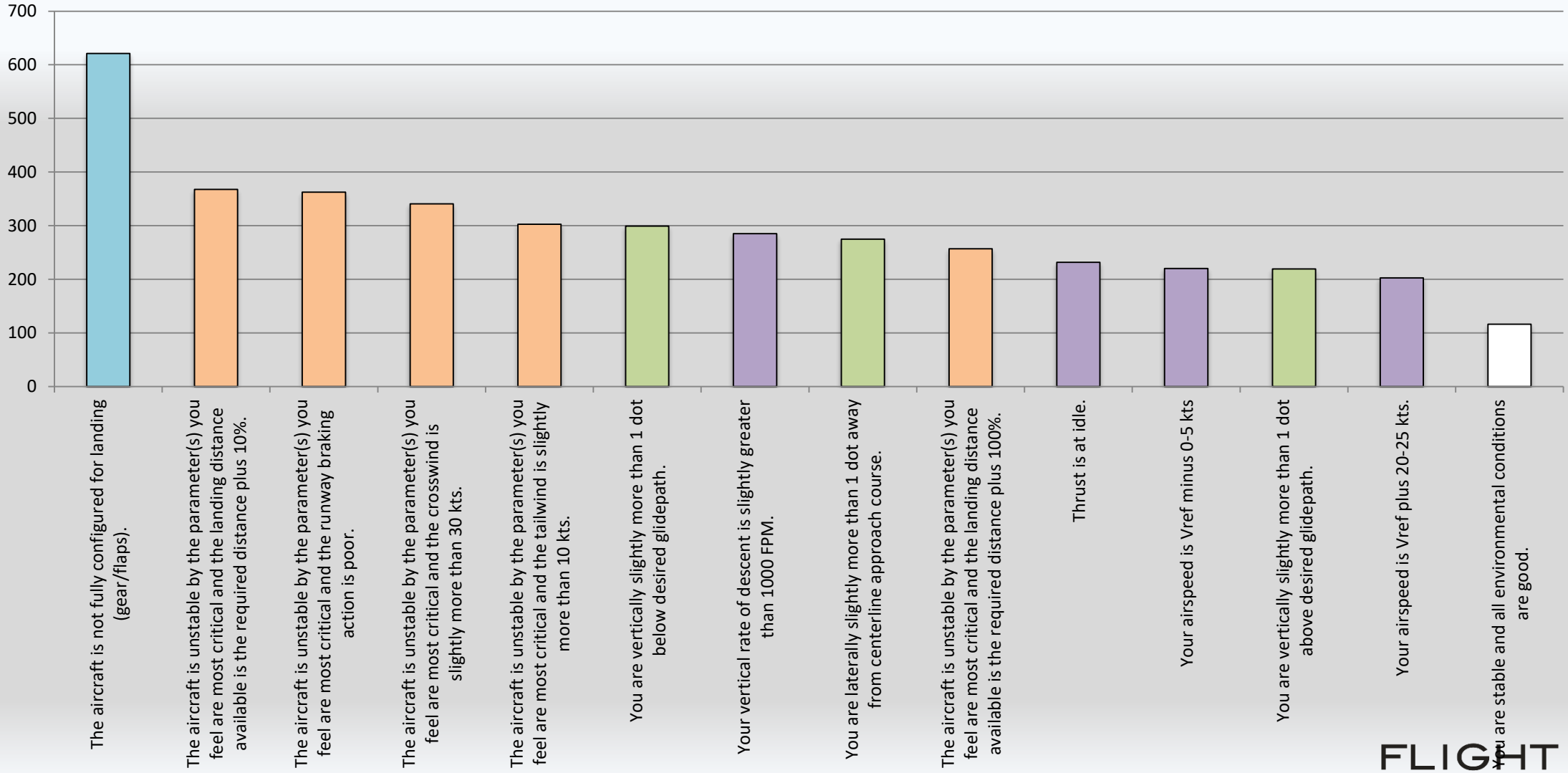
How Pilots see Go-Around Criteria – Turbo Prop



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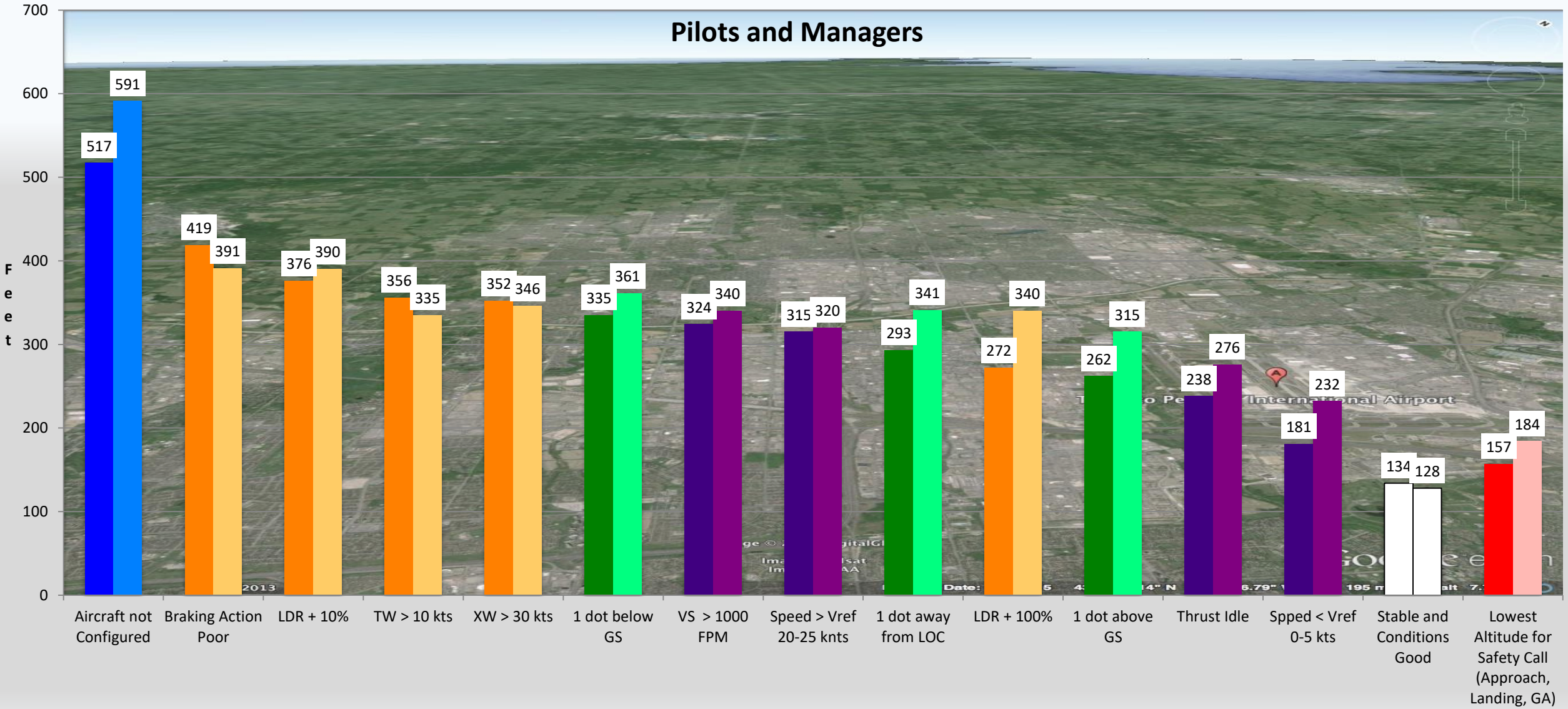
Pilots and Managers



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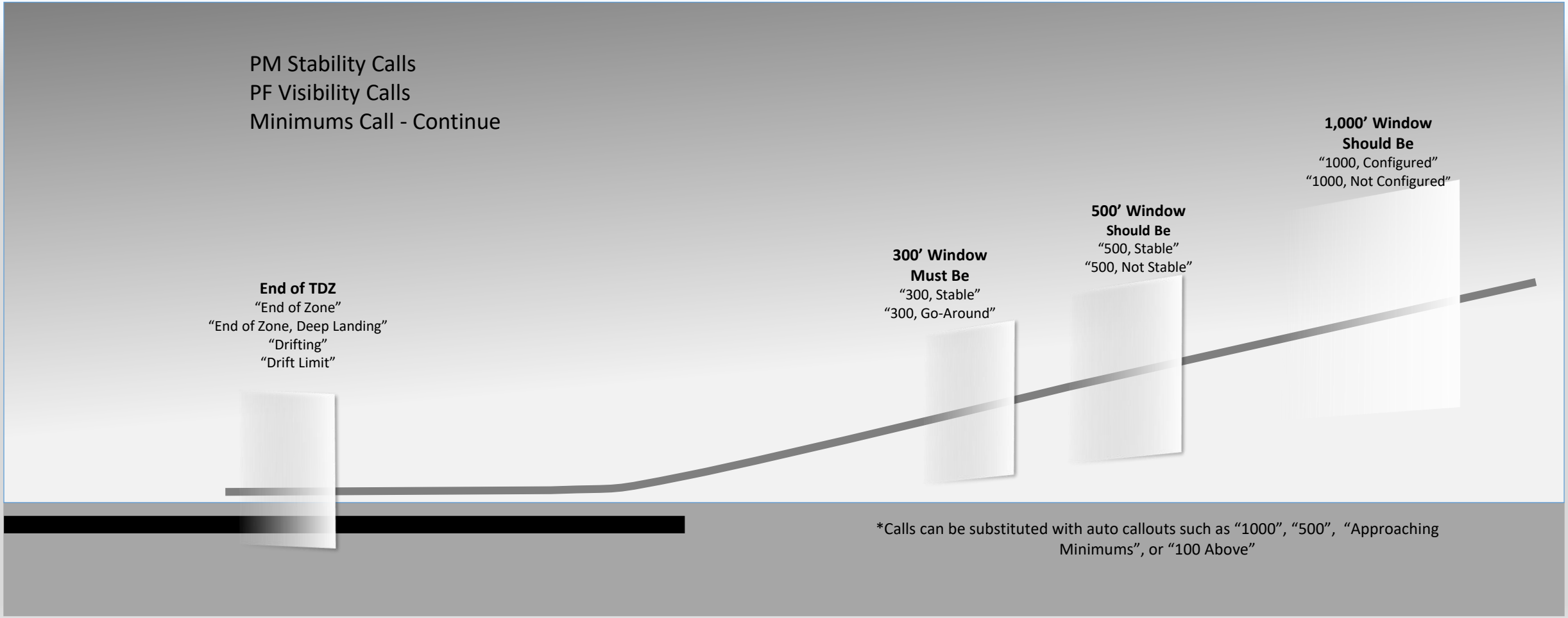
Tabled – Stable Approach & Go Around Elements



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The Significance of Communications

- Significant finding
- Active versus passive / conditional
- Repeated / escalated to resolution

- Protects a shared mental model
- Enriches collaboration and collective decision-making
- Promotes accountability to the procedures

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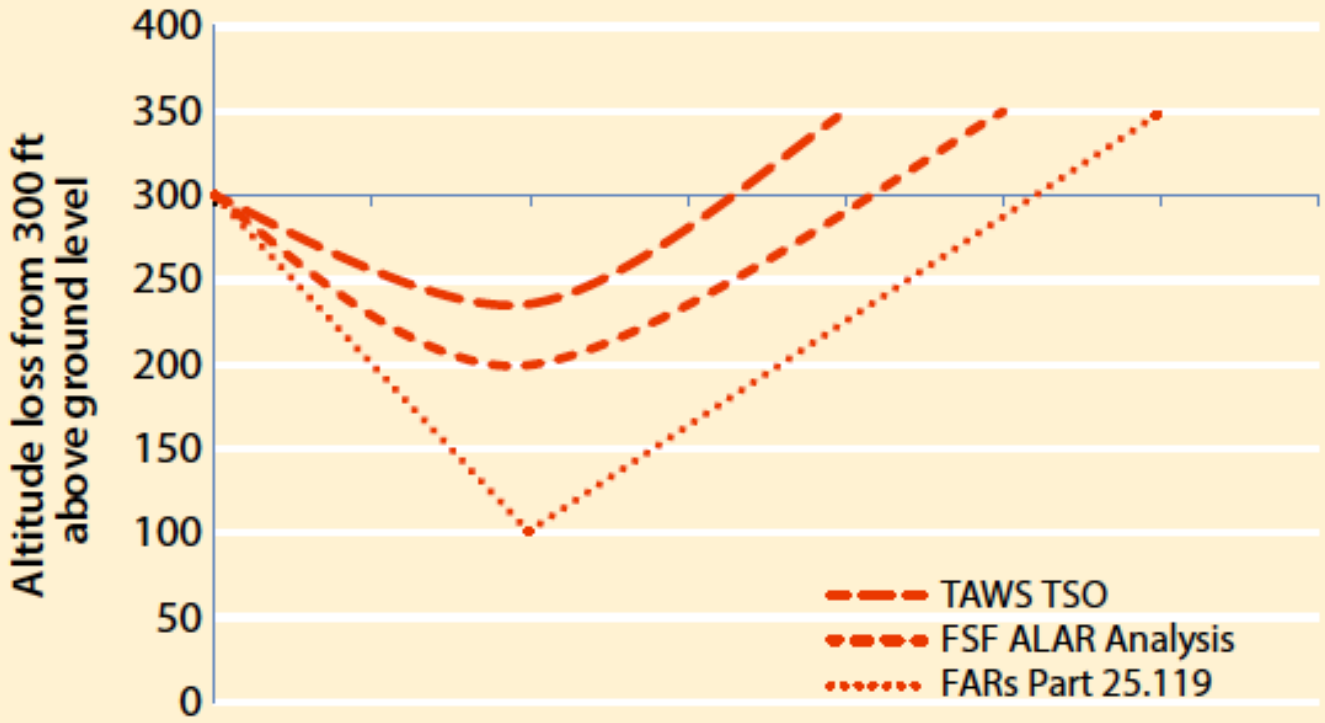
Figure 1

Go-Around Altitude Loss Analysis

Unstable condition: Speed V_{REF}, Thrust Idle, Vertical Rate 1,500 fpm



ALAR = FSF Approach and Landing Accident Reduction; FARs = U.S. Federal Aviation Regulations; TAWS = terrain awareness and warning system; TSO = technical standard order; V_{REF} = reference landing speed

Source: Flight Safety Foundation

Guidance Through the TDZ

- 40% of flight crews did not accurately know the TDZ markings
- Similar amount did not know the difference between ICAO and FAA markings

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FSF Safe Landing Guidelines

For the purpose of these guidelines the landing begins at the threshold to the aircraft reaches taxi speed.

1. Fly a stabilized approach.
2. Height at threshold crossing is 50 ft., if greater than 50 feet by approach profile design, additions should be made to the actual landing distance required
3. Speed at threshold crossing is not more than VREF + 10 kt indicated airspeed and not less than VREF.
4. Tail wind is no more than 10 kt for a non-contaminated runway, no more than 0 kt for a contaminated runway.
5. Touch down just beyond the touchdown aim point following a normal flare, and not beyond the touch down zone (TDZ). If not touched down within the TDZ (or revised touchdown limit point) - go-around.
6. Touchdown on the runway centerline with the main landing gear on both sides of (straddling) the runway centerline. If all main landing gear are on one side of the centerline – go-around
7. After touchdown, promptly transition to the desired deceleration configuration:
   - Brakes
   - Spoilers/speed brakes
   - Thrust reversers or equivalent (e.g., lift dump)

   Note: Once thrust reversers have been activated, a go-around is no longer an option.
8. Speed is less than 80 kt with 2,000 ft of runway remaining.

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ICAO TDZ Markings

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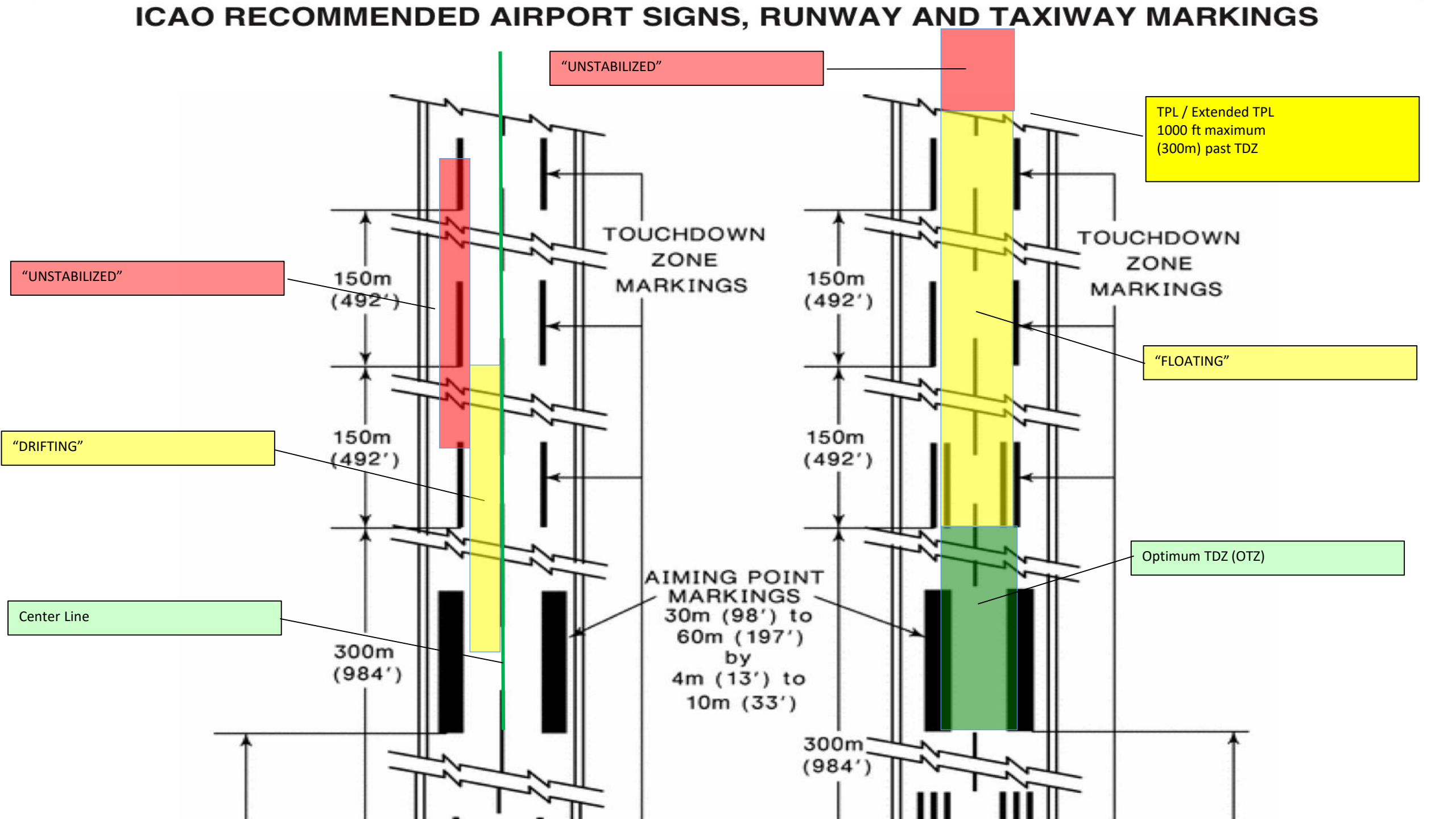
ICAO RECOMMENDED AIRPORT SIGNS, RUNWAY AND TAXIWAY MARKINGS



FAA TDZ Markings

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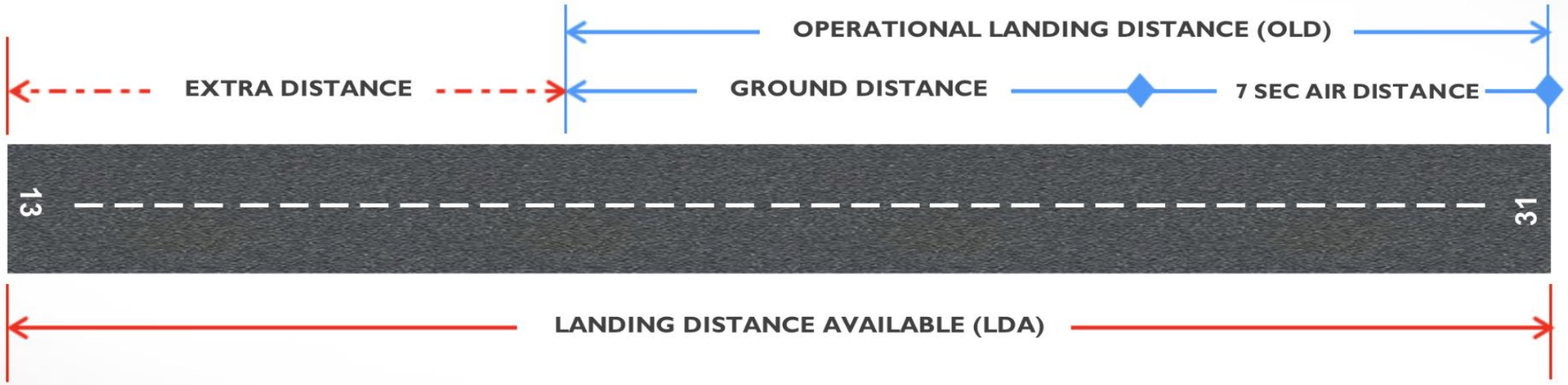
Touchdown Point Limit (TPL)



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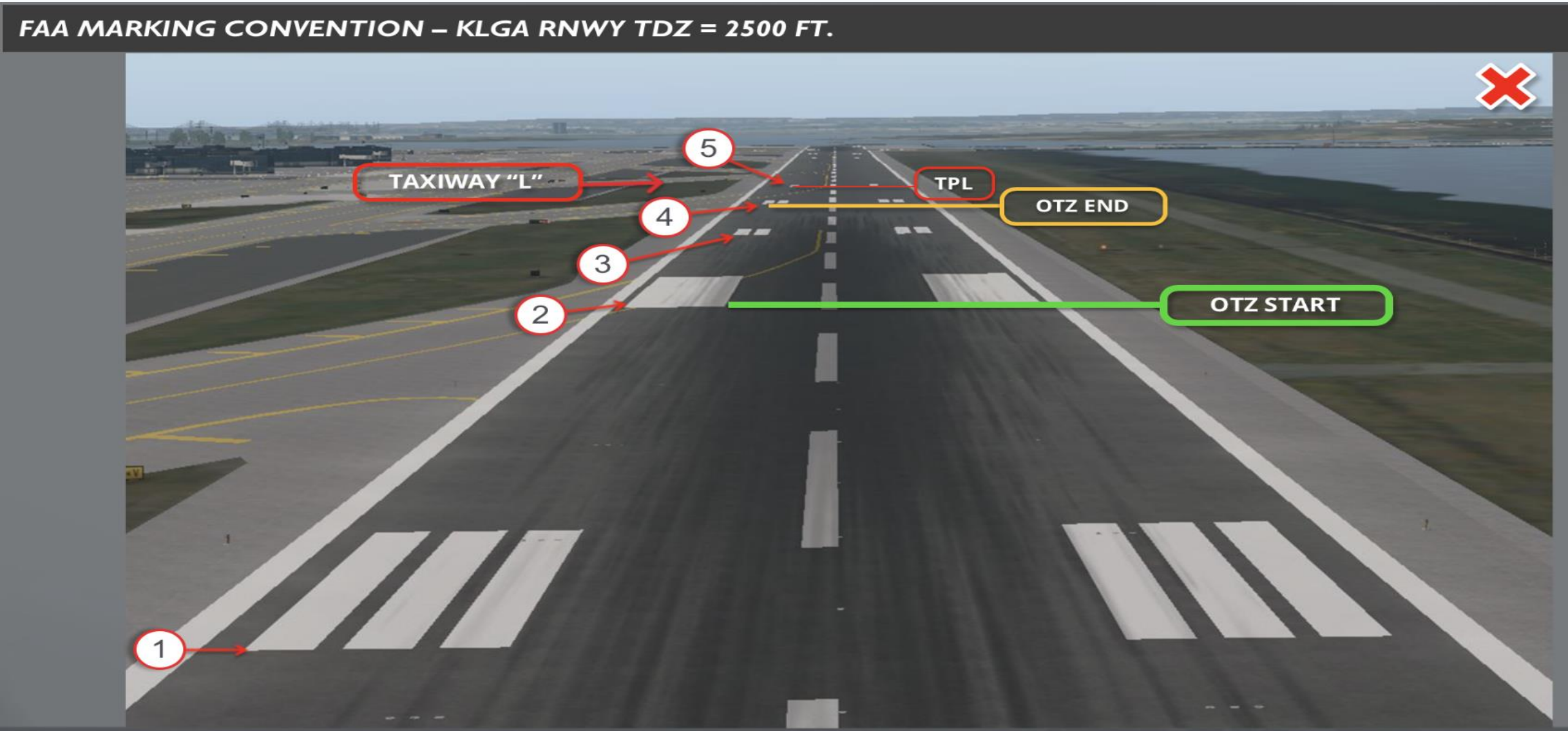
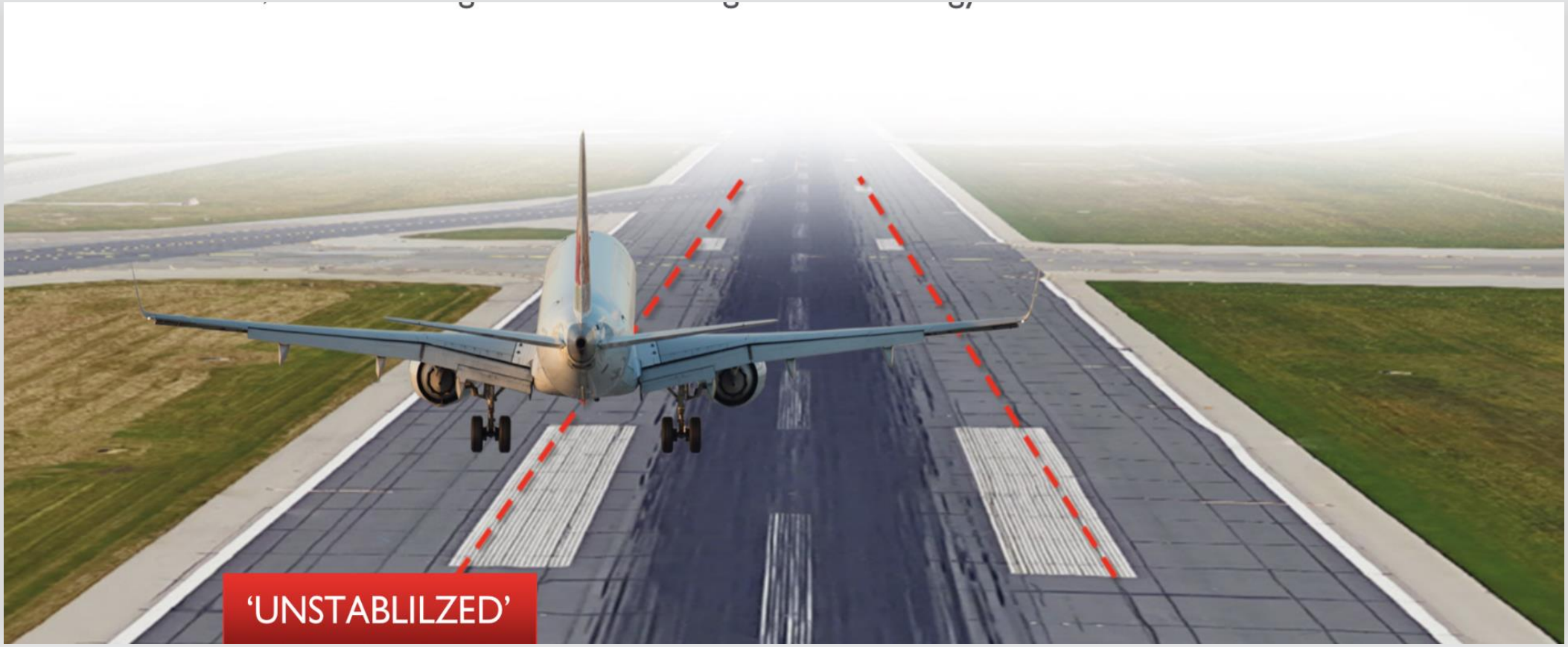
What is your Touchdown Point Limit?



What about your Lateral Touchdown Point Limit?



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Transfer of Risk; Approach and Landing – to Go Around?

Dilemma…

- We want flight crews to follow GA Policies
- We don’t want to have a go-around for every unstable approach
- Can’t have both…

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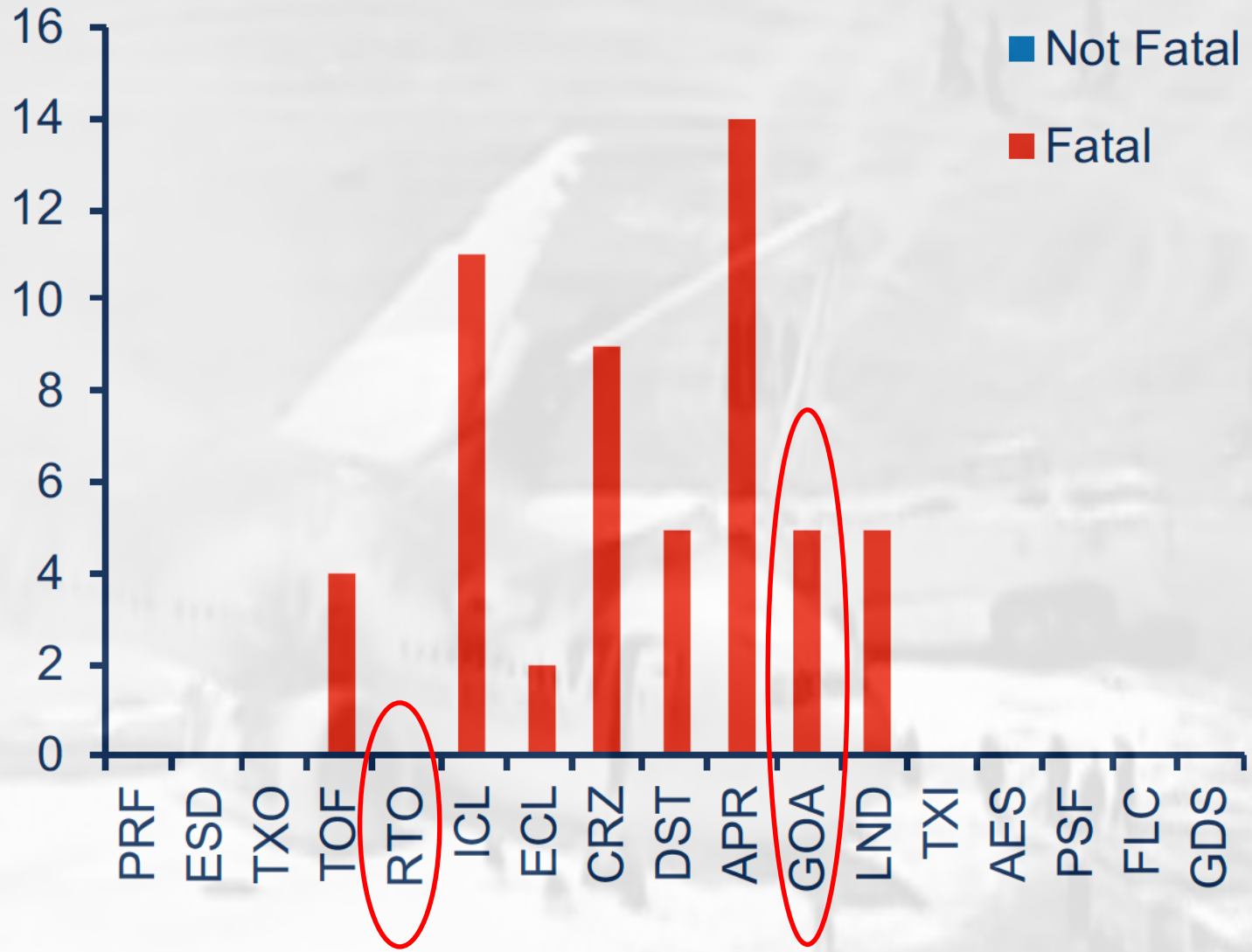
All Accidents

Accidents per Phase of Flight (2012-2016)

Total Number of Accidents (Fatal vs. Non-Fatal)



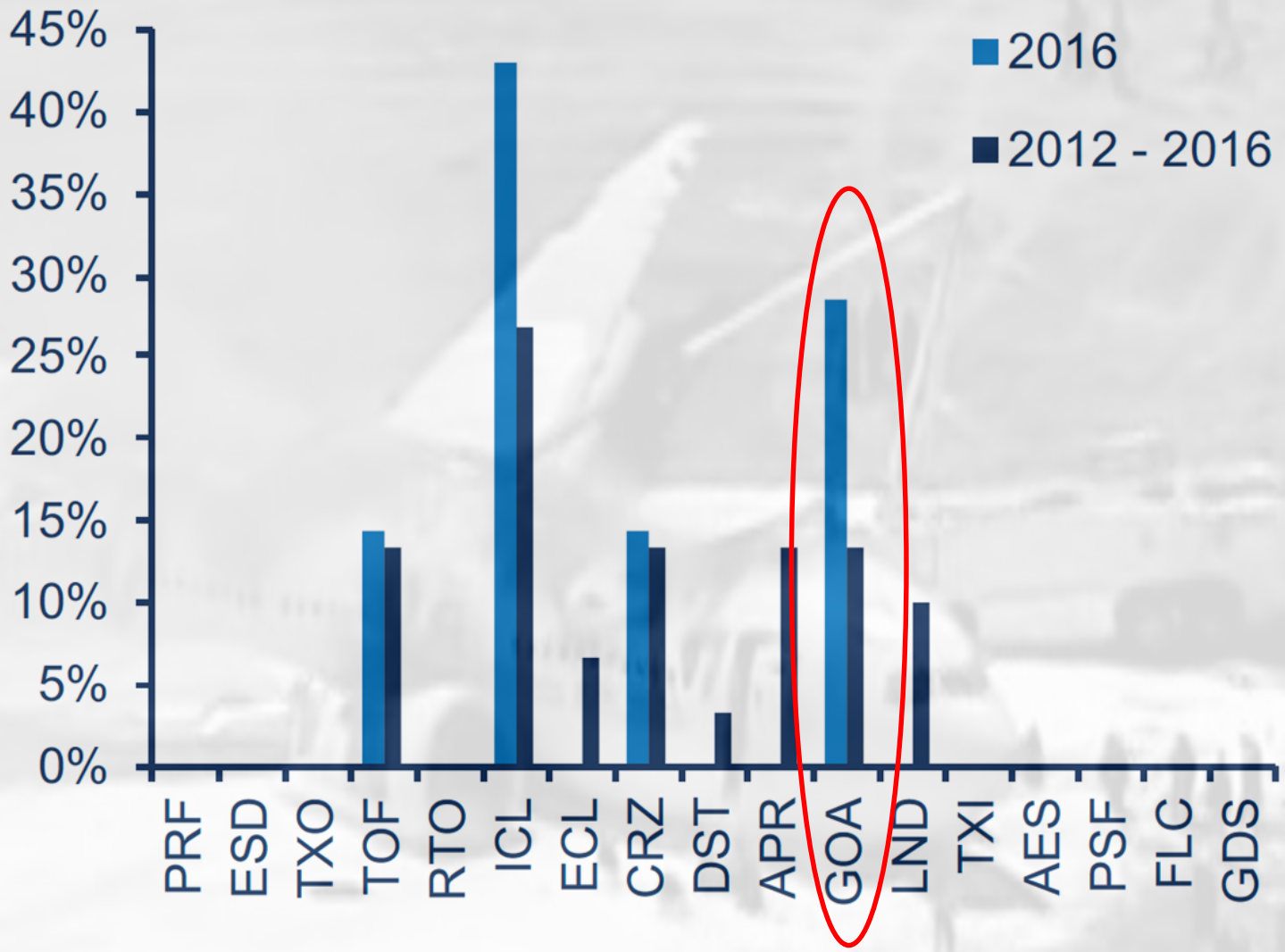
Source; IATA ACTF

LOC-i

Accidents per Phase of Flight (2012-2016)

Distribution of accidents as percentage of total

LOC-i



Source; IATA ACTF

Somatogravic Go around Accidents/Serious Incidents 2000-2016

Date	Type	Operation	Location	Conditions.	Phase	Pilot Hrs	A/SI	Fatal/POB
13 Jun 00	Falcon 20	Charter Freight	Ontario, Canada	Night IMC	GA	11800/2300	A	0/2
23 Aug 00	A320	Scheduled Pax	Bahrain	Night VMC	GA	4416/608	A	143/143
11 Oct 01	Metro	Medevac	Manitoba, Canada	Night IMC	GA	3100/1200	A	2/3
22 Jan 02	B757	Scheduled Pax	Oslo, Norway.	Day IMC	GA	8034/2485	SI	0/82
27 Sep 03	Cesena 182	Private	Concorde, MA, USA	Day IMC	GA	2600	A	2/2
03 May 06	A320	Scheduled Pax	Sochi, Russia	Night IMC	GA	5458/2185	A	113/113
30 Mar 07	A330	Scheduled Pax	Abidjan, Ivory Coast	Night VMC	GA	n/k	SI	0/ n/k
07 Jan 07	King Air	Medevac	Saskatoon, Canada	Night IMC	GA	8814/672	A	1/4
23 Sep 09	Cessna 210	Private	Hilltop Lakes, TX, USA	Night VMC	GA	1276	A	1/1
12 May 10	A330-200*	Scheduled Pax	Tripoli, Libiya	Night IMC	GA	17016/4216	A	103/104
29 Jan 13	CRJ200	Scheduled Pax	Almaty, Kazakhstan.	Day IMC	GA	18194/3507	A	21/21
23 Sep 13	C182	Training	Hamilton, Victoria, Aus.	Night VMC	GA	135	A	1/1
16 Oct 13	ATR 72	Scheduled Pax	Pakse, Laos	Day IMC	GA	5600/400	A	49/49
17 Nov 13	B737-500	Scheduled Pax	Kazan, Russia	Night IMC	GA	2500/2000	A	52/52
22 Nov 15	B737- 300	Scheduled Pax	Osh, Kazakhstan.	Day IMC	GA	10600/16400	A	0/153

How can we manage exposure to GA LOCi

RISK = HAZARD x EXPOSURE

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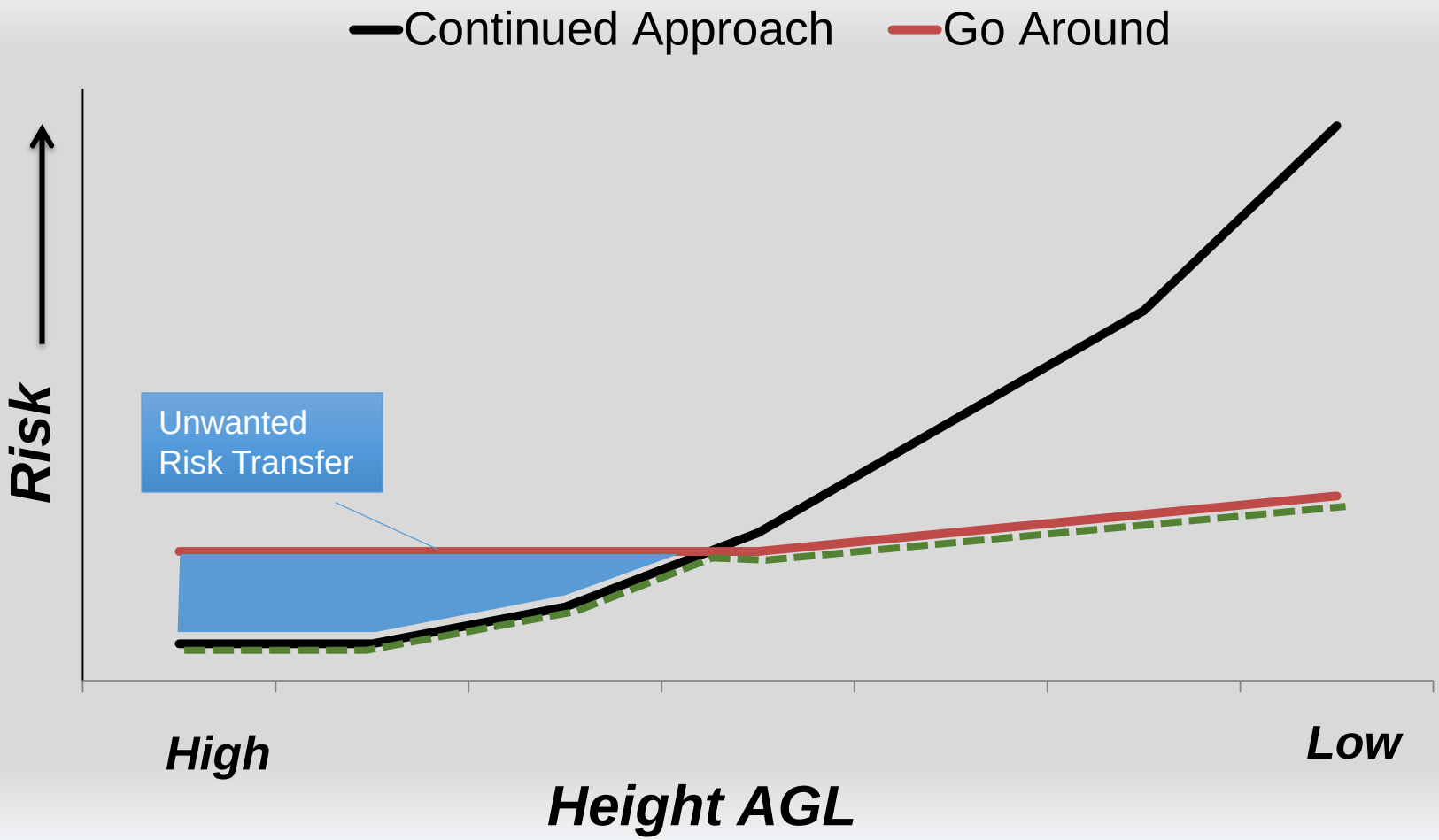
Continued Approach / Go Around Risk Relationship



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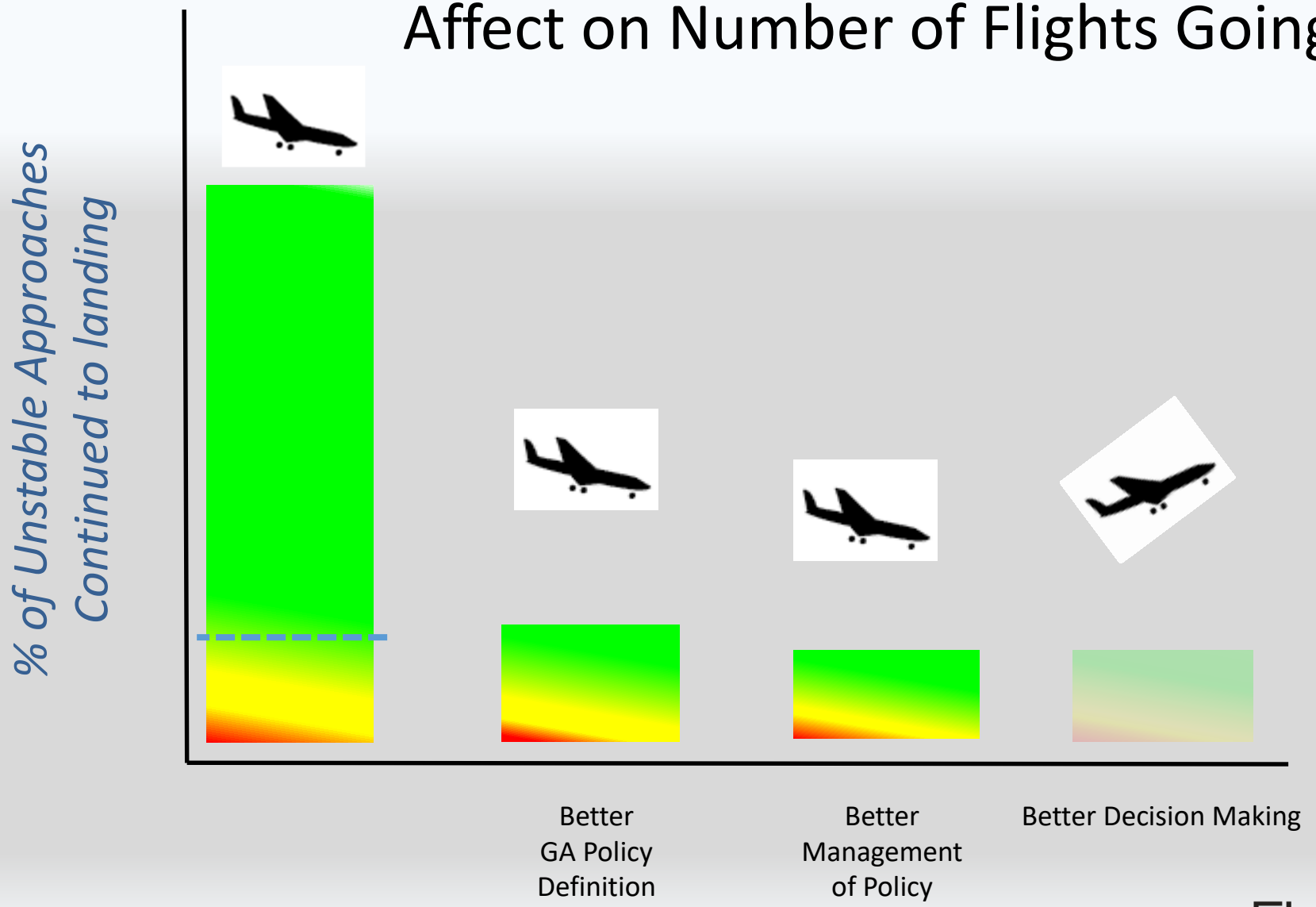
Affect on Number of Flights Going Around



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Operator Experience

- International airline
- Regional / International airline

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Validation Testing - Simulator Trial Design

- An evaluation of procedural continuity / overlap
- Identification of any unforeseen consequences and/or transfer of risk issues
- See if procedures make sense in practice
- Confirmation of improved SA and GA compliance
- Airline / industry requirements for training

(NOTE: Regulator participated in the sim and line trial testing for this airline)

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Simulator Trial Design – Robust

Control Group Existing Procedures	Active Call Group Active @ 1000 & 500’	Non-active Call Group Passive @ 1000 & 500’	E-learning Group Active @ 1000 & 500’
6 Crew • Study Guide on issue • 10 evaluated approaches	9 Crew • Study guide & videos • 45 min **interactive** pre-brief • 1 ‘in sim’ tutorial on TDZ • **6 practice approaches** • 10 evaluated approaches	9 Crew • Study guide & videos • 45 min **interactive** pre-brief • 1 ‘in sim’ tutorial on TDZ • **6 practice approaches** • 10 evaluated approaches	6 Crew • Study guide & videos • 30 min pre-brief with **no interaction** • 1 ‘in sim’ tutorial on TDZ, **no interaction** • 10 evaluated approaches

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Trial Design - Robust

- Crews randomly selected from a volunteer pool
- Different aircraft types – WB / NB
- 300 evaluated approaches
- Varying degrees of stability; Stable, Minor Unstable, Major Unstable
- (Note: Sim manipulation is as much “art” as it is “technology” – and it is possible to inject instabilities although there is opportunity here for Sim manufactures to create more tech options)

- Study is a double-blind study wherein sim facilitator, flight crew, and Presage SME did not know what scenarios they would be asked to perform

Sim Approach #	Training / Trial	Stable Appr	Unstable Approach		Stable Land	Unstable Land	Speed	Profile	Config	Float	Drift	Low Vis	ILS	NPA High	NPA Low
			Above 500	Below 500											
CP1	Training	T			T								T		
CP2	Training	T			T								T		
CP3	Training		T				T							T	
CP4	Training		T	T				T							T
CP5	Training					T					T		T		
CP6	Training					T				T			T		
CP7	Trial	X			X								X		
CP8	Trial	X			X							X	X		
CP9	Trial		X		X			X				X	X		
CP10	Trial		X			X	X				X	X	X		
CP11	Trial	X				X					X			X	
CP12	Trial		X		X		X							X	
CP13	Trial	X			X									X	
CP14	Trial			X	X		X								X
CP15	Trial	X				X									X
CP16	Trial		X		X		X								X
CP17	Trial														
CP18	Trial														
CP19	Trial														
CP20	Trial														
Crew Total		5	4	1	7	3	4	1	0	1	2	3	4	3	3
Crew 4-6 Total		15	12	3	21	9	12	3	0	3	6	9	12	9	9

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Trial Design – Mapping

Sim Approach #	Training / Trial	Stable Appr	Unstable Approach		Stable Land	Unstable Land	Speed	Profile	Config	Float	Drift	Low Vis	ILS	NPA High	NPA Low
			Above 500	Below 500											
CP1	Training	T			T								T		
CP2	Training	T			T								T		
CP3	Training		T				T							T	
CP4	Training		T	T				T							T
CP5	Training					T					T		T		
CP6	Training					T				T			T		
CP7	Trial	X			X								X		
CP8	Trial	X			X								X		
CP9	Trial		X		X		X					X	X		
CP10	Trial	X				X					X	X	X		
CP11	Trial		X		X		X								X
CP12	Trial	X			X										X
CP13	Trial	X				X					X				X
CP14	Trial		X			X		X		X				X	
CP15	Trial		X					X						X	
CP16	Trial			X			X							X	
CP17	Trial														
CP18	Trial														
CP19	Trial														
CP20	Trial														
Crew Total		5	4	1	5	3	3	2	0	1	2	2	4	3	3
Crew 1-3 Total		15	12	3	15	9	9	6	0	3	6	6	12	9	9
Crew 1-6 Total		**30**	**24**	**6**	**36**	**18**	**21**	**9**	**0**	**6**	**12**	**15**	**24**	**18**	**18**

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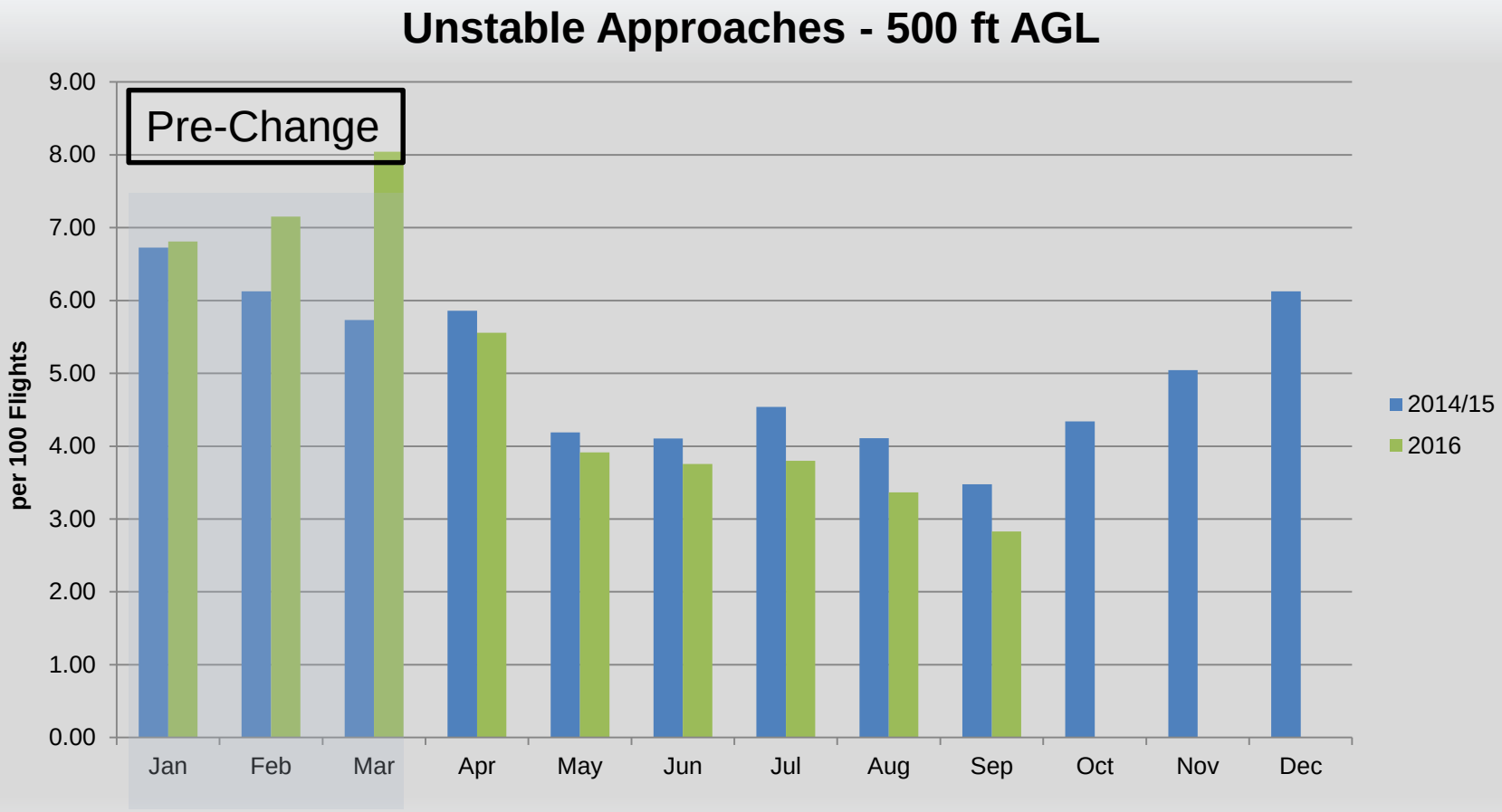
Airline Experience – 6 months



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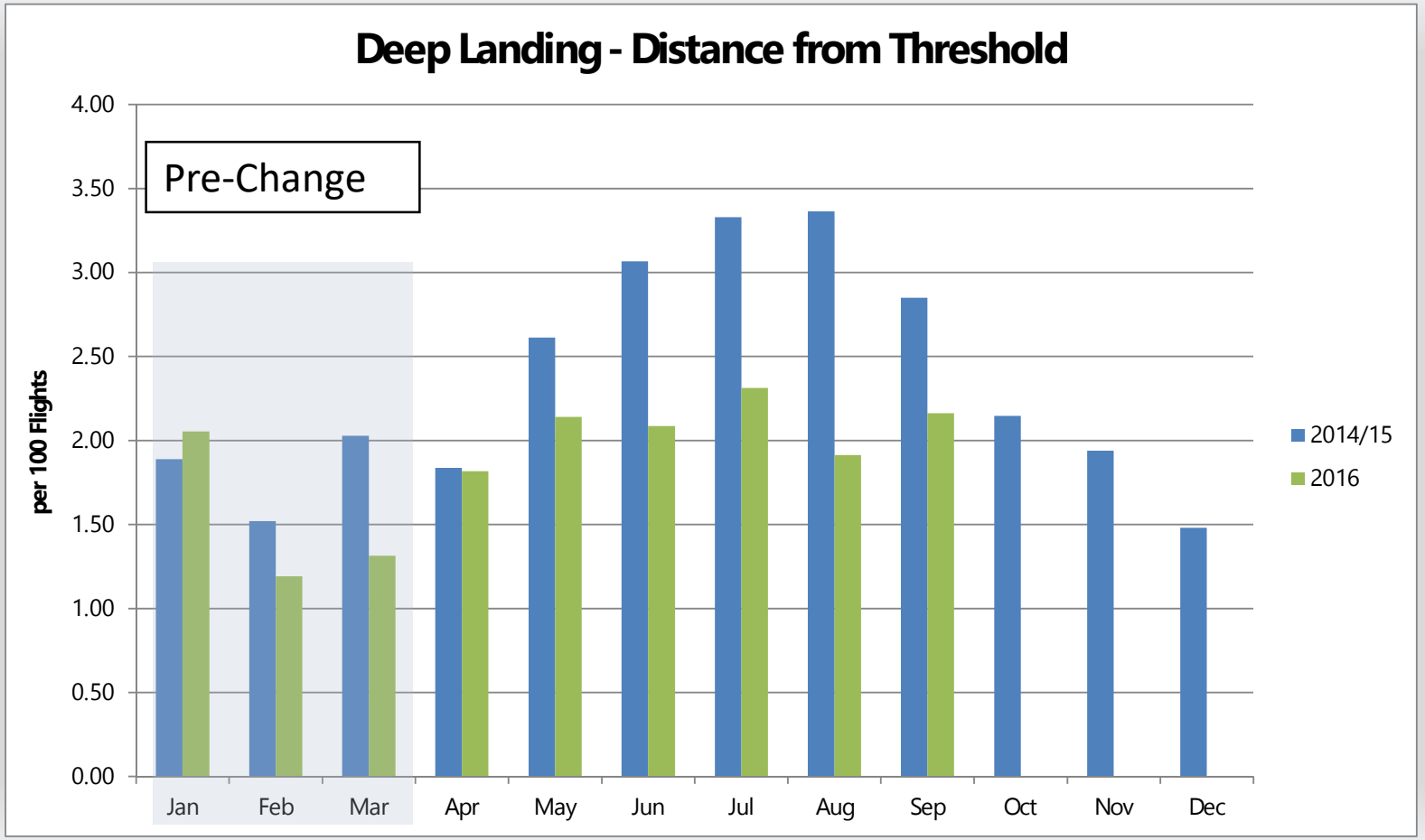
Airline Experience – 6 months



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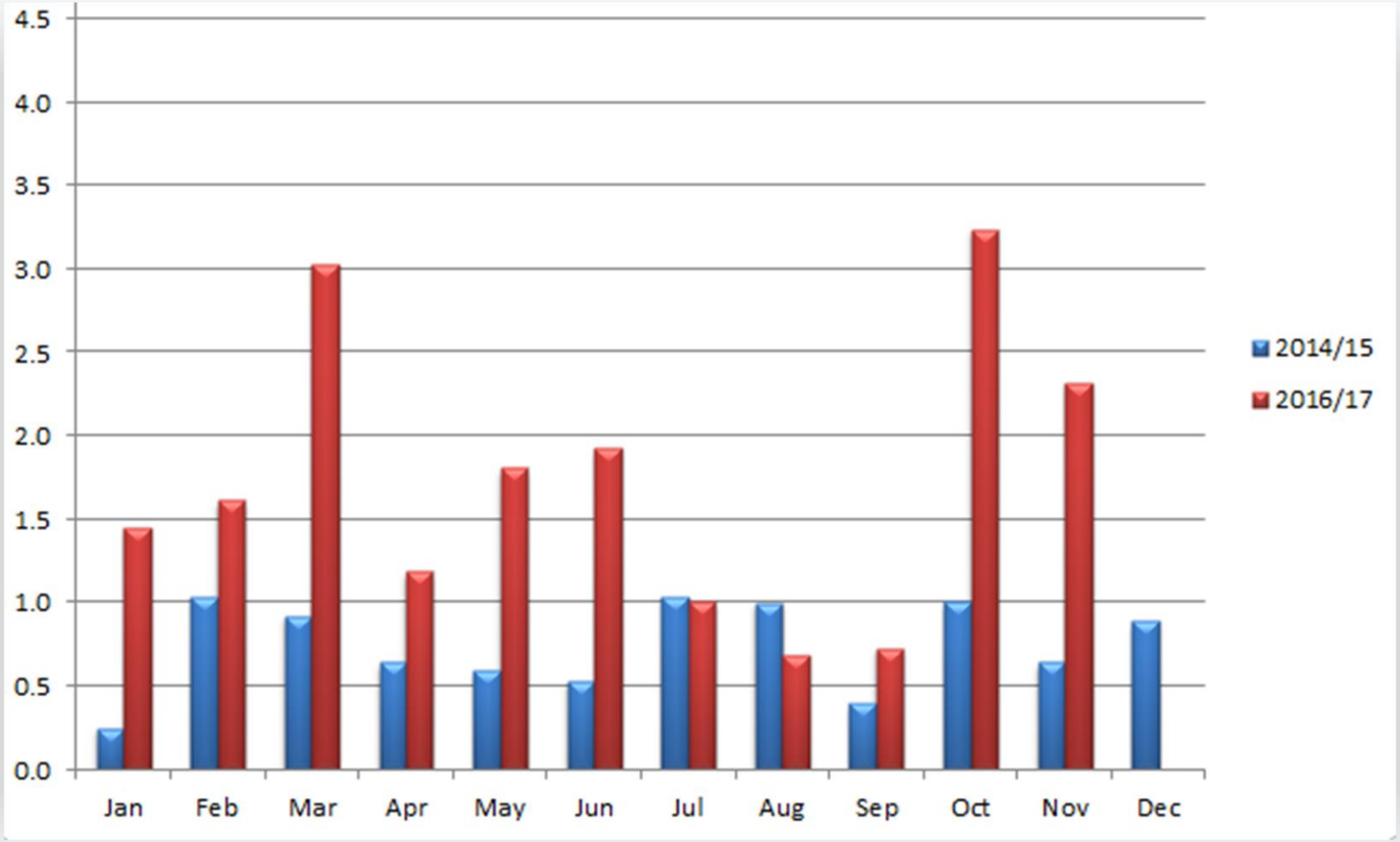
Go Around Rate from < 100’ Rad Alt



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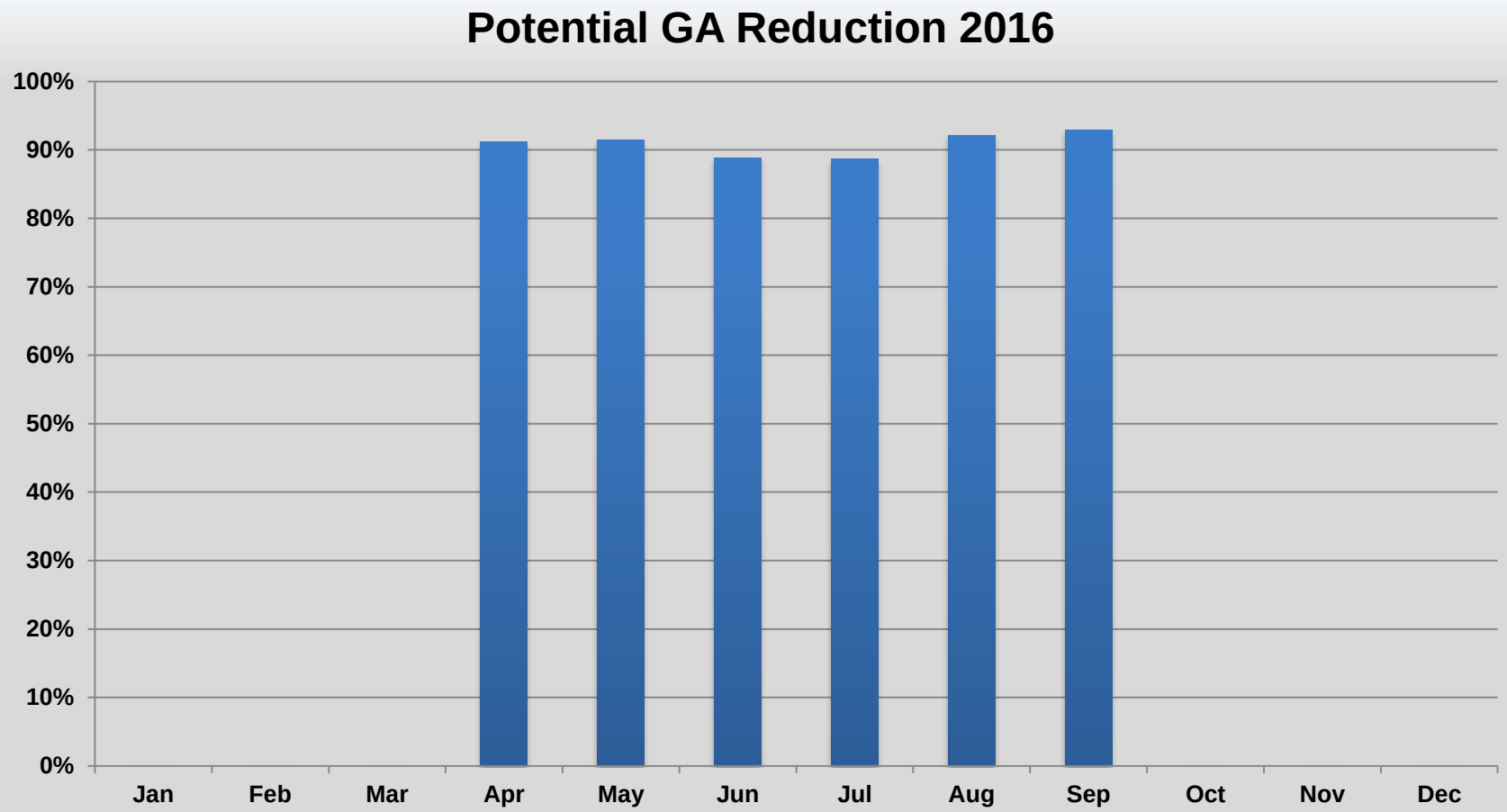
Potential GA Reduction 2016



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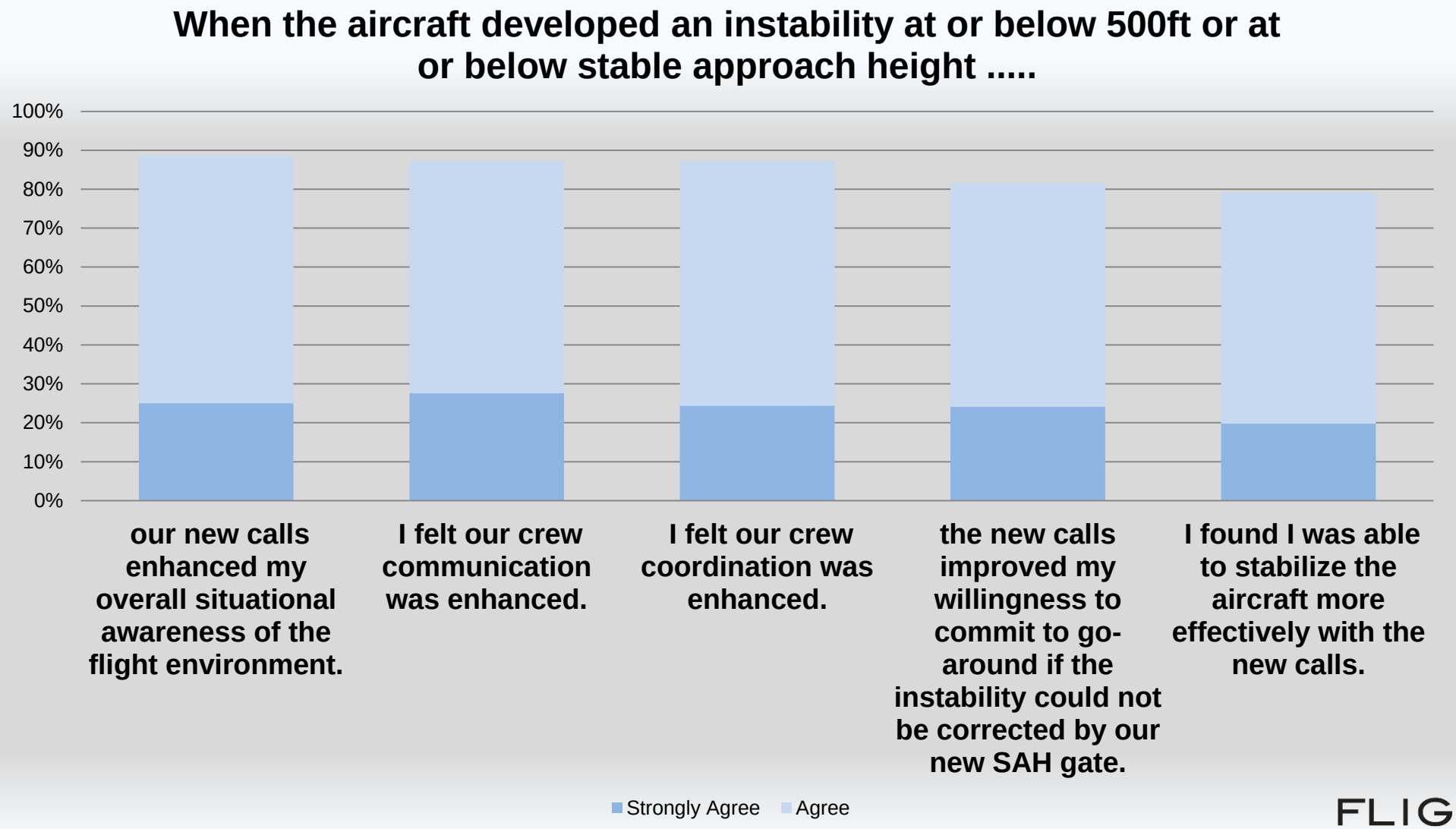
Results – Impact on Psychology



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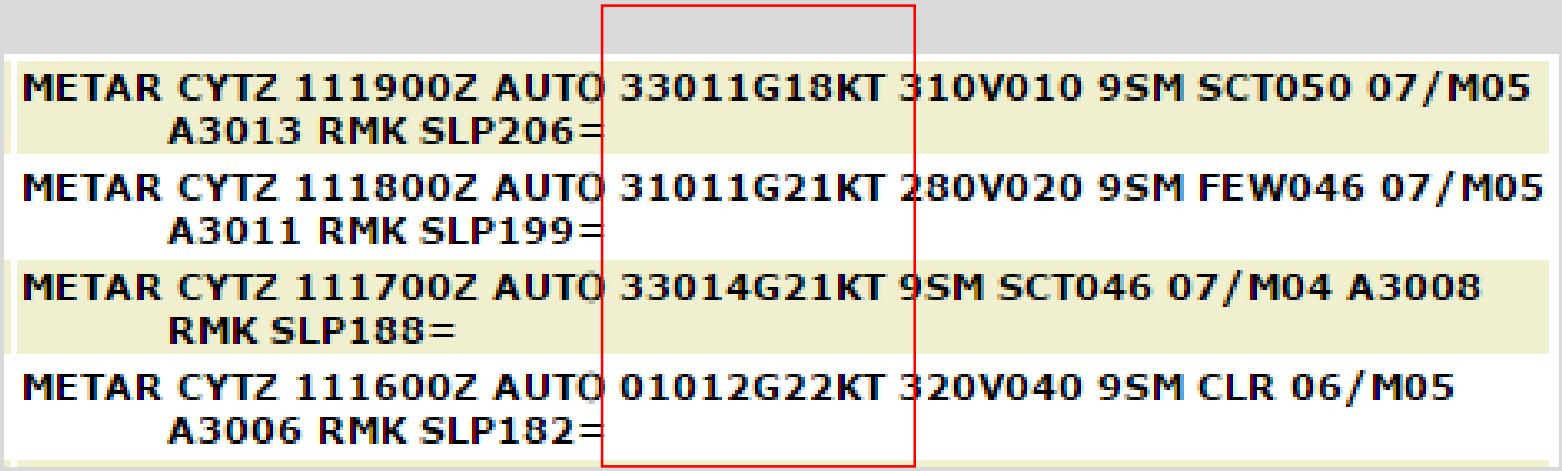
Message from the FDM Manager…

- Of anecdotal interest, on 11NOV2016, **5** aircraft initiated go-arounds in the flare at YTZ. METARs for this period...



METAR CYTZ 111900Z AUTO 33011G18KT 310V010 9SM SCT050 07/M05 A3013 RMK SLP206=

METAR CYTZ 111800Z AUTO 31011G21KT 280V020 9SM FEW046 07/M05 A3011 RMK SLP199=

METAR CYTZ 111700Z AUTO 33014G21KT 9SM SCT046 07/M04 A3008 RMK SLP188=

METAR CYTZ 111600Z AUTO 01012G22KT 320V040 9SM CLR 06/M05 A3006 RMK SLP182=

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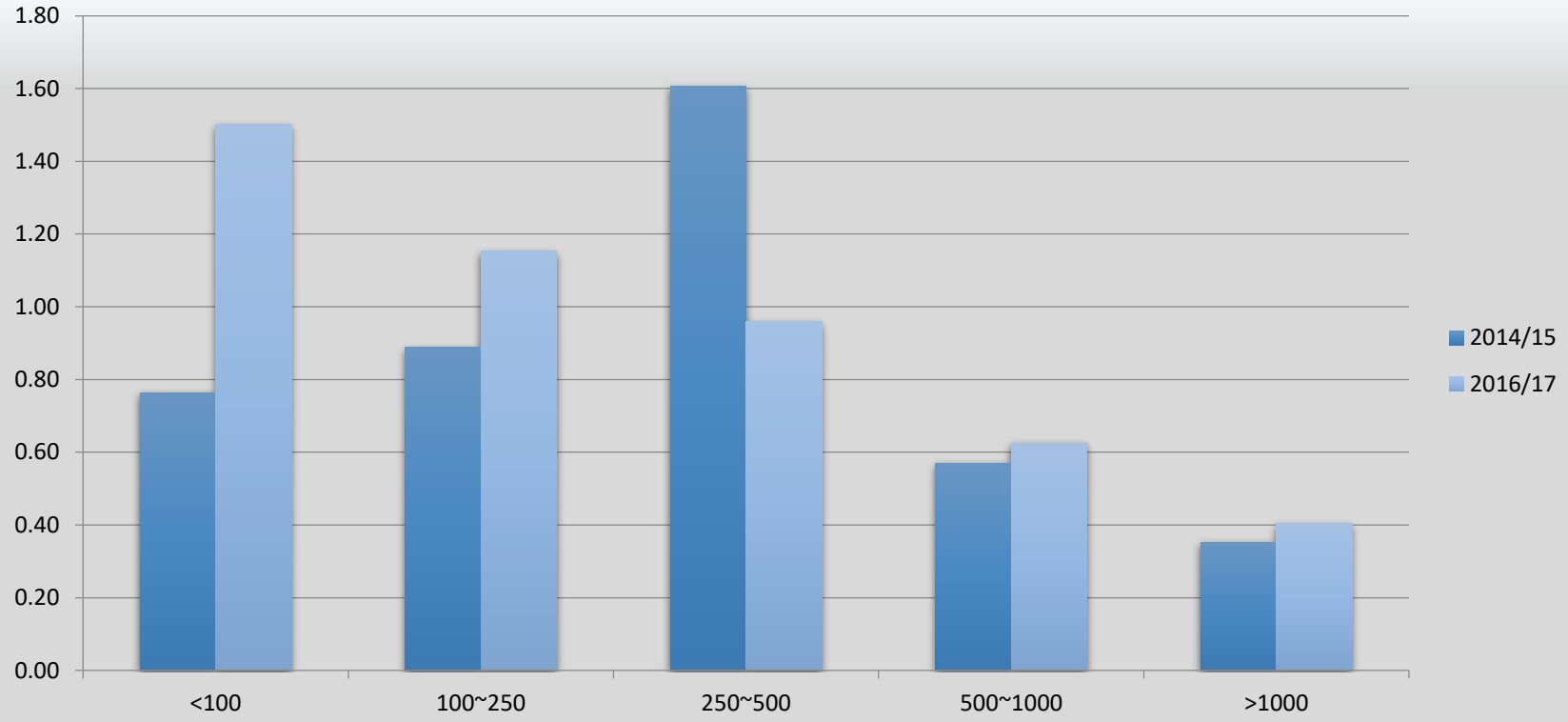
Data – Where do the Go-Arounds Occur?



- Go Arounds from being unstable are still happing at all points 1000'AGL and below
- The increase of go arounds at 100'AGL implies that the procedure is working – **fewer unnecessary go-arounds**

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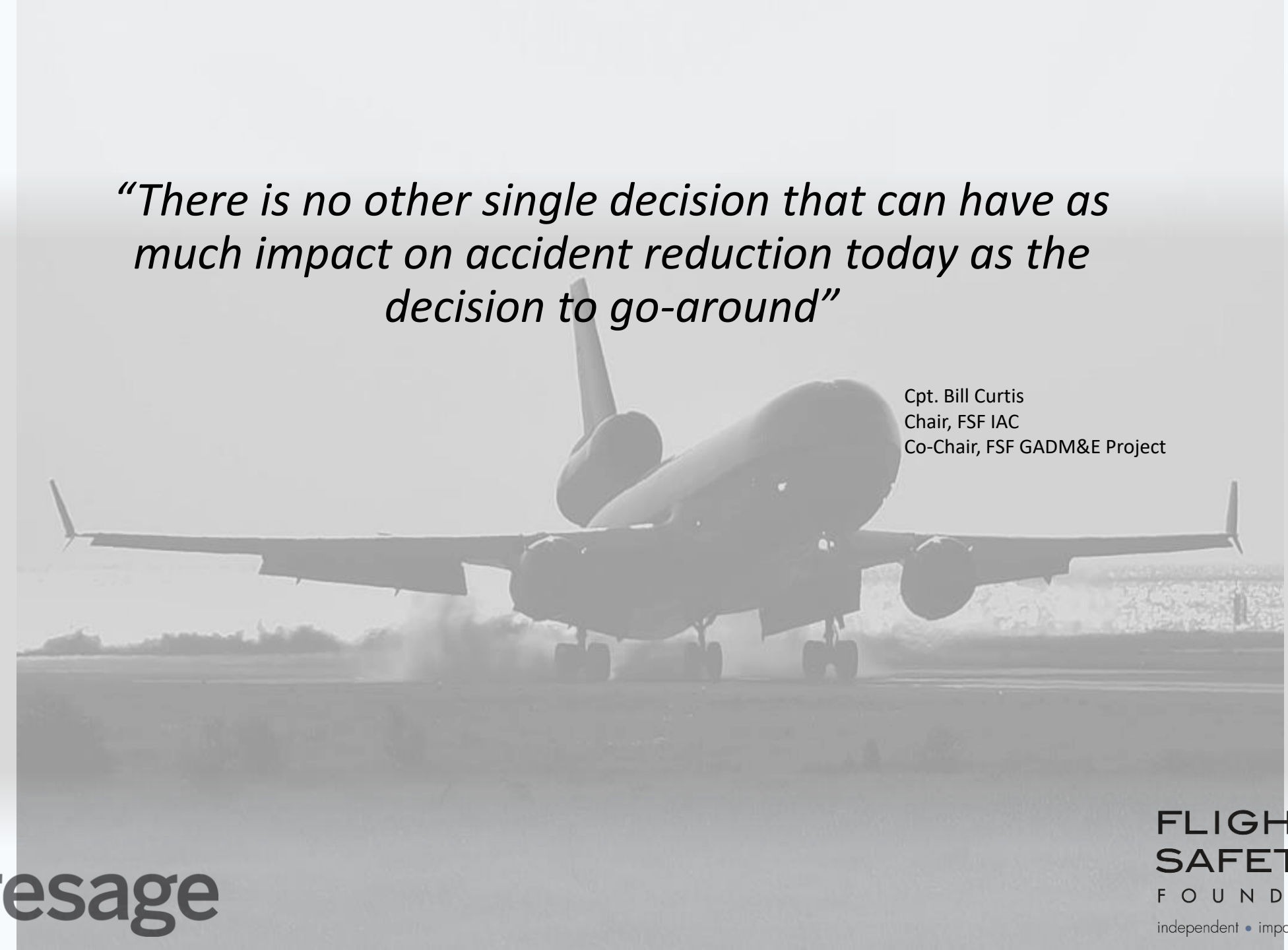
“There is no other single decision that can have as much impact on accident reduction today as the decision to go-around”



Cpt. Bill Curtis
Chair, FSF IAC
Co-Chair, FSF GADM&E Project

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NEXT STEPS

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Project Lifecycle

Activity	Month 1-2	Month 3-4	Month 4-5	Month 6-9	Month 10-11
Stakeholder Engagement, Survey Approval	✔				
Survey Deployment		✔			
Data Analysis			✔		
Development of Recommendations				✔	
Report of Findings					BASS 2019

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