Go-around Safety Forum
18 June 2013
Brussels:

Findings and Conclusions

CONTENTS

Executive Summary

This report describes the background, objectives, and outcomes of the Go-around Safety Forum, initiated by the Flight Safety Foundation, The European Regions Airline Association and EUROCONTROL that took place on 18 of June 2013 in EUROCONTROL Brussels.

The Go-around Safety Forum was launched to support the Flight Safety Foundation go-around safety initiative and to help the early implementation actions for the European Action Plan for the Prevention of Runway Excursions (EAPPRE), issued in January 2013.

The principal Forum conclusions included the following:

❑ Go-around is a normal phase of flight and pilots should be encouraged to go-around when conditions warrant. However, promoting go-around as a normal flight phase does not mean that there are no safety issues associated with it.

❑ The majority of accidents over the last 10 years have occurred during the approach, landing and go-around flight phases. In 2011 68% (63) of accidents in commercial aviation occurred during these phases of flight. The lack of a go-around decision is the leading risk factor in approach and landing accidents and is the primary cause of runway excursions during landing. Yet, less than 5% of unstabilised approaches lead to a go-around. No other single decision could have as great an impact on the overall aviation industry accident rate.

❑ One in ten go-around reports record a potentially hazardous go-around outcome, including exceeded aircraft performance limits or fuel endurance.

❑ The height at which a go-around is initiated during an approach presents different challenges and risks. Procedures and training should explicitly address this.

The Forum discussed in-depth the issues related to go-around decision making, go-around execution, go-around training and ATM aspects of safe go-around and formulated a series of conclusions to respond to the following eight safety improvement strategies:

❑ **S1** Enhance crew dynamic situational awareness.

❑ **S2** Refine the go-around policy (stable approach parameters and stable approach height).

❑ **S3** Minimise the subjectivity of go-around decision making.

❑ **S4** Ensure that go-around training and awareness appropriately reflect different risk execution scenarios.

❑ **S5** Review go-around policy, procedures and documentation to maximize their effectiveness, clarity and understanding.

❑ **S6** Ensure that low relevant experience of one or both crew does not prejudice the effectiveness of cross monitoring during approach, landing and go-around.

❑ **S7** Communicate the go-around issue to industry leaders.

❑ **S8** Communicate the go-around issue to operational stakeholders.

Chapter 1
Introduction

1.1   What is the purpose of this report?

Documenting and communicating.

This report describes the background, objectives, and outcomes of the Go-around Safety Forum, initiated by the Flight Safety Foundation, The European Regions Airline Association and EUROCONTROL. The Forum took place on 18 of June 2013 in EUROCONTROL Brussels and was held in partnership with European Commercial Safety Team (ECAST), ICAO, IFATCA, UK CAA, UK NATS, IATA, ECA and DGAC (France).

1.2   The safety aspects of go-around

Go-around is a safe phase of flight and like any phase of flight it has safety aspects.

Go-around (GA) is a normal phase of flight and the operational risk associated with this phase should be comparable to those related to other phases.

Promoting go-around as a normal flight phase does not mean that there are no safety issues associated with it. The safety risk associated with go-around should be considered.

Indeed, several independent studies, as well as multi-year statistics, confirm what aviation experts have known for many years - the lack of go-arounds is the leading risk factor in approach and landing accidents and is the primary cause of landing runway excursions.

More disturbing is the magnitude of the go-around decision making statistics - within the studies only 1.4% to 3% of unstable approaches lead to a go-around.

Furthermore, when a go-around occurs – it is often poorly performed.   In fact, although runway excursion accident numbers are much higher than go-around accidents, it is the go-around accidents that are, percentage wise, more fatal.

1.3   Flight Safety Foundation Go-around Initiative

Realising the importance of reducing the go-around contribution to the safety risk, the Flight Safety Foundation launched a dedicated initiative to address two problem areas:

Addressing Decision Making and Execution.

❑   Mitigate all industry runway excursions due to unstable approaches. Reduce the number of inappropriate decisions to not go-around by 50% in 5 years. Achieving a high level of compliance with unstable approach go-around policies where the instability is known to the flight crews, and the go-around is warranted by the unstable approach criteria, will mitigate industry runway excursions.

❑   Reduce the accident rate during go-arounds by 80% in 10 years. Ensuring flight crew awareness of associated risks, and execution competency will mitigate industry go-around accidents.

1.4   The objectives of the Go-around Forum

One day, One Issue, One Co-ordinated Outcome Event.

The Go-Around Safety Forum (GASF) was launched to support the Flight Safety Foundation go-around safety initiative and to help the early implementation actions for the European Action Plan for the Prevention of Runway Excursions (EAPPRE), issued in January 2013. Targeting operational and safety professionals the intention was to hold a one-day event, with a clear focus on go-around safety aspects which would lead to the creation of an event report and supporting awareness material.

1.5   Participants

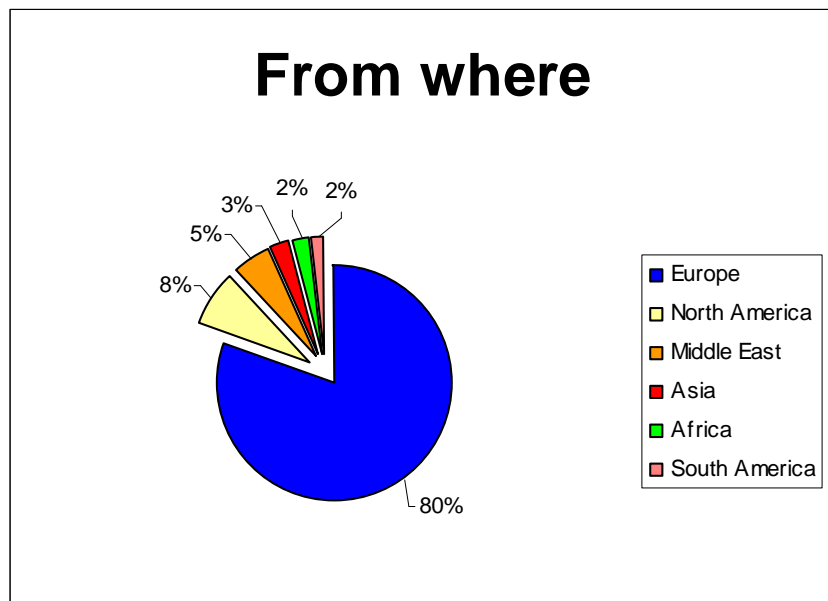**Go-around Safety Forum was attended by 276 participants. The reach to front line operators was significant: there were 117 pilots and controllers.**

276 Participants

■	Aircraft Operators
■	ANSP's
■	Authorities
■	Manufacturers
■	Training Organisations
■	Other
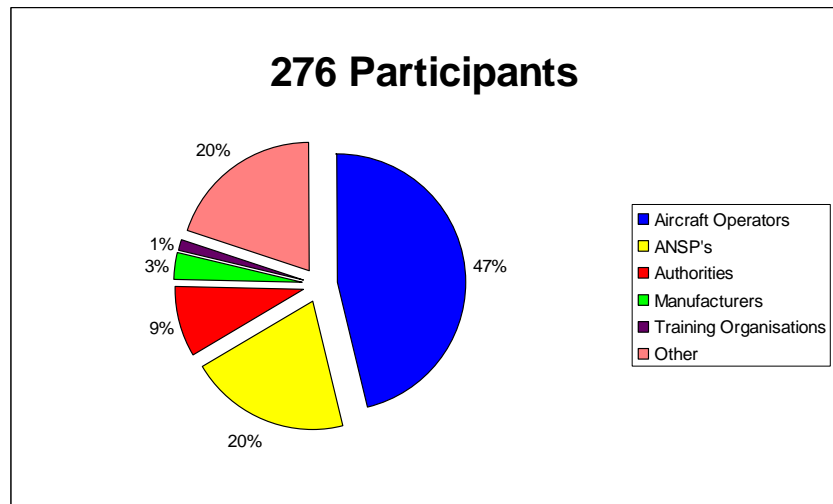
Participants to the Go-around Safety Forum came from 5 Continents.

From where

■	Europe
■	North America
■	Middle East
■	Asia
■	Africa
■	South America

1.6   Outline of the Forum results

Findings, Strategies and Conclusions

The Forum results were summarised in a series of Findings and eight Strategies were developed to help structure the response to the Findings into Conclusions. These Conclusions were grouped according to their predominant relevance for a particular audience and addressed to the Industry in general, to Aircraft Operators, ANSPs and Regulatory Authorities..

Chapter 2
Findings

REF	FINDINGS
F1	Go-arounds occur with an average rate of 1-3 per 1000 approaches. There is a large variation of go-around rates among different aircraft operators and operational environments.
F2	Go-around is a normal phase of flight and pilots should be encouraged to go-around when conditions warrant. However, promoting go-around as a normal flight phase does not mean that there are no safety issues associated with it.
F3	The majority of accidents over the last 10 years have occurred during the approach, landing and go-around flight phases. In 2011 68% (63) of accidents in commercial aviation occurred during these phases of flight.
F4	The lack of go-around decision is the leading risk factor in approach and landing accidents and is the primary cause of runway excursions during landing. Yet, less than 5% of unstabilised approaches lead to a go-around.
F5	No other single decision could have as great an impact on the overall aviation industry accident rate.
F6	One in ten go-around reports record a potentially hazardous go-around outcome, including exceeded aircraft performance limits or fuel endurance.
F7	Go-around is relatively rare manoeuvre for most commercial pilots. On average, a short haul pilot may make a go-around once or twice a year and a long haul pilot may make one every 2 to 3 years. This might partially explain pilot reluctance to perform a go-around.

F8	Encouraging pilots to be "go-around minded" is essential for operational safety and an analogy may be drawn with "go-minded" after V1 is passed during take off.
F9	Making a go-around carries risks which include: ❑ Ineffective initiation of go-around can lead to Loss of Control (LOC) ❑ Failure to maintain control during go-around can lead to LOC, including abnormal contact with the RWY, or to Controlled Flight Into Terrain (CFIT) ❑ Failure to fly required track can lead to CFIT or Mid Air Collision (MAC) ❑ Failure to maintain traffic separation can lead to MAC ❑ Wake turbulence generated may create a hazard to another aircraft that can lead to LOC
F10	The height at which a go-around is initiated during an approach can present different challenges and risks: ❑ At high altitude above the approach minima ❑ At the approach minima ❑ At low height below the approach minima
F11	A FSF study concluded that flight crews that continued an unstable approach to a landing (UA Pilots), vs. crews that decided to go around, scored lower on all 9 dynamic situational awareness constructs, and demonstrated significantly less discussion about potential threats
F12	Based on a FSF study, pilots who continued approaches unstable, compared with those who go around, are less compliant with checklist use and standard calls. Most pilots do not feel they will be reprimanded for non compliance with GA policies and additionally do not feel company go around criteria is realistic. Most pilots feel regret after continuing to land unstable.
F13	Based on a FSF study, flight crews who continued approaches unstable were more comfortable operating on the margin of the safety envelope, and find little failsafe in protective crew norms and processes. They will use a convenient, easy justification for non compliance.
F14	A FSF study determined that most pilots believe their company instability criteria for a go around is unrealistic and their personal thresholds are below 1000 feet for profile and around 500 feet for energy management. UA pilots scored lower on most of the 9 dynamic situational awareness constructs. There is little disincentive for non compliance, nor incentive for compliance to GA policies
F15	Low experience of one or both pilots is associated with difficulty in flying go-arounds.
F16	Violating approach minima is associated with subsequent go-arounds with a reduced safety margin.
F17	It is necessary for operators to be aware of the extent to which go-arounds are flown and the reasons for them as well as the extent to which those flown are safe.
F18	A just culture must prevail if problems in go-around safety are to be sufficiently understood and addressed.
F19	Extreme energy states make unsafe execution of go-arounds more likely and this situation can be exacerbated by a failure to understand how to manage aircraft pitch.
F20	The safety of a go-around is compromised by a delay in deciding to commence one where the

	aircraft becomes unstabilised below a mandatory Stabilised Approach 'Gate'.
F21	The decisions which precede unsafe go-arounds are often made other than at pre-determined procedural decision points.
F22	Pilot go-around training needs to be fully integrated with an Operator's SMS.
F23	Pilot monitoring effectiveness is often poor and can affect the safe execution of go-arounds.
F24	Lack of a proper understanding of automation can affect go-around safety.
F25	Pilot understanding of how their pitch control system works is not always apparent during go-arounds.
F26	The potential for traffic and/or wake vortex conflict during a go around is sometimes reduced if situational awareness of other traffic in the vicinity was available to pilots.
F27	The transition to a go-around from a circle-to-land approach is sufficiently rare and complex that maintaining competency will usually require an unrealistic amount of recurrent training in proportion to other requirements.
F28	The extent of controller training in respect of go-around risk management is variable.
F29	Controllers sometimes provide instructions which may prevent pilots from making a stabilised approach and thereby create an increase in the number of go-arounds.
F30	Go-around procedures can be complex at a time of high workload for pilots. Go-around procedures are not always published. Tactical de-confliction of go-around can place high demands on controllers. There are multiple approach/MAP procedures for the same RWY at many airports.
F31	Due to rapidly changing weather and RWY conditions the pilot doesn't always have the latest information on which to base a landing/go-around decision.
F32	Too much information in one transmission (explanation of reason and executive instruction) can lead to confusion. Late go-around instructions and changes to published MAP, unless these clearly simplify it, increase workload for pilots.
F33	There is an over willingness of pilots to accept ATC instructions. Controllers sometimes issue instructions which are not compatible with aircraft performance. Controllers sometimes issue instructions at times of high pilot workload. Use of unpublished go around/MA tactical instructions at/after go around initiation can place high demands on pilots. There is no direct link between Aircraft Operator and ATC go-around training/awareness.
F34	Current pilot go-around procedures may not adequately address all the circumstances in which an ad hoc go-around decision may be made, especially if this ia above 1000 ft aal or below a decision to continue made at DA/MDA.
F35	Go-around operational challenges are not adequately reflected in current regulatory requirements.
F36	Go-arounds are an integral component of TWR/APP service provision but are not explicitly covered in all aspects of Common Core Content for controller training published by EUROCONTROL.

Chapter 3
Strategies for Go-around
Safety Improvement

3.1   *Strategies to ensure go-around decision making*

Strategy 1	Enhance Crew Dynamic Situational Awareness.
Strategy 2	Refine the go-around Policy (stable approach parameters and stable approach height).
Strategy 3	Minimise the Subjectivity of go-around decision making.

3.2 Strategies to ensure go-around safe operational execution

Strategy 4.	Ensure that go-around training and awareness appropriately reflect different risk execution scenarios.
Strategy 5.	Review go-around policy, procedures and documentation to maximise their effectiveness, clarity and understanding.
Strategy 6.	Ensure that low relevant experience of one or both crew does not prejudice the effectiveness of cross monitoring during approach, landing and go-around.

3.3 Communication Strategies

Strategy 7.	Communicate the go-around safety issue to industry leaders.
Strategy 8.	Communicate the go-around safety issue to operational stakeholders.

Chapter 4
General Industry
Conclusions

REF	Strategy	Finding	CONCLUSION
GEN1	S4, S7, S8	F36	EUROCONTROL Agency should review the ATCO Training Common Core Content to consider the applicability of adding specific objectives and supporting comments related to ATCO responsibilities regarding go-around/Missed Approach.
GEN2	S4, S5	F33	Aircraft Operators and ATC should improve the mutual understanding of each other's go-around practices/procedures.
GEN3	S4,S7, S8	F33	The Industry partners should develop a go-around training aid.

Chapter 5
Aircraft Operation
Conclusions

REF	Strategy	Finding	CONCLUSION
AO1	S1	F11	Develop SOPs to discuss instability threat factors during approach briefings prior to descent.
AO2	S1, S3	F11	Develop SOPs to (briefly) state critical instability factors strategically throughout the approach.
AO3	S1, S3	F11	Develop 'active' communications procedures for each approach that are 'objective', 'progressive', and 'sequential', similar in concept to EGPWS or TCAS systems.
AO4	S1, S2	F12	Ensure unstabilised approach and go-around policies are clear, concise and unambiguous, including follow up procedures for non-compliance.
AO5	S1, S3	F13	Avoid directive or suggestive calls that may compromise on going decision making, e.g., announcing, "Landing" at minimums.[1]
AO6	S2	F14	Re-define the stable approach criteria and stable approach height(s). In redefinition there is a valid argument to separate the profile (vertical and lateral) from the other stable approach criteria.[2]

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[1] A note, concerning this conclusion, has been recorded: The call out "Land" at minima informs the other pilot about the aircraft is in condition to land and that the PF intends to go on. Considering that a go-around can be initiated at any point including after the landing, changing standard call-out which is already in use does not appear to show a safety benefit.

AO7	S1	F11	Provide ongoing training to enhance psychosocial[3] awareness and management, the components and their contribution to non-compliance during the approach phase.
AO8	S6	F15	Cross monitoring effectiveness must recognise the importance integrating low experience pilots into effective contribution to go around decision and execution.
AO9	S5	F16	Pilots and their employers should understand that approach minima violation, is unacceptable because the evidence indicates that if a go-around then has to be made, the chances of a successful transition are reduced.
AO10	S5	F17	The incidence of go-arounds should be continually tracked by Aircraft Operators based on a requirement for all PICs to file on the day of occurrence reports which explain the circumstances of the go-around. This will provide context to triggered OFDM events.
AO11	S5	F18	Operations Manuals must contain a strongly worded policy statement which shows that, provided a full explanatory report is provided on any go-around made, no punitive action will follow. In addition, any 'feedback' will be provided in writing and be incapable of interpretation by a dispassionate expert observer as prejudicial to future operational safety.
AO12	S4	F19	Pilots must be able to demonstrate that they are able to safely execute go-arounds commenced from high energy and low energy states at the point where the go-around decision is indicated.
AO13	S4, S5	F20	Pilots must be able to exercise tactical judgment as well as procedural compliance when deciding to go-around below the mandatory stabilised approach gate so that safe execution is not prejudiced by an inappropriate delay in the decision. Validation of this must be achieved by realistic training scenarios.
AO14	S4	F21	Go-Around training should include a range of operational scenarios, including go-arounds from positions other than DA/MDA and the designated Stabilised Approach Gate. Scenarios should involve realistic simulation of surprise, typical landing weights and full power go-arounds.
AO15	S4	F22	Include lessons learned from operational events/incidents into go-around training.
AO16	S4	F23	Clear guidance should be provided to pilots on how to act in respect of the three stages of cross-monitoring during approach, landing and go around i.e. - noticing/alerting/taking control. Observing members of augmented crews should have a clear understanding of their monitoring role.
AO17	S1, S4, S5	F24	Pilot training to execute GA in automatic modes should be explicitly included and Aircraft Operator automation policy should address the go-around procedure.
AO18	S4	F25	Pilots should have a clear understanding of how the pitch control system works on the aircraft type they fly. This should be validated by both theoretical testing and suitable simulator exercises conducted with full rather than reduced power/thrust available at typical landing weights.

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[2] A note, concerning this conclusion, has been recorded about the value of (1) at least one 'should' gate prior to a ',must' gate and (2) a mandatory gate as low as practicable (500ft)
[3] Relating to the interrelation of social factors and individual thought and behaviour

Chapter 6
Air Traffic Management Related Conclusions

REF	Strategy	Finding	CONCLUSION
ATM1	**S1, S5**	**F26**	Procedures which allow communication with aircraft operating on the same frequency at international airports carried out in languages other than English should be reviewed by means of a safety case to establish if they can contribute to loss of pilot situational awareness of potentially conflicting traffic during go-arounds.
ATM2	**S5**	**F27**	A high priority should be accorded to the provision of RNP approach and missed approach procedures where current procedures involve circle-to-land and active radar surveillance of a transition to a go-around is not available. Consideration should be given to withdrawing circle-to-land procedures at aerodromes where neither option is available.
ATM3	**S4**	**F28**	ANSPs should review and if necessary enhance the provision of go-around risk awareness training for controllers.
ATM 4	**S4, S5**	**F29**	Ensure that the importance of a stabilised approach and compliance with final approach procedures is included in training and briefing for air traffic control staff (European Action Plan for the Prevention of Runway Excursions Recommendation 3.3.1) *Implementation Advice - Training should include:* ▪ *Appropriate speed control instructions* ▪ *Timely descent instructions*

			▪ *The importance of avoiding late change of runway or type of approach* ▪ *Assigning a landing RWY with no significant tailwind component* ▪ *Avoidance of vectoring too tightly onto final approach and intercepting glide path from above* ▪ *Providing crew correct information about distance to touchdown*
ATM 5	**S5**	**F30**	The agency responsible for procedure design should ensure that straightforward go-around procedures are available and published for each runway These go-around procedures should be designed in consultation with pilots who will be expected to use them. *Implementation Advice:* ▪ *The MAP procedure for each runway should be the same or similar* ▪ *Avoid low first stop altitude and early turn in the missed approach procedure (e.g. below 2000ft)* ▪ *Avoid conditional go-around/MAP procedures, e.g. "after xxx but not later yyy…"* ▪ *Avoid lack of procedural de-confliction of the missed approach path from other traffic and wake turbulence exposure, especially for late go-arounds* ▪ *Perform risk assessment if both RNP and conventional missed approach procedures are published*
ATM 6	**S4, S5**	**F31**	Flight crew should receive updated weather and RWY conditions information on final approach. Contingency arrangements/procedures should exist for use in windshear conditions. *Implementation Advice:* ▪ *More relevant & quicker update of weather related information - visibility, wind, RWY status change, e.g. quantity of water on the RWY* ▪ *Improved information to be provided to crews on tailwinds, windshear and significant wind variation, including reports from preceding aircraft* ▪ *RWY information should include FODs, animals on RWY, technical problems on the ground, laser interference, etc*
ATM 7	**S5**	**F32**	Guidance should be developed for controllers regarding content and timings of go-around instructions. *Implementation Advice:* ▪ *Consider whether the go-around instruction should be in a separate transmission to the explanation for the instruction* ▪ *ATCO should specify any non-standard MAP when issuing the approach clearance* ▪ *ATCO should avoid last minute changes/instructions* ▪ *Once a go-around is initiated, unnecessary RTF should be avoided* ▪ *Pilot should inform ATC as soon as possible if deviations from the published go-around-procedure become required*
ATM8	**S4, S5**	**F33**	ANSPs should establish a formal interface between pilots and controllers where issues can be explored and a joint understanding can be reached. *Implementation Advice:* ▪ *Pilots can be invited to attend controllers' training sessions and vice versa* ▪ *Facilitated open days for pilots at ATC Units and familiarisation flights for ATCOs* ▪ *Joint CRM training*

Chapter 7
Aircraft Manufacturers Conclusions

REF	Strategy	Finding	CONCLUSION
AM1	S1, S3	F11	Consider whether it is practicable to develop automated stable approach monitor and alerting systems.
AM2	S5	F34	Ensure that go-around procedures presented in aircraft pilot training and aircraft operating manuals are applicable to go-arounds commenced at any stage on final approach up to and including landings rejected after touchdown.

Chapter 8
Regulatory Authorities
Conclusions

REF	Strategy	Finding	CONCLUSION
REG1	**S4**	**F11**	Review the go-around training requirements and regulatory developments for pilots and ATCOs to ensure that the conclusions of this report are properly reflected.