MISMANAGED GO-AROUNDS AND THE NEED TO MITIGATE THEIR OCCURRENCE

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Abstract: A missed approach (otherwise known as a go-around) is a part of an instrument approach procedure. It is a maneuver conducted by crew when an instrument approach procedure cannot be completed to a landing.
Main objectives of the study:

- To measure the performance of flight crew performing unexpected go-arounds and the number of errors made. (In a simulated environment)

Sub-objectives of the study:

- To determine whether a co-relation exists between the occurrence of error and the number of missed approaches carried out.
- To evaluate the severity of the errors.

A standardized grading system was used to measure the errors observed, the grading system was adapted from the grading system adopted by the airline industry currently. Constraints were imposed on the crew (weather) to observe the effects of external stress factors on crew performance. 15 sets of crew were tested from Feb 14 to July14 on 3 types of aircraft, B-777, B-787 and A-320 (full flight six axis simulators).

Keywords: go-arounds, mis-managed go-arounds, undesired aircraft state during a missed approach, performance errors.

1. Introduction

A missed approach (otherwise known as a go-around) is a part of an instrument approach procedure, it is a manoeuvre conducted by a pilot, when an instrument approach cannot be completed to a landing. This could be due to a variety of reasons, but the most likely reasons for a missed approach are, ATC (Air Traffic Control) or the meteorological conditions existing at the time of the approach. Flight crew errors are considered to be the primary factor in seventy percent of approach and landing incidents/ accidents. Studies have shown that the errors tend to be of a cognitive nature, among others they tend to be errors of judgment and errors caused due to a loss of situational awareness.

Due to the fact that go-arounds are an uncommon manoeuvre for most pilots, the hypothesis was that errors would increase with every missed approach or go-around that is carried out. A study was conducted to observe the performance of flight crew performing unexpected go-arounds, and determine whether a correlation exists between the occurrence of errors, and the number of missed approaches the crew carried out.

2. Study

A Scenario in a simulated environment was created to allow the pilots to fly from point A to point B.
The fuel provided to the crew was sufficient to carry out a maximum of four approaches.
15 sets of crew (a total of 30 pilots) were used in the study; their age group ranged from 24 years to 60 years and their flying experience ranged from 700 hours to 18,000 hours. All the participants were male and type-rated and current on the aircraft they were being observed on.
All 15 sets of crew attempted two approaches and two go-arounds or missed approaches. 7 sets of crew attempted a third approach and a go-around before a diversion was considered.

2.1. Grading and evaluation of the crew's performance

The sessions were observed and graded according to a set of performance indicators and competencies. A competency is commonly defined as a combination of the knowledge, skills and attitude needed to perform a task according to a prescribed standard. A three-point scale (1= poor performance, 2=acceptable performance, 3=ideal performance) was used for the study.
The data collected was classified according to the following performance markers:

1. (Technical) Automation
2. Procedures
3. Knowledge
4. Communication
5. Decision-making
6. Situation awareness
7. Workload management (Non-technical).

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While the evaluation of the Technical markers (Automation, Procedures and Knowledge) is relatively straightforward, the non-technical markers present more of a challenge. In order to remove any bias and subjectivity on the part of the observer, the grading criteria is based on the NOTECHS system created by the European Air and Space Agency (EASA, formerly known as JAA), and further explained by Flin 2003, pp. 95 – 117):

"Five operational principles were established to ensure that each crewmember receives as fair and as objective an assessment as possible with the NOTECHS system.

1. Only observable behaviour is to be assessed - The evaluation must exclude reference to a crewmember's personality or emotional attitude and should be based only on observable behaviour. Behavioural markers were designed to support an objective judgement.

2. Need for technical consequence - For a pilot's non-technical skills to be rated as unacceptable, flight safety must be actually (or potentially) compromised. This requires a related objective technical consequence."

2.2. Analysis of simulator observations

The observations can be looked at in two ways, the occurrence of errors per crew, and the number of actual errors.

Occurrence of errors: while some crew made a few errors on the 1st attempt - 3 out of 15 made errors (20%) the other 12 were error free, the errors increased as the crew undertook more approaches. The errors increased to 8 sets of crew out of 15 on the 2nd approach (53%), and on the 3rd attempt every single set of crew that attempted an approach made an error 7 sets of crew out of 7 (100%). It is important to note here that two crews who were totally error-free **did not** attempt the third approach.

Number of errors: for the number of errors the author looked at the data set as a whole to gauge the total number of errors possible. Given that there were 15 sets of crew and they were graded according to 7 markers, this allowed for a possibility of a total 105 errors. On the 1st attempt by all the crew a total of 4 errors were observed out of a total of 105 possible errors (3.8%), on the 2nd attempt a total of 16 errors were observed out of a total of 105 possible errors (15.23%). On the 3rd attempt however only 7 sets of crew attempted approaches and subsequent missed approaches so the maximum amounts of possible errors were 49, out of which a total of 15 errors were observed (30.6%)

Occurrence of error rating 1 (most severe error)

The author then looked at where errors occurred. It was found that which each approach as the stress of making a landing increased, the crew was committing more errors, with the majority being in decision making and situation awareness. For example, attempting to accomplish a landing with the tailwind component greater than 15kts, or actually going below the decision height and making a landing. On the first approach no errors on decision-making were observed.

The following charts were created from the data collected.

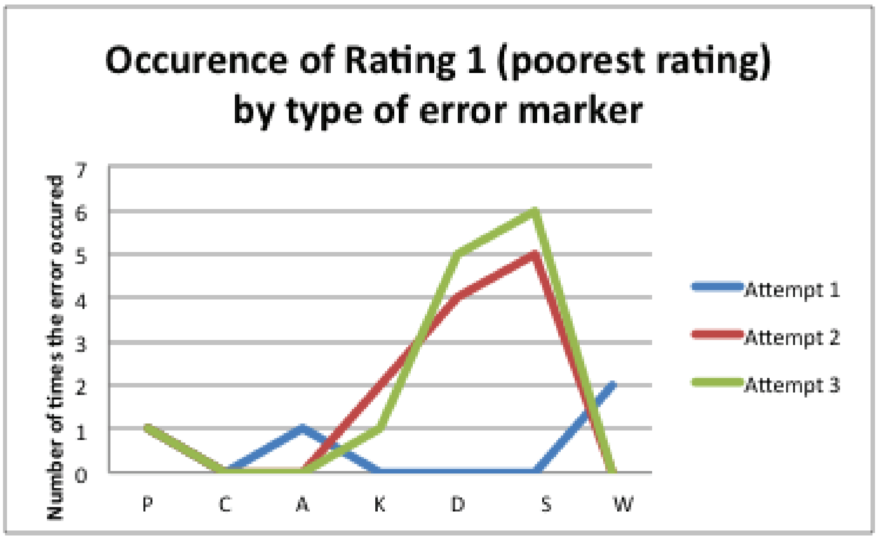

Fig. 1.
Occurrence of rating 1 (poorest rating) by type of error marker

This can be seen more clearly when we look at the charts for Rating 1 (Fig. 2) and Rating 3 (Fig. 3) separately:

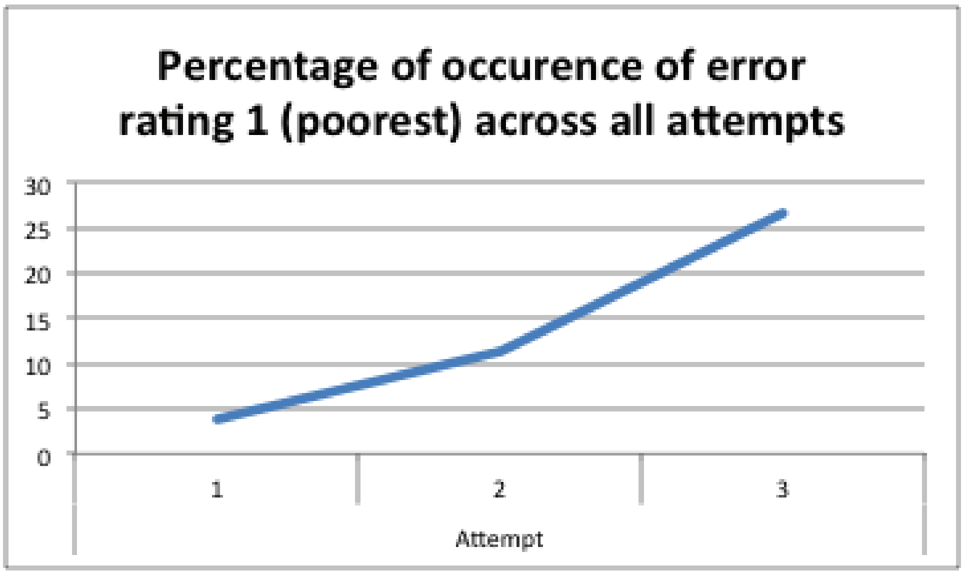

Fig. 2.
Percentage of occurrence of error rating 1 (poorest) across all attempts

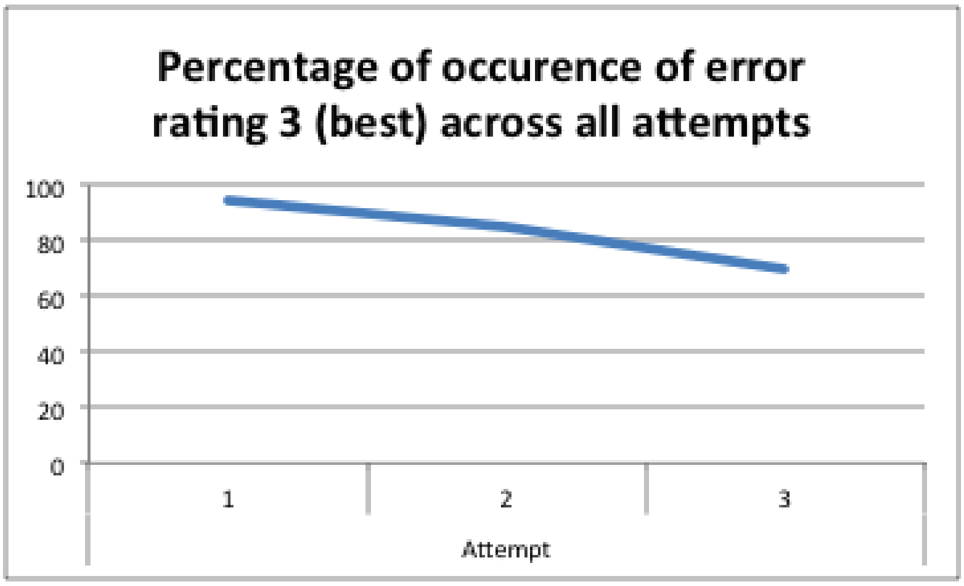

Fig. 3.
Percentage of occurrence of error rating 3 (best) across all attempts

3. Implications of mismanaged go-arounds in the aviation industry

This incident above shows the threat that mismanaged go-arounds can pose to flight safety. A degradation of situational awareness on the part of the crew almost led to an undesired aircraft state. As the research conducted demonstrates the errors increased with each subsequent go-around. As noted in the result section not only did the incident of errors increase on each subsequent go-arounds but the number of errors also showed a steep increase. Given the published statistic (Weigmann and Shappell 2003) that 70 to 80% of all aviation accidents are caused by human error it is therefore of vital importance to identify where these errors occur and take steps to reduce the possibility of their occurrence.
The hypothesis of this study was that human errors would increase with every missed approach or go-around that is carried out. This study clearly shows that mismanaged go-arounds are a potential source of error.

Objective	Outcome
To measure the performance of flight crew performing unexpected go-arounds and the number of errors made	It was noted that errors did occur when flight crews had to perform a go around. These increased with each subsequent attempt. On the first attempt 20% of the flight crews made errors in at least one performance marker. This increased to 53% on the second attempt and 100%

	(in at least one performance marker) on the third attempt.
To determine whether a correlation exists between the occurrence of errors and the number of missed approaches the crew carries out	There was a noted degradation in performance with each unexpected go-around. In addition to the occurrence of errors increasing, the number of these errors also increased. On the 1st attempt by all the crew a total of 4 errors were observed out of a total of 105 possible errors(3.8%), on the 2nd attempt a total of 16 errors were observed out of a total of 105 possible errors (15.23%). On the 3rd attempt however only 7 sets of crew attempted approaches and subsequent missed approaches so the maximum amounts of possible errors were 49, out of which a total of 15 errors were observed (30.6%).

4. Conclusion

Failing to abandon a risky approach when necessary can be disastrous, but several times in recent years go-arounds, formerly considered a simple maneuver, have themselves ended in disaster. Go-arounds occur between one and three times every 1000 flights (Flight International 29th July 2014). This gives rise to a very interesting question: is it safer to continue and land off an unstabilized approach or carry out a go-around? According to the Flight Safety Foundation 3.5-4% of all approaches are deemed to be unstable[2].

The results show strong and unambiguous support for the hypothesis, allowing the author to conclude that even though the research was single blinded if a more elaborate double-blinded process could be undertaken, the results would be similar. The results clearly show that a deficiency lies in the cognitive element of human information processing and not with knowledge, procedures or any of the technical elements. Sadly the current training and recurrent training programme's in force at a majority of airlines worldwide do not give the airlines the flexibility to prioritize issues that arise from time to time. Dated regulatory requirements sadly dictate current training programme. Endorsement training and recurrent training syllabi concentrate on missed approaches with an engine failure but do not practice or recommend the practice of full power two engine missed approaches, which is where the mis-management arises. In fact the pilots surveyed during the BEA study felt they were more than adequately trained for single engine missed approaches but not for those when all engines are operating. To quote flight international " Go-arounds are frequently infrequent and although they are an unexceptional procedure, that does not mean for pilots they are an everyday occurrence"

Until such time as EBT or another alternate form of training allows airlines the flexibility to adjust their training syllabus, it is the strong recommendation of the author that airline seriously consider a limit on the amount of missed approaches that a flight crew can accomplish and only attempt a 2nd or 3rd approach if the weather improves substantially.

References

Airbus Industrie. 2014. *Flight Operations Briefing Notes: Human Performance Error Management.* Available from Internet: <http://www.skybrary.aero/bookshelf/books/194.pdf>.

BEA, (2013). Study on Airplane State awareness during Go-around. Available from Internet: <http://www.bea.aero/etudes/asaga/asaga.study.pdf >.

Beaty, D. 1995. *The Naked Pilot: Human Factors in Aircraft Accidents,* Marlborough: The Crowood Press.

Brain, A. 1997. *Beyond Human Error in incident investigation: why people make mistakes*. Queensland Mining Industry Health and Safety conference proceedings.

Busse, D.K. 2002. *Cognitive Error Analysis in Accident and Incident Investigation in Safety-Critical Domains,* PhD Thesis, University of Glasgow.

Dekker, S.W.A. 2002. *The Re-invention of Human Error, Technical Report*, Lund University of Aviation.

Embrey. D. *Understanding Human Behavior and Error*, Human Reliability. Available from Internet: <http://www.humanreliability.com/articles/UnderstandingHumanBehaviour andError.pdf >.

FAA. 2008. *Aeronautical Decision Making* (FAA-P-8710-69). Available from Internet: <http://faasafety.gov/gslac/ALC/libview_normal.aspx?id=56413>.

Flin, R. et al. 2003. Development of the NOTECHS (Non-Technical Skills) System for Assessing Pilots' CRM Skills, *Human Factors and Aerospace Safety,* 3(2).

Harris, D. 2011. *Human Performance on the Flight Deck,* Surrey: Ashgate Hollnagel, E., (1983), *Why Human Error is a Meaningless Concept*. Position Paper for NATO Conference on Human Error, Bellagio, Italy 1983.

[2] A stabilized approach is one where the aircraft is on the desired approach path and glideslope, at the correct speed and in the landing configuration. All the parameters must be fulfilled before reaching a pre-determined point normally 1000ft.

Kepczynski, A. 1997. *The Human Factor in Aviation Accidents*, SkyNet Research. Available from Internet: <http://www.d-n-a.net/users/dnetGOjg/Hfactors.htm>.
Peters, G.A.; Peters, B.J. 2006. *Human Error: Causes and Control,* Boca Raton: CRC Press.
Pooley, E. 2013. *The Study of Accidents and Serious Incidents Involving a Go- around*. FSF Go Around Safety Forum. Available from: <www.skybrary.com>.
Qatar Airways Flight Training Department. 2014. Operations Manual Part D General, QTR-FO-026 (rev 05A).
Rasmussen, J. 1978. Notes on Human Error and Prediction, *Riso-M*, no. 2139, Riso Library, Roskilde, Denmark.
Reason, J. 1990. *Human Error*, Cambridge: Cambridge University Press.
Reason, J. 2013. *A Life in Error,* Surrey: Ashgate.