

Children of the magenta

by Captain Wolfgang Starke

Most airlines have a stabilised approach policy, which mandates a go-around if the aircraft is not fully configured with the landing checklist completed when passing 1000 or 500 feet aal. Nevertheless, a considerable number of flights continue to land from unstable approaches...

A lack of confidence in the ability to safely perform such a non-standard manoeuvre could be one reason for pilot reluctance to fly a go-around when it is required. But is more pilot training in basic skills a reasonable mitigation of this issue?

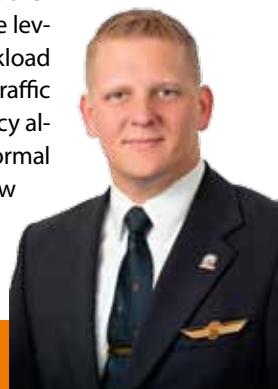
Nowadays, flight management and guidance systems of aircraft are getting better and better. The majority of flights on suitably equipped aircraft types can be safely completed making maximum use of automation. Frankly speaking it could be said that if the magenta flight director command is in the centre of the artificial horizon, the flight is going well. And as use of automation is most of the time the best way to achieve both safety and efficiency, more and more pilots become "children of the magenta". They are managers of the flight and rarely use or train for manual flying. However, there are rare examples when automation malfunctions and intervention is required to continue safely. This is particularly true when aircraft are leaving the scope of normal procedures and need to be brought back to the standard 'condition' as quickly as possible.

This is a situation for which our flight guidance systems are not built. Therefore pilots must always be able to control the aircraft manually without flight guidance assistance during all times in flight even unexpectedly.

For example, in some aircraft when a stall is approaching, the flight director is removed and the autopilot and auto throttle are disengaged. Some aircraft automatically revert from automatic to manual flight the second you push the go-around button.

While an approach to stall in various configurations or a go-around from instrument minima is a well-trained manoeuvre, an in flight upset or a go-around from a completely unstable approach is not part of pilot training in many airlines. Also, since such events could occur in a wide variety of circumstances, it is simply not possible to develop standard procedures for every possibility. The key to maintain safety of flight during rarely encountered non-standard manoeuvres is, and will remain, manual flying skills and raw data instrument scanning.

In respect of training for raw data instrument scanning and manual flying there are different arrangements in place. Some airlines mandate the maximum possible use of automation. This should make their flights as safe and efficient as possible while reducing pilot workload so that they can better oversee and manage flight progress. Other airlines insist that pilots reduce the level of automation whenever workload allows and weather as well as the traffic situation is not critical. Such a policy allows manual flying practice in normal operations. The result is better raw data instrument scan and better manual flying skills. The down-



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Children of the magenta (cont'd)

side of such policies is in the area of efficiency, maybe a partially non-optimum descent profile or an increased number of go-arounds.

But is this second way enough to cope with the risk of loss of control during flight? Or is more training required for pilots?

The clear answer is yes! Having counted just my own personal experiences in 2012, I have flown approximately 650 short haul sectors of which roughly 25% have been training flights with very inexperienced colleagues which, for example, may increase the chances of flying a go-around. During these 650 sectors I counted seven go-arounds, one rejected take-off, four low visibility approaches, three bird strikes and six other minor incidents including airworthiness issues like malfunctions of single aircraft systems. All together this makes 21 flights with non-normal experiences out of 650 sectors, a ratio of roughly 1:30. The ratio for my go-arounds was roughly 1:90 – one every two months. Of course for medium or long haul this can easily be less than one per year.

Those numbers show that a go-around is a relatively rare manoeuvre. Subtracting the number of go-arounds which are initiated with the aircraft fully configured from the total, we know that the number of non-standard go-arounds initiated due to wind shear or unstable approaches is very much lower. But such go-arounds are a highly demanding manoeuvre that is often not trained. The result can easily be a fatal one like the crash of the Gulf Air Airbus A320 in August 2000¹ when a fully functional aircraft with 143 people aboard crashed into sea after the crew failed to properly fly a go around which they had initiated following an unstable approach.



It does not take an unstable approach for a go-around. The May 2010 crash of the Afriqiyah Airbus A330² followed a relatively normal approach albeit one not flown using the most appropriate FMS mode and therefore a bit lower than profile. But after initiating a go-around, everything suddenly went wrong resulting in the airplane impacting ground short of the landing runway at a descent rate of 4400 feet per minute with just one survivor.

What do these two crashes have in common, what can we learn from them?

In both cases, the aircraft itself was fully functional. Pilots simply lost situational awareness during go-around, resulting in inappropriate control inputs. This is clearly the evidence of lack of manual flying capability as well as raw data instrument scanning skills.

Better basic flight training could have prevented both crashes, as in both cases the inadequate execution of the go-around manoeuvre was what led to the accident.

When learning to fly a modern transport category aircraft, there is a chain of automation. The upper end of this chain is represented by high-level functions such as vertical or lateral navigation by the flight management system. Then there is mid-level automation such as heading select, vertical speed or level change (open descent) that constitutes the basic modes of autopilots. Next there is manual flight assisted by flight director guidance and at the lower end of this chain of automation comes basic pitch and power manual flying without any assistance of the flight guidance system.

As many changes to the status of the automated system are not directly recognisable - they are only announced silently on complex displays - it is widely recommended to take a step down the chain of automation whenever a pilot does not understand the behaviour of his aircraft any more. The problems with this recommendation start whenever pilots are not able to fully understand the situation based

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on the raw data presented on their key displays. The performance of modern aircraft provides rapid acceleration upon advancing engine thrust. In combination with the large pitch changes necessary so as not to exceed the aircraft maximum speed for the existing configuration, the resulting g-forces can rapidly lead to spatial disorientation. This experience during an initial go-around can and does lead pilots to reduce their pitch angle dramatically. A finding, which is common to both the Afriqiyah and Gulf Air crashes.

required ones is rare in such an expensive device as a full flight simulator.

From the perspective of a manager, this is clearly understandable and logical. There is a target level of safety that needs to be met. This target is met and usually exceeded, so clearly there is no need to improve training – and by this spend more money – from a manager's point of view.

However, one should query himself whether we want to reach a level of safety which is set by authority as a minimum

EASA published on 23 April a Safety Information Bulletin (SIB) on Manual Flight Training and Operations: SIB 2013-05 encourages manual flying during recurrent simulator training and also, when appropriate, during flight operations.

A similar recommendation has been issued through other publications, such as the FAA SAFO 13002 of 4 Jan 2013.

The overall aim is to reach an appropriate balance between the use of automation and the need to maintain pilot manual flying skills, needed in case of automation failure or disconnection, or when an aircraft is dispatched with an inoperative auto-flight system.

The best protection for the safety of aircraft and people within these aircraft is a well-trained pilot.

This is just one problem in a long list of pilot problems during go arounds. But sticking to this one problem, appropriate reliance on instruments and good instrument scanning skills can eliminate the risk of CFIT in this situation. Such reliance on instruments and instrument scanning skills is part of initial flight training, but do we maintain these skills? In some airlines pilots do, in others, they do not. Thinking ahead, thinking about non-normal situations, do we train instrument scanning during these situations? Hardly ever!

There are many failures and emergency situations that have to be checked and trained during simulator sessions by regulation but there is often barely enough time to complete these requirements. Upset recovery and go arounds other than from the fully configured state at instrument approach minimum altitude are hardly ever trained. Required simulator training includes engine failures in various situations, faults of different systems and low visibility training. Spare time to practise situations other than the

level of safety or if we want to strive for the maximum level of safety. There is a large margin between minimum and maximum level of safety. The position which can be reached somewhere in between depends mainly on the balance of safety versus cost. In times of economic downturn, the focus is often on cost, which is driving training more in the direction of telling pilots to follow the magenta.

We know that aviation safety is at a high level. But since this level could and should be even higher, more and better pilot training is required. Pilots should always be capable of retaining full control of their aircraft without any flight guidance or automatic protections. And if they are confident that they are able to do this, the ratio of go-around responses to unstable approaches should improve. This is a situation that is not covered by normal procedures and requires basic flying from pilots, so we are not just talking about CFIT. The question of basic flying skills affects other accidents like runway excursions and many more. The best protection for the safety of aircraft and people within these aircraft is a well-trained pilot. But this level of safety has its cost.

The airlines have an important role to play here: operators should develop operational principles and include these in their Automation Policy, in accordance with Commission Regulation (EC) No 859/2008 of 20 August 2008 Subpart P 8.3.18.

Airlines should identify appropriate opportunities for pilots to practice their manual flying skills, taking into account factors such as phase of flight, workload conditions, altitude/Flight Level (non-RVSM), meteorological conditions, traffic density, ATC and ATM procedures, pilot and crew experience and operator operational experience. This SIB introduces also risk control measures by encouraging to use SMS and FDM to monitor the potential impact on the number, magnitude and pattern of deviations from consolidated average flight precision, to effectively balance the benefits and the drawbacks of manual flying and adjust policies accordingly. Also, operators implementing ATQP should tailor their training programmes based on available data.