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The Golden Rules for Pilots

Moving from PNF to PM

1. Introduction

On the 4th of November 2010 Qantas flight QF32 experienced an uncontained engine failure shortly after takeoff from Singapore Changi Airport.

This type of incident is so rare and unpredictable that it does not have an allocated procedure attached to it. The crew of the A380 was able to cope with this event by applying a set of simple basic rules, which are referred to as the Golden Rules for Pilots.

2. QANTAS QF32

Australian Transport Safety Bureau (ATSB) Preliminary Report Released 3 December 2010 :



Figure 1
A380 in
Qantas livery

On 4 November 2010, at 0157 Universal Coordinated Time (UTC), an Airbus A380 aircraft, registered VH-OQA (OQA), being operated as Qantas flight 32, departed from runway 20 centre (20C) at Changi Airport, Singapore for Sydney, New South Wales. On board the aircraft were five flight crew, 24 cabin crew and 440 passengers (a total of 469 persons on board).

Following a normal takeoff, the crew retracted the landing gear and flaps. The crew reported that, while maintaining 250 kts in the climb and passing 7,000 ft above mean sea level, they heard two almost coincident 'loud bangs', followed shortly after by indications of a failure of the No 2 engine. The crew advised Singapore Air Traffic Control of the situation and were provided with radar vectors to a holding pattern. The crew undertook a series of actions before returning the aircraft to land at Singapore. There were no reported injuries to the crew or passengers on the aircraft. A subsequent examination of the aircraft indicated that the No 2 engine had sustained an uncontained failure of the Intermediate Pressure (IP) turbine disc. Sections of the liberated disc penetrated the left wing and the left wing-to-fuselage fairing, resulting in structural and systems damage to the aircraft.

In various interviews and statements the crew recognise that Crew Resource Management (CRM) gave them the ability to manage this challenging event. They have spoken of “Synergy in Action”, the goal of CRM, and effective teamwork. They had plenty of fuel and therefore time and options. They acknowledge the impressive performance of the aircraft and their training and knowledge.

3. The Golden Rules

*On the flight deck of QF32 that day
Captain David Evans:*

“From a training point of view it doesn’t matter what aeroplane you are flying, airmanship has to take over. In fact, Airbus has some Golden Rules which we all adhered to on the day – aviate, navigate and communicate – in that order.”

*Royal Aeronautical Society,
6 December 2010*

So, what are the Golden Rules?
When should they be used and why?

The following four Golden Rules for Pilots are applicable to all normal operations and any abnormal or emergency situations:

- **Fly, navigate and communicate**
- **Use the appropriate level of automation at all times**
- **Understand the FMA at all times**
- **Take action if things do not go as expected.**

3.1 Fly, navigate and communicate

In this order and with appropriate tasksharing.

Just as the crew of QF 32 stated, the number one priority in any event and at all times is to fly the aircraft; this is the first Golden Rule.



Figure 2
QF32 n°2 engine after it sustained an uncontained failure of the Intermediate Pressure (IP) turbine disc

Tasksharing should be adapted to the prevailing situation (i.e. task-sharing for hand flying or with the Auto Pilot engaged, task sharing for normal operation or for abnormal / emergency conditions) and tasks should be accomplished in accordance with the following priorities:

3.1.1 Fly

The Pilot Flying (PF) must focus on flying the aircraft by controlling and / or monitoring the pitch attitude, bank angle, airspeed, thrust, sideslip, heading etc. to capture and maintain the desired vertical and lateral flight path.

The Pilot Not Flying (PNF) must assist the Pilot Flying (PF) by actively monitoring all flight parameters and actively directing the attention of the PF to any excessive deviation.

Actively monitoring is a key message, we want to emphasize the

MONITORING role, which is why Airbus will be changing its documentation over the next year to fully reflect and highlight the importance of Pilot Monitoring (PM). Wherever you see PNF, think PM!

Both pilots must remain focused on their task as PF or PM, not allow anything to distract them. This is what we mean by appropriate tasksharing.

Both pilots must maintain their Situational Awareness and immediately resolve any uncertainty as a crew.

3.1.2 Navigate

Navigate can be summarized by the following three statements of situational awareness:

- **Know where you are**
- **Know where you should be**
- **Know where the weather, terrain and obstacles are.**

3.1.3 Communicate

Effective crew communication includes communication between:

- The PF and the PM
- The flight crew and air traffic control
- The flight crew and the cabin crew or any other crew on-board
- The flight crew and ground crew.

Effective communication enables the sharing of goals and intentions and enhances situational awareness. To ensure positive communication, the flight crew must use **standard phraseology and applicable callouts**.

3.2 Use the appropriate level of automation at all times

To fly the aircraft the crew must comply with 'Golden Rule number 2. On highly automated and integrated aircraft, several levels of automation are available to perform a given task. The appropriate level of automation depends on the situation and task; taking into account the forecast or actual weather, any malfunction or crew incapacitation. Pilot judgment prevails for the choice of automation level, including the choice to fly manually.

- **Understand** the implication of the intended level of automation
- **Select** the intended level
- **Confirm** the aircraft responds as expected.

This leads us to Golden Rule number 3.

3.3 Understand the FMA at all times

Any action on the FCU, or on the MCDU/KCCU, should be confirmed by crosschecking the corresponding annunciation or data on the PFD or ND.

At all times, the PF and PM should be aware of:

- The armed or engaged modes
- The guidance targets set
- The aircraft response in terms of attitude, speed and trajectory, etc
- Any mode transitions or reversions.

To sum up:

- **Monitor your FMA**
- **Announce your FMA**
- **Confirm your FMA**
- **Understand your FMA.**

Finally, if any problems occur, refer to the Golden Rule number 4.

3.4 Take action if things do not go as expected

If the aircraft does not follow the desired vertical or lateral flight path or the selected target, the crew should react without delay:

- By PF changing the level of automation:
 - From managed guidance to selected guidance, or
 - From selected guidance to manual flying; or

- By PM taking action, again we want to emphasize the PM function and its essential role in flight safety:

- Questioning, and if that is not enough
- Challenging, and if that is still not enough
- Taking-over.

Never assume that any crewmember is aware of a particular threat, error or deviation and remember that incapacitation may be subtle; act before it is too late.

4. Conclusion

- 1 Fly, navigate and communicate:**
In this order and with appropriate tasksharing
- 2 Use the appropriate level of automation at all times**
- 3 Understand the FMA at all times**
- 4 Take action if things do not go as expected**



Apply these Golden Rules, use them always and support each other. The rules have been proven to make a difference. Just like the crew of Qantas QF 32, remember to always...

Fly the Aircraft Fly the Aircraft..... Fly the Aircraft

Safety First

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