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Publication Date: September 2011

ISBN 978-1-74251-208-2

Sept11/ATSB23

Released in accordance with section 25 of the Transport Safety Investigation Act 2003

# Incorrect aircraft configuration, VH-OGP 1.5 km north of Sydney Airport, New South Wales 26 October 2009

## Abstract

At 0735 Eastern Daylight-saving Time on 26 October 2009, VH-OGP, a Qantas Airways Boeing 767-300, initiated a go-around manoeuvre from an approach into Sydney Airport, New South Wales. The aircraft immediately returned for a normal landing. The go-around was initiated due to the crew becoming aware that the aircraft was not properly configured for landing. Almost simultaneously, the 'Too Low Gear' automated warning activated, which indicated that the aircraft's landing gear was not extended.

The incorrect aircraft configuration was the result of several interruptions and distractions during the approach. These interruptions and distractions resulted in a breakdown in the pilots' situational awareness.

The investigation identified a number of minor safety issues in the operator's procedures and monitoring systems and Qantas Airways has advised of safety action in response.

## FACTUAL INFORMATION

### History of the flight

At 0613 Eastern Daylight-saving Time<sup>1</sup> on the 26 October 2009, a Qantas Airways Boeing 767-300, registered VH-OGP (OGP) and crewed by the captain in the left seat and the first officer (FO) in the right seat, departed Melbourne Airport,

Victoria on a scheduled flight to Sydney Airport, New South Wales.

The FO was the pilot flying (PF) and the captain was the pilot not flying (PNF).<sup>2</sup> Approaching the top of descent, the crew briefed for an instrument landing system (ILS)<sup>3</sup> approach to runway 16R, using the operator's noise abatement approach procedure.<sup>4</sup> The crew also briefed that the approach was to initially be conducted using instrument procedures, but with the expectation that visual conditions would be achieved during the approach and that they would change to visual procedures before landing.<sup>5</sup> The PF intended to fly the approach with the autopilot and autothrottle (the automatics) engaged, with the expectation of disconnecting the automatics when visual conditions were established.

At 0652, the flight crew commenced the descent into Sydney, having been cleared for a Rivet Nine Standard Terminal Arrival Route (STAR)<sup>6</sup> with the

2 See the section titled *PF and PNF duties* for the specific duties assigned to the PF and PNF roles.

3 A standard ground aid to landing, comprising two radio guidance beams: the localizer, for direction in the horizontal plane; and the glideslope, for guidance in the vertical plane, which usually provides an inclination of 3°. Also commonly referred to as a precision approach.

4 See the section titled *Aircraft operating procedures* for a discussion of the operator's noise abatement approach procedure.

5 See the section titled *Nomination of approach procedures* for the requirements concerning instrument procedures and visual procedures.

6 A number of STARs fed aircraft onto the final approach for the various runways at Sydney Airport.

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time (EDT), as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

expectation of an ILS approach for landing on runway 16R.

The aircraft's track, and the radio communications with the aircraft from air traffic control (ATC) during the later part of the descent and approach into Sydney are at Figure 1. The blue line represents the portion of the approach with the aircraft in the clean (no flap selected) configuration, the green line the aircraft's track with the first stage of flap selected (Flap 1, leading edge slats only), and the yellow line the portion of the approach with the second stage of flap selected (Flap 5, which provided for leading edge slats and initial flap extension).

The normal procedure for configuring the aircraft for landing required the flight crew to set Flap 5 as the aircraft intercepted the localiser. On intercepting the glideslope and commencing descent, the flight crew was required to complete the configuration for landing, which included selecting the landing gear down and the flaps to the landing setting, and to complete the landing checklist.

In contrast, the operator's noise abatement procedure required the flight crew to configure per the normal procedure up to Flap 5, then intercept and descend on the glideslope in that configuration until the aircraft descended through 2,000 ft radio altitude (RA).<sup>7</sup> At that point in the operator's procedure, the flight crew was required to complete the remainder of the normal procedure for landing.

The aircraft intercepted the localiser from the right and the glideslope from below with the aircraft configured at Flap 5 and the landing gear up, as required by the noise abatement approach procedure. The flight crew intercepted the glideslope and commenced the final descent at 0731:38, with the aircraft's automatics engaged.

The descent and manoeuvring to intercept the ILS approach, depicted as the blue and green paths on Figure 1, followed a 'normal' profile in terms of the altitude and distance travelled.

As the aircraft descended through about 2,500 ft above mean sea level (AMSL), ATC directed the pilot to call Sydney Tower. The PF stated that he considered that a late requirement to call the

tower, which distracted him from the 2,000 ft RA procedural point in the operator's noise abatement procedure.

The PNF, who was also performing duties as the 'head free' (HF)<sup>8</sup> pilot stated that, after transferring to Sydney tower, the meteorological conditions affecting the approach gradually transitioned from instrument to visual conditions. During that transition, he provided a running commentary to the PF of those conditions, and the progress of the visual segment. The PNF recalled calling 'visual' at about 1,200 ft RA, just before the aircraft passed over the outer marker (OM). The PNF stated that the signal from the OM was weak, prompting him to perform a mental check of the reasonableness of the glideslope profile.

The PF recalled that, when the PNF called visual, the PF looked up and saw showers in the vicinity of the runway. He believed that these showers may have affected a visual approach to the runway, which led the PF to delay the declaration of 'visual procedures' until approaching 1,000 ft RA.

Both pilots reported then focussing their attention on the aircraft that was landing immediately ahead of OGP and then, shortly after, on a possible conflict with an aircraft that was cleared to depart from 16R, both of which created concern with respect to a late landing clearance. The PF stated that, in response, he mentally rehearsed the requirement for a go-around from the approach to runway 16R a number of times during the remainder of the approach.

The tower cleared the departing aircraft for an immediate takeoff at 0734:20, as OGP descended through 800 ft RA. At 0734:48, as the aircraft passed 580 ft RA, the PF disconnected the automatics. At 0734:55, as the aircraft was approaching 500 ft RA, clearance to land was given by ATC and, almost simultaneously, both pilots identified that the aircraft was incorrectly configured. Almost immediately thereafter, the enhanced ground proximity warning system (EGPWS)<sup>9</sup> 'landing configuration' aural warning

<sup>7</sup> Altitude determined by a radar altimeter.

<sup>8</sup> See the section titled *Additional operating procedures* for the HF and 'Head Down' (HD) procedure.

<sup>9</sup> A system that uses aircraft flight data to calculate an envelope along the projected flightpath, which is then

Figure 1: Recorded track into Sydney — image courtesy of Google Earth



‘too low gear’ triggered, which indicated that the aircraft’s landing gear was not extended. The crew immediately initiated a go-around.<sup>10</sup>

After the go-around, the aircraft returned for a landing. There were no injuries and the aircraft was not damaged as a result of the occurrence.

Whereas the pilots stated that each used a number of additional personal altitude check points to confirm the aircraft’s configuration before landing, there was no evidence that any had effect in this case.

### Pilot information

The captain was qualified for the flight and, at the time of the occurrence, had logged about 16,500 hours total flying experience, of which about 15,000 hours were in command and 594 hours were on the aircraft type. The FO was qualified for the flight and, at the time of the

occurrence, had logged 8,882 hours total flying experience and 2,082 hours on the aircraft type.

There was no evidence that fatigue or other physiological issues affected the pilots’ performance during the flight.

As a result of the occurrence, both pilots’ underwent remedial training.

### Aircraft information

The aircraft and its systems were not a factor in the occurrence. Those systems included a recently-updated EGPWS, which provided for a ‘landing configuration’ warning that would activate in the following conditions:

- the aircraft was in flight,
- the landing gear was not down and locked, and either:
  - the flaps were set to a landing position, or
  - any thrust lever was at idle below 800 ft RA.

Those conditions were not met in this case, as the aircraft’s thrust levers were above idle during the portion of the approach below 800 ft RA.

compared with an internal terrain data base for potential conflicts. Such conflicts are notified to the pilots through visual and/or aural warnings.

10 A manoeuvre in which the pilot discontinues the approach, increases power and reconfigures the aircraft for climb.



A recent EGPWS update incorporated a new ‘too low gear’ landing configuration warning. That warning would activate in the following conditions:

- the aircraft was in flight and the landing gear was not down and locked, and
- the aircraft’s airspeed was below 190 kts when the aircraft was at or below 500 ft RA.

The ‘too low gear’ warning parameters were met when OGP descended below 500 ft RA. This triggered the EGPWS ‘too low gear’ warning.

The ‘too low gear’ warning and its activating parameters were not described in the Flight Crew Operation Manual (FCOM), but were contained in a manufacturer’s guide to the operation of the equipment. That guide was distributed to the operator’s technical crew.

## Meteorological information

The surface meteorological observation for Sydney Airport that was recorded at 0730 that day contained the following information: air temperature 14 °C, QNH<sup>11</sup> 1022, wind 150° at 46 km/h (25 kts) gusting to 59 km/h (32 kts), 0.4 mm of precipitation in the last 10 minutes, and the weather description ‘slight rain shower’.

During the approach, the automatic terminal information service (ATIS)<sup>12</sup> was updated to include the following relevant weather conditions: visibility 10 km, reducing to 3,000 m in rain; and FEW<sup>13</sup> clouds at 700 ft and SCT cloud at 2,500 ft. Ten minutes later, the ATIS was again updated to indicate a visibility of 10 km, reducing to 5,000 m in any rain.

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11 That pressure setting which, when placed on the pressure setting sub-scale of a sensitive altimeter, will cause the altimeter to indicate the aircraft’s altitude above mean sea level.

12 A radio transmission service that provides current, routine information to arriving and departing aircraft by means of continuous and repetitive broadcasts. Included in such information are current weather conditions for the aerodrome. Such broadcasts are preceded by a letter identifier, with updated broadcasts identified by sequentially updating the letter.

13 Cloud amounts are reported in oktas. An okta is a unit of sky area equal to one-eighth of total sky visible to the celestial horizon. Few = 1 to 2 oktas, scattered = 3 to 4 oktas, broken = 5 to 7 oktas and overcast = 8 oktas.

## Aids to navigation

The function and availability of the aids to navigation on the ground and in the aircraft were not factors in the occurrence.

## Communications

The radio traffic on all frequencies during the descent and approach into Sydney was not unusual for that time of day.

## Recorded information

The aircraft’s flight data recorder (FDR) recorded a large selection of aircraft parameters. That included the aircraft’s configuration and performance data, such as airspeed and power settings, the flight crew’s use of the automatics, and the activation of various warning devices. The aircraft configuration changes that were derived from the recorded data are included in the depiction of the approach at Figure 1.

The data also recorded the disconnection of the automatics at about 580 ft RA and the activation of the ‘landing configuration’ warning at 500 ft RA. The aircraft configuration and mode changes that were recorded at 500 ft RA were consistent with the flight crew initiating a go-around.

## Organisational and management information

Both pilots were trained in the conduct of the relevant procedures and were aware of the procedural and standard operating procedures (SOP) requirements affecting the flight.

### *Company operational documentation*

The FCOM contained operational procedures and information necessary to operate the aircraft. It was prepared by the aircraft manufacturer and tailored to the operator’s requirements and the Civil Aviation Safety Authority specifications. The FCOM was required to comply with the manufacturer’s Aircraft Flight Manual.

The Flight Crew Training Manual (FCTM) was intended to provide guidance and information in support of the FCOM procedures. It was written in a more general format than that used in the FCOM.

The Flight Administration Manual (FAM) set out the operator’s policy, standards and procedures

and, in particular, contained a chapter titled *Standard Operating Procedures*. The FAM could limit or provide additional definition or scope to the application of the FCOM procedures. For example, the SOPs contained additional procedures that the crews were required to execute during the various phases of flight.

The FCOM landing procedure was only applicable to ILS approaches. Landing procedures for other types of approaches were contained within the FCTM. This appeared to be peculiar to the 767 manuals, as the FCOMs for the operator's other aircraft types contained landing procedures for all types of approaches.

#### *PF and PNF duties*

The PF and PNF duties were defined in the SOP chapter in the FAM. The PF was defined as the 'pilot carrying out manual or automatic control of the flight path', while the PNF was the 'pilot carrying out support duties'. Over and above those roles, the captain held overall responsibility for the conduct of the flight.

The FCOM stated that the '[p]hase of flight duties are divided between the Pilot Flying (PF) and the Pilot Not Flying (PNF).' It further stated that the 'general PNF phase of flight responsibilities are: checklist reading, communications and tasks requested by the PF.'

#### *Aircraft operating procedures*

The FCOM operational philosophy was based on the execution of a procedure from recall with confirmation of the pilot's action by checklist. To assist in the initiation of procedures, all normal procedures and associated checklists were triggered by, and linked to an identifiable phase of flight. For example:

- The thrust reduction height after takeoff triggered the clean-up procedure, which included the retraction of the flaps and other post take-off actions. When complete, the execution of the 'After Takeoff Checklist' verified that the essential actions had been carried out.
- Approaching the top of descent triggered the descent procedure, with confirmation of its completion by the execution of the 'Descent Checklist'.
- Approaching the transition altitude triggered

the approach procedure, with confirmation of its completion by the execution of the 'Approach Checklist'.

This was also the case for an ILS approach, where the procedure was based on the interception of the ILS glideslope and confirmation of the landing procedure was achieved through the immediate execution of the 'Landing Checklist'. The FCOM landing procedure concluded with a note that referred the reader to the FAM and FCTM for noise abatement procedures.

#### *Noise abatement procedure*

The FAM stated that the noise abatement procedure should be used for an ILS approach, provided certain pre-conditions were satisfied. The incident flight met those pre-conditions.

The FCTM detailed the noise abatement procedure, which required the aircraft to be configured normally as it approached the ILS, with final configuration for landing initiated as the aircraft descended through 2,000 ft RA on the ILS. Verification of the completion of the procedure was by the immediate execution of the landing checklist.

#### *Additional operating procedures*

The SOPs required the PF to nominate the intended approach procedure(s) to be used during the approach. The available approach procedure options included visual, instrument or low visibility procedures, the nomination of which depended on the anticipated meteorological conditions affecting the approach. Each procedure had its own procedural calls, the visual procedure calls being essentially a cut down version of the instrument calls.

A PF was permitted to nominate instrument procedures but change to visual procedures if there was an expectation of becoming visual during the instrument approach. The change to visual procedures took place on the call of 'visual' by the PNF and the corresponding declaration of 'visual procedures' by the PF.

The SOPs also explained the operator's 'Head Free' (HF) or 'Head Down' (HD) procedure. The nominated approach procedure determined which pilot was to be HF and which was to be HD, or whether both were to be HF. The HF/HD procedure was based on the principle that, when flying an instrument approach, at least one pilot

was to dedicate full attention to monitoring the aircraft's instruments at all times. That role fell to the HD pilot.

The HF pilot was required to monitor the external references and the aircraft's instruments, and to place increasing emphasis externally as the aircraft progressed down the approach path. The HF pilot was also responsible for 'calling external references as they became visible and for making an assessment of the visual segment'.<sup>14</sup>

When instrument procedures were nominated, the PF was the HD pilot and the PNF the HF pilot. When visual procedures were nominated, both pilots were HF. The change from instrument to visual procedures, and thereby change of the PF's status from HD to HF, relied on the following sequence:

- When the HF pilot determined that the visual segment was suitable for continuation using visual procedures, the HF pilot was to call 'visual'.
- On receipt of the 'visual' call, the PF was required to look up and independently assess the acceptability of the visual segment.
- The PF was then required to either declare visual procedures, thereby being released to HF status, or to continue with instrument procedures with the option of reverting to visual procedures at any time.

### *Monitoring*

The SOPs required all crew members to be aware of the PF's intentions for an approach, which included a common understanding of the nominated procedures. The aim was to ensure that any transgression from the SOPs, air traffic clearance(s) or intended flightpath was immediately drawn to the PF's attention.

The operator also specified stabilised approach criteria for the aircraft type, which required the PNF to monitor the aircraft's approach path, rate of descent and airspeed to ensure they remained within specified tolerances during approach. Any

excursion outside those tolerances was to be notified to the PF immediately.

A final monitoring criterion was contained in the FCOM, which stated that both the PF and PNF were to monitor the approach.

### *Stable approach criteria*

Crews were required to establish a stable approach by certain altitude gates. A stable approach was defined as the:

- aircraft being configured for landing
- aircraft being on a normal approach path with manoeuvring completed, and established on the runway's extended centreline by the defined altitude gate
- correct thrust, rate of descent and airspeed set for the prevailing conditions.

The relevant altitude gate depended on the flight procedures nominated by the PF. When using visual procedures, the gate was 500 ft RA and for instrument procedures, the gate was 1,000 ft RA. A missed approach was mandatory if the approach was not stable at the relevant altitude gate.

The FCTM identified specific aircraft performance criteria that were indicative of a stable approach. If any of those criteria were exceeded while the aircraft was below 500 ft when visual, or 1,000 ft in instrument meteorological conditions (IMC),<sup>15</sup> the approach was considered unstable.

## **Additional information**

### *Guidance on the development and management of SOPs*

The United States Federal Aviation Administration (FAA) Advisory Circular (AC) 120-71A titled *Standard Operating Procedures for Flight Deck Crew Members*<sup>16</sup> provided background information, basic concepts and philosophy on the development, implementation and update of SOPs. In particular, the AC provided a detailed discussion on crew monitoring of flight operations.

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14 The part of the approach from the missed approach point to the landing (the visual segment) required a number of criteria to be met, which included minimum visibility for that approach. If at any point those criteria were not met, a missed approach was to be initiated.

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15 Conditions that are less than the minimum required for visual flight.

16 Available at [http://www.faa.gov/regulations\\_policies/advisory\\_circulars/index.cfm/go/document.information/documentID/23216](http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/23216)

The purpose of the AC was to achieve consistently safe flight operations through adherence to SOPs that are clear, comprehensive and readily available to flight crewmembers. The AC identified that the implementation of any procedure as an SOP is most effective if, amongst other things, the procedure is appropriate to the situation and is practical to use.

The AC also identified the importance of crew monitoring and crosschecking, and stated:

Several studies of crew performance, incidents and accidents have identified inadequate flight crew monitoring and cross-checking as a problem for aviation safety. Therefore, to ensure the highest levels of safety each flight crewmember must carefully monitor the aircraft's flight path and systems and actively cross-check the actions of other crew members. Effective monitoring and cross-checking can be the last barrier or line of defense against accidents because detecting an error or unsafe situation may break the chain of events leading to an accident.

and that:

...it makes better sense to characterize pilots by what they 'are' doing rather than by what they 'are not' doing. Hence, pilot flying remains an appropriate term and is unchanged in this AC. But the term pilot not flying misses the point. Studies of crew performance, accident data, and pilots' own experiences all point to the vital role of the non-flying pilot as a monitor. Hence, the term pilot monitoring is now widely viewed as a better term to describe that pilot.

The AC stated that crew monitoring of performance can be significantly improved by developing and implementing effective SOPs to support those functions. However, the AC also pointed out that SOPs may detract from healthy monitoring, particularly where a procedure draws the attention of one of the pilot's away from monitoring at critical times.

There was no equivalent Australian publication.

#### *FAA Order 8900*

The FAA Flight Standards Information Management System (FSIMS) was a repository that provided policy and guidance for FAA aviation safety inspectors who were responsible for the certification, administration and surveillance of air carriers. The heart of the system was FAA Order

8900.<sup>17</sup> This order was provided as reference material for the aviation industry and included procedural guidance for the conduct of air carrier operations.

Order 8900, chapter 2, section 5 discussed all-weather terminal area approach and landing operations. With respect to basic operating practice under the instrument flight rules, the AC stated at subpart C that:

Under normal circumstances, at least one pilot should maintain a full-time instrument reference to monitor flight progress.

At subpart D, the order discussed standard instrument approach operating practices, and stated that:

...the PNF should provide a callout when the visual cues required to continue the approach by visual reference are acquired...

#### *FAA low visibility approach procedures*

FAA AC 120-29A<sup>18</sup> titled *Criteria for Approval of Category I and Category II Weather Minima for Approach*, at 6.1.7 stated:<sup>19</sup>

[t]he operator should ensure that to the extent possible, flight crew and operational procedures for Category I and Category II are consistent with the procedures for that operator for Category III, particularly to minimize confusion about which procedure should be used in variable weather.

#### *Flight Operation Quality Assurance*

Modern aircraft use digital systems that sense and record the performance of the aircraft and its systems. Some of this information is displayed directly to the pilot as aircraft performance information. However, the vast bulk of the information is recorded in devices such as a Quick Access Recorder (QAR)<sup>20</sup> for monitoring and later analysis.

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<sup>17</sup> Available at <http://fsims.faa.gov/>

<sup>18</sup> Available at [http://rgl.faa.gov/Regulatory\\_and\\_Guidance\\_Library/rgAdvisoryCircular.nsf/key/AC%20120-29A](http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/key/AC%20120-29A)

<sup>19</sup> There were three general classifications of ILS approaches. The basic ILS approach was a CAT I approach. CAT II and CAT III ILS approaches typically had lower minimums and required special certification for pilots, aircraft and ground equipment.

<sup>20</sup> The QAR is a separate and distinct recording unit to the FDR. The parameters recorded by the QAR can be varied by the aircraft operator.

International experience has shown that significant improvements in safety can be achieved through programs that monitor and analyse aircraft performance data for the purpose of detecting adverse trends, such as those experienced within a fleet of aircraft or at a particular airport. Those programs are based at the operator level and known internationally as Flight Operational Quality Assurance (FOQA) programs. In a FOQA program, the QAR data from every flight is analysed against two types of specific operational limits:

- soft limits, which are set to indicate possible adverse safety trends
- hard limits, which are set to indicate serious exceedance of operational limits.

Due to the sensitive nature of the data, from which a specific flight is able to be matched with a particular flight crew, such data is de-identified before being analysed. A protocol had been negotiated between the operator and the relevant pilots association that contained an agreed procedure for the de-identification of the FOQA data. That protocol included the:

- Identification of specific soft and hard limits.
- Nomination of one person, commonly referred to as the 'gatekeeper', with access to the data and identification of the flight crew. The gatekeeper's role was to ensure the anonymity of the flight crew.
- Initiation by the operator of a FOQA investigation whenever a hard limit was exceeded. Such investigations normally required the assistance of the flight crew. The gatekeeper was required to act as an intermediary between the flight crew and the operator during such investigations and in support of any further action that resulted from the investigation.
- Maintenance by the gatekeeper of a record of all enquiries made by the operator. Where an individual was involved in multiple FOQA investigations within a set time frame, the gatekeeper followed an agreed investigation and review procedure.
- Exclusion of the FOQA protocol when an event was the subject of an Air Safety Incident

Report (ASIR).<sup>21</sup> The incident was open to unrestricted investigation by the operator.

The agreement did not include a means of correlating individuals involved in successive but distinct FOQA and ASIR investigations. Also, the agreed hard and soft parameters did not include the monitoring of landing gear selection on approach. However, at the time of the incident, the parameters did include a 'late land flap position' soft alert at 600 ft and a hard alert at 500 ft.<sup>22</sup>

#### *Prospective memory, interruptions and situational awareness*

Dismukes<sup>23</sup> researched the effect of changes to habitual procedures and the role of prospective memory in returning to an interrupted procedure. Prospective memory was characterised by Dismukes as having three distinct features:

- an intention to perform an action at some later time when circumstances permit
- a delay between forming and executing the intention that is typically filled with activities not directly related to the deferred action
- the absence of an explicit prompt indicating that it was time to retrieve the intention from memory. That is, the individual must 'remember to remember'.

The critical issue with respect to prospective memory was not retention of the content of intentions, but the retrieval of those intentions at the appropriate moment. The retrieval of intentions was quite vulnerable to failure due to interruptions and/or distractions.

In a related field of research, Endsley and Jones modelled the effect of disruptions on situational

21 An incident report required to be submitted to the ATSB in accordance with the requirements of the *Transport Safety Investigation Regulations 2003*.

22 Selection of land flap without the landing gear being down and locked would result in an EGPWS alert, which in turn was a hard alert.

23 Dismukes, K. (2006). *Concurrent Task management and Prospective Memory: Pilot Error as a Model of the Vulnerability of Experts*, available at [http://human-factors.arc.nasa.gov/publications/Dismukes\\_HFES.pdf](http://human-factors.arc.nasa.gov/publications/Dismukes_HFES.pdf)



awareness (SA) and decision making.<sup>24</sup> Interruptions are a common occurrence in the cockpit, either through alarms, radio calls or other external inputs. They present as competing tasks that may lead to attention narrowing. Attention narrowing was defined as when an individual focused on one task and forgot to manage other competing goals. Another failure identified with interruptions was the poor prioritisation of the interrupting task in relation to other goals. This was often the result of the competing goals and tasks being lost from short-term memory. Both attention narrowing and poor prioritisation can lead to critical losses of SA and poor decision making.

## ANALYSIS

### Introduction

Incidents such as the incorrect configuration of an aircraft for landing are rarely the result of a single action or identifiable event. Instead, a number of factors can contribute to create a chain of events that result in an outcome that was never the intention of the pilot(s).

This analysis will examine a number of factors in this occurrence that may indicate opportunities for safety enhancement in a system that has been developed to create the safest possible environment for passenger transportation. In particular, the impact of distraction on a flight crew's habitual approach procedure, and potential influence of the operator's procedures and documentation, will be discussed.

### Split landing procedure and distractions

Triggering and linking the aircraft's normal procedures and associated checklists with an identifiable phase of flight was designed to assist flight crews' procedural recall. However, in this instance, the noise abatement procedure had the effect of splitting the normal instrument landing system (ILS) landing procedure. That increased the risk of the procedure being incomplete from that point, which was a potential procedural lapse.

Procedural lapses are overcome through explicit prompts that return crews to the unfinished procedure. In the noise abatement procedure, that prompt occurred at the 2,000 ft radio altitude (RA) point for continuation of the landing configuration procedure.

The radio transfer to Sydney tower at about 2,000 ft RA interrupted and then distracted the crew from returning to the incomplete procedure. A series of further distractions combined to narrow the crew's attention, resulting in a loss of situational awareness (SA). In this occurrence, the crew's reduced awareness of the aircraft's configuration and projected state resulted in their not configuring the aircraft for landing. In turn, the aircraft was in an undesired state at 500 ft RA, which triggered the enhanced ground proximity warning system (EGPWS) warning.

There were a number of opportunities for the crew to regain SA, such as the pilot's personal check points and the 1,000 ft (RA) stabilised approach criterion. The latter was procedurally negated through the pilot flying's (PF) declaration of visual procedures at about 1,200 ft. The visual procedures stabilised approach requirement at 500 ft RA coincided with the EGPWS warning.

The pilots' reported awareness of the configuration error shortly before the EGPWS activated, and early decision to go around eliminated any further threat from the unintended configuration error.

There was insufficient evidence to categorize the split landing procedure as directly contributing to the development of the occurrence; however, as shown in this instance, any distraction during, or interruption to, normal procedures increases the risk of degraded SA.

#### *Operating procedures in the FCTM*

The use of the Flight Crew Training Manual (FCTM) to publish the noise abatement procedure contradicted the operator's guidance regarding the purpose of the Flight Crew Operating Manual (FCOM) and FCTM. This is further supported by the operator's Flight Administration Manual (FAM) statement that the noise abatement procedure 'should' be used where conditions are appropriate, which indicated that the procedure was a normal operation.

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24 Endsley, M. R. & Jones, D. G., *Disruptions, Interruptions and Information Attack: Impact on Situational Awareness and Decision Making*. Available at <http://www.satechnologies.com/Papers/pdf/HFES%2001%20-%20disruptions.pdf>

## The monitoring role

The suggestion in United States Federal Aviation Administration (FAA) Advisory Circular (AC) 120-71A that the title pilot not flying (PNF) should be changed to pilot monitoring (PM) indicated the importance placed by the FAA on the monitoring and crosschecking role of that pilot.

Although the operator had not adopted that nomenclature, the operator's guidance and practices included a strong emphasis on the requirement for crews to monitor a procedure. However, as demonstrated by the FCOM description of the PNF duties, there were inconsistencies in the operator's documentation concerning the importance of the PNF's monitoring role. The conflicting requirements and definitions in the operator's publications had the potential to diminish the importance of monitoring as an essential element in the safe operation of an aircraft.

There was insufficient evidence to identify the operator's guidance on monitoring as directly contributing to the development of the occurrence. However, the PNF did not properly monitor the PF's handling of the aircraft, which contributed to the aircraft not being properly configured for landing.

## Head free/head down

Although the description of the visual segment is critical in the decision to land during a precision approach, its relevance is questionable when the aircraft is 1,000 to 2,000 ft above the decision point. Although the operator's definition of the Head Free (HF)/ Head Down (HD) methodology included the need to describe the visual segment, it did not limit its unnecessarily early use during an approach. In this instance, significant attention was given by the PNF to that description, to the detriment of the effective monitoring of the ILS.

The operator's HF/HD procedure followed the spirit of the FAA recommendation for consistency of procedures across categories (CAT) I, II and III low visibility approaches. That procedure also met the FAA's Order 8900 recommendation that one pilot monitor the aircraft's instruments at all times during an instrument approach, and that the PNF announce the acquisition of the required visual cues to continue the approach. But, as noted by FAA AC 120-71A, SOPs should not

detract from effective monitoring, and should also be appropriate to the situation and practical to use. Whether the HF/HD procedure met those criteria is subjective, but it did add a further layer of complexity to the approach procedures.

There was insufficient evidence to categorise the HF/HD procedure as directly contributing to the development of the occurrence. However, the distraction caused by the early application of the visual segment component of the HF/HD procedure probably contributed to the pilots' loss of SA, and therefore to the occurrence.

## Flight Operational Quality Assurance

The lack of correlation between the results of Flight Operational Quality Assurance (FOQA) and Air Safety Incident Report (ASIR) investigations made it possible for those responsible for identifying adverse trends in a pilot's performance to be unaware that a pilot was subject to successive but distinct investigations. The result was that adverse trends in an individual's performance could be inadvertently overlooked.

The Quick Access Recorder (QAR) hard and soft triggers for the landing configuration were set with the purpose of identifying an unstable approach at the visual stabilised approach gate. However, the recorders did not include triggers for late landing gear selection. That negated the use of QAR data to detect whether flight crews were excessively delaying the selection of landing gear, with possible unstable approach implications. The adoption of soft and hard triggers to monitor the selection of the aircraft's landing gear during an approach would address that missed opportunity.

## FINDINGS

### Context

From the evidence available, the following findings are made with respect to the incorrect configuration of Boeing Company 767-338 aircraft, registered VH-OGP, as it approached Sydney Airport, New South Wales on 26 October 2009 and should not be read as apportioning blame or liability to any particular organisation or individual.

### Contributing safety factors

- The changing flight conditions on approach, the late landing clearance and matters

distracted the flight crew from completing the normal landing procedures.

- A number of distractions combined to narrow the crew's attention, which in turn reduced the crew's situational awareness.
- The early application of the head free/head down standard operating procedure contributed to a loss of situational awareness by the flight crew.
- The flight crew's loss of situational awareness resulted in the crew not configuring the aircraft for landing.
- The pilot not flying's monitoring of the pilot flying's handling of the aircraft was ineffective.

### Other safety factors

- The conflicting requirements and definitions in the operator's publications in relation to the pilot not flying role had the potential to diminish the importance of monitoring as an essential element in an aircraft's safe operation. *[Minor safety issue]*
- There was no correlation between the results of the operator's Flight Operational Quality Assurance and Air Safety Incident Report investigations. *[Minor safety issue]*
- There were no soft and hard triggers in the operator's Flight Operational Quality Assurance system to monitor the selection of the aircraft's landing gear during an approach. *[Minor safety issue]*

### Other key findings

- The immediate initiation of the go-around by the flight crew eliminated any further threat from the unintended error.

## SAFETY ACTION

The safety issues identified during this investigation are listed in the Findings and Safety Actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal

safety recommendations or safety advisory notices.

All of the responsible organisations for the safety issues identified during this investigation were given a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

## Qantas Airways

### *Conflicting requirements and definitions – pilot not flying role*

#### Minor Safety Issue

The conflicting requirements and definitions in the operator's publications in relation to the pilot not flying role had the potential to diminish the importance of monitoring as an essential element in an aircraft's safe operation.

#### Action taken/response by Qantas

In response to this safety issue, Qantas advised that:

Qantas Airlines has reviewed its current procedures and publications concerning monitoring as a result of this occurrence but has not currently deemed it necessary to make any changes at this stage. However, Flight Operations will continue to monitor this and make any necessary changes if required.

### *Correlation between flight operational quality assurance and air safety incident report investigations*

#### Minor Safety Issue

There was no correlation between the results of Flight Operational Quality Assurance and Air Safety Incident Report investigations.

#### Action taken/response by Qantas

Qantas advised that it is reviewing the protocols affecting its Flight Operational Quality Assurance (FOQA) and Air Safety Incident Report (ASIR) investigations, which will include the possible correlation of those investigations.

### *Flight operational quality assurance program monitoring of the selection of landing gear*

#### Minor Safety Issue

There were no soft and hard triggers in the Flight

Operational Quality Assurance system to monitor the selection of the aircraft's landing gear during an approach.

#### **Action taken/response by Qantas**

In response to this occurrence, Qantas advised that, in November 2010, soft and hard triggers were introduced into its Flight Operational Quality Assurance system in order to monitor the selection of the landing gear during an approach.

## **SOURCES AND SUBMISSIONS**

### **Sources of information**

The sources of information during the investigation included the:

- flight crew
- aircraft operator
- Bureau of Meteorology
- United States Federal Aviation Administration (FAA)
- Civil Aviation Safety Authority (CASA).

### **Submissions**

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the flight crew, the aircraft operator and CASA. Submissions were received from the flight crew and the aircraft operator. The submissions were reviewed and where considered appropriate, the text of the report was amended accordingly.