(2) The ATSB report also examined the *way* in which seatbelts are worn, and the relationship this has with injuries sustained during in-flight upsets. On ZZ333, at least one passenger reported that his injuries were sustained as a result of his seatbelt being fastened only loosely across his lap. As highlighted in the ATSB report:

- *Loose seat belts also do not effectively limit the body's motion during vertical forces, and also increase the likelihood of a person being injured due to being thrown against armrests or other fixtures.*

(3) The ATSB report recommended that more frequent reminders regarding seatbelt use should be given during flights, employing a greater variety of communications. More detailed guidance for passengers on the *way* seatbelts should be worn throughout a flight would be useful. These measures, it argued, had the potential to increase compliance on the use of seatbelts. More fundamentally, the ATSB report pointed out that there was a general lack of research into the factors affecting the use of seatbelts.

b. **Safety measures in the cabin**. The ATSB Report also considered whether handholds in an aircraft cabin might assist occupants to secure themselves in the event of an in-flight upset (e.g. unexpected turbulence). A Federal Aviation Administration circular in 2007[11] had recommended the placing of handholds in a variety of locations around aircraft, including in the galley, the lavatories (both inside and outside), and under the overhead baggage compartments. The Voyager cabin has handholds in the galleys, underneath the baggage compartments and inside the lavatories. As with the 2008 incident however, the pitch-down event on ZZ333 happened so quickly that it is unlikely the presence of additional handholds in the cabin would have made a significant difference to the numbers of injuries sustained (unless occupants were already holding on to them). As also noted by the ATSB in their report, poorly placed handholds could themselves represent a hazard if they were 'hit by an occupant during an upset'. The Panel did not consider that a change in the design of the cabin area was warranted. Exhibit 90

Summary

1.4.79 The Panel concluded that, while there were some aggravating factors applicable in the cabin of ZZ333, none was the result of the way cabin safety regulations were applied during the flight. The rules relating to operations with only seven Cabin Crew members were ambiguous; however, neither the number of Cabin Crew, nor the manner in which they managed the situation had any adverse bearing on the outcome. The actions of the Purser were particularly noteworthy in bringing the situation

[11] Federal Aviation Administration, "Preventing Injuries Caused by Turbulence."

under control. A minor change to the policy regarding Cabin Crew seatbelt use could help in mitigating future in-flight upsets. Though a simple strengthening of the rules regarding passenger seatbelt use could seem attractive, the Panel considered that more effective measures to increase seatbelt use might be possible, as alluded to in the ATSB report of 2011. More research was needed in this area. Changes in the design of the cabin were not considered to be necessary.

Recommendations

1.4.80 **The Panel recommended that:**

a. **AOC 2 Gp examines methods of enhancing seatbelt use amongst air transport passengers, including (but not limited to) policy, the content and frequency of briefings, and publicity.**

b. **AOC 2 Gp amends the policy on Cabin Crew restraint to reduce the risk of injury during in-flight upsets. Specifically, Cabin Crew should wear a seatbelt during controlled rest periods.**

Post Occurrence Management

Command and control

1.4.81 Command and control responsibilities during the post-occurrence phase of the incident were not widely understood. The task fell within the Strategic Coupling Bridge, which describes the logistical link by air, land and sea between the UK and the Op HERRICK Joint Operations Area (JOA). In respect to the air component of the Coupling Bridge, command and control is subject to the following directives and instructions: Witness 13 Witness 18

a. **Chief of the Defence Staff (CDS) directive.** The Joint Command is responsible for the Coupling Bridge conveying personnel, equipment and materiel between the Strategic Base and the JOA. This remit includes methodology, strategic assets, infrastructure, facilities, routes, force protection, command and control arrangements and transport assets by which the capability is moved. Witness 18

b. **Chief of Joint Operations (CJO) directive.** CJO retains Operational Command (OPCOM) of all UK assigned naval, land and air forces. Witness 18

c. **Joint Mounting Order and Strategic Movements Instruction.** CJO retains OPCOM of all Force Elements throughout the deployment until they are dismounted from their home base Air Point of Disembarkation (APOD). Front Line Commands are responsible for dismounting their own forces. Exhibit 91

d. **Defence Instruction and Notice (2012DIN03-010).** Assistant Chief of Defence Staff, Logistics Operations (ACDS (Log Ops) sponsors 2012DIN030-010 which addresses the process and priorities for the allocation of fixed wing air mobility support across Defence. The Instruction states that Air Officer Commanding (AOC) 2 Gp has OPCOM of the Air Mobility Force (which includes Voyager aircraft and crews) for non-deployed operations. In the event of assets being assigned to a Theatre of operations, OPCOM of those particular assets is delegated to CJO. Exhibit 92

1.4.82 In practise, for the ZZ333 task:

a. Permanent Joint Headquarters (PJHQ) (CJO) had OPCOM of the passengers from the point that they departed RAF Brize Norton. Witness 18

b. HQ 2 Gp (AOC 2 Gp) had OPCOM of the aircraft and its crew throughout the task. Exhibit 92

c. Defence Supply Chain & Operational Movements (DSCOM) (for the Jt Command) was the tasking authority for the flight. In effect, DSCOM supplied the passenger movement to PJHQ, which Witness 18

was the 'customer'.

d. ASCOT Operations (for DSCOM) had Operational Control (OPCON) of the task, but was itself under the OPCOM of RAF Brize Norton (HQ 2 Gp). Witness 20 Exhibit 93

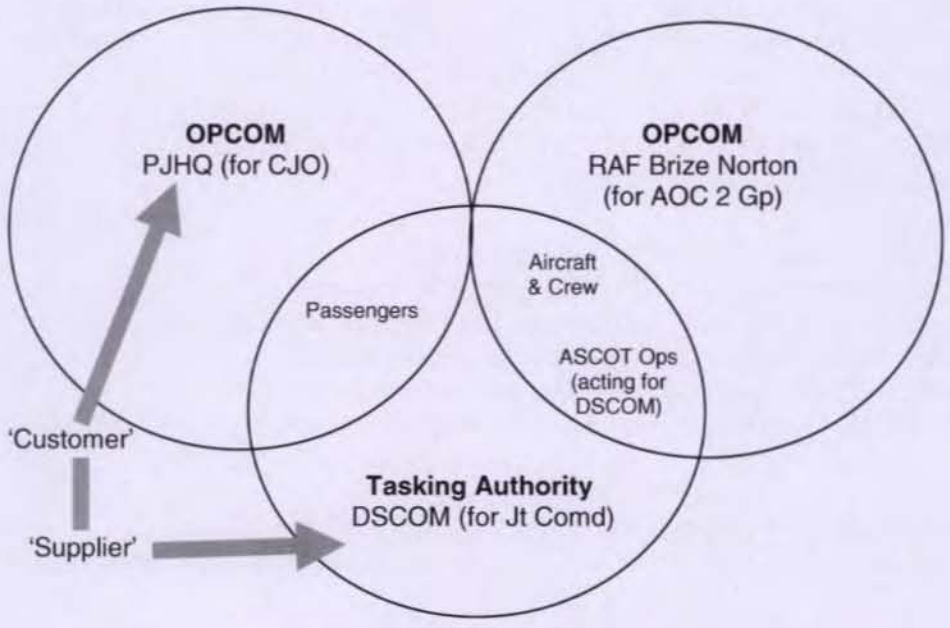

Figure 24: Command and Control relationships.

1.4.83 Following the diversion of ZZ333, RAF Brize Norton took control of the Post Occurrence Management of all force elements in Incirlik. This was not the result of a formal arrangement between HQ 2 Gp, PJHQ or DSCOM, but came about in the absence of general clarity regarding where command and control responsibilities should ultimately sit for a diverted aircraft and its passengers. By the time representatives from RAF Brize Norton and PJHQ spoke to discuss the incident on the evening of 9 Feb, the Station had already established lines of communication with the crew, the RAFLO at Incirlik, the Joint Compassionate and Casualty Centre (JCCC) at Innsworth, and the Directorate of Media and Communications (DMC) in Head Office. They had also begun arrangements to deploy a team to Turkey to support the crew and passengers. As a result, the Station took the default lead in most aspects of Post Occurrence Management, with PJHQ and DSCOM assuming a supporting role. Witnesses 5, 6, 13,16 & 18 Witness 5, 6 & 13

Decision making

1.4.84 The following key decisions and actions were taken at RAF Brize Norton:

a. The decision to deploy a support team to Incirlik, consisting of RAF Brize Norton staff and Trauma Risk Management (TRiM) practitioners (and subsequently mental health nurses from the Department of Community Mental Health, following input from PJHQ). Witness 5, 6 & 21

b. The decision that passengers would return to the UK and not proceed to Theatre. — Witness 20

c. The recording of passenger triage interviews conducted in Incirlik, including a note of physical injuries and any consequent referrals to mental health nurses. — Witness 13

d. The decision as to how and when the passengers would return to the UK. — Witness 20

e. The decision as to which passengers would re-mount the airbridge to Theatre, and which passengers would return to their home unit. — Witnesses 6 &13

1.4.85 Other key decisions and actions were as follows:

a. PJHQ J4 Medical, through HQ Air Command A4 Medical Ops, directed that mental health nurses from the Department of Community Mental Health should accompany the RAF Brize Norton support team which deployed to Incirlik. — Witness 21

b. PJHQ J4 Movements & Mounting led on contingency planning for the possibility of passengers returning to the UK by surface lines of communication. — Witness 18

The practical response

1.4.86 The response of the RAF Brize Norton executive team on 9 Feb was fast, thorough and effective. Notwithstanding that events were developing quickly however, the Panel found it difficult to establish an accurate timeline of key discussions that occurred on the evening of the incident. While records kept by the AirTanker Services Emergency Response Centre and JCCC were helpful in extrapolating a timeline, the lack of a written log for the Brize Norton executive team introduced an element of uncertainty about how and when key decisions were made. — Exhibit 16

1.4.87 The small SO2-led support team deployed by RAF Brize Norton (including the subsequent mental health and medical staff) performed a vital and highly effective role in Incirlik. Given the nature of the incident, the crew members were neither qualified, nor fit to deal with the scale and scope of activity required on the ground during the aftermath of the event. The RAFLO had a limited remit and she had not received any Post Occurrence Management training. Although she was able to deliver highly effective general support, the combination of her rank (OR-9), background (musician) and time accumulated in Theatre (two days) inevitably restricted the extent to which she could generate specialist support or provide liaison with the appropriate parties in the UK. The USAF support was also highly effective, but came with limitations and only from within its own spare capacity. As such the role of the support team became one of tactical control and J1-9 support. That this was possible, however, rested on the fact that suitably qualified and experienced personnel happened to be available to deploy at — Witness 9; Witness 9; Witness 13

the point of need. Excluding lodger units, RAF Brize Norton holds no stand-by commitment for such a task, nor is it resourced to fulfil it. A failure to deploy a support team would have left the 198 crew and passengers in the hands of the host-nation authorities and responsible for overseeing their own J1-9 requirements; without the support of the mental health team and the multi-disciplinary medics who followed from RAF Brize Norton, it is likely that many of the passengers would not have been fit to board the flight back to the UK at all. Chance appeared to have been an important factor in the successful and timely constitution of the support team, who were fortunate to be able to exploit the support of the RAFLO and the USAF in Incirlik. Had the aircraft had a full passenger load, or diverted to where there was no RAFLO or USAF support, it is questionable whether the support team would have had the necessary resources to deal with the situation on the ground. Witness 5

1.4.88 Passengers experienced border control difficulties at Incirlik that could have been avoided had they all been in possession of a NATO Travel Order, or if the crew had held a cash imprest for the payment of visas. The extant Op HERRICK Strategic Mounting Instruction mandated that passengers should carry a NATO Travel Order for scheduled C17 flights through Turkey, but did not include this stipulation for flights overflying Turkey. While the crew of ZZ333 carried a Government Procurement Card, they had no flight sub-imprest. Witnesses 9 & 23 Exhibit 13 Witness 3

Injuries

1.4.89 In determining the extent of injuries sustained during the incident, the following sources were available to the Panel: a report produced by RAF Brize Norton; crew medical records compiled in Incirlik; crew interviews; questionnaires completed by the crew and some of the passengers; a report compiled by one of the support team mental health nurses, and a report compiled by the Op HERRICK Visiting Consultant Psychiatrist. Exhibit 3 Exhibit 21 Exhibit 28 Exhibit 94 Exhibit 26

1.4.90 There were significant discrepancies between the sources, and the Panel could not track injuries that might have been reported at home units after the incident took place. The Panel found that, while diligent attempts had been made by various parties to produce J1/J4 records, there was no co-ordination of the information in such a way as to guarantee the continuity or oversight of J1/J4 action (especially medical treatment), and the accurate notification of that action to home/in-Theatre units. For example, the small support team in Incirlik was able to keep only basic records of the passengers' injuries and their onward disposal. This meant that on return to the UK, a number of passengers were sent back to their home unit without any accompanying paperwork explaining either the reason for their return or the extent of any J1 action that had already been taken. As a result, it was not clear whether home units ever offered TRiM interviews to their returning personnel. Witness 16 Exhibit 3 Witness 13 Witness 13

1.4.91 Elsewhere, some in-Theatre units only learned of individuals' involvement in the incident when they presented with mental health symptoms. On Sun 16 Feb, the PJHQ J4 Medical Duty Officer received a phone call from the Defence Consultant Advisor in Psychiatry (DCA Psych), relaying a message from the Field Mental Health Team (FMHT) at Camp Exhibit 26 Witness 21

Bastion that a large number of personnel from the ZZ333 flight had presented in Theatre with adverse mental health symptoms. The resources of FMHT, the Role 3 hospital and the mental health aero-medical team were insufficient to deal with the quantity and severity of symptoms, or the ongoing referrals which were expected to follow. As a result, PJHQ deployed the Op HERRICK Visiting Consultant Psychiatrist to Camp Bastion on Tue 18 Feb, along with two aero-medical mental health nurses. Exhibit 26

1.4.92 In a report compiled by the Visiting Consultant Psychiatrist, it was stated that within 48 hours of the passengers arriving at Camp Bastion (ie, by Sun 16 Feb), seven personnel had been referred to the FMHT. At this point, the FMHT had received a brief e-mail from the mental health cell at Tactical Medical Wing (TMW) alerting them to the fact that an incident had occurred; however the e-mail could only indicate that a Voyager had an in-flight problem. No further details about the flight or the initial triage process were available. Four of these patients presented with severe distress and significant psychological symptoms, of whom three were admitted to the Role 3 hospital. The other three patients required follow up, of whom two were unable to complete the in-Theatre flights to their final destination. In addition, the following reports were received by the FMHT: Exhibit 26

a. From the Emergency Department at Camp Bastion of patients who had reported in a distressed state overnight.

b. From the physiotherapy department at Camp Bastion of Voyager passengers who had sustained muscoloskeletal injuries who appeared also to be psychologically distressed and in need of mental health care.

c. From the primary care doctors at the outlying locations of soldiers in an anxious and agitated state, or who were not sleeping, and had been prescribed sedating medication.

1.4.93 By Wed 19 Feb, the first contact took place between the FMHT and the mental health staff who had attended the passengers in Incirlik. This provided FMHT with the first quantifiable measure of the number of personnel who had appeared acutely distressed in the immediate aftermath of the original incident. On Fri 21 Feb, orders were issued to all Theatre units (JFSp(A)_FRAGO_013_OPO 001/14) tasking them to identify any personnel who had been on board the Voyager flight and to ensure that they received 'appropriate TRiM support'. By Mon 24 Feb, a further seven passengers from ZZ333 were referred to FMHT. Two of these were patients based at a Forward Operating Base (FOB) only reachable by helicopter. One of these patients was the individual who had the acute stress reaction in the immediate aftermath of the incident and who was assessed at the hospital near Incirlik. By Tue 25 Feb, two more patients from the original seven referrals were returned to the UK by aero-medical evacuation. By now, news had reached Theatre that Voyager had returned to flying and would be resuming Op HERRICK flights. FMHT received several contacts from in-Theatre commanders who had identified that some of their soldiers, who up until this point had appeared to been fine and not presented to healthcare, were now nervous at the prospect of end-touring and returning to the UK on board a Exhibit 26

Voyager aircraft.

1.4.94 From the variety of records obtained by the Panel it was estimated that, as of 25 Feb 14, out of the original 198 personnel on-board ZZ333, a minimum of 32 (16%) and a maximum of 48 (24%) were, for varying reasons and periods of time, rendered unfit for duty. At the point of publishing this report however, **the Panel observed that the overall medical outcome of the incident was not being tracked.** It is possible therefore, that the true figure was higher.

Summary

1.4.95 As a whole, the practical response in the immediate aftermath of the incident was fast, thorough and highly effective. Given the unusual circumstances however, there was a sense in some areas of command, control and support being conducted in an improvised fashion, with chance playing a significant role in the composition of the support team and with key decisions and information being handled at the tactical level (including those with operational consequences). It was not clear how responsibilities in such a situation should be divided between the operating and operational areas of responsibility. Despite some individual diligence, the lack of overall co-ordination of information undermined the continuity and oversight of J1/J4 action, particularly with respect to medical cases. As a result, it is not clear whether initial TRiM was conducted for many of the passengers, and in-Theatre units were not fully pre-prepared for the volume of medical cases which followed (the Panel found no evidence that the quality of individuals' treatment was adversely affected). Up to 24% of the aircraft's occupants were rendered unfit for duty following the incident. At the point of publishing this report, there was no evidence that the overall medical outcome of the incident was being tracked. A properly formulated contingency plan, owned by an appropriate HQ, would ensure that for diversions of large aircraft (especially those involving a large number of passengers), sufficient support was always available from suitably qualified and experienced personnel, and with appropriate HQ oversight.

Recommendations

1.4.96 **The Panel recommended that:**

a. **COS Ops, PJHQ and COS Ops Air Command, in consultation with AOC 2 Gp, produce a contingency plan for unplanned diversions of strategic air transport aircraft. The plan should be held by an appropriate operational level HQ, should clarify command and control responsibilities between operational and operating areas of responsibility and, where necessary, have stand-by resources attributed.**

b. **AOC 2 Gp ensures that crews on all strategic air transport flights carry a flight sub-imprest.**

c. **PJHQ ACOS J1/J4 stipulates the carriage of NATO Travel Orders by all UK military passengers on strategic air transport flights.**

d. **Stn Cdr, RAF Brize Norton, reinforces in Stn Post Occurrence Management Procedures the requirement for key decisions to be recorded in a written log.**

Other areas of analysis

The selection and planning of the diversion

1.4.97 In the 38 minutes of available CVR recorded prior the incident, there was no discussion between the pilots regarding aircraft position, possible en-route diversions or their associated weather. This included the point at which the Co-pilot left his seat, some 18 minutes prior to the incident, although at this point a handover of the radio did take place. The Captain had spent some time in the cruise calculating a point-of-no-return for a theoretical return to RAF Brize Norton. The Voyager Operations Manual, Part B, Section 2.1.15.9 stated a requirement for pilots to continually monitor and discuss possible diversions and their associated weather. When interviewed, the Captain stated that although he and the Co-pilot would have had discussions of a general nature regarding the route, no specific en-route diversions were discussed during the flight. When asked about the scoping of specific en-route diversions prior to the flight, the Captain said that there was not enough time to do so. At the point of the incident the pilots did not have a specific diversion location in mind. As such, there was no scope for a planned diversion location to be used as part of the decision-making process.

Exhibit 19
Witness 1, Panel Interview 1
Exhibit 95
Witness 1, Panel Interview 4
Annex B, para 70 (e)

1.4.98 As the incident developed, the Captain elected to divert and land the aircraft as soon as possible. The Co-pilot asked Turkish ATC for, 'an immediate diversion to a suitable airfield of our choice.' ATC suggested Trabzon (LTCG), some 60nm south of the aircraft's position. The flight-deck route bag, compiled by AirTanker Services, contained Terminal Approach Plates for the following recommended en-route diversion airfields: Trabzon (60 nm range); Samsun (142 nm range); Tbilisi; (242 nm range); Ankara (331 nm range), and Istanbul (486 nm range) (Figure 25). In discussing Trabzon, the pilots were uncertain regarding its suitability and instead tried to recall, 'the name of the major airfield in Turkey.' The crew then asked ATC for a diversion to Istanbul Airport, approximately 500nm from their position. Initially, ATC agreed to this request and instructed the crew to set course to Istanbul. After a few minutes however, ATC relayed a message from the Turkish Military Authorities that it would better if the aircraft diverted to Incirlik (LTAG) where the USAF was based, at a range of some 340nm. This was accepted by the Captain, who turned the aircraft towards Incirlik. **The Panel observed that despite a number of suggested en-route diversions being within safe range of the aircraft, no pre-planned diversion formed part of the crew's decision-making process.** In addition to the lack of a pre-nominated diversion, Human Factors analysis indicated that it was likely the following factors influenced the diversion decision:

Exhibit 19
Exhibit 96

Figure 25: Illustration of diversion route (map data © 2014 Google, Basarsoft.)

a. **Familiarity**. There is a tendency to judge unfamiliar items more negatively than items with which an individual is familiar. The crew had a negative response to the diversion location that they were least familiar with (Trabzon), seeking a less unfamiliar option (Istanbul), and reporting being most happy when presented with a familiar location (Incirlik). Annex B, para 70 (a)

b. **Suitability**. The runway length and distance from current location were primary considerations for the pilots as they evaluated the suitability of any possible diversion airfield. The pilots indicated that they wanted to land the aircraft as soon as possible, but they also wanted enough flying time for preparations to be made for landing. In interviews, the pilots said that time would be required to make the cabin safe and to enable a low rate of descent to be used. The pilots had also perceived that there would be a requirement to cope with medical issues on board, although at the time of selecting a diversion location the nature of any passenger injuries was not known and had not yet been discussed. Exhibit 2

Witness 1 Panel Interview 1
Annex B, para 70 (b)

c. **Workload**. Eleven minutes elapsed between the initial decision to divert the aircraft and the selection of Incirlik. This period corresponded to the immediate aftermath of the incident and was characterised by shock, high workload and high arousal. It is likely that the capacity of the pilots to undertake complex decision making and to evaluate options from scratch would have been reduced. Exhibit 2 Annex B, para 70 (c)

d. **Decision-making aids**. Owing to the negative 'g' experienced during the incident the flight deck was in considerable disarray and both pilots were strapped into their seats, therefore they did not have immediate access to the list of approach plates which were in the route bag. Although the nearest suitable airfield could have been obtained from the Multipurpose Control and Display Unit, this did not appear to influence crew decision-making regarding a suitable diversion location. The difficulty of access to Terminal Approach Plates was mitigated by the availability of ATC primary radar, the favourable weather conditions and the lack of extensive terrain around Incirlik. Exhibit 2 Witnesses 1, 2 & 3 Annex B, para 70 (d) Exhibit 2 Exhibit 119

1.4.99 The Voyager Operations Manual stated that the choice of nearest suitable airport should not be influenced by consideration of passenger ground handling or convenient technical support. The suitability of an airfield was determined by factors such as runway length, opening hours, air traffic services, lighting, navigation aids and emergency services. The guidance reflected the fact that in an emergency, aircraft Captains should not be unduly limited in their choice of available diversion airfields lest it compromise their ability to land the aircraft safely and as soon as possible. In the case of ZZ333, rather than choice being limited, there were numerous 'suitable' airfields within adequate range of the aircraft. That Incirlik was chosen (at the suggestion of the Turkish authorities) did not compromise flight safety but did allow important operational factors, such as medical care and security, to be managed with minimal risk. The Panel did not consider that advice for emergency diversions should change, but noted that none of the suggested en-route diversions in the route bag had been subjected to any form of operational risk assessment (assessed against Foreign and Commonwealth Office travel advice or checked with Embassy Defence Sections, for example). Whilst not directly pertinent to flight safety, factors such as security could have an important bearing on the management of a situation once on the ground, especially where large numbers of operational passengers, weapons and classified material were involved. Even a basic assessment of a regularly flown route would allow the operational risks associated with selected en-route diversions to be understood in advance. Such an assessment could also reveal where *preferred* airfields were in the event of *non-emergency* diversions. Exhibit 97 Exhibit 98

1.4.100 **Summary.** The pilots did not have a specific diversion location in mind at the time of the incident. No pre-planned diversion formed part of the crew's decision-making process. The accessibility of in-flight publications was insufficient to enable the crew to find the appropriate Terminal Approach Plates prior to landing. None of the suggested en-route

diversions had been subjected to an operational risk assessment.

1.4.101 **Recommendation. The Panel recommended that the Air Mobility Force Commander ensures that the list of suggested en-route diversions for operational strategic air transport tasks is informed by an operational risk assessment of the consequences of diverting into each location.**

Cost of damage to aircraft and civilian property

1.4.102 At the time of publishing this report, the cost of damage to the aircraft resulting from the incident could not be accurately assessed, owing to the way costs are dealt with through the Voyager contract. The final figure would be subject to the outcome of an ongoing commercial process. Early estimates put the possible cost in the region of £0.5M, however confidence in the accuracy of this figure was low. There was no reported damage to civilian property as a result of the incident. Exhibit 99

Authorization, crew qualifications and currency

1.4.103 MAA Regulatory Article 2498 (1) detailed the duties of an authorizing officer. They included ensuring that the crew was qualified, in current flying practice and capable of executing the mission. The duties of aircraft commanders were detailed in MAA Regulatory Article 2115 (1) which stated that they should ensure their crew was properly constituted, qualified and capable of performing its duties. Exhibit 100 Exhibit 101

1.4.104 The authorization policy for Voyager flights stated that: Exhibit 102

- *Before departing Brize Norton and during normal working hours, all Captains should be authorized face-to-face by the Authorizing Officer after the crew brief, regardless of self-authorizing status. For flights departing outside of normal working hours, authorization should take place the working day prior unless this would impact on crew rest, in which case authorization should take place 2 working days prior.*

1.4.105 Powers of authorization for specific personnel on 10 Squadron were listed in a Voyager authorization matrix (covering both 10 and 101 Squadrons). Normally, authorization was carried out by a Wing Duty Exec, known as the DEX. The DEX duty was detailed in a Voyager Crew Notice, but it existed principally to provide 24/7 military oversight of Voyager tasking. The duty began at 1000hrs on a Tuesday and ran for seven days, during which time the DEX was required to be contactable at all times and to be able to return to work outside normal hours. Exhibit 102 Exhibit 103

1.4.106 On Fri 7 Feb, the authorization of the flight was conducted by the DEX in the presence of the Captain. The brief covered only an outline of the sortie plan, as the flight was not due to depart until Sun 9 Feb, meaning that a significant number of the items on the authorization brief (as detailed Witness 12 Exhibit 104

in Voyager Operations Manual, Part A, Section 2) were not known; they included considerations of weather, aircraft status, load, crew rest and the status of the in-flight documents. During authorization, the DEX checked to ensure that a properly constituted and Combat Ready crew was assigned to the task, but neither the Captain nor the DEX checked crew currencies. The authorization sheet (F1575B) was signed by both the DEX and the aircraft Captain.

Witness 12
Exhibit 108
Witness 12
Exhibit 15

1.4.107 On Sat 8 Feb, Voyager Crew Control produced a Recency Expiry Sheet for each crew member, as required by the Voyager Ground Operations Procedures Manual. The Sheet detailed crew expiry dates for both essential and non-essential currencies. The reports showed that, of the ten planned crew members, eight had out-of-date currencies of some description. Of these, three individuals had entries which were significant enough to prevent them from flying on the planned flight without a further clarification of their currencies.

Exhibit 105
Exhibit 106
Exhibit 107
Exhibit 108

1.4.108 On Sun 9 Feb, the day of the flight, the Captain required two changes to his authorization. The first was a change to the Cabin Crew composition, as one of the Cabin Crew had reported sick some ten minutes prior to the crewing-in time of 0925 UTC. The second change was to the nominated destination alternate airfield, from Minhad to Kandahar. The duty ops staff attempted to reach the DEX at 0920 UTC by phone to consult him initially regarding the Cabin Crew situation, but he could not be contacted. By 0950 UTC, still unable to reach the DEX, the Squadron Commander was contacted instead. The Squadron Commander approved the change to seven Cabin Crew members and directed that ASCOT Ops be contacted to check on the possibility of changing the booked destination alternate airfield. The DEX phoned Voyager Operations at 1035 UTC and received an update on the changes to the task. The sick crew member was crossed out on the authorization sheet by the Captain, but no annotation was made of how the revised authorization was given, who gave it, or when it was given (such an annotation was a requirement of the Voyager Operations Manual Part A).

Exhibit 16
Exhibit 16
Exhibit 104

1.4.109 The Captain could not recall whether or not he had seen the Recency Expiry Sheet on the morning of the flight. He stated that at the time of the flight it was normal for captains to rely on the Voyager Ground Operations staff to have ensured that the crew members were current, rather than to check themselves. Had he become aware of expired currencies amongst the crew he would normally check with the individual concerned to clarify whether or not they were current, and consult the DEX if there was an unresolved issue. In respect to fatigue, a risk matrix was reported to be available to assist the Captain in assessing the likelihood of crew fatigue before take-off, but use of the matrix was not a requirement.

Witness 1, Panel Interview 4
Annex B, para 16

1.4.110 The on-duty DEX stated that it was generally considered to be the responsibility of Voyager Ground Operations staff (specifically, 'Crew Scheduling') to ensure that crew members were current to complete a flight. The Voyager Operations Manual (Part A, Section 2.3.1) stated that before each flight, Voyager Ground Operations was to check that a Commander had been designated, the required crew complement had been allocated

Witness 12
Exhibit 104

and that they met all the required competency and recency requirements. As such, the DEX had not checked the currencies of the crew before the flight.

1.4.111 A Recency Expiry Sheet printed on Wed 12 Feb showed that, in fact, none of the previously reported expired currencies were out-of-date on the day of the flight. In an e-mail to Squadron staff some four months before the incident, a Voyager Flight Commander had directed a 100% check of currencies to be carried out on Voyager aircrew owing to the discovery of discrepancies in the records. According to the e-mail, the matter of currency oversight had, over several months, given cause for 'grave concern,' and needed to be addressed. Following the ZZ333 incident, the Squadron Commander directed improvements to currency monitoring, including the use of regularly updated quick reference tables in the pilot briefing room. Exhibit 109 Exhibit 110 Exhibit 111

1.4.112 **Summary.** The Panel found that the crew members were sufficiently trained, competent, qualified and current to complete the flight as briefed. However, the Panel also found that:

a. The currencies of crew members were not properly checked prior to the flight on 9 Feb. Poor currency oversight had been an issue on the Squadron for several months.

b. The DEX was not contactable at all times, specifically at the point the crew reported for duty on 9 Feb.

c. A significant variation to the task authorization was not correctly annotated in the authorization sheet.

d. The practise of authorizing flights two working days in advance did not allow for all of the items on the authorization brief to be covered. On the day of the flight there was no positive confirmation made between the DEX and the aircraft Captain of the outstanding items on the authorization brief.

1.4.113 **Recommendation. The Panel recommended that the Hd of Oversights and Approvals, MAA conducts an audit of the authorization process on the Voyager force to ensure that local procedures and practices are satisfactory and in compliance with Military Regulatory Publications.**

Regulations

1.4.114 The Voyager Operations Manual is based on the CAA approved AirTanker Services Operations Manual and amended to reflect Military Regulatory Publications (MRPs), 2 Gp Air Staff Orders and Brize Norton Air Orders (BZAOs). Exhibit 112

1.4.115 The Voyager Operations Manual, Part A, Section 0.1.2 stated:

- *The Operations Manual is to be used in place of HQ 2 Gp Air Staff Orders and RAF Brize Norton Air Orders unless otherwise stated within the Operations Manual.* Exhibit 113

Accordingly, Voyager crews did not sign for BZAOs. However, BZAOs stated:

- *All personnel who fly in RAF Brize Norton aircraft are to comply with the regulations in BZAOs and all other pertinent orders and instructions. Voyager crews are to comply, in the first instance, with the Voyager Operations Manual. In the event of a conflict between orders or instructions the most stringent is to apply. All RAF Brize Norton personnel in flying appointments are to sign as having read BZAOs.* Exhibit 114

1.4.116 Voyager crews did not sign for MRPs because of the Voyager Operations Manual's remit to capture the totality of relevant MRPs. However, the Manual did not contain a reference to Regulatory Article 2309 (3) (carriage of loose articles), and did not fully articulate Regulatory Article 2115 (1) (responsibilities of an aircraft captain). These discrepancies were small, but pertinent to the incident. Exhibit 112

1.4.117 The Cabin Safety Procedures Manual implied that it was not permissible to depart RAF Brize Norton with fewer than eight Cabin Crew members. This stipulation did not appear in the main Voyager Operations Manual, although it had appeared in a previous version of that document. Successive editions of the Operations Manual had seen this rule changed, apparently inadvertently and without recourse to a formal Duty Holder review. As such, there were conflicting views as to whether the limitation on reduced Cabin Crew applied or not on 9 Feb. Evidence submitted to the Panel by AirTanker Services and RAF Brize Norton Standards staff did not resolve this ambiguity. Exhibit 85 Exhibit 87 Exhibit 88

1.4.118 **Summary.** There was conflicting guidance regarding the requirement for Voyager crews to read and sign for BZAOs. There were small but pertinent discrepancies between the Voyager Operations Manual and Regulatory Publications. Within the Operations Manual, there was ambiguous guidance on when the carriage of reduced Cabin Crew numbers was permitted.

1.4.119 **Recommendations. The Panel recommended that:**

a. **AOC 2 Gp clarifies and re-promulgates the hierarchical status of the Voyager Operations Manual in relation to MRPs, 2 Gp Air Staff Orders and BZAOs.**

b. **AOC 2 Gp ensures that the Voyager Operations Manual is compliant with MRPs, is coherent with 2 Gp Air Staff Orders**

and BZAOs, and that this is supported by a timely and robust amendment process.

c. **AOC 2 Gp clarifies the circumstances in which the Voyager Operations Manual policy on reduced cabin crew operations may be applied.**

Charging of portable electronic devices

1.4.120 The aircraft had a number of on-board electrical sockets which were capable of being used to charge portable electronic devices. The Panel heard evidence that the practice of using the on-board sockets for this purpose was widespread, despite it being prohibited by the aircraft Release to Service. Witness 3, Panel Interview 1 Exhibit 43 Witness 2, Panel Interview 1

1.4.121 **The Panel recommended that the Stn Cdr (DDH), RAF Brize Norton, takes steps to ensure that Voyager crews are fully conversant with the Release to Service stipulation prohibiting the on-board charging of portable electronic devices.**

Cockpit voice recorder

1.4.122 That an extensive CVR record of the flight was available, was ensured by the pulling of the CVR Circuit Breaker (CB) after the aircraft had arrived at Incirlik. This was carried out on the prompt of one of the AGEs, who happened to recall that doing so would preserve the record of the flight. A failure to pull the CB would have caused the CVR to run-on under ground power until such time as the recording of the incident itself was lost. Given the importance of the CVR to the Inquiry, there is little doubt this would have hampered the investigation significantly. The Panel identified a need for type-specific instructions to be issued on the preservation of CVR/DFDR data post incident. Witness 22

1.4.123 **The Panel recommended that MAA Certification and Regulation issues advice for Duty Holders on the preservation of CVR data post-incident.**

Cockpit video recorder

1.4.124 The Panel relied on DFDR and CVR evidence to identify the cause of the pitch-down command. In the absence of accurate eye witness evidence, a significant amount of time passed before the aircraft was returned to flight and before the Panel could ascribe a level of confidence to its findings to rule out a technical cause. It is likely that a cockpit video recorder would have enabled the cause of the pitch-down to be established quickly, significantly curtailing the impact of the cease flight decision and preventing unfounded doubts regarding the technical airworthiness of the aircraft from perpetuating. On a subject that has attracted considerable debate across the airline industry, the Panel was not able to conduct enough research to support a generic recommendation.

1.4.125 However, **the Panel observed that the availability of cockpit**

video evidence would have allowed the cause of the ZZ333 pitch-down to be established more quickly than was the case, significantly curtailing the impact of the incident; such technology may be of use in future safety investigations.

Flight data monitoring

1.4.126 Voyager uses a system of Flight Data Monitoring (FDM) which is employed widely across the airline industry. The system allows for the routine downloading of an extensive range of in-flight parameters which can be used for a variety of purposes, including improving operational performance and identifying exceedances. In respect to the Inquiry, FDM data was critical in aiding early analysis of the incident, well ahead of the DFDR and CVR which could not be accessed immediately due to the requirement to physically remove the base units from the aircraft. Furthermore, FDM was able to identify 26 inadvertent disconnections of the Voyager autopilot which had occurred over several months, but which had not been reported.

1.4.127 As such, **the Panel observed that the availability of FDM was a significant aid to the Inquiry, and could represent a valuable source of information for future investigations.**

Fuel dumping

1.4.128 During the diversion, 20 Tonnes of fuel was dumped in order to reduce the landing mass of the aircraft. Fuel dumping was conducted in accordance with the in-flight Quick Reference Handbook, except that the Captain elected to not inform ATC. There was a requirement to record fuel dumping by means of a post-flight Captain's report, however this was not completed.

Exhibit 2
Exhibit 87
Exhibit 115
Exhibit 122

1.4.129 **The Panel observed that a post-flight fuel dumping report was not submitted.**

Logbooks

1.4.130 With respect to pilot logbooks, the Voyager Operations Manual Part A, Section 2.1.6.5 stated that, 'one supervisory signature is required each month.' As at 9 Feb 14, the last supervisory signature in the Captain's logbook was Sep 13; for the Co-pilot this was Oct 13.

Exhibit 116
Exhibit 8
Exhibit 10

1.4.131 **The Panel recommended that STANEVAL, RAF Brize Norton conducts a 100% check of logbooks on 10 Squadron to ensure they have been completed in accordance with the Voyager Operations Manual.**

The Incirlik RAFLO post

1.4.132 In examining whether the Incirlik RAFLO had been suitably trained, qualified and experienced to conduct her role, the Panel was not able to find any terms of reference for the post. The post had been transferred from the

Op HERRICK Operational Establishment Table to HQ Air as a 'below the line' fill. Subsequently, the chain of command for the post and thus the terms of reference appeared to have become ill-defined, with various parties claiming only partial knowledge or responsibility for the post. Exhibit 117

1.4.133 **The Panel recommended that HQ Air A1 Ops reviews the post of Incirlik RAFLO to establish terms of reference, a clear chain of command and appropriate training requirements.**

Summary of findings

The cause

1.4.134 The cause of the incident was an inadvertent physical input to the Captain's side-stick, by means of a physical obstruction (a camera) that jammed between the left armrest and the side-stick unit when the Captain's seat was motored forward.

Contributory factors

1.4.135 The following contributory factors were assessed to make the incident more likely:

a. Normalized behaviour regarding the carriage and treatment of loose articles.	Para 1.4.35
b. The carriage of the camera on the flight deck.	Para 1.4.35
c. The use of the camera in flight.	Para 1.4.36
d. Low workload.	Para 1.4.36
e. Boredom and low arousal.	Paras 1.4.36 and 1.4.38
f. The presence of only a single person on the flight deck for an extended period of time.	Para 1.4.36
g. The armrest setting.	Para 1.4.37
h. The design of the side-stick area.	Para 1.4.37
i. The placing of the camera behind the side-stick.	Para 1.4.37
j. A widespread lack of awareness regarding the risk of side-stick interference.	Para 1.4.37
k. A lack of reporting regarding inadvertent operations of the side-stick.	Para 1.4.37
l. The RAF Brize Norton Occurrence Safety Investigation into loose articles.	Para 1.4.35
m. The lack of an identified Duty Holder risk regarding flight deck control interference.	Para 1.4.37
n. Distraction and a cognitive lack of expectation.	Para 1.4.38
o. The movement of the Captain's seat.	Para 1.4.38

Aggravating factors

1.4.136 The following aggravating factors were assessed to have made the outcome worse:

a. The presence of only a single person on the flight deck.	Para 1.4.49
b. Competing control inputs on the flight deck.	Para 1.4.51
c. The absence of flight deck inputs in accordance with the overspeed drill.	Para 1.4.51
d. The lack of seatbelt restraint amongst some of the passengers and crew.	Para 1.4.63
e. The presence of loose articles and hot liquids in the galley.	Para 1.4.63

Observations

1.4.137 The Panel made the following observations:

a. The rules on the stowage of crew baggage were not followed.	Para 1.4.64
b. The Voyager Crew Notice regarding manual safety briefings was not followed.	Para 1.4.69
c. Although the bilingual instructions did not prevent the effective use of the aircraft first aid kit, they were judged by the medical professional in attendance to be a potential source of confusion.	Para 1.4.74
d. The lack of a pulse oximeter in the aircraft first aid kit did not affect the overall standard of a casualty's treatment, but it would have improved the speed and efficiency with which it was delivered.	Para 1.4.74
e. A cabin emergency exit sign was damaged during the incident.	Para 1.4.77
f. The overall medical outcome of the incident was not being tracked.	Para 1.4.94
g. Despite a number of suggested en-route diversions being within safe range of the aircraft, no pre-planned diversion formed part of the crew's decision-making process.	Para 1.4.98
h. The availability of cockpit video evidence would have allowed the cause of the ZZ333 pitch-down to be established more quickly	Para 1.4.125

than was the case, significantly curtailing the impact of the incident; such technology may be of use in future safety investigations.

i. The availability of FDM was a significant aid to the Inquiry, and could represent a valuable source of information for future investigations.	Para 1.4.127
j. A post-flight fuel dumping report was not submitted.	Para 1.4.129