

may have given the SP the impression of an increased RoD despite pulling power.

h. **SP's VR Diagnosis.** The SP's potential raised awareness/anxiety of VR, the apparent increased RoD when applying power, the short timeframe (18s from start of QS to impact) and his inexperience of RW operations, coupled with his mental state following the penultimate impact, may have led him to diagnose VR. The Panel believed that the SP made a **mistake** in his diagnosis of VR.

The Panel concluded that on the balance of evidence (hampered by lack of ADR) the aircraft did not enter VR and therefore, this was **not a factor**. However, the SP's diagnosis that he was experiencing VR was a **contributory factor**.

1.4.51. **Final Sequence.** The Panel sought to understand the sequence of events just prior to the final impact and used sonographs of the 1<sup>st</sup> and final QSs (Fig 9) and identified the following:

a. The final QS took 18s from entering the manoeuvre until the aircraft impacted the ground (Line A-B). The 1<sup>st</sup> ITW QS took approximately 22s from entry until the aircraft came to a high hover. The point where max power is applied (point D) (aircraft in high hover) can be seen to occur past line B.

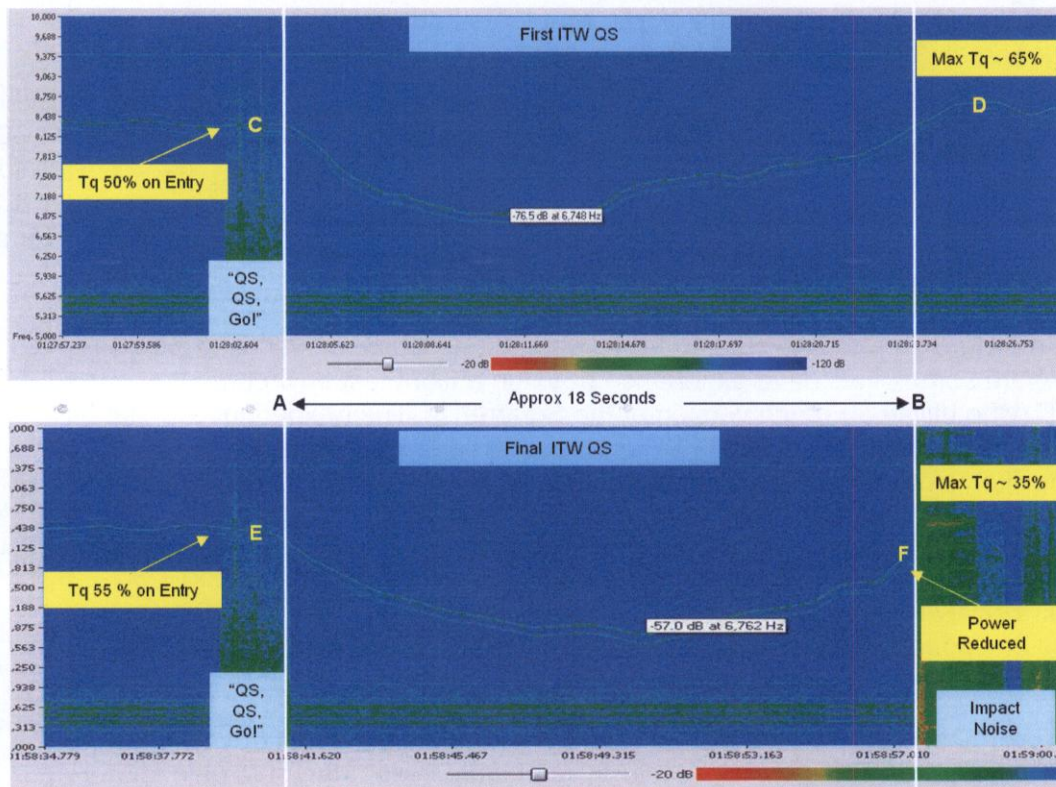


Figure 9 – Comparison Between First and Final ITW QS

b. **Application of Power.** Fig 9 shows the variations of power during the ITW QSs based on the assertions made at 1.4.34.

i. Point C shows that the SP was applying approximately 50% Tq prior to entry on the 1<sup>st</sup> ITW QS. On entry, the power was reduced to near 0% Tq then increased gradually as the aircraft lost translational lift until he was established in a high hover pulling approximately 65% Tq (Point D).

ii. Point E shows that the SP was applying approximately 55% Tq prior to entry to the Final ITW QS. On entry, the power was reduced to near 0% Tq

70

Witness  
1  
Exhibit 4  
Annex F

Exhibit 4

Exhibit 4

Exhibit 4  
& 48



then increased to a maximum of about 35% Tq (Point F). This figure was lower than the previous QSs and insufficient to prevent the aircraft from descending at that stage of the manoeuvre.

- c. **Cushion of Impact.** The SP reports lowering the level and this was reinforced on the sonograph (Fig 10) indicating a reduction in power just prior to impact. The Panel was unable to positively determine why the SP did not cushion the impact but concluded that the following was the most probable:

Witness  
1  
Exhibit 4

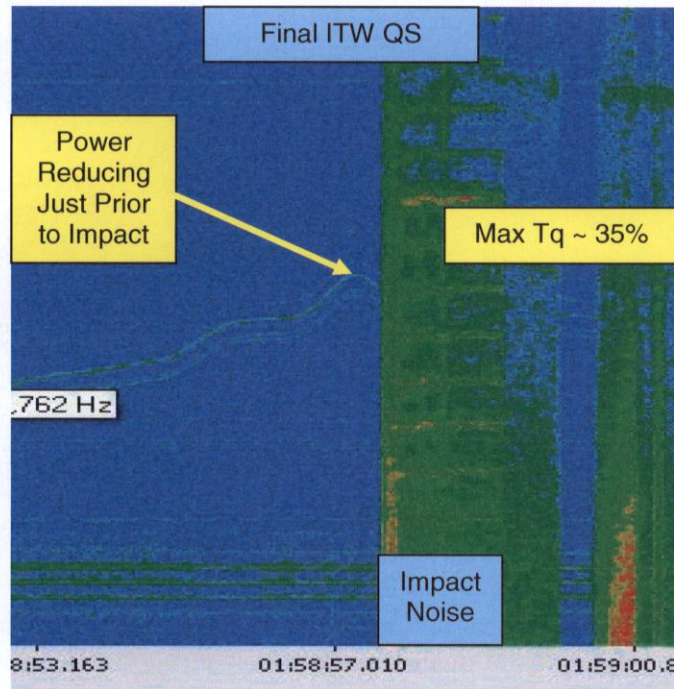


Figure 10 – Impact

- i. Given the SP's diagnosis of VR, he believed raising the collective lever would have exacerbated the situation.
- ii. The SP's significant fixed wing experience may have influenced his actions and caused him to 'revert to type'; therefore, it was not instinctive to pull in the collective.

Witness  
1

Annex F

The Panel concluded that the failure to apply sufficient power to arrest the RoD at the end of the final QS was the **cause** of the accident and that lowering the collective lever just prior to impact was an **aggravating factor**.

1.4.52. **Final Impact.** The aircraft impacted the ground with considerable force in a near level attitude and slight forward speed. The aircraft came to rest in an upright position with the skid forward vertical struts sheared, resulting in the underside of the cockpit touching the ground. The tail pylon failed at the transportation joint causing the pylon to collapse, see Fig 11, below.

Exhibit 4  
Annex A





Figure 11 - ZJ276 Post Accident

1.4.53. **Aircraft Technical.** The final condition of the aircraft is described in detail at Annex A.

Annex A

## Post-Accident

1.4.54. **Survival Aspects.** There were no intrusions into the crew compartment, no post-impact fire and no physical injuries identified in the medical report. No other personnel were involved.

Annex A  
& B

1.4.55. **Shutdown.** The pilot closed the throttle and operated the fuel shut-off lever. He attempted to apply the rotor brake and reports that the rotor brake lock was stuck; therefore, he waited until the rotor blades had slowed sufficiently before evacuating the aircraft. Post accident examination confirmed that the rotor brake lock was still in the flight position (Fig 12) and free to move.

Witness  
1  
Exhibit 4  
& 70  
Annex A  
& F

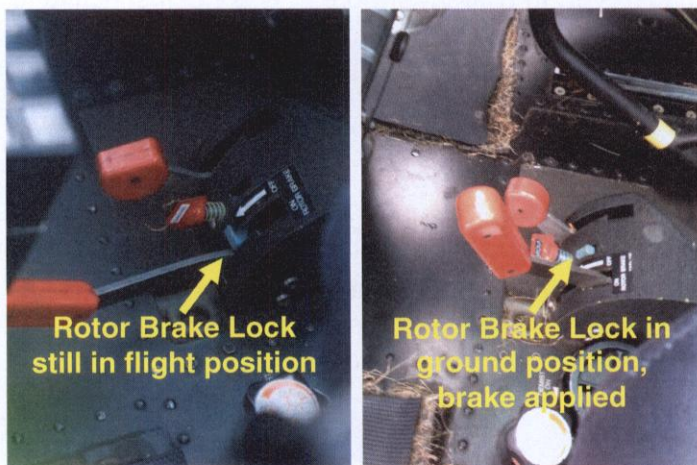


Figure 12 - Rotor Brake Lock

1.4.56. **Egress.** The SP unfastened his QRF and released his restraint harness without difficulty. He egressed the aircraft by the main starboard door, but does not recall opening it. The Panel determined that the door 'popped' open during the final impact. Given that both skids collapsed (Fig 13), and that the port door could not be

Witness  
1

Exhibit 4  
& 70



jettisoned, had the starboard door not 'popped' open the SP would have experienced considerable difficulty exiting the aircraft. The Panel conclude that the lack of an alternative egress method was an **other factor**.

Annex A



Figure 13 - Collapsed Skids

1.4.57. **Personal AEA.** The SP carried the analogue SARBE 7 beacon in a Load Carrying Jerkin Mk 2 and did not consider activating it, although it was fully serviceable. On further investigation the misunderstanding of SARBE 7's capabilities was confirmed in questioning of other personnel. The SARBE 7 when activated simultaneously transmits on monitored distress frequencies. The confusion may have been compounded from briefings that highlighted 'transmissions are no longer received by SAR satellite'. The Panel believed that personnel lacked understanding of the SARBE 7 capabilities and its utility in an emergency situation. This analysis prompted the SI to raise an Interim Safety Observation on 11 May 12. The Panel concluded that the failure to use the SARBE 7 was an **organisational influence** concerning the preparedness of the SP for survivability.

Witness  
1 & 4  
Annex B  
Exhibit  
52

1.4.58. **Post Crash Management (PCM).** The Panel sought to confirm the effectiveness of PCM.

a. **Notification.** There were no other aircraft at Chetwynd at the time of the accident. The SP did not attempt to use the aircraft radio to alert Ternhill but chose to use his mobile phone to report a 'heavy landing' to the EFS.

Witness  
1, 8  
Exhibit 5

b. **Response.** The initial phone call from the SP was made to the EFS stating that he had experienced a heavy landing. The report of a heavy landing triggered the generation of a sortie to fly an engineer to the scene. At this point the severity of the occurrence was not apparent and Contingency Plan (CP) 1 was not initiated. Concurrently, but independently, Ternhill ATC was trying to establish communication with B228. The Deputy Chief Instructor called the SP's mobile phone and spoke to the SP in order to clarify the situation. As a result of this call the EFS phoned 333, which resulted in ATC declaring a State 3, this was followed by the initiation of CP 1 and the activation of the Crisis Management Centre (CMC) (40 min after the SP's initial call).

Witness  
1, 4, 8,  
11, 12 &  
20  
Exhibit 5,  
10, 12,  
13 & 14

c. **PCM Reference Documents.** CP 1 provided guidance that detailed the Station response to an aircraft incident. It was reported that the document was not user friendly. In particular, personnel nominated as both Silver and Bronze had difficulties locating their respective sections detailing their actions.

Witness  
11 & 20  
Exhibit  
28



d. **Documents in Quarantine.** All relevant documentation was impounded at the appropriate time. However, although of no significance to the investigation, the 660 Sqn authorisation sheets were altered whilst in 'quarantine'<sup>16</sup>.

Exhibit 8  
& 53

e. **Communication.** In the early stages of the PCM there were multiple, but independent lines of communication, which was exacerbated by the uncertainty regarding the nature of the occurrence and lack of coverage provided by the Station Broadcast System.

Exhibit  
13, 54  
Witness  
1, 8, 11,  
20 & 23

The Panel found that the initial reaction was in keeping with the report of a heavy landing. As events unfolded and the severity of the occurrence became clear, the Station PCM response gained momentum. The Panel noted that the proactive, timely response and initiative of a number of individuals ensured a comprehensive and successful outcome. The Panel commended the pilot, callsign S26, for his actions on arriving at the scene in collecting photographs and a taped interview of the SP, which greatly assisted the investigation. However, the Panel **made the observation** that the usability of CP 1 and multiple independent lines of communication may have hindered the initial implementation of a fully coordinated PCM response.

1.4.59. **Salvage Operations.** ZJ276 was guarded in situ to allow the SI Panel to view the evidence at the scene. The aircraft was recovered by road to RAF Shawbury on 25 Apr 12. The Panel had no concerns over the recovery or SHE as detailed in JSP 375.

Exhibit  
13 & 55  
Annex A

1.4.60. **Costs of Damage to Aircraft & Civilian Property.** The aircraft, ZJ276 was assessed as Cat 4 equivalent by FBH/Insurance underwriters. There was no damage or associated costs to civilian property.

Annex A

## Wider Issues

1.4.61. **Chetwynd Field.** The Panel sought to understand if the risks associated with Chetwynd operations are tolerable and ALARP. Following a DHFS review of its use and classification on 6 Apr 11, a number of recommendations were implemented.

Exhibit  
56, 60 &  
61  
Witness  
8, 20, 22  
& 23  
Exhibit  
59

1.4.62. **Flying Intensity.** Chetwynd had 23,336 movements in 2010 compared to Ternhill's 25,206 and Shawbury's 55,121 movements. The number of movements is similar to Ternhill but it was not afforded the same 'relief landing ground' status and associate resource allocation.

1.4.63. **Oversight.** Although its value in providing a managed and known environment for training was recognized, the Panel identified a number of potential safety concerns arising from its classification and subsequent oversight:

Witness  
8, 16, 20,  
& 23  
Exhibit 4,  
5, 20, 57,  
62, 63

- i. The activity was not being observed by the supervisory chain.
- ii. There was no remote monitoring of the actual weather conditions.
- iii. There were no restrictions that prevent an ab initio solo student flying the only aircraft at this unmanned field site.
- iv. There were radio blind spots for aircraft on the ground or in the low

<sup>16</sup> An FBH stats clerk requested a copy of auth sheet to release the other ac on the sheet, a mistake was noticed on the line below the SP's entry and the entry was changed from 267 to 276.



hover.

- v. The nearest fire and rescue crew was stationed at Ternhill (approximately 11 road miles away).
- vi. There were discrepancies in the way that Chetwynd and its status was depicted within various military and civilian publications.

The Panel concluded that the risks associated with the management and re-categorisation of Chetwynd operations are not tolerable and ALARP and therefore the use of Chetwynd was considered to be **organisational influence** and a **contributory factor**.

### Ab initio Solo Flying

1.4.64. **Solo Rational.** The accident occurred whilst a student was flying solo and the Panel sought to understand the rationale and justification for inclusion within the SERW course.

- a. **Training Documentation.** The requirement for solo flying was contained within the SERW –Syllabus of Hours (SoH). All DHFS training documentation is owned and endorsed by HQ 22 (Trg) Gp<sup>17</sup>. In order to maintain the JAA PPL(H) accreditation<sup>18</sup> the SERW course contains elements of solo flying.
- b. **Extant Syllabus.** The extant syllabus was not underpinned by a Training Needs Analysis (TNA) or an Operational Performance Statement (OPS), which would identify any need for solo flying. A TNA and OPS were under development by the United Kingdom Military Flying Training System (UKMFTS) partner, Ascent.
- c. **Output Requirement.** Given the configuration of the Front Line rotary wing fleets, it is unlikely that pilots graduating DHFS would fly single crew on their first Front Line squadron.
- d. **Comparison With Other Rotary Wing Training Systems.** The Panel approached the United States Army Aviation School, Fort Rucker and the Australian Defence Force (ADF) Navy Training Unit, 723 Sqn. Neither included solo flying within their ab initio syllabus. The ADF included 5hr 20 min of flying where 2 students are authorized to fly together (mutual). The US Army, with only 1 front line type which operates single crew, introduces solo flying as part of the operational conversion to that aircraft type on a case-by-case basis.

Exhibit  
22, 64

Witness  
14 & 15  
Exhibit  
65

Exhibit  
66

Given that the Panel consider solo flying to be a contributory factor in this accident, they **made the observation** that the rationale for the inclusion of such training lacks authoritative documentation and robust justification.

1.4.65. **Documentation Discrepancies.** There were a number of discrepancies and anomalies within documentation used during this inquiry; examples include:

Witness  
8 & 11  
Exhibit 6,  
28, 67,  
68

- a. Different version numbers between printed and web based versions of the Risk Register and CP1.
- b. The printed (uncontrolled) copy of the FOB held by 660 Sqn was missing a complete chapter.

<sup>17</sup> Link - DHFS Documentation

<sup>18</sup> 45 hrs flight training is the minimum required by the JAA. This must include 10 hrs as "pilot-in-command", of which 5 hrs must be solo cross-country flight.

- c. The SP's FRCs were not correctly amended.
- d. The SP's log book had missing signatures.

The Panel **made the observation** that the configuration control and management of documentation was inadequate.

1.4.66. **Safety Management System (SMS).** There is a healthy and maturing SMS which includes organisational risk management. Relevant risk registers are used with good oversight and engagement at ODH and DDH level.

Witness  
8, 21, 22,  
23.  
Exhibit  
63, & 69

## Summary of Findings

1.4.67. **Cause.** The Panel found that the cause of the accident to be the failure to apply sufficient power to arrest an excessive RoD.

1.4.68. **Contributory Factors.** The Panel identified 10 factors that were contributory to the accident:

- a. Flying Technique (Para 1.4.37)
- b. Rad Alt (Para 1.4.38a)
- c. Safety Margin for QS (Para 1.4.38b)
- d. Aircrew Documentation – Heavy Landings (Para 1.4.41a)
- e. Decision to Continue Sortie (Para 1.4.42)
- f. Solo Flying (Para 1.4.43)
- g. SP's Mental Capacity (Para 1.4.46)
- h. Aircraft Descending During the Flare (Para 1.4.49)
- i. Diagnosis of VR (Para 1.4.50)
- j. Management and categorisation of Chetwynd (Para 1.4.63)

1.4.69. **Aggravating Factors.** The Panel identified the 1 aggravating factor.

- a. Lowering the collective lever just prior to impact. (Para 1.4.51)

1.4.70. **Other Factors.** The Panel identified 4 other factors that could make a future accident more likely:

- a. Student Duties (Para 1.4.22)
- b. Self-Authorisation (Para 1.4.28a)
- c. Limited indications to Pilot or Engineers of Heavy Landing or Stinger Strike (Para 1.4.41)
- d. Alternative Means of Egress (Para 1.4.56)



1.4.71. **Observations.** The Panel made 12 observations:

- a. Instructional Hours (Para 1.4.14)
- b. Auto Pilot (AP) Functional Checks serviceability Not Clearly Defined within Aircrew Manual or FRCs. (Para 1.4.24b)
- c. MAF certificate was not authorized by SPMAP PT (Para 1.4.24c)
- d. External Checks (Para 1.4.24d)
- e. Supervision of Solo Flying (Para 1.4.26)
- f. CVR baseline data (Para 1.4.33)
- g. Lack of weather monitoring equipment at Chetwynd (Para 1.4.36)
- h. Difference between CFS(H) and DHFS guidance on QHI intervention (Para 1.4.37a)
- i. Fidelity of and Capabilities of Synthetic Training Environment (Para 1.4.50c)
- j. PCM (Para 1.4.58)
- k. Rational for Solo Flying (Para 1.4.64)
- l. Configuration control and management of documentation (Para 1.4.65)

1.4.72. The main factors associated with the accident are summarised in Fig 14 below.



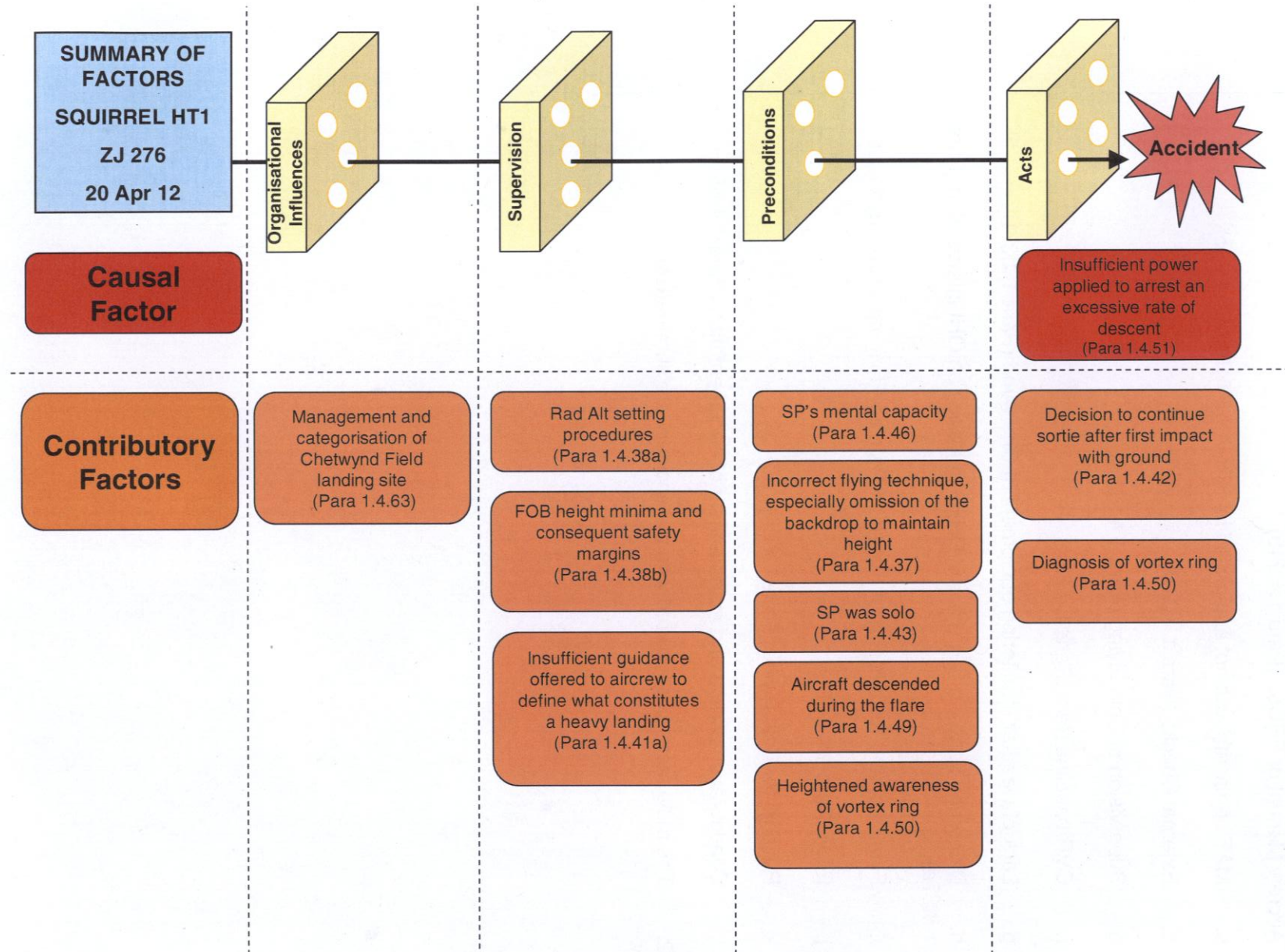


Figure 14 – Accident Factors Summary



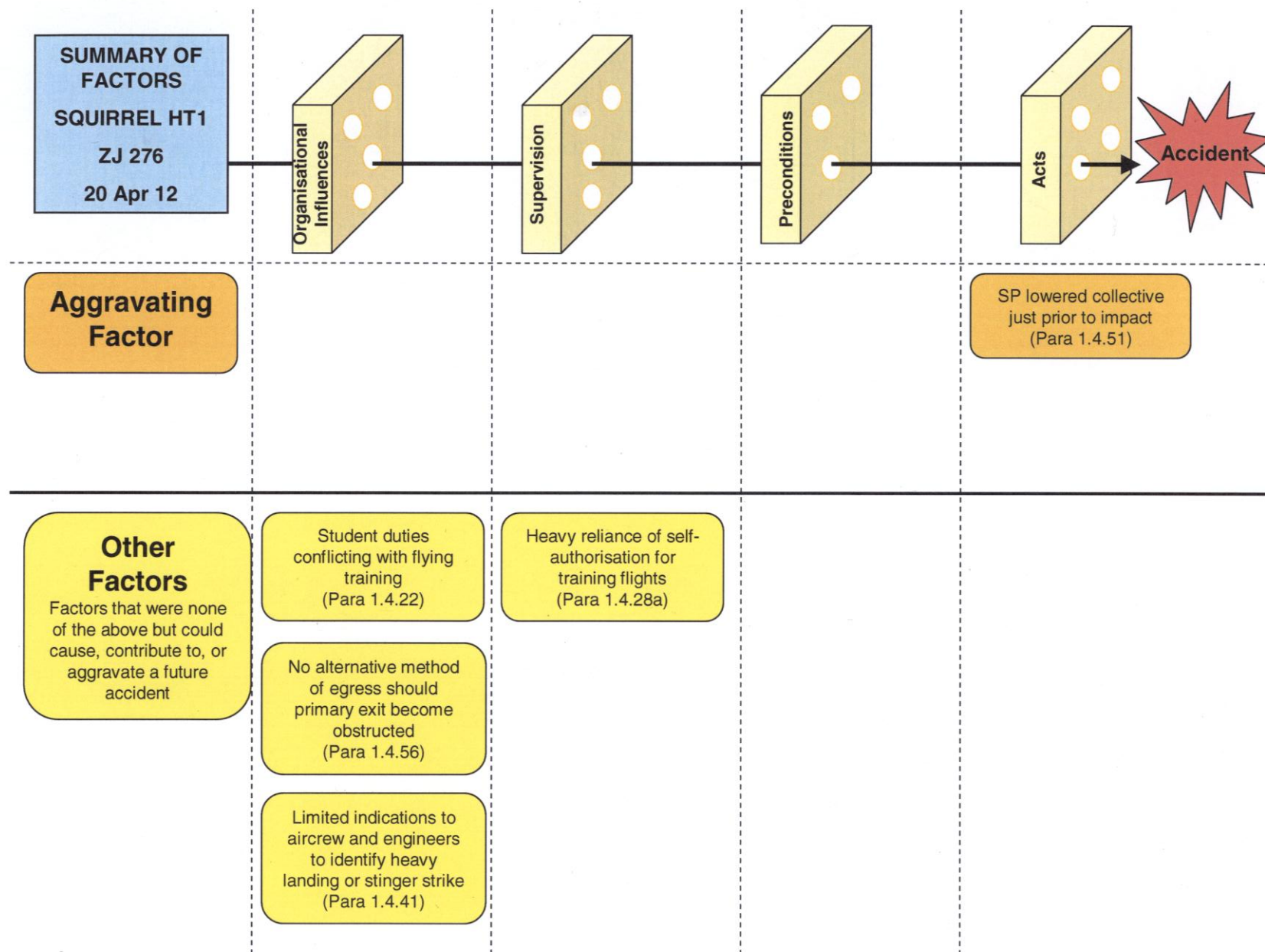


Figure 14 – Accident Factors Summary