AIRWAYS

Oceanic Control System Issue Investigation Report

Occurrence Date: 16 August 2025

Version 1.1

AIRWAYS

Oceanic Control System Issue

INVESTIGATION REPORT DETAILS	
Occurrence Classification	Technology Occurrence (TO)
Occurrence Date / Time	16-Aug-25 04:24 UTC
Location	Oceanic (OCS)
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Lead Investigator	Senior Operational Safety Investigation Specialist, Safety & Assurance
Supporting Investigators	Operational Safety Advisor, Safety & Assurance ATS Subject Matter Expert, Safety & Assurance Senior Operational Safety Human Factors Specialist, Safety & Assurance
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This investigation has been carried out in accordance with AC12-2 Investigation Guidance and Airways Just Culture.

Contents

1. Executive Summary

What happened

On the afternoon of Saturday, 16 August 2025, all Oceanic Control System (OCS) sectors were being operated as a single Pacific (PAC) sector from one OCS Controller Workstation (CWS1) as is normal with low traffic volumes. In anticipation of the increasing daily traffic on trans-Tasman routes, the OCS controllers initiated a routine sectorisation process at 04:24 UTC to assign the Tasman (TAS) sector to the second Controller Workstation (CWS2).

The sectorisation attempt resulted in unexpected display anomalies on both CWS1 and CWS2; the lefthand display was greyed out, the mouse cursor was unavailable, and some flights on the righthand display were showing in incorrect control states.

An attempt to consolidate all sectors onto the third spare workstation (CWS3) was unsuccessful. A decision was made to transfer operations to the OCS Reserve system, with its own set of workstations. Transferring operations between Main and Reserve is a normal response which involves downloading flight data held separately on a Synchronisation (Sync) server platform. The transfer is a routine, checklist-driven process which took seven minutes to complete.

After the team had transferred to CWS1 Reserve, it became apparent that the incorrect control states shown on Main had been retained on CWS1 Reserve. The team did not want to reproduce the Display application failure that had just occurred on the Main platform so attempted to transfer all sectors to CWS2 Reserve. This resulted in the PAC sector operating but did not resolve the issue with the TAS sector flights.

About 11 minutes after the initial display anomaly and following the move to the Reserve platform, a decision was made to hold international departures in domestic airspace, which is managed by a different system. This would ensure the continued safety of all flights while the technical staff worked on a solution:

- Seven international departures already airborne were advised to expect to hold within domestic airspace. Of these, five entered holding patterns. Three of the holding aircraft returned to New Zealand aerodromes due to insufficient reserve fuel for prolonged holding.
- Four international departures that were not yet airborne were held on the ground at New Zealand aerodromes.

Correct timing of this decision was essential and provided assurance of the ability to maintain separation.

It was decided to reload the Main platform while continuing to operate on the Reserve platform (with degraded capabilities) until Main was available.

- Twenty-six minutes after the initial display anomaly, operations resumed on Reserve CWS2 for aircraft operating within the PAC sector.
- Domestic contingency consoles adjacent to Reserve were utilised to provide additional situational awareness.
- Twenty-five minutes into the disruption, technicians were authorised to begin restoring the main platform. Fifty minutes into the disruption the platform was restored and at fifty-seven minutes OCS controllers resumed full normal operations (including TAS sector) on the Main platform.
- Five minutes later, the OCS Reserve platform was restored.

Why it happened

Issue 1 – Data display application: The primary cause for the initial display anomaly on the Main platform workstations was a latent software defect in the display process when a sectorisation process was initiated. In simple terms, when a sectorisation process occurs, some elements are removed and then re-created to align with the new sectors. An incoming external Controller Pilot Data Link Communications (CPDLC) message, received during the computationally complex sectorisation process, prevented the sectorisation process from completing.

Issue 2 – Mismatched sectorisation states: The sector assignment issue of flights was a by-product of the display application anomaly. When sectorisation was initiated at Main CWS1 to split TAS to CWS2, the process completed at the flight data server, and sector assignment data was copied to the Sync server. The subsequent automated steps of the sectorisation were unable to be completed at the individual workstations due to the display process being unresponsive. This partial completion of the sectorisation process, unknown to the technical staff or controllers at the time, was the cause of the subsequently observed system behaviours.

The Reserve platform was started from CWS1 in a single sector state (i.e. all sectors combined into a single sector). This was done, in accordance with procedures, to align with the sector state the technical and ATS staff had last observed before the display issue on Main. Their understanding was that the system was still in a single sector state, not knowing that the flight assignment data retrieved from the Sync server reflected the split into PAC and TAS sectors, as a result of the above partially completed sectorisation.

Safety considerations

The team of very experienced controllers and technical staff, faced with an unfamiliar system situation, worked together to determine the safest and least disruptive course of action.

Oceanic Controllers continued to provide a compliant air traffic control service throughout the event with the systems and procedures still available; aircraft separation and safety were always maintained.

Communications via International Air Ground HF remained operational, and reports were processed appropriately using voice coordination methods throughout. The increased workload was all safely managed.

A move to the offsite Auckland contingency suite was considered but rejected, as transferring to the offsite suite would have resulted in the activation of Traffic Information Broadcast by Aircraft (TIBA) procedures, in which pilots self-broadcast their positions and intentions to each other in the temporary absence of air traffic services.

The course of action taken by the controllers and technical staff on the day is considered the most appropriate action; it ensured safety at all times, retained a level of service (although degraded) and prevented the situation from degrading further to a TIBA state.

By the next morning the cause hadn't yet been identified. As a mitigation, a rollback to the previous software version was undertaken while priority work to identify and rectify the cause continued.

The following actions were undertaken further to the initial software rollback:

- The latent software defect which caused the display issue was identified, and a patch was issued to ensure this display failure would not be repeated.
- A second software patch was issued to ensure that a sectorisation mismatch between Main and Reserve would be accommodated and rectified within the system and enable controllers to complete the transfer between platforms.

- Cross-functional teams from ATS, Technology, Safety & Assurance, and People & Partnerships identified opportunities to improve documentation and communication. Lessons learned from this event and these discussions will be incorporated into operational documentation to improve communication and response.

Note: Unless otherwise noted, all times referenced in this document are expressed in UTC.

2. Timeline

As indicated below, seven aircraft already airborne were instructed to expect holding within domestic airspace. Of these, three aircraft (highlighted red) returned to New Zealand aerodromes due to insufficient reserve fuel for prolonged holding.

Four international departures that were not yet airborne were held on the ground at New Zealand aerodromes.

Position abbreviations (TC, C1, DM, etc) used in the graphic refer to positions (TC Desk) or specific personnel (T1, T2, etc) – see also section 3.1 Personnel.

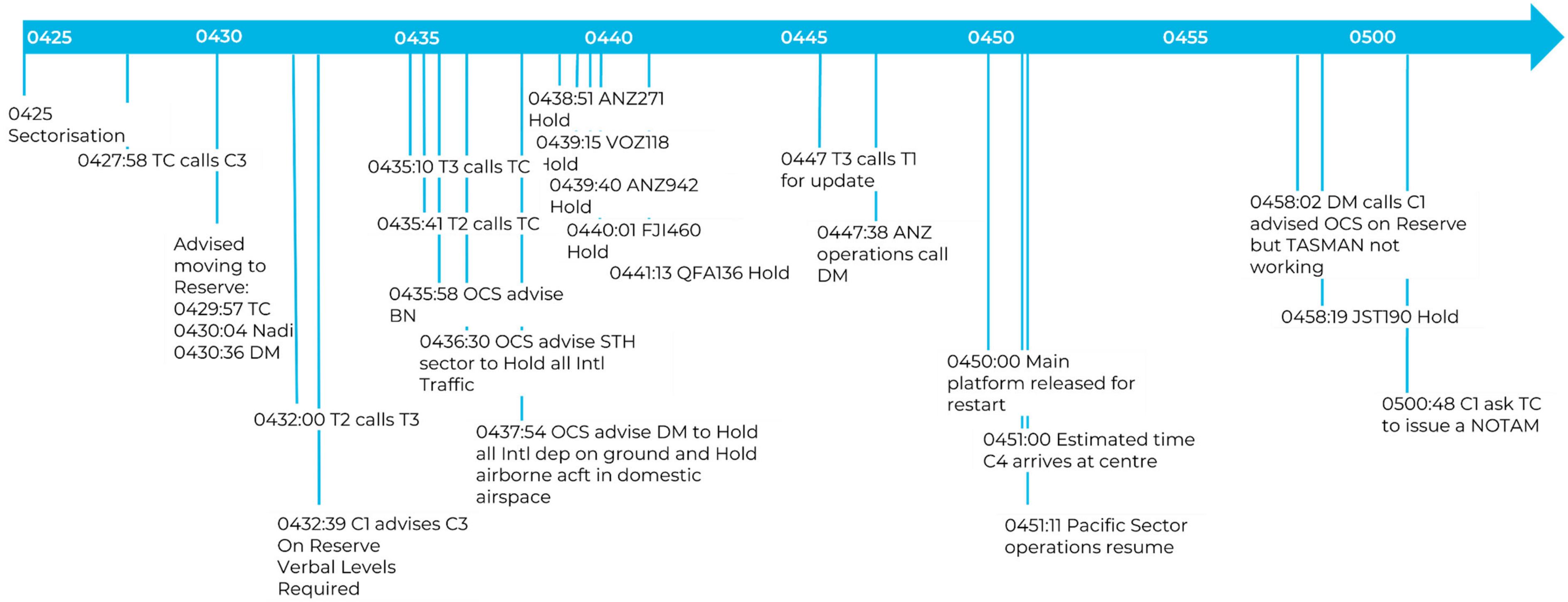

Figure 1: Pictorial view of key events during first 30 minutes

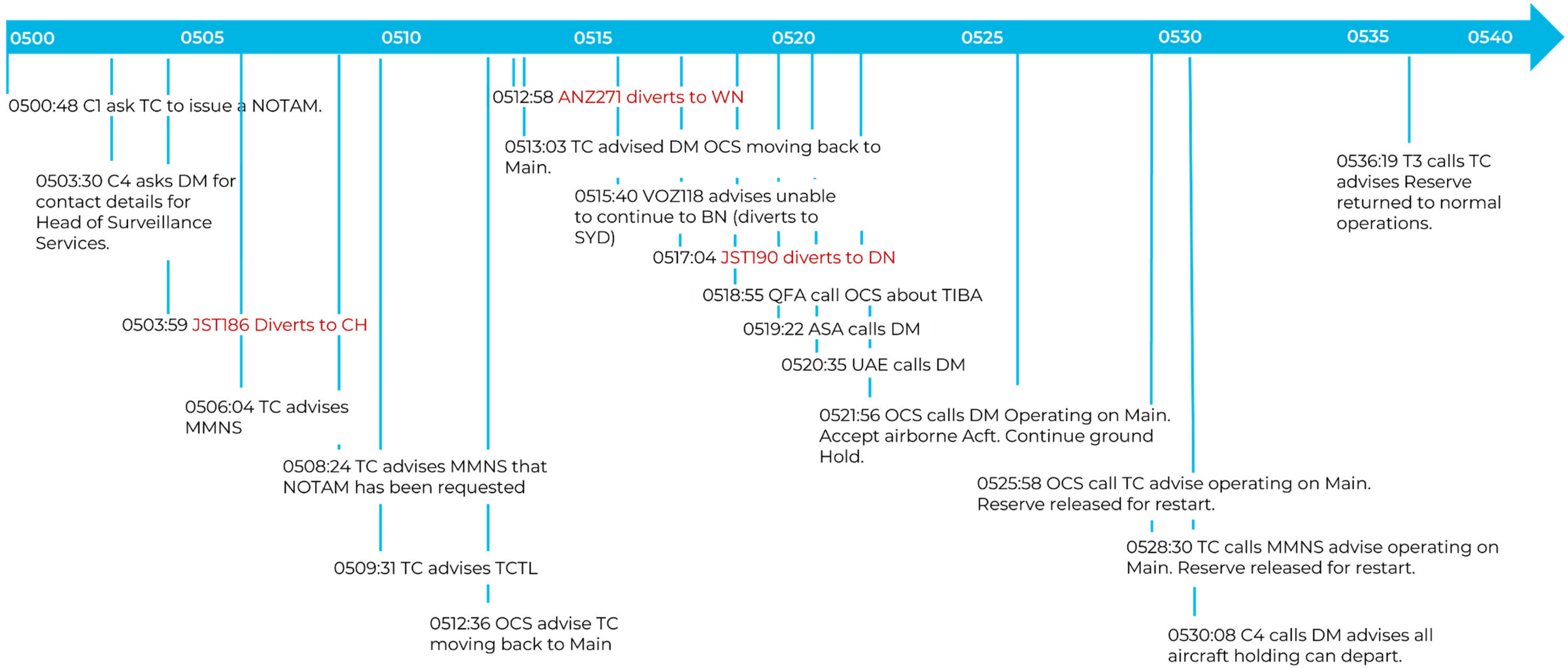

Figure 2: Pictorial view of 2nd 30 minutes

3. Context / Factual Information

3.1. Personnel

The following personnel were interviewed for this investigation:

- **Controller 1 (C1)**
  - Controller with over 20 years' experience, including four years on OCS
- **Controller 2 (C2)**
  - Controller with over 20 years' experience on OCS
- **Controller 3 (C3)**
  - Controller with over 20 years' experience on OCS including as a Software Specialist
- **Controller 4 (C4)**
  - Controller with over 20 years' experience
- **Duty Manager (DM)**
  - Controller with over 10 years' experience
- **ATS Surveillance Operations Manager (ATSOM)**
  - Controller with over 20 years' experience on OCS including as an Operations Manager
- **Technician 1 (T1)**
  - Controller and software specialist with over 10 years' ATC experience
- **Technician 2 (T2)**
  - Aviation specialist with over 12 years of experience across differing roles within Airways
- **Technician 3 (T3)**
  - Software engineer with 30 Years experience with Oceanic System and extensive background as Design Authority
- **Technician 4 (T4)**
  - Technical Coordinator with over 10 years' experience
- **Technician 5 (T5)**
  - Technical Coordinator with over 10 years' experience

** The above roles include operational controllers, technical staff, and line management.*

3.2. Airspace

The Auckland Oceanic Flight Information Region (FIR) covers an area almost four times the size of Australia. The region stretches from the Antarctic to five degrees South of the equator, and across the southwest Pacific.

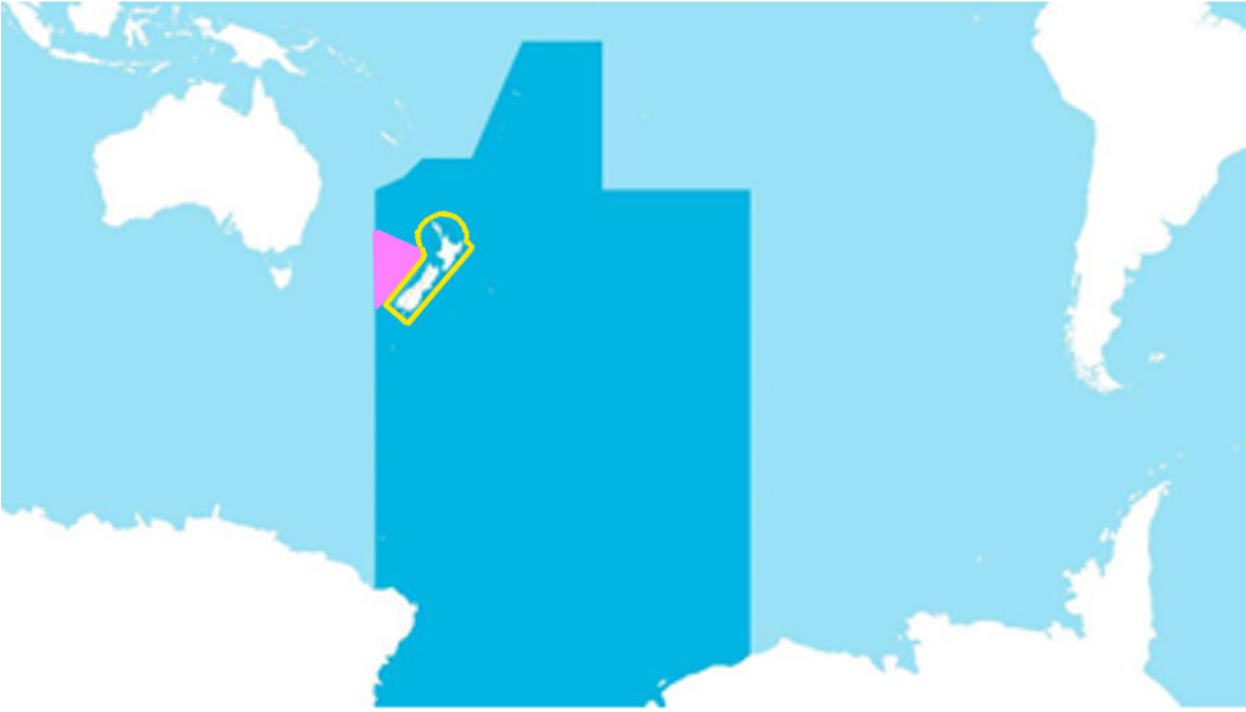

Figure 3: Auckland FIR, Tasman sector (Pink), Domestic NZ (Yellow)

The neighbouring regions with which Auckland coordinates are Brisbane, Nadi, Oakland, Samoa, Tonga, Cook Islands, Tahiti, Santiago and the New Zealand domestic sectors.

The Oceanic Flight Information Region (formally designated the Auckland Oceanic FIR) is the area depicted in blue and pink shading in Figure 3. This FIR is distinct from, and does not include, the New Zealand Domestic FIR, which is outlined in Yellow in Figure 3.

The Oceanic FIR is divided into five areas: Tasman, Norfolk, Pacific, McMurdo and Chathams (i.e. Chatham Islands). All of these areas can be consolidated into one sector, designated Pacific (PAC). The OCS system has the ability to separate the Tasman sector from the combined PAC sector onto other controller workstations (CWS). The Tasman sector (TAS) is depicted in pink shading in Figure 3.

3.3. Location

Oceanic air traffic services and the OCS technical platform are located at the Auckland Air Traffic Services Centre (AAATC). The Technical Coordinator (TC) and Duty Manager (DM) positions are based in the Christchurch Air Traffic Services Centre (CHATC).

As noted above, the Oceanic Control Positions are located in the AAATC. The close physical proximity of the OCS Main and Reserve positions enables an efficient transition when initiating a routine transfer from the Main platform to the Reserve platform.

The close physical proximity between the OCS Reserve positions and the Domestic Auckland TMA contingency positions was also beneficial in providing additional situational awareness information (see section 4.2.6 - ATS Controller Actions).

3.4. Oceanic Control System

3.4.1. OCS Overview

The OCS was initially procured by Airways New Zealand from CAE Canada, based on a set of defined specifications and requirements to provide oceanic air traffic controllers with a computer based controlling tool allowing the use of Future Air Navigation System (FANS) technology, reduced separations and a conflict probe feature.

The OCS was put into operation in 2000, at which time Airways assumed responsibility for the software maintenance and support.

The system integrates:

- Automatic Dependent Surveillance-Contract (ADS-C)
- High-Frequency Radio (HF RO)
- CPDLC position reports
- System-maintained electronic flight data
- Air Traffic Services Inter-facility Data Communications (AIDC)
- Automated procedural conflict detection

OCS uses two types of windows for entering and viewing flight and communication data:

- Tabular data display for supplementary information, planning tools and additional functionality.
- Aircraft situation display (ASD) which displays data graphically using colour and symbols.

The OCS System has maintained a **99.99%** service availability percentage in the 12 months prior to the incident.

3.4.2. System Architecture

The OCS has a dual platform architecture. The two physically independent systems, Main platform and Reserve platform, are available at all times and capable of providing most system functions.

- Main platform provides control in a fully redundant system.
- Reserve platform is available to take over in the event of a main platform malfunction and to provide continued operations during regular system upgrades.

The Reserve platform is intended as a temporary backup system and as such, does not provide all of the functions available on the Main platform, e.g. Datalink functionality is not enabled on the Reserve platform.

The systems share external data and user interfaces. The dual channel architecture depends on Synchronisation (Sync) server receiving and storing data from the operational software platform (Main) and downloading this data on demand when needing to transfer operations to the backup platform (Reserve).

OCS is equipped with several processors used to run various parts of the system. Two processors are of particular note:

- Flight Data Processor (FDP)
- Controller Workstation Processor (CWP)

The FDPs perform a range of complex functions and of relevance to this investigation is the Airspace data management function which is responsible for the assignment of control sectors and the Flight planning and processing function which, among other things, is responsible for assigning aircraft to the relevant control sectors.

The CWP is located at the controller workstation (CWS). This processor shares and exchanges data with the FDPs via the dual Local Area Network (LAN). The CWPs are effectively the graphical user interface clients for the flight data processors with the following functions:

- Data Display Processor, e.g. electronic strips, clearance and coordination windows.
- Aircraft Situation Display
- Flight Planning and Processing
- Recording and Playback

3.4.3. Controller Workstation

The OCS Controller Workstation is equipped with:

- A workstation processor (CWP)
- Data Display Monitor (DISP – lefthand display)
- Aircraft Situation Display (ASD – righthand display)
- Keyboard and mouse
- Audio alarm enabled via data display
- Voice Communications System (VCS)
- Laser Printer
- Satphone
- Air ground Log display

The Main platform consists of 3 Controller Workstations: CWS3 is available as a spare in case of any component unserviceability of CWS1 or CWS2.

NOTE:

1. *The CWP performs significant processing in order to display the flight data e.g. strips and ASD but no actual flight data processing.*
2. *The CWP takes flight plan database updates from the FDP and displays the results.*
3. *The CWP also takes controller input and sends the data to the FDP for processing.*

Data Display Monitor

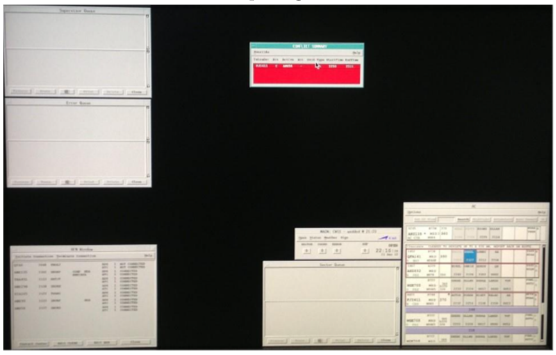

Figure 4: Data Display

The data display application is used to manipulate data via the use of display and task windows.

It displays the electronic flight strip window and data input is via a combination of keyboard and/or mouse operations.

**This is the display that initially went blank on Main CWS1 and CWS2*

Aircraft Situation Display (ASD)

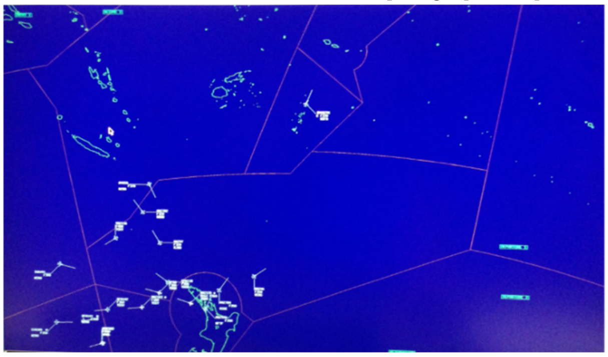

Figure 5: Aircraft Situation Display

The Aircraft Situation Display shows:

- List entries of all active and pending flights known to the system,
- Aircraft Position Symbols (APS) with attached data blocks,
- Active Special Use Airspace and SIGMET areas,
- Overlays of geographical coastlines and features, airspace boundaries and promulgated air routes.

3.5. OCS Software

3.5.1. Software Development Cycle

The software development cycle is tied to a global schedule of data changes known as Aeronautical Information Regulation and Control (AIRAC) which provides global data updates every eight weeks.

This software development process, along with the software testing and release processes described below, are part of Airways' CAA compliance requirements.

3.5.2. Software Testing Process

Testing occurs in layers. First, developers test in their own branches of code. Next, test builds are provided to the Auckland-based Oceanic System Specialists team for further checking. Once the release baseline is built, it is deployed into the laboratory environment for integration testing. This environment mirrors operational platforms but cannot reproduce every dimension of the operational Oceanic system e.g. it does not provide full Main/Reserve parity or the same number of controller working positions. After integration testing, the build enters a formal Software Readiness Testing (SRT) period typically lasting one week. During SRT, live data is fed into the test system. This gives confidence in stability with real traffic flows. Targeted scenarios/test plans can be used to “stress” test the system.

3.5.3. OCS Software Release Process

After SRT, and if no critical defects are found, the version is released into operational service. If issues do occur, the Software Team Leader retains authority to direct rollback to the last accepted baseline. To make this faster and safer, the team had recently implemented a procedure whereby every new release is paired with an “adaptation-only” fallback version i.e. system parameter information and updated AIRAC data – already built, tested, and waiting. This was the recovery path used after the incident.

3.6. OCS Contingency Levels

There are five levels of contingency to enable the delivery of an Oceanic Area air traffic service:

1. The OCS Main platform in AAATC
2. The OCS Reserve platform in AAATC
3. The OCS Main platform in the Local Contingency Centre
4. The OCS Reserve platform in the Local Contingency Centre
5. The geographically separated OCS platform in Christchurch

3.7. Main Platform

3.7.1. Redundancy and Response to Issues

OCS has a redundant architecture ensuring a level of availability of **99.99%**. A dual redundant LAN is used by the operational system. The OCS network monitoring software will re-route all traffic to the second LAN in the event of a failure of the first LAN.

The system uses dual redundant FDP computers that are configured identically and perform the same functions. At any time, one of the pair will perform all operational functions assigned to it and the second will be in a standby state. The standby will automatically take over when a failure is detected that prevents the primary computer from performing its assigned functions.

During normal OCS Main platform operations, air traffic management data is stored and updated on a dual redundant completely independent Sync server system.

In the event of an issue on the Main OCS platform, ATS operations can be transferred to the OCS Reserve platform, which has an independent dual redundant FDP, using the data stored in the Sync server. During ATS operations using the OCS Reserve platform, air traffic management data is stored and updated on the Sync server.

Should the need arise to relocate operations to the Local Contingency Centre, ATS operations will be transferred to the OCS Main platform in the Local Contingency Centre which has an independent dual redundant FDP using the data stored in the Sync server. The Local Contingency Centre is also equipped with a Reserve platform.

The OCS can be restarted in either a hot or cold mode. In hot mode the system is restarted using the last system "snapshot" data. In cold mode the system is restarted in a sterile state and updated using air traffic management data recovered from the Sync server.

Three controller workstations are available on the OCS main platform. In the event of an issue at an operational controller workstation all the functions performed at that workstation will be transferred to a standby workstation. In the event of an issue across all Main platform operational controller workstations, the provision of ATS will be transferred to the OCS Reserve platform.

Two controller workstations are available on the OCS Reserve platforms in Auckland and in Christchurch. In the event of an issue at an operational controller workstation all the functions performed at that workstation can be transferred to the standby workstation.

3.7.2. OCS Failure conditions

The OCS failure conditions are categorised as:

- Partial failure of the OCS Main platform
- OCS Main platform stall

In general, a partial failure of the OCS Main platform will permit continued operation of OCS in a limited or restricted state, and an OCS Main platform stall will require ATS operations to be transferred to the OCS Reserve platform. The failure conditions and procedures detailed are not exhaustive and do not preclude controllers from taking other actions considered appropriate.

If the controller considers an OCS Main platform stall is likely, or a partial failure has occurred and the OCS is operating without an operational standby workstation or FDP, the controller shall resolve all conflicts including those categorised as an "Advisory" (refer *MATSOS GEN section: Conflict Resolution*).

3.7.3. Partial failure of Main platform

A partial failure of the OCS Main platform is any failure of an OCS component or external connection that still permits the provision of an air traffic control service, albeit sometimes without an operational standby.

3.7.4. Main platform stall

An OCS Main platform stall is any failure that renders the provision of an air traffic service using the Main platform impossible. This is any situation which upon the advice of ATC or technical support is deemed as needing a system restart to resolve.

3.7.5. Main platform stall procedures

In the event the OCS Main platform stalls, the Oceanic Controller shall transfer ATS delivery to the OCS Reserve platform and resume the provision of ATS as soon as possible.

On advice from the controller that OCS Main platform has stalled, and the Oceanic operation is likely to be affected, the Oceanic Team Leader shall confirm the nature of the failure and expected duration of outage, and if necessary:

- Advise adjacent Air Traffic Service Units ATSU
- Limit or restrict traffic entering Oceanic sectors
- Arrange extra staffing
- Establish alternative communications

3.8. Reserve platform

3.8.1. Reserve platform overview

If the OCS Main platform fails, controllers move to the Reserve OCS platform to continue operations. To provide an ATC service from the Reserve platform, the Main platform must transfer flight data information for all flights, held at the time of failure, to the Reserve platform.

The Sync server store flight data from the Main platform and then transfers it to the Reserve platform when required. The Sync server:

- Reduces controller intervention in the initial stages of the Reserve operation by increasing the amount of valid information transferred to the Reserve platform.
- Allows controllers to achieve operational status on the Reserve platform within five minutes.

Oceanic operations shall be transferred to the Reserve platform whenever a situation arises that prevents operations from continuing on the Main platform.

Whenever dual sector operations are in force, the Pacific Controller (as the Senior Person On Duty – SPOD) is responsible for ensuring the recovery is carried out. The controller that performs the recovery shall ensure that the Sync Download Begin and

Sync Download Complete messages are received, and that all information is recovered.

Decisions that the recovery is complete and additional traffic can be accepted shall be made by the Pacific Controller after agreement with the Tasman Controller.

The Sync Server

- Stores and processes recovery messages, backing them up when required.
- Is completely independent of both the Main and Reserve platforms to ensure data integrity in case one or both systems fail.

The active platform (Main or Reserve) sends relevant data messages to a database located on the Sync server. If the system fails, the database contents are loaded onto the other platform system.

3.8.2. Transfer to Reserve platform

Oceanic controllers shall follow the procedures for transferring the delivery of ATS operations to the OCS Reserve platform as per the procedures in *ACP Contingency - Appendix B* or *ACP Contingency - Appendix C.*

Once recovery to the OCS Reserve platform is complete, the Oceanic Controller shall:

Resolve all conflicts including those categorised as an "Advisory Conflict" (refer *MATSOS GEN section: Conflict Resolution*) and lift any traffic restrictions that might have been imposed as soon as practicable.

3.8.3. International Air Ground (IAG)

The primary means of communication with most aircraft operating in Oceanic airspace is the satellite-based CPDLC. A secondary means of communication, typically used for aircraft that are not equipped with CPDLC, is the use of High Frequency (HF) radio transmissions via IAG (International Air Ground) operators.

When operating on the OCS Main platform, OCS communicate electronically with most aircraft using CPDLC at the OCS controller positions. When operating on the Reserve platform, OCS rely on HF radio transmissions via the IAG operators rather than CPDLC.

3.8.4. Cold start

After an OCS Main platform stall and ATS has been transferred to the OCS Reserve platform, the restart of the Main platform will be via a Cold Start.

A Cold Start ensures the platform begins with a clean operating base using data recovered from the Sync server or if the Sync server is not available, recovered manually.

4. Analysis

4.1. Precursors/lead-up to event

4.1.1.Software Development Cycle

As described in Section 3.5, the software development cycle is tied to global AIRAC data changes which occur every eight weeks. The team typically consolidates the changes into a release baseline about two and a half weeks before release. This baseline becomes the candidate version for release for the SRT stage. On this occasion the SRT duration was compressed, however all software readiness testing was completed.

4.1.2. Size of change in released software version

The size of the changes between the current and previous versions were 850 files modified with 9,135 lines of code changed. Most of these changes were not functional logic but updates designed to prepare the code for a new compiler as part of a hardware upgrade program.

4.2. Event

4.2.1. Initiation of Sectorisation Process on Main CWS1 and CWS2

On the afternoon of Saturday 16 August at 04:24 UTC, Controller 1 requested Controller 2 return from their break early to open Tasman sector on CWS2. The process should take five to ten seconds however on initiating sectorisation Controller 2's lefthand data display went grey (blank). Controller 1's CWS1 lefthand data display also went grey. Without the data display the controller has limited ability to interact with the system.

This was not a situation the controllers had experienced before so Controller 2 sought expert advice from the on-site OCS Systems Development Team: Technician 1 and Technician 2 were both onsite, enabling a quick response. They walked into the operations room and could see the two controller workstations on the Main platform (CWS1 and CWS2) with their lefthand displays greyed out, while CWS3 still showed a normal image for a standby position. At roughly the same moment, the Principal TC desk located in Christchurch started flagging multiple unusual indicators. No calls had yet been received by the TC from the OCS Department.

With CWS1 and CWS2 having the lefthand display greyed out; it is treated as a complete workstation failure. The spare CWS3 still appeared to be operating normally. The controllers were already discussing whether to move to the Reserve platform. They were asked to hold off by Technician 1 for a moment as an attempt to consolidate everything onto CWS3 was performed.

FINDING 1: Data display application issue

Following the unsuccessful attempt on CWS3, the Main Platform Stall procedure was initiated.

The following systems or services remained available:

- Righthand display continued to display aircraft positions
- VCS was unaffected
- IAG service was unaffected
- RADAR services from New Zealand to the OCA boundary were unaffected

4.2.2. Consolidation on Standby Workstation Main CWS3

In the operations room, the team followed standard practise which is to remain on the Main platform and check whether operations could be consolidated on the standby workstation.

Technician 1 opened the sectorisation window on CWS3 and attempted to bring all sectors onto that position, and received a pop-up warning 'Sectorisation information unavailable'. With CWS1 and CWS2 already down and CWS3 not accepting the sectorisation, the decision was made to move to Reserve. This is the appropriate course of action for this situation. See also Figure 6 on the following page.

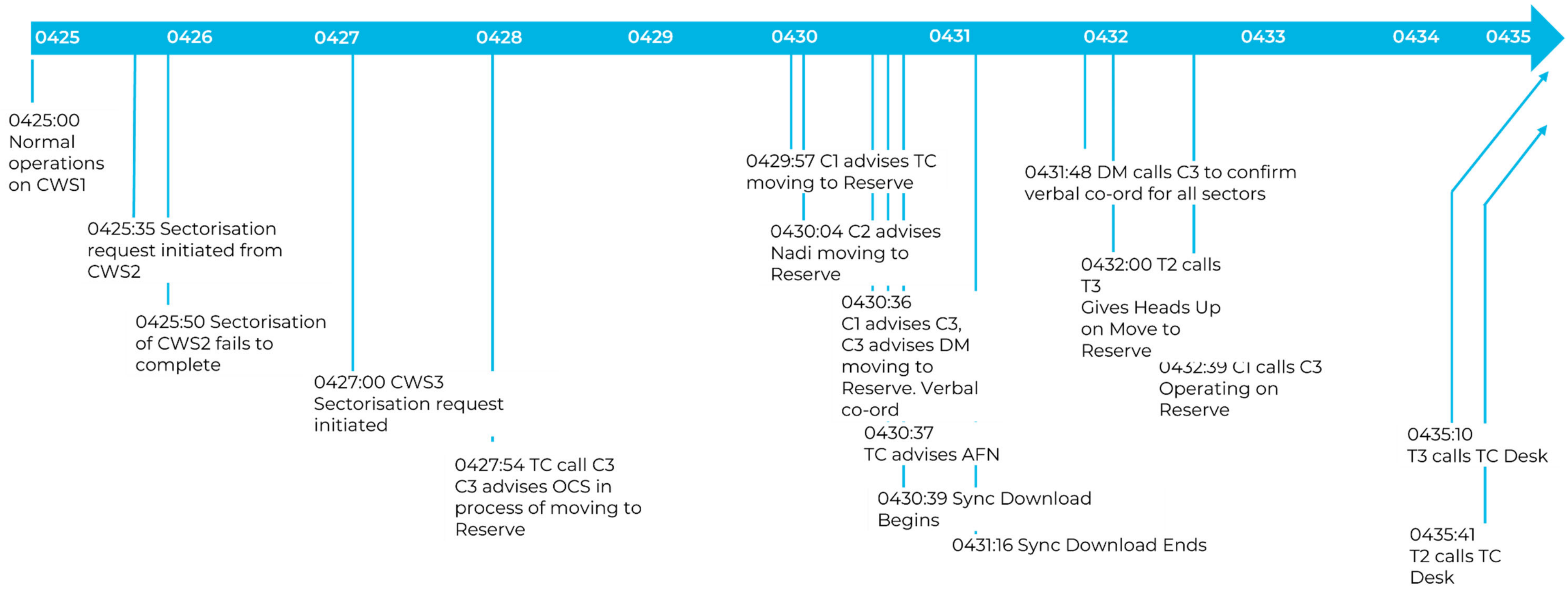

Figure 6: Pictorial view of 10mins from initiation of event to move to Reserve

4.2.3. Move to Reserve

The move from Main to Reserve followed the procedure documented in *Auckland Centre Procedures (ACP) Chapter 8: Contingency – Appendix B – Transfer of ATS Delivery MAIN to Reserve OCS platform - Binary*, commencing the checklist at time 0427. Checklist Stage 1, bullet point two states 'Check the Reserve platform is set up and ready for use (Sectorisation… replicate the Main)'.

The controllers continued with the *ACP – Appendix B* checklist, and at time 0429:57, the OCS Controller advised the TC in Christchurch that they are moving to Reserve. The Radar Controller (Controller 3), co-located beside the OCS Main positions in the Auckland Centre, is also informed that OCS are moving to Reserve.

Informing the DM in Christchurch is part of the Radar checklist, found in *Auckland Centre Procedures (ACP) Contingency Appendix G – OCR responsibilities during OCS platform Move: Main to Reserve*. At time 0430:36, Controller 3 informed the DM that OCS was moving to Reserve, and requested the DM to relay the need for verbal coordination for outbound international flights, as per the Radar checklist in *ACP – Appendix G* .

Stages 3, 4 and 5 of the *ACP – Appendix B* checklist are progressively worked through by the OCS Controller. At time 0432:39, the OCS Controller advised the Radar Controller that Operations had resumed on the Reserve platform, and verbal oceanic level approvals were to continue, in accordance with the checklist.

The final bullet point of the OCS checklist states 'As soon as the controllers are satisfied that the Reserve platform is operating normally request the TC to Cold Start the Main platform'. This instruction assumes Reserve will be operating normally. There is no documented pathway in this checklist for OCS to take when they are not satisfied that Reserve is operating normally, and the TC was not requested to Cold Start the Main platform at that time.

FINDING 2: Deficiency in contingency procedures

4.2.4. Reserve Issues

The controllers and technical staff in the centre knew that Reserve had to replicate the Main in terms of sectorisation state; this is explicitly stated in the *ACP Contingency – Appendix B* checklist at Stage 1. On this day, the sectorisation process had been initiated on Main, but was interrupted by the data display event. The controllers and technical staff did not know that the sectorisation process had been partially completed and that the flight data now reflected the split sectors.

Following the display issue they believed that the sectorisation attempt did not work, i.e. that the system was still operating as a single sector. Following the checklist, the Reserve was initiated in a consolidated sector state, the state they believed replicated the Main. After completing the move to CWS1 Reserve, it became apparent that the incorrect control states shown on the Main platform Aircraft Situation Display (righthand display) had been retained on CWS1 Reserve.

In post-event analysis (refer section 4.3), it was revealed that there was a mismatch in the state of the flight assignment data on the Sync server and the sectorisation state initiated on Reserve. During the event, the only information available was that flight assignment information did not display as expected, first on Main and subsequently on Reserve.

The controllers refreshed the display and tried moving the same consolidated sector plan to Reserve CWS2 and they observed the same outcome. Because the initial failure on Main had coincided with sectorisation, attempting a sector split on Reserve was considered, but rejected.

Technician 2 who would not normally have been present, took the initiative to call Technician 3 to provide a brief heads-up of the issue. This enabled Technician 3 to provide a quicker response than waiting for the normal escalation chain.

To try and understand what was and what wasn't working Controller 1 called Brisbane at 0435:58 to check the data transfer status of three aircraft. Brisbane confirmed they had one of the aircraft but had not yet received coordination for the other two.

Technician 1, recognising that this was more than a straightforward move from Main to Reserve, also contacted Technician 3 by phone, explaining the failures on Main, the attempted sectorisation onto CWP3, the subsequent move to Reserve, and the continuing issue with Tasman not presenting correctly. The advice was to release the Main platform back to the TCs so the Cold Start procedure could be initiated, with the goal of returning operations to Main as soon as possible.

FINDING 3: Mismatched sectorisation states between Main and Reserve

4.2.5. Separation assurance

The OCS Controllers, unsure as to why the system was behaving in this unusual manner decided to keep the departing aircraft within domestic airspace, rather than let them enter Oceanic airspace. This is in accordance with *ACP – Contingency Operations: Restricted Flow Procedures between NZZC Enroute Area Sectors and Oceanic Control* (p. CONT 8-11), which states OCS may impose restricted flow measures, including start approvals for flights and holding aircraft in domestic airspace.

Further escalation from Contingency Level 2 (Reserve Platform in AAATC) to Contingency Level 3 (Main Platform in Local Contingency Centre) was considered but assessed as not warranted at this stage. Transferring to the offsite contingency suite would have resulted in a temporary absence of air traffic services and would have required the activation of Traffic Information Broadcast by Aircraft (TIBA) procedures, in which pilots self-broadcast their positions and intentions to each other.

At the time of the event, separation was in place between the 25 aircraft already in the greater Oceanic airspace (OCA), which at that time was a consolidation of both PAC and TAS sectors. Of these, 10 aircraft were located within the region covered by the TAS sector. These 10 aircraft would continue to operate safely as the conflict probe function had been applied prior to the event. To ensure continued separation with these aircraft from new aircraft about to enter from domestic airspace, the OCS controllers advised adjacent domestic sectors to hold airborne aircraft. Controller 1 then advised the DM to hold all international departures on the ground at Auckland, Christchurch, Wellington and Queenstown.

Controller 2, independently of Controller 1, also informed Brisbane ATC that they were experiencing issues in the Tasman sector and inquired into the status of two aircraft. Brisbane advised they would call back.

In total, seven international departures already airborne were advised to expect to hold within domestic airspace. Of these, five entered holding patterns. Three of the holding aircraft eventually returned to New Zealand aerodromes due to insufficient reserve fuel for prolonged holding.

Four international departures that were not yet airborne were held on the ground at New Zealand aerodromes.

The following four sections provide additional details of the event from four coincident activity areas:

- ATS (controller) actions
- Oceanic Team Leader actions
- Technical Coordinator actions
- Duty Manager actions

4.2.6. ATS (controller) actions

Following the move from Main to Reserve Controller 3 was relieved by another controller on the Radar position. This enabled Controller 3 to move to sit behind the Reserve OCS CWS positions, which are adjacent to the Auckland AA TMA Contingency positions.

The AA TMA Contingency positions operate on the domestic ATM platform which controls a separate flight information region (New Zealand Domestic FIR - NZZC); these positions were used by Controller 3 to provide additional situation awareness information. Controller 3 relayed which aircraft were holding etc, and ranged in on the South sector, going through the aircraft, and relaying the details of each one so that Controller 1 knew exactly which aircraft were holding. This is an excellent example of a Team Resource Management (TRM) initiative in an unusual situation.

While the aircraft were under Radar coverage in domestic airspace ongoing separation assurance was provided. This would not have been as easily achieved had these aircraft entered Oceanic airspace, which is beyond Radar coverage.

Technician 1 phoned Controller 4 who was the acting Team Leader to apprise them of the situation. Controller 4 was driving to work and Technician 1 offered to inform the ATS Surveillance Operations Manager; this did not immediately occur due to other priorities.

4.2.7. Oceanic Team Leader actions

The normal Oceanic Team Leader (OTL) was on leave at the time of the event. When Controller 4, the acting OTL, was notified of the Main platform stall they were in their car enroute to the Centre to commence an operational shift.

According to *ACP – Contingency Operations: OCS Failures* (p. CONT 8-14), the OTL advises adjacent units and limits or restricts traffic entering Oceanic sectors if necessary. This is only practicable when the OTL is present in the centre; according to *ACP – Contingency Operations: Restricted Flow Procedures between NZZC Enroute Area Sectors and Oceanic Control* (p. CONT 8-11), OCS controllers may also impose delays.

Controller 4 arrived at Auckland Centre nine minutes after receiving the notification from Technician 1; on arrival, Controller 4 attempted to contact the acting Head of Surveillance Services (HOSS) to brief them on the situation however their contact details were not readily available, and were requested of the DM.

Controller 4's arrival also coincided with the release of the Main platform, authorising technicians to begin reinstatement, and the resumption of services in the Pacific sector on Reserve CSW2. Controller 4 then focussed on supporting the team in a supervisory role and advised the acting HOSS of the current situation.

Controller 4 was not aware that several aircraft would shortly be required to divert and at this point in time, with the Main platform already in the process of being restored, thought operations would imminently return to normal. The acting HOSS believed the situation to be a routine move between platforms that periodically occur with minimal disruption.

4.2.8. Technical Coordinator actions

The presence of Technician 1 and Technician 2 (both on-site) and Technician 3 (remote) enabled quick troubleshooting by experts, but also introduced another pathway of escalation and communication. This meant some repetition of information as well as a loss of contextual information, which resulted in an unintentional degradation of situational awareness for the TCs, DM and Management.

The TC first became aware of display anomalies at time 0425:50 and followed this up with a phone call to Controller 3. The TC desk was notified of the switch to Reserve at time 0429:57 by Controller 3 in accordance with the *ACP - Appendix* B checklist, Stage 2.

The TCs in Christchurch did not receive notification from Auckland to initiate a Cold start. This is likely because the controllers are not satisfied with the Reserve operations and the *ACP - Appendix B* checklist Dot point 4 states that they should be satisfied with Reserve operations.

** Already identified as* **Finding 2:** Deficiency in contingency procedures

The cold start occurs at time 0450 after Technician 3 makes enquiries.

The calls received at the TC desk in Christchurch from Technicians 2 and 3 were delivered in a calm and professional manner containing instructions of what to do. There is no sense of urgency or context that what is occurring in Auckland is unusual.

This resulted in the TC believing restoration is imminent.

Approximately 20 minutes after the switch to Reserve, the first indication the TCs receive that things are not working well on Reserve is when controller 1 calls the TCs and asks them to issue a NOTAM at time 0500:48.

FINDING 4: Important contextual information was not available to the Technical Coordinator

4.2.9. Duty Manager actions

The DM was initially informed about the move to Reserve at time 0430:36. Seven minutes later at 0437:54 the DM is asked to hold traffic; the DM understood the hold request as part of the Reserve transfer process, and the situation would be resolved quickly. Outbound aircraft had not yet reached the Oceanic boundary and the next Christchurch international departure was 45 minutes away.

At 0447:38 Air New Zealand (ANZ) operations contacted the DM asking if there is an issue with the OCS system. The DM confirms there is an issue, but that OCS is moving to the Reserve platform and should be fully operational shortly. ANZ advised they have aircraft airborne that can only hold for approximately thirty minutes. The DM anticipated this time to be sufficient as moves to the Reserve platform are normally complete in about 10 minutes.

After the phone call the DM seeks an update from the TCs who had just been advised by Technician 3 (at time 0450:00) that the OCS Main platform had been released by OCS for a cold restart.

The DM, having received no further update and aware that aircraft would shortly have to divert, initiated a call first to Radar, then to OCS. It is at this point (at time 0458:02) that the DM is informed about the problems on Reserve.

At 0503:30 Controller 4 calls the DM seeking the phone number of the acting Head of Surveillance Services as per their escalation requirements.

FINDING 5: Important contextual information was not available to the Duty Manager

FINDING 6: Customers were not informed of the service disruption in a timely manner

4.2.10. External calls

A significant distraction for the Oceanic team were incoming non-operational phone calls from airlines. Neither the Main nor the Reserve have dedicated inbound direct lines with other Air Navigation Service Providers (ANSP). So anytime the one external phone line in the Voice Communications System (VCS) rings, it must be answered by the operational controller in case it's another ANSP calling to coordinate a flight.

During the event airlines were contacting OCS directly. Controllers stated a lot of airlines, airport operators, and other agencies have the OCS external line phone number and use it daily for non-urgent calls to Airways.

FINDING 7: External use of OCS direct phone line for non-urgent calls

4.2.11. International Air Ground (IAG)

As CPDLC is not available when operating on the OCS Reserve platform, OCS controllers cannot process position reports electronically at the OCS controller position. They instead rely on IAG operators to pass position reports from aircraft to the controllers. This increased the workload for the IAG operators and OCS controllers.

4.2.12. NOTAM

Auckland Centre Procedures (ACP) – Contingency Operations identifies delivery of the service from the OCS Reserve platform as Contingency Level 2. This section of ACP also outlines a process titled *Restricted Flow Procedures between NZZC Enroute Area Sectors and Oceanic Control*, which contains an option for Holding: 'Area sectors may be required to hold aircraft in domestic airspace'. This section also advises "Issue NOTAM(s) as appropriate", with suggested NOTAM text provided.

At 0500:48 Controller 1 asks Technician 4 (Christchurch TC desk) to issue a NOTAM. As noted above, a NOTAM template is contained within the ACP however the TCs refer to the standard NOTAM text reference booklet where there is no NOTAM template. Discussions ensue between the TCs and DM on the wording to use. Twelve minutes later Controller 1 advises Technician 4 they are moving back to Main and no further action is taken to issue the NOTAM with the understanding that systems are now returning to normal.

FINDING 8: A NOTAM advising of a service restriction was not issued

4.2.13. Resumption of Normal Operations

At 0450:00, twenty-five minutes into the disruption, technicians were authorised to begin restoring the Main platform.

At 0512:36, approximately fifty minutes into the disruption, the OCS Main platform was restored via cold start, with a single sector setup.

At 0521:56, approximately fifty-seven minutes after the initial disruption, OCS controllers resumed full normal operations on Main, including a deconsolidated sector configuration, splitting PAC and TAS sectors.

4.3. Post event determination of primary cause and resolution

4.3.1. Issue 1 – Display application:

After the event, Technician 3 reviewed the core files and traced the initial CWP failures to a long-latent timing defect – referred to as a 'dangling pointer' – in the display process. The defect had been in the code base for around 20 years.

During testing and operational use in the days prior, routine sectorisation had been performed multiple times without incident.

The system 'core file' provides an image of what the application was doing when the problem occurred. Although the incident was unable to be reproduced, the system core file enabled the software team to deduce the cause of the problem.

In simple terms, when a sectorisation process occurs, some elements are removed and then re-created to align with the new sectors. An incoming external CPDLC message, received during the computationally complex sectorisation process, resulted in an inappropriate area in memory being accessed and prevented the sectorisation process from completing.

The resulting failure of the data display application led to the loss of Main CWS1 and CWS2. This prevented the sectorisation process from completing, which subsequently led to Issue 2 below.

* *Already identified as* **Finding 1:** Data display application issue

4.3.2. Issue 2 – Sector assignment:

The incorrect control state issue regarding sectorisation had a different origin; the recovery design deliberately does not re-process flight plans on download. Recovery assumes the sector plan from which the records were captured (i.e. the Source: Main CWS1), will be matched by the sector plan on the recovery platform (i.e. the Target: Main CWS3, or Reserve CWS1).

The sector plan on the recovery platform (first on Main CWS3, later on Reserve CWS1) did not match the sector plan captured in the flight data on the Sync server when sectorisation was initiated on Main CWS1. The mismatch in sector plan between source platform and target platform was as follows:

- Sector Plan (Main): Two sectors, i.e. TAS separated from PAC.
- Sector Plan (Reserve): One single, combined Sector, i.e. TAS included within PAC.

When the sectorisation process was initiated on Main CWS1 relevant flights were successfully assigned to TAS sector. This was not evident to the controllers as the sectorisation process did not successfully complete on Main CWS1 and CWS2 due to the data display failure.

Because the sectorisation process had not successfully completed, the sector plan on Main CWS3 was incorrectly reflecting a single sector, i.e. the TAS sector was not explicitly active. When operations were transferred to the Reserve platform: the sector plan on Reserve CWS1 was also established as a single combined PAC sector (TAS sector was not explicitly active).

When the sync recovery process restored flight records from the Sync server, some had internal flight assignments that referenced TAS sector. However, the sector plan on the target recovery platform (first on Main CSW3, later on Reserve CSW1) did not include TAS, because it had been initiated as a single, combined PAC sector.

Because of the sector plan mismatch, the information presented on both Main CWS3 and Reserve CSW1, showed some Tasman flights as blue rather than white; these flights could not be assumed or manipulated by the controller, and manual "assume control" commands were rejected.

Given that the initial display faults on Main CWS1 and CSW2 coincided with the initiation of the sectorisation process, and incorrect sector flight assignments were displayed on Main CWS3, controllers did not sectorise again when moving to Reserve.

** Already identified as* **Finding 3:** Mismatched sectorisation states between Main and Reserve

4.3.3. Rollback and Subsequent software fixes:

Precautionary Rollback:

The following morning, the software team executed a precautionary rollback to a previously prepared adaptation-only baseline (system parameter information, current

AIRAC/AIP adaptation). This rollback artefact had been pre-built as a standing safeguard with a ready-to-deploy adaptation-only baseline.

Software Fix for Issue 1 – data display application:

A small code change was implemented to mitigate the display application defect.

(Patch 1 released 27 AUG 2025)

* *Already identified as* **Finding 1:** Data display application issue

Software Fix for Issue 2 – mismatched sectorisation states:

Sectorisation processing will be performed on sync recovery to prevent a repeat of the "blue Tasman" control states; a snapshot-at-recovery feature will record an exact database image at the moment of download to aid diagnosis.

(Patch 2 released 31 AUG 2025)

* *Already identified as* **Finding 3:** Mismatched sectorisation states between Main and Reserve

4.4. Human Factors Review

Across the interviews common themes emerged on what helped and what hindered operations during the event. The atmosphere was stressful, time critical and noisy; external attention from outside parties arose quickly. The behaviours that worked were the simple ones: pause, breathe, follow checklists, prioritise controlling, keep communications and escalation structured, and avoid speculative fixes in the moment.

There were different mental models formed regarding what was occurring external to the Auckland Control Centre. Communication inadequacies often occur in high pressure situations so it should not be viewed as unexpected.

Having experienced people available at very short notice, ensured aircraft remained safe and delays were kept to a minimum. Having someone off-position to capture notes, times, and photos preserved facts that the operational team could not record while working the problem. The controllers' concerns about what could be trusted on screen was understandable; the technical team provided steady reassurance while the Main was restored.

Each of the controllers on shift at the start of the event were towards the end of their shift; all completed the shift in full. Once the event was over, relief of staff was not considered due to each controller's shift being completed. Controller 4's shift began approximately 30 minutes after the event began; they completed their shift in full. Controller 4 called Controllers 1, 2 and 3 to check all were okay and able to return to work the next day.

5. Findings and Safety Actions

FINDING 1 (software) - Display software issue during sectorisation process

Description:
The lefthand displays of the two main OCS Controller Workstations failed during a sectorisation process that left only one working screen per position and information displayed on the failed screen unable to be interacted with. The issue occurred due to an incoming CPDLC message from an aircraft, during a system sectorisation process. The sectorisation process is normal when traffic levels are expected to increase.

ACTION 1: Develop and implement a software patch to address the data display application issue, observed when sectorisation process failed to successfully complete.

Action owner: Team Leader OCS Systems Development

Due date: 22 August 2025 **(Completed)**

FINDING 2 (procedures and communications) - Deficiency in contingency procedures - moving from Main to Reserve

Description:
The *Auckland Centre Procedures – Contingency Operations* referenced in this event were only partially effective. The process checklist within the document needs to cover the scenario of a non-successful operational state being achieved when moving from Main to Reserve. A NOTAM should also be considered when operating on Reserve, as CPDLC is not available.

ACTION 2: ACP – Contingency Operations document is to be updated to include a 'not satisfied' state when moving to Reserve and to consider a NOTAM be issued when operating on Reserve.

Action owner: GM of ATS

Due date: 5 December 2025 **(Completed)**

AIRWAYS

FINDING 3 (software) - Mismatched sectorisation states between Main and Reserve

Description:

Sectorisation process failed to complete due to the data display issue on Main. This led to the staff being unable to ascertain which sectorisation to setup on Reserve, resulting in a mismatch and a degraded operational mode on Reserve.

ACTION 3: Develop and implement a software patch, such that the system operates on Reserve, no matter what sectorisation was previously established on Main.

Action owner: Team Leader OCS Software Engineering Team

Due date: 29 August 2025 **(Completed)**

FINDING 4 (procedures and communications) - Important contextual information was not available to the Technical Coordinator

Description:

Several calls occurred between technical staff in Auckland and the Christchurch-based TC, however important contextual information was not made available to the TC in a timely manner to enable them to operate effectively as the technical Focal Point.

ACTION 4: Review existing documentation and practice to identify areas for improvement in terms of information flow between controllers and technical staff and the Technical Coordinator Focal Point during a Contingency situation.

Action owner: GM of ATS and CITO

Due date: 5 December 2025 **(Completed)**

FINDING 5 (procedures and communications) – Important contextual information was not available to the Duty Manager

Description:

Important contextual information was not made available to the Christchurch-based DM from Auckland in a timely manner to enable them to effectively coordinate a response, including issuing a timely NOTAM and provision of timely updates to airline operational staff seeking information.

ACTION 5: Review existing documentation and practice to identify areas for improvement in terms of information flow between controllers and technical staff and the DM during a Contingency situation.

Action owner: GM of ATS and CITO

Due date: 5 December 2025 **(Completed)**

FINDING 6 (procedures and communications) – Customers were not informed of the service disruption in a timely manner

Description:

Customers were not informed of the service disruption in a timely manner.

ACTION 6: Clarify the DM role of informing customers in a timely manner in the event of a service disruption.

Action owner: GM of ATS

Due date: 15 November 2025 **(Completed)**

FINDING 7 (communications) – External use of OCS direct phone line for non-urgent calls

Description:
During the event airlines were contacting OCS direct via a single external phone line with no caller ID. Controllers stated a lot of airlines, airport operators, and other agencies have the OCS external line phone number and use it daily for non-urgent calls to Airways.

ACTION 7: Set up another external phone line and communicate to customers on which line to use for operational matters, as well as that non-urgent calls should be routed to the DM. Amend AIP and LOAs accordingly.

Action owner: Head of Surveillance Services

Due date: 30 June 2026

FINDING 8 (procedures and communications) - A NOTAM advising of a service restriction was not issued

Description:

When informed of the issues on the Reserve platform, the TCs were requested to issue a NOTAM, however the TCs did not have a NOTAM template that they could readily reference, resulting in delays. After discussing a resolution with the DM, the issue with OCS appeared to be resolving, removing the need to issue a NOTAM, so none was issued.

Action description: Ensure a template NOTAM is available in ACP and share it with the ATSS Team Leader and TC Team Leader to ensure readiness for operational use.

Action owner: Team Leader OCA

Due date: 5 December 2025 **(Completed)**

Appendix 1 – Acronyms

ACRONYMS	DEFINITIONS
AAATC	Auckland Air Traffic Services Centre
ADS-C	Automatic Dependent Surveillance - Contract
AIDC	Air Traffic Services Inter-facility Data Communications
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation And Control
ASD	Air Situation Display
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATS	Air Traffic Services
CAA	Civil Aviation Authority
CHATC	Christchurch Air Traffic Services Centre
CPDLC	Controller Pilot Data Link Communications
CWS	Controller Work Station
DM	Duty Manager
FIR	Flight Information Region
HF	High Frequency
IAG	International Air Ground
LAN	Local Area Network
MATS	Manual of Air Traffic Services
NOTAM	Notice to Air Men
OCS	Oceanic Control System
PAC	Pacific
SIGMET	Significant Meteorological Information
SRT	Software Readiness Testing
TAS	Tasman
TC	Technical Coordinator
TIBA	Traffic Information Broadcast by Aircraft
TMA	Terminal
TRM	Team Resource Management
UTC	Coordinated Universal Time

AIRWAYS

Appendix 2 – Airways Documentation

The following Airways documents were reviewed as part of this investigation:

- Manual of Air Traffic Services – Oceanic Services (MATSOS)
- AATC Contingency Plan (Amdt No 003, Effective Date 28 Nov 2024)
- Duty Manager Procedures (Amdt No 017, Effective Date 01 JUN 2025)
- Auckland Centre Procedures (Version 5, Issue Date 07 Aug 2025)
- ACP CH 8 (CONTINGENCY) – Appendix A – OCS Failures
- ACP CH 8 (CONTINGENCY) – Appendix B - Transfer of ATS Delivery MAIN to Reserve OCS Platform – Binary
- ACP CH 8 (CONTINGENCY) – Appendix D - Transfer of ATS Delivery OCS Reserve to Main OCS Platform
- ACP CH 8 (CONTINGENCY) – Appendix G – OCR Responsibilities during OCS Platform Move: Main to Reserve
- ACP CH 8 (CONTINGENCY) – Appendix H – OCR Responsibilities during OCS Platform Move: Reserve to Main
- Local Unit Operational Notice
- Local Unit Procedure Change Notice
- TC Procedures – Escalation of Serious Issues to Management
- TC Procedures – Escalation of Serious Issues to Management – Standby Roster
- TC Procedures – Escalation of Serious Issues to Management – Escalation Email
- TC Procedures – Oceanic Control System (OCS) Fault Procedure
- TGAir Work Activity Records
- Airways Service Framework (Effective 1 July 2025)