NZZO AIDC

APAC/NAT AIDC TF/2
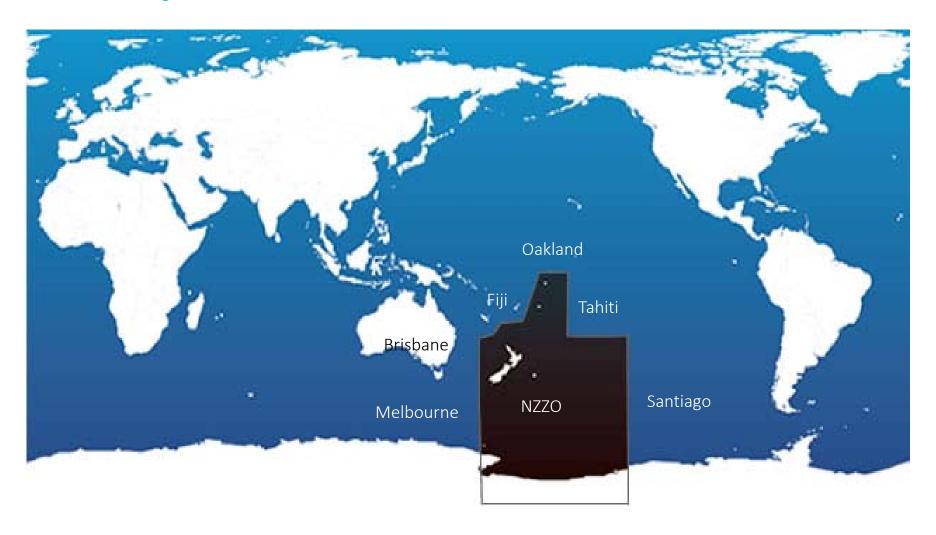Cairo 3-5 March 2014
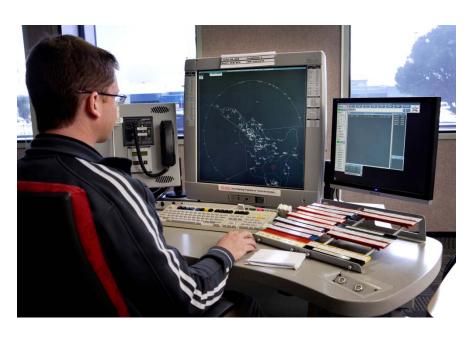Agreed by Paul Rad Ford

NZZO (Auckland OCA)

Domestic ATM - NZZC

- Two Domestic ATC Centres – Christchurch (3 Terminal sectors 6 Area Sectors + Auckland (1 Area Sector)
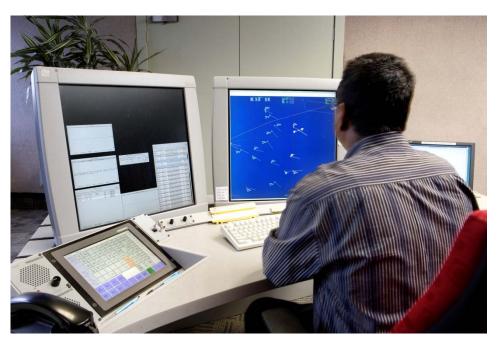

- Skyline ATM System (Lockheed Martin)

- Installed 2002

- Surveillance
  - PSR
  - SSR
  - Multilateration
  - ADS-B

- AIDC interface with NZZO Auckland Oceanic

Oceanic ATM - NZZO

- Auckland Oceanic Centre
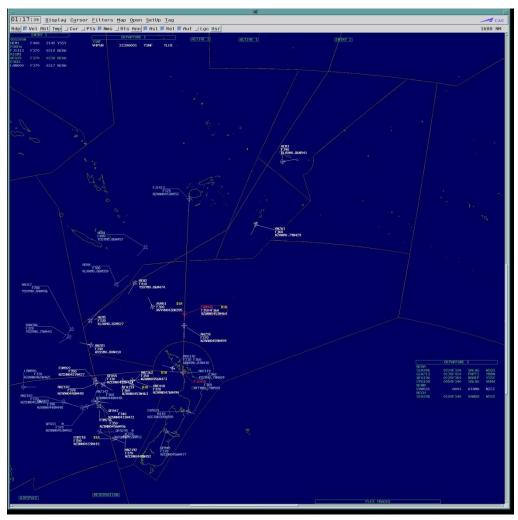- ATM – Oceanic Control System (OCS)

- Installed 2000
  - Procedural System
  - FANS1/A integrated FDP
  - Conflict Probe
  - Electronic Strips
  - RNP10 50/50 separation
  - RNP4 30/30 separation
- Similar to FAA Oceanic Systems, Santa Maria, Nadi, and Iceland ATM systems.
- AFTN AIDC interface with NZZC, YBBB, YMMM, NFFF, NTTT, KZAK per ASIA/PAC ICD.
- "Psuedo" AIDC with Santiago, Tonga, Rarotonga, Samoa

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Oceanic ATM - NZZO

- 2 Screens (Air Situation Display + Display Interface)

- 2K Barco – replaced with 30 inch LCD October 2012

- Airways manages own software and hardware upgrades

- 2nd Hardware refresh installed October 2012

- Airways schedules 4 software upgrades per year

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NZZO Oceanic ATM – AIDC Benefits

- The ICAO Global Plan notes that AIDC brings significant advantages over voice communication in terms of both workload and safety.

- The plan notes that the automation of coordination tasks using AIDC between adjacent sectors improves the quality of information on traffic transiting between sectors and makes it more predictable, thereby allowing **reduced separation minima, decreased workload, increased capacity, more efficient flight operations, and enhanced safety.**

- This has certainly been the NZZO experience.
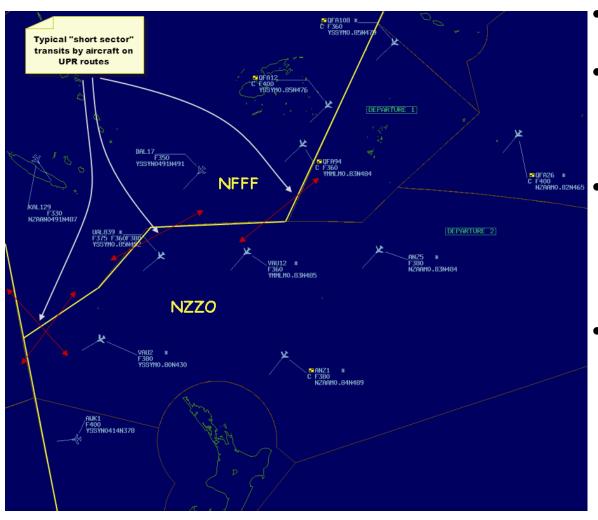
NZZO Oceanic ATM – AIDC Benefits

- In NZZO AIDC was implemented with the OCS ATM system in 2000.

- At that time we were struggling to maintain a procedural paper strip based system using a single oceanic sector operation with an average of around 130 flights per day.

- With OCS and AIDC we are now handling an average of 200 flights per day and still maintaining a single sector operation.

- There has been a significant reduction in controller loop errors and a significant reduction in controller workload by automating the coordination tasks using AIDC.

NZZO Oceanic ATM – AIDC Benefits

- DARP (Dynamic Airborne Reroute Procedure) has the aircraft making reroute requests directly to the ATC unit in control who then process and modify the request if necessary and forward the approved route to aircraft and the next downstream ATC unit.

- AIDC is a pre-requisite before implementing the DARP procedure.

- We have implemented DARP for aircraft in transit between Auckland, Nadi, Tahiti, and Oakland FIR.

- AIDC has assisted Airways New Zealand providing our customers the benefits envisaged in the Global Plan.

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NZZO Oceanic ATM – AIDC Benefits

- Typical early morning traffic pattern in NZZO at 0400AM.
- All FANS1/A data-link aircraft (solid APS symbol) are flying UPR routes between NAM and Australia/New Zealand.
- Two of the southbound aircraft have carried out DARP procedure in Oakland airspace with the revised route passed by AIDC.
- Note traffic flow aligned with NFFF/NZZO boundary, we see numerous "Short Sector" transits with increased coordination requirements assisted by AIDC

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AIDC – In SOPAC via AFTN

- Airways upgraded to a Comsoft AFTN/AMHS switch in March 2012.
- International AFTN circuits are still via X25.
- Intention is to upgrade international circuits to TCP/IP.
- All AIDC currently via AFTN but intention is to move to AMHS.
- Representative AIDC messages received per month and latency

	ABI	CPL	CDN	EST	ACP	TOC/AOC
Average	3.5"	2.5"	2"	2"	2"	1.5"
Min	2"	1"	1"	1"	1"	1"
Total #	4216	3420	5003	2095	5988	10123

- 66726 AIDC messages were received in the month illustrated with 99.9% received within 20 seconds.
- Of 35717 messages with LAM response 1 LAM exceeded accountability timer of 180 seconds

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AIDC – NZZO Daily AIDC Traffic

- Typical numbers of AIDC and FPL messages per day (13/9/13)

Message	ABI	CPL	CDN	EST	ACP	TOC
Total #	606	233	198	122	551	310
Message	AOC	PAC	LAM	LRM	AOC	
Total #	305	35	2262	10	305	
Message	FPL	CHG	DLA	DEP	ARR	
Total #	188	10	20	272	75	

AIDC Interface Differences NZZO and..

- OCS allows the specification of individual message sets per FIR and the parameters to be used with each set in adaptation.

- The adaptation data for each FIR includes:
    - the type of messages to be used e.g. CPL or EST;
    - the fields to be used in each message;
    - the timing of messages;
    - Route detail to be sent in Field Type15. Some FIR require the Field type 15 route to start at the waypoint preceding the coordination point while others expect the full FPL route to be included;
    - The different Field type 14 optional subfields used by each FIR (block level, speed, weather deviation/offset).

AIDC Interface Differences NZZO and..

	YBBB	YMMM	NFFF	NTTT	KZOA	NZZC
Notify	ABI	ABI	ABI	ABI	ABI	ABI
Coordinate Initial	EST	Voice	CPL	CPL	CPL	CPL
Coordinate Negotiate	CDN	Voice	CDN	CDN	CDN	CDN
Item 14 - Block Level	YES	YES	YES	YES	YES	YES
Item 14 – Weather Deviation/Offset	NO	NO	YES	YES	YES	YES
Item 14 - Speed	NO	NO	YES	YES	YES	NO
Notify Time	40'	40'	40'	60'	70'	120'
Coordinate Initial Time	30'	30'	30'	30'	30'	30'
Field 15 Route type	ALL	ALL	ALL	ALL	PRE-COP	PRE-COP

"Pseudo" AIDC Interface.

- Use simple AFTN messages created by templates at SCIZ, NCRG, NFTF, and NSFA
- No Header Information/CRC
- Pragmatic method to overcome difficulties with poor telephone connectivity between stations.

	NCRG	NFTF	NSFA	SCIZ
Notify	NO	NO	NO	ABI
Coordinate Initial	PAC	PAC	PAC	EST
Coordinate Negotiate	CDN	CDN	CDN	Voice
Item 14 - Block Level	YES	YES	YES	YES
Item 14 – Weather Deviation/Offset	YES	YES	YES	YES
Item 14 - Speed	NO	NO	NO	NO

"Pseudo" AIDC Interface.

- NFTF, NCRG, NSFA – Pacific Island States. Coordination for flights departing and climbing directly into NZZO airspace above F250. We use PAC/CDN for co-ordination of flights departing from NFTF,NCRG,NSFA. e.g.

KIA0710 130228
FF NZZOZQZF
130226 NSFAZTZX
(PAC-MGE705-NSTU-LAKER/0239F370F030A-PHNL)

IKA0619
FF NSFAZTZX
130229 NZZOZQZF
(ACP-MGE705-NSTU-PHNL)

KIA0712 130229
FF NZZOZQZF
130227 NSFAZTZX
(CDN-MGE705-NSTU-PHNL-14/LAKER/0239F370F03

IKA0622
FF NSFAZTZX
130231 NZZOZQZF
(ACP-MGE705-NSTU-PHNL)

"Pseudo" AIDC Interface.

- With Santiago we use EST/ACP exchanges for co-ordination e.g.

KIA2468 131011
FF NZZOZQZF
131011 SCELZOZY
(EST-LAN801/A5370-SCEL-
48S131W/1113F280F360-NZAA

IKA2273
FF SCELZOZX
131012 NZZOZQZF
(ACPNZZO/SCEL290-LAN801/A5370-SCEL-NZAA)

AIDC Interface – NZZC Domestic

- **With our domestic airspace (Lockheed Martin Skyline ATM) we use for departing flights into NZZO a CPL-ACP-CDN-ACP-TOC-AOC exchange**

KCA1854
FF NZZOZQZF
130648 NZZCZQZX 2.058387-4.130713064834-5.6F28-
(CPL-CAL052/A0262-IS
-A333/H-SDE1E2E3FGHIJ3J5M1RWY/LB1D1
-NZAA-MADEP/0716F320
-N0454F320 MADEP/N0465F360 N774 MARLN DCT
-YSSY
-PBN/A1B1C1D1O1S2 DOF/130713 REG/B18312 EET/NZZO0030 YBBB0120
YMMM0239 SEL/MSHR CODE/8991BA ORGN/RCTPCALC PER/C RALT/NZAA YSSY
RMK/ADSB AUSEP TCAS EQUIPPED TEL 88633981451)

Note: AUTO ACP

IKA1604
FF NZZCZQZX
130649 NZZOZQZF 2.000841-3.NZZC058387-4.130713064836-5.6688-
(ACP-CAL052/A0262-NZAA-YSSY)

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AIDC Interface – NZZC Domestic (2)

- **With our domestic airspace (Lockheed Martin Skyline ATM) we use for departing flights into NZZO a CPL-ACP-CDN-ACP-TOC-AOC exchange**

FF NZZOZQZF
130650 NZZCZQZX 2.058390-4.130713065034-5.3DCD-
(CDN-CAL052/A0262-NZAA-YSSY
-14/MADEP/0717F320-15/N0454F320 MADEP/N0465F360 N774 MARLN DCT
-18/PBN/A1B1C1D1O1S2 DOF/130713 REG/B18312 EET/NZZO0030 YBBB0120
YMMM0239 SEL/MSHR CODE/8991BA ORGN/PCTPCALC PER/C RALT/NZAA YSSY
RMK/ADSB AUSEP TCAS EQUIPPED TEL 88633981451)

Note: AUTO ACP

IKA1611
FF NZZCZQZX
130651 NZZOZQZF 2.000844-3.NZZC058390-4.130713065036-
5.6688-
(ACP-CAL052/A0262-NZAA-YSSY)

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AIDC Interface – CDN exchange (1)

BAA2915 130849

FF NZZOZQZF

130849 NFFFZQZF 2.000581-4.13071308492**5**-5.D357-

(CPL-UAL870/A1504-IS

-B744/H-SDE3FGHIJ5M1RWXYZ/LB1D1

-YSSY-SOVRA/0932F320F350

-M087F320 3347S15111E 3343S15132E DCT LHI B450 TUT B577 AHNDO A220

 CINNY DCT OSI DCT

-KSFO

-PBN/A1B1C1D1L1O1S2 NAV/RNVD1E2A1 REG/N121UA EET/YBBB0014 NZZO0119

 SEL/BQPS CODE/A0592C OPR/UAL PER/D RALT/PHTO KVBG RMK/TCAS)

Note: AUTO ACP

IKA1975

FF NFFFZQZF

130849 NZZOZQZF 2.000822-3.NFFF000581-4.130713084928-

5.BE44-

(ACP-UAL870/A1504-YSSY-KSFO)

AIDC Interface – CDN exchange (2)

BAA3104 130927
FF NZZOZQZF
130928 NFFFZQZF 2.000601-4.130713092753-5.3D9D-
(CDN-UAL870/A1504-YSSY
-KSFO
-14/SOVRA/0932F320F350/W30R
-15/M087F320 3347S15111E 3343S15132E DCT LHI B450 TUT B577 AHNDO
 A220 CINNY DCT OSI DCT)

Note: Not Auto ACP

IKA2109
FF NFFFZQZF
130930 NZZOZQZF 2.000841-3.NFFF000601-4.130713092938-
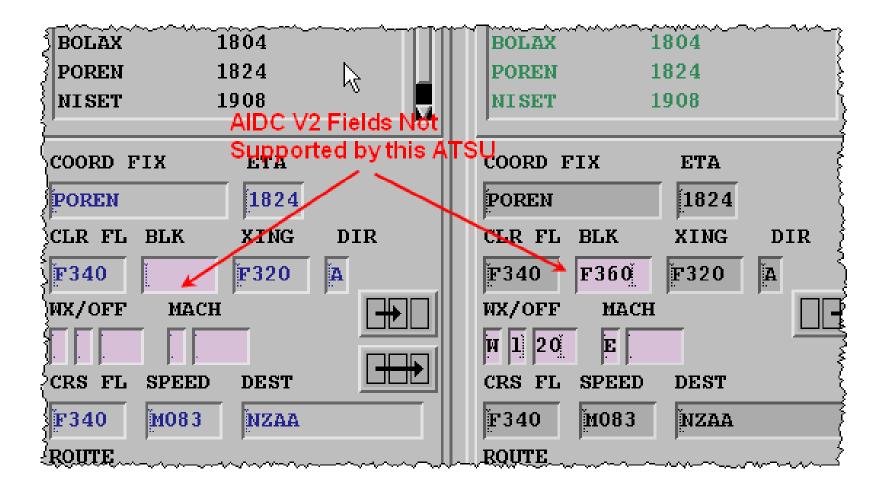5.BE44-
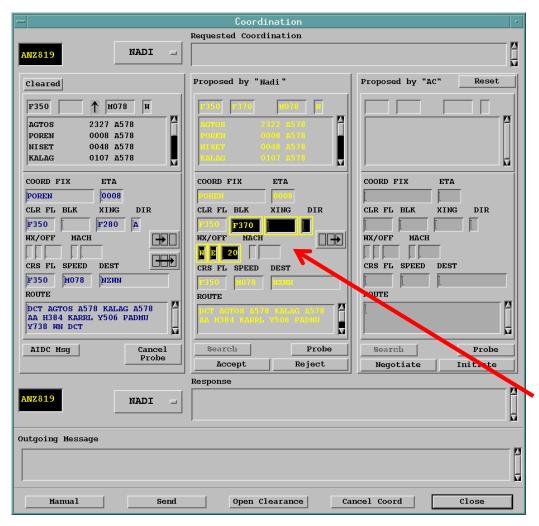(ACP-UAL870/A1504-YSSY-KSFO)

NZZO – OCS Coordination HMI (1)

Coordinated Fix PEBLU/0006

Coordinated Block F340F360

Pink background indicates Mach Speed coordination is not available with this sector

Coordinated Weather Deviation (W) Up to 30NM Right (R 30)

NZZO – OCS Coordination HMI (2)

NZZO – CDN receipt

CDN Message – proposing a change in coordination is received from Nadi (NFFF) and processed from controllers queue.

The Coordination window opens with proposed data prefilled and changes from current coordination highlighted.
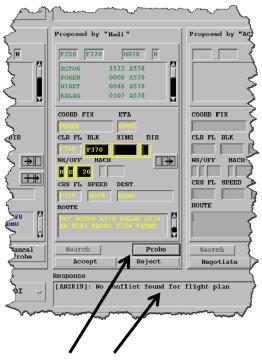
(CDN-ANZ819/A4425-NFFN
-NZWN
-14/POREN/0008F350F370/W20E
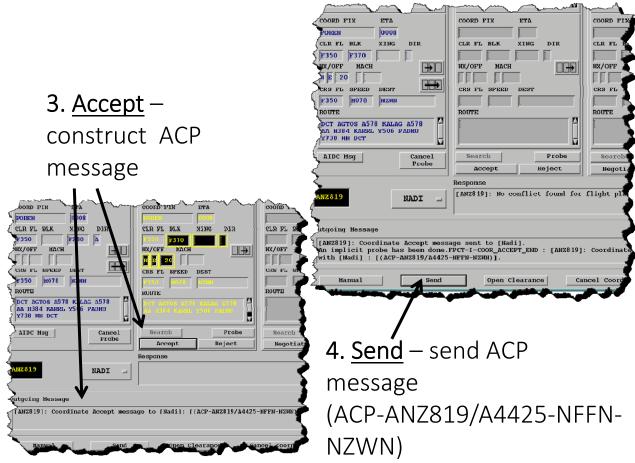*-15/M078F350 DCT AGTOS A578 KALAG A578 AA H384 KARRL Y506 PADMU Y738 WN DCT)*

NZZO — Process CDN

3. <u>Accept</u> – construct ACP message

4. <u>Send</u> – send ACP message (ACP-ANZ819/A4425-NFFN-NZWN)

1. <u>Probe</u> – for conflict
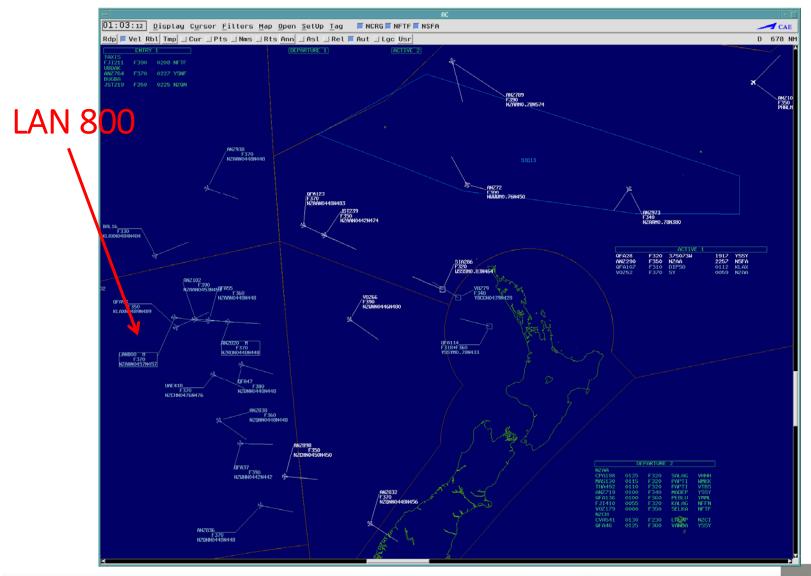2. <u>Response</u> – no conflict found

Coordination – Processing

- **The CDN processing depicted in the previous two slides occurred on 4 September 2012. The timing of the AIDC exchange was as follows:**
  - **2339:42 Nadi send AIDC CDN message**
  - **2339:44 CDN message received in the controllers queue.**
  - **2340:16 CDN message processed from queue.**
  - **2340:20 Proposed coordination probed for conflict.**
  - **2340:24 ACP message sent to Nadi.**
  - **2340:26 ACP message received in Nadi**
  - **2340:28 LAM response received from Nadi**
    - **44 seconds for Nadi controller to complete co-ordination**
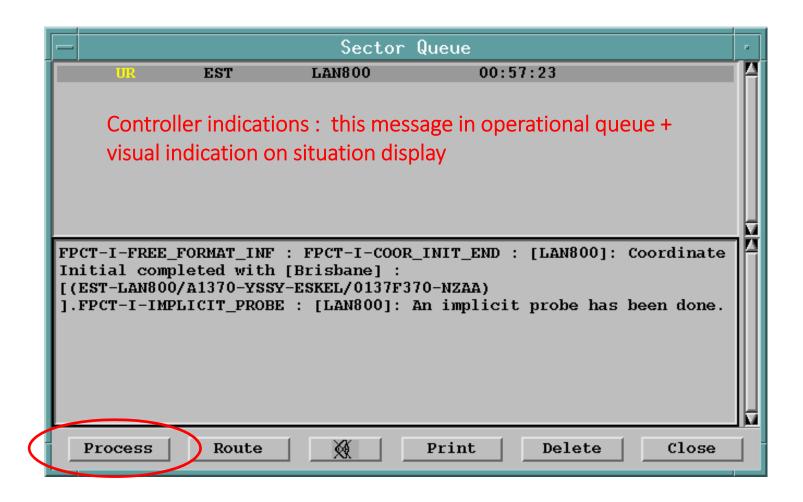   - **8 seconds for Auckland controller to process co-ordination**

NZZO – YBBB – AIDC exchange (1)
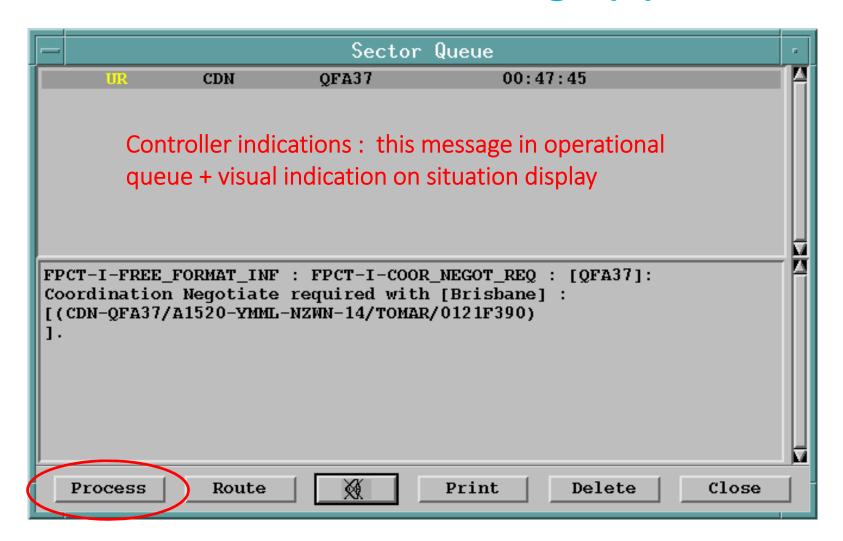

LAN 800

NZZO – YBBB – AIDC exchange (2)

Sector Queue

UR   EST   LAN800   00:57:23

Controller indications : this message in operational queue +
visual indication on situation display

```
FPCT-I-FREE_FORMAT_INF : FPCT-I-COOR_INIT_END : [LAN800]: Coordinate
Initial completed with [Brisbane] :
[(EST-LAN800/A1370-YSSY-ESKEL/0137F370-NZAA)
].FPCT-I-IMPLICIT_PROBE : [LAN800]: An implicit probe has been done.
```

Process   Route   🔇   Print   Delete   Close

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NZZO – YBBB – AIDC exchange (3)

Coordinated data

NZZO – YBBB – AIDC exchange (4)

Sector Queue

UR   CDN   QFA37   00:47:45

Controller indications : this message in operational
queue + visual indication on situation display

FPCT-I-FREE_FORMAT_INF : FPCT-I-COOR_NEGOT_REQ : [QFA37]:
Coordination Negotiate required with [Brisbane] :
[(CDN-QFA37/A1520-YMML-NZWN-14/TOMAR/0121F390)
].

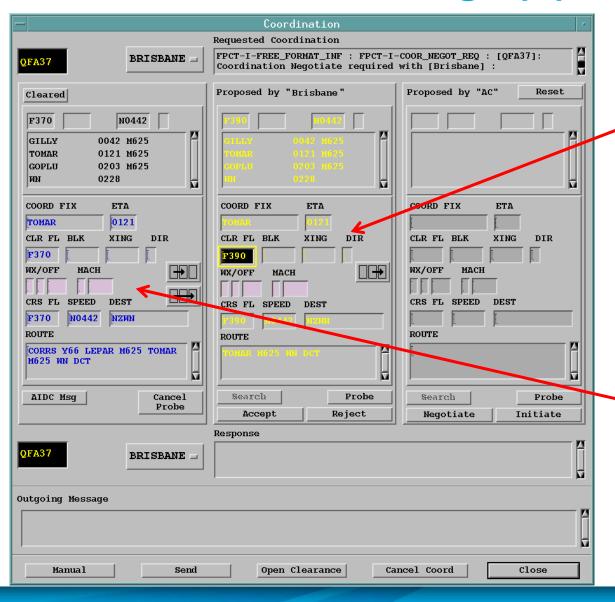Process   Route   ⌀   Print   Delete   Close

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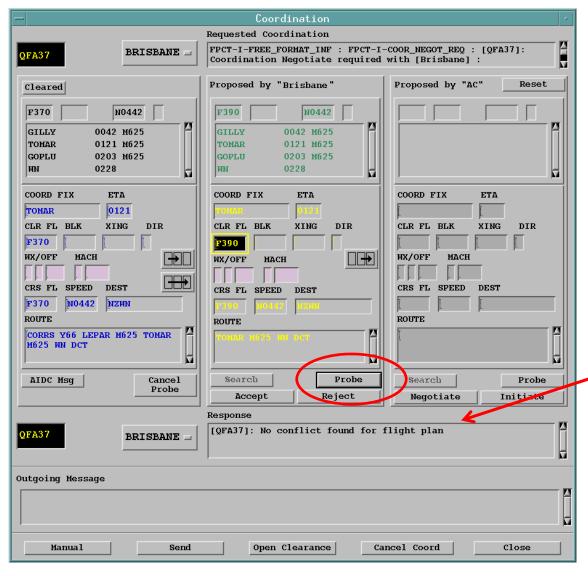# NZZO – YBBB – AIDC exchange (5)

Proposed Data (Changes are highlighted)

Current coordinated data

NZZO – YBBB – AIDC exchange (6)

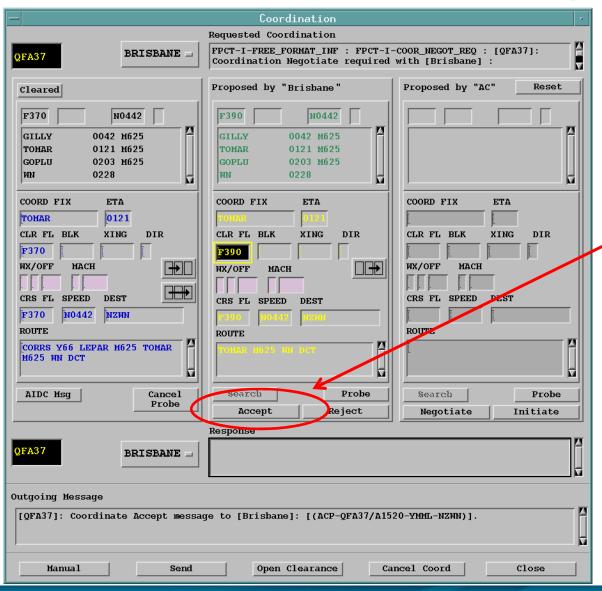Controller probes for conflict on proposed level change

No conflict reported

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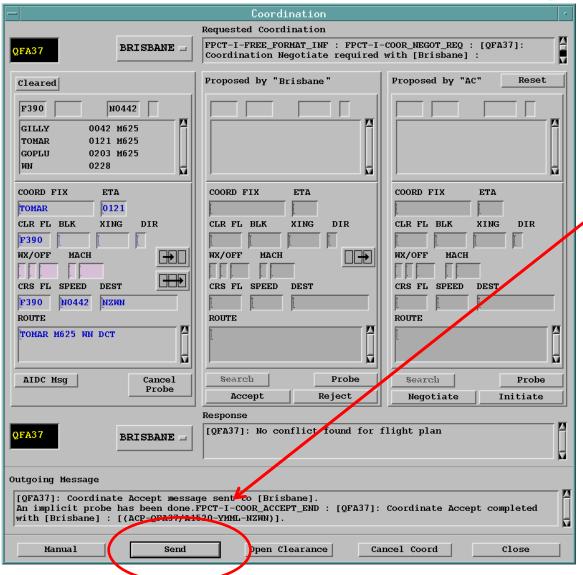# NZZO – YBBB – AIDC exchange (7)

Controller accepts revised coordination

NZZO – YBBB – AIDC exchange (8)

Controller sends ACP

NZZO – AIDC Interface testing

- Airways has a number of OCS platforms separate from the Operational Main and Reserve platforms, that we use for training, software development, and contingency operations.

- We have the ability to setup one of these platforms with its own AFTN connection and distinct AFTN address to enable it to be used for full AIDC testing with other units.

- This AIDC test platform was successfully used for the pre-implementation testing of the new TIARE ATM system in Tahiti in 2008 and 2009, and for the pre-implementation testing of the new Aurora ATM system in Fiji in early 2010.

- More recently it has been used for ICAO 2012 FPL AIDC interoperability testing with the FAA, Tahiti, and Australia.

- Testing being scheduled with Santiago for new AIDC capable ATM system

NZZO – AIDC issues

- <u>Incorrect route truncation</u>. The Asia/Pacific ICD clearly states the rules required for truncating a route after the last known significant route point. If these rules are not followed there are significant risks associated with the transmission of incorrect route information to the downstream ATC unit. While the majority of instances investigated in New Zealand are the result of human error there have been occasions when the automation system was at fault. With the increasing use of DARP procedures and route modifications the accuracy of route handling and transmission between automated systems is of increasing importance. We have found that comprehensive training backed up by regular refresher training is required to minimize these errors.

NZZO – AIDC Issues

- <u>Handling duplicate fix/airway information.</u> A lot of the route processing errors we see are caused by duplicated fix or airway names. The OCS ATM system can handle duplicate fixes in most cases because it uses both the fix name and associated FIR key as the key ie. AA NZZC, AA NFFF, AA NTTT. However, because we do not operate a global data base we do strike problems where a duplicate fix name is used as the entry point to an airway. If the duplicate fix name is known in adaptation but the airway is not the route extraction will fail requiring manual intervention. In the days when most flights flew fixed routes this was not such an issue. However, with the increasing use of UPR routes we are finding we have to spend more time on database management to keep this type of error at a minimum.

NZZO – AIDC issues

- Conformance monitoring by the ATM automation. Mitigating route inaccuracy caused by failures in route truncation requires ground automation conformance monitoring of received position reports against the current flight plan.

- This conformance checking in the Airways OCS ground system will check the reported current, next, and next+1 positions against current flight plan.

- Conformance monitoring also provides mitigation for flight plan input errors in the aircraft FMS.

NZZO – AIDC issues

- <u>ATM system software coding differences</u>. Different ground systems often come up with different interpretations of the same AIDC specification.

- We have seen a number of different interpretations since implementing AIDC which we have had to work around.

- While the interoperability testing and software development associated with the introduction of the ICAO 2012 FPL changes have been able to eliminate most coding differences we expect to see some more examples introduced as we move into the full use of the ICAO 2012 Flight Plan.

- With Global ICD – the work is a good opportunity to clarify implementation requirements in the ICD and minimise interpretation issues.

Supplementary Slides

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Thank you

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