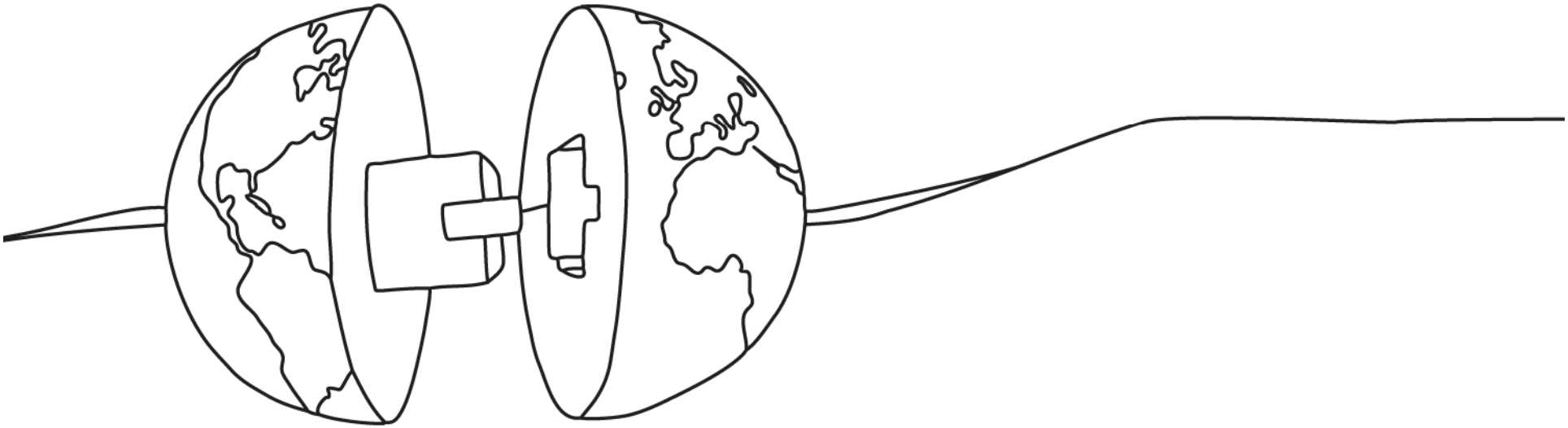
Seminar on ATM Automation-CAR/SAM

Rio de Janeiro, 11-13 Jun2008

Integration case of ADS-B/ADS-C/Radar data



Adriana Mattos
ATM Business Development
Latin America and Caribbean

Communication services

SITA

Agenda

- Overview on Australian ATM system
- ADS-B Upper Airspace Project
- Changes to ATC system
- Human-Machine Interface overview:
  - The track presentation
  - Track source
  - Accuracity
  - The best data presented to the controller
  - The ability to separate source data
- Air situation display show
- Conclusion

Overview on Australian Air Traffic Management System

- 2 Area Control Centers: Melbourne and Brisbane
- All ATC units use Thales Eurocat System
- Around 150 consoles: no paper strip is used
- No analogue radar displayed to the controllers
- All centres use same console type
- ADS-B, ADS-C, Radar and Flight Plan tracks are displayed
- Above FL100, VHF voice coverage is fully available

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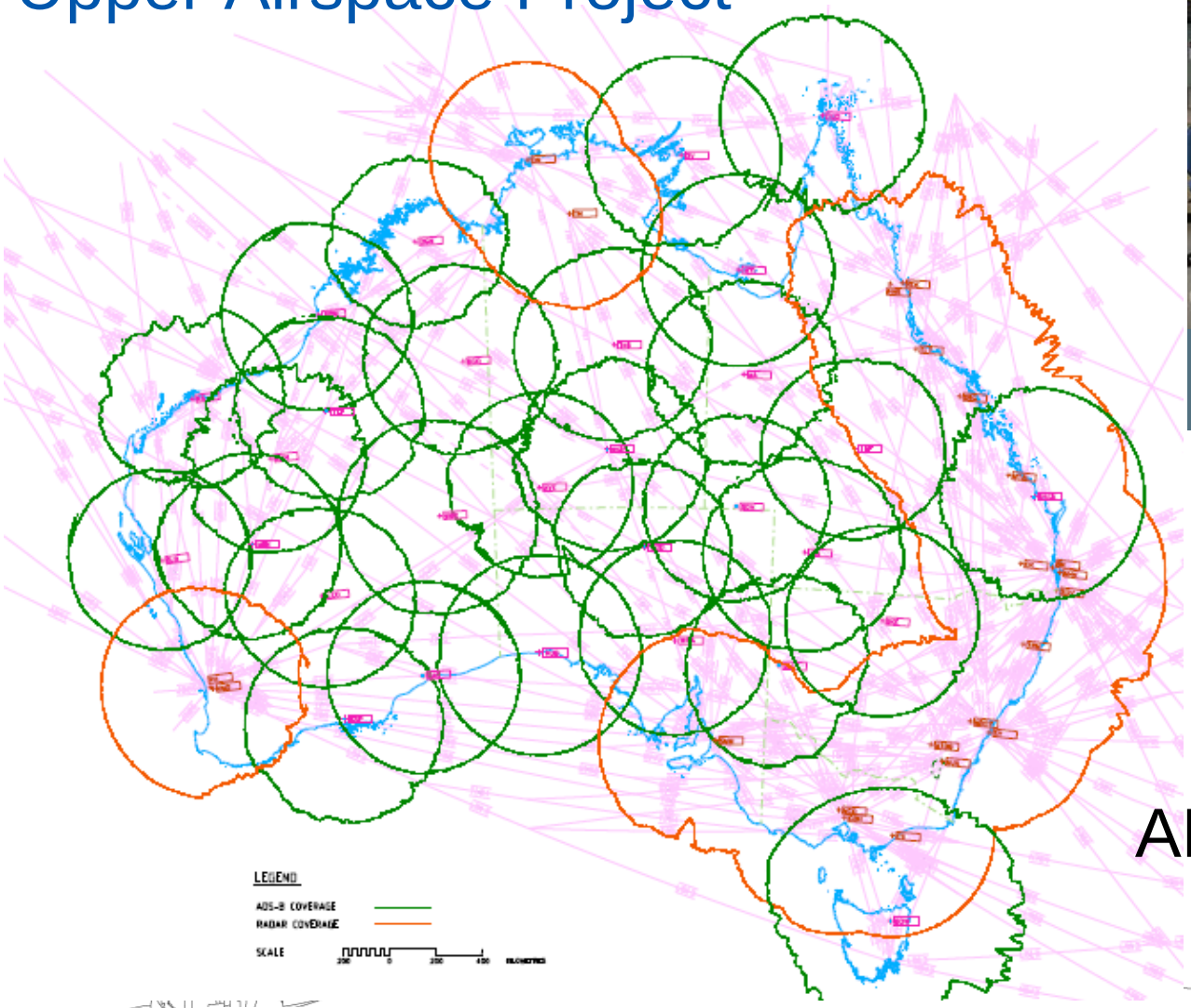
Upper Airspace Project



GROUND STATIONS ARE BEING INSTALLED

ADS-B Coverage at 30,000 feet

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UPA Progress

airspace | airside | AIRSERVICES AUSTRALIA

- 11 ADS-B Ground stations operational delivering service
- Increase in approved aircraft ~ 660
  - 55% of scheduled international aircraft now approved & receiving services
- 19% of scheduled domestic flights
  - Regionals coming on line (Rex – SAABs)

- Thursday is commissioned
  - ADS-B coverage across the FIR boundary – data sharing opportunity

- Work started on Lord Howe Island – ADS-B in the Ocean

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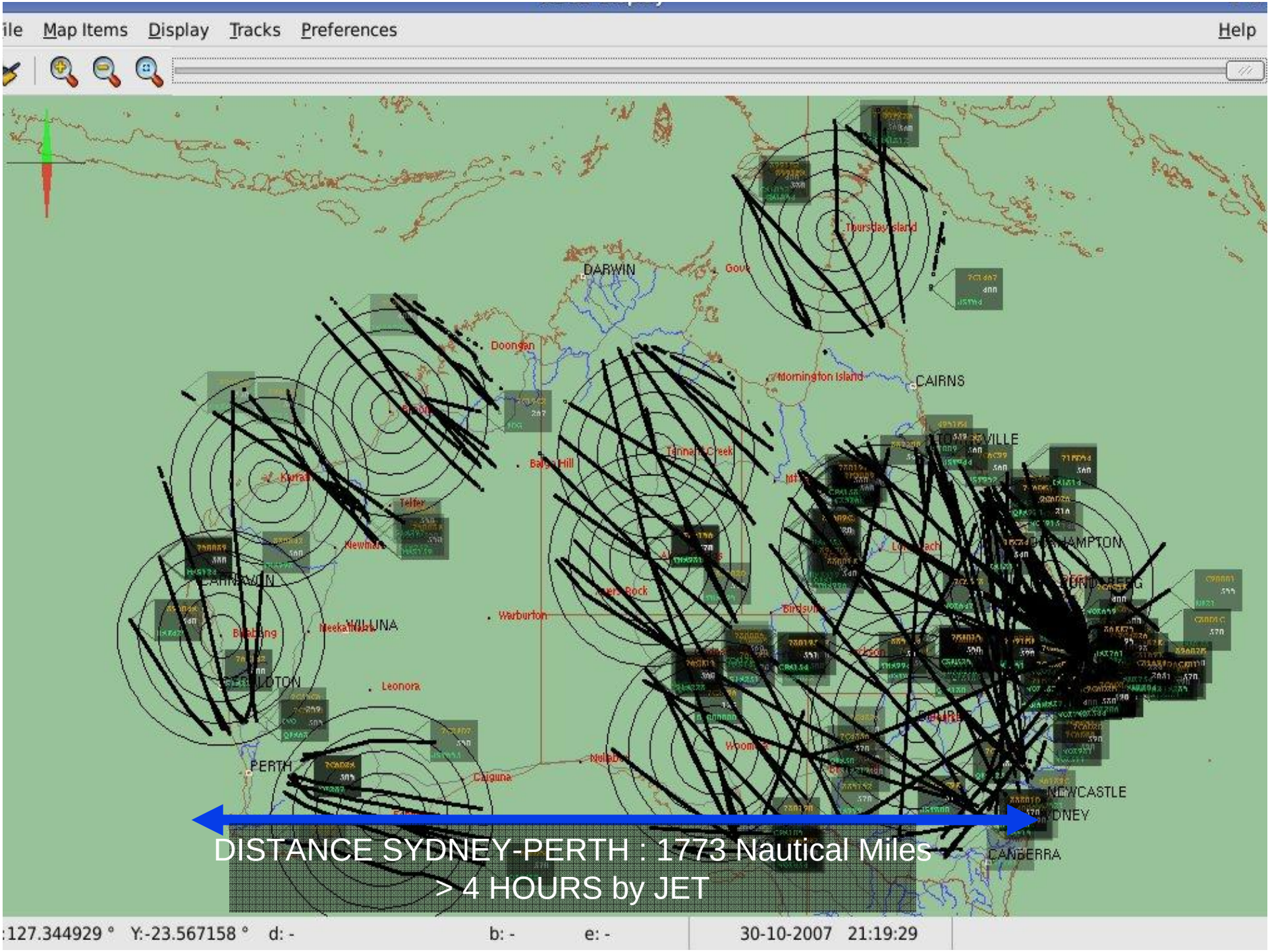
Vestas
Thursday Island


ile Map Items Display Tracks Preferences Help
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PERTH
Laguna
NEWCASTLE
SYDNEY
CANBERRA
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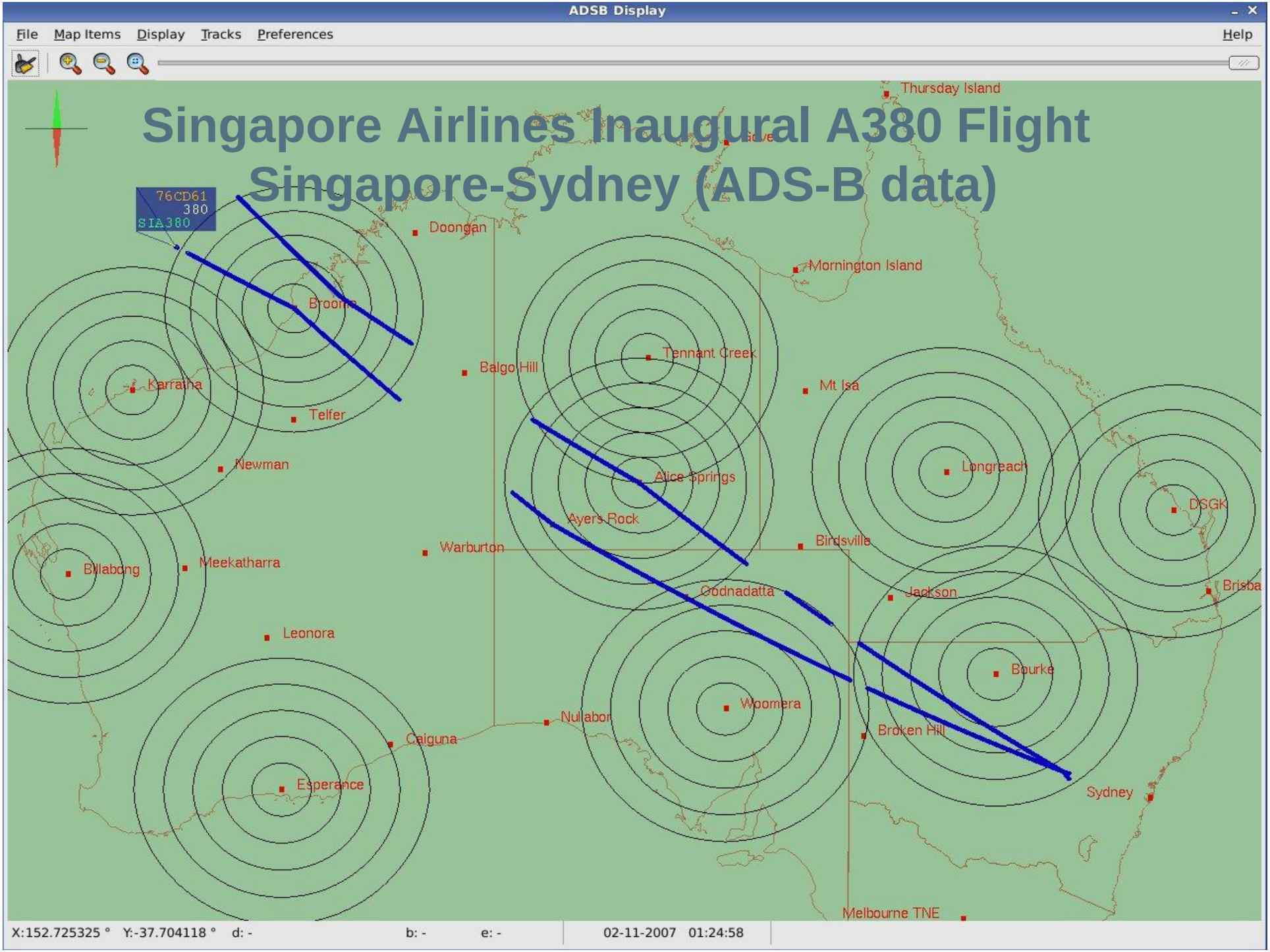
> 4 HOURS by JET
:127.344929 ° Y:-23.567158 ° d: - b: - e: - 30-10-2007 21:19:29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Singapore Airlines Inaugural A380 Flight
Singapore-Sydney (ADS-B data)
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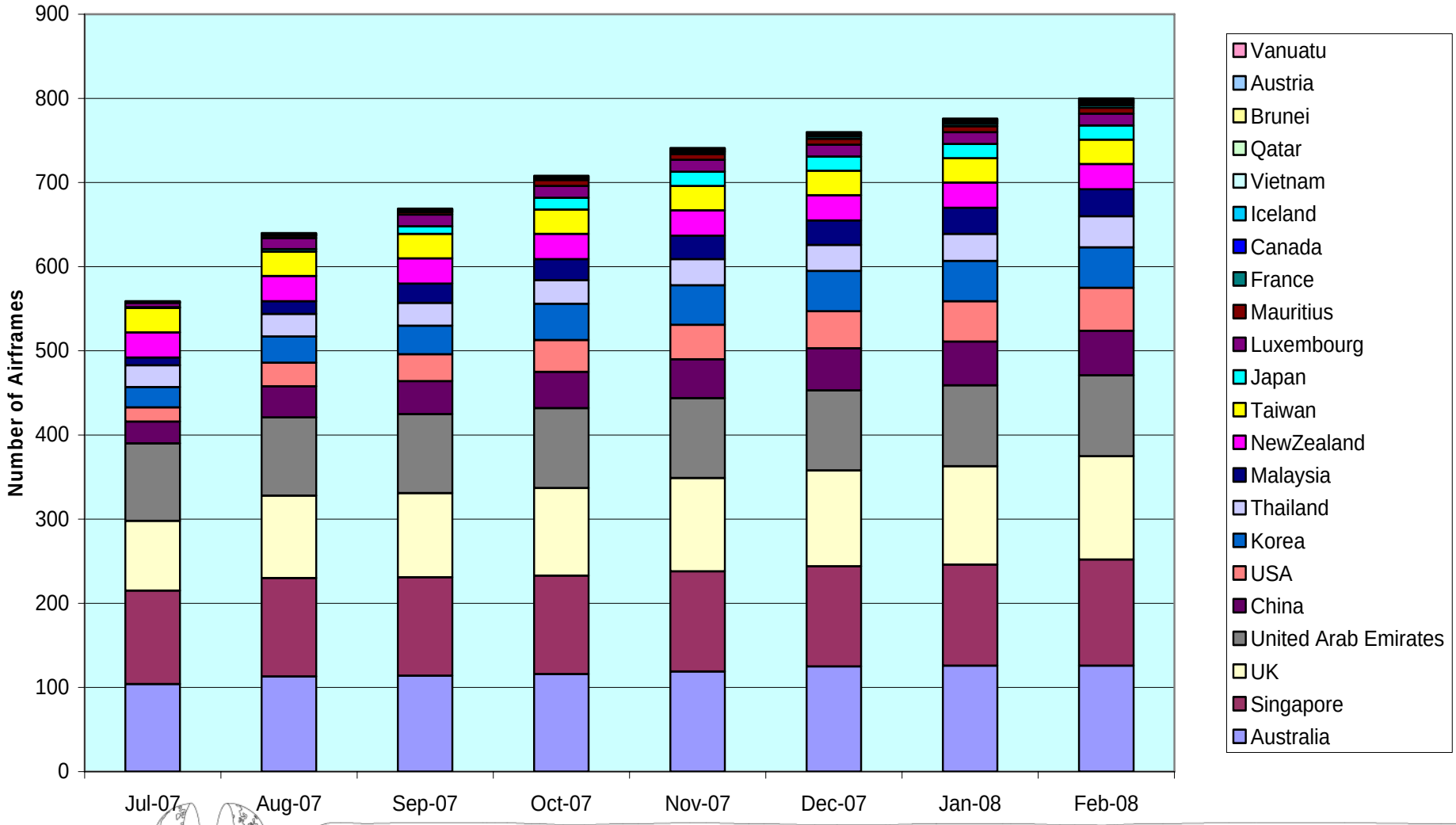
1090 MHz ADS-B Equipped Aircraft broadcasting position with NUC>=5 by State of Registory
(as seen by 11 ADS-B Ground Stations in Australia)



Changes to ATC System

airspace | airside | AIRSERVICES AUSTRALIA

- About to commission supplementary “windows” to follow selected pairs of aircraft
- Contract signed
  - Multi-sensor fusion tracker for enroute/terminal for radar, ADS-B, DAPS, multilateration
  - Support & display of DAPS (Mode S radar & ADS-B)
  - Integration of MLAT & ASMGCS ADS-B
  - ADS-B in TMAs

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THALES

The track presentation

- Display of source of track
- Display of accuracity of track
- Integrated track:
  - One track per aircraft
  - Full alert functionality regardless of source of data
  - The best available data presented to the controller
- Ability to separate and identify the source of data (supervisor)

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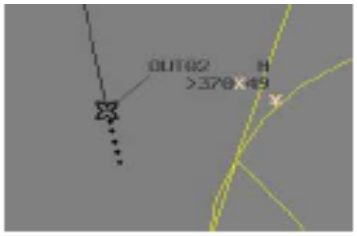
Track source

Visibility of the source of the track

- Combined ADS-B and radar track
- ADS-B track
- Radar track
- ADS-C track
- Flight plan track

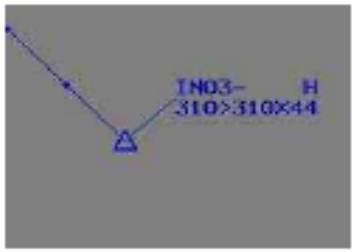
Combined ADS-B and radar track

ADS-B tracks

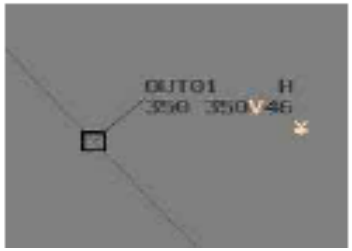


Radar tracks

ADS-C tracks



Flight plan tracks



Accuracity

- ADS-B track with high quality (quality is based on FOM and Ground Station reliability)
- ADS-B track with low quality
- Primary radar track
- Secondary radar track

ADS-B track with high Quality

Primary radar track

ADS-B track with low Quality

Secondary radar track

One track per aircraft

Integrated track – one track per aircraft

- Comprised of
  - Position data
  - Velocity data
  - Alert data
- Important to reduce clutter on screen
- Tolerances for coupling of track need to be configurable
  - Need to show operator two tracks if position data different
  - Need to show worst case emergency data

THALES

Alert functionality regardless source of data

- All alerts to be available on all tracks
  - RAM, DAIW, TDAW, STCA, MSAW, CLAM
- Important for controller to have the same alerts regardless of source of data
- Parameters need to be configurable
  - Tolerances should be configurable for all alerts (e.g. RAM tolerance)
  - Different tolerances should be able to be used for different source's of data (RAM tolerance different between ADS-B and radar)
- Controller should not have to interpret which source has produced alert

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THALES

The best available data presented to the controller

- The best available data may not be from one source. E.g.
  - Position data from radar
  - Velocity data from ADS-B
  - Combined position data from ADS-B and multiple radars
- Should data be combined to provide the controller with the most accurate data? Implications for separation standards.
- Need to have complex, configurable data fusion
  - Different priorities for different data (e.g. velocity/position data may have different priorities between sources)
  - Different methods (Priority, Multi Sensor Track Fusion)

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THALES

The ability to separate and view source data

- The supervisor needs the ability to see what data is contributing to the combined track, but also needs to be able to view the data separately
  - Required in order to check accuracy
  - Needs to be able to verify data consistency
- The supervisor needs to be able to diagnose problems with track data
  - Is ADS-B data incorrect?
    - Possible aircraft position problem
    - Possible aircraft velocity problem
  - Is radar data incorrect?
    - Possible radar problem
      - Data from a radar should be removed from the system

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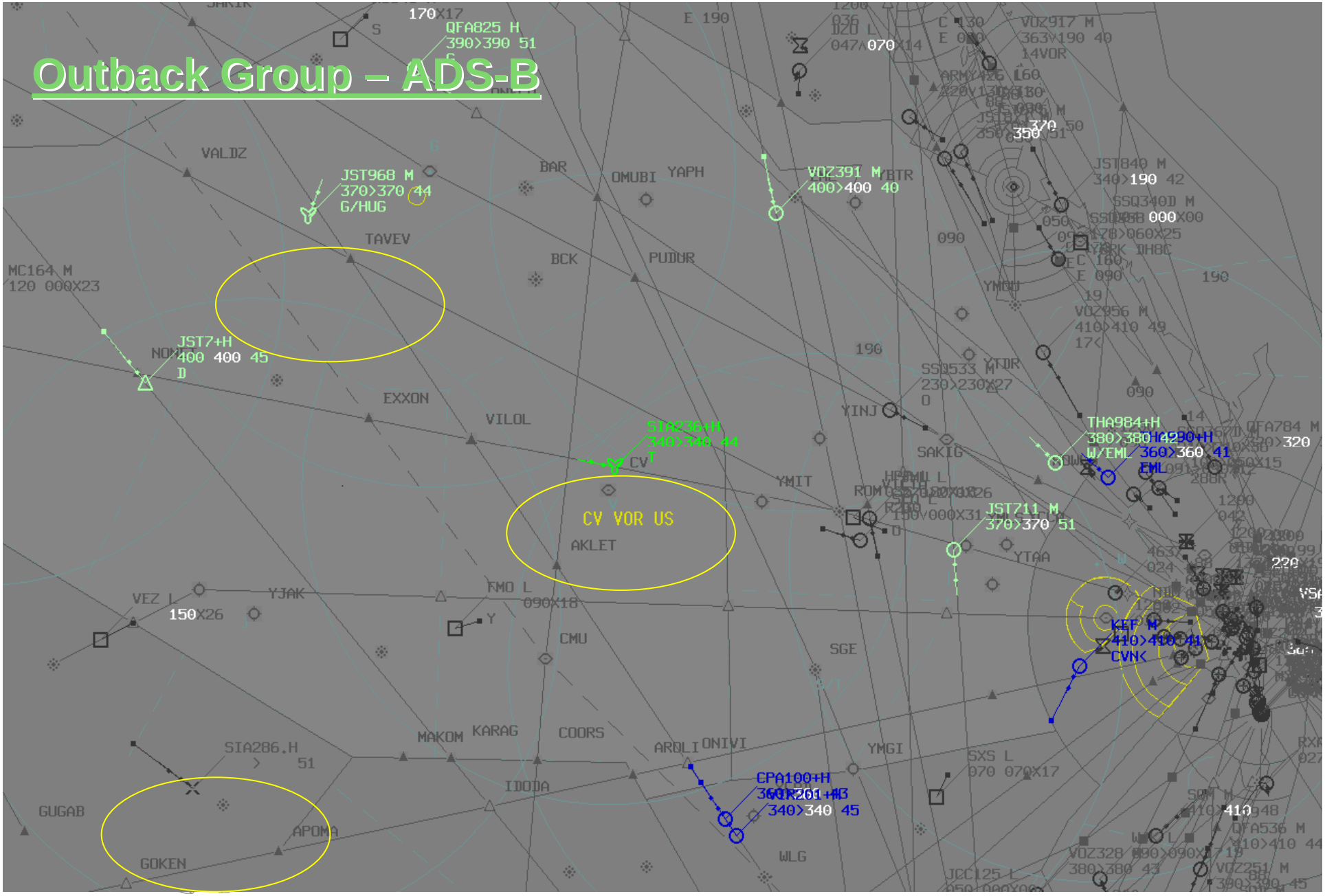
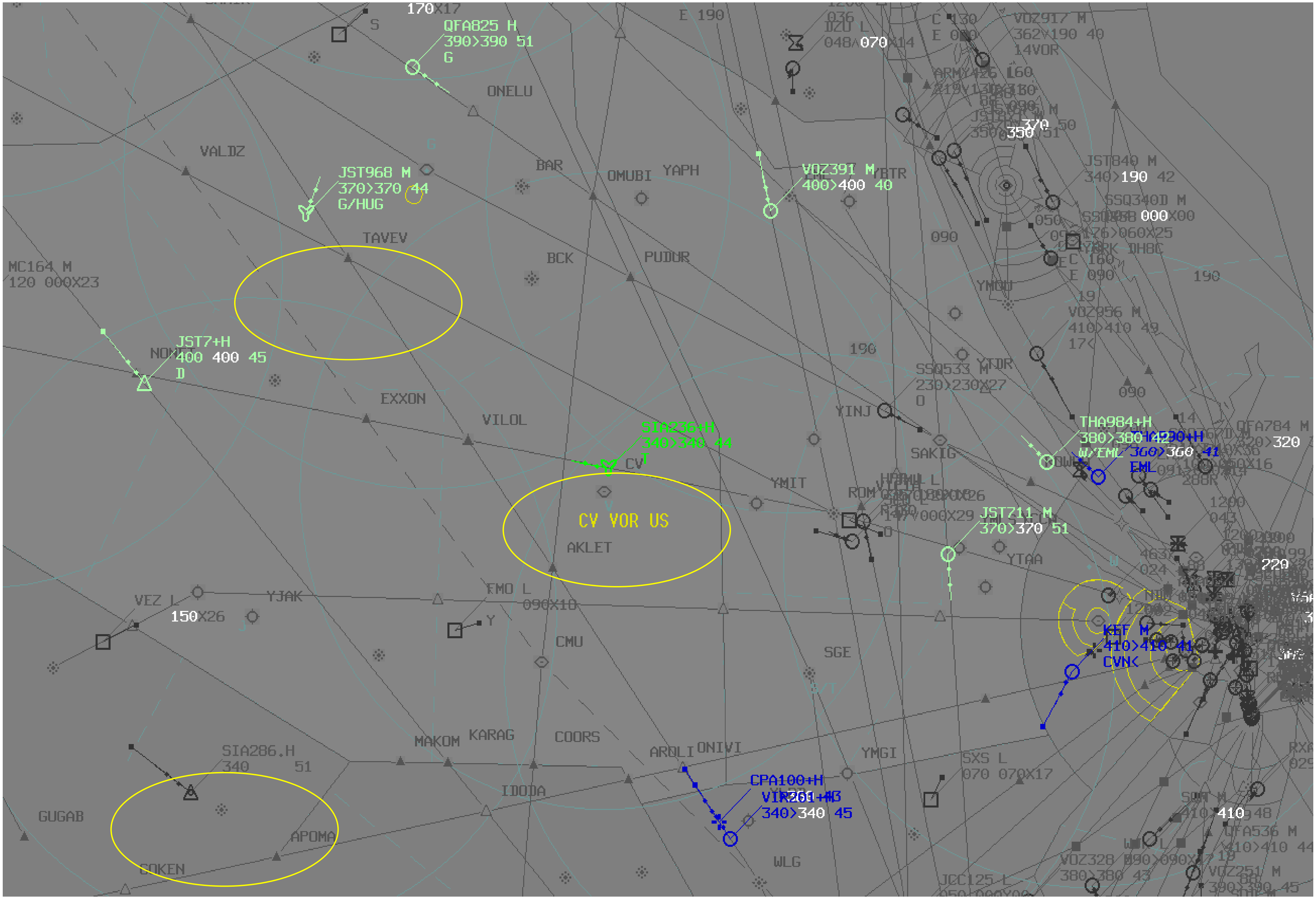
Outback Group – ADS-B

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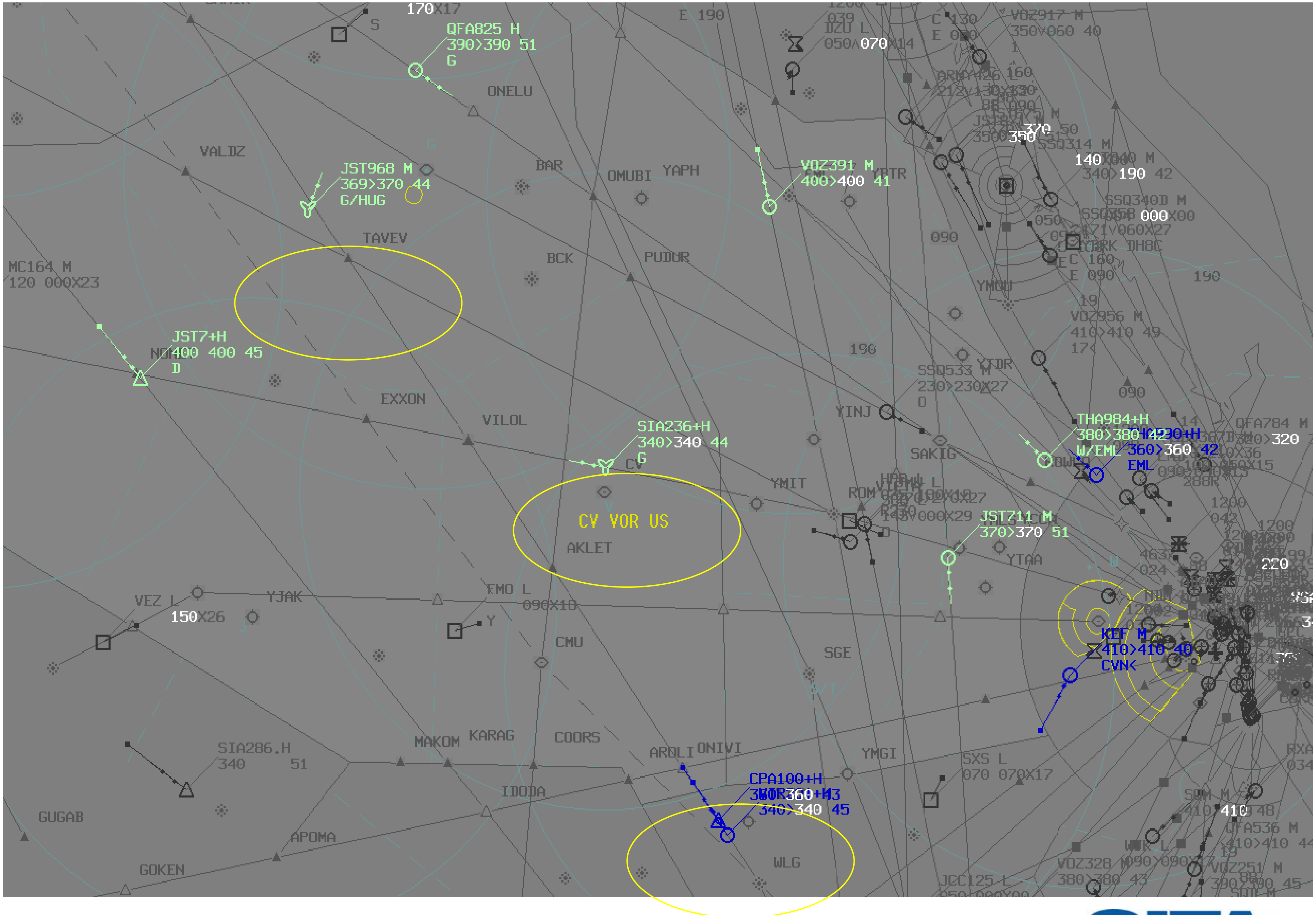
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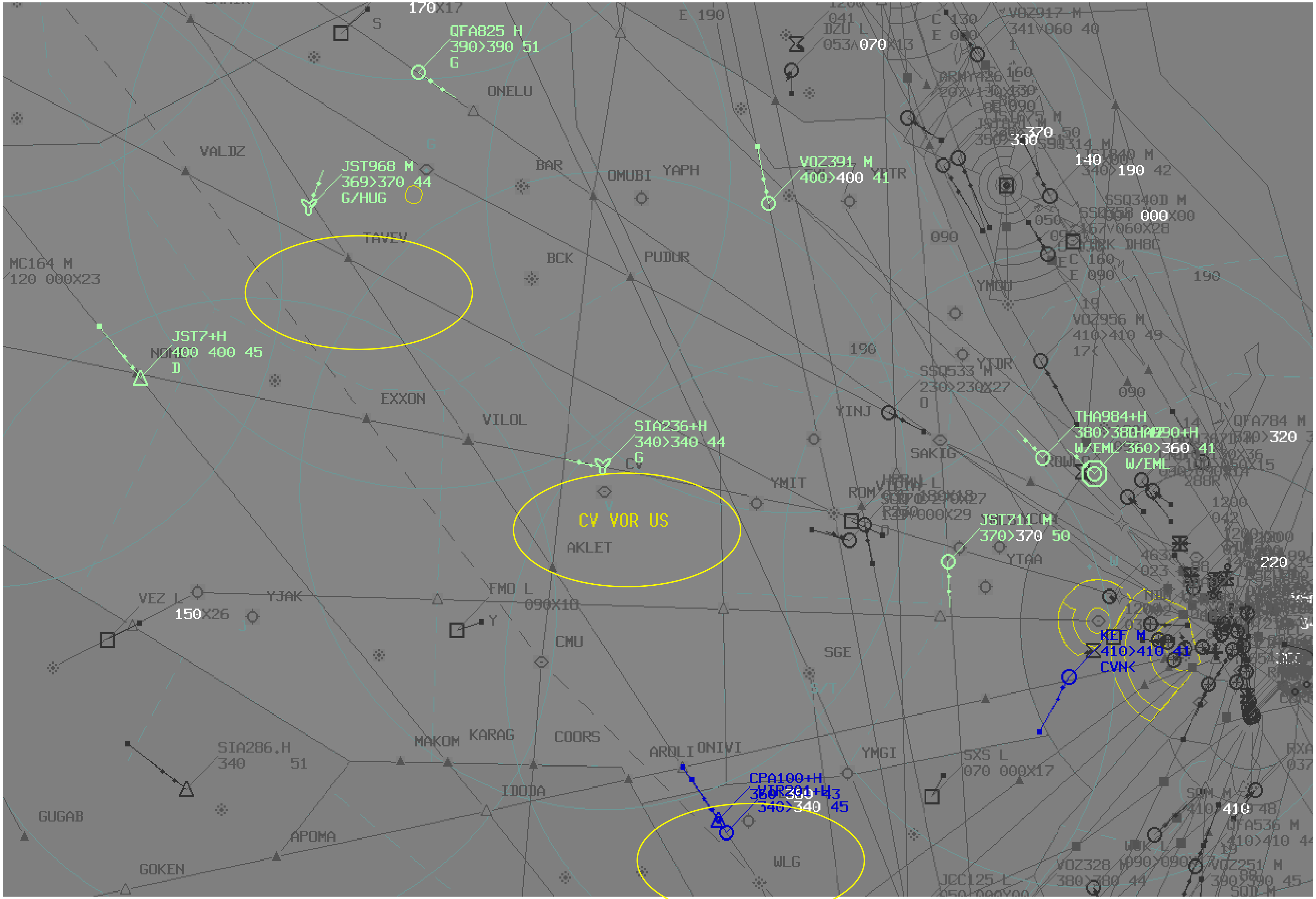
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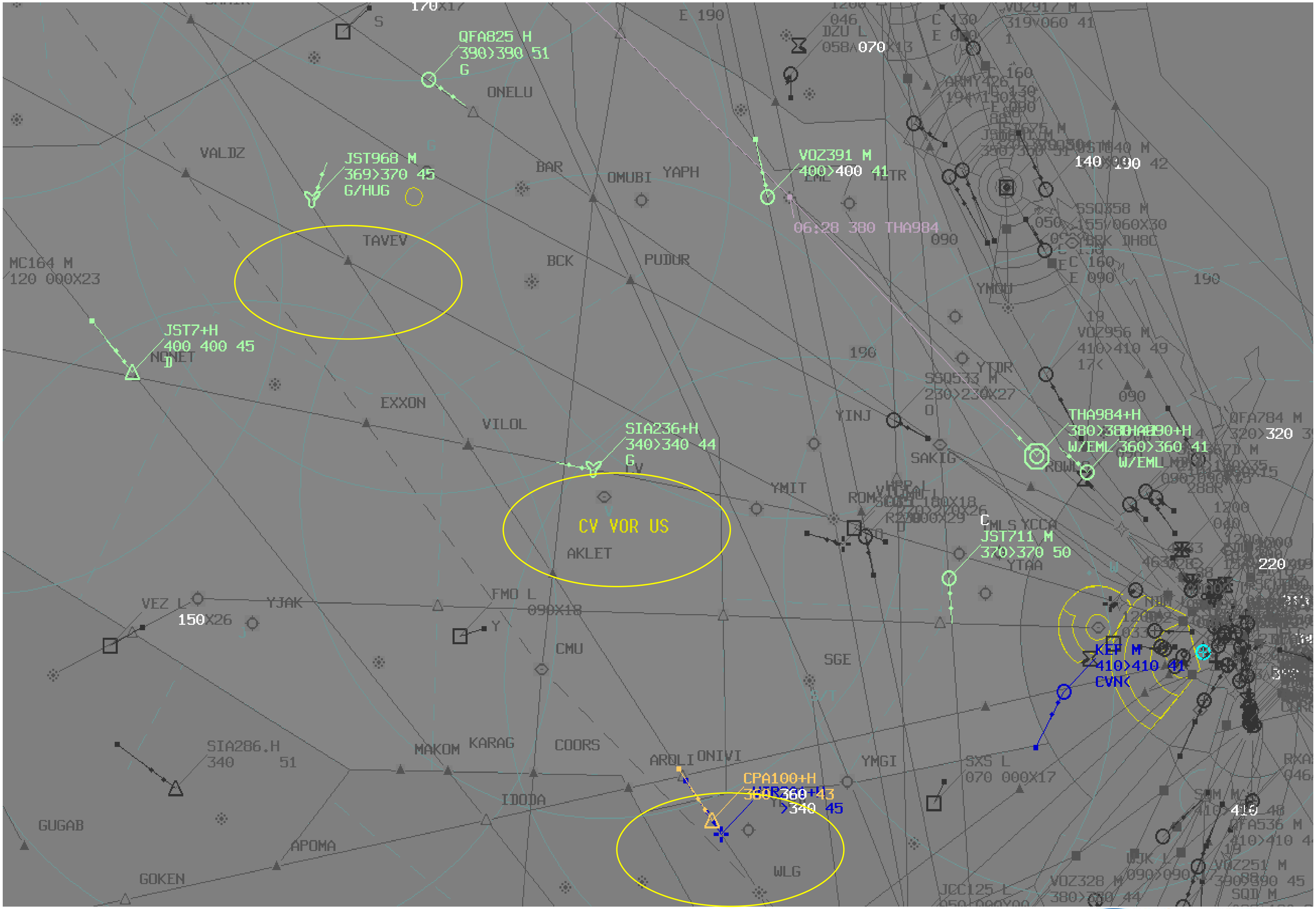
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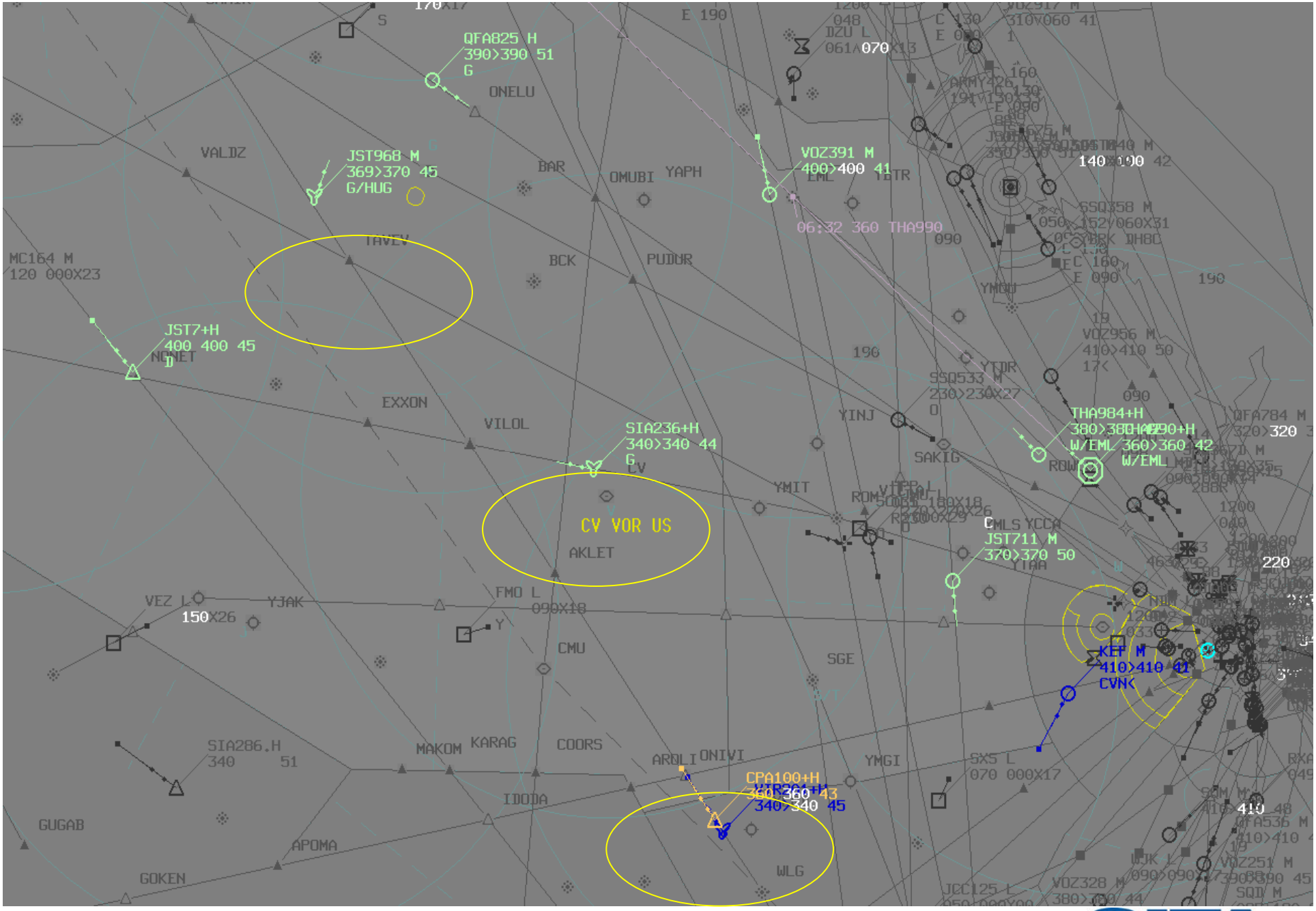
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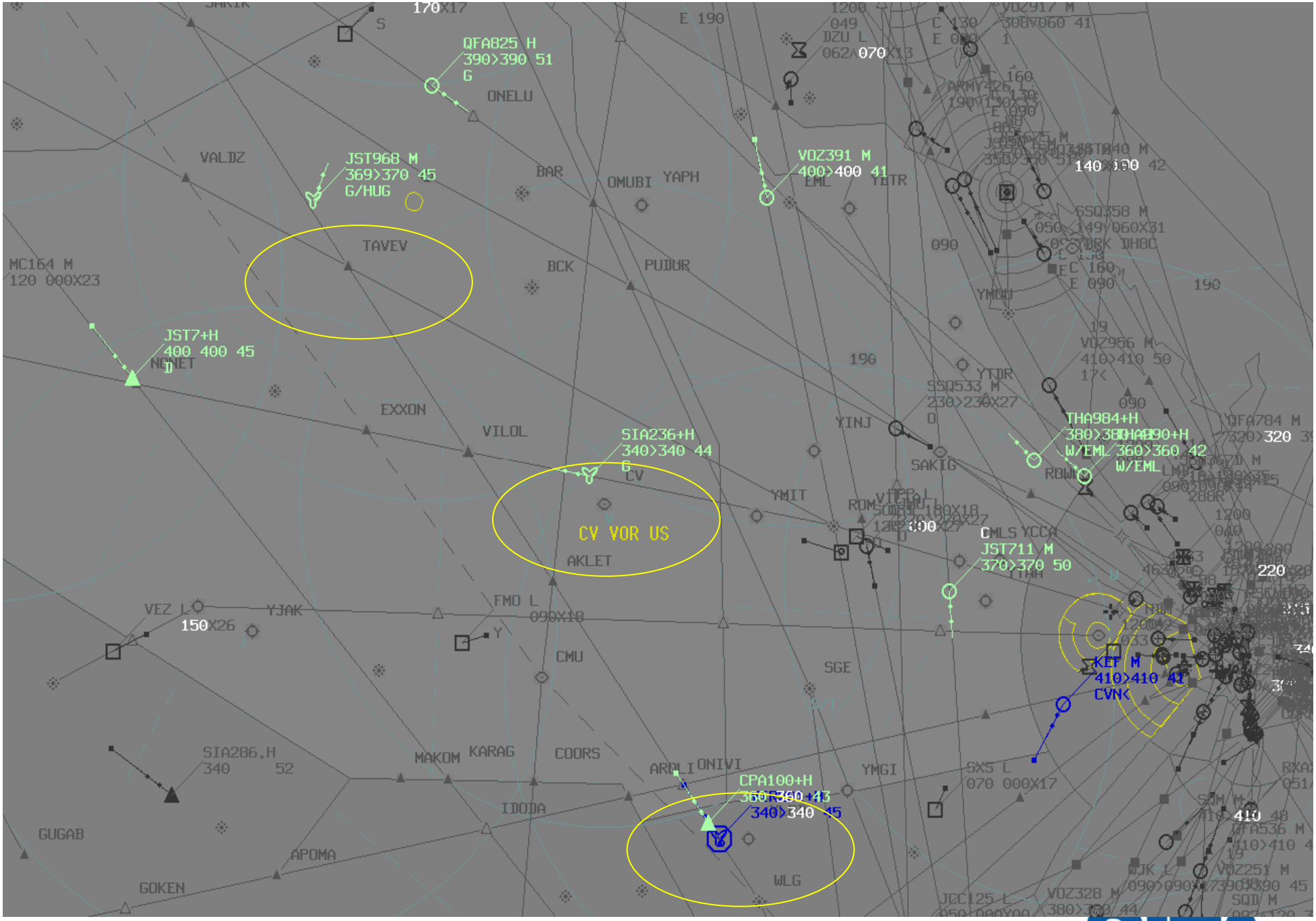
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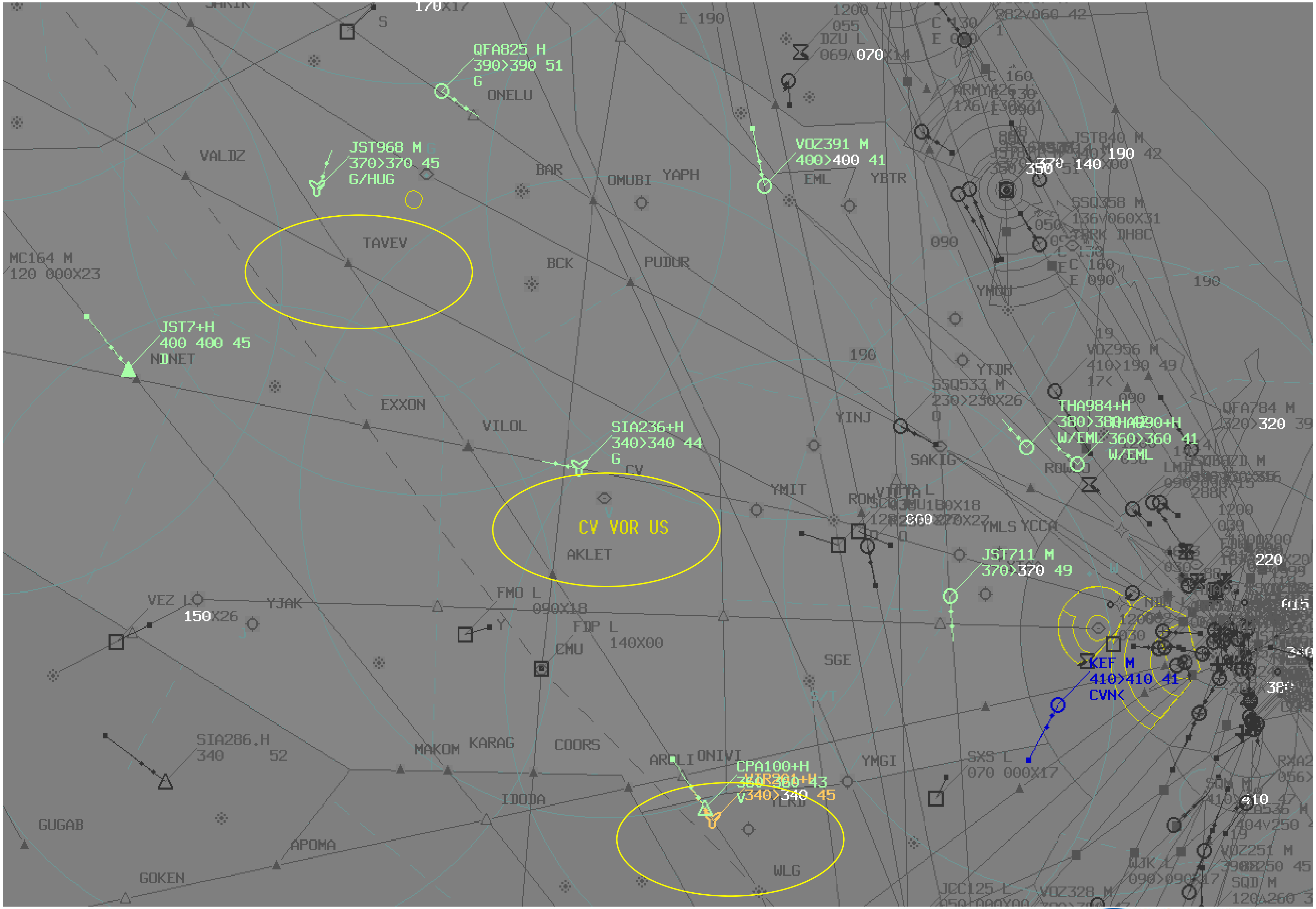
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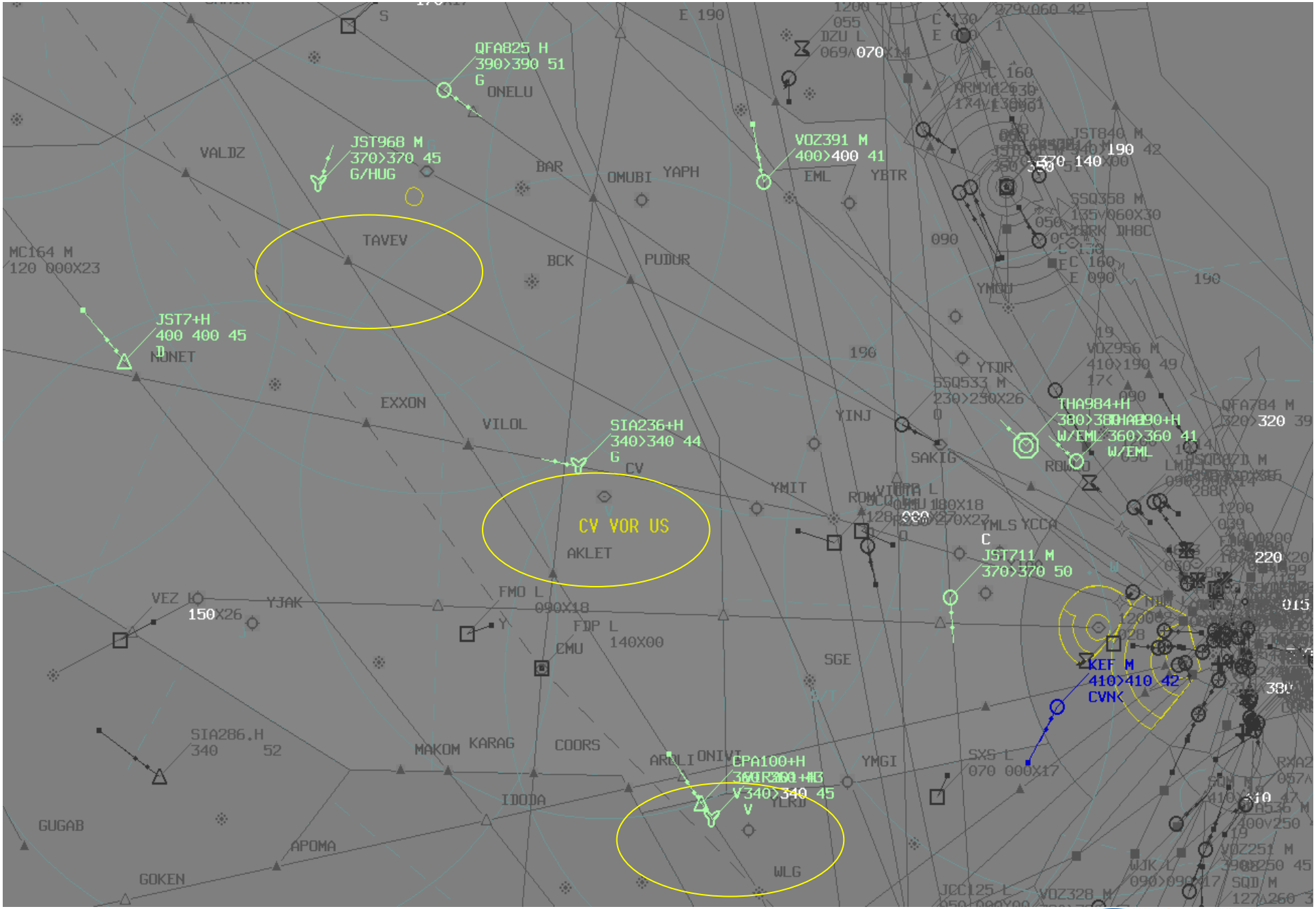
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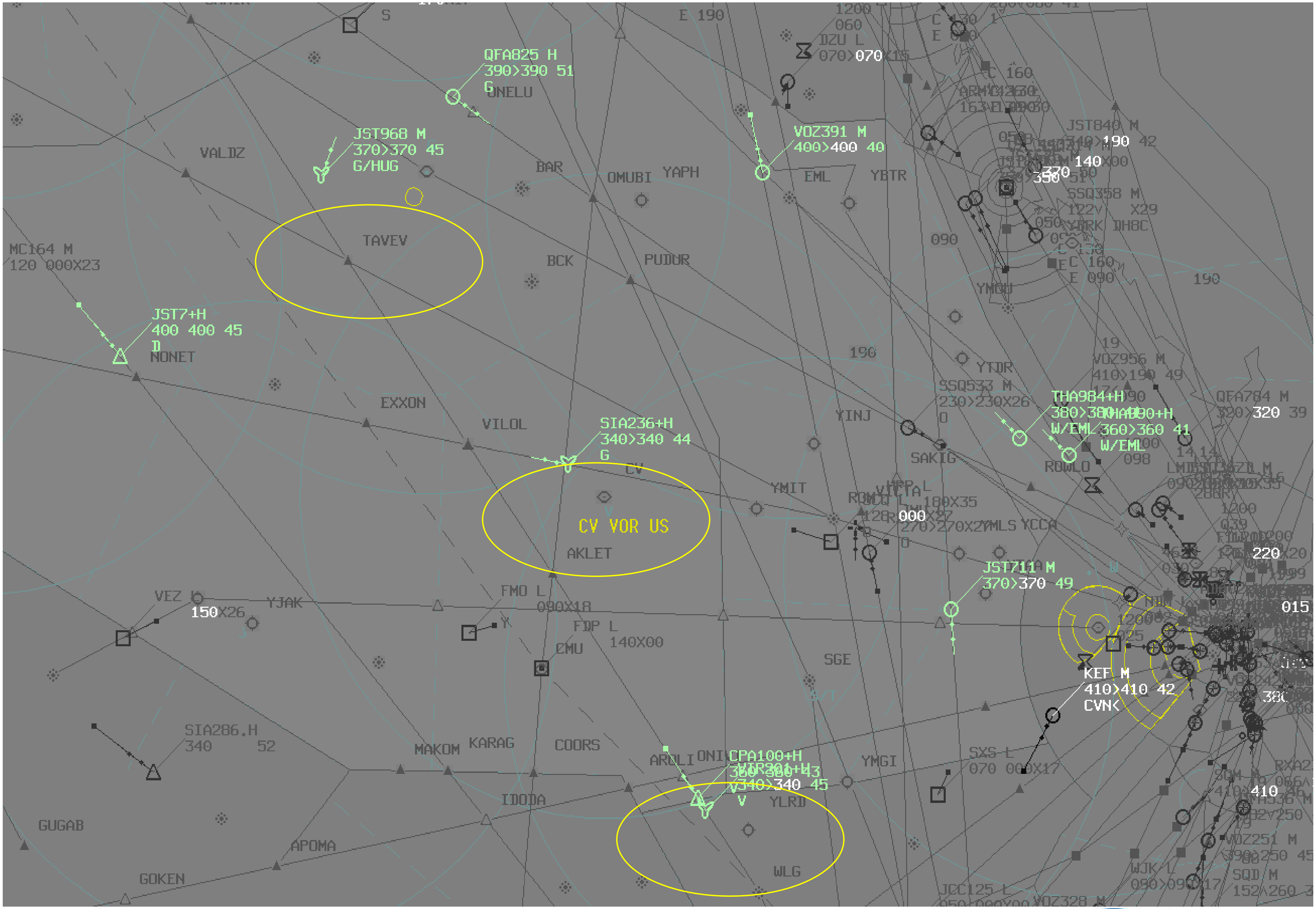
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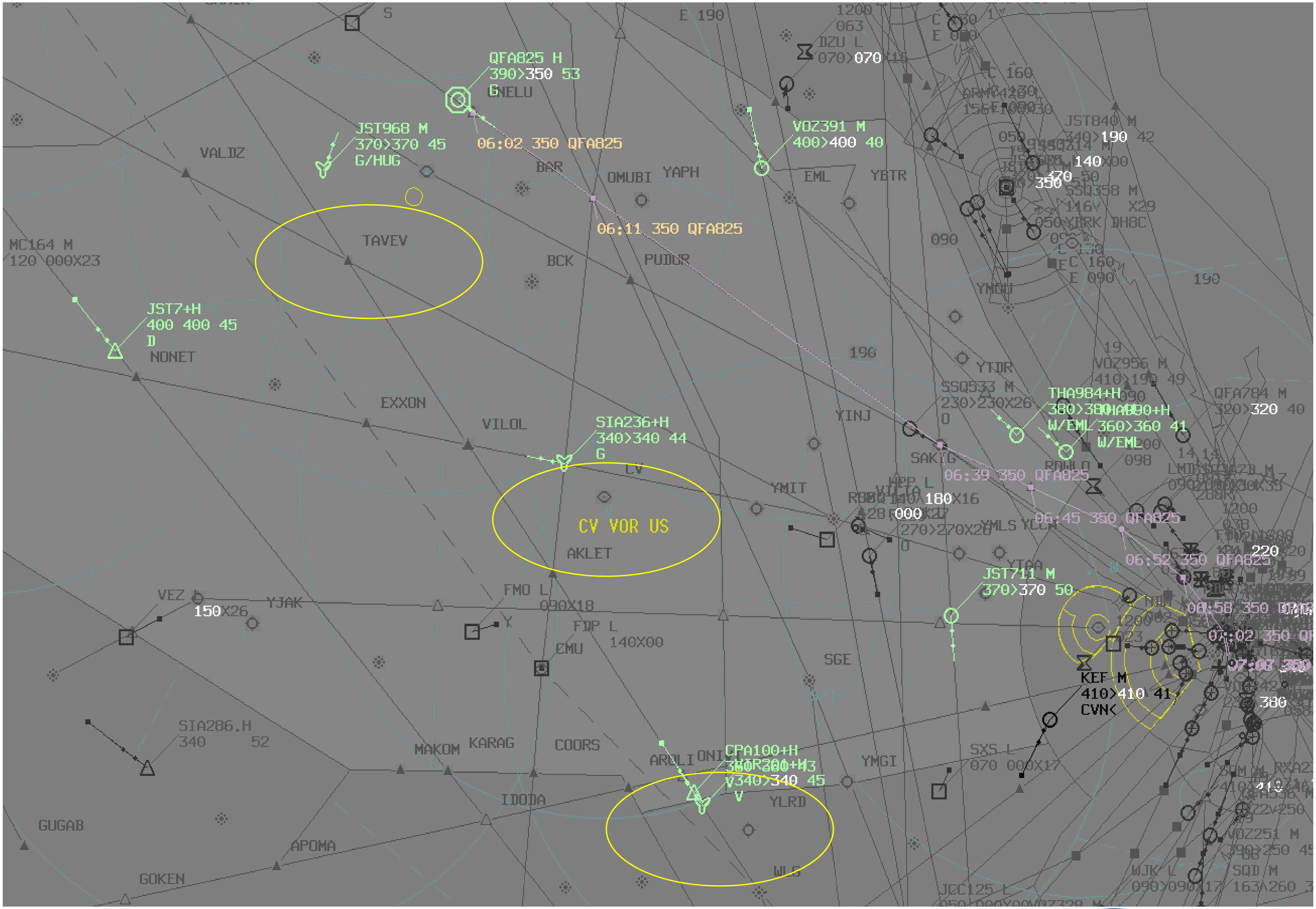
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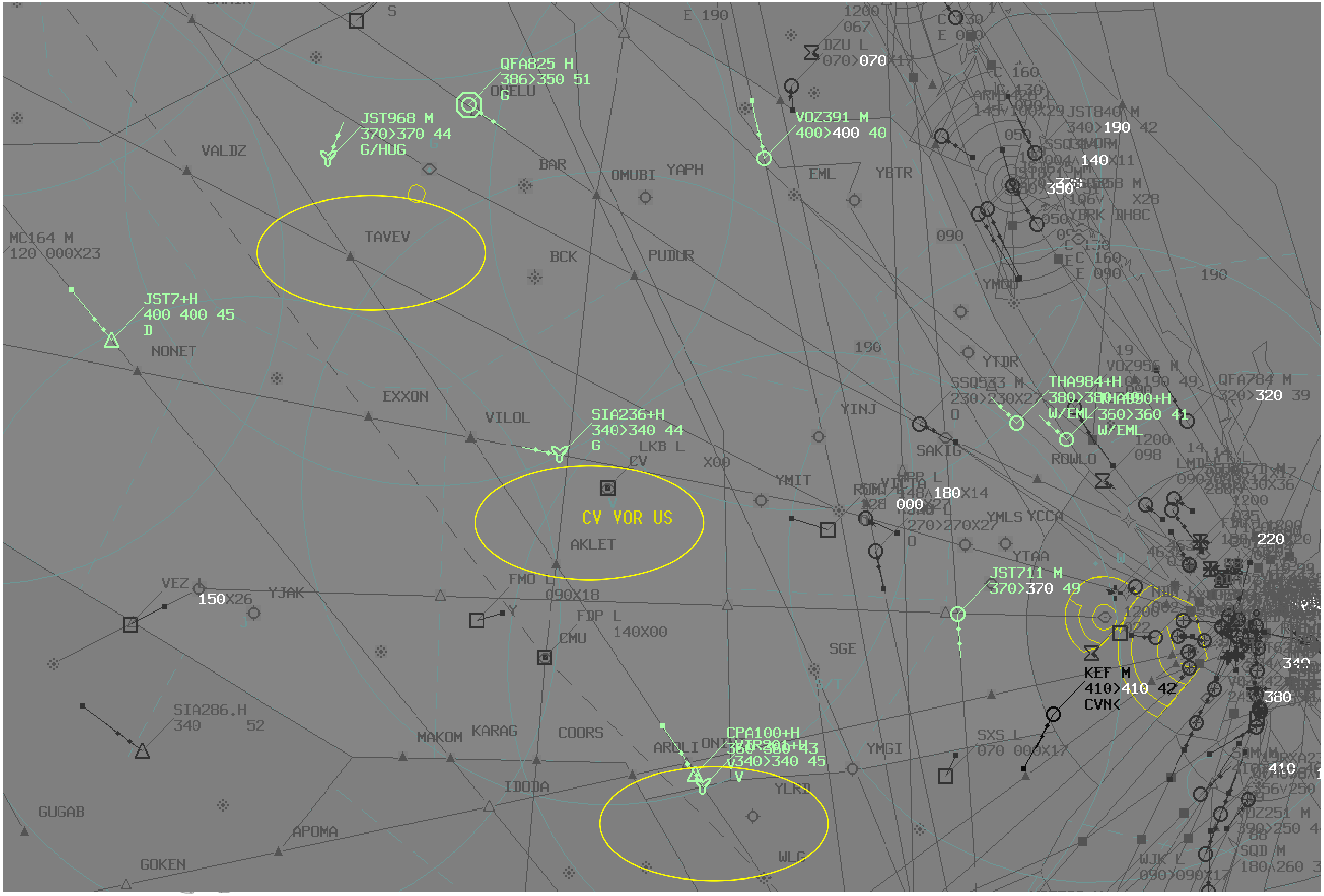
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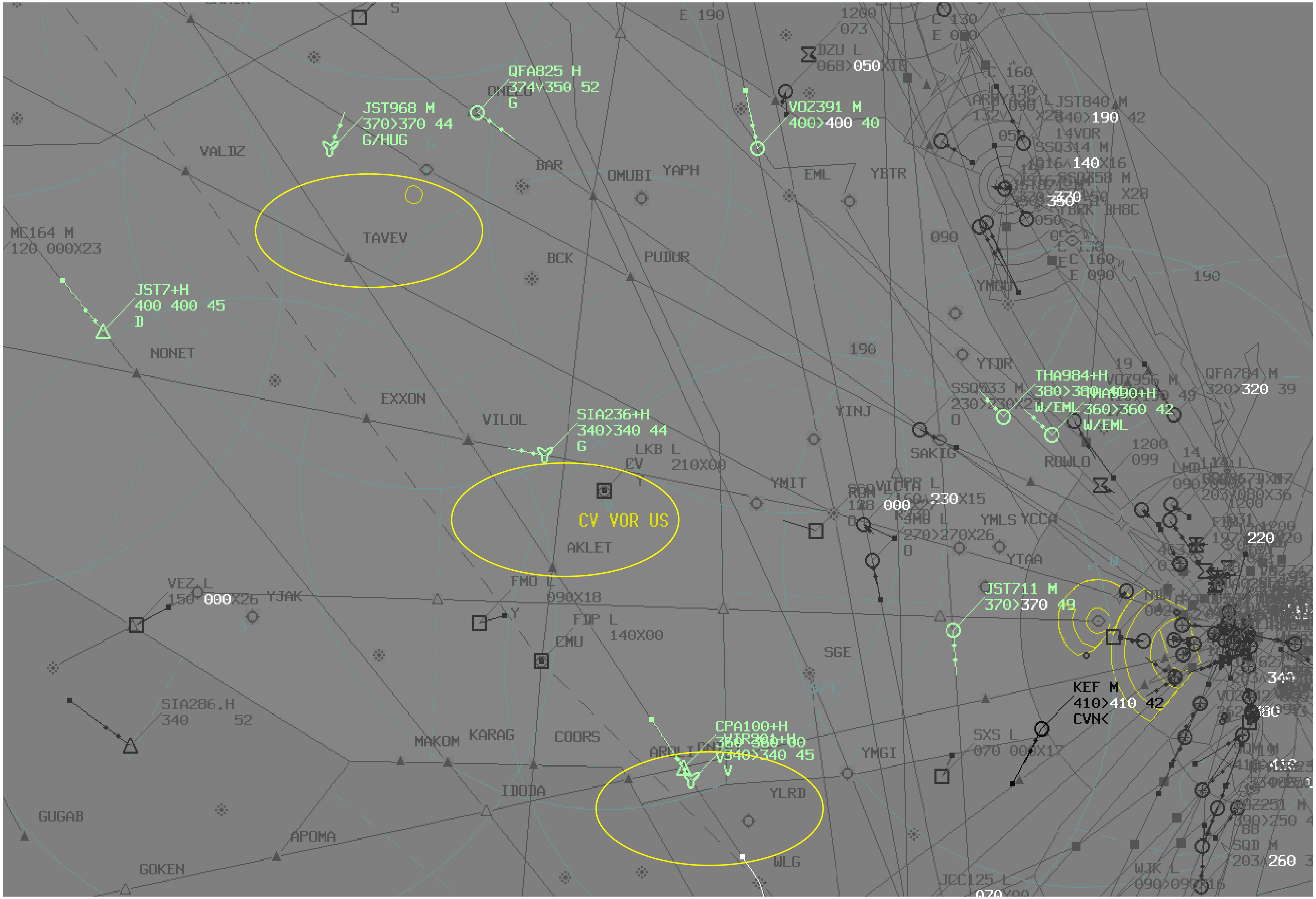
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CVNK
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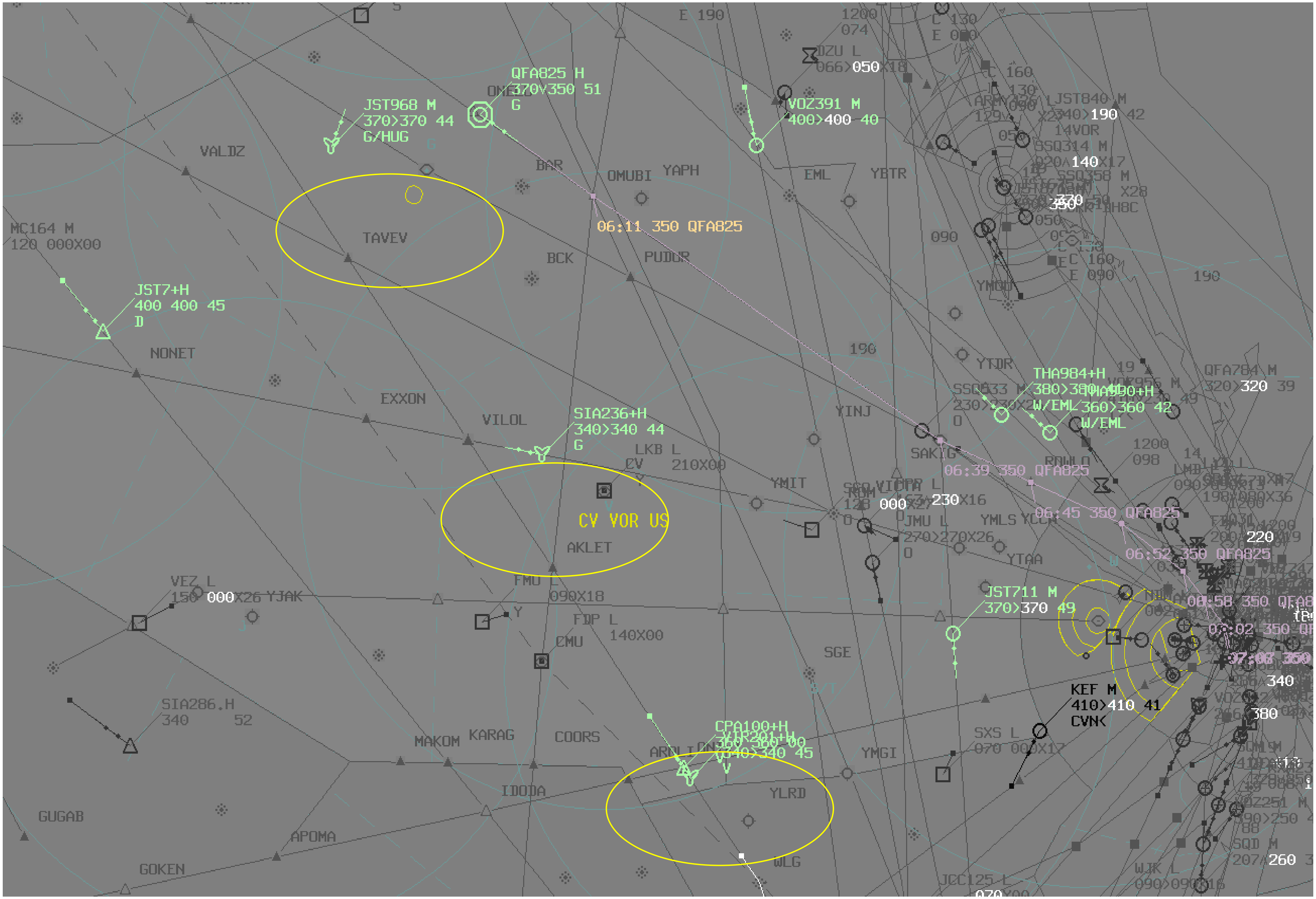
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AKLET
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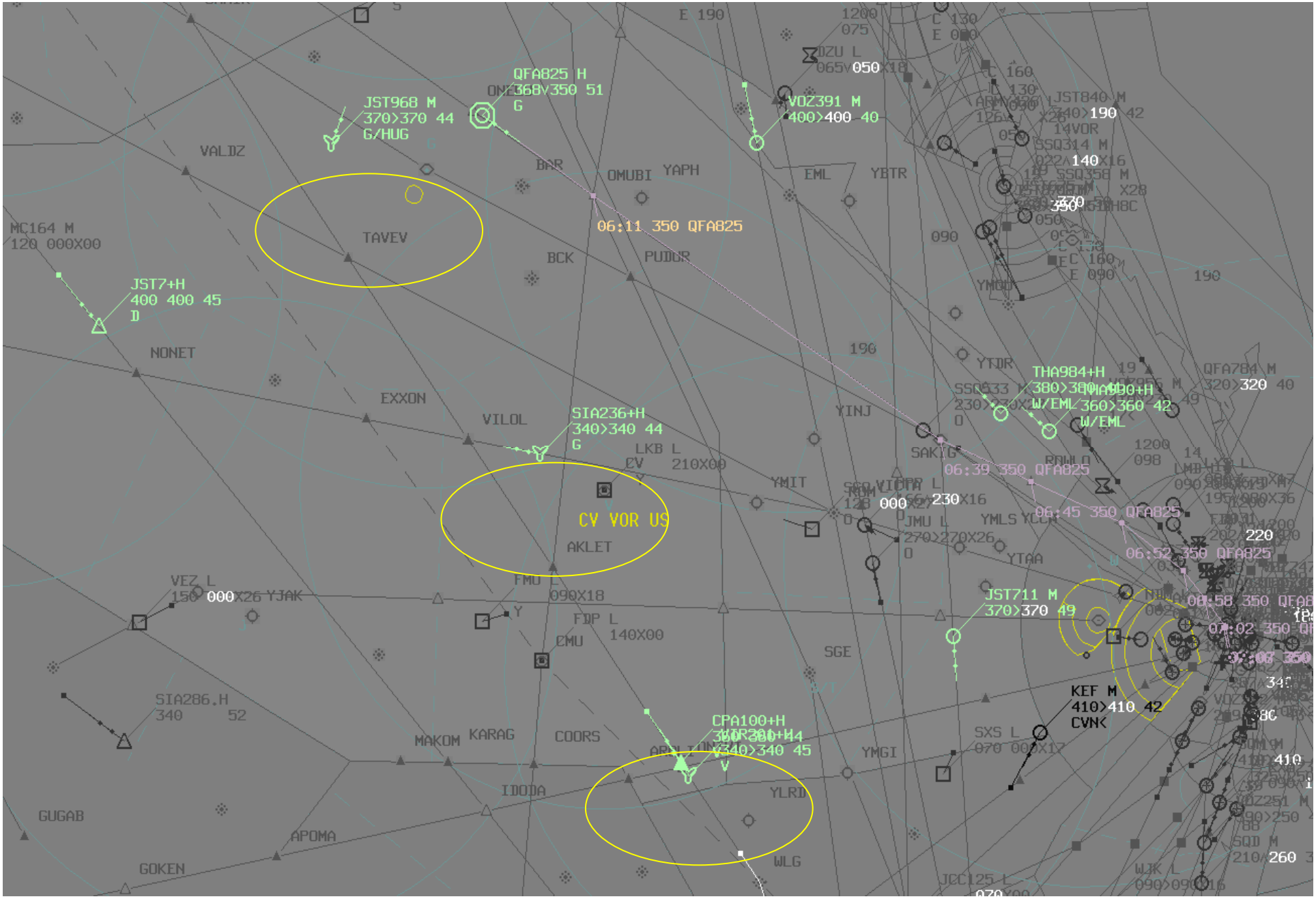
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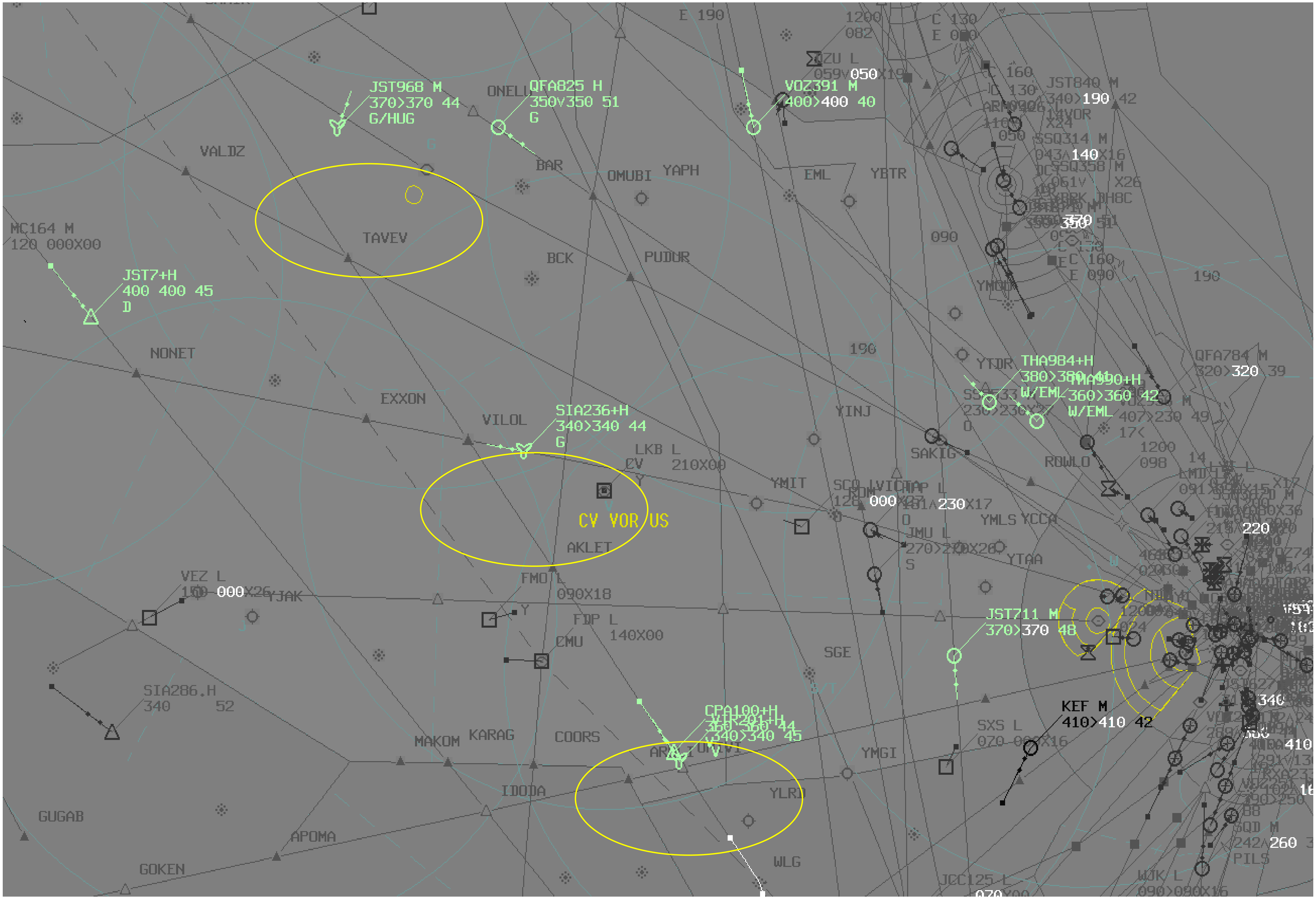
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CV VOR US
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W/EML
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W/EML
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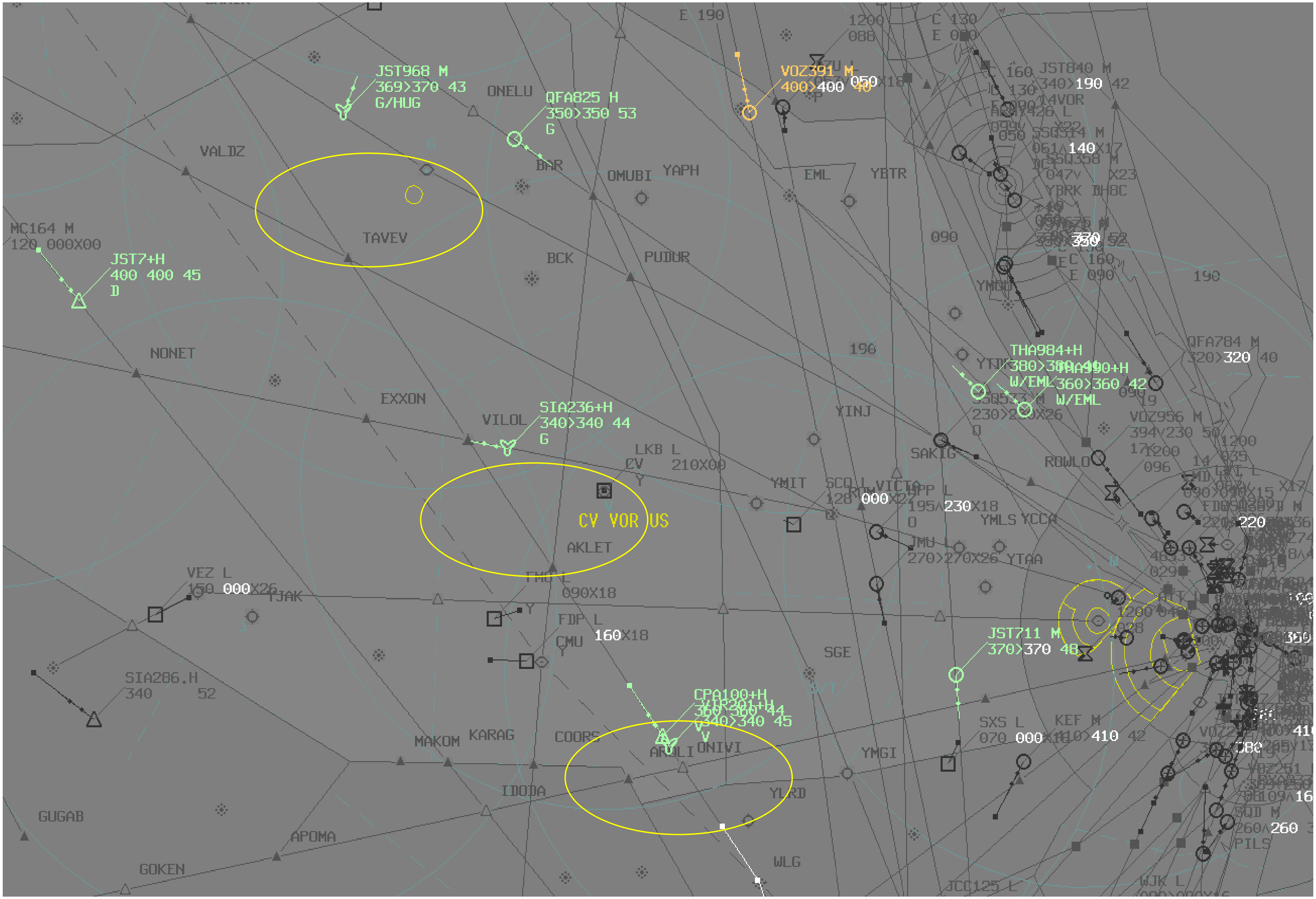
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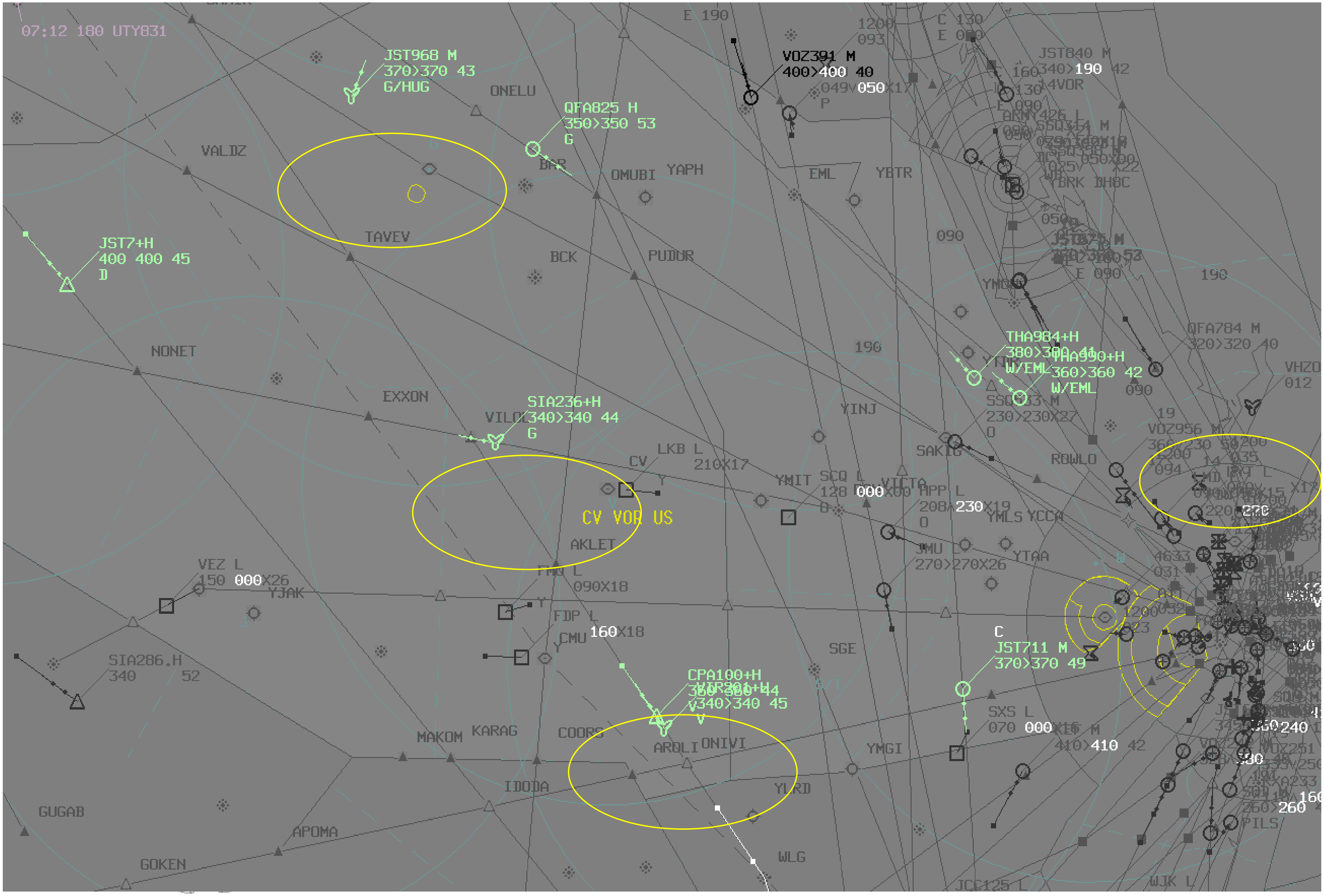
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EXXON
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THA990+H
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W/EML
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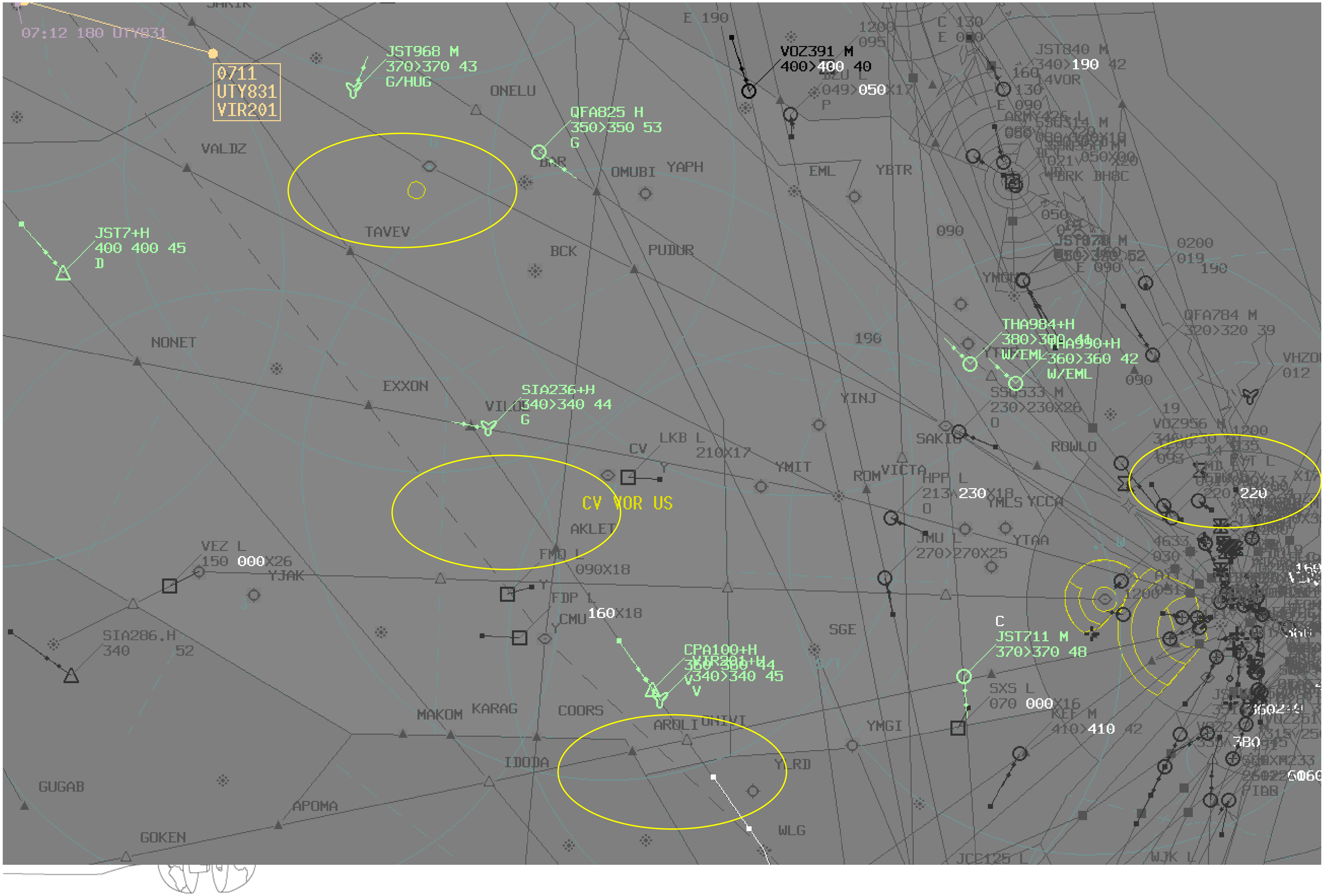
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JST840 M
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JST7+H
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Conclusion

- Airservices Australia is the first ATC in the world to deploy ADS-B for operational use
- ADS-B implementation is more than simply installing ADS-B receivers
- ADS-B data must be fully integrated into ATCO HMI displays alongside radar, ADS-C and flight plan tracks
- Safety Cases and aircraft certification issues must be addressed
- SITA and Airservices Australia ADS-B Alliance could support ANSPs to develop implementation plans for operational ADS-B

Thanks!
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adriana.mattos@sita.aero

Some of slides presented are partially or totally based on Australia Airservices and Thales Eurocat system for Australian ATC Centers