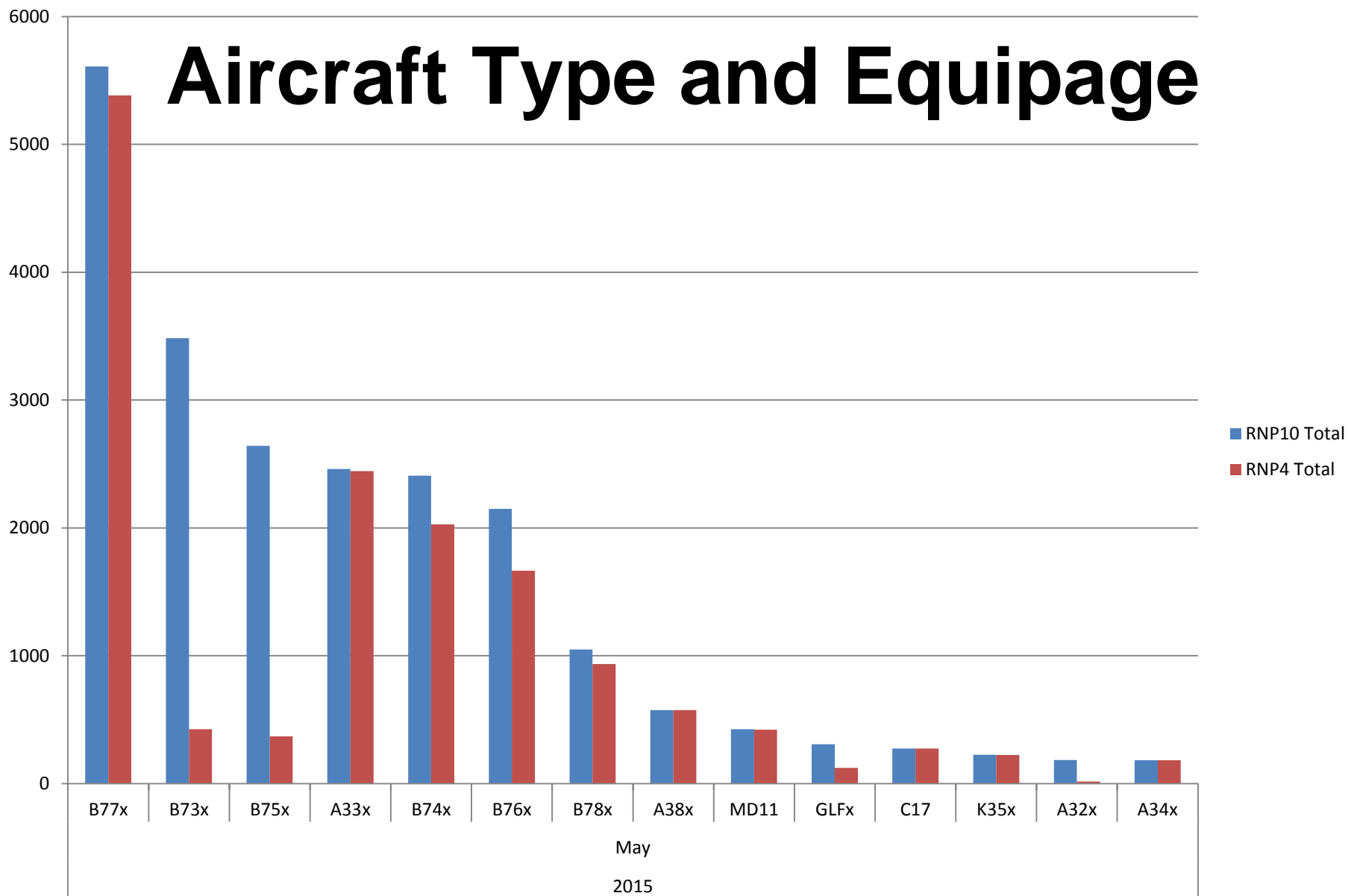


# Fuel Savings and Aircraft equipage



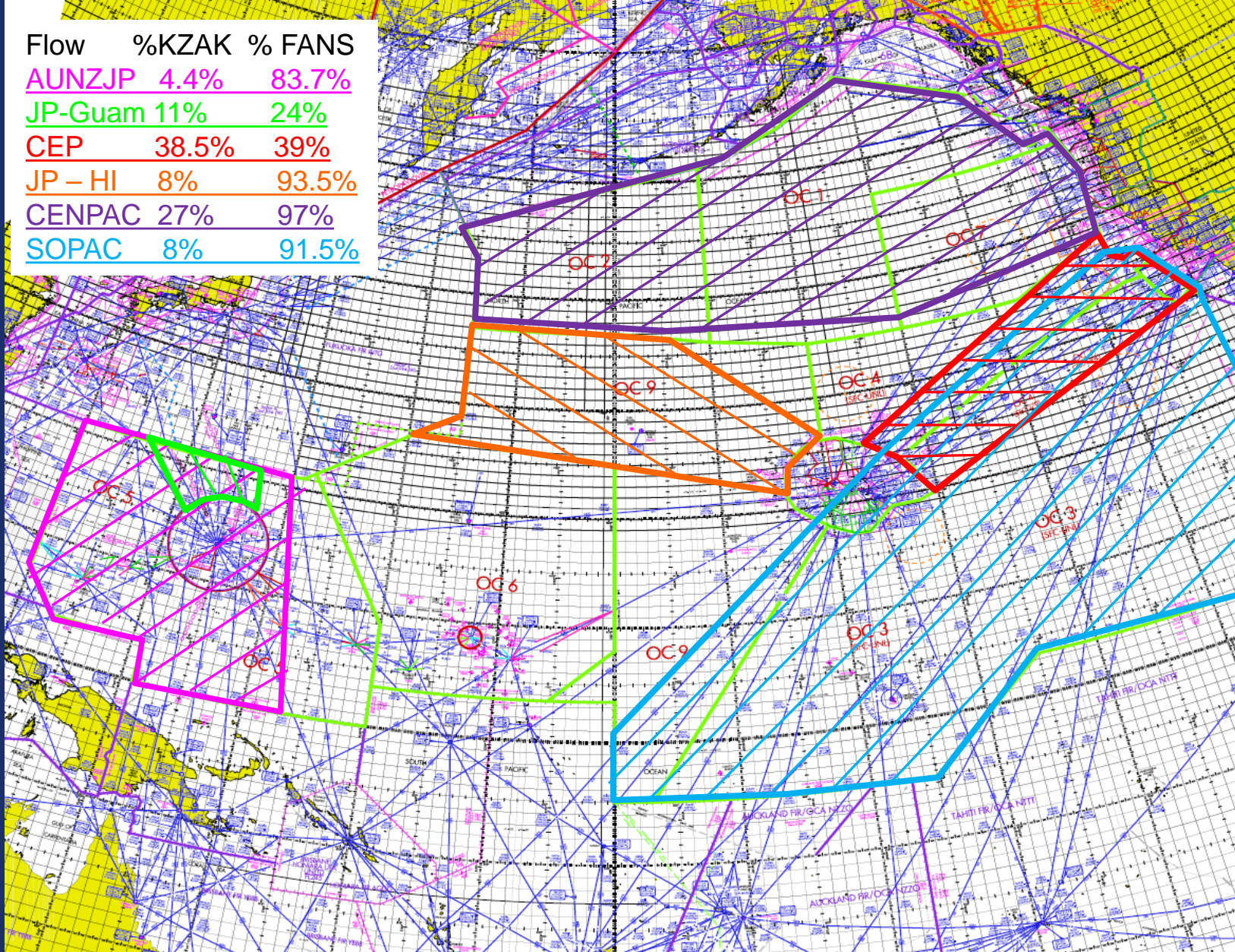
Federal Aviation  
Administration

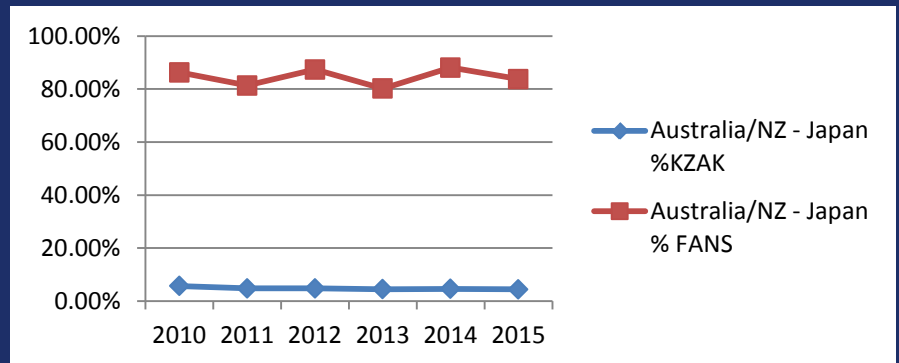
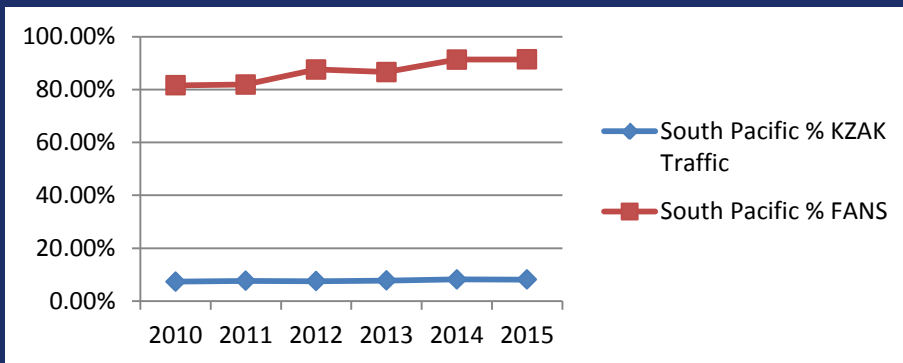
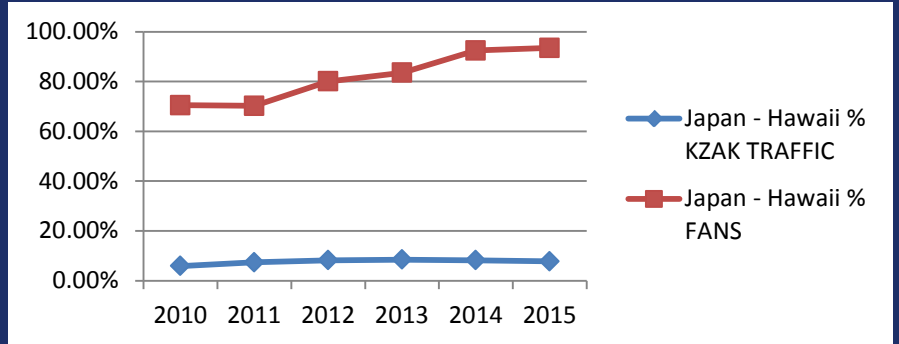
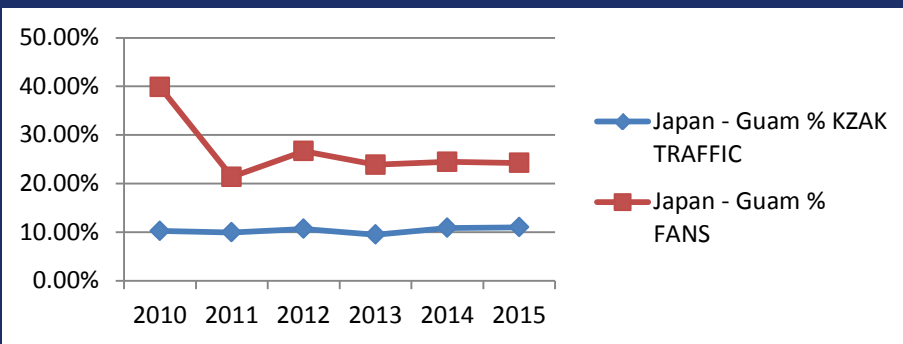
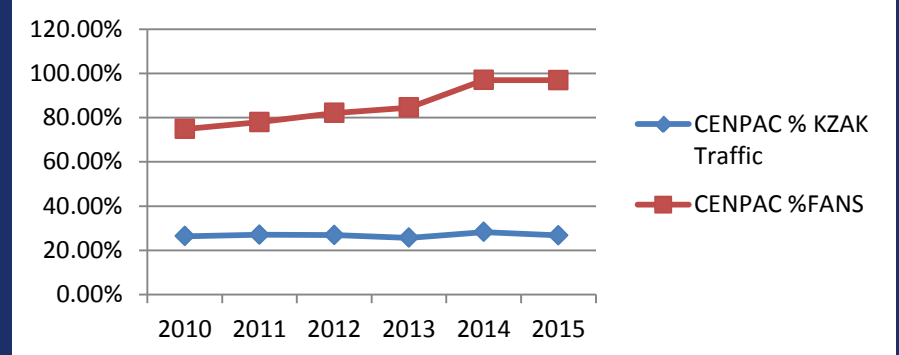
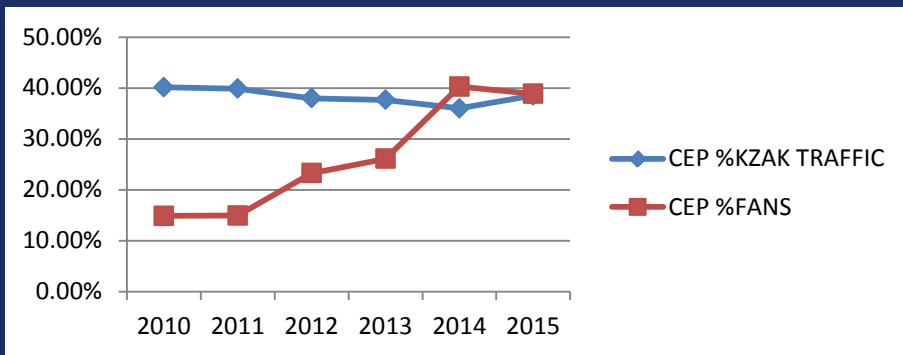
# Aircraft Type and Equipage



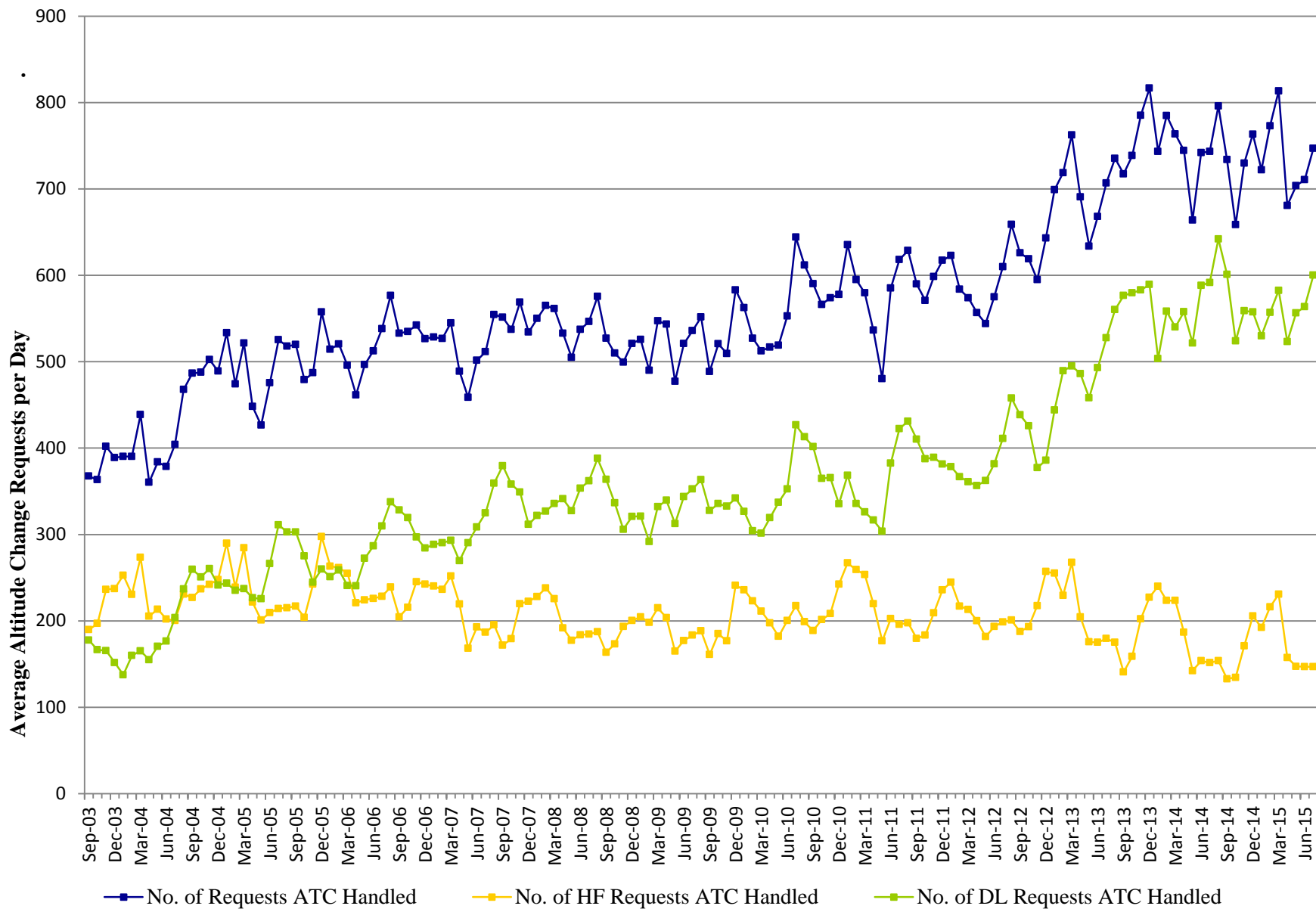


Flow	%KZAK	% FANS
AUNZJP	4.4%	83.7%
JP-Guam	11%	24%
CEP	38.5%	39%
JP – HI	8%	93.5%
CENPAC	27%	97%
SOPAC	8%	91.5%

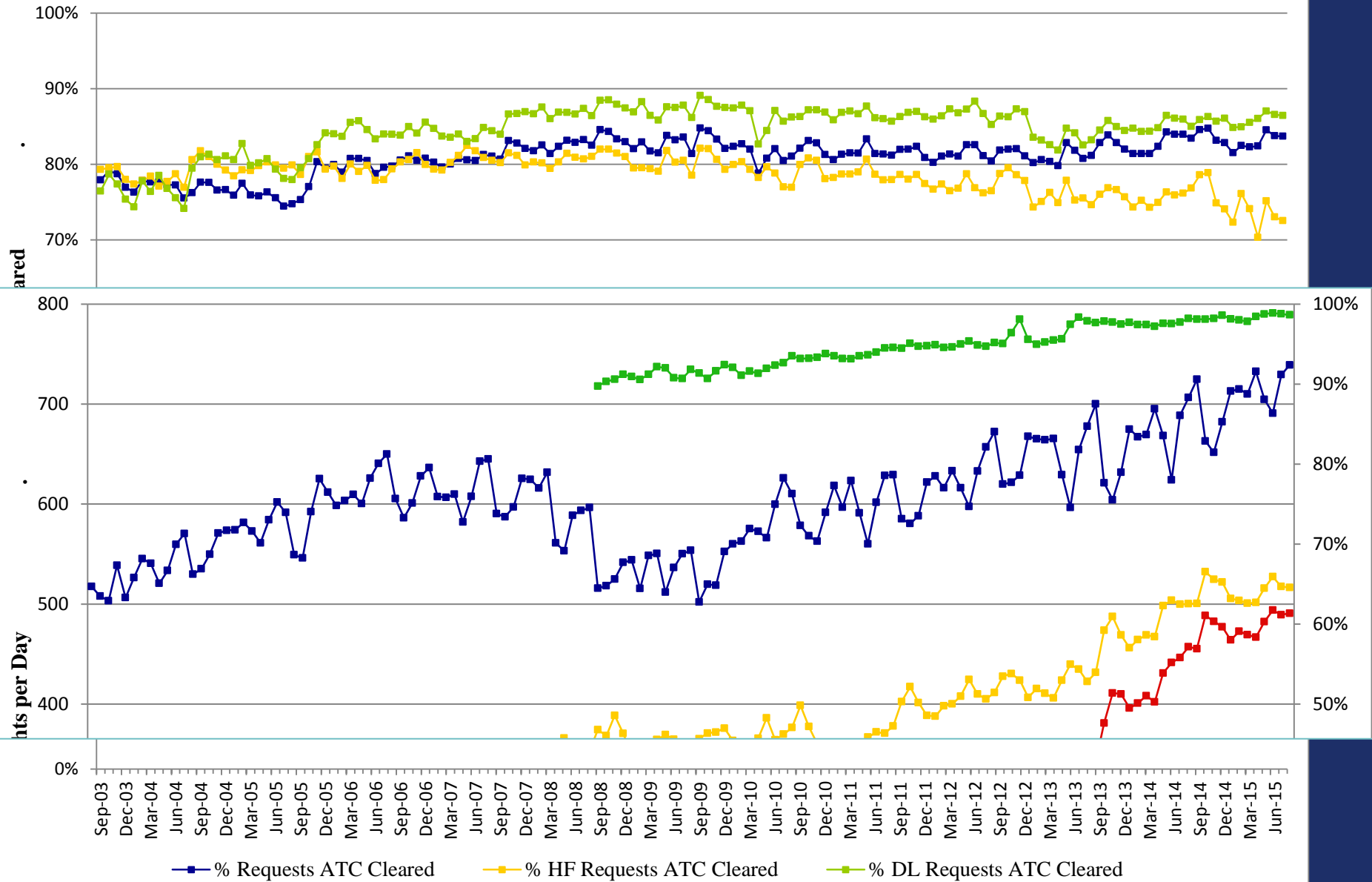




# ZOA Altitude Change Requests ATC Handled



# ZOA % Altitude Change Requests ATC Cleared

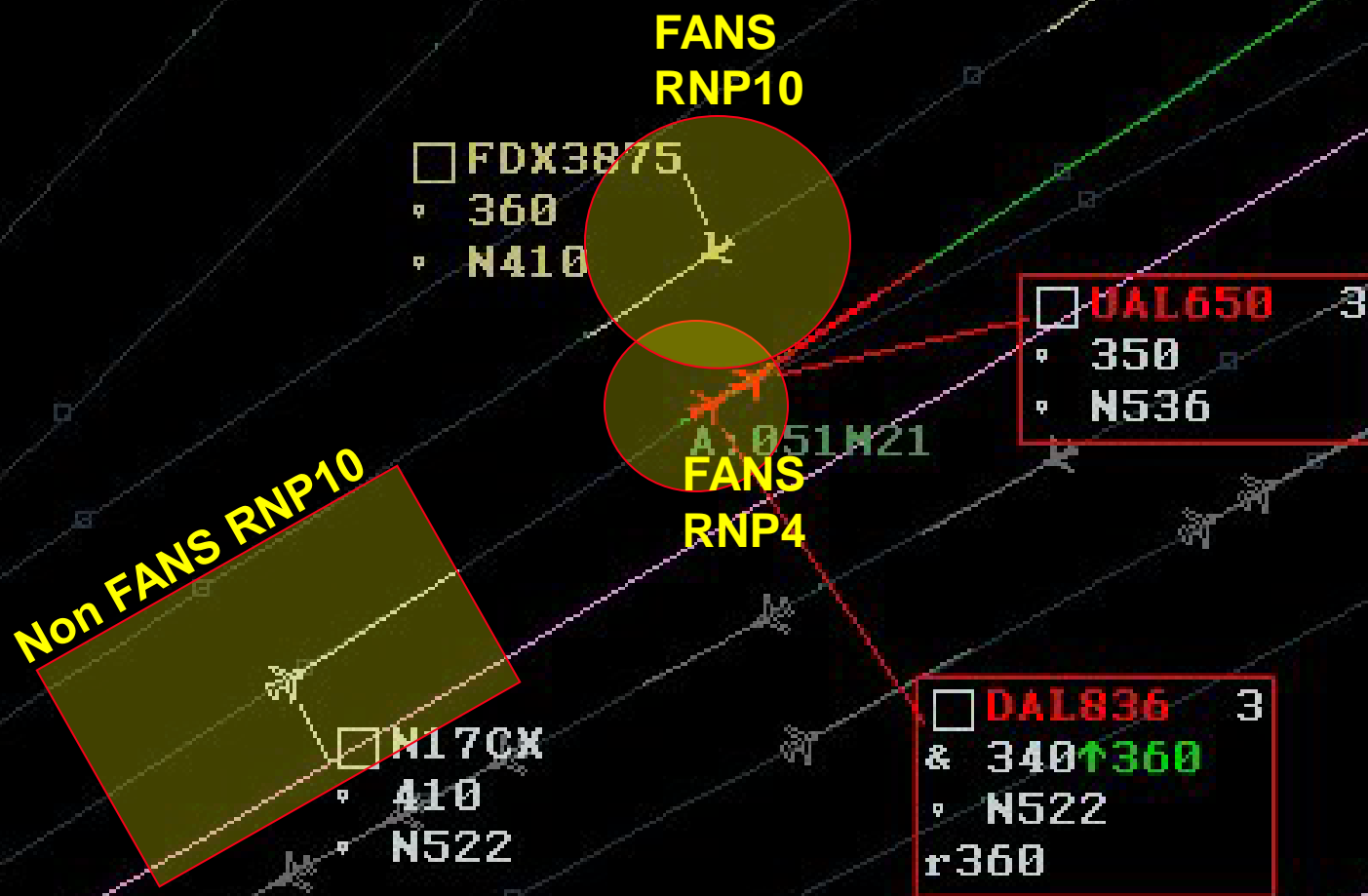




# Lost Fuel Burn Savings

**The following slides identify denied aircraft requests for climb to optimum altitudes and places a value on the increased fuel burn due to lack of FANS equipment and RNP certification**

# RNP4 and FANS Improves efficiency





# Fuel Burn Below Optimum Altitude

- Worked with operators and IATA to develop a table of extra fuel burn when operating below optimum altitude.
- Chart is listed in Attachment A

Aircraft Type A320, Flight length 2500NM, Average weight

Altitude	Ave Additional Fuel burn per hour kg
1000 ft below optimum altitude	36
2000 ft below optimum altitude	72
3000 ft below optimum altitude	118
4000 ft below optimum altitude	172
5000 ft below optimum altitude	254
6000 ft below optimum altitude	336

No data used B757 data

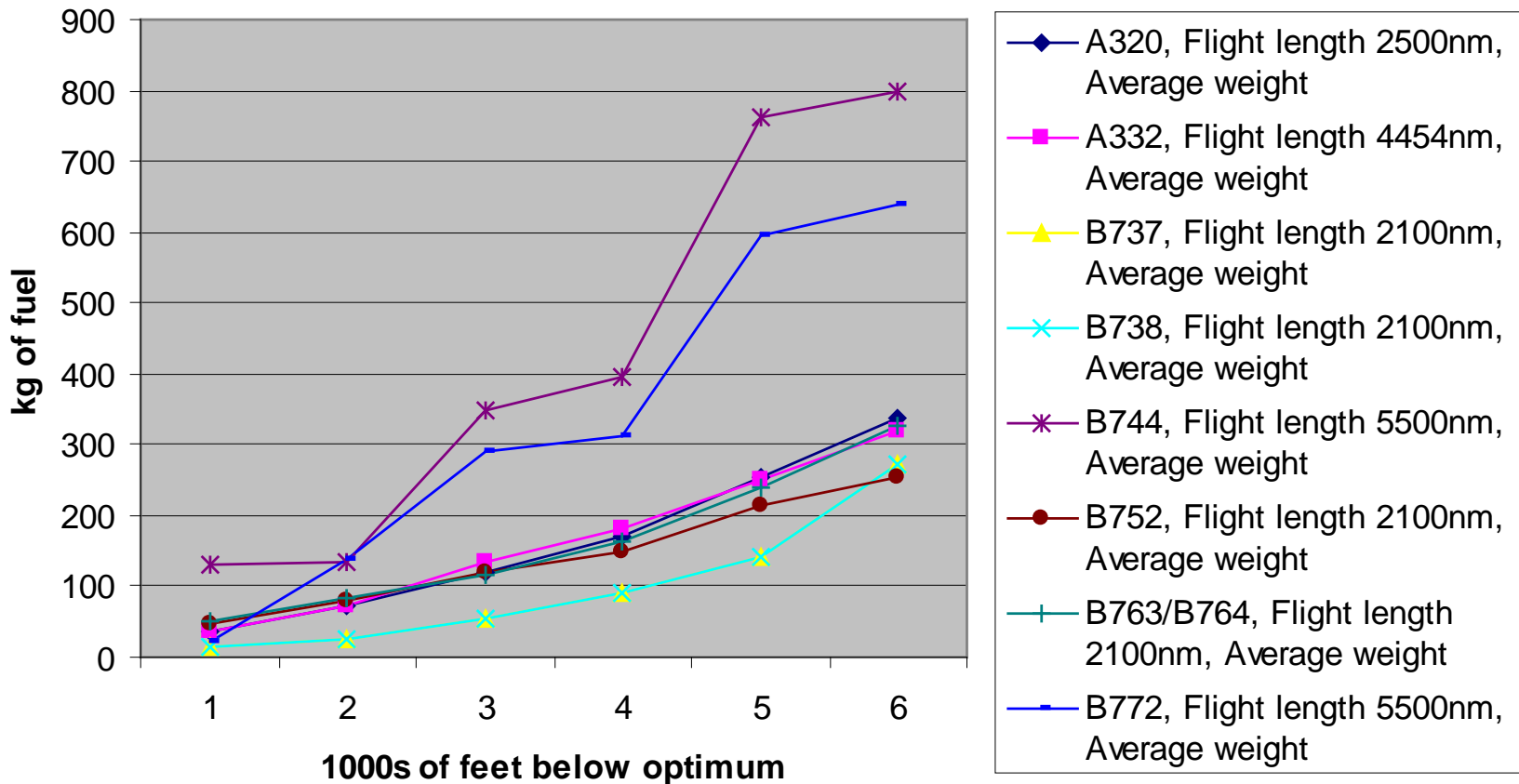
Aircraft Type A332, Flight length 4454NM, Average weight

Altitude	Ave Additional Fuel burn per hour kg
1000 ft below optimum altitude	35
2000 ft below optimum altitude	71
3000 ft below optimum altitude	136
4000 ft below optimum altitude	182
5000 ft below optimum altitude	251
6000 ft below optimum altitude	321

Extrapolated Data

# Impact of Denied Altitude Change Requests

## Fuel Burn Below Optimum Altitude



# Lack of RNP4 extra fuel burn

- ✓ Is the traffic a Same Direction Conflict?
- ✓ Is the distance between the aircraft 16nm or more?
- ✓ If the these two conditions are met; track:
  - ✓ Aircraft type
  - ✓ Feet below optimum altitude
  - ✓ Time the altitude request was denied

F320

Request  
F330

F310

ATC Advises  
UNABLE  
higher due to  
Traffic



# Lack of RNP4 extra fuel burn

ATC Clears  
ZZZ123 Climb  
and Maintain  
F320



Request  
F350

✓ Calculate time from the aircraft's denied climb to optimum altitude.

✓ Begin new tracking if still below optimum altitude.



# Lack of RNP4 extra fuel burn



✓ Aircraft ZZZ123 is a B744 that was 1.5 hours and 2000 feet below optimum altitude.

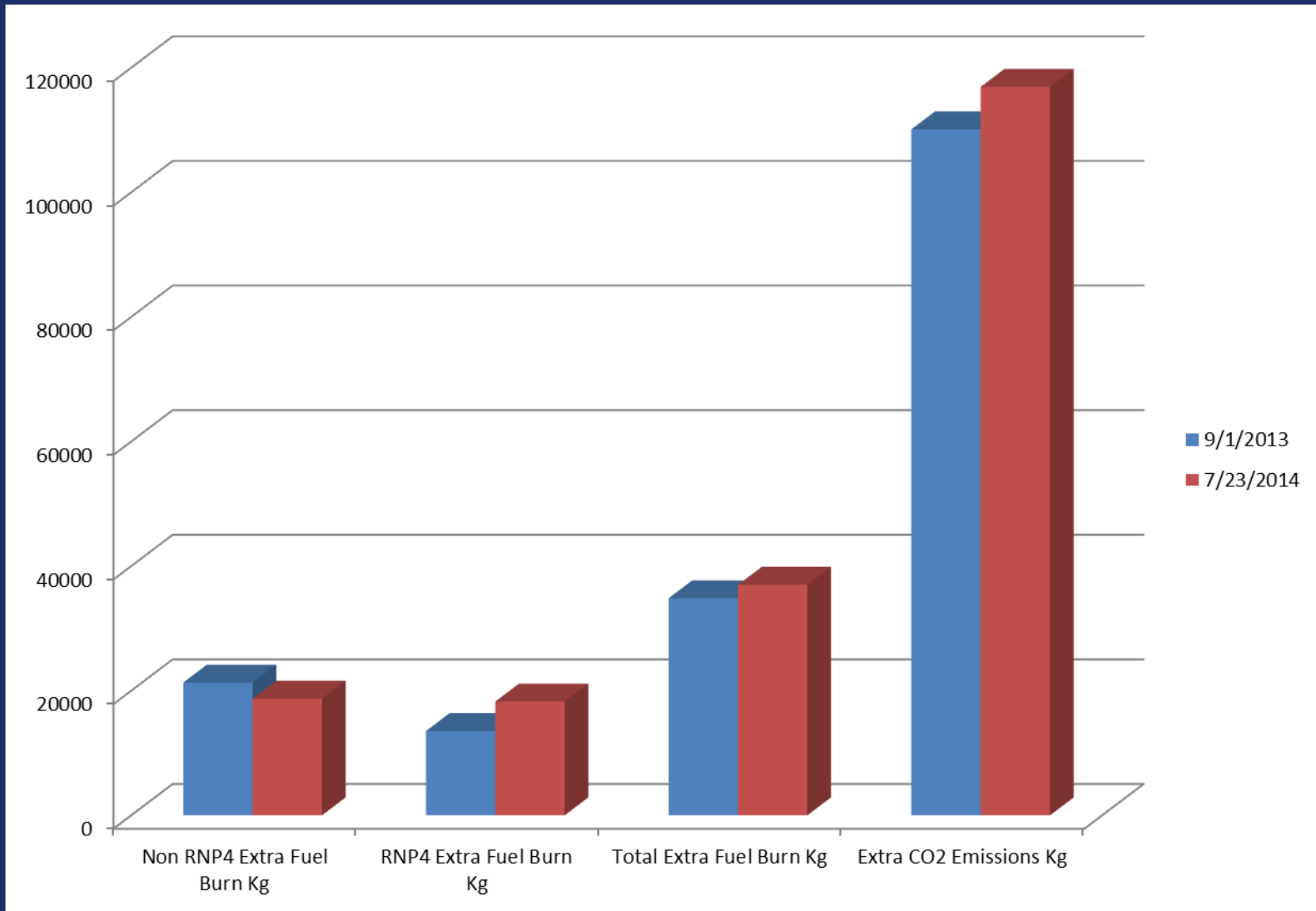
133 kg per hour

Multiplied by 1.5

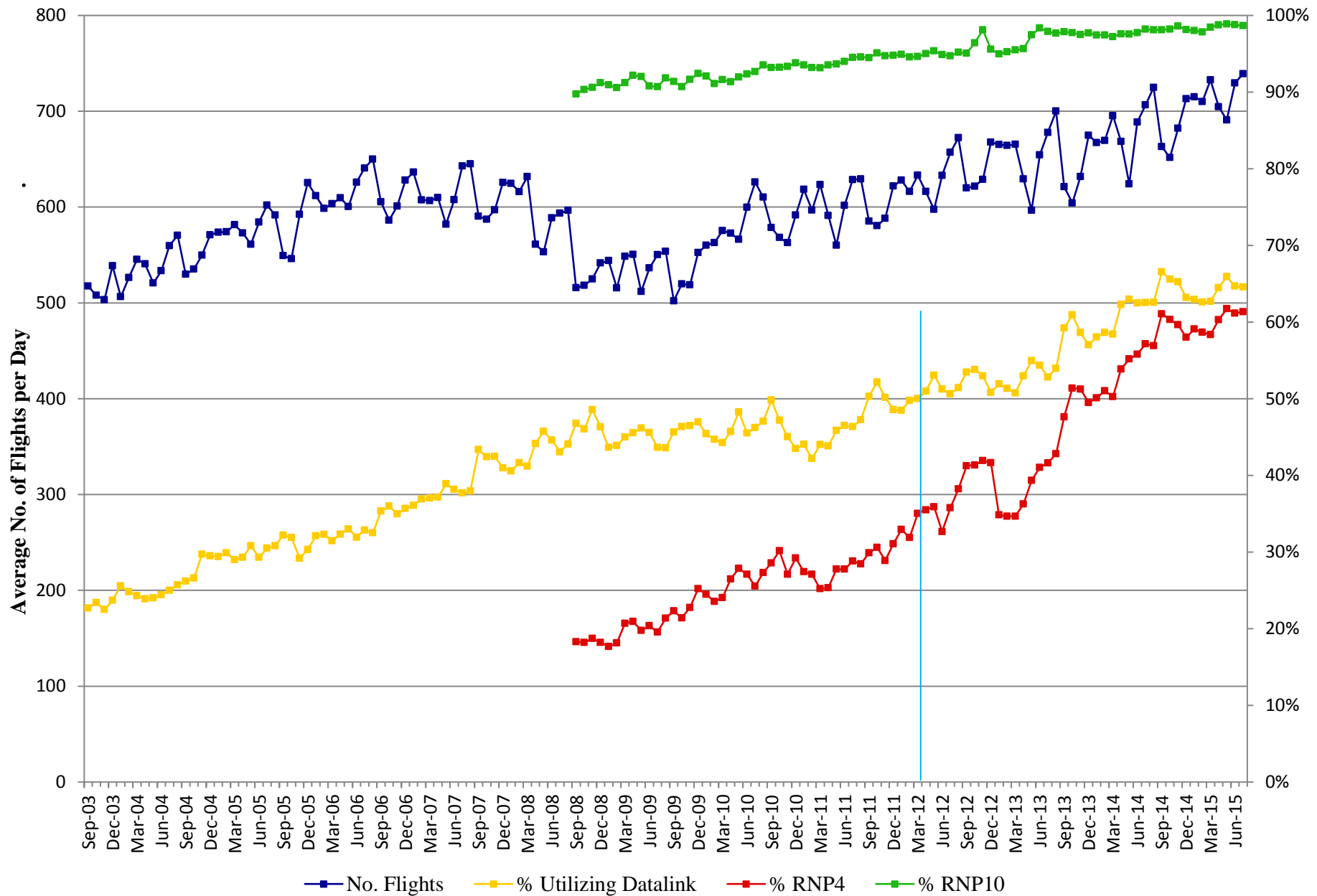
Equals 199.5 kg extra fuel burn for this event

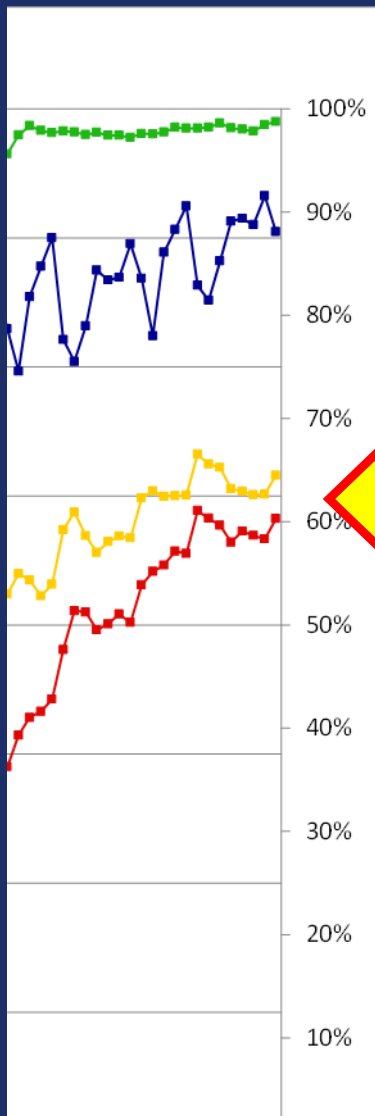


# RNP4 extra fuel burn

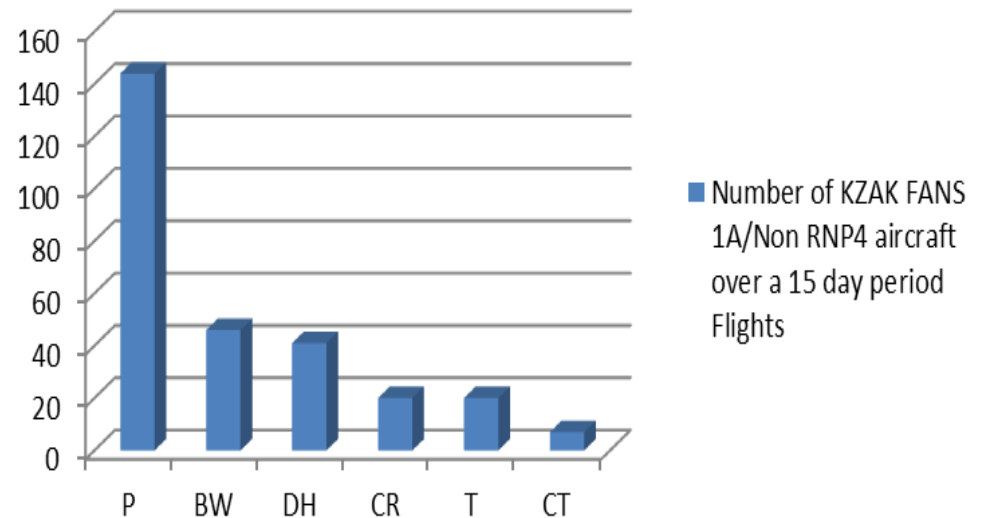


# ZOA Flights & Equipment Utilization





## Number of KZAK FANS 1A/Non RNP4 aircraft over a 15 day period Flights



# **Additional benefits are not tracked**

- 30nm separation after two opposite direction aircraft have passed**
- If an aircraft is held below optimum altitude because of traffic and does not make requests for a new optimum altitude.**

# **Additional benefits are not tracked**

- **Savings that could be realized by developing route systems based on a 30nm lateral standard.**
- **This paper only captures the lost savings for the Oakland FIR. It would be much higher if calculated for all FIRs**



# Conclusion

- The meeting is requested to:
  - Recognize the benefits of RNP 4 and FANS equipage; and
  - Consider certifying FANS equipped aircraft as RNP 4; and
  - Consider equipping aircraft with satellite FANS and RNP 4 certification.