

# Variations in Airspeed Changes

## ISPACG 29

Presented to:      ISPACG 29  
By:                    Dustin Byerly  
Date:    March 2-6, 2015



Federal Aviation  
Administration



Federal Aviation  
Administration

# Mach Speed Variation

- **The FAA has presented papers at IPACG and ISPACG which outline the dangers of unannounced speed changes.**
- **This issue needs attention by ICAO and a Global or Regional Procedure developed.**
- **The ISPACG Working Group has been working on this issue to try and develop a unified regional procedure.**



# ICAO Annex 2 3.6.2.2 change

- **3.6.2.2 Inadvertent changes.** *In the event that a controlled flight inadvertently deviates from its current flight plan, the following action shall be taken:*
- **a) Deviation from track:** *if the aircraft is off track, action shall be taken forthwith to adjust the heading of the aircraft to regain track as soon as practicable.*
- **b) Variation in true airspeed:** *if the average true airspeed at cruising level between reporting points varies or is expected to vary by plus or minus 5 per cent of the true airspeed, from that given in the flight plan, the appropriate air traffic services unit shall be so informed.*
- **c) Change in time estimate:** *if the time estimate for the next applicable reporting point, flight information region boundary or destination aerodrome, whichever comes first, is found to be in error in excess of 2 minutes from that notified to air traffic services, or such other period of time as is prescribed by the appropriate ATS authority or on the basis of air navigation regional agreements, a revised estimated time shall be notified as soon as possible to the appropriate air traffic services unit.*
- 
- **3.6.2.2.1** *Additionally, when an ADS agreement is in place, the air traffic services unit shall be informed automatically via data link whenever changes occur beyond the threshold values stipulated by the ADS event contract.*



# Mach Speed Variation

- **Many aircrews do not monitor their flown speed versus the flight planned speed.**
- **AIDC can over-write flight planned aircraft speeds.**
- **It does not matter whether an ATC system uses the first speed in field 15 of the FPL or accounts for the speed changes imbedded in the route of flight.**



# Flight Planned Speed Changes

- (FPL-XXXX-IS
- -B753/M-SDE2E3FGHIRWXYZ/S
- -KSEA0035
- -**N0396**F300 HAROB4 HQM C1418 SEDAR A331 ZINNO/**N0463**F340  
A331 ZIGIE MAGGI3
- -PHNL0541
- -PBN/A1B1C1D1O1S1T1 NAV/RNVD1E2A1 REG/XXXXX
- EET/KZAK0039
- SEL/XXXX
- RMK/TCAS AGCS EQUIPPED NRP USA)



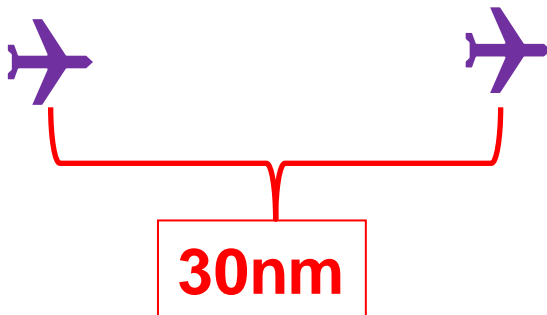
# Mach Speed Variation

- **Annex 2 change fails to fully address the issue.**
- **An en route aircraft at 500 knots only has to inform ATC when its true airspeed changes by 25 knots or more from the speed given in the flight plan. This allows for speed changes of 48 knots without informing ATC.**



# Mach Speed Variation

- ICAO ADS-C 30/30 Separation Rules, FIRs may apply 30nm longitudinal separation standard using an ADS-C reporting rate of 14 minutes. A 48 knot speed change by one aircraft could result in an 11nm closure between two aircraft between ADS-C reports.



# Mach Speed Variation

- **The FAA analyzed two 15 day periods of traffic at Oakland ARTCC.**
- **Aircraft that were not at cruise altitude were eliminated.**
- **The ADS-C reports were filtered to show only aircraft where the Mach Speed in the ADS-C reports changed by M.02 or more between two subsequent ADS-C reports.**

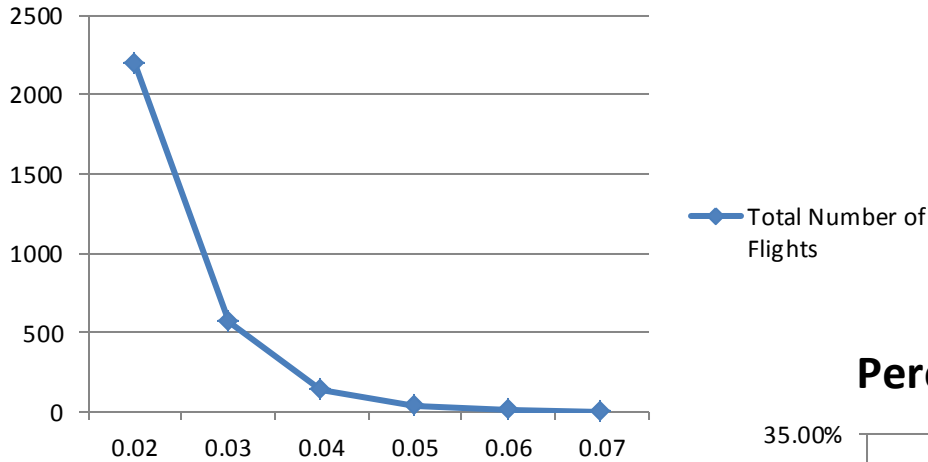




# Mach Speed Variation

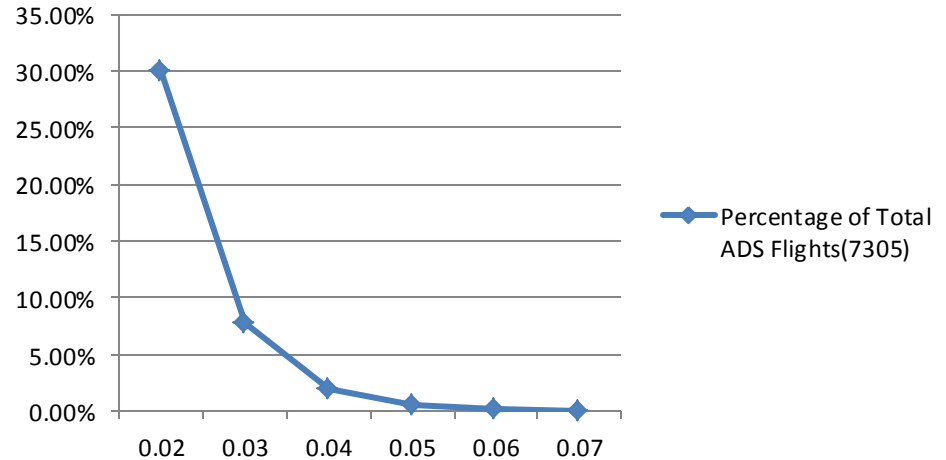
## July 2014

### Total Number of Flights



	Jul-14	Dec-14
M.02+	2193	3008
M.03+	565	907
M.04+	146	261
M.05+	41	115
M.06+	15	51
M.07+	5	16
M.08+	0	5

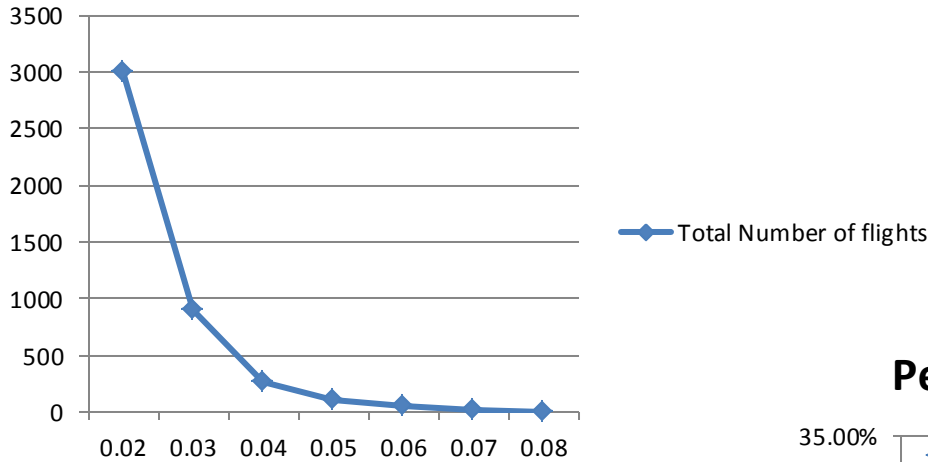
### Percentage of Total ADS Flights(7305)



# Mach Speed Variation

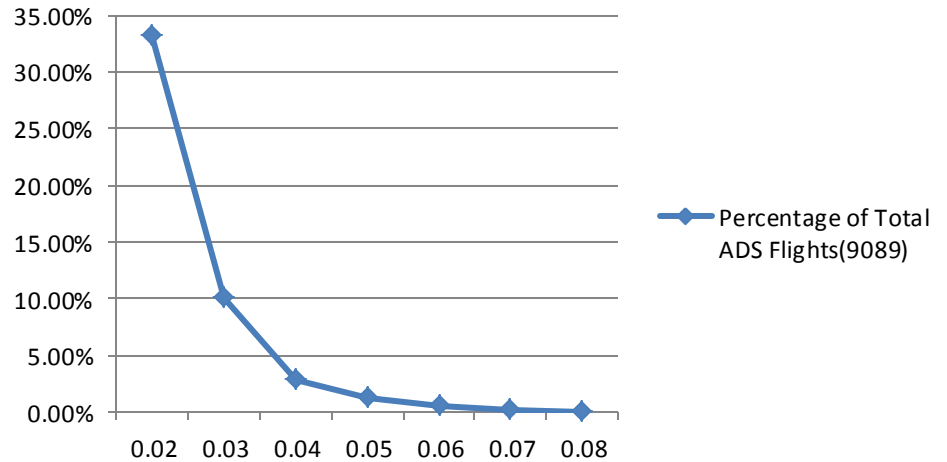
## Dec 14/Jan 15

Total Number of flights



	Jul-14	Dec-14
M.02+	2193	3008
M.03+	565	907
M.04+	146	261
M.05+	41	115
M.06+	15	51
M.07+	5	16
M.08+	0	5
M.09+	0	1
M.10+	0	1

Percentage of Total ADS Flights(9089)



# Mach Speed Variation

9089 ADS-C Flights, 12/28/14 to 1/12/15

- Closely analyzed 261 ADS-C flights which had a speed change of .04 Mach or greater between ADS-C reports in level flight.
- A Mach Speed change of M.04 by one aircraft could cause:
  - A 5.5nm reduction in separation between RNP4 ADS-C reports
  - A 10.8nm reduction in separation between RNP10 ADS-C reports



# Mach Speed Variation

9089 ADS-C Flights, 12/28/14 to 1/12/15

- Of the 333 incidents, ATC was advised of the speed change only 20 times.
- 6 flights had a change of M.08 or more between ADS-C reports
  - 1 of the 6 had an ATC clearance for the change.
  - A Mach Speed change of M.08 could lead to an 11nm reduction in separation.
  - One flight changed speed by M.10 without advising ATC, that could create a 1nm minute overtake



# Australia AIP Amendment

- ***AIP ENR 1.1 para 21:***
- ***A pilot must inform ATS if the average cruising speed, either TAS or Mach whichever is applicable, between reporting points, varies or is expected to vary, by a value equal to or greater than:***
  - ***a. 5% TAS***
  - ***b. 0.01 Mach from that given in the flight plan.***



# Speed Change NOTAM Proposal

- IN ORDER TO PREVENT UNANNOUNCED SPEED CHANGES AIRCREWS ARE REQUIRED TO USE THE FOLLOWING PROCEDURES IN THE KZAK FIR. UPON CROSSING THE KZAK FIR BOUNDARY, AIRCRAFT ARE REQUIRED TO REPORT THEIR SPEED VIA CPDLC OR HF VOICE. TURBOJET AIRCRAFT ARE TO REPORT THEIR MACH NUMBER **(AND NON-TURBOJET AIRCRAFT ARE TO REPORT A TRUE AIRSPEED.)**
- A PILOT MUST INFORM ATS EACH TIME THE CRUISING **(SPEED, EITHER TAS OR) MACH NUMBER (WHICHEVER IS APPLICABLE)** VARIES OR IS EXPECTED TO VARY BY A VALUE EQUAL TO OR GREATER THAN:
  - (A. 10 KNOTS TAS FROM THE PREVIOUSLY REPORTED SPEED - Non-Turbojet)**
  - B. 0.02 MACH FROM THE PREVIOUSLY REPORTED SPEED (- Turbojet.)**



# Mach Speed Variation

- **By requiring a speed report upon entering the FIR/CTA, a pilot is made aware of their speed and the need to notify ATC if the speed will change by .02 Mach or more.**
- **The speed report also allows ATC to check the speed the ATC system is using to calculate separation for the aircraft.**



# Speed Change Proposal

- Procedurally when an aircraft wanted to change by .02 Mach number, they could downlink DM18 with the requested speed (Mach number).
- If ATC required a speed assignment for separation, an appropriate speed assignment would be assigned ie UM106 *MAINTAIN Speed*.
- If ATC did not require a speed assignment, the following could be Uplinked:
  - UM ROGER
  - UM169 Speed change to M0.84 approved
  - This advises the aircraft that the requested speed change is approved but no speed restriction has been assigned.





# Conclusion

**The meeting is requested to:**

- **Support the Implementation of the procedure on June 25, 2015 in the Pacific FIRs where possible.**
- **Keep ATC informed of speed changes of M.02 or greater.**



