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2010 Annual Flight Data Monitoring Cross-Fleet Data Comparison Summary Report

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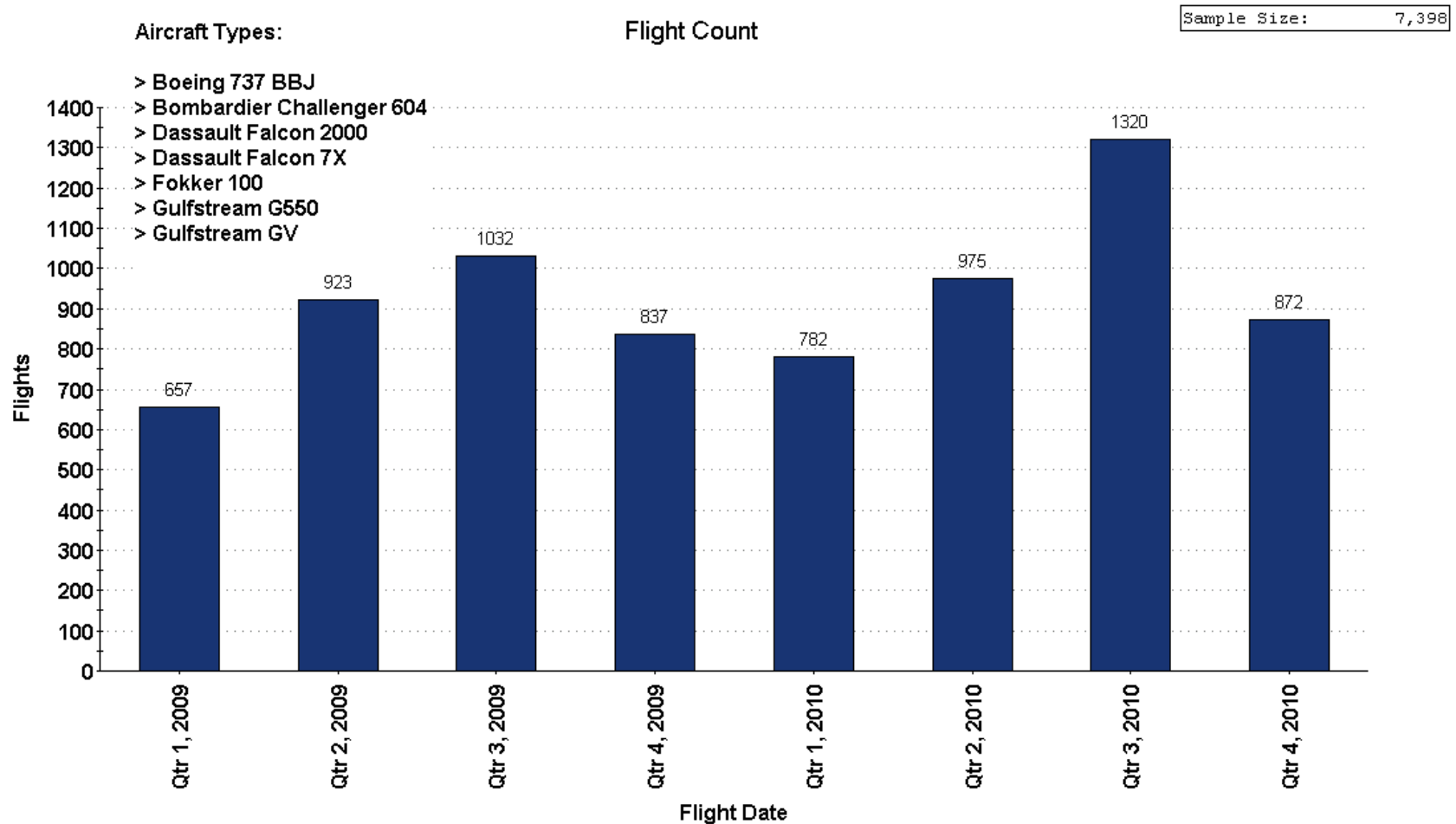
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1 Cross-Fleet Data Comparison Operational Summary

1.1 Enrollment and quarterly Flight Count

All aircraft from customers which have signed the proposed customer feedback form for the Cross-Fleet Data Comparison data release are included in the following aggregated Flight Data Monitoring data set. As of Q4 2010 the below mentioned aircraft types have contributed 7'398 flights and 12'321 flight hours. All data is used and processed in de-identified manner.



1.2 Breakdown of Aircraft Limitation Events by Type (2010)

Event Type	Caution	Warning
EGT Limit Exceedance	0	0
Airspeed Low Relative to Stall Speed	n/a	n/a
Stall Warning	0	1
Initial Climb Airspeed Low Relative to Min Control Speed	1	0
VMO Exceedance	0	0
MMO Exceedance	0	0
Flap / Slat Altitude Limit Exceedance	0	0
VFE (Flap Airspeed Limit) Exceedance	4	0
Slat Speed Limit Exceedance	n/a	n/a
VLE (Gear-Down Airspeed Limit) Exceedance	0	0
MLE (Gear-Down Mach Limit) Exceedance	0	0
VLO (Gear Retraction Airspeed Limit) Exceedance	0	0
VLO (Gear Extension Airspeed Limit) Exceedance	1	0
Takeoff Weight Limit Exceedance	n/a	n/a
Vtire (Tire Speed Limit) Exceedance	0	0
Upper Maneuvering Load Limit Exceeded (Flaps Down)	0	0
Upper Maneuvering Load Limit Exceeded (Flaps Up)	0	0
Lower Maneuvering Load Limit Exceeded (Flaps Up)	0	0
Lower Maneuvering Load Limit Exceeded (Flaps Down)	0	0
Maximum Operating Altitude Exceedance	2	0
Takeoff Altitude is Too High	0	0
Slat Mach Limit Exceedance	n/a	n/a
Taxi Weight Limit Exceedance	n/a	n/a
Landing Weight Limit Exceedance	n/a	n/a
Brake Temperature Exceeds Limit for Takeoff	n/a	n/a
Brake Temperature Exceeds Limit for Taxi In	n/a	n/a
Fuel Temperature Too Low	0	0
Fuel Temperature Too High	0	0

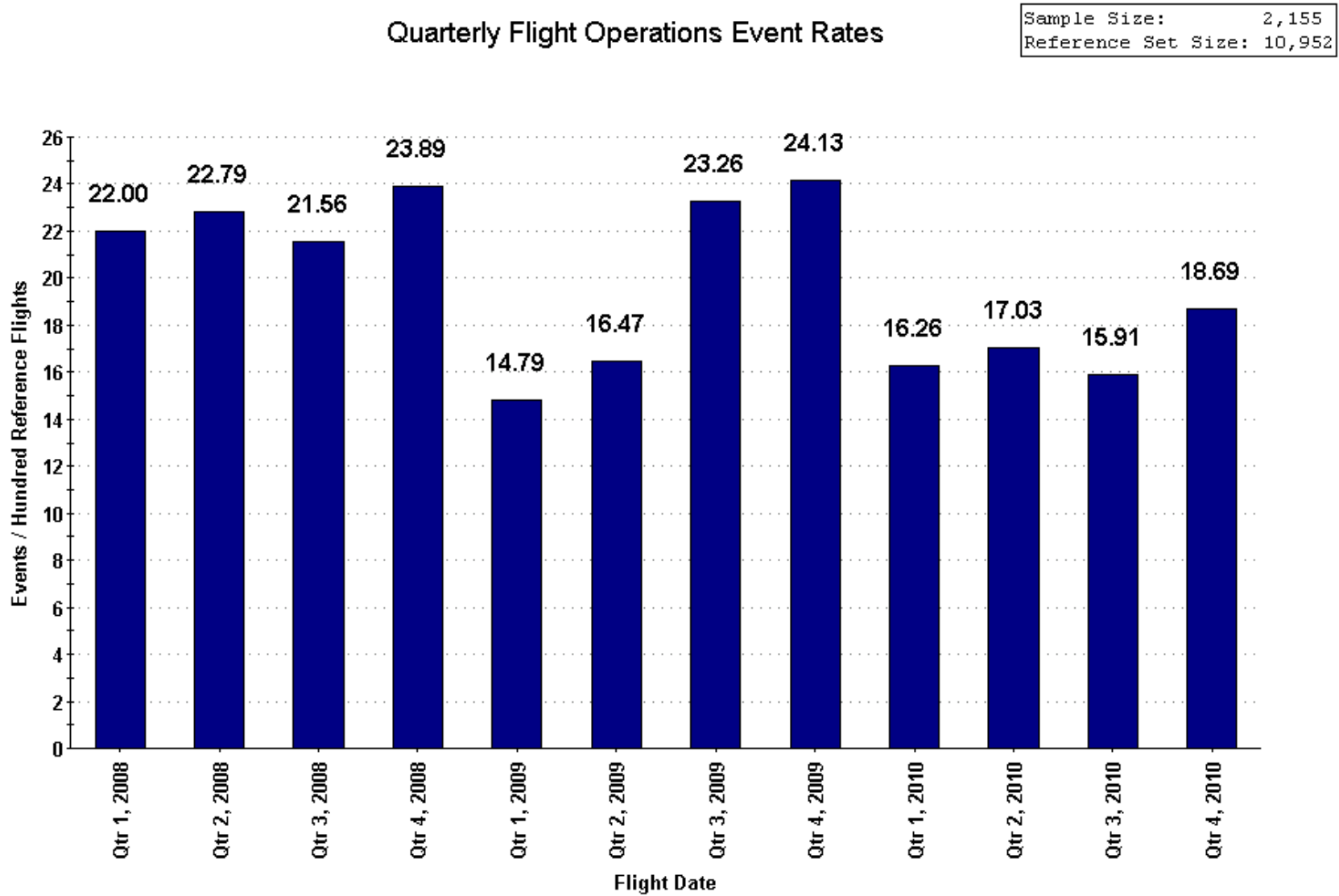
1.3 Breakdown of Aircraft Maintenance Events by Type (2010)

Event Type	Caution	Warning
Engine Fire	0	0
Smoke Warning	0	0
Uncommanded Pitch	n/a	n/a
Uncommanded Roll	0	0
Uncommanded Yaw	0	4
Roll Attitude Disagreement	n/a	n/a
Pitch Attitude Disagreement	n/a	n/a
Thrust Reversers Not Stowed while Airborne	0	0
No Fuel Flow	0	0
Low Hydraulic Pressure	2	2
Cabin Pressure Warning	0	0
Engine Stall or Surge In-Flight	0	0
Reverse Thrust while Slow	0	0
Hard Landing (vertical speed method)	n/a	n/a

26 events *Thrust Reversers Not Stowed while Airborne* (Warning severity) have been detected but confirmed as to be a bad sensor problem on the aircraft.

71 events *Reverse Thrust while Slow* (Caution severity) have been detected but confirmed as to be consistent with operators Standard Operating Procedures SOPs.

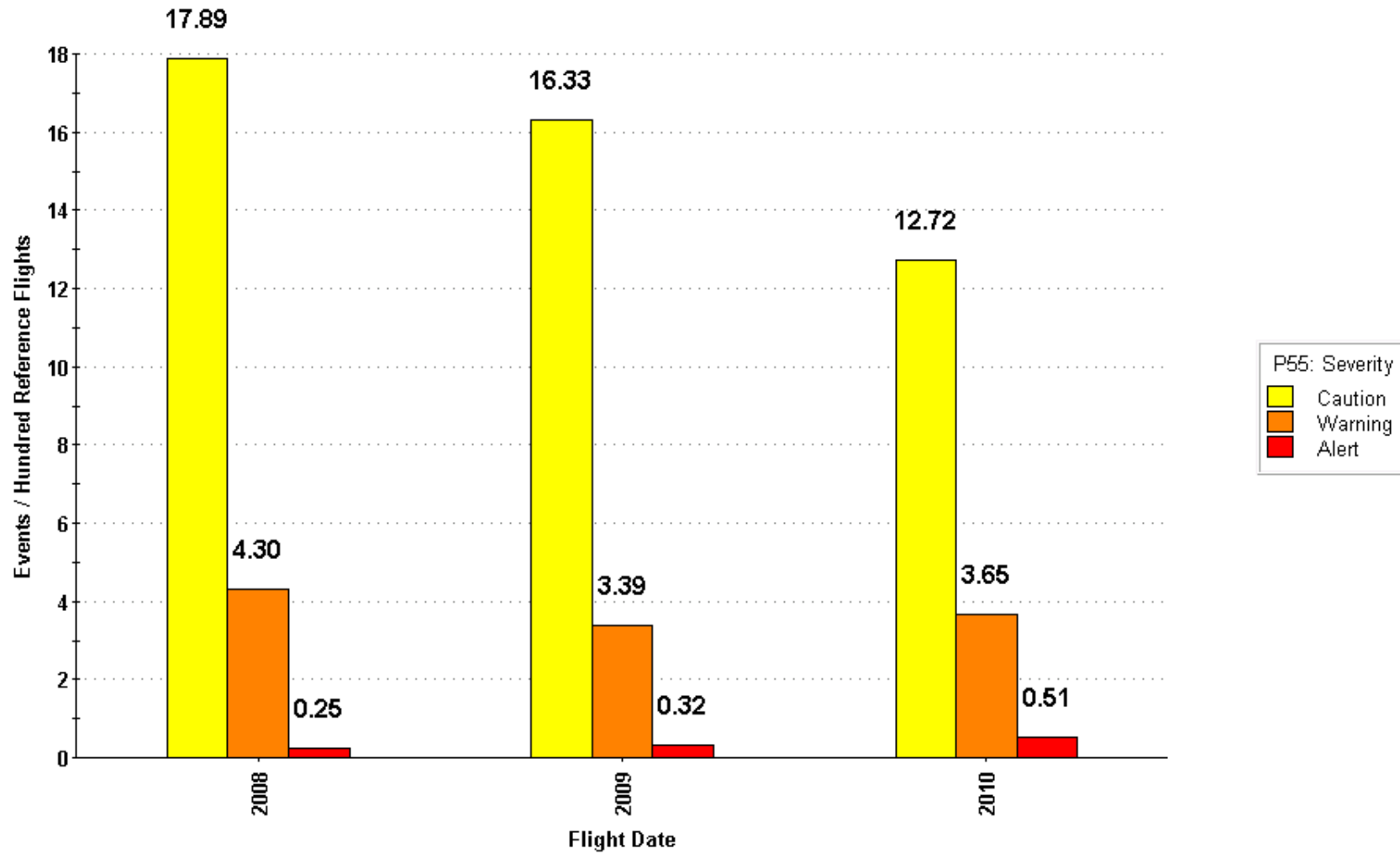
1.4 Quarterly Flight Operations Event Rates



1.5 Annual Flight Operations Event Rates

Annual Flight Operations Event Rates

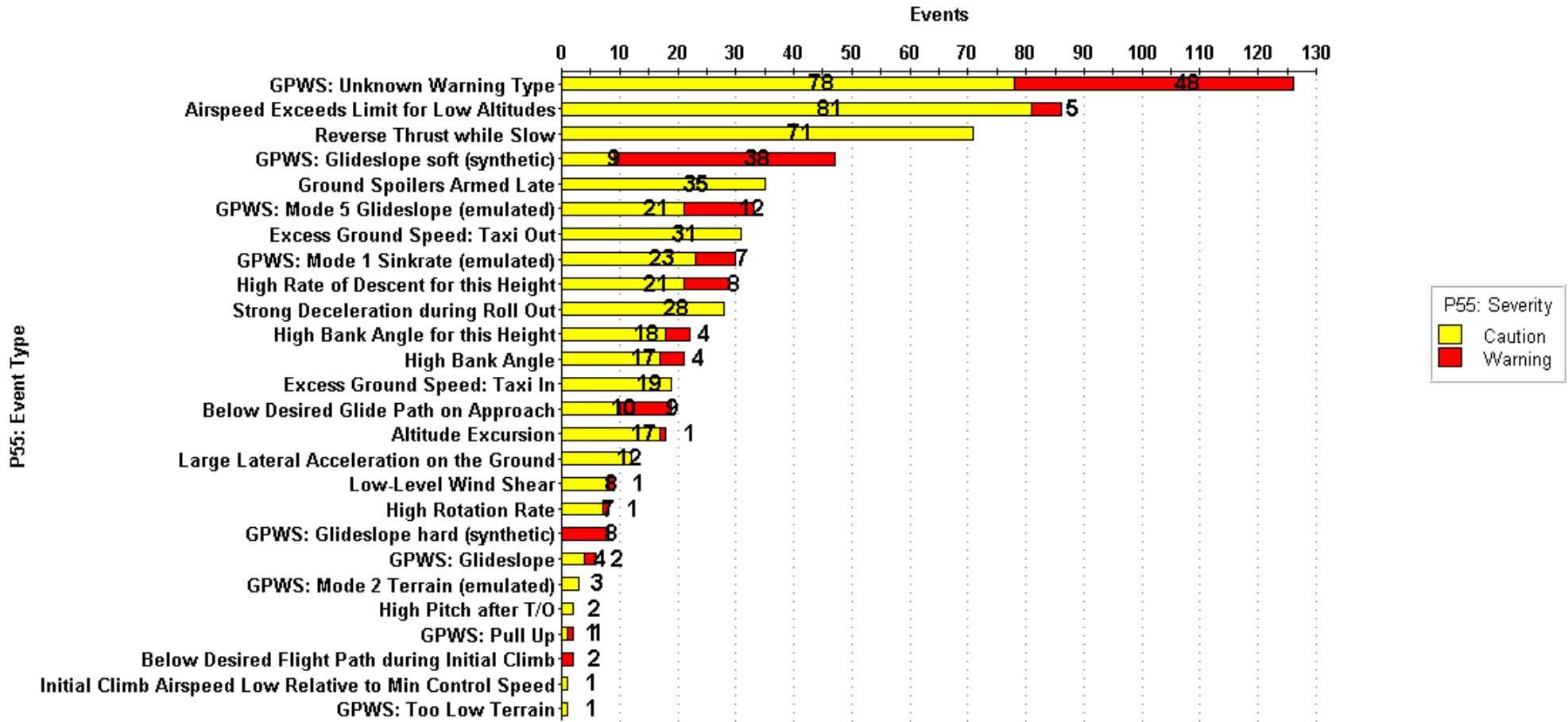
Sample Size: 2,155
Reference Set Size: 10,952



1.6 Breakdown of Flight Operation Events by Type (2010)

Breakdown of Flight Operations Events by Type (2010)

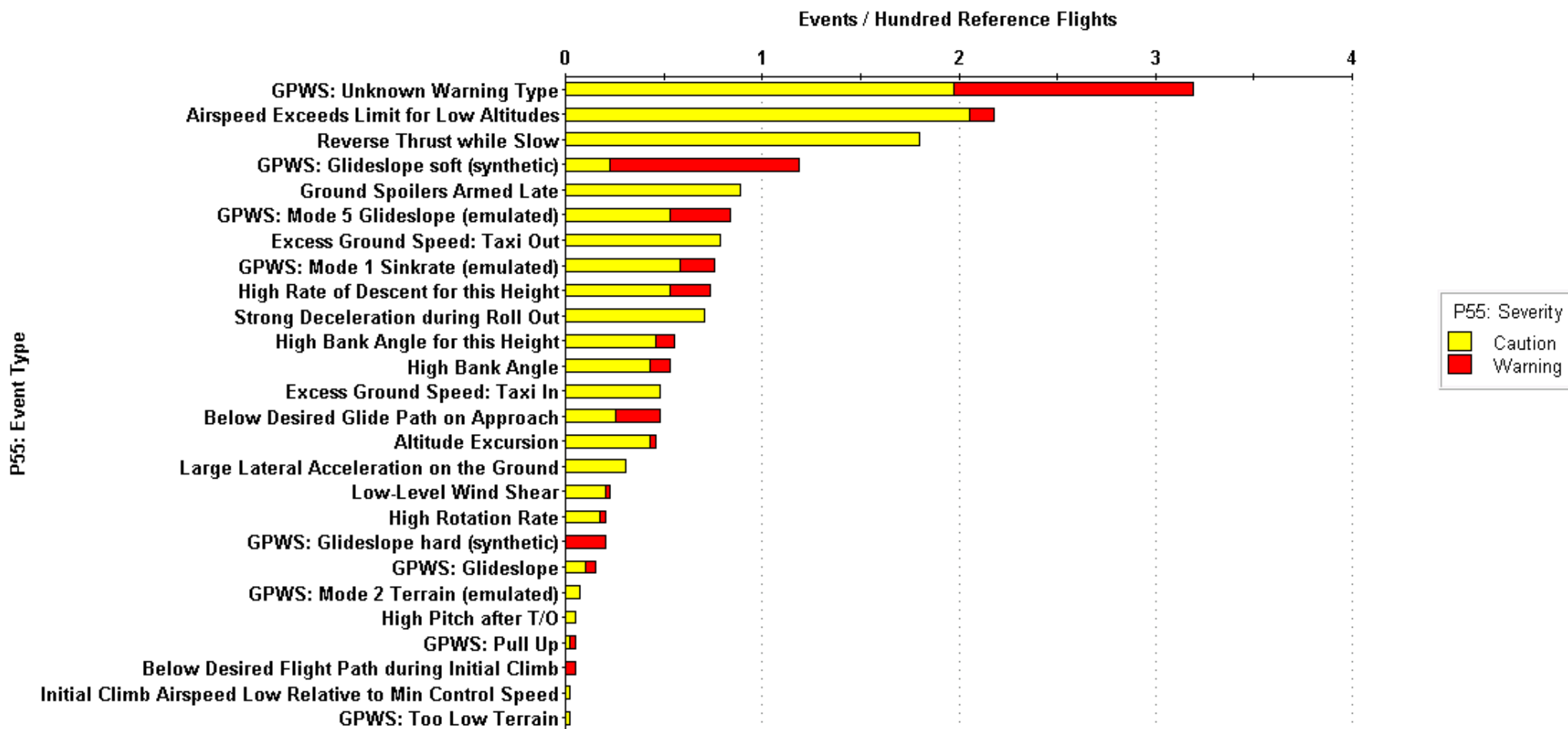
Sample Size: 669



1.7 Breakdown of Flight Operation Event Rates by Type (2010)

Breakdown of Flight Operations Events by Type (2010)

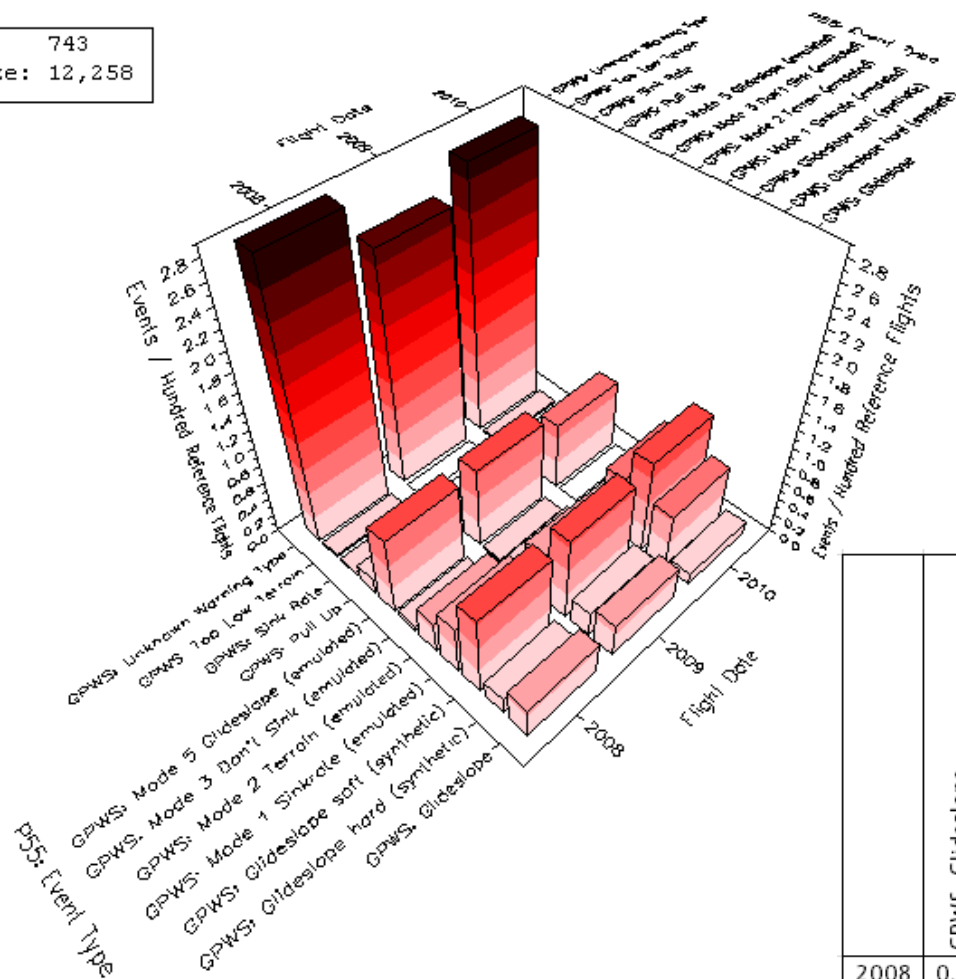
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1.7.1 Breakdown of GPWS event types over past years

GPWS Warnings overview

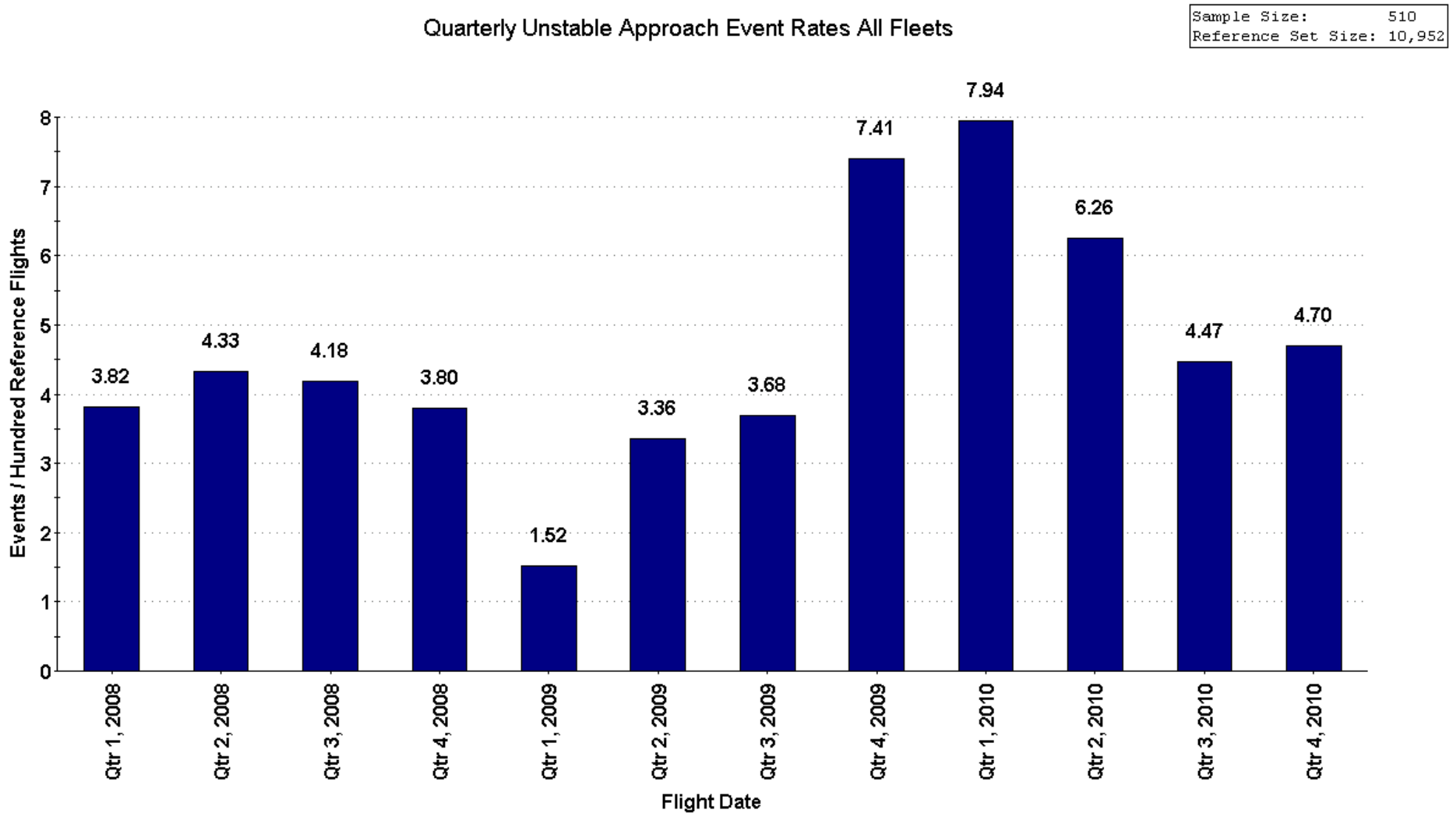
Sample Size: 743
 Reference Set Size: 12,258



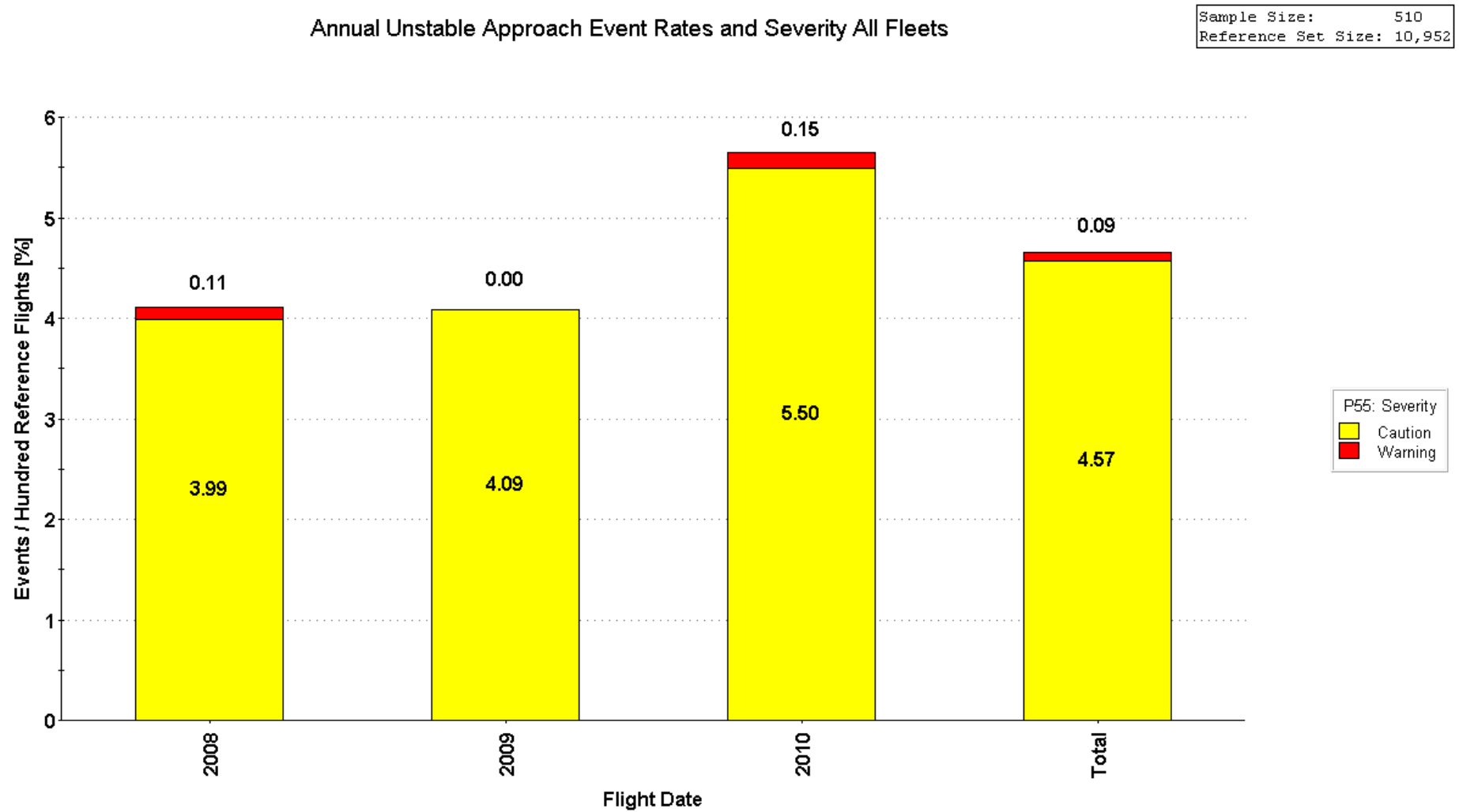
	GPWS: Glideslope	GPWS: Glideslope hard (synthetic)	GPWS: Glideslope soft (synthetic)	GPWS: Mode 1 Sinkrate (emulated)	GPWS: Mode 2 Terrain (emulated)	GPWS: Mode 3 Don't Sink (emulated)	GPWS: Mode 5 Glideslope (emulated)	GPWS: Pull Up	GPWS: Sink Rate	GPWS: Too Low Terrain	GPWS: Unknown Warning Type	Totals
2008	0.35	0.19	0.91	0.53	0.35	0.05	0.88	0.16	0.03	0.03	2.91	6.39
2009	0.38	0.28	0.93	0.53	0.13	0.03	0.9	0.08	0	0	2.48	5.72
2010	0.13	0.62	1.04	0.66	0.07	0	0.73	0.04	0	0.02	2.78	6.09
Totals	0.28	0.38	0.96	0.58	0.17	0.02	0.83	0.09	0.01	0.02	2.72	6.07

2 Cross-Fleet Comparison Approach Stability

2.1 Quarterly Unstable Approach Event Rates



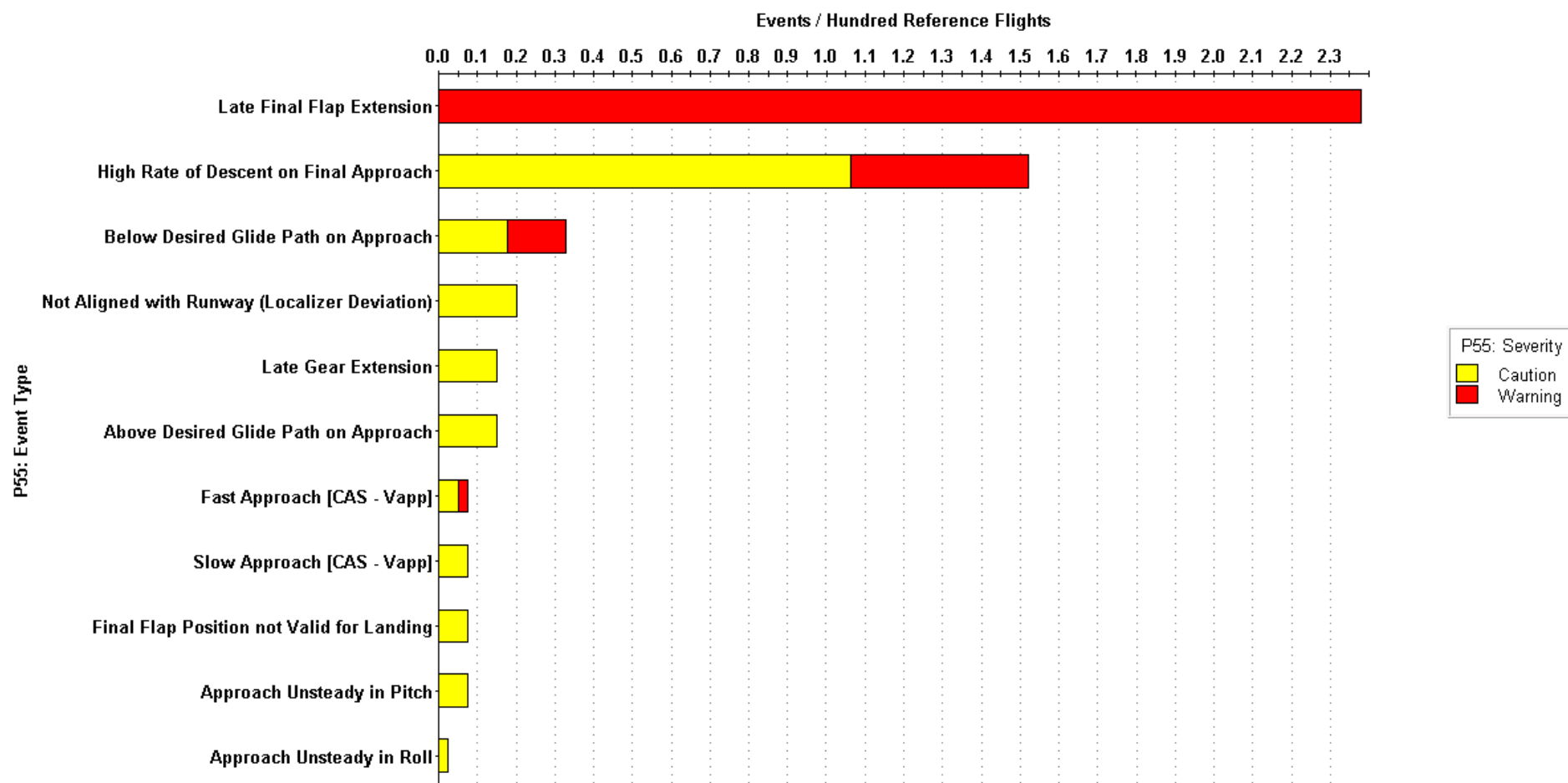
2.2 Annual Unstable Approach Event Rates



2.3 Breakdown of Unstable Approach Events by Cause Year 2010

Breakdown of Unstable Approach Events by Cause Year 2010

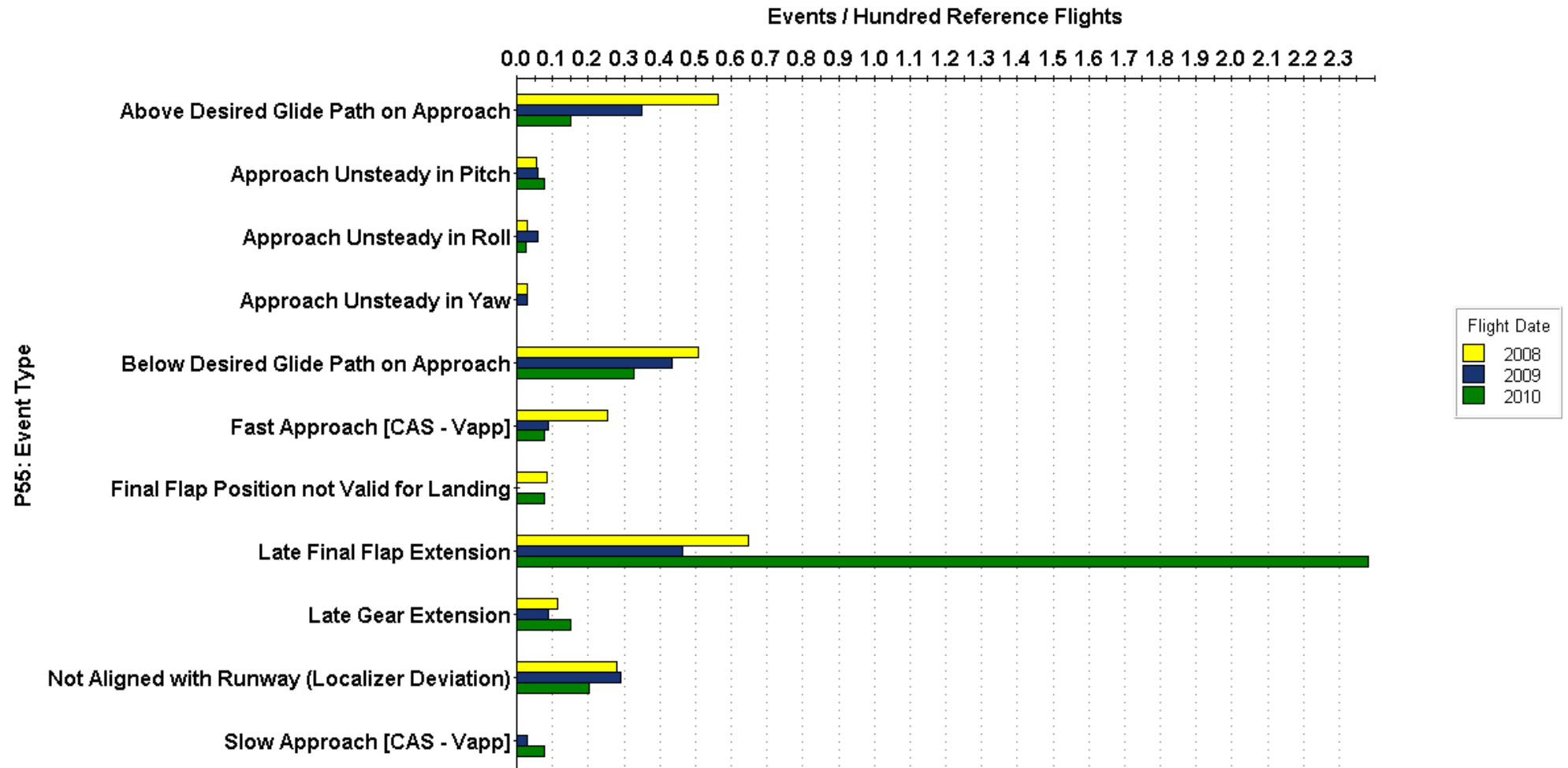
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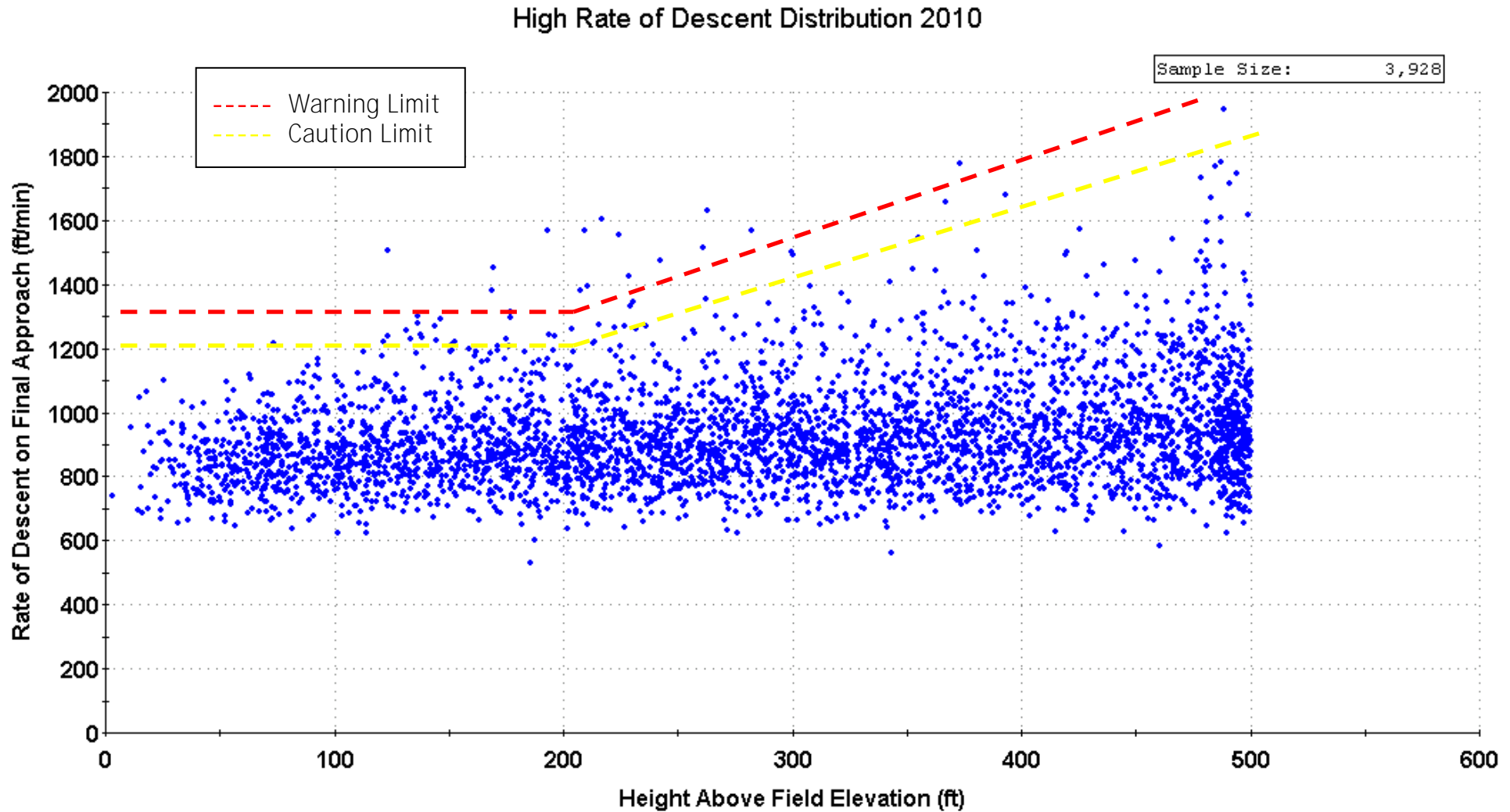
2.4 Unstable Approach Rates by Cause Trend

Trend Unstable Approach Rates by Cause

Sample Size: 296
 Reference Set Size: 10,952

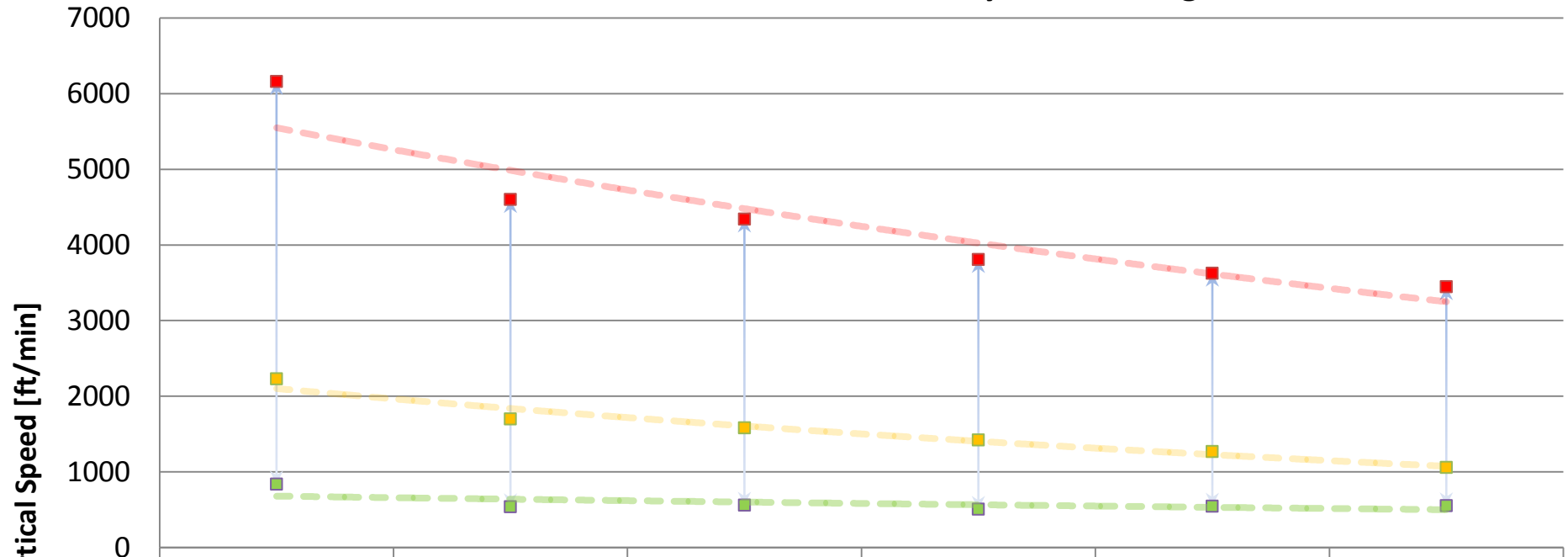


2.5 High Rate of Descent Distribution Final Approach 2010



2.6 High Rate of Descent Distribution Descent/Approach 2010

Peak Rate of Descent Distribution by Altitude Segment



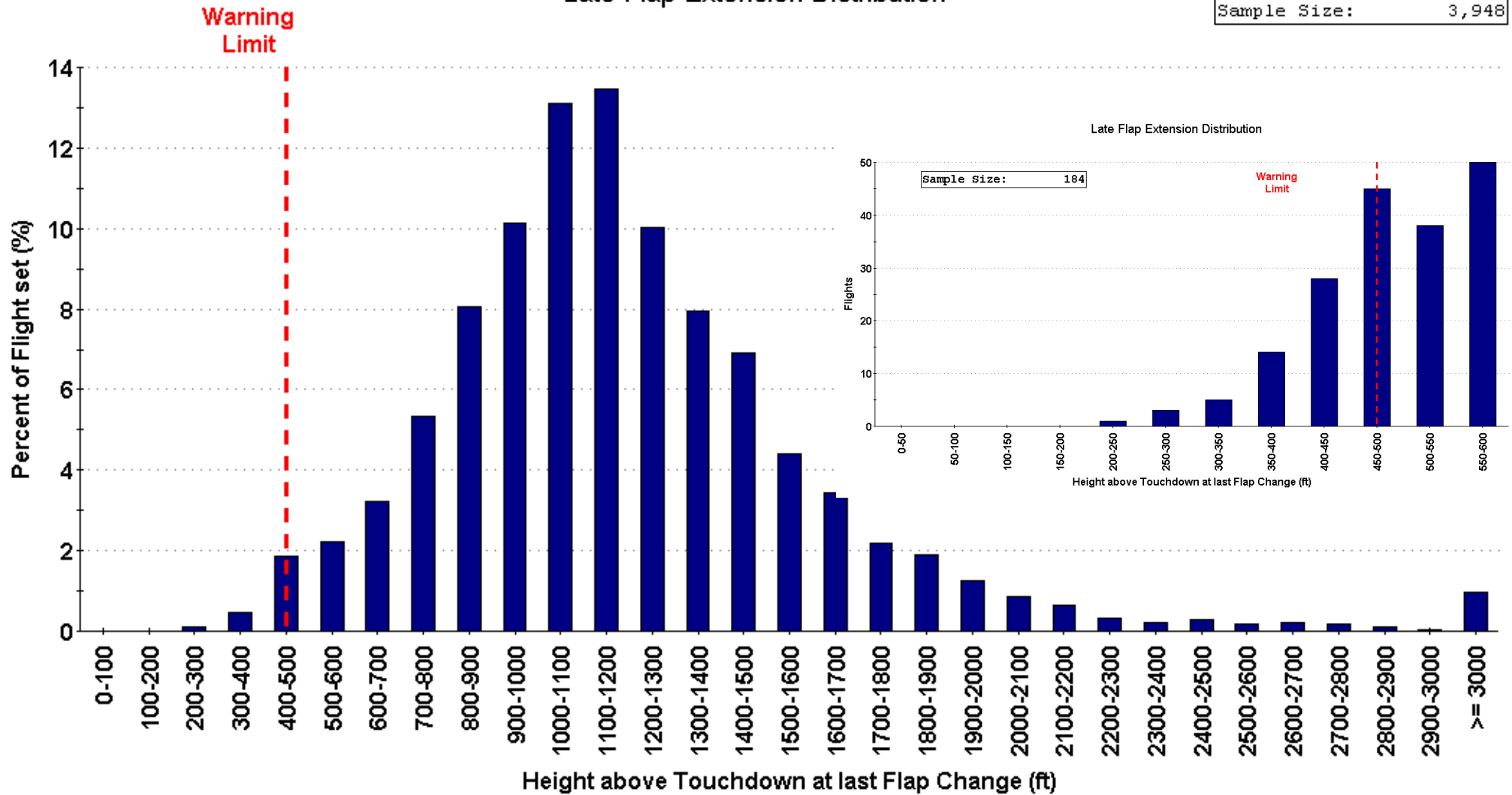
	P43: Max ROD 10'000ft - 5'000 ft HAT (ft/min)	P43: Max ROD 5'000ft - 4'000 ft HAT (ft/min)	P43: Max ROD 4'000ft - 3'000 ft HAT (ft/min)	P43: Max ROD 3'000ft - 2'000 ft HAT (ft/min)	P43: Max ROD 2'000ft - 1'000 ft HAT (ft/min)	P43: Max ROD 1'000 ft HAT - Touchdown (ft/min)
Max Value	6161	4601	4343	3807	3627	3448
Average Value	2229	1701	1582	1420	1270	1059
Min Value	839	540	561	505	547	553

Altitude Segment [ft]

2.7 Late Flap Extension Distribution 2010

Late Flap Extension Distribution

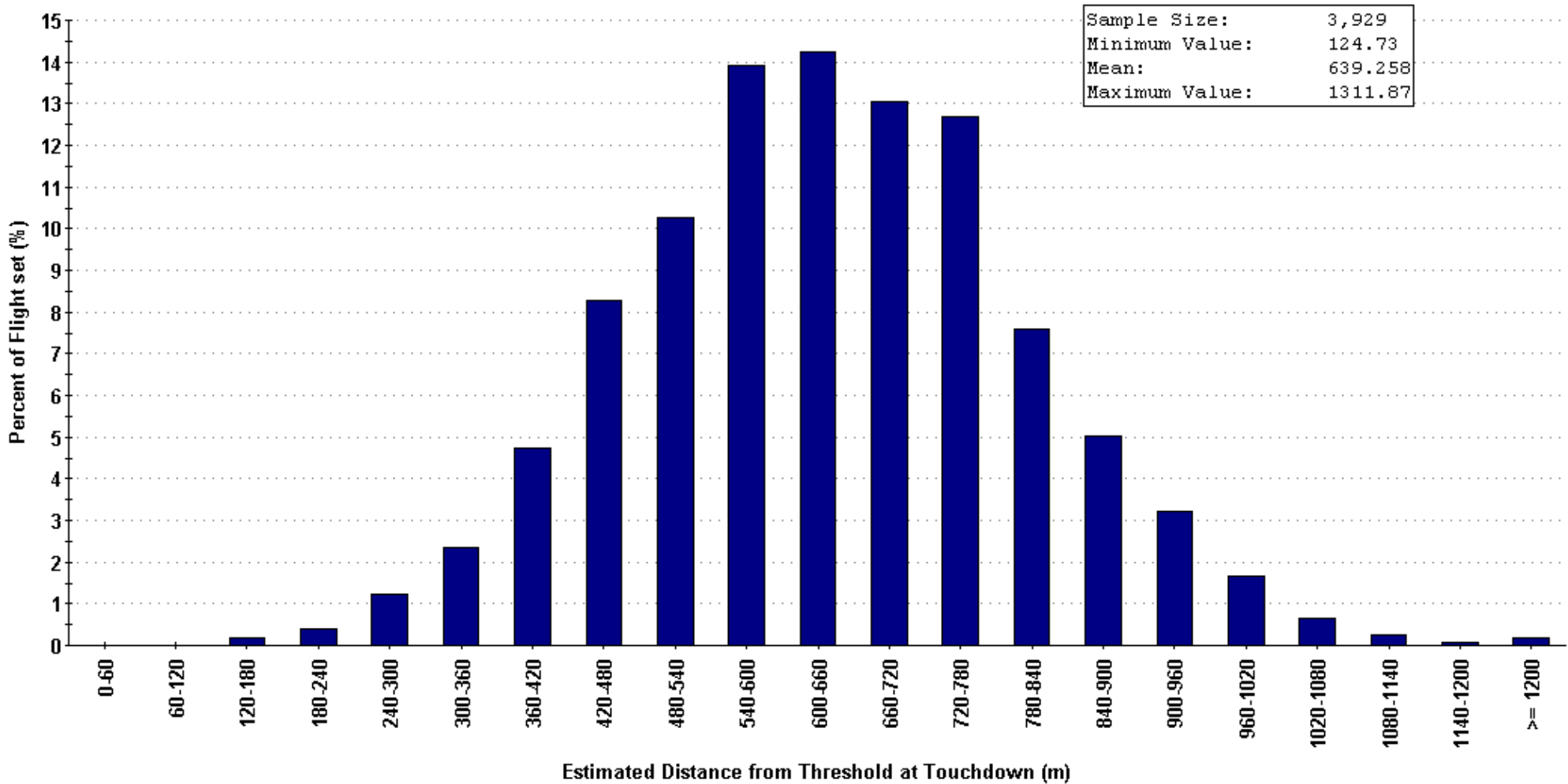
Sample Size: 3,948



3 Cross-Fleet Data Comparison Landing Performance

3.1 Distribution of Distance from Threshold at Touchdown 2010

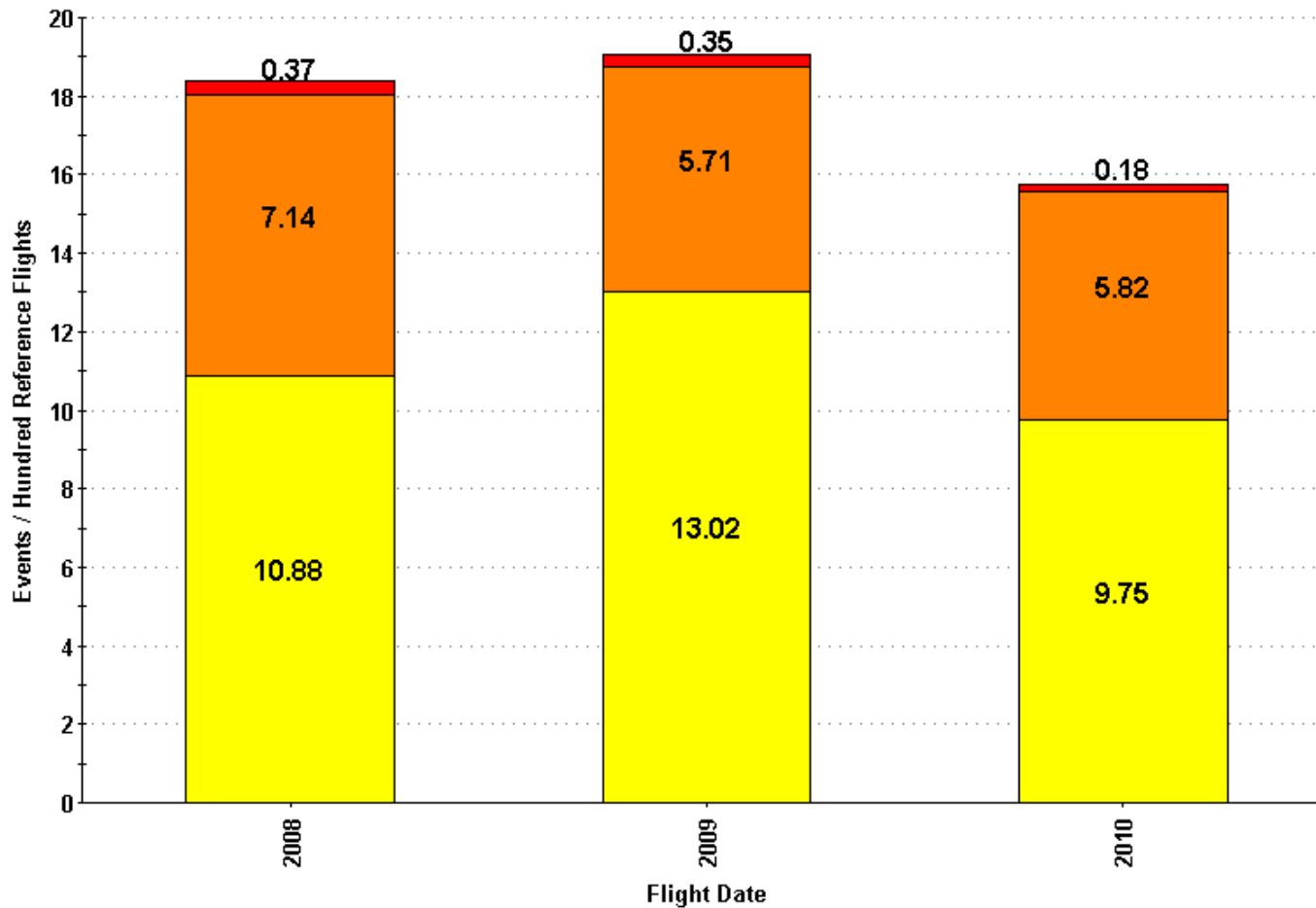
Distribution of Distance from Threshold to Touchdown Year 2010



3.2 Long Landing Event Rates Trend

Long Landing Event Rates

Sample Size: 1,934
 Reference Set Size: 10,954



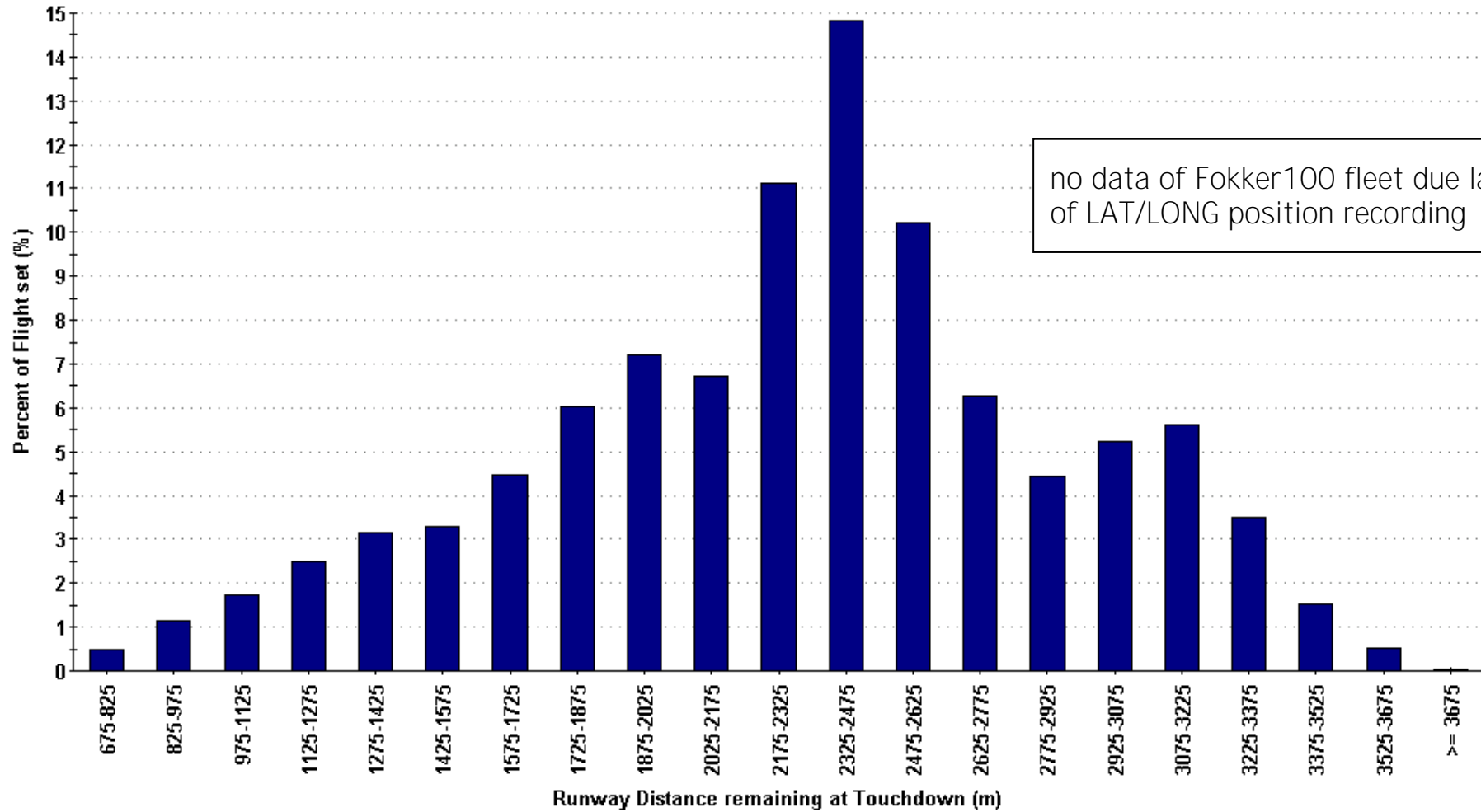
Severity levels:
 Caution = landing distance > 800m
 Warning = landing distance > 900m
 Alert = landing distance > 1'200m

P43: Severity
 Caution Warning Alert

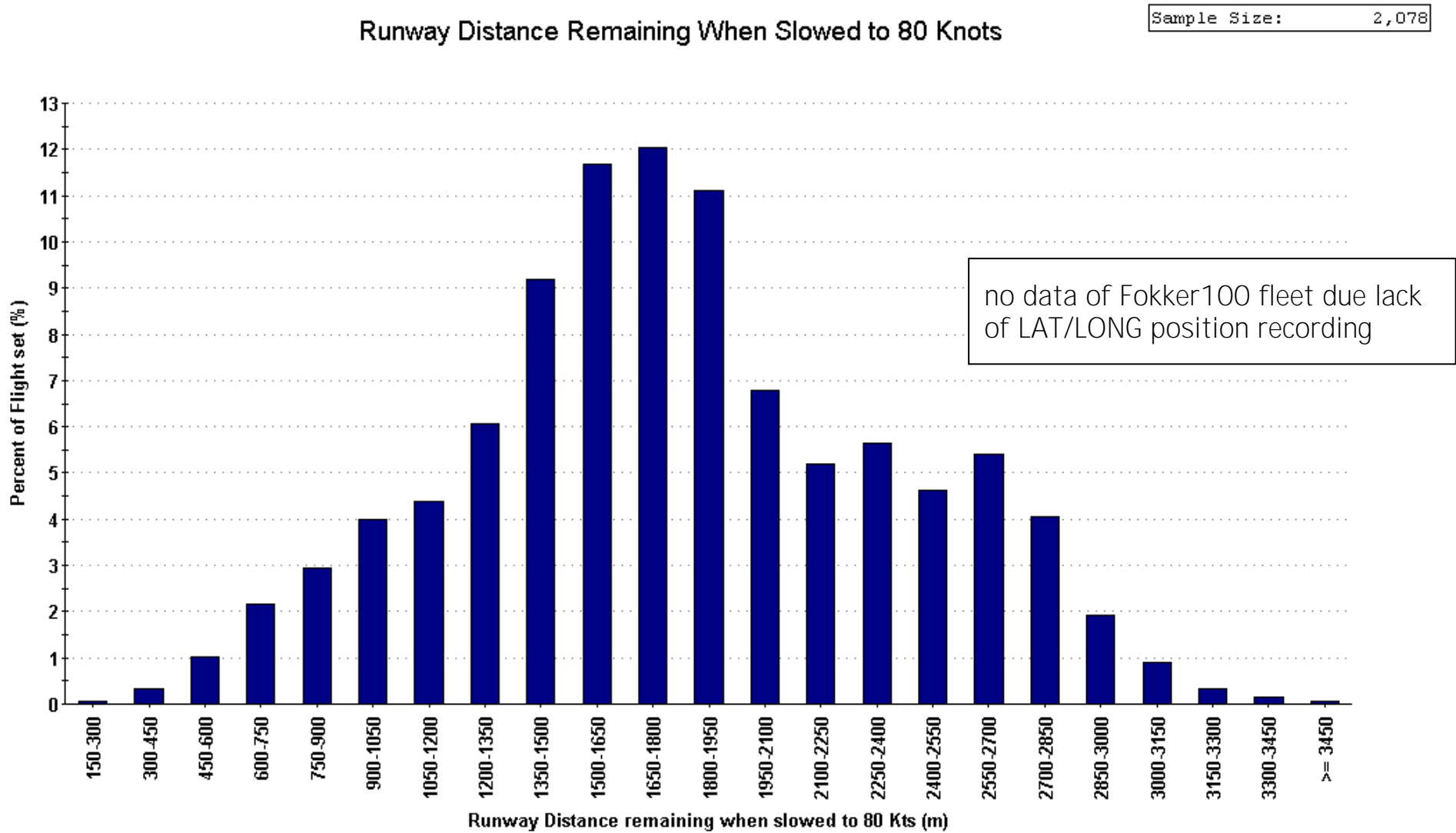
3.3 Distribution of Runway Distance Remaining at Touchdown 2010

Runway Distance Remaining at Touchdown

Sample Size:	2,123
Minimum Value:	685.201
Mean:	2301.06



3.4 Distribution of Runway Remaining When Slowed to 80 Kts 2010



Appendix

Unstable Approach Events -> C-FOQA Standard Event Limits

Unstable Approach Events	Phase of Flight	Measurement Criteria		C-FOQA SEL		units
				Caution	Warning	
Runway Alignment				Caution	Warning	-
1) Above Desired Glide Path	500 ft HAT - 200 ft AGL	One Standard Deviation above Average Glideslope	>	2	-	dots
2) Below Desired Glide Path	500 ft HAT - 200 ft AGL	One Standard Deviation below Average Glideslope	<	-1.3	-3	dots
3) Not Aligned with Runway (Localizer)	500 ft HAT - TD	One Standard Deviation outside Average Localizer	>	1	-	dots
Airspeed						
4) Fast Approach (Airspeed vs. Vapp)	500 ft HAT - 50 ft AGL	One Standard Deviation above Avg (Airspeed - Vapp)	>	20	25	knots
7) Slow Approach (Airspeed vs. Vapp)	500 ft HAT - 50 ft AGL	One Standard Deviation below Avg (Airspeed - Vapp)	<	-10	-	knots
Rate of Descent (ROD)						
9) High Rate of Descent	500 ft HAT - TD	ROD ÷ ROD Limit*	>	0	10	%
Configuration						
11) Final Flap Change is Late	Descent & Approach	HAT at Last Flap Change	<	-	500	feet
12) Final Flaps Not Valid for Landing	Descent & Approach	Final Flap Setting	<	Landing Flaps	-	degrees
13) Gear Extension is Late	Descent & Approach	HAT at Gear Extension	<	1000	500	feet
Aircraft Body Rates						
14) Unsteady in Pitch	500 ft HAT - 100 ft AGL	Standard Deviation of Pitch Rate	>	1.5	-	deg/sec
15) Unsteady in Roll	500 ft HAT - 50 ft AGL	Standard Deviation of Roll Rate	>	4	-	deg/sec
16) Unsteady in Yaw	500 ft HAT - 100 ft AGL	Standard Deviation of Yaw Rate	>	3	-	deg/sec

*Rate of Descent Limit Changes with Altitude and Glide Path Angle and has a Lower Limit of 1200 ft/min