

U.S. Dep't. of Commerce / NMAO / NOAA / Aircraft Operations Center

FLT ID: 201106084	From: KMCF	To: KMCF
FLT #: 11-029	Blk In: 1739 Z	Lnd Time: 1732 Z
ETD: 0800 1200 Z	Blk Out: 1147 Z	T/O Time: 1158 Z
ETE: 7+00	Total Blk: 5.9	Total Flt: 5.6
Sponsoring Org: AOC	Program:	Purpose: WIND CAL

AOC Flight Crew

Aircraft Commander: HALVERSON	Data System: BOSKO
Co-Pilot: GIRIMONTE	Avaps: NEWNAM
Navigator: SLOAN	System Engineer: PAUL/GREEN/SMITH
Flight Eng: DARBY	AA:
Flt Director: SEARS / WILLIAMS / DAMIANO	AA:
Avionics: RICHARDS	Crew Chief:

Participating Scientists, Visitors, & Add'l Aircrew on back. # of people listed on back:

	A/C - Takeoff	Wx Station - Takeoff	A/C - Land	Wx Station - Land
Pressure	1016.2	1016.3	1015.6	1015.4

ATIS - Takeoff

ATIS - Land

Data Source	Number	Data Disposition / Date / Quality
Flight Level Tapes	2	✓
Radar Tapes		
Dropsondes	6	Good: 3 Bad: 2 fastfall one no data
AXBT	✓	

List other data sources on back in Remarks section.

Remarks (Storm Name, Mission ID, Recco Times, Fix Times)

Recco

Times:

Fix #

Fix Time

Storm Name:

WIND CAL

Mission ID:

U.S. Dep't. of Commerce / NMAO / NOAA / Aircraft Operations Center

FLT ID: T/O Time: Z Lnd Time: Z

Name (Last, First)	Activity on Aircraft	Affiliation
SHOOK	INTERN	HOLLINGS
REOLER		
OPATZ	INTERN	HOLLINGS

Remarks:

N42RF ERROR SUMMARY

Wind Calibration



Flight ID: 20110608H1



<u>Sensor or system</u>	<u>Number or Name</u>
INE (for wind derivation)	INE1
Accelerometer	ACC1
Temperature Probe	TT1
Dew Point Probe	TDM2 (EDGETECH)
Static Pressure	PSFX
Dynamic Pressure	PQF1X
Vert. Wind	ALTI1
Constants File	n42_11v4.adc
Project Directory	/acdata/2011/MET/20110608H1

Notes:

There were no data gaps during this flight.

PSF and PQF1 recorded questionable data. From the time period 132458Z – 132648Z, data were modified using direct substitution using the following equations.

$$PSFX = PSW + 3.0$$

$$PQF1X = PQF2 - 0.47$$

4 dropsondes were released during this flight.

Takeoff/Landing data: Data during landing and takeoff are potentially suspect. It is recommended that ground data not be used for scientific analysis.

Wind Calibrations results: Attack Angle

For all levels(3600 points) Slope: **6.108560076** Intercept: **2.277651809**

The program computes a correlation coefficient and it is .997376513 for this data.

Wind Calibration results: Slip Angle

For all levels (832 points) Slope: **7.203803285** Intercept: **0.22**

SPECIAL NOTE!!! The variable names dpj_wgs, dpj_was, and dpj_wz in the netCDF file represent vertical ground, vertical air, and vertical wind speeds respectively, computed using Dave Jorgensen's vertical wind algorithm. It is recommended that these values be used for vertical wind analysis.

	Takeoff 1158Z	Landing 1732Z
Aircraft Static Pressure	1016.2 mb	1015.6 mb
Corrected Tower Pressure	1016.3 mb	1015.4 mb
Flight Director: Ian Sears		(813) 828-3310 ext. 3039

N42RF Calibration Results
From 8 June, 2011 Wind Cal Flight

N42RF flew a 5.6 hour mission on 8 June 2011 the central Gulf of Mexico. Several maneuvers were executed in order to determine the coefficients for the attack and slip angles. Yaw maneuvers were performed at 1500 feet and 15000 feet to provide input for deriving the slope for the aircraft's slip angle. Several speed runs, tracking into and out of the wind, were flown at five pre-determined altitudes. The data collected from these maneuvers were used to determine the slope and intercept for the aircraft's attack angle.

The slow data was stored on the LINUX system (ISIDORE) as well as the HP1000. The prodat2nc program was used to store the flight level as a netCDF file on ISIDORE under `/home/acdata/2011/MET/20110608H1` directory. This allows the NCAR-provided plotting program, NCPlot, to view the flight level data. Furthermore, Zeljko Raic's version of ABD_TPCAL (known as ZR_TPCAL) was used for results and compared with results from the HP1000 version of ABD_TPCAL.

One hundred twenty (120) points were selected for each leg flown into and with the wind for each airspeed (180, 210, 240 IAS), making a total of 240 points per indicated airspeed to make it statistically significant. The following table shows the attack angle coefficients for each of the five altitudes: The results shown are from ZR_TPCAL program because they compared favorably with ABD_TPCAL.

	Slope	Intercept
1500 feet	6.049430206	2.310947286
5000 feet	6.21392188	2.325081919
10000 feet	6.130614438	2.26901094
15000 feet	6.10761194	2.229211816
20000 feet	5.908602347	2.228511788

The above table is for reference purposes only. To obtain the "final" slope and intercept for attack angle all of the selected data points were used as input by ZR_TPCAL. For this calibration flight the slope and intercept for the attack angle are as follows:

For all levels (3600 points) Slope: **6.108560076** Intercept: **2.277651809**

The program computes a correlation coefficient and it is .997376513 for this data.

The input data to determine the slope for the slip angle came from the two yaw maneuvers. A minimum of, but not limited to, 120 points are required per maneuver. ZR_TPCAL computes a slope for the slip angle for each maneuver. For this flight the derived slip angle slopes are as follows:

1500 feet	Slope: 7.080343393	for 442 points
15000 feet	Slope: 7.199720597	for 390 points

As was for the attack angle derivation, both sets of data were entered into the ZR_TPCAL program. The "final" slip angle slope from the 832 points was calculated to be **7.203803285**.

To determine the slip intercept, a subjective technique is employed using plots of wind direction, wind speed and vertical wind from the circle maneuvers conducted at 1500, 5000, 10000, 15000, and 20000 feet. Several plots of the aforementioned parameters were made, varying the intercept value for the slip angle. Through some simple statistics and a "meteorological eyeballing" of the plots, a determination for the slip angle intercept is made. For this flight the slip angle intercept was determined to be **+0.22**. As previously stated this method is very subjective. However it does provide a hands-on view of what is happening to the horizontal and vertical wind values when the value for the slip angle intercept is modified.

ALL

SD =

TACK ANGLE TIMES				RESULTS								
START TIME	STOP TIME	APDAP	PTCHI	SX	SY	XX	YY	XY	KOUNT	SLOPE	INTERCEPT	COR
123038	123136			-168.864	7168.028	176.1371	20582.37	691.33	3600	6.108560076	2.277651809	0.997376513
123240	123340											
123927	124126											
124500	124546											
124557	124709											
125351	125423											
125503	125555											
125620	125653											
130244	130443											
131045	131244											
131932	132055											
132128	132203											
132747	132807											
132930	133108											
133641	133840											
134453	134652											
140316	140515											
141020	141219											
141822	142021											
142417	142455											
142630	142750											
143151	143234											
143304	143308											
143319	143429											
143846	143958											
144025	144111											
145302	145501											
150044	150214											
150233	150301											
152035	152134											
152308	152407											
152812	152852											
152838	153056											
153305	153351											
153453	153605											
154012	154047											
154135	154223											
154247	154321											
155418	155426											
155518	155555											
155713	155825											
160322	160358											
160455	160617											
161454	161653											
162257	162456											
163415	163614											
164002	164201											
165340	165539											
170155	170354											

-166.8518 | 176.1371 | 693.60364 | 6.095218 | 2.277088 | 0.997387

7168.1748 | 20582.5015

SD = .095708

BACK ANGLE TIMES

RT TIME	STOP TIME	AP/DAP	PT/CHH
123038	123136		
123240	123340		
123827	124126		
124500	124546		
124557	124708		
123581	129423		
125503	125555		
125620	125653		
130244	130443		
131045	131244		
131932	132055		
132128	132203		
132747	132807		
132830	133108		
133641	133840		
134453	134652		
140316	140515		
141020	141219		
141822	142021		
142417	142455		
142830	142750		
143151	143234		
143304	143308		
143319	143429		
143946	143958		
144025	144111		
145302	145501		
150044	150214		
150233	150301		
152035	152134		
152308	152407		
152812	152852		
152938	153056		
153305	153351		
153453	153605		
154012	154047		
154135	154223		
154247	154321		
155418	155426		
155518	155555		
155713	155825		
160322	160358		
160455	160817		
161454	161653		
162257	162456		
163415	163814		
164002	164201		
165340	165539		
170155	170354		

SX	SY	XX	YY	XV	KOUNT	SLOPE	INTRCEPT	COR
-168.864	7168.029	176.1371	20562.37	691.33	3600	6.108560076	2.277551809	0.997376513

RESULTS

1500

BACK ANGLE TIMES				RESULTS									
START TIME	STOP TIME	AP/DAP	PITCH										
141822	142021			1500H									
142417	142455			SX	SY	XX	YY	XV		KOUNT	SLOPE	INTERCEPT	COR
142630	142750			-31.8657	1471.113	30.75928	4083.143	112.3999		720	6.048430206	2.310947286	0.998363367
143151	143234												
143304	143308												
143319	143429												
143946	143958												
144025	144111												
145302	145501												
150044	150214												
150233	150301												

-31.86222 } 30.97794 } 112.78310 } 6.039810 } 2.310955 } 0.998371
 1471.1469 } 4083.2520

142001 - 14 ²⁴⁰⁰ ~~2400~~ owe men .07000 +.685
 141951 from 90/220 ~~-.518~~

140
 146
 97

5000

BACK ANGLE TIMES									
START TIME STOP TIME					RESULTS				
AP/DAP	PTCH	SX	SY	XX	YY	XV	KOUNT	SLOPE	INTERCEPT
131932	132055								
132126	132203	-8.17584	1623.255	33.20589	4942.956	187.3293	720	6.21392188	2.325081919
132747	132807								
132930	133108								
133641	133840								
134453	134652								
140316	140515								
141020	141219								

-8.11664

33.25263

787.92349

6.250117

2.32445

0.998167

1623.2803

4943.0520

Cuñen
134550 → 140340

boof +

TACK ANGLE TIMES								RESULTS			
START TIME	STOP TIME	AP/DAP	PITCH	SX	SY	XX	YY	XV	KOUNT	SLOPE	INTERCEPT
123038	123136			16.2187	1733.118	38.15821	5595.6	270.5988	720	6.13061438	2.26907094
123240	123340										0.998524681
123827	124126										
124500	124548										
124557	124709										
125351	125423										
125503	125555										
125620	125653										
130244	130443										
131045	131244										

16.33781
 1733.1465
 38.31842
 5595.7217
 271.42926
 6.116361
 2.268355
 0.998576

15002

JACK ANGLE TIMES					RESULTS				
START TIME	STOP TIME	AP/DAP	PITCH		SX	SY	XX	YY	XY
152035	152134				60.4294	1235.953	34.10799	3210.133	73.80847
152308	152407								
152812	152852								
152938	153058								
153305	153351								
153453	153605								
154012	154047								
154135	154223								
154247	154321								
155418	155426								
155518	155555								
155713	155828								
160022	160358								
160455	160617								

-60.48815
 1235.9834
 34.24003
 3210.2275
 73.88014
 6.0794816
 2.228683
 0.9975523

Plots:

180 kts

1,500 feet

Into/With Wind

Begin leg:

Begin Time: 141822 End Time: 142021

Begin Time: _____ End Time: _____

End leg:

Begin Time: _____ End Time: _____

180 kts

1,500 feet

With/Into Wind

Begin leg:

Begin Time: 142417 End Time: 142455Begin Time: 142630 End Time: 142750

End leg:

Begin Time: _____ End Time: _____

210 kts

1,500 feet

Into/With Wind

Begin leg:

Begin Time: 143151 End Time: 143234Begin Time: 143304 End Time: 143308

End leg:

Begin Time: 143319 End Time: 143429

210 kts

1,500 feet

With/Into Wind

Begin leg:

Begin Time: 143846 End Time: 143958Begin Time: 144025 End Time: 144111

End leg:

Begin Time: _____ End Time: _____

240 kts

1,500 feet

Into/With Wind

Begin leg:

Begin Time: 145302 End Time: 145501

Begin Time: _____ End Time: _____

End leg:

Begin Time: _____ End Time: _____

240 kts

1,500 feet

With/Into Wind

Begin leg:

Begin Time: 150044 End Time: 150214Begin Time: 150233 End Time: 150301

End leg:

Begin Time: _____ End Time: _____

180 kts	Begin Time:	<u>131932</u>	End Time:	<u>132055</u>
5,000 feet				
Into/With Wind	Begin Time:	<u>132128</u>	End Time:	<u>132203</u>
Begin leg:				
End leg:	Begin Time:		End Time:	

180 kts	Begin Time:	<u>132747</u>	End Time:	<u>132807</u>
5,000 feet				
With/Into Wind	Begin Time:	<u>132930</u>	End Time:	<u>133108</u>
Begin leg:				
End leg:	Begin Time:		End Time:	

210 kts	Begin Time:	<u>133641</u>	End Time:	<u>133840</u>
5,000 feet				
Into/With Wind	Begin Time:		End Time:	
Begin leg:				
End leg:	Begin Time:		End Time:	

210 kts	Begin Time:	<u>134453</u>	End Time:	<u>134652</u>
5,000 feet				
With/Into Wind	Begin Time:		End Time:	
Begin leg:				
End leg:	Begin Time:		End Time:	

240 kts	Begin Time:	<u>140316</u>	End Time:	<u>140515</u>
5,000 feet				
Into/With Wind	Begin Time:		End Time:	
Begin leg:				
End leg:	Begin Time:		End Time:	

240 kts	Begin Time:	<u>141020</u>	End Time:	<u>141219</u>
5,000 feet				
With/Into Wind	Begin Time:		End Time:	
Begin leg:				
End leg:	Begin Time:		End Time:	

180 kts
10,000 feet
Into ~~With~~ Wind
Begin leg: Begin Time: 123038 End Time: 123136
Begin leg: Begin Time: 123240 End Time: 123340
End leg: Begin Time: _____ End Time: _____

180 kts
10,000 feet
With ~~Into~~ Wind
Begin leg: Begin Time: 123927 End Time: 124126
Begin leg: Begin Time: _____ End Time: _____
End leg: Begin Time: _____ End Time: _____

210 kts
10,000 feet
~~Into~~ With Wind
Begin leg: Begin Time: 124500 End Time: 124546
Begin leg: Begin Time: 124557 End Time: 124709
End leg: Begin Time: _____ End Time: _____

210 kts
10,000 feet
~~With~~ Into Wind
Begin leg: Begin Time: 125351 End Time: 125423
Begin leg: Begin Time: 125503 End Time: 125555
End leg: Begin Time: 125620 End Time: 125653

240 kts
10,000 feet
Into ~~With~~ Wind
Begin leg: Begin Time: 130244 End Time: 130443
Begin leg: Begin Time: _____ End Time: _____
End leg: Begin Time: _____ End Time: _____

240 kts
10,000 feet
With ~~Into~~ Wind
Begin leg: Begin Time: 131045 End Time: 131244
Begin leg: Begin Time: _____ End Time: _____
End leg: Begin Time: _____ End Time: _____

180 kts
15,000 feet
Into/With Wind
Begin leg: Begin Time: 152035 End Time: 152134
Begin Time: 152308 End Time: 152407
End leg: Begin Time: _____ End Time: _____

180 kts
15,000 feet
With/Into Wind
Begin leg: Begin Time: 152812 End Time: 152852
Begin Time: 152938 End Time: 153056
End leg: Begin Time: _____ End Time: _____

210 kts
15,000 feet
Into/With Wind
Begin leg: Begin Time: 153305 End Time: 153351
Begin Time: 153453 End Time: 153605
End leg: Begin Time: _____ End Time: _____

210 kts
15,000 feet
With/Into Wind
Begin leg: Begin Time: 154012 End Time: 154047
Begin Time: 154135 End Time: 154223
End leg: Begin Time: 154247 End Time: 154321

240 kts
15,000 feet
Into/With Wind
Begin leg: Begin Time: 155418 End Time: 155426
Begin Time: 155518 End Time: 155555
End leg: Begin Time: 155713 End Time: 155825

240 kts
15,000 feet
With/Into Wind
Begin leg: Begin Time: 160322 End Time: 160358
Begin Time: 160455 End Time: 160617
End leg: Begin Time: _____ End Time: _____

180 kts	Begin Time:	<u>161454</u>	End Time:	<u>161653</u>
20,000 feet	Begin Time:		End Time:	
Into/With Wind	Begin Time:		End Time:	
Begin leg:	Begin Time:		End Time:	
End leg:	Begin Time:		End Time:	

180 kts	Begin Time:	<u>162257</u>	End Time:	<u>162456</u>
20,000 feet	Begin Time:		End Time:	
With/Into Wind	Begin Time:		End Time:	
Begin leg:	Begin Time:		End Time:	
End leg:	Begin Time:		End Time:	

210 kts	Begin Time:	<u>163415</u>	End Time:	<u>163614</u>
20,000 feet	Begin Time:		End Time:	
Into/With Wind	Begin Time:		End Time:	
Begin leg:	Begin Time:		End Time:	
End leg:	Begin Time:		End Time:	

210 kts	Begin Time:	<u>164002</u>	End Time:	<u>164201</u>
20,000 feet	Begin Time:		End Time:	
With/Into Wind	Begin Time:		End Time:	
Begin leg:	Begin Time:		End Time:	
End leg:	Begin Time:		End Time:	

240 kts	Begin Time:	<u>165340</u>	End Time:	<u>165539</u>
20,000 feet	Begin Time:		End Time:	
Into/With Wind	Begin Time:		End Time:	
Begin leg:	Begin Time:		End Time:	
End leg:	Begin Time:		End Time:	

240 kts	Begin Time:	<u>170155</u>	End Time:	<u>170354</u>
20,000 feet	Begin Time:		End Time:	
With/Into Wind	Begin Time:		End Time:	
Begin leg:	Begin Time:		End Time:	
End leg:	Begin Time:		End Time:	

PAGE _____ **OF** _____

FIX TYPES

(G) - GPS (I) - INS (R) - RADIO (V) - VISUAL (C) - CELESTIAL (D) - DR

[illegible]