National Transportation Safety Board
Office of Research and Engineering
Washington, D.C. 20594

Airplane Performance Study

Specialist Report
Timothy Burtch

A. ACCIDENT

Location:	Riverwoods, IL
Date:	November 28, 2011
Time:	2250 CST
Airplane:	Piper PA-31-350 Chieftain
NTSB Number:	CEN12FA086

B. GROUP

No airplane performance group was formed.

C. SUMMARY

On November 28, 2011, about 2250 Central Standard Time (CST), Lifeguard N59773, a Piper PA-31-350 Chieftain and an emergency medical services flight operated by Trans North Aviation Ltd, sustained substantial damage when it impacted trees and terrain in Riverwoods, Illinois. The pilot declared an emergency, reported that the airplane was out of fuel, and that the flight was coasting direct to the destination airport[1], Chicago Executive Airport (PWK), near Wheeling, Illinois. The airline transport pilot and two passengers sustained fatal injuries. The pilot-rated passenger and medical crewmember received serious injuries. The non-scheduled domestic, on-demand, passenger flight was conducted under 14 Code of Federal Regulations Part 135. Night visual meteorological conditions prevailed at the time of the accident.

An active instrument flight rules (IFR) flight plan was on file for the flight. The flight departed from Jesup-Wayne County Airport (JES) near Jesup, Georgia, about 1858 CST.

[1] N59773 was being vectored for the PWK ILS 16 approach due to a 1400 ft ceiling and was planning to circle-to-land on runway 34.

D. PERFORMANCE STUDY

The performance study describes the airplane ground track and basic flight planning for the accident flight as well as the other flight legs for 11/28/2011. The study will include fuel burn estimates for each leg using estimated airplane performance for the Piper Chieftain[2], data from the on-board Garmin GPSMAP 396, and radar data[3].

Times in the study are also reported in Greenwich Mean Time (GMT or "Z"): CST = GMT – 6 hr and Eastern Standard Time, EST = GMT – 5 hr.

Weather Observation

The accident site was approximately 2.5 nautical miles (NM) north of PWK. See Figure 2. PWK has a field elevation of 647 feet above mean sea level and a magnetic variation of 2˚ west. Two weather observations recorded around the time of the accident (2250 CST) are as follows. (Note: cloud heights are reported above ground level or agl.)

201111290452 METAR KPWK 290452Z 35009KT 10SM OVC014 02/M02 A2999
PWK weather at **2252 CST**, wind 350 at 9 kt, visibility 10 miles, an overcast ceiling at 1400 ft agl, temperature 2˚ Celsius (C), dew point -2˚C, altimeter 29.99 in Hg.

201111290352 METAR KPWK 290352Z 01007KT 10SM OVC014 02/M02 A3003
PWK weather at **2152 CST**, wind 010 at 7 kt, visibility 10 miles, an overcast ceiling at 1400 ft agl, temperature 2˚ Celsius (C), dew point -2˚C, altimeter 30.03 in Hg.

Airplane Ground Track

Figure 3 shows the radar ground track for the four flight legs that N59773 flew on 11/28/2011. The day started with a departure from Crawfordsville Municipal Airport (CFJ) in Indiana at approximately 0650 CST and ended with the accident near Chicago Executive Airport in Illinois at 2250 CST. There were two stops in Georgia for full fuel, one southbound at Perry-Houston County Airport (PXE) and one northbound at Jesup-Wayne County Airport. The ultimate southbound destination was Palm Beach International Airport (PBI) in Florida to pick up two passengers and to add 75 gal of fuel.

Figure 4 lists the approximate departure and arrival times for each of the four legs, as well as the duration of each.

[2] The Piper Chieftain is a stretched version of the Navajo with more powerful 350-hp (261-kW) engines that rotate in opposite directions (a Lycoming TIO-540 and a Lycoming LTIO-540) to eliminate engine / propeller roll and yaw effects. See Figure 1.
[3] Radar data from FlightAware were used to estimate the enroute times.

Basic Flight Planning and Fuel Burn Estimates

While original flight planning records for the accident could not be found, FltPlan.com, the online service used by the accident pilot, was able to re-create the navigation logs for the investigation. These are contained in Figures 5 through 8.

According to the FltPlan navigation logs, the 182 gal of useable fuel[4] available for the Piper Chieftain should have been sufficient for all flight legs that day. The final leg from KJES to KPWK would have required the most fuel, especially at the lower altitudes where the tailwind was lighter and where true airspeed is typically lower[5]. For example, Figure 8 shows an estimated 138.6 gal of fuel required at 6000 ft and 134.1 gal at 8000 ft. (The average cruise altitude for N59773 was approximately 8000 ft.) It should be noted that the FltPlan calculations assume fuel burn rates between 34-37 gal/hr for cruise. Similarly, the Chieftain Pilot's Operating Manual (POM) quotes 26-35 gal/hr (depending on the power setting) with the engines leaned to best economy.

Actual fuel burn estimates based on radar data for the accident flight leg as well as the other flight legs that day are presented in Figure 9. The radar times used in the figure are the same as or slightly longer than the corresponding GPS times documented in the Specialist's GPS Factual Report. As a result, the fuel burn estimates presented in the figure are lower[6] than those derived from the GPS times. The average actual fuel burn computed for the 11/28/11 flight legs is 47 gal/hr[7].

Fuel Receipts

Trans North Aviation fuel records recovered from the wreckage indicate that the airplane was topped with fuel at Crawfordsville Municipal Airport, Perry-Houston County Airport, and Jesup-Wayne County Airport. The fuel records also indicate that only 75 gal of fuel was added at Palm Beach International Airport. Based on the full fuel load that was added at Jesup-Wayne County Airport following Palm Beach, the 75 gal added at KPBI was only enough to make it to KJES and did not include the necessary 45 minute fuel reserve. A nominal fuel burn rate of 30 gal/hr would dictate landing with a minimum of 22.5 gal of fuel to meet the IFR fuel reserve requirement: with the Chieftain's182 gal of usable fuel, the

[4] The Piper Chieftain POM describes four flexible fuel cells, two in each wing panel. The outboard cells hold 40 gal each and the inboard cells hold 56 gal each, providing a total of 192 gal. Of the 192 gal, only 182 gal are usable.
[5] The FltPlan navigation logs indicate that the winds were generally out of the south at 15 to 20 kt at the altitudes the airplane was flying. A 25 mph southerly wind is also consistent with the actual ground speeds computed in Figure 9 using the nominal cruise speed of 175 kt that was programmed into the recovered GPSMAP 396. True airspeed is greater than indicated airspeed by approximately 2% per thousand feet of altitude.
[6] Lower in this case is conservative because the fuel burn estimates are to determine if a case of fuel exhaustion can be supported. In other words, a higher fuel burn estimate would result in an even stronger case for fuel exhaustion.
[7] N59773 had one engine that was new and still within the break-in period. It is typical to run a new engine at higher power settings and at extra rich fuel-to-air mixtures. This is one possible explanation for the higher than expected fuel burn rates. Another possible explanation is the 50,000 BTU Janitrol heater that is installed in the right nose section for cabin heating and windshield defrosting. The heater is supplied with fuel from the right side tanks and burns fuel at a maximum rate of 0.65 gph. The surviving pilot-rated passenger reported that the Janitrol heater was in use.

maximum fuel that should be added after a flight conducted under instrument flight rules is 159.5 gal. N59773 added 167.3 gal and 165.0 gal at Perry-Houston County Airport and Jesup-Wayne County Airport, respectively[8].

Finally, a comparison of the initial flight leg, KCFJ to KPXE, to the final leg, KJES to KPWK, may provide some insight into the pilot's fuel planning strategy. The initial 473 NM leg from KCFJ to KPXE was subject to a 20 kt headwind and used 167.3 gal of fuel. The final leg from KJES to KPWK was 696 NM but benefited from a 20 kt tailwind. Based on distance alone, fuel exhaustion on the final leg would be predicted. However, the tailwind made a non-stop from Jesup-Wayne County Airport to Chicago Executive Airport a possibility, albeit close. A factor that the accident pilot may not have considered was the additional air traffic control (ATC) vectoring over Lake Michigan that was required because of traffic in the Chicago area. The pilot ultimately declared an emergency and requested priority handling from ATC. However, the airplane was already out of fuel.

Timothy Burtch
Specialist – Airplane Performance
National Transportation Safety Board

[8] A post-accident comparison of fuel prices between KPBI and KJES shows that the cost of re-fueling at KPBI would have been approximately $500 higher than at KJES: on 2/7/2011, the KJES 100LL price was $5.15/gal while the KPBI 100LL price was $8.21/gal. The 59% higher fuel price may explain why the pilot chose only to top the tanks with enough fuel to reach Jesup-Wayne County Airport before departing Palm Beach. As one PBI pilot commented, "(I) would HIGHLY recommend avoiding PBI at all costs ... because it WILL cost."

E. Figures

Figure 1: Accident Airplane N59773, a Piper PA-31-350 Chieftain

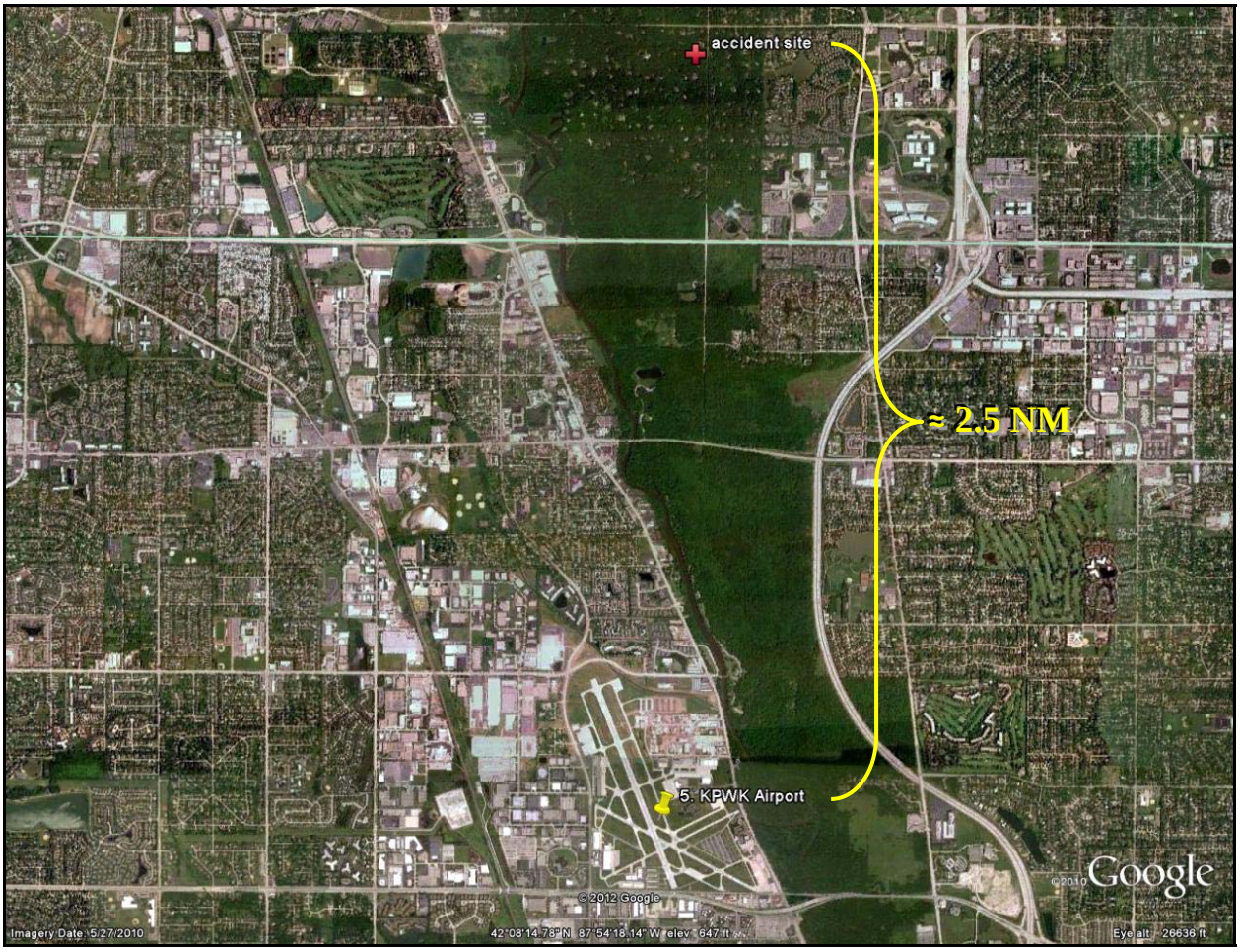

Figure 2: Location of Accident Site Relative to Destination Airport

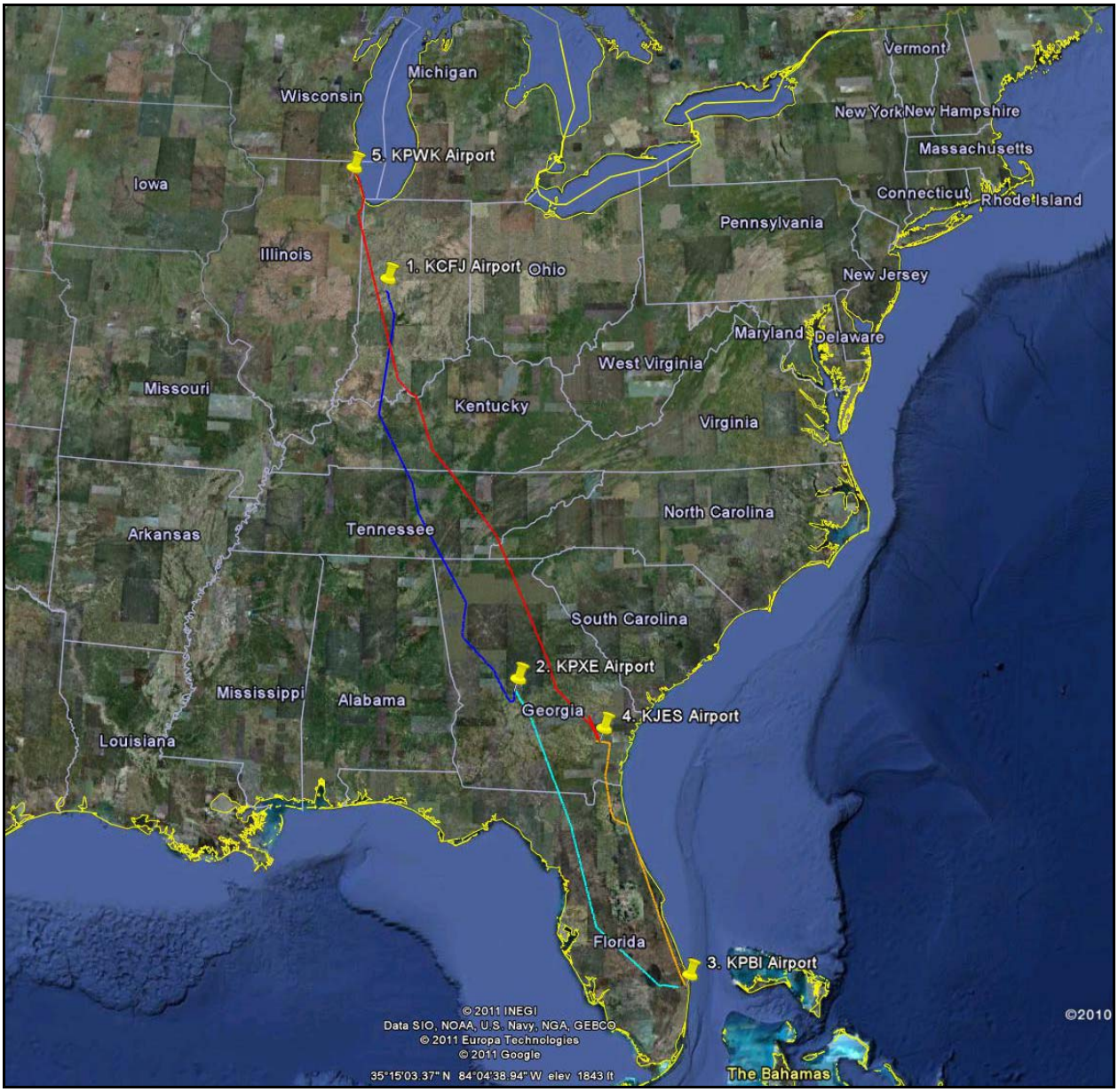

Figure 3: N59773 Recorded Radar Data from November 28, 2011

Leg	Origin	Destination	Approximate Departure	Approximate Arrival	Duration
1	Crawfordsville Muni (KCFJ)	Perry-Houston County (KPXE)	07:51 EST	11:28 EST	3:37
2	Perry-Houston County (KPXE)	Palm Beach Intl (KPBI)	12:01 EST	14:54 EST	2:53
3	Palm Beach Intl (KPBI)	Jesup-Wayne County (KJES)	17:53 EST	19:36 EST	1:43
4	Jesup-Wayne County (KJES)	Chicago Executive (KPWK)	19:58 EST	22:39 CST	3:41

Figure 4: N59773 Estimated Flight Leg Times from Radar

Navigation Log	FltPlan.com	Monday 11-28-11 Dept: 0700L - Arr: 1013L

IFR	N59773	Type:PA31/G	175Kts	Dep: KCFJ
Dept: 1200Z	7,000	ROUTE (see below)		
Dest: KPXE	ETE: 3:13			
FOB: 0415	Altn: KMCN		SOB: 3	Color: W/B

Clnc: 888-766-8267 (46)
FSS: 800-992-7433 (1-46)

Elev:799 CTAF: 122.8

DIRECT
KCFJ to KPXE : TC=162° : (FMS winds: 162°/ 28) : MC= 164° : ST. LINE=**473nm** : AIRWAY=**473nm** : Extra=**0%**

Imagery Sectionals Jet Airways Victor Airways Route Map

Winds Aloft	FL090 ISA(-03) Comp	FL070 ISA(+01) Comp	FL050 ISA(+05) Comp	FL030 ISA(+09) Comp
KPXE0400	134/031 +04 -028	132/028 +01 -025	118/029 N/A -022	092/032 N/A -015
KPXE0350	142/040 +04 -039	139/039 +01 -037	129/037 N/A -033	111/034 N/A -024
KPXE0300	143/045 +04 -043	139/041 +01 -038	131/035 N/A -031	119/029 N/A -022
KPXE0250	147/048 +04 -047	141/043 +01 -041	136/036 N/A -034	132/028 N/A -025
KPXE0200	221/034 +02 -020	088/029 -02 -010	097/024 -08 -011	103/016 N/A -009
KPXE0150	242/028 +01 -007	253/023 -03 -001	266/019 -08 +004	273/015 N/A +005
KPXE0100	205/052 +04 -041	218/038 -02 -024	231/028 -08 -012	240/022 N/A -006
KPXE0050	179/057 +03 -055	192/043 -03 -039	204/033 N/A -026	215/027 N/A -018
Avg. Trip Winds=>	- 35 Headwind	- 28 Headwind	- 21 Headwind	- 15 Headwind
FLT TIME==>	**3:18(+05) 178TAS**	**3:13(+00) 175TAS**	**3:11(-02) 171TAS**	**3:07(-06) 168TAS**
Fuel Burn==>	**125.0 Gal.**	**122.0 Gal.**	**120.8 Gal.**	**118.1 Gal.**

FIX	ST	LAT/LON	InB/Out	Leg	Rem	Fuel Burn Leg	Fuel Burn Tot.	Leg|	Rem	ETE	WX
KCFJ CRAWFORDSVIL	IN	N3958.5W08655.2	---/162	0	473	3.0	3	0:00|	3:13	0:00	
KPXE0400		N3849.7W08623.5	162/163	73	400	22.4	25	0:31|	2:42	0:31	122.0
KPXE0350		N3802.5W08602.4	163/163	50	350	12.7	38	0:21|	2:21	0:52	122.0
KPXE0300		N3715.3W08541.7	163/163	50	300	13.2	51	0:22|	1:59	1:14	122.0
KPXE0250		N3628.0W08521.5	163/163	50	250	13.2	65	0:22|	1:37	1:36	122.0
KPXE0200		N3540.6W08501.7	163/163	50	200	11.9	76	0:20|	1:17	1:56	122.0
KPXE0150		N3453.2W08442.2	163/164	50	150	10.4	87	0:18|	0:59	2:14	122.0
KPXE0100		N3405.8W08423.1	164/164	50	100	10.8	98	0:18|	0:41	2:32	122.0
KPXE0050		N3318.3W08404.4	165/165	50	50	12.1	110	0:21|	0:20	2:53	122.0
KPXE PERRY	GA	N3230.6W08346.0	165/---	50	0	12.2	122	0:20|	0:00	3:13	

EL:418 AWOS: 123.82 CTAF: 122.7 Fuel hourly method: 124

ALTN: KMCN MIDDLE GEORGIA RGNL MACON ,GA BRG:32 **NM:12** Time 10 **Fuel: 6**

PERRY-HOUSTON 122.7
478-988-3699

AWOS : 478-987-8768

FSS Arrival Airport
800-992-7433 (1-42-1)

11/28	Sunrise	Sunset
KCFJ	7:47	17:24
KPXE	7:16	17:30

TRIP NOTES:

Figure 5: N59773 Re-created Navigation Log – KCFJ to KPXE

Navigation Log	FltPlan.com	Monday 11-28-11 Dept: 1046L - Arr: 1328L

IFR	N59773	Type:PA31/G	175Kts	Dep: KPXE
Dept: 1546Z	7,000	ROUTE (see below)		
Dest: KPBI	ETE: 2:42			
FOB: 0415	Altn: KFXE		SOB: 3	Color: W/B

AWOS:123.82

Clnc:121.72 (GCO)
FSS: 800-992-7433 (1-42-1)

Elev:418 CTAF: 122.7

DIRECT
KPXE to KPBI : TC=152° : (FMS winds: 152°/ 23) : MC= 155° : ST. LINE=**399nm** : AIRWAY=**399nm** : Extra=**0%**

Imagery Sectionals Jet Airways Victor Airways Route Map

Winds Aloft	FL090 ISA(-03) Comp	FL070 ISA(+01) Comp	FL050 ISA(+05) Comp	FL030 ISA(+09) Comp
KPBI0300	191/048 +08 -040	192/045 +03 -037	197/039 N/A -029	207/029 N/A -018
KPBI0250	211/038 +08 -022	213/036 +05 -019	218/031 +04 -015	221/026 N/A -011
KPBI0200	196/036 +09 -028	194/035 +06 -027	193/031 N/A -025	192/025 N/A -020
KPBI0150	208/027 +09 -017	207/027 +07 -017	203/025 +05 -017	195/021 N/A -016
KPBI0100	202/026 +10 -017	201/027 +07 -019	195/026 +05 -020	184/023 N/A -020
KPBI0050	219/020 +11 -009	212/021 +08 -011	200/020 +05 -014	182/020 N/A -018
Avg. Trip Winds=>	- 24 Headwind	- 23 Headwind	- 21 Headwind	- 18 Headwind
FLT TIME==>	**2:41(-01) 178TAS**	**2:42(+00) 175TAS**	**2:43(+01) 171TAS**	**2:41(-01) 168TAS**
Fuel Burn==>	**103.5 Gal.**	**104.3 Gal.**	**104.3 Gal.**	**102.8 Gal.**

FIX	ST	LAT/LON	InB/Out	Leg	Rem	Fuel Burn Leg	Fuel Burn Tot.	Leg	Rem	ETE	WX
KPXE PERRY	GA	N3230.6W08346.0	---/154	0	399	3.0	3	0:00	2:42	0:00	
KPBI0300		N3104.3W08248.9	154/154	99	300	30.9	34	0:45	1:57	0:45	122.0
KPBI0250		N3020.6W08220.6	155/155	50	250	12.4	46	0:21	1:36	1:06	122.0
KPBI0200		N2936.8W08152.8	155/155	50	200	11.8	58	0:19	1:17	1:25	122.0
KPBI0150		N2852.9W08125.4	156/157	50	150	11.7	70	0:20	0:57	1:45	122.0
KPBI0100		N2808.9W08058.4	157/157	50	100	11.3	81	0:19	0:38	2:04	122.0
KPBI0050		N2724.8W08031.8	158/158	50	50	11.0	92	0:19	0:19	2:23	122.0
KPBI 115.7 W. PALM BCH	FL	N2641.0W08005.7	158/---	50	0	12.2	104	0:19	0:00	2:42	

EL:20 Atis: 123.75 Twr: 119.1 Gnd: 121.9 Fuel hourly method: 105

ALTN: KFXE FORT LAUDERDALE EXECUTIVE FT LAUDERDLE,FL BRG:194 **NM:29** Time 18 **Fuel: 11**

GALAXY AVIATION 131.42
866-450-6724
NOISE RESTRICTION
561-471-7467

JET AVIATION-AVIT 130.37
800-538-0724
ASOS : 561-683-2548

SIGNATURE FSO 128.97
561-478-8700
FSS Arrival Airport
800-992-7433 (1-35)

11/28	Sunrise	Sunset
KPXE	7:16	17:30
KPBI	6:49	17:27

TRIP NOTES:

Figure 6: N59773 Re-created Navigation Log – KPXE to KPBI

Navigation Log	FltPlan.com	Monday 11-28-11 Dept: 1600L - Arr: 1739L

IFR	LN59773	Type:PA31/G	179Kts	Dep: KPBI
Dept: 2100Z	10,000	ROUTE (see below)		
Dest: KJES	ETE: 1:39			
FOB: 0300	Altn: KSAV		SOB: 5	Color: W/B

ATIS:123.75 VOT:109.0

Clnc:121.6
FSS: 800-992-7433 (1-35)

Elev:20 Gnd:121.9 Twr:119.1

DIRECT
KPBI to KJES : TC=343° : (FMS winds: 163°/ 27) : MC= 349° : ST. LINE=**307nm** : AIRWAY=**307nm** : Extra=**0%**

Imagery Sectionals Jet Airways Victor Airways Route Map

Winds Aloft	FL120 ISA(-09) Comp	FL100 ISA(-05) Comp	FL080 ISA(-01) Comp	FL060 ISA(+03) Comp
KJES0250	203/022 +11 +016	207/020 +12 +014	206/019 +08 +014	200/021 +08 +016
KJES0200	205/032 +11 +023	206/030 +11 +021	204/028 +08 +020	199/027 +07 +021
KJES0150	212/037 +10 +022	211/033 +11 +020	209/030 +07 +019	206/026 +07 +018
KJES0100	210/043 +10 +026	206/038 +11 +025	203/032 +07 +023	200/026 +06 +020
KJES0050	187/054 +09 +048	184/046 +09 +042	181/038 +05 +036	179/030 +04 +029
Avg. Trip Winds=>	+ 30 Tailwind	+ 27 Tailwind	+ 24 Tailwind	+ 22 Tailwind
FLT TIME==>	**1:37(-02) 183TAS**	**1:39(+00) 179TAS**	**1:41(+02) 176TAS**	**1:42(+03) 173TAS**
Fuel Burn==>	**66.1 Gal.**	**67.2 Gal.**	**67.9 Gal.**	**68.5 Gal.**

FIX	ST	LAT/LON	InB/Out	Leg	Rem	Fuel Burn Leg	Fuel Burn Tot.	Leg|	Rem	ETE	WX
KPBI 115.7 W. PALM BCH	FL	N2641.0W08005.7	---/349	0	307	3.0	3	0:00|	1:39	0:00	
KJES0250		N2735.2W08024.8	348/347	57	250	16.7	20	0:21|	1:18	0:21	122.0
KJES0200		N2822.9W08041.9	347/347	50	200	9.3	29	0:15|	1:03	0:36	122.0
KJES0150		N2910.5W08059.3	346/346	50	150	9.1	38	0:15|	0:48	0:51	122.0
KJES0100		N2958.1W08116.9	346/346	50	100	9.0	47	0:15|	0:33	1:06	122.0
KJES0050		N3045.7W08134.8	346/346	50	50	8.5	56	0:14|	0:19	1:20	122.0
KJES JESUP	GA	N3133.2W08153.0	346/---	50	0	11.6	67	0:19|	0:00	1:39	

EL:107 AWOS: 340K CTAF: 122.8 Fuel hourly method: 67

ALTN: KSAV SAVANNAH/HILTON HEAD INTL SAVANNAH ,GA BRG:50 **NM:49** Time 26 **Fuel: 16**

AIRPORT AUTH. 122.8
912-427-5949

FSS Arrival Airport
800-992-7433 (1-42-1)

11/28	Sunrise	Sunset
KPBI	6:49	17:27
KJES	7:07	17:24

TRIP NOTES:

Figure 7: N59773 Re-created Navigation Log – KPBI to KJES

Navigation Log	FltPlan.com	Monday 11-28-11 Dept: 1808L - Arr: 2034L

IFR	**LN59773**	Type:**PA31/G**	**179Kts**	Dep: **KJES**
Dept: **2308Z**	**10,000**	**ROUTE (see below)**		
Dest: **KPWK**	ETE: **3:26**			
FOB: **0500**	Altn: **KDPA**		SOB: **5**	Color: W/B

AWOS:340K

Clnc: 888-766-8267 (42-1)
FSS: 800-992-7433 (1-42-1)

Elev:107 CTAF: 122.8

DIRECT
KJES to KPWK : TC=336° : (FMS winds: 156°/ 30) : MC= 340° : ST. LINE=**696nm** : AIRWAY=**696nm** : Extra=**0%**

Imagery Sectionals Jet Airways Victor Airways Route Map

Winds Aloft	FL120 ISA(-09) Comp	FL100 ISA(-05) Comp	FL080 ISA(-01) Comp	FL060 ISA(+03) Comp
KPWK0600	176/062 +06 +058	182/055 +07 +048	188/046 +02 +039	192/038 +00 +030
KPWK0550	179/065 +06 +059	183/051 +06 +045	196/039 +01 +029	213/026 -01 +013
KPWK0500	183/061 +05 +054	187/048 +05 +040	202/037 +01 +025	219/026 -01 +011
KPWK0450	174/052 +05 +048	171/039 +06 +038	183/034 +02 +030	201/030 +02 +020
KPWK0400	172/053 +05 +051	168/039 +06 +038	180/034 +02 +031	201/034 +01 +022
KPWK0350	149/050 +06 +050	141/037 +06 +035	145/030 +02 +030	161/030 +01 +030
KPWK0300	149/045 +05 +045	137/032 +06 +030	140/026 +02 +025	158/027 +02 +027
KPWK0250	140/036 +06 +034	129/025 +07 +022	134/021 +03 +020	155/022 +03 +022
KPWK0200	157/031 +04 +031	155/024 +04 +024	165/021 +01 +021	186/020 +01 +017
KPWK0150	143/023 +05 +022	141/019 +05 +018	149/017 +02 +017	165/015 +02 +015
KPWK0100	124/016 +06 +014	127/016 +07 +014	130/016 +03 +014	133/016 +03 +015
KPWK0050	150/015 +06 +015	149/015 +07 +015	142/015 +02 +015	130/014 +01 +013
Avg. Trip Winds=>	+ 39 Tailwind	+ 30 Tailwind	+ 24 Tailwind	+ 19 Tailwind
FLT TIME==>	**3:16(-10) 183TAS**	**3:26(+00) 179TAS**	**3:34(+08) 176TAS**	**3:42(+16) 173TAS**
Fuel Burn==>	**123.7 Gal.**	**129.7 Gal.**	**134.1 Gal.**	**138.6 Gal.**

FIX	ST	LAT/LON	InB/Out	Leg	Rem	Fuel Burn Leg	Fuel Burn Tot.	Leg	Rem	ETE	WX
KJES JESUP	GA	N3133.2W08153.0	---/341	0	696	3.0	3	0:00	3:26	0:00	
KPWK0500		N3433.4W08325.0	340/339	50	500	8.2	41	0:14	2:30	0:56	122.0
KPWK0450		N3519.2W08349.6	339/339	50	450	8.3	49	0:14	2:16	1:10	122.0
KPWK0400		N3604.9W08414.6	339/339	50	400	8.3	58	0:14	2:02	1:24	122.0
KPWK0350		N3650.5W08440.0	339/339	50	350	8.3	66	0:13	1:49	1:37	122.0
KPWK0300		N3736.0W08506.0	338/337	50	300	8.4	74	0:15	1:34	1:52	122.0
KPWK0250		N3821.4W08532.5	337/337	50	250	8.6	83	0:14	1:20	2:06	122.0
KPWK0200		N3906.8W08559.6	337/337	50	200	8.7	92	0:15	1:05	2:21	122.0
KPWK0150		N3952.0W08627.3	337/336	50	150	8.7	100	0:15	0:50	2:36	122.0
KPWK0100		N4037.1W08655.6	336/336	50	100	8.9	109	0:16	0:34	2:52	122.0
KPWK0050		N4122.0W08724.5	336/336	50	50	8.9	118	0:15	0:19	3:07	122.0
KPWK CHICAGO/WHEE	IL	N4206.9W08754.1	336/---	50	0	11.6	130	0:19	0:00	3:26	

EL:647 Atis: 124.2 Twr: 119.9 Gnd: 121.7 Fuel hourly method: 131

11/28	Sunrise	Sunset
KJES	7:07	17:24
KPWK	6:57	16:22

Figure 8: N59773 Re-created Navigation Log – KJES to KPWK

origin airport	destination airport	distance (statue miles)	FlightAware time (hh:mm)	GS (mph)	fuel added @ dest (gal)	fuel burn** (gal/hr)
KCFJ	KPXE	544	3:37	151	167.3*	44
KPXE	KPBI	459	2:53	159	75	?***
KPBI	KJES	353	1:43	206	165	49
KJES	KPWK	801	3:41	217	*182*	47****
					AVG	**47**

Figure 9: N59773 Fuel Burn Estimates for Flight Legs

*** Based on the 167.3 gal of fuel that was added at KPXE, it was assumed that the airplane had full fuel tanks at KCFJ.**
**** Assumes that 7.5 gal of fuel used for taxi.**
***** Since the fuel tanks were not topped at KPBI, fuel burn could not be computed on the KPXE to KPBI flight leg.**
****** Assumes fuel exhausted. ("Out of fuel" was reported by the pilot to air traffic control.)**