

DCA23FA149

OPERATIONAL FACTORS

Attachment 5
FedEx Simulator Evaluation
July 31, 2023

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Rules of Engagement

The Simulator work will be used to document procedures, cockpit flows, visual and aural cues available to the pilots.

The Simulator work is NOT to recreate the incident sequence.

The simulator is not the incident airplane.

No videos will be taken during the simulator session.

Still pictures will be taken but will be subject to FDX Approval.

A. INCIDENT

Location: Austin, TX
Date: February 4, 2023
Time: 06:40 central standard time (CST)¹
1140 coordinated universal time (UTC)
Airplane: B767-32LF (A2); B737-79P (A1)

B. OPERATIONAL FACTORS & HUMAN PERFORMANCE SIMULATOR EVALUATION

Group Chair	Warren Abrams NTSB Washington, D.C.
Human Factors	Dujuan Sevillian, Ph.D. NTSB Washington, D.C.
Group Member	Andy Anderson ALPA Memphis, TN
Group Member	Corey Franklin FedEx Memphis, TN
Group Member	Matt Rigsby ² FAA Washington, D.C.
Group Member	Mark Diaz Boeing Safety Pilot Seattle, WA

C. SUMMARY

On February 4, 2023, at about 0640 central standard time (CST), Federal Express (FedEx) flight 1432 (FDX1432), a Boeing 767-32LF, and Southwest Airlines flight 708 (SWA708) a Boeing 737- 79P were involved in a runway incursion with overflight that

¹ All times central standard time (CDT) unless otherwise noted.

² Matt Rigsby did not attend the Sim Eval for medical reasons.

resulted in a loss of separation at the Austin-Bergstrom International Airport (AUS), Austin, Texas. There were no injuries reported to the 128 passengers and crew onboard the SWA airplane or to the 3 crew members onboard the FedEx airplane. SWA flight 708 was a regularly scheduled international passenger flight operating under the provisions of 14 *Code of Federal Regulations* (CFR) Part 121 from AUS to the Cancún International Airport (CUN), Cancún, Mexico. FedEx flight 1432 was a domestic cargo flight operating under the provisions of 14 CFR Part 121 from Memphis International Airport (MEM), Memphis, Tennessee to AUS

D. FOLLOW-ON DAILY ACTIVITIES

On April 12, 2023, at 1100 local, the Ops Group conducted simulator evaluations of various scenarios at the Federal Express (FDX) Training Center in Memphis, TN. Scenarios included Normal as well as Non-Normal procedures according to the FDX 767 Flight Training manual. The running of the Normal Checklist was combined with low visibility procedures and guidelines as found in the FDX Flight Operations Procedure Manual

E. SIMULATOR EVALUATION

Location: FedEx Training Center, Memphis, TN

Date: April 12, 11:00 CDT

Overall Objectives:

- Document the simulator fidelity, systems, and alerts.
- Documents any alerts and warnings associated with low visibility procedures.
- Document landings and go-arounds in VFR conditions.
- Document landing preparations in low visibility conditions (Less than 1800 RVR).
- Document the auto pilot response from the time the TOGA switch is pushed until there is a positive rate of climb on either the altimeter or the IVSI.
- Document the effectiveness of the HUD/EFVS

Aircraft: Boeing 767 simulator³
Airport: Memphis, KMEM
Invited participants: Warren Abrams, NTSB Operations

³ Able to accommodate only 6 occupants at a time with the motion on.

Dejuan Sevillian, NTSB Human Performance
Mike Hauf, IIC⁴
Matt Rigsby, FAA
Andy Anderson, ALPA
Corey Franklin, FedEx
Mark Diaz, Boeing Safety pilot.
Sim operator⁵

Initial Simulator Setup:

- Configuration⁶
- 12 mile final, 3000 feet, flaps 5, 190 knots. Take snapshot.
- Will consider additional simulator presets as necessary.
 - Weight: 300,000
 - Fuel: 24,000 lbs.
 - Ref +5 Speed selected from the FMS.
 - Arrival Runway, MEM 36L
 - Night
 - Weather: winds calm, RVR 1200, ceiling 200'
 - First run will be VFR

- The evaluation will take place in one sim session, but we will need to run each scenario twice since we are unable to accommodate everyone in the simulator at one time.
- The left seat will be the pilot flying (PF) and the right seat will be the Pilot Monitoring (PM)
- For the evaluation, Andy Anderson will be in the left seat and Corey Franklin will be in the right seat.
- Fuel Freeze will be utilized during the entire simulator evaluation in order to repetitively simulate the incident flight.
- All runs will be conducted with motion ON unless noted otherwise

⁴ Investigator in Charge, He was not present for the sim eval.

⁵ There was no instructor to operator the sim. The Instructors Operators Screen, IOS, was operated remotely by Corey Franklin.

⁶ Based on dispatch paperwork completed on 02/04/2023


Run 1: 12 mile final, 3,000 feet, flaps 5, speed 190 kts. Take snapshot. Position Freeze, ON.

Procedure

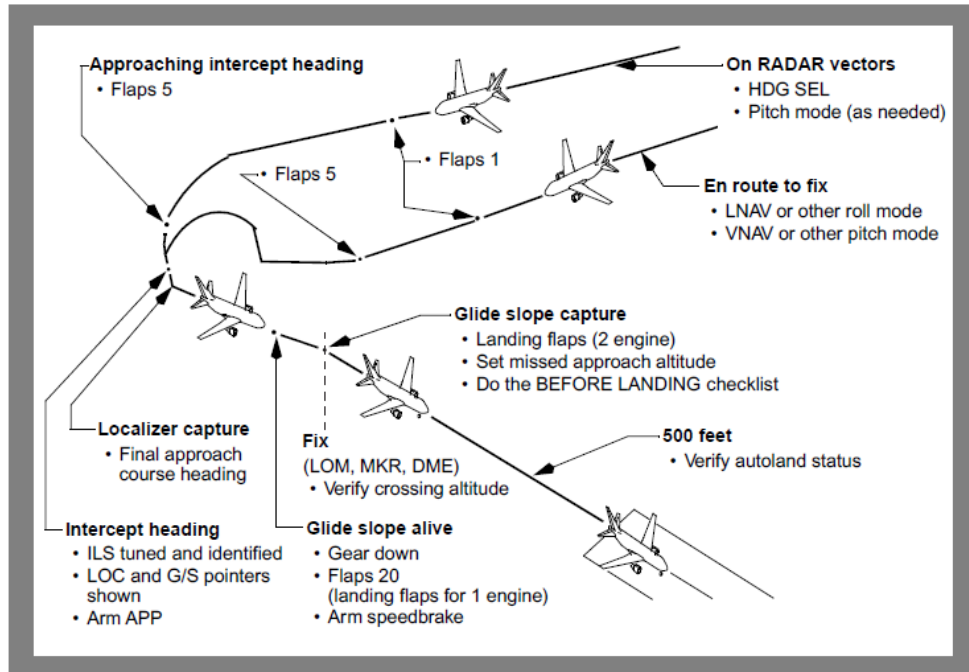
- Night VFR conditions, calm winds
- Normal CAT I coupled approach to a landing runway 36L MEM.
- Give crew time to brief the approach.
- Give crew time to conduct the Approach Checklist and Before Landing checklist.
- When ready, tell crew they are; "4 from MACEE, maintain 3 until established, you are cleared for the ILS 36L approach. Contact tower at CADUS 128.425."
- Flaps 30
- Normal landing; **Autopilot Off**
- HUD/EFVS: **Off**
- F/O is the PF

	Notes
	<ol style="list-style-type: none">1. Engine indications during approach: Nothing abnormal2. Checklist usage: Excellent3. EICAS Messages: None4. Inhabits, if any: All inhabited5. Normal landing Notes: Normal hand flown flight director visual approach backed up with the ILS. Night, VFR conditions, calm winds, 3 on the autobrakes, full reverse until stopping assured.6. Additional notes: No Go-around, approach terminated with a full stop.

Landing Procedure - ILS

Pilot Flying	Pilot Monitoring
Call "FLAPS____" according to the flap extension schedule.	Set the flap lever as directed.
When on localizer intercept heading: <ul style="list-style-type: none"> Verify the ILS is tuned and identified. Verify the LOC and G/S pointers are shown. 	
Arm the APP mode.	
⊖ Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.	
Use LNAV, HDG SEL, or HDG HOLD to intercept the final approach course, as needed.	
	Call "LOCALIZER ALIVE".
Verify that the localizer is captured. Verify the final approach course heading.	
	Call "GLIDE SLOPE ALIVE".
At glide slope alive, call: <ul style="list-style-type: none"> "GEAR DOWN" "FLAPS 20" 	Set the landing gear lever to DN. Set the flap lever to 20.
Call "BEFORE LANDING CHECKLIST".	Do the BEFORE LANDING checklist.
	Set the SPEEDBRAKE lever to ARMED.
At glide slope capture, call "FLAPS____" as needed for landing.	Set the flap lever as directed.
 Warning: Interference with the glideslope signal can result in erroneous AFDS pitch guidance indicated by FMA mode degradation, the AUTOPILOT caution message and removal of the F/D pitch bar. If this occurs, do a go-around unless suitable visual references can be established and maintained.	
When established on the glide slope, set the missed approach altitude in the altitude window of the MCP.	
At the final approach fix or OM, verify the crossing altitude.	
Monitor the approach.	
Verify the autoland status at 500 feet AGL.	

ILS Approach Profile



Run 2: 18 mile final, 3,000 feet, flaps 5, speed 190 kts. Position Freeze, ON

Procedure

- Night IFR conditions, calm winds, RVR: 1800
- Normal CAT I coupled approach to runway 36L MEM.
- Give crew time to brief the approach.
- Give crew time to conduct the Approach Checklist and Before Landing checklist.
- When ready, tell crew they are; "4 from MACEE, maintain 3 until established, you are cleared for the ILS 36L approach. Contact tower at CADUS 128.425."
- HUD/EFVS: ON
- Flaps 30 to be the final flap setting.
- Autopilot: ON
- Approach will end with a go-around with the autopilot On.
- Observer will note the time it takes from the pushing of the Go-Around switch on the throttles to a positive rate of climb on either the IVSI or the altimeter.

- Observers will also note the altitude lost, after pushing the Go-around switch until there is a positive rate of climb on the altimeter or the IVSI.

	Notes
	<ol style="list-style-type: none"> 1. Engine indications during approach: Normal, 2. Checklist usage: Outstanding 3. EICAS Messages: None 4. Inhabits, if any: All inhabits were inhabited 5. Normal landing Notes: No landing. The approach terminated in a go-around issued by the tower. 6. Additional notes: After the go-around was commanded by the tower at 150 feet on the Radio altimeter, RA, the plane bottomed out at approximately 110 feet on the RA and took approximately 5.85-6.57 seconds to resume a positive rate of climb.

Run 3: 12 mile final, 3,000 feet, flaps 5, speed 190 kts. Position Freeze, ON

Procedure

- Night IFR conditions, calm winds, RVR: 1200
- Normal CAT I coupled approach to runway 36L MEM.
- Give crew time to brief the approach.
- Give crew time to conduct the Approach Checklist and Before Landing checklist.
- When ready, tell crew they are; "4 from MACEE, maintain 3 until established, you are cleared for the ILS 36L approach. Contact tower at CADUS 128.425."
- Approximately 150' above the threshold, call the Go-Around. GA
- Crew will fly the published GA with the with the **autopilot on**
- HUD/EFVS: ON
- Flaps 30 to be the final flap setting.
- Observer will note the time it takes from the pushing of the Go-Around switch on the throttles to a positive rate of climb on either the IVSI or the altimeter.
- Observers will also note the altitude lost, after pushing the Go-around switch until there is a positive rate of climb on the altimeter or the IVSI.

	Notes
	<ol style="list-style-type: none">1. Engine indications during approach: Normal2. Checklist usage: Excellent3. EICAS Messages: None4. Inhabits, if any: None5. Time how long it takes from pushing either Go-Around Switch until there is a positive rate of climb on the IVSI or the altimeter. See #7.

6. Normal landing Notes: No landing. The approach terminated in a go-around issued by the tower

7. Additional notes: After the go-around was commanded by the tower at 130 feet on the Radio altimeter, RA, the plane bottomed out at approximately 110 feet on the RA and took approximately 5.57-6.57 seconds to resume a positive rate of climb.

Category III Operations

Category III operations are based on an approach to touchdown using the automatic landing system. Normal operations should not require pilot intervention. However, pilot intervention should be anticipated in the event inadequate airplane performance is suspected, or when an automatic landing cannot be safely accomplished in the touchdown zone. Guard the controls on approach through the landing roll and be prepared to take over manually, if required.

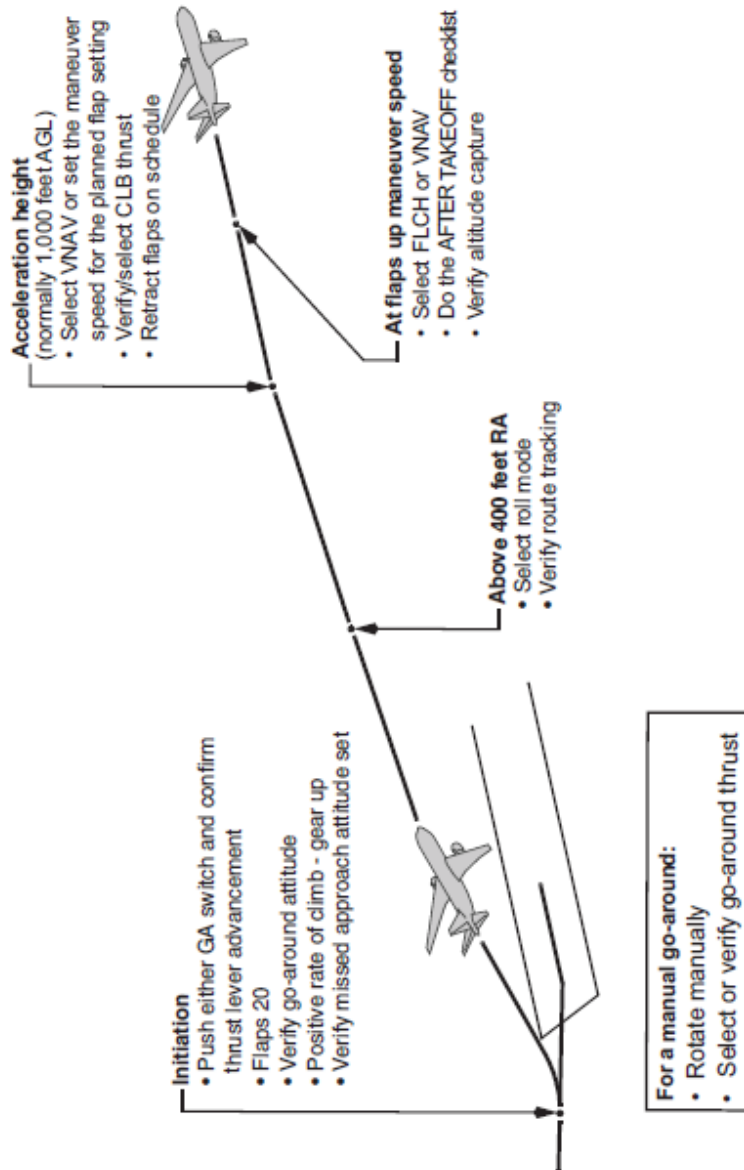
The airplane has been demonstrated to meet fail operational criteria with two engines operating. The airplane has also been demonstrated to meet fail passive criteria with two engines operating or with one engine inoperative if the engine failure occurs during the final approach.

Go-Around Procedure

Go-Around and Missed Approach Procedure

Go-Around and Missed Approach Procedure - VNAV	
Pilot Flying (PF)	Pilot Monitoring (PM)
Simultaneously: <ul style="list-style-type: none"> Push either GA switch and confirm thrust lever advancement¹, Rotate to go-around attitude (if AP engaged monitor for proper rotation), Call "GO-AROUND, FLAPS 20." 	Simultaneously: <ul style="list-style-type: none"> Position the flap lever to 20, Verify thrust lever advancement, pitch attitude, and FMAs.²
	Call "THRUST SET." ³
(Footnote ⁴)	
	Verify positive rate of climb on the altimeter and call, "POSITIVE RATE."
Verify a positive rate of climb on the altimeter and call "GEAR UP, CHECK MISSED APPROACH ALTITUDE."	Set the landing gear lever to UP. Verify that the missed approach altitude is set. Call "_____ SET". (e.g., "5,000 SET").
Above 400 feet radio altitude, select or call for a roll mode.	Verify or select the roll mode as directed by the PF.
Verify that the missed approach route is tracked.	
At acceleration height (normally 1,000 feet AGL), select or call for VNAV.	Verify or select VNAV as directed by the PF.
Verify that climb thrust is set.	
Engage the autopilot, if not already engaged at go-around, after a roll and pitch mode are selected.	
Call "FLAPS _____" according to the flap retraction schedule. ⁵	Set the flap lever as directed.
Call "AFTER TAKEOFF CHECKLIST".	Do the AFTER TAKEOFF checklist.
Verify that the missed approach altitude is captured.	

GO-AROUND AND MISSED APPROACH



Run 4: 12 mile final, 3,000 feet, flaps 5, speed 190 kts. Position Freeze, ON

Procedure

- Night IFR conditions, calm winds, RVR: 1200
- Normal CAT I coupled approach to runway 36L MEM.
- Give crew time to brief the approach.
- Give crew time to conduct the Approach Checklist and Before Landing checklist.
- When ready, tell crew they are; "4 from MACEE, maintain 3 until established, you are cleared for the ILS 36L approach. Contact tower at CADUS 128.425."
- Crew will fly the **GA** with the with the **autopilot OFF**.
- Approximately 150' above the threshold, call the Go-Around. GA
- HUD/EFVS: ON
- Flaps 30 to be the final flap setting.
- Observer will note the time it takes from the pushing of the Go-Around switch on the throttles to a positive rate of climb on either the IVSI or the altimeter.
- Observers will also note the altitude lost, after pushing the Go-around switch until there is a positive rate of climb on the altimeter or the IVSI.

	Notes
	<ol style="list-style-type: none">1. Engine indications during approach: Normal2. Checklist usage: Excellent3. EICAS Messages: None4. Inhabits, if any: None5. Time how long it takes from pushing either Go-Around Switch until there is a positive rate of climb on the IVSI or the altimeter.6. Normal landing Notes: No landing. The approach terminated in a go-around issued by the tower.

7. Additional notes: Additional notes: After the go-around was commanded by the tower at 130 feet on the Radio altimeter, RA, the plane bottomed out at approximately 110 feet on the RA and took approximately 5.57-6.57 seconds to resume a positive rate of climb.

KMEM/MEM
MEMPHIS INTL

JEPPESEN
15 MAY 20 **11-6A**

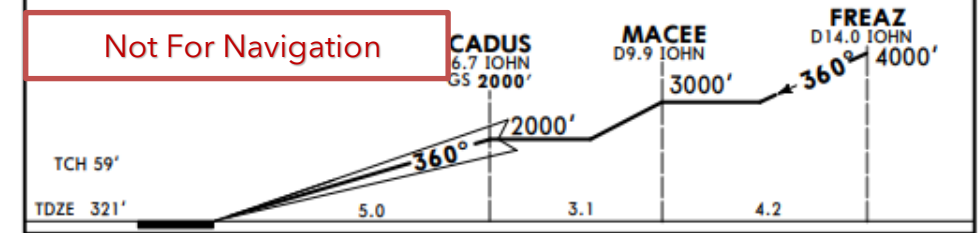
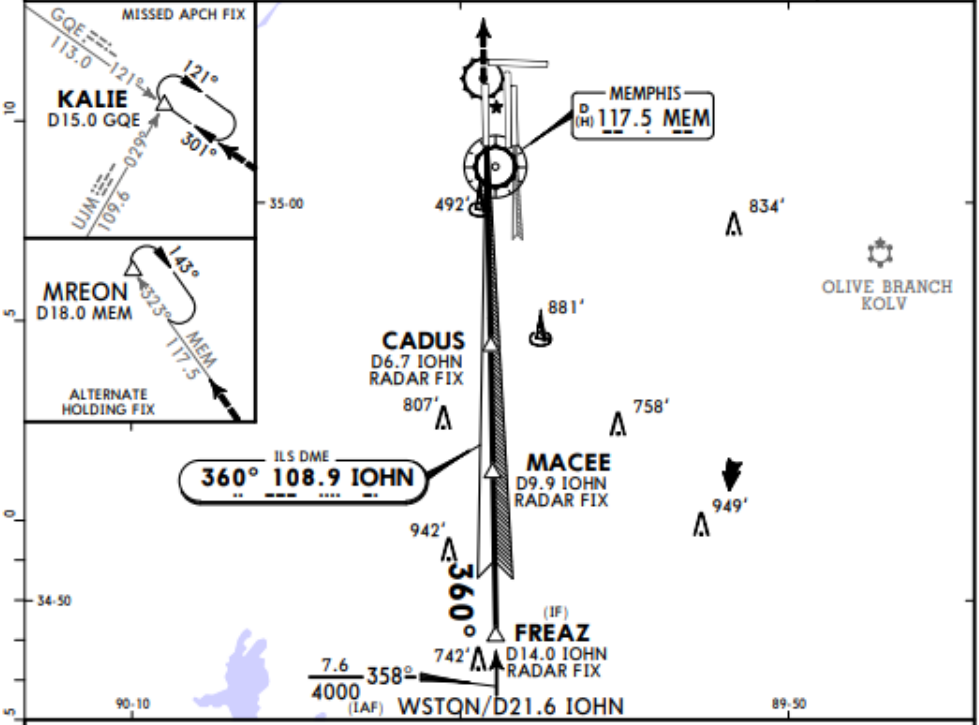
MEMPHIS, TENN
ILS Rwy 36L CAT II & III

D-ATIS	MEMPHIS Approach (R)	MEMPHIS Tower		Ground	
127.75	356°-175° 176°-355°	Rwys 18R-36L	Rwys 9-27	Rwys 18C-36C, 18L-36R	Rwys 18R-36L Rwys 9-27 18L-36R
125.8	119.1	128.425	118.3	119.7	121.65 121.0 121.9
LOC IOHN	Final Apch Crs	CADUS	CAT IIIC	CAT IIIB	CAT IIIA
108.9	360°	2000' (1679')	NA	Refer to Minimums	Refer to Minimums
				CAT II ILS	Apt Elev
				RA 100'	341'
				DA(H) 421' (100')	TDZE 321'

MISSED APCH: Climb to 1000' then climbing LEFT turn to 5000' via 330° heading and GQE VOR R-121 to KALIE INT/D15.0 GQE and hold, continue climb-in-hold to 5000'.

Alt Set: INCHES Trans level: FL 180 Trans alt: 18000'

1. Special Aircrew & Aircraft Certification required. 2. DME or Radar required.
3. Simultaneous approach authorized with Rwy 36C/R. 4. VGSI and ILS glidepath not coincident.



Gnd speed-Kts	70	90	100	120	140	160	ALSF-II	1000'	5000'	330°	GQE
GS	3.00°	372	478	531	637	849	PAPI	↑	←	hdg	and 113.0
											R-121

STRAIGHT-IN LANDING RWY36L			
CAT IIIC ILS	CAT IIIB ILS	CAT IIIA ILS	CAT II ILS
NA	RVR 3	RVR 7	RA 100' DA(H) 421' (100')
			RVR 12

CHANGES: Chart format. © JEPPESEN, 1998, 2020. ALL RIGHTS RESERVED.

Run 5: 12 mile final, 3,000 feet, flaps 5, speed 190 kts. Position Freeze, ON

Procedure

- Night IFR conditions, calm winds, RVR: 600
- Normal CAT IIIA coupled approach to runway 36L MEM.
- Give crew time to brief the approach.
- Give crew time to conduct the Approach Checklist and Before Landing checklist.
- When ready, tell crew they are; "4 from MACEE, maintain 3 until established, you are cleared for the ILS 36L approach. Contact tower at CADUS 128.425."
- Crew will fly the published **missed approach** with the with the **autopilot ON**.
- Approximately 150' RA call the Go-Around. GA
- HUD/EFVS: OFF
- Flaps 30 to be the final flap setting.
- Observer will note the time it takes from the pushing of the Go-Around switch on the throttles to a positive rate of climb on either the IVSI or the altimeter.
- Observers will also note the altitude lost, after pushing the Go-around switch until there is a positive rate of climb on the altimeter or the IVSI.

	Notes
	1. Engine indications during approach: Normal
	2. Checklist usage: Excellent
	3. EICAS Messages: None
	4. Inhabits, if any: None
	5. Time how long it takes from pushing either Go-Around Switch until there is a positive rate of climb on the IVSI or the altimeter.
	6. Normal landing Notes: No landing. The approach terminated in a go-around issued by the tower

7. Additional notes: Additional notes: After the go-around was commanded by the tower at 130 feet on the Radio altimeter, RA, the plane bottomed out at approximately 110 feet on the RA and took approximately 5.57-6.57 seconds to resume a positive rate of climb.

Test and Observation Complete

Submitted by:

Warren Abrams
Ops Group Chairman

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