NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

February 2, 2015

Attachment 23 – Ypsilanti Simulator Work

OPERATIONAL FACTORS

DCA13MA081

Table Of Contents

A. YPSILANTI SIMULATOR WORK

1.0 Simulator Statement of Qualification

Federal Aviation Administration
National Simulator Program

Statement of Qualification

The Federal Aviation Administration (FAA)
National Simulator Program has evaluated the Flight Simulation Training
Device (FSTD) listed below. This FSTD has been found to meet
the standards set forth in the qualification document described below:

Sponsor: Kalitta Air, LLC
Location: Ypsilanti
Aircraft Type: B-747-400
FAA Identification Number: 1234
Qualification Basis: 14 CFR Part 60 Change 1, Appendix A
Qualification Level: C

Issued by the National Simulator Program
on June 26, 2012.

[redacted]
Harlan Gray Sparrow III
Manager, National Simulator Program
Federal Aviation Administration

To maintain qualification, the FSTD must meet all of the standards and specifications of the qualification basis and is subject to the conditions and limitations listed in the last FAA FSTD Evaluation Report. This certificate is not transferable, and unless revoked, suspended, or amended, shall remain in effect until July 31, 2013.

NSP Form 1001
Rev 2: 08/24/2005

Federal Aviation Administration National Simulator Program Statement of Qualification	Sponsor: FSTD ID: Aircraft Type:	Sponsor: Kalitta Air, LLC. FSTD ID: 1234 Aircraft Type: B747-400

Sponsor Submission Date: 06/26/2012

FSTD Sponsor Information

Sponsor Name:	Kalitta Air, LLC.	FSTD Location:	
Address:	312 Willow Run Airport	Physical Address:	332 Willow Run Airport
City:	Ypsilanti	City:	Ypsilanti
State/Province:	Michigan	State:	Michigan
Country:	United States	Country:	United States
ZIP:	48198	ZIP:	48198
Sponsor ID No: (FAA Designator)	KCBA712A	Nearest Airport: (Apt Code)	Detroit Metro, DTW
Local FAA Authority			
FAA Training Program Approval Authority:		☒ POI ☐ TCPM ☐ Other: _____	
Name:	Robert Keegan	Office ID:	AGL-FSDO-28 (DTW)
Telephone:	734-487-7482	Fax:	734-487-7221
Email:	Roberty.keegan@faa.gov		
Sponsor Personnel			
FSTD Management Representative:			
Name:	Jeff Phelps		
Address 1:	Kalitta Air, LLC.	Address 2	312 Willow Run Airport
City:	Ypsilanti	State:	MI
ZIP:	48198	Email:	jphelps@kalittaair.com
Tel:	734-484-7168	Fax:	734-644-7042
FSTD Scheduling Contact:			
Name:	Betty Benka		
Address 1:	Kalitta Air, LLC.	Address 2	312 Willow Run Airport
City:	Ypsilanti	State:	MI
ZIP:	48198	Email:	bbenka@kalittaair.com
Tel:	734-644-7010 Ext: 7081	Fax:	734-644-7042
FSTD Technical Contact:			
Name:	Jeff Phelps		
Address 1:	Kalitta Air, LLC.	Address 2	312 Willow Run Airport
City:	Ypsilanti	State:	MI
ZIP:	48198	Email:	jphelps@kalittaair.com
Tel:	734-484-7168	Fax:	734-644-7042

Federal Aviation Administration National Simulator Program Statement of Qualification	Sponsor: FSTD ID: Aircraft Type:	Sponsor: Kalitta Air, LLC. FSTD ID: 1234 Aircraft Type: B747-400

FSTD Information			
Aircraft make/model/series:	B-747-400	A/C Common Name:	747-400
Qualification Basis: Qualification Level:	Part 60 Change 1 C	Mfgr's ID or Serial No.:	013
	☒ Full Flight Simulator (FFS) ☐ Flight Training Device (FTD)	Sponsor's FSTD ID:	N1234CK, where XXXXX is FSTD ID#
National Aviation Authority Qualification (For ICAO-SIP Evaluations only)			
NAA Name:			
NAA FSTD ID No:		NAA Qualification Basis:	
NAA Qualification Level:			
Technical Information:			
FAA FSTD ID No: 1234 (If Applicable)	Convertible FSTD: ☐ Yes	FSTD Manufacturer:	CAE
☒ eMOTQ	Conv. FAA FSTD ID No.	Date of Manufacture:	1988
FSTD Configuration:			
Pri. Engine Type/Thrust: Alt Engine Type/Thrust: Alt Engine Type/Thrust: Alt Engine Type/Thrust:	CF6-80C2-B1F / 62,080 / / /	FADEC Version	1618MS8P80
Flight Instrumentation/Systems:	☒ EFB ☐ HUD/HGS ☐ EVS ☒ WX Radar ☐ NVG ☒ GPS ☒ GPWS ☒ FMS ☒ TCAS Ver: 7 ☒ EFB Class: 2 ☐ Other:		
FSTD Seats Available: No.	6	Flight control data revision:	D811U818 / Rev G
FMS: Honeywell / P/N: 4062608-962		Aerodynamic model/data:	Boeing / D811U808 / Rev G
Visual image generator: RSI Raster XT		Avionics Type/Suite:	
Visual system display: Cross cockpit / 180 x 40		Avionics Std/Rev:	
Visual projector: 8 / Christie D1PVLED		Motion system:	CAE / 600 / 6
Helicopter Chin Windows Functional: ☐			
Airport Qualification Models:	If illustrations or other presentation cards attached please specify: ☐		
Airport Qualification Model 1 / Available In-Use Runways / Taxiway:	EHAM / 24,06 / From parking R23 taxi out on R, turn right on to B, turn right on to S7, takeoff rwy 24; Land rwy 06, turn left on to S7, turn left on to B, turn right on to R, park at R23.		
Airport Qualification Model 2 / Available In-Use Runways / Taxiway:	ED DF / 07C ,25C / From parking FZ11 taxi out on Q, turn right on to N, turn left on to L, takeoff rwy 7C; Land rwy 25C, turn right on to L, turn right on to N, turn left on to Q, park at FZ11.		
Airport Qualification Model 3 / Available In-Use Runways / Taxiway:	VHHH / 25L,7R / From parking C27 taxi out on L3, turn right on to K, turn left on to K7, takeoff rwy 25L; Land rwy 7R, turn right on to H5, turn right on to K, turn left on to L2, park at C27.		
Visual Ground Segment:	KSFO Airport Designator	28R Landing Runway	

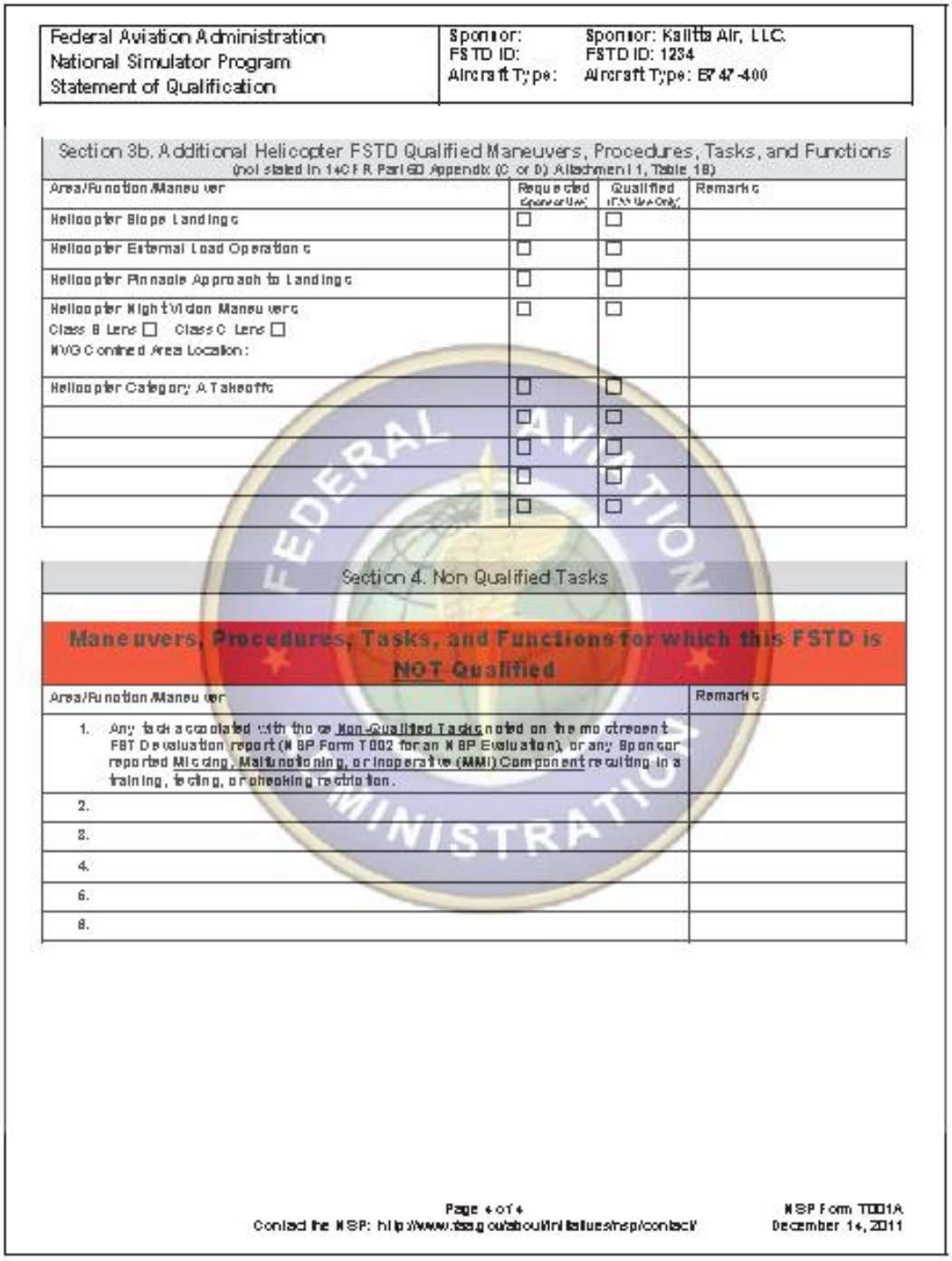
Federal Aviation Administration National Simulator Program Statement of Qualification	Sponsor: FSTD ID: Aircraft Type:	Sponsor: Kalitta Air, LLC. FSTD ID: 1234 Aircraft Type: B747-400

Except for Non-Qualified items stated in section 4 below, this FSTD is qualified to perform all maneuvers, procedures, tasks, and functions listed in the applicable QPS Appendix, Table 1B and 1C of 14 CFR Part 60 as amended. Additionally, this FSTD is qualified to perform maneuvers, procedures, tasks, and functions annotated in sections 3a. or 3b, below. Specific use of this device in conjunction with any training program must be approved by the FAA Training Program Approval Authority (TPAA).

Section 3a. Additional FSTD Qualified Maneuvers, Procedures, Tasks, and Functions

(not listed in 14 CFR Part 60 Appendix (A, B, C or D) Attachment 1, Table 1B)

Area/Function/Maneuver	Requested (Sponsor Use)	Qualified (FAA Use Only)	Remarks
CAT I: (RVR 2400/1800 ft. DH 200 ft)	☒	☒	
CAT II: (RVR 1200 ft. DH 100 ft)	☒	☒	
CAT III * (lowest minimum) 300 RVR 100 ft. * State CAT IIIa (≥ 700 ft.), CAT IIIb (≥ 150 ft.), or CAT IIIc (No Min.)	☒	☒	
Circling Approach : KJFK, RWAY 4R/31R	☒	☒	
Wind shear Training :	☒	☒	
Auto-coupled Approach/Auto Go Around	☒	☒	
Auto-land / Roll Out Guidance	☒	☒	
TCAS/ACAS I / II	☒	☒	TCAS II
WX-Radar	☒	☒	
HUD / HGS	☐	☐	
EFVS	☐	☐	
TAWS (GPWS / EGPWS)	☒	☒	EGPWS
BMGCS KLAX, From parking at IGC taxi straight out on A1, left turn onto A, right turn onto F, to hold short of 25L full length., 500', Bidirectional	☒	☒	
Enhanced Taxi Markings KSFO, From parking at UAL maintenance hanger taxi straight out on K, left turn onto C, cross runways 19R and 19L on C, to hold short of 28R full length.	☒	☒	
GPS	☒	☒	
RNP/AR	☐	☐	
LPV/GLS	☐	☐	
EFB	☒	☒	Class 2
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	



Federal Aviation Administration National Simulator Program Statement of Qualification	Sponsor: FSTD ID: Aircraft Type:	Sponsor: Kalitta Air, LLC. FSTD ID: 1234 Aircraft Type: B747-400

Section 3b. Additional Helicopter FSTD Qualified Maneuvers, Procedures, Tasks, and Functions
(not listed in 14 CFR Part 60 Appendix (C or D) Attachment 1, Table 1B)

Area/Function/Maneuver	Requested (Sponsor Use)	Qualified (FAA Use Only)	Remarks
Helicopter Slope Landings	☐	☐	
Helicopter External Load Operations	☐	☐	
Helicopter Pinnacle Approach to Landings	☐	☐	
Helicopter Night Vision Maneuvers Class B Lens ☐ Class C Lens ☐ NVG Combined Area Location:	☐	☐	
Helicopter Category A Takeoffs	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	

Section 4. Non Qualified Tasks

Maneuvers, Procedures, Tasks, and Functions for which this FSTD is NOT Qualified

Area/Function/Maneuver	Remarks
1. Any task associated with those Non-Qualified Tasks noted on the most recent FSTD evaluation report (NSP Form T002 for an NSP Evaluation), or any Sponsor reported Missing, Malfunctioning, or Inoperative (MMI) Component resulting in a training, testing, or checking restriction.	
2.	
3.	
4.	
5.	
6.	

Page 4 of 4
Contact the NSP: http://www.faa.gov/about/initiatives/nsp/contact/
NSP Form T001A
December 14, 2011

2.0 Simulator Photos

Photo 1: Kalitta Level C full motion simulator

Photo 2: Kalitta IOS Panel – CG display page

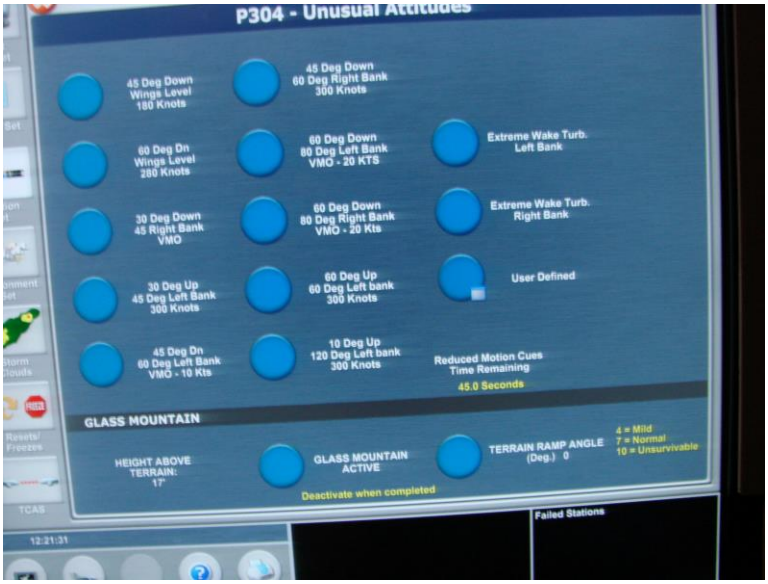


Photo 3: Kalitta IOS panel – Unusual Attitude preset page

3.0 General Notes

- Simulator is a Level C. Kalitta also has a B747-400 FTD. Both were purchased from ANA Airlines in Japan.
- CG preset only allowed an aft-most setting of 33%. Simulator engineering could bypass the preset to a max of 52.8%.
- National Airlines "dry-leases" Kalitta simulator time, using National Airlines instructors to teach National Airlines pilots.
- National Airlines also utilizes a B747-400 simulator in Denver. The accident crew was trained in the YIP simulator.

4.0 Simulator Test Plan for National Airlines Bagram, Afghanistan Accident

Aircraft:	Boeing 747-400 Simulator (4 hours)	
Airport:	Ypsilanti, Michigan (Kalitta Training Facility)	
Participants (6):	Simulator Operator:	Reid Sutherland – National Airlines
	Captain Seat:	Jose Rodriguez – National Airlines
	F/O's Seat:	Norm Bissonette - FAA
	Observers:	Mark Barker – DoD (Observer)
	Test Director:	David Lawrence - NTSB
Date:	June 7, 2013	
Notes:	- For the departure scenarios, KDEN runway 25L (12,000 feet long, Field elevation 5352 feet) was used (Bagram was not in the simulator data base)	

- Task times were estimates only
- Simulator IOS panel was unable to be set with a CG aft of 52.8% MAC
- Full motion was disabled for CG's greater than 33% MAC

Objectives:

1. To document NAL crew procedures for normal and special Bagram departures.
2. To document pitch attitudes for normal and aft CG locations at rotation and required elevator/stabilizer trim inputs.
3. To document NAL high pitch attitude recovery techniques and capabilities for normal and aft CG locations at rotation.
4. To document high pitch attitude recovery techniques defined in the Upset Recovery Training Aid (Section 2.6.3.2 Nose-High, Wings-Level) with various aft CG locations.

4.1 Task 1 - Setup

Time Estimate: **20 minutes (00:20/00:20)**[1]

Initial Setup

- FMS Flight plan - KDEN-KDEN
- Simulator Position - End of runway 25L (KDEN)
- Alternate - N/A
- Fuel Weight - 103,838 pounds
- Aircraft weights - ZFW 571,000 pounds
  - Takeoff weight 685,000 pounds
- Autopilot - Off
- Config - Flaps 10, Gear Down, stabilizer trim 3.8 NU
- Thrust - TO Full
- Field elevation - 5352 feet
- CG location - varied with task
- Vspeeds - V1=145
  - Vr=149
  - V2=168
- PF/PM - Captain will be PF[2] and F/O will be PM[3]
- Environmental - winds 320/17 (Sim was unable to replicate gusts – Level C) (wind direction replicates 70 degree right crosswind from Bagram ATIS)
  - Few 8500, BKN 14000
  - Temp 17/06, Altimeter: 29.92
- Sim Position - Instructor took a "snapshot" of Task 1 start position

Procedure

1) Provide simulator safety briefing
2) Observer/pilot occupant cockpit familiarization
3) Document NAL procedures
   - Weight and Balance form
   - FMS entries
   - Crew briefing
   - Use of required paperwork
4) Other information

[1] Time of Task/Total Time in Simulator
[2] Pilot Flying
[3] Pilot Monitoring

Note: Task complete when simulator occupants briefed

Proc.	Notes
1	Completed
2	Completed
3	NAL Procedures • Load master comes to the cockpit and provides crew with computer generated paperwork that includes: - ZFW, MAC%, GTW, TO power setting, Stab trim • Pilot completes Perf Data using performance analysis • Pilot enters ZFW in PERF INIT page • Vspeeds are then generated internally by the FMC
4	Other Information: • According to the NAL Check Airman, NAL does not have, nor does it train any special or "tactical" departures.

4.2 Task 2 - Normal Takeoff

Time Estimate: 20 minutes (00:20/00:40)

Initial Setup

- Weight - Per initial setup
- CG - 33.0%
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

Procedure

Note:

1) Place simulator motion to "on" (CAP is PF) (Leave simulator on position freeze at end of runway)
2) Initiate a normal takeoff. Document call-outs
3) Document acceleration times (Note times for brake release, V1, Vr, rotation, time to target pitch)
4) Other Information

Note: Task completed when established on climb at target pitch

Proc.	Notes

1	Completed
2	Callouts per NAL procedures
3	• NAL takeoff procedures were used • Time was "hacked" a brake release - Full Thrust at 15 secs - V1 at 45 secs - Vr at 49 secs - liftoff at 54 secs • Target pitch (FDs) was 15 degrees
4	Other Information: • Initial climb speed was 182 kts • Max angle (from CLB page in FMS) was 264 kts • Pilot impressions: - none – normal takeoff

4.3 Task 3 – Nose High Upset Recovery

Time Estimate: 20 minutes (00:20/01:00)

Initial Setup

- Weight - Per initial setup
- CG - 33.0% MAC
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

Procedure

1) Place simulator motion to "on" (CAP is PF) (Leave simulator on position freeze at end of runway). Initiate a normal takeoff. Climb to 10K with level off
2) Initiate a training session for upset recovery, nose high attitude (simulator preset)
3) Document crew actions during recovery(Pitch inputs, Stab trim inputs, Control column inputs: pitch/trim)
4) Compare recovery techniques to those from the Upset Recovery Training Aid (see Reference Section)
5) Other observations

NOTE: Task complete when established on climb at target pitch or stall recovery

Proc.	Notes
1	Completed
2	Completed
3	• Visibility reduced to zero (no outside reference) • Maneuver initiated at 250 kts. • IOS preset user defined 60 degrees up wings level • NAL takeoff procedures were used
4	• V1 occurred 42 seconds after brake release • Vr occurred 47 seconds after brake release • Lifoff occurred 54 seconds after brake release • "Positive rate" occurred 57 secs from brake release • "Gear up" call occurred 10 secs after liftoff • Initial recovery technique: - aggressive pitch over to below level flight - recovery began with stick shaker - recovery initiated a secondary stall warning (2nd shaker) - speed slowed to about 203 knots during recovery - pilots are taught not to use the rudder during upset recovery • Separate recovery technique demonstrated: - repeated setup at 10k - 250 speed - test director manually pulled column to about 50 degrees pitch - pilot recovered using bank first instead of pitch, bank to about 45 degrees and nose to the horizon - speed slowed to about 230 kts - no stick shaker or secondary stall

4.4 Task 4 – CG Shift on Takeoff

Time Estimate: 20 minutes (00:20/01:20)

Initial Setup

- Weight - Per initial setup
- CG - 34.3% MAC
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

Procedure

Note: MOTION OFF

1) Place simulator motion to “OFF” (CAP is PF) (Leave simulator on position freeze at end of runway). Initiate a normal takeoff.
2) Document acceleration times (Note times for brake release, V1, Vr, rotation, time to target pitch)
3) Document alerts (aural and visual)
4) Document crew actions (Pitch inputs, Stab trim inputs, Control column inputs: pitch/trim)

NOTE: Task complete when established on climb at target pitch or stall recovery

Proc.	Notes
1	Completed
2	• V1 occurred 42 seconds after brake release • Vr occurred 47 seconds after brake release • Lifoff occurred 54 seconds after brake release • “Positive rate” occurred 57 secs from brake release • “Gear up” call occurred 10 secs after liftoff • NAL takeoff procedures were used
3	• EICAS message “STAB GREENBAND” with aural TO warning alert occurred because TO was initiated outside of the normal TO trim setting (disabled aural alert via circuit breaker)
4	• Pilot impressions: - No significant pitch or roll inputs - airplane felt “a little tail heavy”

4.5 Task 5 – CG Shift at Rotation

Time Estimate: 15 minutes (00:15/1:35)

Initial Setup

- Weight - Per initial setup
- CG - Begin at 33.0% (52.8% MAC at rotation)
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

Procedure

Note: MOTION OFF

1) Place simulator motion to “OFF” (CAP is PF) (Leave simulator on position freeze at end of runway). Initiate a normal takeoff. **At rotation, full freeze simulator, and reset CG to 52.8%**
2) Document alerts (aural and visual)
3) Document crew actions (Pitch inputs, Stab trim inputs, Control column inputs: pitch/trim)
4) Document Speeds (V1/Vr/V2Minimum speed attained)
5) Other observations (ie. time for crew reaction)

NOTE: Task complete when established on climb at target pitch or stall recovery

Proc.	Notes
1	Completed
2	None during takeoff
3	None
4	Similar to previous takeoffs
5	• Airplane experienced a tailstrike • Sim position froze after tailstrike, requiring a reset of the simulator

4.6 Task 6 – CG Shift at Rotation (Repeat of Task 5)

Time Estimate: 30minutes (00:15/1:50)

Initial Setup

- Weight - Per initial setup
- CG - Begin at 33.0% (52.8% MAC at rotation)
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

Procedure

Note: MOTION OFF

1) Place simulator motion to “OFF” (CAP is PF) (Leave simulator on position freeze at end of runway). Initiate a normal takeoff. **At rotation, full freeze simulator, and reset CG to 52.8%** (crew asked to rotate slower than in Task 5)
2) Document alerts (aural and visual)
3) Document crew actions (Pitch inputs, Stab trim inputs, Control column inputs: pitch/trim)
4) Document Speeds (V1/Vr/V2Minimum speed attained)
5) Other observations (ie. time for crew reaction)

NOTE: Task complete when established on climb at target pitch or stall recovery

Proc.	Notes
1	Completed
2	None during takeoff
3	None
4	Similar to previous takeoffs
5	• Airplane experienced a tailstrike • Sim position froze after tailstrike, requiring a reset of the simulator

4.7 Task 7 – CG Shift at 50 Feet

Time Estimate: 20 minutes (00:20/2:10)

Initial Setup

- Weight - Per initial setup
- CG - Begin at 33.0% (52.8% MAC at 50 feet RA)
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

Procedure

Note: MOTION OFF

1) Place simulator motion to “OFF” (CAP is PF) (Leave simulator on position freeze at end of runway). Initiate a normal takeoff. **<u>At 50 feet RA</u>, full freeze simulator, and reset CG to 52.8%**
2) Document acceleration times (Note times for brake release, V1, Vr, rotation, time to target pitch)
3) Document alerts (aural and visual)
4) Document crew actions (Pitch inputs, Stab trim inputs, Control column inputs: pitch/trim)
5) Other observations

NOTE: Task complete when established on climb at target pitch or stall recovery

Proc.	Notes
1	Completed
2	Similar to previous takeoffs
3	None
4	• Pilot impressions: - nose down pitch required to maintain climb attitude - Stab trim required (all the way to zero nose down trim) - still required pitch down input with trim to zero - no roll input required -Pilot stated climb attitude was still “controllable”
5	(Other Observations)

4.8 Task 8 – CG Shift at 50 Feet (Repeat of Task 7)

Time Estimate: 20 minutes (0020:/2:30)

Initial Setup

- Weight - Per initial setup
- CG - Begin at 33.0% (52.8% MAC at 50 feet RA)
- Autopilot - Off
- Config - Flaps 10, TO Full, Gear Down, Trim 4.0NU

<u>Procedure</u>

Note: MOTION OFF

1) Place simulator motion to "OFF" (CAP is PF) (Leave simulator on position freeze at end of runway). Initiate a normal takeoff. **At 50 feet RA, full freeze simulator, and reset CG to 52.8%**
2) Document acceleration times (Note times for brake release, V1, Vr, rotation, time to target pitch)
3) Document alerts (aural and visual)
4) Document crew actions (Pitch inputs, Stab trim inputs, Control column inputs: pitch/trim)
5) Other observations

NOTE: Task complete when established on climb at target pitch or stall recovery

Proc.	Notes
1	Completed
2	Similar to previous takeoffs
3	None
4	• Pilot impressions - nose down pitch required to maintain climb attitude - Stab trim required (all the way to zero nose down trim) after full pitch used - forward column pressure required "constantly" -Pilot stated climb attitude was still "controllable" to maintain flight director guided pitch
5	(Other Observations)

5.0 Final Notes

- An attempt was made to replicate an aft CG shift with multiple hydraulic failures (Systems 1 and 2, and Systems 1, 2, 3), but data was not recorded because flight characteristics of the simulator where obviously inconsistent with any realistically anticipated flight dynamics (simulator oscillated around the pitch axis and eventually stopped functioning).
- With System 1 and 2 hydraulic failures, the gear handle would only raise to the "Extend/Extended" mid position (half-way up).