ATTACHMENT 3

TO

SYSTEMS GROUP CHAIRMAN'S FACTUAL REPORT

DCA17FA076

DC-9-83 (MD-83), N786TW, Elevator Load Testing Plan and Plots

Lab Test Procedures

Elevator Trailing Edge Down (TED) Limit Stop Loading

1. Introduction

These procedures contain tests intended to help determine the effects of loads on the spring-loaded elevator travel stop at the TED limit caused by tail winds of various speeds and elevator boost cylinder actuation. Tail wind loads are simulated by suspending weights from the elevator tab hinge fittings. The elevator boost cylinder actuation load can be applied by hydraulically pressurizing the cylinder, or a pressurized boost cylinder can be simulated by suspending additional weights.

The spring-loaded elevator travel stop consists of a stop arm mounted to a torsion bar installed in the elevator surface. Elevator travel is limited when the elevator stop arm makes contact with a stop fitting mounted on the horizontal stabilizer.

These procedures measure elevator stop arm deflections and corresponding elevator surface angles under varying loads in a test series:

Series 1 Hydraulic actuation of boost cylinder

Series 2 Application of weights to simulate hydraulic actuation of boost cylinder

Series 3 Static application of various weight arrangements to simulate 25 kt, 55 kt, and 75 kt tail wind loads

Series 4 Static application of various weight arrangements to simulate 25 kt, 55 kt, and 75 kt tail wind loads plus hydraulic actuation of boost cylinder

Series 5 Dynamic application of various weight arrangements to simulate 25 kt, 55 kt, and 75 kt tail wind loads

Series 6 Dynamic application of various weight arrangements to simulate 25 kt, 55 kt, and 75 kt tail wind loads plus hydraulic actuation of boost cylinder

Series 7 Series 3 through 6 tests done using weights simulating 100 kt tail wind load

2. Prepare Fixture for Testing

A. Make sure elevator stop torsion bar is installed and attaching fasteners are tight.

B. Install elevator stop arm on torsion bar and tighten clamp bolt.

C. Install leading edge section that covers torsion bar.

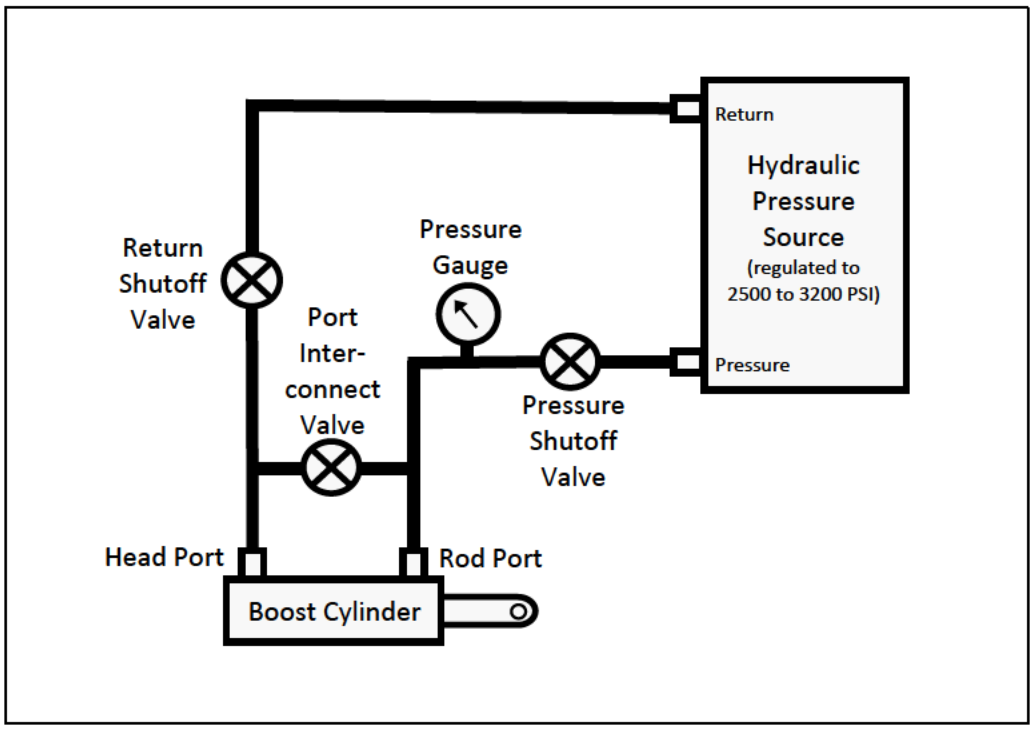
D. Install elevator damper.

E. Install elevator boost cylinder to be used for testing in horizontal stabilizer.

(1) Remove existing boost cylinder.

(2) Install test boost cylinder.

F. Connect hydraulic pressure source having 2500 to 3200 PSI no-flow pressure capability and rated output of 5 to 20 GPM to boost cylinder (see **Hydraulic System Schematic**).



Hydraulic System Schematic

G. Mark elevator neutral position on sheet metal panel attached to horizontal stabilizer.

H. Install elevator stop arm movement indicator (bend beam deflection transducer and monitoring/recording system).

I. Install inclinometer to measure elevator surface position angles.

(1) Attach inclinometer to upper surface of elevator near inboard end using tape or other means sufficient to prevent separation during elevator movements, including dynamic loading (ref. Series 5 through 7 tests in paragraphs 3.E., 3.F. and, 3.G.).

3. <u>Testing Series</u>

A. **SERIES 1** - Boost Cylinder Actuation

(1) Hold elevator surface at neutral position and set stop arm movement indicator and inclinometer to zero.

(2) Announce start of **Test Run 3A3** (cue to begin data recording).

(3) Use hand force to hold elevator against TED stop and record measurements.

(a) Elevator stop arm movement indicator: _____

(b) Elevator surface angle: _____

(4) Place elevator surface at trailing edge up (TEU) position.

<u>WARNING</u>: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(5) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(6) Record measurements with elevator held against TED stop by pressurized boost cylinder.

(a) Elevator stop arm movement indicator reading: _____

(b) Elevator surface angle: _____

(7) Announce end of **Test Run 3A3** (cue to stop data recording).

(8) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

Simulation Weights Table
(pounds)

Outboard *Inboard*

	Anti-Float Tab			Geared Tab			Control Tab				
	Hinge 11	Hinge 10	Hinge 9	Hinge 8	Hinge 7	Hinge 6	Hinge 5	Hinge 4	Hinge 3	Hinge 2	Hinge 1
Boost Cylinder	0	0	0	0	0	0	0	150	370	150	0
25 kts	5	7	7	10	12	15	5	5	10	15	20
55 kts	20	20	50	50	50	75	50	75	50	50	50
75 kts	40	70	70	100	100	115	70	120	120	100	100
100 kts	100	110	120	175	200	200	155	170	170	200	200

B. **SERIES 2** - Weight Simulation of Boost Cylinder Actuation

(1) Make sure elevator stop arm movement indicator and inclinometer read zero with elevator surface at neutral position.

(2) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **Boost Cylinder**.

(3) Announce start of **Test Run 3B4**.

(4) Record measurements with elevator held against TED stop by weights.

(a) Elevator stop arm movement indicator reading: _____

(b) Elevator surface angle: _____

(5) Announce end of **Test Run 3B4**.

C. **SERIES 3** - Static Tests, Wind

(1) Make sure elevator stop arm movement indicator and inclinometer read zero with elevator surface at neutral position.

(2) 25 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **25 kts**.

(b) Announce start of **Test Run 3C2C**.

(c) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(d) Announce end of **Test Run 3C2C**.

NOTE: Paragraph 3.D(2) may be accomplished at this point to reduce the number of weight setup changes.

(3) 55 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **55 kts**.

(b) Announce start of **Test Run 3C3C**.

(c) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(d) Announce end of **Test Run 3C3C**.

NOTE: Paragraph 3.D(3) may be accomplished at this point to reduce the number of weight setup changes.

(4) 75 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **75 kts**.

(b) Announce start of **Test Run 3C4C**.

(c) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(d) Announce end of **Test Run 3C4C**.

NOTE: Paragraph 3.D(4) may be accomplished at this point to reduce the number of weight setup changes.

D. **SERIES 4** - Static Tests, Wind and Boost Cylinder Actuation

(1) Make sure elevator stop arm movement indicator and inclinometer read zero with elevator surface at neutral position.

(2) 25 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **25 kts**.

(b) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(c) Announce start of **Test Run 3D2D**.

(d) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(e) Announce end of **Test Run 3D2D**.

(f) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(3) 55 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **55 kts**.

(b) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(c) Announce start of **Test Run 3D3D**.

(d) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(e) Announce end of **Test Run 3D3D**.

(f) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(4) 75 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **75 kts**.

(b) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(c) Announce start of **Test Run 3D4D**.

(d) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(e) Announce end of **Test Run 3D4D**.

(f) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

E. **SERIES 5** - Dynamic Tests, Wind

(1) Make sure elevator stop arm movement indicator and inclinometer read zero with elevator surface at neutral position.

(2) 25 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **25 kts**.

(b) Lift elevator surface to approximately neutral position.

(c) Announce start of **Test Run 3E2D**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(d) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(e) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(f) Announce end of **Test Run 3E2D**.

(g) Check security of test fixture to determine whether allowing elevator surface to fall from TEU position is acceptable.

(h) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

(i) Announce start of **Test Run 3E2 J**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(j) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(k) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(l) Announce end of **Test Run 3E2 J**.

(3) 55 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **55 kts**.

(b) Lift elevator surface to approximately neutral position.

(c) Announce start of **Test Run 3E3D**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(d) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(e) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(f) Announce end of **Test Run 3E3D**.

(g) Check security of test fixture to determine whether allowing elevator surface to fall from TEU stop is acceptable.

(h) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

(i) Announce start of **Test Run 3E3J**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(j) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(k) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(l) Announce end of **Test Run 3E3J**.

(4) 75 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **75 kts**.

(b) Lift elevator surface to approximately neutral position.

(c) Announce start of **Test Run 3E4D**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(d) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(e) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(f) Announce end of **Test Run 3E4D**.

(g) Check security of test fixture to determine whether allowing elevator surface to fall from TED stop is acceptable.

(h) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

(i) Announce start of **Test Run 3E4J**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(j) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(k) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator retained maximum reading: _____

2) Elevator surface angle: _____

(l) Announce end of **Test Run 3E4J**.

F. **SERIES 6** - Dynamic Tests, Wind and Boost Cylinder Actuation

(1) Make sure elevator stop arm movement indicator and inclinometer read zero with elevator surface at neutral position.

(2) 25 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **25 kts**.

(b) Lift elevator surface to approximately neutral position.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(c) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(d) Announce start of **Test Run 3F2E**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(e) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(f) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(g) Announce end of **Test Run 3F2E**.

(h) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(i) Check security of test fixture to determine whether allowing elevator surface to fall from TEU position is acceptable.

(j) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(k) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(l) Announce start of **Test Run 3F2M**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(m) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(n) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(o) Announce end of **Test Run 3F2M**.

(p) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(3) 55 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **55 kts**.

(b) Lift elevator surface to approximately neutral position.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(c) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(d) Announce start of **Test Run 3F3E**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(e) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(f) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(g) Announce end of **Test Run 3F3E**.

(h) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(i) Check security of test fixture to determine whether allowing elevator surface to fall from TEU stop is acceptable.

(j) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(k) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(l) Announce start of **Test Run 3F3M**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(m) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(n) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(o) Announce end of **Test Run 3F3M**.

(p) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(4) 75 Knot Simulation

(a) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **75 kts**.

(b) Lift elevator surface to approximately neutral position.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(c) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(d) Announce start of **Test Run 3F4E**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(e) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(f) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(g) Announce end of **Test Run 3F4E**.

(h) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(i) Check security of test fixture to determine whether allowing elevator surface to fall from TED stop is acceptable.

(j) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(k) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(l) Announce start of **Test Run 3F4M**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(m) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(n) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(o) Announce end of **Test Run 3F4M**.

(p) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

G. **SERIES 7** - 100kt Wind Tests

(1) Make sure elevator stop arm movement indicator and inclinometer read zero with elevator surface at neutral position.

(2) Suspend weights from tab hinge fittings as listed in **Simulation Weights Table**, row labeled **100 kts**.

(3) Static Test, Wind

(a) Announce start of **Test Run 3G3B**.

(b) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(c) Announce end of **Test Run 3G3B**.

(4) Static Test, Wind and Boost Cylinder Actuation

(a) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(b) Announce start of **Test Run 3G4C**.

(c) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator reading: _____

2) Elevator surface angle: _____

(d) Announce end of **Test Run 3G4C**.

(e) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(5) Dynamic Test, Wind

(a) Lift elevator surface to approximately neutral position.

(b) Announce start of **Test Run 3G5C**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(c) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(d) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(e) Announce end of **Test Run 3G5C**.

(f) Check security of test fixture to determine whether allowing elevator surface to fall from TEU position is acceptable.

(g) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

(h) Announce start of **Test Run 3G5I**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(i) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(j) Record measurements with elevator held against TED stop by weights.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(k) Announce end of **Test Run 3G5I**.

(6) Dynamic Test, Wind and Boost Cylinder Actuation

(a) Lift elevator surface to approximately neutral position.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(b) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(c) Announce start of **Test Run 3G6D**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(d) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(e) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(f) Announce end of **Test Run 3G6D**.

(g) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

(h) Check security of test fixture to determine whether allowing elevator surface to fall from TEU position is acceptable.

(i) If acceptable, lift elevator surface to TEU position, but maintain gap between stop arm and TEU stop on horizontal stabilizer. Gap is not to exceed 0.5 inch.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE HYDRAULIC PRESSURE IS APPLIED TO ELEVATOR BOOST CYLINDER.

(j) Apply hydraulic pressure to boost cylinder (see **Appendix**, paragraph 4.(A)(1)).

(k) Announce start of **Test Run 3G6L**.

WARNING: STAY CLEAR OF ELEVATOR SURFACE WHILE IT IS IN MOTION AFTER LIFTING FORCE IS REMOVED.

(l) Remove lifting force from elevator surface to allow elevator to fall to TED stop.

(m) Record measurements with elevator held against TED stop by weights and pressurized boost cylinder.

1) Elevator stop arm movement indicator maximum recorded reading: _____

2) Elevator surface angle: _____

(n) Announce end of **Test Run 3G6L**.

(o) Depressurize boost cylinder (see **Appendix**, paragraph 4.(A)(2)).

4. Appendix

A. Hydraulically pressurize and depressurize elevator boost cylinder (see **Hydraulic System Schematic**).

(1) Apply hydraulic pressure to boost cylinder.

(a) Close Port Interconnect Valve.

(b) Open Pressure Shutoff Valve.

(c) Open Return Shutoff Valve.

(d) Turn on hydraulic pressure source.

NOTE: Relief valve in boost cylinder will cause fluid to flow through cylinder and limit pressure to approximately 2200 PSI.

(e) If necessary, bleed air from boost cylinder by allowing fluid to flow through cylinder for 30 seconds minimum or until air can no longer be heard passing through cylinder, whichever occurs last.

NOTE: Bleeding is only necessary if hydraulic system connections were opened since last operated.

(2) Depressurize boost cylinder.

(a) Turn off hydraulic pressure source.

(b) Close Pressure Shutoff Valve.

(c) Close Return Shutoff Valve.

(d) Open Port Interconnect Valve.

(e) Make sure that pressure at boost cylinder after depressurization does not exceed 120 PSI during testing or 0 PSI if hydraulic system connections will be opened. If necessary, open Return Shutoff Valve to decrease pressure and then close again.

Beam deflection to torsion bar deflection (rotation)

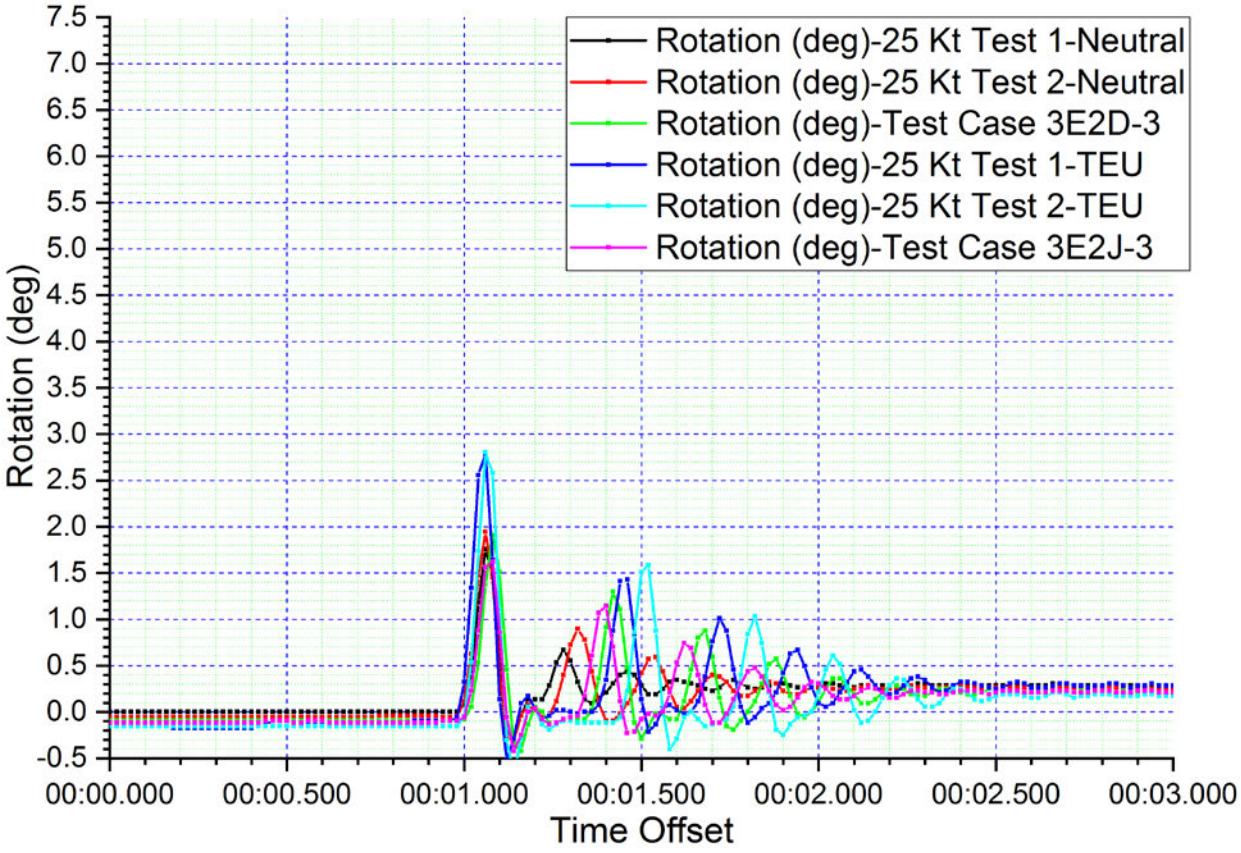
The beam deflection gage was connected to the stop arm 3.00 inches from the rotation center of the torsion bar.

Torsion bar deflection in degrees was calculated from the following formula:

$$\tan^{-1}\left(\frac{Beam\ Deflection\ in\ Inches}{3.00\ inches}\right)$$

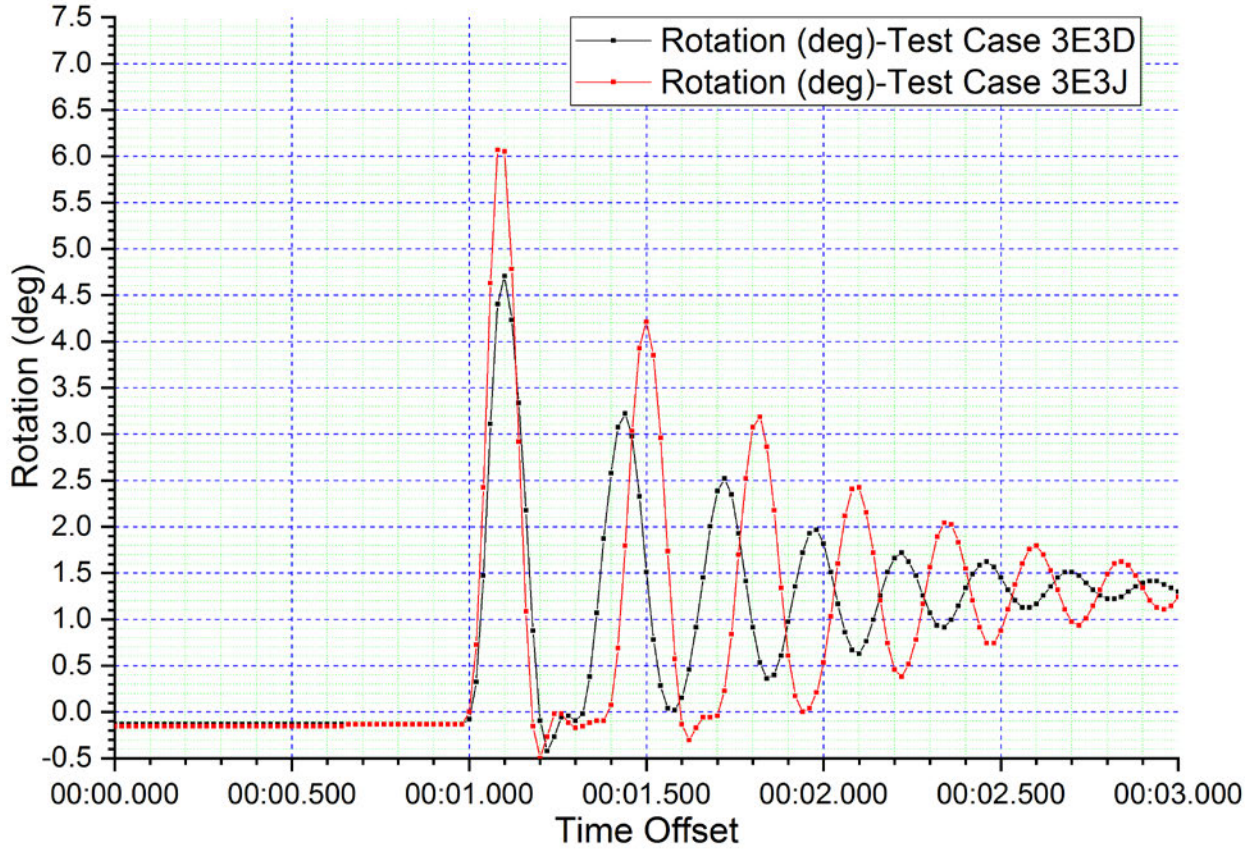
When the elevator against the TED stop, the position equates to 16.5° TED, with elevator neutral being 0°.

Series 5 – Dynamic Loading without boost cylinder activated (25 Knot Test Cases)



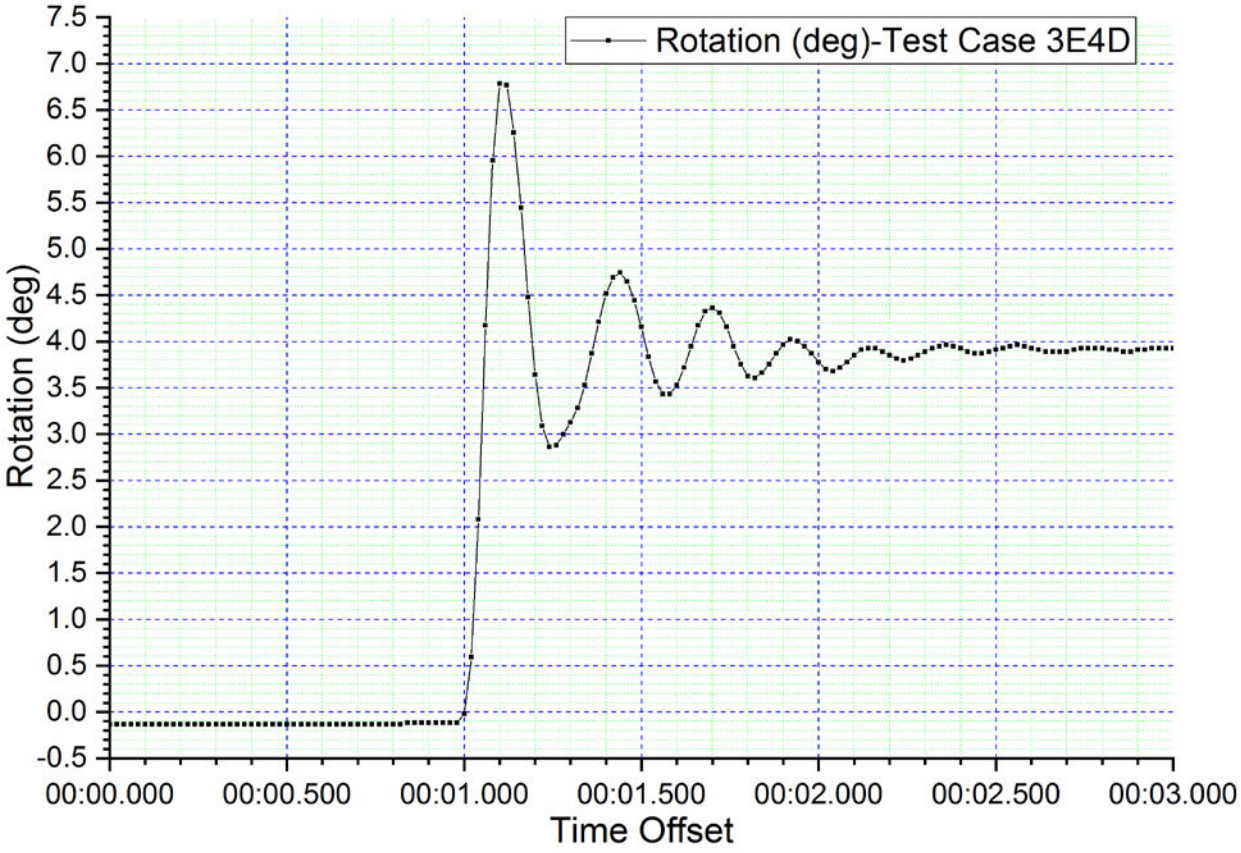
	Elevator Torsion Bar Stop Load Test				25kt wind						
	Inboard										*Outboard*
	Control Tab					Geared Tab			Anti-Float Tab		
	Hinge 1	Hinge 2	Hinge 3	Hinge 4	Hinge 5	Hinge 6	Hinge 7	Hinge 8	Hinge 9	Hinge 10	Hinge 11
Weight 1	20	15	10	5	5	15	12	10	7	7	5
Weight 2											
Weight 3											
Weight 4											
Weight 5											
Weight 6											
Weight 7											
Weight 8											
Total Weight [#]	20	15	10	5	5	15	12	10	7	7	5
Moment Arm [in]	23.50	22.50	21.00	20.00	19.00	17.50	16.00	15.00	12.00	10.00	9.00
Moment [in-#]	470	338	210	100	95	263	192	150	84	70	45
Control Tab Moment	1212.5		% Total	60.14							
Geared Tab Moment	604.5		% Total	29.99							
Anti Float Tab Moment	199		% Total	9.87							
Total elevator HM	2016										
TARGET HM	~~2400 in-#~~	*1992 in-#*									
TARGET DISTRIBUTION	60-30-10	*inbd to outbd*									
Total Dead Weight [#]	111										

Series 5 – Dynamic Loading without boost cylinder activated (55 Knot Test Cases)



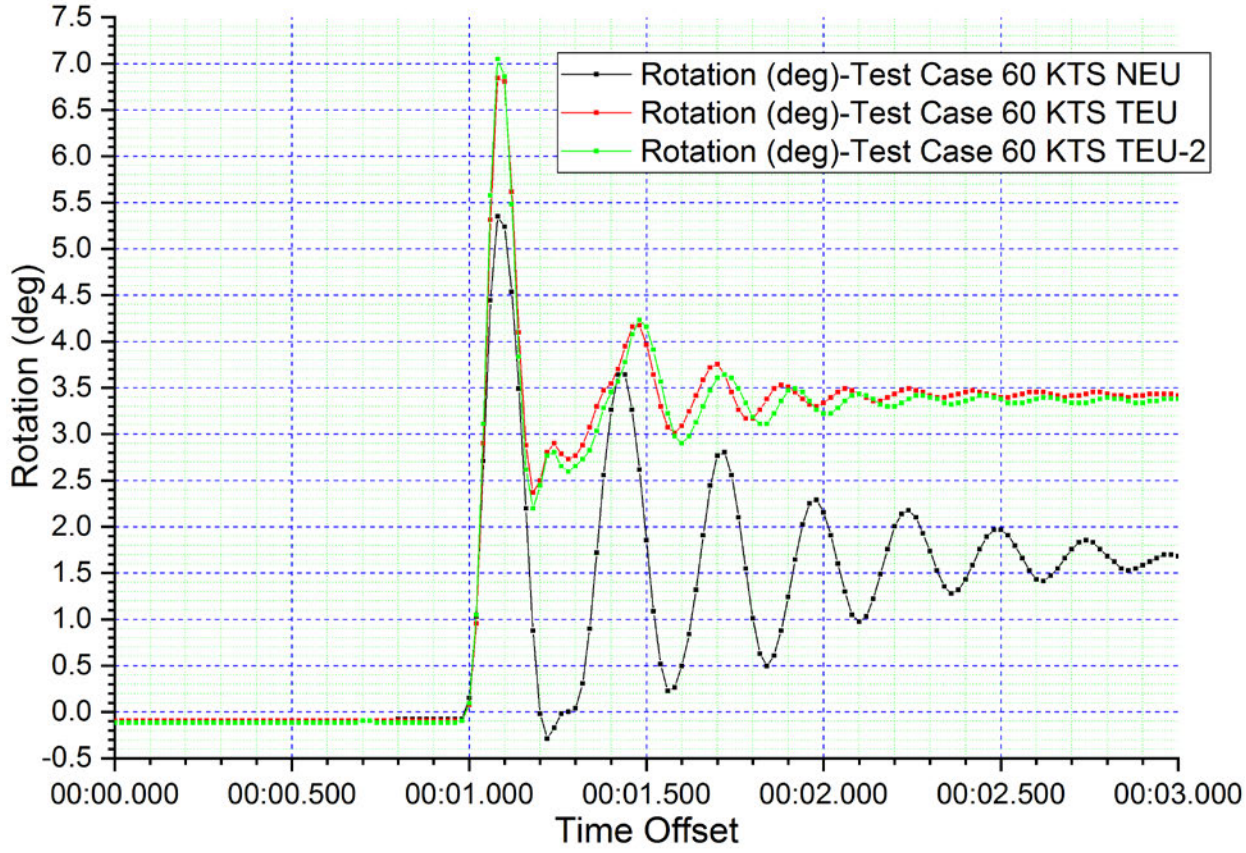
	Elevator Torsion Bar Stop Load Test				55 kt wind gust						
	Inboard										*Outboard*
	Control Tab					Geared Tab			Anti-Float Tab		
	Hinge 1	Hinge 2	Hinge 3	Hinge 4	Hinge 5	Hinge 6	Hinge 7	Hinge 8	Hinge 9	Hinge 10	Hinge 11
Weight 1	50	50	50	50	50	50	50	50	50	20	20
Weight 2				20		20					
Weight 3				5		5					
Weight 4											
Weight 5											
Weight 6											
Weight 7											
Weight 8											
Total Weight [#]	50	50	50	75	50	75	50	50	50	20	20
Moment Arm [in]	23.50	22.50	21.00	20.00	19.00	17.50	16.00	15.00	12.00	10.00	9.00
Moment [in-#]	1175	1125	1050	1500	950	1313	800	750	600	200	180
Control Tab Moment	5800		% Total	60.15							
Geared Tab Moment	2862.5		% Total	29.69							
Anti Float Tab Moment	980		% Total	10.16							
Total elevator HM	9642.5										
TARGET HM	~~9940 in-#~~	9640 in-#									
TARGET DISTRIBUTION	60-30-10	*inbd to outbd*									
Total Dead Weight [#]	540										

Series 5 – Dynamic Loading without boost cylinder activated (75 Knot Test Case)



	Elevator Torsion Bar Stop Load Test				75kt wind						
	Inboard										*Outboard*
	Control Tab					Geared Tab			Anti-Float Tab		
	Hinge 1	Hinge 2	Hinge 3	Hinge 4	Hinge 5	Hinge 6	Hinge 7	Hinge 8	Hinge 9	Hinge 10	Hinge 11
Weight 1	50	50	50	50	50	50	50	50	50	50	20
Weight 2	50	50	50	50	20	50	50	50	20	20	20
Weight 3			20	20		15					
Weight 4											
Weight 5											
Weight 6											
Weight 7											
Weight 8											
Total Weight [	100	100	120	120	70	115	100	100	70	70	40
Moment Arm [in]	23.50	22.50	21.00	20.00	19.00	17.50	16.00	15.00	12.00	10.00	9.00
Moment [in-#]	2350	2250	2520	2400	1330	2013	1600	1500	840	700	360
Control Tab Moment	10850		% Total	60.74							
Geared Tab Moment	5112.5		% Total	28.62							
Anti Float Tab Moment	1900		% Total	10.64							
Total elevator HM	17862.5										
TARGET HM	~~18500 in #~~	*17927 in-#*									
TARGET DISTRIBUTION	60-30-10	*inbd to outbd*									
Total Dead Weight [#]	1005										

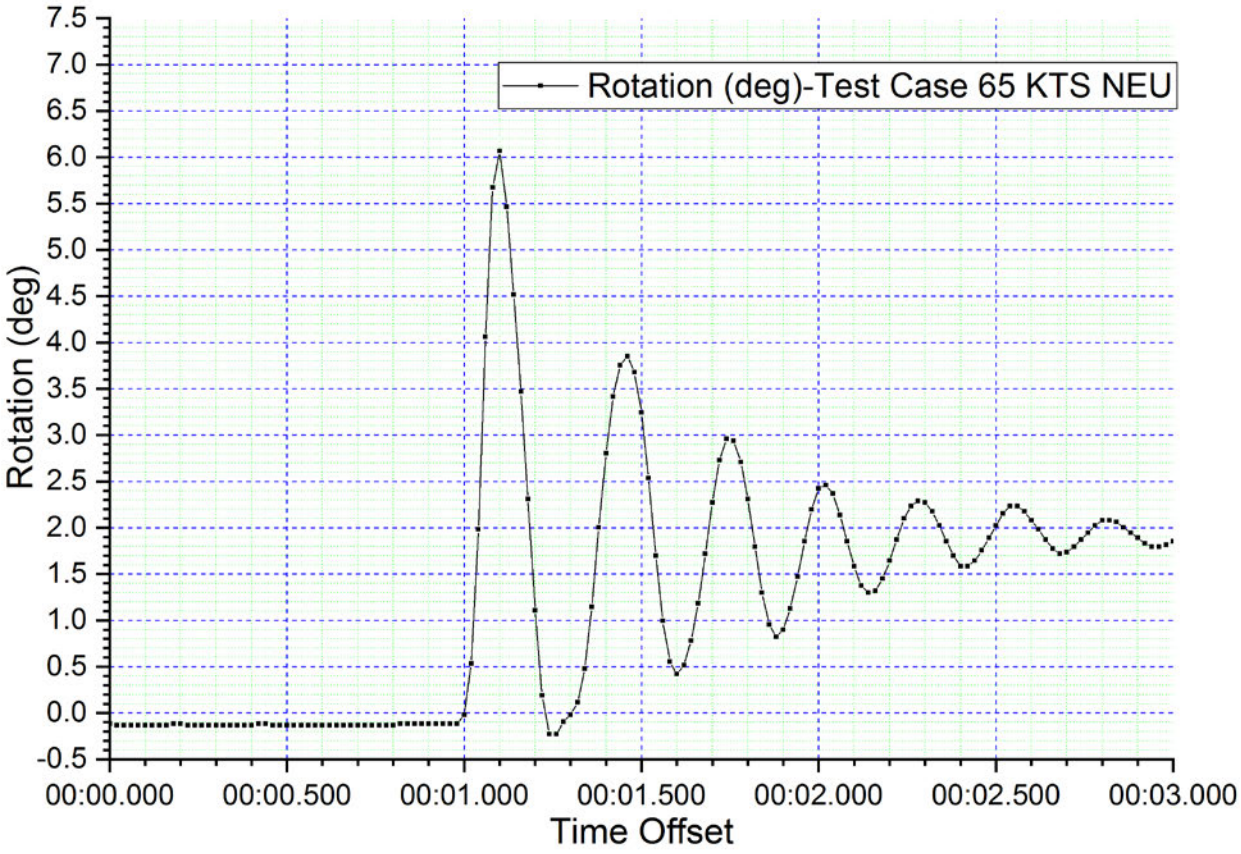
Additional Test – Dynamic Loading without boost cylinder activated (60 Knot Test Cases)



	Elevator Torsion Bar Stop Load Test				60 kt wind gust						
	Inboard										*Outboard*
	Control Tab					Geared Tab			Anti-Float Tab		
	Hinge 1	Hinge 2	Hinge 3	Hinge 4	Hinge 5	Hinge 6	Hinge 7	Hinge 8	Hinge 9	Hinge 10	Hinge 11
Weight 1	50	50	50	50	50	50	50	50	50	30	30
Weight 2			50	30		30	20				
Weight 3						5					
Weight 4											
Weight 5											
Weight 6											
Weight 7											
Weight 8											
Total Weight [#]	50	50	100	80	50	85	70	50	50	30	30
Moment Arm [in]	23.50	22.50	21.00	20.00	19.00	17.50	16.00	15.00	12.00	10.00	9.00
Moment [in-#]	1175	1125	2100	1600	950	1488	1120	750	600	300	270

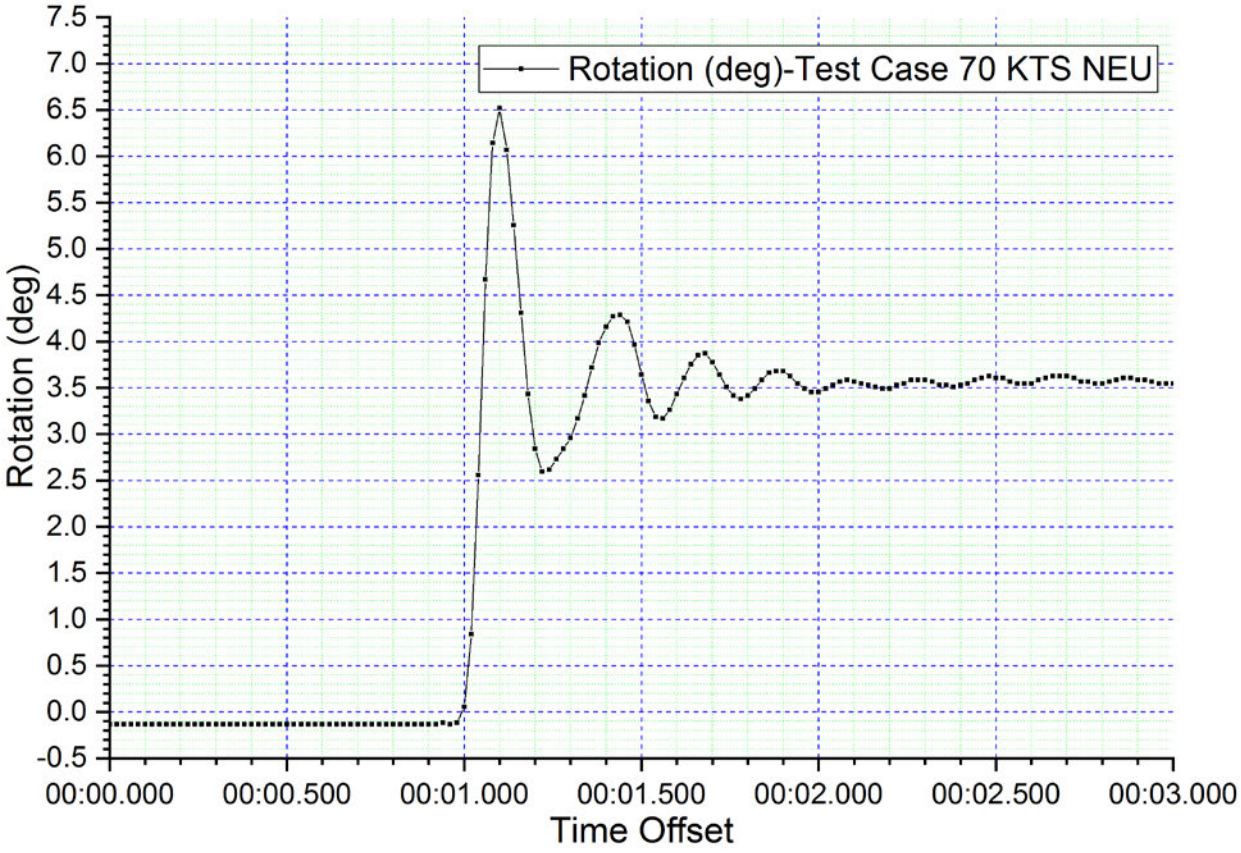
Control Tab Moment	6950		% Total	60.55
Geared Tab Moment	3357.5		% Total	29.25
Anti Float Tab Moment	1170		% Total	10.19
Total elevator HM	11477.5			
TARGET HM	~~9940 in-#~~	11473 in-#		
TARGET DISTRIBUTION	60-30-10	*inbd to outbd*		
Total Dead Weight [#]	645			

Additional Test – Dynamic Loading without boost cylinder activated (65 Knot Test Case)



	Elevator Torsion Bar Stop Load Test				65 kt wind gust						
	Inboard										*Outboard*
	Control Tab					Geared Tab			Anti-Float Tab		
	Hinge 1	Hinge 2	Hinge 3	Hinge 4	Hinge 5	Hinge 6	Hinge 7	Hinge 8	Hinge 9	Hinge 10	Hinge 11
Weight 1	50	50	50	50	50	50	50	50	50	30	30
Weight 2			50	50	5	50	20	5	5		
Weight 3			20	10		10	10		10		
Weight 4											
Weight 5											
Weight 6											
Weight 7											
Weight 8											
Total Weight [	50	50	120	110	55	110	80	55	65	30	30
Moment Arm [in]	23.50	22.50	21.00	20.00	19.00	17.50	16.00	15.00	12.00	10.00	9.00
Moment [in-#]	1175	1125	2520	2200	1045	1925	1280	825	780	300	270
Control Tab Moment	8065		% Total	59.99							
Geared Tab Moment	4030		% Total	29.97							
Anti Float Tab Moment	1350		% Total	10.04							
Total elevator HM	13445										
TARGET HM	~~9940 in-#~~	13465 in-#									
TARGET DISTRIBUTION	60-30-10	*inbd to outbd*									
Total Dead Weight [#]	755										

Additional Test – Dynamic Loading without boost cylinder activated (70 Knot Test Case)



	Elevator Torsion Bar Stop Load Test				70 kt wind gust						
	Inboard										*Outboard*
	Control Tab					Geared Tab			Anti-Float Tab		
	Hinge 1	Hinge 2	Hinge 3	Hinge 4	Hinge 5	Hinge 6	Hinge 7	Hinge 8	Hinge 9	Hinge 10	Hinge 11
Weight 1	50	50	50	50	50	50	50	50	50	30	30
Weight 2	10	10	50	50	20	50	20	20	20	10	5
Weight 3			20	20	20	20	10	10			
Weight 4						5					
Weight 5											
Weight 6											
Weight 7											
Weight 8											
Total Weight [#]	60	60	120	120	90	125	80	80	70	40	35
Moment Arm [in]	23.50	22.50	21.00	20.00	19.00	17.50	16.00	15.00	12.00	10.00	9.00
Moment [in-#]	1410	1350	2520	2400	1710	2188	1280	1200	840	400	315
Control Tab Moment	9390		% Total	60.14							
Geared Tab Moment	4667.5		% Total	29.90							
Anti Float Tab Moment	1555		% Total	9.96							
Total elevator HM	15612.5										
TARGET HM	~~9940 in-#~~	15616 in-#									
TARGET DISTRIBUTION	60-30-10	*inbd to outbd*									
Total Dead Weight [#]	880										