RUDDER CONTROL CABLES - ADJUSTMENT/TEST

EFFECTIVITY: ACFT MODEL(S) EMB-145

1. General

A. This section gives the procedures to do the check of the tension of the rudder control cables and rudder autopilot-servo cables.

B. The procedures in this section are given in the sequence below. The tasks identified with (♦) are part of the Scheduled Maintenance Requirements Document (SMRD).

TASK NUMBER	*DESCRIPTION*	*EFFECTIVITY*
27-21-01-700-801-A ♦	TENSION OF RUDDER CONTROL CABLES - FUNCTIONAL CHECK	ACFT MODEL(S) EMB-145
27-21-01-700-802-A	TENSION OF RUDDER AUTOPILOT-SERVO CABLES - FUNCTIONAL CHECK	ACFT MODEL(S) EMB-145

TASK 27-21-01-700-801-A
EFFECTIVITY: ACFT MODEL(S) EMB-145

2. TENSION OF RUDDER CONTROL CABLES - FUNCTIONAL CHECK

A. General

(1) This task gives the procedures to do the check of the tension of the rudder control cables.

(2) Figure 502 gives the graph “Load x Temperature for Rudder Control Cables Tension”.

B. References

REFERENCE	*DESIGNATION*
AMM MPP 06-41-01/100	-
AMM MPP 06-41-02/100	-
AMM MPP 06-42-00/100	-
AMM TASK 25-27-02-000-801-A/400	-
AMM TASK 25-27-02-400-801-A/400	-
AMM TASK 27-21-01-400-802-A/400	AUTOPILOT CONTROL CABLE - INSTALLATION
AMM TASK 27-21-01-700-802-A/500	-
IPC 27-21-00	RUDDER PRIMARY MECHANICAL CONTROL

C. Zones and Accesses

ZONE	*PANEL/DOOR*	*LOCATION*
123	123BL	Area below the cockpit floor
261	261BF	Passenger cabin
312	312AR	Structural area aft of the rear pressure bulkhead - RH

D. Tools and Equipment

ITEM	*DESCRIPTION*	*PURPOSE*	*QTY*
GSE 058	Rig Pin Kit	To lock the rudder system in the neutral position	
GSE 074	Tensiometer	To measure the loads	
Commercially available	Thermometer	To measure the temperature	
GSE 380	Clip - Tension Adj, Control Cable	To prevent twist of the control cable during adjustment	

E. Auxiliary Items

Not Applicable

F. Consumable Materials

Not Applicable

G. Expendable Parts

ITEM	*IPC REFERENCE (VENDOR REFERENCE)*	*QTY*
Locking clip	IPC 27-21-00	AR

H. Persons Recommended

QTY	*FUNCTION*	*PLACE*
1	Does the task	Fuselage
1	Helps the other technician	Fuselage

I. Preparation

SUBTASK 841-011-B

(1) Make sure that the aircraft is safe for maintenance.

(2) Do not do other tasks on the rudder system.

(3) Remove cockpit underfloor access hatch 123BL (AMM MPP 06-41-01/100).

(4) Remove the cover of the FWD Cargo Compartment Partition (AMM TASK 25-27-02-000-801-A/400).

(5) Remove floor panel 261BF (AMM MPP 06-41-02/100).

(6) Open access door 312AR (AMM MPP 06-42-00/100).

J. Functionally Check Tension of Rudder Control Cables (Figure 503)

SUBTASK 720-011-B

(1) Measure the temperature in the fuselage.

NOTE:
- You must adjust the rudder control cables with the aircraft parked for a minimum of one hour in the hangar.
- To measure the temperature, you must put the thermometer near the control cable circuit. Let the thermometer stay in position for a minimum of 5 minutes, until the temperature becomes stable.

(2) Use the graph of Figure 502 to get the load value related to the temperature.

NOTE: The tolerance for the rudder control cable tension is ± 5 lbf (± 2.3 kgf).

CAUTION:
- TURN THE BARREL OF THE TURNBUCKLE TO APPLY TENSION TO THE CONTROL CABLE. DO NOT TURN THE CONTROL CABLE TO TENSION IT.
- WHEN YOU APPLY TENSION TO THE RUDDER CONTROL CABLES, YOU MUST DO A VISUAL CHECK ON THE UNION OF THE RUDDER CONTROL CABLES AND RUDDER AUTOPILOT CONTROL CABLES FOR GENERAL CONDITION AND INTEGRITY.

(3) Settling-down check (Immediately after the replacement of an old cable with a new one only).

NOTE: Do step 4 for other control cable circuit (s) where you did not replace the control cable (s).

(a) Install the rig pins to the forward torque tube and rear torque tube. See Figure 501.

(b) With the aid of GSE 380 (Figure 504) and only in the control cable circuit (s) where you replaced the control cable (s), do as follows:

1 Apply sufficient tension to only stretch out the cables and then make sure that the insertion points of the Rudder Servo into the primary rudder control cable are correctly positioned (refer to AMM TASK 27-21-01-400-802-A/400).

2 Apply a load to the rudder control cable circuit 50% higher than the load related to the measured temperature.

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(c) (ON AIRCRAFT WITH RUDDER−CONTROL STAINLESS−STEEL CABLES) Remove the rig pins and do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(d) (ON AIRCRAFT WITH RUDDER−CONTROL CARBON−STEEL CABLES) Remove the rig pins and do twenty (20) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You must operate the rudder system in the mechanical reversion mode.

(e) Install the rig pins to the forward torque tube and rear torque tube. See Figure 501.

(f) (ON AIRCRAFT WITH RUDDER−CONTROL STAINLESS−STEEL CABLES) With the aid of GSE 380 (Figure 504) adjust the load of the rudder control cables installed in the fuselage to the value related to the measured temperature in step 1.

(g) (ON AIRCRAFT WITH RUDDER−CONTROL CARBON−STEEL CABLES) Measure the tension of the rudder control cables in the fuselage:

NOTE: You must measure the cable tension away from the pulleys, turnbuckles, and cable passages.

1 If you get the tension value 50% higher than the load related to the measured temperature given in the graph of Figure 502, keep the system under tension for a minimum of 24 hours.

2 If you do not get the tension value 50% higher than the load related to the measured temperature given in the graph of Figure 502, do steps (a) thru (g) again until you have the tension specified.

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(h) (ON AIRCRAFT WITH RUDDER−CONTROL STAINLESS−STEEL CABLES) Remove the rig pins and do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(i) (ON AIRCRAFT WITH RUDDER−CONTROL CARBON−STEEL CABLES) Remove the rig pins and do twenty (20) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You must operate the rudder system in the mechanical reversion mode.

(j) Install the rig pins to the forward torque tube and rear torque tube. See Figure 501.

(k) (ON AIRCRAFT WITH RUDDER−CONTROL CARBON−STEEL CABLES) With the aid of GSE 380 (Figure 504) adjust the load of the rudder control cables installed in the fuselage to the value related to the measured temperature in step 1.

(l) (ON AIRCRAFT WITH RUDDER−CONTROL STAINLESS−STEEL CABLES) Measure the tension of the rudder control cables in the fuselage.

NOTE: You must measure the cable tension away from the pulleys, turnbuckles, and cable passages.

(m) (ON AIRCRAFT WITH RUDDER−CONTROL STAINLESS−STEEL CABLES) If necessary, apply tension to the rudder control cables.

1 Use the graph of Figure 502 to get the load value related to the temperature.

NOTE: The tolerance for the rudder control cables tension is ± 5 lbf (± 2.3 kgf).

2 Do steps (e) thru (h) until you get the tension of the graph of Figure 502.

(n) Install new locking clips on the turnbuckle.

(o) Do a check of the tension of the rudder autopilot-servo cables (AMM TASK 27-21-01-700-802-A/500).

CAUTION:
- TURN THE BARREL OF THE TURNBUCKLE TO APPLY TENSION TO THE CONTROL CABLE. DO NOT TURN THE CONTROL CABLE TO TENSION IT.
- WHEN YOU APPLY TENSION TO THE RUDDER CONTROL CABLES, YOU MUST DO A VISUAL CHECK ON THE UNION OF THE RUDDER CONTROL CABLES AND RUDDER AUTOPILOT CONTROL CABLES FOR GENERAL CONDITION AND INTEGRITY.

(4) Do this procedure only for the control cables circuit where you did not replace the control cable (s).

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(a) Remove the rig pins and do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

(b) Install the rig pins to the forward torque tube and rear torque tube. See Figure 501.

(c) Measure the tension of the rudder control cables in the fuselage.

NOTE: You must measure the cable tension away from the pulleys, turnbuckles, and cable passages.

(d) If necessary, apply tension to the rudder control cables, with the aid of GSE 380 (Figure 504). Use the graph of Figure 502 to get the load value related to the temperature.

NOTE: The tolerance for the rudder control cables tension is ± 5 lbf (± 2.3 kgf).

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(e) Remove the rig pins and do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

(f) Install the rig pins to the forward torque tube and rear torque tube. See Figure 501.

(g) Measure the tension of the rudder control cables in the fuselage.

NOTE: You must measure the cable tension away from the pulleys, turnbuckles, and cable passages.

(h) If necessary, do steps “d” thru “g” again until you get the tension of the graph of Figure 502.

(i) Install new locking clips on the turnbuckle.

(j) Do a check of the tension of the rudder autopilot-servo cables (AMM TASK 27-21-01-700-802-A/500).

K. Follow-on

SUBTASK 842-011-B

(1) Remove all rig pins (Figure 501).

(2) Do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

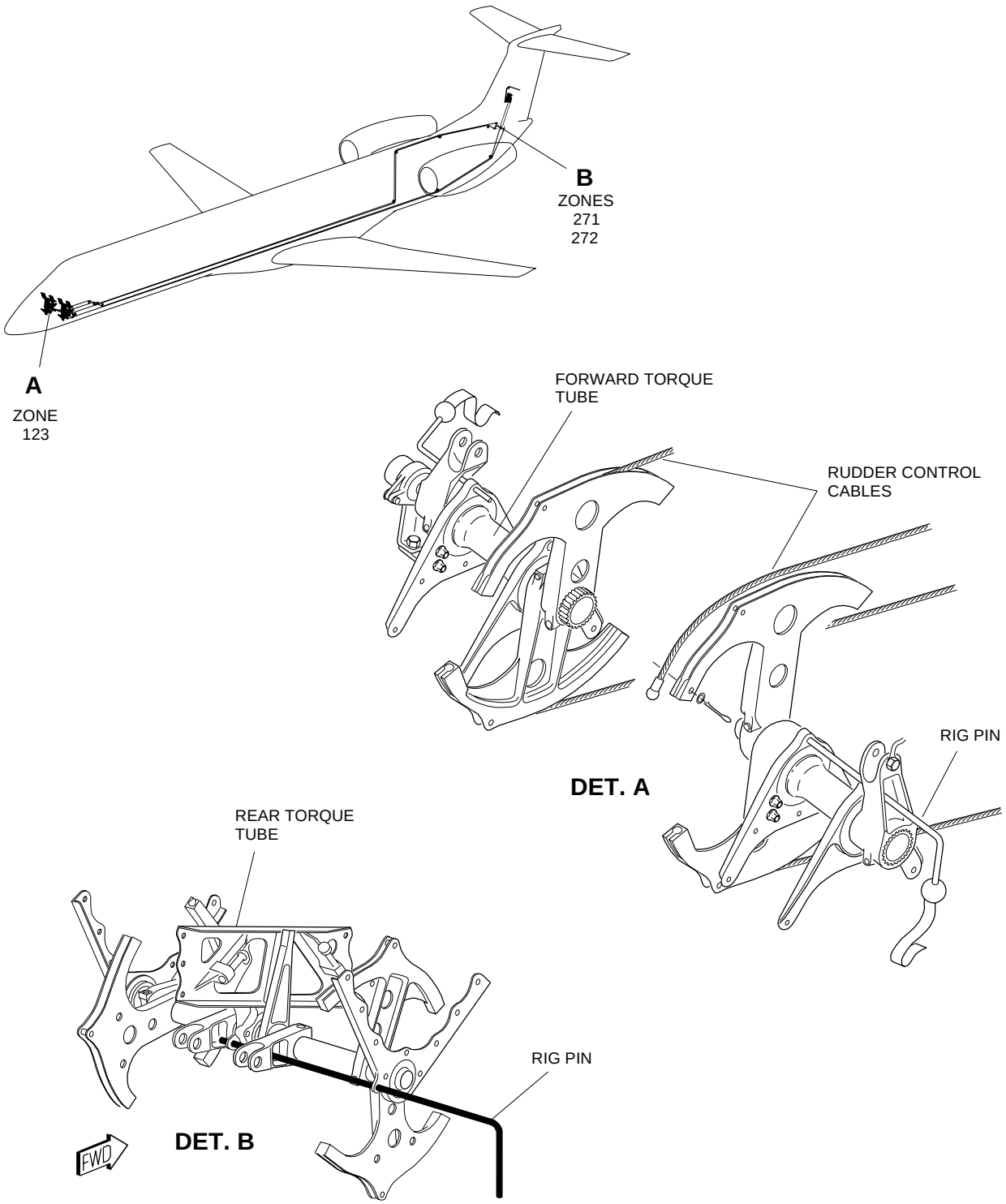
(3) Install the cover of the FWD Cargo Compartment Partition (AMM TASK 25-27-02-400-801-A/400)..

(4) Install control rigging door 123BL (AMM MPP 06-41-01/100).

(5) Install floor panel 261BF (AMM MPP 06-41-02/100).

(6) Close access door 312AR (AMM MPP 06-42-00/100).

EFFECTIVITY: ACFT MODEL(S) EMB-145
Forward and Rear Torque Tubes - Location
Figure 501



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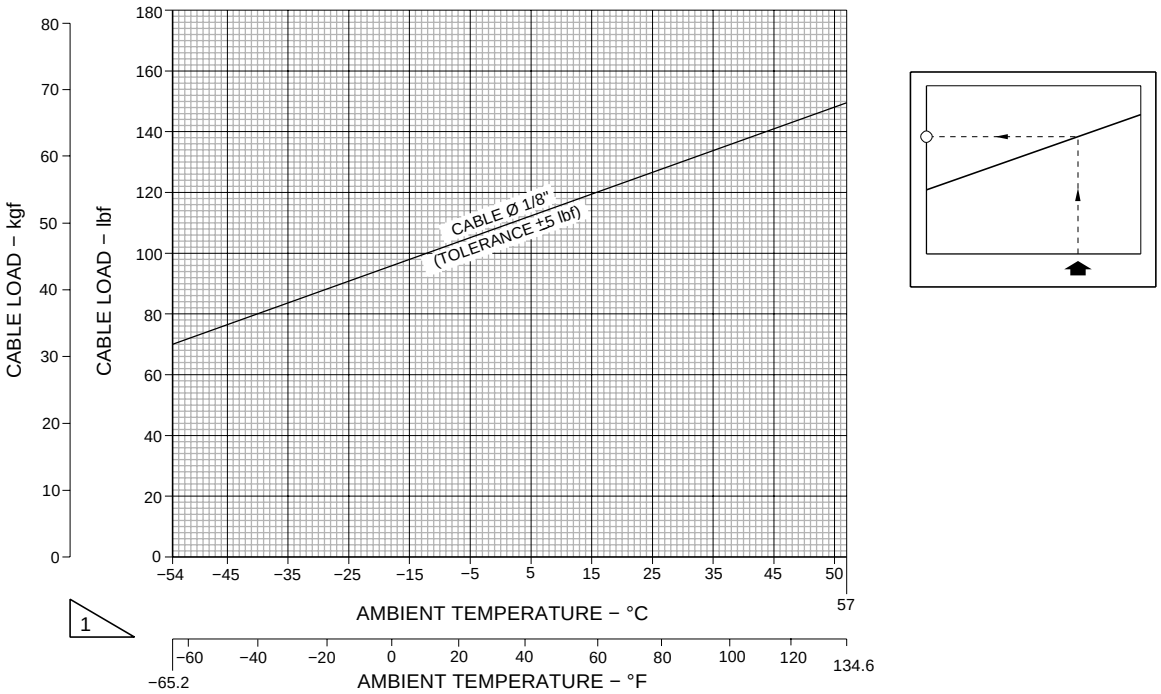
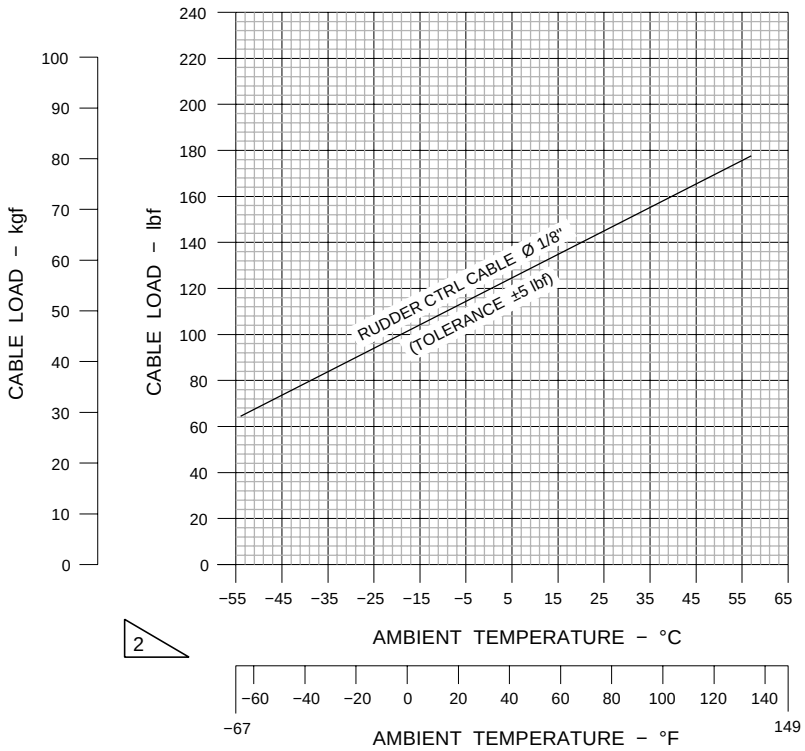
EFFECTIVITY: ACFT MODEL(S) EMB-145

Load x Temperature for Tension of Rudder Control Cables - Graph
Figure 502





1 ON AIRCRAFT WITH RUDDER−CONTROL STAINLESS−STEEL CABLES.

2 ON AIRCRAFT WITH RUDDER−CONTROL CARBON−STEEL CABLES.

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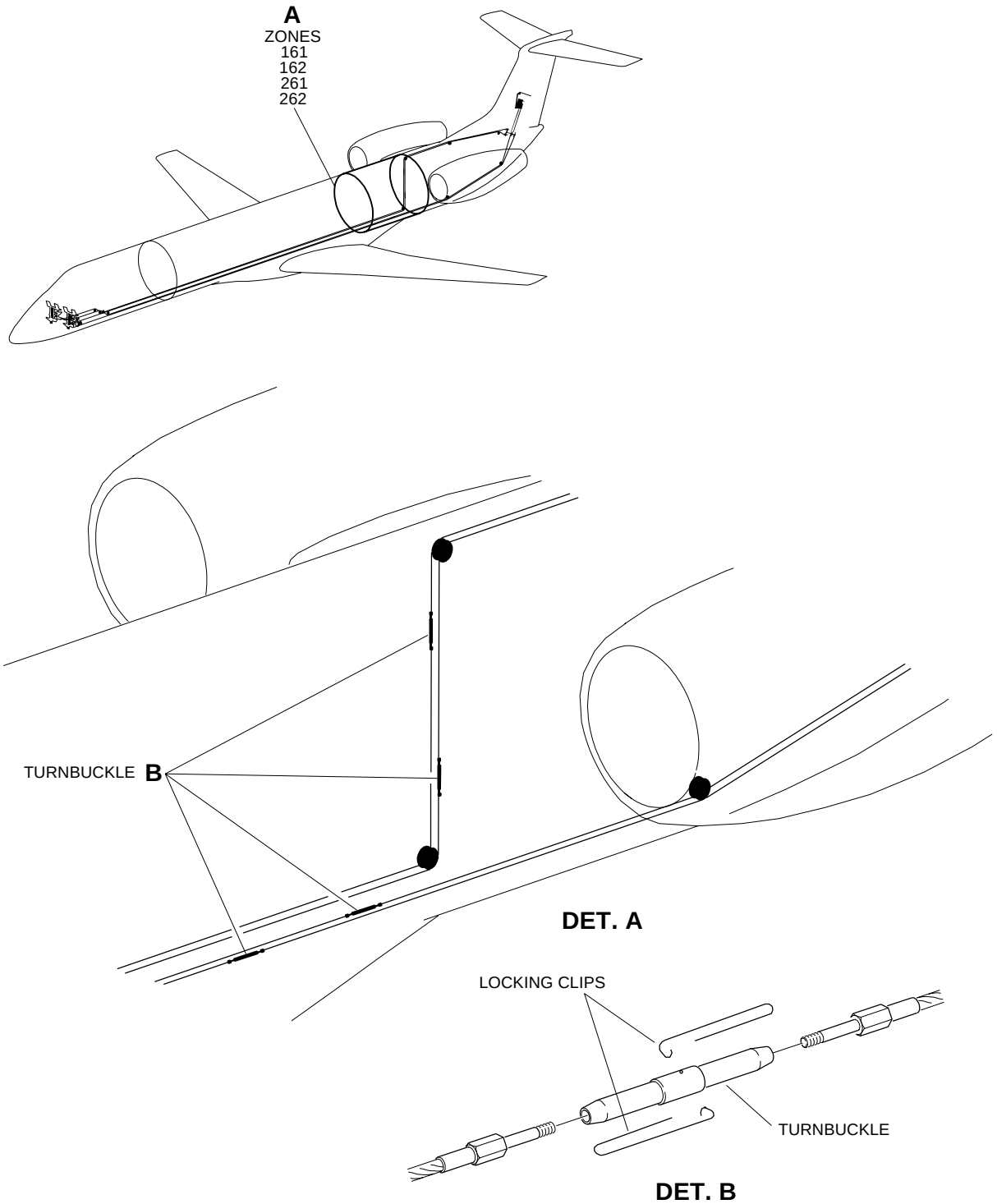
EFFECTIVITY: ACFT MODEL(S) EMB-145

Turnbuckles of the Rudder Control Cables - Location
Figure 503



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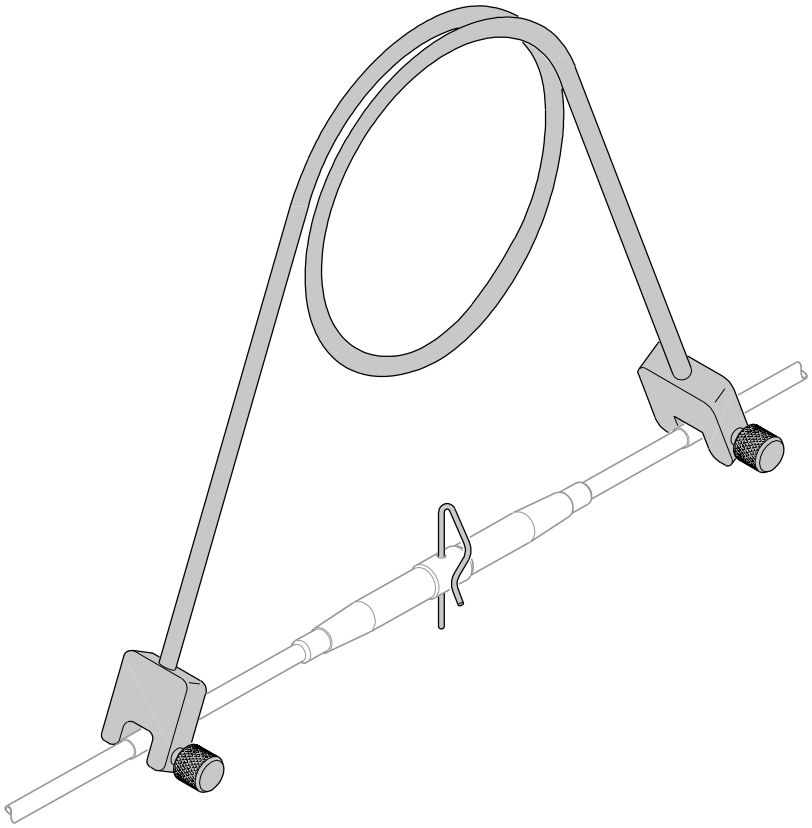
EFFECTIVITY: ACFT MODEL(S) EMB-145
GSE 380 - Clip - Tension Adj, Control Cable
Figure 504



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TASK 27-21-01-700-802-A
EFFECTIVITY: ACFT MODEL(S) EMB-145

3. TENSION OF RUDDER AUTOPILOT-SERVO CABLES - FUNCTIONAL CHECK

A. General

(1) This task gives the procedures to do the check of the tension of the rudder autopilot-servo cables.

B. References

REFERENCE	*DESIGNATION*
AMM MPP 06-41-01/100	-
AMM MPP 06-41-02/100	-
AMM TASK 27-21-01-400-802-A/400	AUTOPILOT CONTROL CABLE - INSTALLATION
AMM TASK 27-21-01-700-801-A/500	-
IPC 22-10-05	RUDDER SERVO

C. Zones and Accesses

ZONE	*PANEL/DOOR*	*LOCATION*
123	123BL	Area below the cockpit floor
271	271EF	Rear fuselage
272	272DR	Rear electronic compartment

D. Tools and Equipment

ITEM	*DESCRIPTION*	*PURPOSE*	*QTY*
GSE 058	Rig pin kit	To lock the rudder system in the neutral position	
GSE 074	Tensiometer	To measure the loads	
Commercially available	Thermometer	To measure the temperature	
GSE 380	Tension Adj, Control Cable	To prevent twist of the control cable during adjustment	

E. Auxiliary Items

Not Applicable

F. Consumable Materials

Not Applicable

G. Expendable Parts

ITEM	*IPC REFERENCE (VENDOR REFERENCE)*	*QTY*
Locking clip	IPC 22-10-05	AR

H. Persons Recommended

QTY	*FUNCTION*	*PLACE*
1	Does the task	Fuselage
1	Helps the other technician	Fuselage

I. Preparation

SUBTASK 841-012-B

(1) Make sure that the aircraft is safe for maintenance.

(2) Do not do other tasks on the rudder system.

(3) Remove cockpit underfloor access hatch 123BL (AMM MPP 06-41-01/100).

(4) Remove access door 272DR (AMM MPP 06-41-01/100).

(5) Remove floor panel 271EF (AMM MPP 06-41-02/100).

(6) Install the rig pin in the forward and rear torque tubes (Figure 501).

J. Functionally Check Tension of Rudder Autopilot-servo Cables (Figure 505)

SUBTASK 720-012-B

NOTE:
- Do a check of the tension of the rudder control cables (AMM TASK 27-21-01-700-801-A/500) before you do this procedure. If necessary, adjust the tension of the rudder control cables (AMM TASK 27-21-01-700-801-A/500).
- Make sure that the insertion points of the rudder servo into the primary rudder control cable are correctly positioned (refer to AMM TASK 27-21-01-400-802-A/400).

(1) Measure the temperature in the fuselage.

NOTE:
- You must adjust the rudder autopilot control cables with the aircraft parked for a minimum of one hour in the hangar.
- To measure the temperature, you must put the thermometer near the control cable circuit. Let the thermometer stay in position for a minimum of 5 minutes, until the temperature becomes stable.

(2) Use the graph of Figure 506 to get the load value related to the temperature.

(3) Measure the tension of the rudder autopilot-servo cables and then do a check with the load value of the graph of Figure 506.

- The tolerance for the rudder autopilot control cable tension is ± 5 lbf (± 2.3 kgf).

CAUTION: • TURN THE BARREL OF THE TURNBUCKLE TO APPLY TENSION TO THE CONTROL CABLE. DO NOT TURN THE CONTROL CABLE TO TENSION IT.

• WHEN YOU APPLY TENSION TO THE RUDDER AUTOPILOT CONTROL CABLES, YOU MUST DO A VISUAL CHECK ON THE UNION OF THE RUDDER CONTROL CABLES AND RUDDER AUTOPILOT CONTROL CABLES FOR GENERAL CONDITION AND INTEGRITY.

(4) If necessary, do this procedure to apply tension to the rudder autopilot servo cables.

(a) With the aid of GSE 380 (Figure 504) apply tension to the rudder autopilot-servo cables until you get the load value of the graph of Figure 506.

WARNING: DO NOT OPERATE THE RUDDER SYSTEM WITH THE RIG PINS INSTALLED TO PREVENT DAMAGE TO THE RIGGING HOLES/PINS.

(b) Remove the rig pin from the rear and forward torque tubes and do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

(c) Measure the tension of the rudder autopilot-servo cables and then do a check with the load value of the graph of Figure 506.

(d) If necessary, with the aid of GSE 380 (Figure 504), adjust the tension of the rudder autopilot-servo cables.

(e) Do steps “a” thru “d” until you get the tension of the graph of Figure 506.

(f) Do a check of the rudder control cables (AMM TASK 27-21-01-700-801-A/500).

• If necessary, with the aid of GSE 380 (Figure 504), adjust the tension of the rudder control cables (AMM TASK 27-21-01-700-801-A/500).

(5) Do this step only if you apply tension to the rudder control cables (AMM TASK 27-21-01-700-801-A/500) after you adjusted the rudder autopilot-servo cables.

(a) Do step 3 again.

(b) If necessary, do step 4 again.

(6) Install new locking clips on the turnbuckle.

K. Follow-on

SUBTASK 842-012-B

(1) Remove all rig pins.

(2) Do ten (10) full rudder command cycles (fully left - neutral - fully right - neutral - for each cycle).

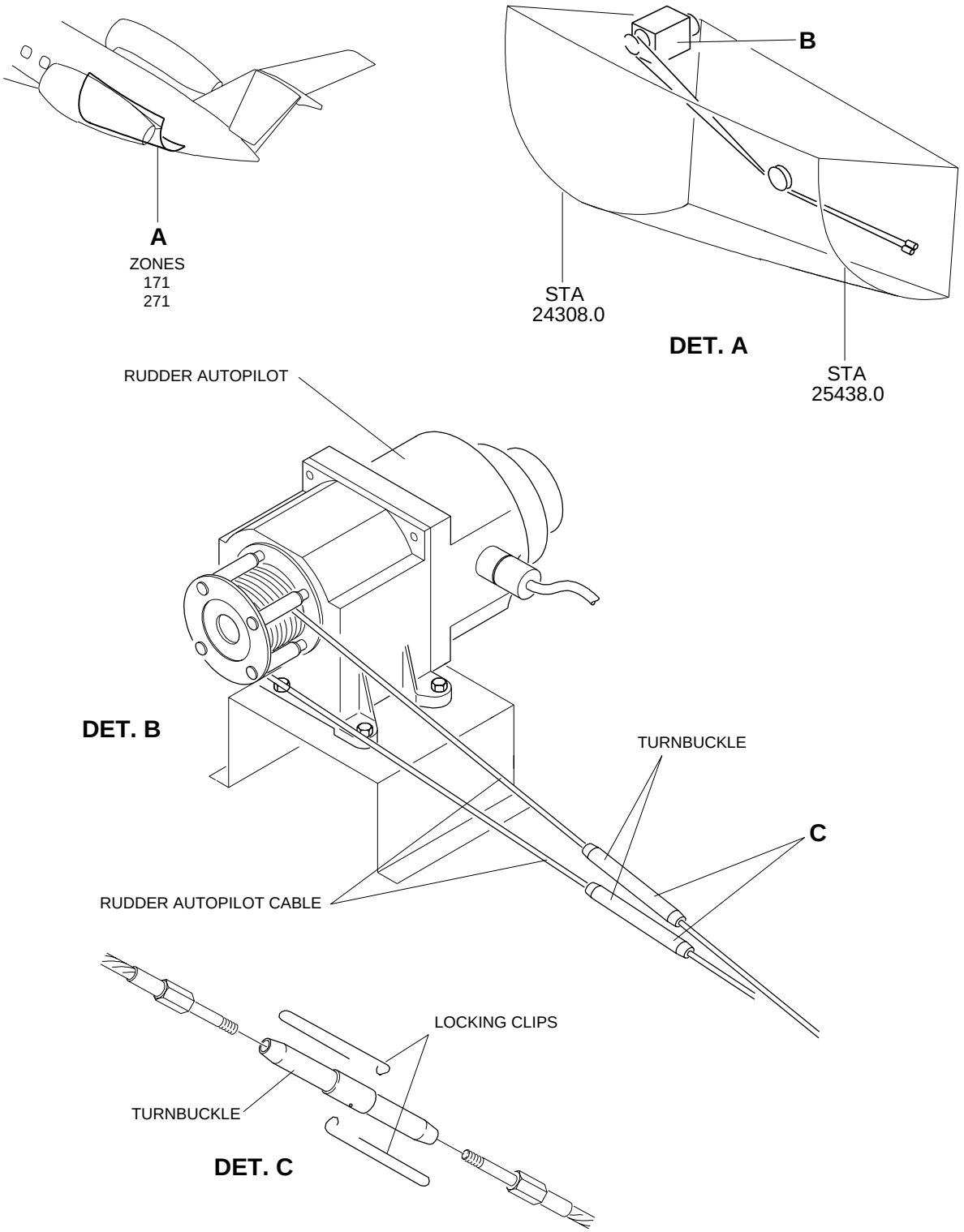
NOTE: You can operate the rudder system in two modes: mechanical reversion or hydraulic power. Use the mode which is easier for you.

(3) Install cockpit underfloor access hatch 123BL (AMM MPP 06-41-01/100).

(4) Install floor panel 271EF (AMM MPP 06-41-02/100).

(5) Install access door 272DR (AMM MPP 06-41-01/100).

EFFECTIVITY: ACFT MODEL(S) EMB-145
Rudder Autopilot-servo Cables - Location
Figure 505



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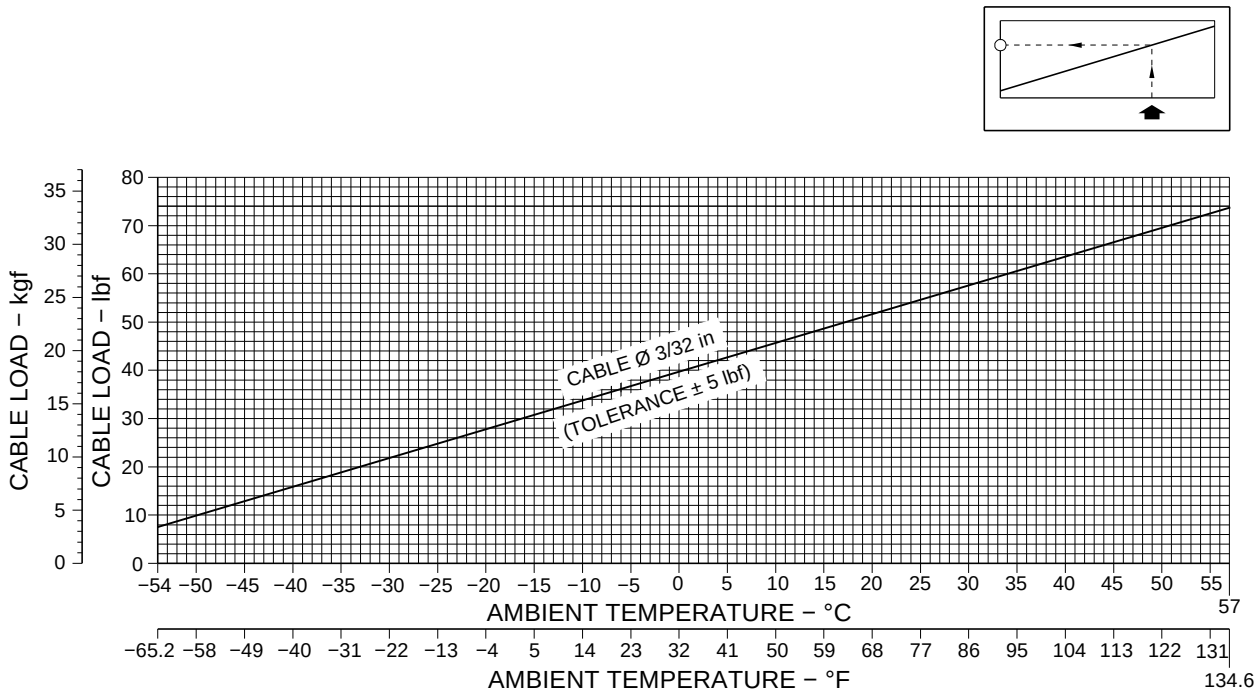
EFFECTIVITY: ACFT MODEL(S) EMB-145

Load x Temperature for Tension of Rudder Autopilot-servo Cables - Graph
Figure 506



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