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MAINTENANCE INSTRUCTIONS

AIRCRAFT TOWING

70/MAINT 00/2

ANALYZED

SECURITY CLASSIFICATION - CONFIDENTIAL

Classification cancelled / Changed to UNCLASS
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ARROW

MAINTENANCE INSTRUCTIONS

AIRCRAFT TOWING

70/MAINT 00/2

2 Dec. 57

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1. DESCRIPTION

1.1 General

1.1.1 Under normal conditions the aircraft is towed by a modified tractor using the tow bar provided.

1.1.2 There are certain limitations to be observed while towing the aircraft so that damage to the equipment may be prevented. The nose landing gear of the aircraft can be turned 55° to either side of straight ahead. An increase in the turning angle beyond this limit will result in the shearing of the turn shear-bolt on the tow bar. The rate of change of the turning angle is also limited to approximately 19° per second. A rate of turn greater than this will shear the turn shear-bolt on the tow bar.

1.1.3 The tow bar is attached to the nose landing gear of the aircraft by means of the jaws on the fork end of the tow bar. The saddle of the jaws is placed over the towing spools of the nose landing gear and a lever on the tow bar moves the hook of the jaws under the spools. A geometric lock is formed when the lever is moved forward to the maximum travel position.

1.1.4 The tractor is coupled to the tow bar by means of the tow bar eye and the tractor towing hitch. Pulling up on a spring loaded T-handle closes the upper jaw of the hitch and locks it.

1.1.5 An intercommunication system between the tractor operator and the aircraft occupant is necessary since visibility between these points is not possible at all times.

1.1.6 Under adverse conditions such as heavy snow, mud or rough ground, the aircraft is towed by a tractor using the towing bridle provided.

1.1.7 Before towing the aircraft, ensure that the main and nose landing gear ground locks are installed. Release the parking brake.

1.2 Tow Bar

1.2.1 The tow bar is connected to the tractor and to the aircraft electrically as well as mechanically. The connectors are stowed on bosses provided on the tow bar. The connectors are retained in place by spring-loaded fingers which are part of the connectors. The fingers are released by pulling the cable at the side of the connectors. The connector at the eye end of the tow bar is coupled to the receptacle at the centre rear of the tractor.

1.2.1 (continued)

The connector at the fork end is coupled to the receptacle on the nose landing gear. These connections provide the line of communication and signalling between the tractor, the tow bar and the aircraft.

1.2.2 To prevent damage to the aircraft by loading beyond the limits of travel, rate limit or pulling force, two shear-bolts are incorporated in the tow bar. If the tractor operator turns in too short a radius for sufficient time, the limit of travel will be reached and the turn shear-bolt will shear. If the tractor operator turns so that the rate of change of angle of the nose landing gear wheels is too great again the turn shear-bolt will shear. This shear bolt is at the fork end of the tow bar. A warning system will signal the tractor operator should these limits tend to be exceeded. If the pulling load on the nose landing gear is exceeded, a shear bolt at the eye end of the tow bar will shear. A warning system will signal the aircraft occupant and the tractor operator if this condition occurs.

1.2.3 A stowage is made for 6 spare towing shear-bolts in the skid at the eye end of the tow bar and for 6 spare turning shear-bolts in the axle bracket. The towing shear bolts are NAS 464-P4A63 and the turning shear bolts are NAS 464-P5A67.

1.3 Tractor

1.3.1 The tractor is standard but it has been modified for the protection of the tractor operator and the prevention of damage to the aircraft. A protective arch and screen shields the operator if the nose landing gear fails.

1.3.2 An intercommunication and warning set with a power pack is mounted on the tractor. The tractor operator is provided with a headset and microphone so that he may converse with the occupant of the aircraft during towing operations. Warning signals are also heard through this system.

1.3.3 A towing hitch is provided to couple the tractor to the tow bar. At the centre rear above the towing hitch, a multiple receptacle is housed to provide the connection for the intercommunication system.

1.4 Intercommunication

1.4.1 Intercommunication is achieved through the tractor operator's headset, the control intercom set, the tractor mounted power pack, the connectors, the tow bar and the aircraft system to the cockpit occupant's headset.

1.4.2 Headsets with microphones are used by the tractor operator and the occupant of the aircraft when testing communications, testing the warning signal system or towing the aircraft.

1.4.3 The control intercom set is on the right hand side of the tractor beside the tractor driver's seat. For the control panel layout, see Figure 1. When the master switch is ON, the power pack is in operation and the set is ready to operate.

1.5 Towing Warning System

1.5.1 The tow bar has three micro-switches mounted on it. These are used to control the audio warning oscillator in the intercom set. The warning signal indicates to the tractor operator that a limit is about to be or has been exceeded. Because all warnings are not received by the aircraft occupant, the warnings he receives indicate only that a limit has been exceeded and that he should apply the aircraft brakes.

1.5.2 A warning signal will be heard by both the tractor operator and the aircraft occupant if the towing shear-bolt is sheared. This is a signal to the aircraft occupant to apply the aircraft brakes. The tractor operator will apply the tractor brakes as he sees necessary on hearing the signal. There is approximately 6 feet of electric cable stowed inside the tow bar. He must not stop before the aircraft does, but he should stop so that the cable does not disconnect. To cancel the signal so that communication is audible the SHEAR PIN SIGNAL OFF-PUSH button on the control intercom set is pressed.

1.5.3 A warning signal will be heard only by the tractor operator, if he tends to turn at too high a rate of turn or at the extreme limits of turn. This signal occurs at 10° before the tractor operator is to reduce his rate of turn and increase his radius of turn. Since this condition can be remedied only by the tractor operator, and does not require any stopping, the signal is fed only to the tractor operator. When the tractor operator has remedied the cause for the warning signal it will cease.

1.5.4 If the audible warning signal continues after the corrective action outlined in para. 1.5.3 has been taken, this indicates that the turn shear-bolt has sheared. Automatically, this signal is now transmitted through the intercom system to the headset of the aircraft occupant who is to apply aircraft brakes immediately.

1.5.5 If either of the shear-bolts fail, the towing operations are to be halted and a new shear-bolt installed.

1.6 Towing Bridles

1.6.1 The towing bridle consists of a pulley that pivots on a shear bolt which is mounted to a frame. The frame has a towing eye to couple the assembly to the tractor. The cable that passes around the pulley has suitable anchor shackles that may be fixed by means of ball-lock pins to the retractable towing eyes on the main landing gear.

1.6.2 The aircraft may be towed from the front or from the rear using the towing bridle. When towing from the front of the aircraft, the tractor must not be more than 5°off the centre line of the aircraft or the cables will foul the nose landing gear.

1.6.3 An excessive towing force will shear the bolt about which the pulley rotates. A stowage for 4 spare shear-bolts is made above the pulley. The shear bolts used in this assembly are AN 76-25 bolts.

2. FUNCTION TESTS

2.1 Adjustments

2.1.1 The adjustment of the turn warning arm and micro-switch should have an initial setting as shown in Figure 2. This setting is to be checked when the tow bar is attached to the nose landing gear of the aircraft.

2.1.2 The micro-switch should operate when the tow bar and the nose landing gear are at an angle of 45°off the centre line of the aircraft. This gives a warning 10°before the limit of turn of the nose gear is reached. Adjust as required by means of the adjusting screw shown in Figure 2.

2.2 Preparation For Tests

2.2.1 Couple the tow bar to the tractor.

2.2.2 Connect the quick-disconnect telecom plug at the eye end of the tow bar to the receptacle at the centre back of the tractor.

2.2.3 Connect the quick-disconnect telecom plug at the fork end of the tow bar to the tow bar test set.

2.2.4 Switch the master switch of the control intercom set to the ON position. The system is now ready for testing.

NOTE

Since the power pack imposes a high drain on the tractor battery, the master switch should be ON only when necessary.

NOTE (continued)

It is preferable to have the tractor engine running to keep the battery charged.

2.3 Intercommunication Test

With the lever at the fork end of the tow bar pulled rearwards and the hook of the jaws out of contact with the saddle (jaws open), check the intercom as follows:

2.3.1 Plug in the headsets at the tractor intercom set and at the tow bar test set.

2.3.2 Set the intercom switches to NORMAL and, using P.T.T. switches, test voice reception.

2.3.3 Set the intercom switches to HOT-MIC and test voice reception. The control intercom should be left in this position during towing operations.

2.3.4 Set the intercom switches to ENGINE RUN-UP and using the P.T.T. switches, test voice reception.

2.3.5 Satisfactory reception in the above cases proves the tractor and tow bar are serviceable for intercommunication.

2.3.6 Recheck the intercom between the tractor and the aircraft when tow bar is coupled and towing operations are ready to commence. The occupant of the aircraft is to select two switches on the interphone control panel of the front cockpit right hand console and plug in the headset to establish communication with the tractor. The mixing switch marked INTER will be switched ON (forward) and the rotary switch selected to the INTER position. The headset is plugged into the composite leads disconnects on the right hand side of the seat. Volume may be adjusted on the interphone control panel to suit the occupant of the aircraft.

2.4 Towing Warning System Check

2.4.1 To test the towing shear warning signal, press the button on the top of the tow bar at the towing eye end. The signal will be heard by the tractor operator and by the test set operator. To cancel the signal, press the SHEAR PIN SIGNAL OFF-PUSH button on the control intercom set.

2.4.2 To test the turn shear warning signal, press up on the micro switch located between the prongs of the fork at the bottom of the tow bar. This closes the switch and the warning signal should be heard by both the tractor operator and the test set operator. To cancel the signal press, the SHEAR PIN SIGNAL OFF-PUSH button on the control intercom set.

2.4.3 To test the turn limit warning signal, move the actuating lever at the fork end forward so that the hook is in contact with the saddle (jaws closed). This closes the micro switch and the turn limit warning signal should be heard. Press down on the micro-switch actuating lever on the inside of the prong of the fork and the signal should cease. This is the normal position of the lever while towing. Release the lever and the warning signal should be heard again. This is the action of the lever when the rate or limit of turn tends to be exceeded.

2.5 Completion of Tests

With all of the above tests completed satisfactorily, the tractor and tow bar are considered safe for towing operations.

3. SAFETY PRECAUTIONS

3.1 General

3.1.1 The regulations regarding the handling of aircraft on the ground are contained in a publication entitled "Procecure For The Safe Handling of Aircraft". This publication which is issued by the Company, describes the general precautions to be followed in towing the aircraft.

3.1.2 When towing the aircraft in a confined space "look-outs" are required at the extremities to ensure its safe movement.

3.1.3 If the aircraft intercom system is in operative, sufficient care must be taken to establish adequate communication between the tractor operator and the aircraft occupant. The aircraft occupant must be warned if any shear-bolt shears.

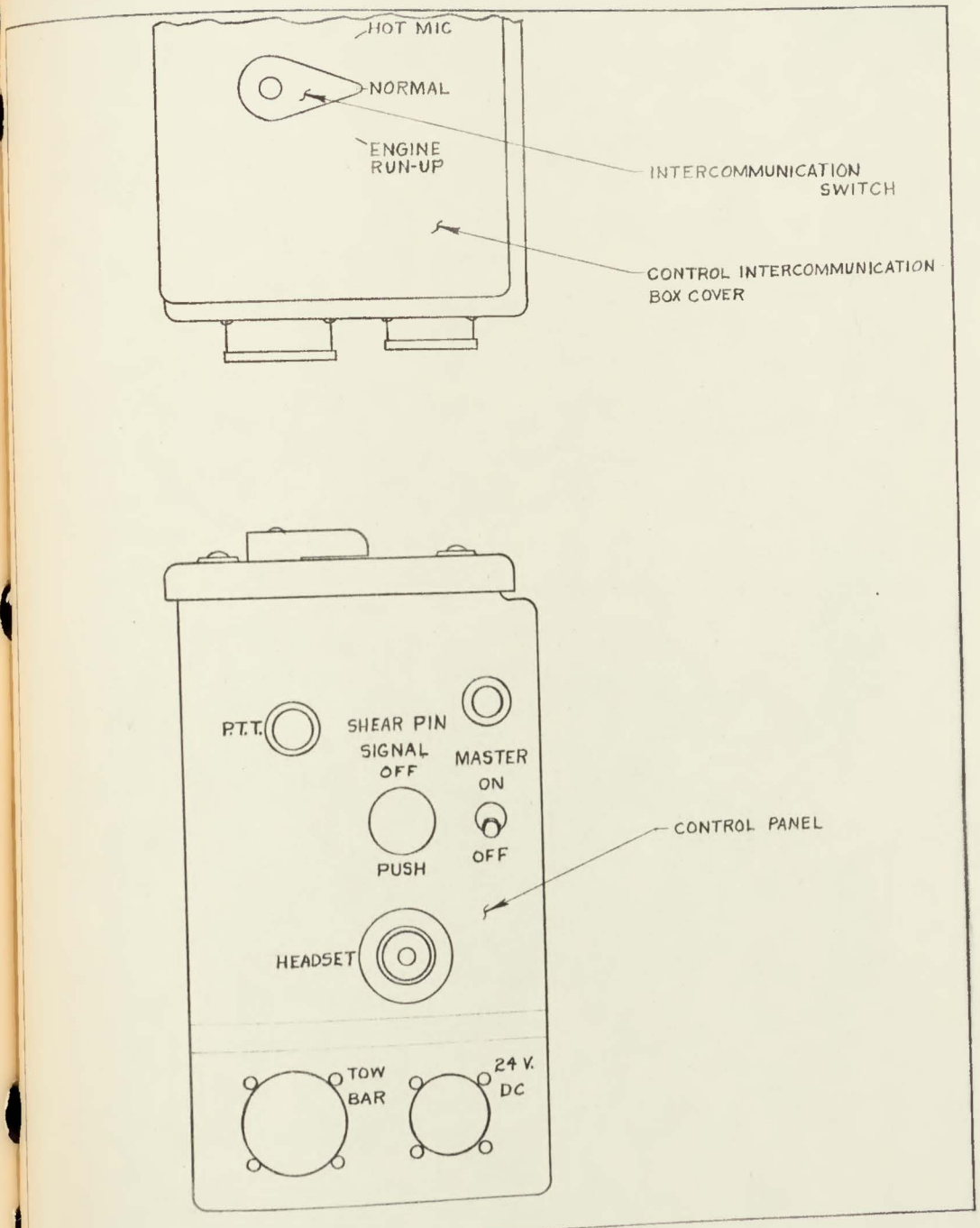
3.2 Limits

3.2.1 A steady tractive force must be applied by the tractor during towing operations.

3.2.2 The nose wheels of the aircraft should not be turned beyond angle of 45°off the centre line of the aircraft.

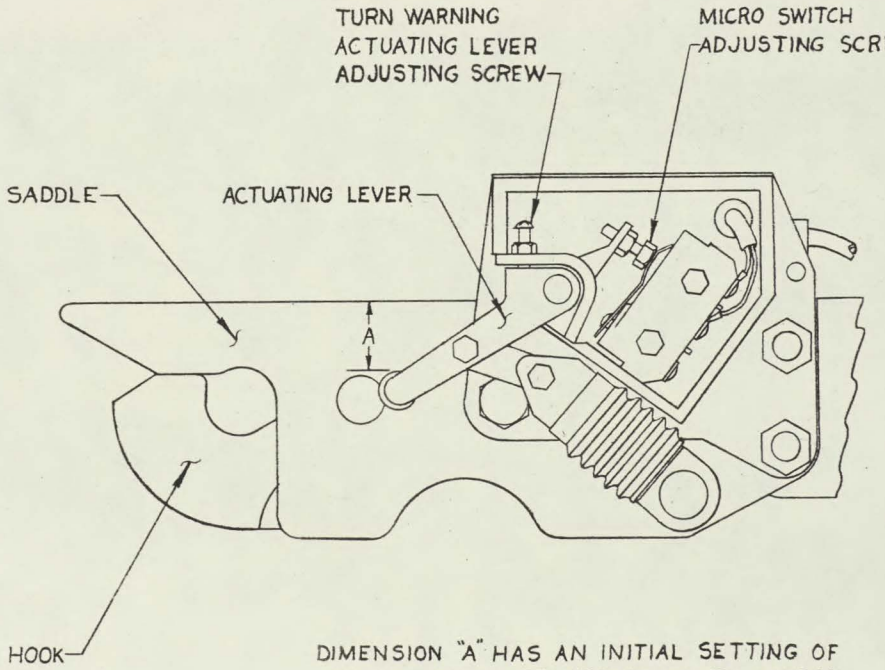
3.2.3 The rate of change of the turning angle must be limited to 19° per second.

3.2.4 The tractor must not be more than 5°off the centre line of the aircraft when using the towing bridle from the front of the aircraft.



INTERCOMMUNICATION CONTROL BOX

FIGURE 1



DIMENSION "A" HAS AN INITIAL SETTING OF 1·06 INS. IT WILL BE NECESSARY TO CHECK THE FINAL SETTING OF THE ACTUATING LEVER WITH THE TOW BAR COUPLED TO THE AIRCRAFT.

FORK END OF THE TOW BAR
FIGURE 2