

CHAPTER

9

BOEING 707

MAINTENANCE MANUAL

PAGE	DATE	PAGE	DATE	PAGE	DATE	PAGE	DATE
CHAPTER 9 TAB							
EFFECTIVE PAGES SEE LAST PAGE OF LIST FOR NUMBER OF PAGES							
CONTENTS 9							
1	MAY 15/66						
2	BLANK						
9- 2- 1							
*	201	APR 15/69					
	202	JAN 15/67					
	202A	AUG 15/66					
	202B	BLANK					
*	203	APR 15/69					
	204	JUL 15/68					
	205	JAN 15/69					
	206	JAN 15/63					
	207	JUL 15/68					
	208	JUN 15/63					
9- 3- 1							
	201	OCT 15/67					
	202	BLANK					

* = REVISED, ADDED OR DELETED PAGE

F = FOLDOUT PAGE

CHAPTER 9 EFFECTIVE PAGES
PAGE 1
LAST PAGE

D6-6003

SN REV. MAR. 01/89

BOEING *707* 
Intercontinental
MAINTENANCE MANUAL

CHAPTER 9

TOWING AND TAXIING

TABLE OF CONTENTS

<u>Subject</u>	<u>Subject No.</u>
<u>TOWING</u>	9-2-1
Maintenance Practices	
Ground Turning Techniques	
Nose Gear Shock Strut Inflation	
Structural Provisions For Towing	
Towing Airplane in a Turn	
Towing Airplane With Engines Removed	
 <u>TAXIING</u>	 9-3-1
Maintenance Practices	



MAINTENANCE MANUAL

TEMPORARY REVISION NR. DFW 9-1

INSERT COVER PAGE OF THIS TR IN FRONT OF CHAPTER 9

REASON FOR CHANGE: DCN/R ESEC-DO-09-0066

INSTRUCTION: Insert page 3/4 of this TR in front of page 201 of the original chapter 9-2-1.

NOTE: The insertion of this TR has to be listed in the Record of Temporary Revisions at the beginning of Volume 1.

TCA: LX-N20199

RTCA: LX-N19997, LX-N20000

9-2-1

TR-Nr. DFW 9-1

Page 1 of 4

Sept 15/2010

INTENTIONALLY LEFT BLANK



MAINTENANCE MANUAL

TOWING

1. General

A. The airplane is towed by using a nose gear tow bar or main gear tow cables and a suitable tow vehicle. Prior to towing, the following precautions must be taken:

- (1) Check that all gear ground locks are installed.

WARNING:

- APPROACHING TIRES WITH HOT BRAKES FROM FORE AND AFT ONLY.
- DO NOT USE WATER/LIQUID AS A COOLING AGENT TO DECREASE HOT BRAKE AND WHEEL TEMPERATURES UNLESS FIRE OCCURS. LIQUID APPLICATION CAN RESULT IN THERMAL SHOCK OF THE METALLIC COMPONENTS POTENTIALLY RESULTING IN METAL CRACKS OR FATIGUE. SUDDEN WHEEL FRACTURE CAN CAUSE HIGH-ENERGY RELEASE OF TIRE PRESSURE RESULTING IN INJURY TO PERSONNEL AND DAMAGE EQUIPMENT.

NOTE: Towing or pushing with the landing gear ground lock pins removed is optional when moving airplane for flight (flight crew aboard) after loading in a terminal. It is recommended that the utility hydraulic system be pressurized during this procedure.

CAUTION: DO NOT RESTRAIN OR MOVE STEERING WHEEL WHEN HYDRAULIC SYSTEM IS PRESSURIZED. FAILURE TO COMPLY COULD RESULT IN STRUCTURAL DAMAGE.

- (2) Towing with entry and galley doors open should be held to a minimum.
- (3) Cargo Airplanes: Towing aircraft with main cargo door open is authorized only for towing speeds of less than 10 mph.
- (4) Check that airplane brakes are released.
- (5) Check that center of gravity is within towing limits.
- (6) Check that nose and main gear wheel well doors are closed.

CAUTION: BECAUSE OF MARGINAL CLEARANCE BETWEEN MAIN GEAR WHEEL WELL DOORS AND GROUND LINE AND THE POSSIBILITY OF THE TOW BAR DAMAGING THE NOSE GEAR WHEEL WELL DOORS, THE NOSE AND MAIN GEAR WHEEL WELL DOORS SHOULD BE CLOSED BEFORE TOWING.

B. The airplane brakes should not be used while the airplane is being towed, except in case of necessity. When required, the main gear brakes can be operated using brake accumulator pressure. With a brake accumulator pressure gage reading of 3000 psi and no power being applied to either the utility or auxiliary hydraulic system, the accumulator contains sufficient fluid to provide hydraulic pressure for five complete brake applications. The airplane also is equipped with an emergency pneumatic brake system powered by a nitrogen bottle.

CAUTION: AFTER APPLICATION OF EMERGENCY PNEUMATIC BRAKES, WAIT 7 TO 10 MINUTES BEFORE MOVING AIRPLANE. THIS IS TO AVOID DRAGGING THE BRAKES.



MAINTENANCE MANUAL

- C. The center of gravity of the aircraft should be maintained forward of 35% M.A.C. during all phases of ground handling and maintenance. Unusual conditions such as personnel gathered in the aft end of the airplane, fuel in wing, deletion of major radio equipment components in the forward body, etc., should be carefully checked to ensure that the center of gravity has not moved aft of 35% M.A.C.

2. Equipment and Materials

- A. Standard Tow Tug

- B. Towbar, F71136-503, F71136-500 or equivalent

NOTE: The F71136-503 is basically a F71136-500 towbar that has incorporated the F71136-505 change and may be used on all 707, 720, and 727 airplanes. It includes two restrictor assemblies (one for 707 and 720 usage only, and one for 727 usage only) containing load limiting shear pins and restrictor frames to prevent interchangeability between airplanes and possible damage due to towing load differences. A rack attached to the towbar is provided to stow spare shear pins and one restrictor assembly. The modified towbar also has provisions for towbar height adjustment.

- C. Wire Cable (3/4 in.) and End Fittings for Main Gear Towing

- D. For braking pressure, a 115/200 volts ac, 400-cycle ground electrical supply, for operating the motor-driven pump in the auxiliary hydraulic system is required. The supply shall have a minimum continuous rating of 15 KVA and shall be capable of delivering 60 KVA for one second to start motor at -20°F ambient.

NOTE: The systems interconnect valve must be opened before the auxiliary pump can supply braking pressure.

- E. Additional power will be required for lighting and communications during the towing operation.

3. Structural Provision for Towing

- A. A towing collar is provided on the nose gear shock strut to which a tow bar can be attached. (See figure 201.) The tow bar is of tubular construction approximately 21 feet long with a coupler assembly consisting of a crank-operated link and sliding pin. In order to ensure that excessive loads are not imposed on the nose gear, a shear connection is incorporated within the tow bar. The combined loads should not exceed the tow bar design shear load of 45,000 pounds.



MAINTENANCE MANUAL

TOWING

1. General

A. The airplane is towed by using a nose gear tow bar or main gear tow cables and a suitable tow vehicle. Prior to towing, the following precautions must be taken:

- (1) Check that all gear ground locks are installed.

NOTE: Towing or pushing with the landing gear ground lock pins removed is optional when moving airplane for flight (flight crew aboard) after loading in a terminal. It is recommended that the utility hydraulic system be pressurized during this procedure.

CAUTION: DO NOT RESTRAIN OR MOVE STEERING WHEEL WHEN HYDRAULIC SYSTEM IS PRESSURIZED. FAILURE TO COMPLY COULD RESULT IN STRUCTURAL DAMAGE.

- (2) Towing with entry and galley doors open should be held to a minimum.
- (3) Cargo Airplanes: Towing aircraft with main cargo door open is authorized only for towing speeds of less than 10 mph.
- (4) Check that airplane brakes are released.
- (5) Check that center of gravity is within towing limits.
- (6) Check that nose and main gear wheel well doors are closed.

CAUTION: BECAUSE OF MARGINAL CLEARANCE BETWEEN MAIN GEAR WHEEL WELL DOORS AND GROUND LINE AND THE POSSIBILITY OF THE TOW BAR DAMAGING THE NOSE GEAR WHEEL WELL DOORS, THE NOSE AND MAIN GEAR WHEEL WELL DOORS SHOULD BE CLOSED BEFORE TOWING.

B. The airplane brakes should not be used while the airplane is being towed, except in case of necessity. When required, the main gear brakes can be operated using brake accumulator pressure. With a brake accumulator pressure gage reading of 3000 psi and no power being applied to either the utility or auxiliary hydraulic system, the accumulator contains sufficient fluid to provide hydraulic pressure for five complete brake applications. The airplane also is equipped with an emergency pneumatic brake system powered by a nitrogen bottle.

CAUTION: AFTER APPLICATION OF EMERGENCY PNEUMATIC BRAKES, WAIT 7 TO 10 MINUTES BEFORE MOVING AIRPLANE. THIS IS TO AVOID DRAGGING THE BRAKES.



MAINTENANCE MANUAL

- C. The center of gravity of the aircraft should be maintained forward of 35% M.A.C. during all phases of ground handling and maintenance. Unusual conditions such as personnel gathered in the aft end of the airplane, fuel in wing, deletion of major radio equipment components in the forward body, etc., should be carefully checked to ensure that the center of gravity has not moved aft of 35% M.A.C.

2. Equipment and Materials

- A. Standard Tow Tug
- B. Towbar, F71136-503, F71136-500 or equivalent

NOTE: The F71136-503 is basically a F71136-500 towbar that has incorporated the F71136-505 change and may be used on all 707, 720, and 727 airplanes. It includes two restrictor assemblies (one for 707 and 720 usage only, and one for 727 usage only) containing load limiting shear pins and restrictor frames to prevent interchangeability between airplanes and possible damage due to towing load differences. A rack attached to the towbar is provided to stow spare shear pins and one restrictor assembly. The modified towbar also has provisions for towbar height adjustment.

- C. Wire Cable (3/4 in.) and End Fittings for Main Gear Towing
- D. For braking pressure, a 115/200 volts ac, 400-cycle ground electrical supply, for operating the motor-driven pump in the auxiliary hydraulic system is required. The supply shall have a minimum continuous rating of 15 KVA and shall be capable of delivering 60 KVA for one second to start motor at -20°F ambient.

NOTE: The systems interconnect valve must be opened before the auxiliary pump can supply braking pressure.

- E. Additional power will be required for lighting and communications during the towing operation.

3. Structural Provision for Towing

- A. A towing collar is provided on the nose gear shock strut to which a tow bar can be attached. (See figure 201.) The tow bar is of tubular construction approximately 21 feet long with a coupler assembly consisting of a crank-operated link and sliding pin. In order to ensure that excessive loads are not imposed on the nose gear, a shear connection is incorporated within the tow bar. The combined loads should not exceed the tow bar design shear load of 45,000 pounds.



MAINTENANCE MANUAL

- B. Towing lugs are also provided on the forward and aft main gear axles for the attachment of towing cables, enabling the aircraft to be moved in a forward or aft direction. The tow load limits are specified in figure 202.

NOTE: Loads shown in figure 202 are in the forward and aft direction. If the nose gear tow loads are applied at $90^\circ (\pm 45)$ to the forward and aft direction, they are reduced by one-half. All loads given, are for the Boeing tow bar (or equivalent) and nose gear attach points. Any other type tow bar will require recalculation of tow bar loads.

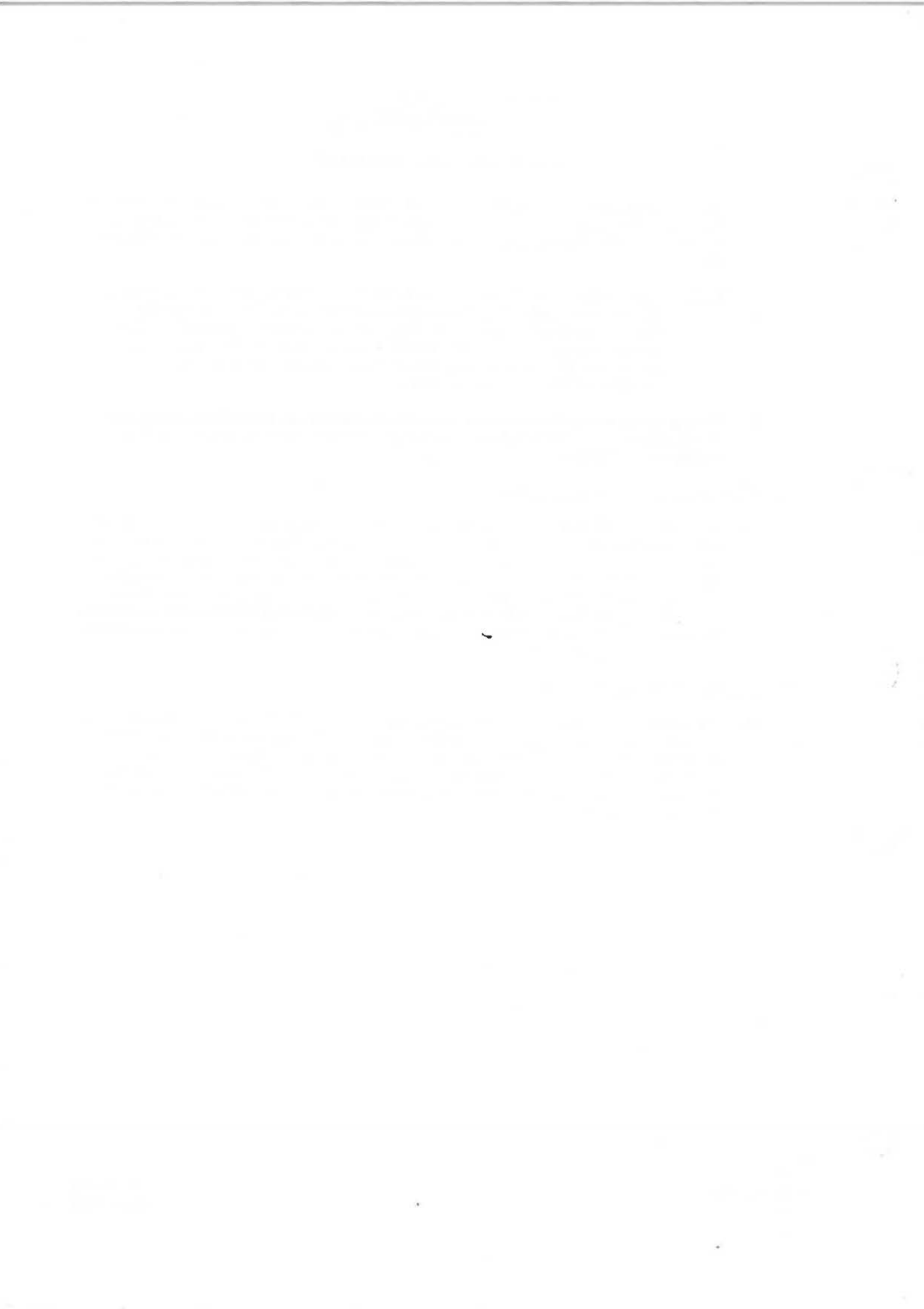
- C. Towing with any one main gear tire flat places no restrictions on nose wheel angles or gross weight, although greater care in handling the airplane is advised.

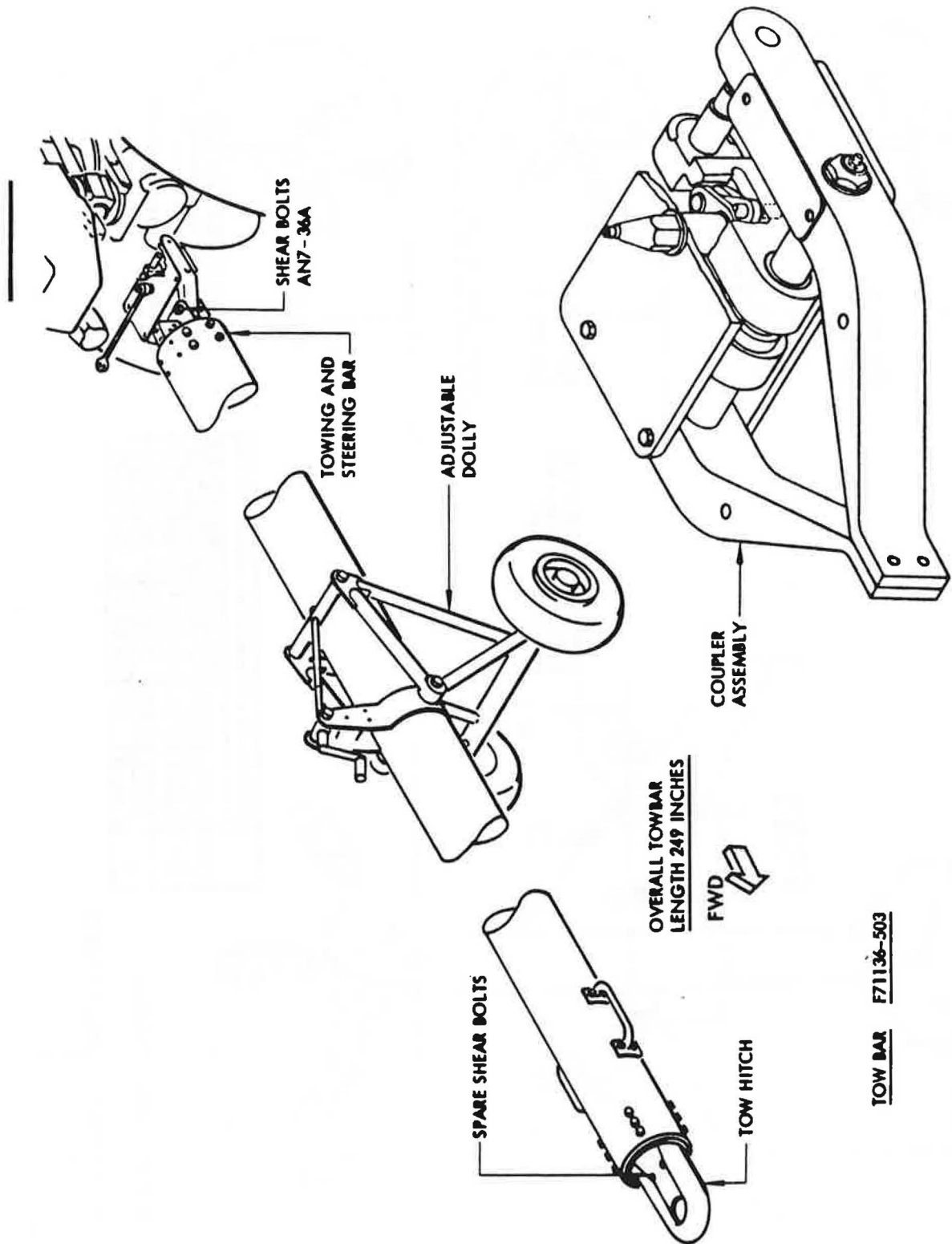
4. Nose Gear Shock Strut Inflation

- A. Care should be taken to ensure that the nose gear shock strut is properly inflated before towing the airplane. Towing, with excessive nose gear strut extension, could result in damage to the nose gear centering cams. If the gear is centered, extension may go to 16 inches, but the largest safe extension of the shock strut while towing or taxiing, regardless of steering angle, is 12 inches. However, if the extension is 12 inches or even near to that, the strut is improperly inflated or the CG is aft of 35% M.A.C., or both.

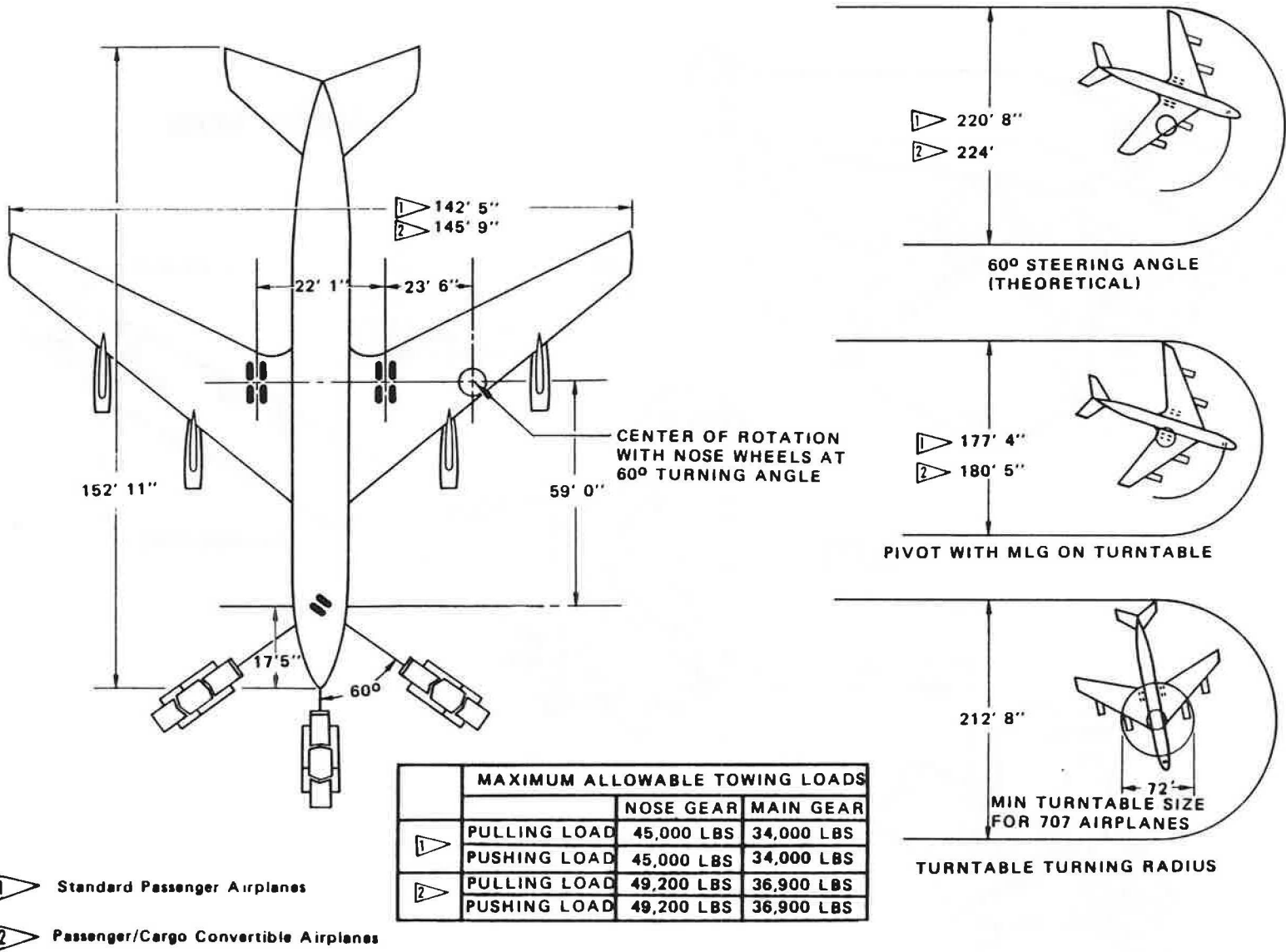
5. Towing Airplane in a Turn

- A. The nose wheels must not be turned more than 60° on either side of center unless the steering link assembly (figure 203) has been disconnected, otherwise damage will be incurred within the nose wheel steering cylinders. When moving and positioning the aircraft, maximum possible turning radius shall be used to prevent scuffing or deformation of the main gear tires.





TOW BAR F71136-503





MAINTENANCE MANUAL

It is recommended that turns of 50 degrees steering angle or less be made whenever possible and maximum steering angle turns be held to a minimum. Moving the airplane in such a manner that will cause pivoting on or about one main gear should be avoided unless that gear is on a turntable. If the ramp is uneven or soft, the towing should be done with cables from the main gear towing eyes, using the nose gear tow bar for steering.

CAUTION: EVEN WITH THE NOSE STEERING LINK ASSEMBLY DISCONNECTED, IT IS NOT ADVISABLE TO MAKE TURNS SHARPER THAN 58 DEGREES AT GROSS WEIGHTS EXCEEDING 180,000 POUNDS BECAUSE OF THE RESULTANT STRAIN ON THE MAIN LANDING GEAR.

DO NOT PARK THE AIRPLANE IN A TURN FOR AN EXTENDED PERIOD OF TIME. IF THE AIRPLANE IS PARKED IN A TURNED POSITION, LEAKAGE OF FLUID MAY OCCUR ON THE MAIN GEAR SHOCK STRUT.

6. Ground Turning Techniques

A. A ground turning maneuver that requires a minimum amount of space is shown in figure 204. In this recommended procedure, the nose gear is turned abruptly from zero to the desired steering angle, and then held constant while the airplane is turned. When the airplane centerline is aligned in the desired direction of exit, the nose wheel is abruptly centered.

NOTE: After a turn has been completed the airplane should be towed in a straight line for 6 to 8 feet to relieve torsional stresses in the outer cylinder of the shock-strut and to minimize the loss of hydraulic oil from the oleo.

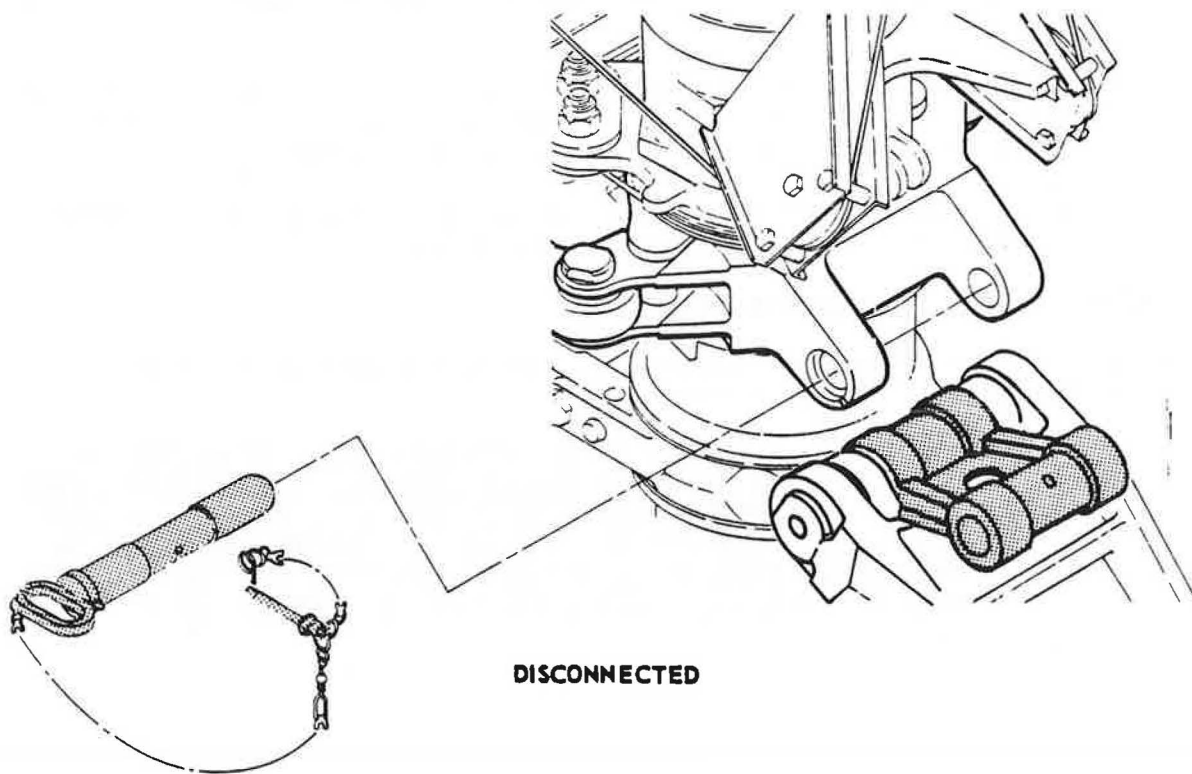
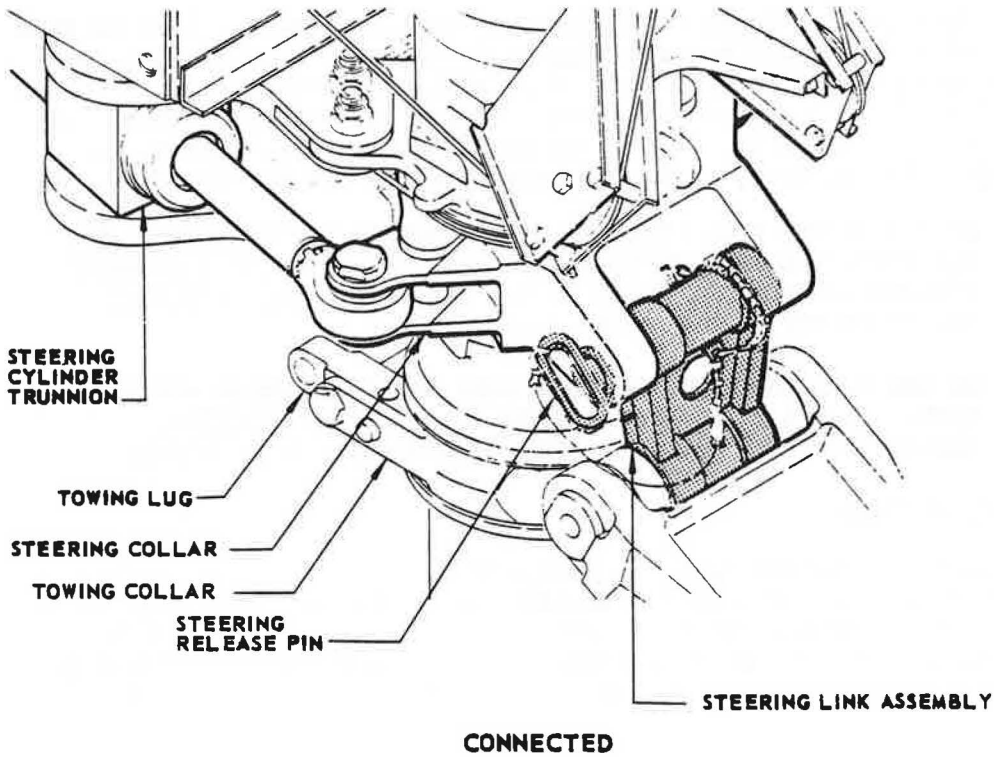
B. By using the recommended technique, the nose gear steering angle required to turn the airplane is minimized, thus resulting in lower stresses and longer service life. Tire wear is significantly reduced.

C. To aid in planning space requirements figure 205 shows a plot of Wing Tip Radius "D" vs Nose Gear Steering Angle " ϕ ."

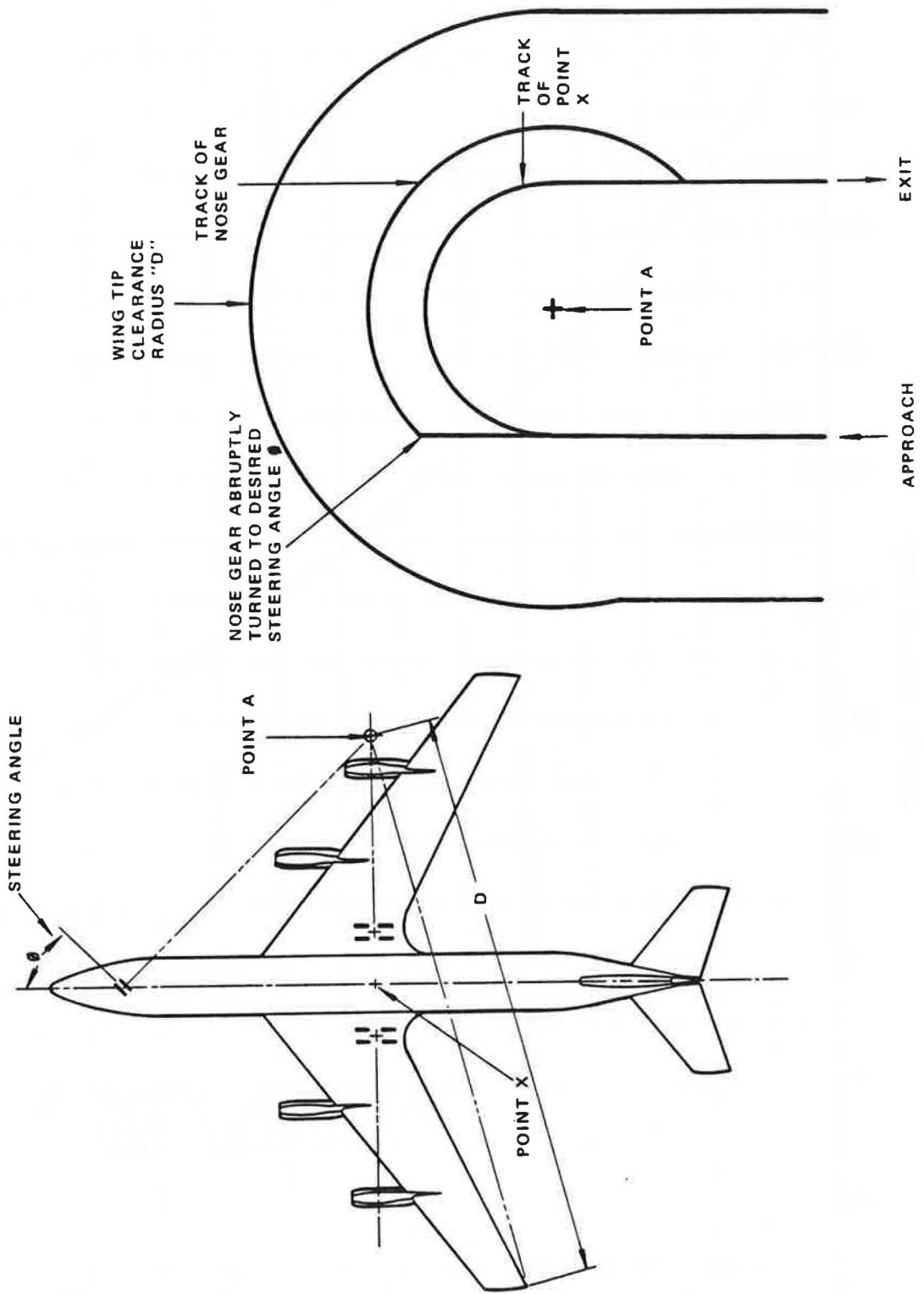
7. Towing Airplane with Engines Removed

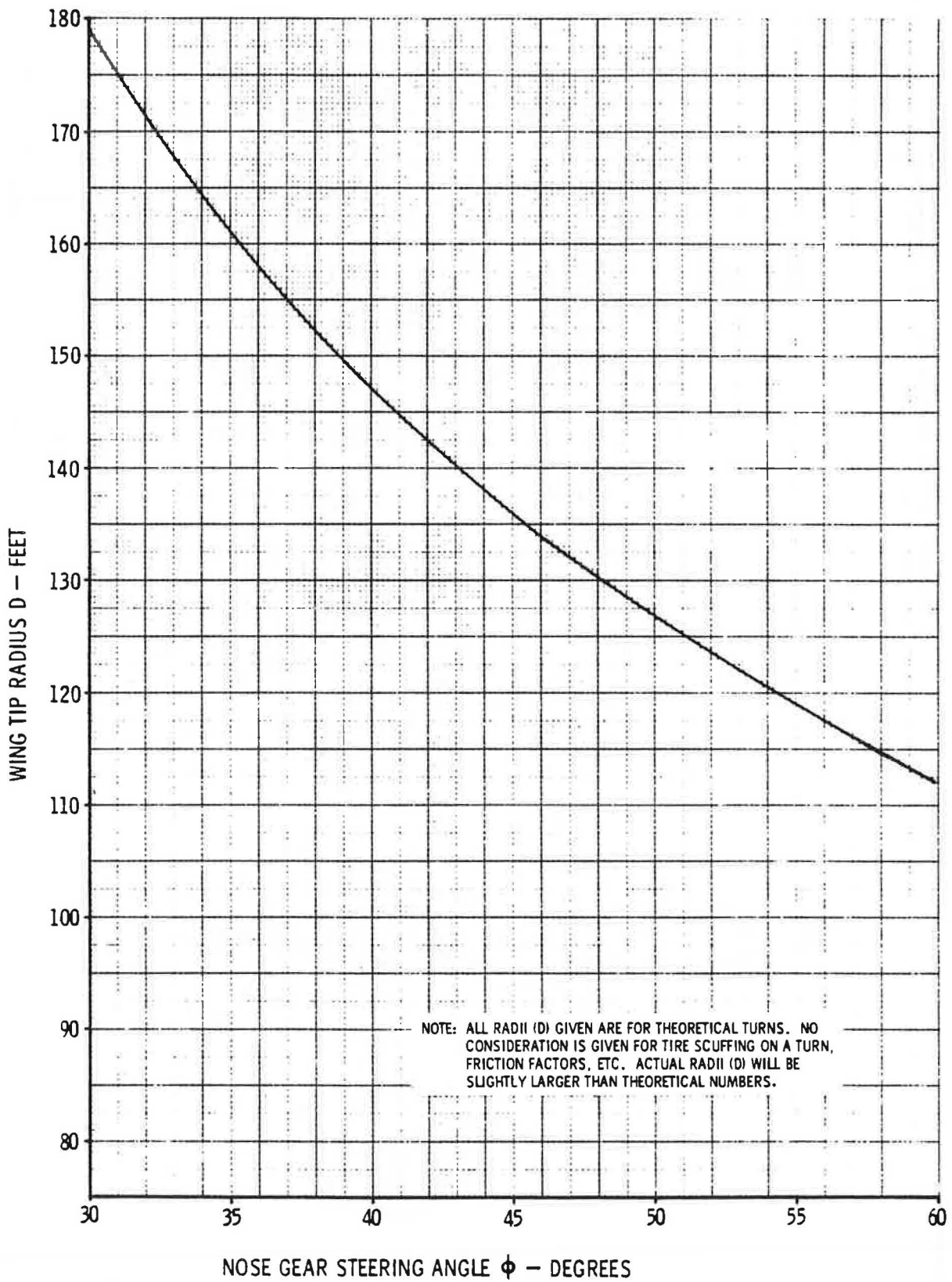
A. Normally no ballast is required when towing the aircraft with any combination of engines removed.

CAUTION: THE CENTER OF GRAVITY OF THE AIRCRAFT SHOULD BE MAINTAINED FORWARD OF 35% MAC WHILE TOWING AIRCRAFT. UNUSUAL CONDITIONS SUCH AS PERSONNEL GATHERED IN AFT FUSELAGE, FUEL IN OUTBOARD WING TANKS, DELETION OF MAJOR RADIO EQUIPMENT COMPONENTS IN THE FORWARD BODY, ETC., SHOULD BE CAREFULLY CHECKED TO ENSURE THAT THE CENTER OF GRAVITY DOES NOT MOVE AFT OF 35% MAC.



Nose Gear Steering Disconnect Link
Figure 203





Wing Tip Clearances Radius
 Figure 205



MAINTENANCE MANUAL

TAXIING

1. General

- A. Maneuvering the airplane on the ground is accomplished similarly to other conventional tricycle geared airplanes. Nose wheel steering and engine thrust as required, are used for taxiing. Differential braking is also effective as an aid in taxiing. While taxiing can be accomplished with either two or four engines as desired, it is also possible at light gross weights to taxi the airplane with any one engine operating. Always use the largest radius of turn possible and never attempt to turn until the airplane is moving. Make all turns at a slow taxi speed to avoid possible skidding of the airplane. In event of hydraulic failure while taxiing, the emergency brakes and thrust reversers can be used for stopping the airplane. During taxiing, the anti-skid switch should be turned OFF.

CAUTION: DO NOT USE BRAKES TO AID MAKING A TURN WHILE MANEUVERING THE AIRPLANE ON THE GROUND. THE MINIMUM RADIUS TURN IS MADE WITH MAXIMUM NOSE WHEEL STEERING AND ENGINE THRUST ONLY. ANY BRAKING WILL RESULT IN EXCESSIVE SCRUBBING OF MAIN GEAR TIRES AND ESPECIALLY NOSE GEAR TIRES.

- B. Because of the swept wings, the wing tips must be watched carefully for clearance of equipment on the ramp and especially while making a turn.

NOTE: After a turn has been completed, the airplane should be taxied in a straight line for 6-8 feet to minimize the loss of hydraulic oil from the oleo.

