CHAPTER

09

TOWING AND TAXIING

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 09
TOWING AND TAXIING

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09-EFFECTIVE PAGES

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 09
TOWING AND TAXIING

09-CONTENTS

GENERAL - DESCRIPTION AND OPERATION

1. Description

A. Towing and taxiing procedures are basically the same as those used for other aircraft equipped with tricycle landing gears.

B. The aircraft can be towed forward or pushed aft, on hard surfaces, using a yoke-type towbar attached to the nosewheel. Placing the nosewheel steering bypass valve in bypass position frees the nosewheel from the steering cylinders and allows steering control through the towbar.

C. During towing operations, ground personnel should maintain a safe distance of 10 ft (3M) away from the nose gear, towbar, and towing vehicle. Being too near the nose gear, towbar, or towing vehicle could result to being caught in them. This can cause injury or death to personnel. (Figure 5)

D. Communication is essential during aircraft movement to prevent injury to ground personnel and/or damage to the aircraft. This should be established between the towing vehicle operator and the person in the flight compartment using the aircraft interphone system or portable two way radios (walkie-talkies).

E. For taxi operations, directional control is accomplished by operation of the nosewheel steering control, or by rudder pedal steering. When taxiing with both engines operating (both hydraulic systems pressurized), the nosewheel steering control provides nosewheel turning angles of 82 degrees each side of center. Single-engine taxiing provides a lesser maximum turning angle in one direction, depending on which engine is operating (one hydraulic system pressurized), as follows:

Table 1

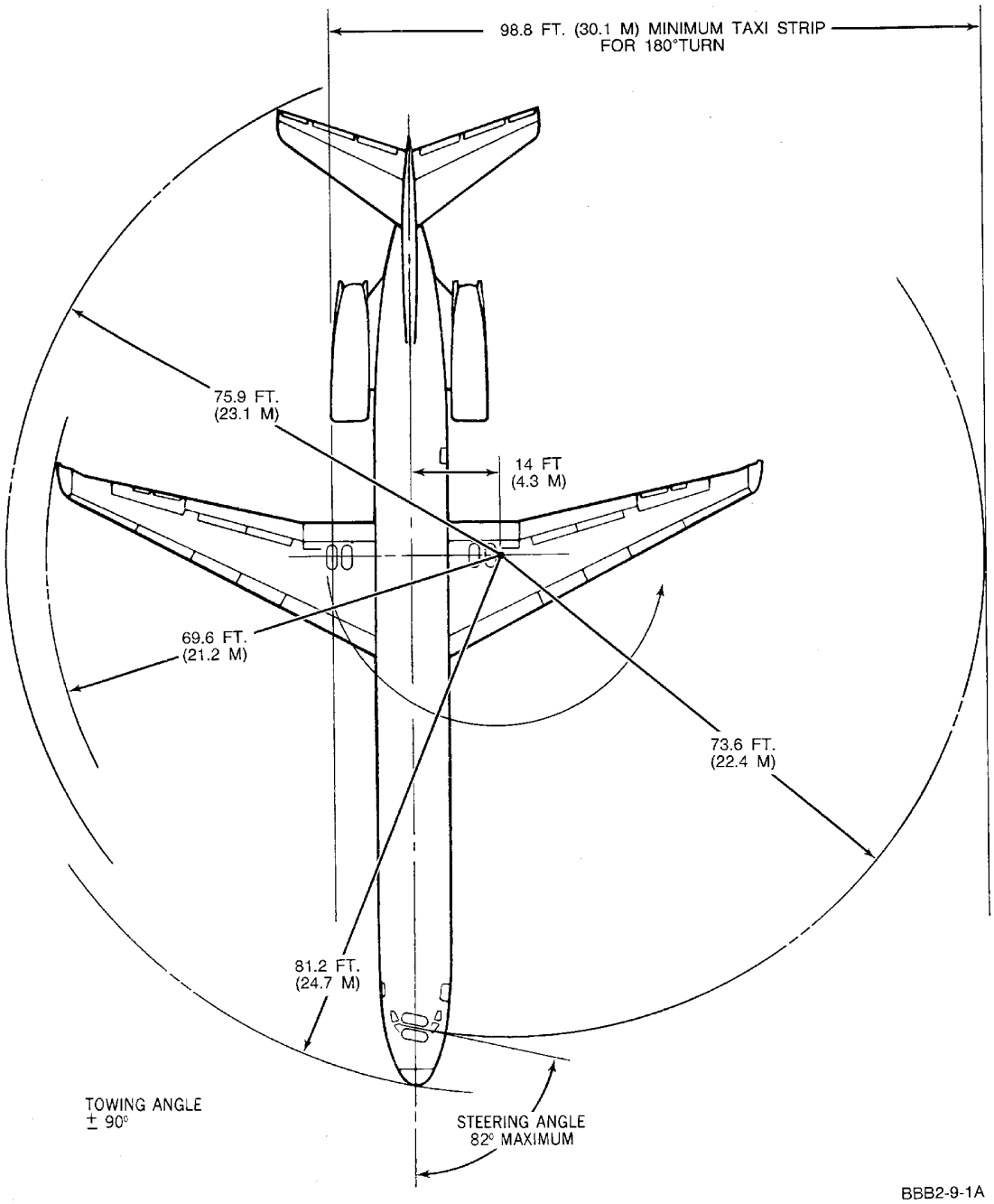
Engine and Respective Hydraulic System Operating	Maximum Turn Angle
Right	80° Left - 70° Right
Left	70° Left - 80° Right
NOTE: The auxiliary hydraulic pump pressurizes the right hydraulic system and provides the same turning angles as the right engine-driven pump.	

Rudder pedal steering provides nosewheel turning angles of 17 degrees each side of center for both single-and two-engine taxiing. See Turning Radii illustration for turning radii and minimum distances required for clearance when maneuvering the aircraft. See Engine Hazard Areas illustration for the hazard areas and exhaust velocities encountered during engine run-up. (Figure 1) (Figure 2) (Figure 3)

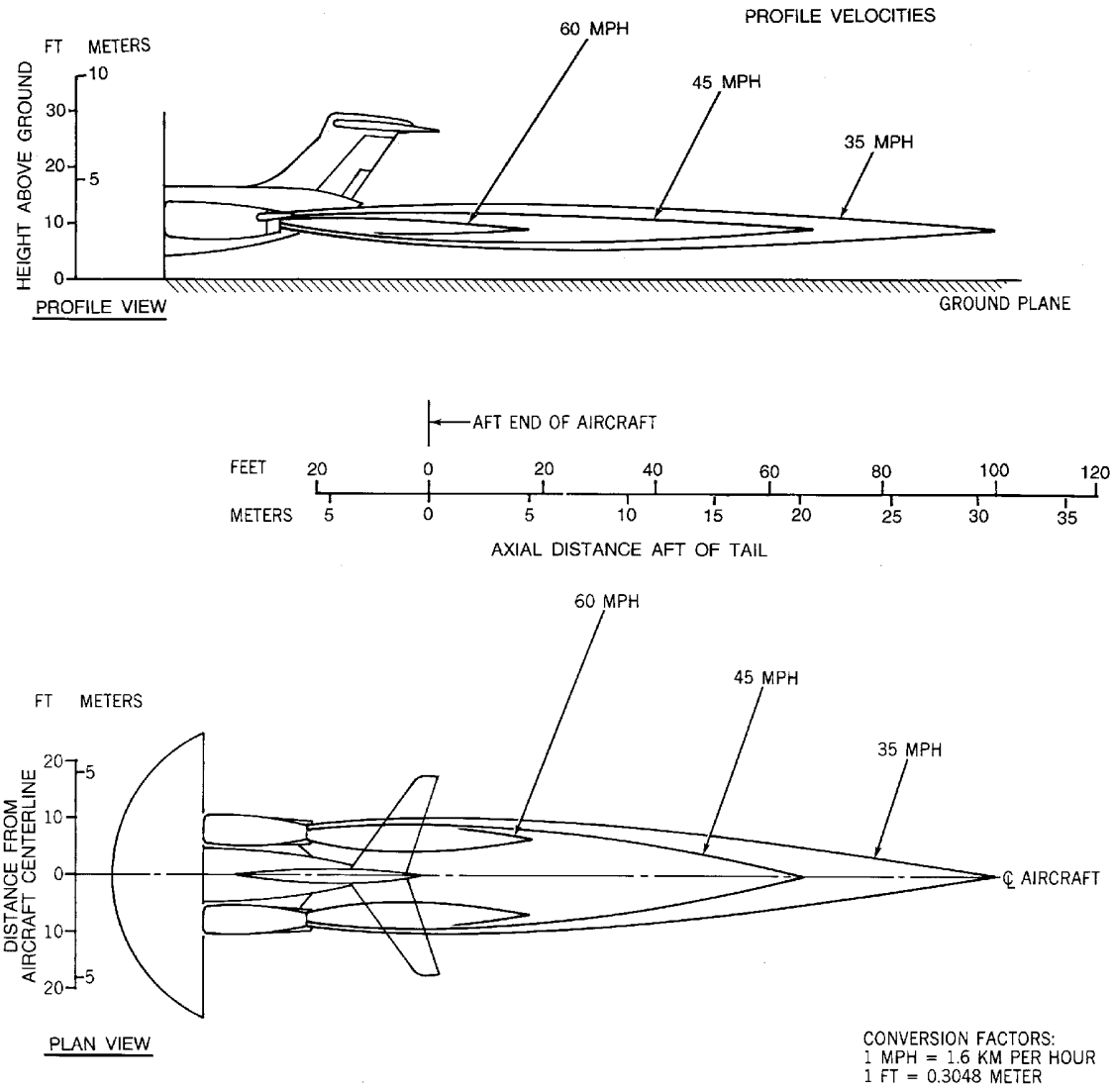
F. At times an aircraft with one or more flat tires must be moved from an active runway or taxiway. The Towing or Taxiing With Flat Tires illustration is intended as an aid to such operations. (Figure 4)

G. Prior to movement of an aircraft in a multiple flat tire condition, numerous variables that might cause more damage should be considered. In addition to the flat tire situation, the variables to be considered include weather, ramp inclination, aircraft weight, symmetrical loading, center of gravity location, tire tread, position and condition of landing gear components. Because of these numerous possibilities, The Towing or Taxiing With Flat Tires illustration does not list all possible conditions which may require consideration before moving an aircraft. It does not list all detail inspections that may be required, however, it can be a useful guide for determining allowable taxiing or towing with one or more flat tires. (Figure 4)

H. If a lateral fuel unbalance is indicated while on the ground, the aircraft will need to be re-balanced laterally. To do this, the aircraft may be taxied back, or otherwise moved, to the gate, or other convenient location, to balance the fuel load without a structural inspection being required, provided normal taxi or towing procedures and these recommendations are followed. It is not necessary to unload passengers prior to moving the aircraft. If the aircraft must be taxied, the maximum taxi speed must be kept below 25 knots and use only gentle brake application (no “hard braking” or “maximum effort braking”). If the aircraft taxi speed is more than 24 knots, with hard braking and/or maximum braking applied, do the wing fuel imbalance check procedure. (HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03, Page 601), (Figure 09-10-00-990-803)



Turning Radii
Figure 1/09-00-00-990-801



NOTES:

THESE CONTOURS ARE TO BE USED AS GUIDELINES ONLY SINCE OPERATIONAL ENVIRONMENT VARIES GREATLY – OPERATIONAL SAFETY ASPECTS ARE THE RESPONSIBILITY OF THE USER/PLANNER

ALL VELOCITY VALUES ARE STATUTE MILES PER HOUR

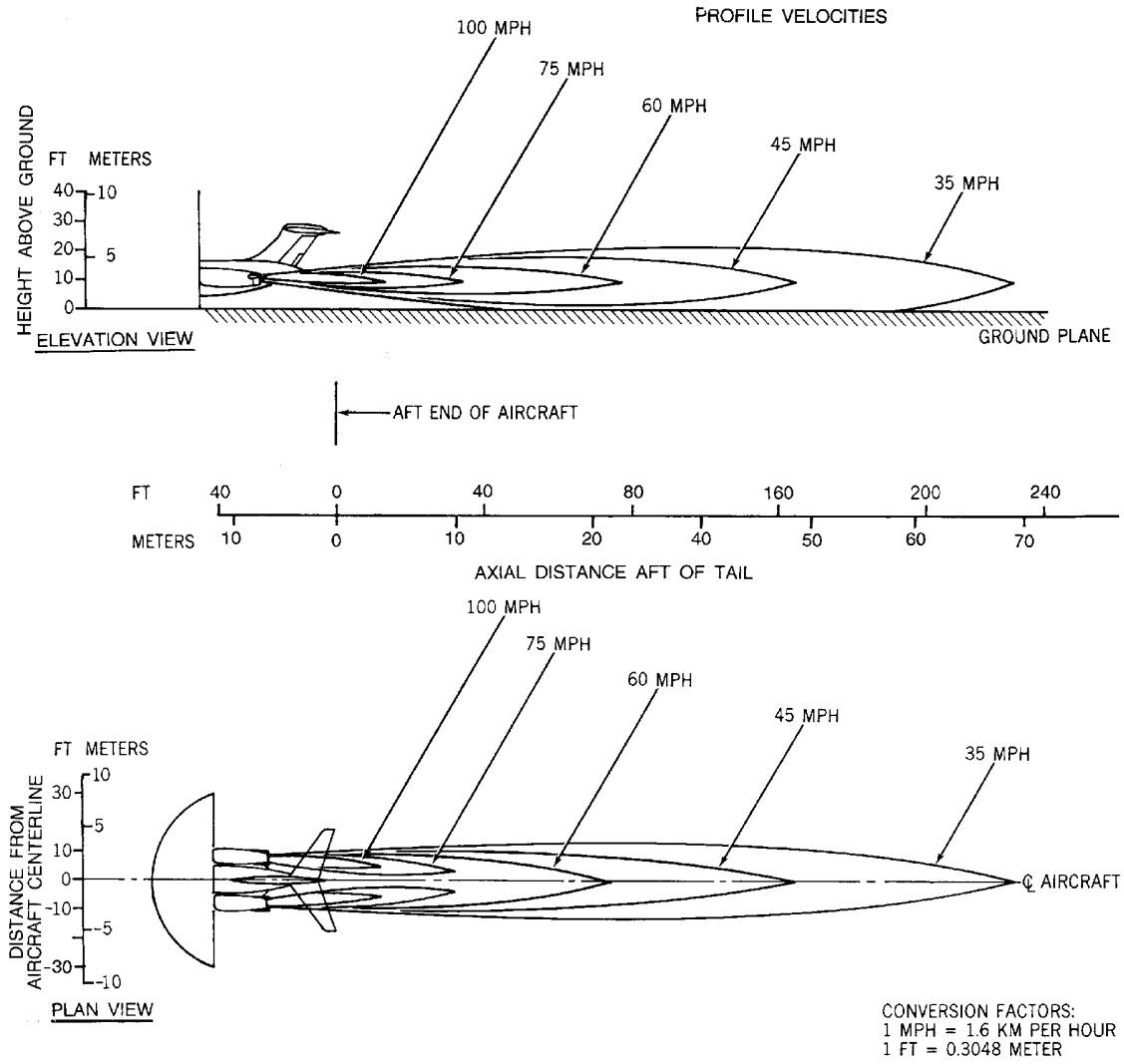
CROSSWINDS WILL HAVE CONSIDERABLE EFFECT ON CONTOURS

SEA LEVEL STATIC – STANDARD DAY – ZERO RAMP GRADIENT

ALL ENGINES AT SAME THRUST

BBB2-9-7A

Engine Hazard Areas (Idle Power)
Figure 2/09-00-00-990-802



NOTES:

THESE CONTOURS ARE TO BE USED AS GUIDELINES ONLY SINCE OPERATIONAL ENVIRONMENT VARIES GREATLY – OPERATIONAL SAFETY ASPECTS ARE THE RESPONSIBILITY OF THE USER/PLANNER

ALL VELOCITY VALUES ARE STATUTE MILES PER HOUR

CROSSWINDS WILL HAVE CONSIDERABLE EFFECT ON CONTOURS

SEA LEVEL STATIC – STANDARD DAY – ZERO RAMP GRADIENT

ALL ENGINES AT SAME THRUST

BBB2-9-8A

Engine Hazard Areas (Breakaway Power)
Figure 3/09-00-00-990-805

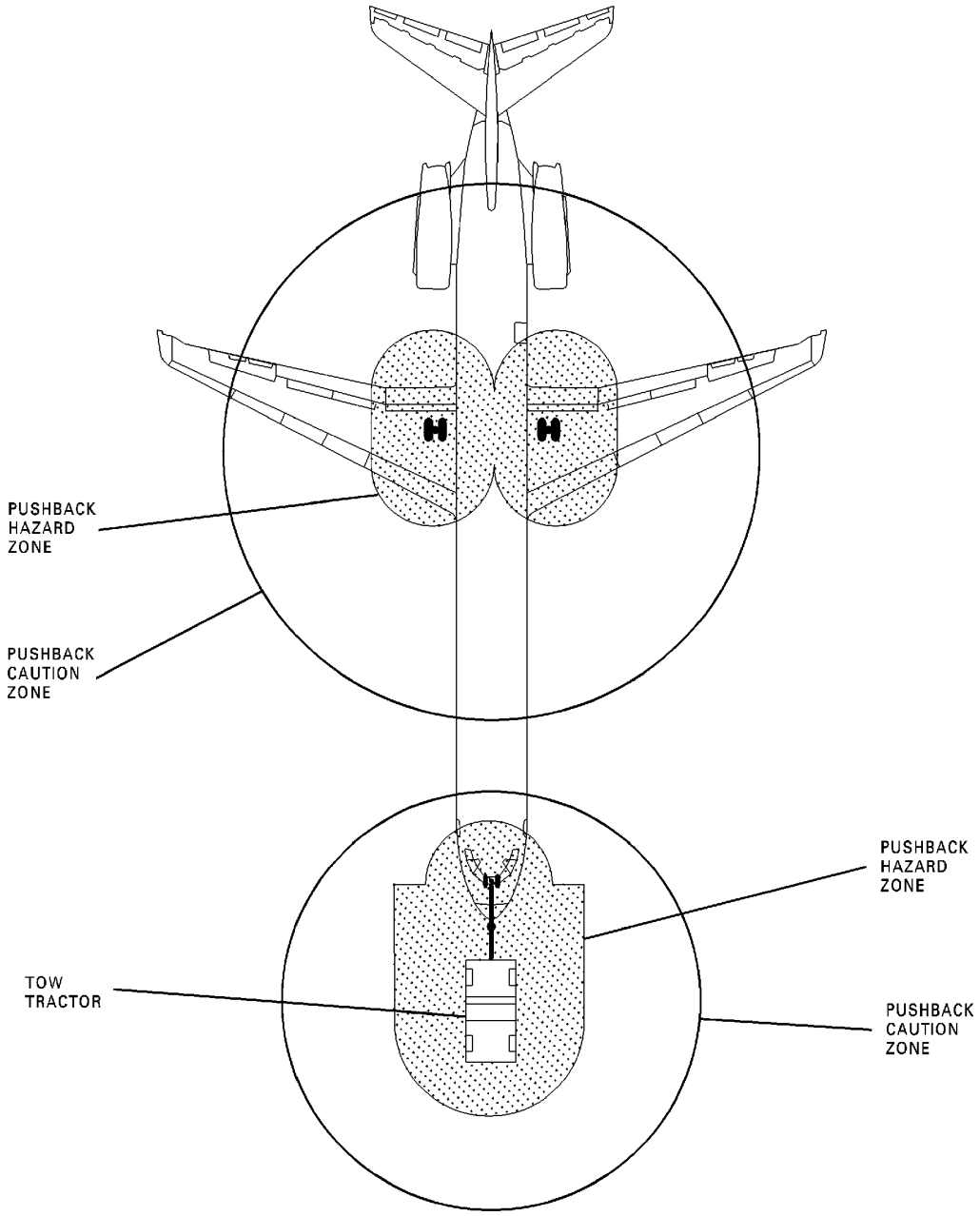
ITEM NO.	MAIN GEAR CONDITION	TIRE FOOTPRINT EXAMPLES	IS TAXIING ALLOWED?	IS TOWING ALLOWED?	DISTANCE ALLOWED (TAXIING & TOWING)	NOSE WHEEL ANGLE OF TURN	REMARKS
1	ONLY ONE FLAT TIRE (ANY TIRE)		YES	YES	UNLIMITED	NORMAL	SEE NOTES 1., 2., 6.
2	TWO FLAT TIRES (ONE EACH AXLE)		YES	YES	UNLIMITED	NORMAL	SEE NOTES 1., 3., 4., 6.
3	TWO FLAT TIRES (ON ONE AXLE)		YES	YES (BOTH MAIN GEARS ONLY)	MINIMUM TO CLEAR RUNWAY	10° MAXIMUM	SEE NOTES 1., 3., 4., 5., 6., 7.
4	THREE FLAT TIRES (ANY COMBINATION)		YES	YES (BOTH MAIN GEARS ONLY)	MINIMUM TO CLEAR RUNWAY	10° MAXIMUM	SEE NOTES 1., 3., 4., 5., 6., 7.
5	FOUR FLAT TIRES		YES	YES (BOTH MAIN GEARS ONLY)	MINIMUM TO CLEAR RUNWAY	10° MAXIMUM	SEE NOTES 1., 3., 4., 5., 6., 7.
	NOSE GEAR CONDITION						
6	ONE FLAT TIRE		YES	YES	UNLIMITED	NORMAL	SEE NOTES 1., 2., 4.
7	TWO FLAT TIRES		YES	YES (BOTH MAIN GEARS ONLY)	MINIMUM TO CLEAR RUNWAY	10° MAXIMUM	SEE NOTES 1., 2., 5., 6., 7.

NOTES:

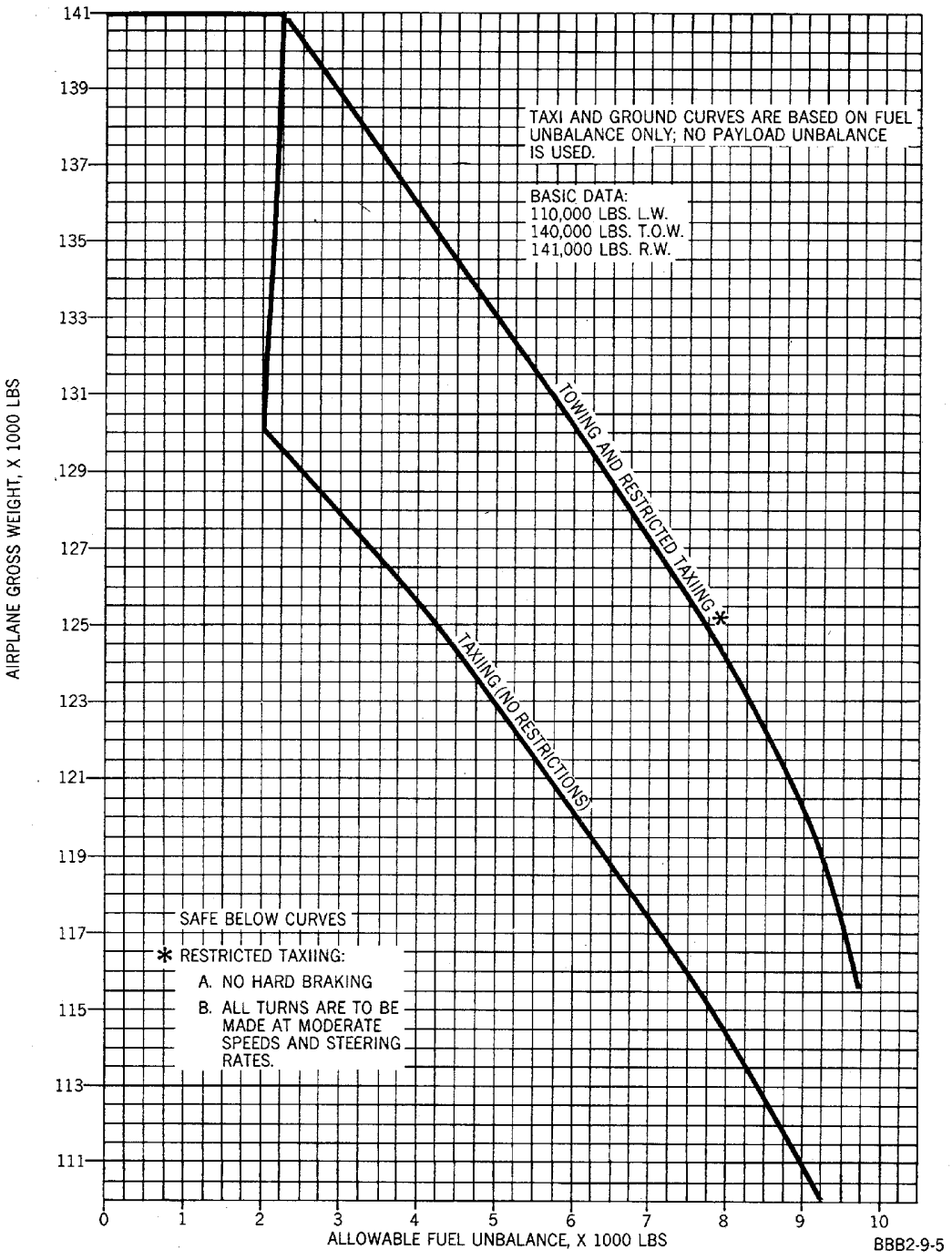
1. AVOID SHARP TURNS, ABRUPT STARTS AND STOPS.
2. MAXIMUM TAXIING OR TOWING SPEED = 5 MPH.
3. MAXIMUM TAXIING OR TOWING SPEED = 2 MPH.
4. AFTER CLEARING RUNWAY, OR IF ADDITIONAL TIRE FAILS, AIRPLANE SHOULD BE STOPPED AND SERVICEABLE WHEEL/TIRE ASSEMBLY (IES) INSTALLED TO OBTAIN ITEM NUMBER 2 OR 6.
5. CAUTION TAXIING OR TOWING WITH TWO FLAT TIRES ON SAME GEAR CAN RESULT IN WHEEL DAMAGE.
6. AFTER ANY TIRE FAILURE OR EXCESSIVE HEAT CONDITION THE AFFECTED WHEEL ASSEMBLY MUST BE INSPECTED PER APPLICABLE GOODYEAR OVERHAUL MANUAL PRIOR TO FURTHER USE.
7. UNDER MULTIPLE FAILED TIRE CONDITION, THE AFFECTED LANDING GEAR ASSEMBLIES AND LINKAGES MUST BE INSPECTED FOR POSSIBLE STRUCTURAL DAMAGE.

BBB2-9-2

Towing or Taxiing With Flat Tires
Figure 4/09-00-00-990-803



Pushback Hazard Zone
Figure 5/09-00-00-990-804



Fuel Unbalanced Chart
Figure 6/09-00-00-990-806

TOWING - DESCRIPTION AND OPERATION

1. General

A. Towing the aircraft over hard surfaces is accomplished at the nosegear for normal maintenance and ramp functions.

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL.

B. Forward or aft towing (pushing) is normally accomplished through the nosegear axle, using a yoke-type towbar and a towing vehicle. Maintain at least 10 ft (3M) distance from the nose gear, towbar, and towing vehicle while the aircraft is moving. (Figure 2)

C. The nosegear towing load, directly forward or directly aft with the towbar parallel to the ground, is limited to 15 percent of the maximum allowable gross ramp weight. The maximum load limit in any turn is 7.5 percent of the gross ramp weight. The towing vehicle should be equipped with a torque converter to minimize acceleration and deceleration loads on the nosegear. Figure 1 shows towbar pull required to tow the aircraft over various surfaces, as well as, backing aircraft against idle thrust.

D. During the towing operation, the vehicle operator must make certain that turning limits of the nosegear are not exceeded. Maximum nosewheel turning angle is 90 degrees either side of center. Turning limits are displayed on the nosegear and nosegear door with red lines visible from the towing vehicle operator's position. During nosewheel towing all turning is accomplished through the towbar. The nosewheel steering control is made inoperative by placing the steering bypass valve in bypass position and installing the steering bypass valve lockpin.

E. If the aircraft is off the runway in soft sand, earth, or mud, towing can be accomplished at the main gear. This method of towing is used when conditions such as those above would exceed the towing load limits of the nosegear. Cables or ropes are attached from each main gear to the towing vehicles. When cables are used for towing, it is good practice to attach connecting ropes at frequent intervals to minimize whipping in the event of cable break. The maximum main gear towing load limit, within 30 degrees of directly forward or directly aft, is 11 percent of the gross ramp weight for each gear. During main gear towing, steering is accomplished either through nosewheel steering control (when hydraulic pressure is available) or by allowing the nosewheel to caster. To allow the nosewheel to caster, the nosewheel steering bypass valve must be in bypass position with the bypass valve lockpin installed. For nosewheel steering control the bypass valve lockpin must be removed, allowing the bypass valve to return to normal position.

CAUTION: PERSON IN FLIGHT COMPARTMENT MUST SPEAK TO TOWING VEHICLE OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

F. A qualified person shall be stationed in the flight compartment during all phases of towing to watch for hazardous conditions and to stop the aircraft using the aircraft brakes in the event the towbar breaks or becomes uncoupled. Station wing and/or tail walkers as necessary to insure adequate clearance between aircraft and adjacent equipment and structures.

CAUTION: AVOID PROLONGED GROUND USE OF POSITION LIGHTS DURING AIRCRAFT PARKING. PROLONGED USE OF LIGHTS IN AMBIENT AIR MAY CAUSE HEAT DAMAGE TO LENS.

G. It is desirable to establish some form of communication between the towing vehicle operator and person in the flight compartment; either two way radio (walkie-talkie) or through the aircraft interphone system. Electrical power for aircraft lights, radio communication with the control tower, hydraulic power and interphone communication may be furnished by the auxiliary power unit (APU).

NOTE: At the completion of towing, nose wheels should be placed in a center or near center position to prevent nose wheel steering lockup.

H. Fuel Requirements for Towing Operations

(1) Fuel in the left and right wing tanks is balanced. (Figure 3)

NOTE: If the acceptable wing tank fuel unbalance limits in Figure 3, are exceeded, refer to HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03, Table 601, for the required maintenance action.

(2) Examine the nose gear strut extension.

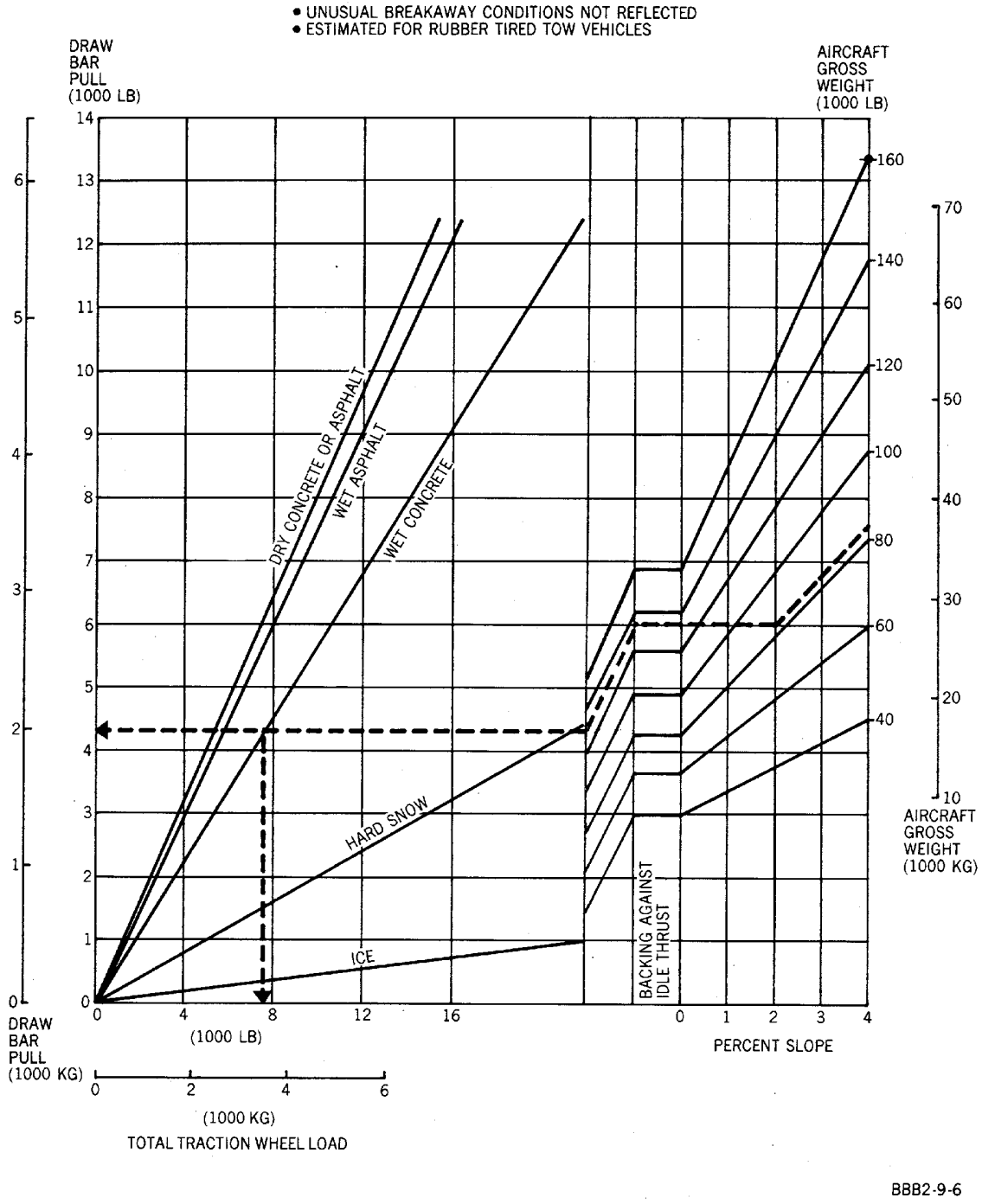
CAUTION: DO NOT TOW AIRCRAFT IF MORE THAN 6.5 INCHES OF CHROME PLATE IS VISIBLE ON NOSE GEAR PISTON. TOWING OF AIRCRAFT BEYOND THIS LIMIT MAY CAUSE NOSE GEAR SHOCK STRUT DAMAGE.

(3) If the strut extension is more than 6.5 in. (16.5 cm) inches do one of the steps that follows:

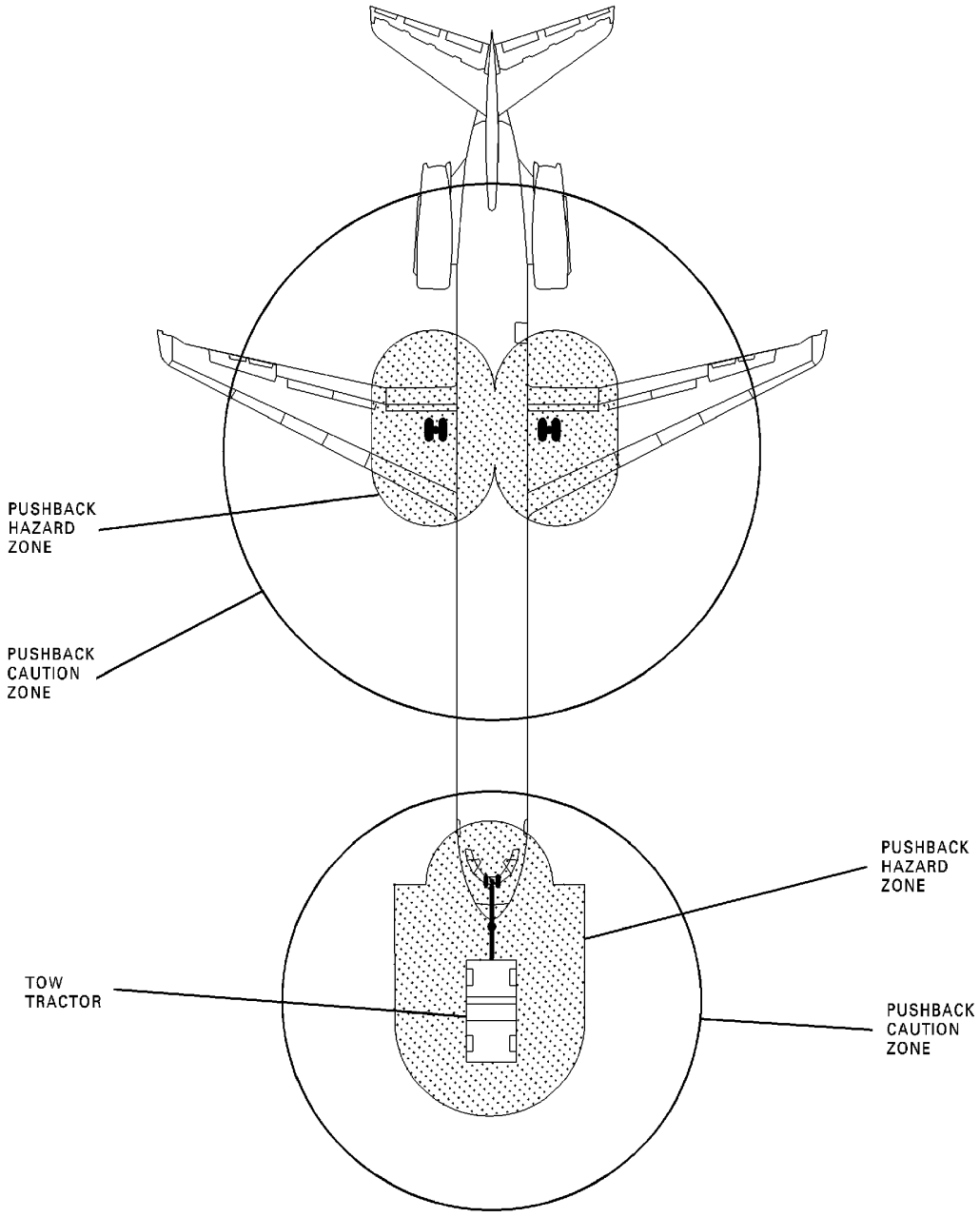
(a) Transfer or add 5000.0 lb (2268.0 kg) of fuel to the center fuel tank. (DEFUELING, SUBJECT 12-11-01 or FUEL LOADING, SUBJECT 12-11-03)

NOTE: This can be accomplished by using a fuel truck or by transferring fuel from the left wing or right wing fuel tanks to the center wing tank.

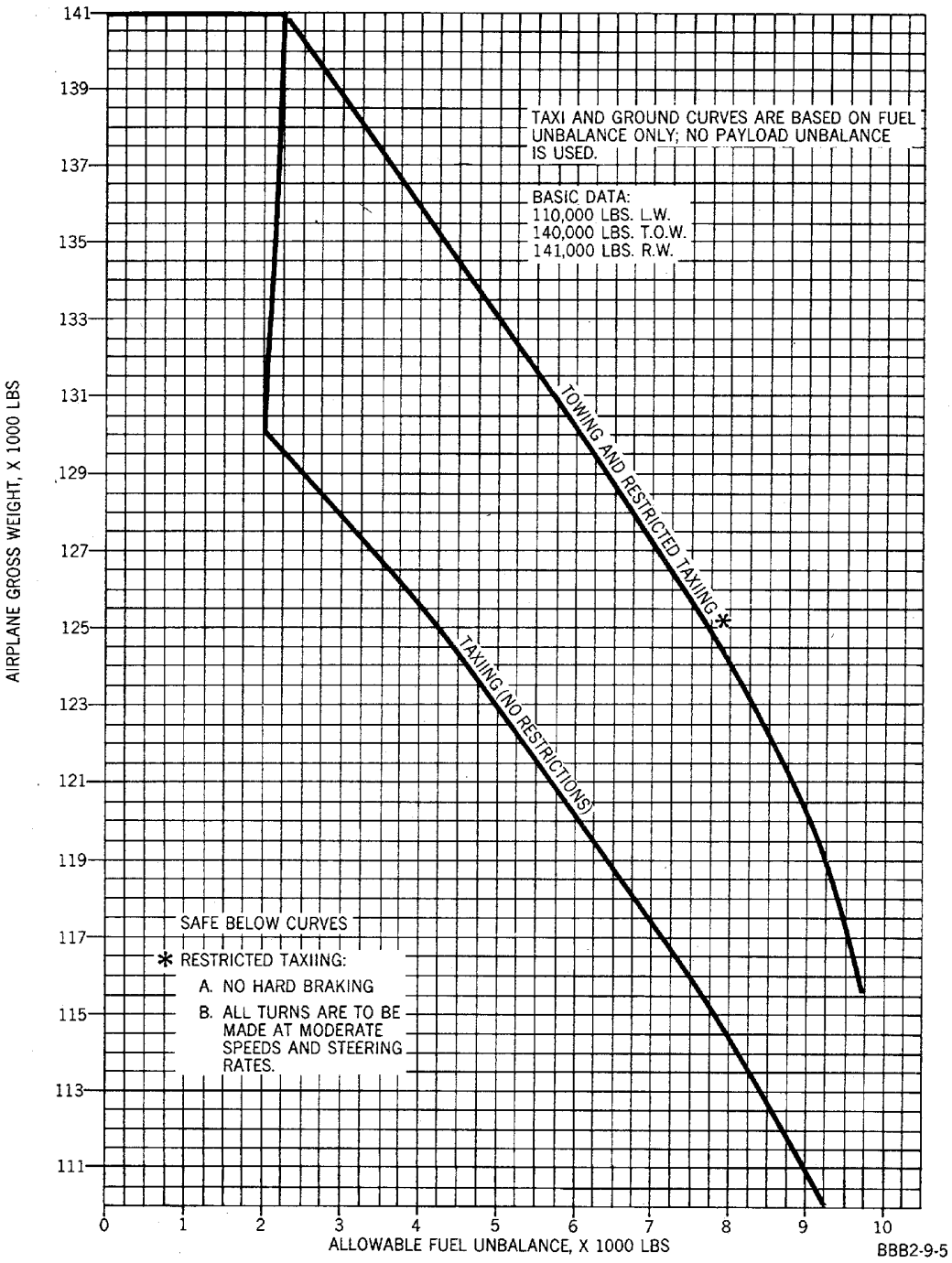
(b) If the center fuel tank cannot be used, add 650 lb (295 kg) of ballast weight evenly distributed in the forward cargo compartment between stations 218 and 294.



Towing Chart
Figure 1/09-10-00-990-801



Pushback Hazard Zone
Figure 2/09-10-00-990-802



Fuel Unbalance Chart
Figure 3/09-10-00-990-803

MAIN GEAR TOWING - MAINTENANCE PRACTICES

1. General

A. Towing at the main gear is performed when the aircraft is in soft sand, mud or earth, or at any time it is determined that towing at the nosegear would exceed the nosegear towing load limit of 15 percent of the maximum allowable gross ramp weight during straight forward and aft movement or 7.5 percent of the gross ramp weight during turns.

NOTE: Towing or pushing with landing gear ground lockpins removed is optional when moving aircraft for flight (flight crew aboard) after loading in a terminal.

B. During main gear towing, steering is accomplished either through the nosewheel steering control or by allowing the nose-wheel to caster. Normal nosewheel steering control will permit turning angles up to 82 degrees either side of center. To allow the nosewheel to caster up to 82 degrees, the nosewheel bypass valve must be placed in bypass position and the lockpin installed.

C. When pulling the aircraft backward by the main gear, steering should be accomplished by the steering control wheel with the torque links connected and the lockpin removed from the bypass valve. This prevents the nosewheel from swiveling to, and remaining at, 90 degrees to fore and aft.

D. The maximum main gear towing load limit (within 30 degrees of directly forward or directly aft) is 11 percent of the maximum allowable gross ramp weight for each main gear.

E. Communication between the tractors and the flight compartment should be established.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items:

Table 201

Name and Number	Manufacturer
Lockpin, main landing gear 2916700-1	Douglas Aircraft Co.
Lockpin, nose landing gear 2916700-501	Douglas Aircraft Co.
Lockpin, steering bypass 2916721-1	Douglas Aircraft Co.
Adapter, 5916713-1	Douglas Aircraft Co.
Cable	Commercially available
Shackle, NAS 1043-16	Commercially available

3. Safety and Operating Precautions

A. The following safety and operating precautions should be thoroughly understood before towing procedures outlined in paragraph 4. are accomplished.

NOTE: If the acceptable wing tank fuel unbalance limits in Figure 201 are exceeded, refer to HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03 Table 601, for maintenance action.

CAUTION: BEFORE TOWING AIRCRAFT, MAKE CERTAIN THAT FUEL IN LEFT AND RIGHT WING TANKS IS BALANCED.

CAUTION: TO PREVENT POSSIBILITY OF MISALIGNMENT OF ATTITUDE HEADING AND REFERENCE SYSTEMS (AHRS), AIRCRAFT SHOULD NOT BE TOWED FOR AT LEAST ONE MINUTE AFTER APPLYING ELECTRICAL POWER TO AHRS.

(1) Prior to towing, all stairs, ramps, and/or loading equipment should be retracted, stowed or removed. External power and other equipment should be disconnected and the area cleared.

NOTE: In some instances, the towing vehicle may have to be disconnected from the tow bar and the tow bar and nosegear manually repositioned to avoid exceeding the maximum towing angle.

CAUTION: SHARP TURNS RESULT IN EXCESSIVE SCRUBBING OF MAIN GEAR TIRES.

CAUTION: SHARP TURNS OVER UNEVEN SURFACES MAY DAMAGE RUDDER PEDAL SHIFT DRUM BRACKET AND/OR STEERING LOCKOUT RODS.

(2) Avoid sharp turns.

CAUTION: FAILURE TO ALIGN GEARS TO RELIEVE TIRE AND STRUT STRESSES CAUSED BY TURNING MOTIONS MIGHT RESULT IN HYDRAULIC LEAKAGE THROUGH SHOCK STRUT SEALS.

(3) Last few feet of any towing action should be in a straight line to align gears and relieve tire twisting stresses.

4. Main Gear Towing

A. Towing

(1) Examine the nose gear strut extension.

CAUTION: DO NOT TOW AIRCRAFT IF MORE THAN 6.5 INCHES OF CHROME PLATE IS VISIBLE ON NOSE GEAR PISTON. TOWING OF AIRCRAFT BEYOND THIS LIMIT MAY CAUSE NOSE GEAR SHOCK STRUT DAMAGE.

(2) If the strut extension is more than 6.5 in. (16.5 cm) inches do one of the steps that follows:

(a) Transfer or add 5000.0 lb (2268.0 kg) of fuel to the center fuel tank. (DEFUELING, SUBJECT 12-11-01 or FUEL LOADING, SUBJECT 12-11-03)

NOTE: This can be accomplished by using a fuel truck or by transferring fuel from the left wing or right wing fuel tanks to the center wing tank.

(b) If the center fuel tank cannot be used, add 650 lb (295 kg) of ballast weight evenly distributed in the forward cargo compartment between stations 218 and 294.

(3) Make certain cargo doors are closed.

(4) Make certain that main landing gear doors are closed, and landing gear lockpins are installed.

CAUTION: DO NOT TOW AIRCRAFT IF NOSEGEAR STRUT BECOMES FULLY EXTENDED (FLIGHT MODE). NOSEGEAR SHIFT MECHANISM CAN BE DAMAGED.

(5) Place nosewheel steering bypass valve in normal position to activate nosewheel steering control.

(6) Pressurize aircraft hydraulic system. (PAGEBLOCK 29-00-00/201)

(7) Station person in captain's seat in flight compartment.

(8) Establish communication with control tower if towing is to be performed through taxi or takeoff area.

(9) Station wing walkers in congested areas to check clearance between aircraft and adjacent equipment.

CAUTION: DO NOT WRAP CABLE AROUND MAIN GEAR. CABLE MUST BE USED WITH TOWING ADAPTERS AND HAVE SUFFICIENT STRENGTH TO WITHSTAND MAXIMUM ALLOWABLE MAIN GEAR TOWING LOAD OF 11 PERCENT OF MAXIMUM ALLOWABLE GROSS RAMP WEIGHT. EACH GEAR CABLE MUST BE OF SUFFICIENT LENGTH TO ALLOW AIRCRAFT CLEARANCE FOR TOWING VEHICLES.

(10) Install towing adapters around each main gear in vicinity of nameplate. Use care to prevent crushing tubing or wiring in area. (Figure 202)

NOTE: It may be necessary to disconnect outboard door drive rod to clear strap.

(11) Install shackles through adapters and attach tow cables to shackles.

CAUTION: BRIDGE CABLES WITH ROPE AT FREQUENT INTERVALS TO MINIMIZE WHIPPING ACTION IN EVENT OF CABLE BREAK.

(12) Attach tow cables to towing vehicles. Make certain that cables are of sufficient length to clear aircraft, and that towing vehicles are operating on hard, firm surface.

(13) Place ANTISKID switch to the OFF position.

(14) Remove wheel chocks, mooring cables, and static ground cables.

(15) If towing surface is not firm, place supporting planks ahead of towing vehicle wheels as aircraft is towed. Under wet or icy conditions apply sand to planks to prevent tire slippage. Keep areas forward of wheel direction free of snow, mud, and debris.

CAUTION: DO NOT EXCEED MAIN GEAR TOWING LOAD LIMIT OF 11 PERCENT OF MAXIMUM ALLOWABLE GROSS RAMP WEIGHT (EACH GEAR). USE SAME TOWING ANGLE (MAXIMUM OF 30 DEGREES FROM LANDING GEAR CENTER LINE) AT BOTH MAIN GEARS. DO NOT EXCEED LIMIT OF NOSEWHEEL IN TURNS. COORDINATE MOVEMENT OF TOWING VEHICLES TO PREVENT UNEVEN LOADS.

(16) Tow aircraft either forward or aft, applying smooth even loads from towing vehicles. Steer aircraft by nosewheel steering control. Brake aircraft smoothly and evenly using aircraft brakes.

(a) If nosegear steering lockup occurs during towing operation:

1) Place nosewheel steering bypass valve in bypass position and install lockpin.

2) Using tow bar or manual forces, turn nosewheels to approximate center position (less than 82 degrees).

3) Remove bypass valve lockpin.

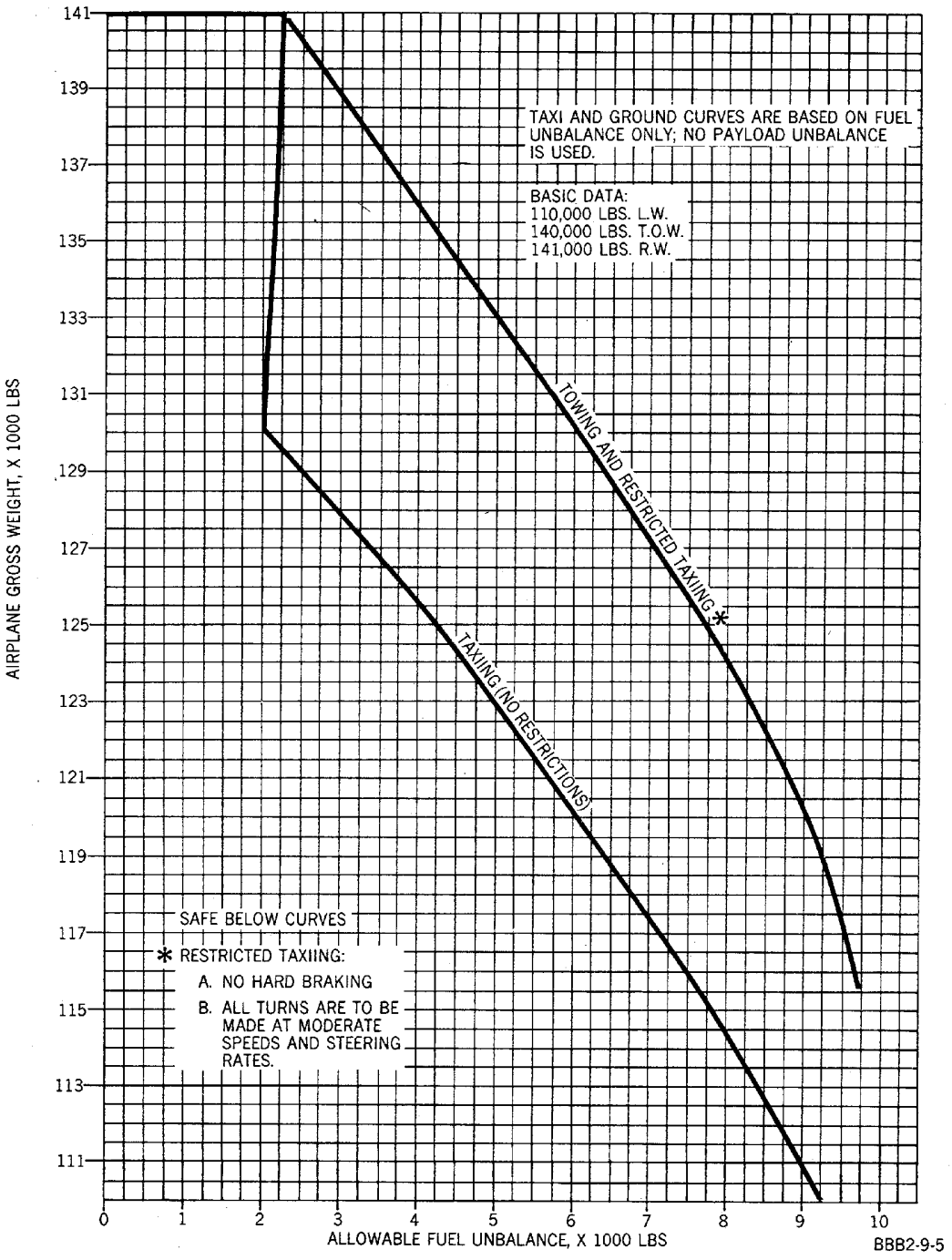
4) Check nosewheels for proper steering.

CAUTION: NOSEWHEEL MUST BE CENTERED OR NEAR CENTER. NOSEWHEEL STEERING IS INOPERATIVE IF NOSEWHEEL IS TURNED MORE THAN 82 DEGREES.

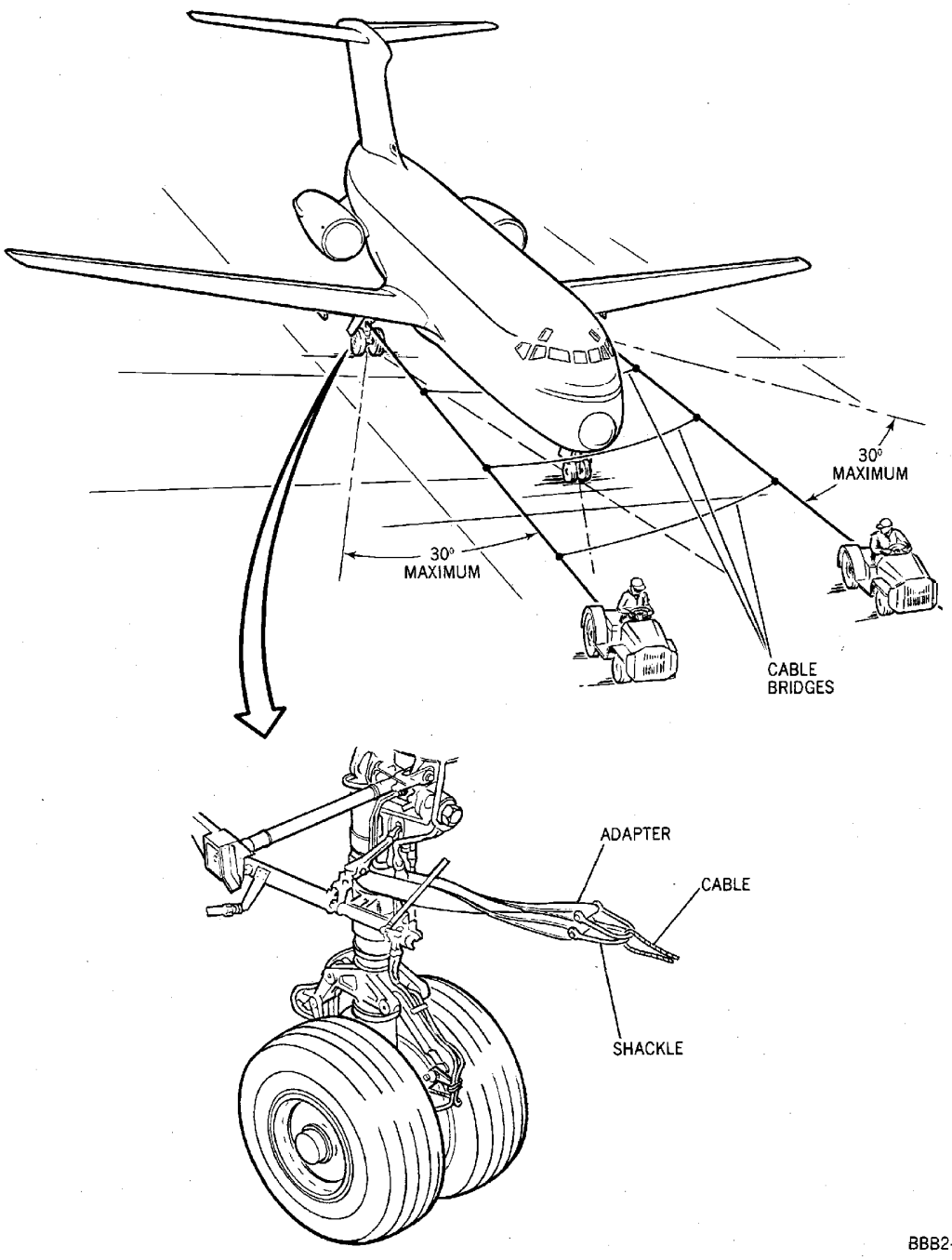
(17) When towing operation is complete, turn nosewheels to center or near center position, chock aircraft wheels, connect static ground cables, (mooring cables if applicable) and deactivate or disconnect source of electrical power.

(18) Disconnect tow cables and remove towing adapters from main gear.

NOTE: If aircraft is to be parked or moored, refer to PAGEBLOCK 10-20-00/201.



Fuel Unbalance Chart
Figure 201/09-11-00-990-801



Main Gear Towing
Figure 202/09-11-00-990-802

NOSE GEAR TOWING - MAINTENANCE PRACTICES

1. General

A. Towing the aircraft over hard surfaces is accomplished at the nose gear for normal maintenance and ramp functions. During nose gear towing, the nosewheel steering bypass valve shall be placed in the bypass position and the lockpin installed.

B. The nose gear towing loads are shown on Figure 202.

C. During towing operations, ground personnel should maintain a safe distance of 10 ft (3M) away from the nose gear, towbar, and towing vehicle. Being too near the nose gear, towbar, or towing vehicle could result to being caught in them. This can cause injury or death to personnel. (Figure 203)

D. Communication is essential during aircraft movement to prevent injury to ground personnel and/or damage to the aircraft. This should be established between the towing vehicle operator and the person in the flight compartment using the aircraft interphone system or portable two way radios (walkie-talkies).

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following items:

NOTE: It is possible that some materials in the Equipment and Materials List cannot be used for some or all of their necessary applications. Before you use the materials, make sure the types, quantities, and applications of the materials necessary are legally permitted in your location. All persons must obey all applicable federal, state, local, and provincial laws and regulations when it is necessary to work with these materials.

Table 201

Name and Number	Manufacturer
Towbar, 5916708-509, -511, or -515	Douglas Aircraft Co.
Lockpins, landing gear 2916700-1	Douglas Aircraft Co.
Lockpin, nose landing gear 2916700-501	Douglas Aircraft Co.
Lockpin, steering bypass 2916721-1	Douglas Aircraft Co.
Tractor, towing, towbarless (for towing and pushback) (**) AM-110 (*)(**) AM-150	Manghh
Tractor, towing, towbarless (for towing and pushback) (*)(**) Push Pilot 10	FMT Push Pilot
Tractor, towing, towbarless (for towing and pushback) (*)(**) PTS-2	Krauss Maffei
Tractor, towing, towbarless (for towing and pushback) (*)(**) ATOS 3-R101	AES
Tractor, towing, towbarless (for towing and pushback) (*)(**) AST-2	Goldhoffer
Tractor, towing, towbarless (for towing and pushback) (*)(**) IQ 200	Kalmar Motor
NOTE: (*) Maintenance towing.	
NOTE: (**) Push/Pull operations at the gate.	

3. Safety and Operating Precautions

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL.

A. The following safety and operating precautions should be thoroughly understood before the towing procedures outlined in Paragraph 4. are accomplished.

NOTE: If the acceptable wing tank fuel unbalance limits in Figure 204 are exceeded, refer to HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03 Table 601, for the required maintenance action.

CAUTION: BEFORE TOWING AIRCRAFT, MAKE CERTAIN THAT FUEL IN LEFT AND RIGHT WING TANKS IS BALANCED.

CAUTION: DO NOT TOW AIRCRAFT IF MORE THAN 6.5 INCHES OF CHROME PLATE IS VISIBLE ON NOSE GEAR PISTON. TOWING OF AIRCRAFT BEYOND THIS LIMIT MAY CAUSE NOSE GEAR SHOCK STRUT DAMAGE.

CAUTION: TO PREVENT POSSIBILITY OF MISALIGNMENT OF ATTITUDE HEADING AND REFERENCE SYSTEMS (AHRS), AIRCRAFT SHOULD NOT BE TOWED FOR AT LEAST ONE MINUTE AFTER APPLYING ELECTRICAL POWER TO AHRS.

CAUTION: SHARP TURNS RESULT IN EXCESSIVE SCRUBBING OF MAIN GEAR TIRES.

CAUTION: FAILURE TO ALIGN GEARS TO RELIEVE TIRE AND STRUT STRESSES CAUSED BY TURNING MOTIONS MIGHT RESULT IN HYDRAULIC LEAKAGE THROUGH SHOCK STRUT SEALS.

(1) Last few feet of any towing action should be in a straight line to align gears and relieve tire twisting stresses.

4. Nose Gear Towing

A. Towing

CAUTION: BEFORE TOWING AIRCRAFT, MAKE CERTAIN THAT FUEL IN LEFT AND RIGHT WING TANKS IS BALANCED.

(1) Examine the nose gear strut extension.

CAUTION: DO NOT TOW AIRCRAFT IF MORE THAN 6.5 INCHES OF CHROME PLATE IS VISIBLE ON NOSE GEAR PISTON. TOWING OF AIRCRAFT BEYOND THIS LIMIT MAY CAUSE NOSE GEAR SHOCK STRUT DAMAGE.

(2) If the strut extension is more than 6.5 in. (16.5 cm) inches do one of the steps that follows:

(a) Transfer or add 5000.0 lb (2268.0 kg) of fuel to the center fuel tank. (DEFUELING, SUBJECT 12-11-01 or FUEL LOADING, SUBJECT 12-11-03)

NOTE: This can be accomplished by using a fuel truck or by transferring fuel from the left wing or right wing fuel tanks to the center wing tank.

(b) If the center fuel tank cannot be used, add 650 lb (295 kg) of ballast weight evenly distributed in the forward cargo compartment between stations 218 and 294.

(3) Close cargo doors, main landing gear doors and connect nose gear torque links.

(4) Observe the following:

(5) Place nosewheel steering bypass valve in bypass position and install bypass valve lockpin.

(6) Place towbar at nosewheel, insert towbar axle adapter into nosewheel axle and secure towbar locking handles. (Figure 201)

(7) Connect towbar to towing vehicle.

CAUTION: PERSON IN FLIGHT COMPARTMENT MUST SPEAK TO TOWING VEHICLE OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

(8) Station person in captain's seat in flight compartment.

(9) Make certain antiskid switch is in off position.

(10) For brake pressure, pressurize aircraft hydraulic system. (PAGEBLOCK 29-00-00/201).

(11) In congested areas, station wing walkers to check clearance between aircraft and adjacent equipment.

(12) Make certain that wheel chocks, static ground cables, and mooring cables have been removed.

(13) If towing is to be accomplished in taxi or takeoff areas, establish radio contact with control tower for instructions.

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL.

CAUTION: DO NOT TOW AIRCRAFT UP SLOPE EXCEEDING FIVE DEGREES.

CAUTION: IF NOSEWHEELS ARE TURNED BEYOND MAXIMUM TOWING ANGLE OF 90 DEGREES (INDICATED BY RED STRIPES ON NOSEGEAR AND GEAR DOORS), DAMAGE MAY OCCUR. IF MAXIMUM TOWING ANGLE IS INADVERTENTLY EXCEEDED, REFER TO MAINTENANCE MANUAL, CHAPTER 32–50–00, PAGE 101, FOR AREAS TO INSPECT FOR DAMAGE.

(14) Maintain a minimum distance of 10 ft (3M) from the nose gear, towbar, and towing vehicle at all times. (Figure 203)

(15) Tow aircraft, making smooth starts and stops with towing vehicle. Make sure aircraft is in motion (tow a short distance) before attempting a change of direction. Observe maximum turn markings on nosewheel doors. Before parking, tow aircraft in straight line for a short distance to relieve landing gear side loads.

NOTE: In some instances, the towing vehicle may have to be disconnected from the tow bar and the tow bar and nosegear manually repositioned to avoid exceeding the maximum towing angle.

CAUTION: NOSEWHEELS MUST BE CENTERED OR NEAR CENTER. NOSEWHEEL STEERING IS INOPERATIVE IF NOSEWHEELS ARE TURNED MORE THAN 82 DEGREES.

CAUTION: WHEN REMOVING TOWBAR FROM AIRCRAFT, MAKE CERTAIN TOWBAR IS COMPLETELY CLEAR OF NOSE TIRE BEFORE ANY SHARP TURNS ARE MADE OR DAMAGE TO NOSE WHEEL AND/OR TIRE COULD RESULT.

(16) When towing operation is complete, turn nosewheels to center or near center position, chock aircraft wheels, connect static ground cables, and remove towbar clear of aircraft.

NOTE: If the landing gear ground lockpins were installed, remove the pins before taxi and takeoff.

WARNING: WHEN BYPASS VALVE LOCKPIN IS REMOVED, BYPASS VALVE CLOSES AND CAUSES HYDRAULIC PRESSURE TO CENTER NOSEGEAR. BEFORE REMOVING LOCKPIN, MAKE CERTAIN THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF NOSEWHEEL.

(17) Remove lockpin from nosewheel bypass valve - handle will return to normal position.

B. Alternate Nose Gear Towing

NOTE: Alternate nose gear towing procedure may be used when external electrical power is unavailable during tow operation. The following steps must be performed in order to assure brake pressure will be available if needed.

(1) Install nose and main landing gear ground lockpins and chock wheels.

(2) Apply external power to the aircraft.

(3) Release parking brake and place antiskid control switch in OFF position.

WARNING: BEFORE PRESSURIZING HYDRAULIC SYSTEM, MAKE CERTAIN THAT LANDING GEAR GROUND LOCKPINS ARE INSTALLED AND THAT APPLICABLE CONTROLS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF LANDING GEAR AND FLIGHT CONTROL SYSTEMS.

(4) Pressurize hydraulic power system, maintain pressure for 2 to 3 minutes to stabilize system accumulators.(PAGEBLOCK 29-00-00/201)

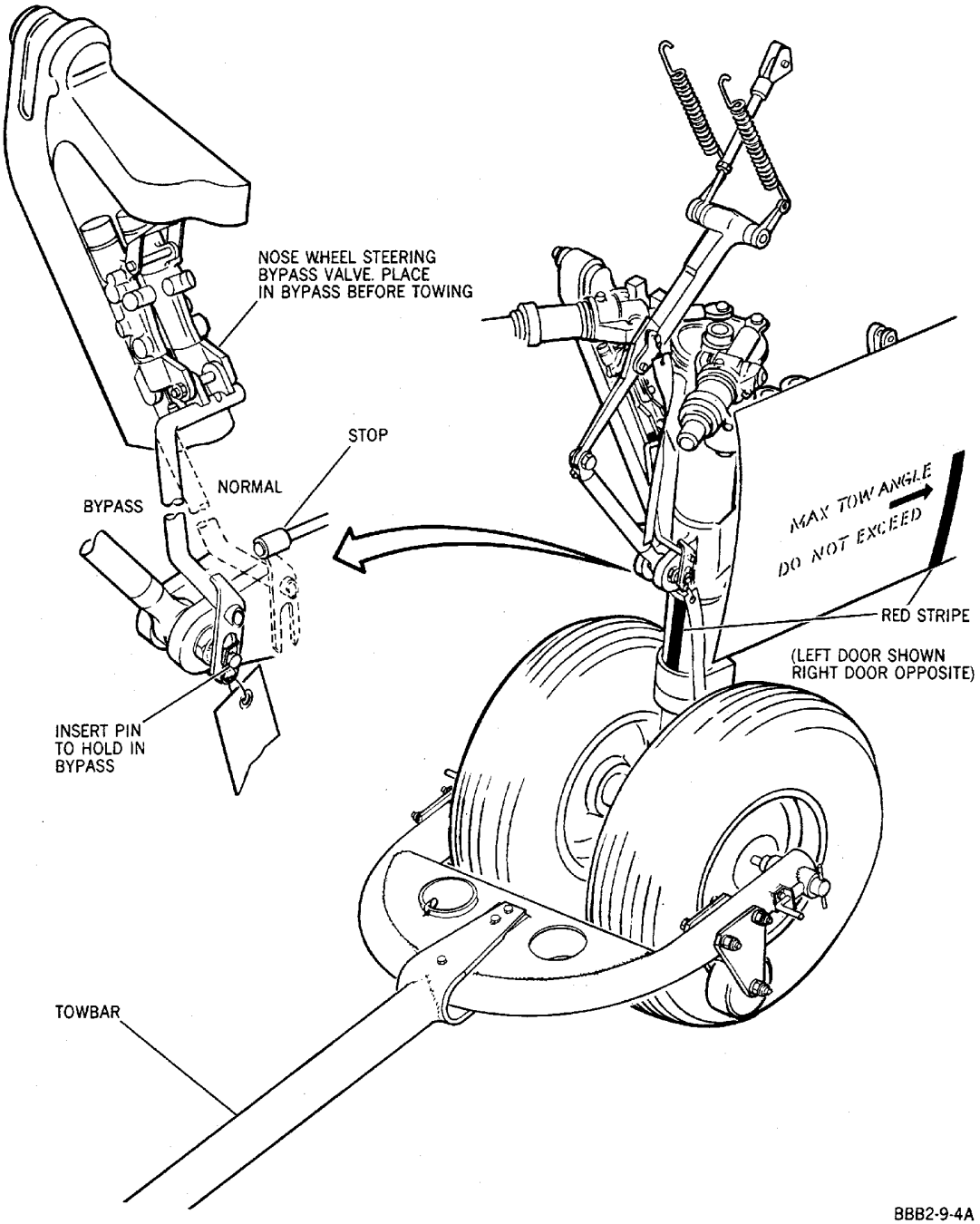
(5) Reduce system pressure to zero psi; brake system accumulator is charged and pressure should not drop more than 150 psi (1035 kPa) in 10 minutes.

NOTE: If pressure drops more than 150 psi (1035 kPa) in 10 minutes, do not tow aircraft.

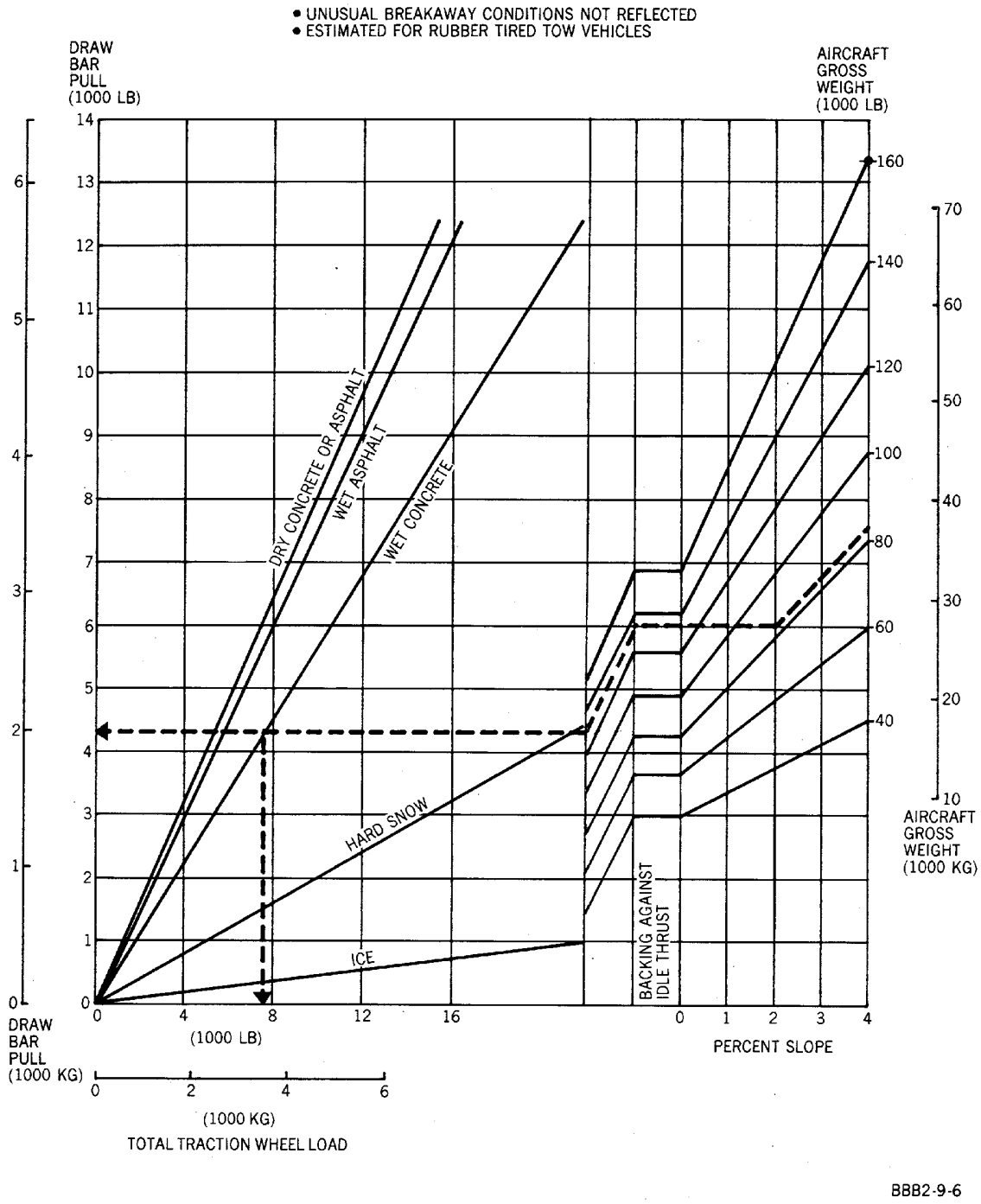
(6) Remove electrical power.

(7) Remove wheel chocks.

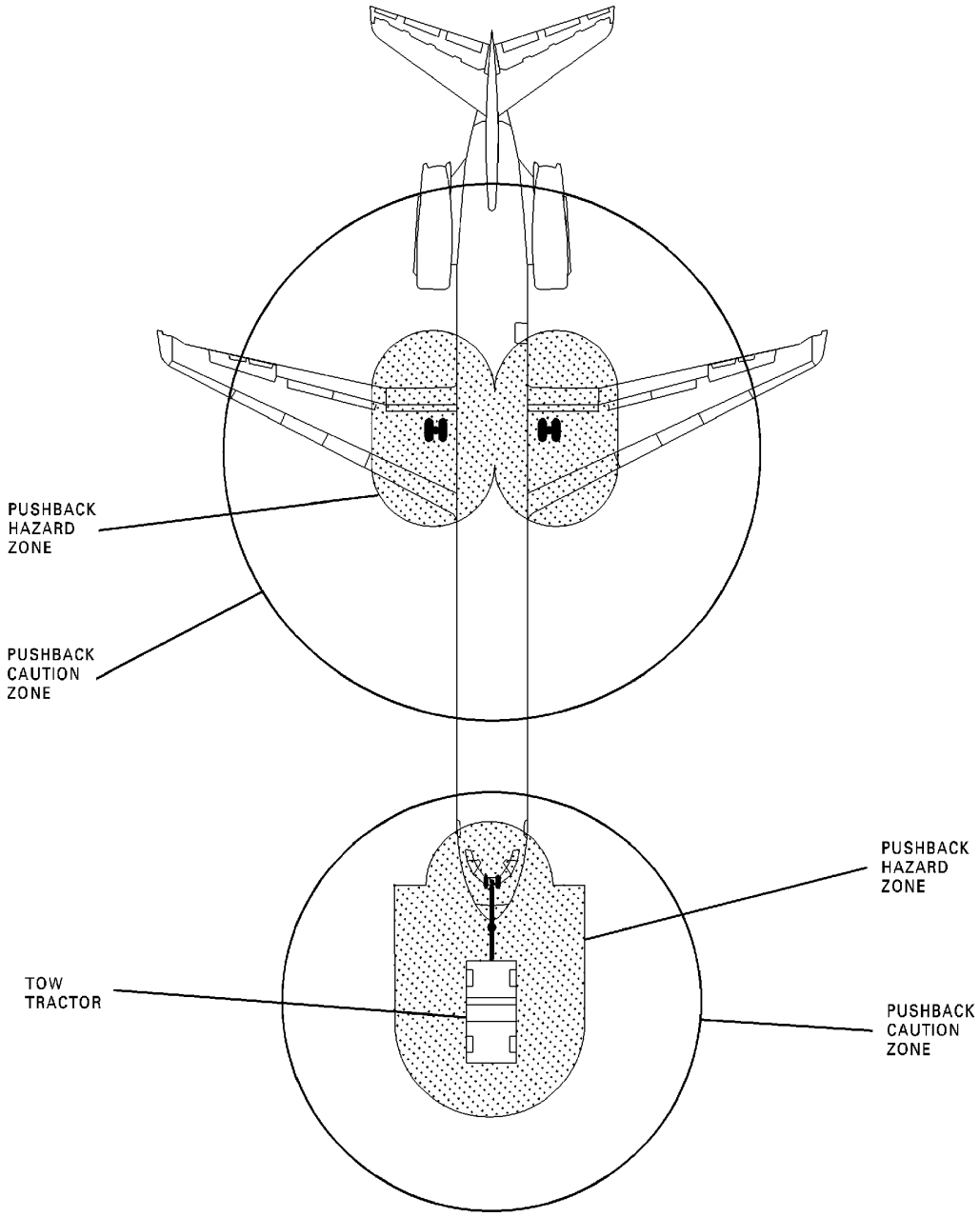
NOTE: Do not ride brakes as pressure is limited to that stored in the brake accumulator.



Nosegear Towing
Figure 201/09-12-00-990-801



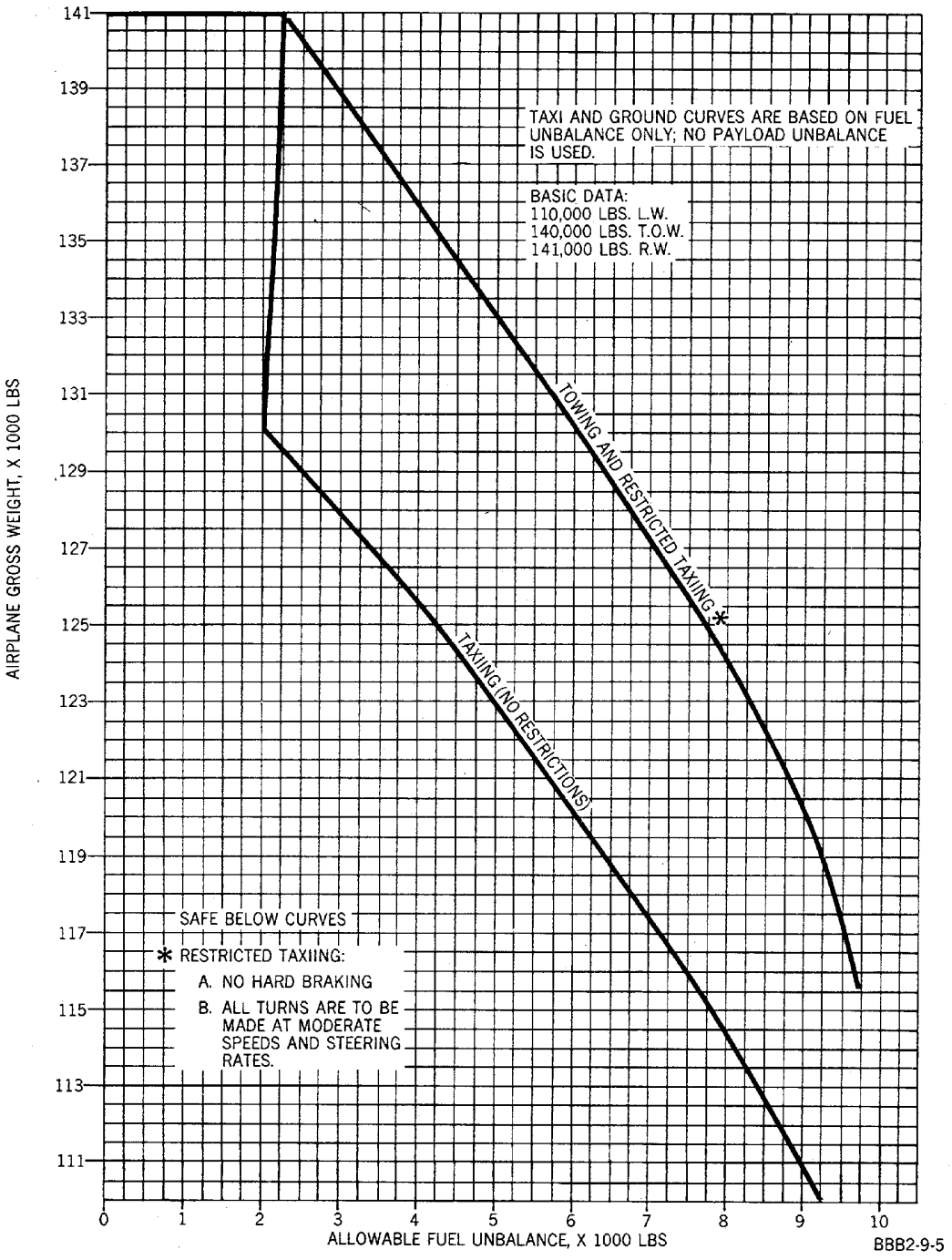
Towing Chart
Figure 202/09-12-00-990-802



WARNING: PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FEET (3 METERS) CLEARANCE FROM TOW TRACTOR, TOW BAR AND LANDING GEAR.

CAG(IGDS) BBB2–9–13

Pushback Hazard Zone
Figure 203/09-12-00-990-803



Fuel Unbalance Chart
Figure 204/09-12-00-990-804

5. Nose Gear Towing - Using Towbarless Tractor

A. Towing

CAUTION: DO NOT TOW AIRCRAFT IF MORE THAN 6.5 INCHES OF CHROME PLATE IS VISIBLE ON NOSE GEAR PISTON. TOWING OF AIRCRAFT BEYOND THIS LIMIT MAY CAUSE NOSE GEAR SHOCK STRUT DAMAGE.

CAUTION: BEFORE TOWING AIRCRAFT, MAKE CERTAIN THAT FUEL IN LEFT AND RIGHT WING TANKS IS BALANCED.

CAUTION: BEFORE TOWING AIRCRAFT, MAKE CERTAIN MINIMUM OF 5000 LBS OF FUEL IS IN CENTER WING TANK. THIS WILL PREVENT DAMAGE TO NOSE LANDING GEAR AND PROTECT AIRCRAFT FROM LONGITUDINAL INSTABILITY.

(1) Close cargo doors.

NOTE: This can be accomplished by using a fuel truck or by transferring fuel from the left wing and right wing fuel tank to the center wing tank.

NOTE: If an aircraft is unable to maintain a minimum of 5000 pounds of fuel in the center wing tank due to non usage of that tank, a suitable weight of ballast (eg; sandbags) can be placed in the most forward section of the forward cargo compartment such that the center of gravity (C.G.) of the aircraft falls within the limits. (Ref. Flight Crew Operating Manual (FCOM), Volume VI, Chapter 1-30-10).

(2) Make certain that main landing gear doors are closed, landing gear lockpins are installed, and nosegear torque links are connected.

(3) Place nosewheel steering bypass valve in bypass position and install bypass valve lockpin.

(4) Tractors without towbar (towbarless towing vehicles) are subject to specific qualification procedure.

(5) Before towing, be sure that tractor is qualified for towing without towbar for this aircraft.

(6) Select aircraft type on towbarless tractor if necessary.

(7) Install nose landing gear on towbarless tractor.

(8) Make sure that nose landing gear is correctly centered and secured on tractor platform and cannot be disconnected from tractor.

CAUTION: PERSON IN FLIGHT COMPARTMENT MUST SPEAK TO TOWING VEHICLE OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

(9) Station person in captain's seat in flight compartment.

(10) Make certain antiskid switch is in off position.

(11) For brake pressure, pressurize aircraft hydraulic system. (PAGEBLOCK 29-00-00/201)

(12) In congested areas, station wing walkers to check clearance between aircraft and adjacent equipment.

(13) Make certain that wheel chocks, static ground cables, and mooring cables have been removed.

(14) If towing is to be accomplished in taxi or takeoff areas, establish radio contact with control tower for instructions.

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL.

CAUTION: DO NOT TOW AIRCRAFT UP SLOPE EXCEEDING FIVE DEGREES.

CAUTION: IF NOSEWHEELS ARE TURNED BEYOND MAXIMUM TOWING ANGLE OF 90 DEGREES (INDICATED BY RED STRIPES ON NOSEGEAR AND GEAR DOORS), DAMAGE MAY OCCUR. IF MAXIMUM TOWING ANGLE IS INADVERTENTLY EXCEEDED, REFER TO MAINTENANCE MANUAL, CHAPTER 32–50–00, PAGE 101, FOR AREAS TO INSPECT FOR DAMAGE.

(15) Maintain a minimum distance of 10 ft (3M) from the nose gear, towbar, and towing vehicle at all times. (Figure 203)

(16) Tow aircraft, making smooth starts and stops with towing vehicle. Make sure aircraft is in motion (tow a short distance) before attempting a change of direction. Observe maximum turn markings on nosewheel doors. Before parking, tow aircraft in straight line for a short distance to relieve landing gear side loads.

CAUTION: NOSEWHEELS MUST BE CENTERED OR NEAR CENTER. NOSEWHEEL STEERING IS INOPERATIVE IF NOSEWHEELS ARE TURNED MORE THAN 82 DEGREES.

(17) When towing operation is complete, turn nosewheels to center or near center position with towbarless tractor, chock aircraft wheels, connect static ground cables, and remove nose landing gear from towbarless tractor.

WARNING: WHEN BYPASS VALVE LOCKPIN IS REMOVED, BYPASS VALVE CLOSES AND CAUSES HYDRAULIC PRESSURE TO CENTER NOSEGEAR. BEFORE REMOVING LOCKPIN, MAKE CERTAIN THAT PERSONNEL AND EQUIPMENT ARE CLEAR OF NOSEWHEEL.

(18) Remove lockpin from nosewheel bypass valve - handle will return to normal position.

NOSE GEAR PUSHBACK - MAINTENANCE PRACTICES

1. General

A. This section provides recommended pushback procedures of the aircraft immediately prior to flight. Pushback of the aircraft over hard surfaces is accomplished at the nosewheel. Maintain at least 10 ft (3 m) distance from the landing gear, towbar, and tow tractor while the aircraft is moving. During pushback, the nosewheel steering bypass valve shall be placed in the bypass position and the lockpin installed.

NOTE: This pushback procedure is to be used only for aircraft dispatch with flight crew in the cockpit. Refer to towing section for pushback in connection with maintenance functions or repositioning of the aircraft. (PAGEBLOCK 09-12-00/201)

B. It is very important that safety and operating precautions are understood prior to pushback operations.(Paragraph 3.)

C. Nose gear pushback load limits are shown in Figure 203.

2. Equipment and Materials

NOTE: Equivalent substitutes may be used instead of the following listed items:

Table 201

Name and Number	Manufacturer
Communication equipment (head sets, walkie talkies, or approved cordless headsets)	Commercially available
Retractable reel headset cord mounted on tow tractor or coiled-type headset cord	Commercially available
NOTE: Headset cord length should be a minimum of 20 ft.	
Towbar, 5916708-509 or -511	Douglas Aircraft Co.
Nosewheel steering bypass valve lockpin 2916721-1	Douglas Aircraft Co.
Tractor, towing 12,000 lbs DBP	
Tractor, towing, towbarless (for towing and pushback) (**) AM-110 (*)(**) AM-150	Manghh
Tractor, towing, towbarless (for towing and pushback) (*)(**) Push Pilot 10	FMT Push Pilot

Table 201 (Continued)

Name and Number	Manufacturer
Tractor, towing, towbarless (for towing and pushback) (*)(**) PTS-2	Krauss Maffei
Tractor, towing, towbarless (for towing and pushback) (*)(**) ATOS 3-R101	AES
Tractor, towing, towbarless (for towing and pushback) (*)(**) AST-2	Goldhoffer
Tractor, towing, towbarless (for towing and pushback) (*)(**) IQ 200	Kalmar Motor
NOTE: (*) Maintenance towing.	
NOTE: (**) Push/Pull operations at the gate.	
NOTE: Tow tractor should be equipped with a torque converter to minimize acceleration and deceleration loads on the nose gear.	

3. **Safety and Operating Precautions**

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSH-BACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL. (FIGURE 201)

A. The following precautions should be thoroughly understood before pushback procedures outlined in Paragraph 4. are accomplished.

WARNING: PILOT IN FLIGHT COMPARTMENT MUST MAINTAIN DIRECT COMMUNICATION WITH TOW TRACTOR OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

WARNING: CORRECT INTERPHONE HEADSET OPERATION IS VITAL TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT. COMMUNICATION BETWEEN GROUND/FLIGHT CREW PERSONNEL MUST BE CLEAR, CONCISE, AND UNDERSTANDABLE.

(1) The aircraft flight interphone system is essential for communication between ground/flight crew personnel prior to and during pushback operations to ensure safety to ground personnel.

CAUTION: SHARP TURNS RESULT IN EXCESSIVE SCRUBBING OF MAIN GEAR TIRES.

CAUTION: SHARP TURNS OVER UNEVEN SURFACES MAY DAMAGE RUDDER PEDAL SHIFT DRUM BRACKET AND/OR STEERING LOCKOUT RODS.

(2) The nosewheel steering bypass valve handle must be placed in the bypass position and the lockpin installed prior to pushback. Placing the handle in the bypass position permits nosewheel to be turned a maximum of 90 degrees. (Figure 202)

CAUTION: TOW TRACTOR OPERATOR MUST HAVE TURNING LIMITS IN FULL VIEW AT ALL TIMES WHILE TURNING. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

(3) Turning limits must be observed during pushback to prevent damage to aircraft. (Figure 202)

CAUTION: PUSHING AIRCRAFT WHOSE NOSE GEAR STRUT EXTENSION EXCEEDS 6.5 INCHES OF CHROME PLATE MAY CAUSE NOSE GEAR SHOCK STRUT DAMAGE.

(4) Check that nose gear strut extension does not exceed 6.5 inches of chrome plate.

NOTE: If strut extension exceeds 6.5 inches of chrome plate, contact maintenance personnel.

CAUTION: FAILURE TO ALIGN NOSE GEAR WHEELS TO RELIEVE TIRE AND STRUT STRESSES CAUSED BY TURNING MOTIONS MAY RESULT IN HYDRAULIC LEAKAGE THROUGH SHOCK STRUT SEALS.

(5) Last few feet of any pushing action should be in a straight line to align gears and relieve tire twisting stresses.

CAUTION: PUSHING BACK AND STEERING LOADED AIRCRAFT WITH A TRACTOR CAPABLE OF DRAWBAR PULL OF 12,000 LBS OR MORE MAY RESULT IN EXCEEDING AFT DRAWBAR PULL LIMITS. WHEN PUSHING BACK ON UNEVEN OR GRADED RAMPS, POWER MUST BE APPLIED SMOOTHLY AND EVENLY TO PREVENT DAMAGE TO AIRCRAFT. (FIGURE 203)

(6) Observe pushback drawbar pull limits during pushback procedure. (Figure 203)

4. Nose Gear Pushback

WARNING: PILOT IN FLIGHT COMPARTMENT MUST MAINTAIN DIRECT COMMUNICATION WITH TOW TRACTOR OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSH-BACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL. (FIGURE 201)

A. Pushback

(1) If tires are frozen to ground, thaw with warm water or hot air to break ice bond.

(2) Check that landing gear downlock pins are not installed.

NOTE: If landing gear downlock pins are installed, notify maintenance.

WARNING: NOSEWHEEL STEERING BYPASS VALVE LOCKPIN MUST BE INSTALLED PRIOR TO CONNECTING TOWBAR. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

(3) Place nosewheel steering bypass valve handle in bypass position and install lockpin.

(4) Verify correct towbar and check condition of towbar and shear bolts.

(5) Place towbar at nosewheel, insert towbar axle adapter into nosewheel axle and secure towbar locking handles. (Figure 202)

(6) Connect towbar to tow tractor.

(7) Connect headset cord to flight interphone jack.

(8) Station wing-walkers to check clearance between aircraft and adjacent buildings and equipment.

(9) Ground personnel should watch for hazardous conditions and signal tow tractor operator to stop aircraft if necessary.

(10) Check that all aircraft doors and access panels are closed and locked and all external equipment has been removed from pushback area.

CAUTION: BEFORE TOWING AIRCRAFT, MAKE CERTAIN THAT FUEL IN LEFT AND RIGHT WING TANKS IS BALANCED.

(11) Check that fuel in left and right fuel tanks is balanced. (Figure 204)

NOTE: If the acceptable wing tank fuel unbalance limits in Figure 204 are exceeded, refer to HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03 Table 601, for the required maintenance action.

(12) Remove wheel chocks.

WARNING: PILOT IN FLIGHT COMPARTMENT MUST MAINTAIN DIRECT COMMUNICATION WITH TOW TRACTOR OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

(13) Establish communications with cockpit for pushback instructions. Communication between ground/flight crew personnel must be clear, concise, and understandable.

(14) Verify that aircraft brakes are released before beginning pushback.

CAUTION: USE EXTREME CAUTION WHEN GROUND IS ICY, SLUSHY, SLIPPERY OR SNOW COVERED. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

(15) Pushback speed should be kept at a minimum.

CAUTION: SHOULD AN INADVERTENT TOW BAR DISCONNECT OCCUR DURING PUSHBACK OR TOWING, THE NOSE LANDING GEAR SPRAY DEFLECTOR MUST BE INSPECTED PER AMM PROCEDURES IN 05-52-00-6 NOSE GEAR WATER DEFLECTOR - CHECK.

(16) Tow tractor operator must maintain surveillance of wing-walkers and be prepared to stop pushback if hazardous condition develops or to instruct flight crew to apply aircraft brakes if towbar becomes disconnected.

(a) If a towbar disconnect occurs, nose landing gear spray deflector must be inspected. (NOSE GEAR WATER DEFLECTOR - CHECK, PAGEBLOCK 05-52-00/601)

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR, TOWBAR, AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL. (FIGURE 201)

CAUTION: TOW TRACTOR OPERATOR MUST HAVE TURNING LIMITS IN FULL VIEW AT ALL TIMES WHILE TURNING. THESE LIMITS MUST NOT BE EXCEEDED OR DAMAGE TO AIRCRAFT MAY RESULT.

(17) Push aircraft, making smooth starts and stops with towing vehicle. Make sure aircraft is in motion (push a short distance) before attempting a change of direction. Observe maximum turn markings on nosewheel doors.

CAUTION: IF NOSEWHEELS ARE TURNED BEYOND MAXIMUM TOWING ANGLE OF 80 DEGREES (INDICATED BY RED STRIPES ON NOSEGEAR AND GEAR DOORS), DAMAGE MAY OCCUR. IF MAXIMUM TOWING ANGLE IS INADVERTENTLY EXCEEDED, REFER TO MAINTENANCE MANUAL, PAGEBLOCK 32-50-00/101, FOR AREAS TO INSPECT FOR DAMAGE.

(a) When pushing aircraft with towbar attached to forward nose gear, observe red turn limit markings on forward side of nose gear piston and nose gear doors.

NOTE: In some instances, the towing vehicle may have to be disconnected from the towbar and the towbar and nosegear manually repositioned to avoid exceeding the maximum towing angle.

CAUTION: FAILURE TO ALIGN NOSE GEAR WHEELS TO RELIEVE TIRE AND STRUT STRESSES CAUSED BY TURNING MOTIONS MAY RESULT IN HYDRAULIC LEAKAGE THROUGH SHOCK STRUT SEALS.

(18) Last few feet of any pushing action should be in a straight forward direction to align nose gear wheels with fuselage and relieve tire twisting stresses.

(19) Tow tractor operator will brake gently to a stop.

(20) Tow tractor operator will request aircraft parking brakes to be set.

(21) Disconnect towbar from tow tractor.

(22) Disconnect towbar from nosewheel.

WARNING: WHEN NOSEWHEEL STEERING BYPASS VALVE LOCKPIN IS REMOVED, BYPASS VALVE CLOSES AND CAUSES HYDRAULIC PRESSURE TO CENTER NOSEWHEEL. BEFORE REMOVING LOCKPIN, MAKE CERTAIN PERSONNEL AND EQUIPMENT ARE CLEAR OF NOSEWHEEL.

(23) Remove lockpin from nosewheel steering bypass valve handle; handle will return to normal position.

(24) Notify flight crew that nosewheel steering bypass valve lockpin is removed and that engines are ready for start.

(25) After engine start, flight crew should notify ground personnel that aircraft is ready for dispatch and flight interphone may be disconnected.

(26) Inform cockpit that area is being secured.

(27) Disconnect headset cord from flight interphone jack.

(28) Clear area and give departure salute to cockpit while displaying nosewheel steering bypass lockpin.

NOTE: It may be necessary for the flight crew to re-establish interphone communications with tow tractor operator. Flashing of taxi lights shall notify tow tractor operator to re-connect headset cord.

(29) Observe aircraft until aircraft taxis away from area.

5. Nose Gear Pushback - Using Towbarless Tractor

WARNING: PILOT IN FLIGHT COMPARTMENT MUST MAINTAIN DIRECT COMMUNICATION WITH TOW TRACTOR OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSH-BACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL.

A. Pushback

(1) If tires are frozen to ground, thaw with warm water or hot air to break ice bond.

(2) Check that landing gear downlock pins are not installed.

NOTE: If landing gear downlock pins are installed, notify maintenance.

WARNING: NOSEWHEEL STEERING BYPASS VALVE LOCKPIN MUST BE INSTALLED PRIOR TO CONNECTING TO TOW TRACTOR. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

(3) Place nosewheel steering bypass valve handle in bypass position and install lockpin.

(4) Tractors without towbar (towbarless towing vehicles) are subject to specific qualification procedure.

(5) Before towing, be sure that tractor is qualified for towing without towbar for this aircraft.

(6) Select aircraft type on towbarless tractor if necessary.

(7) Install nose landing gear on towbarless tractor.

(8) Make sure that nose landing gear is correctly centered and secured on tractor platform and cannot be disconnected from tractor.

CAUTION: PERSON IN FLIGHT COMPARTMENT MUST SPEAK TO TOW TRACTOR OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

(9) Connect headset cord to flight interphone jack.

(10) Station wing-walkers to check clearance between aircraft and adjacent buildings and equipment.

(11) Ground personnel should watch for hazardous conditions and signal tow tractor operator to stop aircraft if necessary.

(12) Check that all aircraft doors and access panels are closed and locked and all external equipment has been removed from pushback area.

(13) Remove wheel chocks.

WARNING: PILOT IN FLIGHT COMPARTMENT MUST MAINTAIN DIRECT COMMUNICATION WITH TOW TRACTOR OPERATOR DURING AIRCRAFT MOVEMENT. THIS WILL PREVENT INJURY TO PERSONNEL AND DAMAGE TO AIRCRAFT.

(14) Establish communications with cockpit for pushback instructions. Communication between ground/flight crew personnel must be clear, concise, and understandable.

(15) Verify that aircraft brakes are released before beginning pushback.

CAUTION: USE EXTREME CAUTION WHEN GROUND IS ICY, SLUSHY, SLIPPERY OR SNOW COVERED. THIS WILL PREVENT DAMAGE TO AIRCRAFT.

(16) Pushback speed should be kept at a minimum.

(17) Tow tractor operator must maintain surveillance of wing-walkers and be prepared to stop pushback if hazardous condition develops or to instruct flight crew to apply aircraft brakes if tow tractor becomes disconnected.

WARNING: GROUND PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FT (3 M) AWAY FROM LANDING GEAR AND TOW TRACTOR. ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING CAN CAUSE INJURY OR DEATH TO PERSONNEL.

CAUTION: TOW TRACTOR OPERATOR MUST HAVE TURNING LIMITS IN FULL VIEW AT ALL TIMES WHILE TURNING. THESE LIMITS MUST NOT BE EXCEEDED OR DAMAGE TO AIRCRAFT MAY RESULT.

(18) Push aircraft, making smooth starts and stops with towing vehicle. Make sure aircraft is in motion (push a short distance) before attempting a change of direction. Observe maximum turn markings on nosewheel doors.

CAUTION: IF NOSEWHEELS ARE TURNED BEYOND MAXIMUM TOWING ANGLE OF 90 DEGREES (INDICATED BY RED STRIPES ON NOSEGEAR AND GEAR DOORS), DAMAGE MAY OCCUR. IF MAXIMUM TOWING ANGLE IS INADVERTENTLY EXCEEDED, REFER TO MAINTENANCE MANUAL, PAGEBLOCK 32-50-00/101, FOR AREAS TO INSPECT FOR DAMAGE.

(a) When pushing aircraft, observe red turn limit markings on forward side of nose gear piston and nose gear doors.

CAUTION: FAILURE TO ALIGN NOSE GEAR WHEELS TO RELIEVE TIRE AND STRUT STRESSES CAUSED BY TURNING MOTIONS MAY RESULT IN HYDRAULIC LEAKAGE THROUGH SHOCK STRUT SEALS.

(19) Last few feet of any pushing action should be in a straight forward direction to align nose gear wheels with fuselage and relieve tire twisting stresses.

(20) Tow tractor operator will brake gently to a stop.

(21) Tow tractor operator will request aircraft parking brakes to be set.

(22) Remove nose landing gear from towbarless tractor.

WARNING: WHEN NOSEWHEEL STEERING BYPASS VALVE LOCKPIN IS REMOVED, BYPASS VALVE CLOSES AND CAUSES HYDRAULIC PRESSURE TO CENTER NOSEWHEEL. BEFORE REMOVING LOCKPIN, MAKE CERTAIN PERSONNEL AND EQUIPMENT ARE CLEAR OF NOSEWHEEL.

(23) Remove lockpin from nosewheel steering bypass valve handle; handle will return to normal position.

(24) Notify flight crew that nosewheel steering bypass valve lockpin is removed and that engines are ready for start.

(25) After engine start, flight crew should notify ground personnel that aircraft is ready for dispatch and flight interphone may be disconnected.

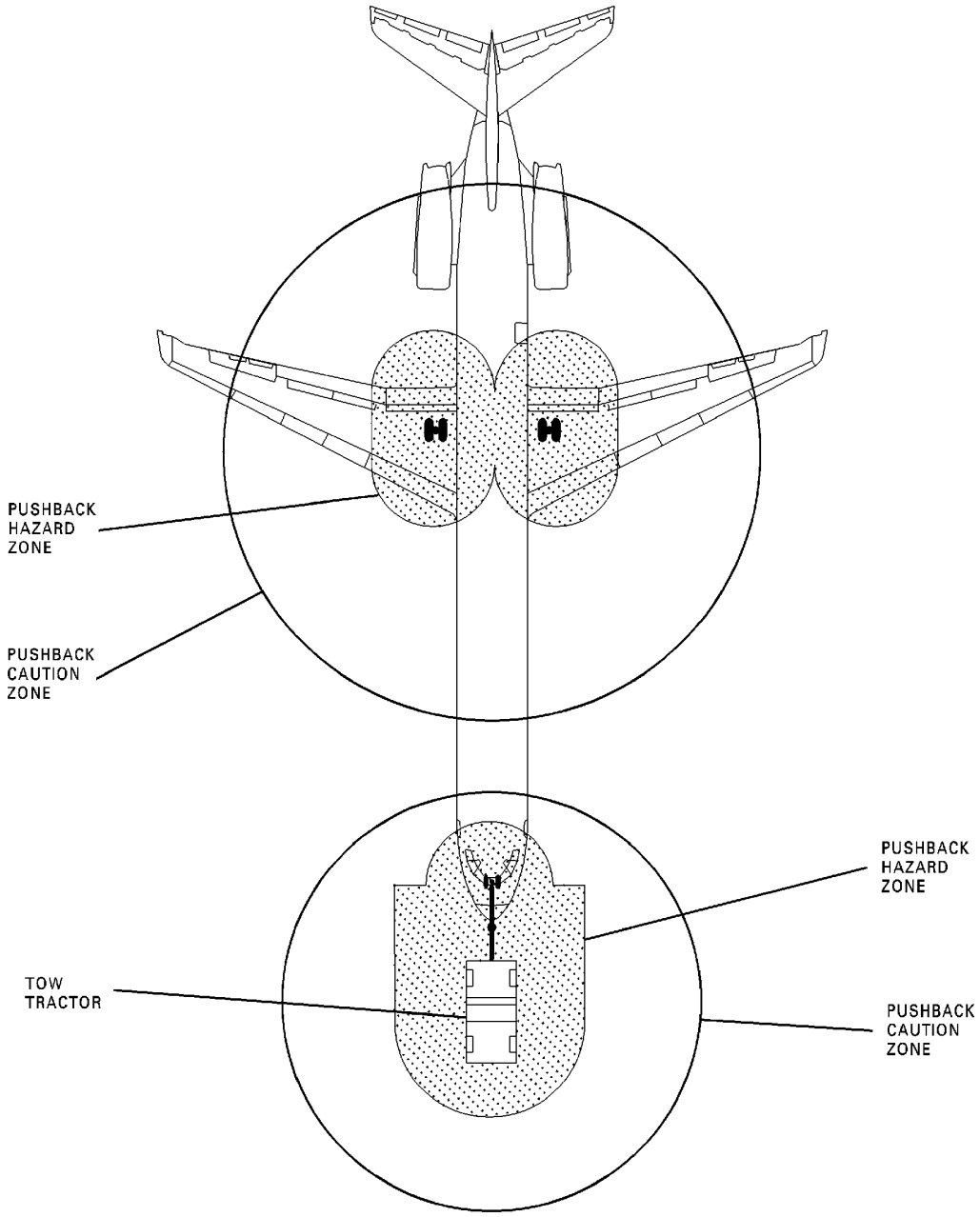
(26) Inform cockpit that area is being secured.

(27) Disconnect headset cord from flight interphone jack.

(28) Clear area and give departure salute to cockpit while displaying nosewheel steering bypass lockpin.

NOTE: It may be necessary for the flight crew to re-establish interphone communications with tow tractor operator. Flashing of taxi lights shall notify tow tractor operator to re-connect headset cord.

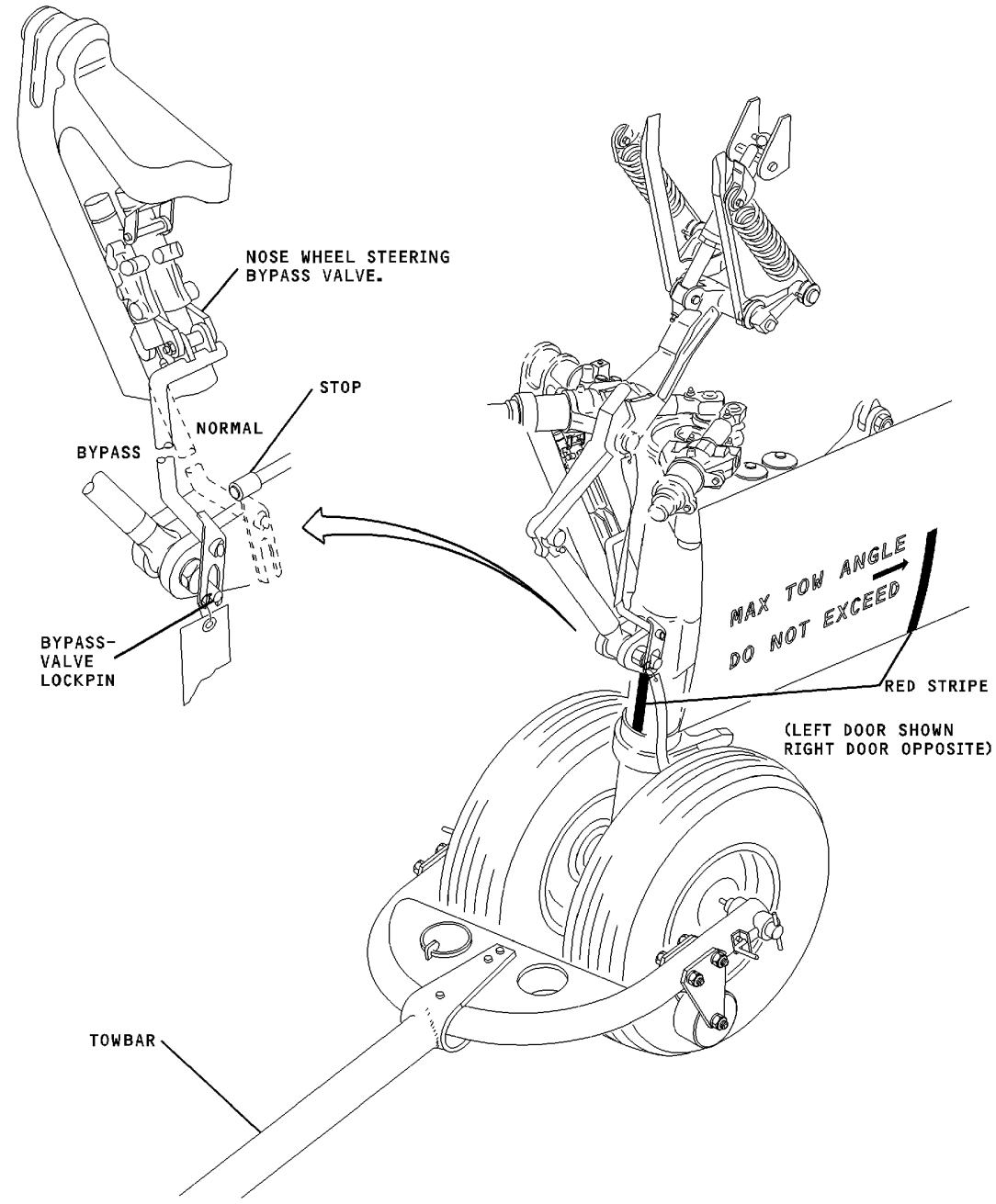
(29) Observe aircraft until aircraft taxis away from area.



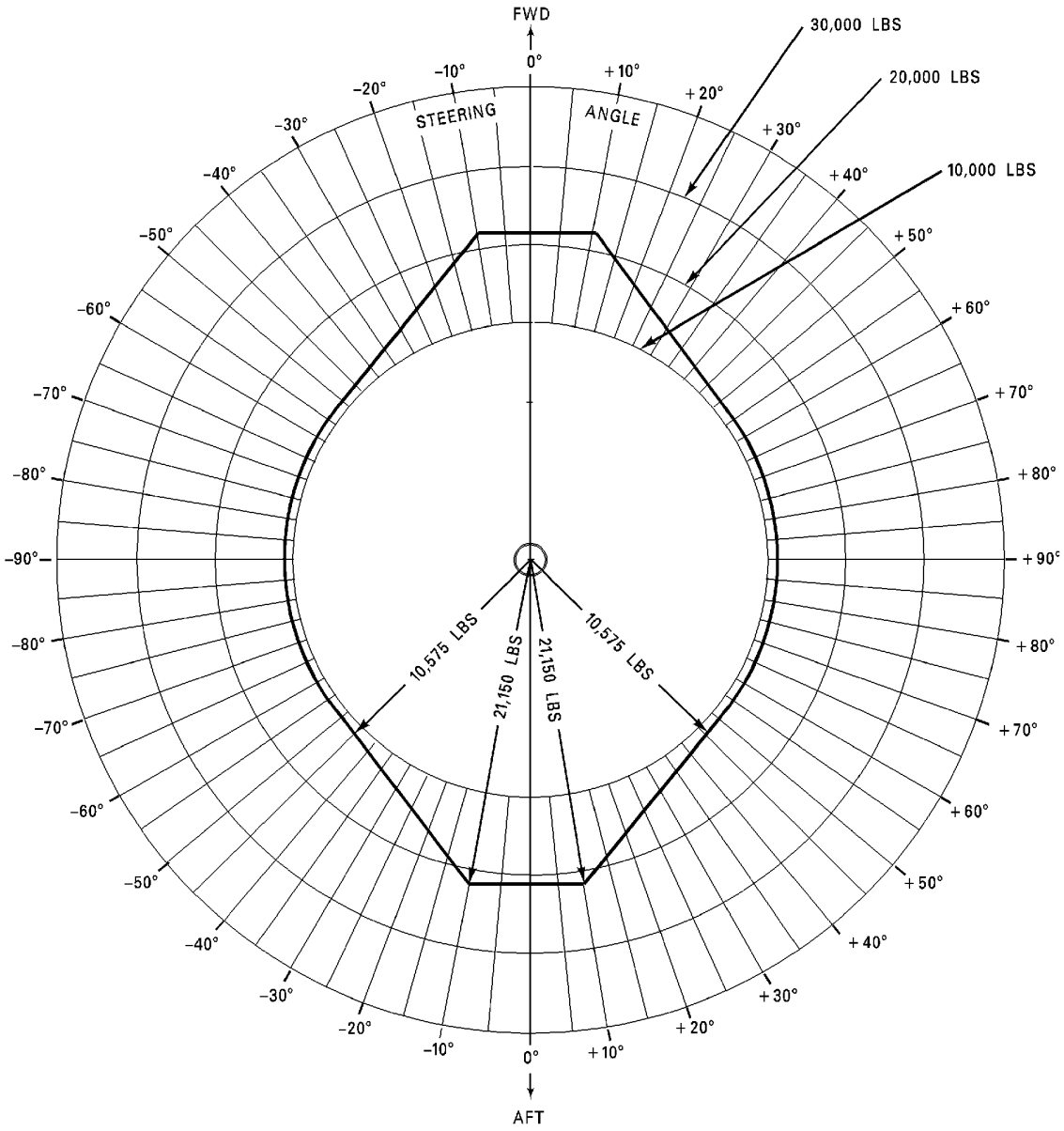
WARNING: PERSONNEL ARE PROHIBITED FROM ENTERING PUSHBACK HAZARD ZONE WHILE AIRCRAFT IS MOVING. MAINTAIN MINIMUM OF 10 FEET (3 METERS) CLEARANCE FROM TOW TRACTOR, TOW BAR AND LANDING GEAR.

CAG(IGDS) BBB2–9–13

Pushback Hazard Zone
Figure 201/09-13-00-990-801



Nose Gear, Towbar, And Bypass-Valve
Figure 202/09-13-00-990-802



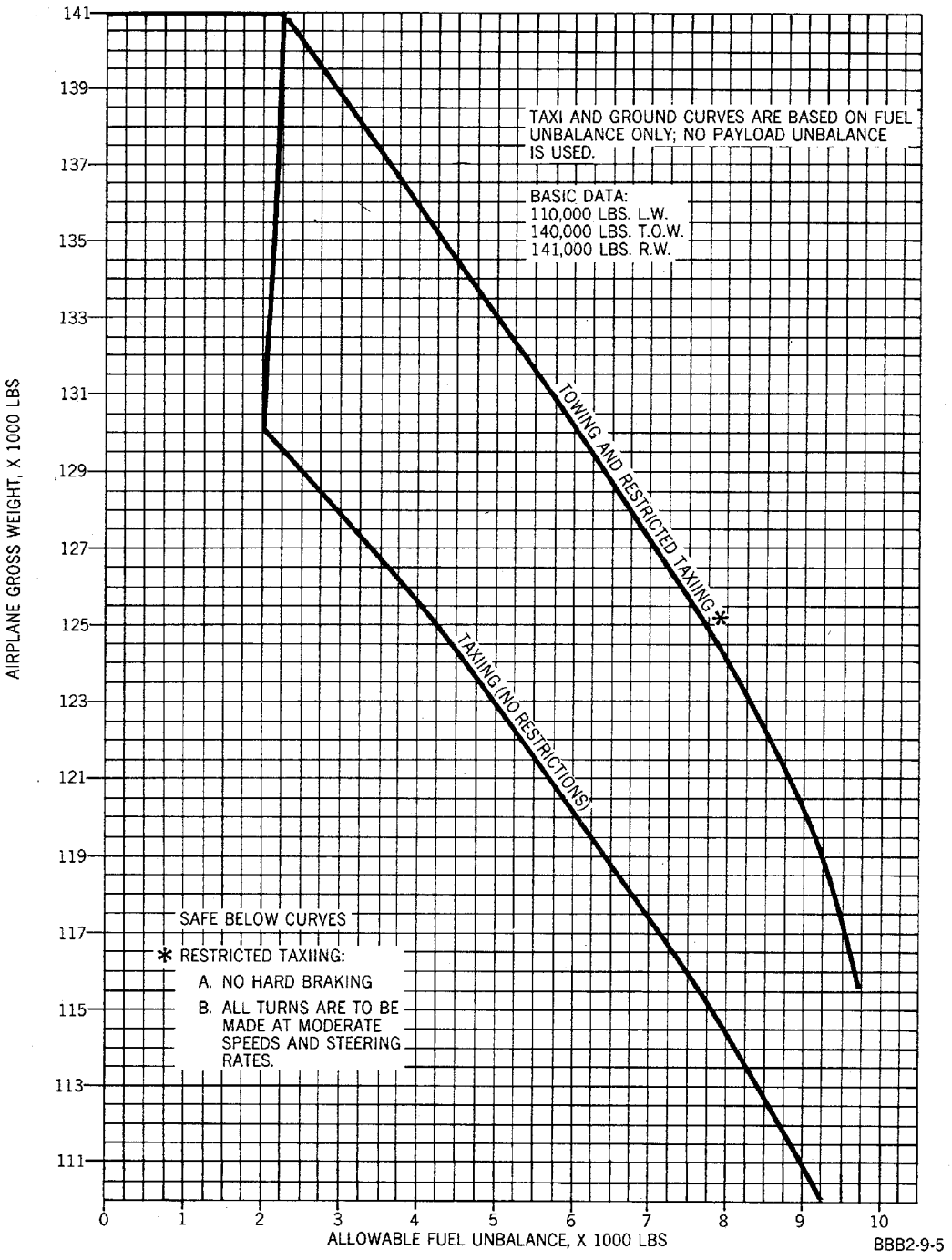
NOTE:

TOWING ANGLE LIMITED TO 90° WITH TORQUE LINKS CONNECTED.

CAG(IGDS)

BBB2-9-15

Nose Gear Pushback Load Limits
Figure 203/09-13-00-990-803



Fuel Unbalance Chart
Figure 204/09-13-00-990-804

TAXIING - DESCRIPTION AND OPERATION

1. General

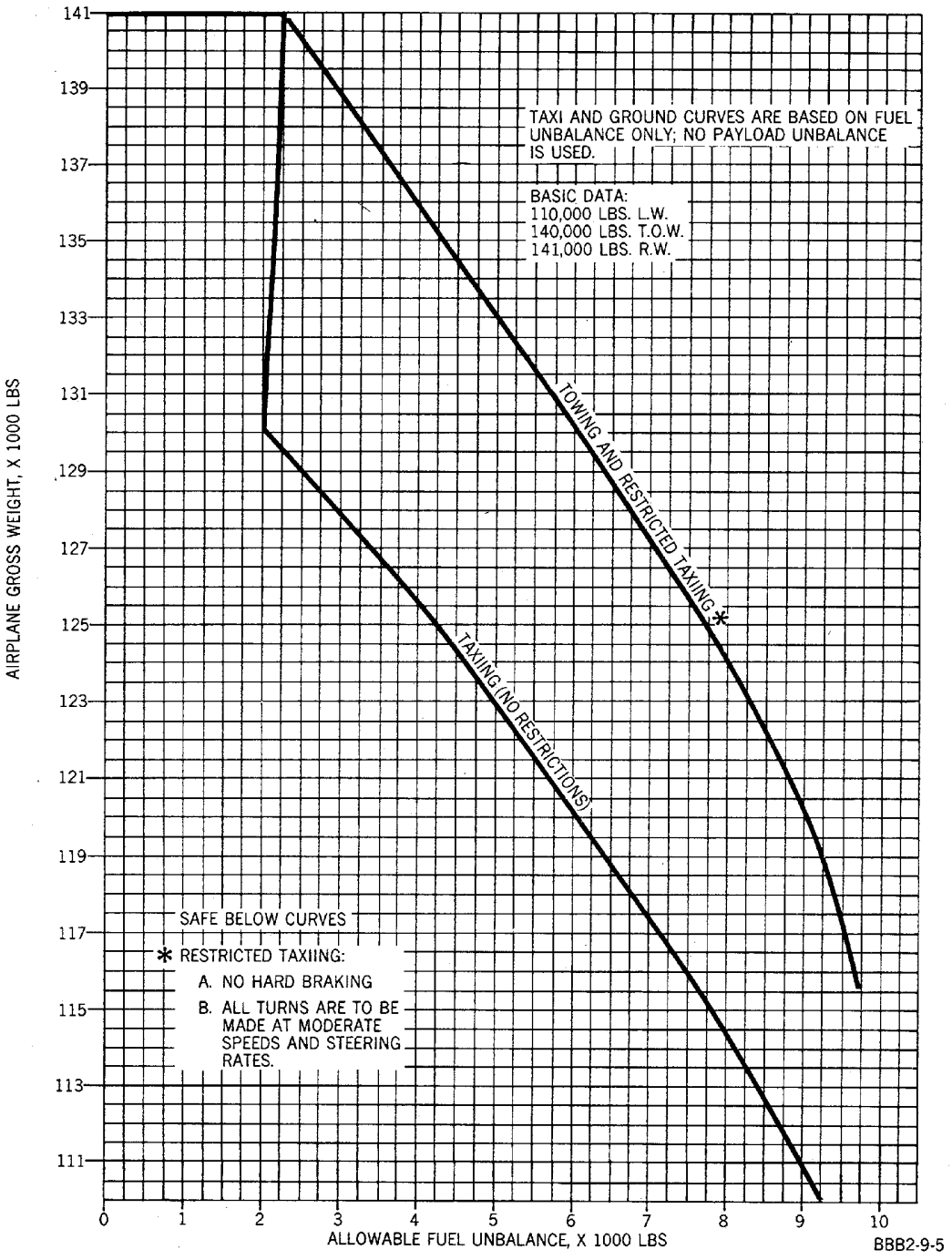
CAUTION: PRIOR TO TAXIING, MAKE CERTAIN NOSEGEAR IS IN NEAR CENTER POSITION AND THAT FORWARD MOTION IS ESTABLISHED BEFORE INTRODUCING A HIGH ANGLE OF TURN. INTRODUCING A HIGH ANGLE TURN BEFORE FORWARD MOTION IS ESTABLISHED COULD CAUSE NOSEGEAR STEERING LOCKUP.

A. Taxiing procedures are generally the same as those used for other aircraft equipped with tricycle landing gears. Two persons should be stationed in the flight compartment, one to maneuver the aircraft, and one to assist and act as observer.

B. Selective engine thrust, nosewheel steering control, rudder pedal steering, and brakes are used to control movement during taxi operations. Taxiing can be accomplished with one or both engines operating; however, two engine taxiing is recommended. A high engine thrust may be required when taxiing on one engine, and compensation in nosewheel steering becomes necessary.

C. The maximum steering angle, using the nosewheel steering control, is 82 degrees right or left of center. Maximum steering angle, using rudder pedal steering, is 17 degrees right or left of center. The minimum taxi strip width, required for a 180-degree turn, is 98.8 feet. The Turning Radii illustration shows turning radii and minimum clearance data (Figure 09-00-00-990-801). Maximum nose-wheel turning angles for single-engine taxiing is outlined in PAGEBLOCK 09-00-00/001.

D. If a lateral fuel unbalance is indicated while on the ground, the aircraft will need to be re-balanced laterally. To do this, the aircraft may be taxied back, or otherwise moved, to the gate, or other convenient location, for refueling/re-balancing without a structural inspection being required, provided normal taxi or towing procedures and these recommendations are followed. It is not necessary to unload passengers prior to moving the aircraft. If the aircraft must be taxied, the maximum taxi speed must be kept below 25 knots and use only gentle brake application (no “hard braking” or “maximum effort braking”). If the aircraft taxi speed is more than 24 knots, with hard braking and/or maximum braking, do the wing fuel imbalance check procedure. (HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03, Page 601), (Figure 1)



Fuel Unbalanced Chart
Figure 1/09-20-00-990-802

TAXIING - MAINTENANCE PRACTICES

1. General

A. Taxiing procedures are generally the same as those used for other aircraft equipped with tricycle landing gears.

2. Taxiing

A. Preliminary Procedures

(1) Retract, stow, or remove all stairs, ramps, stands and loading or other equipment and clear area.

(2) Make certain cargo doors are closed.

(3) Make certain that main landing gear doors are closed, and landing gear lockpins are installed.

(4) Chock main gear wheels and make certain that static ground cables are removed.

(5) Make certain that nosewheel steering bypass valve is in normal position.

(6) Make certain that the the load between the left and right wing is in the acceptable unbalance limits. (Figure 201)

(a) If the acceptable wing tank fuel unbalance limits are exceeded, and the aircraft is taxied in this unbalanced condition, do the fuel imbalanced procedure. (HIGH DRAG/SIDE LOADS OR UNUSUAL GROUND HANDLING CONDITIONS, SUBJECT 05-51-03, Page 601)

B. Taxiing Procedures

(1) Station two men in flight compartment; one in captain's seat to maneuver aircraft, and one in first officer's seat to assist and act as observer.

(2) Pressurize aircraft hydraulic system. (PAGEBLOCK 29-00-00/201)

(3) Extend flaps to 15° to minimize particles picked up by tires entering engine intakes.

WARNING: MAKE CERTAIN PERSONNEL AND EQUIPMENT ARE CLEAR OF ENGINE INGESTION AND BLAST AREAS.

(4) Apply parking brake before engine start.

(5) Post fireguards and start engines. (SUBJECT 71-00-00, Page 501).

(6) Disconnect external power.

(7) Establish radio contact with control tower.

CAUTION: MAKE CERTAIN ANTISKID BRAKE CONTROL SWITCH IS IN OFF POSITION TO ENSURE MANUAL BRAKING.

(8) Remove wheel chocks and released parking brake.

CAUTION: PRIOR TO TAXIING, MAKE CERTAIN NOSEGEAR IS IN NEAR CENTER POSITION AND THAT FORWARD MOTION IS ESTABLISHED BEFORE INTRODUCING A HIGH ANGLE OF TURN. INTRODUCING A HIGH ANGLE TURN BEFORE FORWARD MOTION IS ESTABLISHED COULD CAUSE NOSEGEAR STEERING LOCKUP.

(9) As applicable, obtain taxi instructions from control tower.

(a) If nosegear steering lockup occurs:

1) Place nosewheel steering bypass valve in bypass position and install lockpin.

2) Using tow bar or manual forces, turn nosewheels to approximate center position (less than 82 degrees).

3) Remove bypass valve lockpin.

4) Check nosewheels for proper steering.

(10) Begin taxi roll, applying only sufficient thrust to start roll.

NOTE: The relative high thrust required for initial start of taxi roll may cause higher taxi speeds than desired. Reduce thrust to minimum and allow air-plane to accelerate, then brake to slow taxi speed, release brake and repeat procedure. Intermittent braking provides a cooling period between brake applications and helps prevent brake overheating.

CAUTION: WHEN TAXIING ON SLICK SURFACES (WET OR ICY CONDITIONS) DO NOT CONTINUE TO TURN STEERING WHEEL IF NO ACTION IS OBSERVED. THIS INDICATES NOSEWHEEL IS SKIDDING, AND WITH LARGE TURNING DEFLECTIONS, COULD CAUSE STRUCTURAL DAMAGE IF ROUGH SPOTS ARE ENCOUNTERED.

(11) Steer aircraft using nosewheel steering control (maximum steering angle 82 degrees either side of center) or rudder pedal steering (maximum steering angle 17 degrees either side of center).

(12) As applicable, make large radius turns. Minimum radius turns create heavy side loads and unnecessary scrubbing of tires.

(13) On completion of a turn and before stopping, center nosewheel steering control and roll forward to align nose and main gear wheels; this action tends to relieve tire twisting stresses.

CAUTION: DO NOT USE REVERSE THRUST FOR BACKING UP.

(14) Use assistance of aircraft director and wing walkers to clear congested areas.

(15) Taxi aircraft to desired area.

CAUTION: TAXIING OVER ANY SURFACE OBSTRUCTION, INCLUDING ARRESTING CABLES, MAY CAUSE DAMAGE TO THE NOSEWHEEL SPRAY DEFLECTOR. DAMAGE TO THE NOSEWHEEL SPRAY DEFLECTOR MAY CAUSE THE NOSEWHEEL TO JAM DURING EXTENSION OR RETRACTION, THEREFORE, AVOID NOSEWHEEL CONTACT WITH ANY OBSTUCTION, INCLUDING ARRESTING CABLES.

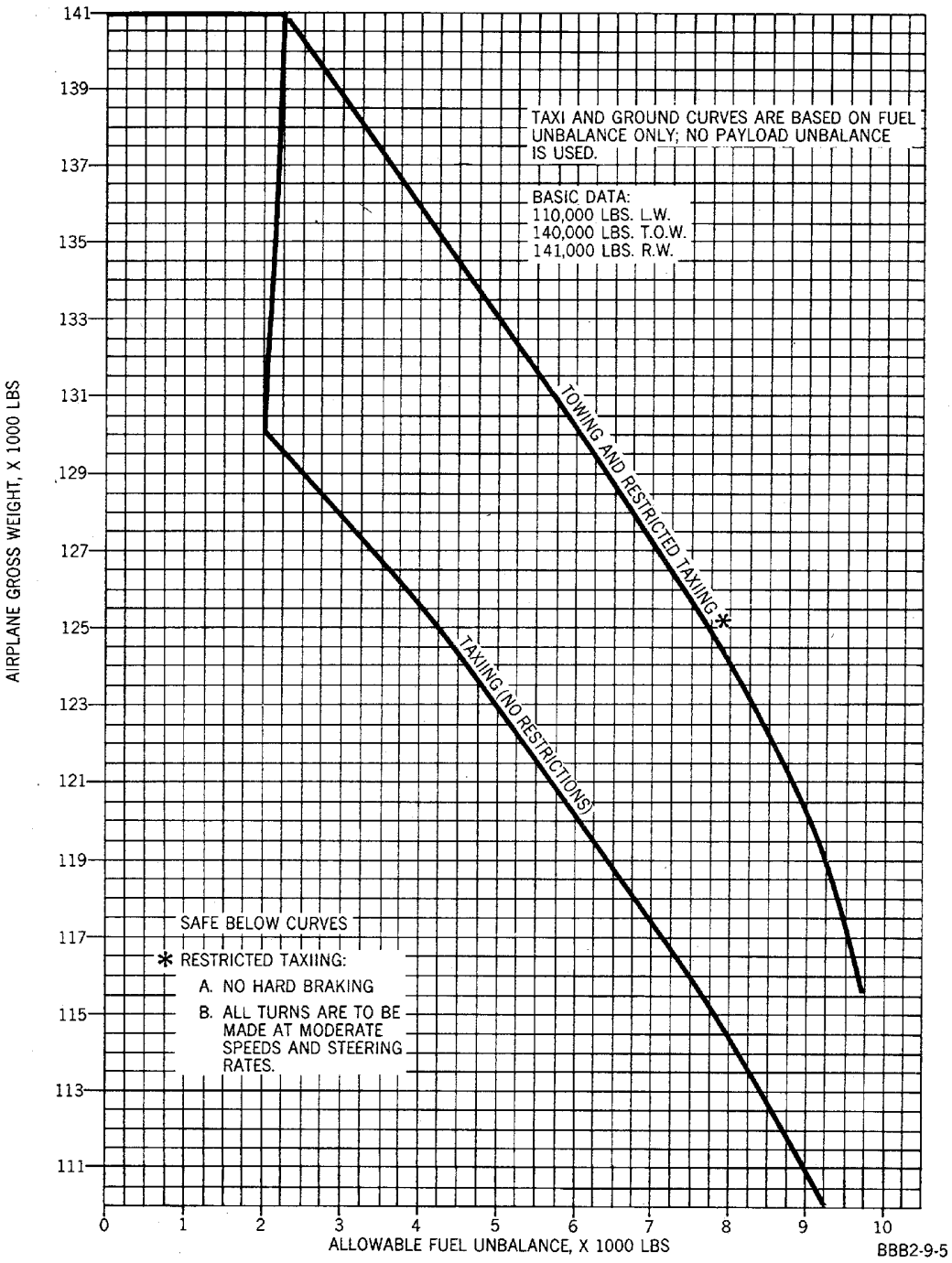
(16) If any contact is suspected with the nose landing gear spray deflector, it must be inspected before the aircraft is dispatched. NOSE GEAR WATER DEFLECTOR - CHECK, PAGEBLOCK 05-52-00/601

(17) Apply parking brake.

(18) Shut down engines. (SUBJECT 71-00-00, Page 501)

(19) Chock main gear wheels, connect static ground cables, and if applicable connect mooring cables.

NOTE: If aircraft is to be parked or moored. (PAGEBLOCK 10-20-00/201)



Fuel Unbalance Chart
Figure 201/09-20-00-990-801