CHAPTER

09

TOWING AND TAXIING

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09-EFFECTIVE PAGES

CHAPTER 09
TOWING AND TAXIING

09-CONTENTS

TOWING - MAINTENANCE PRACTICES

1. General

A. This procedure has three tasks:

(1) Maintenance Towing.

(2) Pushback/Dispatch Towing.

(3) Towing the Airplane in High Wind.

B. Definitions:

(1) Maintenance Towing: The movement of an airplane for maintenance/remote parking purposes (e.g., from the gate to a maintenance hangar). Aircraft is typically unloaded with minimal fuel load.

(2) Pushback Towing: The movement of a fully loaded aircraft (up to Maximum Ramp Weight (MRW)) from the parking position to the taxiway. Movement includes: pushback with turn, a stop, and short tow forward to align aircraft and nose wheels. Engines may or may not be operating. Airplane movement is similar to a conventional pushback operation with a towbar.

(3) Dispatch (Operational) Towing: The movement of a revenue aircraft (loaded with passengers, fuel, and cargo up to Maximum Ramp Weight (MRW)), from the terminal gate/remote parking area, to a location near the active runway. The movement may cover several kilometers with speeds up to 32 km/h (20 mph), with several starts, stops and turns. Replaces typical taxiing operations prior to takeoff.

C. The design of the airplane will permit you to tow or push the airplane from the nose or main landing gear.

(1) A forward tow fitting on the nose and the main landing gear can be used to tow the airplane with a tow bar.

(2) An aft tow fitting can be installed on the nose landing gear to push or pull the airplane with a tow bar.

(3) An aft tow fitting can be installed on the main landing gear to pull or push the airplane with a tow bar.

NOTE: Before you can install a towbar onto the aft tow fitting, you must remove the aft tow fitting jack adapter.

D. You must be careful when you tow the airplane in a turn. Do not cause more than the Maximum Towing Loads as shown in Figure 204.

E. Make sure you have the necessary clearance when you go near a parked airplane or other structures. When the APU in the towed airplane or a parked airplane is on, you must have a minimum clearance of 50 ft (15 m). The clearance must be between the APU exhaust port and the adjacent airplane's wingtip (fuel vent).

F. To tow the airplane with the entry or the cargo doors open is optional.

G. Be careful when you move the throttle in the flight deck. Throttle movement can activate the PWS radar. Do not operate the weather radar in the hangar. Make sure no personnel, fuel leaks, or open fuel cells are in the 50 ft (15 m) radius from the radar.

H. Towing stability of a Towbarless Tow Vehicle (TLTV)/Airplane combination is dependent on many variables, two of these key variables being the characteristics of the tow vehicle tractive forces and the runway conditions. Maximum towing speeds shall be the responsibility of the airplane operator in conjunction with the airport authorities with consideration of recommendations from the TLTV manufacturer.

WARNING

DO NOT APPLY THE AIRPLANE BRAKES WHEN YOU TOW THE AIRPLANE WITH TOWBARLESS TOW VEHICLES. MOST TOWBARLESS TOW VEHICLES DO NOT HAVE A SHEAR PIN TO LIMIT THE LOADS IF THE AIRPLANE BRAKES ARE USED DURING TOWING. IF YOU APPLY THE BRAKES, YOU CAN APPLY LOADS TO THE NOSE LANDING GEAR THAT ARE MORE THAN THE DESIGN LOAD LIMITS. IF YOU DO NOT OBEY THIS WARNING, MAINTENANCE PERSONS CAN BE INJURED, AND DAMAGE WILL OCCUR TO THE NOSE LANDING GEAR, AND THE TOW VEHICLE.

I. You can use towbarless equipment to push or pull the airplane.

NOTE: This procedure is for towing or pushing the airplane with a tow bar. However, most of the steps in this procedure will apply if you use towbarless equipment. Refer to the equipment manufacturer's data for procedures that are specific to their equipment.

(1) Make sure the maximum permitted loads on the nose landing gear are not more than the maximum towing loads as shown in Figure 204.

J. Boeing recommends towbarless tow vehicles be designed, tested, operated, and maintained per the following Society of Automotive Engineers (SAE) Aerospace Recommended Practices (ARP), and applicable Boeing documentation:

NOTE: Airlines must insure the latest revisions of the standards and documents are applied.

(1) SAE ARP 4852: Specification for Towbarless Push-Back Tow Vehicles.

(2) SAE ARP 4853: Specification for Towbarless Tow Vehicles (TLTV).

(3) SAE ARP 5283: Towbarless Tow Vehicles - Aircraft Nose Landing Gear Steering and Tractive Force Protection Systems or Alerting Devices - Inspection, Maintenance, and Calibration Requirements.

(4) SAE ARP 5285: Towbarless Towing Vehicle Operating Procedure.

(5) Boeing document D6-56872: Towbarless Towing Vehicle Assessment Criteria.

WARNING

THE SERVICE LETTER MAKES QUALIFICATION PROCEDURES THAT APPLY TO TOWBARLESS TOW VEHICLE MAXIMUM SPEEDS IN CONTROLLED OPERATIONS. ROUGH, BUMPY RUNWAYS OR TAXIWAYS CAN CAUSE INSTABILITY OF THE AIRPLANE AND VEHICLE COMBINATION. THIS CAN APPLY TO RUNWAYS OR TAXIWAYS WITH A SLOPE. OPERATORS MUST DECREASE SPEED WHEN THEY GO NEAR ROUGH, BUMPY, OR SLOPING SURFACES.

(6) Boeing Service Letter 777-SL-09-001: Towbarless Towing Evaluation.

NOTE: The service letter provides additional guidance and information regarding towbarless towing recommendations and regulatory requirements.

TASK 09-11-00-580-801

2. Maintenance Towing

A. References

Reference	Title
05-51-29-200-801	Phase I Inspection (P/B 201)
05-51-29-200-802	Phase II Inspection (P/B 201)
10-11-05-500-801	Chock Installation in Winds or Wind Gusts to a Maximum of 35 Knots (P/B 201)

(Continued)

Reference	Title
24-22-00-860-805	Supply Electrical Power (P/B 201)
24-22-00-860-806	Remove Electrical Power (P/B 201)
27-81-00-440-801	Leading Edge Slat Reactivation (P/B 201)
29-11-00-860-801	Main Hydraulic System Pressurization (P/B 201)
32-00-30-480-801	Landing Gear Downlock Pins Installation (P/B 201)
32-21-11-000-803	Nose Landing Gear Torsion Link Disconnection/Electrical Harness Storage (P/B 201)
32-21-11-400-803	Nose Landing Gear Torsion Link Connection (P/B 201)
71-11-04-410-814-H00	Close the Fan Cowl Panel (Selection) (P/B 201)
78-31-00-410-816-H00	Close the Thrust Reverser (Selection) (P/B 201)
78-31-00-440-805-H00	Thrust Reverser Activation After Ground Maintenance (P/B 201)

B. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
COM-959	Tractor - Towbarless (TLTV) Part #: AM210 Supplier: 71760 Part #: AST-1X Supplier: C3351 Part #: AST-2 Supplier: C3351 Part #: EXPEDITER 310H Supplier: 93408 Part #: EXPEDITER 600 Supplier: 93408 Part #: TBL-200 Supplier: K4234 Part #: TBL-280 Supplier: K4234 Part #: TBL-400 Supplier: K4234 Part #: TBL-600 Supplier: K4234 Part #: TPX-200-MT Supplier: 6L481 Part #: TPX-200-MTS Supplier: 6L481 Part #: TPX-200-S Supplier: 6L481 Opt Part #: EXPEDITER 300 Supplier: 93408 Opt Part #: EXPEDITER 400 Supplier: 93408
COM-1500	Towbar - Airplane, Towing and Steering Part #: 01-1340-0100 Supplier: 59603 Part #: 15F2397 Supplier: 56535 Part #: 215030-1 Supplier: 9M323 Part #: 215030-3 Supplier: 9M323 Part #: PF09-007-1 Supplier: 3D5B2 Part #: TOWUNIV-2 Supplier: D2029 Opt Part #: 214030-1 Supplier: 9M323
COM-1505	Chocks - Wheel Part #: AC6820-LR Supplier: 032T9 Part #: PF10-010 Supplier: 3D5B2 Part #: W88 Supplier: 9L752

(Continued)

Reference	Description
COM-13663	Tractor - Tow - Aircraft Part #: B1200 Supplier: 93408 Part #: GT110 Supplier: 4TVG2 Part #: MODEL 100 Supplier: 44185 Part #: MODEL 140 Supplier: 44185 Part #: MODEL 200 Supplier: 44185 Part #: RM8001 Supplier: A0145 Part #: TC-50 Supplier: 08786 Part #: U30 Supplier: 4TVG2 Opt Part #: B-1000 Supplier: 50477 Opt Part #: GT50E Supplier: 12603 Opt Part #: GT60E Supplier: 12603 Opt Part #: T-750 Supplier: 81381
SPL-1499	Pin - Lock, NLG Towing Lever Part #: A09003-2 Supplier: 81205 Opt Part #: A09003-1 Supplier: 81205

C. Consumable Materials

Reference	Description	Specification
C50056	Compound - Corrosion Inhibiting Material, Nondrying Resin Mix	BMS3-27
G50237	Compound - Corrosion Inhibiting, Non-drying - Cor-Ban 27L	BMS3-38

D. Location Zones

Zone	Area
711	Nose Landing Gear
731	Left Main Landing Gear
741	Right Main Landing Gear

E. Access Panels

Number	Name/Location
413AL	Left Fan Cowl Panel, Left Engine
414AR	Right Fan Cowl Panel, Left Engine
415AL	Left Thrust Reverser, Left Engine
416AR	Right Thrust Reverser, Left Engine
423AL	Left Fan Cowl Panel, Right Engine
424AR	Right Fan Cowl Panel, Right Engine
425AL	Left Thrust Reverser, Right Engine
426AR	Right Thrust Reverser, Right Engine

F. Prepare to Tow the Airplane

SUBTASK 09-11-00-860-001

CAUTION

MAKE SURE ALL ENGINE COWLS ARE CLOSED AND LATCHED BEFORE YOU TOW THE AIRPLANE. DAMAGE TO THE AIRPLANE AND EQUIPMENT CAN OCCUR.

(1) To prepare to tow the airplane, do the steps that follow:

WARNING DO ALL OF THE SPECIFIED TASKS IN THE CORRECT SEQUENCE TO CLOSE THE THRUST REVERSERS. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

(a) Do these tasks in sequence to safely close the left and right thrust reversers on the applicable engine.

1) Do this task:

Close the Thrust Reverser (Selection), TASK 78-31-00-410-816-H00

Number	Name/Location
415AL	Left Thrust Reverser, Left Engine
416AR	Right Thrust Reverser, Left Engine
425AL	Left Thrust Reverser, Right Engine
426AR	Right Thrust Reverser, Right Engine

2) Do this task:

Close the Fan Cowl Panel (Selection), TASK 71-11-04-410-814-H00

Number	Name/Location
413AL	Left Fan Cowl Panel, Left Engine
414AR	Right Fan Cowl Panel, Left Engine
423AL	Left Fan Cowl Panel, Right Engine
424AR	Right Fan Cowl Panel, Right Engine

3) Do this task: Thrust Reverser Activation After Ground Maintenance, TASK 78-31-00-440-805-H00.

4) Do this task: Leading Edge Slat Reactivation, TASK 27-81-00-440-801.

(b) An approved brake operator must be in the flight compartment.

WARNING DO NOT CONNECT A HEADSET, OR TOUCH CONNECTIONS TO THE AIRPLANE WHEN THERE IS LIGHTNING, OR IN STRONG ELECTROMAGNETIC FIELDS. LIGHTNING, AND ELECTRICAL CURRENT CAN CAUSE INJURIES TO PERSONNEL.

(c) Make sure there is clear intercom communication between the control cabin crew, the towing ground crew and the tow tractor operator.

WARNING WHEN YOU USE A TOW BAR TO MOVE THE AIRPLANE IN HIGH WINDS, CONNECT THE TOW BAR BEFORE YOU INSERT THE TOWING LEVER LOCKPIN (NLG TOWING LEVER PIN). THE AIRPLANE COULD MOVE AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(WARNING PRECEDES)

CAUTION MAKE SURE THAT YOU PUT THE TOWING LEVER IN THE TOW POSITION BEFORE YOU TOW THE AIRPLANE. IF YOU DO NOT, YOU CAN CAUSE DAMAGE TO LANDING GEAR COMPONENTS OR THE TOWING EQUIPMENT.

(d) Move the towing lever on the metering valve module to the TOW POSITION (Figure 201).

NOTE: When you hold the tow lever in the TOW POSITION with the lockpin, the nose gear steering will not operate. This is when the hydraulic system is pressurized. You can make the airplane turn 70 degrees and not disconnect the torsion links (the steering actuator bottoms at 70 degrees). To turn more than 70 degrees, you must disconnect the torsion links.

WARNING ONLY USE THE CORRECT PIN FOR THE AIRPLANE MODEL. IF YOU USE AN INCORRECT PIN, THE HYDRAULIC STEERING CAN OPERATE. THIS CAN CAUSE INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT.

(e) Install the NLG towing lever pin, SPL-1499.

(f) Make sure the landing gear downlock pins are installed on the nose and main landing gear (TASK 32-00-30-480-801).

NOTE: It is optional to install landing gear downlock pins when you tow or push the airplane for flight. This is when the airplane is in position for the flight crew to taxi the airplane prior to or after a flight.

CAUTION DO NOT TOW THE AIRPLANE WITH A FULLY COMPRESSED LANDING GEAR SHOCK STRUT. IF YOU TOW THE AIRPLANE WITH A FULLY COMPRESSED SHOCK STRUT, DAMAGE TO THE AIRPLANE CAN OCCUR.

CAUTION IN AN EMERGENCY YOU CAN TOW THE AIRPLANE WITH ONE OR MORE DEFLATED SHOCK STRUTS. THE TOW SPEED MUST NOT EXCEED 5 MPH. IF THE AIRPLANE HAS A DEFLATED NOSE STRUT IT SHOULD BE TOWED AS STRAIGHT AS POSSIBLE AND THE TOWING ANGLE KEPT TO A MINIMUM. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE SHOCK STRUT.

(g) Make sure the landing gear shock struts have sufficient extension (Figure 202):

NOTE: The nose shock strut is deflated when the DIM "A" is less than 20.42 in. (518.67 mm) and greater than 18.42 in. (467.87 mm). The main shock struts are deflated when DIM "A" is less than 5.13 in. (130.30 mm) and greater than 3.13 in. (79.50 mm).

A fully compressed nose shock strut is indicated by DIM "A" equal to 18.42 in. (467.87 mm). A fully compressed main gear shock strut is indicated by a DIM "A" equal to 3.13 in. (79.50 mm).

The check for a minimum shock strut extension is a "quick check" for towing the airplane during maintenance. The landing gear must be filled as shown on the servicing chart for flight dispatch.

1) Make sure the main gear shock struts have a minimum of 5.13 in. (130.30 mm) at DIM "A".

2) Make sure the nose gear shock strut has a minimum of 20.42 in. (518.67 mm) at DIM "A".

CAUTION

DO NOT LET THE NOSE-LANDING-GEAR SHOCK-STRUT EXTEND MORE THAN THE MAXIMUM PERMITTED EXTENSION OF 36 INCHES. IF IT DOES, THE CENTERING CAM CAN ENGAGE DURING A TURN AND CAUSE DAMAGE TO THE SHOCK STRUT. IT CAN ALSO MAKE THE FORWARD CENTER OF GRAVITY LIMITS CHANGE AND CAUSE THE AIRPLANE TO FALL IN ITS TAIL. IF YOU DO NOT FOLLOW THESE INSTRUCTIONS, DAMAGE TO THE AIRPLANE OR TOWING EQUIPMENT CAN OCCUR.

(h) Make sure the shock strut of the nose landing gear does not have more than a maximum of 36 in. (914 mm) at DIM "A".

(i) Make sure the airplane center of gravity is below the GROUND STABILITY MARGIN line (Figure 203).

WARNING

MAKE SURE THAT THE PITOT PROBE HEAT IS OFF. A HOT PROBE CAN CAUSE INJURIES TO PERSONNEL.

(j) Do these steps to make sure that the pitot probe does not heat up:

1) Open these circuit breakers and install safety tags:

Left Power Management Panel, P110

Row	Col	Number	Name
G	5	C30405	PH B PITOT PROBE HTR L
H	6	C30424	PH C PITOT PROBE HTR L

Right Power Management Panel, P210

Row	Col	Number	Name
D	5	C30404	PH B PITOT PROBE HTR R
E	4	C30423	PH C PITOT PROBE HTR R
E	20	C30406	PH B PITOT PROBE HTR C
G	26	C30425	PH C PITOT PROBE HTR C
L	11	C30625	PITOT PROBE HTR C CTRL

SUBTASK 09-11-00-860-002

(2) Supply electrical power to the airplane (TASK 24-22-00-860-805).

CAUTION

BE CAREFUL WHEN YOU USE THE MAIN BATTERY BUS TO SUPPLY ELECTRICAL POWER, WITHOUT AN AC POWER SUPPLY. MAKE SURE THAT YOU DO NOT RUN OUT OF POWER. THE BATTERY BUS SUPPLIES POWER TO SEVERAL LOADS AND WITHOUT AN AC SUPPLY, IT CAN RUN OUT OF ENERGY. THE SYSTEM WILL QUICKLY DISCHARGE WHEN YOU OPERATE IT WITHOUT AN AC SUPPLY. A FULL DISCHARGE CAN DAMAGE THE BATTERY.

(a) An alternate way to supply electrical power is through the use of the main battery bus when AC power is not supplied.

NOTE: This step will prevent the unwanted operation of the ground warning horn while the airplane is being towed.

1) Push the BAT switch on the P5 panel to the ON position.

2) Turn the STBY POWER switch on the P5 panel to the AUTO position.

3) Open this circuit breaker and install safety tag:

Standby Power Management Panel, P310

Row	Col	Number	Name
J	3	C23626	GND CREW HORN

4) When AC power is available, make sure this circuit breaker is closed:

Standby Power Management Panel, P310

Row	Col	Number	Name
J	3	C23626	GND CREW HORN

SUBTASK 09-11-00-750-001

(3) Check for a fuel imbalance condition.

NOTE: If an aircraft was moved (tow or taxi) with a lateral fuel imbalance in excess of structural limits while on the ground, a structural inspection is not required provided normal taxi procedures were followed, the maximum taxi speed was below 29 mph (25 knots) and no hard braking or maximum braking occurred. If these limitations were exceeded a structural inspection is required, contact engineering for a specific bill of work.

SUBTASK 09-11-00-780-002

CAUTION

OBEY THE SEQUENCE IN WHICH YOU PRESSURIZE OR REMOVE THE PRESSURE FROM THE HYDRAULIC SYSTEMS. IF YOU DO NOT OBEY THE SEQUENCE, FLUID CAN MOVE BETWEEN THE CENTER AND RIGHT SYSTEMS. THIS CAN CAUSE A HIGH FLUID LEVEL IN ONE SYSTEM AND A LOW FLUID LEVEL IN THE OTHER SYSTEM. DAMAGE TO THE HYDRAULIC PUMP AND AIRCRAFT SYSTEMS THAT USE HYDRAULIC FLUID CAN OCCUR.

(4) Supply right system hydraulic power to operate main gear steering (TASK 29-11-00-860-801).

SUBTASK 09-11-00-780-001

(5) Supply center system hydraulic power to operate main gear steering (TASK 29-11-00-860-801).

NOTE: If you want to reduce tire wear during towing or pushback in the turns, you can operate the main gear steering. The main gear steering system can operate only if the center hydraulic system is pressurized.

(a) If you do not use the center or right hydraulic systems, or they do not operate, do the steps that follow:

NOTE: To tow the airplane with brakes that operate, you must have 2600 psi (17,926 kPa) to 3100 psi (21,374 kPa) in the brake accumulator. You can apply the brakes from two to six times when the brake accumulator pressure is in this range.

1) Make sure that the hydraulic brake accumulator pressure is 2600 psi (17,926 kPa) to 3100 psi (21,374 kPa).

NOTE: The BRAKE PRESSURE indicator gage is found on the pilot's center instrument panel, P3.

WARNING

WHEN ELECTRICAL POWER IS NOT AVAILABLE TO OPERATE THE BRAKE HYDRAULIC SYSTEM, TELL THE TOW VEHICLE DRIVER. YOU MUST DECREASE THE SPEED OR YOU MUST NOT TOW THE AIRPLANE. WITHOUT ELECTRICAL POWER, THERE IS ONLY ACCUMULATOR PRESSURE AVAILABLE TO OPERATE THE BRAKES. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT WILL OCCUR.

2) If electrical power is not available, make sure the pressure gage for the brake accumulator reads 2600 psi (17,926 kPa) to 3100 psi (21,374 kPa).

NOTE: This accumulator gage is found in wheel well adjacent to accumulator.

SUBTASK 09-11-00-580-001

(6) If the nose gear angle will exceed 70 degrees when you tow, disconnect the torsion links (TASK 32-21-11-000-803).

NOTE: A red indicator stripe is painted on the doors for the nose landing gear. This stripe will tell you when you are near a 70 degree nose gear turn.

NOTE: If you disconnect the torsion links, the main gear steering will not operate.

(a) The airplane turning radii versus nose gear steering angle is shown in Figure 207.

(b) If the maximum towing angle is exceeded with the torsion link connected and the hydraulic bypass pin is installed, do this task: Phase I Inspection, TASK 05-51-29-200-801.

CAUTION

DO NOT LET THE LOADS ON THE NOSE LANDING GEAR BE MORE THAN THE SPECIFIED LOADS WHILE THE AIRPLANE IS IN A TURN. IF YOU APPLY MORE LOADS THAN ARE SPECIFIED, STRUCTURAL DAMAGE TO THE LANDING GEAR CAN OCCUR.

(7) When you tow the airplane, make sure the maximum permitted tow loads for the landing gear are not more than those shown in Figure 204.

NOTE: Towing trials have shown that during normal towing operations, including breakaway, turning and smooth stopping, loads do not exceed the maximum permitted tow loads for the landing gear.

NOTE: Normal towing is defined as a smooth breakaway push/pull and stop of the airplane with the nose wheel in a straight position. Towing start and stop with the nose wheel at an angle can cause the loads to exceed the maximum permitted tow loads for the landing gear.

CAUTION

IF YOU USE A TOW BAR, MAKE SURE THAT THE TOW BAR HAS THE CORRECT SHEAR PINS. THE SPECIFICATION DRAWING FOR THE TOW BAR SHOWS THIS DATA. IF YOU DO NOT FOLLOW THESE SPECIFICATIONS, DAMAGE TO THE TOW FITTING ON THE NOSE LANDING GEAR CAN OCCUR.

(8) Put the tow vehicle in position and, if it is necessary, attach the towbar, COM-1500, to the fitting on the nose or main landing gear as shown in Figure 205 and Figure 206.

NOTE: Before you can install a towbar onto the aft tow fitting of the main landing gear, you must remove the aft tow fitting jack adapter.

(9) Make sure the parking brakes are released.

G. Tow the Airplane

SUBTASK 09-11-00-580-002

WARNING ALL WORK AROUND THE AIRPLANE MUST STOP WHEN LIGHTNING OCCURS AT A DISTANCE OF 6 MILES OR LESS. ALL PERSONNEL MUST GO IN A BUILDING OR THE AIRPLANE. LIGHTNING CAN KILL PERSONNEL OR CAUSE INJURY.

CAUTION DO NOT HOLD OR TURN THE TILLER FOR THE NOSE WHEEL STEERING WHILE YOU TOW THE AIRPLANE. IF YOU HOLD OR TURN THE TILLER, DAMAGE TO THE NOSE WHEEL STEERING SYSTEM CAN OCCUR.

(1) To tow the airplane, do the steps that follow:

WARNING WHEN YOU TOW THE AIRPLANE, STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, AND AIRPLANE TIRES. IT IS POSSIBLE FOR THE TIRES AND EQUIPMENT TO PULL YOU BELOW THEM WHILE THE AIRPLANE CHANGES POSITIONS AND DIRECTIONS. IF YOU DO NOT KEEP THIS SEPARATION, INJURY TO PERSONNEL CAN OCCUR.

(a) Make sure the persons that work near the tow vehicle, tow bar, nose wheels, and the main wheels know the pushback hazard zones as shown in Figure 211.

(b) It is optional to tow the airplane with the entry or cargo doors open.

CAUTION DO NOT APPLY THE AIRPLANE BRAKES WHEN YOU TOW THE AIRPLANE WITH A TOW BAR. IF YOU USE THE AIRPLANE BRAKES WHILE YOU TOW THE AIRPLANE, YOU CAN CAUSE THE SHEAR PINS TO BREAK.

CAUTION WHEN YOU USE A TOW BAR THAT DOES NOT SEPARATE WHEN THE FUSE PIN SHEARS, DO NOT USE UNCOORDINATED TRIES TO PANIC STOP THE TOW TUG AND/OR THE AIRPLANE AFTER A FUSE PIN SHEAR. THIS CAN CAUSE DYNAMIC LOADS THAT ARE MORE THAN THE INITIAL FUSE LOAD. DAMAGE TO THE AIRPLANE AND EQUIPMENT CAN OCCUR.

(c) While the airplane is towed, do not use the airplane brakes to stop the airplane, unless it is an emergency.

(d) Follow the specified airplane clearance for under-aircraft towing (Figure 208).

(e) Examine the breakaway tow bar load specifications (Figure 209).

(f) Make sure you start the towing operation with a slow and smooth breakaway.

(g) If the shear pin fractures during towing, do these steps:

1) Carefully disconnect the tow bar from the tow lug.

NOTE: The tow bar may have a force on it. Slowly move the tow bar as necessary to remove any force between the tow bar and the tow lug.

2) Examine the upper and lower ends of the shock strut of the nose gear for fluid leakage.

3) Inspect the tow lug and landing gear structure for damage.

4) Examine the outer cylinder of the landing gear.

5) Examine the nose landing gear trunnions for signs of damage.

6) Examine the nose landing gear trunnion attachment areas for signs of damage.

7) Examine the nose landing gear inner cylinder at tow fitting attach points.

8) Examine the doors, hinges and retraction mechanism of the nose landing gear for signs of damage.

9) Examine the tow fitting and inner cylinder attachment for signs of damage.

10) If damage is found in any of the examinations above, do this task: Phase II Inspection, TASK 05-51-29-200-802.

(h) Before the airplane is parked, make sure you move the airplane not less than 10 ft (3 m) in a straight line.

NOTE: This procedure will make sure that the torsional loads (side load pressures) are released before it is parked.

CAUTION

DO NOT LET THE TORSION LINK FALL BEFORE IT IS CONNECTED. IF THE TORSION LINK FALLS, IT CAN CAUSE DAMAGE TO ADJACENT EQUIPMENT.

(i) If the torsion links were disconnected, align the links during the last 10 ft (3 m) of the tow.

NOTE: This will permit the torsion links to be installed smoothly.

NOTE: Small adjustments for the torsion link connection can be made with the side movement of the tow bar or tow vehicle.

(j) Connect the torsion links (TASK 32-21-11-400-803).

CAUTION

DO NOT LET THE PARKING BRAKES STAY APPLIED WHEN YOU HAVE HOT BRAKES. IT IS POSSIBLE THAT THE BRAKES WILL NOT RELEASE WHEN THEY ARE APPLIED WHILE THEY ARE HOT.

(k) Set the parking brake.

1) Make sure the pressure gage for the parking brake shows approximately 3000 psi (20,684 kPa).

H. Put the Airplane Back to Its Usual Condition

SUBTASK 09-11-00-580-003

(1) Install the wheel chocks, COM-1505, on each of the main gears (TASK 10-11-05-500-801).

SUBTASK 09-11-00-580-004

(2) Release parking brake.

SUBTASK 09-11-00-860-004

(3) Remove the electrical power if it is not necessary (TASK 24-22-00-860-806).

(a) If necessary, remove safety tag and close the circuit breaker on the P130 panel if only power from the main battery bus was used:

Standby Power Management Panel, P310

Row	Col	Number	Name
J	3	C23626	GND CREW HORN

(4) Remove the safety tags and close these circuit breakers:

Left Power Management Panel, P110

Row	Col	Number	Name
G	5	C30405	PH B PITOT PROBE HTR L
H	6	C30424	PH C PITOT PROBE HTR L

Right Power Management Panel, P210

Row	Col	Number	Name
D	5	C30404	PH B PITOT PROBE HTR R
E	4	C30423	PH C PITOT PROBE HTR R
E	20	C30406	PH B PITOT PROBE HTR C
G	26	C30425	PH C PITOT PROBE HTR C
L	11	C30625	PITOT PROBE HTR C CTRL

SUBTASK 09-11-00-080-001

(5) Disconnect the towbar, COM-1500, from the tow fitting and remove the tow bar, if it is necessary.

NOTE: The alternative to towbar, COM-1500 used with Tractor - Tow - Aircraft, COM-13663 is towbarless tow tractor, COM-959.

(a) Make sure you install the aft tow fitting jack adapter into the aft tow fitting of the main landing gear, if it was removed.

SUBTASK 09-11-00-420-001

WARNING

USE NITRILE GLOVES FOR SKIN PROTECTION WHEN YOU USE COR-BAN 27L, G50237. IF IT GETS ON YOUR SKIN, IMMEDIATELY REMOVE IT WITH WATER. IF THIS MATERIAL GETS IN YOUR EYES, IMMEDIATELY FLUSH YOUR EYES WITH WATER. GET MEDICAL AID. THIS MATERIAL CONTAINS FLAMMABLE AGENTS WHICH CAN CAUSE INJURIES TO PERSONNEL.

WARNING

DO NOT GET THIS MATERIAL IN YOUR MOUTH, EYES, OR ON YOUR SKIN. DO NOT BREATHE THE FUMES FROM THIS MATERIAL. PUT ON A RESPIRATOR, EYE PROTECTION (GOGGLES, OR OTHER APPROVED PROTECTION), AND GLOVES BEFORE YOU USE THIS MATERIAL. MAKE SURE THAT THERE IS SUFFICIENT AIRFLOW. KEEP THIS MATERIAL AWAY FROM SPARKS, FLAME, AND HEAT. THIS MATERIAL CAN CAUSE INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT.

(6) Install the aft tow fitting jack adapter into the aft tow fitting of the main landing gear, if it was removed.

(a) Apply a layer of Cor-Ban 27L Compound, G50237 or Mastinox 6856 K, C50056 prior to installing the aft fitting jack adapter.

SUBTASK 09-11-00-860-005

WARNING

STAY AWAY FROM THE NOSE GEAR WHEELS WHEN THE LOCKPIN IS REMOVED. THE NOSE WHEELS CAN TURN TO THE CENTERED POSITION QUICKLY AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(7) Make sure the wheels of the nose landing gear are in the centered position, and remove the NLG towing lever pin, SPL-1499.

END OF TASK

TASK 09-11-00-560-801

3. Pushback/Dispatch Towing

A. General

(1) This procedure has general steps for pushback/dispatch operations. You can use this procedure as a guide to develop a unique procedure based on customer specific operational requirements.

B. References

Reference	Title
05-51-29-200-801	Phase I Inspection (P/B 201)
05-51-29-200-802	Phase II Inspection (P/B 201)
32-00-30-480-801	Landing Gear Downlock Pins Installation (P/B 201)

C. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
COM-959	Tractor - Towbarless (TLTV) Part #: AM210 Supplier: 71760 Part #: AST-1X Supplier: C3351 Part #: AST-2 Supplier: C3351 Part #: EXPEDITER 310H Supplier: 93408 Part #: EXPEDITER 600 Supplier: 93408 Part #: TBL-200 Supplier: K4234 Part #: TBL-280 Supplier: K4234 Part #: TBL-400 Supplier: K4234 Part #: TBL-600 Supplier: K4234 Part #: TPX-200-MT Supplier: 6L481 Part #: TPX-200-MTS Supplier: 6L481 Part #: TPX-200-S Supplier: 6L481 Opt Part #: EXPEDITER 300 Supplier: 93408 Opt Part #: EXPEDITER 400 Supplier: 93408
COM-1500	Towbar - Airplane, Towing and Steering Part #: 01-1340-0100 Supplier: 59603 Part #: 15F2397 Supplier: 56535 Part #: 215030-1 Supplier: 9M323 Part #: 215030-3 Supplier: 9M323 Part #: PF09-007-1 Supplier: 3D5B2 Part #: TOWUNIV-2 Supplier: D2029 Opt Part #: 214030-1 Supplier: 9M323

(Continued)

Reference	Description
COM-13663	Tractor - Tow - Aircraft Part #: B1200 Supplier: 93408 Part #: GT110 Supplier: 4TVG2 Part #: MODEL 100 Supplier: 44185 Part #: MODEL 140 Supplier: 44185 Part #: MODEL 200 Supplier: 44185 Part #: RM8001 Supplier: A0145 Part #: TC-50 Supplier: 08786 Part #: U30 Supplier: 4TVG2 Opt Part #: B-1000 Supplier: 50477 Opt Part #: GT50E Supplier: 12603 Opt Part #: GT60E Supplier: 12603 Opt Part #: T-750 Supplier: 81381
SPL-1499	Pin - Lock, NLG Towing Lever Part #: A09003-2 Supplier: 81205 Opt Part #: A09003-1 Supplier: 81205

D. Location Zones

Zone	Area
711	Nose Landing Gear
731	Left Main Landing Gear
741	Right Main Landing Gear

E. Prepare to Release the Airplane

SUBTASK 09-11-00-560-001

(1) To prepare to tow the airplane, do the steps that follow:

WARNING DO NOT CONNECT A HEADSET, OR TOUCH CONNECTIONS TO THE AIRPLANE WHEN THERE IS LIGHTNING, OR IN STRONG ELECTROMAGNETIC FIELDS. LIGHTNING, AND ELECTRICAL CURRENT CAN CAUSE INJURIES TO PERSONNEL.

(a) Make sure there is clear intercom communication between the flight deck crew, the towing ground crew and the tow tractor operator.

WARNING WHEN YOU USE A TOW BAR TO MOVE THE AIRPLANE IN HIGH WINDS, CONNECT THE TOW BAR BEFORE YOU INSERT THE TOWING LEVER LOCKPIN (NLG TOWING LEVER PIN). THE AIRPLANE COULD MOVE AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

CAUTION MAKE SURE THAT YOU PUT THE TOWING LEVER IN THE TOW POSITION BEFORE YOU TOW THE AIRPLANE. IF YOU DO NOT, YOU CAN CAUSE DAMAGE TO LANDING GEAR COMPONENTS OR THE TOWING EQUIPMENT.

(b) Move the towing lever on the metering valve module to the TOW POSITION (Figure 201).

WARNING ONLY USE THE CORRECT PIN FOR THE AIRPLANE MODEL. IF YOU USE AN INCORRECT PIN, THE HYDRAULIC STEERING CAN OPERATE. THIS CAN CAUSE INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT.

(c) Install the NLG towing lever pin, SPL-1499.

(d) Make sure the landing gear downlock pins are installed on the nose and main landing gear (TASK 32-00-30-480-801).

NOTE: It is optional to install landing gear downlock pins when you tow or push the airplane for flight. This is when the airplane is in position for the flight crew to taxi the airplane prior to or after a flight.

(e) Make sure the landing gear shock struts have sufficient extension prior to release (Figure 202):

NOTE: The nose shock strut is deflated when the DIM "A" is less than 20.42 in. (518.67 mm) and greater than 18.42 in. (467.87 mm). The main shock struts are deflated when DIM "A" is less than 5.13 in. (130.30 mm) and greater than 3.13 in. (79.50 mm).

A fully compressed nose shock strut is indicated by DIM "A" equal to 18.42 in. (467.87 mm). A fully compressed main gear shock strut is indicated by a DIM "A" equal to 3.13 in. (79.50 mm). The check for a minimum shock strut extension is a "quick check" for towing the airplane during maintenance. The landing gear must be filled as shown on the servicing chart for flight dispatch.

1) Make sure the main gear shock struts have a minimum of 5.13 in. (130.30 mm) at DIM "A".

2) Make sure the nose gear shock strut has a minimum of 20.42 in. (518.67 mm) at DIM "A".

CAUTION DO NOT EXTEND THE SHOCK STRUT OF THE NOSE LANDING GEAR TO MORE THAN THE SPECIFIED MAXIMUM DIMENSION 'A'. IF YOU EXTEND THE SHOCK STRUT MORE, YOU CAN ENGAGE THE CENTERING CAM WHICH CAN CAUSE DAMAGE.

(f) Make sure the shock strut of the nose landing gear does not have more than a maximum of 36 in. (914 mm) at DIM "A".

(g) Make sure the airplane center of gravity is below the GROUND STABILITY MARGIN line (Figure 203).

SUBTASK 09-11-00-560-002

CAUTION DO NOT TURN THE NOSE GEAR MORE THAN 70 DEGREES TO ONE SIDE OR THE OTHER OF CENTER WITH THE TORQUE LINKS CONNECTED. THIS WILL PREVENT DAMAGE TO THE STEERING MECHANISM.

(2) Make sure the tow operator does not allow the nose gear angle to exceed 70 degrees when you tow the airplane.

NOTE: A red indicator stripe is painted on the doors for the nose landing gear. This stripe will tell you when you are near a 70 degree nose gear turn.

(a) The airplane turning radii vs nose gear steering angle is shown in Figure 207.

(b) If the maximum towing angle is exceeded with the torsion link connected and the hydraulic bypass pin is installed, do this task: Phase I Inspection, TASK 05-51-29-200-801.

CAUTION DO NOT LET THE LOADS ON THE NOSE LANDING GEAR BE MORE THAN THE SPECIFIED LOADS WHILE THE AIRPLANE IS IN A TURN. IF YOU APPLY MORE LOADS THAN ARE SPECIFIED, STRUCTURAL DAMAGE TO THE LANDING GEAR CAN OCCUR.

(3) When you tow the airplane, make sure the maximum permitted tow loads for the landing gear are not more than those shown in Figure 204.

NOTE: Towing trials have shown that during normal towing operations, including breakaway, turning and smooth stopping, loads do not exceed the maximum permitted tow loads for the landing gear.

NOTE: Normal towing is defined as a smooth breakaway push/pull and stop of the airplane with the nose wheel in a straight position. Towing start and stop with the nose wheel at an angle can cause the loads to exceed the maximum permitted tow loads for the landing gear.

CAUTION IF YOU USE A TOW BAR, MAKE SURE THAT THE TOW BAR HAS THE CORRECT SHEAR PINS. THE SPECIFICATION DRAWING FOR THE TOW BAR SHOWS THIS DATA. IF YOU DO NOT FOLLOW THESE SPECIFICATIONS, DAMAGE TO THE TOW FITTING ON THE NOSE LANDING GEAR CAN OCCUR.

(4) Put the tow vehicle in position and, if it is necessary, attach the towbar, COM-1500, to the fitting on the nose or main landing gear as shown in Figure 205 and Figure 206.

NOTE: Before you can install a towbar onto the aft tow fitting of the main landing gear, you must remove the aft tow fitting jack adapter.

(5) Make sure the parking brakes are released.

F. Pushback/Dispatch the Airplane

SUBTASK 09-11-00-560-003

WARNING ALL WORK AROUND THE AIRPLANE MUST STOP WHEN LIGHTNING OCCURS AT A DISTANCE OF 6 MILES OR LESS. ALL PERSONNEL MUST GO IN A BUILDING OR THE AIRPLANE. LIGHTNING CAN KILL PERSONNEL OR CAUSE INJURY.

CAUTION DO NOT HOLD OR TURN THE TILLER FOR THE NOSE WHEEL STEERING WHILE YOU TOW THE AIRPLANE. IF YOU HOLD OR TURN THE TILLER, DAMAGE TO THE NOSE WHEEL STEERING SYSTEM CAN OCCUR.

(1) To pushback the airplane, do the steps that follow:

WARNING WHEN YOU TOW THE AIRPLANE, STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, AND AIRPLANE TIRES. IT IS POSSIBLE FOR THE TIRES AND EQUIPMENT TO PULL YOU BELOW THEM WHILE THE AIRPLANE CHANGES POSITIONS AND DIRECTIONS. IF YOU DO NOT KEEP THIS SEPARATION, INJURY TO PERSONNEL CAN OCCUR.

(a) Make sure the persons that work near the tow vehicle, tow bar, nose wheels, and the main wheels know the pushback hazard zones as shown in Figure 211.

(b) Remove the chocks.

(c) Start the pushback with a slow smooth breakaway.

CAUTION DO NOT APPLY THE AIRPLANE BRAKES WHEN YOU TOW THE AIRPLANE WITH A TOW BAR. IF YOU USE THE AIRPLANE BRAKES WHILE YOU TOW THE AIRPLANE, YOU CAN CAUSE THE SHEAR PINS TO BREAK.

CAUTION WHEN YOU USE A TOW BAR THAT DOES NOT SEPARATE WHEN THE FUSE PIN SHEARS, DO NOT USE UNCOORDINATED TRIES TO PANIC STOP THE TOW TUG AND/OR THE AIRPLANE AFTER A FUSE PIN SHEAR. THIS CAN CAUSE DYNAMIC LOADS THAT ARE MORE THAN THE INITIAL FUSE LOAD. DAMAGE TO THE AIRPLANE AND EQUIPMENT CAN OCCUR.

(d) While the airplane is towed, do not use the airplane brakes to stop the airplane, unless it is an emergency.

(e) Follow the specified airplane clearance for under-aircraft towing (Figure 208).

(f) Examine the breakaway tow bar load specifications (Figure 209) .

(g) If the shear pin fractures during towing, do these steps:

1) Carefully disconnect the tow bar from the tow lug.

NOTE: The tow bar may a force on it. Slowly move the tow bar as necessary to remove any force between the tow bar and the tow lug.

2) Examine the upper and lower ends of the shock strut of the nose gear for fluid leakage.

3) Inspect the tow lug and landing gear structure for damage.

4) Examine the outer cylinder of the landing gear.

5) Examine the nose landing gear trunnions for signs of damage.

6) Examine the nose landing gear trunnion attachment areas for signs of damage.

7) Examine the nose landing gear inner cylinder at tow fitting attach points.

8) Examine the doors, hinges and retraction mechanism of the nose landing gear for signs of damage.

9) Examine the tow fitting and inner cylinder attachment for signs of damage.

10) If damage is found in any of the examinations above, do this task: Phase II Inspection, TASK 05-51-29-200-802.

(h) When you stop the airplane, make sure you move the airplane not less than 10 ft (3 m) in a straight line.

NOTE: This will make sure that the torsional loads (side load pressures) are released you remove the steering lockout pin.

G. Put the Airplane Back to Its Usual Condition

SUBTASK 09-11-00-030-001

(1) Apply the parking brakes.

NOTE: The alternative to towbar, COM-1500 used with Tractor - Tow - Aircraft, COM-13663 is towbarless tow tractor, COM-959.

(2) Disconnect the towbar, COM-1500, from the tow fitting and remove the tow bar, if it is necessary.

(a) Make sure you install the aft tow fitting jack adapter into the aft tow fitting of the main landing gear, if it was removed.

SUBTASK 09-11-00-840-001

(3) Make sure the wheels of the nose landing gear are in the centered position, and remove the NLG towing lever pin, SPL-1499.

——— END OF TASK ———

TASK 09-11-00-580-802

4. Tow the Airplane in High Winds

(Figure 210)

A. Location Zones

Zone	Area
711	Nose Landing Gear
731	Left Main Landing Gear
741	Right Main Landing Gear

B. Procedure

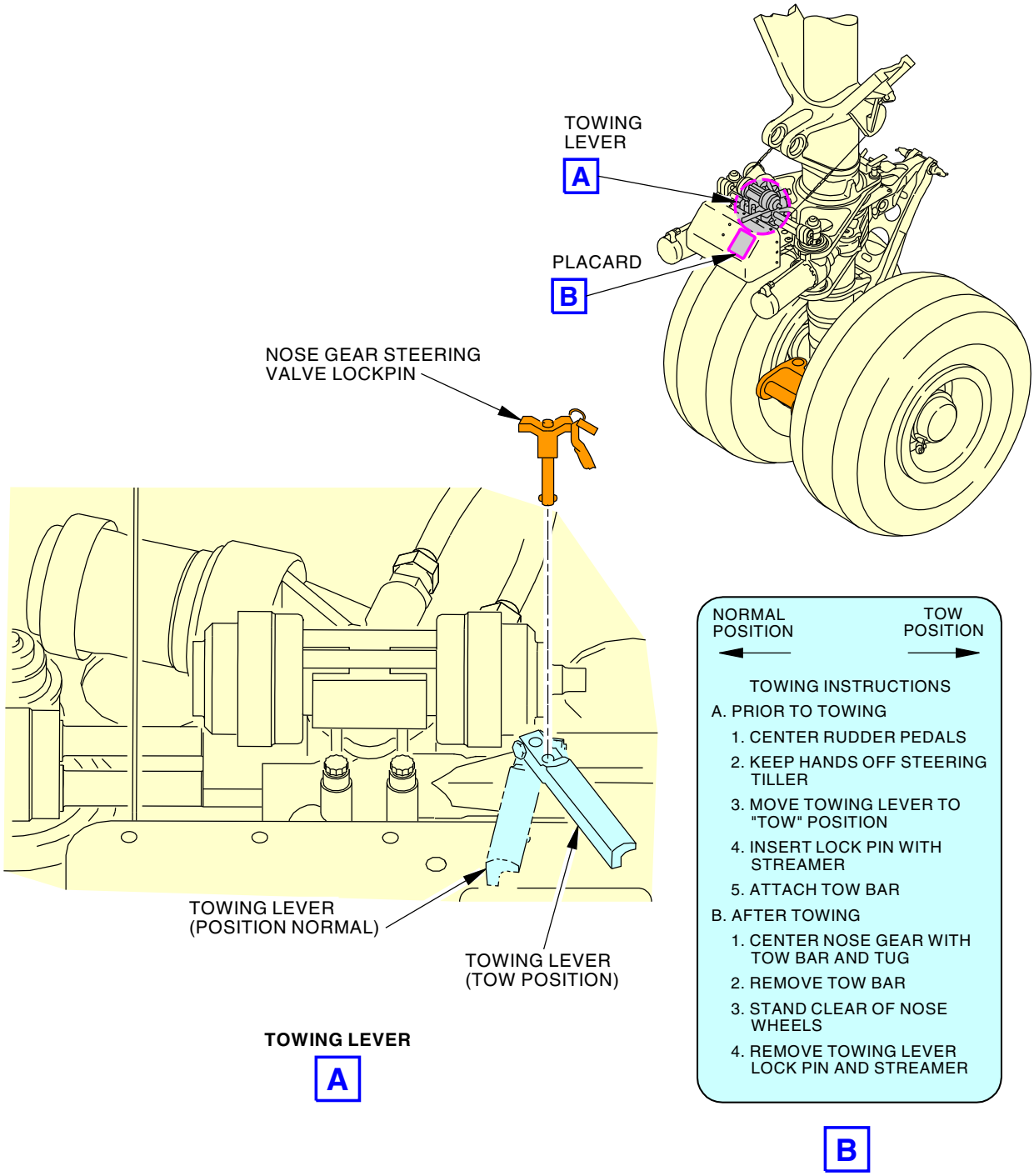
SUBTASK 09-11-00-584-001

CAUTION

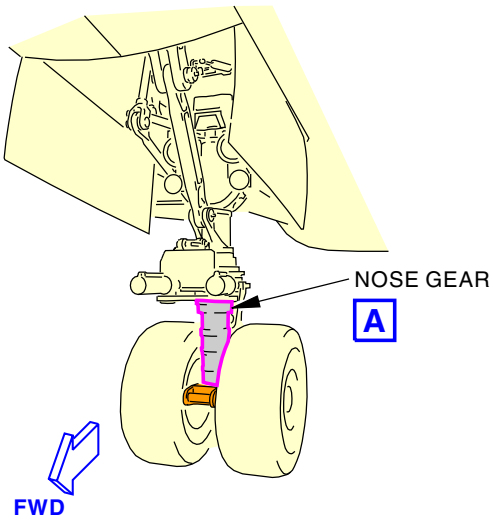
DO NOT TOW THE AIRPLANE IN HIGH WINDS WITH THE CARGO DOORS OPEN. IF THE AIRPLANE IS TOWED IN HIGH WINDS WITH THE CARGO DOORS OPEN DAMAGE TO THE AIRPLANE AND DOOR CAN OCCUR.

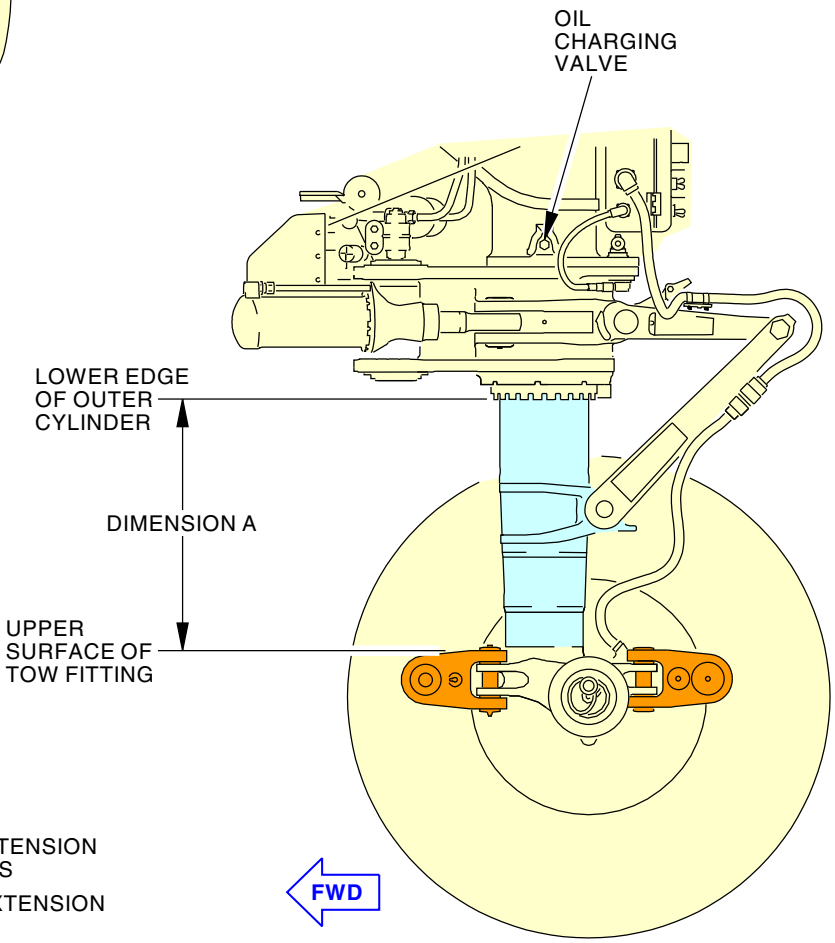
(1) Do this task: Maintenance Towing, TASK 09-11-00-580-801, but you must also obey the conditions described in Figure 210.

——— END OF TASK ———



Nose Gear Steering Valve Lockpin Installation
Figure 201/09-11-00-990-801





MINIMUM SHOCK STRUT EXTENSION
DIMENSION A = 20.42 INCHES

MAXIMUM SHOCK STRUT EXTENSION
DIMENSION A = 36.0 INCHES

NOTE:

FULLY COMPRESSED STRUT:
DIMENSION A = 18.42 INCHES

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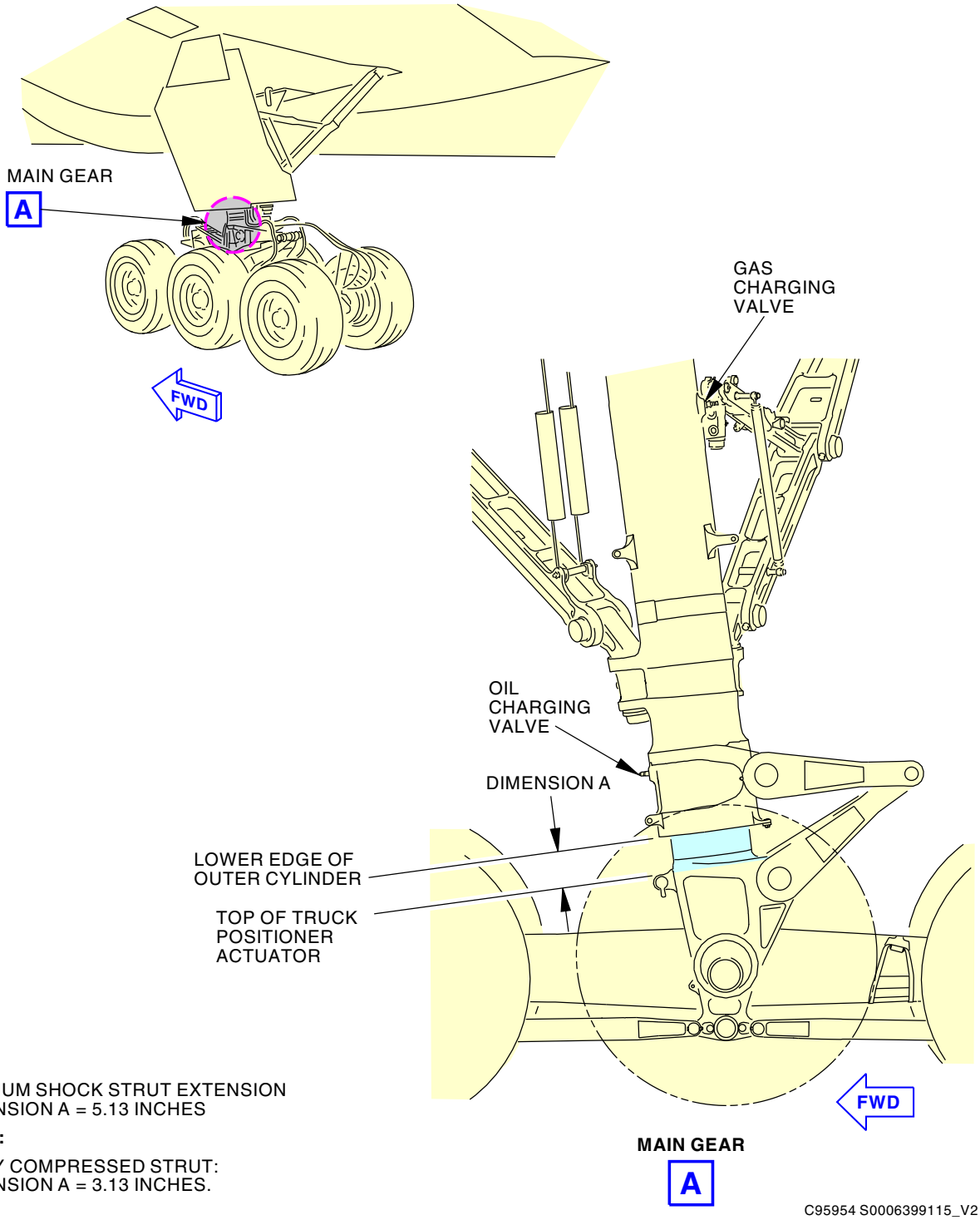
Landing Gear Shock Strut Extension Specifications
Figure 202/09-11-00-990-802 (Sheet 1 of 2)



MINIMUM SHOCK STRUT EXTENSION
DIMENSION A = 5.13 INCHES

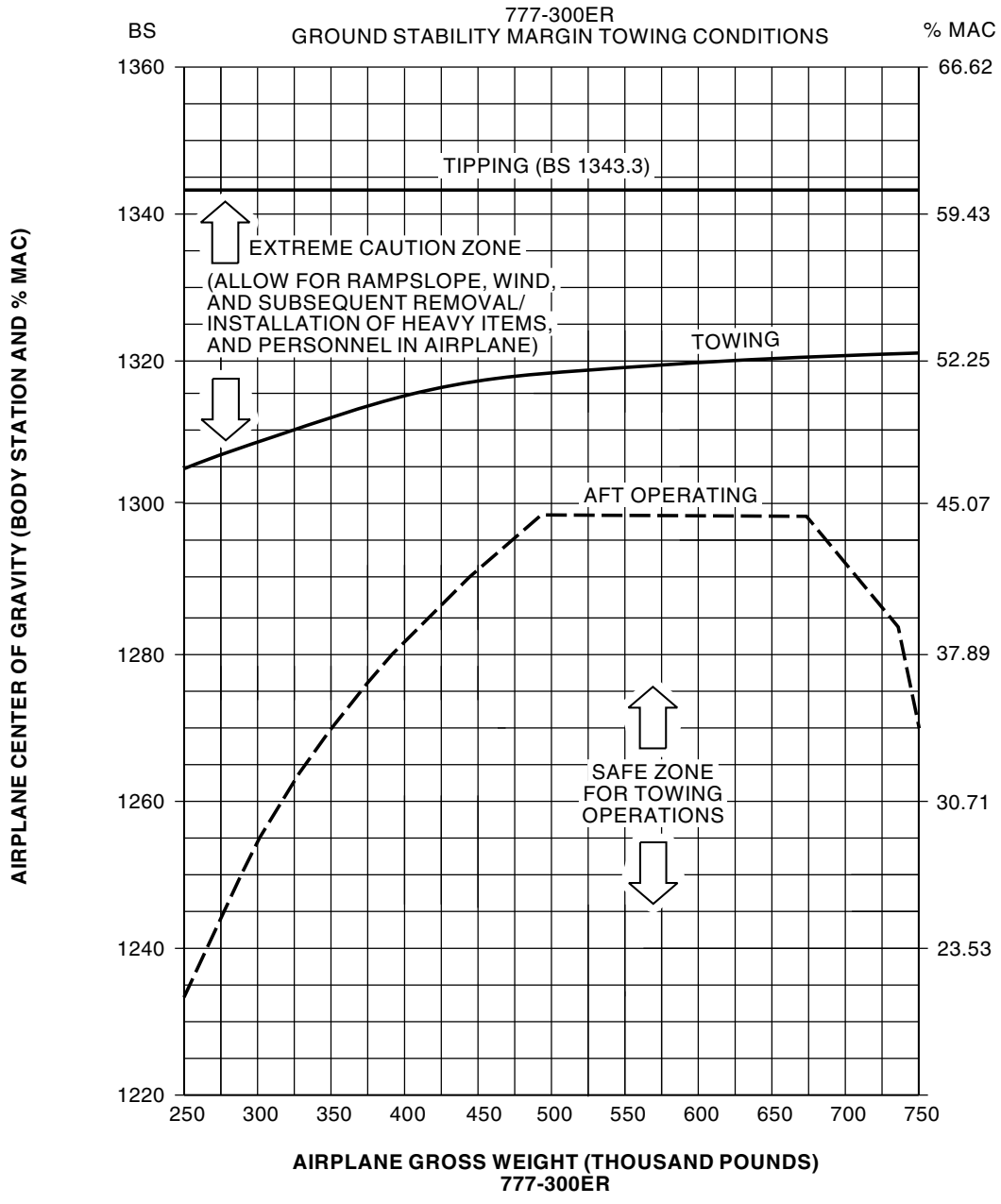
NOTE:

FULLY COMPRESSED STRUT:
DIMENSION A = 3.13 INCHES.

C95954 S0006399115_V2

Landing Gear Shock Strut Extension Specifications
Figure 202/09-11-00-990-802 (Sheet 2 of 2)

TIPPING OF 777 AIRPLANE
THE CHART BELOW SHOWS THE 777-300ER TIPPING LIMITS. THE ABSOLUTE TIPPING LIMIT IS THE MLG CENTERLINE AT B.S. 1343.3. THE GROUND STABILITY MARGIN LINE REPRESENTS THE ABSOLUTE TIPPING LIMIT TO ACCOUNT FOR FACTORS SUCH AS TOWING FORCES, RAMP SLOPE AND WIND. BY ENSURING THAT THE AIRPLANE WEIGHT AND C.G. DURING MAINTENANCE OPERATIONS IS BELOW THIS LINE, A TIPPING SITUATION WILL BE AVOIDED



N30316 S0006399120_V2

Towing Center of Gravity Limits
Figure 203/09-11-00-990-803 (Sheet 1 of 2)

FIGURE DESCRIPTIONS:

THE ATTACHED GRAPH ILLUSTRATES THE VARIOUS AFT GROUND LIMITS FOR THE 777 AIRPLANES. A BRIEF DESCRIPTION OF EACH LIMIT FOLLOWS:

- TIPPING LIMIT - THE ABSOLUTE TIPPING LIMIT OF THE AIRPLANE. IF THE AIRPLANE CG GOES AFT OF THIS LIMIT THE AIRPLANE WILL TIP ON IT'S TAIL.
- TOWING LIMIT - THE GROUND LIMIT WHICH PROVIDES AN OPERATING BUFFER FOR THE TIPPING LIMIT. INCLUDED IN THE BUFFER ARE:
  - WINDS UP TO 35 KNOTS
  - TOWING FORCES
  - 3% RAMP SLOPE
- AFT OPERATING LIMIT - THE AFT LIMIT OF THE GROSS WEIGHT VERSUS CG ENVELOPE. IT IS THE MOST AFT CG THAT THE AIRPLANE CAN OPERATE AT DURING NORMAL REVENUE SERVICE.

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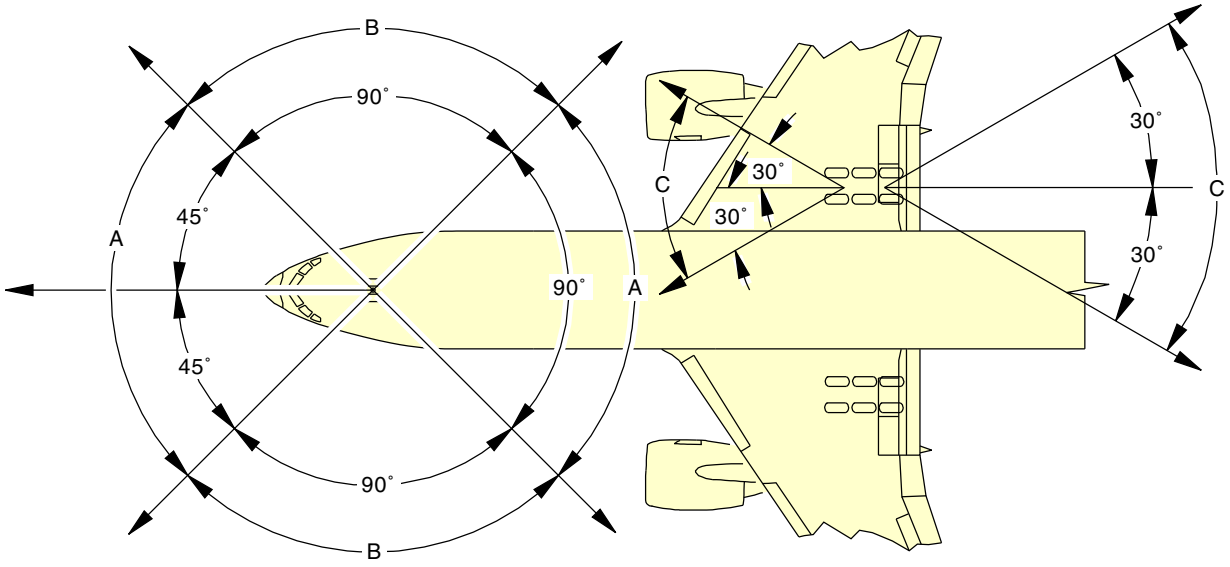
Towing Center of Gravity Limits
Figure 203/09-11-00-990-803 (Sheet 2 of 2)



MAXIMUM TOWING LOADS:

A = 95,000 LB (43091 KG)
B = 47,500 LB (21546 KG)
C = 75,000 LB (34019 KG)

NOTE:

DISCONNECT THE NOSE GEAR TORSION LINK WHEN TOWING AT ANGLES MORE THAN 70‘ TO PREVENT DAMAGE TO THE HYDRAULIC STEERING SYSTEM.

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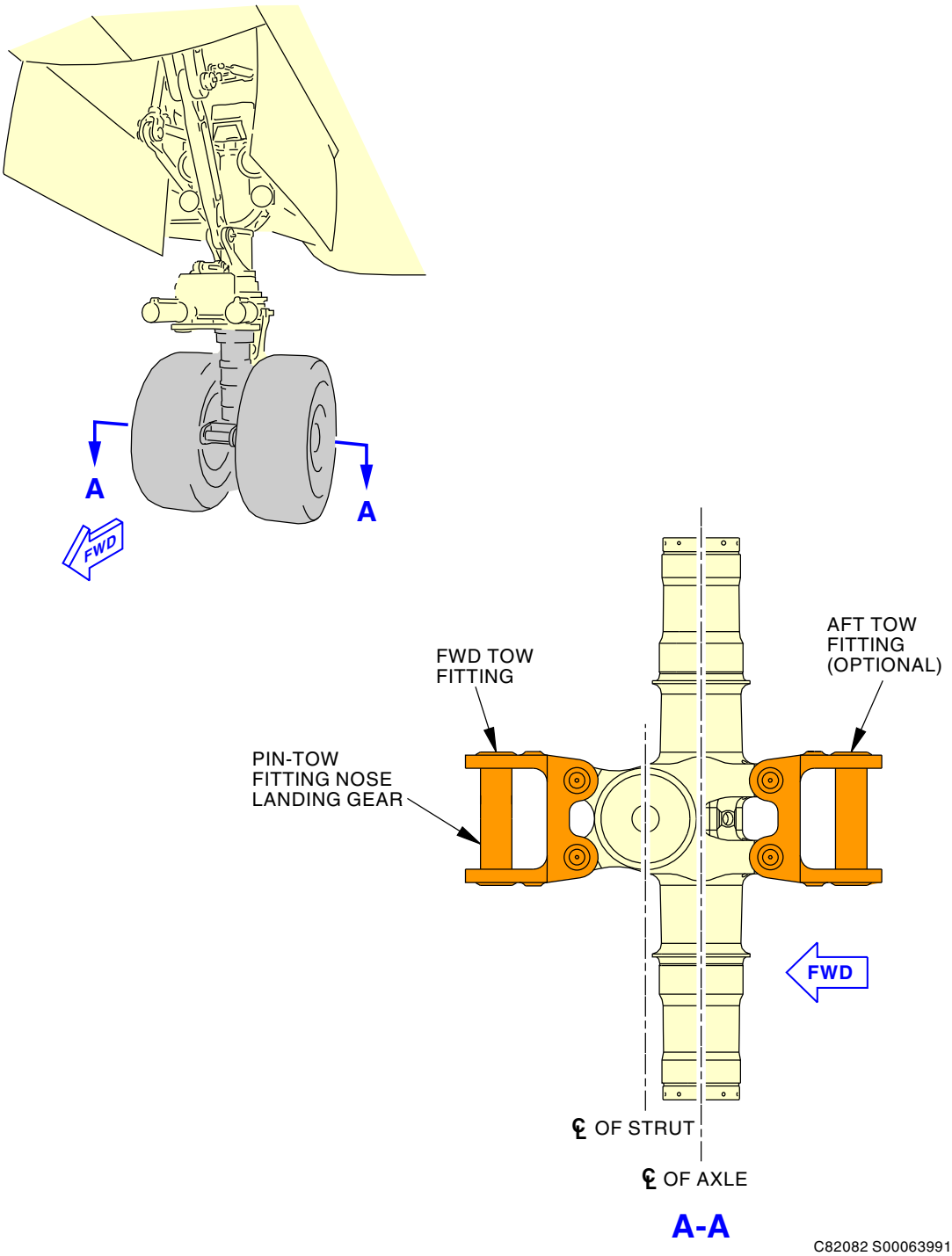
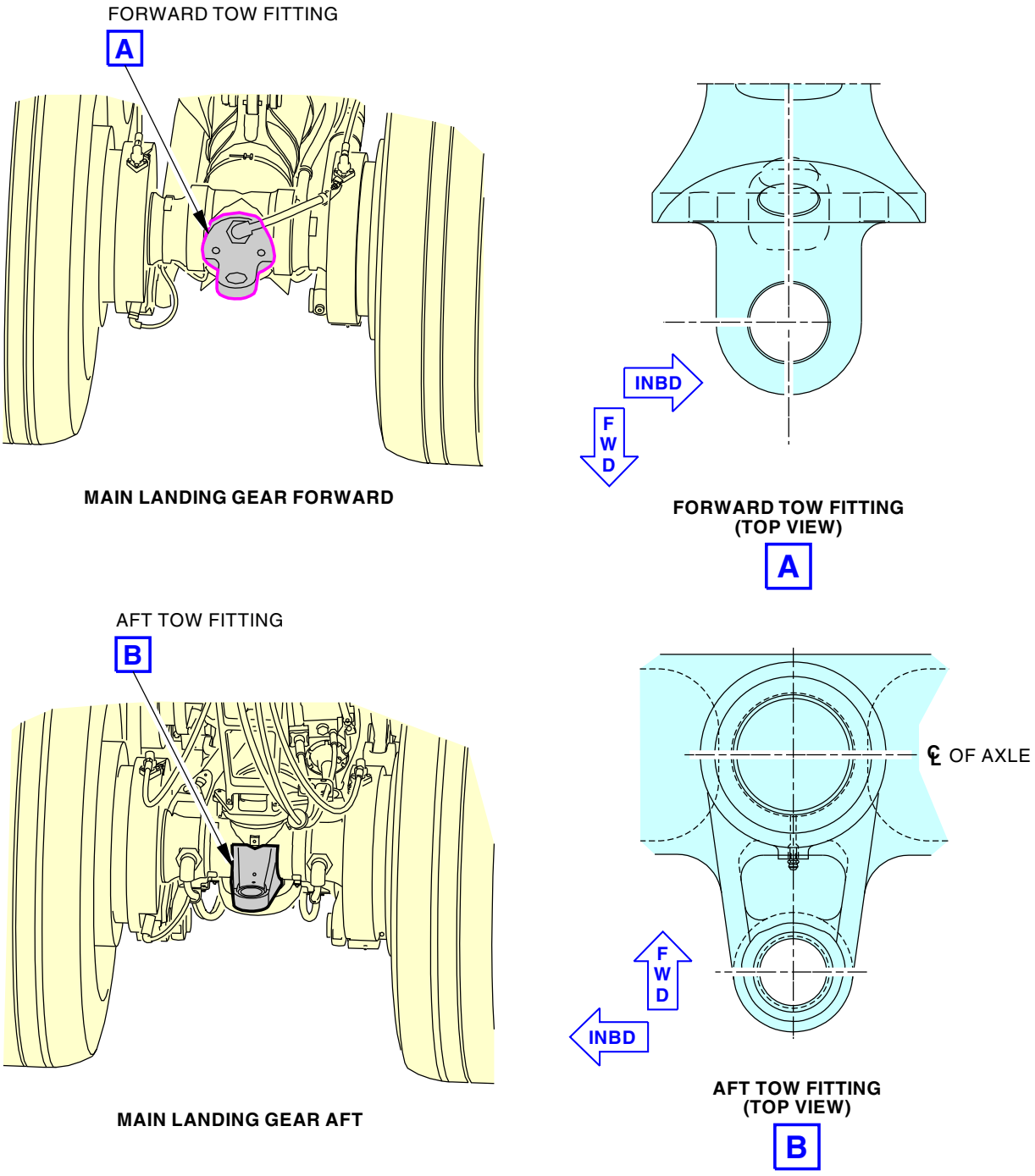
Nose and Main Gear Maximum Towing Loads vs Towing Directions
Figure 204/09-11-00-990-804



Nose Gear Tow Bar Attachment Fitting
Figure 205/09-11-00-990-805



MAIN LANDING GEAR FORWARD

FORWARD TOW FITTING
(TOP VIEW)
A

MAIN LANDING GEAR AFT

AFT TOW FITTING
(TOP VIEW)
B

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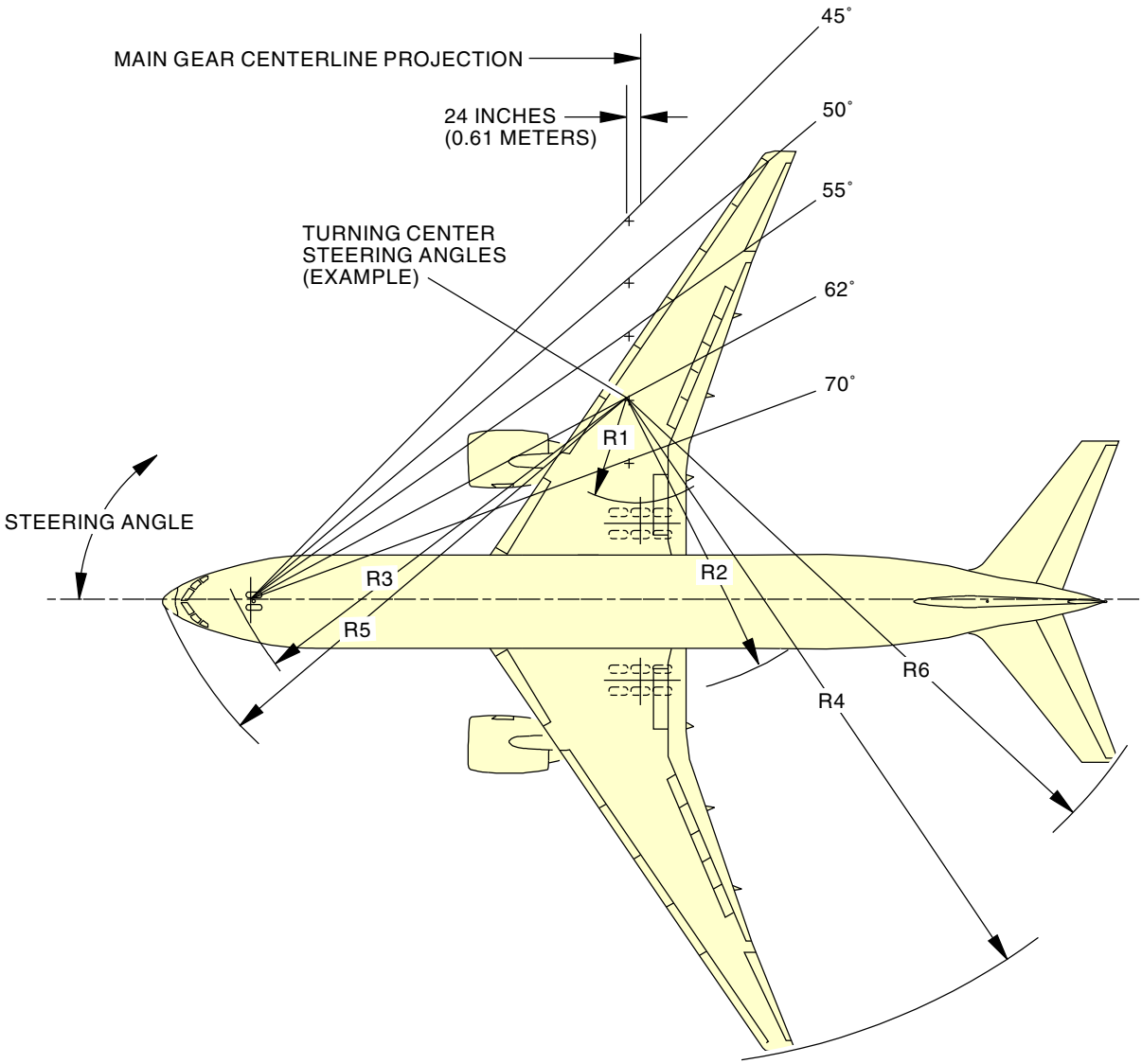
Main Gear Tow Bar Attachment Fitting
Figure 206/09-11-00-990-806



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Turning Radii - No Slip Angle
Figure 207/09-11-00-990-807 (Sheet 1 of 2)

777-300ER												
STEERING ANGLE (DEG)	R1 INNER GEAR		R2 OUTER GEAR		R3 NOSE GEAR		R4 WINGTIP		R5 NOSE		R6 TAIL	
	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
30	153	46.5	195	59.5	204	62.1	283	86.2	212	64.7	242	73.6
35	122	37.2	165	50.2	178	54.3	253	77.0	188	57.3	216	65.7
40	99	30.0	141	42.9	159	48.6	229	69.9	171	52.0	196	59.8
45	79	24.1	122	37.1	145	44.3	210	64.1	158	48.1	182	55.3
50	63	19.2	107	32.5	135	41.0	195	59.3	148	45.1	169	51.6
55	49	14.9	92	27.9	126	38.5	181	55.1	141	42.8	160	48.9
60	37	11.2	79	24.1	120	36.5	169	51.5	135	41.1	153	46.5
65	25	7.8	68	20.7	115	34.9	158	48.1	130	39.7	146	44.5
70 (MAX)	15	4.7	58	17.7	111	33.7	148	45.2	125	38.0	140	42.8

777-300ER

NOTE:

ACTUAL OPERATING TURNING RADII MAY BE GREATER THAN SHOWN.
DIMENSIONS ROUNDED TO NEAREST FOOT AND 0.1 METER.

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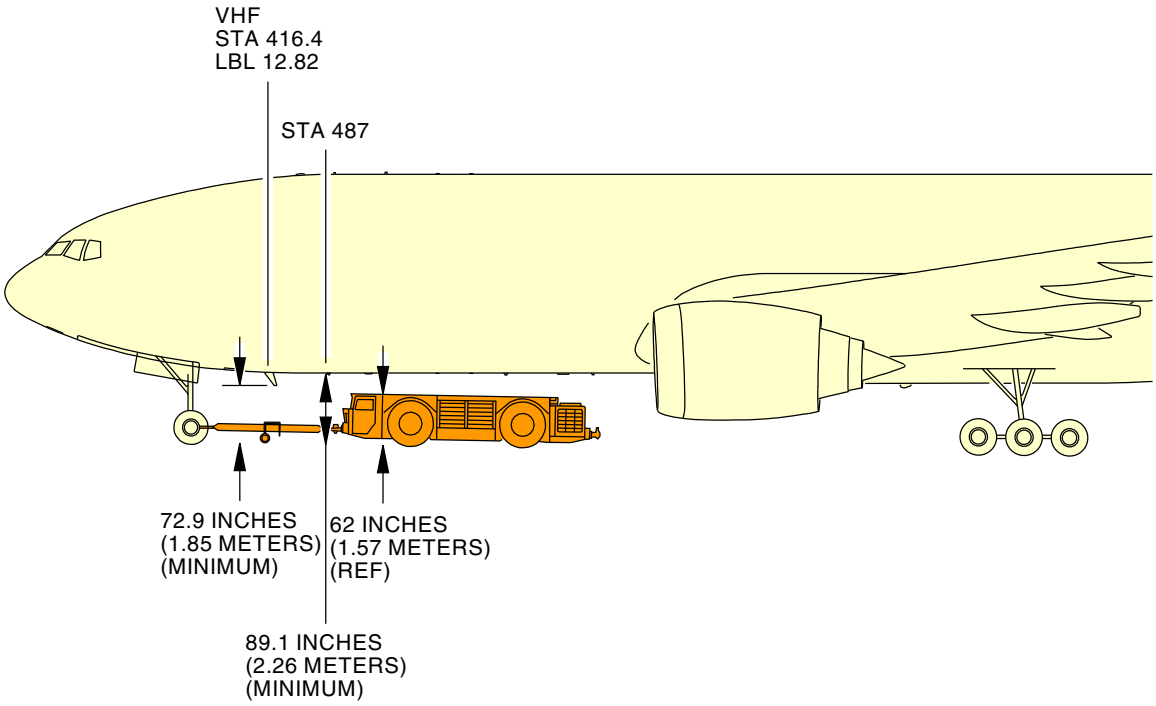
Turning Radii - No Slip Angle
Figure 207/09-11-00-990-807 (Sheet 2 of 2)



777-300ER

NOTE:

MINIMUM GROUND CLEARANCE CALCULATED FOR AIRPLANE AT 749,000 LB. (339,741 kg) AND 17.1% C.G.

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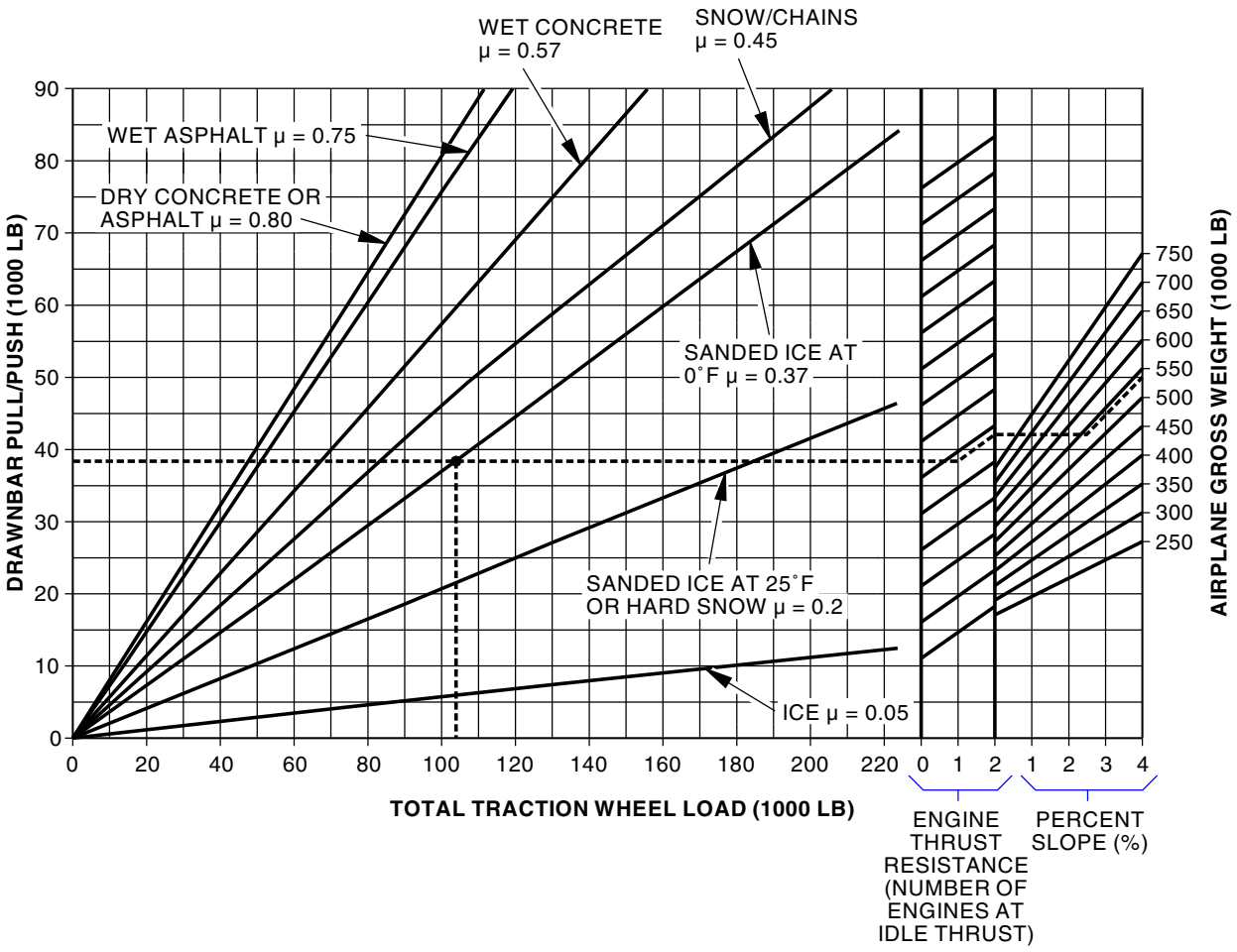
Under - Aircraft Towing
Figure 208/09-11-00-990-808

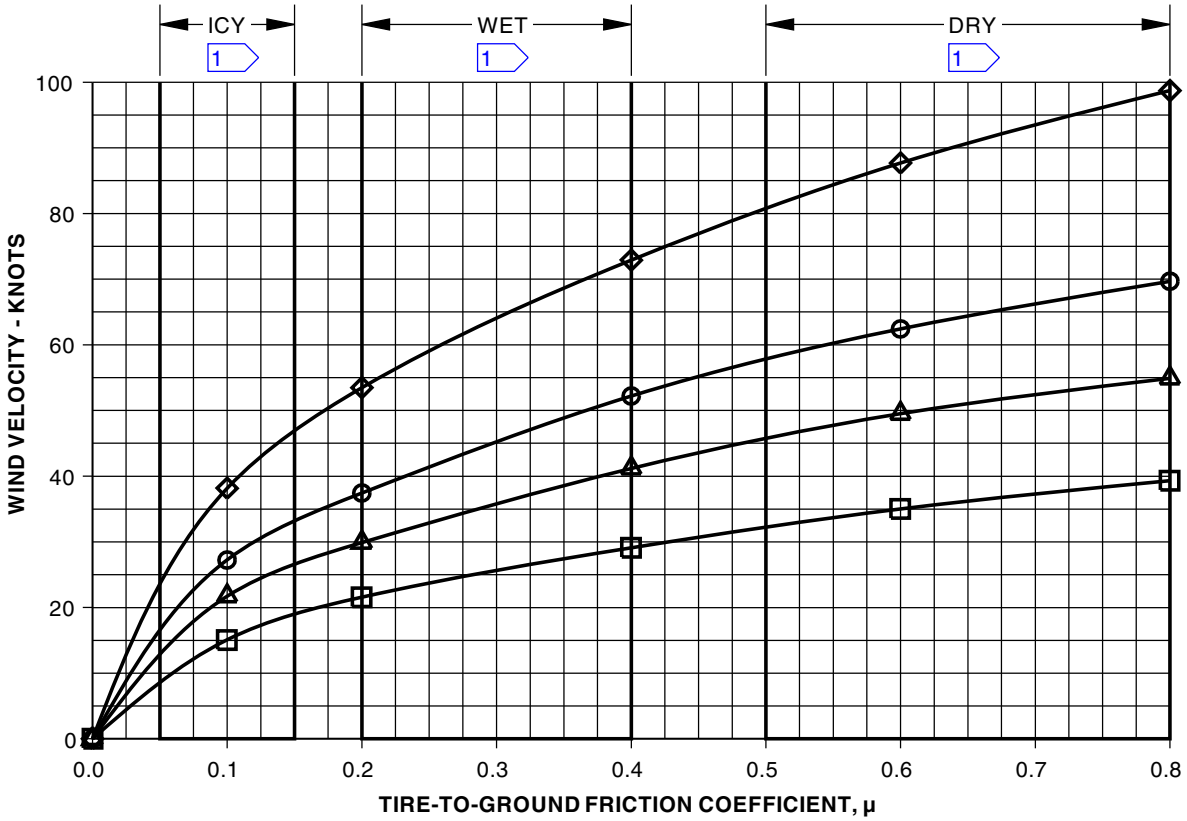


NOTE:

1. EXAMPLE ------- SHOWS A 777 WEIGHING 537,000 LB BEING PUSHED UP A 2.5% SLOPE ON SANDED ICE AT 0‘ AGAINST ONE ENGINE AT IDLE THRUST. 38,000 LB OF DRAW BAR PUSH AND A WHEEL TRACTION LOAD OF 103,000 LB ARE REQUIRED FOR TOWING.
2. UNUSUAL BREAKAWAY CONDITIONS NOT SHOWN
3. STRAIGHT-LINE TOW
4. COEFFICIENTS OF FRICTION (μ) ARE ESTIMATED FOR RUBBER-TIRED TOW VEHICLES

C82168 S0006399135_V2

Breakaway Tow Bar Load Specifications
Figure 209/09-11-00-990-809



NOTE:

A. FLAPS UP, STAB = 4 PILOT UNITS (HORIZONTAL)
B. WIND FROM ANY DIRECTION
C. WIND GUST SHOULD BE ADDED TO STEADY WIND VELOCITY FOR MAXIMUM WIND SPEED
D. USE ACTUAL AIRPLANE WEIGHT, CG POSITION, AND TIRE-TO-GROUND FRICTION COEFFICIENT FOR INTERPOLATION
E. IF NO MEASURED VALUE FOR TIRE-TO-GROUND FRICTION COEFFICIENT IS AVAILABLE, USE THE LOWER LIMIT OF THE APPROPRIATE BOUNDED FRICTION BAND
F. FOR TOWING AND MANEUVERING IN CLOSE PROXIMITY TO BUILDINGS OR OTHER AIRPLANES, THE ALLOWABLE WIND VELOCITY SHOULD BE REDUCED BY ONE THIRD
G. REDUCE WIND SPEED LIMITS TO ACCOUNT FOR OPERATIONAL CONSIDERATIONS SUCH AS HIGH SPEED TOWING OR CONTAMINATED TIRES OR RUNWAYS
H. BASED ON ZERO PERCENT GROUND SLOPE

1 APPROXIMATE NORMAL RANGES SHOWN

	WEIGHT (LB)	CG (%MAC)
○	385,000	8
□	385,000	44
◇	762,700	8
△	762,700	44

777-300ER

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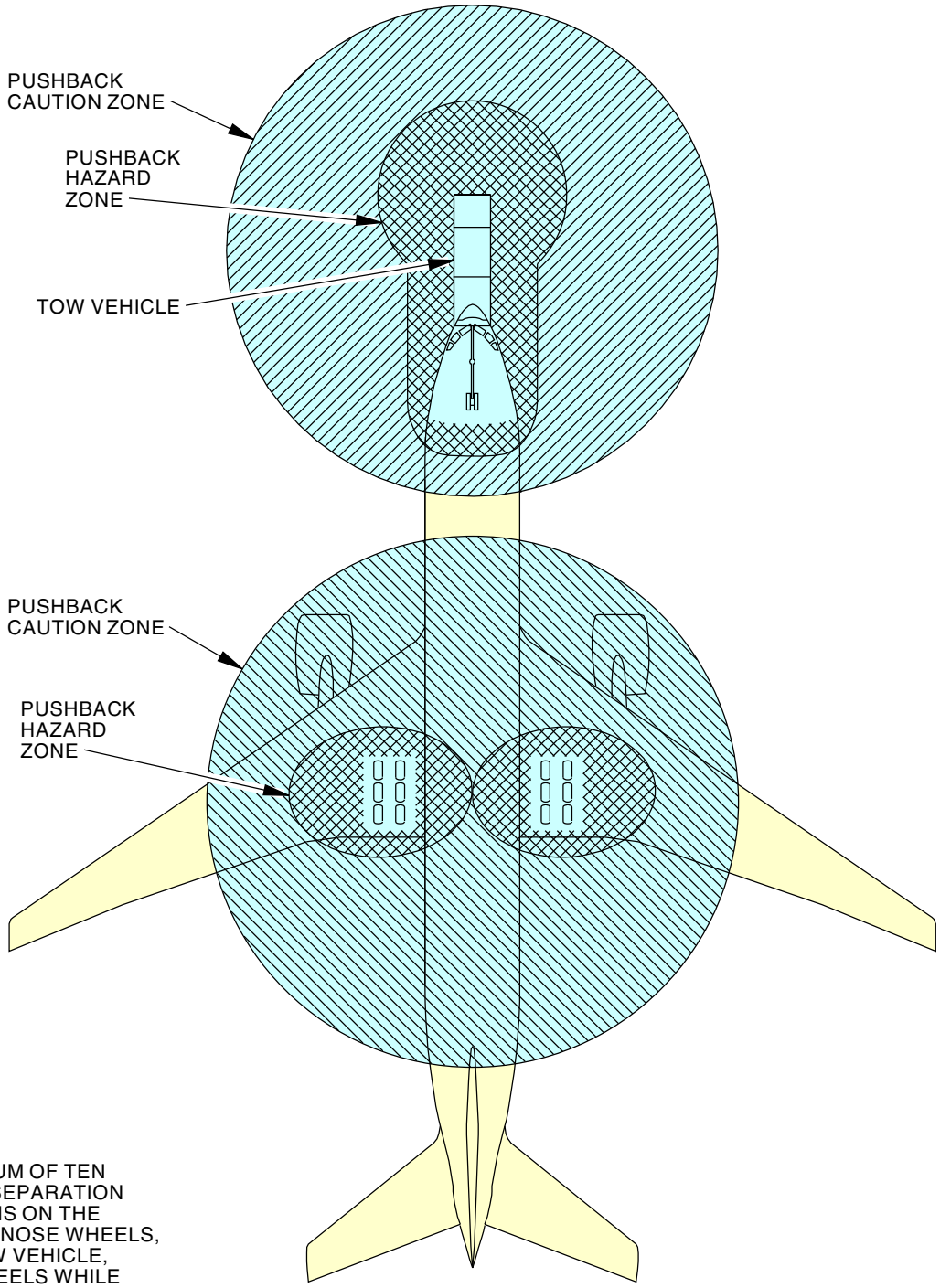
Wind Velocity During Towing
Figure 210/09-11-00-990-810



WARNING:

MAINTAIN A MINIMUM OF TEN FEET (3 METERS) SEPARATION BETWEEN PERSONS ON THE GROUND AND THE NOSE WHEELS, TOW BAR AND TOW VEHICLE, AND THE MAIN WHEELS WHILE THE AIRPLANE IS MOVING.

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Towing Hazard Zones
Figure 211/09-11-00-990-811

TOW AIRPLANE WITH ENGINE(S) REMOVED - MAINTENANCE PRACTICES

1. General

A. The data that follows tells about the Center of Gravity (CG) limits:

(1) Tipping Limit. This is the absolute tipping limit of the airplane. If the airplane CG goes aft of this limit, the airplane will tip on it's tail.

(2) One Engine Removal Limit. The airplane CG must be forward of this limit before one engine is removed. When the CG is forward of this limit, it will make sure the airplane CG will not be aft of the-SAFE ZONE Limit when an engine is removed.

(3) Two Engine Removal Limit. The airplane CG must be forward of this limit before the two engines are removed. When the CG is forward of this limit, it will make sure the airplane CG will not be aft of the-SAFE ZONE Limit when the engines are removed.

(4) Do not tow the airplane with one or two engines removed if the center of gravity prior to engine removal was not in the SAFE ZONE.

TASK 09-11-01-580-801

2. Tow Airplane With Engine(s) Removed

(Figure 201)

A. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)

B. Procedure

SUBTASK 09-11-01-580-001

CAUTION

AT ALL TIMES, KEEP THE CENTER OF GRAVITY IN THE LIMITS SHOWN IN THE TOW CENTER-OF-GRAVITY LIMITATIONS FIGURE. LOOK AT ALL UNUSUAL CONDITIONS TO MAKE SURE THAT THE CENTER OF GRAVITY DOES NOT MOVE TOO FAR AFT. IF THE CENTER OF GRAVITY MOVES TOO FAR AFT, THE AIRPLANE COULD FALL ON ITS TAIL.

(1) Do this task: Maintenance Towing, TASK 09-11-00-580-801.

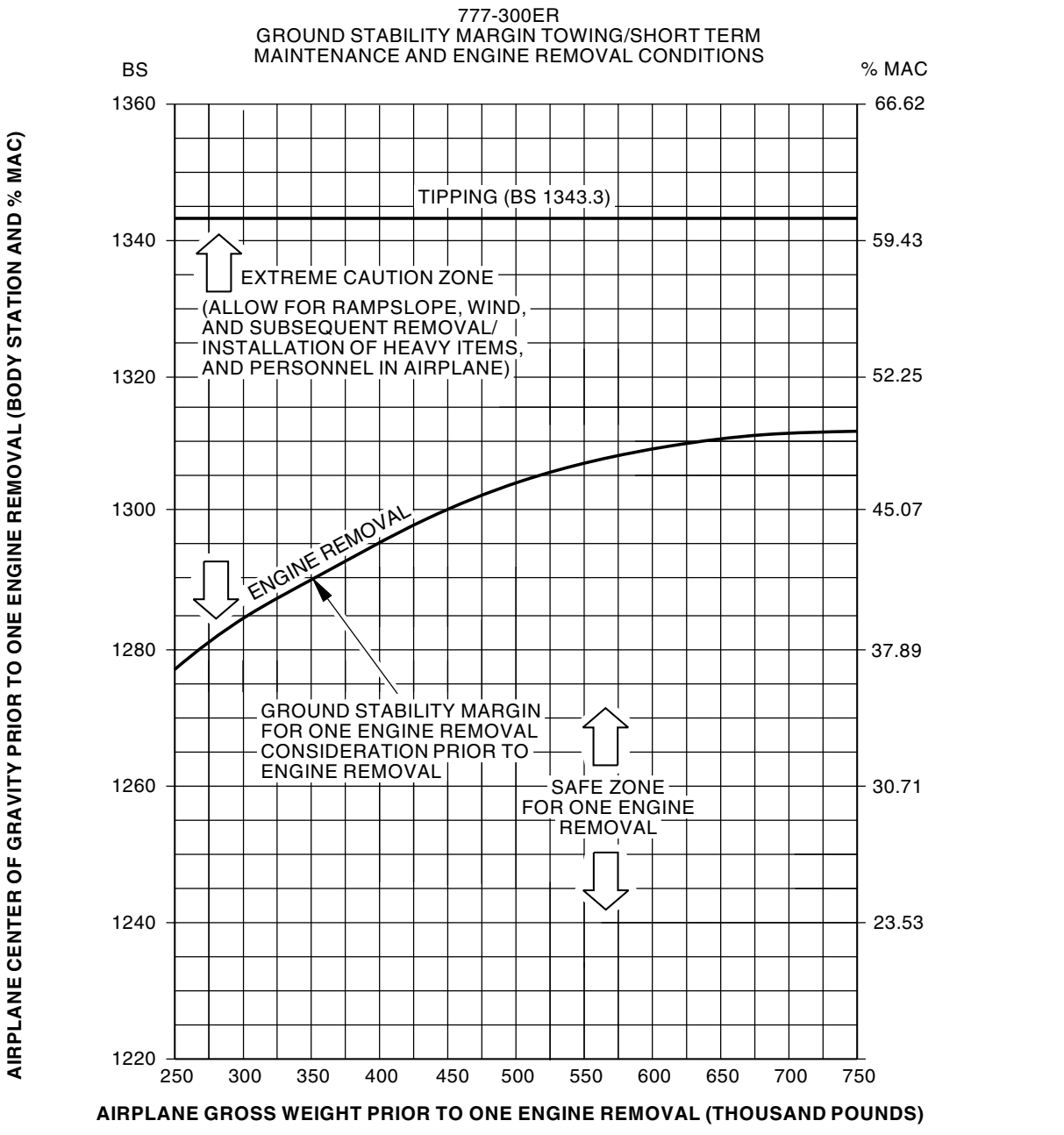
(a) Do not tow the airplane with one or two engines removed if the center of gravity is not in the SAFE ZONE (Figure 201).

NOTE: The center of gravity must be in the SAFE ZONE before the removal of the engines.

1) Use accepted weight and balance procedures to determine the airplane center of gravity is below the GROUND STABILITY MARGIN line.

END OF TASK

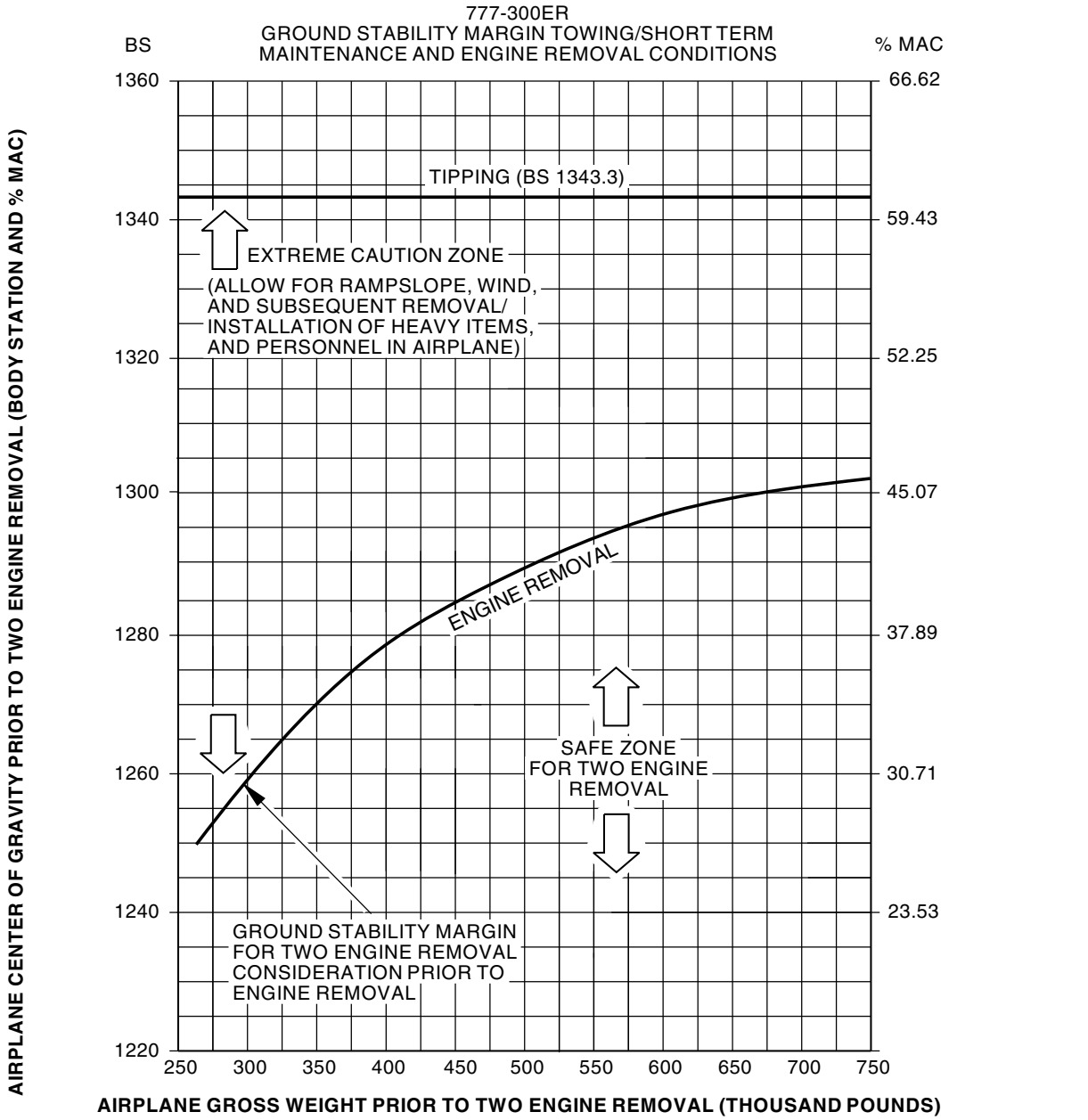
TIPPING OF 777 AIRPLANE
THE CHART BELOW SHOWS THE 777-300ER TIPPING LIMITS. THE ABSOLUTE TIPPING LIMIT IS THE MLG CENTERLINE AT B.S. 1343.3. THE GROUND STABILITY MARGIN LINE REPRESENTS THE ABSOLUTE TIPPING LIMIT TO ACCOUNT FOR FACTORS SUCH AS TOWING FORCES, RAMP SLOPE AND WIND. BY ENSURING THAT THE AIRPLANE WEIGHT AND C.G. DURING MAINTENANCE OPERATIONS IS BELOW THIS LINE, A TIPPING SITUATION WILL BE AVOIDED



N29519 S0006399162_V3

Towing Center of Gravity Limitations with Engine(s) Removed
Figure 201/09-11-01-990-801 (Sheet 1 of 2)

TIPPING OF 777 AIRPLANE
THE CHART BELOW SHOWS THE 777-300ER TIPPING LIMITS. THE ABSOLUTE TIPPING LIMIT IS THE MLG CENTERLINE AT B.S. 1343.3. THE GROUND STABILITY MARGIN LINE REPRESENTS THE ABSOLUTE TIPPING LIMIT TO ACCOUNT FOR FACTORS SUCH AS TOWING FORCES, RAMP SLOPE AND WIND. BY ENSURING THAT THE AIRPLANE WEIGHT AND C.G. DURING MAINTENANCE OPERATIONS IS BELOW THIS LINE, A TIPPING SITUATION WILL BE AVOIDED



N29525 S0006399164_V3

Towing Center of Gravity Limitations with Engine(s) Removed
Figure 201/09-11-01-990-801 (Sheet 2 of 2)

TOW AIRPLANE WITH LIMITED HYDRAULIC BRAKE PRESSURE - MAINTENANCE PRACTICES

1. General

WARNING

WHEN ELECTRICAL POWER IS NOT AVAILABLE TO OPERATE THE BRAKE HYDRAULIC SYSTEM, TELL THE TOW VEHICLE DRIVER. TOW SPEEDS MUST BE DECREASED OR YOU MUST NOT TOW THE AIRPLANE. WITHOUT ELECTRICAL POWER, THERE IS ONLY ACCUMULATOR PRESSURE AVAILABLE TO OPERATE THE BRAKES.

A. When you tow the airplane, do not touch the rudder pedals with your feet.

NOTE: Full pressure (3000 psig) will only supply six full applications of the brakes.

(1) A light pressure on the top of the rudder pedals will cause a decrease of hydraulic pressure through the bleed hole in each antiskid valve.

NOTE: This flow will not stop when you turn off the antiskid system.

B. Do not apply the brakes unless there is an emergency, or until the airplane is stopped.

C. The brakes are usually supplied with power by the airplane right hydraulic system.

(1) The center hydraulic system is used when the right system has a failure.

(a) The center system operates automatically when the right system does not operate.

TASK 09-11-03-580-801

2. Tow the Airplane

A. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)
32-00-15-480-801	Landing Gear Door Safety Pins Installation (P/B 201)
32-00-40-860-802	Landing Gear Ground Door Release System Operation (Open the Doors) (P/B 201)

B. Location Zones

Zone	Area
211	Flight Compartment, Left
740	Subzone 740 - Right Main Landing Gear and Landing Gear Doors

C. Procedure

SUBTASK 09-11-03-580-001

(1) Tow the Airplane, do this task: Maintenance Towing, TASK 09-11-00-580-801.

D. Prepare to set the parking brake when the airplane is parked.

SUBTASK 09-11-03-420-001

WARNING

USE THE CORRECT PROCEDURE TO OPEN THE DOORS. THE DOORS OPEN AND CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(1) Open the door for the right landing gear, do this task: Landing Gear Ground Door Release System Operation (Open the Doors), TASK 32-00-40-860-802.

SUBTASK 09-11-03-010-001

WARNING USE THE CORRECT PROCEDURE TO INSTALL THE DOOR LOCKS. THE DOORS OPEN AND CLOSE QUICKLY AND CAN CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) Install the door lock, do this task: Landing Gear Door Safety Pins Installation, TASK 32-00-15-480-801.

SUBTASK 09-11-03-860-001

CAUTION USE ELECTRICAL POWER FROM THE 28V DC HOT BATTERY BUS TO SET THE PARKING BRAKE ELECTRICALLY (NORMAL). WHEN ELECTRICAL POWER IS NOT AVAILABLE, THE MANUAL OVERRIDE LEVER ON THE PARKING BRAKE VALVE MUST BE MOVED MANUALLY TO POSITION 2. IF YOU DO NOT CLOSE THE PARKING BRAKE VALVE BEFORE YOU APPLY THE BRAKES THE HYDRAULIC PRESSURE WILL DECREASE.

(3) Do the steps that follow to apply the parking brake:

(a) Put the manual override lever of the parking brake valve to POS 2 (closed).

NOTE: The parking brake valve is in the right main gear wheel well.

(b) Push the top of the rudder pedals to apply the brakes.

(c) Pull the parking brake lever to keep pressure on the brake linkage.

(d) Release the brake pedal pressure.

(e) Release the parking brake handle.

NOTE: The foot pressure on the brake pedal must be released before the parking brake handle is released. When you do not release the foot pressure, the parking brakes will not be applied.

END OF TASK

TOW AIRPLANE WITH FLAT TIRE(S) - MAINTENANCE PRACTICES

1. General

A. The airplane can be towed when it has flat tires (Figure 201).

(1) Such operations must be kept to a minimum because flat tires can put too much load on the inflated tires.

(a) These loads cause the good tires to be damaged and replacement tires will be necessary.

(b) Also, during some conditions, damage can occur to the wheels, landing gear, and the airplane structure.

TASK 09-11-04-580-801

2. Tow the Airplane With Flat Tire(s)

A. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)
32-45-03-700-802	Wheels Inspection (Wheel Removed from the Airplane) (P/B 601)

B. Location Zones

Zone	Area
700	Landing Gear and Landing Gear Doors

C. Prepare to Tow the Airplane with Flat Tires

SUBTASK 09-11-04-580-001

(1) To tow the airplane with flat tires, do the steps that follow, do this task: Maintenance Towing, TASK 09-11-00-580-801

(a) Refer to the Towing Limits to tow the airplane safely, (Figure 201).

(b) Keep the tow speeds to a minimum.

(c) Prevent sharp turns when you tow the airplane.

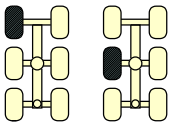
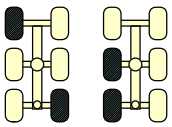
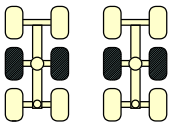
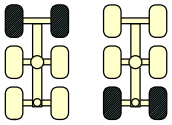
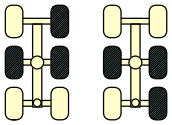
SUBTASK 09-11-04-210-001

(2) After the airplane is towed with two flat tires on one axle (as shown in conditions (2) and (5) thru (11) (Figure 201), do a wheel inspection; do this task: Wheels Inspection (Wheel Removed from the Airplane), TASK 32-45-03-700-802.

NOTE: It is not recommended to tow the airplane if the wheels are flat spotted. Wheels with flat spots can cause high drag loads and landing gear damage. Do a tow only to get the airplane (with flat spotted wheels) off of the runway when the runway must be cleared.

NOTE: It is recommended to replace the flat spotted wheels and the flat tires with serviceable equipment before you tow the airplane.

——— END OF TASK ———

CONDITIONS	FLAT TIRE(S) POSITION 1	RESTRICTIONS
(1) ONE FLAT TIRE ON NOSE GEAR		1. DO NOT USE TOWBARLESS TOWING. 2. NO RESTRICTIONS FOR TOWING WITH CONVENTIONAL TOW BARS.
(2) TWO FLAT TIRES ON NOSE GEAR		1. DO NOT USE TOWBARLESS TOWING. 2. TOW TO CLEAR RUNWAY WITH CONVENTIONAL TOWBAR THEN INSTALL AT LEAST ONE SERVICEABLE TIRE.
(3) ONE FLAT TIRE IN ANY POSITION, EITHER OR BOTH MAIN GEARS		NONE
(4) TWO FLAT TIRES, EITHER OR BOTH MAIN GEARS BUT NOT ON THE SAME AXLE		NONE
(5) TWO FLAT TIRES ON CENTER AXLE, EITHER OR BOTH MAIN GEARS		NONE
(6) TWO FLAT TIRES ON THE SAME AXLE, (FORWARD OR AFT), EITHER OR BOTH MAIN GEARS		TOW ONLY IF RUNWAY MUST BE CLEARED. LIMIT NOSE GEAR STEERING TO ±35˚. AFTER CLEARING RUNWAY, INSTALL SERVICEABLE TIRE(S) TO MEET CONDITION (3).
(7) THREE FLAT TIRES, EITHER OR BOTH MAIN GEARS. BOTH TIRES ON CENTER AXLE FLAT PLUS ONE ADDITIONAL TIRE FLAT		INSTALL AT LEAST ONE CENTER AXLE TIRE PER GEAR TO MEET CONDITION (4). TOW TO CLEAR RUNWAY.

TOWING RESTRICTIONS

1 BLACK TIRE INDICATES POSITION OF FLAT TIRE. FLAT TIRE MAY BE IN ANY OTHER COMPARABLE POSITION TO THE ONE SHOWN.

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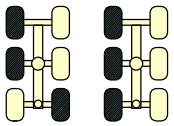
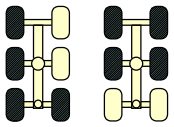
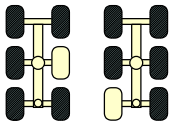
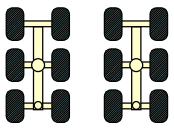
Tow Airplane With Flat Tire(s)
Figure 201/09-11-04-990-801 (Sheet 1 of 2)

CONDITIONS	FLAT TIRE(S) POSITION 1	RESTRICTIONS
(8) ALL OTHER COMBINATIONS OF THREE FLAT TIRES, EITHER OR BOTH MAIN GEARS. EXAMPLE OF TWO COMBINATIONS SHOWN.		TOW ONLY IF RUNWAY MUST BE CLEARED. LIMIT NOSE GEAR STEERING TO ±35°. AFTER CLEARING RUNWAY, INSTALL SERVICEABLE TIRE(S) TO MEET CONDITION (4).
(9) FOUR FLAT TIRES, EITHER OR BOTH MAIN GEARS. EXAMPLE OF TWO COMBINATIONS SHOWN.		1. INSTALL SERVICEABLE TIRES TO MEET CONDITION (4). TOW TO CLEAR RUNWAY. 2. DEFLATE ALL REMAINING MAIN GEAR TIRES. TOW AT BOTH MAIN GEARS IF RUNWAY MUST BE CLEARED. LIMIT NOSE GEAR STEERING TO ±35°. AFTER CLEARING RUNWAY, INSTALL SERVICEABLE TIRES TO MEET CONDITION (4).
(10) FIVE FLAT TIRES, EITHER OR BOTH MAIN GEARS. EXAMPLE OF TWO COMBINATIONS SHOWN.		1. INSTALL SERVICEABLE TIRES TO MEET CONDITION (4). TOW TO CLEAR RUNWAY. 2. DEFLATE ALL REMAINING MAIN GEAR TIRES. TOW AT BOTH MAIN GEARS IF RUNWAY MUST BE CLEARED. LIMIT NOSE GEAR STEERING TO ±35°. AFTER CLEARING RUNWAY, INSTALL SERVICEABLE TIRES TO MEET CONDITION (4).
(11) SIX FLAT TIRES, EITHER OR BOTH MAIN GEARS		1. INSTALL SERVICEABLE TIRES TO MEET CONDITION (4). TOW TO CLEAR RUNWAY. 2. TOW AT BOTH MAIN GEARS IF RUNWAY MUST BE CLEARED. LIMIT NOSE GEAR STEERING TO ±35°. AFTER CLEARING RUNWAY, INSTALL SERVICEABLE TIRES TO MEET CONDITION (4).

TOWING RESTRICTIONS (CONTINUED)

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Tow Airplane With Flat Tire(s)
Figure 201/09-11-04-990-801 (Sheet 2 of 2)

TOW AIRPLANE WITH ONE MAIN LANDING GEAR WHEEL REMOVED - MAINTENANCE PRACTICES

1. General

A. The airplane can be towed when one of the twelve main landing gear wheels is removed.

(1) Such operations shall be kept to a minimum because having one MLG wheel removed puts additional load on the remaining tires. Do not exceed the limits below or damage may occur to the remaining tires. Exceeding these limits can also damage the wheels, landing gear, and airplane structure.

TASK 09-11-05-580-801

2. Tow the Airplane With One Main Landing Gear Wheel Removed

A. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)

B. Location Zones

Zone	Area
700	Landing Gear and Landing Gear Doors

C. Procedure

SUBTASK 09-11-05-580-001

(1) To tow the airplane with one main landing gear wheel removed, do the steps that follow, do this task: Maintenance Towing, TASK 09-11-00-580-801

(a) Keep the tow speeds to a minimum. A maximum tow speed of 10 mph is permitted.

(b) Prevent sharp turns when you tow the airplane. Nose gear turn angle is limited to 55 degrees.

(c) Airplane weight is limited to a maximum of 565 k with a CG between 14% and 44%. The 777-200 A-market Airplane with a maximum taxi weight of 547 k can have a maximum weight of 547 k when towing with a main landing gear wheel removed.

NOTE: Only one main landing gear wheel can be removed at any one time.

——— END OF TASK ———

TAXIING - MAINTENANCE PRACTICES

1. General

A. This procedure has the task to taxi the airplane for maintenance.

(1) Refer to the Operations Manual to taxi the airplane for revenue service.

B. Taxi Safety

(1) When you taxi the airplane, caution and precision are necessary.

(a) This procedure must be done only by persons who are trained to taxi the airplane.

(2) The taxi path must be clear of all persons and vehicles.

(3) You must get approval from the airport ground control to taxi the airplane.

(4) You must keep clearance from buildings and other airplanes, at all times.

(5) You must have electrical power to operate: the taxi lights, the navigation lights, the radio and intercom equipment, other necessary systems.

NOTE: Electrical power, lights, radio, intercom, and other necessary systems are is necessary to taxi the airplane safely.

(6) The hydraulic systems described in the procedure must be pressurized to supply hydraulic pressure.

NOTE: Hydraulic systems must be pressurized so you can use the airplane brakes and the nose wheel steering systems.

(7) When you taxi the airplane at night or in bad weather conditions, the crew must know the area around the airplane.

(a) They must know the location of parked vehicles, maintenance stands, and the condition of the pavement surface.

(8) A taxi checklist is necessary to help the crew have a safe taxi operation.

TASK 09-21-00-580-802

2. Prepare Personnel for Airplane Taxi

A. Maintenance Persons Necessary to Taxi the Airplane

SUBTASK 09-21-00-580-003

(1) The persons necessary for a safe taxi operation must include a flight compartment crew and a ground crew.

SUBTASK 09-21-00-580-004

(2) There must be a minimum of two flight compartment persons.

(a) The flight compartment persons must be trained in all of the procedures that follow:

1) Correct procedure to prepare the flight compartment

2) The engine start, operation, and shutdown procedures

3) The engine fire and emergency procedures

4) The radio and intercom operation and procedures

5) The ground crew communication procedures

6) The taxi procedures (turning, wing tip clearances, taxi speeds, etc.).

SUBTASK 09-21-00-580-005

(3) A minimum of one ground crew person is necessary to do the tasks that follow:

NOTE: In areas of congestion or a limit of space (hangers, ramp areas next to the terminal, airplane parking areas, etc.) more ground persons are necessary. This is to help monitor the wing clearances and to be general observers.

(a) To remove and replace the wheel chocks

NOTE: If the ramp does not slope : Move the aft NLG chocks away from the tires. During the refuel, the NLG tires roll aft as the MLG shock absorber compresses. Make sure that the chocks do not touch the MLG tires. The weight of the fuel can lower the aircraft and cause the tires to catch the chocks

NOTE: If the ramp slopes: Make sure that the chocks down from the tires touch the NLG and MLG tires. Make sure that the chocks up from the tires do not touch the NLG and MLG tires.

(b) To help during the engine start

(c) To help the flight compartment crew during the airplane movement

(d) To make sure the airplane taxi path is clear.

SUBTASK 09-21-00-580-006

(4) Communications

(a) It is not easy to see most of the area around the airplane from the flight compartment windows.

1) Also, it is hard to see much of the ground operations work near the airplane from the flight compartment.

WARNING DO NOT CONNECT A HEADSET, OR TOUCH CONNECTIONS TO THE AIRPLANE WHEN THERE IS LIGHTNING, OR IN STRONG ELECTROMAGNETIC FIELDS. LIGHTNING, AND ELECTRICAL CURRENT CAN CAUSE INJURIES TO PERSONNEL.

(b) There must be communication between the airplane and the ground crews.

1) Communication is necessary during the engine start, removal and replacement of the wheel chocks, and during the engine shutdown

(c) Safe taxi operation require the use of hand signals, lights, intercom and/or radio communications.

(d) Communication with the airport ground control is also necessary for taxi operations.

1) Communication will make sure that the persons in the control tower know of the taxi operation and the path that the airplane will follow.

——— END OF TASK ———

TASK 09-21-00-840-801

3. Airplane Taxi Procedure

A. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)

B. Taxi Airplane

SUBTASK 09-21-00-580-007

(1) Procedure to Taxi the Airplane

(a) When you taxi the airplane on the ground, the movement is equivalent to other airplanes with conventional tricycle landing gear.

(b) The nose wheel steering and the engine thrust are used to taxi the airplane.

(c) Airplane ground stability.

1) During the airplane taxi, the center of gravity (CG) must always be below the operational CG limits (TASK 09-11-00-580-801).

(d) Airplane clearance during the taxi.

1) Make sure you have the necessary clearance when you go near a parked airplane or other structures.

2) When the APU in the taxi airplane or the parked airplane is on you must have a minimum clearance of 50 feet.

a) The clearance must be between the APU exhaust port and the adjacent airplane's wingtip (fuel vent).

(e) Airplane taxi speed.

1) The taxi speed must not be more than approximately 20 knots. Speeds more than 20 knots, added to long taxi distances will cause heat to collect in the tires.

2) Before you make a turn, decrease the speed of the airplane to a speed which is applicable to the local conditions.

a) On a dry surface, use a speed of approximately 8 to 12 knots.

(f) Airplane turns during taxi.

1) Always use the largest turn radius possible.

(g) Do not try to turn the airplane until it has started to move.

(h) Make sure you know the taxi turning radii (Figure 201).

1) Monitor the wingtips and the horizontal stabilizer carefully for clearance with buildings, equipment, and other airplanes.

(i) Make all turns at a slow taxi speed to prevent tire skids.

(j) When a left or right engine is used to help make a turn, use only the minimum power possible.

(k) Do not let the airplane stop during a turn.

(l) Do not use the brakes to help during a turn.

NOTE: See the paragraph on airplane taxi in bad weather conditions about differential braking.

1) Decrease the speed of the airplane with the brakes when it is necessary, before the turn is started.

2) Make a minimum radius turn with maximum nose wheel steering, and the engine thrust only.

3) When you use the brakes during a turn, they will cause the main and nose landing gear tires to wear.

(m) When it is possible, complete the taxi in a straight line roll for a minimum of 10 feet.

NOTE: This will remove the torsional stresses in the landing gear components, and in the tires.

(n) Airplane taxi in bad weather conditions.

1) You must know the conditions of the taxiway surface, and reduce the taxi speeds when you taxi the airplane in bad weather conditions.

2) Taxi the airplane with the flaps up.

3) Use the differential engine thrust when you taxi the airplane on a slick surface at decreased speeds.

NOTE: Differential thrust will help to keep airplane movement through a turn.

4) A light differential braking can have more of an effect than nose wheel steering, on very slick surfaces.

SUBTASK 09-21-00-580-008

(2) Airplane Characteristics (Figure 201, Figure 202, Figure 203, Figure 204)

(a) The turn radius that the airplane can make is shown in (Figure 201).

(b) The factors that can change the diameter of a turn are as follows:

1) The nose wheel steering angle

2) The engine power

3) The center of gravity of the airplane

4) The airplane gross weight

5) The taxiway surface conditions

6) The airplane ground speed.

(c) Engine operation.

WARNING YOU MUST FOLLOW ALL PRECAUTIONS WHEN YOU OPERATE THE JET ENGINES. INJURY TO PERSONS OR DAMAGE TO BUILDINGS, EQUIPMENT, OR OTHER AIRPLANES CAN OCCUR.

1) To find the dangerous areas at engine idle and at the engine breakaway thrust see (Figure 202, Figure 203).

2) All persons must keep away from the two engine inlet and exhaust areas.

3) Hot, high velocity gases come out of the exhaust nozzles of the engine.

a) The velocity of the engine fan air, especially at high thrust positions, is sufficient to cause injury to persons.

4) When the thrust reverser is in the reverse position, the high velocity fan air will come out and move forward.

5) When this occurs, the hot, high velocity engine exhaust gases will continue to come out rearward.

(d) To find the angles of view from the flight compartment, for a person in the left or right seat, see (Figure 204).

NOTE: This is when the seat is in the correct position for the pilot or co-pilot to operate the rudder and brake pedals.

END OF TASK

TASK 09-21-00-580-801

4. Taxi the Airplane

(Figure 201, Figure 202, Figure 203, Figure 204, Figure 205)

A. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)
10-11-05-500-801	Chock Installation in Winds or Wind Gusts to a Maximum of 35 Knots (P/B 201)
12-15-01-610-810	Main Landing Gear Shock Strut Servicing (P/B 301)
12-15-02-610-805-002	Nose Landing Gear Shock Strut Servicing (P/B 301)
24-22-00-860-805	Supply Electrical Power (P/B 201)
29-11-00-860-801	Main Hydraulic System Pressurization (P/B 201)
71-00-00-800-835-H00	Engine Start (Selection) (P/B 201)

B. Tools/Equipment

NOTE: When more than one tool part number is listed under the same "Reference" number, the tools shown are alternates to each other within the same airplane series. Tool part numbers that are replaced or non-procurable are preceded by "Opt:", which stands for Optional.

Reference	Description
COM-1505	Chocks - Wheel Part #: AC6820-LR Supplier: 032T9 Part #: PF10-010 Supplier: 3D5B2 Part #: W88 Supplier: 9L752

C. Location Zones

Zone	Area
211	Flight Compartment, Left
212	Flight Compartment, Right

D. Prepare to Taxi the Airplane

SUBTASK 09-21-00-580-001

(1) To prepare to taxi the airplane, you must do the steps that follow:

NOTE: These steps are only minimum procedures.

(a) Use a taxi checklist applicable to your operations.

(b) Examine the external areas of the airplane.

1) Make sure that the wheel chocks, COM-1505 are correctly installed (Chock Installation in Winds or Wind Gusts to a Maximum of 35 Knots, TASK 10-11-05-500-801).

2) Make sure that all engine cowls, doors, and hatches are closed.

3) Make sure that the engine inlets and exhausts are clear.

4) Make sure that the flight control surfaces are clear and will not touch the ground equipment.

5) Make sure that the tires are in a satisfactory condition.

CAUTION DO NOT TAXI THE AIRPLANE WITH THE SHOCK STRUTS OF THE MAIN LANDING GEAR FULLY COMPRESSED. DAMAGE TO THE SHOCK STRUTS CAN OCCUR.

6) Make sure that the shock struts of the main landing gear are filled correctly, do this task: Main Landing Gear Shock Strut Servicing, TASK 12-15-01-610-810.

CAUTION DO NOT TAXI THE AIRPLANE WITH THE SHOCK STRUT OF THE NOSE LANDING GEAR FULLY COMPRESSED. DAMAGE TO THE SHOCK STRUT CAN OCCUR.

7) Make sure that the shock strut of the nose landing gear is filled correctly, do this task: Nose Landing Gear Shock Strut Servicing, TASK 12-15-02-610-805-002.

CAUTION THE MAXIMUM PERMITTED SHOCK STRUT EXTENSION FOR THE NOSE LANDING GEAR IS 36 INCHES AT DIM "A". THIS IS TO MAKE SURE THE CENTERING CAM DOES NOT ENGAGE. ALSO, THIS IS TO KEEP A FORWARD CENTER OF GRAVITY TO MAKE SURE THE AIRPLANE DOES NOT FALL ON ITS TAIL. IF YOU DO NOT FOLLOW THESE INSTRUCTIONS, DAMAGE TO THE AIRPLANE CAN OCCUR.

8) Make sure the shock strut of the nose landing does not have more than a maximum of 36 inches at DIM "A" (Figure 205).

NOTE: See (Figure 205) for the procedure to measure the extension of the shock strut for the nose landing gear.

9) Make sure that the towing lever on the metering valve module on the nose landing gear is in the NORMAL position (TASK 09-11-00-580-801).

(c) Make sure the flight compartment seats are adjusted as follows:

1) To give the correct view from the flight compartment windows

2) To give the correct position to operate the rudder and brake pedals

(d) Make sure that all airplane systems are prepared to have electrical power safely put on the airplane.

(e) Supply electrical power, do this task: Supply Electrical Power, TASK 24-22-00-860-805.

CAUTION A MINIMUM OF 1080 GALLONS (7303 POUNDS/3313 KILOGRAMS) OF FUEL IS NECESSARY IN THE RIGHT MAIN FUEL TANK TO COOL THE HYDRAULIC FLUID. A MINIMUM OF 709 GALLONS (4794 POUNDS/2175 KILOGRAMS) OF FUEL IS NECESSARY IN THE LEFT MAIN FUEL TANK TO COOL THE HYDRAULIC FLUID. WHEN SUFFICIENT FUEL IS NOT IN THE FUEL TANKS, THE HYDRAULIC FLUID WILL BECOME TOO HOT.

(f) Make sure that the fuel quantity indication on the primary EICAS display shows the correct level of fuel.

NOTE: Add a sufficient quantity of fuel (more than the minimum) that will be necessary for the engine start and taxi operations.

1) Check for a fuel imbalance condition.

NOTE: If an aircraft was moved (tow or taxi) with a lateral fuel imbalance in excess of AMM limits while on the ground, a structural inspection is not required provided normal taxi procedures were followed, the maximum taxi speed was below 25 knots and no hard braking or maximum braking occurred. If these limitations were exceeded a structural inspection is required, contact engineering for a specific bill of work.

(g) Make sure that the hydraulic systems are pressurized for the brake and nose wheel steering operations, do this task: Main Hydraulic System Pressurization, TASK 29-11-00-860-801.

NOTE: Hydraulic power for the brakes comes from the right hydraulic system. The alternate braking receives its hydraulic power from the center hydraulic system and gives automatic backup when the right system does not operate. If the right and center systems do not operate, the airplane must not be taxied. But, if all hydraulic systems stop during the taxi, the brakes will be operated through the brake accumulator. The brake accumulator is in the right hydraulic system.

When it is fully serviceable, the accumulator for the parking brake will permit the brakes to be applied approximately 5 to 6 times.

The nose wheel steering gets hydraulic power from the center hydraulic system. The landing-gear-control lever must be in the DN position to use the nose wheel steering system.

(h) Make sure that the landing-gear-control lever is in the DN position.

WARNING

DO NOT CONNECT A HEADSET AND DO NOT TOUCH CONNECTIONS TO THE AIRPLANE DURING ATMOSPHERIC ELECTRICAL ACTIVITY OR STRONG RADIATIVE FIELDS. LIGHTNING STRIKE AND HIGH DISCHARGE CURRENTS CAN CAUSE SEVERE INJURY.

(i) Make sure that the VHF radio is on and set to the correct frequency.

NOTE: This is for radio communications with the authority for the airport ground control.

(j) Make sure that the service interphone and the hand radios operate, and the ground crew can hear you.

E. Taxi the Airplane

SUBTASK 09-21-00-580-002

(1) To taxi the airplane, do the steps that follow:

(a) Get the necessary approval from the airport ground control to start the engine.

(b) Tell the ground crew to remove the wheel chocks, and the static electrical ground wire (as necessary).

(c) Make sure that the beacon light that turns, is on.

NOTE: The beacon light must be on while the engines are on.

(d) Make sure that the navigation lights are on.

NOTE: The lights must be on during movement of the airplane.

(e) Start the engines, do this task: Engine Start (Selection), TASK 71-00-00-800-835-H00.

(f) When the airplane is prepared to taxi, get approval to taxi from the airport ground control.

(g) When the ground crew gives the signal, release the brakes and start to taxi the airplane.

1) Supply engine power smoothly to start the airplane forward movement.

2) Put the engines back to minimum power when the airplane starts to move.

(h) Make sure the airplane moves forward, in a straight line before a turn is started.

(i) Turn the airplane with the tiller for the nose wheel steering, or the rudder pedals.

NOTE: You will get approximately 70 degrees of nose wheel steering when the tiller for the nose wheel steering is turned to its maximum. You will get approximately 7 degrees of nose wheel steering through maximum movement of the rudder pedals.

(j) Speak to the ground crew during a turn to make sure that the airplane stays clear of all equipment, buildings, and airplanes.

1) Use the service interphone or the hand radios.

(k) When the taxi surface has taxi lines available, taxi the airplane with the nose wheel on the line.

(l) Taxi the airplane slowly with the engines at minimum power.

1) Use the Inertial Reference System (IRS) in the ground speed (GS) mode to monitor the taxi speed.

CAUTION

DO NOT USE THE BRAKES CONTINUOUSLY TO KEEP THE NECESSARY TAXI SPEED. IF YOU USE THE BRAKES WITHOUT SUFFICIENT TIME FOR THE BRAKE TEMPERATURE TO DECREASE, YOU CAN CAUSE THE BRAKES TO BECOME TOO HOT. THIS CAN CAUSE BRAKE DAMAGE OR THE TIRE INFLATION PRESSURE TO DECREASE BECAUSE A WHEEL-THERMAL-FUSE PLUG MELTED.

2) Operate the brakes slowly and smoothly for short periods only.

NOTE: The Brake Temperature Monitoring System may not indicate high wheel temperatures if the heating comes from continuous light brake application.

a) Do not taxi the aircraft at low speeds that require continuous or frequent brake application.

CAUTION

DO NOT TAXI MORE THAN 8 MILES. IF YOU TAXI MORE THAN 8 MILES, THE BRAKES CAN BECOME TOO HOT. THE HEAT CAN ALSO MELT THE THERMAL-HEAT PLUG WHICH WILL DECREASE THE TIRE INFLATION PRESSURE. DAMAGE TO THE WHEELS, BRAKES, AND TIRES CAN OCCUR.

3) Limit the total taxi distance to 8 mi (13 km).

a) If this taxi distance limit is exceeded, stop and cool the tires for 1 hour before continuing.

(m) Always use the largest radius possible when you turn the airplane.

NOTE: This will decrease the side loads on the landing gear, and the tire wear will be decreased.

1) Make sure that the airplane continues to move while a turn is made.

a) Do not stop during a turn.

(n) When it is possible, complete the taxi in a straight line roll for a minimum of 10 feet.

NOTE: This will remove the torsional stresses in the main landing gear components, and in the tires.

(o) Operate the brakes to stop the airplane.

(p) Set the parking brake after the airplane has stopped.

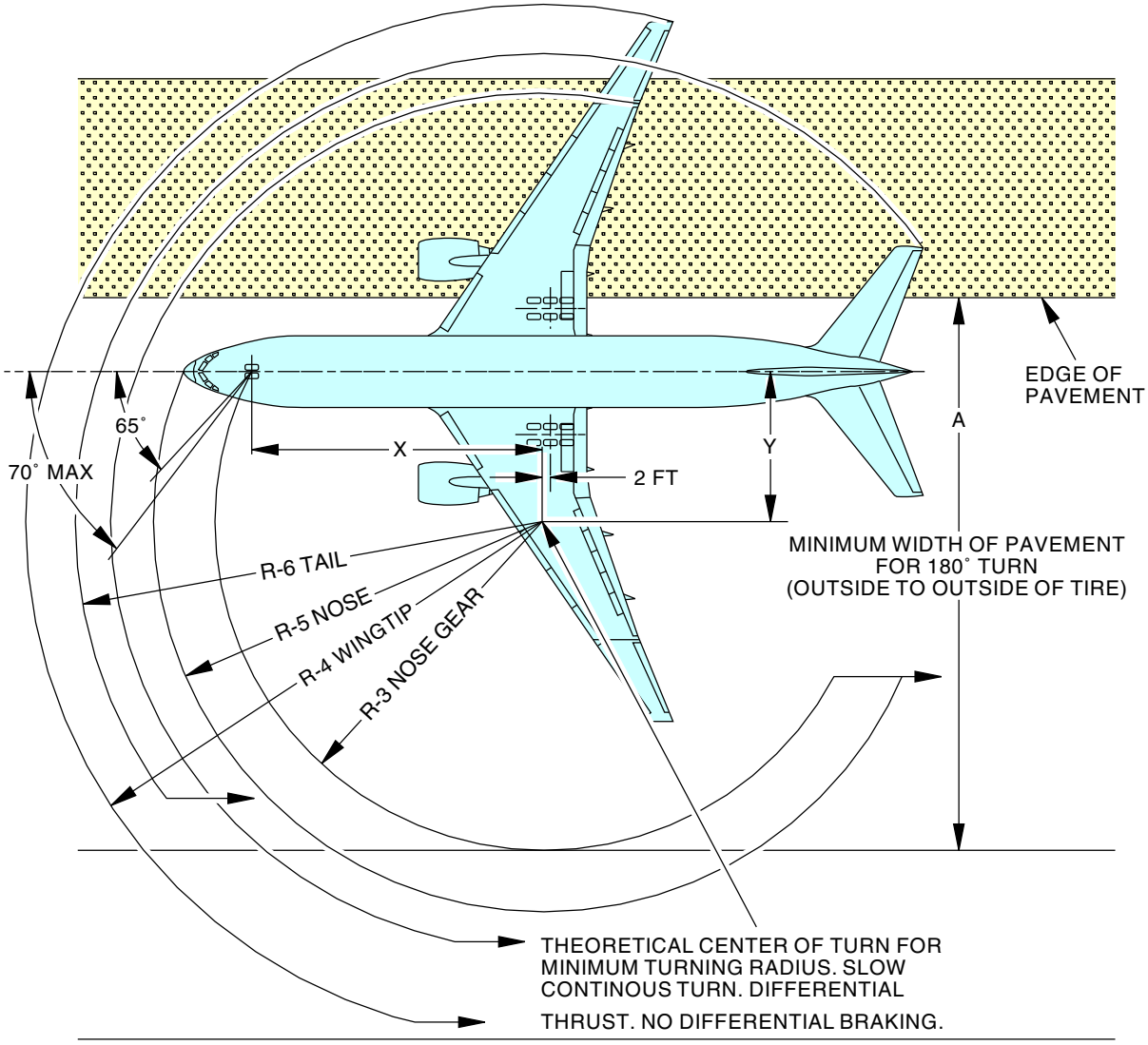
(q) Use the airline checklist to deactivate, and to shutdown the applicable airplane systems.

(r) Install the wheel chocks, COM-1505 on the landing gear wheels, do this task: Chock Installation in Winds or Wind Gusts to a Maximum of 35 Knots, TASK 10-11-05-500-801.

(s) Install the static electrical ground wire.

(t) Release the parking brake after the wheel chocks are installed (optional).

——— END OF TASK ———



NOTE:

6-DEGREE TIRE SLIP ANGLE
APPROXIMATE FOR 64˚ TURN ANGLE.
777-300 SHOWN.

MODEL	EFFECTIVE TURNING ANGLE (DEG)	X		Y		A		R3		R4		R5		R6	
		FT	M	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
777-300ER	64	100	30.6	49	14.9	183.9	56.1	112	34.0	161	49.1	129	39.4	149	45.3

NOTE:

DIMENSIONS ARE ROUNDED TO THE NEAREST FOOT AND 0.1 METER.

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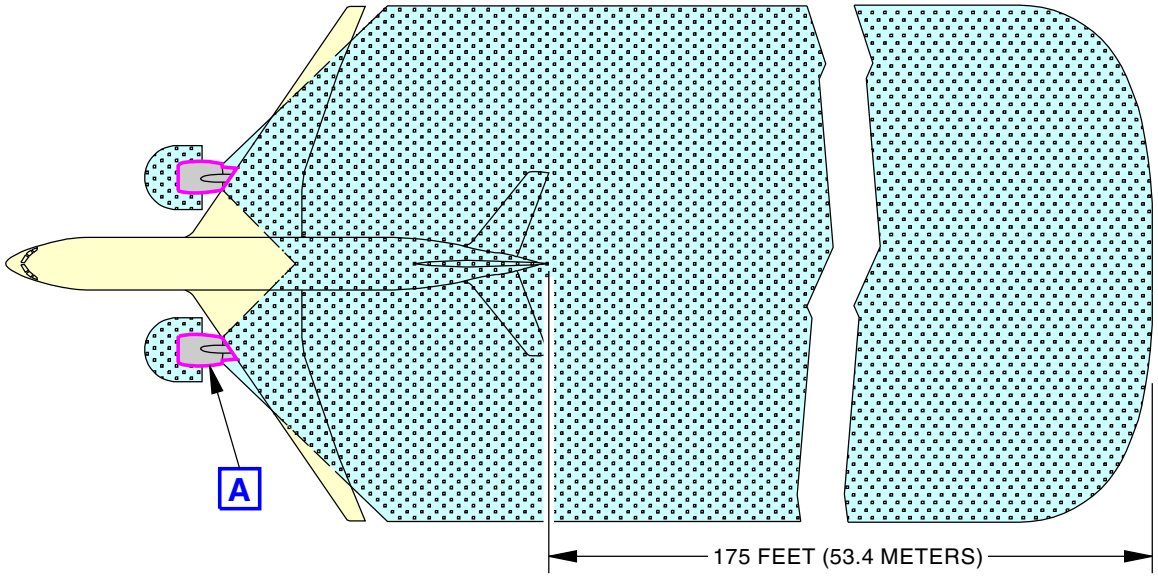
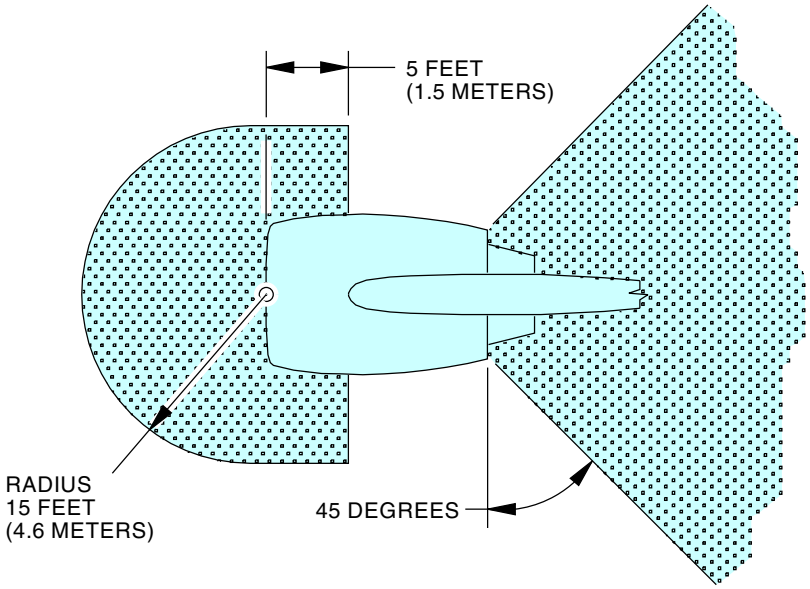
Taxi Turning Radii
Figure 201/09-21-00-990-801



EXHAUST HAZARD AREA



INLET HAZARD AREA

A

WARNING:

IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DISTANCE OF THE INLET AREA BY 20%. IF THE RAMP SURFACES ARE SLIPPERY, ADDITIONAL PRECAUTIONS SUCH AS CLEANING THE RAMP WILL BE NECESSARY FOR SAFETY.

GROUND PERSONS MUST STAY CLEAR OF THESE HAZARD ZONES. MAKE SURE YOU KEEP COMMUNICATION WITH THE FLIGHT COMPARTMENT PERSONS DURING THE ENGINE RUNS.

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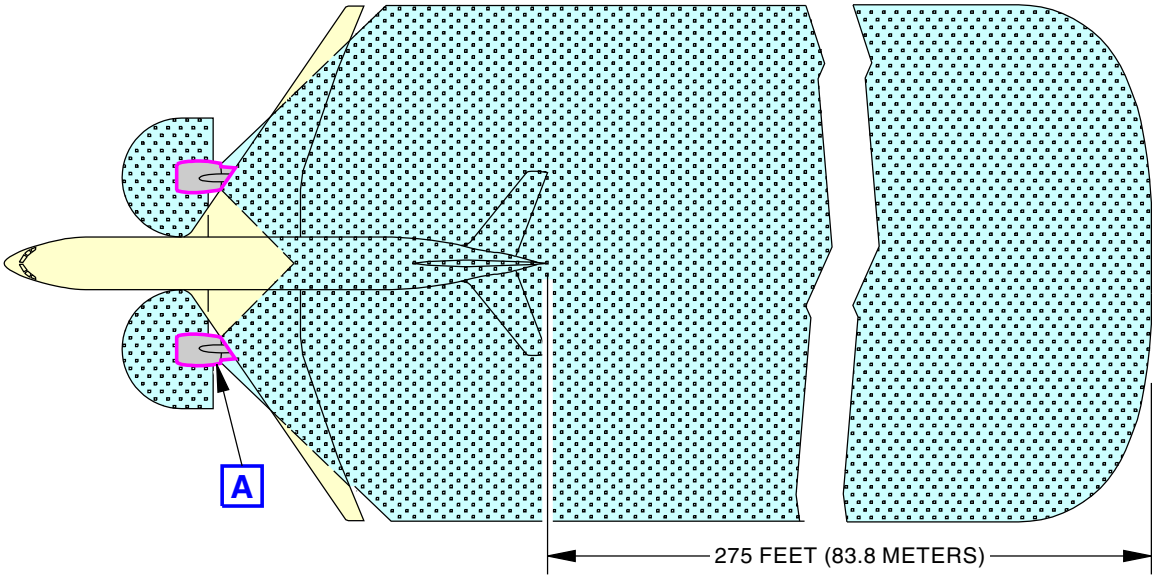
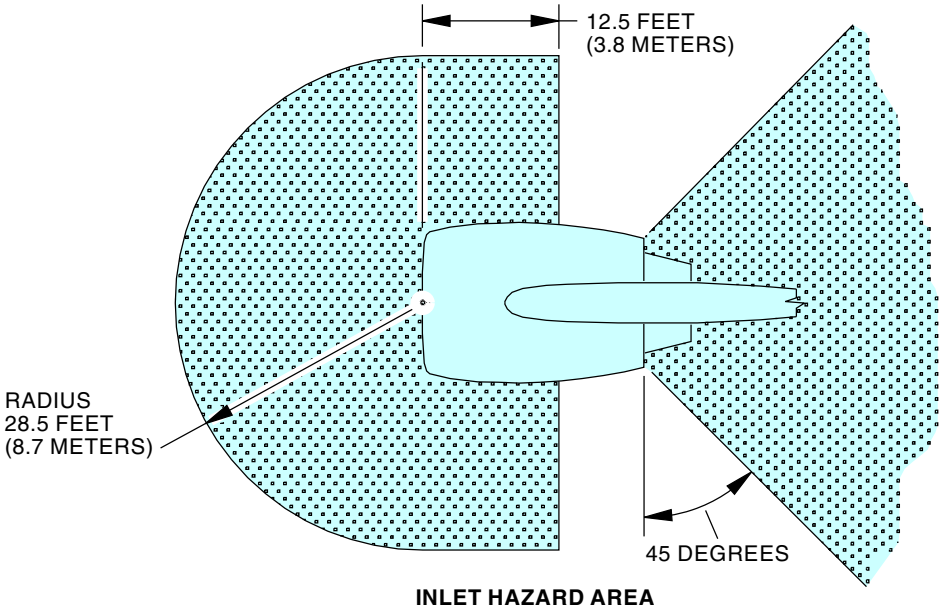
Minimum Idle-Power - Hazard Area
Figure 202/09-21-00-990-802



EXHAUST HAZARD AREA



INLET HAZARD AREA

A

WARNING:

IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DISTANCE OF THE INLET AREA BY 20%. IF THE RAMP SURFACES ARE SLIPPERY, ADDITIONAL PRECAUTIONS SUCH AS CLEANING THE RAMP WILL BE NECESSARY FOR SAFETY.

GROUND PERSONS MUST STAY CLEAR OF THESE HAZARD ZONES. MAKE SURE YOU KEEP COMMUNICATION WITH THE FLIGHT COMPARTMENT PERSONS DURING THE ENGINE RUNS.

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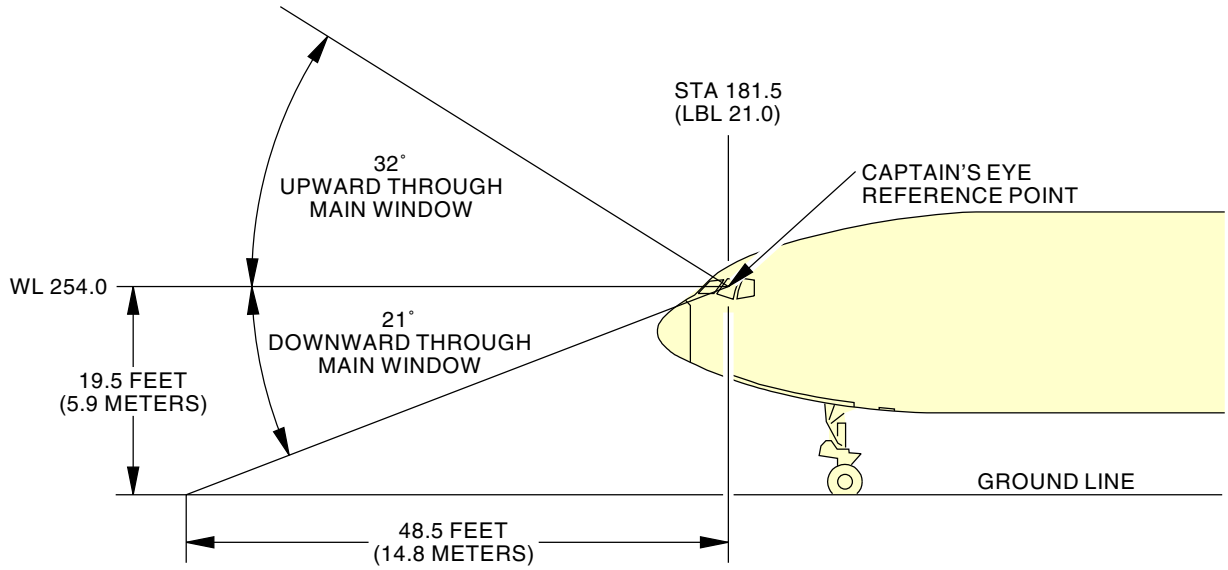
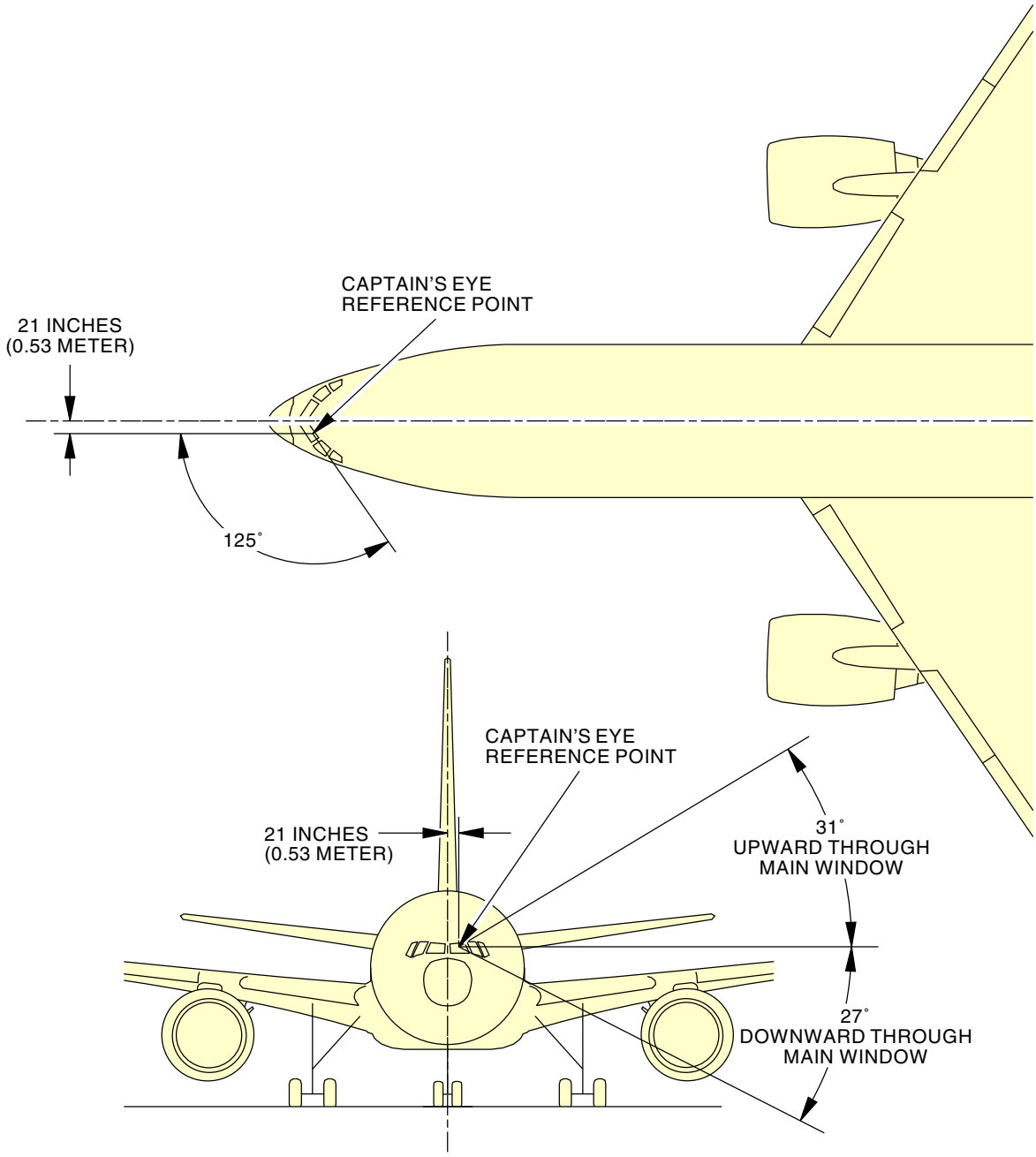
Breakaway Thrust Power - Hazard Area
Figure 203/09-21-00-990-803



NOTE:
PITCH = -1°

C19449 S0006399192_V2

Visibility from Cockpit in Static Position
Figure 204/09-21-00-990-804 (Sheet 1 of 2)



NOTE:

HEAD ROTATED ABOUT POINT 3.3 INCHES (0.08 METER)
AFT OF CAPTAIN"S EYE REFERENCE POSITION

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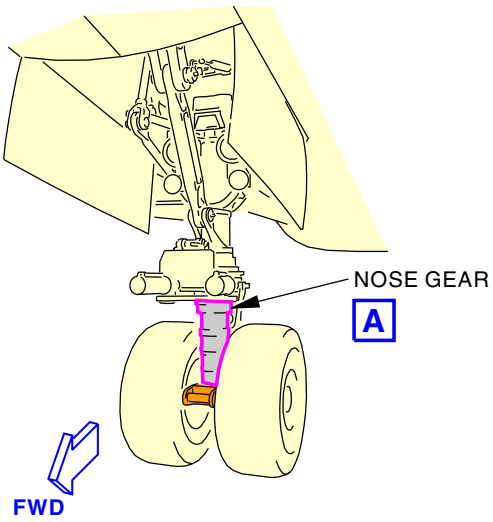
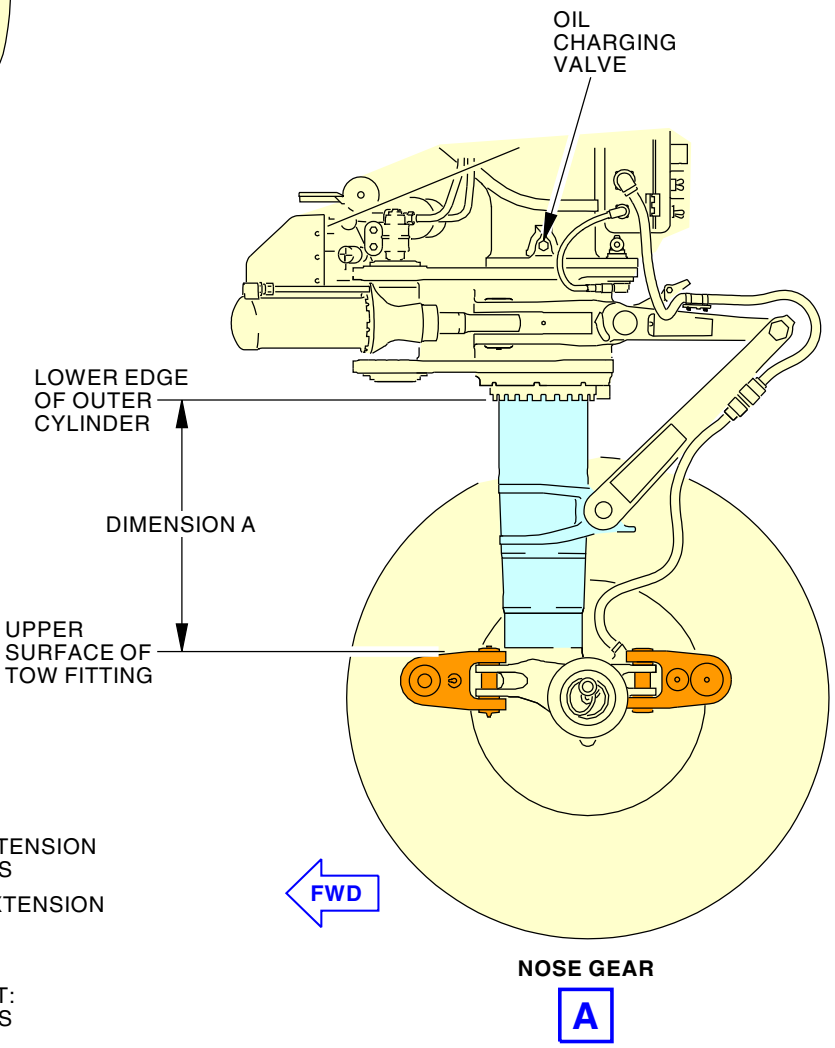
Visibility from Cockpit in Static Position
Figure 204/09-21-00-990-804 (Sheet 2 of 2)





MINIMUM SHOCK STRUT EXTENSION
DIMENSION A = 20.42 INCHES

MAXIMUM SHOCK STRUT EXTENSION
DIMENSION A = 36.0 INCHES

NOTE:

FULLY COMPRESSED STRUT:
DIMENSION A = 18.42 INCHES

E27032 S0006399194_V2

Landing Gear Shock Strut Extension Specifications
Figure 205/09-21-00-990-805