CHAPTER

09

TOWING AND TAXIING



CHAPTER 09 TOWING AND TAXIING

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CHAPTER 09 TOWING AND TAXIING

CHAPTER SECTION

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TOWING - MAINTENANCE PRACTICES

1. General

- This procedure has three tasks.
 - Maintenance Towing (1)
 - Pushback/Dispatch Towing
 - (3) Towing the Airplane in High Winds

Definitions B.

- 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 minimum 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.
- Dispatch (Operation) 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 mile (kilometers) with speeds up to 20 mph (32 km/h), with several starts, stops, and turns. Replaces typical taxi operation.
- The design of the airplane will permit you to tow the airplane from the nose or main landing gear.
 - The tow fitting on the nose gear can be used to tow the airplane with a tow bar (Figure 205).
 - (2)The maximum normal towing turning limits are indicated by the painted stripes on the nose gear doors.
- You can tow the airplane on firm and level ground by the nose gear with one tire flat on each main landing gear if the starting loads are held to the minimum.
 - NOTE: With two flat tires on one main gear, if it is possible, you should replace one of the flat tires with a serviceable tire before towing to prevent damage to the tires and wheels. Refer to (Tow the Airplane with Flat Tire(s), TASK 09-11-04-580-801).
 - (1) For other unusual towing loads, such as towing with two flat tires on one main gear, towing on soft ground, or towing up inclines more than 5 degrees, you should tow the airplane from the main gear as the structural limitations of the nose gear can be exceeded.
- You can tow the airplane with one or both engines removed if you make sure the center of gravity stays forward of the aft center of gravity limits (Figure 202).
 - NOTE: For center of gravity data, refer to the Center of Gravity Calculations for Towing tasks.
- 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.

09-11-00 **EFFECTIVITY AKS ALL**

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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.

- G. You can use towbarless equipment to push or pull the airplane for pushback or maintenance towing.
 - 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 203).
- 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 make sure that 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).
- 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.
- (6) Boeing Service Letter 737-SL-09-002: Towbarless Towing Evaluation.
 - NOTE: The service letter provides additional guidance and information regarding towbarless towing recommendations and regulatory requirements.
- When it is necessary to tilt the airplane for tail clearance in hangars and storage areas, do this task: Tilt the Airplane For the Tail Clearance, TASK 07-11-06-580-801.
- During all phases of ground handling and maintenance, the center of gravity (CG) of the airplane must be forward of the aft CG limit (Figure 201).
 - This CG limit provides a margin of safety to allow for grade, winds, and acceleration forces as noted.
 - (2) The configuration to be towed should be carefully checked to make sure that the CG is forward of the towing limit.
 - If the aft towing limit CG is more than the center of gravity limits, the recommended procedure is to add ballast or fuel, to move the CG forward.
 - The Table in (Figure 202) gives the incremental CG shift for some of the items that you need to consider.
 - 1) A forward CG shift is (-) and an aft CG shift is (+).
 - All of the data is for a level airplane.

09-11-00 **EFFECTIVITY AKS ALL**



K. 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 that no personnel, fuel leaks, or open fuel cells are in the 50 ft (15 m) radius from the radar.

TASK 09-11-00-580-801

2. Maintenance Towing

(Figure 201, Figure 202, Figure 204, Figure 203, Figure 205, Figure 206, Figure 207)

A. References

Reference	Title
05-51-01-210-801	Phase I Inspection (P/B 201)
05-51-29-200-801	Phase I Inspection (P/B 201)
10-11-05 P/B 201	CHOCK INSTALLATION
12-15-31-610-802	Main Landing Gear Shock Strut Servicing, Airplane on the Ground (P/B 301)
12-15-41-610-802	Nose Landing Gear Shock Strut Servicing, Airplane on the Ground (P/B 301)
12-15-51-610-802	Add Nitrogen or Air to the Tire (P/B 301)
24-22-00-860-812	Remove Electrical Power (P/B 201)
24-22-00-860-813	Supply External Power (P/B 201)
29-00-00 P/B 201	HYDRAULIC POWER - MAINTENANCE PRACTICES
29-11-00-860-801	Hydraulic System A or B Pressurization (P/B 201)
32-00-01-480-801	Landing Gear Downlock Pins Installation (P/B 201)
32-21-31-400-803	Nose Landing Gear Torsion Link Connection (P/B 401)
49-11-00-860-801	APU Starting and Operation - Activation (P/B 201)
71-11-02 P/B 201	FAN COWL PANELS - MAINTENANCE PRACTICES
78-31-00 P/B 201	THRUST REVERSER SYSTEM - MAINTENANCE PRACTICES

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
SPL-1498	Eyebolt - Towing, Main Gear
	Part #: F72719-500 Supplier: 81205
SPL-1499	Pin - Lock, NLG Towing Lever
	Part #: A09003-2 Supplier: 81205 Opt Part #: A09003-1 Supplier: 81205

C. Location Zones

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Zone	Area
700	Landing Gear and Landing Gear Doors

AKS ALL



D. Prepare to Tow the Airplane

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.

SUBTASK 09-11-00-420-001

(1) Install the landing gear ground lockpins, do this task: Landing Gear Downlock Pins Installation, TASK 32-00-01-480-801

NOTE: It is optional to install the 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 flight.

SUBTASK 09-11-00-420-004

(2) Install the NLG towing lever pin, SPL-1499, do one of the steps that follow.

WARNING: WHEN YOU WILL USE A TOWBAR TO MOVE THE AIRPLANE IN HIGH WINDS, INSERT THE STEERING LOCKOUT PIN (TOWPIN) BEFORE YOU CONNECT THE TOWBAR. THE TOWBAR COULD MOVE AND CAUSE INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

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.

- (a) Move the towing lever to the "Tow" position.
 - NOTE: The towing lever is located at the left forward side of the steering metering valve.
- (b) Install the NLG towing lever pin, SPL-1499.

SUBTASK 09-11-00-860-009

- (3) Supply electrical power to the airplane, do this task: Supply External Power, TASK 24-22-00-860-813.
 - (a) Put the BAT switch on the P5 panel to the ON position.
 - (b) Turn the STBY power switch on the P5 panel to the AUTO position.
 - (c) You can start and operate the APU if it is necessary (APU Starting and Operation Activation, TASK 49-11-00-860-801).

SUBTASK 09-11-00-420-002

(4) Close the Fan Cowl Panels, do this task: FAN COWL PANELS - MAINTENANCE PRACTICES, PAGEBLOCK 71-11-02/201.

SUBTASK 09-11-00-420-003

(5) Close the Thrust Reversers, do this task: THRUST REVERSER SYSTEM - MAINTENANCE PRACTICES, PAGEBLOCK 78-31-00/201.

SUBTASK 09-11-00-610-001

(6) Make sure that the tires are properly inflated (see this task: Add Nitrogen or Air to the Tire, TASK 12-15-51-610-802).



SUBTASK 09-11-00-610-002

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.

- (7) Make sure that the landing gear shock struts have proper extension.
 - NOTE: The nose landing gear and main landing gear shock struts are considered deflated when the DIM "X" is below the servicing band as shown on the servicing chart located in the wheel well.
 - NOTE: The nose landing gear shock strut is considered fully compressed when DIM "X" is equal to 13.9 in. (353.1 mm). The main landing gear shock strut is considered fully compressed when DIM "X" is equal to 0.9 in. (22.9 mm).
 - NOTE: 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.
 - (a) Make sure that the shock strut of the nose landing gear is properly serviced (see this task: Nose Landing Gear Shock Strut Servicing, Airplane on the Ground, TASK 12-15-41-610-802).
 - (b) Make sure that the shock strut of the main landing gear is properly serviced (see this task: Main Landing Gear Shock Strut Servicing, Airplane on the Ground, TASK 12-15-31-610-802).

SUBTASK 09-11-00-280-001

- (8) Supply system B hydraulic power. (HYDRAULIC POWER MAINTENANCE PRACTICES, PAGEBLOCK 29-00-00/201).
 - (a) If you do not use hydraulic system B or it does not operate, do the steps that follow:
 - NOTE: To tow the airplane with brakes that operate, you must have approximately 3000 psi (20,684 kPa) in the brake accumulator. You can apply the brakes two to six times when the brake accumulator pressure is approximately 3000 psi (20,684 kPa).
 - 1) Make sure that the hydraulic brake accumulator pressure is approximately 3000 psi (20,684 kPa).
 - 2) If electrical power is not available, make sure that the pressure gage for the brake accumulator reads 3000 psi (20,684 kPa).

SUBTASK 09-11-00-410-001

(9) Make sure that the electronic compartment access door is closed.

SUBTASK 09-11-00-580-006

- (10) Make sure that the maximum permitted loads are not more than those shown in Figure 203.
 - 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 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.

SUBTASK 09-11-00-580-007

(11) Make sure that the airplane is within the center of gravity limitations (Figure 201).

AKS ALL



SUBTASK 09-11-00-280-002

(12) 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.

(a) Adjust the current fuel load as appropriate.

SUBTASK 09-11-00-580-008

(13) Make sure you have an approved brake operator in the flight compartment.

SUBTASK 09-11-00-560-001

(14) Put into position the flight compartment crew, the tow tractor operator, and the ground crew so all are in visual contact.

SUBTASK 09-11-00-560-002

(15) Make sure that persons that work near the tow vehicle, tow bar, nose wheels, and the main wheels know the pushback hazard zones as shown in Figure 207.

SUBTASK 09-11-00-410-002

CAUTION: DO NOT MOVE THE AIRPLANE WITH THE AIRSTAIRS EXTENDED. IF THE AIRSTAIRS ARE EXTENDED WHEN YOU MOVE THE AIRPLANE, DAMAGE WILL OCCUR TO THE AIRSTAIRS OR TO THE AIRPLANE.

(16) Make sure that the airstairs are stowed.

SUBTASK 09-11-00-560-003

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.

WARNING: MAKE SURE THAT THE TOW TRACTOR OPERATOR, THE GROUND CREW, AND THE FLIGHT COMPARTMENT CREW CAN SPEAK TO THE OTHERS. IF THEY CAN NOT SPEAK TO THE OTHERS, AIRPLANE MOVEMENTS CAN CAUSE INJURIES TO PERSONNEL AND DAMAGE TO THE EQUIPMENT.

- (17) Make sure that there is clear intercom communication between the flight compartment crew and the towing ground crew or the tow tractor operator.
 - (a) Connect the interphone system or equivalent between the flight compartment and the tow tractor operator or the towing ground crew.

NOTE: Wireless handsets may be used in place of an interphone system.

SUBTASK 09-11-00-580-010

(18) Make sure that the ramp area is clear of all stands and equipment in the towing path.

SUBTASK 09-11-00-480-001

(19) Connect the tow bar to the tow tractor and to the plane, if it is necessary.

SUBTASK 09-11-00-580-012

(20) If the nose gear angle will exceed 78 degrees when you tow, do the steps that follow.

NOTE: For the airplane turning radii vs nose gear steering angle, see Figure 204.

NOTE: The maximum normal turning angle is 78 degrees and is indicated by red stripes on the nose gear doors.

AKS ALL



- (a) Disconnect the torsion links.
- (b) Support the lower torsion link.

NOTE: This is to make sure that the torsion link will not drag and to prevent damage to the lubrication fittings when the torsion link is disconnected.

(c) Disconnect the nose gear taxi light wire.

SUBTASK 09-11-00-020-001

(21) Remove the airplane static ground wires, if necessary.

E. Tow the Airplane from the Nose Landing Gear

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.

SUBTASK 09-11-00-580-002

(1) Do the steps that follow to tow the airplane:

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 that persons that work near the tow vehicle, tow bar, nose wheels, and the main wheels know the pushback hazard zones as shown in Figure 207.
- (b) Put into position the flight compartment crew, the tow tractor operator, and the ground crew so all are in visual contact.

WARNING: MAKE SURE THAT THE TOW TRACTOR OPERATOR, THE GROUND CREW, AND THE FLIGHT COMPARTMENT CREW CAN SPEAK TO THE OTHERS. IF THEY CAN NOT SPEAK TO THE OTHERS, AIRPLANE MOVEMENTS CAN CAUSE INJURIES TO PERSONNEL AND DAMAGE TO THE EQUIPMENT.

- (c) Make sure that the flight compartment crew has intercom or wireless communication with the tow tractor operator or the ground crew.
- (d) Remove the wheel chocks.
- (e) Release the parking brakes.

CAUTION: MOVE THE AIRPLANE FORWARD BEFORE YOU START SHARP TURNS.

MAKE SURE THERE ARE NO SUDDEN STARTS AND STOPS. IF YOU TOW
THE PLANE UNDER HIGH LOAD CONDITIONS, SUCH AS TOWING WITH
BOTH TIRES FLAT ON ONE MAIN GEAR, TOWING ON SOFT TERRAIN,
TOWING UP INCLINES GREATER THAN 5 DEGREES, OR OTHER ABNORMAL
LOADS, REFER TO THE TOW AIRPLANE UNDER ABNORMAL LOADS TASK. IF
YOU DO NOT OBEY THIS CAUTION, THE NOSE GEAR TOWING STRESS CAN
BE MORE THAN THE SPECIFICATIONS PERMIT.

- (f) Tow the airplane.
- (g) It is optional to tow the airplane with the entry or lower cargo doors open.
- (h) Tow the airplane slowly straight ahead before you try to turn.

AKS ALL



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.

(i) Keep brake applications to minimum use within safety limitations. If airplane brakes are used during towing, do this task: Phase I Inspection, TASK 05-51-01-210-801.

NOTE: Fully charged accumulators are capable of approximately six brake applications.

(j) Complete the airplane tow in a straight line for a minimum of 10 ft (3 m).

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

1) 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 towbar or to vehicle.

- (k) If the nose gear turning angle was more than 78 degrees, do this task: Phase I Inspection, TASK 05-51-29-200-801.
- (I) Connect the torsion links, do this task: Nose Landing Gear Torsion Link Connection, TASK 32-21-31-400-803.
- (m) Install the chocks (CHOCK INSTALLATION, PAGEBLOCK 10-11-05/201).
- (n) Disconnect the tow bar (if it was installed).

WARNING: IF HYDRAULIC SYSTEM A IS PRESSURIZED, STAY CLEAR OF THE NOSE LANDING GEAR. DO THIS WHEN THE STEERING LOCKOUT PIN IS REMOVED FROM THE STEERING TOW LEVER. IF YOU DO NOT OBEY THIS WARNING, INJURY TO PERSONS CAN OCCUR.

(o) Remove the NLG towing lever pin, SPL-1499, with streamer from the towing lever.

F. Tow the Airplane Under Abnormal Loads (Main Gear Towing)

SUBTASK 09-11-00-580-003

(1) Preparation for towing and towing airplane under abnormal loads is the same as towing airplane from nose gear except for the steps that follow:

NOTE: The nose gear tow bar is not used.

- (a) Put eyebolt assemblies eyebolt, SPL-1498 in the position of the jacking cone on each main gear.
- (b) Locally fabricate cables and attach them to each main gear and to the tow tractors.
- (c) Fabricate the wire cable (3/4 inch) with end fittings to match F72719 eyebolt, SPL-1498.
- (d) Pressurize Hydraulic System A (Hydraulic System A or B Pressurization, TASK 29-11-00-860-801).

<u>NOTE</u>: The airplane is steered during the towing by the nose wheel steering system and from the directions of the ground crew.

(e) Airplane motion is interrupted by the application of the airplane brakes.

NOTE: The number of applications is not limited when the hydraulic systems are operational.

AKS ALL



G. Put the Airplane to its Usual Condition

SUBTASK 09-11-00-040-003

(1) Make sure that the parking brake is released.

SUBTASK 09-11-00-040-004

(2) Remove electrical power, if it is not necessary (Remove Electrical Power, TASK 24-22-00-860-812).

SUBTASK 09-11-00-580-014

(3) Make sure that the wheels of the nose landing gear are in the centered position.

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.

(a) Remove the NLG towing lever pin, SPL-1499.

SUBTASK 09-11-00-860-010

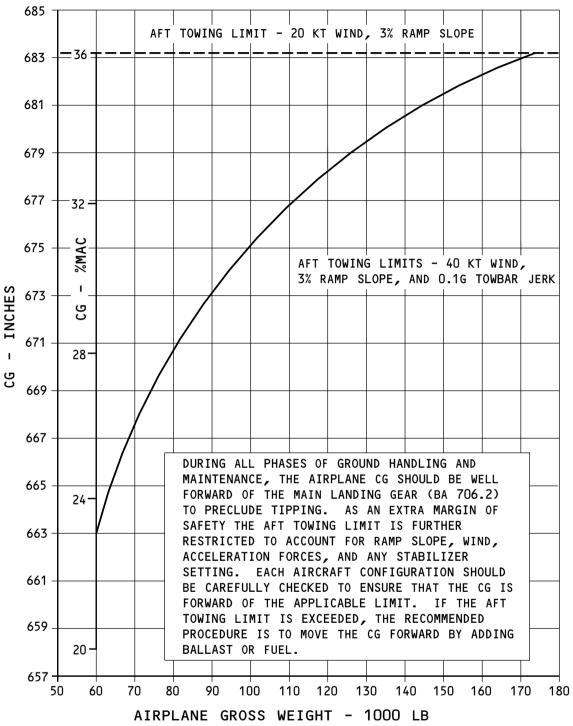
(4) Attach the static ground wires, if necessary.

----- END OF TASK -----

09-11-00

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Aft CG Limits for Towing (Airplane CG versus Gross Weight) Figure 201/09-11-00-990-801

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SHIFTS	WEI	WEIGHT OF GRAV		737-800 1 Moment Weight X B.A. (LB.) (B.A.) 75000 678		
	POUNDS	KILOGRAMS	B.A.	(INCHES)	(%MAC)	
ONE MAN IN PILOT'S SEAT	200	90.7	32	-1.6	-1.0	
ONE MAN IN CABIN AT BS 990	200	90.7	1202	1.3	0.8	
1000 LB ATTACHED TO THE NOSE GEAR	1000	453.6	93	-7.3	-4.7	
1000 LB LOADED IN THE FWD CARGO HOLD AT (CENTROID)	1000	453.6	360.7	-4.0	-2.6	
ONE ENGINE REMOVED	-7500	-3401.9	551.5	13.6	8.7	
TWO ENGINES REMOVED	-15000	-6803.9	551.2	30.4	19.5	
FUEL IN THE WING TANKS - (7.1 LB/GAL.)	2500 5000 7500 10000 12500 15000 17500 18289	1134.0 2268.0 3401.9 4535.9 5669.9 6803.9 7937.9 8295.8	657.3 660.24 663.49 668.58 675.88 684.93 696.06 700.71	-0.8 -1.3 -1.7 -1.6 -1.0 0.3 2.3 3.3	-0.5 -0.9 -1.1 -1.0 -0.6 0.2 1.5 2.1	
FUEL IN THE CENTER TANK - (7.1 LB/GAL.)	2500 5000 7500 10000 12500 15000 17500 20000 22500 25000 27500 30000 30523	1134.0 2268.0 3401.9 4535.9 5669.9 6803.9 7937.9 9071.8 10205.8 11339.8 12473.8 13607.8 13845.0	607.95 605.22 604.75 604.85 605.22 605.71 606.13 606.46 606.69 606.74 606.38 605.59 605.39	-2.3 -4.6 -6.7 -8.7 -10.5 -12.2 -13.8 -15.3 -16.8 -18.2 -19.6 -21.1 -21.4	-1.5 -2.9 -4.3 -5.6 -6.7 -7.8 -8.9 -9.8 -10.8 -11.7 -12.6 -13.5 -13.8	

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Shifts Based on Weight and Center of Gravity Figure 202/09-11-00-990-802 (Sheet 1 of 2)

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1 EACH AIRPLANE CONFIGURATION SHOULD BE CAREFULLY CHECKED TO MAKE SURE THAT THE CENTER OF GRAVITY (CG) IS FORWARD OF THE APPLICABLE LIMIT. IF THE AFT TOWING LIMIT IS EXCEEDED, THE RECOMMENDED PROCEDURE IS TO MOVE THE CENTER OF GRAVITY FORWARD BY ADDING BALLAST OR FUEL (B. A. = BALANCE ARM). THE TABLE ABOVE SHOWS THE EFFECT THAT VARIOUS ITEMS HAVE ON THE CENTER OF GRAVITY LOCATION OF THE AIRPLANE. A FORWARD CG SHIFT IS INDICATED BY A MINUS (-) SIGN.

WEIGHTS AND BALANCE ARMS (B.A.) GIVEN ON FIGURE 202 ARE BASED ON THE AS MANUFACTURED OPERATIONAL EMPTY WEIGHT (OEW). POST DELIVERY MODIFICATIONS CHANGE WEIGHT AND BALANCE.

H15637 S0006558530_V3

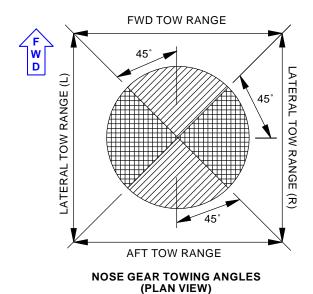
Shifts Based on Weight and Center of Gravity Figure 202/09-11-00-990-802 (Sheet 2 of 2)

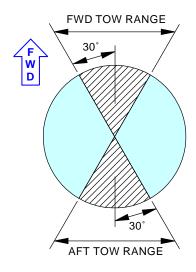
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MAIN GEAR TOWING ANGLES (PLAN VIEW)

MODEL	MAXIMUM TAXI	NOSE	LANDING GEAR LB (kg)	MAIN LANDING GEAR LOAD LB (kg)(EACH)		
GROSS WEIG		FWD	AFT	LATERAL	FWD	AFT
LB (kg)		(±45°)	(180 ±45°)	(±90' ±45°)	(±30°)	(180 ±30°)
737-800	174,700	25,950	25,950	12,975	19,460	19,460
	(79,244)	(11,771)	(11,771)	(5,885)	(8,827)	(8,827)

NOTE:

 0° = AIRPLANE FORWARD (FWD) DIRECTION.

MAXIMUM TOWING LOADS

NOTE:

- THE MAXIMUM STEERING/TOWING ANGLE FOR PUSH BACK IS 75 DEGREES.
- FOR NOSE GEAR TOW ANGLES GREATER THAN 78 DEGREES, THE TORSION LINKS MUST BE DISCONNECTED.
- WITH TORSION LINK DISCONNECTED, NOSE GEAR TOWING ANGLE IS LIMITED TO APPROXIMATELY 90 DEGREES UNLESS NOSE GEAR TAXI LIGHT CABLE IS DISCONNECTED.
- TOWBARLESS TOWLOADS ARE 80% OF ABOVE VALVES. SEE SERVICE LETTER 737-SL-09-002 FOR DETAILS.

CAUTION:

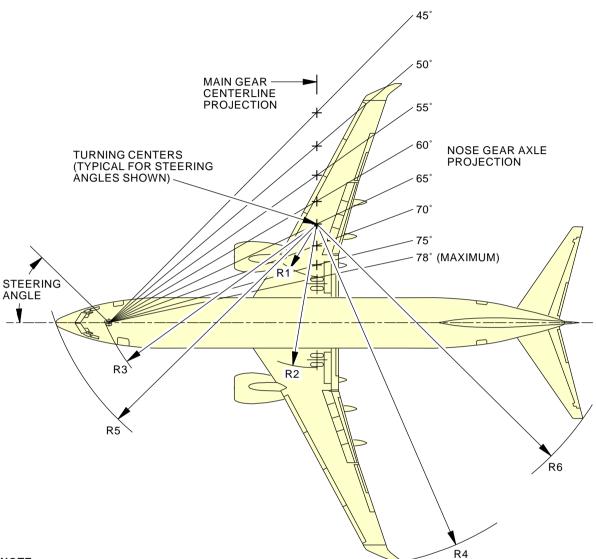
DEPRESSURIZE NOSE GEAR STEERING BEFORE TOWING AIRPLANE. FAILURE TO COMPLY COULD RESULT IN DAMAGE TO NOSE GEAR STEERING ACTUATOR.

N62882 S0006558534_V4

Towing Loads and Turning Radius Figure 203/09-11-00-990-803

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NOTE:

- ACTUAL OPERATING TURNING RADII MAY BE GREATER THAN SHOWN.
- ALL OF THE WING TIP RADII (R4) THAT ARE GIVEN ARE FOR THEORETICAL TURNS. THEORY IGNORES TIRE SCRUFFING ON A TURN, FRICTION FACTORS, ETC. ACTUAL RADII (R4) WILL BE LARGER THAN THEORETICAL NUMBERS.
- DIMENSIONS ROUNDED TO NEAREST FOOT AND 0.1 METER.

737-800 WITH WINGLET

L51917 S0006558554_V3

Turning Radii - No Slip Angle Figure 204/09-11-00-990-808 (Sheet 1 of 2)

EFFECTIVITY

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STEERING ANGLE	R INN GE	IER	R OUT GE		R3 R4 R5 NOSE WING TIP NOSE							
(DEGREES)	FT	М	FT	М	FT	М	FT	М	FT	М	FT	М
30	76.9	23.4	100.0	30.5	102.7	31.3	149.1	45.4	109.5	33.4	129.5	39.5
35	61.4	18.7	84.5	25.8	89.6	27.3	133.6	40.7	97.4	29.7	116.4	35.5
40	49.3	15.0	72.4	22.1	80.1	24.4	121.6	37.1	88.7	27.0	106.6	32.5
45	39.5	12.0	62.6	19.1	72.9	22.2	111.9	34.1	82.3	25.1	99.0	30.2
50	18.2	9.5	54.4	16.6	67.4	20.6	103.8	31.6	77.4	23.6	93.0	28.3
55	24.2	7.4	47.3	14.4	63.2	19.3	96.8	29.5	73.8	22.5	88.0	26.8
60	17.9	5.3	41.0	12.5	59.8	18.3	90.6	27.6	70.9	21.6	83.9	25.6
65	12.3	3.7	35.4	10.8	57.3	17.5	85.1	25.9	68.8	21.0	80.4	24.5
70	7.0	2.1	30.1	9.2	55.3	16.9	80.0	24.4	67.1	20.5	77.5	23.6
78 (MAXIMUM)	-0.7	-0.2	22.4	6.8	53.2	16.2	72.5	22.1	65.4	19.9	73.6	22.4

737-800 WITH WINGLET

L52665 S0006558555_V2

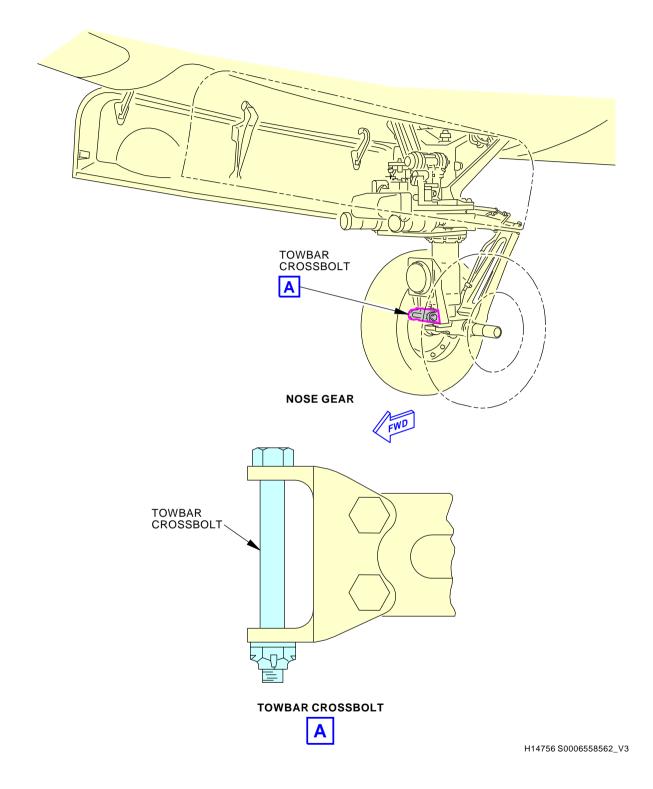
Turning Radii - No Slip Angle Figure 204/09-11-00-990-808 (Sheet 2 of 2)

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Airplane Towbar Attach Point Figure 205/09-11-00-990-805

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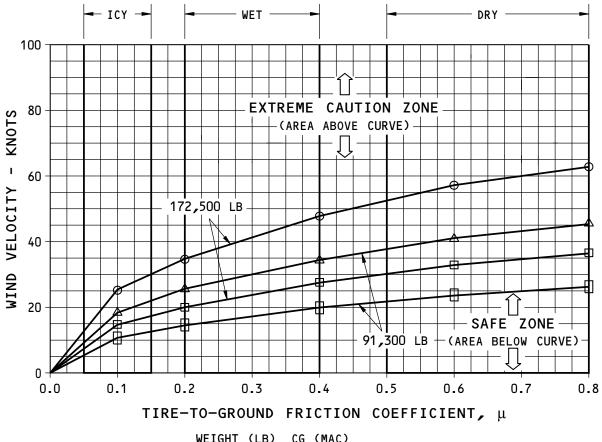
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	MEIGHI (LB)	CG (MAC)	
0	172,500	6%	——— TOWING
	172,500	36%	
Δ	91,300	6%	
	91,300	36%	

NOTE: • FLAPS UP, STAB = 4 PILOT UNITS (HORIZONTAL)

- WIND FROM ANY DIRECTION
- WIND GUST SHOULD BE ADDED TO STEADY WIND VELOCITY FOR MAXIMUM WIND SPEED
- USE ACTUAL AIRPLANE WEIGHT, CG POSITION, AND TIRE-TO-GROUND FRICTION COEFFICIENT FOR INTERPOLATION
- IF NO MEASURED VALUE FOR TIRE-TO-GROUND FRICTION COEFFICIENT IS AVAILABLE, USE THE LOWER LIMIT OF THE APPROPRIATE BOUNDED FRICTION BAND
- FOR TOWING AND MANEUVERING IN CLOSE PROXIMITY TO BUILDINGS OR OTHER AIRPLANES, THE ALLOWABLE WIND VELOCITY SHOULD BE REDUCED BY ONE THIRD
- REDUCE WIND SPEED LIMITS TO ACCOUNT FOR OPERATIONAL CONSIDERATIONS SUCH AS HIGH SPEED TOWING OR CONTAMINATED TIRES OR RUNWAYS
- BASED ON ZERO PERCENT GROUND SLOPE

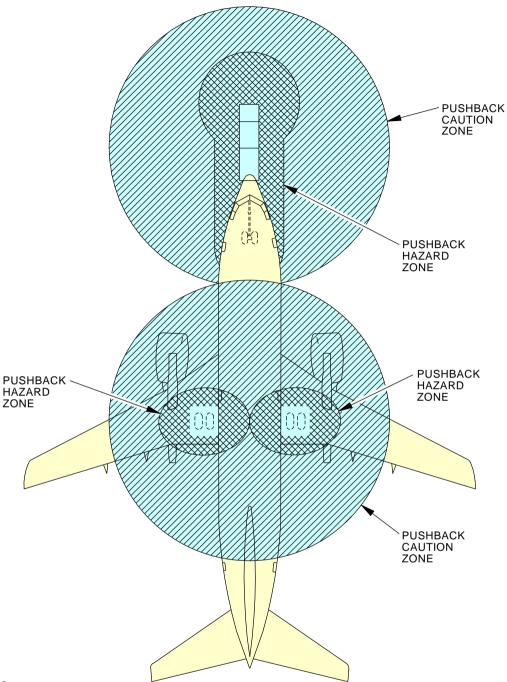
737-800 MAXIMUM WINDS FOR TOWING

N50842 S0006558569_V3

Wind Velocity During Towing Figure 206/09-11-00-990-818

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WARNING:

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

H14758 S0006558573_V3

Towing Hazard Zones Figure 207/09-11-00-990-811

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TASK 09-11-00-580-802

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)
12-15-31-610-802	Main Landing Gear Shock Strut Servicing, Airplane on the Ground (P/B 301)
12-15-41-610-802	Nose Landing Gear Shock Strut Servicing, Airplane on the Ground (P/B 301)
32-00-01-480-801	Landing Gear Downlock Pins Installation (P/B 201)
32-21-31-400-803	Nose Landing Gear Torsion Link Connection (P/B 401)

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
SPL-1499	Pin - Lock, NLG Towing Lever
	Part #: A09003-2 Supplier: 81205
	Opt Part #: A09003-1 Supplier: 81205

D. Prepare to Release the Airplane

SUBTASK 09-11-00-280-003

(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.

(a) Adjust the current fuel load as appropriate.

SUBTASK 09-11-00-560-005

WARNING: DO NOT REFUEL THE AIRPLANE WHEN YOU SEE LIGHTNING, OR THERE IS HIGH ATMOSPHERIC ELECTRICAL ACTIVITY. STOP THE REFUEL OPERATION IF YOU SEE LIGHTNING. DO NOT CONNECT A HEADSET. DO NOT TOUCH ELECTRICAL CONNECTIONS TO THE AIRPLANE. LIGHTNING STRIKES CAN CAUSE INJURIES TO PERSONNEL, A FIRE, OR AN EXPLOSION.

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

AKS ALL O9-11-00



SUBTASK 09-11-00-440-001

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.

(3) Move the towing lever on the metering valve module to the TOW position.

SUBTASK 09-11-00-420-005

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.

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

SUBTASK 09-11-00-420-006

(5) Make sure that the landing gear downlock pins are installed on the nose and main landing gear, do this task: Landing Gear Downlock Pins Installation, TASK 32-00-01-480-801.

NOTE: It is optional to install the 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 flight.

SUBTASK 09-11-00-610-003

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.

- (6) Make sure that the landing gear shock struts have proper extension prior to release.
 - NOTE: The nose landing gear and main landing gear shock struts are considered deflated when the DIM "X" is below the servicing band as shown on the servicing chart located in the wheel well.
 - NOTE: The nose landing gear shock strut is considered fully compressed when DIM "X" is equal to 13.9 in. (353.1 mm). The main landing gear shock strut is considered fully compressed when DIM "X" is equal to 0.9 in. (22.9 mm).
 - NOTE: 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.
 - (a) Make sure that the shock strut of the nose landing gear is properly serviced (see this task: Nose Landing Gear Shock Strut Servicing, Airplane on the Ground, TASK 12-15-41-610-802).
 - (b) Make sure that the shock struts of the main landing gear are properly serviced (Main Landing Gear Shock Strut Servicing, Airplane on the Ground, TASK 12-15-31-610-802).

SUBTASK 09-11-00-580-015

(7) Make sure that the airplane center of gravity is within the center of gravity towing limitations (Figure 201).

AKS ALL



SUBTASK 09-11-00-580-016

- (8) If the nose gear steering angle will exceed 78 degrees, do the steps that follow.
 - NOTE: For the airplane turning radii vs nose gear steering angle, see Figure 204.
 - NOTE: The maximum normal turning angle is 78 degrees and is indicated by red stripes on the nose gear doors.
 - (a) Disconnect the torsion links.
 - (b) Support the lower torsion link.
 - NOTE: This is to make sure that the torsion link will not drag and to prevent damage to the lubrication fittings when the torsion link is disconnected.
 - (c) Disconnect the nose gear taxi light wire.

SUBTASK 09-11-00-480-003

(9) Put the tow vehicle in position and attach the towbar to the fitting on the nose landing gear, if necessary.

SUBTASK 09-11-00-040-005

(10) Release the parking brakes.

E. Pushback/Dispatch Tow the Airplane

SUBTASK 09-11-00-580-017

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) Make sure that the maximum permitted tow loads are not more than those shown in Figure 203.
 - 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 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.

SUBTASK 09-11-00-560-006

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.

(2) Make sure that persons who work near the tow vehicle, towbar, nose wheels, and the main wheels know the pushback hazard zones as shown in Figure 207.

SUBTASK 09-11-00-080-001

(3) Remove the wheel chocks.

SUBTASK 09-11-00-580-018

(4) Start the pushback with a slow and smooth breakaway.

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SUBTASK 09-11-00-580-019

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.

- (5) While the airplane is towed, do not use the airplane brakes to stop the airplane unless it is an emergency.
 - (a) If the brakes are used during towing, do this task: Phase I Inspection, TASK 05-51-29-200-801.

NOTE: Fully charged accumulators are capable of approximately six brake applications.

SUBTASK 09-11-00-580-020

(6) Complete the airplane tow in a straight line for a minimum of 10 ft (3 m).

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

SUBTASK 09-11-00-580-021

(7) If the nose gear turning angle was more than 78 degrees, do this task: Phase I Inspection, TASK 05-51-29-200-801.

SUBTASK 09-11-00-410-003

(8) Connect the torsion links if they were disconnected, do this task: Nose Landing Gear Torsion Link Connection, TASK 32-21-31-400-803.

F. Put the Airplane Back to Its Usual Condition

SUBTASK 09-11-00-440-002

(1) Apply the parking bakes.

SUBTASK 09-11-00-080-002

(2) Disconnect the towbar from the tow fitting and remove the towbar if it was installed.

SUBTASK 09-11-00-580-022

(3) Make sure that the wheels of the nose landing gear are in the centered position.

SUBTASK 09-11-00-020-003

(4) Remove the NLG towing lever pin, SPL-1499 from the towing lever.



TASK 09-11-00-580-803

4. Towing the Airplane in High Winds

A. Procedure

SUBTASK 09-11-00-580-023

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.
 - (a) Obey the conditions in Figure 206.

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	VI 17	7017	

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TOW THE AIRPLANE WITH FLAT TIRES - MAINTENANCE PRACTICES

1. General

A. This procedure has a task to tow the airplane with flat tires.

NOTE: If it is possible, replace the flat tires before you move the airplane.

TASK 09-11-04-580-801

2. Tow the Airplane with Flat Tire(s)

A. General

CAUTION: DO NOT USE THE NOSE WHEEL TO TOW THE AIRPLANE IF THERE IS MORE THAN ONE FLAT TIRE ON EACH LANDING GEAR. YOU CAN PUT TOO MUCH FORCE ON THE NOSE LANDING GEAR IF YOU TOW THE AIRPLANE WITH MORE THAN ONE FLAT TIRE ON EACH GEAR. THIS CAN CAUSE DAMAGE TO THE NOSE LANDING GEAR.

- (1) You can use the nose wheel to tow the airplane if there is only one flat tire on each landing gear, do this task: (Maintenance Towing, TASK 09-11-00-580-801).
- (2) When there is more than one flat tire per landing gear, replace the flat tires with serviceable tires before the airplane is towed at the nose wheel.
 - (a) Do not turn the airplane quickly.
 - (b) Move the airplane slowly to minimize further damage to the flat tire or to the wheel, do this task: (Maintenance Towing, TASK 09-11-00-580-801).
 - (c) Alternatively, you can attach cables to each main landing gear to tow the airplane.
- (3) Do not use Towbarless Towing if one or two nose landing gear tires are flat.

B. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)
29-11-00-860-801	Hydraulic System A or B Pressurization (P/B 201)
29-11-00-860-805	Hydraulic System A or B Power Removal (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			
SPL-1498	Eyebolt - Towing, Main Gear			
	Part #: F72719-500 Supplier: 81205			

D. Location Zones

I

Zone	Area
700	Landing Gear and Landing Gear Doors

E. Tow the Airplane with One Flat Tire on Each Landing Gear

SUBTASK 09-11-04-580-001

- (1) To tow the airplane with one flat tire on each landing gear, do the steps that follow:
 - (a) Do the normal towing procedure to tow the airplane safely, do this task: (Maintenance Towing, TASK 09-11-00-580-801).
 - (b) Keep the tow speeds to a minimum.

AKS ALL



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

F. Tow the Airplane with More Than One Flat Tire on Each Landing Gear

SUBTASK 09-11-04-480-001

CAUTION: DO NOT USE THE NOSE WHEEL TO TOW THE AIRPLANE IF THERE IS MORE THAN ONE FLAT TIRE ON EACH LANDING GEAR. YOU CAN PUT TOO MUCH FORCE ON THE NOSE LANDING GEAR IF YOU TOW THE AIRPLANE WITH MORE THAN ONE FLAT TIRE ON EACH GEAR. THIS CAN CAUSE DAMAGE TO THE NOSE LANDING GEAR.

(1) Install the main gear towing eyebolt assembly on each main landing gear eyebolt, SPL-1498.

<u>NOTE</u>: It is possible some electrical brackets will have to be removed when you tow the airplane in the aft direction from the main landing gear.

(a) Make sure the eye points in the direction you want to tow the airplane.

SUBTASK 09-11-04-420-001

(2) Attach the cables between the eyebolts and the vehicle you use to tow the airplane.

SUBTASK 09-11-04-780-001

(3) Put pressure in hydraulic system A, do this task: (Hydraulic System A or B Pressurization, TASK 29-11-00-860-801).

NOTE: This makes it possible to steer and stop the airplane. When you pull the airplane, you can steer the airplane with an unequal pull of the tow vehicles and/or the airplanes ground steering system. You can only stop the airplane with its brakes.

SUBTASK 09-11-04-580-002

- (4) Pull the airplane with the tow vehicle(s).
 - (a) Make sure the angle does not exceed \pm 30 degrees on the cables.
 - (b) Have a person who can see both the flight deck and the tow vehicles control the movement of the airplane.

G. Put the Airplane Back to Its Usual Condition

SUBTASK 09-11-04-840-001

(1) Remove the hydraulic power, do this task: (Hydraulic System A or B Power Removal, TASK 29-11-00-860-805).

SUBTASK 09-11-04-080-001

(2) Remove the main gear towing eyebolt assembly from each main landing gear.

——— END OF TASK ———

09-11-04

EFFECTIVITY



TAXI THE AIRPLANE - MAINTENANCE PRACTICES

1. General

- A. This procedure has the instructions to taxi the airplane for maintenance.
 - (1) Refer to the Operations Manual to taxi the airplane for revenue service.

TASK 09-20-00-580-801

2. Taxi the Airplane

(Figure 201, Figure 202)

A. General

- (1) Taxi Safety
 - (a) When you taxi an airplane, caution and precision are necessary.
 - The taxi procedure must be done only by persons that are trained to taxi the airplane.
 - (b) The taxi path must be clear of all persons and vehicles.
 - (c) You must get approval from the airport ground control to taxi the airplane.
 - 1) This will prevent interference with other airport operations.
 - (d) You must keep clearance from the buildings and the other airplanes, at all times.
 - (e) You must have electrical power to operate:

NOTE: This is necessary to taxi the airplane safely.

- 1) the taxi lights
- 2) the navigation lights
- 3) the radio and intercom equipment
- 4) other necessary systems.
- (f) 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) The applicable airplane hydraulic systems must be pressurized to supply hydraulic pressure.
 - NOTE: This is for the airplane brakes and the nose wheel steering systems.
- (h) When you taxi the airplane at night or in bad weather conditions, the crew must know the area around the airplane.
 - 1) They must know the location of parked vehicles, maintenance stands, and the condition of the pavement surface.
- (i) A taxi checklist is necessary to help the crew have a safe taxi operation.
- (2) Maintenance Persons Necessary to Taxi the Airplane
 - (a) The persons necessary for a safe taxi operations must include a flight compartment crew and a ground crew.

AKS ALL



- (b) There must be a minimum of two flight compartment persons (One taxi approved person and one observer).
 - 1) One flight compartment person must be trained in all of the procedures that follow, for the taxi operations:

NOTE: It is not necessary for the observer to be taxi approved.

- a) Correct procedure to prepare the flight compartment
- b) The engine start, operation, and shutdown procedures
- c) The engine fire and emergency procedures
- d) The radio and intercom operation and procedures
- e) The taxi procedures (turning, wing tip clearances, taxi speeds, etc)
- (c) One or two ground crew persons are 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.

- 1) To remove and replace the wheel chocks
- 2) To help during the engine start
- 3) To help the flight compartment crew during the airplane movement
- 4) To make sure the airplane taxi path is clear.
- (3) Communications
 - (a) Most areas around the airplane are out of the field of view permitted by the flight compartment windows.
 - 1) Also, it is hard to see much of the ground operations work near the airplane from the flight compartment crew.
 - (b) There must be communication between the airplane and the ground crew.
 - 1) This is necessary during the engine start, removal and replacement of wheel chocks, and during the engine shutdown.
 - (c) To have a safe taxi operation you must use hand signals, lights, intercom and/or radio communication.
 - (d) The communications with the ground control authority is also necessary for taxi operations.
 - 1) This will make sure that the persons in the tower know of the taxi operation.
 - 2) This will also make sure the control tower knows the path that the airplane will follow.
- (4) Taxi the Airplane
 - (a) When you taxi the airplane on the ground, the movement is equivalent to other conventional tricycle geared airplanes.
 - 1) The nose wheel steering, and the engine thrust are used as necessary, to taxi the airplane.
 - (b) Airplane ground stability.
 - During the airplane taxi, the center of gravity (CG) must always be below the Ground Stability Limits line, see, do this task: (Maintenance Towing, TASK 09-11-00-580-801), (Figure 201)
 - 2) Find the airplane center of gravity (CG) for the applicable airplane configuration.

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- a) Use component weight and CG data, and the procedures to calculate them, in the approved weight and balance manuals.
- (c) 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 32.8 ft (10.0 m).
 - a) The clearance must be between the APU exhaust port and the adjacent airplane's wingtip (fuel vent).
- (d) Airplane taxi speed.
 - 1) The taxi speed must not be more than approximately 20 knots.
 - Speeds more than this, 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.
- (e) Airplane turns during taxi.
 - 1) Always use the largest turn radius possible.
 - 2) Do not try to turn the airplane until it has started to moved.
 - 3) Make sure you know the taxi turn radii, see, do this task: (Maintenance Towing, TASK 09-11-00-580-801, Figure 202)
 - a) Monitor the wingtips and the horizontal stabilizer carefully for clearance with buildings, equipment, and other airplanes.
 - 4) Make all turns at a slow taxi speed to prevent tire skids.
 - 5) When a left or right engine is used to help make a turn, use only the minimum power possible.
 - 6) Do not let the airplane stop during a turn.
 - 7) Do not use the brakes to help during a turn.
 - <u>NOTE</u>: See the paragraph on airplane taxi in bad weather conditions about differential braking.
 - Decrease the speed of the airplane with the brakes when it is necessary, before the turn is started.
 - b) Make a minimum radius turn with maximum nose wheel steering, and the engine thrust only.
 - c) When you use the brakes during a turn, they will cause the main and nose landing gear tires to wear.
 - 8) When it is possible, complete the taxi in a straight line roll for a minimum of 12 ft (4 m).
 - NOTE: This will remove the torsional stresses in the landing gear components, and in the tires.
- (f) Airplane taxi in bad weather conditions.
 - 1) You must know the conditions of the taxi surface, and reduce the taxi speeds when you taxi in bad weather conditions.

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- 2) If the taxi surface has snow, slush, or ice on it, be very careful.
- 3) Taxi the airplane with the flaps up.
- 4) Use the differential engine thrust when you taxi the airplane on a slick surface at decreased speeds.
 - NOTE: This will help to keep airplane movement through a turn.
- 5) A light differential braking can have more of an effect than nose wheel steering, on very slick surfaces.
- (5) Airplane Characteristics, see figures (Figure 201, Figure 202), and, do this task: Maintenance Towing, TASK 09-11-00-580-801.
 - (a) The minimum turn radius that the airplane can make is shown in, do this task: (Maintenance Towing, TASK 09-11-00-580-801, Figure 202)
 - NOTE: The wingtips and the horizontal stabilizer move in larger arcs during a turn than the nose of the airplane. You must monitor these areas of the airplane carefully for clearance with buildings, equipment, and other airplanes.
 - (b) The basic 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 taxi surface conditions
 - 6) the airplane ground speed
 - 7) the differential braking that you use.
 - (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 201), and, do this task: (Engine Ground Safety Precautions, TASK 71-00-00-800-805-F00).
 - a) All persons must keep away from the two engine inlet and exhaust areas.
 - b) Hot, high velocity gases come out of the exhaust nozzles of the engine.
 - NOTE: The velocity of the engine fan air, specially at high thrust positions, is sufficient to cause injury or death to persons.
 - 2) When the thrust reverser is in the reverse position, the high velocity fan air will come out and move forward.
 - a) When this occurs, the hot, high velocity engine exhaust gases will continue to come out rearwards.
 - (d) To find the angles of view from the flight compartment, for a person in the left seat, see (Figure 202, Figure 203).
 - NOTE: This is when the pilot or first officer's seat is in the correct position to operate the rudder and brake pedals.

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B. References

Reference	Title
09-11-00-580-801	Maintenance Towing (P/B 201)
10-11-05 P/B 201	CHOCK INSTALLATION
12-15-31-610-802	Main Landing Gear Shock Strut Servicing, Airplane on the Ground (P/B 301)
12-15-41-610-802	Nose Landing Gear Shock Strut Servicing, Airplane on the Ground (P/B 301)
24-22-00-860-811	Supply Electrical Power (P/B 201)
29-11-00-860-801	Hydraulic System A or B Pressurization (P/B 201)
71-00-00-800-805-F00	Engine Ground Safety Precautions (P/B 201)

C. Location Zones

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

D. Prepare to Taxi the Airplane

SUBTASK 09-20-00-580-001

(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 operation.
- (b) Examine the external areas of the airplane.
 - 1) Make sure that the wheel chocks are in the correct position (CHOCK INSTALLATION, PAGEBLOCK 10-11-05/201).
 - 2) Make sure that all engine cowls, doors, and hatches are in a latched/locked position or restrained from swinging by some other means.
- (c) Make sure that all engine inlets and exhausts are clear.
- (d) Make sure that the flight control surfaces are clear and will not touch the ground equipment.
- (e) 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.

(f) Make sure that the shock struts of the main landing gear are filled correctly, do this task: (Main Landing Gear Shock Strut Servicing, Airplane on the Ground, TASK 12-15-31-610-802).

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

(g) Make sure that the shock strut of the nose landing gear is filled correctly, do this task: (Nose Landing Gear Shock Strut Servicing, Airplane on the Ground, TASK 12-15-41-610-802).

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CAUTION: DO NOT LET THE SHOCK STRUT OF THE NOSE LANDING GEAR EXTEND MORE THAN THE MAXIMUM PERMITTED EXTENSION OF 10 INCHES (25.4 CENTIMETERS). AN EXTENSION MORE THAN 10 INCHES (25.4 CENTIMETERS) CAN CAUSE THE CENTERING CAM TO ENGAGE AND CAUSE DAMAGE TO THE SHOCK STRUT DURING A TURN, 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.

- (h) Make sure the shock strut of the nose landing gear does not show more than 10 inches (25.4 centimeters) of chrome surface.
- (i) Make sure that the towing lever on the nose landing gear is in the NORMAL position.
- (j) 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.
- (k) Make sure that all airplane systems are prepared to have electrical power safely put on the airplane.
- (I) Put electrical power on the airplane, do this task: (Supply Electrical Power, TASK 24-22-00-860-811).

CAUTION: A MINIMUM OF 1675 POUNDS (760 KILOGRAMS) OF FUEL IS NECESSARY IN NO. 1 AND 2 FUEL TANKS TO GIVE COOLING TO THE HYDRAULIC FLUID. WHEN SUFFICIENT FUEL IS NOT IN THE FUEL TANKS, THE HYDRAULIC FLUID WILL BECOME TOO HOT.

(m) Make sure that the fuel quantity indicator on the upper center display unit shows a minimum of 1675 lb (760 kg) of fuel.

NOTE: Also increase the quantity of fuel over the minimum to that necessary for the engine start and taxi operations.

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

NOTE: Hydraulic power for the brakes comes from hydraulic system B. Hydraulic system A gives automatic backup when system B does not operate. If all hydraulic 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.

Fully charged accumulators are capable of approximately six brake applications.

The nose wheel steering gets power from the hydraulic System A. Backup power for steering comes from Hydraulic System B. The landing gear control lever must be in the DN position to use the nose wheel steering system.

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

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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.

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

E. Taxi the Airplane

SUBTASK 09-20-00-580-002

- (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) Make sure that the parking brake is set.
 - (c) Tell the ground crew to remove the wheel chocks, and the static electrical ground wire (as necessary).
 - (d) Make sure that the beacon light that turns, is on.

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

WARNING: STAY AWAY FROM THE ENGINE INLET, AND THE EXHAUST AREAS WHILE THE ENGINE OPERATES. INJURIES TO PERSONNEL CAN OCCUR.

- (e) Obey these precautions before starting the engines:
 - To find the dangerous areas at engine idle and at the engine breakaway thrust, see Figure 201, and, do this task: Engine Ground Safety Precautions, TASK 71-00-00-800-805-F00.
 - 2) All persons must keep away from the two engine inlet and exhaust areas.
- (f) Start the engines.
- (g) Make sure that the navigation lights are on.
 - NOTE: The navigation lights must be on during movement of the airplane.
- (h) When the airplane is prepared to taxi, get approval to taxi from the airport ground control.
- (i) 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 in forward movement.
 - 2) Put the engines back to idle power when the airplane starts to move.
- (j) Make sure the airplane moves, forward in a straight line before a turn is started.
- (k) Turn the airplane with the tiller, or the rudder pedals for the nose wheel steering.
 - NOTE: You will get approximately 78 +/-2 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.
- (I) Talk to the ground crew during a turn to make sure the airplane has the necessary clearance.
 - 1) Make sure the airplane stays clear of all equipment, buildings, and airplanes.
 - a) Use the service interphone or the hand radios.
- (m) When the taxi surface has taxi lines available, taxi the airplane with the nose wheel on the line.
- (n) Taxi the airplane slowly with the engines at minimum power.

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 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.

<u>NOTE</u>: 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.
- (o) Always use the largest radius possible when you turn the airplane.

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

- 1) Make sure that the airplane continues to move while a turn is made.
- 2) Do not stop during a turn.
- (p) When it is possible, complete the taxi in a straight line roll for a minimum of 12 ft (4 m).

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

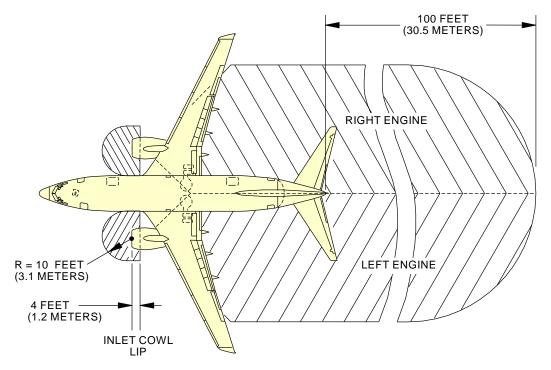
- (g) Operate the brakes to stop the airplane.
- (r) Set the parking brake after the airplane has stopped.
- (s) Use the airline checklist to deactivate, and to shutdown the applicable airplane systems.
- (t) Tell the ground crew to install the wheel chocks, and to install the static electrical ground wire (CHOCK INSTALLATION, PAGEBLOCK 10-11-05/201).
- (u) Release the parking brake after the wheel chocks are installed (optional).

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EFFECTIVITY





WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE ENGINE INLET BY 20 PERCENT.

CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. YOU CAN ALSO MOVE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

IDLE POWER (FORWARD THRUST)

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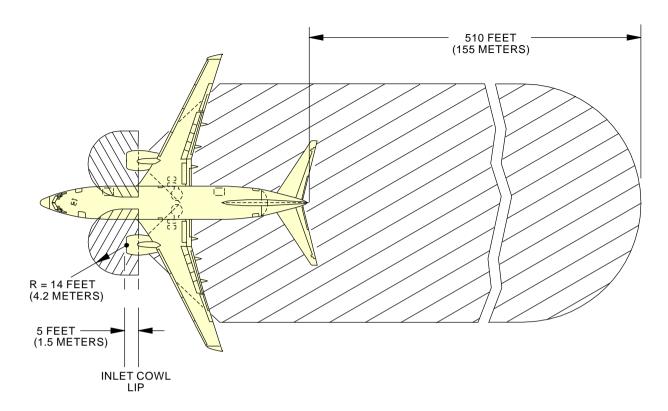
Engine Inlet and Exhaust Hazard Areas Figure 201/09-20-00-990-801 (Sheet 1 of 4)

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WARNING: KEEP ALL PERSONS OUT OF THE DANGEROUS AREA DURING ENGINE OPERATION. IF THE SURFACE WIND IS MORE THAN 25 KNOTS, INCREASE THE DANGEROUS AREA AT THE

ENGINE INLET BY 20 PERCENT.

CLEAN THE RAMP IF THERE IS SNOW, ICE, WATER, OIL OR OTHER CONTAMINATION ON THE RAMP. YOU CAN ALSO MOVE THE AIRPLANE TO A LOCATION THAT IS CLEAN.

MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

FORWARD BREAKAWAY POWER (BOTH ENGINES OPERATING)

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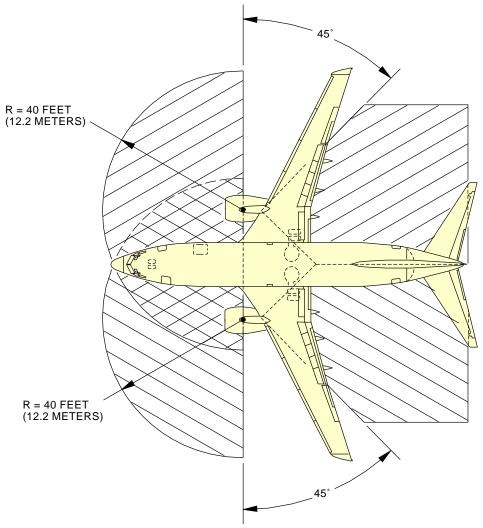
Engine Inlet and Exhaust Hazard Areas Figure 201/09-20-00-990-801 (Sheet 2 of 4)

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WARNING: MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

> MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

> OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

> **REVERSER OPERATION AT IDLE POWER** (RIGHT ENGINE ONLY)

> > H14081 S0006558583_V3

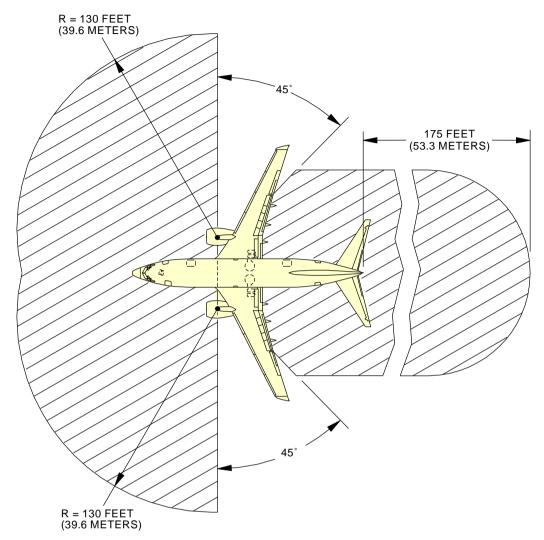
Engine Inlet and Exhaust Hazard Areas Figure 201/09-20-00-990-801 (Sheet 3 of 4)

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WARNING: MAKE SURE THAT ALL PERSONS ARE SAFE BEFORE YOU START THE ENGINE.

MAKE SURE THE PERSONS IN THE FLIGHT COMPARTMENT CAN SPEAK TO ALL PERSONS NEAR THE DANGEROUS AREA DURING ENGINE OPERATION.

OBEY ALL OF THE GROUND SAFETY PRECAUTIONS FOR THE ENGINES.

THE ENGINES CAN PULL PERSONS OR UNWANTED MATERIALS INTO THEM AND CAUSE INJURIES TO PERSONS OR DAMAGE TO EQUIPMENT.

REVERSER OPERATION AT BREAKAWAY POWER (BOTH ENGINES OPERATING)

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Engine Inlet and Exhaust Hazard Areas Figure 201/09-20-00-990-801 (Sheet 4 of 4)

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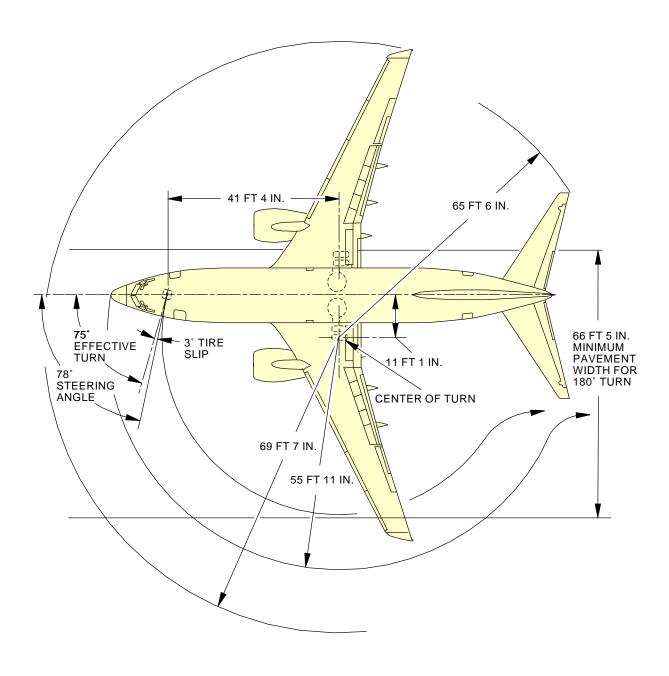
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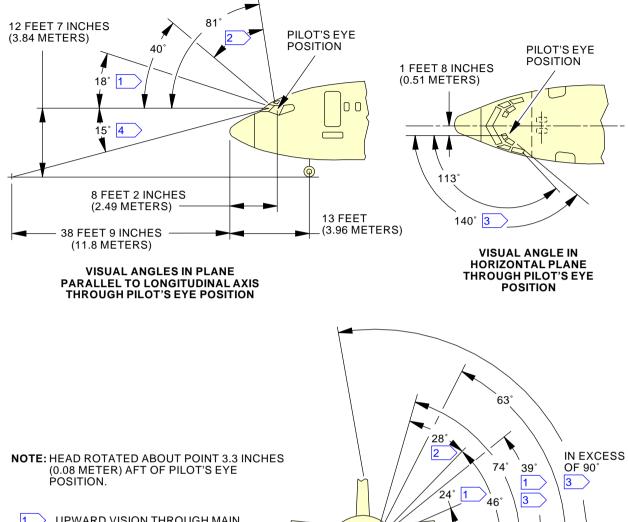


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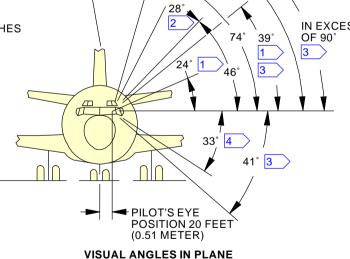
Taxi Turning Radius Figure 202/09-20-00-990-802







- UPWARD VISION THROUGH MAIN WINDOW.
- VISION THROUGH EYEBROW WINDOW.
- WITH HEAD MOVED 5 INCHES (0.13 METERS) OUTBOQARD
- DOWNWARD VISION THROUGH MAIN WINDOW.



PERPENDICULAR TO LONGITUDINAL AXIS THROUGH PILOT'S EYE POSITION

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Angle of View Figure 203/09-20-00-990-803

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