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CHAPTER 09 - TOWING AND TAXIING

TABLE OF CONTENTS

TOWING AND TAXIING - DESCRIPTION AND OPERATION

1. General

CAUTION: WHEN USING A TOW BAR THAT DOES NOT SEPARATE WHEN THE FUSE PIN SHEARS, UNCOORDINATED ATTEMPTS TO PANIC STOP THE TOW TUG AND/OR THE AIRPLANE FOLLOWING A FUSE PIN SHEAR CAN PRODUCE DYNAMIC LOADS THAT ARE IN EXCESS OF THE INITIAL FUSE LOAD. IN THE EVENT THAT THE TOW BAR FUSE PIN SHEARS, SMOOTHLY AND GENTLY APPLY THE BRAKES ON THE TOW TUG AND/OR AIRPLANE TO BRING THE COMBINATION TO A CONTROLLED STOP.

A. Usual towing, towing with an engine removed, emergency towing, and towing when the body landing gear is not centered, are presented in 09-11-00/201. Emergency cable towing for airplane recovery is possible if no damage has occurred to landing gear.

B. When you move the airplane on the ground, control of the airplane is similar to other tricycle-geared airplanes. Nose wheel steering and engine thrust are used as required. Always use the largest turning radius possible and never attempt to steer the nose wheel until the airplane is moving. Taxiing, airplane clearance, turning radii, engine danger areas, exhaust temperatures and exhaust velocities are presented in 09-21-00/201.

TOWING - MAINTENANCE PRACTICES

1. General
   A. This procedure contains these tasks:
      (1) Prepare to tow the airplane.
      (2) Usual airplane towing with the body landing gear in the center and locked.
      (3) Tow the airplane with engines removed.
      (4) Emergency towing of the airplane.
      (5) Tow the airplane with the body landing gear not in the center.
      (6) Tow the airplane supported by the nose gear and body gear (maximum weight 500,000 pounds).
      (7) Tow the airplane supported by the nose gear and wing gear (maximum weight 360,000 pounds).
      (8) Tow the airplane supported by the nose gear and wing gear (maximum weight 500,000 pounds).
      (9) Tow the airplane with a flat tire or flat tires.
      (10) Tow the airplane in high winds.
      (11) Put the airplane to its usual condition.
   B. The design of the airplane will permit you to tow or push the airplane from the nose or main landing gear.
   C. It is optional to tow the airplane with the entry doors, the upper and lower cargo doors, and/or the nose loading cargo door (if it is applicable) open.

      NOTE: Make sure you do not tow the airplane with these doors open at speeds more than 3 miles per hour. Also do not tow with the doors open in high winds or through jet engine exhaust.

      CAUTION: DURING SOME WEIGHT AND CENTER OF GRAVITY (CG) CONDITIONS, CLEARANCE BETWEEN THE AIRPLANE AND TOW VEHICLE CAN BE LIMITED. THIS IS WHEN THE TOW VEHICLE IS POSITIONED AFT OF THE NOSE LANDING GEAR. MAKE SURE THERE IS SUFFICIENT CLEARANCE BETWEEN THE TOW VEHICLE AND THE ANTENNAS BEFORE YOU DO UNDER BODY TOWING. IF YOU DO NOT OBEY THIS CAUTION, DAMAGE TO THE AIRPLANE AND TOW VEHICLE CAN OCCUR.

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

      (2) Each main landing gear has an eye for towing at each end. They are used for airplane recovery and other unusual operations.
   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 203.

      NOTE: Try not to make small turns. A small turn radius can cause an increase in the tire wear. This occurs most frequently during the pushback operation.

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 32.8 feet (10 meters). The clearance must be between the APU exhaust port and the adjacent airplane's wingtip (fuel vent).

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

F. You can use towbarless equipment to push or pull the airplane. Make sure the maximum permitted loads on the landing gear are not more than the Maximum Towing Loads as shown in Figure 203.

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 manufacturers data for procedures that are specific to their equipment.

G. If you tow the airplane at an angle and weight more than is specified, do the Exceeding Maximum Nose Gear Towing Angle Conditional Inspection (AMM 05-51-31/201).

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

H. Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

TASK 09-11-00-842-001

2. Prepare to Tow the Airplane (Fig. 201 thru 207A)
   A. Special Tools and Equipment
      (1) 2MIT65B04011-41 Safety - Nose Gear Rig, Steering Lockout Pin, and Tow Pin (Referred to as "Steering Lockout Pin" or "Tow Pin")
      (2) 6ME65B00161-1 Wing and Body Gear Ground Lockpin (4 required)

(3) 2ME65B01202-1 Nose Gear Ground Lockpin
(4) Nose Landing Gear Tow Bar (if it is necessary) - (Commercially Avail able)
(5) 8ME65B01202-1 Torsion Link Holding Tool
(6) 4MIT64B01202-1 Nose Gear Ground Lock Removal/Installation Tool

B. Standard Tools and Equipment
(1) Tow Vehicle

C. References
(1) AMM 05-51-05/201, Hard Landing or High Drag/Side Load Landing Condition
(2) AMM 05-51-31/201, Exceeding Maximum Nose Gear Towing Angle
(3) AMM 12-15-03/301, Wing Landing Gear Shock Strut
(4) AMM 12-15-04/301, Body Landing Gear Shock Strut
(5) AMM 24-22-00/201, Manual Control
(6) AMM 24-29-00/001, 115 Volt AC Standby Power Generator.
(7) AMM 24-29-00/501, 115 Volt AC Standby Power Generator.
(8) AMM 24-29-05/401, Towing Static Inverter.
(9) AMM 28-26-00/201, Defueling
(10) AMM 29-11-00/201, Main Hydraulic Supply System
(11) AMM 32-00-30/201, Landing Gear Door Locks
(12) AMM 32-21-03/201, Nose Gear Torsion Links
(13) AMM 49-11-00/201, Auxiliary Power Unit
(14) AMM 71-11-04/201, Fan Cowl Panel
(15) AMM 71-11-06/201, Core Cowl Panel
(16) AMM 78-31-00/201, Thrust Reverser System

D. Access
(1) Location Zones

715	Nose Landing Gear
735	Wing Landing Gear, Left
745	Wing Landing Gear, Right
755	Body Landing Gear, Left
765	Body Landing Gear, Right

E. Procedure

S 862-079
(1) Make sure you have an approved brake operator in the flight compartment.

S 412-068

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

CAUTION: MAKE SURE THE FAN REVERSER HALVES ARE CLOSED AND LATCHED BEFORE YOU TOW THE AIRPLANE. DAMAGE TO THE AIRPLANE AND EQUIPMENT CAN OCCUR.

(2) Close the fan cowl panels (AMM 71-11-04/201).

S 412-069
(3) Close the thrust reversers (AMM 78-31-00/201).

S 412-070
(4) Close the core cowl panels (AMM 71-11-06/201).

S 862-002
(5) Make sure the airplane is in an approximate lateral level condition. If it is not, do a check of these items:
(a) Examine the fuel quantity and distribution shown on EICAS.
(b) Examine the main landing gear strut pressures.
(c) Examine the cargo for lateral balance.
1) If the airplane remains in a list or lateral unbalance condition, calculate the weight and balance. Use the Weight and Balance Control and Loading Manual (D043U400). Make sure the lateral balance limits are not exceeded.

S 212-088
(6) If you will use a tow bar do the steps that follow:
(a) Examine the tow bar shear bolts for fractures.
(b) If there is a fracture in the tow bar shear bolts, replace the bolts.

NOTE: Four spare shear bolts are kept on the tow bar. When you replace the shear bolts, use AN9-57A bolts and NAS1022C9 nuts. Tighten the nuts 50 to 100 pound-inches.

S 862-005
(7) Move the cargo to give lateral balance, if it is necessary.

S 862-003
(8) Move the fuel to give lateral balance, if it is necessary (Ref 28-26-00-201).

S 862-093

CAUTION: DO NOT TOW THE AIRPLANE WITH A FULLY COMPRESSED SHOCK STRUT. DAMAGE TO THE SHOCK STRUT CAN OCCUR.

(9) Make sure that the shock struts are serviceable (Ref 12-15-03/301, 12-15-04/301, 12-15-05/301).

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.

S 282-078

CAUTION: THE MAXIMUM PERMITTED SHOCK STRUT EXTENSION FOR THE NOSE LANDING GEAR IS 18 INCHES. THIS IS TO MAKE SURE THE CENTERING CAM DOES NOT ENGAGE.

(10) Make sure the open surface of the inner cylinder chrome, of the nose landing gear, is not more than 18 inches.

S 492-005

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

CAUTION: DO NOT SET THE SUMMING LEVER WITH THE HYDRAULIC SYSTEM ACTIVATED. THE WHEELS WILL TURN WHICH CAN CAUSE DAMAGE TO EQUIPMENT.

(11) Install the Steering Lockout Pin (Fig. 201).

NOTE: When you insert the Steering Lockout Pin the nose gear hydraulic steering will lock out. With the Steering Lockout Pin installed the nose gear will turn as far as 65 degrees. To make a turn more than 65 degrees, you must disconnect the torsion links.

You can reach the summing lever through an access hole in the nose gear steering, metering valve. If it is necessary, you can insert the Steering Lockout Pin when you move the summing lever.

S 862-092

WARNING: MAKE SURE YOU INSTALL THE LANDING GEAR DOOR LOCKS BEFORE YOU INSTALL THE GEAR GROUND LOCK PINS, IF THE LANDING GEAR DOORS ARE OPEN (REF 32-00-30/201). AS AN ALTERNATIVE, MAKE SURE THE DOOR HANDLES ARE IN THE DOOR OPEN POSITION. TO PREVENT ACCIDENTAL OPERATION, REMOVE THE GEAR GROUND LOCKPIN INSTALLATION TOOL AFTER YOU INSTALL THE LOCKPIN. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(12) Make sure you install all gear ground lockpins (Fig. 201). Remove the nose gear ground lockpin installation tool, if it is necessary.

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

S 862-007

(13) Make sure you release the airplane brakes.

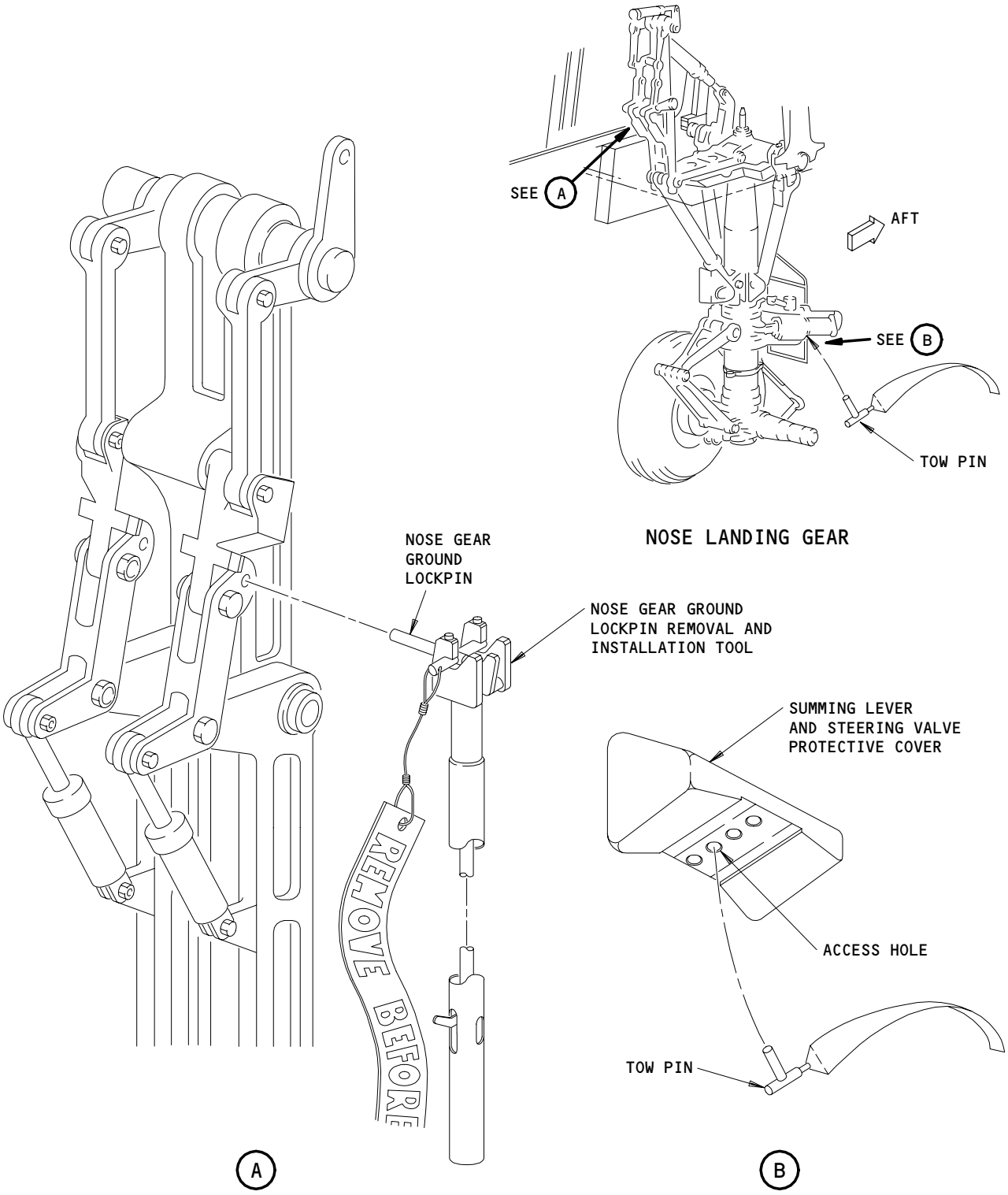
S 752-007

CAUTION: AT ALL TIMES, KEEP THE CENTER OF GRAVITY WITHIN THE LIMITS SHOWN (FIG. 202). UNUSUAL CONDITIONS, SUCH AS PERSONNEL GATHERED IN THE AFT FUSELAGE, FUEL IN THE OUTBOARD WING TANKS, REMOVAL OF MAJOR RADIO AND ELECTRONIC EQUIPMENT COMPONENTS FROM THE FORWARD BODY, ETC., CAN CAUSE A CHANGE IN THE AFT CENTER OF GRAVITY. IF THE CENTER OF GRAVITY MOVES TOO FAR AFT, THE AIRPLANE COULD FALL ON IT'S TAIL.

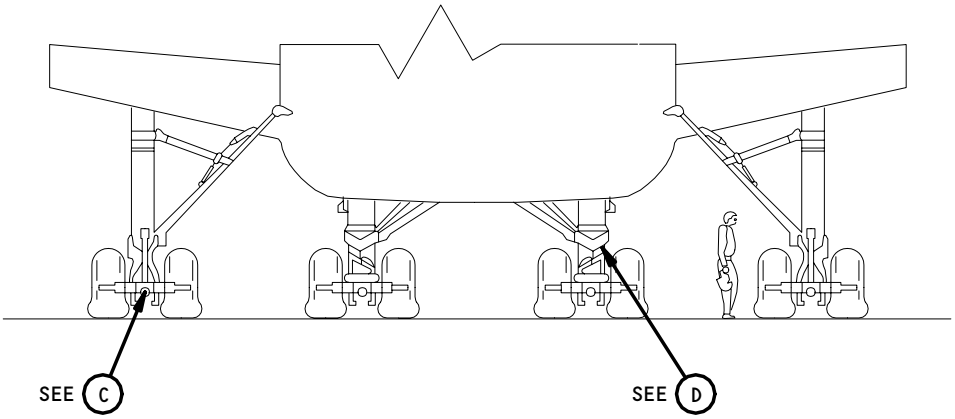
(14) Make sure the center of gravity is in the towing limits (Fig. 202).

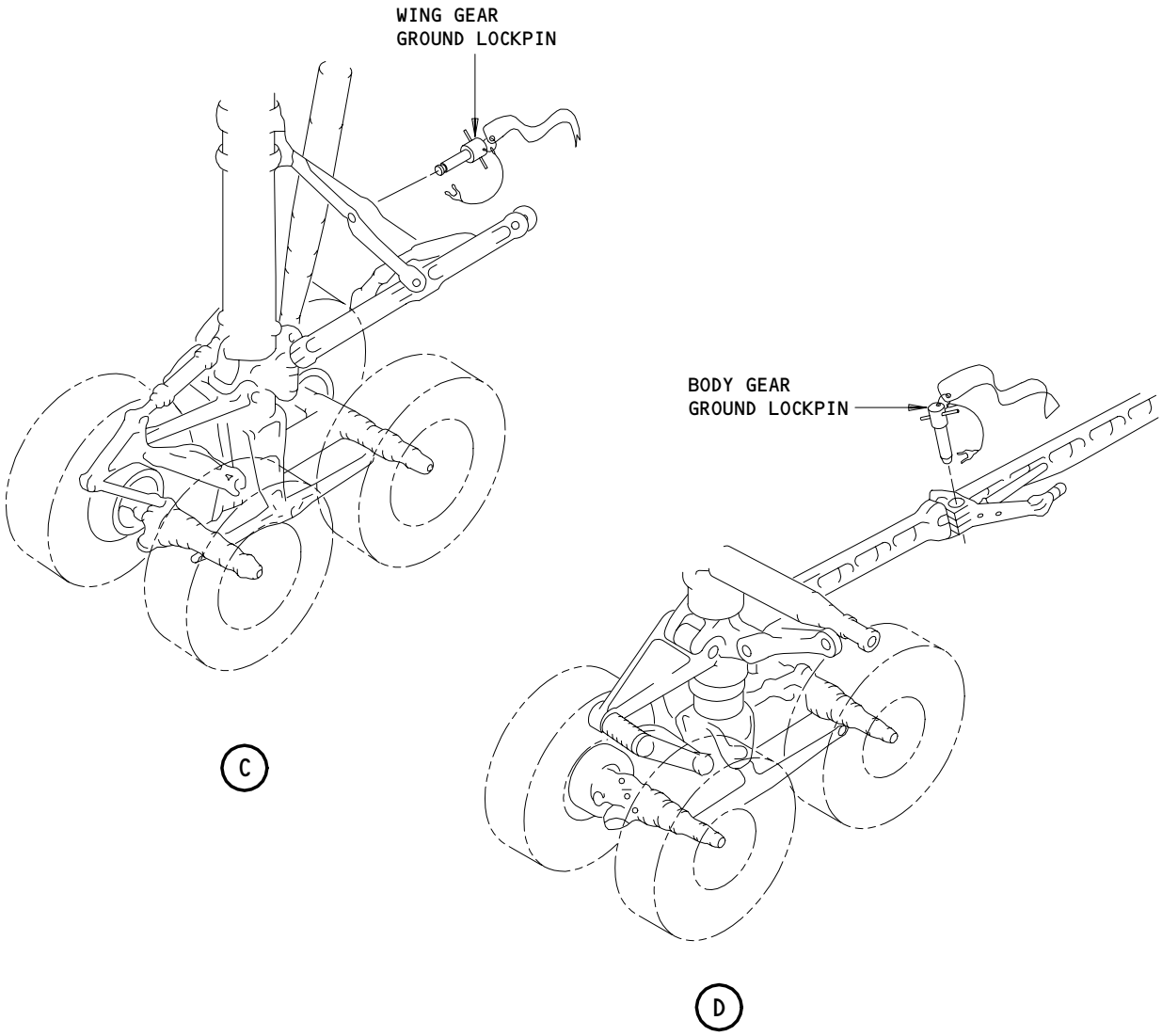
S 862-085

(15) Supply electrical power to the airplane.
  (a) Do the applicable steps below to use external power during towing.
    1) ALL EXCEPT KLM AIRPLANES;
      Do these steps to use external power during towing:
      a) Connect the power cable from the tow vehicle to the external power receptacle No. 1 (Ref 24-22-00/201).

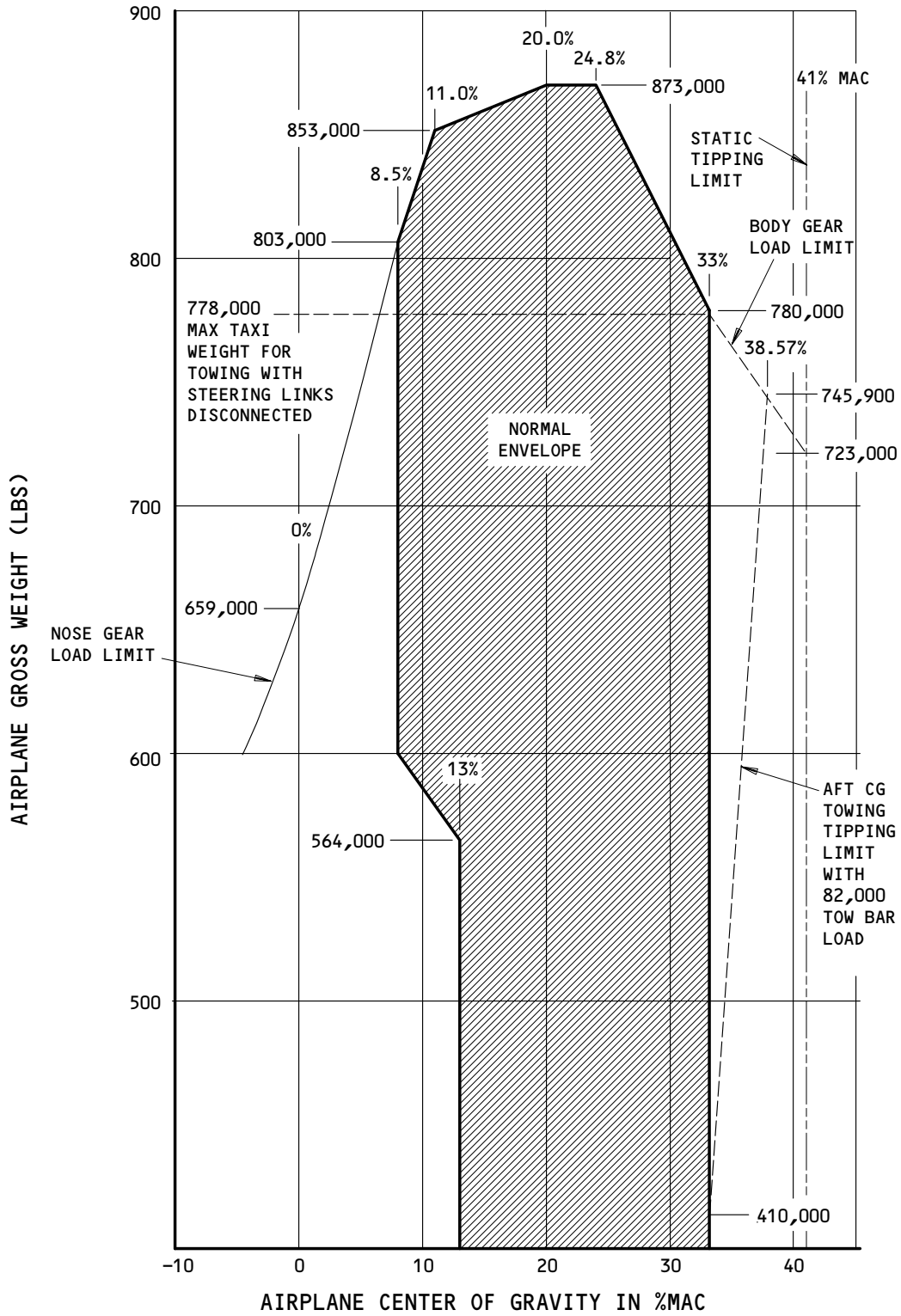


Wing Body and Nose Landing Gear Ground Lockpin Installation
Figure 201 (Sheet 1)





Wing Body and Nose Landing Gear Ground Lockpin Installation
Figure 201 (Sheet 2)



Towing Center of Gravity Limitations
Figure 202

CAUTION: THE BATTERY SWITCH MUST BE OFF WHEN ELECTRICAL POWER IS REMOVED FROM THE AIRPLANE. IF THE BATTERY SWITCH IS ON WITH NO AC POWER ON THE AIRPLANE, THE BATTERIES CAN BECOME DISCHARGED. THE APU WILL NOT START IF THE APU BATTERY IS DISCHARGED.

b) Set the BATTERY switch, on the P5 overhead panel, to ON.

NOTE: On airplane line number 812, airplane numbers after 819, and airplanes prior to 819 with SB-747-24-2152, the battery switch can be turned off during maintenance operations after airplane power is established. This will keep the batteries from discharging if the external power source trips off while the airplane is unattended.

2) KLM AIRPLANES;
Do these steps to use external power during towing:
a) Connect the power cable from the tow vehicle to the external power receptacle No. 1 (Ref 24-22-00/201).
b) Push the GROUND SERVICE switch on the P461 panel to energize the ground service bus.
c) Make sure that the STANDBY POWER switch on the P5 panel is set to the OFF position.
d) Set the TOWING POWER BACKUP switch on the P461 panel (if installed) to the ENABLE position.

CAUTION: THE BATTERY SWITCH MUST BE OFF WHEN ELECTRICAL POWER IS REMOVED FROM THE AIRPLANE. IF THE BATTERY SWITCH IS ON WITH NO AC POWER ON THE AIRPLANE, THE BATTERIES CAN BECOME DISCHARGED. THE APU WILL NOT START IF THE APU BATTERY IS DISCHARGED.

e) Set the BATTERY switch, on the P5 overhead panel, to ON.

NOTE: On airplanes line number 819 and on, and airplanes prior to line number 819 with SB-747-24-2152, the battery switch can be turned off during maintenance operations after airplane power is established. This will keep the batteries from discharging if the external power source trips off while the airplane is unattended.

(b) Do these steps to use power from the APU generators during towing:
1) Start and operate the APU (Ref 49-11-00/201).
2) Supply APU generator power to the ground handling/ground service busses (Ref 24-22-00/201).

(c) Do these steps to tow an airplane without external or APU electrical power (AMM 24-29-00/001, AMM 24-29-00/501, AMM 24-29-05/401) :
1) With electrical power still on the airplane, switch on hydraulic system number 4 and fully charge the brake accumulator.

NOTE: Hydraulic system number 4 supplies pressure to the normal brake system and the hydraulic brake accumulator. With only the number 4 system energized, there will be no hydraulic pressure available to steer the body gear. Also, 1800 psi will supply sufficient pressure for brakes while towing with only the number 4 electric pump to supply the system pressure.

2) Close the parking brake module.
a) Close the 6L18 Park Brake circuit breaker on the P6 panel.
b) Set the parking brake.
c) Open the 6L18 Park Brake circuit breaker on the P6 panel.

NOTE: This procedure must be followed otherwise, without electrical power, the brake accumulator pressure will bleed off if brakes are allied and the parking module remains open.

3) Switch off hydraulic systems and remove electrical power.
4) Ensure the 180-1K6 Towing BAT PWR circuit breaker and 180-1N1 Towing BAT PWR CONT circuit breaker on P180-1 standby power panel are closed.
5) Switch the Towing BAT PWR switch on P461 panel to BAT position and the standby power switch on the P5 panel to OFF position.

NOTE: This provides power from the airplane battery to the towing static inverter and supplies power to the navigation lights, flood and panel lights and the brake pressue indicator.

6) If the hydraulic power is necessary to steer the body gear, pressurize the hydraulic system No. 1.

NOTE: On airplanes equipped with the optional hydraulic system 1 auxiliary pump the external power may operate the system 1 auxiliary pump to pressurize system 1. Hydraulic system number 1 will provide hydraulic power to steer the body gears when the towing angle exceeds 20 degrees. This is when the airplane is in the ground mode, the wheel speed is less than 20 knots. The power to operate both the system 4 and system 1 auxiliary hydraulic pumps (maximum starting current of 200 amps and maximum operating current of 38.5 amps for each pump).

On airplanes not equipped with the optional hydraulic system 1 auxiliary pump the APU must be used to operated the system 1 demand pump.

S 862-012

(16) Supply hydraulic power (Ref 29-11-00/201).

(a) If the APU is not used and external electrical power is available:

1) Supply pressure to the hydraulic system No. 4.

NOTE: Hydraulic system No. 4 supplies pressure to the normal brake system and the hydraulic brake accumulator. With only the No. 4 system energized, there will be no hydraulic pressure available to steer the body gear. Also, 1800 psi will supply sufficient pressure for brakes while towing with only the No. 4 electric pump to supply the system pressure.

2) If hydraulic power is necessary to steer the body gear, pressurize the hydraulic system No. 1.

NOTE: Hydraulic system No. 1 will provide hydraulic power to steer the body gears when the towing angle exceeds 20 degrees. This is when the airplane is in the ground mode, and the wheel speed is less than 20 knots.

(b) If you use the APU:

1) Supply pressure to the main hydraulic system No. 4.

NOTE: Hydraulic system No. 4 supplies pressure to the normal brake system and the hydraulic brake accumulator.

2) If hydraulic power is necessary to steer the body gear, pressurize the hydraulic system No. 1.

NOTE: Hydraulic system No. 1 will provide hydraulic power to steer the body gears when the towing angle exceeds 20 degrees. This is when the airplane is in the ground mode, and the wheel speed is less than 20 knots.

S 862-095

WARNING: IF YOU LOSE ELECTRICAL POWER OR IF THE HYDRAULIC SYSTEM 4 IS INTERRUPTED, DECREASE THE TOW SPEED IMMEDIATELY OR STOP THE TOWING PROCEDURE. A DECREASE IN ELECTRICAL POWER OR HYDRAULIC PRESSURE CAN DECREASE OR PREVENT THE OPERATION OF THE BRAKES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(17) While towing with the APU off, electrical power from the tow vehicle to the airplane can be lost. Hydraulic pump operation will stop. If this happens, do the steps that follow to stop the airplane and prevent the loss of brake hydraulic pressure.
(a) Advise the tow vehicle operator to stop.

KLM CAUTION: IF THE BRAKES ARE RELEASED FOR ANY REASON, FURTHER BRAKING
KLM ABILITY MAY BE LOST.

(b) When the tow is stopped, apply airplane brakes and keep them applied.
(c) Turn the battery switch on.
(d) Set the parking brake.
(e) Open the 6L18 PARK BRAKE circuit breaker on the P6 Main Power Distribution Panel to make sure the valve remains closed.
(f) Turn the battery switch off.
(g) Release the parking brake and make sure that HYD BRAKE PRESS gage shows approximately 3000 psi.

NOTE: Full hydraulic pressure (3000 psi.) supplies only one full application of the brakes.

S 862-090

WARNING: IF YOU LOSE ELECTRICAL POWER OR IF THE HYDRAULIC SYSTEM 4 IS INTERRUPTED, DECREASE THE TOW SPEED IMMEDIATELY OR STOP THE TOWING PROCEDURE. A DECREASE IN ELECTRICAL POWER OR HYDRAULIC PRESSURE CAN DECREASE OR PREVENT THE OPERATION OF THE BRAKES. INJURY TO PERSONS OR DAMAGE TO EQUIPMENT CAN OCCUR.

(18) While towing, the towing shear pin can fail. This will disconnect the tow vehicle from the airplane. If the APU is off, this condition will cause hydraulic pump operation to stop. If this happens, do the steps that follow to stop the airplane and prevent the loss of brake hydraulic pressure.

KLM CAUTION: IF THE BRAKES ARE RELEASED FOR ANY REASON, FURTHER BRAKING
KLM ABILITY MAY BE LOST.

(a) Immediately apply airplane brakes and keep them applied.
(b) Turn the battery switch on.
(c) Set the parking brake.
(d) Open the 6L18 PARK BRAKE circuit breaker on the P6 Main Power Distribution Panel to make sure the valve remains closed.
(e) Turn the battery switch off.
(f) Release the parking brake and make sure that HYD BRAKE PRESS gage shows approximately 3000 psi.

NOTE: Full hydraulic pressure (3000 psi.) supplies only one full application of the brakes.

S 862-015

CAUTION: IF YOU EXCEED THE PERMITTED NOSE GEAR LOADS IN A TURN, YOU CAN CAUSE STRUCTURAL DAMAGE.

(19) Make sure you do not exceed the maximum permitted tow load. See Fig. 203 for the maximum nose and main gear tow loads.

NOTE: A tow bar shear pin values can be larger than the permitted nose gear loads in turns more than 20 degrees.

(a) If you tow the airplane at an angle and weight more than is specified, do the Exceeding Maximum Nose Gear Towing Angle Conditional Inspection (AMM 05-51-31/201).

S 582-008

(20) If you will exceed the maximum nose gear tow loads, use the Emergency Towing procedure (see par. 5) to tow the airplane.

NOTE: Do not attach a tow bar to the airplane. Do not disconnect the nose gear torsion links. See the Emergency Towing procedure for more towing information.

S 492-009

(21) If you will use a tow bar, do the steps that follow:

(a) Align the tow bar in front of the nose gear towing lug.

(b) Lift the handle of the tow bar lock mechanism.

CAUTION: MAKE SURE THE TOW BAR PINS ARE ALIGNED WITH THE TOW LUG HOLES. DO NOT USE FORCE TO MOVE THE TOW BAR PINS INTO THE TOW LUG HOLES. DAMAGE TO TOW BAR MECHANISM CAN OCCUR.

(c) Move the tow bar above the towing lug and lower the handle of the tow bar lock mechanism.

CAUTION: ON SOME AIRPLANES, WHEN YOU USE UNDER BODY TOWING, DAMAGE CAN OCCUR TO THE VHF ANTENNA. CLEARANCE BETWEEN THE TOW VEHICLE AND THE VHF ANTENNA WILL DEPEND ON THE VHF ANTENNA LOCATION, TOW BAR LENGTH, TOW VEHICLE HEIGHT, AIRPLANE WEIGHT, AND CG CONDITIONS. MAKE SURE SUFFICIENT CLEARANCE EXISTS BEFORE YOU USE UNDER BODY TOWING.

(d) Move the tow vehicle to the tow bar and engage the tow bar.

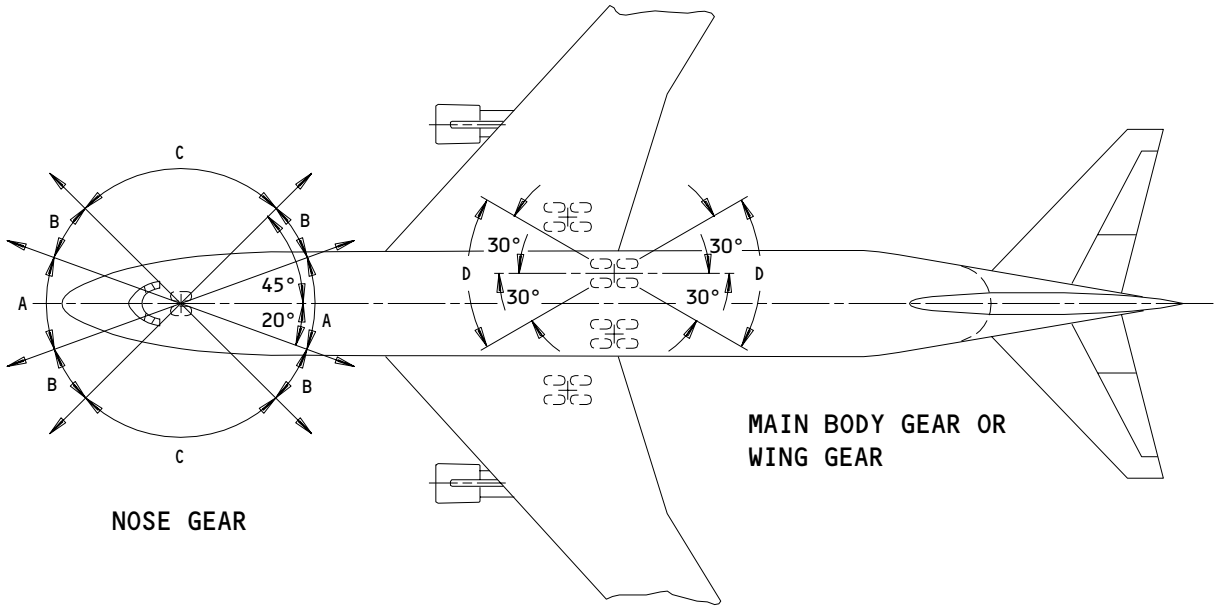
(e) Lift the tow bar wheels.

S 862-016

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(22) If the nose gear angle may be more than 65 degrees, disconnect the torsion links before you start to tow the airplane (AMM 32-21-03/201).

NOTE: If you will use the body landing gear steering system (par. 6), do not disconnect the torsion links and do not tow at an angle more than 70 degrees. The nose gear torsion links must stay connected while you tow the airplane. This will permit the body landing gear steering system to work when the nose gear is turned 20 degrees or more.



MAXIMUM ALLOWABLE TOWING LOADS FOR SUSTAINED TOWING

MAX TAXI GROSS WEIGHT	
LOAD	873,000 LBS
A	131,000 LBS
B	65,500 LBS
C	46,200 LBS
D	97,800 LBS

TOW FORCE CALCULATION

BREAKAWAY ON DRY LEVEL CONCRETE: 4% X W

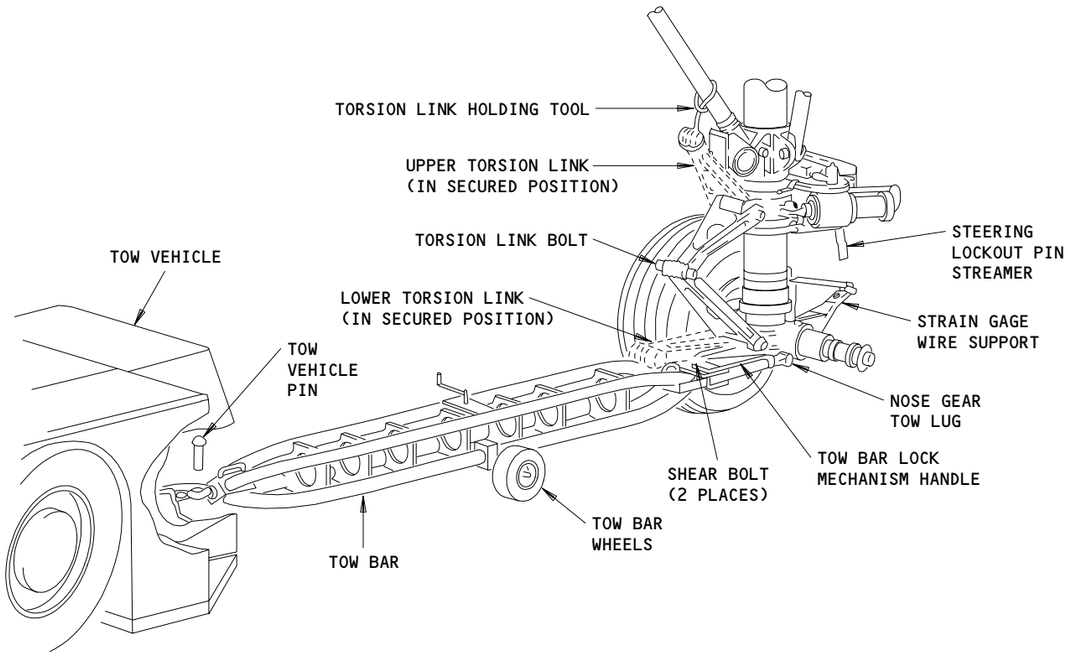
TO MAINTAIN ROLLING ON LEVEL SURFACE: 3% X W

BREAKAWAY ON SLOPE: 4% X W + 1% X W PER 1% SLOPE

TO MAINTAIN ROLLING ON SLOPE: 3% X W + 1% X W PER 1% SLOPE

EXAMPLE: BREAKAWAY ON 2% SLOPE FOR 873,000 POUND AIRPLANE (NO ENGINE OPERATING) 4% X 873,000 + 2% X 873,000 = 52,380 LB PULL

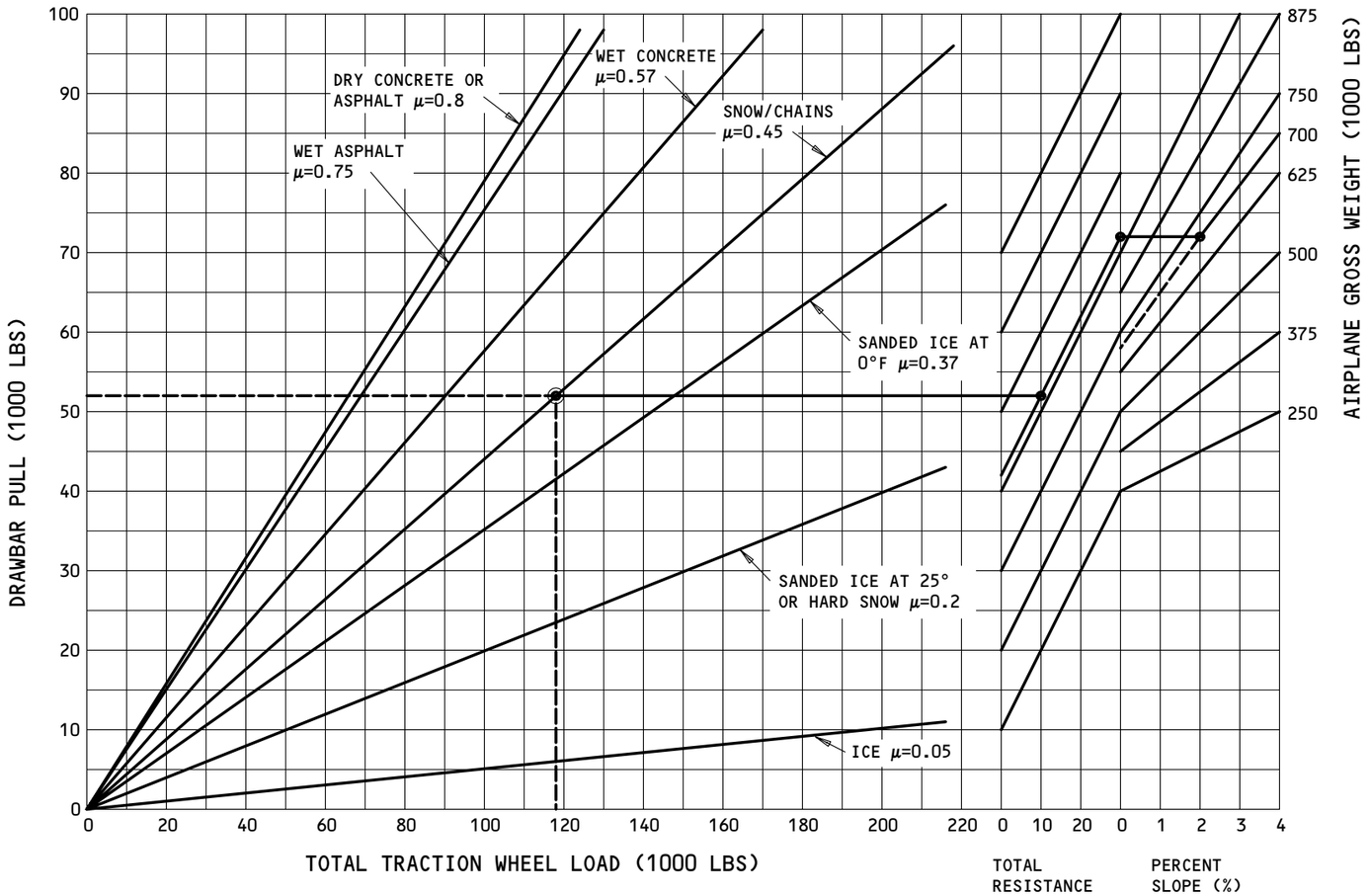
Nose and Main Landing Gear Maximum Towing Loads
Figure 203



NOTE: WHEEL REMOVED FOR CLARITY.

Tow Bar Attachment
Figure 204

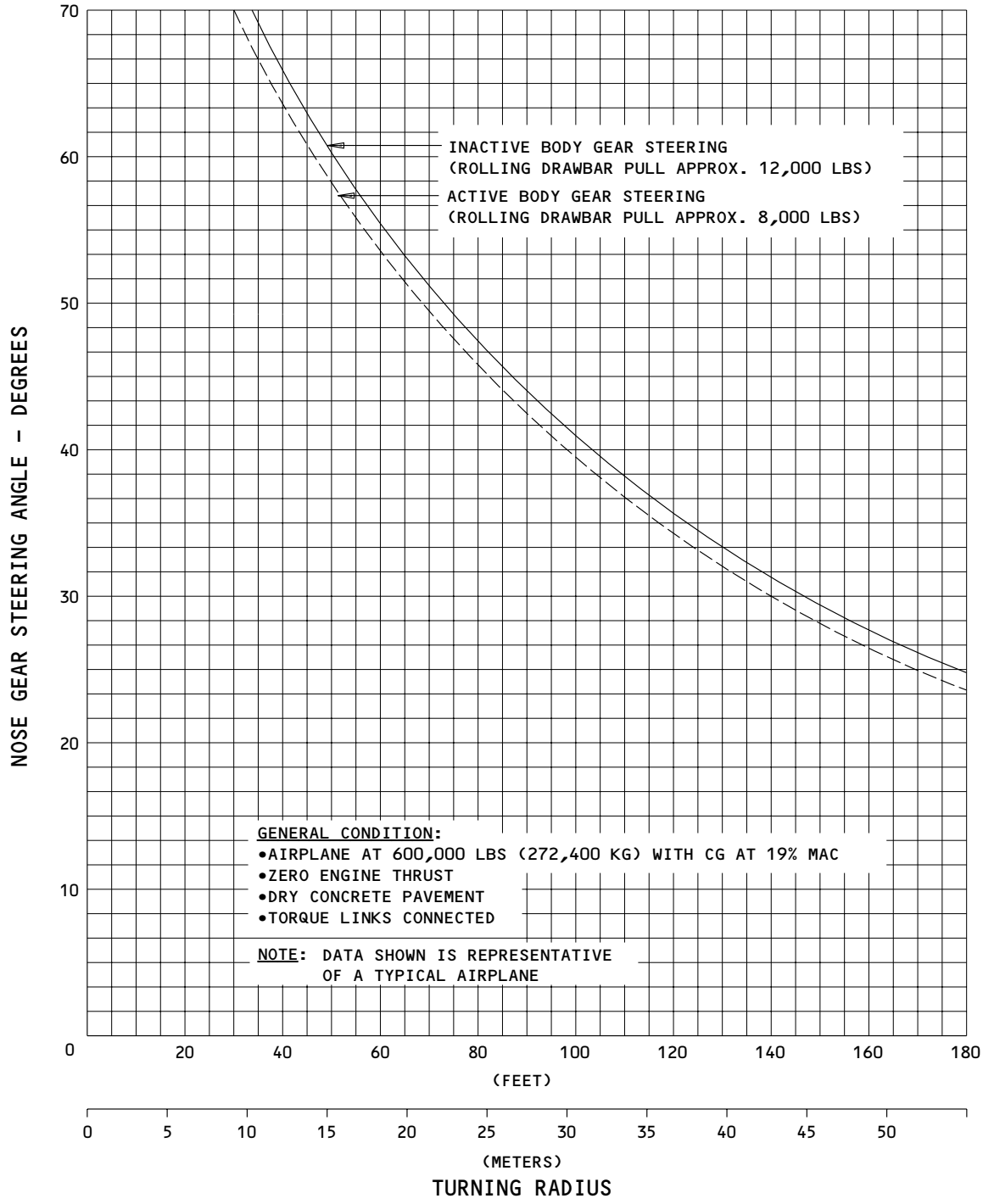
NOTE: UNUSUAL BREAKAWAY CONDITIONS NOT SHOWN. STRAIGHT LINE TOW SHOWN.
COEFFICIENTS OF FRICTION (μ) ARE SHOWN FOR RUBBER-TIRED TOW VEHICLES.
(FOR ALLOWABLE TOWING LOADS, SEE FIG 203)



EXAMPLE: AIRPLANE GROSS WEIGHT 700,000 POUNDS TOWING ON SNOW WITH CHAINS INSTALLED ON TRACTOR AGAINST A 2% SLOPE WITH AN ADDED RESISTANCE OF 10,000 POUNDS FROM IDLE THRUST OF ENGINES (WHEN BACKING AIRPLANE). THE RESULT IS A DRAWBAR PULL OF 52,000 POUNDS AND TRACTOR WEIGHT OF 118,000 POUNDS, OR LARGER.

Breakaway Towbar Load Requirements
Figure 205

U23267

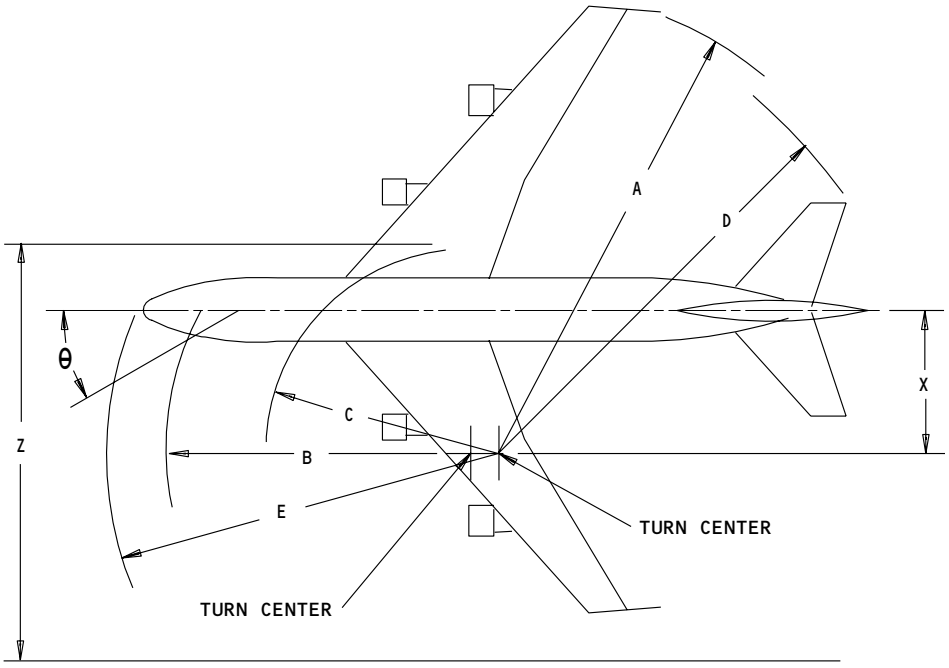


Turning Radius of Towed Airplane with Body Gear Steering Active or Inactive
Figure 206

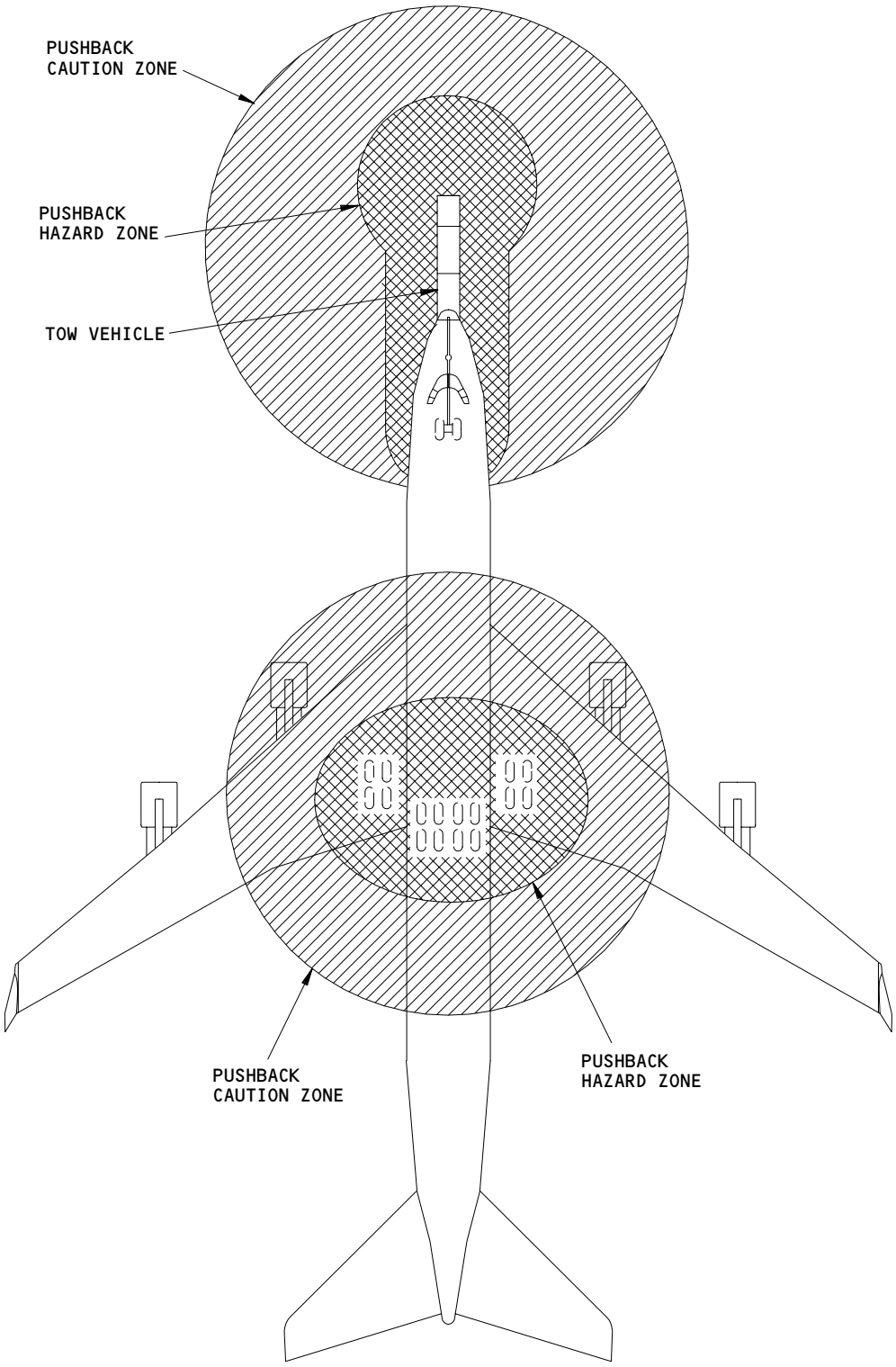
θ NOSE GEAR TOWING ANGLE	X TURN RADIUS		CLEARANCE RADIUS										Z [2] MINIMUM WIDTH FOR 180° TURN	
			A WING TIP		B [2] NOSE GEAR		C [2] WING GEAR		D TAIL TIP		E NOSE			
	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M	FT	M
30°	137	42	244	75	160	49	158	48	214	65	173	53	318	97
40°	94	29	206	63	125	38	115	35	180	55	141	43	240	73
50°	66	20	181	55	105	32	87	27	161	49	124	38	192	59
60°	46	14	165	50	94	29	67	20	150	46	115	35	161	49
65° [1]	35	11	158	48	90	28	55	17	146	45	112	34	148	45
70°	29	9	150	46	87	26	50	15	141	43	109	33	136	41

[1] MAXIMUM ALLOWABLE TOWING ANGLE WITH TORSION LINKS CONNECTED IS 65 DEGREES.
[2] TO OUTSIDE OF TIRE

NOTE: ABOVE VALUES ARE CALCULATED AND DO NOT ACCOUNT FOR TIRE SCRUB OR SLIP.
ABOVE VALUES INCLUDE BODY GEAR STEERING.



Turning Clearance
Figure 207



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.

Towing Hazard Zones
Figure 207A

S 862-017

CAUTION: HOLD THE UPPER TORSION LINK ABOVE THE NOSE WHEEL TIRES. THIS WILL PREVENT DAMAGE TO THE TIRES WHILE YOU TOW THE AIRPLANE.

(23) Hold the upper torsion link in the up position. Put the lower torsion link on the tow bar (Fig. 204).

S 862-010

CAUTION: IF YOU USE THE AIRPLANE BRAKES, WITHOUT ELECTRICAL POWER ON THE AIRPLANE, YOU WILL LOSE HYDRAULIC PRESSURE TO THE BRAKES UNLESS THE PARKING BRAKE MODULE IS CLOSED.

(24) Close the parking brake module.
  (a) If electrical power is available, close the module as follows:
    1) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.
    2) Set the parking brake.
    3) Open the 6L18 PARK BRAKE circuit breaker on the P6 panel.
    4) Release the parking brake.
  (b) If electrical power is not available, close the module as follows:
    1) Open the 6L18 PARK BRAKE circuit breaker on the P6 panel.
    2) Move the parking brake module, manual override lever, to position 1 (closed).

      NOTE: The manual override lever is found in the body gear wheel well.

TASK 09-11-00-582-018

3. Tow the Airplane (Usual - Body Landing Gear Centered and Locked)
  A. General
    (1) It is optional to tow the airplane with the entry or cargo doors open.

CAUTION: WHEN YOU TOW AN AIRPLANE WITH A GROSS WEIGHT MORE THAN 778,000 POUNDS, LIMIT THE NOSE GEAR TOWING ANGLE TO A MAXIMUM OF 65 DEGREES. IF YOU HAVE DISCONNECTED THE TORSION LINKS AND YOU MUST TURN THE AIRPLANE GREATER THAN 65 DEGREES, MAKE SURE YOU DO NOT DAMAGE THE STRAIN GAGE WIRING INSTALLATION ON THE AFT SIDE OF THE NOSE GEAR.

DO NOT OVER-ROTATE INTO THE ORANGE MARKER. DAMAGE TO THE TILLER ASSEMBLY OR STEERING ACTUATORS CAN OCCUR.

(2) You must monitor a turn at or near 65 degrees.

NOTE: There is a painted stripe on the nose gear outer cylinder that will align with a painted stripe on the inner cylinder when the nose gear turning angle is at 60 degrees. The marks are on the both the forward and aft side of the nose gear, however, not all airplanes have the painted stripe due to the airplanes configuration and paint.

CAUTION: IF YOU USE A TOW BAR, YOU CAN CAUSE THE SHEAR PINS TO SHEAR IF YOU USE THE AIRPLANE BRAKES WHILE YOU TOW THE AIRPLANE. MOST TOWBARLESS TOW VEHICLES DO NOT HAVE A SHEAR PIN TO LIMIT THE LOADS IF AIRPLANE BRAKES ARE USED DURING TOWING. IF AIRPLANE BRAKES ARE USED WHILE TOWING WITH A TOWBARLESS TOW VEHICLE ATTACHED TO THE NOSE LANDING GEAR, PERFORM THE "HARD LANDING OR HIGH DRAG/SIDE LOAD LANDING CONDITION" INSPECTION FOR THE NOSE LANDING GEAR AREAS (REF 05-51-05).

(3) When you tow the airplane, do not use the airplane brakes to stop the airplane, unless it is an emergency.

B. References

(1) 32-53-00, Body Gear Steering System

C. Procedure

S 842-011

(1) Prepare to tow the airplane (see par. 2).

S 862-075

(2) Make sure the body landing gear are centered and locked (Ref 32-53-00).

S 582-012

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A DECREASE IN HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE TOWING THE AIRPLANE.

(3) Tow the airplane.

NOTE: For airplane clearances while towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) Before you park the airplane, complete towing with a 12-foot straight path.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(c) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: To make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-013

(4) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-020

(5) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in location.

S 782-021

(6) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-023

(7) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-024

4. Tow the Airplane (With Engines Removed)

A. Procedure

S 842-025

(1) Prepare to tow the airplane (see par. 2).

S 842-080

CAUTION: AT ALL TIMES, KEEP THE CENTER OF GRAVITY IN THE LIMITS SHOWN (FIG. 202). UNUSUAL CONDITIONS, SUCH AS PERSONNEL GATHERED IN THE AFT FUSELAGE, FUEL IN THE OUTBOARD WING TANKS, REMOVAL OF MAJOR RADIO AND ELECTRONIC EQUIPMENT COMPONENTS FROM THE FORWARD BODY, ETC., CAN CAUSE A CHANGE IN THE AFT CENTER OF GRAVITY. IF THE CENTER OF GRAVITY MOVES TOO FAR AFT, THE AIRPLANE COULD FALL ON IT'S TAIL.

(2) Measure the center of gravity.

NOTE: Usually, no ballast is required when towing the airplane with any combination of engines removed. The plane must be fully equipped (except crew, payload, and fuel), and all landing gear must be supporting the airplane.

To keep the aft towing tipping limit (Fig. 202) you can add ballast. Keep a minimum load on the nose gear of 15,000 pounds (235 psi nose gear strut pressure).

S 582-081

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE TOWING THE AIRPLANE.

(3) Tow the airplane.

NOTE: For airplane clearances during towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) Before you park the airplane, complete towing with a 12-foot straight path.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(c) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: To make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-024

(4) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-067

(5) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in location.

S 782-025

(6) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-028

(7) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-029

5. Tow the Airplane (Emergency)

A. General

(1) When you move the airplane after it has gone off the runway, taxiway, or parking strip, gear tow loads near maximum can possibly be applied to each gear. This procedure assumes that no damage has occurred to the landing gear. Also, the airplane cannot be moved by nose gear towing without causing the nose gear towing load to exceed the maximum limit (Fig. 202).

WARNING: YOU WANT TO PREVENT DAMAGE FROM TOW CABLES IF THEY BREAK. YOU CAN CONNECT MANILA ROPE TO THE CABLES TO PREVENT THE CABLE FROM FAST MOVEMENT IF THE CABLE BREAKS OR THE SHEAR LINK FAILS. THIS CAN PREVENT INJURY TO PERSONS OR DAMAGE TO EQUIPMENT.

(2) You must use 98,200-pound shear links when you tow the wing and body main landing gear with a cable.

(3) You must use a 131,000-pound shear link when you tow the nose gear with a cable.

B. Procedure

S 842-030

(1) Prepare to tow the airplane (see par. 2).

S 582-077

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF THERE IS A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE TOWING THE AIRPLANE WITH THE NOSE LANDING GEAR TOW BAR.

(2) Tow the airplane.

NOTE: For airplane clearances while towing, see Fig. 207.

(a) Connect the cables to the landing gear lugs and the tow vehicles.
(b) Make sure all tow vehicles pull at the same time.
(c) Increase the pull slowly until the airplane starts to move.
(d) Make sure you apply the wheel chocks each time the airplane moves.
(e) When the airplane starts to move, keep a slow and continuous speed in a straight line.
(f) When the airplane has returned to a hard surface (runway, taxi, or parking strip) stop the airplane and apply the airplane chocks.

S 862-027

(3) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in position.

S 782-028

(4) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 092-029

(5) Remove the cables from the landing gear lugs and the tow vehicles.

S 492-030

(6) Attach the tow bar or tow vehicle to the airplane (see par. 2).

S 582-031

(7) Tow the airplane.

NOTE: For airplane clearances during towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) Before you park the airplane, complete towing with a 12-foot straight path.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(c) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: To make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-032

(8) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-033
(9) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in position.

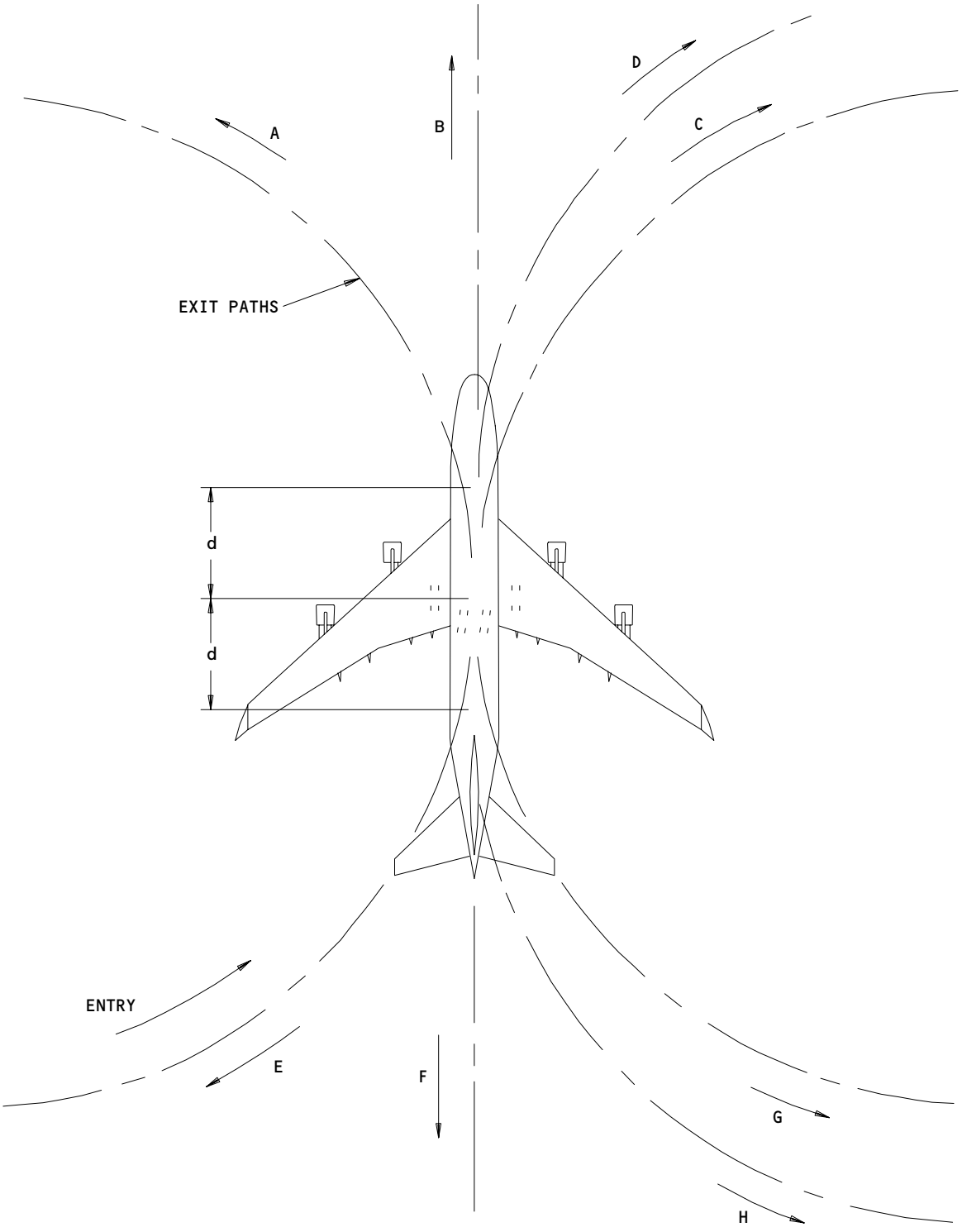
S 782-034
(10) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-032
(11) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-033

6. Tow the Airplane (With Body Landing Gear Not Centered)
   A. General
      (1) Make sure you use the body landing gear steering system (Ref 32-53-00/001) when you follow this procedure. As part of this procedure, follow the normal towing procedures (par. 2 and 3).
      (2) The condition of the runway (wet or dry), the airplane gross weight, and the airplane CG can affect the performance of the system.
      (3) Do not disconnect the nose gear torsion links. This will allow the body landing gear steering system to work when the nose gear is turned 20 degrees or more.
      (4) The position of the body gear trucks will change with the direction of the entry path.
      (5) The exit path for towing an airplane from a parked position is shown on Fig. 208.
      (6) The exit path is identified on Fig. 209.
      (7) The system performance and a recommended towing procedure for each exit path is shown in Fig. 210.
         (a) The towing procedure will be effected by the parked position of body trucks (steered or centered), No. 1 hydraulic system pressure, electrical power, and the exit path (Fig. 210).
         (b) The main gear body trucks will center and lock when a straight path of 20- to 40-feet is used to get the airplane to the parked position. Figure 210 will show you the exit path comments and towing procedures when the main gear body trucks are not in the center when the airplane is parked.
   B. References
      (1) 32-53-00/001, Body Gear Steering
   C. Procedure

S 842-034
(1) Prepare to tow the airplane (see par. 2).



Parked Airplane
Figure 208

PATH	DESCRIPTION
A	Forward direction turn with nose gear steering angle in the range of 20 to 70 degrees in the same direction as for the entry path.
B	Forward direction with nose gear steering angle in the range of ±20 degrees from straight.
C	Forward direction turn with nose gear steering angle in the range of 20 to 70 degrees in the opposite direction as for the entry path.
D	Identical to C except preceded by a straight (nose gear angle ±20 degrees) forward path of length d, Fig. 207 (20 to 40 feet).
E	Aft direction turn with nose gear steering angle in the range of 20 to 70 degrees in the same direction as for the entry path.
F	Aft direction with nose gear steering angle in the range of ±20 degrees from straight.
G	Aft direction turn with nose gear steering angle in the range of 20 to 70 degrees in the opposite direction as for the entry path.
H	Identical to G except preceded by a straight (nose gear angle ±20 degrees) aft path of length d, Fig. 207 (20 to 40 feet).

Exit Paths
Figure 209

PARKED POSITION OF BODY TRUCKS	NO. 1 HYDRAULIC SYSTEM PRESSURIZED	ELECTRICAL POWER AVAILABLE	EXIT PATH (Fig. 208)	COMMENTS AND TOWING PROCEDURE
Centered and Locked	Yes	Yes	A,B,C,D,F	Body trucks steer as desired. No special towing procedure required.
			E,G,H	Body trucks steer as desired up to ±35 degree nose gear angle. Above ±35 degrees body trucks will center themselves as aircraft rolls. 1 No special towing procedure required.
	Yes	No	All Paths	Body trucks remain centered and locked.
	No	Yes or No	A to H	No special towing procedure required.
Steered	Yes	Yes	A,D	Body trucks steer as desired. No special towing procedure required.
			B,F	Body trucks will center and lock themselves as aircraft rolls. No special towing procedure required.
			C	Body trucks positioned for opposite hand turn at start causing "crabwise" motion or large turning radius. Use exit path D.

1 NOTE: Above 35 degrees body trucks center themselves because torsional force of tire scrubbing overcomes steering cylinder hydraulic pressure.

Recommended Towing Procedures
Figure 210 (Sheet 1)

PARKED POSITION OF BODY TRUCKS	NO. 1 HYDRAULIC SYSTEM PRESSURIZED	ELECTRICAL POWER AVAILABLE	EXIT PATH (Fig. 208)	COMMENTS AND TOWING PROCEDURE
Steered	Yes	Yes	E,H	Body trucks steer as desired up to ±35 degree nose gear angle. Above ±35 degrees body trucks will center themselves as aircraft rolls. 1 No special towing procedure required.
			G	Body trucks positioned for opposite hand turn at start causing "crabwise" motion or large turning radius. Use exit path H.
		No	A,B,C,D,E, F,H	Body trucks will center and lock as aircraft rolls. Some "crabwise" motion will occur when attempting path C. After locking, trucks will stay centered and locked for re-mainder of tow. No special towing procedure required.
			G	Body trucks positioned for opposite hand turn at start causing "crabwise" motion or large turning radius. Use exit path H.
	No	Yes or No	A,G,H	Body trucks will steer to maxi-mum angle permitted by actuator stroke and excessive tire scrubbing will occur.

1 NOTE: Above 35 degrees body trucks center themselves because torsional force of tire scrubbing overcomes steering cylinder hydraulic pressure.

Recommended Towing Procedures
Figure 210 (Sheet 2)

PARKED POSITION OF BODY TRUCKS	NO. 1 HYDRAULIC SYSTEM PRESSURIZED	ELECTRICAL POWER AVAILABLE	EXIT PATH (Fig. 208)	COMMENTS AND TOWING PROCEDURE
Steered	No	Yes or No	A,G,H	Body trucks must be centered and locked by towing aft with nose wheel steering angle set for the same direction turn as used for the entry maneuver. Greater nose wheel angles will shorten the required towing distance aft. Trucks will be centered and locked for remainder of tow. Aircraft may now be towed per paths A, G, or H.
			B,F	Body trucks will center and lock during path F if nose gear steering angle is set for the same direction turn as used for entry; and during path B if nose gear steering angle is set for the opposite direction turn as used for entry. Body trucks will be centered and locked for remainder of tow. No special towing procedure required. Body trucks will steer to maximum angle permitted by actuator stroke and excessive tire scrubbing will occur during path B if nose gear steering angle is set for the same direction turn as for entry; and during path F if nose gear steering angle is set for the opposite direction turn as for entry.

Recommended Towing Procedures
Figure 210 (Sheet 3)

PARKED POSITION OF BODY TRUCKS	NO. 1 HYDRAULIC SYSTEM PRESSURIZED	ELECTRICAL POWER AVAILABLE	EXIT PATH (Fig. 208)	COMMENTS AND TOWING PROCEDURE
Steered	No	Yes or No	B,F	Body trucks must be centered and locked using procedure given for paths A, G, and H above. Aircraft may then be towed per paths B or F.
			C,D,E	Body trucks will center and lock themselves as aircraft rolls. No special towing procedure required.

Recommended Towing Procedures
Figure 210 (Sheet 4)

S 582-078

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE TOWING THE AIRPLANE.

(2) Tow the airplane (Ref 32-53-00/001).

NOTE: For airplane clearances during towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) To center the body landing gear trucks that have been parked in a steered position, do the steps that follow.

NOTE: This is when hydraulic power is not available.

1) Tow the airplane forward or aft with the nose gear steering angle set for the same direction turn as the body gear trucks.

2) When the body landing gears center and lock, you can follow the normal towing procedures (par. 2 and 3).

(c) The main gear body trucks will center and lock when a straight path of 20- to 40-feet is used to get the airplane to the parked position.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(d) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: The make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-035

(3) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-036

(4) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in location.

S 782-037

(5) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-036

(6) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-037

7. Tow the Airplane (Maximum Weight 500,000 Pounds) Supported by the Nose Gear and Body Gear

A. References

(1) 12-15-04/301, Body Landing Gear Shock Strut
(2) 12-15-05/301, Nose Landing Gear Shock Strut
(3) 12-15-06/301, Landing Gear Tire

B. Procedure

S 842-038

(1) Prepare to tow the airplane (see par. 2).

S 862-039

CAUTION: AT THIS WEIGHT AND GEAR CONDITION, TOW THE AIRPLANE STRAIGHT FORWARD OR STRAIGHT BACK. IF YOU MUST TURN THE AIRPLANE; FIRST, FOLLOW A STRAIGHT PATH, AND THEN USE THE MINIMUM TURN ANGLE NECESSARY. START THE TURN AFTER THE AIRPLANE HAS STARTED TO MOVE. DO NOT MAKE A TURN THAT IS LARGER THAN 15 DEGREES. DAMAGE TO THE LANDING GEAR CAN OCCUR.

(2) Make sure that the nose gear steering linkage is connected.

S 862-040

(3) Make sure the nose and body gear are fully serviceable (Ref 12-15-04/301, 12-15-05/301).

S 782-041

(4) Make sure the tire pressures are correct (Ref 12-15-06/301).

S 582-086

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: IN THIS CONFIGURATION, DO NOT USE THE AIRPLANE BRAKES TO TURN OR STOP THE AIRPLANE. DAMAGE TO THE LANDING GEAR CAN OCCUR.

(5) Tow the airplane.

NOTE: For airplane clearances while towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) To center the body landing gear trucks that have been parked in a steered position, do the step that follows:

NOTE: This is when hydraulic power is not available.

1) Tow the airplane forward or aft with the nose gear steering angle set for the same direction turn as the body gear trucks.
2) When the body landing gear center and lock, you can follow the normal towing procedures (par. 2 and 3).

(c) The main gear body trucks will center and lock when a straight path of 20- to 40-feet is used to get the airplane to the parked position.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(d) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: The make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-043

(6) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-044
(7) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in location.

S 782-045
(8) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-044
(9) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-045

8. Tow the Airplane (Maximum Weight 360,000 Pounds) Supported by the Nose and Wing Gear

A. References
(1) 12-15-03/301, Wing Landing Gear Shock Strut
(2) 12-15-05/301, Nose Landing Gear Shock Strut
(3) 12-15-06/301, Landing Gear Tire

B. Procedure

S 842-046
(1) Prepare to tow the airplane (see par. 2).

S 862-047
(2) Make sure that the center of gravity is not aft of 24% MAC.

S 862-048
(3) Make sure that the nose gear steering linkage is connected.

S 862-049
(4) Make sure that the nose and wing gear are fully serviceable (Ref 12-15-03/301, 12-15-05/301).

S 782-050
(5) Make sure that the tire pressures are correct (Ref 12-15-06/301).

S 582-082

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE YOU TOW THE AIRPLANE

(6) Tow the airplane.

NOTE: For airplane clearances while towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) Before you park the airplane, complete towing with a 12-foot straight path.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(c) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: To make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-052

(7) Close the 6L18 PARK BRAKE circuit on the P6 panel.

S 862-051

(8) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in location.

S 782-053

(9) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-052

(10) Put the airplane back to it's usual condition (see par. 12).

TASK 09-11-00-862-053

9. Tow the Airplane (Maximum Weight 500,000 Pounds) Supported by the Nose and Wing Gear

A. References

(1) 12-15-03/301, Wing Landing Gear Shock Strut
(2) 12-15-05/301, Nose Landing Gear Shock Strut
(3) 12-15-06/301, Landing Gear Tire

B. Procedure

S 842-054

(1) Prepare to tow the airplane (see par. 2).

S 862-055

(2) Make sure that the center of gravity is not aft of 24% MAC.

S 212-087

CAUTION: AT THIS WEIGHT AND GEAR CONDITION, TOW THE AIRPLANE STRAIGHT FORWARD OR STRAIGHT BACK. IF YOU MUST TURN THE AIRPLANE; FIRST, FOLLOW A STRAIGHT PATH, AND THEN USE THE MINIMUM TURN ANGLE NECESSARY. START THE TURN AFTER THE AIRPLANE HAS STARTED TO MOVE. DO NOT MAKE A TURN THAT IS LARGER THAN 15 DEGREES. DAMAGE TO THE LANDING GEAR CAN OCCUR.

(3) Make sure that the nose gear steering linkage is connected.

S 862-057

(4) Make sure that the nose and wing gear are serviceable (Ref 12-15-03/301, 12-15-05/301).

S 782-058

(5) Make sure that the tire pressures are correct (Ref 12-15-06/301).

S 582-083

WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE YOU TOW THE AIRPLANE.

CAUTION: IN THIS CONFIGURATION, DO NOT USE THE AIRPLANE BRAKES TO TURN OR STOP THE AIRPLANE. DAMAGE TO THE LANDING GEAR CAN OCCUR.

(6) Tow the airplane.

NOTE: For airplane clearances while towing, see Fig. 207.

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) Before you park the airplane, complete towing with a 12-foot straight path.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(c) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: To make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-059

(7) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-089

(8) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the parking brake after the wheel chocks are in location.

S 782-060

(9) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-061

(10) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-068

10. Tow the Airplane With Flat Tire(s)

A. General

(1) When you tow the airplane with a flat tire, you must obey the conditions specified on Fig. 211.

(2) For airplane clearances during towing, see Fig. 207.

B. Procedure

S 842-069

(1) Prepare to tow the airplane (see par. 2).

S 582-084

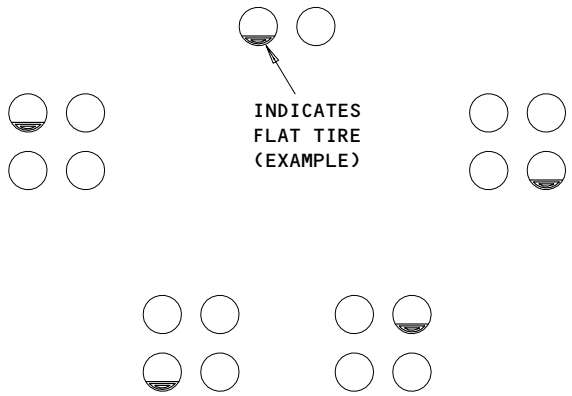
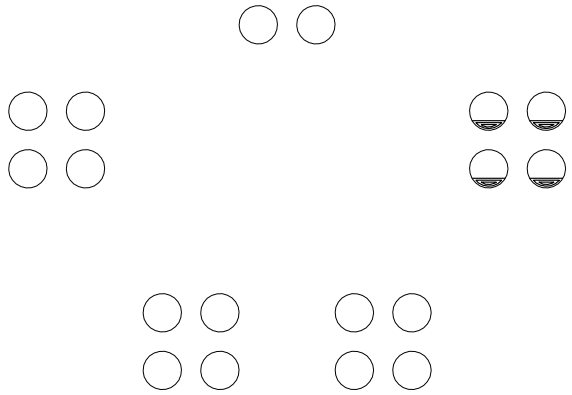
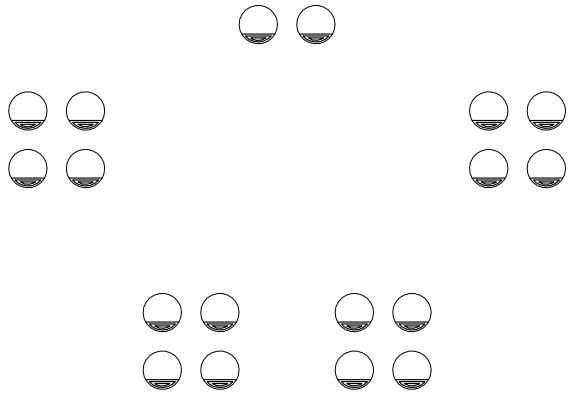
WARNING: IF YOU LOSE HYDRAULIC POWER ON THE AIRPLANE WHILE YOU ARE TOWING THE AIRPLANE, YOU MUST TELL THE TOW VEHICLE OPERATOR. YOU MUST DECREASE THE TOW SPEED OR STOP TOWING, IF IT IS NECESSARY. IF YOU HAVE A DECREASE IN HYDRAULIC POWER, ONLY ACCUMULATOR PRESSURE WILL BE AVAILABLE FOR BRAKE OPERATION.

IF YOU HAVE A DECREASE IN HYDRAULIC POWER WHILE TOWING, DO NOT APPLY THE BRAKES EXCEPT IN AN EMERGENCY OR UNTIL THE AIRPLANE IS PARKED. SMALL PRESSURE ON THE PEDAL ENDS WILL CAUSE A LOSS OF HYDRAULIC BRAKE PRESSURE. A DECREASE IN HYDRAULIC PRESSURE WILL LIMIT THE ABILITY OF THE BRAKE SYSTEM TO STOP THE AIRPLANE.

CAUTION: DO NOT HOLD OR TURN THE NOSE WHEEL STEERING TILLER WHILE YOU TOW THE AIRPLANE.

(2) Tow the airplane.

NOTE: For airplane clearances during towing, see Fig. 207.

CONDITION 1 ANY ONE FLAT TIRE ON ONE OR MORE GEAR ASSEMBLY (MAXIMUM FIVE FLAT TIRES).		(A) ±40° MAXIMUM NOSE GEAR TURN ANGLE FOR FORWARD TOW OR TAXI WITH BODY GEAR STEERING SYSTEM OPERATIVE. (B) ±10° MAXIMUM NOSE GEAR TURN ANGLE FOR FORWARD TOW OR TAXI WITH BODY GEAR STEERING SYSTEM INOPERATIVE. (C) ±10° MAXIMUM NOSE GEAR TURN ANGLE FOR AFT TOW. (D) NOSE GEAR TOWING LIMITED BY (A),(B) AND (C). (E) TOW OR TAXI TO HANGER OR TERMINAL.
CONDITION 2 TWO OR MORE FLAT TIRES ON ANY ONE GEAR ASSEMBLY ONLY (MAXIMUM FOUR FLAT TIRES).		SAME AS CONDITION 1 ABOVE EXCEPT FOR (F),(G),(H) AND (I) AS FOLLOWS: (F) TOW FROM GEAR ASSEMBLY WITH FLAT TIRES. TOWING SHALL BE SYMETRICAL (I.E. FLATS ON ONE WING GEAR, TOW FROM BOTH WING GEARS). (G) DEFLATE THE SHOCKSTRUT WITH FLAT TIRES. INFLATE THE SHOCKSTRUT ON THE SAME SIDE OF THE AIRPLANE SO 0.5 INCH OF CHROME WILL SHOW ON THE SHOCKSTRUT WITH FLAT TIRES. (H) IF IT IS NECESSARY, TRANSFER FUEL TO LIMIT PRESSURE ON THE GEAR WITH FLAT TIRES. (I) MAKE SURE THE AIRPLANE BALANCE IS WITHIN AMM LIMITS.
CONDITION 3 TWO OR MORE FLAT TIRES ON ANY TWO OR MORE GEAR ASSEMBLIES (MAXIMUM 18 FLAT TIRES).		SAME AS CONDITION 1 ABOVE EXCEPT FOR (J) AND (K) AS FOLLOWS: (J) INSTALL SERVICEABLE TIRES TO MEET CONDITION 1 ABOVE. (K) TOW AT BOTH MAIN GEARS IF RUNWAY MUST BE IMMEDIATELY CLEARED.

CAUTION: ABRUPT STARTS OR STOPS DURING TOWING, ROUGH OR SOFT RUNWAYS, OR SHARP TURNS, WILL LET THE WHEEL FLANGES TOUCH RUNWAY SURFACES. THIS CAN CAUSE DAMAGE TO BEAMS, TORQUE ARMS, WHEEL/BRAKE ASSEMBLIES AND OTHER LANDING GEAR COMPONENTS.

NOTE: ABOVE LIMITATIONS ARE FOR AIRPLANES BELOW OR AT THE MAXIMUM LOAD CONDITIONS.

Tow Airplane with Flat Tires
Figure 211

WARNING: WHEN YOU TOW THE AIRPLANE, ALL PERSONS MUST STAY OUT OF THE DANGEROUS AREAS AROUND THE TOW VEHICLE, TOW BAR, NOSE WHEELS, AND THE MAIN WHEELS. PERSONS ON THE GROUND MUST KNOW IT IS POSSIBLE TO BE RUN OVER BY THE NOSE WHEELS, MAIN WHEELS, AND THE TOW VEHICLE. THIS IS BECAUSE THE AIRPLANE WILL CHANGE POSITION DURING PUSHBACK AND TOWING. MAKE SURE YOU KEEP A MINIMUM OF 10 FEET SEPARATION BETWEEN PERSONS ON THE GROUND AND THE EQUIPMENT THAT MOVES. IF YOU DO NOT KEEP THE MINIMUN DISTANCE, A FATAL INJURY CAN OCCUR.

(a) Make sure the persons that work near the areas that follow, know the pushback hazard zones as shown in Figure 207A:
- tow vehicle
- tow bar
- nose wheels
- main wheels.

(b) Before you park the airplane, complete towing with a 12-foot straight path.

NOTE: This will release torsional stress applied to the landing gear components and tires during a turn.

CAUTION: IF YOU HAVE DISCONNECTED THE TORSION LINKS, MAKE SURE THE TORSION LINKS DO NOT DROP. DAMAGE TO THE SQUAT SWITCH MOUNTING BRACKET CAN OCCUR.

(c) If the torsion links were disconnected, align the links during the last few feet of the tow so that the torsion link bolt can be installed.

NOTE: To make the final adjustment of the torsion links, move the tow bar sideways (if installed).

S 862-062

(3) Close the 6L18 PARK BRAKE circuit breaker on the P6 panel.

S 862-063

(4) Set the parking brake.

NOTE: If the Brake Temp display shows on EICAS, release the brake after the wheel chocks are in location.

S 782-064

(5) Make sure the HYD BRAKE PRESS gage shows approximately 3000 psi.

S 842-071
(6) Put the airplane to it's usual condition (see par. 12).

TASK 09-11-00-582-076

11. Tow the Airplane in High Wind

A. Procedure

S 582-096
(1) You can tow the airplane in high wind. You must obey the conditions specified in Fig. 212.

TASK 09-11-00-842-072

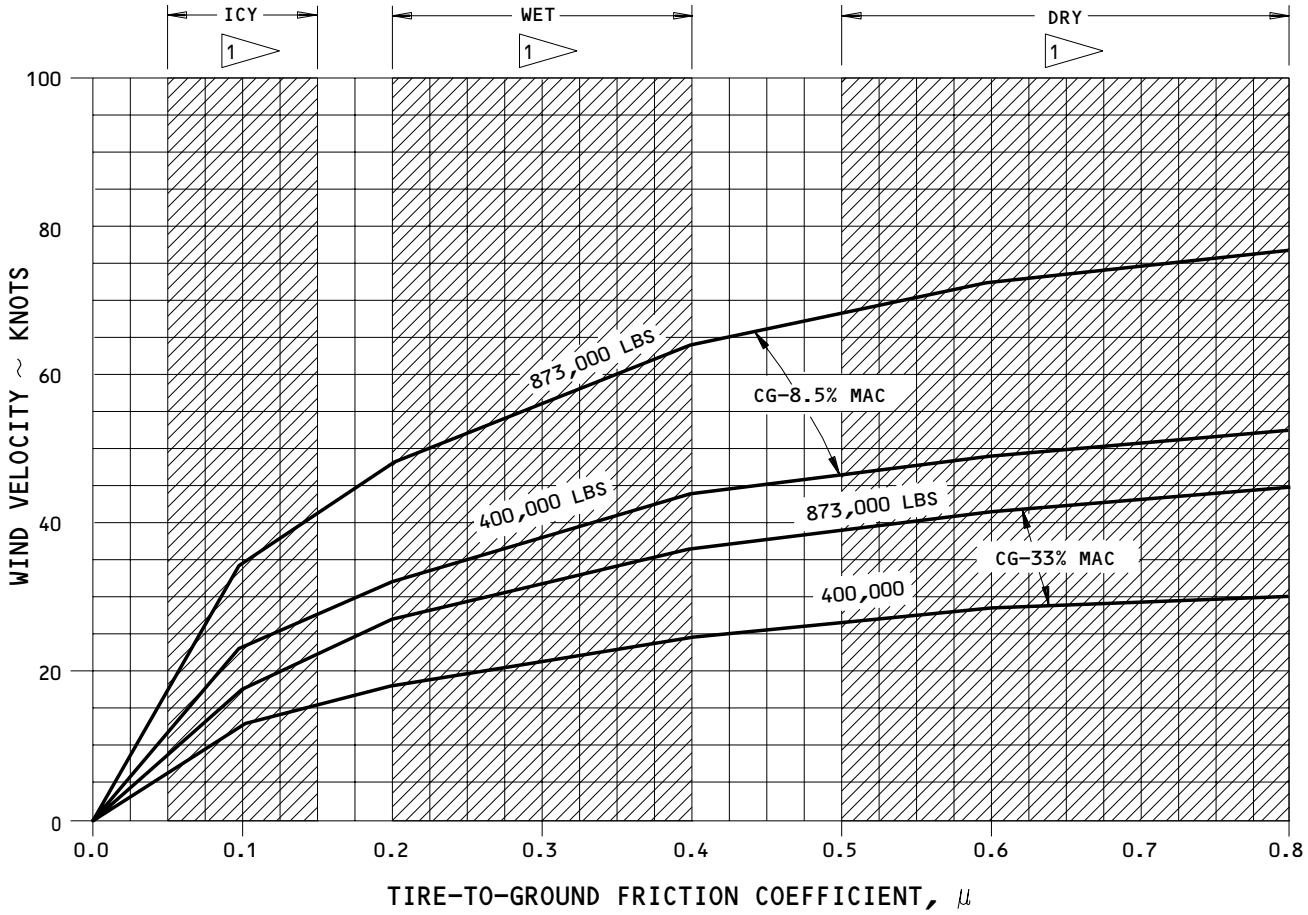
12. Put the Airplane to It's Usual Condition

A. References
(1) 24-22-00/201, Manual Control
(2) 29-11-00/201, Main Hydraulic Supply System
(3) AMM 32-21-03/201, Nose Gear Torsion Links

B. Procedure

S 862-094
(1) Remove the pressure from the hydraulic systems No. 1 and 4 (Ref 29-11-00/201).

S 862-074
(2) Remove electrical power, if it is not necessary.
(a) Do the applicable steps below to remove external power.
1) ALL EXCEPT KLM AIRPLANES;
Disconnect the power cable from the external power receptacle No. 1 (AMM 24-22-00/201).
2) KLM AIRPLANES;
Do these steps:
a) Set the TOWING POWER BACKUP switch on the P461 panel to the DISABLE position.
b) Disconnect the power cable from the external power receptacle No. 1 (Ref 24-22-00/201).
(b) Do these steps to remove power supplied by the APU generators:
1) Remove APU generator power to the ground handling/ground service busses (Ref 24-22-00/201).



A. FLAPS UP, STAB = 3 PILOT UNITS (HORIZONTAL)
B. WIND FROM ANY DIRECTION
C. WIND GUST SHALL BE ADDED TO STEADY WIND VELOCITY FOR MAXIMUM WIND SPEED
D. USE ACTUAL AIRPLANE WEIGHT, CG POSITION, AND TIRE-TO-GROUND FRICTION CO-EFFICIENT 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

Wind Velocity During Towing
Figure 212

2) Stop the APU (Ref 49-11-00/201).
KLM 3) Turn the battery switch off.

S 432-091
(3) Connect the upper and lower landing gear torsion links, if it is necessary (AMM 32-21-03/201).

KLM NOTE: Make sure the STANDBY POWER SWITCH on the P5 panel is off.

S 092-076
(4) If you have used a tow bar, remove the tow bar from the nose gear tow lug and do the steps that follow:
(a) Lower the tow bar wheels.
(b) Lift the tow bar locking mechanism handle.
(c) Pull the tow bar straight out from the tow lug.
(d) Lower the tow bar locking handle.
(e) Remove the tow bar and tow vehicle.

S 282-077

WARNING: WHEN YOU REMOVE THE NOSE WHEEL LOCKOUT PIN, THE NOSE WHEELS CAN QUICKLY CENTER. INJURY TO PERSONS CAN OCCUR.

(5) Make sure that the nose wheels center.

S 092-065
(6) Remove the nose gear Tow Pin (Fig. 201).

S 092-066

CAUTION: MAKE SURE THAT THE FOUR WING AND BODY GEAR GROUND LOCKPINS, NOSE GEAR GROUND LOCKPIN, AND THE NOSE GEAR STEERING LOCKPIN ARE ALL REMOVED FROM THE AIRPLANE BEFORE YOU RELEASE THE AIRPLANE FOR FLIGHT.

(7) Remove all of the landing gear ground lockpins.

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

S 092-082

WARNING: REFER TO 32-00-30/201 FOR THE DOOR LOCK REMOVAL PROCEDURE. THE DOORS CAN MOVE QUICKLY AND CAUSE DAMAGE TO EQUIPMENT OR INJURY TO PERSONS.

(8) Remove the wing, body, and nose gear door locks, if it is necessary (Fig. 201).

TAXIING - MAINTENANCE PRACTICES

1. General
   A. This procedure contains one task. The task is to taxi the airplane.

   TASK 09-21-00-582-001

2. Airplane Taxi
   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 approved.
         (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. This will prevent interference with other airport operations.
         (d) You must keep clearance from structures and other airplanes, at all times.
         (e) You must have electrical power to operate these systems to taxi the airplane safely:
            1) The taxi lights
            2) The navigation lights
            3) The radio and intercom equipment
            4) All other systems that are necessary
         (f) You must supply pressure to the applicable hydraulic systems to supply pressure for these operations:
            1) To brake the airplane
            2) For nose wheel steering
            3) For body gear steering
         (g) When you taxi the airplane at night or in bad weather conditions, the crew must know the area around the airplane. They must know the location of parked vehicles, maintenance stands, and the condition of the taxi surface.
         (h) A taxi checklist for the airline maintenance persons is necessary to help the crew have a safe taxi operation.
      (2) Maintenance Persons Necessary to Taxi the Airplane
         (a) The persons necessary to taxi the airplane must include a flight compartment crew and a ground crew.
         (b) A minimum of two flight compartment persons are necessary.
            1) Flight compartment persons must be approved on all the procedures that follow, for the taxi operations:
               a) 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 (hangars, 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 airplane movement
4) To make sure the taxi path is clear

(3) Communications

(a) Most of the area around the airplane is out of the field of view permitted by the flight compartment windows. Also, much of the ground operations work near the airplane is out of the field of view of the flight compartment crew.

(b) There must be communication between the airplane and ground crews. This is necessary during the engine start, removal and replacement of the wheel chocks, and the engine shutdown.

(c) You must use hand signals, lights, intercom and/or radio communications to have a safe taxi operation.

(d) The communications with the ground control authority is also necessary for taxi operations. This will make sure that persons in the tower know of the taxi operation, and the path the airplane will follow.

(4) Procedures to Taxi the Airplane

(a) Airplanes that exceed the maximum nose landing gear towing angle or maximum towing load should be inspected per AMM 05-51-29/201.

(b) If you do not use the body gear steering, the airplane will not taxi like an airplane with a tricycle landing gear.

NOTE: This is caused by the geometric configuration of the four main landing gear.

CAUTION: YOU SHOULD USE THE BODY GEAR STEERING SYSTEM WHEN YOU TAXI THE AIRPLANE. IF YOU DO NOT USE BODY GEAR STEERING, YOU CAN CAUSE DAMAGE TO THE TIRES.

1) With the body gear steering system not armed, you can cause the tires to scrub or slip.

(c) When you use the body gear steering system, the movement of the airplane on the ground is done with a procedure the same as that used for other tricycle geared airplanes.
1) To arm the body gear steering system, you must close specified circuit breakers.

NOTE: This is very important during the operation at a high gross weight where high stress is supplied to the tires.

The body gear steering arms automatically when you close specific circuit breakers.

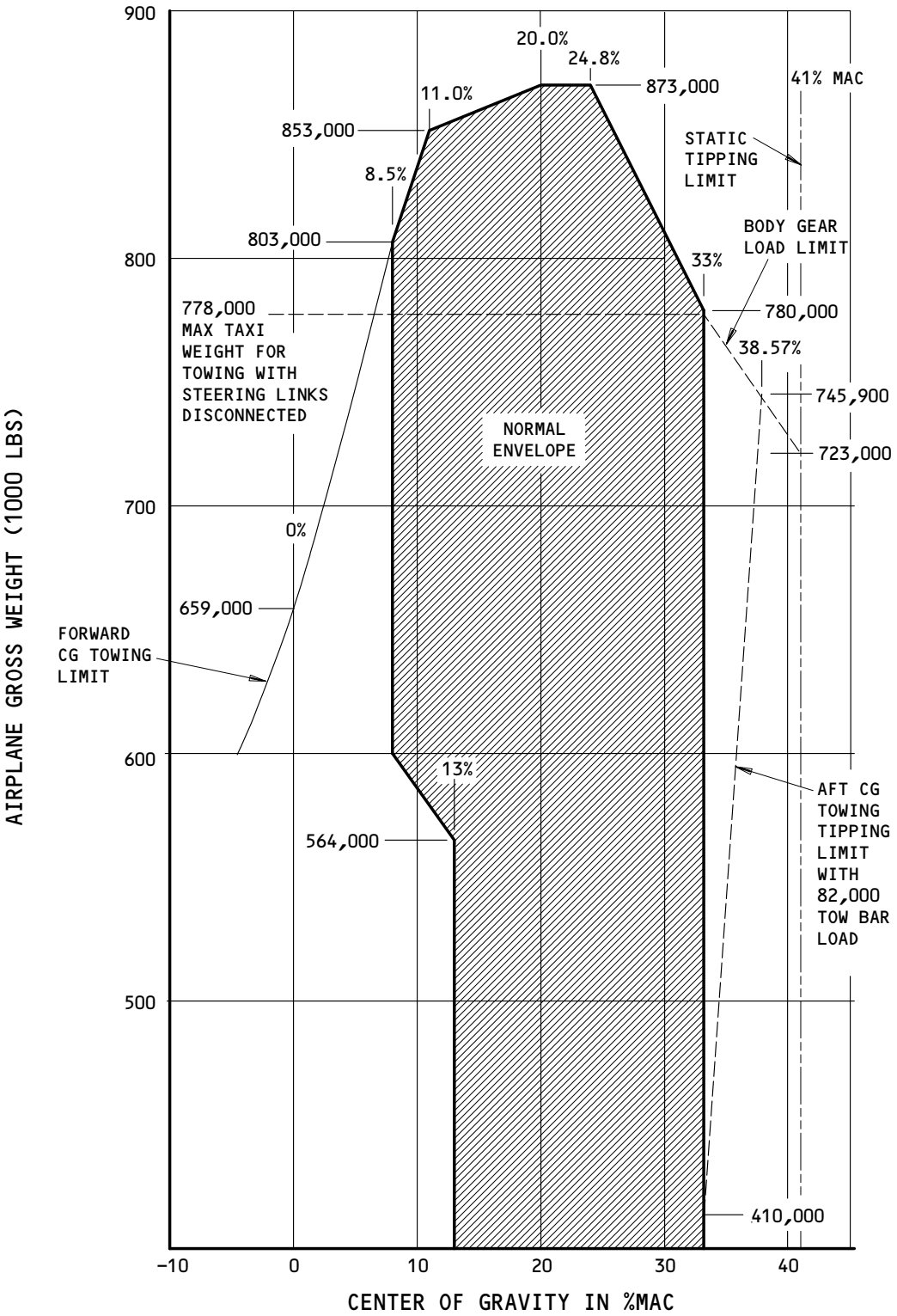
2) Use the nose wheel steering, the body gear steering, and the engine thrust as it is necessary to taxi the airplane.

(d) Airplane ground stability.
1) During airplane taxi, the center of gravity (CG) must always be below the ground stability limits (Fig. 201).
2) Find the airplane CG for the applicable airplane configuration. Use the component weight and CG data, and the procedures to calculate them, in the approved Weight and Balance manuals.

(e) Airplane clearance during the taxi operation.
1) Make sure you have the necessary clearance when you go near a parked airplane or other structure.
a) When the APU in the taxi airplane or the parked airplane is on, you must have a minimum clearance of 32.8 feet (10 meters). The clearance must be between the APU exhaust port and the adjacent airplane's wingtip (fuel vent).

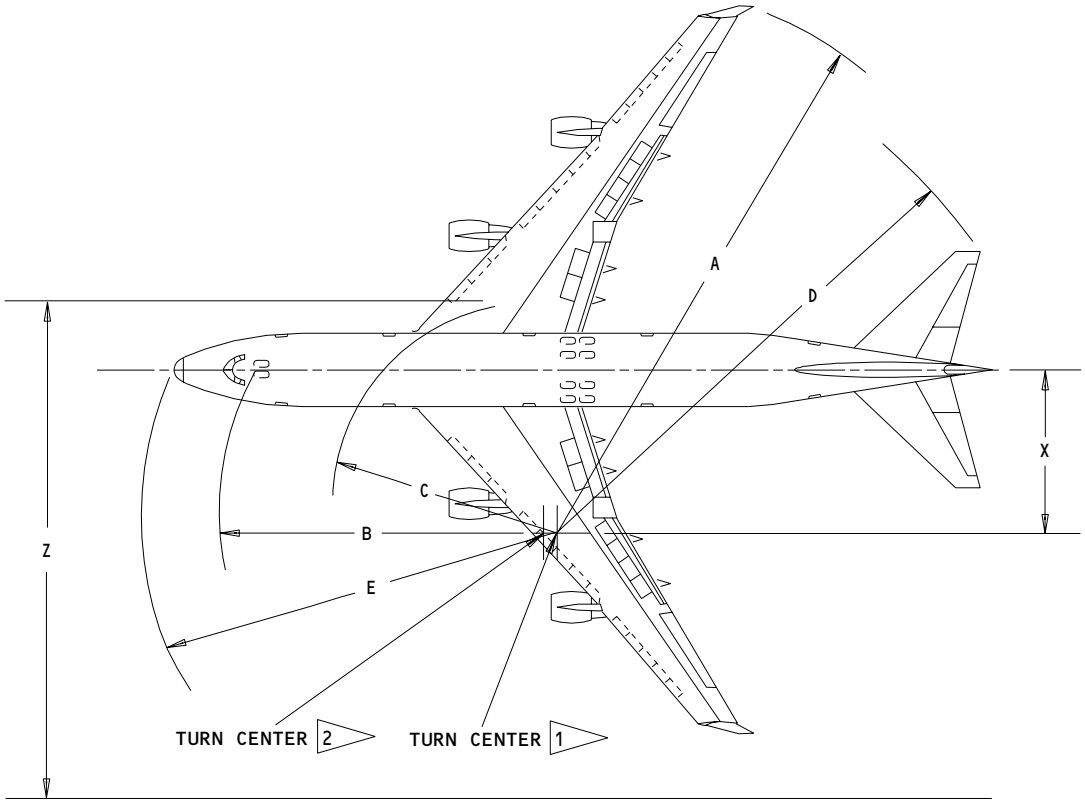
(f) Airplane taxi speed.
1) The usual taxi speed should not be more than approximately 20 knots. Speeds more than this, added with long taxi distances, will increase the temperature of the tires.
2) Before you make a turn, decrease the speed of the airplane to a speed which is applicable to the local conditions. On a dry surface, use a speed of approximately 8 to 12 knots.

(g) Airplane turns during taxi.
1) Always use the largest turn radius possible.
2) Do not try to turn the airplane until it has moved.
3) The wingtips and the horizontal stabilizer move in larger arcs during a turn than the nose of the airplane (Fig. 202). Thus, monitor these areas of the airplane carefully for clearance with structures, equipment, and other airplanes.



Taxi Center of Gravity Limitations
Figure 201

X TURN RADIUS (FEET)	CLEARANCE RADIUS – (FEET)										Z [3] MINIMUM WIDTH FOR 180° TURN (FEET)	
	A WING TIP		B [3] NOSE GEAR		C [3] WING GEAR		D TAIL TIP		E NOSE			
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
40	157	159	96	91	61	61	142	146	117	112	156	152
60	176	177	106	102	81	81	154	158	125	120	187	183
80	195	196	119	115	101	101	167	171	136	132	219	216
100	214	215	133	130	121	121	182	185	148	145	254	251
120	233	234	149	146	141	141	197	200	162	159	290	287
140	253	254	166	163	161	161	213	216	178	175	327	324
160	272	273	183	181	181	181	230	233	194	191	364	362



NOTE: RADII B AND C ARE TO OUTSIDE EDGE OF OUTBOARD TIRES

Turning Clearance
Figure 202 (Sheet 1)

X TURN RADIUS (METERS)	CLEARANCE RADIUS - (METERS)										Z [3] MINIMUM WIDTH FOR 180° TURN (METERS)	
	A WING TIP		B [3] NOSE GEAR		C [3] WING GEAR		D TAIL TIP		E NOSE			
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
15	50.4	50.9	30.5	29.2	21.3	21.3	44.9	46.1	36.6	35.2	51.8	50.5
20	55.1	55.6	33.3	32.1	26.3	26.3	48.0	49.1	38.9	37.6	59.6	58.4
25	59.9	60.3	36.6	35.5	31.3	31.3	51.3	52.4	41.7	40.5	67.9	66.8
30	64.7	65.1	40.2	39.3	36.3	36.3	55.0	56.0	44.9	43.7	76.5	75.6
35	69.5	69.9	44.2	43.3	41.3	41.3	58.8	59.8	48.3	47.3	85.5	84.6
40	74.4	74.8	48.3	47.5	46.3	46.3	62.8	63.7	52.1	51.1	94.6	93.8
45	79.3	79.6	52.6	51.8	51.3	51.3	66.9	67.8	56.0	55.1	103.9	103.1

[1] BODY GEAR STEERING INOPERATIVE
[2] WITH BODY GEAR STEERING
[3] MEASURED TO OUTSIDE EDGE OF OUTER TIRE(S)

Turning Clearance
Figure 202 (Sheet 2)

4) Make all turns at a slow taxi speed to prevent tire skids.
5) When you use an outboard engine to help make a turn, use the minimum power that is possible.
6) Do not let the airplane stop during a turn.
7) Prevent the use of the brakes to help make a turn.

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

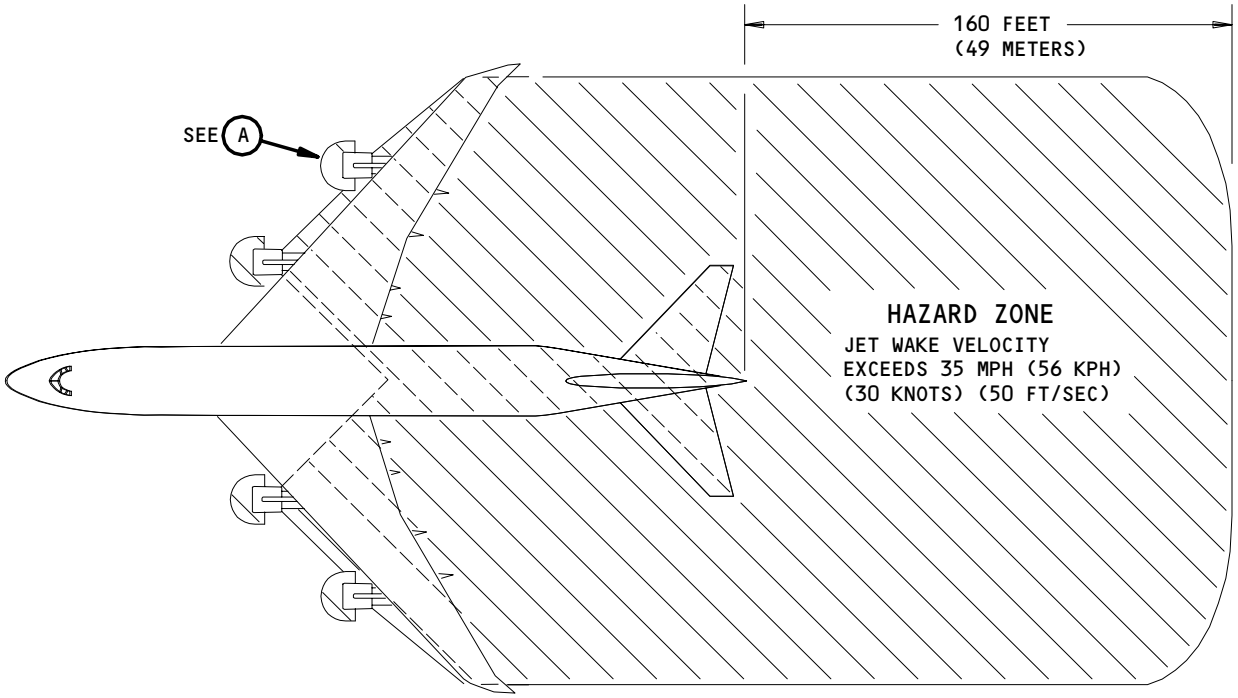
a) Decrease the speed of the airplane with the brakes when it is necessary, before you start the turn.
b) Make a minimum radius turn with maximum nose wheel steering, body gear steering, and engine thrust only.
c) Use of the brakes during a turn will cause the main and nose gear tires to scrub.

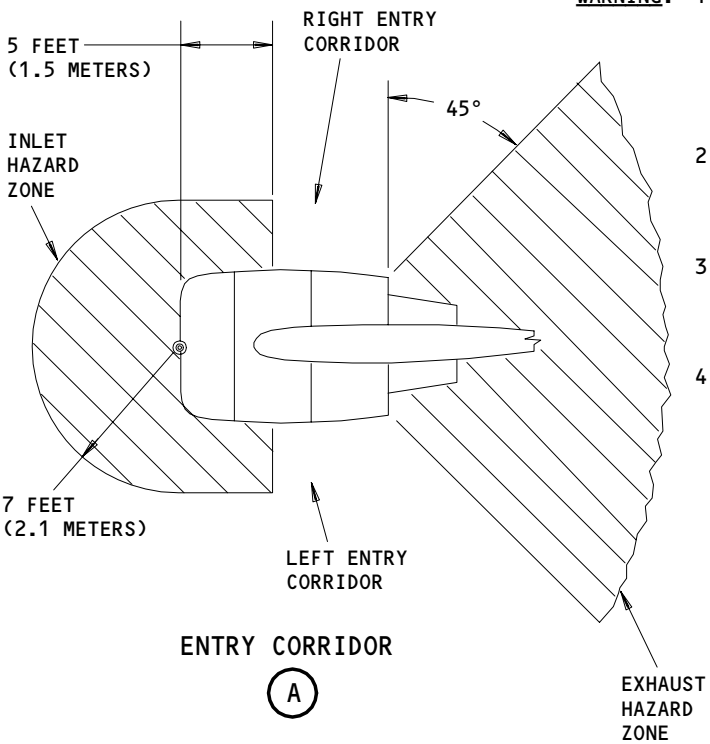
8) When it is possible, complete the taxi in a straight line roll for a minimum of 12 feet.

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

(h) Airplane taxi in bad weather conditions.
1) You must know the conditions of the taxi surface, and the taxi speeds when you taxi in bad weather conditions.
2) If the taxi surface has snow, slush, or ice on it, you can use the anti-ice system.
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. This will help to keep the 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
(a) Figure 202 shows the minimum turn radius that the airplane can make. The wingtip will make the largest arc in a turn and give the minimum clearance path.
(b) The basic factors that can change the geometry of a turn are as follows:
1) The angle of the nose wheel steering
2) The body gear steering
3) The engine power position
4) The CG location on the airplane
5) The airplane gross weight
6) The taxi surface conditions
7) The airplane ground speed
8) The differential braking that you use
(c) When you operate jet engine airplanes, you must follow all precautions. This is necessary to prevent injury to persons, or damage to structures, equipment, or other airplanes.
1) Figure 203 shows the engine hazard areas at idle, breakaway, and takeoff power.





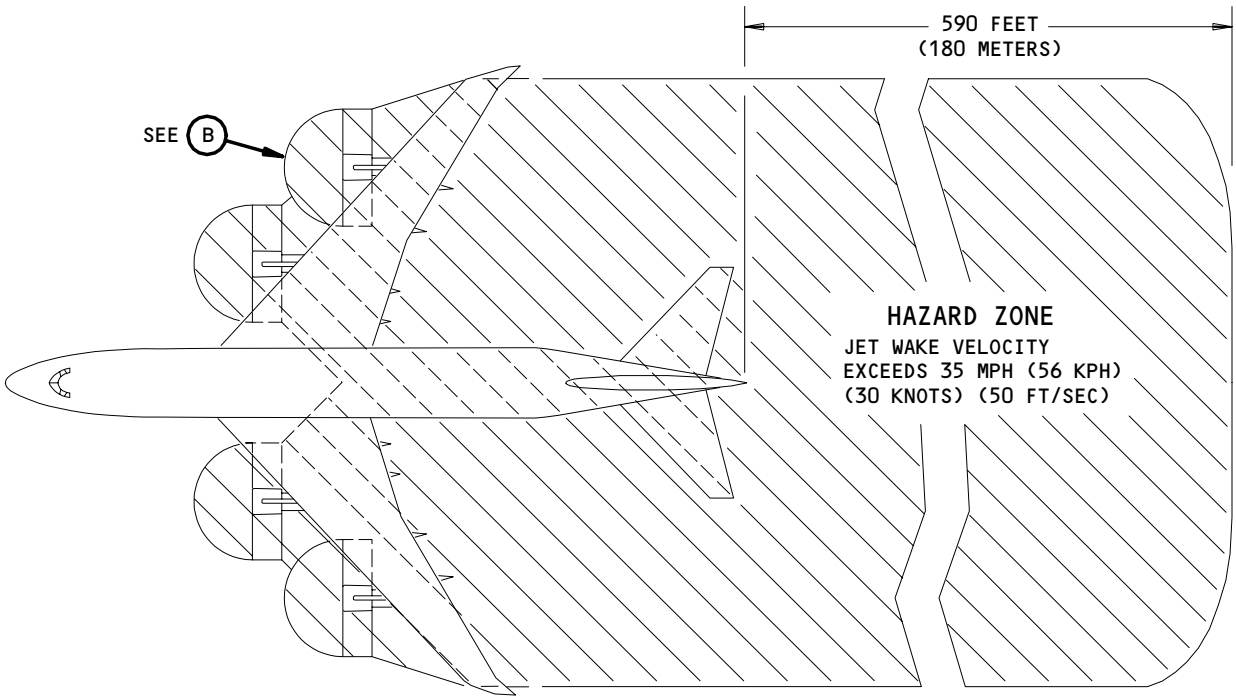
ENTRY CORRIDOR

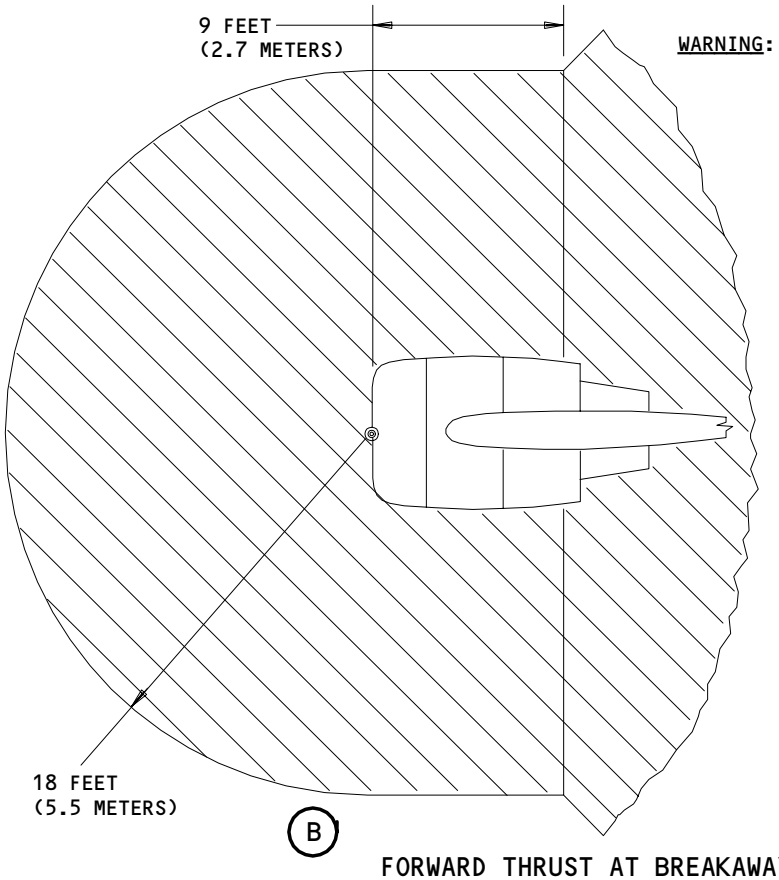
A

WARNING:

1. IF SURFACE WIND IS REPORTED GREATER THAN 25 KNOTS, INCREASE DISTANCE OF INLET BOUNDARY BY 20%. IF RAMP SURFACES ARE SLIPPERY, ADDITIONAL PRECAUTIONS SUCH AS CLEANING THE RAMP WILL BE NECESSARY TO PROVIDE PERSONNEL SAFETY.
2. GROUND PERSONNEL MUST STAND CLEAR OF THESE HAZARD ZONES AND MAINTAIN COMMUNICATION WITH FLIGHT COMPARTMENT PERSONNEL DURING ENGINE RUNNING.
3. DO NOT USE ENGINE NACELLE SERVICE INTERPHONE JACK ON ENGINE WHICH IS TO BE STARTED OR IS IN OPERATION. PERSONNEL MAY BE INJURED BY ENGINE INLET SUCTION OR EXHAUST BLASTS.
4. ENTRY CORRIDOR MUST BE USED ONLY UNDER FOLLOWING CONDITIONS:
   A. NOT MORE THAN ONE ENGINE ON EACH SIDE OF AIRPLANE MAY BE OPERATING WHEN PERSONNEL ARE IN ENTRY CORRIDOR.
   B. ENGINE OPERATION MAY NOT EXCEED GROUND IDLE THRUST WHILE PERSONNEL ARE IN ENTRY CORRIDOR.
   C. POSITIVE COMMUNICATION BETWEEN PERSONNEL IN FLIGHT COMPARTMENT AND PERSONNEL USING ENTRY CORRIDOR IS MANDATORY.
   D. INLET AND EXHAUST HAZARD AREAS MUST BE STRICTLY OBSERVED BY PERSONNEL IN ENTRY CORRIDOR.

FORWARD THRUST AT MINIMUM IDLE POWER
Engine Inlet and Exhaust Hazard Areas
Figure 203 (Sheet 1)





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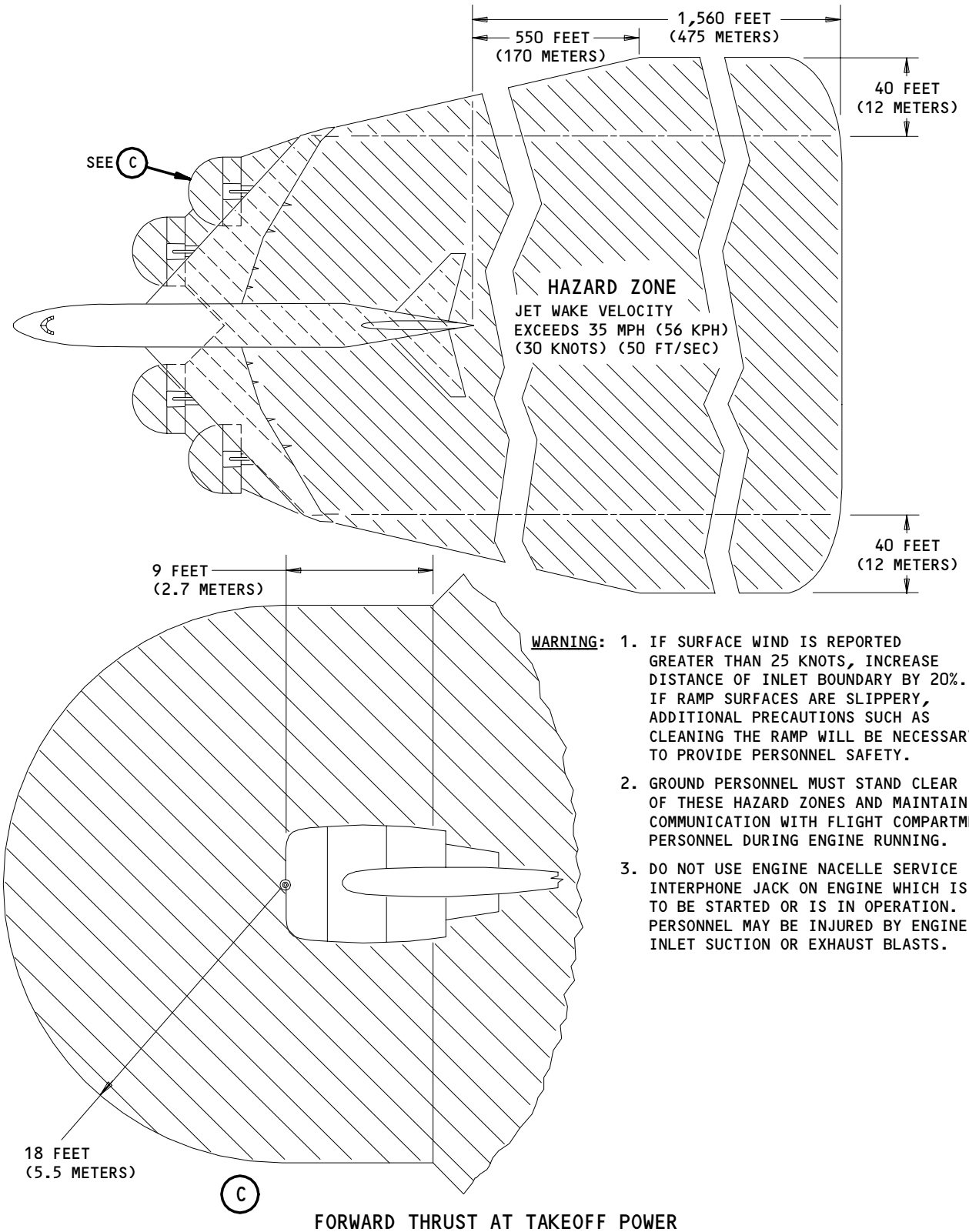
2. GROUND PERSONNEL MUST STAND CLEAR OF THESE HAZARD ZONES AND MAINTAIN COMMUNICATION WITH FLIGHT COMPARTMENT PERSONNEL DURING ENGINE RUNNING.
3. DO NOT USE ENGINE NACELLE SERVICE INTERPHONE JACK ON ENGINE WHICH IS TO BE STARTED OR IS IN OPERATION. PERSONNEL MAY BE INJURED BY ENGINE INLET SUCTION OR EXHAUST BLASTS.

FORWARD THRUST AT BREAKAWAY POWER

Engine Inlet and Exhaust Hazard Areas
Figure 203 (Sheet 2)

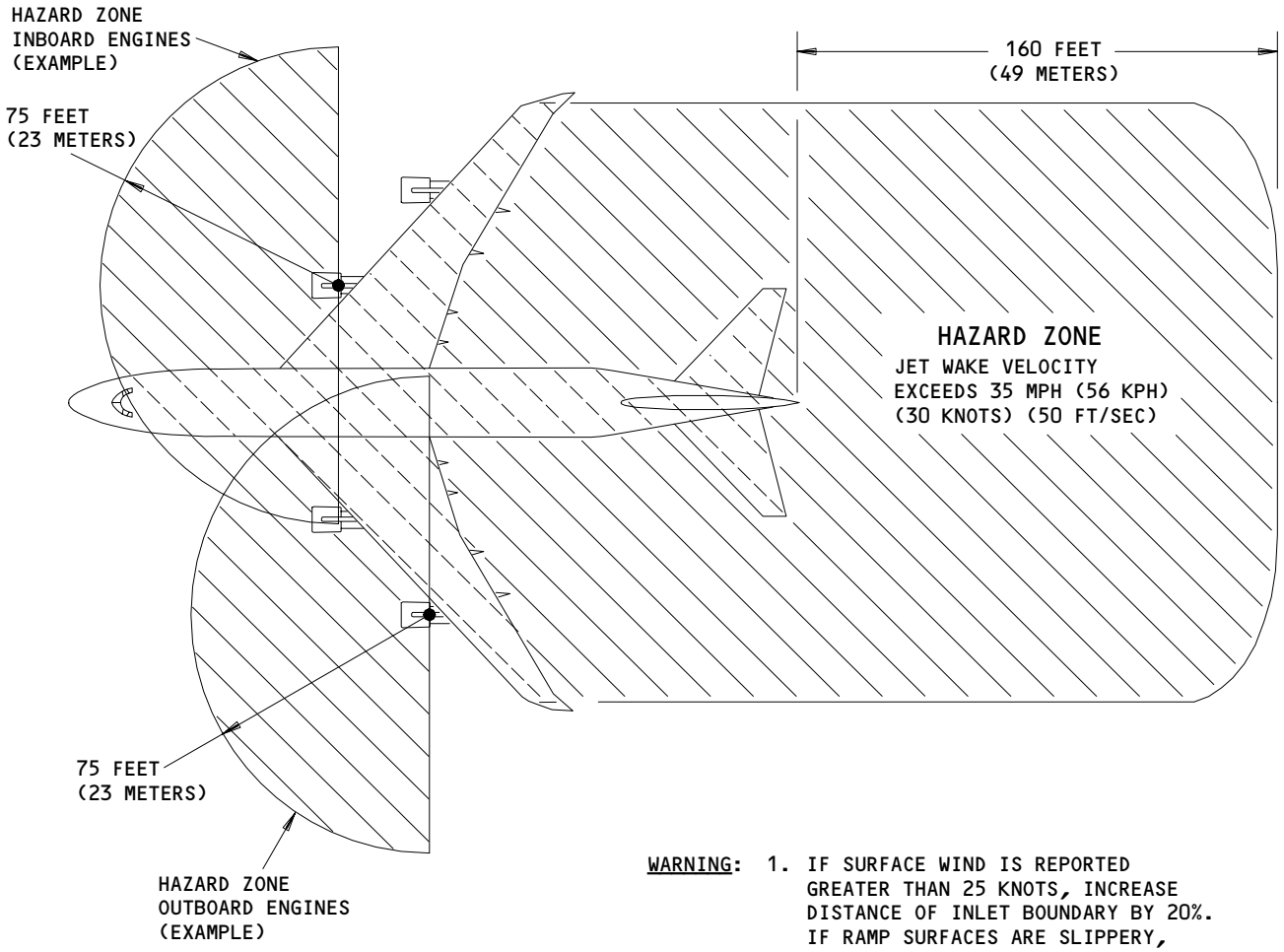


WARNING: 1. IF SURFACE WIND IS REPORTED GREATER THAN 25 KNOTS, INCREASE DISTANCE OF INLET BOUNDARY BY 20%. IF RAMP SURFACES ARE SLIPPERY, ADDITIONAL PRECAUTIONS SUCH AS CLEANING THE RAMP WILL BE NECESSARY TO PROVIDE PERSONNEL SAFETY.

2. GROUND PERSONNEL MUST STAND CLEAR OF THESE HAZARD ZONES AND MAINTAIN COMMUNICATION WITH FLIGHT COMPARTMENT PERSONNEL DURING ENGINE RUNNING.

3. DO NOT USE ENGINE NACELLE SERVICE INTERPHONE JACK ON ENGINE WHICH IS TO BE STARTED OR IS IN OPERATION. PERSONNEL MAY BE INJURED BY ENGINE INLET SUCTION OR EXHAUST BLASTS.

FORWARD THRUST AT TAKEOFF POWER
Engine Inlet and Exhaust Hazard Areas
Figure 203 (Sheet 3)



WARNING:
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2. GROUND PERSONNEL MUST STAND CLEAR OF THESE HAZARD ZONES AND MAINTAIN COMMUNICATION WITH FLIGHT COMPARTMENT PERSONNEL DURING ENGINE RUNNING.
3. DO NOT USE ENGINE NACELLE SERVICE INTERPHONE JACK ON ENGINE WHICH IS TO BE STARTED OR IS IN OPERATION. PERSONNEL MAY BE INJURED BY ENGINE INLET SUCTION OR EXHAUST BLASTS.

REVERSE THRUST AT MINIMUM IDLE POWER

Engine Inlet and Exhaust Hazard Areas
Figure 203 (Sheet 4)

2) All persons must keep away from the engine inlet and exhaust areas. Hot, high velocity gasses come out of the exhaust nozzle of the engine. The velocity of the engine fan air, specially at high thrust positions, is sufficient to cause serious injury or death to persons.
3) When the thrust reverser is in the reverse position, the fan air will come out forward. The exhaust gases will continue to come out rearwards.

(d) Figure 204 shows the angles of view from the flight compartment for a crewman in the left seat that is correctly adjusted.

B. References
(1) 24-22-00/201, Manual Control
(2) 29-11-00/201, Main Hydraulic Supply Systems
(3) 71-00-00/201, Power Plant

C. Prepare to Taxi

S 842-002

(1) Use an airline taxi checklist to prepare the airplane for taxi.

S 422-023

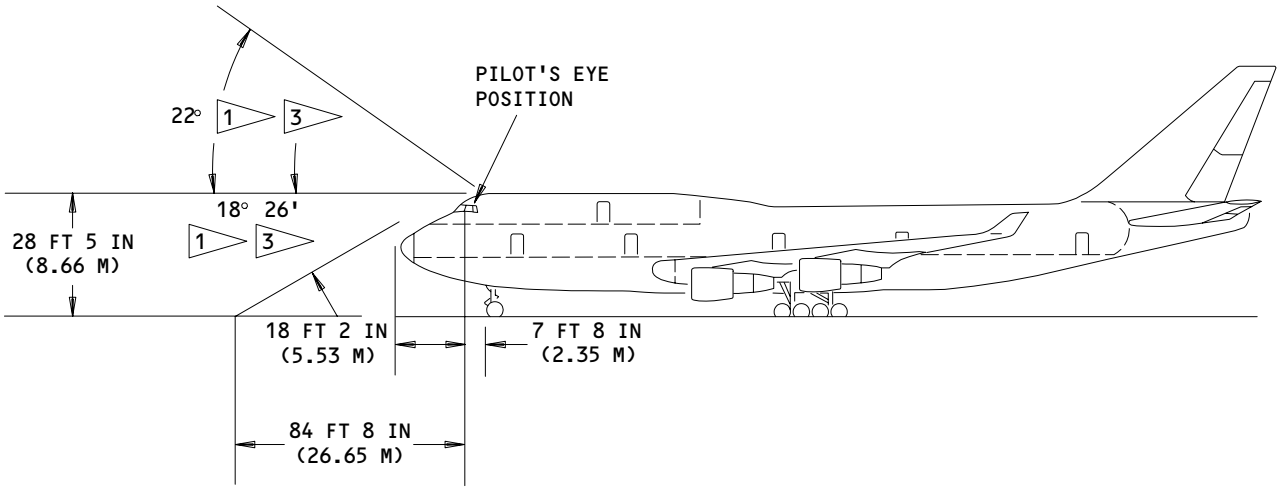
CAUTION: MAKE SURE ALL ENGINE COWLS ARE CLOSED AND LATCHED BEFORE YOU TAXI THE AIRPLANE. IF THE ENGINE COWLS ARE NOT CLOSED, YOU CAN DAMAGE THEM WHEN YOU MOVE THE AIRPLANE.

CAUTION: MAKE SURE THE FAN REVERSER HALVES ARE CLOSED AND LATCHED BEFORE YOU MOVE THE AIRPLANE WITH ITS POWER. YOU CAN CAUSE DAMAGE TO THE FAN REVERSER HALVES IF THEY ARE NOT CLOSED.

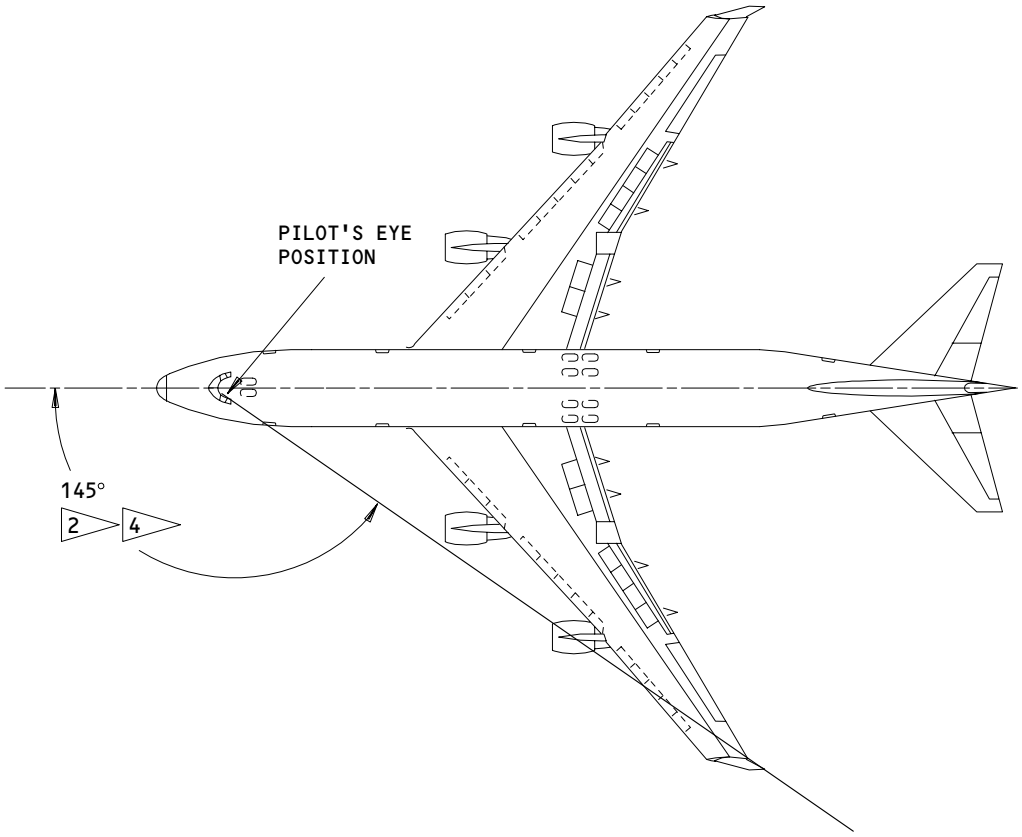
(2) As a minimum to prepare for the taxi, do these steps:
(a) Examine the external areas of the airplane.
1) Make sure that the wheel chocks are installed.
2) Make sure that all cowling, doors, and hatches are closed or put in a satisfactory position.
3) Make sure that the engine inlets and exhausts are clear.
4) Make sure that the flight control surfaces have sufficient clearance from all ground equipment and other structures.
5) Make sure that the tires are in a satisfactory condition.

CAUTION: DO NOT TAXI THE AIRPLANE WITH A SHOCK STRUT FULLY COMPRESSED. YOU CAN CAUSE DAMAGE TO THE SHOCK STRUT IF YOU TAXI THE AIRPLANE WHEN IT IS FULLY COMPRESSED.

6) Make sure that the chrome surface of the inner cylinder on all of the gears show a minimum of two inches.

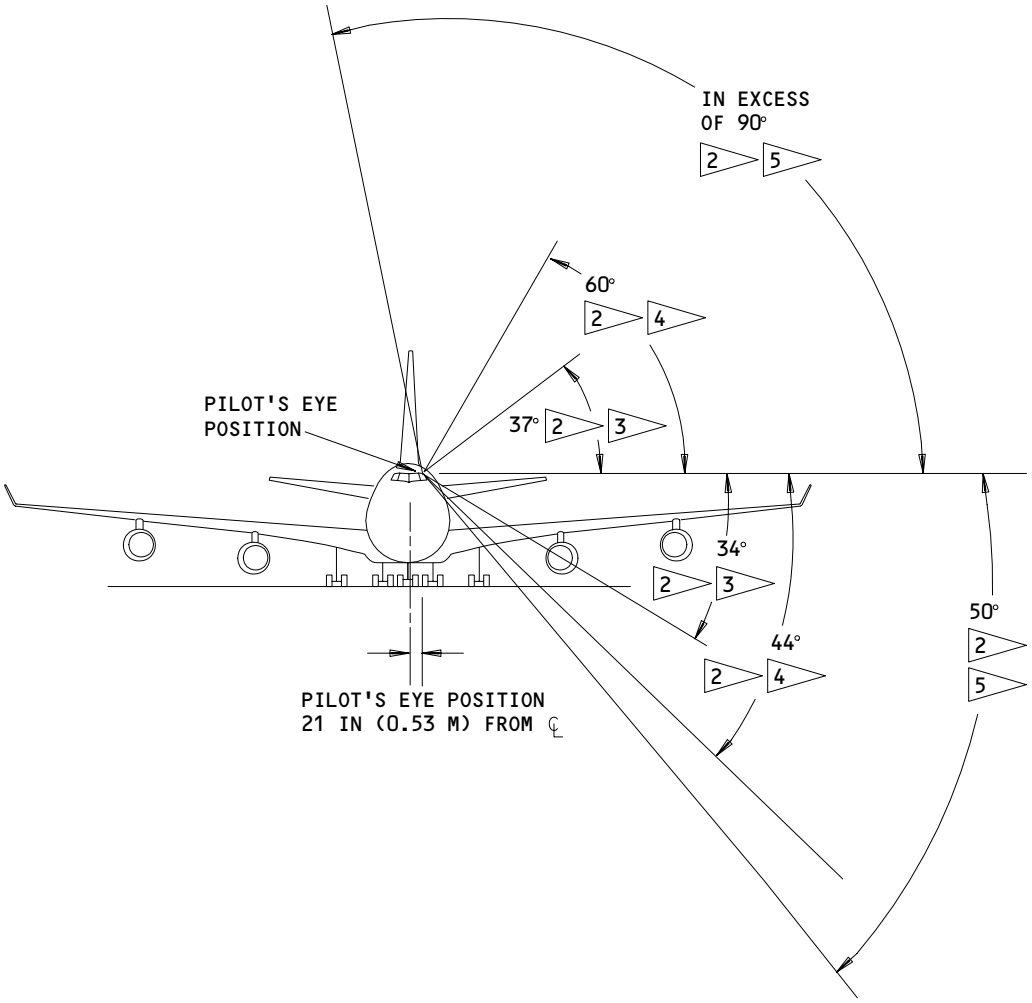


VISUAL ANGLES IN VERTICAL PLANE
THROUGH PILOT'S EYE POSITION



VISUAL ANGLE IN HORIZONTAL PLANE
THROUGH PILOT'S EYE POSITION

Visibility From Cockpit In Static Position
Figure 204 (Sheet 1)



VISUAL ANGLES IN PLANE PERPENDICULAR
TO LONGITUDINAL AXIS THROUGH PILOT'S
EYE POSITION

1 VISUAL ANGLES THROUGH WINDSHIELD.

2 VISUAL ANGLES THROUGH SIDE WINDOW.

3 VISUAL ANGLES FROM NORMAL POSITION.

4 VISUAL ANGLES FROM ALERT POSITION.
HEAD MOVED OUTBOARD 5 IN. (0.127 M)

5 VISUAL ANGLES FWITH HEAD MOVED 7 IN.
(0.178 M) OUTBOARD

6 HEAD IS ROTATED ABOUT A POINT 3 IN.
(0.084 M) AFT OF PILOT'S EYE POSITION

Visibility From Cockpit In Static Condition
Figure 204 (Sheet 2)

CAUTION: DO NOT LET THE NOSE GEAR SHOCK STRUT EXTEND MORE THAN THE MAXIMUM PERMITTED NOSE GEAR SHOCK STRUT EXTENSION OF 18 INCHES. EXTENSION MORE THAN 18 INCHES CAN CAUSE THE CENTERING CAM TO ENGAGE AND CAUSE DAMAGE TO THE SHOCK STRUT DURING A TURN.

IF IS ALSO POSSIBLE THE AFT CG LIMITS WILL BE MORE THAN THE APPROVED LIMIT. THIS CAN CAUSE THE TAIL OF THE AIRPLANE TO MOVE DOWN.

7) Make sure that the chrome surface of the inner cylinder of the nose landing gear shows no more than 18 inches.
8) Make sure the steering bypass pin is removed.
9) Make sure the torsion links of the nose landing gear are connected.

(b) Adjust the flight compartment seats to give the conditions that follow:
1) To give the correct view from the flight compartment windows.
2) To give the correct position to operate the rudder and brake pedals.

(c) Make sure that all airplane systems are prepared to have electrical power safely put on the airplane.
1) Supply the necessary electrical power to the airplane to start the engine and taxi (Ref 24-22-00/201).

CAUTION: THERE MUST BE A MINIMUM OF 300 GALLONS OF FUEL IN EACH NO. 1 AND NO. 4 MAIN FUEL TANKS AND 805 GALLONS IN EACH NO. 2 AND NO. 3 MAIN FUEL TANKS. THIS IS NECESSARY TO DECREASE THE TEMPERATURE OF THE HYDRAULIC FLUID. IF THERE IS NOT SUFFICIENT FUEL IN THE TANKS, THE HYDRAULIC FLUID CAN GET TOO HOT.

(d) Make sure that the fuel quantity indication on the main EICAS display shows fuel in the tanks as follows:
1) 375 gallons (2400 pounds/1090 kilograms) in the No. 1 and No. 4 main fuel tanks

2) 805 gallons (5200 pounds/2366 kilograms) in the No. 2 and No. 3 fuel tanks.
3) Supply more fuel as is necessary for the engine start and taxi operations.

(e) Make sure that the flap handle and the flaps are in the same position before you supply hydraulic power.

(f) Supply pressure to the necessary hydraulic systems for the brakes, the body gear steering and the nose gear steering (Ref 29-11-00/201).

NOTE: The hydraulic power for the normal brake system comes from the No. 4 hydraulic system. The hydraulic power for the alternate brake system is supplied by the No. 1 or No. 2 hydraulic system.

The hydraulic power for the nose wheel steering and the body gear steering comes from the No. 1 hydraulic system. The control handle for the landing gear must be in the DN position to activate the two steering systems.

If all hydraulic systems do not operate you should not taxi the airplane.

(g) Do not steer the nose gear with the steering tiller when there is no pressure to hydraulic system No. 1.

NOTE: Too much force (50 to 60 pounds) will unseat the steering cable compensator assembly and cause the tiller to not be correctly aligned with the nose gear.

(h) If the tiller and the nose gear are not correctly aligned when you taxi the airplane, do these steps:

NOTE: The usual force on the steering tiller with pressure to system No. 1 is 7 to 8 pounds.

1) Stop the airplane.
2) Remove the pressure from hydraulic system No. 1.
3) Move the tiller in the correct direction to align it with the nose gear.
4) Supply pressure to hydraulic system No. 1.

(i) Make sure that the control lever for the landing gear is in the DN position.

(j) Make sure that the VHF radio is on.

(k) Set the VHF radio to the correct frequency for communications with the ground control authority at the airport.

(l) Make sure that the service interphone or the hand radios for ground crew communications are on.

S 862-024
(3) Close these circuit breakers and attach DO-NOT-CLOSE tags to arm the body gear steering system:
(a) P7 Overhead Circuit Breaker Panel
1) 7G23, BODY GR STRG ARM AC
2) 7G24, BODY GR STRG ARM DC
(b) P18O DC Power Distribution Panel
1) 18OJ07, ANTISKID 1-3
2) 18OF07, ANTISKID 2-4
3) 18OF08, ANTISKID 13-15
4) 18OJ08, ANTISKID 14-16
5) 18OF25, BRK CONT IND/TEST 1
6) 18OF1O, BRK CONT IND/TEST 2

D. Taxi the Airplane

S 842-004
(1) Get the necessary approval from the airport ground control to start the engine.

S 842-005
(2) Tell the ground crew to remove the wheel chocks and the static ground wire if it is attached.

S 862-006
(3) Make sure that the beacon light that turns is on.

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

S 862-007
(4) Make sure that the navigation lights are on.

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

S 862-008
(5) Start and operate the engines (Ref 71-00-00/201).

S 842-009
(6) When the airplane is prepared to taxi, get approval to taxi from the airport ground control.

S 862-010
(7) When the ground crew gives the signal, release the brakes and start to taxi.
(a) Supply engine power smoothly to start the airplane movement.
(b) Move the engines to idle when the airplane starts to move.

S 582-011
(8) Let the airplane move straight before you start a turn.

S 582-012

(9) Use the steering tiller or the rudder pedals to turn the airplane.

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

S 842-013

(10) Communicate with the ground crew during a turn to make sure that the airplane stays clear of all structures, equipment, and airplanes.

S 582-014

(11) If taxi lines are available, taxi with the nose wheel on the line.

S 582-015

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

(12) Taxi slowly with the engines at idle.

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

(b) If the airplane taxi speed is too fast (with engines at idle), operate the brakes slowly and smoothly for a short time.

1) If the taxi speed increases, operate the brakes again, as you did in the step before.

NOTE: On and off application of the brakes permits the temperature of the brakes to decrease when they are off. Do not ride the brakes to keep a constant speed.

S 582-016
(13) Make the turns with the largest radius possible.

NOTE: This will decrease landing gear side loads, and the tire scrub will decrease.

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

NOTE: Do not stop during a turn.

S 582-017
(14) When it is possible, complete the taxi in a straight line roll for a minimum of 12 feet.

NOTE: This will release the stresses in the tires and the gears.

S 862-018
(15) Operate the brakes when it is necessary to stop the airplane.

S 862-019
(16) Set the parking brake.

S 842-020
(17) Use the airline checklist to deactivate and shutdown the applicable airplane systems.

S 862-021
(18) Tell the ground crew to install the wheel chocks, and to install the static ground wire.

S 862-022
(19) You can release the parking brake after the wheel chocks are installed.