CHAPTER

07

LIFTING AND SHORING

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 07
LIFTING AND SHORING

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07-EFFECTIVE PAGES

MD-80
AIRCRAFT MAINTENANCE MANUAL

CHAPTER 07
LIFTING AND SHORING

07-CONTENTS

GENERAL - DESCRIPTION AND OPERATION

1. Description

A. Lifting the aircraft is accomplished by using conventional airplane jacks at the jack points on the wing and aft fuselage, or at the nose and main landing gear axle jack points. The aircraft may also be lifted with pneumatic lifting bags when the use of conventional jacks is impractical.

B. Shoring can be accomplished by using contoured boards that conform to the lower surface of the wing and fuselage at specified locations.

C. Aircraft recovery is limited to recovery methods which raise the aircraft with jacks or lifting bags, enabling the landing gear to be lowered, repaired, or replaced as necessary for the aircraft to be towed or interfaced with a recovery vehicle.

JACKING - DESCRIPTION AND OPERATION

1. Description

A. Three jack points are provided on the primary structure for lifting the entire aircraft. A jack pad adapter receptacle is located on each wing outboard of the main landing gear, at Station 852.9; and on the aft fuselage centerline at Station 1337.3. The maximum jacking load limit is 58,457 pounds (26,516.6 kg) at each wing jack point and 21,787 pounds (9882.4 kg) at the aft fuselage jack point but total airplane jacking weight limit at the three jack points must not exceed 124,000 pounds (56,245 kg).

B. An additional jack point receptacle is located in the forward fuselage at Station 216.8 for attachment of a ball type adapter for raising the nose of the aircraft about the main landing gear axis. Maximum jacking load is 14,212 pounds (6,446.4 kg).

C. Both nose and main landing gear contain integral jack pads located on and below each axle, midway between each set of wheels. The type of jack required for nose or main gear jacking varies with purpose and tire condition. With one or both tires normally inflated on any axle, conventional axle jacks of adequate capacity, lift, and body dimensions are satisfactory. Certain flat tire conditions may require the use of a cantilever type jack. Maximum allowable axle jack loads are in excess of any anticipated load limit.

D. In some instances pneumatic lifting bags may be the only means possible for lifting the aircraft. If the aircraft has landed on soft terrain or has made a gear-up landing, the fuselage may be in contact with the ground and use of conventional jacks would not be practical. Instructions are provided for lifting an aircraft from this attitude by use of pneumatic bags. The instructions should be augmented with the operating and/or usage instructions furnished by the manufacturer of the pneumatic lifting bags and related equipment.

WING AND FUSELAGE JACKING - MAINTENANCE PRACTICES

1. General

A. The entire aircraft can be jacked at the wing and aft fuselage jack points. Jacking the aircraft at these points is generally done to perform landing gear tests or to remove or install nose or main gear components. (Figure 201)

B. An additional jack receptacle is installed at station 216.8 for raising the nose of the aircraft for nose landing gear maintenance.

C. When possible, the aircraft should be moved to a level surface known to be capable of supporting each jack. The jacking site should be protected from the wind, preferably in a hanger. When jacking the aircraft in unprotected open areas, the aircraft should be headed into the wind.

CAUTION: PRIOR TO JACKING, PERSONNEL SHOULD BE BRIEFED ON ASSIGNMENTS AND PROCEDURES TO BE FOLLOWED.

CAUTION: DO NOT JACK AIRCRAFT IF WIND VELOCITY EXCEEDS 30 KNOTS.

CAUTION: MAXIMUM JACK LOAD IS 21,787 POUNDS (9,882.4 KG) AT AFT FUSELAGE JACK POINT; 58,457 POUNDS (26,515.6 KG) AT EACH WING JACK POINT; AND 2000 POUNDS (907.2 KG) TO 14,212 POUNDS (6446.5 KG) AT FORWARD FUSELAGE JACK POINT. MAXIMUM TOTAL AIRCRAFT WEIGHT SHOULD NOT EXCEED 124,000 POUNDS (56,245 KG) WHEN JACKED AT AFT AND WING JACK POINTS (NOT APPLICABLE WHEN JACKED ONLY AT FORWARD JACK POINT).

CAUTION: ALLOWANCE SHOULD BE MADE FOR ENVIRONMENTAL CONDITIONS (WIND, GROUND SLOPE, ETC.) AND FOR ABNORMAL INTERIOR CONFIGURATIONS SUCH AS ITEMS REMOVED, ADDITIONAL CREW, AND TOOLS SO THAT AIRCRAFT CENTER OF GRAVITY DOES NOT GO FORWARD OF STATION 881.1.

D. Before starting jacking operations, the center of gravity and the load for the wing and fuselage jack points of the aircraft to be jacked must be known. Ballast may be required to adjust the fuselage center of gravity for jacking.

CAUTION: DO NOT JACK FORWARD FUSELAGE STATION 216.8 IN CONJUNCTION WITH AFT FUSELAGE STATION 1337.3. SEVERE STRUCTURAL DAMAGE WILL OCCUR IF WING JACKS ARE RELEASED WHILE JACKS ARE RAISED AT BOTH FUSELAGE JACK POINTS.

CAUTION: DO NOT EXTEND OR RETRACT THE AFT FUSELAGE JACK OR LOWER THE WING JACKS WHILE THE NOSE SUPPORT IS IN PLACE OR SERIOUS DAMAGE WILL RESULT.

CAUTION: WHEN POSITIONING NOSE, JACK MUST BE EXTENDED ONLY UNTIL IT JUST TOUCHES NOSE JACKING RECEPTACLE. IF JACK IS EXTENDED FURTHER, DAMAGE CAN RESULT.

E. A nose jack can be positioned at station 218.8 nose jack receptacle to steady aircraft while it is on wing and aft fuselage jacks.

2. Equipment and Materials

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

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 201

Name and Number	Manufacturer
Jack, fuselage forward (1) (7.5 ton/ 6.8 metric ton tripod)	
Jack, fuselage aft (1) (15 ton/ 13.5 metric ton tripod)	
Jack, wing (2) (35 ton/ 31.5 metric ton tripod)	
Adapter, forward and aft fuselage jack point (2) 4916701-1	Douglas Aircraft Company
Adapter, wing jack (2) 4916702-1 or -501	Douglas Aircraft Company
Support, tail (1) 3916746-503, -505	Douglas Aircraft Company
Pin assembly, main landing gear downlock (2) 2916700-1	Douglas Aircraft Company
Pin assembly, nose landing gear downlock (1) 2916700-501	Douglas Aircraft Company
*Fitting, nose ballast attach 4916782-1	Douglas Aircraft Company
* Provides nose ballast attach point at Sta Y=218 (right and left).	
Weight, ballast (2) (1500 lb/ 680.3 Kg)	
Winch, manual (3000 lb/ 1360.6 Kg minimum lift capacity)	

Table 201 (Continued)

Name and Number	Manufacturer
Adapter, tail skid ballast weight hoist 5965697	Douglas Aircraft Company
Gauge, air pressure	

3. Preliminary Jacking Instructions

WJE ALL POST AOL MD80-9-2262A

NOTE: The aft pressure bulkhead lower web may oil-can slightly when the aircraft Center of Gravity (CG) moves towards the aft limit during jacking. In order to minimize this condition, 1500 lbs (680.1 kg) of ballast may be added to each side of the fuselage using nose ballast attach fitting at Station 218, prior to jacking. Make sure that the forward CG is not exceeded.

Substitution for ballast may be used, which may be sandbags in the forward cargo compartment, fuel in the center tank, or equivalent.

During jacking, stabilize the suspended weights to prevent damage to the aircraft.

When the aircraft is lowered from jacks, check for any deformation of the aft pressure bulkhead lower web.

WJE ALL

CAUTION: MAXIMUM STATIC LOAD LIMIT IS 21,787 POUNDS (9,882.4 KG) AT THE AFT JACK POINT; 58,457 POUNDS (26,515.6 KG) AT EACH WING JACK POINT; AND 14,212 POUNDS (6,446.5 KG) AT THE FORWARD FUSELAGE JACK POINT. MAXIMUM TOTAL AIRCRAFT WEIGHT SHOULD NOT EXCEED 124,000 POUNDS (56,245 KG).

A. To jack aircraft within its limitations, weight at the wing and fuselage jack points and aircraft center of gravity should be determined.

B. If weight and center of gravity are not known, a nomogram and formulas are provided as a rapid and convenient means of computing this data without the necessity of using weight cells. (Figure 202)

(1) Instructions for using the nomogram are as follows:

(a) Balance fuel between left and right main tanks within 1000 pounds (454.0 kg) before checking strut pressures.

(b) Using an air pressure gauge, read pressure of nosegear and either main gear strut; find and mark corresponding pressure on "A" and "B" scales of nomogram. (Figure 202)

NOTE: Strut piston must not be bottomed or binding.

(c) CG is read on diagonal scale "E" at the intersection of a straight line connecting the pressures marked on the "A" and "B" scales.

(d) Read "C" and "D" scales opposite the marked pressure values on the "A" and "B" scales. Weight (W) of aircraft equals weight of "C" scale plus twice weight on "D" scale.

(e) If center of gravity is too far aft, attach 1500 lb. (680.3 Kg) of ballast to each side of aircraft nose using nose ballast attach fitting at station 218. (Figure 203)

4. Jacking Procedure

A. Jacking Aircraft at Aft Fuselage and Wing Jack Points

CAUTION: TO JACK WITHIN BALANCE (TIPABILITY) AND STRUCTURAL LIMITS, CENTER OF GRAVITY MUST BE AFT OF WING JACK POINTS. CENTER OF GRAVITY MUST BE AFT OF WING JACK POINTS BEFORE JACKING AIRCRAFT AND WHILE AIRCRAFT IS ON JACKS.

(1) Ensure landing gear downlock pins are installed.

(2) Verify wheels are chocked and parking brake is released.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: WITH ELECTRICAL POWER ON AND CIRCUIT BREAKERS ALL NORMAL, CABIN PRESSURE CONTROL LEVER SHALL BE IN “MANUAL” POSITION. IF FOR ANY PURPOSE LEVER IS REQUIRED TO BE IN “AUTOMATIC” POSITION, IT SHALL NOT BE ALLOWED TO REMAIN IN EXCESS OF 30 MINUTES.

(3) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	27	B1-509	FWD DRAIN MAST HEATER
Z	27	B1-507	AFT DRAIN MAST HEATER

(4) To provide instrument and radio rack cooling with aircraft on jacks (aircraft in flight mode), the instrument cooling fan may be operated by installing a jumper wire between terminals B1 and B2 on relay R2-283, located on the Sta. 110 relay panel in the E/E compartment.

CAUTION: IF NOSEWHEELS ARE TURNED BY HAND WHILE AIRCRAFT IS ON JACKS, RUDDER PEDAL STEERING ARM AND CLEVIS MAY BE DAMAGED.

(5) Place hydraulic steering bypass in normal position, to prevent turning nosewheels by hand.

CAUTION: DO NOT USE JACK ADAPTER MOUNTING BOLTS WITH LENGTH GREATER THAN AN6–5A BOLTS PROVIDED WITH ADAPTERS. LONGER BOLTS WILL GO THROUGH JACK PAD AND DAMAGE LOWER WING SKIN.

(6) Install jack adapter at each wing jack point. (Figure 204)

(7) Install fuselage jack adapter at aft fuselage jack point, Station 1337.3. (Figure 204)

WARNING: JACKING AIRCRAFT MAY CAUSE SUFFICIENT STRUT EXTENSION TO SHIFT AIRCRAFT FROM GROUND TO FLIGHT MODE. MAKE CERTAIN THAT SWITCHES, CIRCUIT BREAKERS, AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF THE AUTOMATIC SLAT EXTENSION SYSTEM AND POSSIBLE INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: MAKE CERTAIN THAT FLIGHT RECORDER CIRCUIT BREAKER IS OPEN TO PREVENT OPERATION OF FLIGHT RECORDER AND ERASURE OF DATA FROM FLIGHT RECORDER.

CAUTION: IF CAPTAIN'S AND FIRST OFFICER'S STALL WARNING CIRCUIT BREAKERS ARE CLOSED WHEN AIRCRAFT IS BEING JACKED OR IS ON JACKS, THERE IS A POSSIBILITY THAT IN-FLIGHT CONDITIONS FOR OPERATION OF THE AUTOMATIC SLAT EXTEND SYSTEM COULD BE SATISFIED (FLAPS RETRACTED, AIRSPEED LESS THAN 260 KNOTS, SLATS RETRACTED, AND GROUND CONTROL RELAY CIRCUIT IN FLIGHT MODE), THE ANGLE-OF-ATTACK SENSOR COULD DRIFT TO HIGH ANGLE-OF-ATTACK AND ACTUATE THE STALL WARNING SYSTEM AND EXTEND THE SLATS.

(8) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
Z	29	B1-62	RAM AIR TEMP & PROBE HEATER

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
F	21	B10-45	FLIGHT RECORDER

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
C	14	B10-331	FLIGHT RECORDER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
WJE ALL			
G	21	B10-46	FLIGHT RECORDER

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
B	7	B10-329	FLIGHT RECORDER

WJE ALL

CAUTION: WHEN USING JACK-SCREW EXTENSIONS, MAKE CERTAIN THAT SCREW IS NOT EXTENDED BEYOND SAFE THREAD ENGAGEMENT (THREE TO FOUR THREADS MINIMUM).

(9) Position jack beneath each wing jack adapter and aft fuselage adapter.

(10) Mark position (without scoring or damaging) of all landing gear struts.

(11) Make certain that jack cylinders are vertical at start of jacking operations to prevent side loads and possible gear strut binding.

CAUTION: WHEN LIFTING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(12) Raise primary jacks in accordance with manufacturer's instructions to seat jacks in jacking pads.

CAUTION: DO NOT JACK AIRCRAFT WITH BRAKES APPLIED.

(13) Remove wheel chocks and release parking brake.

(14) Using inclinometer in nosegear wheelwell, level aircraft laterally by extending appropriate wing jack. (Figure 205)

(15) With aircraft level laterally, simultaneously raise wing jacks until nosegear strut has extended.

(16) Simultaneously raise wing and aft jacks at the same rate until main landing gear tires are clear of ground. If main gear is to be operated (hydraulic power or free swing) aircraft must be raised so that minimum clearance between ground and tires is not less than 4 inches (101.6 mm). Maintain follower nut of each jack against jack shoulder.

CAUTION: WHILE EXTENDING AFT FUSELAGE JACK, MAKE CERTAIN THAT THE NOSE GEAR STRUT DOES NOT COMPRESS BEYOND THE PREVIOUSLY MARKED POSITION. STRUCTURAL DAMAGE COULD OCCUR.

(17) Raise aft fuselage jack to level aircraft longitudinally. Maintain follower nut of jack against jack shoulder.

NOTE: On some aircraft (such as aircraft with both engines installed), the forward nose ballasts are required and Paragraph 4.A.(18) may apply.

(18) To minimize deformation of the aft pressure bulkhead, the following is recommended:

(a) Level aircraft on jacks.

(b) Attach 1500 pounds (681 kg) of ballast on each side of aircraft nose using ballast attach fitting at Station 218.

(c) When aircraft is lowered from jacks, deformation of the aft pressure bulkhead should not be present.

B. Lowering Instructions

CAUTION: MAKE CERTAIN THAT PARKING BRAKE IS RELEASED BEFORE LOWERING AIRCRAFT.

CAUTION: MAKE CERTAIN THAT LANDING GEAR DOWNLOCK PINS ARE INSTALLED AND MAIN LANDING GEAR INBOARD DOORS ARE UP AND LATCHED.

CAUTION: ENSURE AREA IS CLEAR OF ALL WORKSTANDS AND EQUIPMENT PRIOR TO LOWERING AIRCRAFT.

CAUTION: MAKE CERTAIN THAT NOSE AND MAIN GEAR STRUTS ARE NOT BINDING (THIS CAN BE DETERMINED FROM MARKS PLACED ON STRUTS). BINDING CAUSES EXCESSIVE LOADS AT NOSEGEAR AND AFT FUSELAGE JACK POINTS, OR CAN CAUSE AIRCRAFT TO FALL ON PARTIALLY REMOVED JACKS.

CAUTION: REMOVE NOSE JACK BEFORE LOWERING AIRCRAFT OR DAMAGE MAY RESULT.

(1) Place landing gear wheel chocks in position to be installed when aircraft is on ground. Check that chocks will not interfere with wheels as aircraft is lowered.

(2) Make certain that parking brake is released before lowering aircraft.

(3) On completion of maintenance, retract wing and aft fuselage jacks simultaneously, maintaining level attitude, until nosegear compresses to within 3 to 4 inches (76.2 mm to 101.6 mm) of compressed position marked on nosegear strut. Keep follower nut within one-half inch (12.7 mm) of jack shoulder at all times.

(4) Stop retraction of wing jacks; completely retract aft fuselage jack and move clear of aircraft.

CAUTION: ENSURE NOSEGEAR STRUT IS NOT BINDING AND HAS RETURNED TO POSITION MARKED ON STRUT TO WITHIN 3.0 TO 4.0 INCHES (76.2 MM TO 101.6 MM). A BINDING STRUT COULD LOOSEN SUDDENLY AND ALLOW AIRCRAFT TO FALL ON A PARTIALLY REMOVED JACK.

(5) Continue to lower wing jacks until aircraft is supported on nose and main gears.

(6) Remove all jacks clear of aircraft; remove wing jack adapters and install AN6-5A bolts in stowed position on adapters.

(7) Remove fuselage jack adapter and replace plug bolts.

(8) Remove previously installed jumper wire between terminals B1 and B2 on relay R2-283.

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

LOWER EPC, AC BUS

Row	Col	Number	Name
X	27	B1-509	FWD DRAIN MAST HEATER
Z	27	B1-507	AFT DRAIN MAST HEATER
Z	29	B1-62	RAM AIR TEMP & PROBE HEATER

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
F	21	B10-45	FLIGHT RECORDER

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
C	14	B10-331	FLIGHT RECORDER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
WJE ALL			
G	21	B10-46	FLIGHT RECORDER

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
B	7	B10-329	FLIGHT RECORDER

WJE ALL

C. Jacking Aircraft at Forward Fuselage Jack Point

CAUTION: TO PREVENT TIPPING, JACK REACTION (WEIGHT) AT STATION 216.8 SHOULD BE MORE THAN 2000 POUNDS (907.2 KG) UNDER IDEAL JACKING CONDITIONS. IF JACKING CONDITIONS ARE LESS FAVORABLE (WIND BUFFETING AIRCRAFT, OR OTHER MAINTENANCE FUNCTIONS ARE BEING PERFORMED IN OR ON AFT FUSELAGE) MAINTAIN 5,000 POUNDS (2,268 KG) BY BALLASTING OR ADJUSTING AIRCRAFT LOAD.

(1) Ensure landing gear downlock pins are installed.

NOTE: Jacking aircraft at the forward fuselage jack point is generally done for nosegear maintenance and/or testing procedures.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: WITH ELECTRICAL POWER ON AND CIRCUIT BREAKERS ALL NORMAL, CABIN PRESSURE CONTROL LEVER SHALL BE IN “MANUAL” POSITION. IF FOR ANY PURPOSE LEVER IS REQUIRED TO BE IN “AUTOMATIC” POSITION, IT SHALL NOT BE ALLOWED TO REMAIN IN EXCESS OF 30 MINUTES.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	27	B1-509	FWD DRAIN MAST HEATER
Z	27	B1-507	AFT DRAIN MAST HEATER

(3) Ensure aircraft is electrically (static) grounded.

(4) Install jack adapter at forward fuselage jack point (Station 216.8). (Figure 204)

CAUTION: IF NOSEWHEELS ARE TURNED BY HAND WHILE AIRCRAFT IS ON JACKS, RUDDER PEDAL STEERING ARM AND CLEVIS MAY BE DAMAGED.

(5) To prevent turning nosewheels by hand, place hydraulic steering by-pass in normal position.

CAUTION: ENSURE VENTRAL STAIRWAY IS IN FULLY RETRACTED POSITION. DO NOT USE JACKS OR SHORING AT WING OR AFT FUSELAGE WHEN LIFTING AT STATION 216.8 JACK POINT. SERIOUS STRUCTURAL DAMAGE CAN OCCUR.

CAUTION: WHEN LIFTING OR LOWERING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

CAUTION: WHEN USING JACK-SCREW EXTENSIONS, MAKE CERTAIN THAT SCREW IS NOT EXTENDED BEYOND SAFE THREAD ENGAGEMENT (THREE TO FOUR THREADS MINIMUM).

(6) Position and extend jack until snug against adapter.

(7) Release brakes and loosen chocks.

(8) Extend jacks until nosegear tire is clear of ground. (Figure 201)

NOTE: If the aircraft center of gravity or stability is in question, a tail support can be installed as a precautionary measure to limit down travel of the fuselage tail section. (Figure 206)

(9) Refer to weigh and balance nomogram (Figure 202).

D. Lowering Instructions

CAUTION: MAKE CERTAIN NOSEGEAR DOWNLOCK PIN IS INSTALLED.

(1) On completion of maintenance, retract jack until weight is assumed by nosegear.

(2) Remove jack clear of aircraft; remove and stow jack adapter and tail support.

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

LOWER EPC, AC BUS

Row	Col	Number	Name
X	27	B1-509	FWD DRAIN MAST HEATER
Z	27	B1-507	AFT DRAIN MAST HEATER

5. Lifting Nosedown Aircraft

NOTE: A nosedown aircraft may be lifted about the main landing gear axis utilizing standard wing and aft fuselage jacks.

A. Preliminary Instructions

(1) Ensure main landing gear downlock pins are installed.

CAUTION: DO NOT USE JACK ADAPTER MOUNTING BOLTS WITH LENGTH GREATER THAN AN6–5A BOLTS PROVIDED WITH ADAPTERS. LONGER BOLTS WILL GO THROUGH JACK PAD AND DAMAGE LOWER WING SKIN.

(2) Install jack adapter at each wing jack point. (Figure 204)

(3) Remove two plug bolts next to aft fuselage jack point (Station 1337.3) and install fuselage jack adapter. (Figure 204)

(4) Place jacks under wing jack points; extend jacks until snug against adapters.

B. Jacking Procedure

CAUTION: ENSURE MAIN GEAR STRUTS ARE NOT BINDING IN A PARTIALLY EXTENDED POSITION, AND MAIN GEAR WHEELS ARE FREE TO ROLL.

CAUTION: WHEN LIFTING OR LOWERING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(1) Level aircraft laterally by extending appropriate wing jack.

(2) Extend wing jacks simultaneously until aircraft is level longitudinally (±2) degrees. Maintain followers (lock rings) against jack shoulders.

(3) Place jack under aft fuselage jack point; extend jack until snug against adapter.

(4) Extend all jacks simultaneously to height that will allow nosegear to freely swing to down position; install nosegear downlock pin.

C. Lowering Instructions

CAUTION: WHEN LIFTING OR LOWERING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(1) Lower all jacks simultaneously keeping follower (lock ring) nuts not more than one-half inch (12.7 mm) above jack shoulders until weight of aircraft is assumed by landing gear.

CAUTION: MAINTAIN CONSTANT PRESSURE ON TAIL JACK AT ALL TIMES UNTIL WEIGHT OF AIRCRAFT HAS BEEN ASSUMED BY BOTH NOSE AND MAIN LANDING GEAR. THEN REMOVE TAIL JACK.

(2) Remove jacks clear of aircraft; remove and stow jack adapters.

6. Stabilizing Aircraft

A. Support aircraft at tail skid to limit down travel of tail if center of gravity and/or stability may be in question.

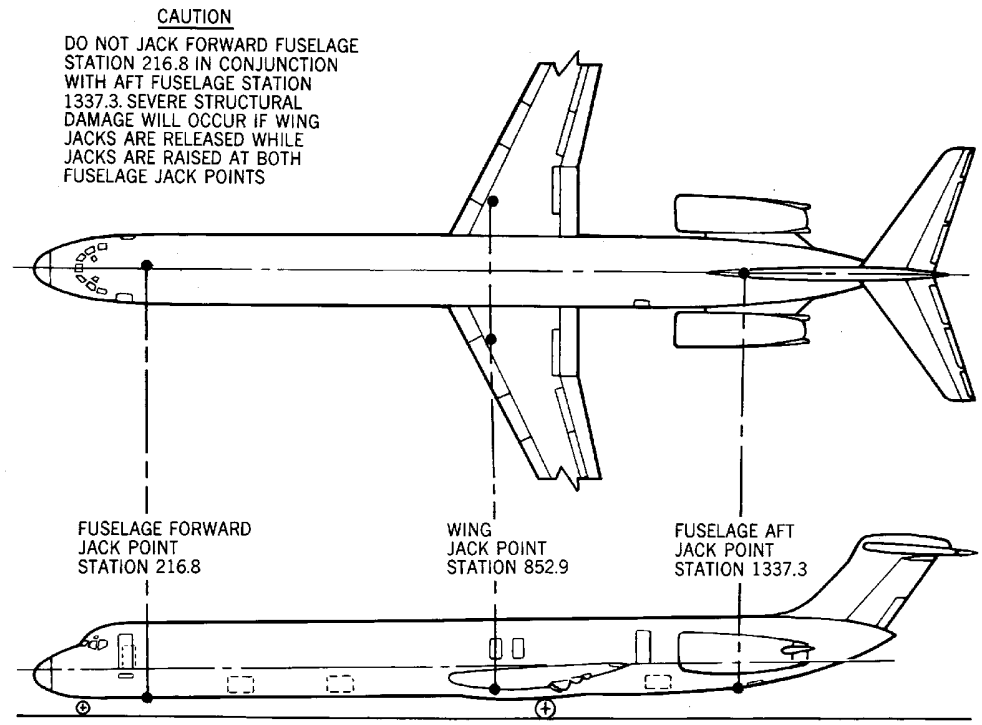
(1) Place tail support in position. (Figure 206)

(2) Attach adapter to tail skid with bolt.

(3) Remove and install bolt located in lower half of support to adjust height of support.

(4) On completion of maintenance, and after all weight has been removed from support, remove bolt attaching tail skid support from tail skid. Remove tail support.

B. Shore the aircraft if necessary. (SHORING - DESCRIPTION AND OPERATION, PAGEBLOCK 07-20-00/001)

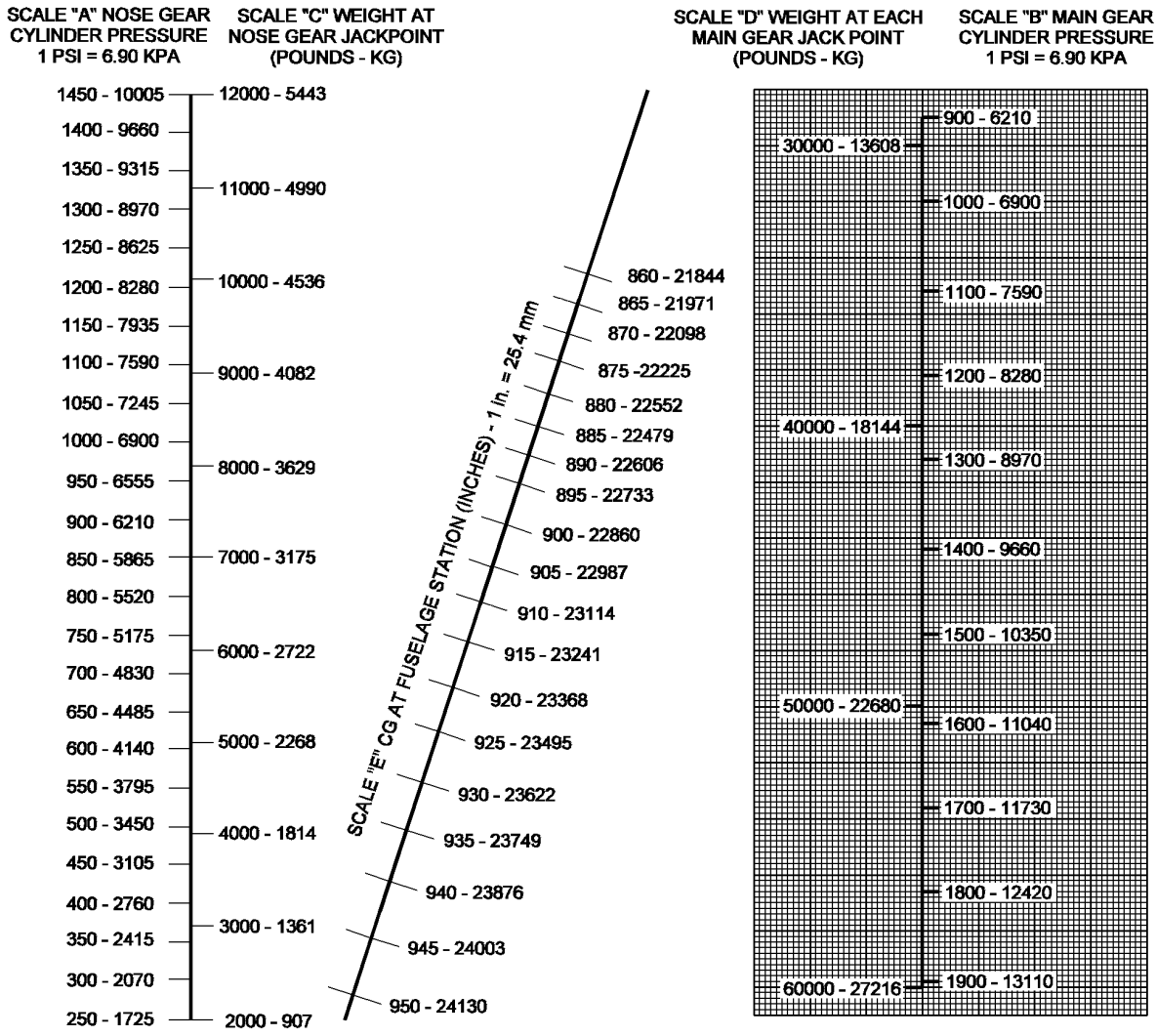


JACK POINT HEIGHT ABOVE GROUND						
CONDITION	JACK POSITION					
	FORWARD FUSELAGE		WING		AFT FUSELAGE	
	STN. (IN.)	216.8 (MM)	STN. (IN.)	852.9 (MM)	STN. (IN.)	1337.3 (MM)
STATIC	35.8	909	69.3	1760	64.9	1648
ALL TIRES FLAT AND STRUTS COMPRESSED	32.4	823	60.3	1532	55.9	1420
ALL STRUTS COMPRESSED	34.3	871	66.3	1684	61.9	1572
MAIN LANDING GEAR TIRES 2 IN. OFF GROUND (AIRCRAFT LEVEL)	—	—	93.9	2385	80.8	2052
REMOVE NOSE GEAR PISTON (WITH WHEEL ASSEMBLY INSTALLED)	61.8	1570	—	—	—	—
REMOVE NOSE GEAR PISTON (WITHOUT WHEEL ASSEMBLY INSTALLED)	55.6	1412	—	—	—	—
REMOVE MAIN LANDING GEAR PISTON (WITH WHEEL ASSEMBLY INSTALLED)	—	—	112.0	2845	98.9	2512
REMOVE MAIN LANDING GEAR PISTON (WITHOUT WHEEL ASSEMBLY INSTALLED)	—	—	97.7	2482	84.5	2146
REMOVE NOSE GEAR ASSEMBLY (STRUT FULLY COMPRESSED)	56.8	1443	—	—	—	—
REMOVE MAIN LANDING GEAR ASSEMBLY (STRUT FULLY COMPRESSED)	—	—	85.7	2177	72.5	1842
SWING NOSE GEAR	50.5	1283	—	—	—	—
SWING MAIN LANDING GEAR (AIRCRAFT LEVEL)	—	—	95.9	2436	82.8	2103
MAXIMUM JACK LOAD – TONS	7.5	13608	35	31751	15	13608

NOTES:
1. 2 INCHES (50.8 MM) MINIMUM GROUND CLEARANCE
2. DIMENSIONS TO LOWEST POINT ON JACK ADAPTER
3. JACKING IS ASSUMED TO BE DONE AT BOTH WING JACK POINTS SIMULTANEOUSLY TO PRODUCE ZERO ROLL ANGLE
4. 4 INCHES (101.6 MM) MINIMUM GROUND CLEARANCE WILL BE MAINTAINED THROUGH COMPLETE GEAR SWING ARC WHEN UTILIZING REFERENCE DIMENSION

BBB2-7-1E

Fuselage and Wing Jack Points and Elevations
Figure 201/07-11-00-990-808



INSTRUCTIONS: Weight at nose and main gear jackpoints are read on the (C) and (D) scales opposite corresponding pressure values on the (A) and (B) scales. Weight (W) of aircraft equals the weight at nose gear jackpoint plus twice the weight at one main gear jackpoint. The CG is read at the intersection of diagonal scale (E) and straight line connecting the values located on scales A-C and D-B.

FORMULAS FOR CALCULATING WEIGHT AT PRIMARY STRUCTURE JACK POINTS:

1. JACKING AT FWD FUS JACK POINT TO RAISE NOSE ABOUT MAIN GEAR FWD FUS STA 216.8

$$W\left(\frac{967.1\text{-}CG}{967.1\text{-}216.8}\right) = W\left(\frac{967.1\text{-}CG}{750.3}\right)$$

2. JACKING AT WING JACK POINTS TO RAISE NOSE ABOUT MAIN GEAR WING, FUS STA 852.9

$$\frac{W}{2}\left(\frac{976.1\text{-}CG}{967.1\text{-}852.2}\right) = \frac{W}{2}\left(\frac{967.1\text{-}CG}{114.9}\right) = W\left(\frac{967.1\text{-}CG}{229.8}\right)$$

3. JACKING AT WING AND AFT FUSELAGE JACK POINTS TO RAISE ENTIRE AIRPLANE

A. WING $\frac{W}{2}\left(\frac{1337.3\text{-}CG}{1337.3\text{-}852.2}\right) = W\left(\frac{1337.3\text{-}CG}{970.2}\right)$

B. AFT FUS STA 1337.3 $W\text{-}\left[W\left(\frac{1337.3\text{-}CG}{485.1}\right)\right]$

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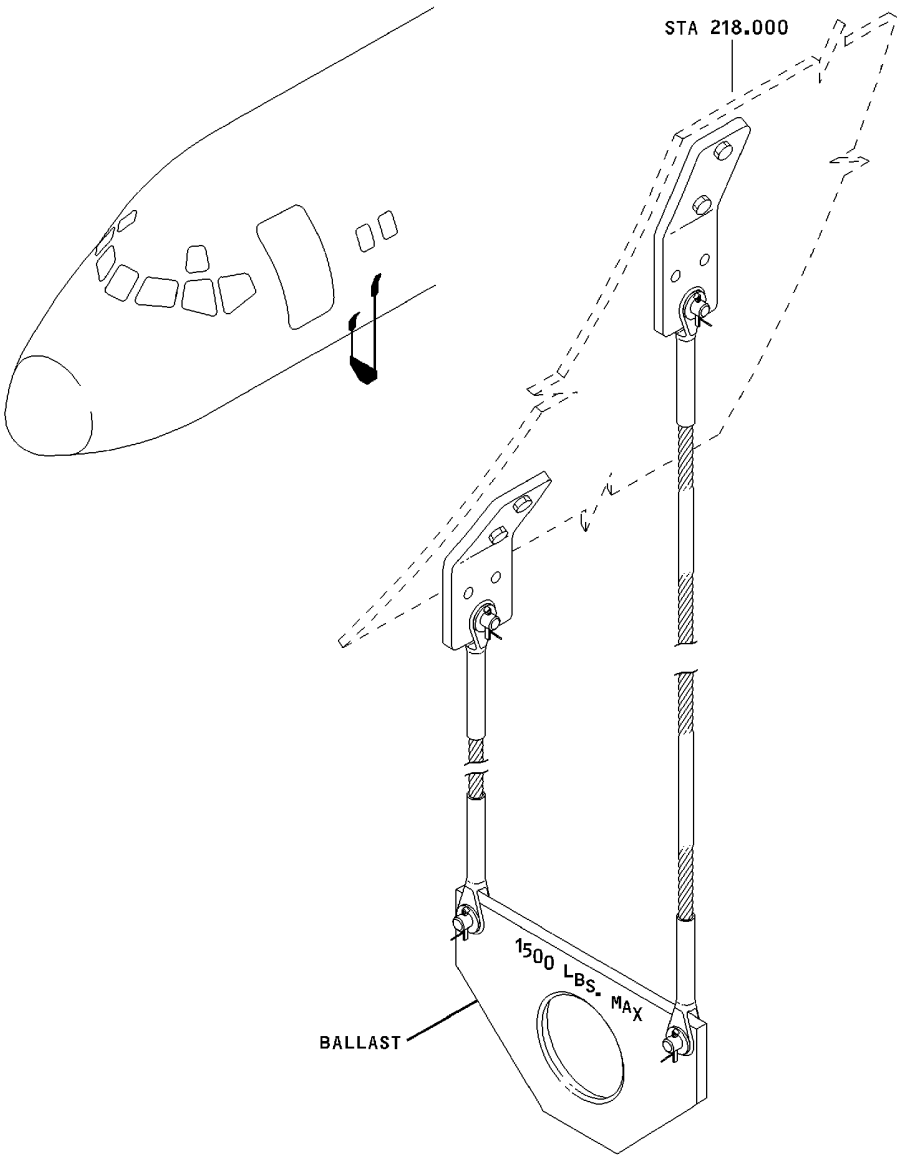
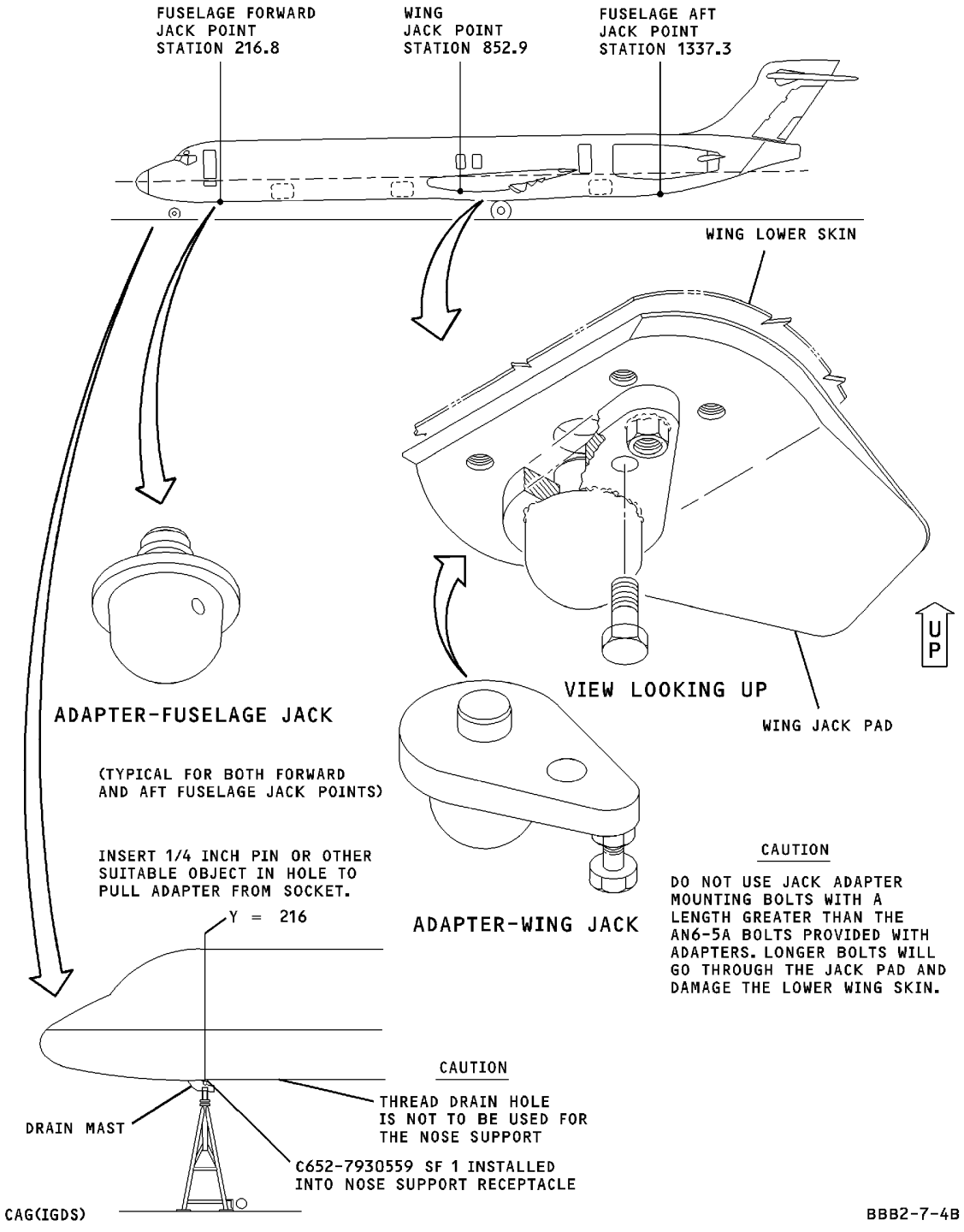
S0006522957V1

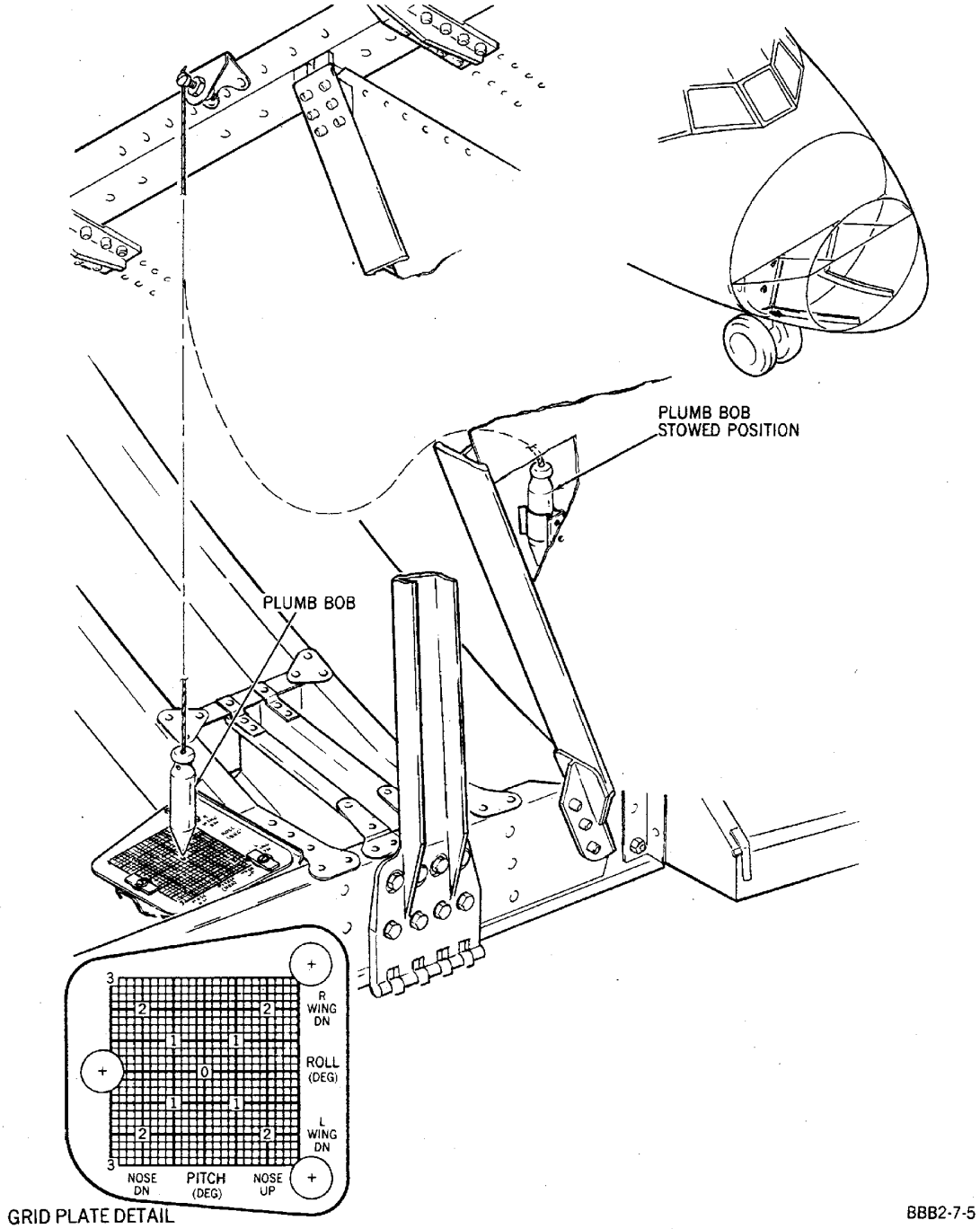
Jack Reaction and Center-of-Gravity
Figure 202/07-11-00-990-809



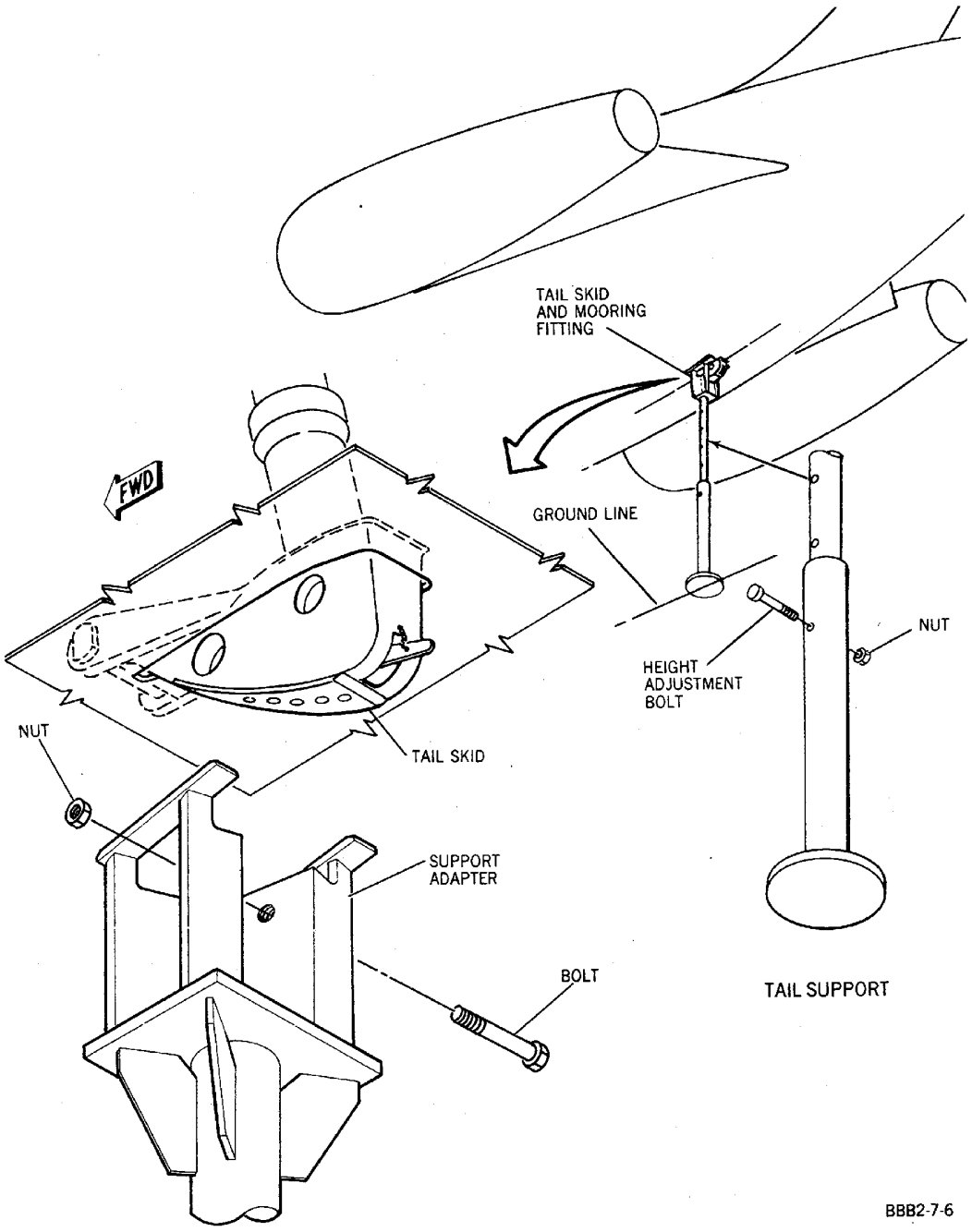
Nose Ballast Attach Fitting
Figure 203/07-11-00-990-813



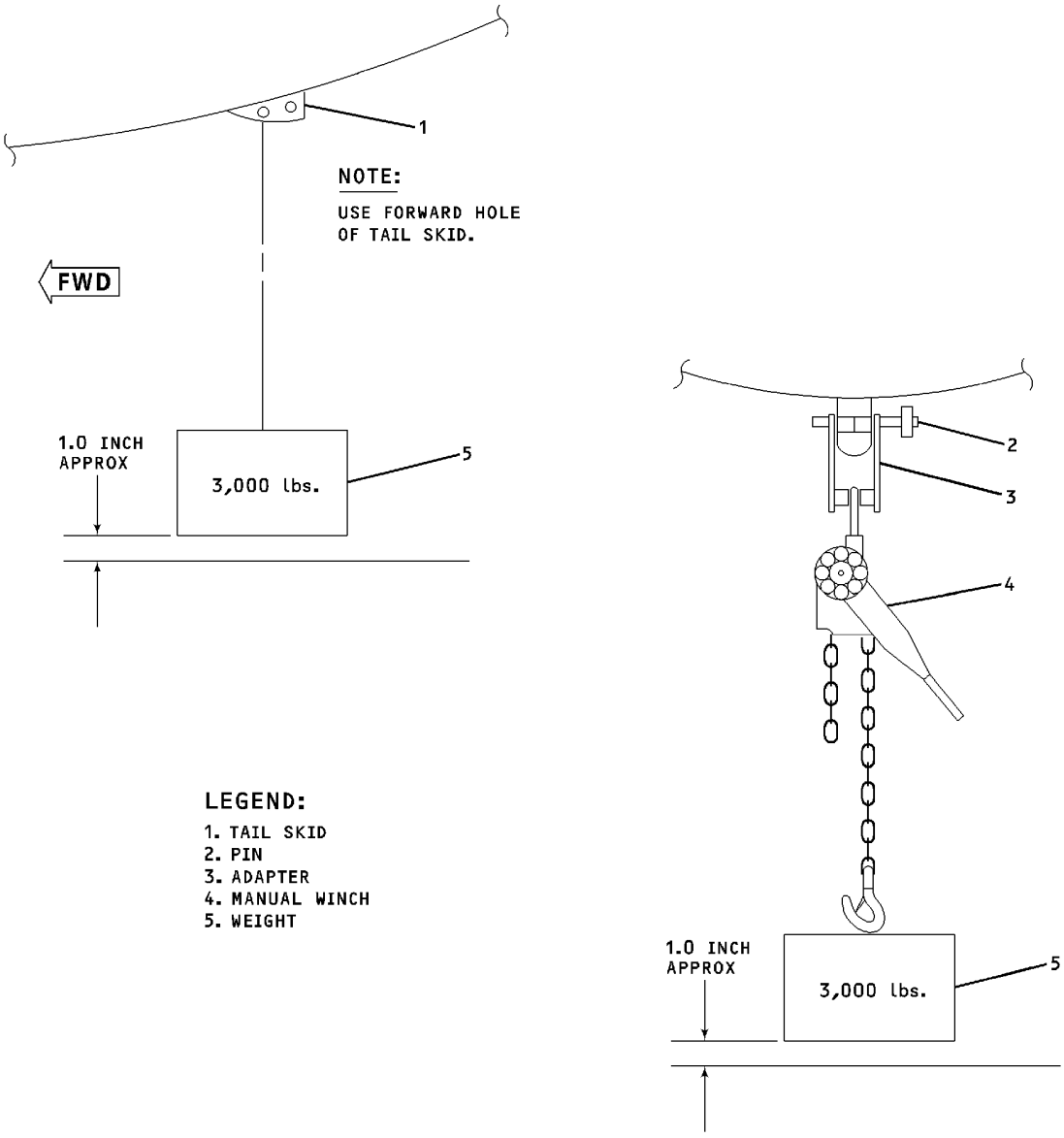
Fuselage and Wing Jack Adapters
Figure 204/07-11-00-990-810



Inclinometer
Figure 205/07-11-00-990-811



Tail Skid Mooring Support Fitting
Figure 206/07-11-00-990-812



Tail Skid Ballast Weight Hoist Adapter
Figure 207/07-11-00-990-814

7. **Jacking Aircraft Without Engines at Wing and Aft Fuselage Jack Points**

A. Jack the aircraft at aft fuselage and wing jack points as follows:

WARNING: MAKE SURE THE LANDING GEAR DOWNLOCK PINS ARE INSTALLED. THIS WILL PREVENT ACCIDENTAL RETRACTION OF THE LANDING GEAR, INJURY TO PERSONS, AND DAMAGE TO EQUIPMENT.

CAUTION: BEFORE YOU LIFT THE AIRCRAFT ON JACKS, MAKE SURE THE CENTER OF GRAVITY IS AFT OF THE WING JACK POINTS. ALSO, THE CENTER OF GRAVITY MUST STAY AFT OF THE WING JACK POINTS WHILE THE AIRCRAFT IS ON JACKS. THIS WILL HELP KEEP THE AIRCRAFT WITHIN THE BALANCE AND STRUCTURAL LIMITS.

CAUTION: MAXIMUM JACK LOAD IS 21,787 LBS (9,882.4KG) AT AFT FUSELAGE JACK POINT; 58,457 LBS (26,515.6 KG) AT EACH WING JACK POINT; AND 14,212 LBS (6,446.5 KG) AT THE FORWARD FUSELAGE JACK POINT. MAXIMUM TOTAL AIRCRAFT WEIGHT MUST NOT BE MORE THAN 124,000 LBS (56,245 KG).

(1) Make sure the landing gear downlock pins are installed.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: WITH ELECTRICAL POWER ON AND CIRCUIT BREAKERS ALL NORMAL, CABIN PRESSURE CONTROL LEVER SHALL BE IN “MANUAL” POSITION. IF FOR ANY PURPOSE LEVER IS REQUIRED TO BE IN “AUTOMATIC” POSITION, IT SHALL NOT BE ALLOWED TO REMAIN IN EXCESS OF 30 MINUTES.

(2) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
X	27	B1-509	FWD DRAIN MAST HEATER
Z	27	B1-507	AFT DRAIN MAST HEATER

(3) Make sure the aircraft is connected to the grounding cable and that cable has sufficient length for the aircraft to be elevated on the jacks.

CAUTION: IF NOSEWHEELS ARE TURNED BY HAND WHILE AIRCRAFT IS ON JACKS, RUDDER PEDAL STEERING ARM AND CLEVIS MAY BE DAMAGED.

(4) Place hydraulic steering by-pass lever in NORMAL position, to prevent turning nosewheels by hand.

CAUTION: DO NOT USE JACK ADAPTER MOUNTING BOLTS WITH LENGTH GREATER THAN AN6–5A BOLTS PROVIDED WITH ADAPTERS. LONGER BOLTS WILL GO THROUGH JACK PAD AND DAMAGE LOWER WING SKIN.

(5) Install jack adapter at each wing jack point. (Figure 202)

(6) Install fuselage jack adapter at aft fuselage jack point, station 1337.3. (Figure 202)

(7) Install nose jack adapter into un-threaded receptacle at Station 216.8. (Figure 204)

NOTE: Do not use the threaded drain hole just aft of the receptacle.

WARNING: JACKING AIRCRAFT MAY CAUSE SUFFICIENT STRUT EXTENSION TO SHIFT AIRCRAFT FROM GROUND TO FLIGHT MODE. MAKE CERTAIN THAT SWITCHES, CIRCUIT BREAKERS, AND CONTROLS OF AFFECTED SYSTEMS ARE IN CORRECT POSITION TO PREVENT INADVERTENT OPERATION OF THE AUTOMATIC SLAT EXTENSION SYSTEM AND POSSIBLE INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

WARNING: TAG AND USE SAFETY CLIPS TO SAFETY THE CIRCUIT BREAKERS. IF THE CIRCUIT BREAKERS ARE NOT OPENED, TAGGED, AND SAFETIED, INJURY TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

CAUTION: MAKE CERTAIN THAT FLIGHT RECORDER CIRCUIT BREAKER IS OPEN TO PREVENT OPERATION OF FLIGHT RECORDER AND ERASURE OF DATA FROM FLIGHT RECORDER.

CAUTION: IF CAPTAIN'S AND FIRST OFFICER'S STALL WARNING CIRCUIT BREAKERS ARE CLOSED WHEN AIRCRAFT IS BEING JACKED OR IS ON JACKS, THERE IS A POSSIBILITY THAT IN-FLIGHT CONDITIONS FOR OPERATION OF THE AUTOMATIC SLAT EXTEND SYSTEM COULD BE SATISFIED (FLAPS RETRACTED, AIRSPEED LESS THAN 260 KNOTS, SLATS RETRACTED, AND GROUND CONTROL RELAY CIRCUIT IN FLIGHT MODE), THE ANGLE-OF-ATTACK SENSOR COULD DRIFT TO HIGH ANGLE-OF-ATTACK AND ACTUATE THE STALL WARNING SYSTEM AND EXTEND THE SLATS.

(8) Open these circuit breakers and install safety tags:

LOWER EPC, AC BUS

Row	Col	Number	Name
Z	29	B1-62	RAM AIR TEMP & PROBE HEATER

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
F	21	B10-45	FLIGHT RECORDER

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
C	14	B10-331	FLIGHT RECORDER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
WJE ALL			
G	21	B10-46	FLIGHT RECORDER

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
B	7	B10-329	FLIGHT RECORDER

WJE ALL

CAUTION: BEFORE YOU LIFT THE AIRCRAFT ON JACKS, MAKE SURE THE CENTER OF GRAVITY IS AFT OF THE WING JACK POINTS. ALSO, THE CENTER OF GRAVITY MUST STAY AFT OF THE WING JACK POINTS WHILE THE AIRCRAFT IS ON JACKS. THIS WILL HELP KEEP THE AIRCRAFT WITHIN THE BALANCE AND STRUCTURAL LIMITS.

(9) Install aft ballast weights as follows: (Figure 207)

(a) Install tail skid ballast weight hoist adapter into the forward hole of the tail skid, install pin.

(b) Position two 1500 lb (680.3 kg) ballast weights or equivalent beneath the tail skid hoist adapter.

(c) Install one end of manual winch to hoist adapter and the other end to ballast weights.

WARNING: WHEN THE JACK SCREW EXTENSIONS ARE USED, MAKE SURE THE SCREW IS NOT EXTENDED THROUGH THE SAFE THREAD ENGAGEMENT. A MINIMUM OF THREE TO FOUR THREADS IS NECESSARY. THIS WILL PREVENT COLLAPSE OF THE JACK, INJURY TO PERSONS, AND DAMAGE TO EQUIPMENT.

(10) Position jack beneath each wing jack adapter and aft fuselage adapter, and extend jack extension screws 4.0 in. (101.6 mm) from the jack adapters.

NOTE: The jack screw extensions must never be extended beyond a safe thread engagement of 3-4 threads minimum.

(11) Position nose support jack near the forward fuselage adapter.

(12) Mark position (without scoring or damaging) of all landing gear struts.

(13) Lift the aft ballast weights with the manual winch at the tail skid approximately 1 in. (25.4 mm) from the ground, maintain the clearance at all times during the lifting procedure.

(14) Extend the wing jacks and aft fuselage jack until seated into the jack adapters.

(15) Make sure that jack cylinders are vertical at start of jacking operations to prevent side loads and possible gear strut binding.

CAUTION: WHEN LIFTING OR LOWERING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(16) Using inclinometer in nosegear wheelwell, level aircraft laterally by extending appropriate wing jack. (Figure 205)

(17) With aircraft level laterally, simultaneously raise wing jacks until nosegear strut has extended.

(18) Simultaneously raise wing and aft jacks until main landing gear tires are clear of ground. If main gear is to be operated (hydraulic power or free swing), aircraft must be raised so that minimum clearance between ground and tires is not less than 4.0 in. (101.6 mm). Maintain follower nut of each jack against jack shoulder.

CAUTION: WHILE EXTENDING AFT FUSELAGE JACK, MAKE CERTAIN THAT THE NOSE GEAR STRUT DOES NOT COMPRESS BEYOND THE PREVIOUSLY MARKED POSITION. STRUCTURAL DAMAGE COULD OCCUR.

(19) Raise aft fuselage jack to level aircraft longitudinally. Maintain follower nut of jack against jack shoulder.

(20) Position nose support jack beneath forward fuselage jack adapter, extend support jack to jack adapter and seat lockring.

B. Lower the aircraft at the wing and aft fuselage jack points as follows:

WARNING: MAKE SURE THE LANDING GEAR DOWNLOCK PINS ARE INSTALLED. THIS WILL PREVENT ACCIDENTAL RETRACTION OF THE LANDING GEAR, INJURY TO PERSONS, AND DAMAGE TO EQUIPMENT.

WARNING: MAKE SURE ALL PERSONS ARE CLEAR OF DOORS, GEAR, AND THE ADJACENT AREA. THIS WILL PREVENT INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

(1) Place landing gear wheel chocks in position to be installed when aircraft is on ground. Make certain chocks will not interfere with wheels as aircraft is lowered.

(2) Make certain that parking brake is released before lowering aircraft.

(3) Unseat lockring and lower forward fuselage support jack from jack adapter, and remove jack clear of aircraft.

(4) If binding occurs to the lockring, raise both wing jacks simultaneously to a minimum that will remove the preload on the nose support jack.

(5) Slowly lower aircraft with wing and aft fuselage jacks simultaneously while maintaining aircraft in a level condition. Maintain the ballast weights 1.0 in. (25.4 mm) from the ground at all times during the lowering procedure.

(6) When main landing gear tires contact the ground and the struts start to compress, stop lowering the aircraft.

(7) Lower ballast weights to the ground, and remove weights, manual winch and aft ballast attach fitting.

(8) Lower the aircraft fully onto the landing gear tires, retract jack screw extensions and remove jacks clear of aircraft.

(9) Make sure all the struts return to the position marked on the struts before the aircraft was jacked.

(10) Remove wing jack adapters and install AN6-5A bolts in stowed position on adapters.

(11) Remove fuselage jack adapters and replace plug bolts.

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

LOWER EPC, AC BUS

Row	Col	Number	Name
X	27	B1-509	FWD DRAIN MAST HEATER
Z	27	B1-507	AFT DRAIN MAST HEATER
Z	29	B1-62	RAM AIR TEMP & PROBE HEATER

LOWER EPC, MISCELLANEOUS LEFT DC BUS

Row	Col	Number	Name
P	35	B1-487	STALL WARNING AND AUTO SLAT-1

LOWER EPC, MISCELLANEOUS RIGHT DC BUS

Row	Col	Number	Name
R	35	B1-26	STALL WARNING AND AUTO SLAT-2

UPPER EPC, LEFT RADIO AC BUS

Row	Col	Number	Name
F	21	B10-45	FLIGHT RECORDER

UPPER EPC, LEFT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
C	14	B10-331	FLIGHT RECORDER

UPPER EPC, LEFT RADIO DC BUS

Row	Col	Number	Name
WJE ALL			
G	21	B10-46	FLIGHT RECORDER

UPPER EPC, RIGHT RADIO BUS

Row	Col	Number	Name
WJE 401-412, 414-427, 429, 861-866, 868, 869, 871-874, 877, 880, 881, 883, 884, 886, 887, 891-893			
B	7	B10-329	FLIGHT RECORDER

NOSE AND MAIN LANDING GEAR JACKING - MAINTENANCE PRACTICES

1. General

A. This procedure has the maintenance practices for jacking of the aircraft at the main landing gear and nose landing gear.

CAUTION: ALLOWANCE SHOULD BE MADE FOR ENVIRONMENTAL CONDITIONS (WIND, GROUND SLOPE, ETC.) AND FOR ABNORMAL INTERIOR CONFIGURATIONS SUCH AS ITEMS REMOVED, ADDITIONAL CREW, AND TOOLS SO THAT AIRCRAFT CENTER OF GRAVITY DOES NOT GO FORWARD OF STATION 881.1.

CAUTION: DO NOT LIFT THE AIRCRAFT ON JACKS IF THE WIND SPEED IS MORE THAN 30 KNOTS. WIND CAN CAUSE THE AIRCRAFT TO FALL FROM THE JACKS.

B. When possible, the aircraft must be on a level surface that can hold the jack.

(1) It is recommended that the aircraft be on jacks in a hangar or area with wind protection.

(2) When the aircraft is in an open area and wind conditions make it necessary, park the nose of the aircraft into the wind.

C. Make sure that the landing gear is safe for maintenance. (GENERAL - MAINTENANCE PRACTICES, PAGEBLOCK 32-00-00/201)

2. Equipment and Materials

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

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 201

Name and Number	Manufacturer
MLG axle jack, COM-3978	
MLG axle jack, STD-1485	
10 ton axle jack, STD-3838	
*Adapter, nose axle jack 5916703-501	The Boeing Company
**Fitting, nose ballast attach 4916782-1	The Boeing Company
Pin assembly, main landing gear downlock, (2) 2916700-1	The Boeing Company
Pin assembly, nose landing gear downlock, (1) 2916700-501	The Boeing Company
*Nose jacking. Provides jack point forward of axle jack pad clearance between jack and tires.	
**Provides nose ballast attach point at Sta Y=110 (right and left).	

3. Jacking Procedures

CAUTION: MAKE SURE YOU ALIGN THE JACK CUP WITH THE JACK BALL. IF THE JACK CUP IS NOT ALIGNED WITH THE JACK BALL, DAMAGE TO THE AIRCRAFT CAN OCCUR.

CAUTION: WHEN YOU LIFT THE AIRCRAFT ON JACKS, REMOVE ALL EQUIPMENT FROM THE AREA. THIS WILL PREVENT DAMAGE TO THE AIRCRAFT AND EQUIPMENT.

A. Jacking the aircraft at a main landing gear axle: (Figure 201) (Figure 203)

(1) Ensure landing gear downlock pins are installed.

(2) Ensure aircraft is electrically (static) grounded.

(3) Position jack under main landing gear axle and extend jack until snug against jack ball.

(4) Remove wheel chocks at main landing gear being raised.

(5) Make sure that the area around the aircraft is clear of personnel and equipment.

(6) Extend the main landing gear axle jack until tires clear ground a minimum of 1.0 in. (25.4 mm).

CAUTION: MAKE SURE YOU ALIGN THE JACK CUP WITH THE JACK BALL. IF THE JACK CUP IS NOT ALIGNED WITH THE JACK BALL, DAMAGE TO THE AIRCRAFT CAN OCCUR.

CAUTION: WHEN YOU LIFT THE AIRCRAFT ON JACKS, REMOVE ALL EQUIPMENT FROM THE AREA. THIS WILL PREVENT DAMAGE TO THE AIRCRAFT AND EQUIPMENT.

B. Jacking the aircraft at nose landing gear axle: (Figure 201), (Figure 202)

(1) Ensure nose and main landing gear downlock pins are installed.

(2) Ensure aircraft is electrically (static) grounded.

(3) Ensure wheel chocks are installed at the main landing gear wheels.

(4) Position the NLG axle jack (COM-3838) below the axle ball and extend jack until snug against axle ball.

If a nose axle jack adapter is necessary, install the adapter to the axle ball. Position the MLG axle jack (COM-3978) below the adapter and extend until jack is snug against adapter.

(5) Make sure that the area around the aircraft is clear of personnel and equipment.

(6) Extend the main landing gear axle jack until tires clear ground a minimum of 1.0 in. (25.4 mm).

(7) If loading cannot be adjusted to maintain safe jacking conditions, install nose ballast attach fittings and ballast nose of aircraft, as necessary.

C. Lowering Instructions

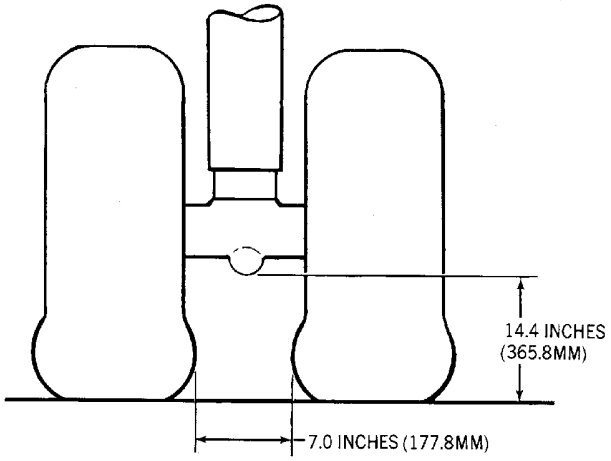
WARNING: MAKE SURE ALL PERSONS ARE CLEAR OF LANDING GEAR DOORS, LANDING GEAR, AND THE ADJACENT AREA. THIS WILL PREVENT INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

CAUTION: WHEN YOU LOWER THE AIRCRAFT OFF JACKS, REMOVE ALL EQUIPMENT FROM THE AREA. THIS WILL HELP PREVENT DAMAGE TO THE AIRCRAFT AND EQUIPMENT.

(1) On completion of maintenance, retract jack(s) until aircraft weight is on its landing gear.

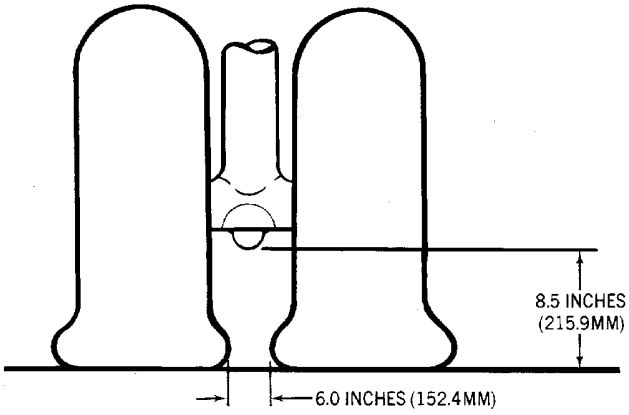
(2) Remove jack(s) from under applicable gear and away from aircraft.

(3) Remove nose ballast and ballast fittings, if installed.



✻GROSS WEIGHT WITH NORMAL TIRE INFLATION
MAIN GEAR

JACK POINT	MAX. LOAD-TONS		JACK POINT HEIGHT (IN INCHES/MILLIMETERS) ABOVE GROUND							
			STATIC		FLAT TIRES		ON RIMS		TIRES 2 INCHES CLEAR OF GROUND	
	TONS	TONS METRIC	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM
MLG	35	31.75	14.4	365.8	8.4	213.4	7.6	193.0	20.4	518.2
NLG	7.5	6.8	8.5	215.9	6.6	167.6	5.3	134.6	12.3	312.4



GROSS WEIGHT WITH NORMAL TIRE INFLATION
NOSE GEAR

✻ THIS DIMENSION IS VARIABLE WHEN TIRES ARE UNDERINFLATED OR FLAT

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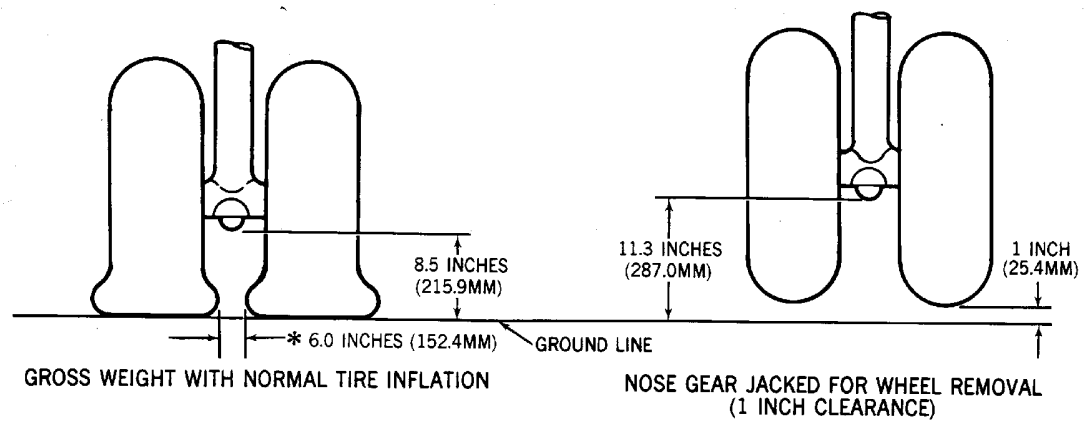
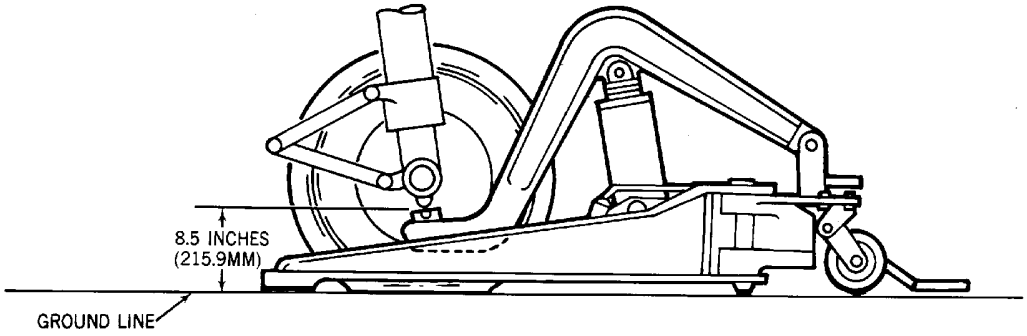
Main and Nose Landing Gear Jack Point Elevations
Figure 201/07-12-00-990-801

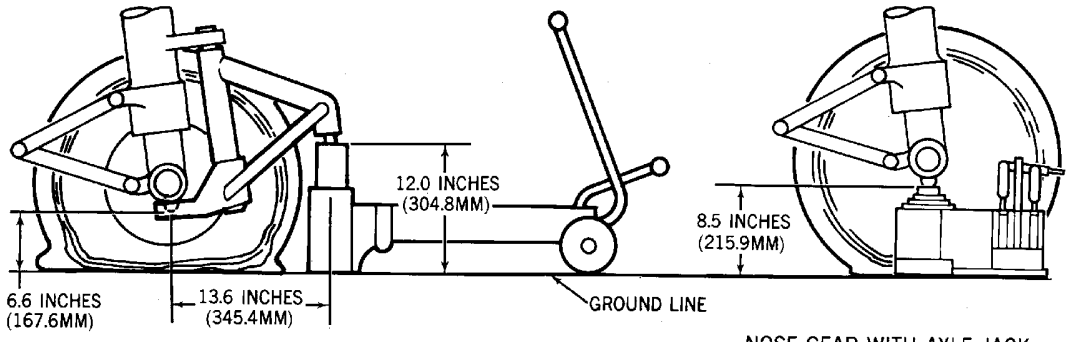


GROSS WEIGHT WITH NORMAL TIRE INFLATION

NOSE GEAR JACKED FOR WHEEL REMOVAL
(1 INCH CLEARANCE)



NOSE GEAR WITH CANTILEVER JACK
(ONE WHEEL REMOVED FOR CLARITY)



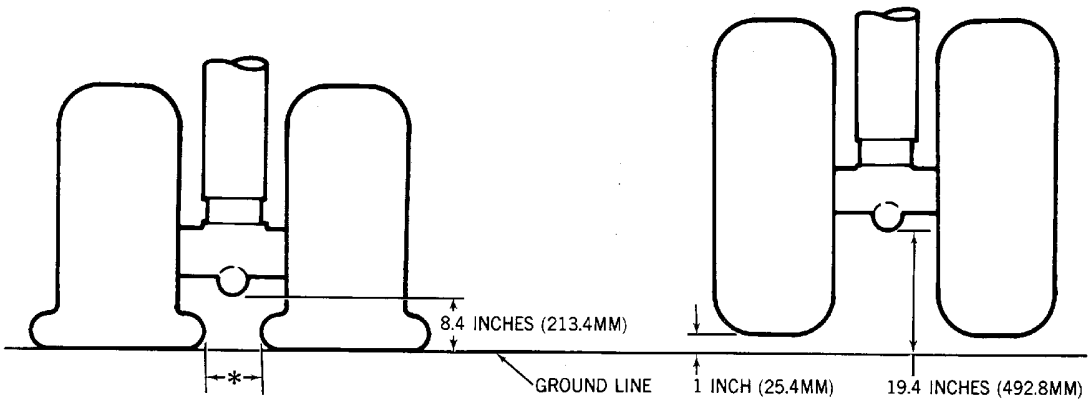
JACKING NOSE GEAR WITH TWO FLAT TIRES,
USING AXLE JACK AND JACK ADAPTER

NOSE GEAR WITH AXLE JACK

* THIS DIMENSION IS VARIABLE WHEN TIRES ARE UNDERINFLATED OR FLAT.

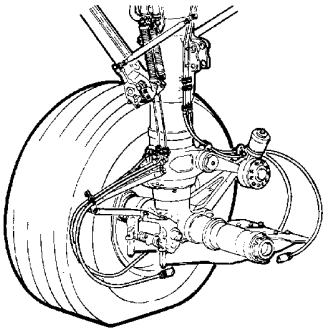
BBB2-7-2B

Nose Landing Gear Axle Jacks
Figure 202/07-12-00-990-802

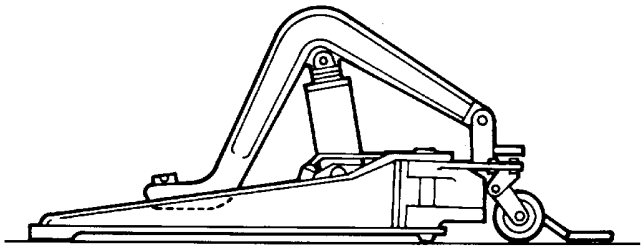


MAIN GEAR WITH TWO FLAT TIRES

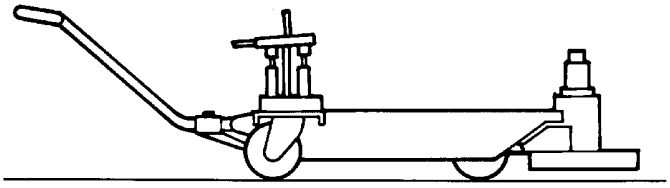
MAIN GEAR JACKED FOR WHEEL REMOVAL
(1 INCH CLEARANCE)



LEFT MAIN GEAR SHOWN
RIGHT GEAR OPPOSITE



MAIN GEAR WITH CANTILEVER AXLE JACK

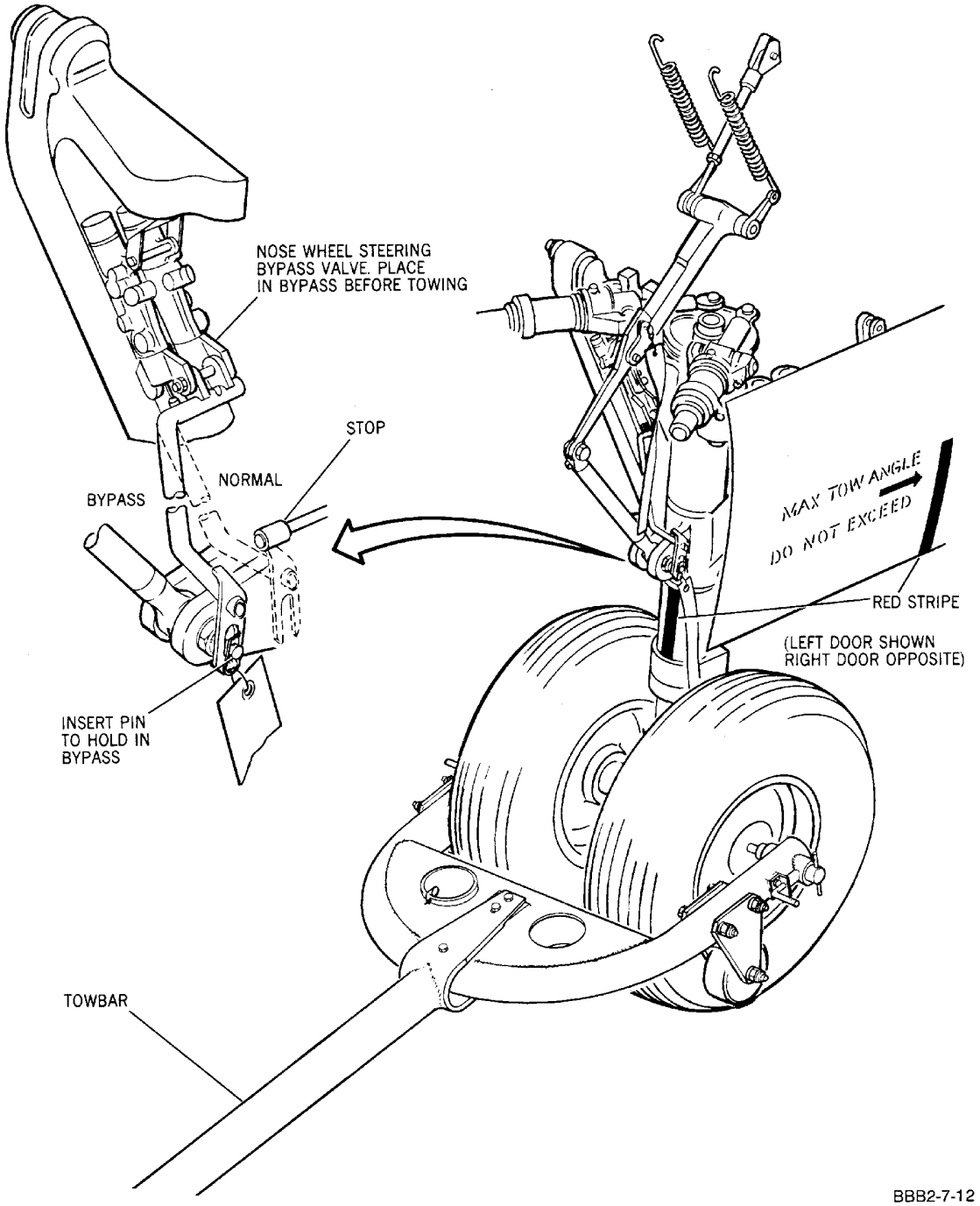


MAIN GEAR WITH DOLLY TYPE AXLE JACK

* THIS DIMENSION IS VARIABLE WHEN TIRES ARE UNDERINFLATED OR FLAT.

BBB2-7-3C

Main Landing Gear Axle Jacks
Figure 203/07-12-00-990-803



Alternate Nose Wheel Jacking
Figure 204/07-12-00-990-804

4. Alternate Method of Lifting Each Nose Wheel for Tire Change

NOTE: These methods of lifting nose wheels are to be used only when a nose gear jack is not readily available.

A. Lift nose wheel/tire using tow bar to rotate nose gear as follows:

(1) Make certain both main gears are chocked fore and aft, main and nose gear ground locks are installed, nose gear torque links are connected and hydraulic system is depressurized.

(2) Make certain aircraft is clear of all mobile equipment, ground support fixtures or any other items that could be contacted if aircraft moves.

CAUTION: WIND AND GROUND SLOPE CONDITIONS AND MAINTENANCE FUNCTIONS BEING PERFORMED CONCURRENTLY IN FUSELAGE SHOULD BE CONSIDERED WHEN EVALUATING STABILITY OF AIRCRAFT DURING THIS PROCEDURE.

(3) Place nose wheel steering bypass valve in bypass position and install bypass valve lockpin. (Figure 204) (PAGEBLOCK 09-12-00/201)

(4) Remove outboard deflector (if installed) in accordance with PAGEBLOCK 32-40-02/201.

(5) Use tow bar or other suitable lever bar to manually turn nose wheels to right (for changing LH tire) or to left (for changing RH tire) from center position as necessary to lift tire free of ground contact.

WARNING: WHEN GEAR IS ROTATED, STRUT WILL HAVE TENDENCY TO CENTER ITSELF IF NOT RESTRAINED. CAUTION SHOULD BE EXERCISED TO AVOID POSSIBLE INJURY TO PERSONNEL FROM TWISTING GEAR.

(6) Chock nose wheel opposite from side that is lifted for wheel/tire change.

CAUTION: CHOCKING RESTRAINT OF WHEEL IS REQUIRED TO RESIST TENDENCY OF ROTATED GEAR TO CENTER ITSELF AND PROVIDE ADDITIONAL PROTECTION AGAINST INADVERTENT MOVEMENT OF AIRCRAFT.

(7) Remove and install nose wheel/tire assembly in accordance withPAGEBLOCK 32-40-02/201.

(8) If required, repeat Paragraph 4.A.(4) through Paragraph 4.A.(7) for replacement of opposite wheel/tire assembly.

(9) Manually center nose wheels, return steering bypass valve to normal position and remove main and nose gear lockpins.

B. Lift nose wheels using hydraulic power to turn nose gear as follows:

(1) Make certain both main gears are chocked fore and aft, main and nose gear ground locks are installed and nose gear torque links are connected.

(2) Make certain aircraft is clear of all mobile equipment, ground support equipment or any other items that could be contacted if aircraft moves.

CAUTION: WIND AND GROUND SLOPE CONDITIONS AND MAINTENANCE FUNCTIONS BEING PERFORMED CONCURRENTLY IN FUSELAGE SHOULD BE CONSIDERED WHEN EVALUATING STABILITY OF AIRCRAFT DURING THIS PROCEDURE.

(3) Remove outboard deflector (if installed) in accordance with PAGEBLOCK 32-40-02/201.

(4) With hydraulic power on, rotate nose gear steering to right (for changing LH tire) or to left (for changing RH tire) from center position as necessary to lift tire free of ground contact.

WARNING: WHEN GEAR IS ROTATED, STRUT WILL HAVE TENDENCY TO CENTER ITSELF IF NOT RESTRAINED. CAUTION SHOULD BE EXERCISED TO AVOID POSSIBLE INJURY TO PERSONNEL FROM TWISTING GEAR.

(5) Place nose wheel steering bypass valve in bypass position, install bypass valve lockpin and shut hydraulics pumps off.

(6) Chock nose wheel opposite from side that is lifted for wheel/tire change.

CAUTION: CHOCKING RESTRAINT OF WHEEL IS REQUIRED TO RESIST TENDENCY OF ROTATED GEAR TO CENTER ITSELF AND PROVIDE ADDITIONAL PROTECTION AGAINST INADVERTENT MOVEMENT OF AIRCRAFT.

(7) Remove and install nose wheel/tire assembly in accordance with PAGEBLOCK 32-40-02/201.

(8) If required, repeat Paragraph 4.B.(3) through Paragraph 4.B.(7) for replacement of opposite wheel/tire assembly.

(9) Turn hydraulic pump on, pull bypass pins, and rotate nose steering back to the center position.

EMERGENCY LIFTING PROCEDURES - MAINTENANCE PRACTICES

1. General

A. Pneumatic lifting bags can assist in raising a damaged aircraft that has landed with collapsed or retracted landing gear. When the aircraft is resting on a runway or equivalent hard surface there is adequate clearance for pneumatic lifting bag placement. If the aircraft has plowed into soft ground, it may be necessary to undermine the aircraft pressure lifting areas to provide clearance for placement of the lifting bags. Adequate stabilization through the use of cables and/or ropes is mandatory to prevent the aircraft from shifting due to lack of rigidity of the lifting bag surface.

B. If the aircraft must be lifted higher than one lifting bag and additional height is required, lacing straps should be used to tie two bags together.

2. Equipment and Materials

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

NOTE: Some materials in the Equipment and Materials list may not be permitted to be used in your location. Persons in each location must make sure they are permitted to use these materials. All persons must obey all applicable federal, state, local, and provincial regulations for their location.

Table 201

Name and Number	Manufacturer
Pneumatic bag, aircraft lifting	
Jack, forward and/or aft fuselage (1) (15 ton/(13.5 metric ton tripod)	
Jack, wing (2) (35 ton/(31.5 metric ton tripod)	
Adapter, forward and aft fuselage jack point (2) 4916701-1	Douglas Aircraft Company
Adapter, wing jack (2) 4916702-1	Douglas Aircraft Company
Support, tail (1) 3916746-503	Douglas Aircraft Company
Pin assembly, main landing gear downlock (2) 2916700-1	Douglas Aircraft Company
Pin assembly, nose landing gear downlock (1) 2916700-501	Douglas Aircraft Company

3. Preliminary Instructions

A. The quantity and location of the pneumatic lifting bags will depend on the terrain, structural condition, position and gross weight of the aircraft.

B. Determine locations on aircraft where lifting bags are to be placed.

(1) Recommended positioning of lifting bags is shown on Figure 201.

NOTE: Placement of pneumatic lifting bags should not obstruct use of wing and fuselage jacks and operation of landing gear.

(2) Select smooth level surfaces of aircraft having adequate structural strength.

(3) Such items as marker beacons, antennas, etc., which may be damaged during lifting should if possible be removed.

(4) Cover or remove any sharp or rough edges of aircraft surface that will come in contact with lifting bags.

(5) Build up, or smooth down sloping ground areas that may allow lifting bags to shift.

C. After determining location for lifting bags, check ground area for sharp or rough objects that might damage lifting bags during placement or use.

4. Setting Up Lifting Bags

A. Set up bags in preparation for lifting aircraft.

NOTE: For best results and maximum service life, follow manufacturer's instructions for setting up the lifting bags.

(1) Place lifting bag near each predetermined location, unbuckle tarpaulin cover straps, and remove inflation hose.

(2) Spread tarpaulin cover flat, unroll lifting bag, and arrange bag so that bottom lies flat and is in center of tarpaulin.

(3) Unfasten outlet covers and check each outlet sleeve to ensure it is properly tied off to prevent air escaping from bag.

NOTE: The bag outlet(s) should be stenciled OUTLET.

(4) Replace each outlet sleeve by folding it back onto itself until sleeve is well inside its base reinforcement on bag. Close and secure outlet covers.

(5) Move lifting bag(s) into desired location by grasping tarpaulin cover and sliding into place under aircraft.

(6) Connect bag inflation hose to pressure source and other end to bag inlet valve.

NOTE: When more than one bag is used at a single location, they should be manifolded.

(7) Manifold lifting bags under each wing.

(8) Connect one end of inflation hose to manifold and other end to pressure source. Bags are now ready for inflation.

(9) Provide and connect, static grounding cable.

5. Stabilizing Aircraft

WARNING: ADEQUATE STABILIZATION BY RESTRAINING CABLES OR ROPES MUST BE PROVIDED TO PREVENT AIRCRAFT FROM SHIFTING, RESULTING IN POSSIBLE INJURY TO PERSONNEL.

A. Attach stabilizing cables or ropes to aircraft before starting lifting operation. (Figure 201)

6. Lifting Aircraft

A. Lifting Nosedown Aircraft

NOTE: Nosedown aircraft can be lifted about the main landing gear axis by using a pneumatic lifting bag for initial lift followed by the use of aircraft tripod jacks and normal jacking procedures.

(1) Place lifting bag lengthwise under forward fuselage between stations 218 and 308. (Figure 201)

(2) Inflate bag to raise nose enough to level aircraft longitudinally (±2) degrees.

(3) Install jack adapters at wing jack points. (Figure 202)

(4) Remove two plug bolts next to aft fuselage jack point (station 1337.8) and install fuselage jack adapter. (Figure 202)

(5) Place jacks under jack points; extend jacks until snug against adapters. (WING AND FUSELAGE JACKING, SUBJECT 07-11-00, page 201)

CAUTION: DO NOT USE LIFTING BAGS OR SHORING AT FORWARD FUSELAGE TO STABILIZE AIRCRAFT WHILE SUPPORTED ON WING AND AFT FUSELAGE JACKS. STRUCTURAL DAMAGE COULD RESULT.

(6) Deflate and remove lifting bag clear of aircraft.

CAUTION: WHEN LIFTING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(7) Extend all jacks simultaneously to height that will allow nosegear to free swing to down position; install nosegear downlock pin.

B. Lowering Instructions

CAUTION: WHEN LIFTING OR LOWERING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(1) Lower all jacks simultaneously keeping follower (lock ring) nuts not more than one-half inch (12.7 mm) above jack shoulders until weight of aircraft is assumed by landing gear.

(2) Remove jacks clear of aircraft; remove and stow jack adapters.

C. Lifting Entire Aircraft

NOTE: Lifting entire aircraft resting on the lower fuselage is accomplished by using pneumatic lifting bags under the wings, forward and aft fuselage. The lifting bags are inflated enough to allow placement of aircraft tripod jacks at the wing and aft fuselage jack points. (WING AND FUSELAGE JACKING, SUBJECT 07-11-00, Page 201)

(1) Place two manifolded (air lines teed together) lifting bags under each wing. (Figure 203)

CAUTION: FORWARD AND AFT FUSELAGE LIFTING BAGS SHOULD BE INFLATED SUFFICIENTLY TO STABILIZE AIRCRAFT AND MUST BE PLACED IN AREAS OF SUFFICIENT STRUCTURAL STRENGTH TO AVOID AIRCRAFT DAMAGE.

(2) Place one lifting bag under nose section and one under aft section of fuselage.

(3) Attach nose ballast attachment fittings to left and right side of fuselage nose section.

(4) Attach adjustable guy wires to nose ballast attachment fittings and extend each wire at approximately 45° angle from fuselage centerline to an anchor point close to ground. (Figure 203)

(5) Attach adjustable guy wires to tail skid and anchor to point close to ground. (Figure 203)

(6) Inflate lifting bags evenly to maintain equal weight distribution to minimize possibility of aircraft shifting.

(7) Inflate lifting bags to level aircraft.

(8) Continue inflation of bags; inflate forward and aft fuselage bags only as required to maintain level attitude longitudinally.

(9) Monitor and loosen stabilizing guy wires/ropes as aircraft is raised, to prevent them from becoming too taut.

(10) Raise aircraft sufficiently to install wing and aft fuselage jack adapters. (Figure 202)

CAUTION: DO NOT USE LIFTING BAGS OR SHORING AT FORWARD FUSELAGE TO STABILIZE AIRCRAFT WHILE SUPPORTED ON WING AND AFT FUSELAGE JACKS. STRUCTURAL DAMAGE COULD RESULT.

(11) Place jacks under wing and aft fuselage jack points; extend jacks until snug against adapters. (WING AND FUSELAGE JACKING, SUBJECT 07-11-00, Page 201)

(12) Check that sufficient height has been reached, adequate support has been provided beneath aircraft and aircraft is sufficiently stable for removal of stability guy wires/ropes and lifting bags.

(13) Unfasten stability guy wires/ropes.

(14) Deflate lifting bags by unfastening bag outlet covers and untieing outlet sleeves.

NOTE: In an emergency, use both outlets of manifolded bags to provide a quick release of pressure.

(15) Remove deflated lifting bags from under aircraft.

CAUTION: WHEN LIFTING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

(16) Raise all jacks simultaneously until landing gear has free-fall clearance. (WING AND FUSELAGE JACKING, SUBJECT 07-11-00, page 201)

(17) Lower landing gear and install downlock pins.

NOTE: If landing gear has sustained damage to extent that it will not support aircraft while being repaired, or major structural damage has occurred, shoring in addition to fuselage and wing jacks must be provided.

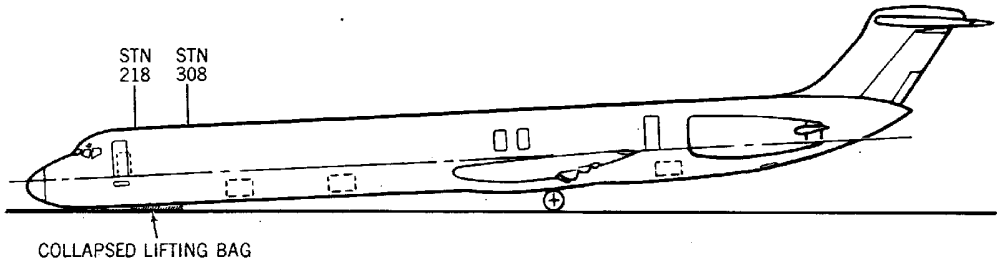
D. Lowering Instructions

CAUTION: WHEN LIFTING OR LOWERING AIRCRAFT ON JACKS, MAINTAIN FOLLOWER NUT (LOCK RING) WITHIN ONE-HALF INCH (12.7 MM) OF JACK SHOULDER.

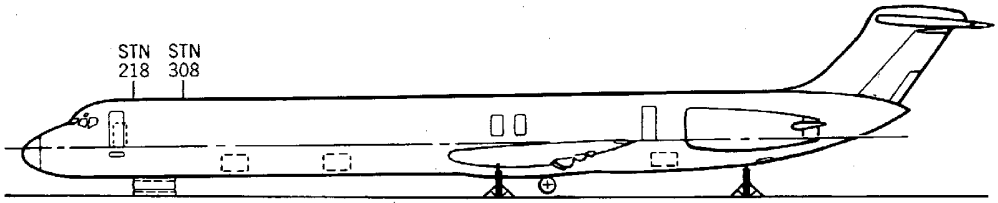
(1) Lower all jacks simultaneously keeping follower (lock ring) nuts not more than one-half inch (12.7 mm) above jack shoulders until weight of aircraft is assumed by landing gear.

(2) Remove jacks clear of aircraft; remove and stow jack adapters.

(3) Remove nose ballast attachment fittings.



LIFTING BAG PLACEMENT-NOSE GEAR COLLAPSED



LIFTING BAG INFLATED-FUSELAGE AND WING
JACKS INSTALLED AT JACK POINTS

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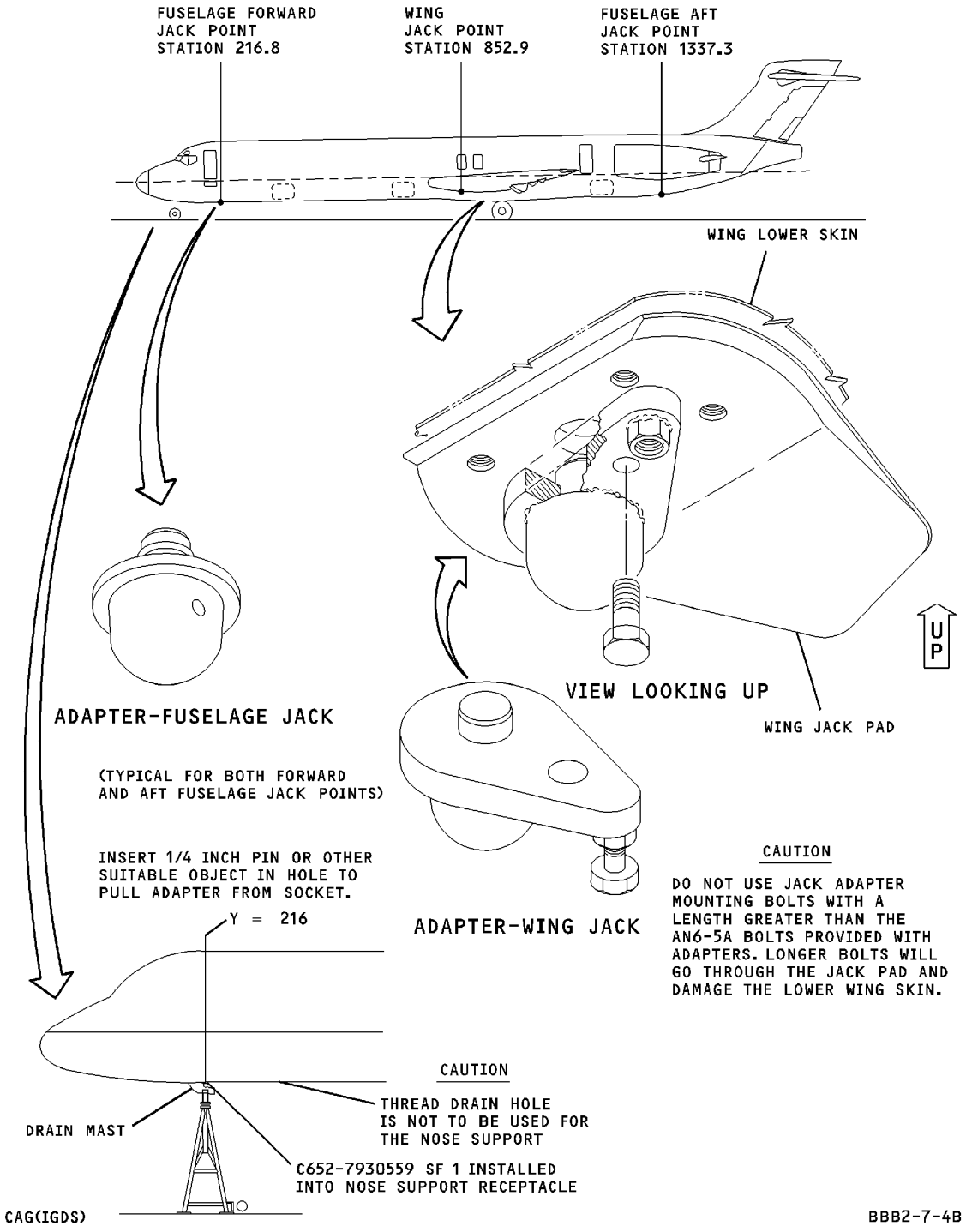
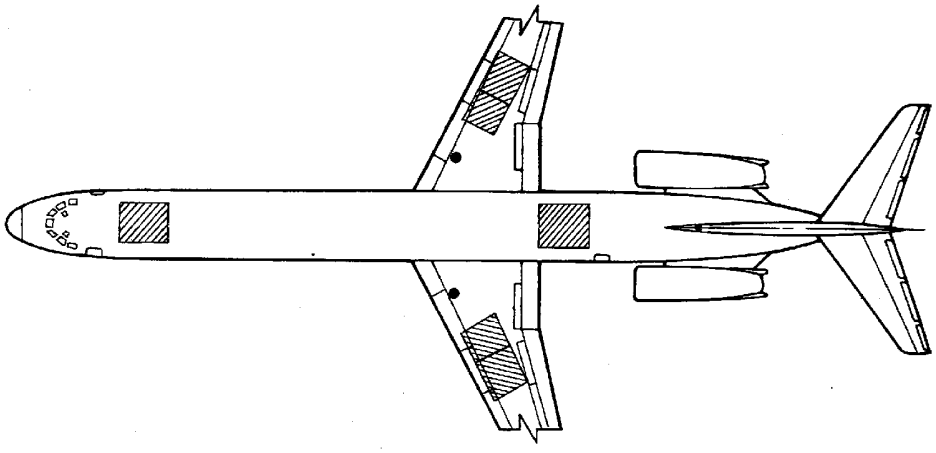
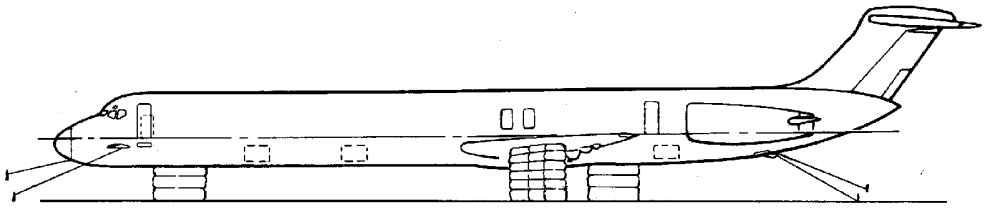
Lifting Bag Placement - Aircraft Nose Gear Collapsed or Retracted
Figure 201/07-13-00-990-801



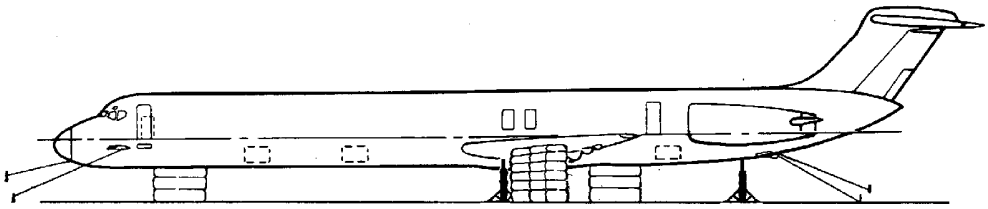
Fuselage and Wing Jack Adapters
Figure 202/07-13-00-990-802



AIRCRAFT LIFTING BAG PLACEMENT



LIFTING BAGS INFLATED AND STABILIZING GUY WIRES IN PLACE



AIRCRAFT WITH LIFTING BAGS INFLATED AND JACKS IN PLACE

BBB2-7-9

Lifting Bag Placement - Aircraft Nose and Main Gear Collapsed
Figure 203/07-13-00-990-803

SHORING - DESCRIPTION AND OPERATION

1. General

A. An aircraft at rest on its landing gear or on jacks has certain definite structural stresses imposed. These stresses must be relieved by adequate shoring before any major repair or modification work can begin. Shoring is used at specified locations beneath the fuselage and/or wings, depending upon the particular work to be performed. An aircraft supported by proper jacking and shoring methods can be repaired without creating additional stress concentrations causing damage to aircraft.

B. Shoring can be accomplished using contour boards that conform to the lower surfaces of the wing and fuselage. Contour boards should be fabricated from four thicknesses of 1 inch (25.4 mm) plywood, laminated together and secured by bolts. The contoured surfaces should be padded with 1/2 inch (12.7 mm) felt and covered with heavy canvas duck.

C. Wing and fuselage jacking should be used in conjunction with wing and/or fuselage shoring when possible. Maximum wing jack load is 58,457 pounds (26,516.4 kg) at each wing jack point. Maximum aft fuselage jack load is 21,787 pounds (9882.4 kg). Total airplane jacking weight limit is 124,000 pounds at the three jack points.

D. Contour shoring may be used at the following locations.

Table 1

Wing Station	Fuselage Station
121 XCW	Y=
111.5 XRS	
164.0 XRS	110.0
267.0 XRS	218.0
353.0 XRS	275.0
477.0 XRS	370.0
	427.0
	503.0
	560.0
	579.0
	636.0
	693.0
	769.0
	822.0
	1003.0
	1079.0
	1136.0
	1155.0
	1211.0
	1338.0
	1361.0

Table 1 (Continued)

Wing Station	Fuselage Station
	1510.0