HIGHLIGHTS

REVISION NO. 75 Jun 01/15

Pages which have been revised are outlined below, together with the Highlights of the Revision

CH/SE/SU C PAGES	REASON FOR CHANGE	EFFECTIVITY
CHAPTER 08		
L.E.P. 1- 1	Revised to Reflect this revision indicating new,revised, and/or deleted pages	

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CHAPTER 08

LEVELING & WEIGHING

LIST OF EFFECTIVE PAGES

N, R or D indicates pages which are New, Revised or Deleted respectively
Remove and insert the affected pages and complete the Record of Revisions and the Record of Temporary Revisions as necessary

CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE	CH/SE/SU	C	PAGE	DATE
RECORD OF TEMP. REVISION											
L.E.P.	R	1-	1 Jun01/15								
T. of C.			1 Mar01/03								
08-00-00			1 Dec01/89								
08-12-00			1 Jun01/08								
08-12-00			2 Jun01/08								
08-12-00			3 Jun01/08								
08-12-00			4 Jun01/08								
08-20-00			1 Jun01/04								
08-21-00			1 Dec01/89								
08-21-00			2 Dec01/89								
08-22-00			1 Jun01/95								
08-22-00			2 Dec01/89								
08-22-00			3 Dec01/89								

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CHAPTER 08

LEVELING & WEIGHING

TABLE OF CONTENTS

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LEVELING AND WEIGHING - GENERAL

1. General

This chapter covers the following operation :

- weighing
- leveling

Two leveling procedures may be used :

- quick leveling using clinometers
- precise leveling, which calls for appropriate equipment : sighting rods, transit theodolite, etc.

WEIGHING

1. Weighing the Aircraft on Jacks

A. General

The following procedure serves to prepare the aircraft for weighing, to determine the aircraft weight and to calculate the center of gravity position.

CAUTION : WHEN AIRCRAFT IS ON JACKS, IT IS RECOMMENDED TO PLACE A SAFETY STAY AT REAR OF FUSELAGE TO AVOID ANY ACCIDENTAL TAIL TIPPING. SUCH SAFETY STAY SHALL NEVER BE USED TO LIFT AIRCRAFT : SAFETY STAY SHALL BE ADJUSTED TO AIRCRAFT HEIGHT DURING ALL THE VARIOUS PROCEDURES.

NOTE : To get accurate results, we recommend to weigh the aircraft on a level area in a hangar with :
- the hangar doors and windows closed
- the hangar heating, air conditioning and ventilation systems stopped.

Wind and air flows prevent accurate results.

NOTE : Weighing may be performed by one of the following methods ; in order of preference :
1) Mechanical method using 3 mobile scales
2) Electronic method using 3 load cells (Not as accurate as mechanical scales).

B. Equipment and Materials

Hydraulic Jack data	Force (min)	Height (jack retracted)
Fwd Jacking Point	20,000 daN (44,962 lbf)	2 m (78.74 In.)
Under Wing Jacking Point	70,000 daN (157,366 lbf)	3.8 m (149.6 in.)
Safety Stay (FR85)	5000 daN (11,240 lbf)	4 m (157.48 in.)

R

NOTE : The special adaptor must be used at RIB10.

R
R

ITEM	DESIGNATION
(1)	Wheel Chocks
(2)	Weighing Equipment - Mechanical, including : - 2 scales, capacity 100 t (224,000 lbs) graduated in increments of 50 kg (110 lbs) - 1 scale, capacity 50 t (112,000 lbs) graduated in increments of 20 kg (44 lbs)
	or
(3)	Weighing Equipment - Electronic, including : - 3 load cells, capacity 90 t (200,000 lbs

ITEM	DESIGNATION
	approx.) each
(4)98A07004003000	Wing Jack Pad (LH)
(5)98A07004003001	Wing Jack Pad (RH)
(6)98A07004002000	Jacking Adaptor
Referenced Procedure	
- 07-11-00, P. Block 1	Jacking
- 12-12-29, P. Block 1	Hydraulics
- 12-13-49, P. Block 1	APU - Replenishing
- 12-16-38, P. Block 1	Replenishing - Toilets
- 12-24-38, P. Block 1	Drainage Potable Water
- 12-13-79, P. Block 1	Engines
- WBM 1-20-06	Defueling Procedure Prior to Weighing

C. Procedure

(1)Job set-up

(a)Check that engines and APU are topped up with oil (Ref. 12-13-49 and 12-13-79, P. Block 1).

(b)Check that hydraulic systems are topped up (Ref. 12-12-29, P. Block 1).

(c)Check that no fire extinguishers, oxygen masks or safety belts are missing.

(d)Drain potable water system and tanks (Ref. 12-24-38, P. Block 1).

(e)Drain waste water from toilets and toilet systems (Ref. 12-16-38, P. Block 1).

(f)Defuel aircraft (Ref. WBM 1-20-06 - Defueling procedure prior to weighing).

CAUTION : DO NOT OPERATE THE TANK PUMPS WHEN THE TANKS ARE EMPTY. THIS CAN DAMAGE THE PUMPS.

(g)Remove all tools and work equipment from flight and cargo compartments.

(h)Make certain that all control surfaces are in neutral position.

(j)Check aircraft exterior and interior to make certain that conditions for weighing are fulfilled (ground power units disconnected, etc ...).

(k)Chock wheels and release brakes.

(l)Close all crew, cargo and inspection doors.

(2)Preparation for weighing

NOTE : Aircraft must be in 0 deg. pitch and 0 deg. roll attitude.

(a)Preparation for use of mechanical equipment

1 Position 50 t scale below the FWD jacking point.

2 Position 100 t scales below the wing jacking points.

3 Position jacks on scales.

4 Jack up the aircraft (Ref. 07-11-00, P. Block 1).

(b)Preparation for use of electronic equipment

1 Install adaptors on jacks

2 Follow the instructions for installation and lifting supplied with the equipment.

3 Position safety stay at FR85.

CAUTION : YOU MUST NOT LIFT THE AIRCRAFT WITH THE SAFETY STAY BECAUSE THIS CAN CAUSE DAMAGE TO THE FUSELAGE.

(3)Weighing and center of gravity calculation

NOTE : Safety stay must not be in contact with the aircraft structure during weighing.
Chocks must not be in contact with wheels and if on the scales they must be removed during weighing.

W = Aircraft weight
RAV = Reaction measured at the forward jacking point.
RAR = Addition of LH and RH side reaction measured at wing jacking points.
RC = Reference chord

NOTE : If the aircraft is weighed with mechanical equipment (scales), you must subtract the weight of the jacks.

(a)Weigh the aircraft

$$W = RAV + RAR$$

(b)Calculate the CG position.

$$CG\ (\%\ RC) = \frac{53.16\ RAR - 260.9\ RAV}{W}$$

D. Close-Up

(1)Lower the aircraft onto its wheels (Ref. 07-11-00, P. Block 1).
(2)Remove the weighing equipment.
(3)Chock the aircraft wheels.

2. Weighing the Aircraft on its Wheels

A. General

The following procedure serves to prepare the aircraft for weighing, to determine the aircraft weight and to calculate the center of gravity position.

NOTE : To get accurate results, we recommend to weigh the aircraft on a level area in a hangar with :
- the hangar doors and windows closed
- the hangar heating, air conditioning and ventilation systems stopped.
Wind and air flows prevent accurate results.

B. Equipment and Materials

ITEM	DESIGNATION
(1)	2 scales, capacity 100 t (224,000 lbs)
(2)	1 scale, capacity 50 t (112,000 lbs)
(3)	1 clinometer
Referenced Procedure	
- 09-11-00, P. Block 1	Towing by the nose gear
- 12-12-29, P. Block 1	Hydraulics
- 12-13-49, P. Block 1	APU - Replenishing
- 12-16-38, P. Block 1	Replenishing - Toilets
- 12-24-38, P. Block 1	Drainage Potable Water
- 12-13-79, P. Block 1	Engines

ITEM	DESIGNATION
- WBM 1-20-06	Defueling Procedure Prior to Weighing

C. Procedure
(1)Job set-up
(a)Check that engines and APU are topped up with oil (Ref. 12-13-49 and Ref. 12-13-79, P. Block 1).
(b)Check that hydraulic systems are topped up (Ref. 12-12-29, P. Block 1)
(c)Check that no fire extinguishers, oxygen masks or safety belts are missing.
(d)Drain potable water system and tanks (Ref. 12-24-38, P. Block 1).
(e)Drain waste water from toilets and toilet systems (Ref. 12-16-38, P. Block 1).
(f)Defuel aircraft (Ref. WBM 1-20-06 - Defueling procedure prior to weighing).
CAUTION : DO NOT OPERATE THE TANK PUMPS WHEN THE TANKS ARE EMPTY. THIS CAN DAMAGE THE PUMPS.
(g)Remove all tools and work equipment from flight and cargo compartments.
(h)Make certain that all control surfaces are in neutral position.
(j)Check aircraft exterior and interior to make certain that conditions for weighing are fulfilled (ground power units disconnected, etc ...).
(k)Chock wheels and release brakes.
(l)Close all crew, cargo and inspection doors.
(2)Preparation for weighing
(a)Position the scales.
(b)Tow the aircraft onto the scales (Ref. 09-11-00, P. Block 1).
(c)Position a clinometer on the support plate located at the rear of the landing gear well adjacent to and on the RH side of the center longitudinal beam.
- Measure the pitch attitude.
(3)Weighing and center of gravity calculation
W = Aircraft weight
r = Reaction on nose landing gear
R1 = Sum of the reactions on main landing gear bogies
Alpha = Aircraft pitch attitude at weighing
RC = Reference chord
XG = Aircraft CG in % RC
(a)Aircraft weight :
W = R1 +r
(b)Center of gravity position :

$$XG\ (\%\ RC) = 52.30 - 62.0 \tan Alpha - \frac{260.9\ r}{W}$$

D. Close-Up
(1)Remove the clinometer.
(2)Tow the aircraft off the scales (Ref. 09-11-00, P. Block 1).
(3)Chock the aircraft wheels.

LEVELING

1. Leveling

Leveling shall be carried out prior to measurement or inspection of structure.

A. Equipment and Materials

ITEM	DESIGNATION
(1)98A08003005000	Sighting Rods - Wing
(2)98A08003001000	Sighting Rods - Fuselage
(3)(Spec. MM 07-11-00)	Aircraft Lifting Hydraulic Jack (Under Wing)
(4)(Spec. MM 07-11-00)	Aircraft Lifting Hydraulic Jack (Under Forward Fuselage)
(5)98A07004002000	Jacking Adaptor - Jacking Point
(6)98A07004003000	Wing Jack Pad - LH
(7)98A07004003001	Wing Jack Pad - RH
(8)	Access Platform 4.10 m (13 ft. 5 in.)
(9)	Sight Tube

2. Precautions Before Leveling Operation

NOTE : Leveling must be performed in still air with constant temperature throughout the period during which measurements are being taken.

The flight control surfaces must be set to zero and in the case of precision leveling, the aircraft fuel tanks must be empty.

In case of wind, close hangar doors. Readings must only be taken one hour after :

- Engine shutdown
- Prolonged exposure of aircraft to sun.

NOTE : To make sighting easier, the legs of each jack must be placed away from the aircraft X nd Y axes.

Open main landing gear doors

CAUTION : DO NOT USE THE SAFETY STAY TO LIFT THE AIRCRAFT.

Position jacks below the jacking points and lift the aircraft (Ref. 07-11-00, P. Block 1).

NOTE : Do not put the safety stay in position before you make the aircraft level.

3. Procedure

Quick leveling (Ref. 08-21-00, P. Block 1)

Precise leveling (Ref. 08-22-00, P. Block 1)

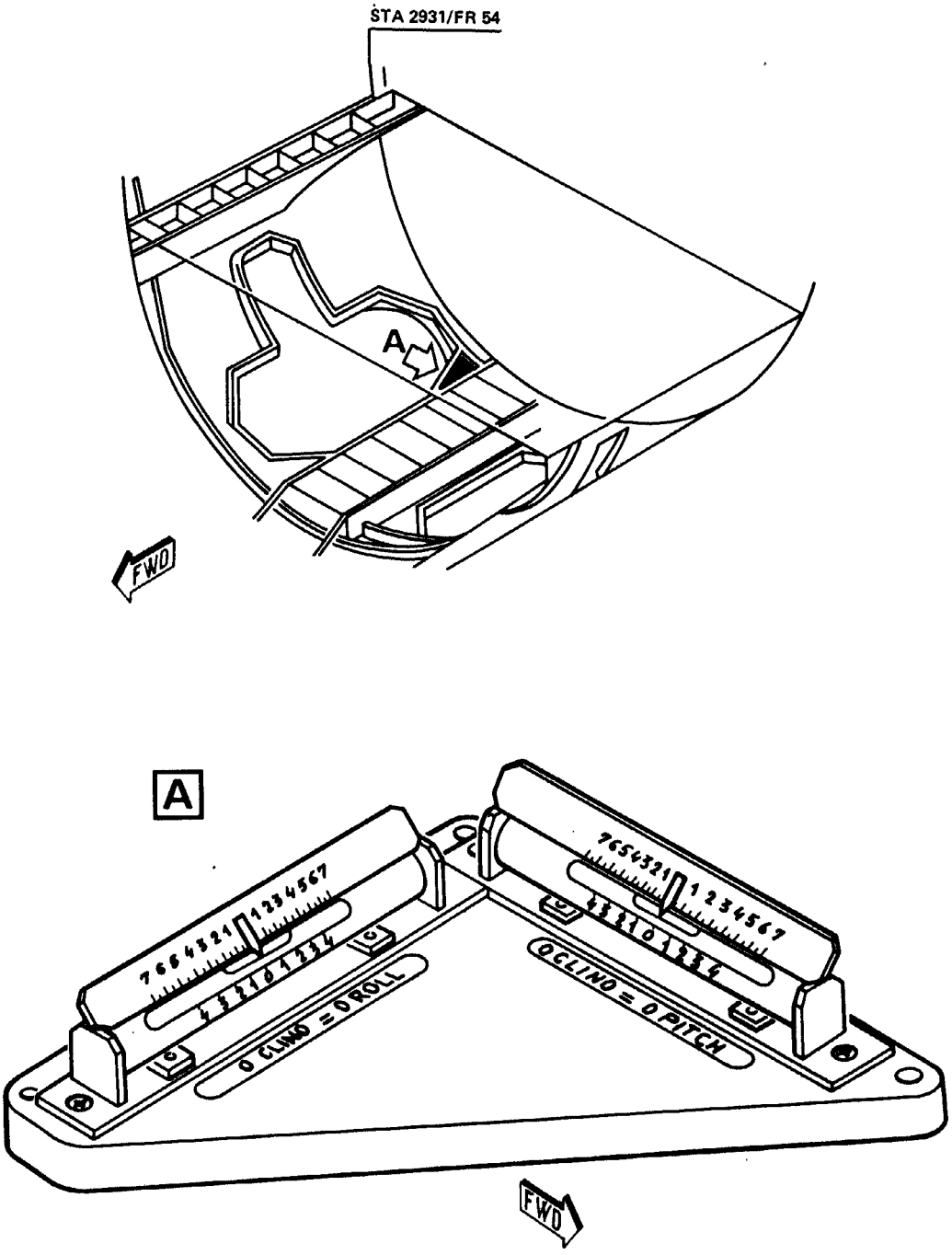
QUICK LEVELING

1. Quick Leveling Using Clinometer

(Ref. Fig. 001)

Quick leveling of aircraft can be carried out by means of two clinometers. These two clinometers are placed thus : one parallel with the horizontal datum line, the other at 90 deg. to the horizontal datum line.

The clinometers are mounted on a support plate located on the lower fuselage and aft of the RH main landing gear well.



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Quick Leveling (Using Clinometer)
Figure 001

PRECISE LEVELING

1. Definition of Leveling Axes
   - Longitudinal axis XX' : alignment of points 11 and 16 along the fuselage. Horizontal datum line point 22R. Z = 0
   - Vertical axis ZZ' : vertical line crossing point 12
   - Transverse axis YY' : perpendicular to XX' and ZZ'

   (Ref. Fig. 001)

R 2. Precautions Before Leveling Operation

R NOTE : Leveling must be performed in still air with constant temperature throughout the period during which measurements are being taken.

R The flight control surfaces must be set to zero and in the case of precision leveling, the aircraft fuel tanks must be empty.

R In case of wind, close hangar doors. Readings must only be taken one hour after :

R - Engine shutdown

R - Prolonged exposure of aircraft to sun.

R NOTE : To make sighting easier, the legs of each jack must be placed away from the aircraft X and Y axes.

R Open main landing gear doors.

R Position jacks below the jacking points.

R 3. Transverse Leveling (Ref. Fig. 002)

Place wing sighting rods in position at points 1RH and 1LH on wing. Scan the wing sighting rods plane with a sight tube set o Z = 4500 mm (177.166 in.) from the fuselage horizontal datum line.

Adjust crosswise level by raising or lowering jacks at RH and LH jacking points so that identical reference marks on sighting rods at points 1RH and 1LH can be scanned through the sight tube.

R 4. Longitudinal Leveling (Ref. Fig. 002)

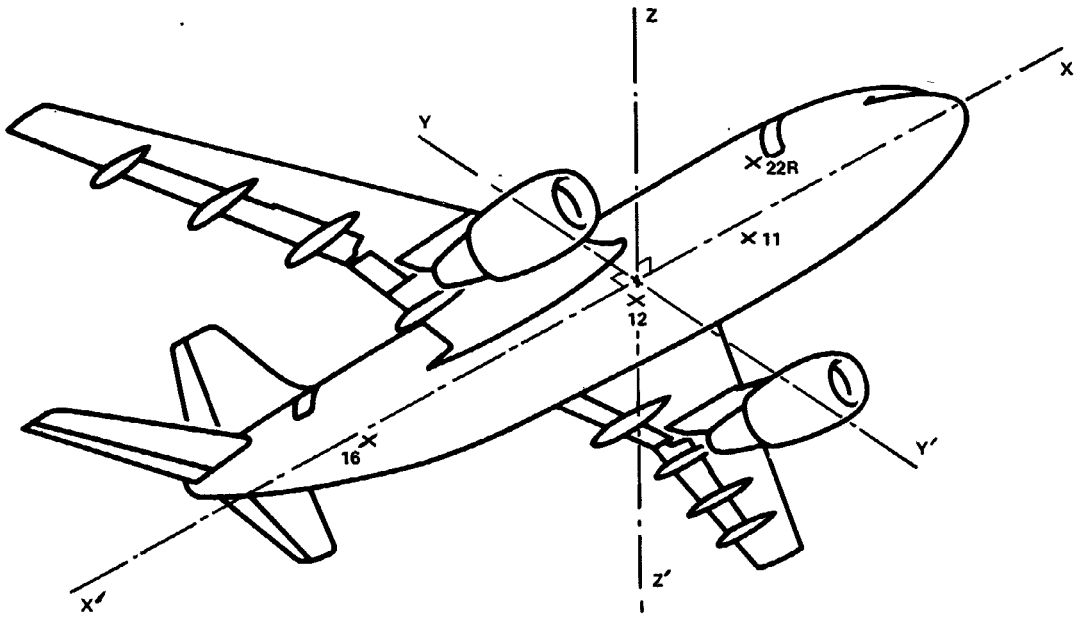
Place the wing sighting rods in position at points 11 and 14 in underside of fuselage.

Position sight tube and make certain that the field scannel allows for sighting of points 11 and 14.

Set sight tube to height of fuselage datum line and line up sight tube with reference mark on sighting rod at point 11.

Scan with sight tube and operate jack at forward jacking point until the reference mark on wing sighting rod at point 14 is in the sight tube sighting plane.

NOTE : Because longitudinal leveling may have upset the transverse leveling, re-check, by means of sight tubes left in place, the position of the reference marks on the sighting rods at points 1RH and 1LH.



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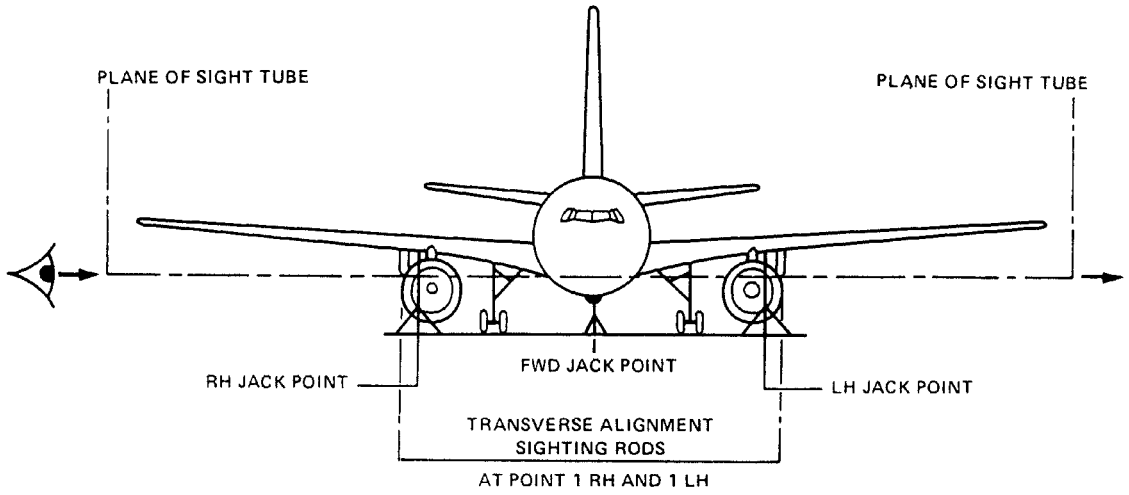
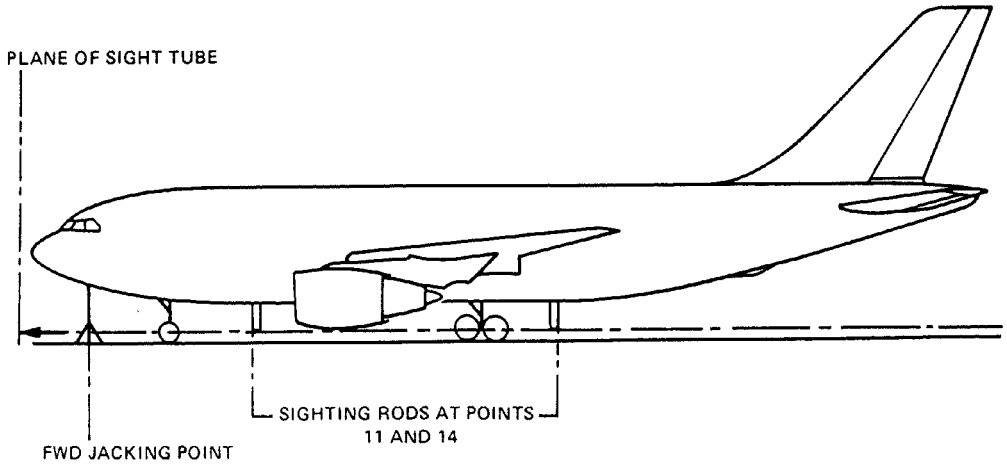
Leveling Axis
Figure 001





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Transverse and Longitudinal Leveling
Figure 002