Chapter 8 HARMONIZATION

(completely revised)

LIST OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

Introduction

1. Information on the harmonization of the guided weapons, Light Fighter Sight, G90 camera and the radar head is given in this chapter and the description and servicing of harmonization equipment is given in A.P.4483A, Vol.1. Description, servicing, removal and assembly of the armament equipment will be found in their relevant chapters.

Preparation

WARNING

1. The relevant safety precautions, detailed on the LETHAL WARNING marker card, must always be observed before entering the cockpit or performing any operations upon the aircraft.

2. A tail trestle must be positioned (Sect.2, Chap.4) prior to the removal from the aircraft of the radar head or weapon pack, unless suitable ballast has been fitted in the front fuselage.

2. Preparation for harmonization entails removal of the radar head, fitting and aligning the aircraft weapon-aligning instrument *(fig.1)*, preparing the guided-weapon pylons, G90 camera and radar-head mountings for alignment with the respective aiming marks, in accordance with the pattern approved by Command Armament Staff, on the harmonization board. Using the aircraft weapon-aligning instrument obviates the necessity for leveling the aircraft either longitudinally or laterally, the levels being determined and transferred to the leveling platform of the aircraft weapon-aligning instrument. The aircraft weapon-aligning instrument is offset 28 inches to port of the aircraft centre line, therefore the vertical sighting datum on the harmonization board is also offset this amount.

Tools and equipment

3. For tools and equipment used during the following operations refer to Table 1.

Procedure *(fig. 2)*

WARNING

Ensure that all armament switches are at OFF or SAFE, all ammunition and missiles are removed from the aircraft, all ejector release units are disconnected and that the safety tools are fitted and all warning pennants showing.

4.

(1) Ensure that the upper engine hatch is in position and is correctly secured.

(2) Site the aircraft with a clear space to the front of at least 30 yards.

(3) Remove the radar head *(Sect. 3, Chap. 1)*.

(4) Ensure that the securing bolts for the G.W. pack are fully tightened as detailed in the respective chapter(s).

(5) Steady the aircraft by jacking the nose wheel *(Sect. 2, Chap. 4)* until the jack just takes the weight of the aircraft. Position a tail trestle *(Sect. 2, Chap. 4)*, this must not take any weight.

Note...

A supporting jack and beam at frame 2 must not be used.

(6) Remove the rear datum screw from the port side of the fuselage near to the tail plane.

(7) Remove the two front datum screws from the port side of the fuselage near to the cockpit.

(8) Fit the weapon aligning instrument spigot into the rear datum hole.

(9) Fit the weapon-aligning instrument to its spigot, with the sighting head vertical, and tighten the cone nut and locknut.

(10) Fit the weapon aligning instrument foresight into the forward datum hole adjacent to the cockpit.

(11) Fit the weapon-aligning instrument fore and aft leveling bar spigot into the rear datum hole adjacent to the cockpit.

(12) Position the fore and aft leveling

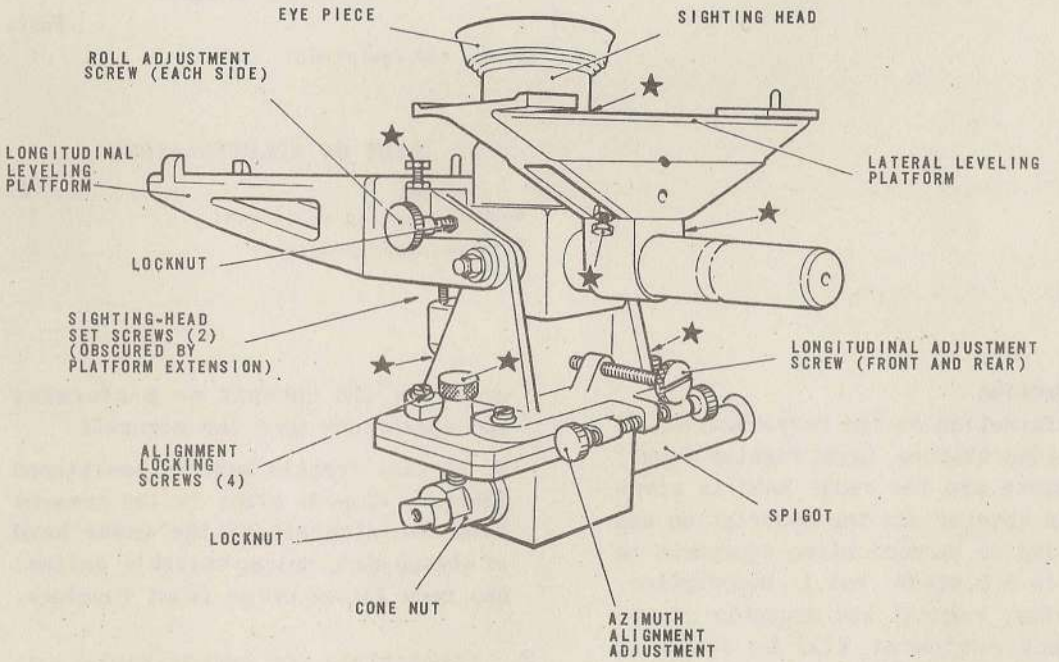

Fig. 1. Weapon-aligning instrument 3-8982-1

bar on the foresight and leveling bar spigot.

(13) On the weapon-aligning instrument, slacken the four alignment locking screws and adjust in azimuth until the intersection of the graticule coincides with the vertical line of the foresight.

(14) Tighten the azimuth locking screws.

(15) Insert the lateral leveling pins into the canopy shoot-bolt holes and position the lateral leveling bar across them. Place the adjustable spirit-level, with its adjustable head toward the port side, on the lateral leveling bar. Adjust the level until its bubble is central (within 1 deg).

(16) Remove the spirit level from the lateral leveling bar and, without disturbing its setting, place it on the weapon-aligning instrument lateral leveling platform.

(17) Slacken the two setscrews securing the sighting head and the locknuts of the roll adjustment screws and adjust the weapon-aligning instrument until the bubble in the spirit level is central. Tighten the setscrews and locknuts then re-check the bubble of the spirit level. Remove the spirit level.

(18) Position the spirit level on the fore and aft leveling bar and adjust the spirit level until the bubble is central.

(19) Remove the spirit level from the fore and aft leveling bar and, without disturbing its setting, place it on the longitudinal leveling platform of the weapon-aligning instrument.

(20) Manipulate the longitudinal adjustment screws on the weapon-aligning instrument until the bubble in the spirit level is central. Ensure both adjustment screws are tight and then re-check the spirit level.

Note...

The line of sight of the weapon-aligning instrument is now parallel to the aircraft horizontal datum in plan and elevation. The vertical leg of the graticule is parallel to the vertical datum line of the aircraft. Any subsequent movement of the aircraft will not alter this relationship.

(21) Set up the harmonization board 1000 inches in front of the aircraft main wheel axles and adjust the attitude of the board until, as viewed through the eye-piece of the weapon-aligning instrument, the horizontal and vertical sighting lines of the appropriate cross on the board are aligned with those of the weapon aligning instrument graticule. Ensure that the vertical graticule line coincides with the vertical line, on the board, over the whole of its length.

Light fighter sight

5. Before the commencement of the following checks ensure that the flight control system tests *(Sect.7, Chap.3D)* have been carried out then proceed as follows:-

(1) Carry out the electrical tests detailed in A.P.112E-0004-16, Sect.12, Chap.3, and Sect.7, Chap.2 of this publication.

(2) Select G.W. on the Master Armament Selector (M.A.S.).

(3) Ensure that the sight graticule is aligned with the G.W. cross on the harmonization board. If necessary, adjust the reflector glass by turning the adjusting screws on either side of the glass until true alignment is achieved.

(4) Engage the locating angle against the starboard side of the sight and lock it in this position.

(5) Carry out the final electrical checks detailed in Sect.7, Chap.2.

G90 camera

6.

(1) Remove the two 2 B.A. screws securing the G90 camera access panel in the forward end of the nose-wheel well and remove the panel.

(2) At the port rear end of the camera, turn the knurled knob counter-clockwise and remove the magazine.

(3) At the starboard rear end of the camera, press and turn the knurled knob counter-clockwise until the shutter opens.

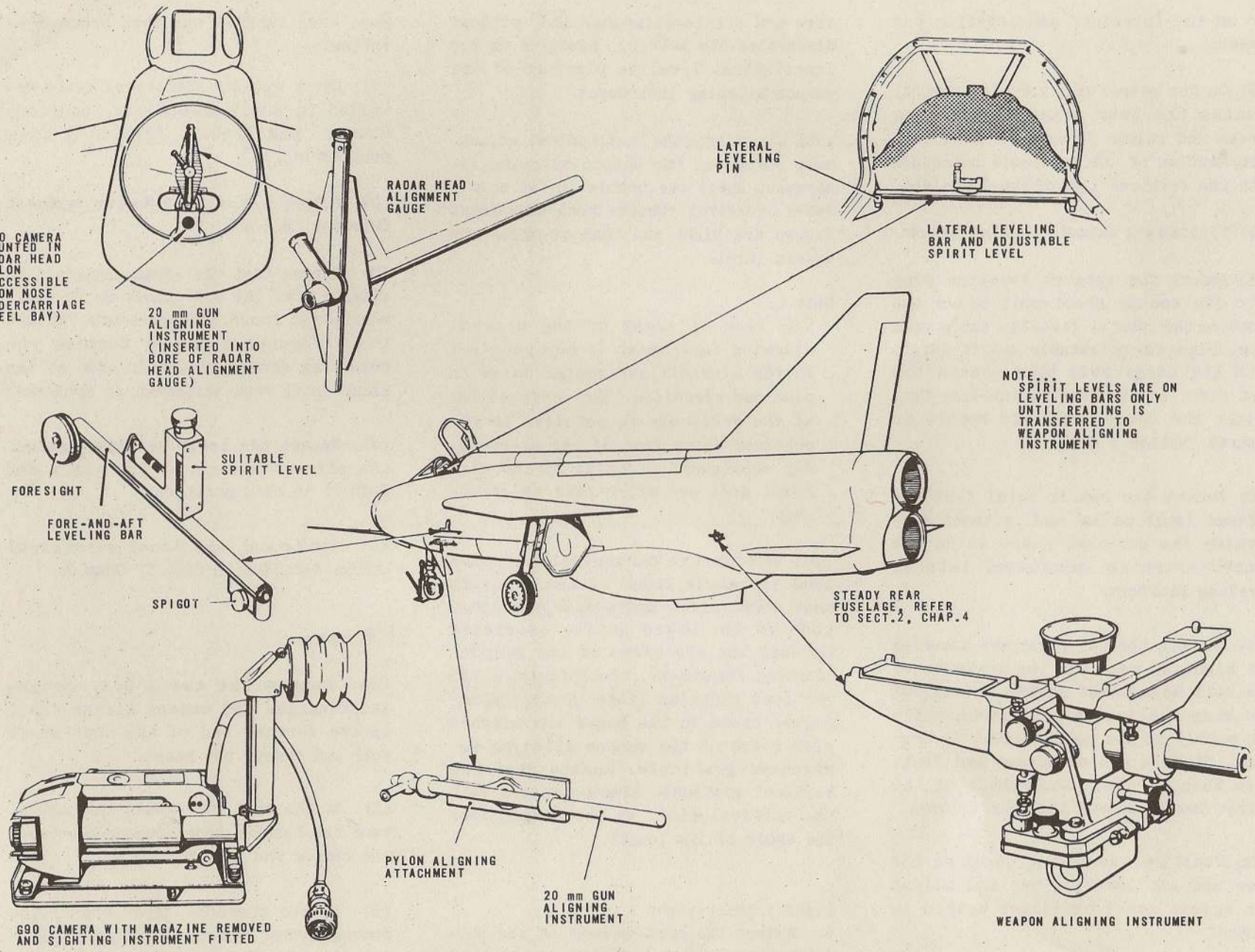

FIG. 2. HARMONIZATION PROCEDURE

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(4) Fit the periscopic-sighting instrument into the position formerly occupied by the magazine and, viewing through the periscope, check that the graticule is correctly aligned with the camera aiming mark on the harmonization board.

(5) If adjustment in azimuth is necessary, slacken the two 2 B.A. nuts at the rear of the camera mounting and move the lever on the port side of the mounting until the vertical line of the graticule coincides with the centre line of the aiming mark. Tighten the nuts.

(6) If vertical adjustment is necessary, slacken the two 2 B.A. nuts at the rear starboard side of the mounting and move the lever on the same side until the horizontal lines of the graticule and aiming mark coincide. Tighten the nuts.

(7) When the camera is correctly aligned, remove the sighting instrument, close the shutter by further rotation of the shutter control knob and refit the magazine and access panel.

Radar-head mounting

7.

(1) Fit the radar head alignment gauge to the mounting and insert the rod of the 20 mm gun-aligning instrument into the bore of the gauge.

(2) View the radar head aiming mark through the eye-piece of the aligning instrument.

(3) Check that the intersection of the lines of the instrument graticule coincides with the centre of the aiming mark.

(4) If adjustment is necessary, slacken the nut on the securing bolt of the rear mounting adjustment eccentrics and rotate the eccentrics by their knurled rims until the radar head is correctly aligned with the aiming mark.

(5) Tighten the nut of the securing bolt and re-check alignment.

(6) Remove the gun-aligning instrument and the alignment gauge in readiness for refitting the radar head.

G.W. pylons

8. To check the alignment of the Firestreak or Red Top missile pylons:-

(1) Remove the pylon base fairings.

(2) Refer to A.P.4483A, Vol.1, Part 1, Sect.4, Chap.16, fit the pylon aligning attachment No.1 (Firestreak) or No.2 (Red Top) and apply a crutching torque loading of 10 lb ft or 53 lb ft respectively.

(3) Insert the 20 mm gun-aligning instrument into the bosses of the attachment and secure with the grub-screws in the bosses.

(4) View through the gun-aligning instrument and, if necessary use the Allen-key wrench and pylon socket spanner to adjust the pylon rear dowel socket up or down until the cross in the gun-aligning instrument correlates with the G.W. mark on the harmonization board. Lock the dowel bush in this position and then re-check the alignment.

(5) Repeat operations (2) to (4) on the opposite pylon.

(6) Remove the instruments and replace the pylon fairings; in the case of Red Top fairings a crutching torque loading of 53 lb ft is required.

Note...

If alignment is outside limits in azimuth the G.W. pack is to be changed.

TABLE 1

Tools and equipment

Ref. No.	Part No.	Description	Remarks
1A/6247		Wrench, Allen key	
1B/4235		Levels, adjustable	
1C/7003		Spanner, torque	
1L/200		Spanner, torque	Alternatives
1L/297		Spanner, torque	
4G/7175		Instrument, aircraft weapon aligning	
4G/7176		Adapter set	Used with 4G/7175
4G/7187		Attachments, pylon aligning, No. 1	Firestreak
4G/7189		Attachments, pylon aligning, No. 2	Red Top
7G/1445		Instrument, gun aligning, 20 mm	Used with 4G/7187 and 4G/7189
11A/5023		Crutching handle assembly	Consists of handle, extension and adapter
14A/5054		Instrument, periscopic-sighting	G90 camera
26DK/95098	EB2.88.1873	Gauge, radar head alignment	
26DK/95099	EB2.88.2185	Gauge, longitudinal leveling	
26DK/95100	EB2.88.2187	Gauge, lateral leveling	
26DK/95414	EB2.88.6065	Pin, port lateral level rigging	
26DK/95415	EB2.88.6066	Pin, starboard lateral level rigging	
26DK/95743	EF3.88.563	Spanner, socket	G.W. pylon locking

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