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Notes on a Meeting held at R.A.F. Station, Polebrook, on 14/8/41,
to consider present and future developments with regard to
B.17.C. Aircraft.

War Department
Washington, D. C.
Censor
of the Air Corps

There were present:-

M.A.P.

A/Cdr. Lockyer
W/Cdr. Ewing
F/Lt. Greenman
S/L. Whiteley
Mr. Walmsley
Mr. Shipp
Mr. Wells
Mr. Prior

- D.D./R.D.Q. (Chairman)
- R.D.Q.B.
- R.D.Q.B.
- D.P.C.A.
- A.D./D.A. (N.A.)
- R.D.L.2.
- Vickers-Armstrong, Ltd.
- R.T.O. " "

Air Ministry.

A/Cdr. Breakley
W/Cd. Smith
S/L. Lang

- D.O.R.
- Sigs. 1(A).
- " "

Bomber Command.

A.V.M. Graham
A/Cdr. Lees
G/Cpt. Williamson Jones

Part Time
" "
C.T.O.

Headquarters No. 2 Group.

W/Cd. Palmer.
S/L. Pollitt.
F/Lt. Crowley.
F/Lt. Baker.
F/O. Thompson.

R.A.F. Station, Polebrook.

F/Lt. Bennett.
F/Lt. Hackott.
F/O. Phillips.

No. 90 Squadron.

S/Ld. McLaren, and representatives of
technical sections and operational crews.

Incl 9

1. 1. Is present provision for oxygen, non-misting windows, radio and photography considered satisfactory?

A(i) Oxygen Mark X System. The Unit reported that the system provided satisfactory oxygen supply for operational requirements. There had been one case where the observer reported shortage of oxygen, but it was considered that this apparent shortage might well be due to psychological factors, and it was agreed that no action is required pending a detailed investigation by the medical officer of the Unit. It is probable that the "two man" technique will have to be adopted for bomb sighting, and provision for oxygen with economisers in the nose

P.T.O.

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compartment would considerably decrease the oxygen endurance of aircraft, and it is desirable to avoid this if at all possible. There are certain technical problems which require investigation in detail, and it was agreed that R.D.Q.B. should look into these problems with the Unit.

A(ii) Portable Oxygen. The Unit reported satisfactory functioning of portable oxygen equipment, but requested the provision of a Y piece to the lead to the mask, to which the portable oxygen could be permanently attached and carried on the body. It was agreed this should be investigated and a trial set be provided for the Unit to test.

A(iii) The Unit reported that the condition of installations received from R.R.D. is very poor, and considerable work has been necessary to make them serviceable on receipt in the Unit. It was agreed that D.P.C.A. should look into this, and that the R.T.O. and representatives of A.I.D. at Burtonwood should visit the Unit with the next aircraft delivered, to run through the details causing trouble.

B.(i) Non-Misting Windows.

It appeared from discussion that the principle of the dry air sandwich is sound, but it is evident that the production of a satisfactory seal is not yet ensured. It was agreed that A.D./D.A.(N.A.) should proceed with investigations of high priority to produce a satisfactory sealing compound.

B.(ii) The Unit engineer officer reported that Gacmist Co. claim to have produced a solution, which is alleged to prevent misting under all conditions. It was agreed that A.D./D.A.(N.A.) should investigate this on high priority as if this is, in fact, the case, it would seem to be the solution to all internal misting problems.

C.(i) Radio and Electrics.

The Unit report the general satisfactory functioning of the modified radio equipment. A case had arisen, however, where the L.T. accumulator appeared to have frozen at high altitude, and it was requested that the low tension should be taken from the aircraft mains service. It was agreed that R.D.Q.4 with Signals 1A should visit the Unit as soon as possible, to clarify details, as it appears uncertain whether sufficient mains power is available to meet this additional service.

C.(ii) The Unit asked for urgent provision of "Taylor" electrically heated suits. It was confirmed that urgent provision action has already been taken to this end.

D.(i) Photography.

The Unit report that the camera bearers should be run fore and aft to provide the necessary aft tilt of the camera to obtain photographic record of bomb bursts. The Unit also request a device to keep the camera aperture clear of mud and oil. It was agreed that the modification to the camera bearers and the provision of a door and an oil deflector should be proceeded with.

D.(ii) The Unit asked that the type 35 control be re-positioned adjacent to the bomb sight. In view, however, of the "two man" bomb aiming technique it was agreed that re-positioning of the control should not be proceeded with.

D.(iii) Consideration has been given to fitting a Fairchild camera in lieu of the F.24 now provided. It was agreed that provision for this camera should not be undertaken on the present B.17C aircraft, but should be considered for B.17E's in the future.

2. What further requirements are considered essential in the light of operational experience for the day bomber role.

A.(i) Bomb Gear.

Adaptors are most urgently required to carry 500 lbs. British bomb.

A.(ii) The bigger British bombs previously under consideration are not now a requirement.

A.(iii) There are certain detailed technical problems which require improvement. It was agreed that R.D.Q.2 should arrange for a detailed discussion with Squadron Leader Pollitt of No. 2 Group and R.A.F.

A.(iv) The Unit report instances of bombs being dropped "safe". It was agreed that the Unit should develop a scheme to prevent this occurring, and to forward suggestions through the normal channels.

B.(i) Bomb Sights.

The Unit report the general satisfactory functioning of the Sperry sight, particularly in view of the possibilities of the "two man" technique, increasing accuracy.

B.(ii) The provision, therefore, for the Mark IX sight is not required.

B.(iii) The Unit report some difficulty in maintenance of this Sperry sight and automatic control but close co-operation with the Sperry Co. representatives has helped considerably, and it is considered that as maintenance experience develops so will the maintenance improve. It was agreed that R.D.Inst. should collaborate with the Unit with regard to maintenance problems.

C.(i) Guns.

The Unit requested the provision of 3 x .30 hand held guns in the nose compartment, for which mountings already exist. It was agreed that the Unit should operate with these guns, using Squadron stocks of guns for the purpose, and that any shortage of guns should be reported.

C.(ii) There was some discussion with regard to increasing the number of beam guns. This introduces the problem of increased crew and oxygen supply, and if required is likely to be a big modification. It was agreed that Bomber Command should discuss the matter with D.O.R., who would state the agreed requirements to M.A.P.

D.(i) Fire Controllers' Station.

Urgent action is required to provide de-misting facilities for the observation dome. In this respect the Gnomist fluid may well provide the answer. Action is already in hand with a view to developing a non-misting dome suitable for Astral navigation. This development is to be proceeded with urgently.

D.(ii) The Unit request the provision of a seat with a short back support for the fire controller. It was agreed that this should be provided.

D.(iii) The Unit request provision of a reflector sight type GJ3A^H in the observation dome for range finding. It was stated, however, that there were other devices available to meet this requirement, and it was agreed that the Unit should develop their own scheme, such that no aircraft modification is involved.

D.(iv) It was agreed that bullet proof glass panels should be provided for the observation dome, and that these should be of a type similar to that provided in British types, to be mounted on the aircraft under Unit arrangements.

D.(v) The Unit reported that the Verrey pistol mounting differed on individual aircraft, and requested that provision of the standard No. 2 Mark III pistol should be provided on all aircraft. This was agreed, D.P.C.A. to take action to ensure that this, which is a standard equipment to all aircraft, should be provided.

E. Fire proofing of soundproofing. A recent accident shows that U.S.A. sound proofing material is not fireproof. A.D./D.A.(N.A.) is to proceed urgently with an investigation to render this fireproof.

F. Recognition Lights. The aircraft are still being delivered with blue glasses on station keeping lights. White glasses have been called for, and R.D.Q.B. and D.P.C.A. are to take action to provide the necessary glasses. As an interim measure, should necessity arise, lamps may be fitted with no external glass covers.

G. Navigation. The Unit report serious electrical interference of observer's compass from electric leads. B.R.D. have been instructed now to run "return" leads to eliminate magnetic interference, and it was agreed that the Unit should apply this same modification.

H.(1) Instruments.

Pilot's Instruments. These are dealt with under para. 3. below.

H.(ii) The Unit report that exhaust gas analysers are unreliable and dangerous. It was agreed that these should be deleted by the Unit, and the holes blanked off.

I. Controls. The Unit report that it is important that the boost levers be increased in length, and provided with a means of synchronization to ensure even boost in all engines, without necessitating watching the gauges. After discussion it was agreed that these should be provided, if at all possible. R.D.Q.B. to initiate the necessary action.

J.(1) Windscreens.

The Unit have asked for the provision of clear view panels, but the extent of structural modification involved is prohibitive. In lieu, it is proposed to proceed with a windscreen wiper installation, and it was agreed that a scheme should proceed for trial by the Unit.

J.(ii) The Unit request a device for breaking ice from the side window, should necessity arise. It was agreed that the Unit should lay out their own ideas and forward a scheme for consideration through the usual channels.

J.(iii) The extension of provision of existing type non-misting windows was discussed, and it was agreed that before action on these lines is taken the existing non-misting device should be fully proved, and the newly developed Gnomist solution should be tested.

3. Is it proposed to employ these aircraft for night operation during the coming winter? If so, what are the bare essential requirements?

A. Role. The role, as stated by H.Q. No. 2 Group and agreed by Bomber Command and D.O.R. is for a continuation of high altitude day operation, with ability to take off and land by night.

Additional Essential Requirements.

B.(i) Flame Damping. Flame damping of Turbo superchargers is not yet a practicable proposition, and it was agreed that pending a satisfactory solution of this problem flame damping would have to be dispensed with.

B.(ii) Navigation. Provision for Astral navigation with Astrograph is required, if at all possible.

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Radio Compass Signals IA reported that the frequencies provided by this equipment are insufficiently low to meet new frequency requirements. It was stated, however, that Bomber Command are considering a re-organisation of ground stations to work at 150 K.C.'s, and it was strongly recommended that this intention be proceeded with if at all possible. Signals IA to discuss with Signals, Bomber Command.

Cockpit Lighting.

B.(iv) It was agreed that R.D.Q.A. should co-operate with the Unit to decide exactly what modifications, if any, are required for cockpit lighting.

B.(v) Black-out. It was agreed that the Unit should proceed with fitting their own black out requirements.

B.(vi) Instruments. The Unit report that the lay out of instruments in the pilot's cockpit is not satisfactory, either for blind flying or for night flying, and approach to the aerodrome with standard left hand circuits. It was agreed that the Unit should carry out trials with a view to finding the best instrument lay out practicable without excessive alterations, the final requirements to be put forward for consideration through the usual channels. In relation to future deliveries of aircraft of this type it was requested that a sketch of the ideal cockpit lay out should also be developed by the Unit for transmission to British representatives in U.S.A.

B.(vii) Photography.

No provision is required for special night photography.

B. How can additional requirements be met?

- (a) In relation to design and experimental work required?
- (b) In relation to production capacity available?
- (c) Without interfering with the operational functioning of the Unit?

(i) After discussion it was agreed that the whole problem of design and trial installations should be proceeded with in accordance with the instructions now being issued, with regard to modifications to American types of aircraft.

(ii) Unit and No. 2 Group agreed to undertake as much fitting of modifications to aircraft as was reasonably possible within the Unit, subject to the number of man hours involved in each instance.

(iii) With regard to the shortage of production capacity for modification parts it was recommended that where possible modification parts should be made by Benson and Halton, or similar R.A.F. establishments.

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REPORT ON WEIGHING OF BOEING B17-C AIRPLANE NO. AN536 (COMBAT CONDITION)
AT BOSCOMBE DOWN ON AUGUST 26th, 1941.

Aircraft no. AN536 was flown from Polebrook to Boscombe Downs with full tactical equipment aboard. The weighing was conducted for the purpose of determining the correct all-up battle weight and location of centre of gravity. The exact location of the centres of gravity was necessary for use in the determination of permissible additions to the armour plating now in use on the B17-C Aircraft.

Detail Summary of Condition of the Airplane as Weighed.

The following items were aboard the airplane when it was weighed;

Engine oil - The four tanks were full to the gauge mark for 1700 U.S. gallons fuel load; that is, approximately 38.6 U.S. gallons of oil per engine.

Fuel - No. 1 & 4 Engine tanks.....437 U.S. gals each
No. 2 & 3 " "215 U.S. gals each
Feeder tanks.....214 U.S. gals each

Hydraulic system oil tank.....Full

Sperry auto pilot tank....."

Supercharger lubrication oil tanks (4)...."

Heating system glycol tank....."

Propeller deicer tank....."

Windshield glycol tanks (2)....."

Oxygen system:

Regular ME X system now being used; 16 charged, wire wound bottles were in place.

Portable oxygen bottles: Three per crew member (21 total) at the crew stations.

Crew personnel equipment (7 crew members) (at the respective crew stations)

Flying suits

Oxygen masks

Parachute bags

" packs

" harnesses

Life jackets Portable oxygen bottle slings

Boots

Gloves

Helmets

Machine guns: (all in combat position)

Nose.....2.30 cal: Browning

Top.....2.50 cal: Browning

Bottom.....2.50 cal: Browning

Side.....2.50 cal: Browning.

Ammunition: (at regular stowed positions)

Nose.....500 rounds..30 cal

Top.....1000 " .50 cal

Bottom.....1000 " .50 cal

Side.....1000 " .50 cal

Hand Fire Extinguishers: (Graviner)

(7).....Stowed in regular brackets

Dingies: (2)....." " " compartments.

Dinghy ration packs: (2).....Stowed aft of Sta. 8

Brandy and water ration:.....Stowed in Radio Compartment

Very pistol stowed in cockpit: (1)Very cartridges: Approx: 12 stowed in cockpit.

Smoke floats: total (4).....Stowed in flare brackets.

Radio Equipment: Complete, including the additions installed in England

Camera:Stowed in place

Fire axe:Stowed in cockpit

Bottom Gunners cushion.....Stowed in place

Armour plate: Pilots (2 plates)

Top gunner (on Blk 6)

Bottom gunner (at gun station)

Passed
by the
Technical Censor
Office, Chief of the Air Corps
War Department
Washington, D. C.

Navigational Equipment: As normally carried
 Aldis Signalling lamp..... In cockpit
 Canvas bombsight cover..... In place
 Machine gun range finders (2) At bulkhead, 4
 First aid kits: (3)
 Right hand seats in radio compartment, including seat cushion and belts: (2) each
 Parachute storage racks..... all installed
 Frost prevention window panels:

Installed on: Bombsight window
 Pilots windscreen (2)
 " side windows (2)

Mesh stowage brackets for emergency oxygen: All installed

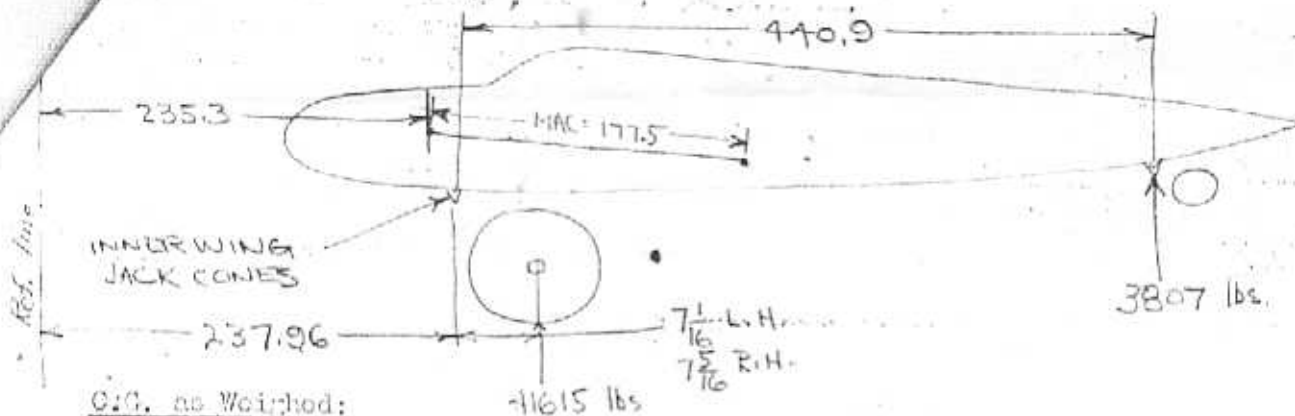
~~Devex~~ Boots

The following items were NOT aboard the airplane during landing:

Bombs, bomb shackles
 Crew members (none aboard)
 Side gun armour plates
 Side gun windows (2)
 Top gun window
 Bottom gun window
 Ladders
 Work platforms
 Bombardier's seat and armour

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C.G. as Weighed:

Gross 18-11-2-7

Tare - 0 -

Net, Main Wheels, 18-11-2-7

18(2240) = 40320

11(112) = 1232

2(28) = 56

7

Gross 0-36-0-20

Tare 2-0-21

36(112) = 4032

20

Gross 4052

Tare, 2(112)

+ 21 = 245

NET, MAIN WHEELS: 41,615 pounds

NET, JACKCONE: 3807 pounds

TAKING MOMENTS ABOUT MAIN WHEEL AXLE CENTRE;

3807 (440.9 - 7.188) = (41615 + 3807)X

X = 36.3"

36.3 + 7.188 = 237.96 = 281.45 Distance of C.G. from Ref. line

281.45 - 235.3 = 46.15 = .26

177.5 177.5

C.G. Without Bombs or Crew, Wheels Down

= .26% C.G.

Weight without Bombs or Crew

= 45,422 pounds

C.G. FULL LOAD

	<u>Weight</u>	<u>Arm, from Ref line</u>	<u>Moment</u>
Airplane as weighed	45422	281.45	12,784,022
Bombs & shackles	4471	283.7	1,250,000
Navigator	170	121.0	20,550
Pilot	170	187.0	31,800
Co-pilot	170	187.0	31,800
Radio Operator	170	374.0	63,600
Bottom Gunner	170	467.0	79,400
Side Gunner	170	547.0	93,000
Fire Controller	170	232.5	39,500
	<u>51023</u>		<u>14,393,672</u>

14,393,672 = 282 C.G. from ref. line

51023

282 - 235.3 = .263

177.5

C.G. WITH WHEELS RETRACTED:

	51023.....	14393872
Retract Wheels		-52426
		<u>14341246</u>

$\frac{14341246}{51023} = 281.2$ C.G. From ref. line

$\frac{281.2 - 235.3}{177.5} = .259$

C.G. Full load, Wheels up.....25.9% M.A.C.

C.G. FULL LOAD, BOMBS DROPPED:

Full Load	51023	14341246
Subtract Bombs	4400	1250000
Bombs Gone	<u>46623</u>	<u>13091246</u>

$\frac{13091246}{46623} = 281.0$ C.G. From Ref. Line

$\frac{281 - 235.3}{177.5} = .257$

C.G. Full Load, Bombs Dropped, Wheels Up25.7% M.A.C.

C.G. FULL LOAD, FUEL EXHAUSTED, BOMBS DROPPED:

Fuel Load: (U.S. Gallons)

(437) (2) (6)	= 5244	281.9	1480000
(215) (2) (6)	= 2580	293.0	756000
(214) (2) (6)	= <u>2568</u>	<u>324.0</u>	<u>832000</u>
	10392		3068000

(Bombs Gone)	46623	13091246
	<u>10392</u>	<u>3068000</u>
	36234	<u>10023246</u>

$\frac{10023246}{36234} = 277.0$ C.G. From Ref. Line

$\frac{277 - 235.3}{177.5} = .235$

C.G. Fuel Exhausted, Bombs Dropped, Wheels up.....23.5% M.A.C.

From the foregoing data it is obvious that the maximum aft position of the centre of gravity occurs when the airplane is fully loaded.

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EFFECT OF ADDING 225 POUNDS OF ARMOUR PLATE AT A POINT 2"
FORWARD OF STA. 8 BULKHEAD

Full load, Wheels up -	51023		14341246
Armour	225	585	131600
	<u>51248</u>		<u>14472846</u>

$\frac{14472846}{51248} = 282.5$ C.G. From Ref. Line

$\frac{282.5 - 235.3}{177.5} = .266$

C.G Full Load, Wheels up, with sta. 8 Armour.....26.6% M.A.C.

The recommended maximum aft position of the centre of gravity,
from structural and aerodynamic stability standpoint, is 26% M.A.C.

K. L. Perry
Boeing Aircraft Co.

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