Wt. 35101/P.2398. 1,000M. 11/43. B.C.Co.Ld. 51-7673.

Form 2007.

Part No.

ROYAL AIR FORCE.

File Number.

Date of Opening.

References to other papers.

UNIT OR BRANCH.

F/O TWELLS

SUBJECT.

ENG QUESTIONS

Referred to	Min. or Enc.	Date	Initials of Sender	Referred to	Min. or Enc.	Date	Initials of Sender	Referred to	Min. or Enc.	Date	Initials of Sender

AUTHORITY TO CLOSE OR P.A.

Closed or P.A.	Date.....
Due for Board under K.R. 2199.	Date.....

.....

Signature of a responsible Officer.

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F/O TWELLS

NO. 23 COURSE FIRST THREE WEEKS ENGINEERING EXAMINATION.

ENGINE

(a) What symptoms would lead you to expect that an engine was detonating during flight.
(b) How would you verify this ?
(c) What subsequent action would you take ?

CARBURETTOR

(a) Why are you instructed, when handling the Claudel Hobson carburettor, never to use a throttle lever position midway between E.C.B. and R.B. (Exception - Halifax 3).
(b) If the power valve on a Claudel Hobson carburettor had jammed open, what probable effect would result when cruising at a very low attitude (throttle engine).

PROPELLOR

A fixed pitch propellor, when fitted to a normally aspirated engine, operate with reasonable efficiency.
In view of this fact, why is flying in fixed pitch with the electrical propellor not advocated when fitted to a supercharged engine.

LUBRICATION

What symptoms experienced during flight, would lead you to diagnose a choked scavenge filter in the engine. What action would you take ?

HANDLING

How would the following influence your choice of height and/or airspeed giving reasons for your decision.

(a) Airframe icing
(b) High temp. and unstable air
(c) Weight reduction due to parachute load.

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F/O TWELLS

No. 36 Course Pilots Intermediate Exam "Y" Squad

Engineering

SPERRY

1. (a) What are the follow upcables and why are they fitted ?

(b) Tabulate procedure for engaging Sperry in Flight

Marks 20

SERVICING

2. (a) Where would you find information that would tell you when the next Minor inspection is due for your aircraft ?

(b) What advantages has progressive servicing over the old method of servicing ?

Marks 20

ELECTRICS

3. (a) If two accs. are connected in parallel each of 12v 88 AMP/HR what would be the capacity ?
(b) Show how these accs. are connected in parrallel ?

RANGE FLYING

4. (a) What is specific fuel consumption ?
(b) What are the rules for keeping the SFC to a minimum ?
(c) If an engine is developing 800 BHP and is doing so using 50 GPH what is the S.F.C. ?

5. If the weight of an A/C is decreased, what happens to ?
(i) Induced drag
(ii) Parasite drag
(iii) Totaldrag
(vi) Recommended speed

Marks 40

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F/O TWELLS

School of Flight Efficiency. Final Paper, Part II.

Question 1 (30 Marks)

Show how specific air range varies with an increase of parasite drag, assuming constant S.F.C. and propeller efficiency.

Question 2 (40 Marks)

Why is performance at full throttle best:-

(a) for range.
(b) for speed?

Question 3 (30 Marks)

Why is performance at sea level best for endurance? Under what circumstances would a height above 1,000 feet be used?

Question 4 (30 Marks)

Write brief notes on:-

(a) Vertical Climb
(b) Range Descent.
(c) Delayed Climb.

Answer Question 2 and two others. Wherever possible illustrate your answer with a diagram or graph which should be large and clear.

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1.80 x 1.1

WT 22000 lbs 6,000

T.THP = ~~106~~ x ~~75~~ = 780 / 390 / 1170 / 1056 / 4

TTHP REQ. L.F. ~~3,000 x 75 / 2,000 100~~ x ~~2,000 x 180 x 1.1~~

360 / 60 / 960 / 1.1 / 960 / 960 / 1056.0

16 / ~~80~~ / ~~700~~ / 60 / ~~375~~ / 75 / ~~15~~

T HP 198 x 100

1200 180 / 1056 / 30

30 — ~~2,000 x ROC / 3,000~~

ROC = 30 x 3/2

ROC = 45'/min.

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F/O TWELLS

School of Flight Efficiency. Final Paper, Part I

Question 1 (70 Marks)

Two aircraft of the same type and weight are flying at the same T.A.S. (repeat, T.A.S.) which in each case gives an I.A.S. above that for minimum drag. Propeller efficiency and S.F.C. are the same in each case, but one is at sea level and the other at 5,000 ft. Which will have the greater:-

(a) I.A.S.
(b) Angle of Attack.
(c) Total Drag.
(d) Induced Drag.
(e) Parasite drag.
(f) Power Required.
(g) Rate of Fuel Consumption.
(h) Specific Air Range.

Explain each answer briefly.

Question 2 (15 Marks)

An aircraft operates at constant R.P.M. i.e. decreasing S.F.C. with increased power. Explain why the best speed for range is above the speed for minimum drag.

Question 3 (15 Marks)

Explain how the best speed for range varies with an increase in weight, assuming constant S.F.C. and propeller efficiency.

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F/O TWELLS

No. 1 FLIGHT EFFICIENCY COURSE, AERODYNAMIC EXAMINATION.

Ques. (1) Forty Marks.

(a) Why is the ICAN Standard Atmosphere necessary for aviation?

(b) An aircraft is flying at 1200ft. in standard atmospheric conditions. What is the pressure in MBs? What is the % density? What is the temperature in °C and "°" Absolute? For the same altimeter reading and temperature -15degs. what is the pressure in MBs? What is the percentage density?

Ques. 2. 30 Marks.

An aircraft weighing 22000lbs is flying at 6000 ft., where the altitude factor is 1.1 at 180 knots I.A.S. with 1560 B.H.P. The propeller efficiency is 75% and the drag 2000lbs. Is the aircraft flying level, climbing, or descending and if so at what rate?

Ques. 3. 30 Marks.

An aircraft with a constant speed propeller is flying at a given R.P.M. and Boost. If (a) boost is increased at constant R.P.M. (b) R.PM. is increased at constant boost what happens to the pitch of the propellor and why? Explain briefly possible inefficiency at high boost and low R.P.M. at low speed.

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No 1 FLIGHT EFFICIENCY COURSE. ENGINE EXAMINATION. F/O TWELLS

Ques. 1. With the aid of graphs explain,
(a) Why the Brake Thermal Efficiency is increased with increasing boost at constant R.PM. (b) Why the B.TH.E. is decreased with increasing R.P.M. at cons--tant boost? (c) What happens to S.F.C. in each case?

Ques. 2. If at 7000ft. atmospheric temperature were -10degs. C would the mixture strength bericher, weaker or unchanged compared to that for which the Carb. was designed, in the case of., (1) Pegasus(Claudel Hobson), (2) Twin Wasp,(Stromberg) (3) Rolls Merlin,(S.U.)
Give brief reasons for your answers.

Ques.3. At 7000ft. the engine settings required for 140 Knts. are 2000 R.P.M. ,zero boost,. What are the settings required for 2000ft?
(b) At 15000ft. settings required are2250 R.P.M.-3 lbs boost, what are the settings at Sea level?

Ques. 4. What is S.F.C?
At Sea level an engine developes 1350 B.H.P. and consumes 78 G.P.H. At 3000ft. with same R.P.M. and boost develops 1400B.H.P. and consumes 81 G.P.H. What is the S.F.C. in Pints/B.H.P.hr. in each case? Account briefly for any difference. (Constant air/fuel ratio)

Ques. 5. Draw the Power / Altitude curve for a N.A. eng. at full throttle, and for same engine fitted with an E.D. Super-charger, with zero boost, max. permiss., and also for the same enginefitted with a Turbo-supercharger, zero boost, max. permiss.
(a) Enumerate and explain the advantage of a Turbo-super chager

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184727 F/O Humphries
R.A.F. Dunkeswell
Nr Honiton
Devon

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EFFECT OF RANGE WITH HEAD WIND

$$T.M.P.G = \frac{TM}{GALLS} = \frac{GS}{G.P.H.}$$

$$A.M.P.G = \frac{T.A.S}{GPH}$$

$$T.M.P.G = A.M.P.G \times \frac{GS}{T.A.S}$$

150 T.A.S 50 GALLS/HR NO WIND

$$A.M.P.G = \frac{150}{50} = 3 \text{ AMPG}$$

$$T.M.P.G \quad \frac{150}{50} = 3 \text{ T.M.P.G}$$

WITH 50 M.P.H. AMPG 3

$$TMPG = 3 \times \frac{100}{150} = 2 \text{ TMPG}$$

INCREASE I.A.S 20 M.P.H $T.M.P.G = 3 \times \frac{120}{170} = 2{\cdot}12.$

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ANTI-ICER SYSTEM.

PROPS Alcohol glycerin is used. 4 U.S gallons in tank at the bulkhead behind the pilots seat 12 V electric motor with gear type pump controlled by switch on elec panel above pilots windshield. Amount used controlled by rheostat on bulkhead at back of pilots seat

Windshield. fluid used alcohol. contained in a 5 GALLS tank in right baggage compartment hand pump near co pilots seat

Deicing Equipment deicing shoes on leading edge of wings tail and vertical stabilizers

Inflated by exhaust from vac pumps are on each engine air lines go to a distributor

The cycle is as follows
Centre cells on left and right main out board plane

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Upper and lower cells on right and left outboard outer wing shoes

Center cells on right and left inboard wing

Upper and lower cells on right and left inboard

each cycle takes approx 8 secs

Tail shoes.

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