

ESTIMATION OF RANGE & ANGLE OFF

Bag the Hun!

TRY THIS SERIES
OF EXERCISES &
IMPROVE YOUR

Shooting

FOR OFFICIAL USE ONLY

A.P. 2580 A

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Bag the Hun!

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Arthur

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AMENDMENT RECORD SHEET

Incorporation of an Amendment List in this publication is to be recorded by inserting the Amendment List number, signing in the appropriate column, and inserting the date of making the amendments.

A.L. No.	Amendments made by	Date

INTRODUCTION

Combat films prove that many combats against the Fw190 are unsuccessful because of wrong estimation of opening range and wrong deflection. This booklet provides instruction and practice in these fundamentals.

Estimation of range and of deflection are treated separately at first, and then together. Speed tests are given in Chapter 4.

It is realised that not all pilots will be in need of this instruction. If you are in doubt, turn at once to Chapter 4. If you can perform the speed tests satisfactorily, there is no need for you to work through the exercises. If not, this booklet will make you much more able to cope with the Fw190.

KEY

Pages are headed with one of these:—



WHEN INFORMATION IS GIVEN



WHEN EXERCISES ARE PRESENTED



WHEN ANSWERS ARE GIVEN

Answers to each exercise are given on the page following that on which the exercise is printed. Answer the whole set of questions on a page before turning over to find the answers. Write your answers in pencil alongside the corresponding diagrams.

ESTIMATION OF RANGE

----- Unit

$\frac{1}{2}$

$\frac{1}{3}$

$\frac{1}{4}$

$\frac{1}{5}$

$\frac{1}{6}$

Range can be estimated, when you are almost dead astern of the enemy aircraft, by comparison between the wing span and the diameter of the sight ring. This chapter will show you how to do this.

On this page the dotted line is taken as a unit. The other lines are fractions of this unit. Check them visually and remember them—they are the basis of range estimation.

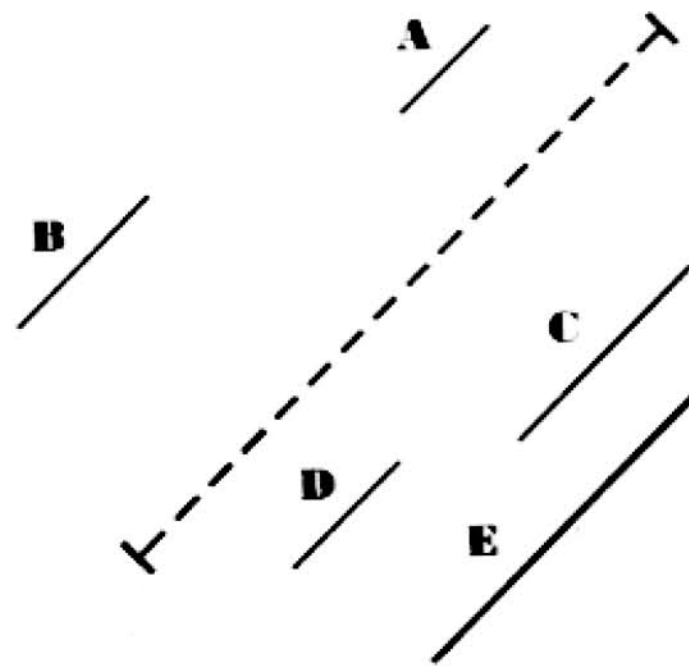




satisfied customer writes



The dotted line is the unit. What fraction of this unit are the lines marked A, B, C, D, and E?

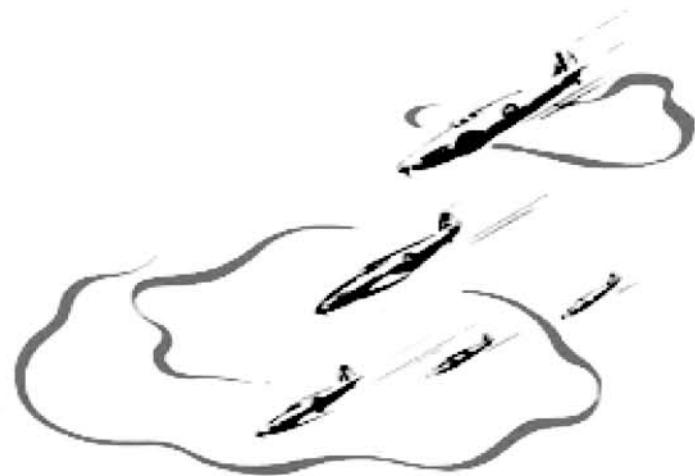


Solution

$$\mathbf{A} = \frac{1}{6} \quad \mathbf{B} = \frac{1}{4}$$

$$\mathbf{C} = \frac{1}{3} \quad \mathbf{D} = \frac{1}{5}$$

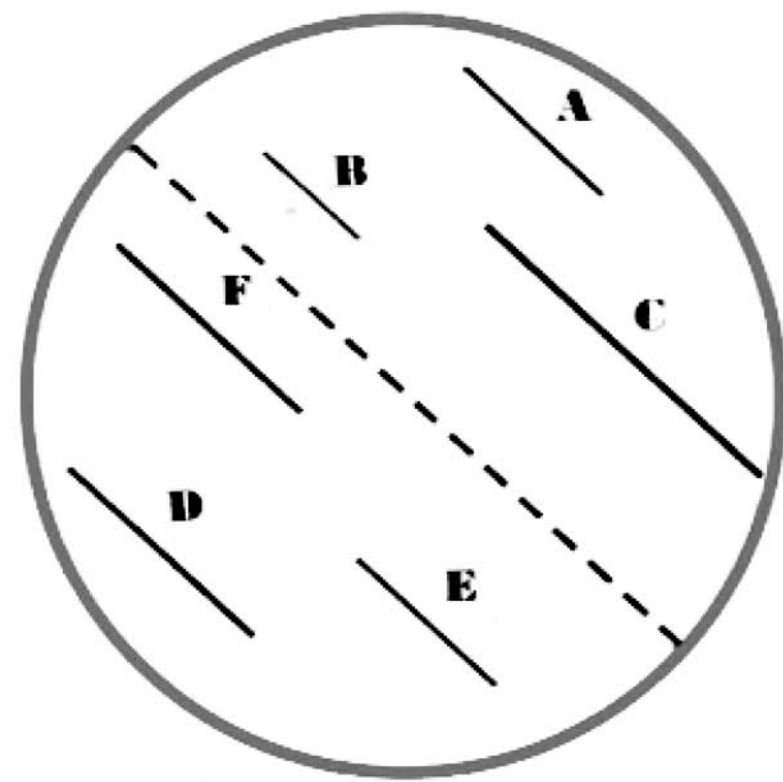
$$\mathbf{E} = \frac{1}{2}$$



Tally-Ho—



The dotted line has now become the diameter of the red circle. What fractions of the diameter of the circle are the lines A, B, C, D, E, and F?



Solution

$$A = \frac{1}{4}$$

$$B = \frac{1}{6}$$

$$C = \frac{1}{2}$$

$$D = \frac{1}{3}$$

$$E = \frac{1}{4}$$

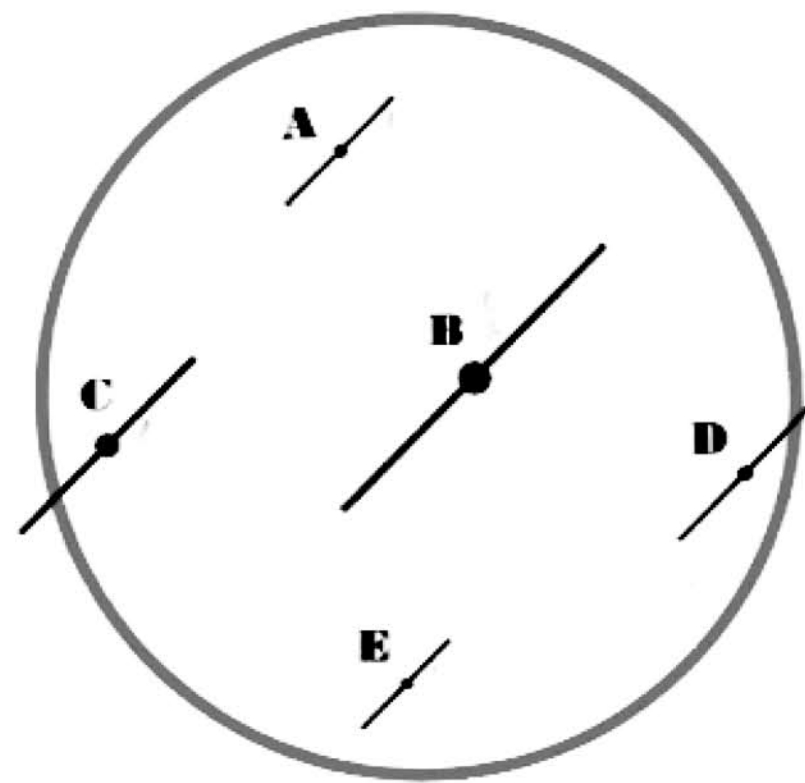
$$F = \frac{1}{3}$$

—and funnily enough, it worked



From this point onwards the dotted line, which was drawn in as the diameter of the ring, is omitted and can appear only in your imagination.

Now state what fractions of this diameter are represented by the lines A, B, C, D, and E.



Solution

$$A = \frac{1}{5}$$

$$B = \frac{1}{2}$$

$$C = \frac{1}{3}$$

$$D = \frac{1}{4}$$

$$E = \frac{1}{6}$$



that's when I let him have it

Gen



The ring has now become the sight ring. The lines will shortly appear as Fw190's. The span of a Fw190 (and Me109, too) is such that it appears equal to a diameter of a ring when it is 100 yds. away, half a diameter when it is 200 yds. away, and so on.

In future, then, instead of 1/2 state 200 yds.

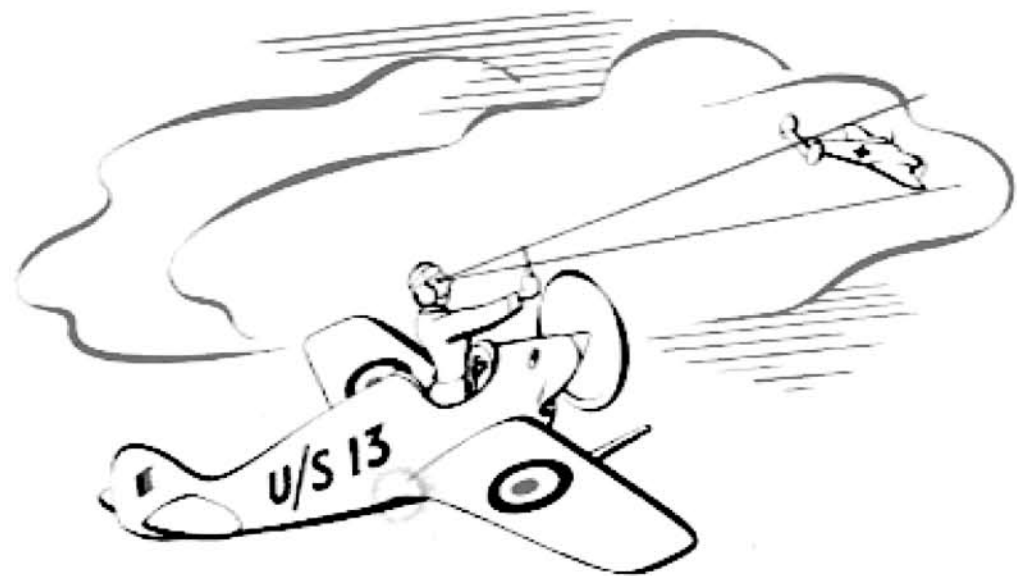
1/3 300 yds.

1/4 400 yds.

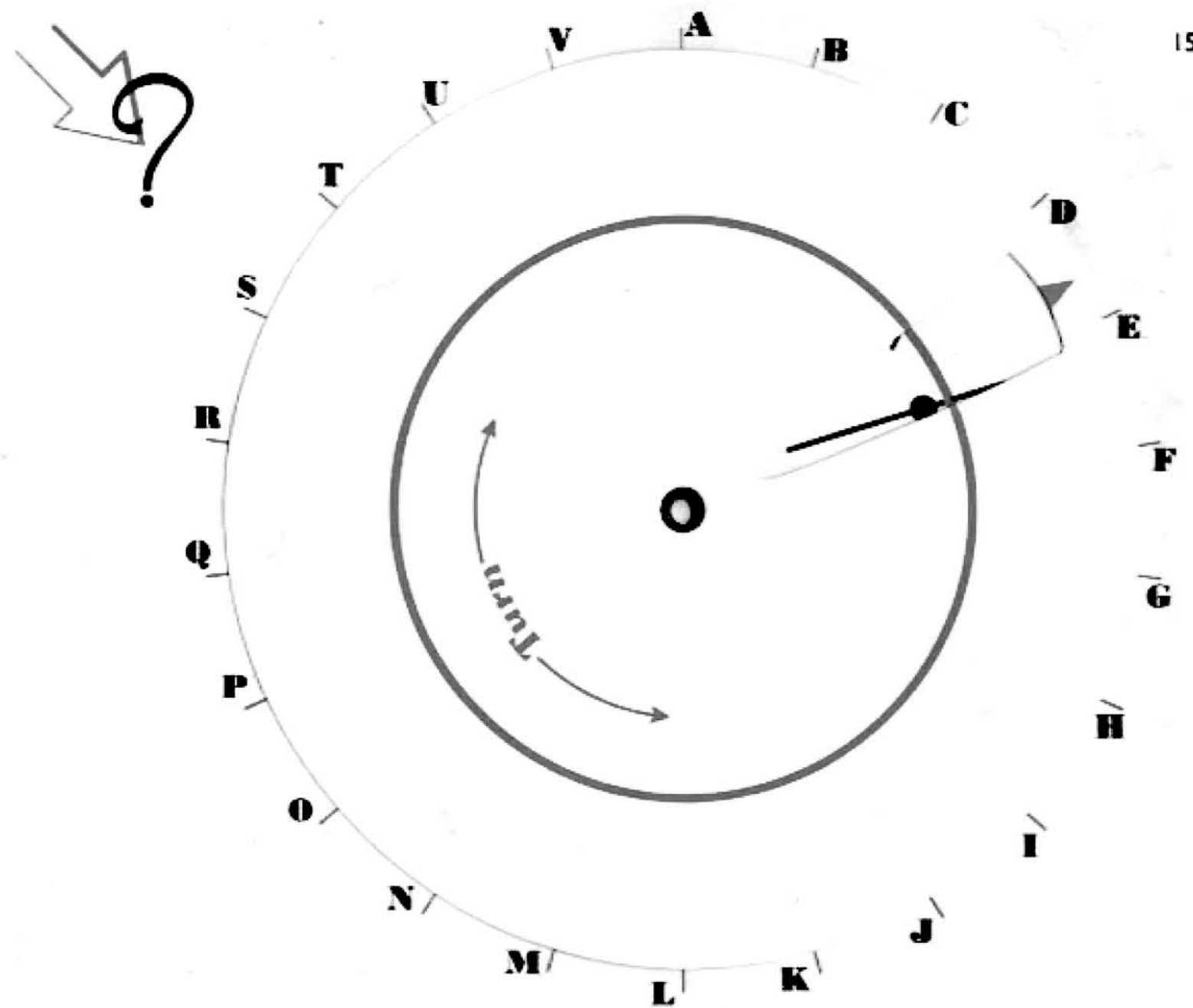
1/5 500 yds.

1/6 600 yds.

You will then be giving the range of the Fw190.



This method is definitely dated



JOT DOWN THE RANGES OF 'A' TO 'V'

Solution

A=400 yds. B=500 yds. C=300 yds.

D=400 yds. E=200 yds. F=300 yds.

G=400 yds. H=200 yds. I=300 yds.

J=600 yds.

K=200 yds. L=400 yds. M=600 yds.

N=500 yds. O=200 yds. P=300 yds.

Q=500 yds. R=400 yds. S=300 yds.

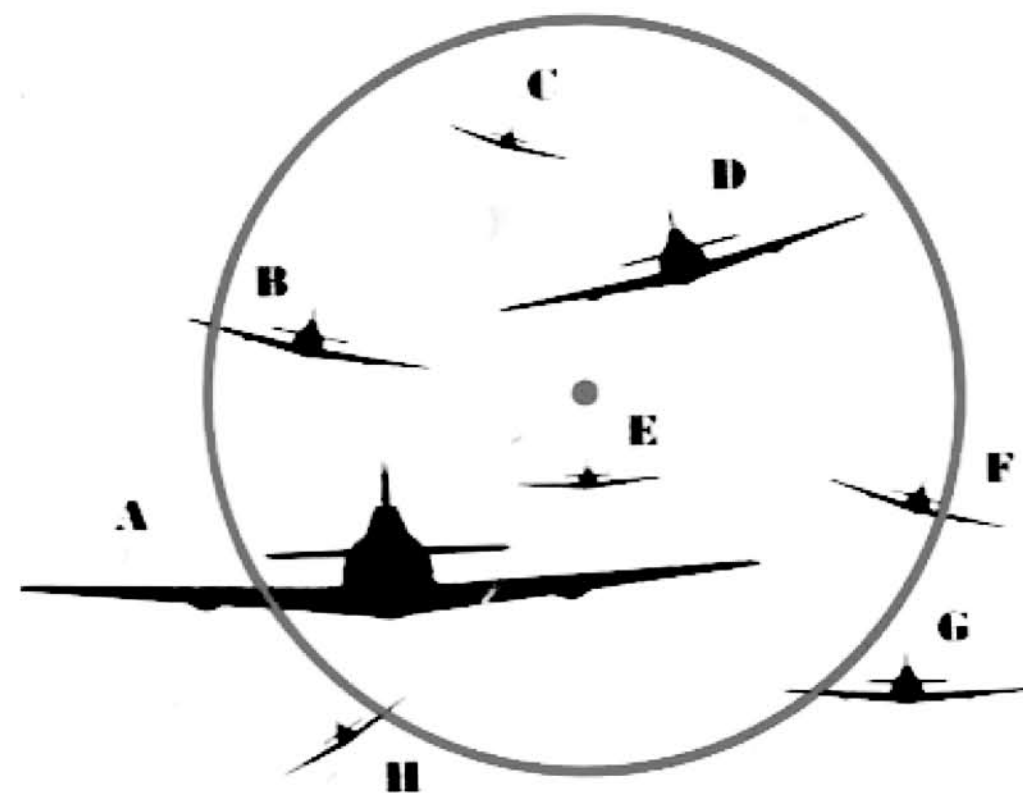
T=300 yds. U=200 yds. V=600 yds.



Yes, I thought I missed this page



Now the Hun has appeared. You ought to know what to do to estimate his range. Jot down your answers.



Solution

A = 100 yds. B = 300 yds. C = 600 yds.

D = 200 yds. E = 500 yds. F = 400 yds.

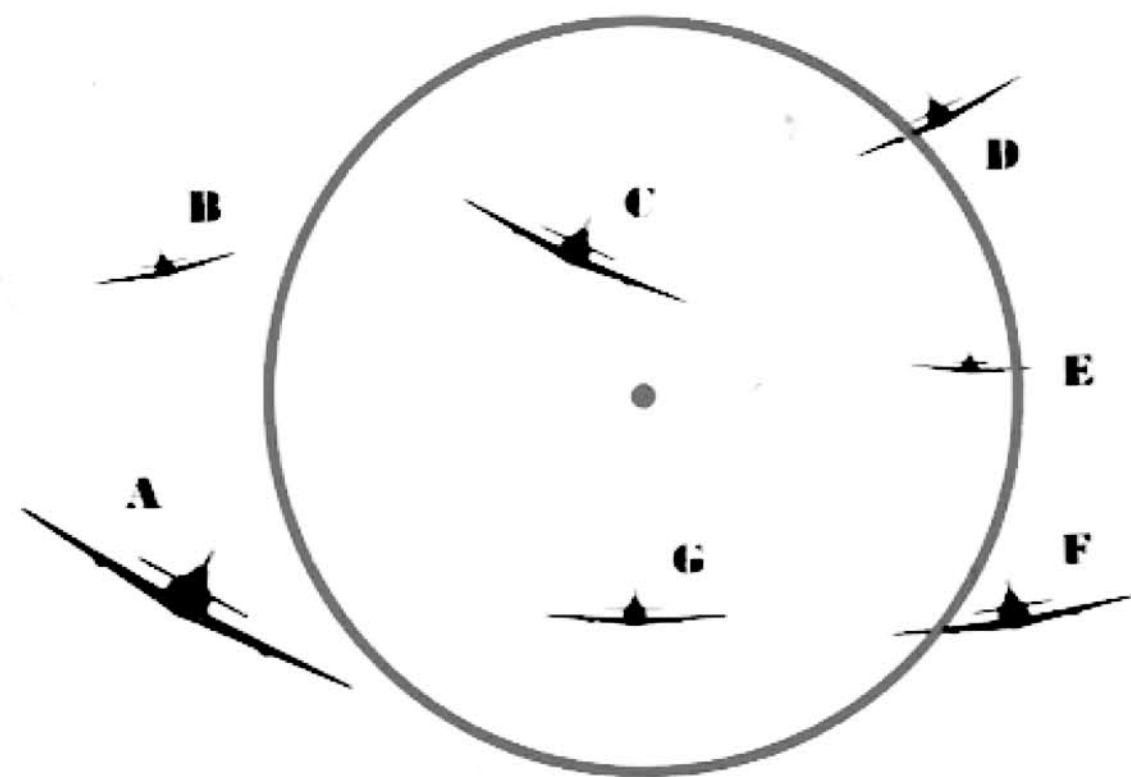
G = 300 yds. H = 500 yds.



The Hun knew his range



Try these too



Solution

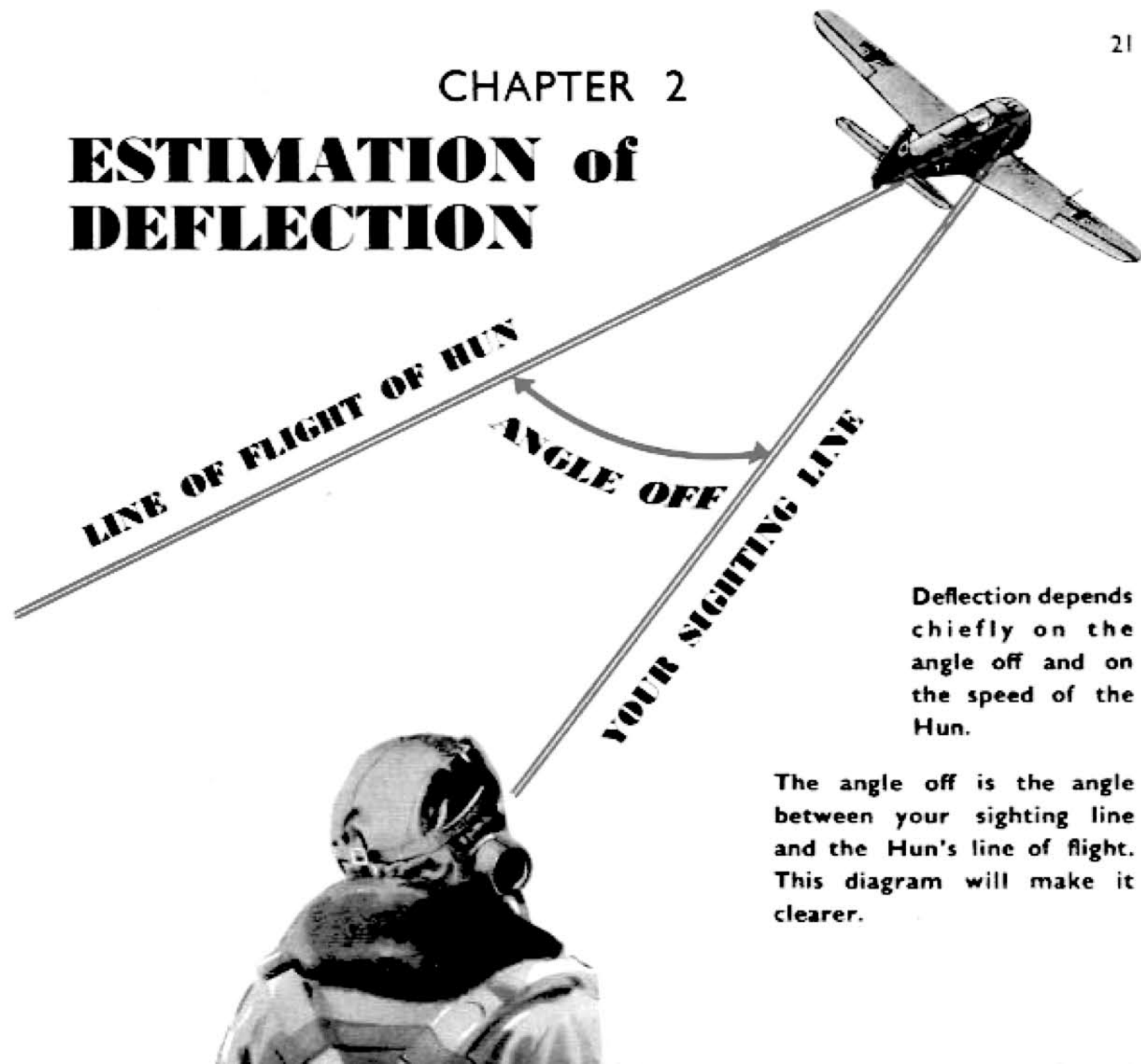
A=200 yds. B=500 yds.
C=300 yds. D=400 yds.
E=600 yds. F=300 yds.
G=400 yds.

The chapter ends



CHAPTER 2

ESTIMATION of DEFLECTION



Deflection depends chiefly on the angle off and on the speed of the Hun.

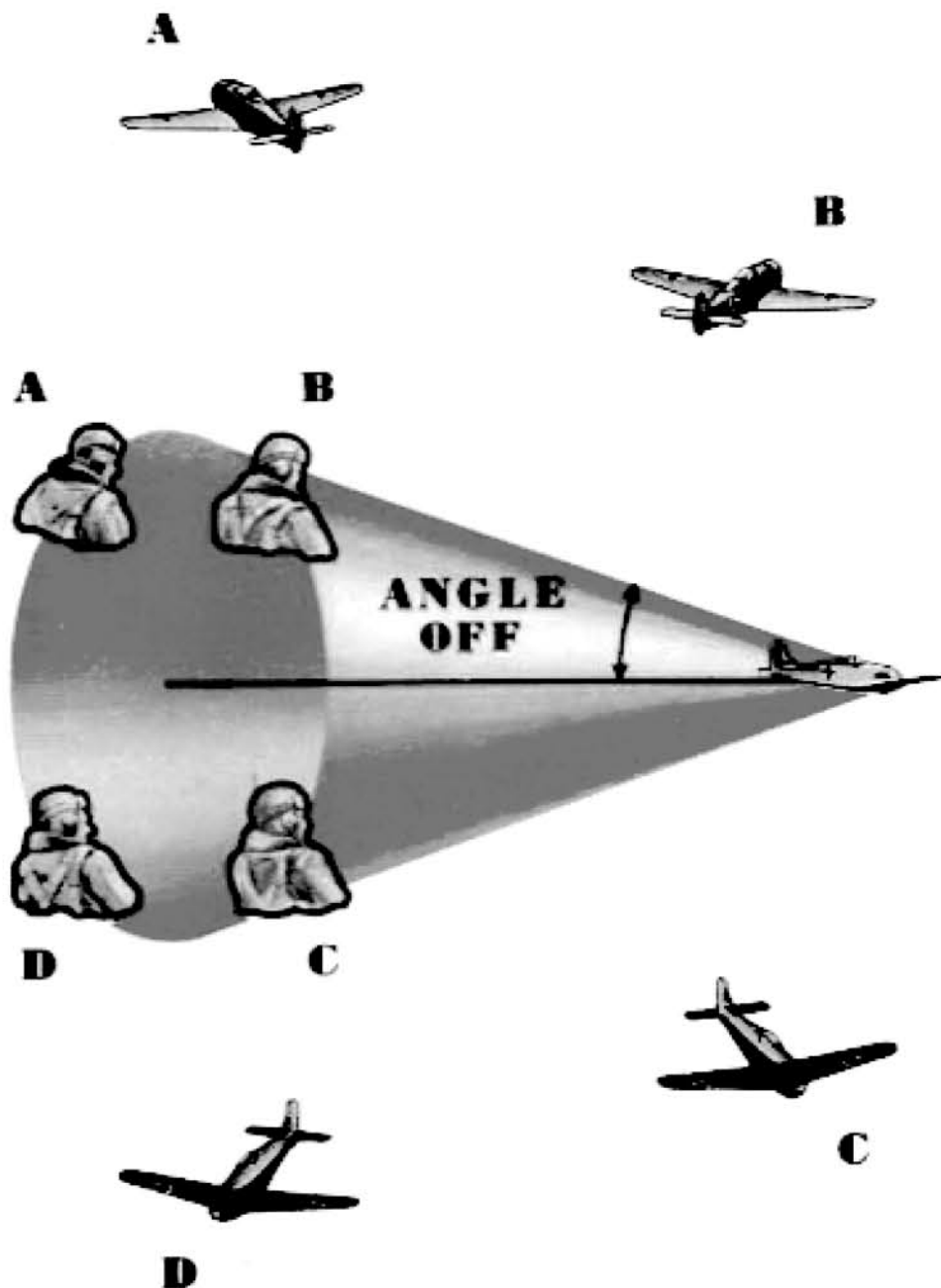
The angle off is the angle between your sighting line and the Hun's line of flight. This diagram will make it clearer.



The picture of the Hun presented to the eye can differ even when the angle off remains the same.





















For example, whether you are at A, B, C, or D, the angle off is the same. The pictures of the Hun, however, are different, as shown in the diagrams corresponding to A, B, C, and D.

This makes it difficult to estimate angle off without a great deal of practice.

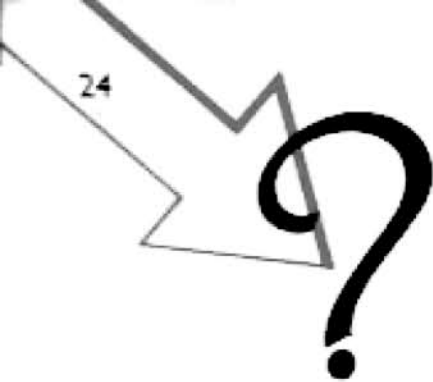


Stern  View

ANGLE OFF

					5°
					10°
					20°
					30°

Make yourself familiar with these pictures



Jot down what you think are

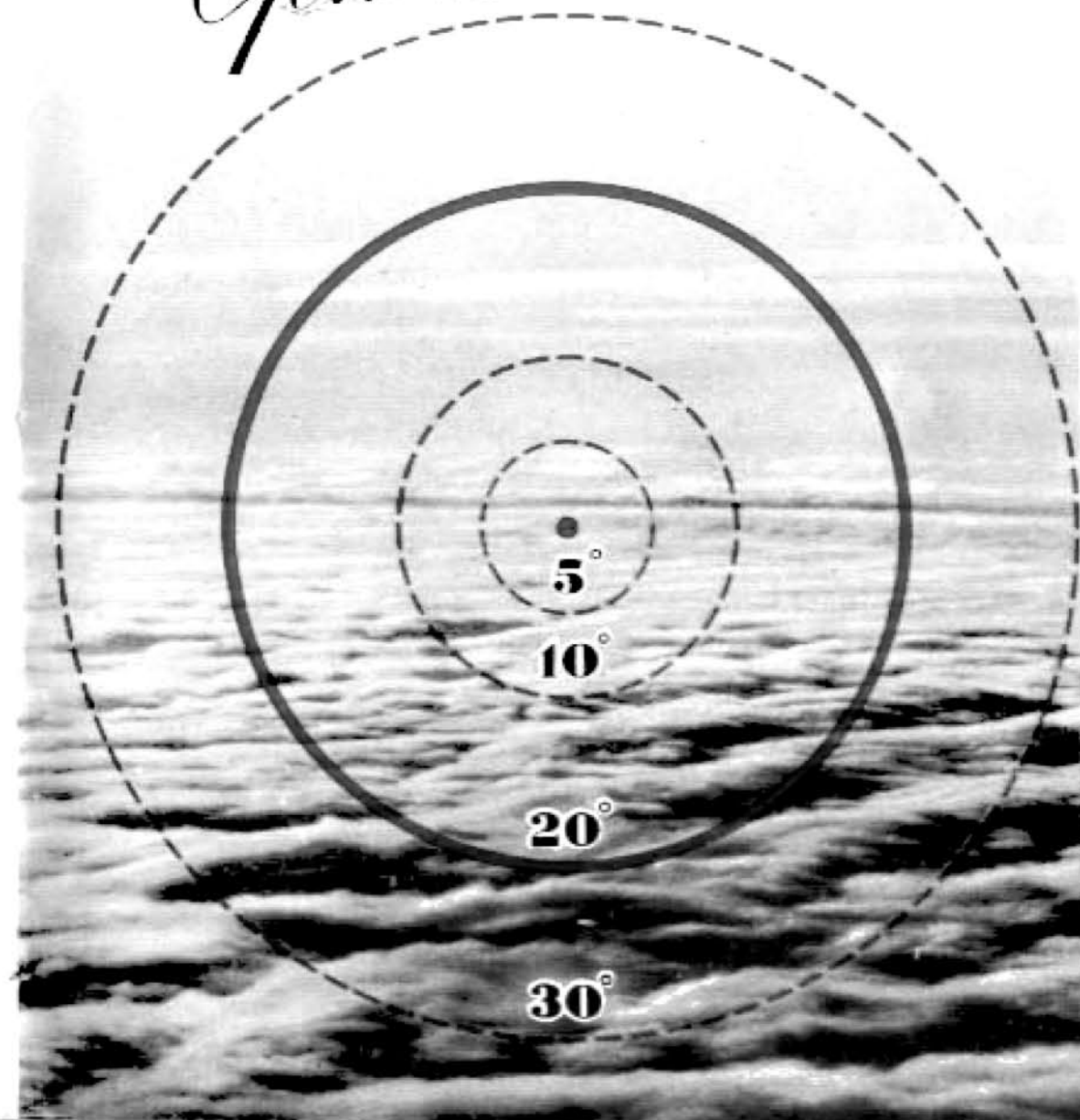
the angles off for these planes

Solution

A	_____	20°
B	_____	5°
C	_____	5°
D	_____	5°
E	_____	20°
F	_____	20°
G	_____	30°
H	_____	5°
I	_____	30°
J	_____	10°
K	_____	10°
L	_____	30°

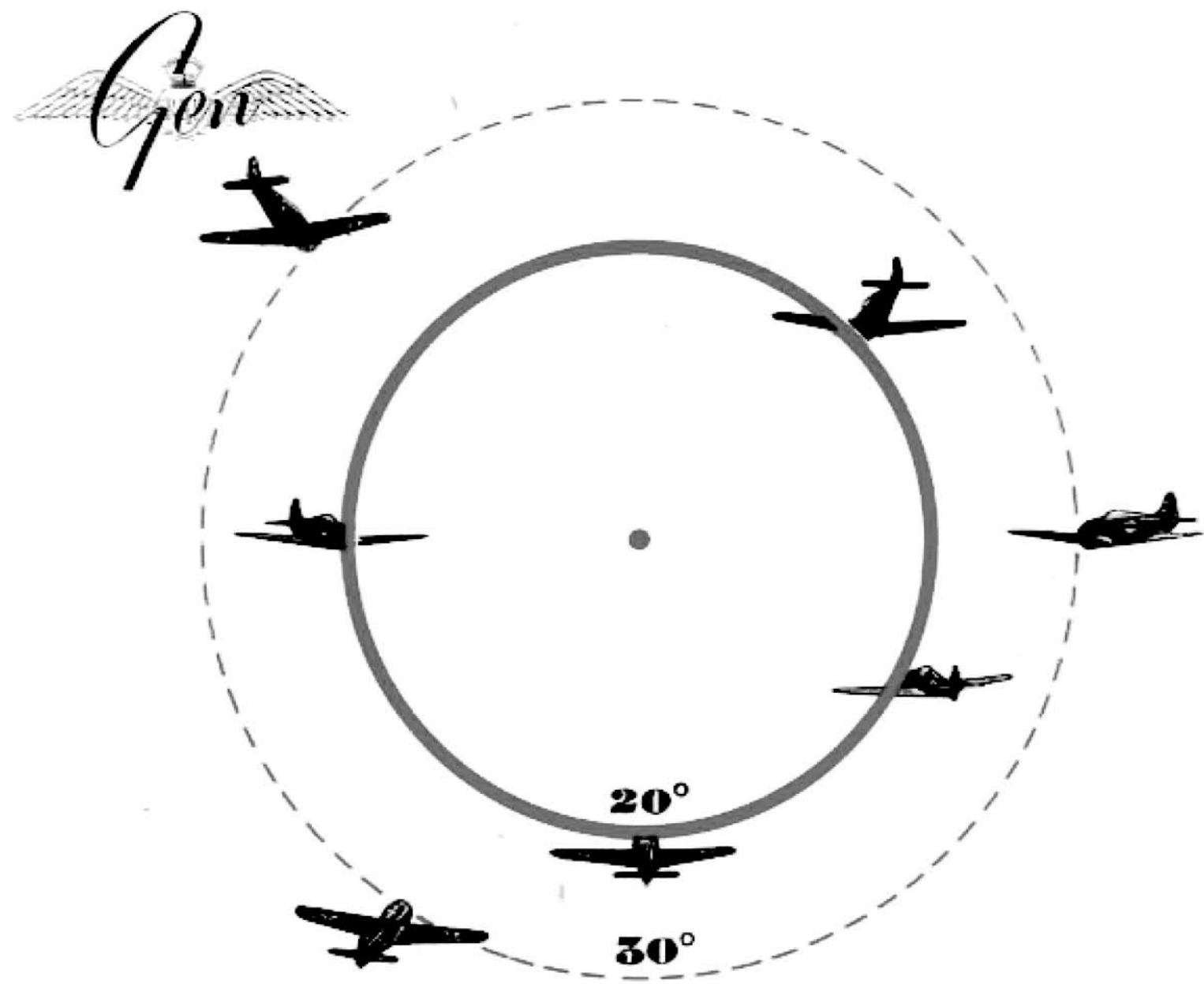


Gen

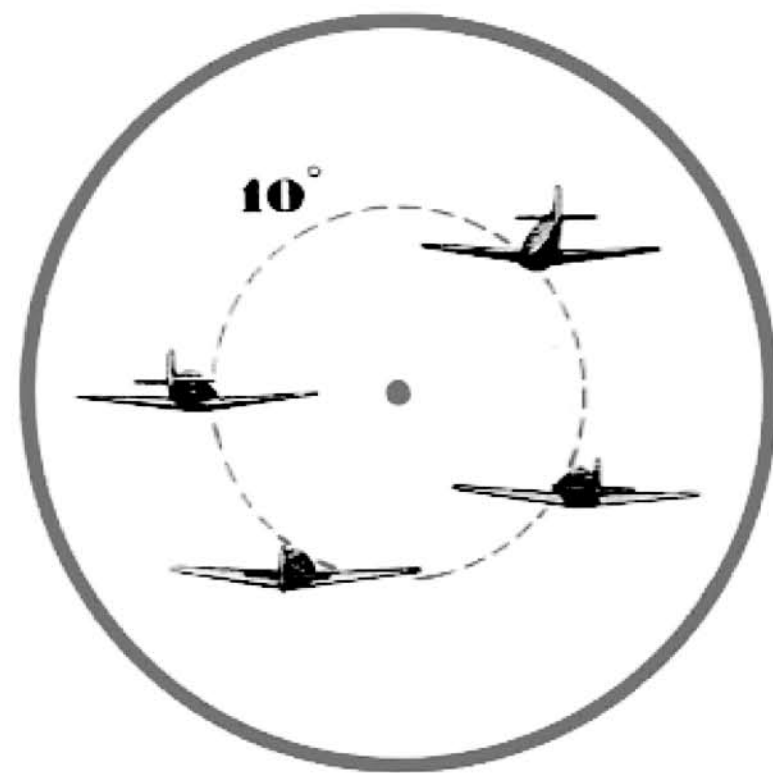


This diagram shows where the target ought to appear in the sight ring, according to the angle off. The nose of the target should touch the appropriate circle. (Notice that for 20° angle off, this circle is the sight ring).

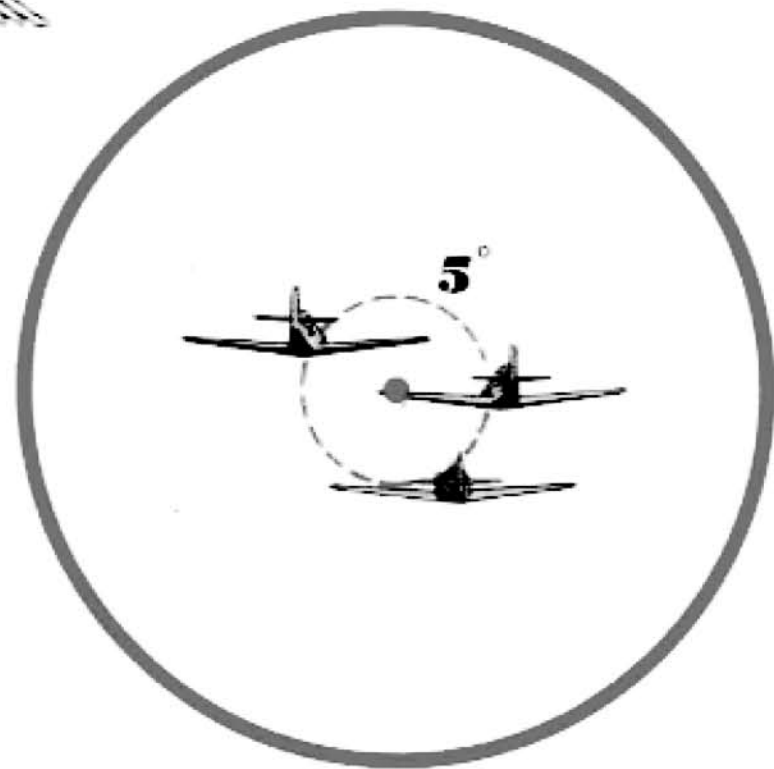
Note—The diagram is almost exactly correct, under average combat conditions, for 1303 in. ammunition against a 300 m.p.h. target, or for 20 mm. ammunition against a 350 m.p.h. target. A change in target speed of 50 m.p.h. alters these allowances by only one-sixth, and deviations from the assumed combat conditions alter the allowances even less. Such variations are nearly always covered by the bullet pattern, and thus the scheme shown here covers a wide range of conditions.



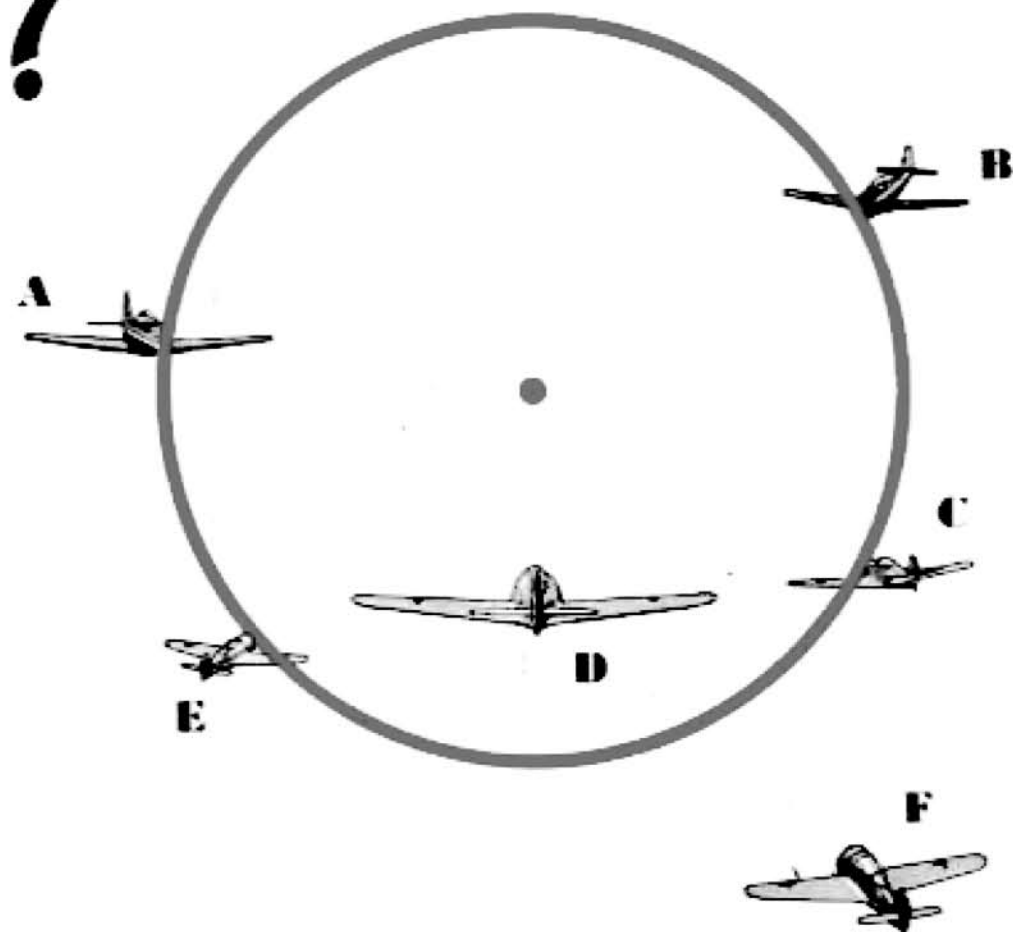
Diagrams on pp. 28, 29 and 30 show the Hun at various angles off, and with various appearances for the same angle off, positioned correctly. Study these carefully.



Combat films show that very often only half the correct allowance is made !



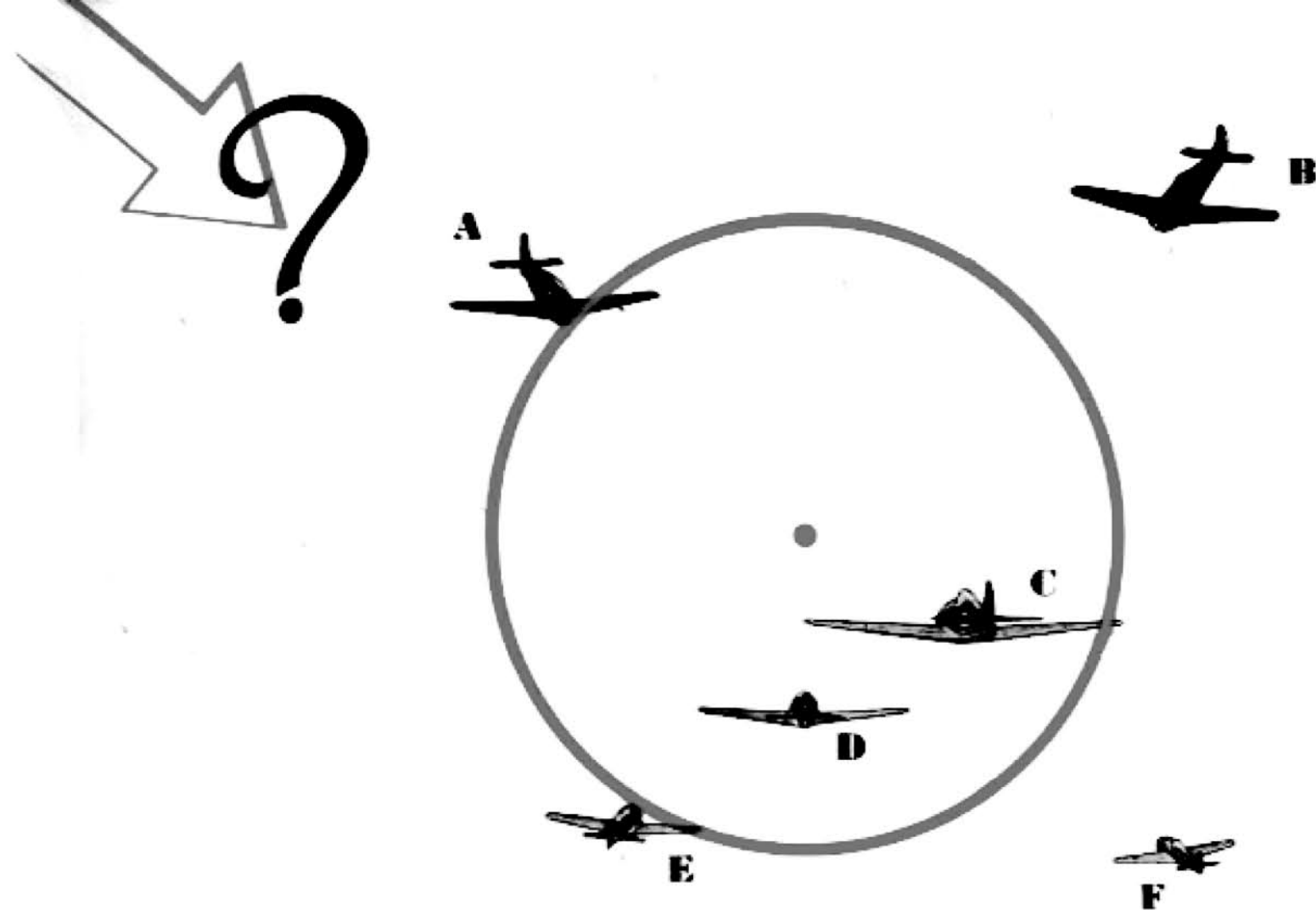
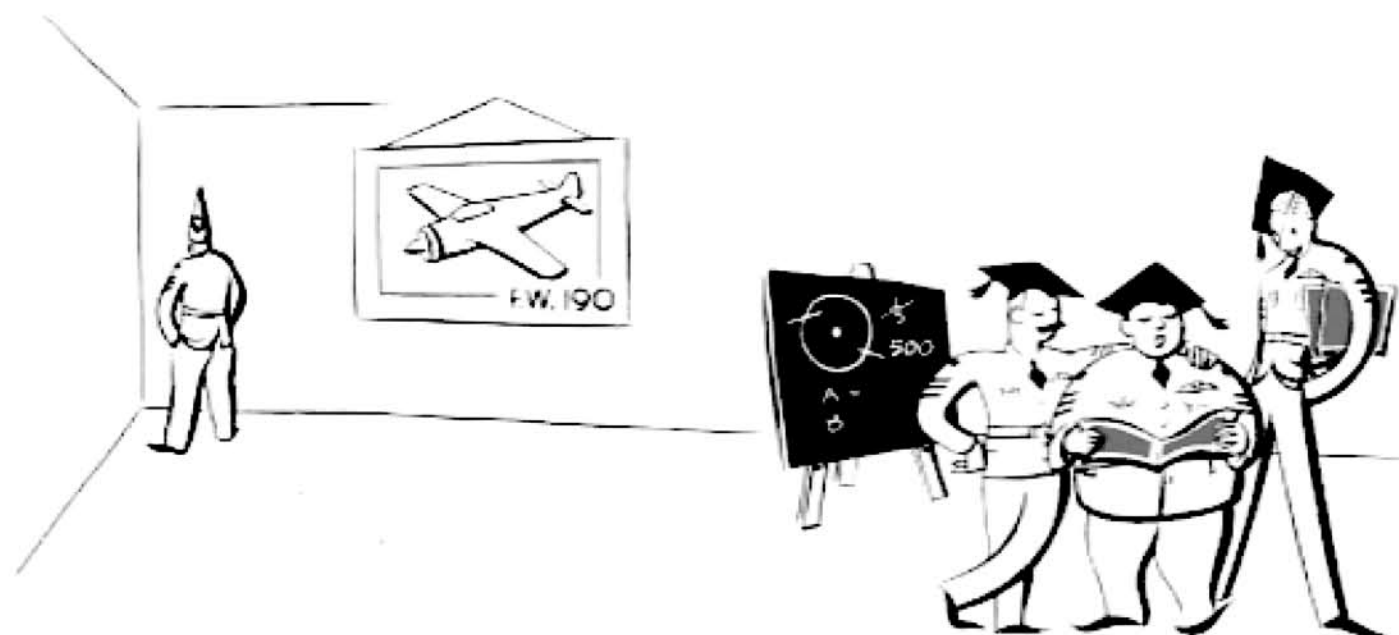
Study and remember



Some of these aircraft are positioned correctly: some are not. For each aircraft, estimate the angle off. Is correct deflection being made? If not, is it too great or too small?

Solution

	ANGLE OFF	DEFLECTION
A	10°	TOO GREAT
B	20°	O.K.
C	20°	O.K.
D	10°	O.K.
E	30°	TOO SMALL
F	30°	O.K.



Try these exercises as well—you can't have too much practice!

Solution

	ANGLE OFF	DEFLECTION
A	20°	O.K.
B	30°	O.K.
C	10°	O.K.
D	10°	O.K.
E	20°	O.K.
F	30°	O.K.



Gen

CHAPTER 3

RANGE AND DEFLECTION

We now combine the work of the first two chapters.

1. Range

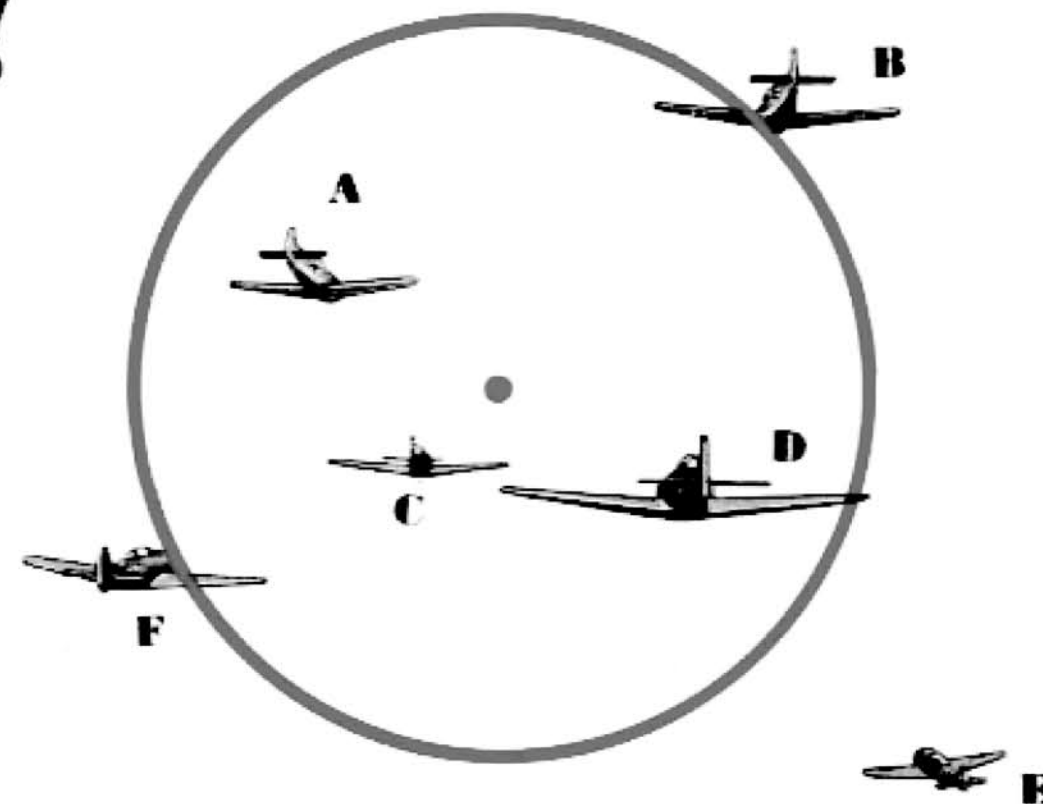
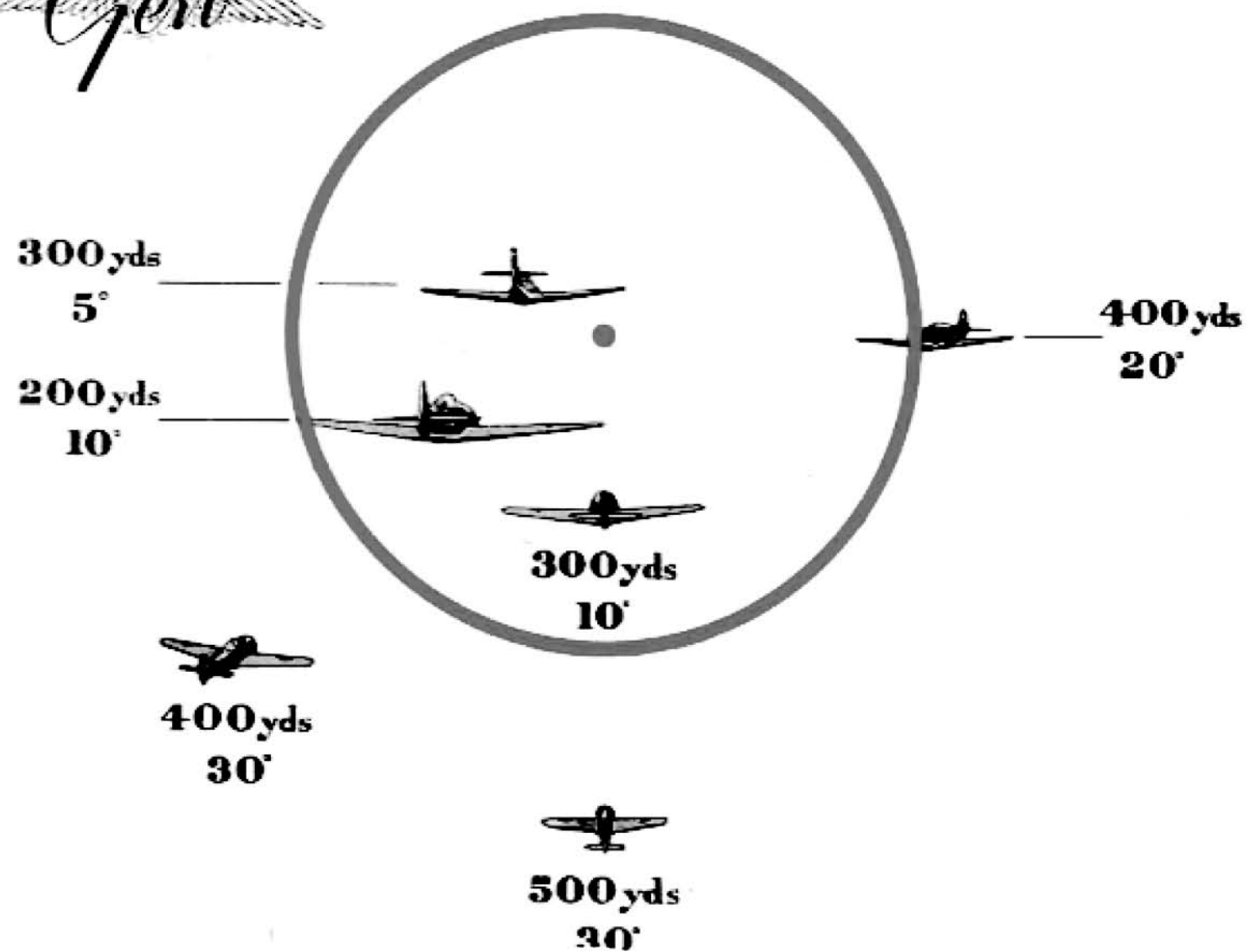
Estimate the number of times the span of the Fw 190 goes into the diameter of the sight ring. The range is that number of hundreds of yards. This method holds even when the angle off is as large as 30°. Remember always to concentrate on the span of the aircraft.

2. Deflection.

Estimate the angle off and position the enemy aircraft accordingly.

With practice these two operations should become one.

Look at these. You may not believe it, but the range, the angles off, and the deflections are correct.



1. Estimate the ranges of the aircraft shown on pp. 31 and 33.
2. Try your hand now at estimating the ranges and the angles off in this diagram. Is the deflection correct, too great, or too small?

Solution

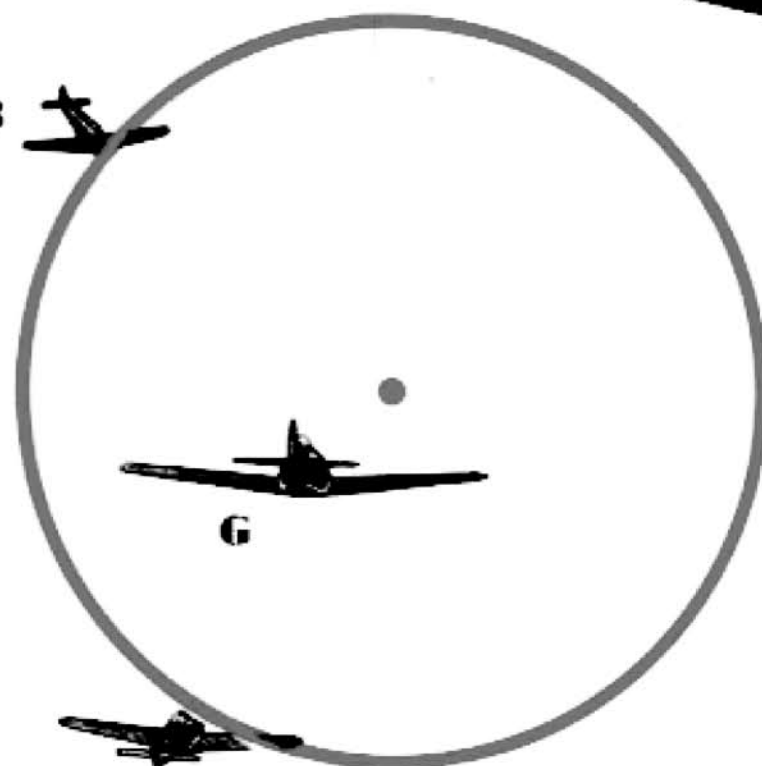
	RANGE	ANGLE OFF	DEFLECTION
A	400 yds.	20°	TOO SMALL
B	300 yds.	10°	TOO GREAT
C	400 yds.	5°	O.K.
D	200 yds.	5°	TOO GREAT
E	500 yds.	30°	O.K.
F	300 yds.	20°	O.K.

**PAGE
31**

A	300 yds.
B	400 yds.
C	400 yds.
D	200 yds.
E	500 yds.
F	300 yds.

**PAGE
33**

A	300 yds.
B	300 yds.
C	200 yds.
D	300 yds.
E	400 yds.
F	500 yds.



Now try these

Solution

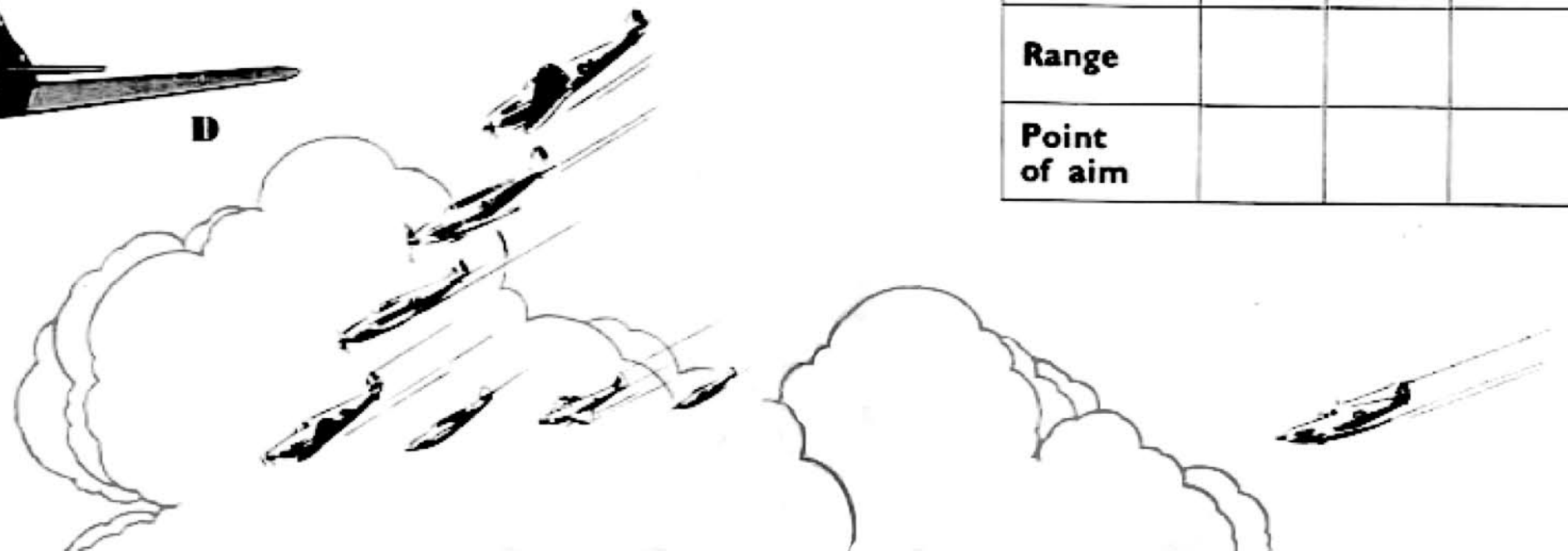
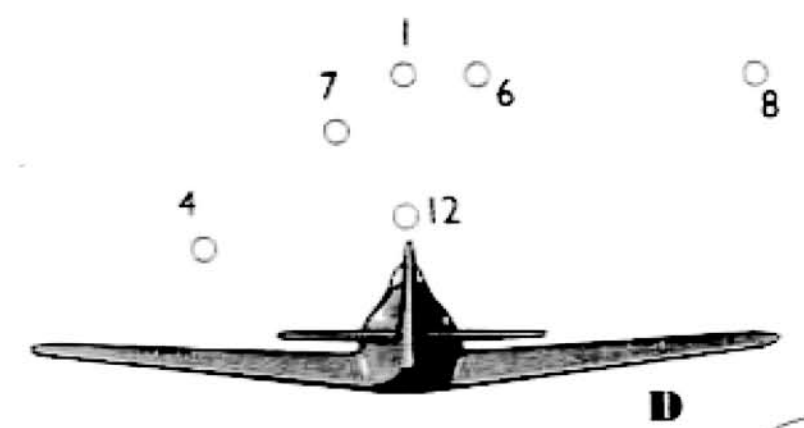
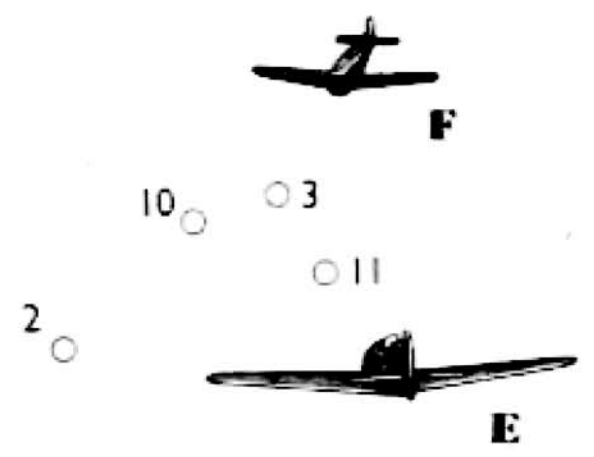
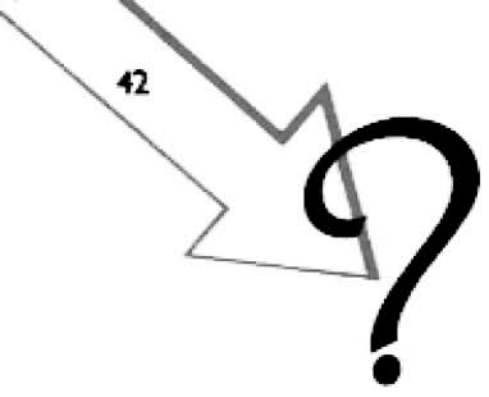
	RANGE	ANGLE OFF	DEFLECTION
A	300 yds.	20°	TOO GREAT
B	500 yds.	30°	TOO SMALL
C	300 yds.	20°	TOO GREAT
D	500 yds.	45°	TOO SMALL
E	300 yds.	30°	O.K.
F	300 yds.	20°	O.K.
G	200 yds.	5°	O.K.



To do these exercises correctly is not enough ; they must be done speedily.

Make up your mind to answer the following tests as quickly as possible. Get someone to time you—you can have your own back by timing him! Each test after the first has a time estimate given. See if you can beat it.

From now on use the celluloid ring which you will find in the pocket at the end of the book. Estimate the range of the aircraft shown, and the correct point of aim.



In the table below, fill in the range, and the number corresponding to what you think is the correct point of aim for each of the aircraft on the page opposite. Although no time limit is set in this instance, bear in mind that, in the subsequent tests, you are fighting against time as well as the Hun.

Aircraft	A	B	C	D	E	F
Range						
Point of aim						

Solution

	RANGE	POINT OF AIM
A	200 yds.	5
B	300 yds.	7
C	300 yds.	8
D	100 yds.	12
E	200 yds.	3
F	400 yds.	2



First speed test. Complete the table as in previous exercise, but remember that you are being timed.

Aircraft	A	B	C	D	E	F
Range						
Point of aim						

Solution

	RANGE	POINT OF AIM
A	400 yds.	4
B	200 yds.	6
C	300 yds.	3
D	300 yds.	10
E	400 yds.	1
F	200 yds.	5

IF (a) you have less than 10 items correct, or
 (b) you took more than 45 seconds, your
 performance is unsatisfactory.

More practice is indicated.



Beware the 'Waistammo' gremlins



Second speed test

11
○
13
○

2 ○ 9 ○
4 ○

6 ○ 10 ○
8 ○

3 ○ 5 ○
1 ○

12 ○ 13 ○
7 ○

Aircraft	A	B	C	D	E	F
Range						
Point of aim						

Solution

	RANGE	POINT OF AIM
A	300 yds.	6
B	200 yds.	13
C	300 yds.	2
D	500 yds.	3
E	400 yds.	1
F	200 yds.	7

TIME 45 secs.

Fighter Pilots should—



**BE
MODEST**



**BE
TOUGH**



**FLY LIKE
ANGELS**



**AND SHOOT LIKE
W/Cdr. W. TELL**

