F211

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CURRENT TACTICAL ORDERS AND DOCTRINE
U. S. FLEET AIRCRAFT
VOLUME ONE
CARRIER AIRCRAFT

USF-74 (REVISED)

[illegible]
Registered Publication Section

PREPARED BY
COMMANDER AIRCRAFT BATTLE FORCE
MARCH -- 1941

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UNITED STATES PACIFIC FLEET
AIRCRAFT, BATTLE FORCE

Fleet Air Detachment,
Naval Air Station,
Pearl Harbor, T. H.,
20 April, 1941.

From: Commander Aircraft, BATTLE FORCE.
To : HOLDERS OF USF-74, (REVISED).

Subject: Current Tactical Orders and Doctrine, U. S. Fleet Aircraft — Volume I, Carrier Aircraft, USF-74 (Revised).

1. This publication, Current Tactical Orders and Doctrine, U. S. Fleet Aircraft — Volume I, Carrier Aircraft, USF-74 (revised) is one of three volumes of Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, prepared under the supervision of Commander Aircraft, BATTLE FORCE, in accordance with directives from the Commander-in-Chief, U. S. Fleet, for the use and guidance of the Fleet. The short and long titles for these publications are listed below:

(a) USF-74 (revised). Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume I, Carrier Aircraft (Parts 1 to 5 inclusive).

(b) USF-75 (revised). Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume II, Battleship and Cruiser Aircraft (Parts 6 and 7).

(c) USF-76. Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume III, Patrol Aircraft (Part 8).

2. All recommended changes to this publication shall be forwarded to Commander Aircraft, ~~Battle~~ Force Pacific Fleet, for approval.

3. Part I of this Volume (USF-74 revised) is applicable to all Fleet Aircraft. The parts of these three volumes have been numbered consecutively throughout the three volumes for continuity.

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8. This publication becomes effective upon receipt and supersedes the following publications:

(a) USF-74, register numbers 1-3200. All copies bearing register numbers below 3200 shall be destroyed by burning and report made to the Chief of Naval Operations (Registered Publication Section);

(b) Experimental Carrier Type Tactics 1-39 and Aircraft Tactical Bulletin (BTI) 2-40, all copies of which shall be destroyed by burning and report made to Commander Aircraft, Battle Force.

W. F. HALSEY
Vice Admiral, U. S. Navy.

CORRECTION PAGE

CHANGE NO.	RPM	DATE ENTERED	SIGNATURE	CHANGE NO.	RPM	DATE ENTERED	SIGNATURE
	1377	PRINTED HEREIN	J. Greaney RPS				
	1390	PRINTED HEREIN	JMS				
	1498	28 Dec '44	JMS				
*M.D.	1530	"	JMS				
	1623	"	JMS				
	1667	"	JMS				

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CHAPTER 1

INTRODUCTORY

FORMATIONS — GENERAL

1-100. The basic aircraft tactical organization is the section of two or three planes. The aircraft division may consist of either two or three sections depending on the size of the squadron and the task assigned. If the number of planes available exceeds three sections, increased striking power is obtained by forming the squadron into two or three divisions. As types, models and missions vary so widely, distances, intervals and heights, (step up or step down), for formations are not specified, nor are there prescribed formations for any particular purpose.

FORMATIONS — GOVERNING FACTORS

1-101. (a) The formation must accomplish the purpose for which it is intended.

(b) The formation must be flexible, so that it may be readily altered to meet a different purpose and so that it may be readily closed up in event of vacancies.

(c) The formation must be simple, to provide for easy control, facilitate station keeping, and afford best lookout efficiency.

(d) The formation must be maneuverable.

(e) The formation must provide for the rapid development of the combined offensive and defensive power.

(f) The formation must be able to defend itself from attacks from any direction.

(g) The formation must offer the least possible degree of visibility from the surface.

DEFINITIONS

1-102. (a) DISTANCE — The horizontal space between planes within a section.

(b) HEIGHT — The vertical space between planes within a section. Height may be above or below the plane ahead depending upon whether the formation is stepped up or stepped down.

(c) INTERVAL — The horizontal space between the section leader's plane and the plane next ahead in the formation.

(d) STANDARD DISTANCE, HEIGHT AND INTERVAL — That distance, height and interval specified by a squadron commander as standard for his particular squadron.

(e) OPEN DISTANCE, HEIGHT AND INTERVAL — That distance, height and interval at which aircraft, while concentrated, can be flown with minimum attention to strict formation keeping.

(f) SECTION - The basic tactical unit of the aircraft division. If of three planes it consists of the section leader, number 1, with number two wing man on the left, and number three on the right. These numerical designations of the wing planes remain unchanged and follow them to subsequent positions. If the section consists of two planes the leader is number one and the second plane number two and may fly either on the right or left as directed.

(g) DIVISION — An organization consisting of two or more vessels of the same type, or two or more sections of aircraft of the same type. The aircraft division is normally the basic tactical unit of the squadron, for cruising, attack, or defense.

(h) SQUADRON — An organization consisting of two or more divisions of vessels or one or more divisions of aircraft. It is normally composed of vessels or aircraft of the same type. The term "squadron" may also be applied to a separate organization of minor strength whose commander operates directly under the instructions or orders of the department. The aircraft squadron is the basic administrative and tactical unit of AIRCRAFT, U. S. FLEET.

(i) FORMATION — A prescribed arrangement of airplanes in a section, division, or squadron for maintaining concentration in the execution of a mission. Within any formation, it should be possible to transmit visual orders and instructions rapidly and positively.

(j) DISPOSITION — A prescribed arrangement of all the tactical units composing a flight or group.

(k) GROUP — An aircraft group is an organization consisting of two or more squadrons of aircraft.

(l) WING — An aircraft wing is an organization consisting of two or more aircraft groups.

(m) FLIGHT — A general term used to refer to any or all aircraft in the air.

(n) MANEUVER — A change of course or of the form of a disposition or formation.

(o) LIAISON PLANE — An airplane, equipped with superior radio and navigational facilities, hence normally a two-seater, assigned to a squadron of single-seaters, and operated with that squadron. When accompanying the squadron, the position of the liaison plane will be dictated by the type of plane, the mission, the difficulties of navigation and the instructions issued by the squadron commander.

(p) TWO PLANE UNITS — For vessels carrying ~~four~~ two aircraft as a unit, the unit shall be considered as a division of the squadron.

(q) FOUR PLANE UNITS — For vessels carrying four aircraft as a unit, the unit shall be considered as a division of a squadron, ~~the division consisting of two 2-plane sections.~~

SUMMARY OF SIGNALS

1-103. There are summarized below the signals commonly employed. A still arm signal directs the placement of planes within a section whereas a pumped arm signal directs the placement of sections within a division. For ready reference the paragraph in which the signal is discussed is noted.

SIGNAL	MEANING
Arm raised vertically over head (on ground)	Prepare to take-off. (1-200)
Arm raised vertically over head (in the air)	Form echelon. (1-201)
Shake elevators	Form vee. (1-202)
Series of small zooms	Form vee or close up. (1-208)
Series of pronounced zooms	Join up.
Arm held horizontally	Form line. (1-205)
Wave back with palm of hand	Take open distance (open out). (1-207)
Pat side of fuselage	Close up. (1-208)
Thumb poked over shoulder	Form A-B-C. (1-209)
Swish tail	Form column. (1-210)
Thumb poked vertically downward	Take step-down formation. (1-211)
Thumb poked vertically upward	Take step-up formation. (1-212)
One wing plane stepped down	Form six-plane divisions (from nine-plane divisions). (1-308).
One wing plane stepped down	Form nine-plane divisions (from six-plane divisions). (1-310).
Leader shades eyes with hand and looks from side to side	Form scouting line. (1-523).
Succession of pronounced zooms followed by circling	Rendezvous scouting line. (1-524).
Shake wings and elevators by rotary motion of stick	Break-up. (1-213)
Shake ailerons	Execution signal.
Hand waved in front of face	Negative last tactical signal.
Shake fist	Ammunition, bombs, or torpedoes expended.

Cranking motion of hand	Retract or extend wheels. (1-214 or 1-215)
Flap hand up and down	Lower flaps.
Fist thrust forward twisting wrist	Low propellor pitch to higher pitch. (1-216)
Extended fist smartly drawn toward body, twisting wrist	High propellor pitch to lower propellor pitch. (1-217)
Rotate clutching hand, arm extended	Shift gasoline suction. (1-218)
Head moved backwards	Slow down.
Head moved forward	Speed up.
Head nodded to right or left	I am turning to right or left.
Rock wings from side to side	Attack. (1-219)
Rocking of wings by a following plane	We are being or about to be attacked. (1-608b).
Circle hand horizontally	Form Lufberry circle. (1-630)
Blow a kiss	Leaving the formation. (1-603)
Leader pats self on head, points to number two plane, holds up one finger then blows a kiss	Leader shifting lead to number two plane. (1-603)
Leader pats self on head, points to number two plane, holds up two fingers and blows a kiss Number two plane has his number three cross over into opposite echelon and back	Leader shifting lead to second division. (1-604)
Leader with forearm erect, hand open, chops	Directs course to be steered. (1-503)
Leader beckons wing plane then points to vessel or object	Directs plane to investigate object or vessel.
Closed fist or open palm tapping	Dot, dash system of Morse characters. (1-702)
Taps earphones followed by holding nose	Radio out of commission. (1-703)
Taps earphones followed by patting head	I have taken over communications. (1-703)
Taps earphones and nods head	Radio is now in commission. (1-703)
Press closed fist with thumb	Check microphone button and keys. (1-703)
Taps earphones and points to plane being called	You are being called by radio. (1-703)
Arm bent across forehead (weeping)	I am having a forced landing. (1-802)

NIGHT TACTICAL SIGNALS

1-104. Night tactical signals are transmitted by section light or flashlight. Maneuvers at night must be kept to a minimum.

Signals:	R (.-.)	form right echelon*
	K (-.-)	form left echelon*
	V (...-)	form vee*
	X (-..-)	close up
	O (---)	open out
	ABC (.---...-.-.)	form A-B-C
	Long dash (————)	execute
	Succession of I's (.. .. ..)	break-up
	N (-)	negative last tactical signal

A	(.)	attack
W	(. - -)	wheels up or down
Turning off section light		Attention (signals to follow)

* If in a compound formation signal refers to movement of sections within the division, unless already in this formation, in which case the signal refers to planes within the sections.

CHAPTER 2

SIMPLE FORMATIONS

THE SECTION

SECTION I — THREE PLANE SECTIONS

TAKE-OFF

1-200. Preparatory Signal: Arm (either) raised vertically over head.

Execution Signal: Lower arm.

All pilots certify by repeating the preparatory signal that they have completed the take-off check-off list and that they are in all respects ready to take-off. The leader must ascertain that the preparatory signal has been repeated by the accompanying planes and that the path is clear for take-off before giving the signal of execution. The repeating of the preparatory signal is passed up the line from the last plane to the leader, each pilot being responsible that the signal has been made by the plane on the side away from the leader before he himself makes the signal.

VEE TO ECHELON

1-201.

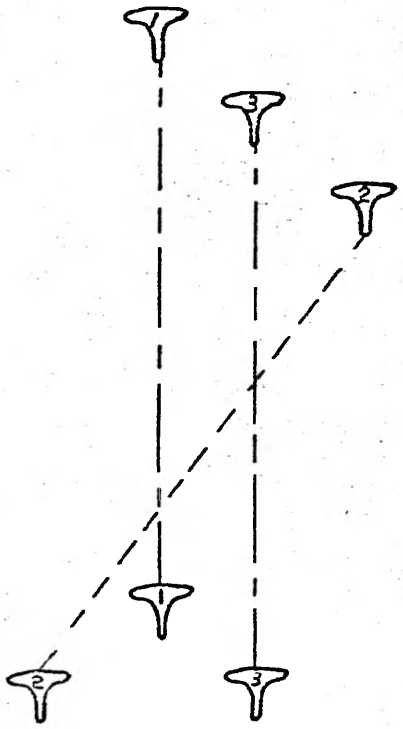


Fig. 1-1
To right echelon
Preparatory Signal:
Execution Signal:

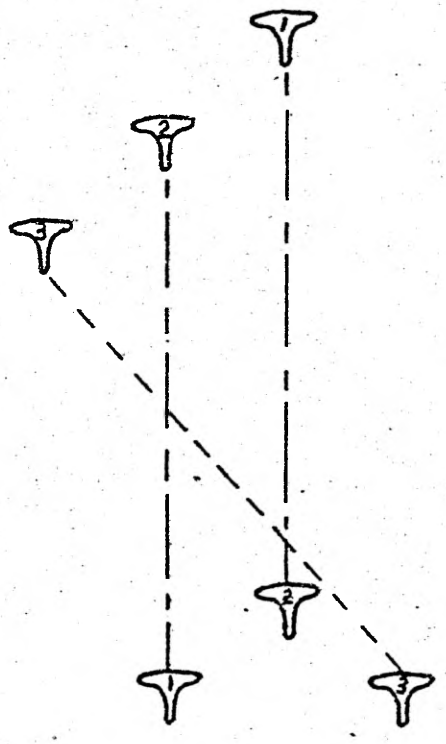


Fig. 1-2
To left echelon
Right (left) arm raised vertically over head.
Shake ailerons.

Leader maintains course and speed. On execution, number two (number three) plane slides over to new position as rear plane in echelon.

ECHELON TO VEE

1-202.

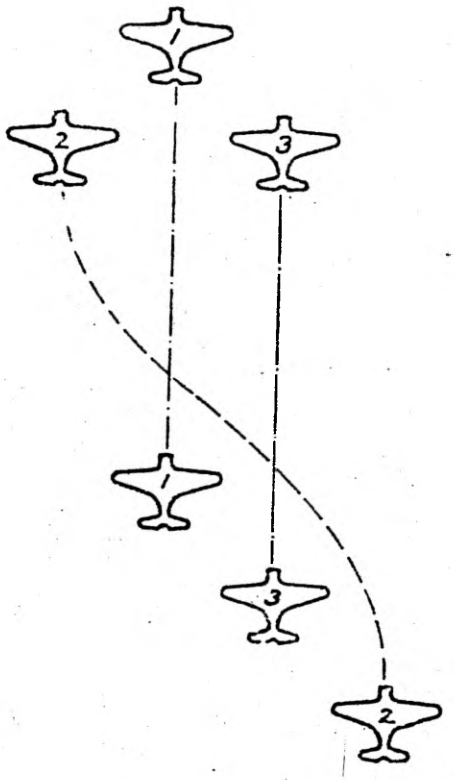


Fig. 1-3 Right Echelon to Vee

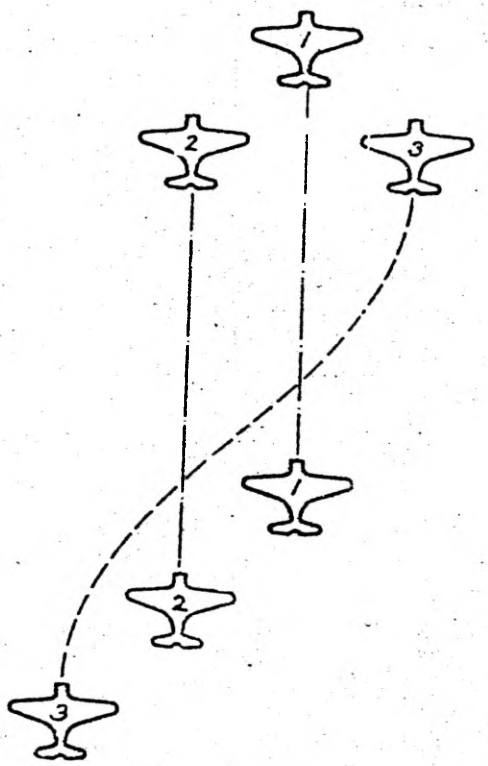


Fig. 1-4 Left Echelon to Vee

Preparatory Signal: Shake elevators.
Execution Signal: None.

Rear plane speeds up and slides over to Vee position.

ECHELON TO OPPOSITE ECHELON

1-203.

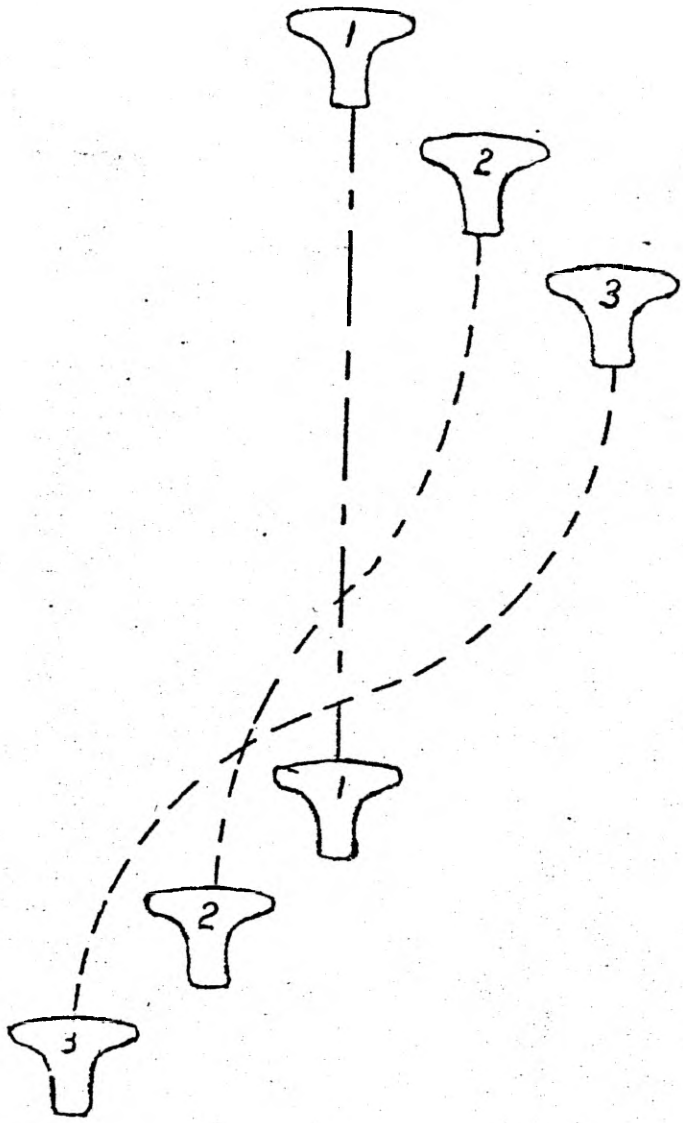


Fig. 1-5

Preparatory Signal: Right (left) arm raised vertically over head.
Execution Signal: Shake ailerons.

Leader maintains course and speed. On execution, both wing planes slide over to opposite echelon simultaneously.

NUMBERING OF PLANES

1-204. The sketch in paragraph 1-202 also shows the standard numbering of planes within a section. The same system applies to the numbering of sections within a division or divisions within a squadron. In a Vee the leader is number one, the left wing plane, number two, and the right wing plane, number three. If a right echelon is formed, the section (division) becomes inverted to the extent that the number two plane (section) occupies the rear position.

VEE TO LINE

1-205.

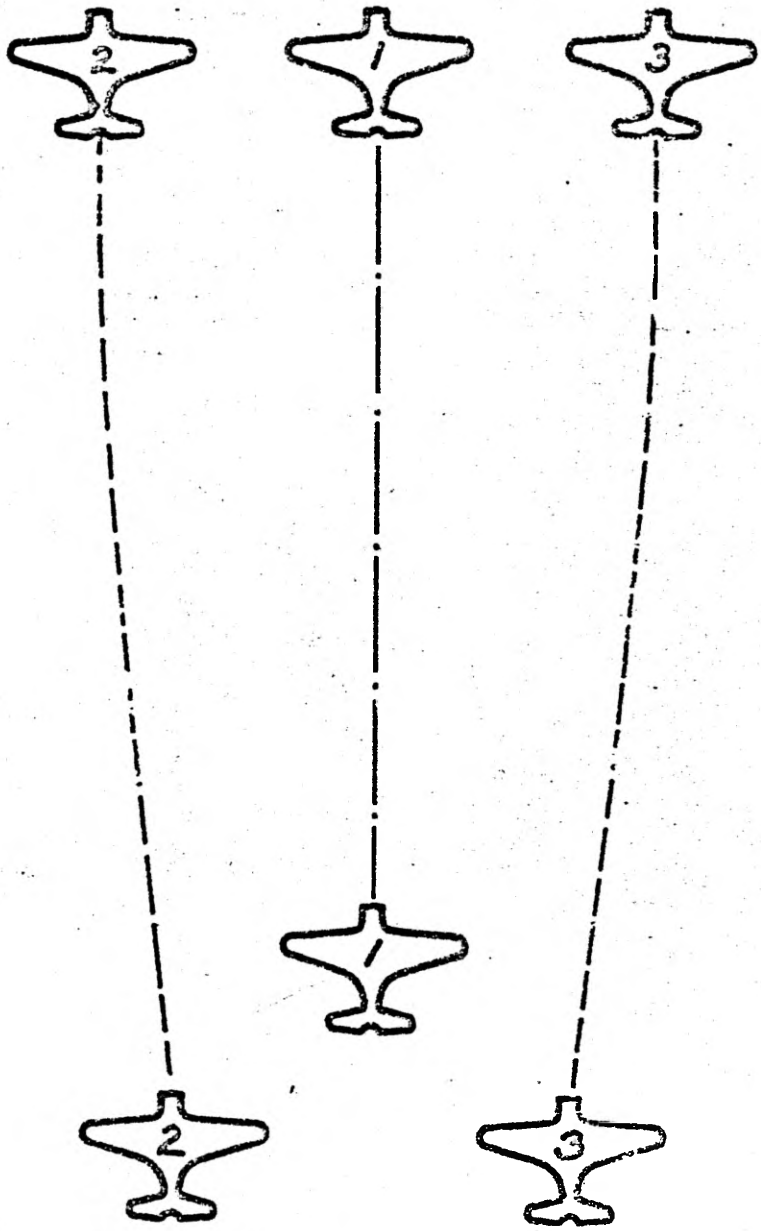


Fig. 1-6

Preparatory Signal: Arm held horizontally.
Execution Signal: Shake ailerons.

Wing planes speed up and take position on line at level of leader.

LINE TO VEE

1-206.

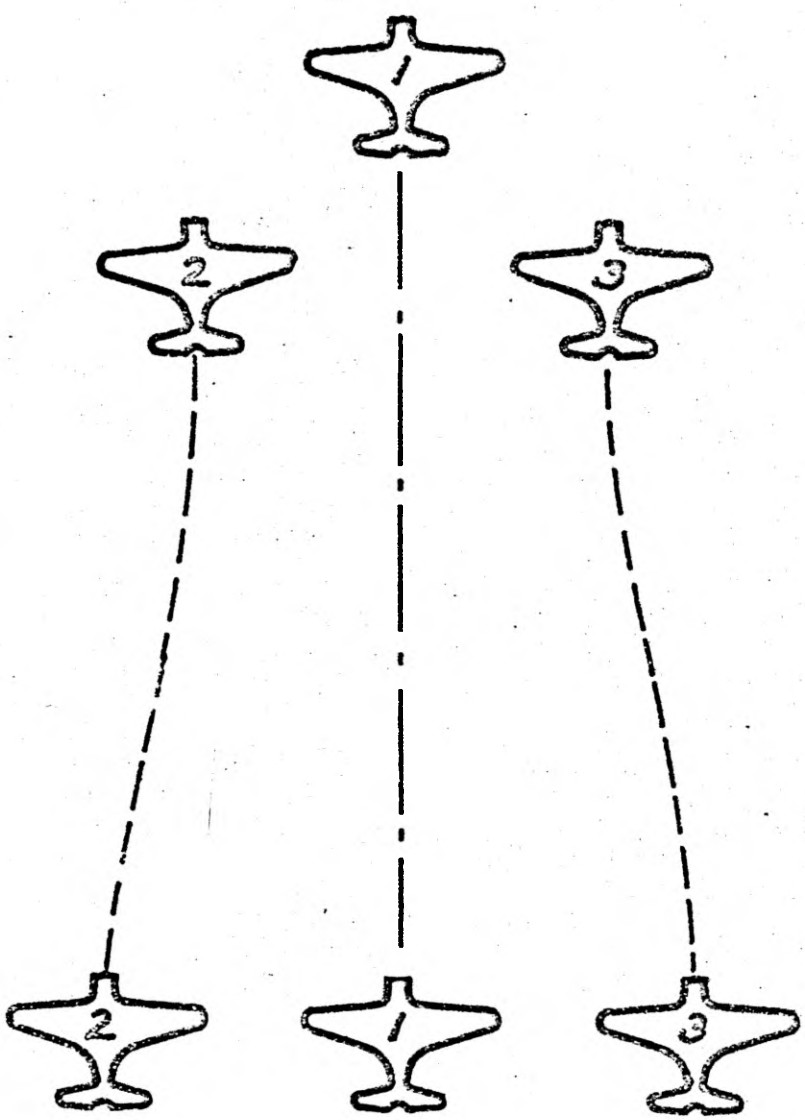


Fig. 1-7

Preparatory Signal: Shake elevators.

Execution Signal: None.

Wing planes drop back to Vee position.

VEE TO OPEN VEE

1-207.

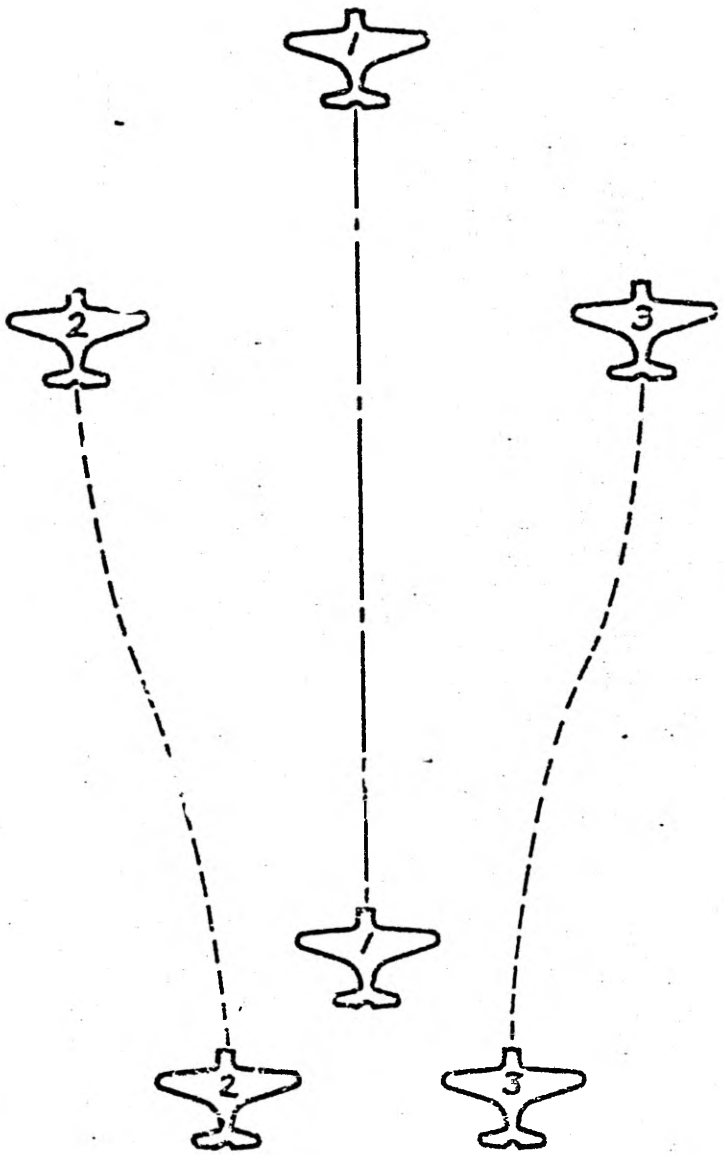


Fig. 1-8

Preparatory Signal: Wave back with palm of hand.
Execution Signal: None.

Planes open to double distance maintaining same relative positions. The distance may be further opened by repeating this signal.

OPEN VEE TO VEE

1-208.

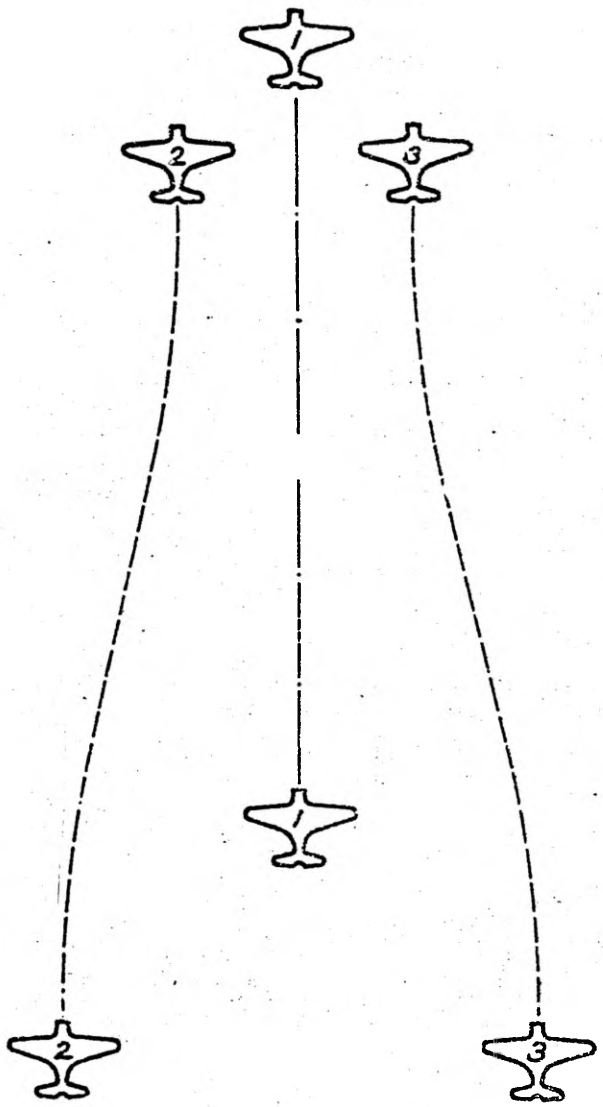


Fig. 1-9

Preparatory Signal: Pat side of fuselage or execute a series of short zooms.

Execution Signal: None.

Wing planes resume position in standard Vee formation as soon as practicable. The formation may be further closed up by repeating the signal. If the formation is so open that wing planes have difficulty seeing hand signals, a series of short zooms directs the closure.

EE TO A-B-C

1-209.

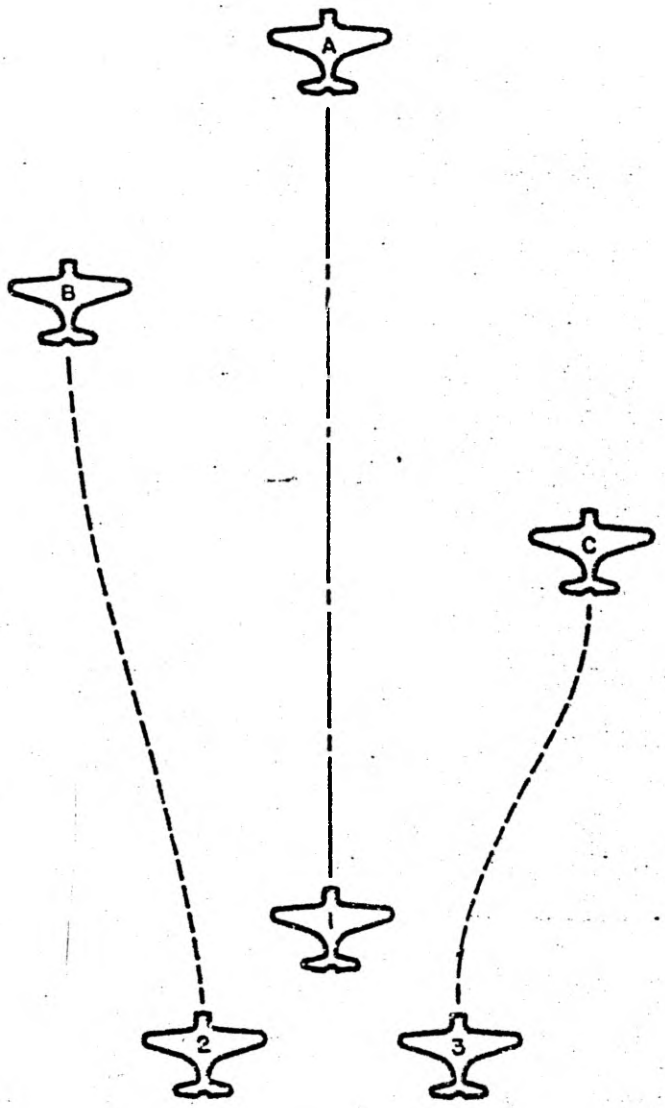


Fig. 1-10

Preparatory Signal: Poke thumb over shoulder.
Execution Signal: None.

Number one plane is designated "A"; number two, "B"; number three, "C". These designations are retained throughout all maneuvers. "A" is the leader, "B" is stationed on either quarter at approximately open height and distance. "C" is on the other quarter at approximately double open height and distance.

(a) Shallow turns in A-B-C formation are accomplished without cross-over by following planes. "B" and "C" tend to tail in behind the leader, retaining their step-up. Upon completion of turn, "B" and "C" return to normal bearings on respective quarter of leader.

(b) Fast or steeply banked turns are accomplished by cross-over of following planes. The plane on the flank away from the direction of turn, turns with the leader, crossing over the latter's flight path and assuming position, upon completion of the turn, on the quarter opposite to that occupied before the turn. The plane on the side toward which the turn is made holds course until almost over the leader's new flight path, and then turns. This plane thus assumes a new position on the quarter opposite to that occupied before the turn. The designations "B" and "C" do not change, however, and "C" will, as before, have double distance and double step-up as compared to 'B". It is obvious that considerable increments of step-up must be used to avoid danger of collision between "B" and "C".

(c) In practice, "B" and "C", while turning usually tail in above and behind the leader, maintaining original step-up. With this method, the wing planes should never lose sight of the leader during the turn, and the latter may consider himself free to turn as sharply as he desires. Upon completion of the turn, 'B" takes station on either quarter as may be convenient, and "C" slips over to the opposite flank maintaining, as before, double distance and step-up.

VEE TO COLUMN

1-210. (See Figure 1-11).

STEP-UP TO STEP-DOWN FORMATION

1-211.	Preparatory Signal:	Thumb poked vertically downward.
	Execution Signal:	Shake ailerons.

Wing planes maintain distance and bearing but assume position below level of plane ahead.

STEP-DOWN TO STEP-UP FORMATION

1-212.	Preparatory Signal:	Thumb poked vertically upward.
	Execution Signal:	Shake ailerons.

Wing planes maintain distance and bearing but assume position above level of plane ahead.

BREAK-UP

1-213.	Preparatory Signal:	Shake wings and elevators by rotary motion of stick.
	Execution Signal:	Leader dives out.

The break-up should be executed from an echelon formation in the direction opposite the echelon. Following planes maintain course and altitude until normal break-up distance has been gained.

RETRACT WHEELS

1-214.	Preparatory Signal:	Cranking motion of hand.
	Execution Signal:	None.

Wing planes follow leader's movements in retracting wheels.

EXTENDING WHEELS

1-215.	Preparatory Signal:	Cranking motion of hand.
	Execution Signal:	None.

Wing planes extend wheels, followed by leader.

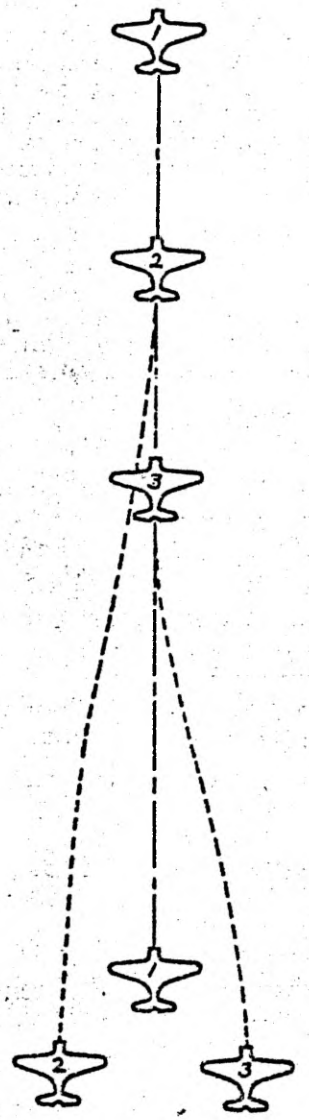


Fig. 1-11

Vee to Column

Preparatory Signal: Swish tail.
Execution Signal: Shake ailerons.

Leader speeds up; number two tails in behind leader taking just sufficient step-up or step-down avoid slip stream. Number three tails in similarly behind number two.

LOW PROPELLER PITCH TO HIGHER PITCH

1-216. Preparatory Signal: Fist thrust forward twisting wrist.
Execution Signal: None.

This signal by its forward motion indicates a desire for higher speed and consequently directs a shift to higher pitch.

HIGH PROPELLER PITCH TO LOWER PITCH

1-217. Preparatory Signal: Extended fist smartly drawn toward body, twisting wrist.
Execution Signal: None.

This signal by its backward motion indicates a desire for slower speed and consequently directs a shift to lower pitch.

TO SHIFT GASOLINE SUCTION

1-218. Preparatory Signal: Rotate clutching hand, arm extended. (Simulates shifting selector valve).
Execution Signal: None.

This signal can be used by a flight leader to direct a shift of gasoline suction such as a shift to reserve tank prior to coming in for a landing or to shift from auxiliary when the flight leader notices his supply running low. The time and the place usually dictate the change to be made. Individual squadrons may adopt finger signals to specify tanks for various fuel systems.

ATTACK SIGNAL

1-219. Preparatory Signal: Rock wings.
Execution Signal: None.

After the signal is given, all pilots are alert for the attack and follow the movements of the leader.

SECTION II — TWO PLANE SECTIONS ~~(ADDITIONAL FOR CRUISER UNITS)~~

1-220. The simple formations and signals described in Part I, Chapter 2, Section I, USF-74 apply to the two plane sections ~~of the VCS unit~~ with the following governing features:

(a) The section rendezvous is always with the No. 2 plane in the No. 2 position.

(b) The No. 2 plane remains in the No. 2 position unless shifted by use of arm signals.

(c) When the No. 2 plane of a section has been shifted into the No. 3 position on the right of the leader, he will remain there unless shifted back into the No. 2 position by use of the signal, "left arm raised vertically" and the execution signal, "shake ailerons".

(d) The signal "shaking elevators" will not be used with the two plane section singly.

(Additional for Cruiser Units)

1-221. When in obedience to signals described in Chapter 3, the VCS unit is acting as a single 4-plane unit, the meaning of the signals described for the 3 plane section in Part I, Chapter 2, USF-74 will apply with the following governing features:

(a) The VEE formed in obedience to the signal, "shake elevators", will be the closed VEE, with the number four plane closing the VEE as shown in Figure 1-23.

(b) When going into a four plane left or right echelon the movement will be executed in steps such that the planes when in echelon are in numerical order behind the leader.

(c) When in four-plane echelon, and the Form VEE signal is given, the two rear planes will always shift over and close up on the leader to form a closed VEE. No. 2 plane of the first section remains in its position adjacent to the leader to the right or left as the case may be at the time of executing the signal.

(d) Line formations will be formed from a right or left echelon only and never from a VEE formation.

CHAPTER 3

COMPOUND FORMATIONS

THE DIVISION

SECTION I — DIVISIONS OF 3-PLANE SECTIONS

GENERAL

1-300. (a) Compound formations of more than nine planes are usually operated as two or more divisions. ~~Thus the nine-plane division becomes the usual tactical unit.~~ Following divisions are patterned after the leading division, maneuvering in such a manner as to conform to the formations and maneuvers of the leading division.

(b) Within a division, each following section is patterned after the first section. Any formation taken by the leading section is taken by the following sections.

(c) Signals: A still arm signal directs the placement of planes in a section; a "pumped" (repeated) signal directs the placement of sections within a division or divisions within a squadron. In a compound formation it is mandatory that all signals be relayed by each plane.

DIVISION VEE OF VEES TO ECHELON OF VEES

1-301. (See Figure 1-12).

FREE CRUISING FORMATION

1-302 When used as a free cruising formation the echelon of Vees need not conform to geometrical bearings, but is sufficiently flexible to permit following sections to slide from one echelon to the other, to facilitate turning. Following sections will generally conform, in this, to the movements of the section immediately behind the leader.

Echelons may be shifted from one side to the other without taking up Vee formation, and without regard to the inversion of section positions.

ECHELON OF VEES TO DIVISION VEE OF VEES

1-303. (See figure 1-13).

DIVISION VEE OF VEES TO DIVISION VEE

1-304. (See Figure 1-14).

DIVISION VEE TO DIVISION VEE OF VEES

1-305. (See Figure 1-15).

DIVISION VEE OF VEES OR ECHELON OF VEES TO A-B-C

1-306. (See Figure 1-16).

DIVISION VEE OF VEES OR ECHELON OF VEES TO COLUMN

1-307. (See Figure 1-17).

THE SQUADRON

TWO NINE-PLANE DIVISIONS IN VEE OF VEES TO VEE OF THREE SIX PLANE DIVISIONS

1-308. (See Figure 1-18).

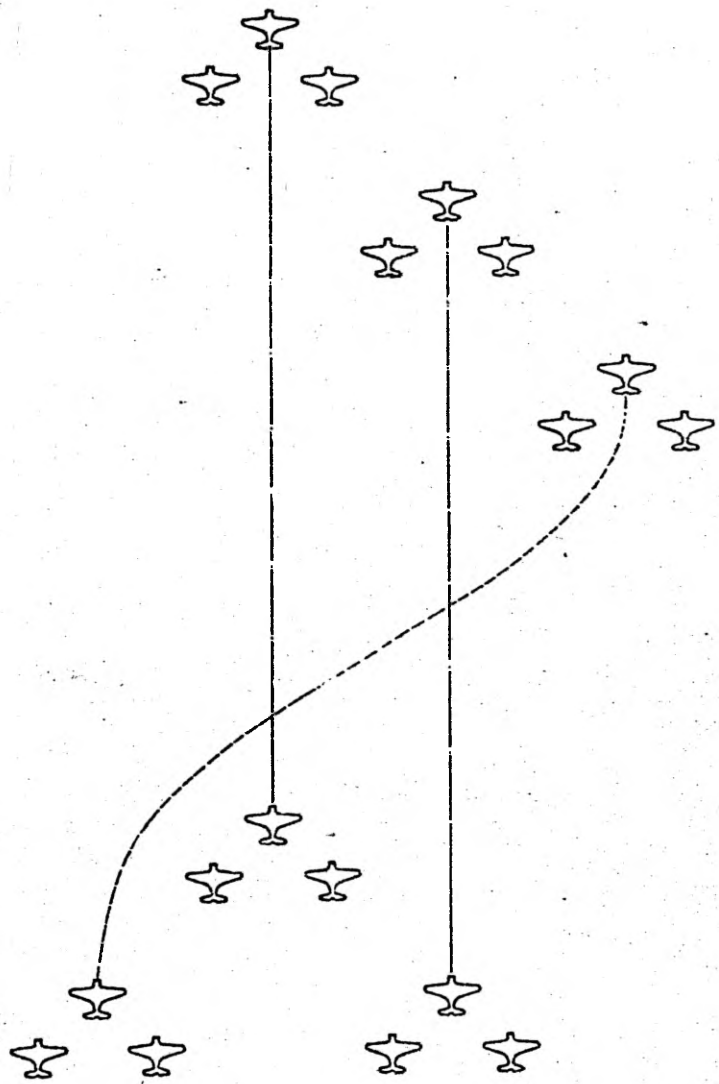


Fig. 1-12

Division Vee of Vees to Echelon of Vees

Preparatory Signal:	Division leader "pumps" right (left) arm vertically.
Execution Signal:	Shake ailerons. Except in close formations, wing plane of leader's section slides part way over, and returns to Vee.

Section affected slides over to rear position in echelon.

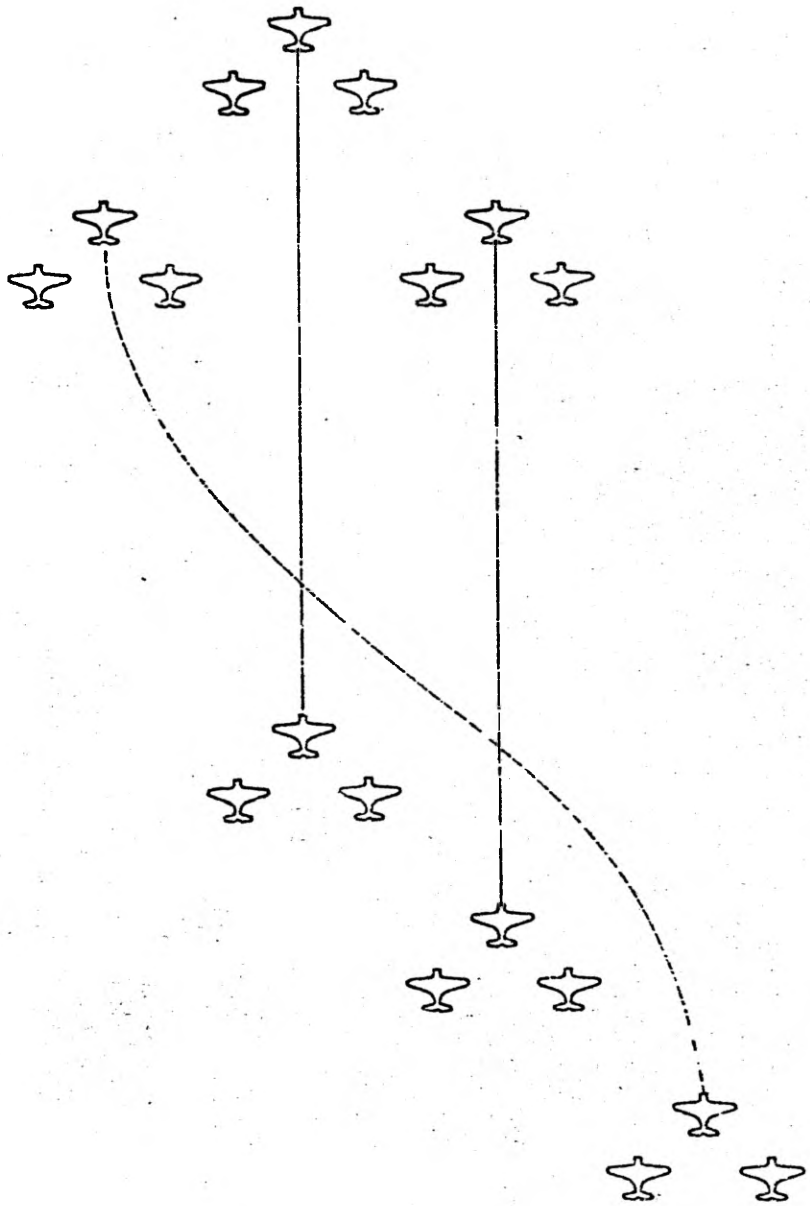


Fig. 1-13

Echelon of Vees to Division Vee of Vees

Preparatory Signal: Division leader shakes elevators.
Execution Signal: None.

Section at rear of echelon slides over to Vee position.

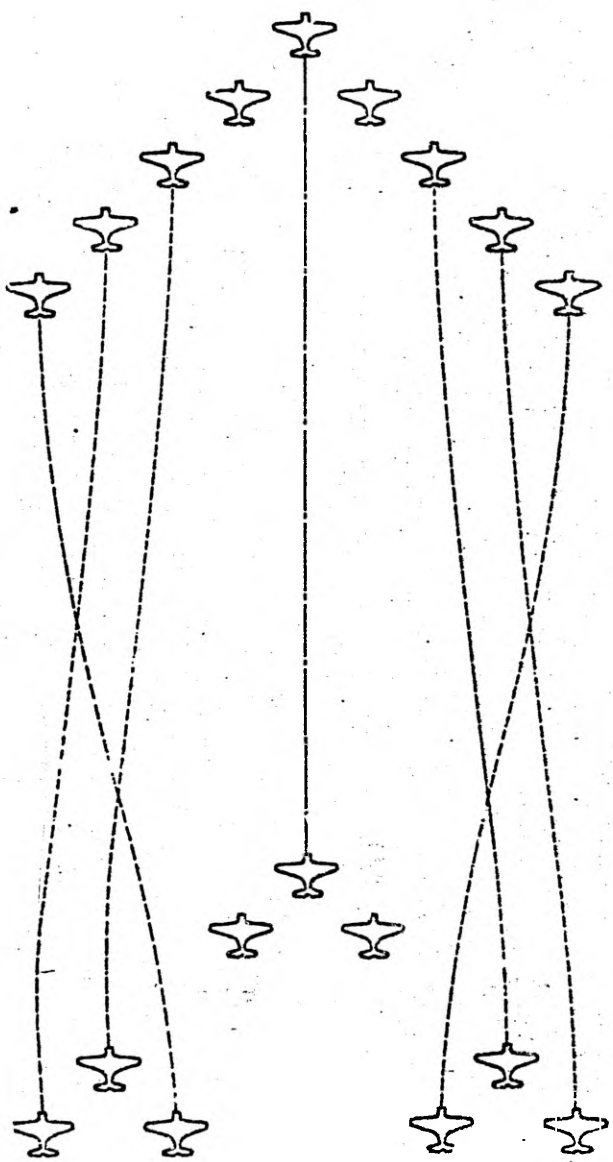


Fig. 1-14

Division Vee of Vees to Division Vee

Preparatory Signal: Division leader shakes elevators.

Execution Signal: None.

Following section leaders place sections in echelon away from leading section, and then close in to standard distance on wing planes of leading section.

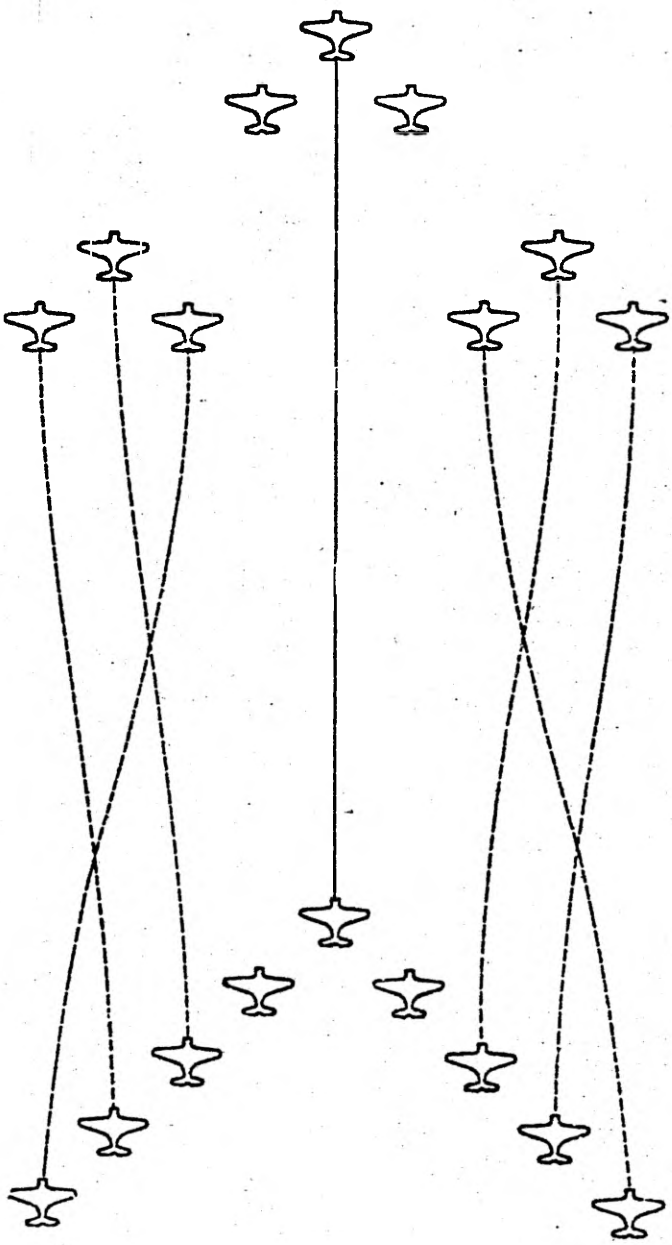


Fig. 1-15

Division Vee to Division Vee of Vees

Preparatory Signal: Shake elevators.

Execution Signal: None.

Wing section leaders open out to standard interval and then return sections to Vee formation.

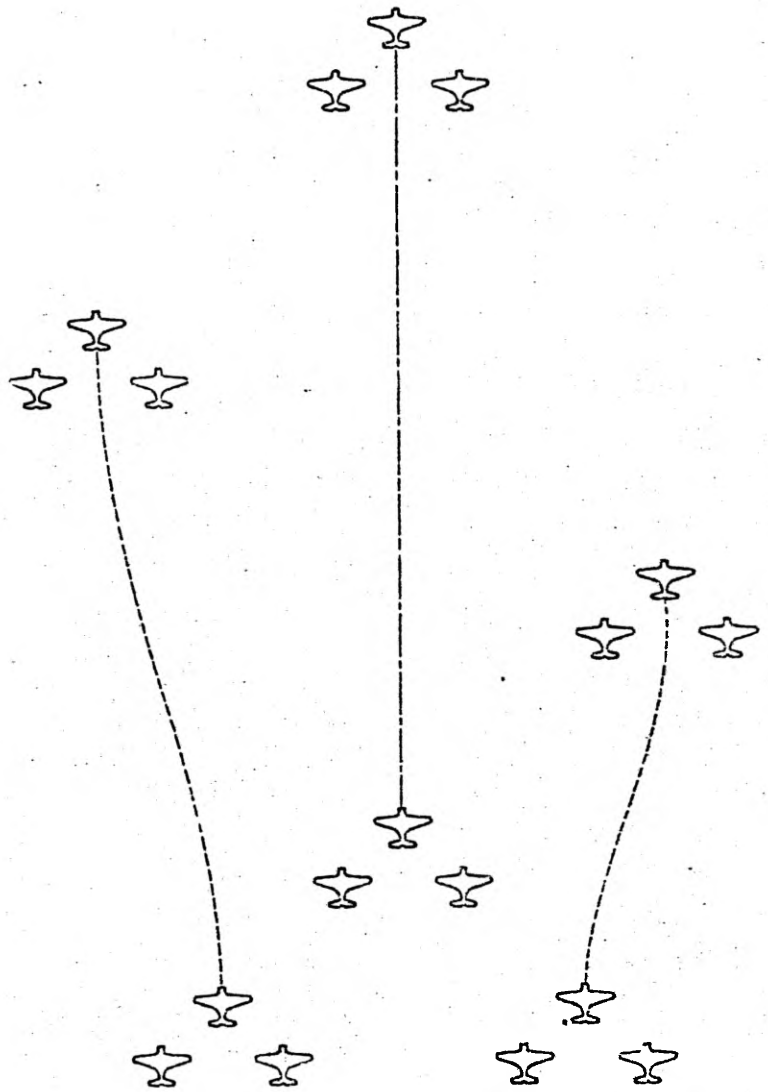


Fig. 1-16

Division Vee of Vees or Echelon of Vees to A-B-C

Preparatory Signal: Poke thumb over shoulders.

Execution Signal: Shake ailerons.

Number two section drops back to "B" position and number three section takes "C" position. When section leaders have gained position, division leader may place each section in A-B-C by so placing his section. This formation gives a minimum of fatigue, frees pilots from the necessity of accurate station keeping, enhances look-out efficiency, reduces fuel consumption and provides a flexible and easily maneuvered formation, which is difficult for an enemy to see.

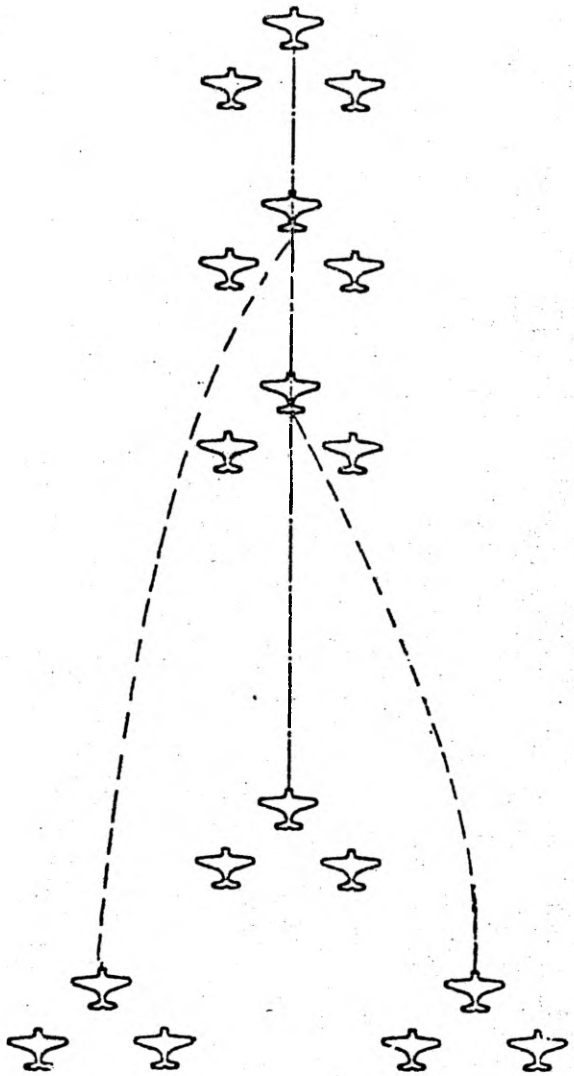


Fig. 1-17

Division Vee of Vees or Echelon of Vees to Column

Preparatory Signal: Swish tail.

Execution Signal: None.

(a) Leader speeds up.

(b) Second section eases astern of first section.

(c) Third section eases astern of the second.

(d) Take sufficient step-up or step-down between sections to avoid slip stream.

(e) Second division follows the maneuvers of first division.

From this formation any maneuver may be executed by the first section including very radical turns and be followed easily by the other sections. From echelon, sections simply slide astern of leading section in the order occupied in the echelon.

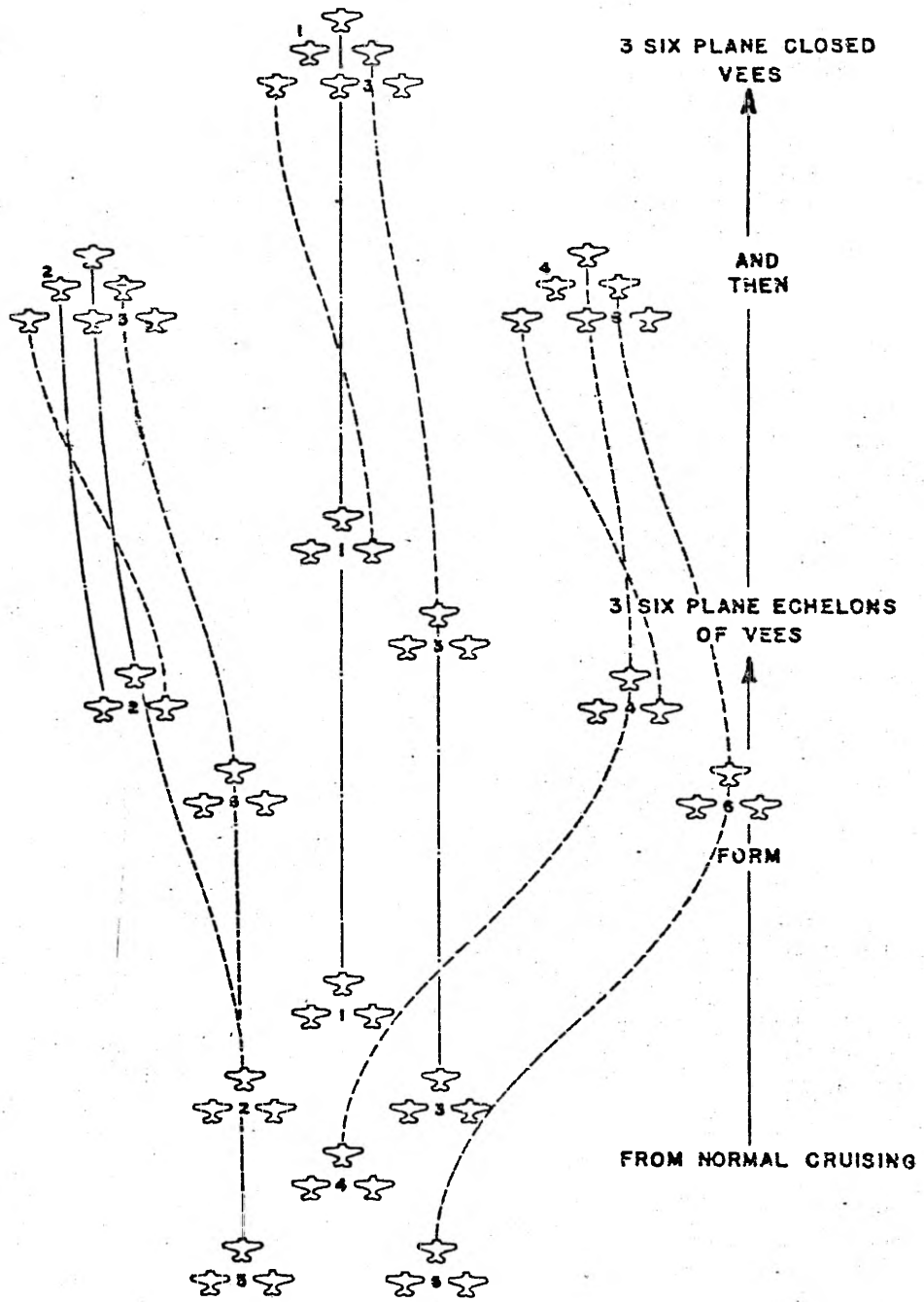


Fig. 1-18
To Form Three Six-Plane Divisions From Normal Cruising Formation

20

Preparatory Signal: One plane of leader's section stepped up, the other stepped down.

Execution Signal: Shake ailerons.

(a) The first and third sections maintain formation.

(b) The second section eases off to the left and drops back; it is joined by the fifth section. This division takes number two position.

(c) The fourth and sixth sections maintain formation and ease into number three position.

(d) The first section is placed in left echelon.

(e) The second and third divisions form similar closed vees.

(f) If remaining in this formation for a considerable period of time, with the division in open order, the plane closing the vee in each division may move over to the right flank for ease in maneuvering.

The same signal (one wing plane stepped up, the other down) when given with the squadron in six-plane divisions directs the return to nine-plane divisions.

TWO NINE-PLANE DIVISIONS IN ECHELON TO ECHELON OF THREE SIX-PLANE DIVISIONS

1-309. (See Figure 1-19).

Preparatory Signal: One plane of leader's section stepped up, the other stepped down.

Execution Signal: Shake ailerons.

(a) Second and fifth sections ease clear of formation.

(b) First and third sections close up to form first division.

(c) Fourth and sixth sections close up to form second division.

(d) Second and fifth sections join up as third division.

(e) Third division takes rear position in echelon.

The same signal (one of leader's wing planes stepped down) when given with the squadron in six-plane divisions directs the return to nine-plane divisions.

THREE SIX-PLANE DIVISIONS TO TWO NINE-PLANE DIVISIONS

1-310.

Preparatory Signal: One plane of leader's section stepped up, the other stepped down.

Execution Signal: Shake ailerons.

(a) The third division leader flies his division alongside the second division, and gives the breakup signal.

(b) The fifth section (second section of the third division) breaks off and joins the second division.

(c) The second section (leader of the third division) flies up to and joins the first division.

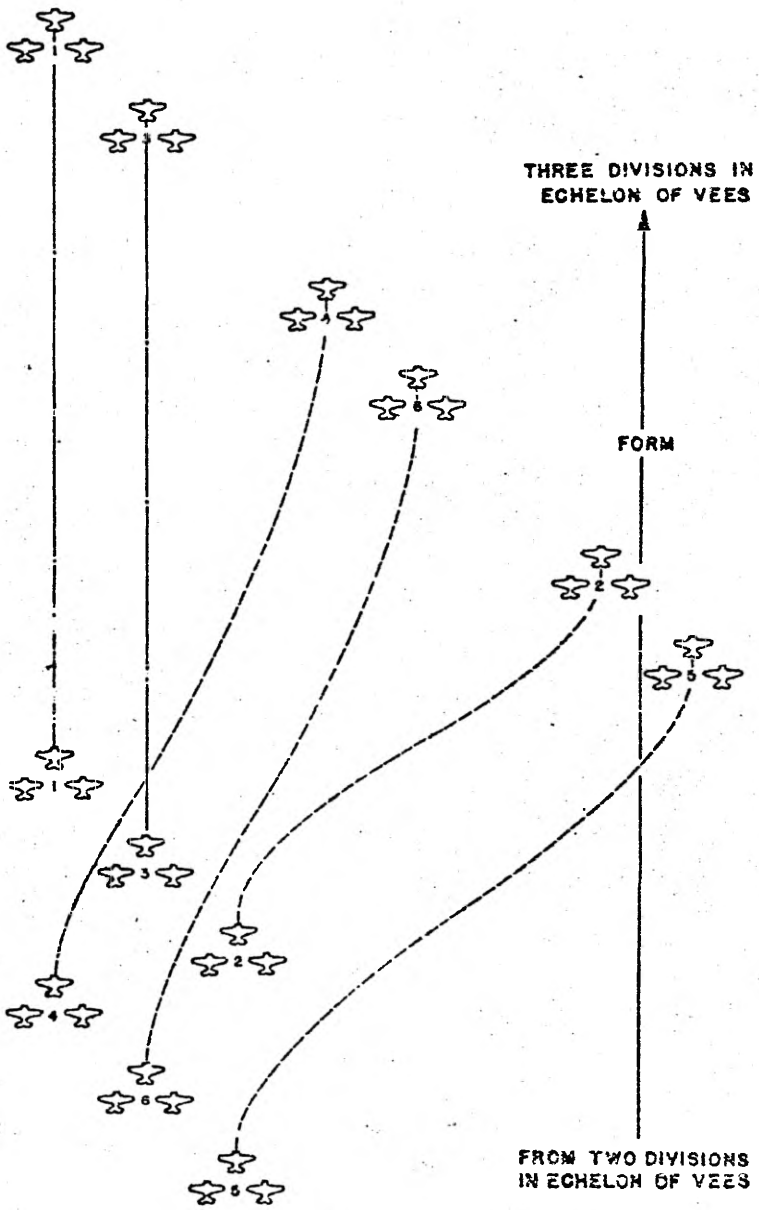


Fig. 1-19
Two Nine-Plane Divisions in Echelon to Echelon of Three Six-Plane Divisions

SECTION II — DIVISIONS OF 2-PLANE SECTIONS

(Additional for Cruiser and Battleship Units)

THE DIVISION WITH TWO PLANE SECTIONS

1-311. (a) The two or four airplanes in the aviation unit of each cruiser comprise one or two two-plane sections and will be known as a division of the aircraft squadron to which it is assigned.

(b) Due to the organization of a VCS squadron the formations and signals for the compound formations described in USF-74, Part I, Chapter 3, Section I are modified for cruiser aircraft as indicated in this section.

1-312. (a) The divisions will always join up in free cruising echelon. The second section need not conform to geometric bearings. It is intended to provide sufficient flexibility to permit following sections to slide from one echelon to the other, to facilitate turning.

(b) The two sections of each division remain as individual sections unless closed up into one four-plane unit by proper signals from the division leader.

1-313. (a) Division-Left Echelon of Sections-Left-Echelon to Simple Four-Plane-Left-Echelon. (Figure 1-20).

(b) Division Four Plane Left (Right) Echelon to Division Left (Right) Echelon of Section Left (Right) Echelon. (Figure 1-21).

1-314. (a) Division Left Echelon of Section Left Echelon to Division Left Echelon of Section Right Echelon. (Figure 1-22).

(b) Division Left Echelon of Section Right Echelon to Division Closed VEE. (Figure 1-23).

(c) Division Left Echelon of Section Right Echelon to Division Right Echelon of Section Right Echelon. (Figure 1-24).

1-315. (a) Division Left Echelon of Section Left Echelon to Division Closed Vee. (Figure 1-25).

(b) Division Closed VEE to Division Right Echelon of Section Left Echelon. (Figure 1-26).

1-316. Division Left Echelon of Section Left Echelon to Division Right Echelon of Section Left Echelon. (Figure 1-27).

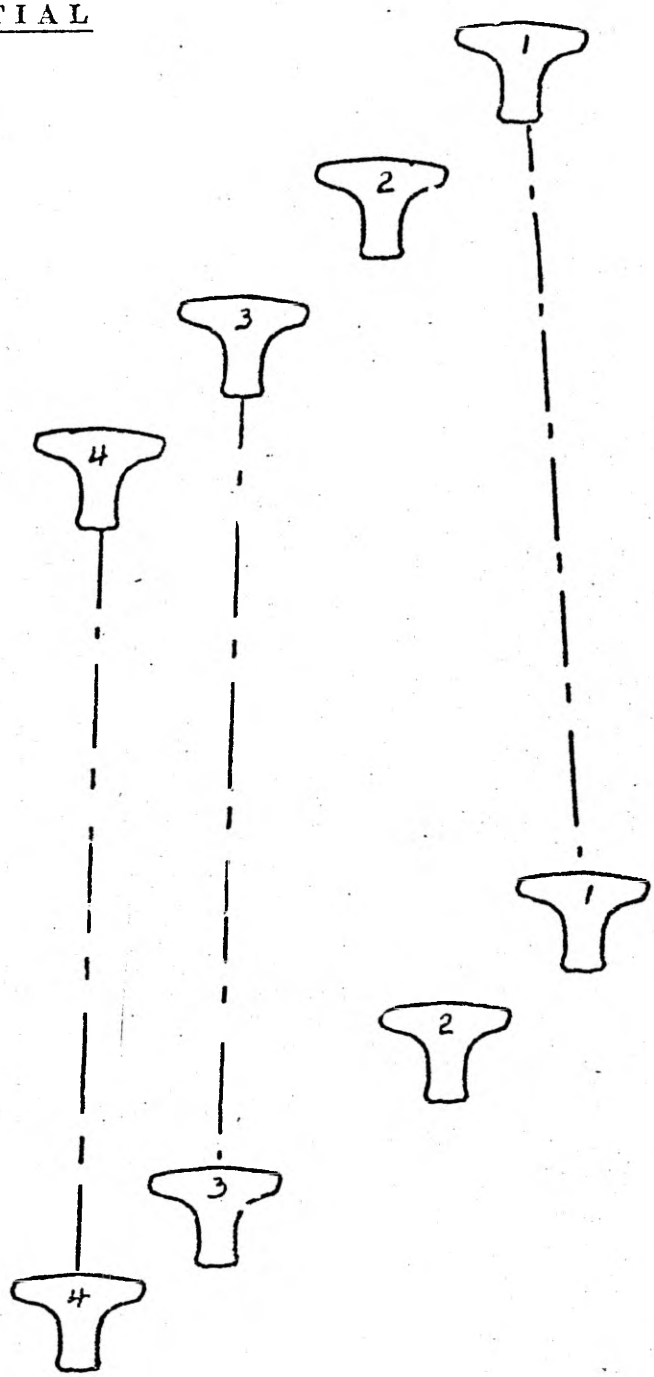


Fig. 1-20

Division left echelon of section left echelon to one four plane left echelon.

Preparatory Signal: Division leader raises left arm vertically overhead.

Execution Signal: Shake ailerons.

Second section leader closes up on No. 2 plane of first section.

NOTE: From this formation the unit of four planes may be maneuvered into any of the simple formations by the use of conventional signals.

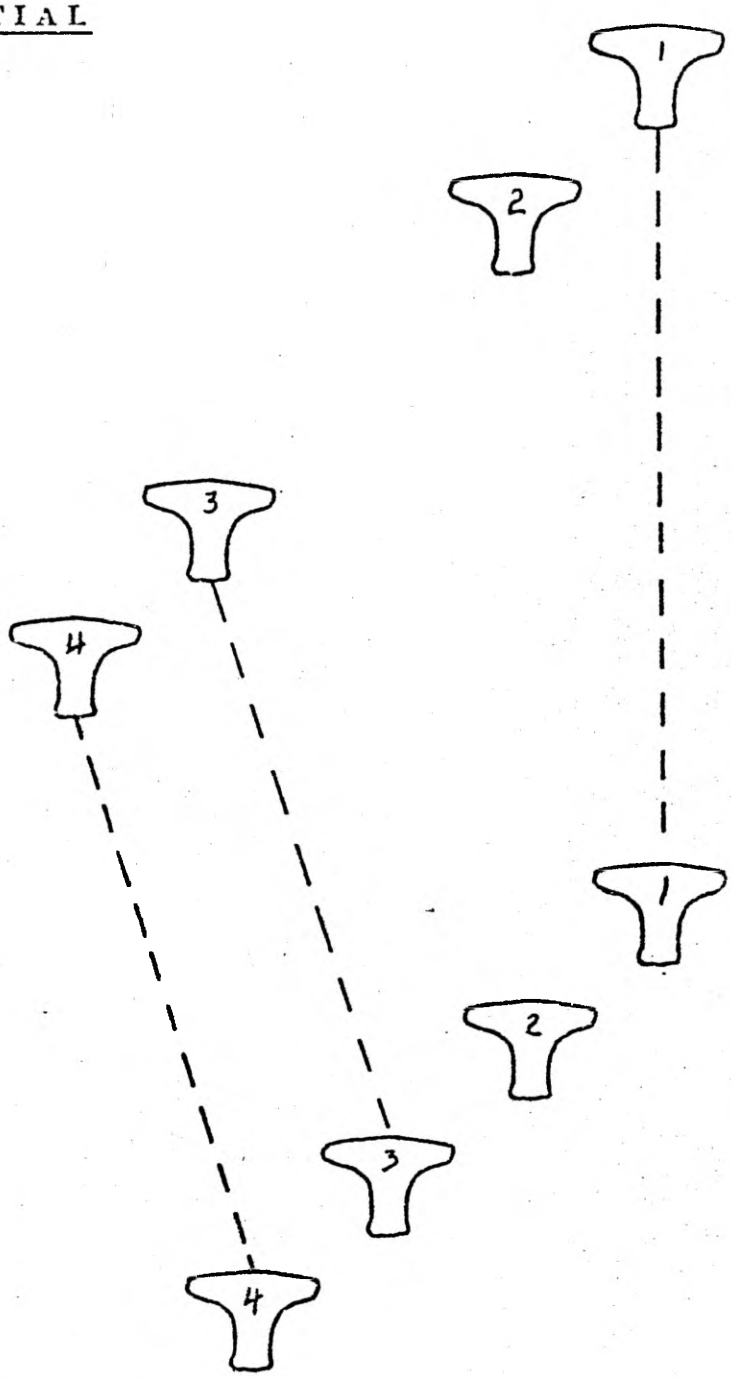


Fig. 1-21

Division four plane left (right) echelon to division left (right) echelon of section left (right) echelon.

Preparatory Signal: Division leader "pumps" left (right) arm vertically.

Execution Signal: Shake ailerons.

Second section leader drops back, No. 2 plane of second section dropping back with section leader.

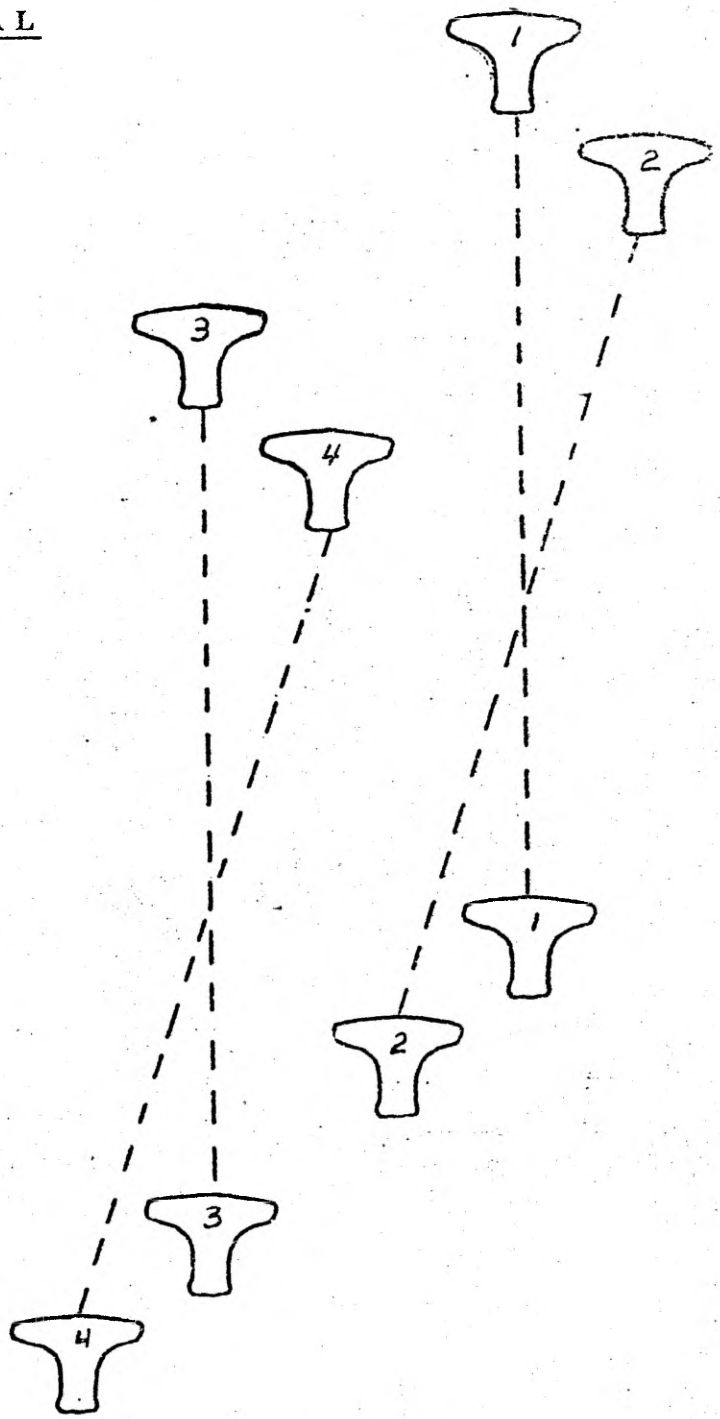


Fig. 1-22

Division left echelon of section left echelon to division left echelon of section right echelon.

Preparatory Signal: Division leader raises right arm vertically.

Execution Signal: Shake ailerons.

Number two section repeats signals and movements of leading section. The No. 2 planes of each section shifting over to right echelon position.

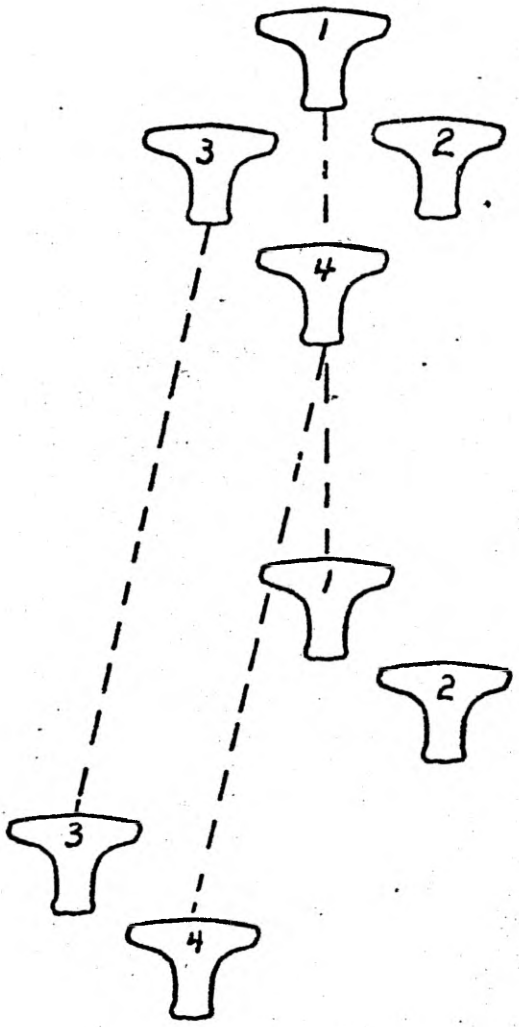


Fig. 1-23

Division left echelon of section right echelon to division VEE.

Preparatory Signal: Division leader shake elevators.

Execution Signal: None.

Second section closes up on first section, section leader of No. 2 section taking position in the No. 2 position of a normal three plane section. No. 2 plane of second section being in right echelon maintains this position on his section leader.

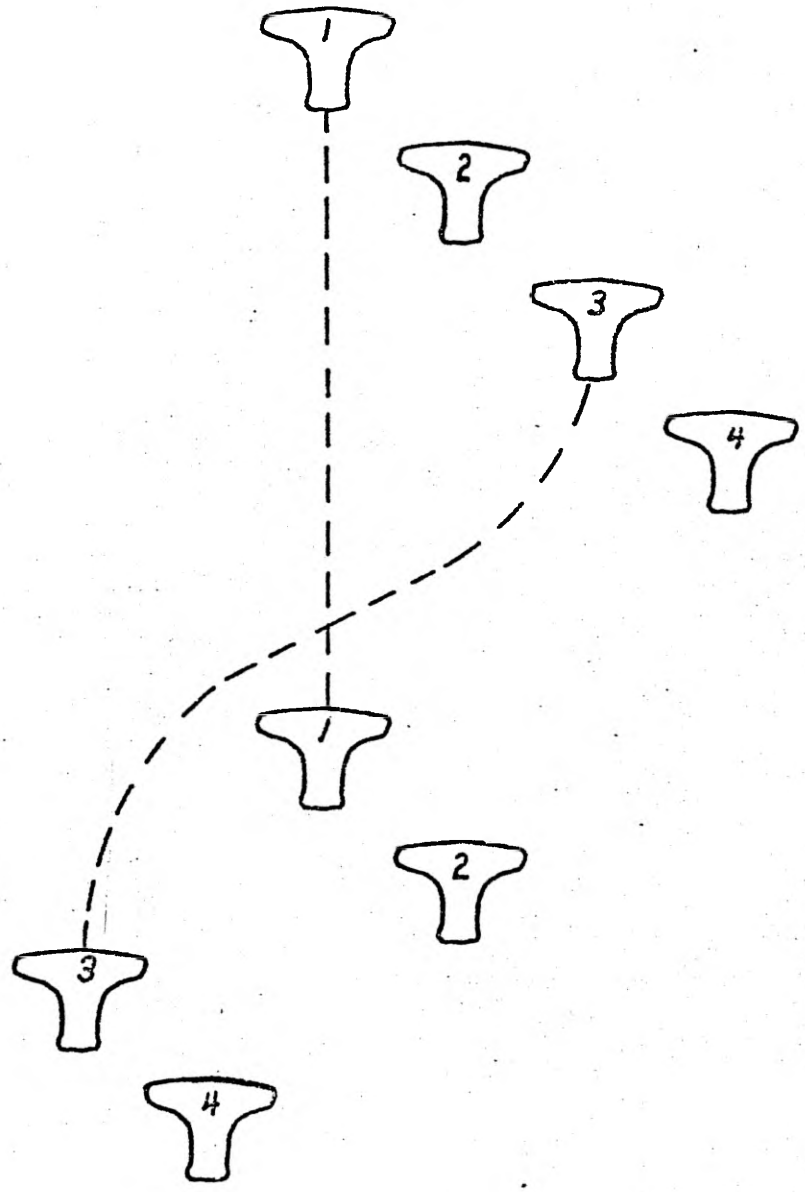


Fig. 1-24

Division left echelon of section right echelon to division right echelon of section right echelon.

Preparatory Signal: Division leader "pumps" right arm vertically.
Execution Signal: Shake ailerons.

Second section crosses over into right echelon.

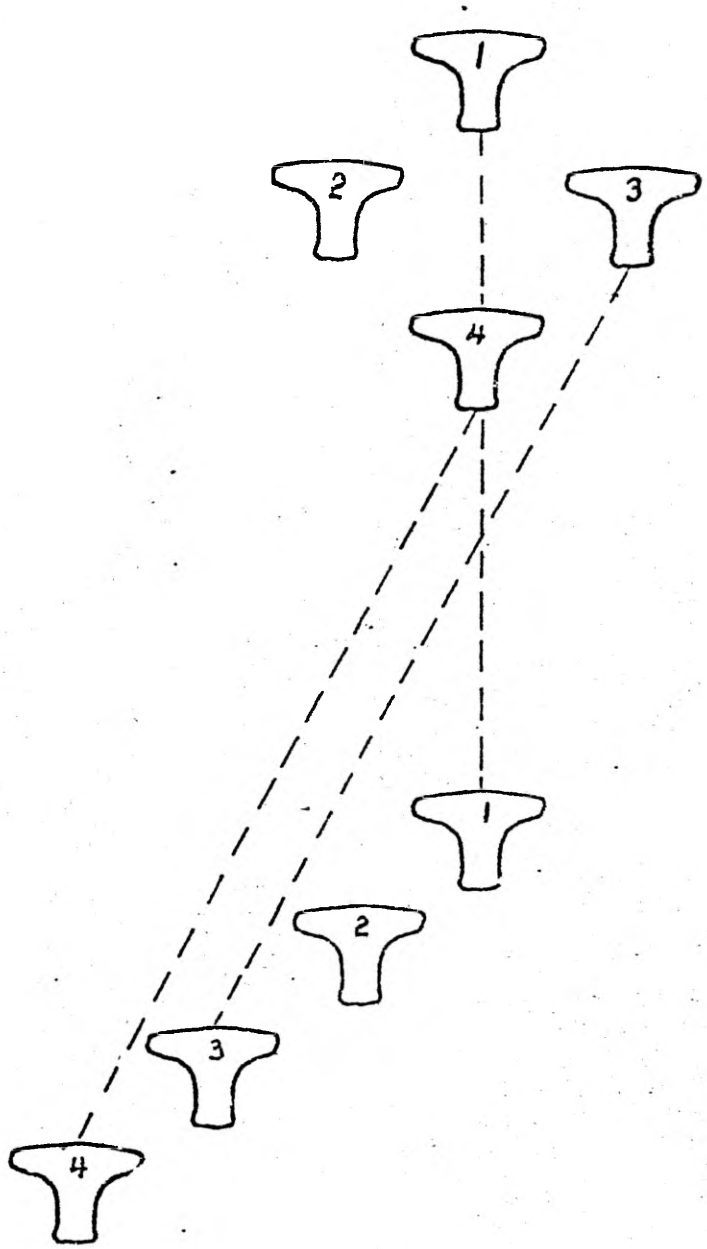


Fig. 1-25

Division left echelon of section left echelon to division closed VEE

Preparatory Signal: Division leader shake elevators.

Execution Signal: None.

Number two section leader shifts over to right echelon and then closes up occupying the No. 3 position in a normal three plane section. The No. 2 plane of the second section remains in the No. 2 position on his section leader, thereby closing the VEE.

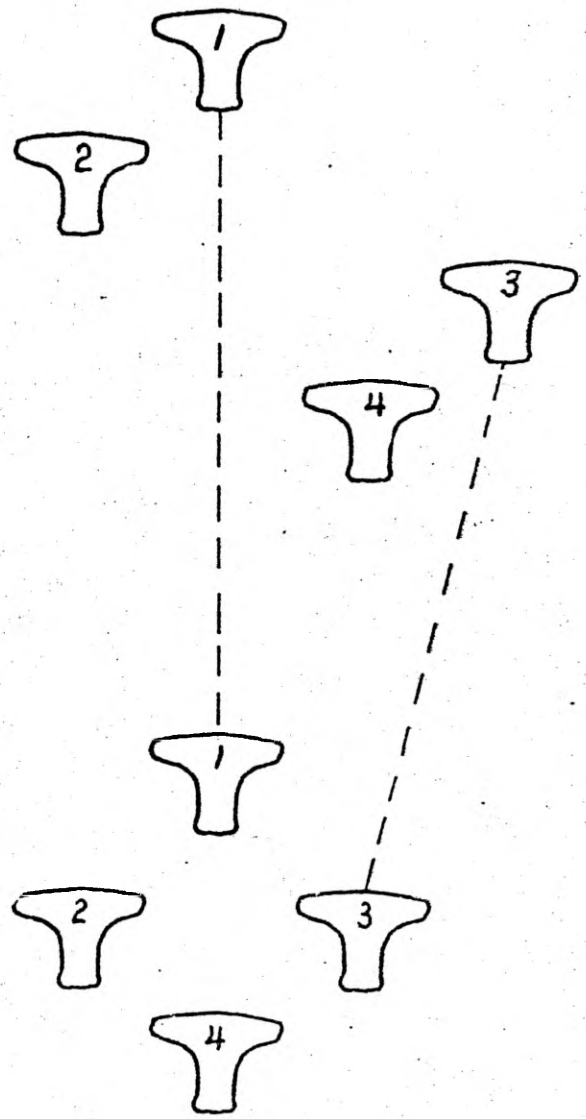


Fig. 1-26

Division closed VEE to division right echelon of section left echelon.

Preparatory Signal: Division leader "pumps" right arm vertically.

Execution Signal: Shake ailerons.

Second section drops back to proper interval.

NOTE: If the closed VEE is formed from division left echelon of section right echelon as in Figure 1-23, the proper signal is pump left arm upon the execution of which the second section drops back to form division left echelon of section right echelon.

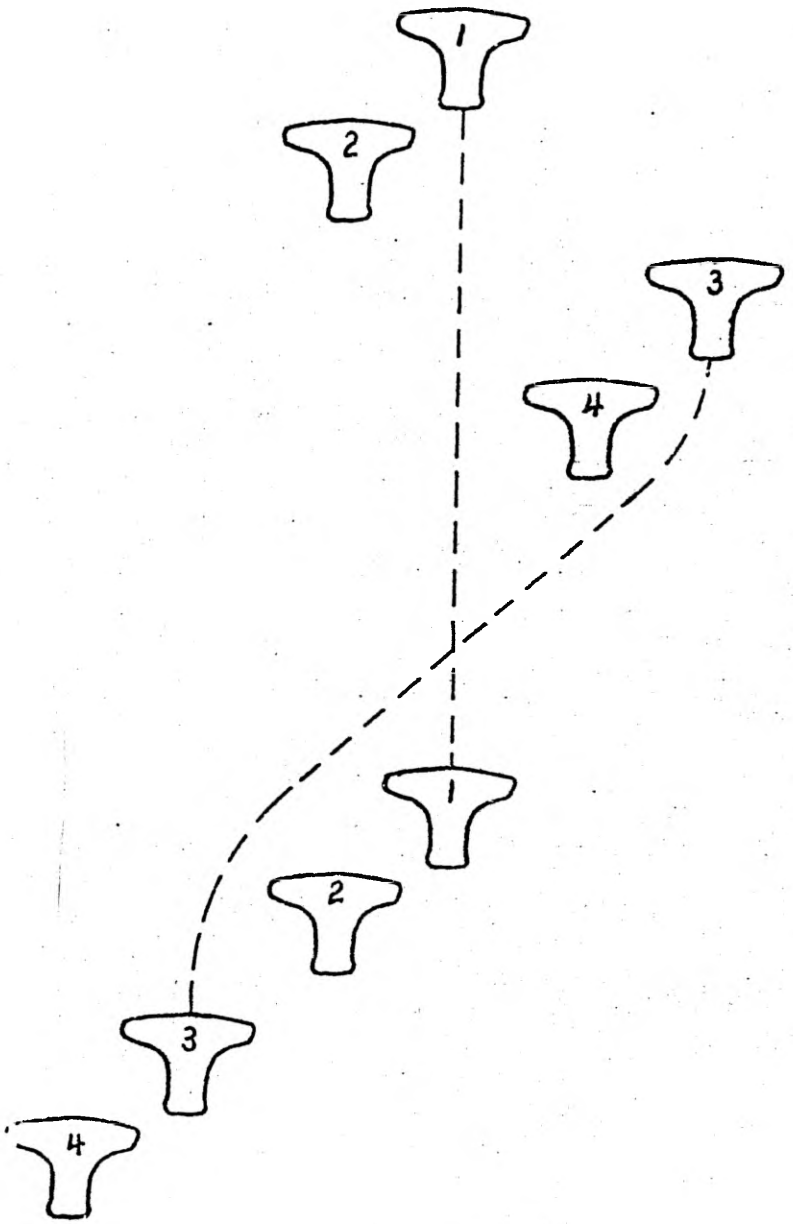


Fig. 1-27

Division left echelon of section left echelon to division right echelon of section left echelon

Preparatory Signal: Division leader "pumps" right arm vertically.

Execution Signal: Shake ailerons.

Second section slides over to right echelon.

THE SQUADRON WITH TWO OR FOUR-PLANE DIVISIONS

1-317. (a) The squadron will always join up in free cruising column of divisions with the divisions free to slide from one side to the other as desired to facilitate turning.

(b) Squadron join up with divisions always in numerical order of units present.

(c) Except when in a squadron echelon, VEE, line, or the A B C formation, the following divisions shall be considered in free cruising formation.

(d) The normal cruising formation will be squadron column of divisions with following divisions in the same formation as the leading division.

(e) When a signal is given requiring the shifting over of one or two divisions, the last two divisions in the squadron formation will always shift together with the second division holding his position on the leader.

(f) The squadron leader will so maneuver his squadron as to keep the following divisions in their proper numerical order.

SQUADRON FORMATIONS

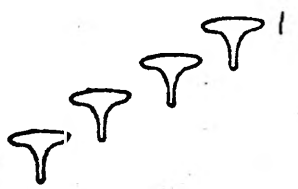
1-318. (a) Column of divisions with divisions in left (right) echelon of sections left (right) echelon. (Figure 1-28 (a)).

(b) Column of divisions with divisions in division four-plane left (right) echelon. (Figure 1-28 (b)).

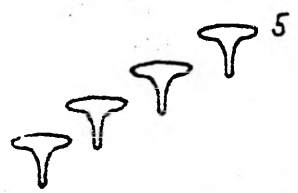
(c) Column of divisions with divisions in right (left) echelon of sections left (right) echelon. (Figure 1-28 (c)).

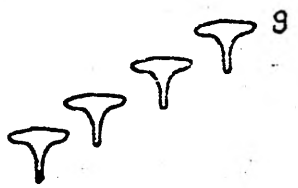
(d) Column of divisions with divisions in division closed VEE. (Figure 1-28 (d)).

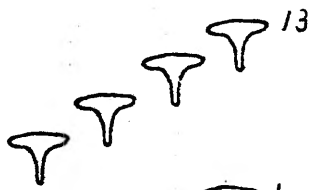
(e) Column of divisions with divisions in line. (Figure 1-29).

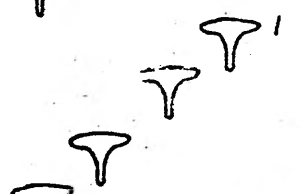


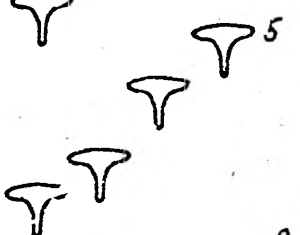
Squadron Column of Divisions. Divisions in Four Plane Left Echelon.
Fig. 1-28(b)



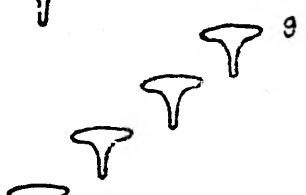


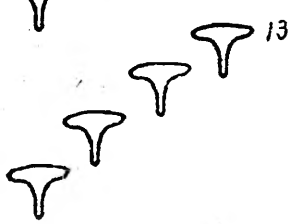


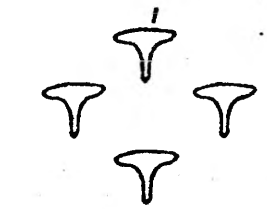




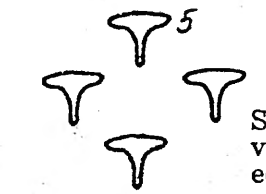
Squadron Column of Divisions. Divisions in Left Echelon of Section Left Echelon.
Fig. 1-28(a)

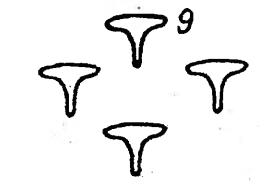


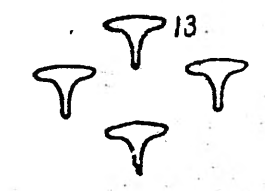


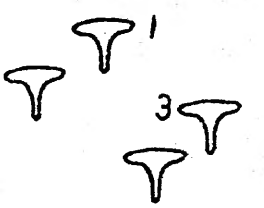


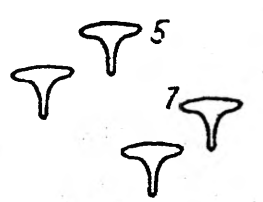
Squadron Column of Divisions. Divisions in Closed VEE.
Fig. 1-28(d)

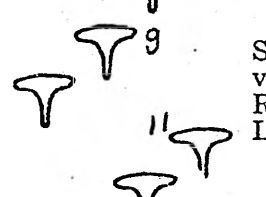




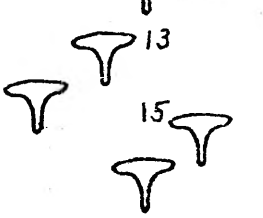








Squadron Column of Divisions. Divisions in Right Echelon of Section Left Echelon.
Fig. 1-28(c)



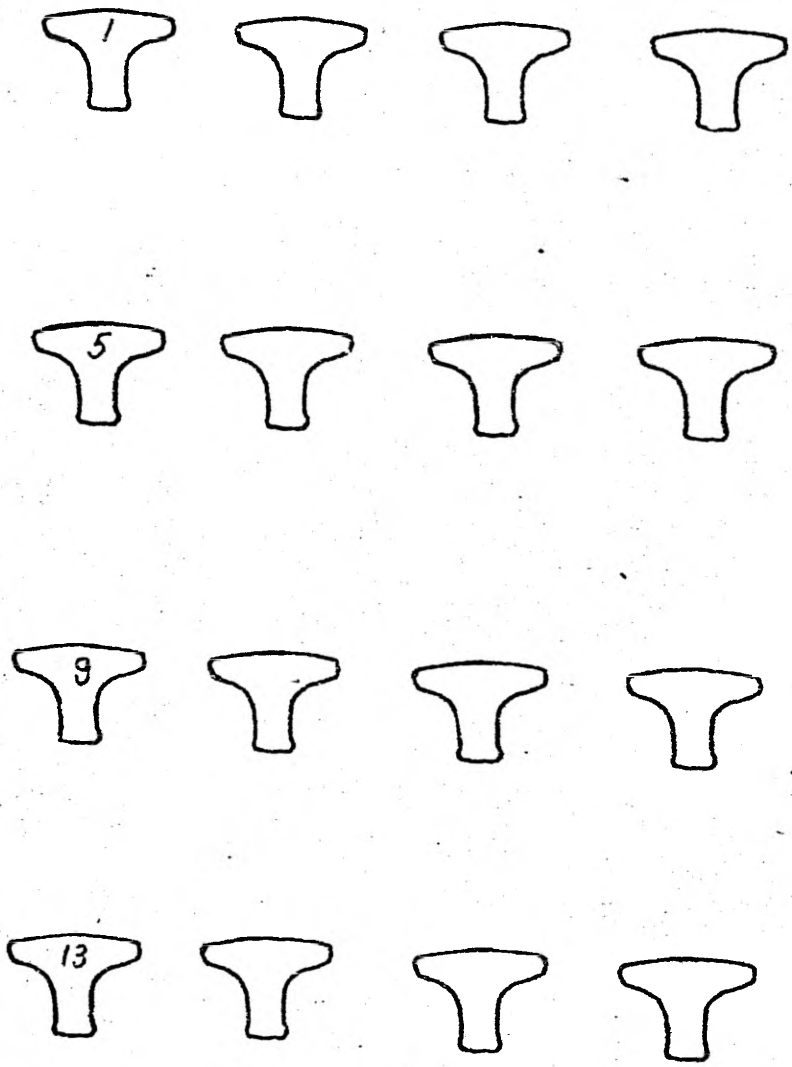


Fig. 1-29
Squadron Column of Divisions. Divisions in Line.

EVOLUTIONS OF A SIXTEEN PLANE VCS SQUADRON

1-319. Squadron Column of Divisions, Divisions in Right (Left) Echelon of Section Right (Left) Echelon. (Figure 1-30 (a)).

to

Squadron Right (Left) Echelon of Divisions in Right (Left) Echelon of Section Right (Left) Echelon. (Figure 1-30 (b)).

Preparatory Signal: Squadron Leader "pumps" right (left) arm vertically (repeated by all planes).

Execution Signal: Shake ailerons.

Division leaders slide over into Right (Left) Echelon on First Division keeping Division Interval.

NOTE: To go from 1-30(b) to 1-30(a), the Preparatory Signal: Squadron Leader Swish Tail.
Execution Signal: None.

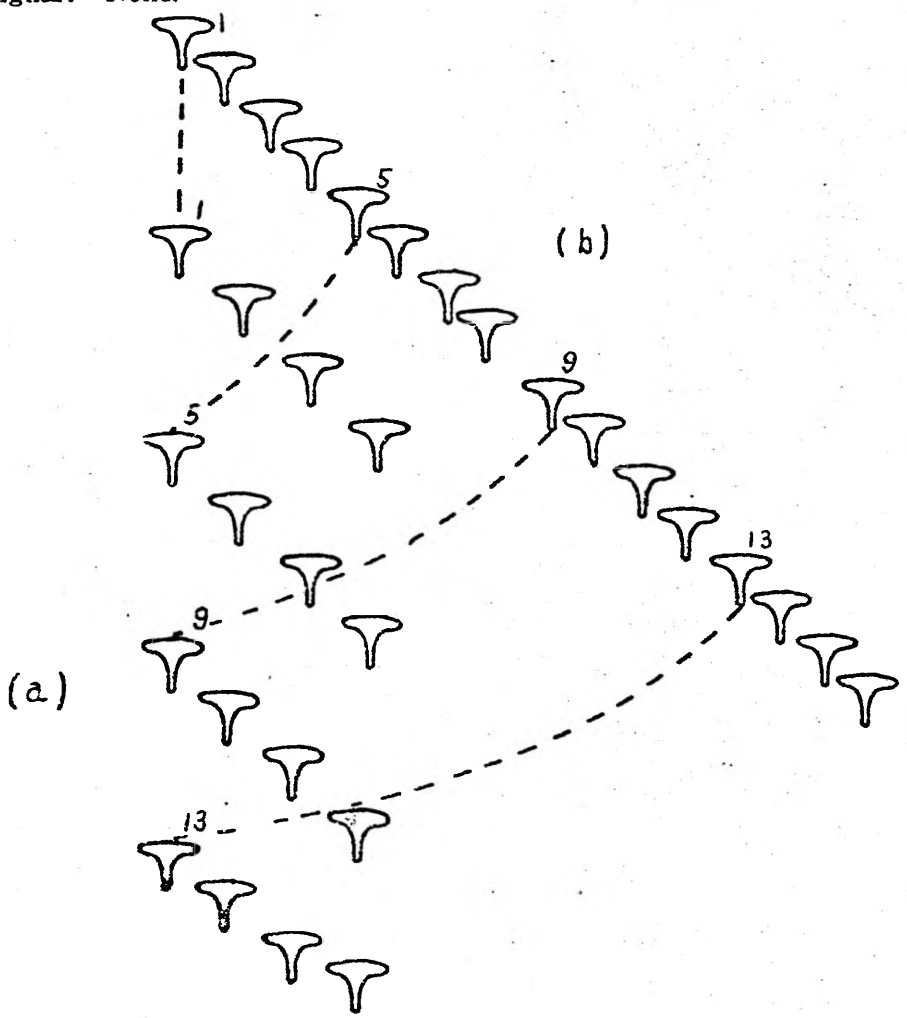


Fig. 1-30

Column of Division, Divisions in Right Echelon of Section Right Echelon,
to
Squadron Right Echelon of Divisions, Divisions of Right Echelon of Section Right Echelon.

Fig. 1-31(b)

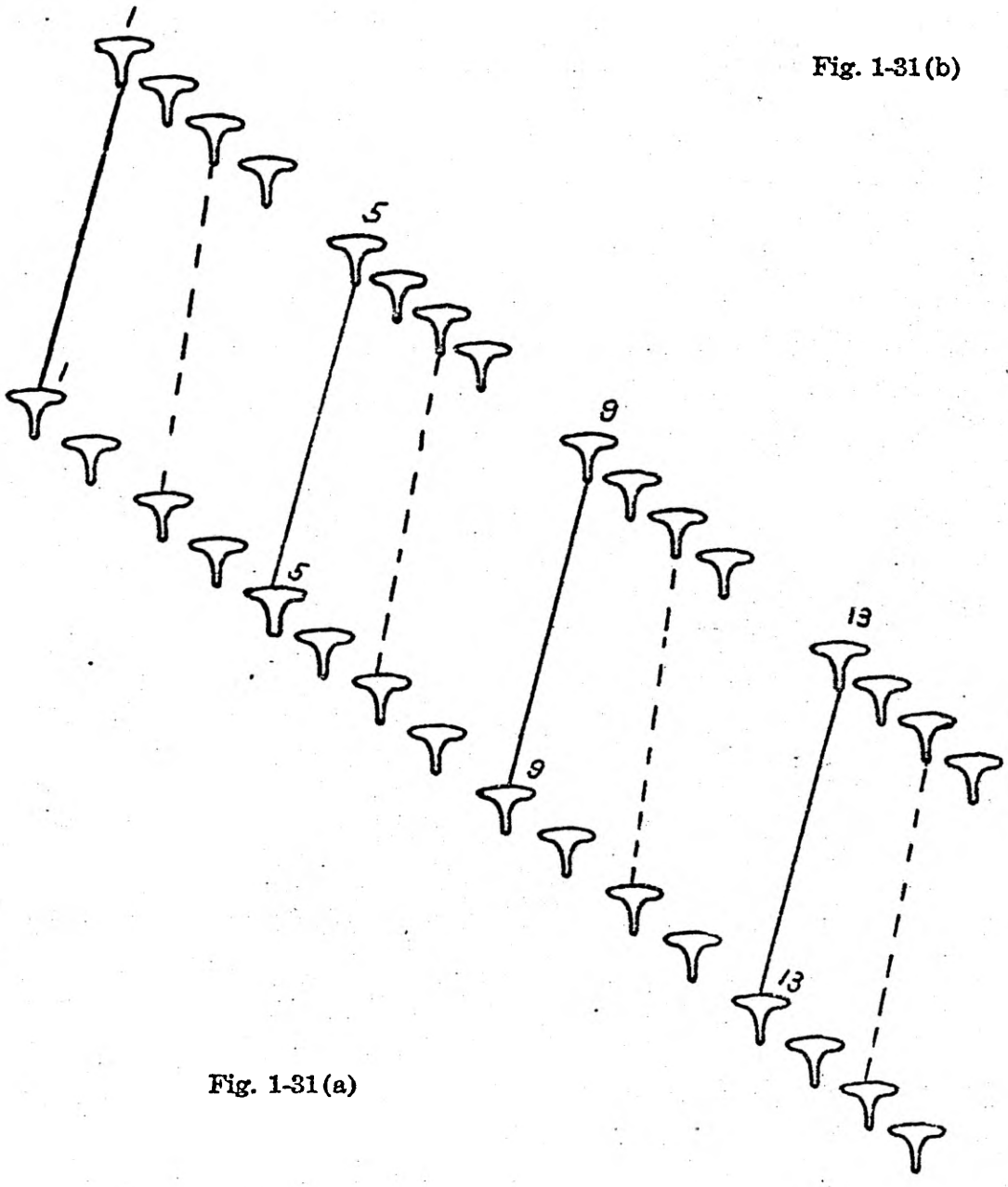


Fig. 1-31(a)

Squadron Right Echelon of Division, Divisions in Right Echelon of Section Right Echelon,
to
Squadron Right Echelon of Division Four Plane Right Echelon

1-320. Squadron Right (Left) Echelon of Divisions in Right (Left) Echelon of Section Right (Left) Echelon. (Figure 1-31(a)).

to

Squadron Right (Left) Echelon of Division Four Plane Right (Left) Echelon. (Figure 1-31(b)).

Preparatory Signal: Right (left) arm raised vertically.

Execution Signal: Shake ailerons.

Second section each division close up on respective first sections. Division Leaders maintain Division Interval.

NOTE: To go from 1-31(b) to 1-31(a): Squadron leader pumps right (left) arm vertically followed by signal of execution. Second section leaders drop back to section interval on respective first sections.

1-321. Squadron Right (Left) Echelon of Divisions in Four-Plane Right (Left) Echelon. (Figure 1-32(a)).

to

Squadron Right (Left) Echelon. (Figure 1-32(b)).

Preparatory Signal: Squadron Leader raise right (left) arm vertically.

Execution Signal: Shake ailerons.

All divisions close up on division next ahead in echelon.

NOTE: To go from 1-32(b) to 1-32(a): Squadron leader "pump" right (left) arm vertically followed by signal of execution. Division leaders drop back to division interval.

The section leaders of the second section of each division must realize that the pump arm signal applies to the largest component part (in this case the division) and in this case does not mean for the section to drop back.

Fig. 1-32(b)

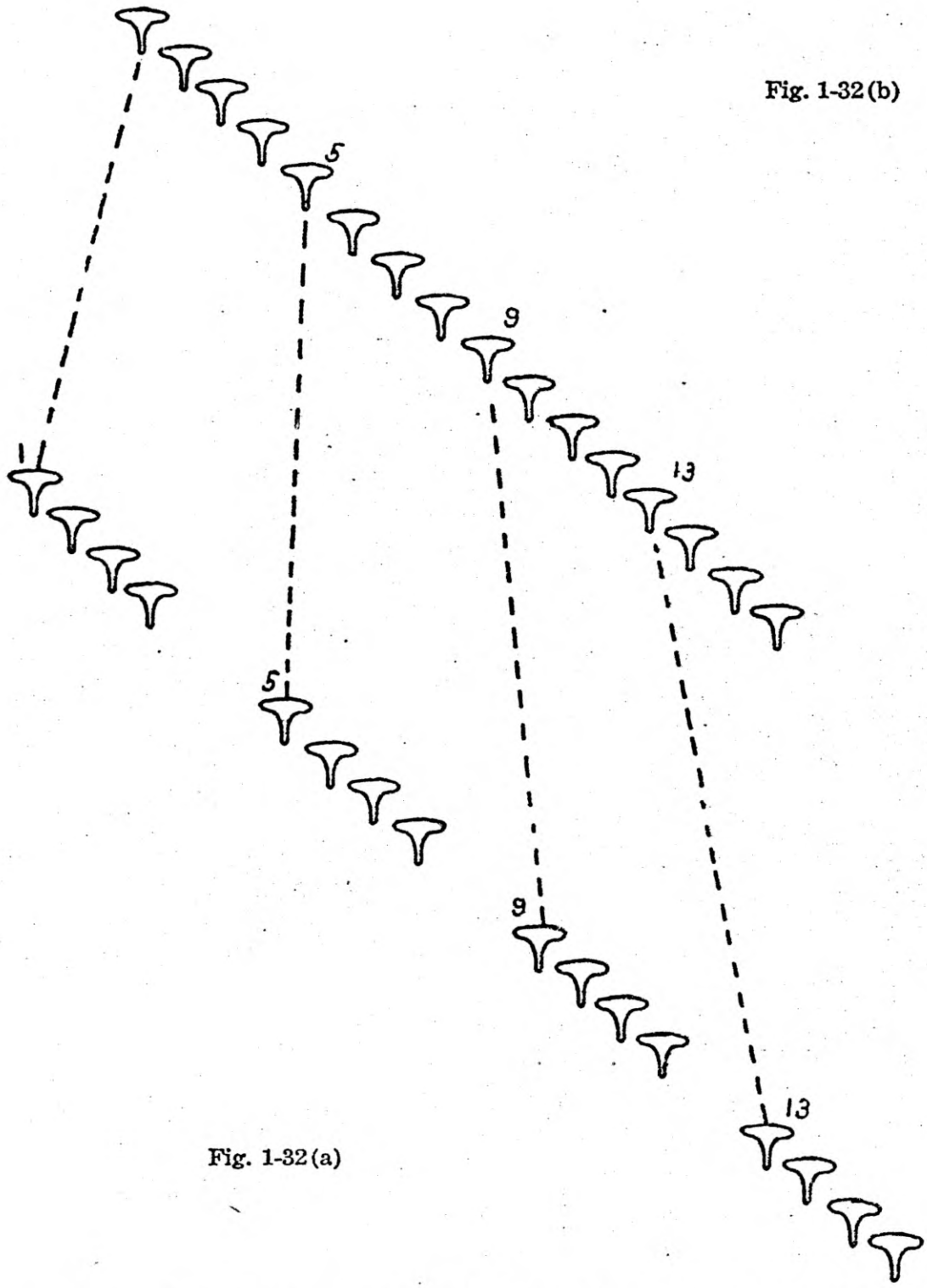


Fig. 1-32(a)

Squadron Right Echelon of Divisions in Four Plane Echelon to Squadron Right Echelon

1-322. Squadron Closed VEE of Closed VEES. This formation may be formed directly from a Squadron Column of Closed VEES, or it may be formed by steps from Squadron Right (Left) Echelon of Divisions, Division in Right (Left) Echelon of Sections Right (Left) Echelon. (Figures 1-33(a), 1-33(b), 1-33(c), 1-33(d), 1-33(e)).

Squadron Right (Left) Echelon of Divisions in Right (Left) Echelon of Section Right (Left) Echelons. (Figure 1-33(a)).

to

Squadron Right (Left) Echelon of Division Closed VEES. (Figure 1-33(b)).

Preparatory Signal: Snake elevators.

Execution Signal: None.

NOTE: To go from 1-33(b) to 1-33(a): Squadron leader "pumps" right (left) arm followed by signal of execution.

Fig. 1-33(b)
Squadron Right Echelon of Division Closed VEES.

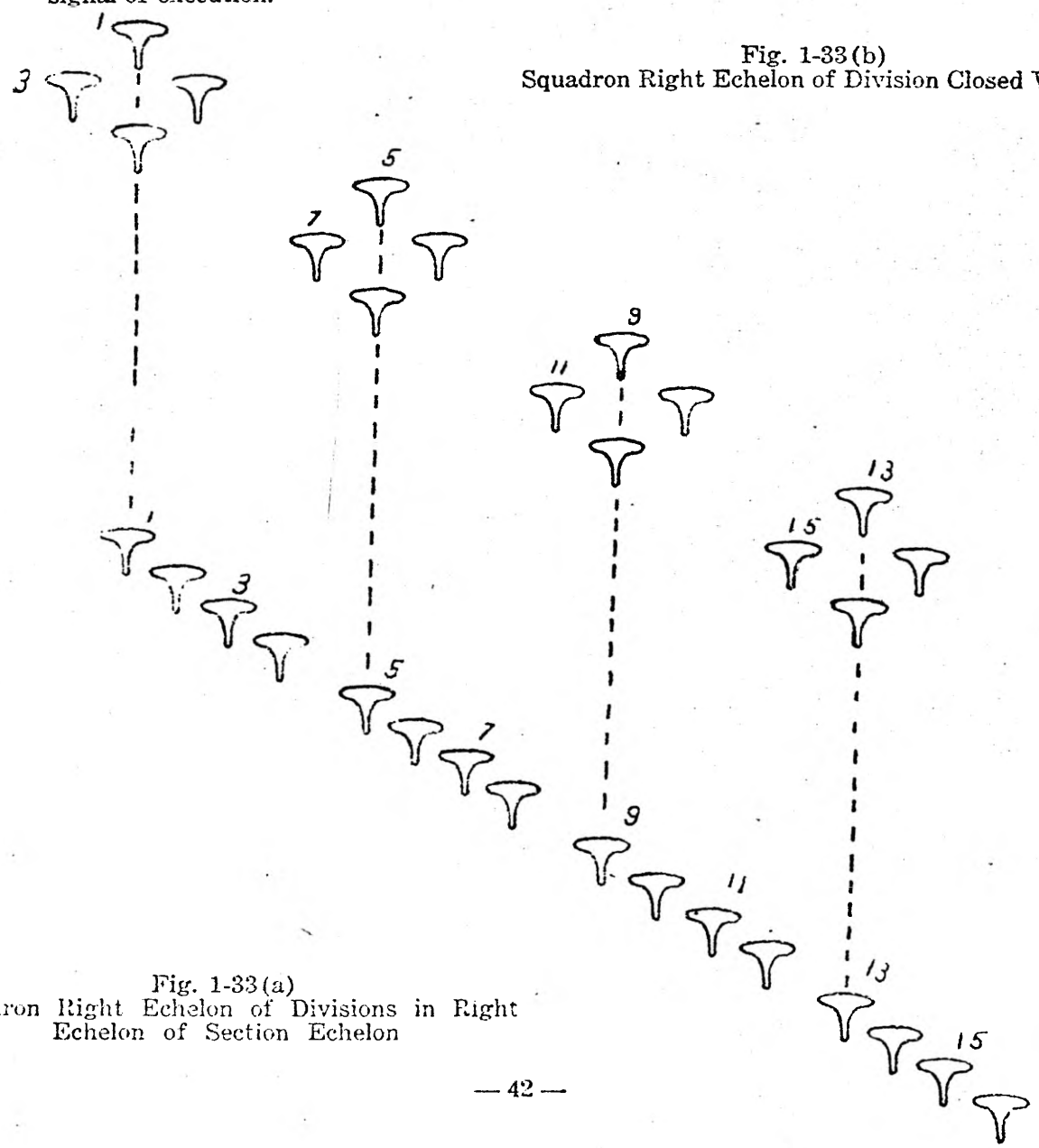


Fig. 1-33(a)
quadron Right Echelon of Divisions in Right Echelon of Section Echelon

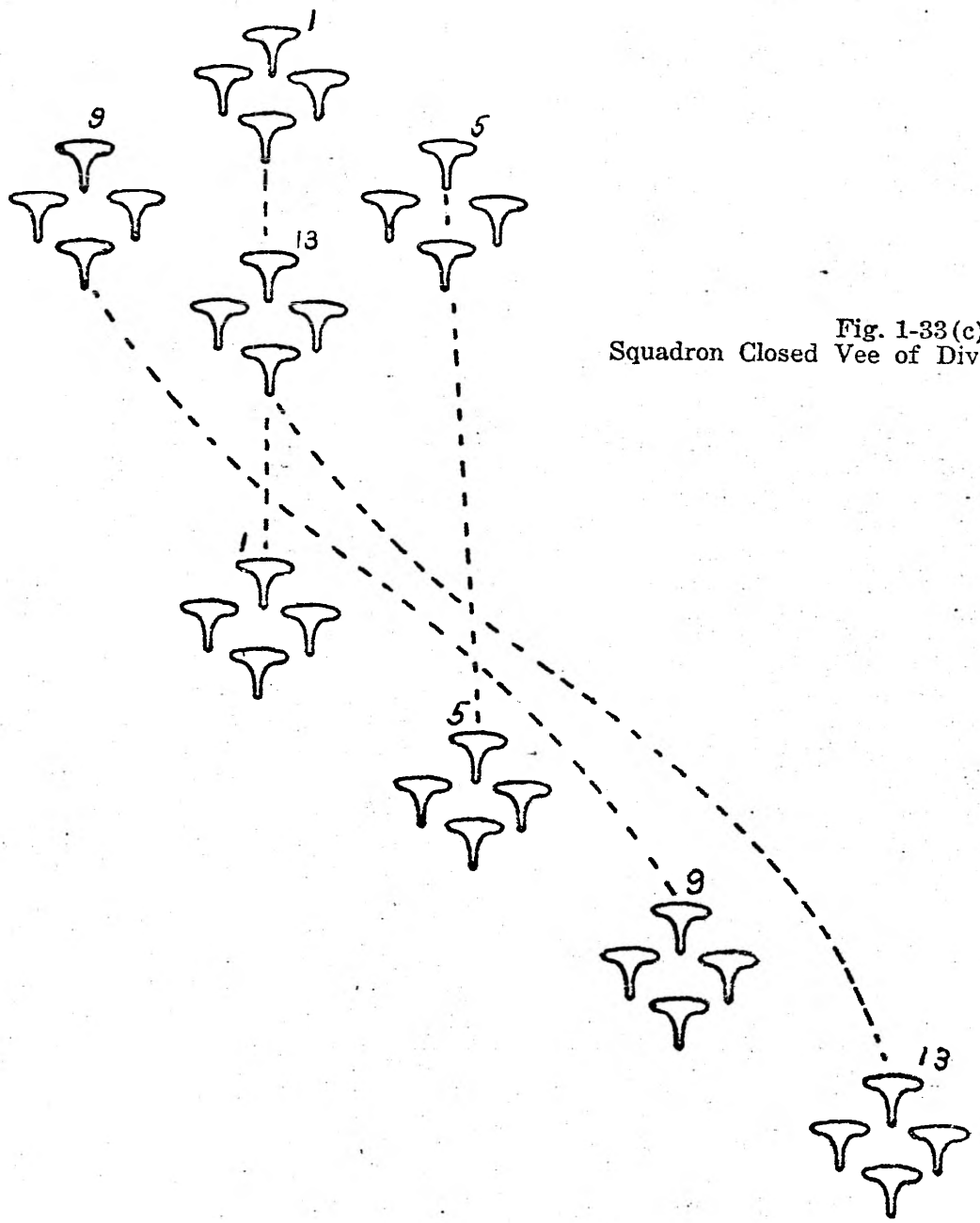
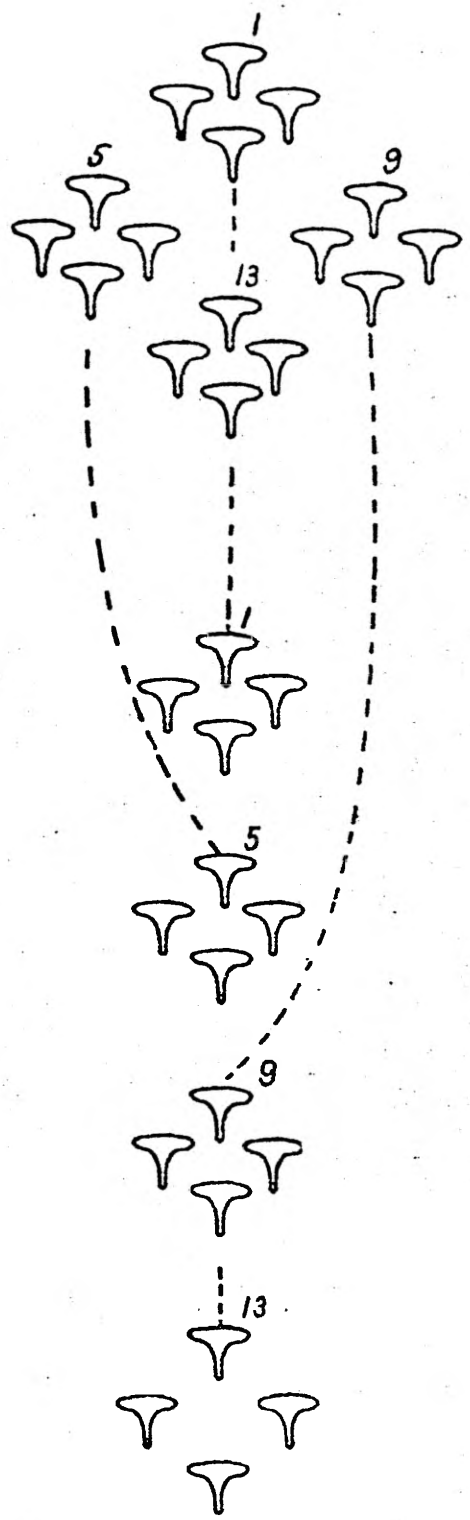


Fig. 1-33(c)
Squadron Closed Vee of Division Closed VEES.

Fig. 1-33(b)
Squadron Right Echelon of Division Closed VEE.

Squadron Closed VEE of Division Closed VEE.
Fig. 1-33(e)

Squadron column of Division VEES.
Fig. 1-33(d)



1-323. Squadron Right (Left) Echelon of Division Closed VEES. (Figure 1-33(b)).

to

Squadron Closed VEE of Closed VEES. (Figure 1-33(c)).

Preparatory Signal: Succession of short zooms.

Execution Signal: None.

Third and fourth divisions shift over and close up. Second division holds fast.

NOTE: To go from 1-33(c) to 1-33(b): Squadron leader pumps right (left) arm followed by signal of execution. Third and fourth divisions shift over and drop back. Second division holds fast.

When the signal pump right (left) arm is given, section leaders of No. 2 section of each division must remember that the pump arm signal in this case applies to the divisions only and not to the No. 2 sections.

To go from Squadron Right (Left) Echelon of Division Closed VEES. (Figure 1-33(b)).

to

Squadron Column of Division Closed VEES. (Figure 1-28(d)).

Preparatory Signal : Swish tail.

Execution Signal: None.

1-324. To go from Squadron Column of Closed VEES. (Figure 1-33(d)).

to

Squadron VEE of Closed VEES. (Figure 1-33(e)).

Preparatory Signal: Leading Division make succession of short zooms.

Execution Signal: None.

NOTE: The movement from a squadron VEE of closed VEES to squadron column of closed VEES must be done by steps as shown in 1-33(c), 1-33(b) and 1-33(d).

1-325. Squadron Closed VEE of Division VEE. (Figure 1-34(a)).

to

Squadron VEE. (Figure 1-34(b)).

Preparatory Signal: Shake elevators.

Execution Signal: None.

Leading division places his division in left or right echelon as he desires.

Second and third divisions place their divisions in the echelon of their respective sides.

Fourth division places his division on the side and in the echelon to balance the VEE with the 16th plane taking station to close the VEE if all planes are present.

In the absence of individual planes or whole divisions the second, third or fourth division distribute their wing planes to balance the VEE using any odd plane to close the VEE.

NOTE: To go from 1-34(b) to 1-34(a): Squadron leader shake elevators.

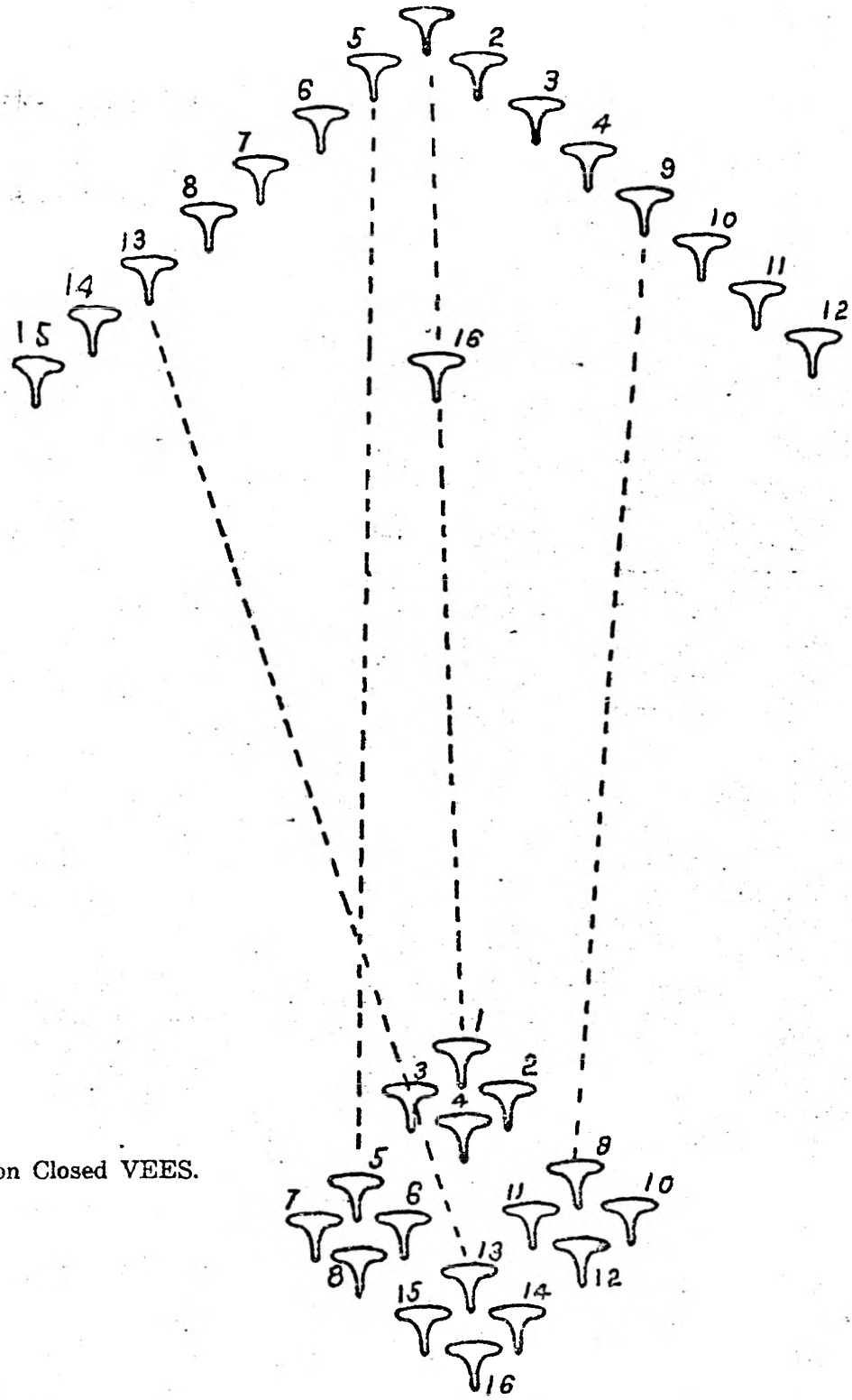


Fig. 1-34(b)
Squadron VEE

Fig. 1-34(a)
Squadron Closed VEE of Division Closed VEES.

A, B, C, FORMATION.

1-326. From any squadron column formation or from any squadron echelon formation, the squadron may be placed in an A, B, C, formation. The division leaders take up their respective positions and take their division in free cruising echelon of sections as shown in Figure 1-35. Sections are in free cruising within the divisions. In this formation the division leaders are free to maneuver to facilitate following the leader in sharp turns, dives or climbs.

Preparatory Signal: Poke thumb over shoulder.
Execution Signal: Shake ailerons.

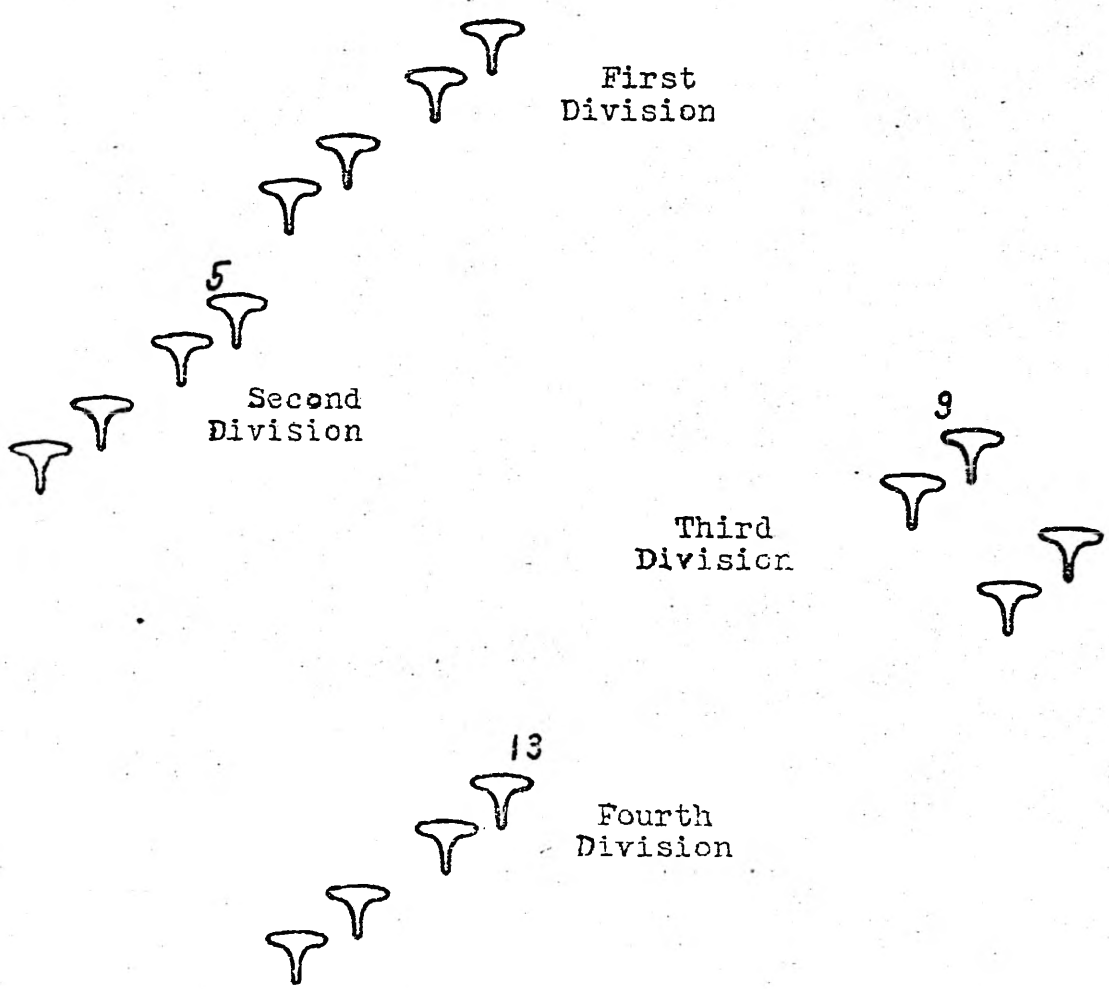


Fig. 1-35
Squadron A-B-C Formation with Four Divisions of Two Two-Plane Sections

1-327. To form two divisions of four two-plane sections, (Figure 1-36(b)), from four divisions of two two-plane sections. (Figure 1-36(a)).

Preparatory Signal:	Wing plane of leading section steps down.
Execution Signal:	None.

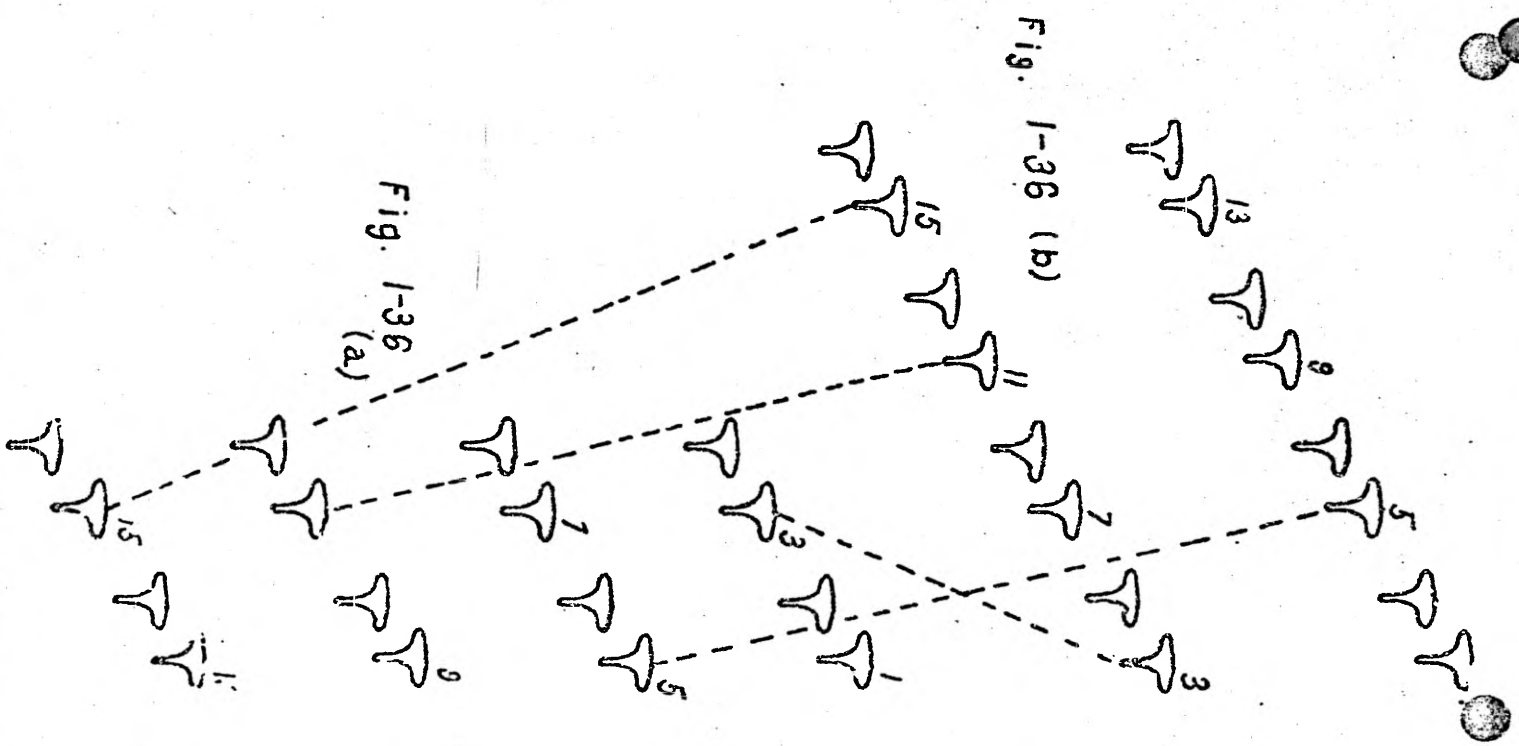
NOTE: All section leaders must step their respective wing planes down using the thumb down signal. Second section of leading division hauls out to rear to form lead of the second division as newly formed. Then second section of each ship's unit hauls out to form up on the second section of the leading division, all wing planes are brought back into position by patting side of fuselage.

The formation of a VCS squadron in two divisions of four two-plane sections is for purposes of accomplishing two separate missions simultaneously. Accordingly only a free cruising echelon of sections within each division is used in this formation.

To close the second division in on the first division the squadron leader will zoom radically. The leader of the second eight-plane division will close in to easy sight contact with the leader.

When in the two divisions of four two-plane sections, to go back to the standard organization, the squadron leader will signal the second division leader to close in and then by stepping down his wing plane will indicate: "form four divisions of two two-plane sections."

The second sections of each ship's unit will then close up on their respective sections. (Fig. 1-36(a)).



CHAPTER 4

SQUADRON MANEUVERS

SQUADRON TAKE-OFF

1-400. The usual take-off unit is the section. Where space and type of plane permit, division take-offs are authorized and encouraged. Procedure is as for section take-off. (Paragraph 1-200).

SQUADRON RENDEZVOUS

1-401. (a) Divisions of 3-plane sections normally rendezvous in echelon of section vees with the divisions in natural order above and astern of divisions ahead, and patterned after the leading (first) division. The number two section of the first division sets the echelon to be formed, on the side away from the turn. For operations ashore, the leading unit proceeds to the rendezvous location (which should be at or above a definite point, if practicable, and at a prescribed altitude) and starts a wide sweeping left turn at reduced speed.

(b) Rendezvous for two and four-plane units will be made in an easy left turn, number two planes of each section joining up in the number two position on the section leader; sections and divisions following in free cruising formation.

(c) When about to join a formation, the pilot of a single airplane, or the leader of another formation, will approach his position from a safe altitude and from the side, and he will not finally take his position until his presence has been acknowledged by the leader of the formation to be joined.

SQUADRON DEPARTURE

1-402. Departure on mission assigned may be:

(a) NORMAL DEPARTURE. Aircraft on scouting missions depart by sections, as formed, without waiting to accomplish squadron rendezvous; aircraft on inner, intermediate and outer air patrols depart by patrol units. Aircraft on other missions effect squadron rendezvous before proceeding on mission assigned.

(b) URGENT DEPARTURE. Aircraft on scouting missions, as well as on intermediate and outer air patrols, depart by single planes after section leader is assured that all planes of section have been launched, and rendezvous as a section enroute. Aircraft on other missions depart by sections as soon as formed, squadron effecting assembly enroute to objective.

(c) DEFERRED DEPARTURE Squadrons and group rendezvous are effected prior to departure.

NAVIGATIONAL RESPONSIBILITY

1-403. Each plane is at all times responsible for its own navigation and will continually fix its own position as accurately as its facilities permit. Even when flying in formation, each plane must, to the best of its ability, record its successive positions in order that it may be able at any time to operate independently. If any pilot believes that his formation commander is flying on an incorrect course, he may fly alongside the leader and indicate what he considers to be the correct course, but he shall then rejoin the formation and continue to follow his commander.

CHAPTER 5

SCOUTING

SECTION I

GENERAL

1-500. Any type of squadron may be used for scouting, but where choice exists only those types whose characteristics fit them for the particular type of scouting to be used should be assigned. The contents of this chapter apply to all type aircraft assigned scouting missions. Special instructions pertaining to the different types of aircraft are included in the applicable Type Tactical Orders and doctrine.

DEFINITIONS

1-501. (a) **FIXED POINT OF ORIGIN** is a geographical point determined either by geographical coordinates, a definitely fixed object, or by a time designated position of a reference vessel which is unaffected by the subsequent movement of such a vessel.

(b) **MOVING POINT OF ORIGIN** is a point maintained relative to a moving reference vessel, or an imaginary point moving along defined courses at defined speeds. When referred to a moving origin the area or line moves with the origin, whether defined by true or relative bearing.

(c) **GEOGRAPHICAL AREA** is a fixed area defined by bearings and distances from a fixed point of origin.

(d) **RELATIVE AREA** is a moving area defined by bearings and distances from a moving origin.

(e) **VISIBILITY** is the distance at which the objectives of the scouting operation can be seen and recognized.

(f) **SEARCH** entails one complete investigation of the defined area, such that all parts of the area have passed within visibility.

(g) **OBSERVATION (PATROL)** entails repeated investigation of the defined area during specified time.

(h) **DISTANCE TO BE SEARCHED** is the distance to be covered by the airplane's track from the POINT OF ORIGIN along the median of the subsector to the maximum chord of the subsector.

(i) **SCOUTING SPEED** is a designated true airspeed.

INFORMATION FURNISHED SCOUTS

1-502. Prior to departure on scouting missions as much of the following information as is known, or as can be estimated, will be furnished the commanders of all units concerned, by signal unless otherwise covered by general or special instructions:

(a) Type of operations — Search, Observation, Tracking, Contact Scouting, etc.

(b) Objective of mission.

(c) Number of aircraft to be launched by each vessel concerned.

(d) Number of aircraft in each scouting unit if not standard.

(e) Origin of area or line and whether fixed or moving origin. When moving origin is designated, course and speed of movement must be specified, and subsequent changes therein must be sent to the scouting units.

(f) Limiting bearings of sector for sector search (three numerals indicate true bearing, one or two numerals indicate relative bearing in tens of degrees). NOTE: When referred to a moving origin, the area or line moves with the origin whether defined by true or relative bearings.

(g) When other sector search is used, track of guide and bearing of line will be indicated. Other aircraft units take parallel courses unless otherwise directed. Either scouting front or distance between tracks of adjacent aircraft scouting units may be used.

(h) Distance to be searched.

(i) Visibility to be used in search plan if not standard.

(j) Instructions for action after contact.

Additional to above for Cruiser and Battleship Units.

(k) Total number of scouting units to be launched to cover designated sector or area.

(l) Initial time of entry into area or arrival on the line, if necessary.

(m) Order of ship's aircraft on the line or in the area. (May be omitted if order is that of ships on line, is covered by instructions, or is normal order).

(n) True airspeed to be used, unless standard.

(o) Altitude, if not covered by instructions.

(p) Course and speed of parent vessels (Point Option) during duration of search. NOTE: This is essential for navigational purposes. It may not be the same as movement of origin.

PREPARATION FOR MISSION

1-503. Prior to manning planes for any scouting mission, scouts must be allowed ample time for navigation after receiving all necessary navigational information, or from time of receiving information requiring a change of tracks to be flown.

ATTACK INSTRUCTIONS

1-504. Scouting aircraft will not attack unless:

(a) Specifically directed in the orders for operation.

(b) Enemy aircraft are headed so as to make initial contact with own important surface forces.

(c) Scouting mission is completed and considerable damage can be inflicted by the armament carried. However, such attack will not be carried out if there is reason to believe that the presence of own force is unknown to the enemy.

(d) Air operations from an enemy carrier can be delayed. Own forces must be definitely informed of the carrier's position and the condition of its deck prior to such attack.

ENCOUNTERING OPPOSITION

1-505. Scouts will be governed by the following principles when air opposition cannot be avoided:

(a) Close up.
(b) If performing contact scouting or observing gun fire take defensive formation and make use of available cloud cover.
(c) Fly close to water if practicable.

CONCENTRATION

1-506. Scouts will not concentrate upon objective unless all the units composing the objective are known to have been located, and unless previously directed. Unless otherwise ordered, they will continue to search to the end of assigned area, even though forces have been located in that area. If enemy forces other than the primary objective of the search are located in sufficient number and suitable position to threaten own forces, they should be tracked and the parent vessel informed as to this action. In any case, the required contact reports will be made.

RENDEZVOUS FOR ATTACK

1-507. When the operation order indicates that scouting units should rendezvous for attack each section leader will be responsible for the decision as to proceeding to the contact and rendezvous, depending upon time and distance involved, weather conditions, and fuel available. All sections for whom it is practicable should attempt to rendezvous at the contact and should return to the carrier immediately if the rendezvous is missed.

INFORMATION TO ATTACK GROUP

1-508. Scouts in contact with the objective of an air attack must be prepared to direct the attack to the objective by supplying continuous information as to the position of the enemy and by radio transmissions that will permit homing by the attack group. Scouts watching important forces should be relieved on station so that continuous contact may be maintained.

REPORTS

1-509. Contact, amplifying and tactical reports will be made as outlined in the *section on* Contact Doctrine, Part One, Chapter 6, Section Two, of this publication.

AVOID DETECTION

1-510. Aircraft making contact shall act to avoid detection by enemy ships unless this avoidance is definitely no longer appropriate.

SCOUTING UNIT

1-511. The normal peacetime scouting unit will be as designated for the particular type of scouting and type of aircraft used.

ORDER OF STATION UNITS

1-512. The relative order of units in the various forms of scouting will be as specified for the aircraft type.

SCOUTING ALTITUDE

1-513. For purposes of accurate navigation, scouting altitude should be between 500 and 1000 feet, varied to obtain desirable horizontal visibility conditions, in order that there will be a minimum variation between surface wind and that at scouting altitude. As no satisfactory drift measuring instrument is available for scouting aircraft, the estimation of the surface wind, which with practice can be done with considerable accuracy, must remain the basis of aerial navigation. When distant from land, the altitude may be increased. Air soundings are generally uniform for large areas in the open sea. When confident of the wind velocity and direction at higher altitudes, scouts should maintain the best altitude for visibility.

Often a change of a few hundred feet will increase horizontal visibility to a marked extent. Scouts should try various altitudes during the last few minutes of the intercept leg as much better visibility may be obtained at other altitudes and navigation will be little effected by this procedure.

DEPARTURE

1-514 Aircraft on scouting missions shall take normal departure (Art. 1-402) unless otherwise directed.

SECTION II

SECTOR SEARCH

GENERAL

1-515 AIRCRAFT SECTOR SEARCH as employed by aircraft differs from the sector search used by surface craft. Because of the facts that aircraft scouts must generally start search from a common origin, that their endurance is limited, and that aerial navigation is subject to greater variables than surface navigation, the aircraft form of sector search is the only preferred form; however, search of a rectangular area may be required by the necessities of the situation. The limited fuel endurance of aircraft and their small value for night search restrict their employment as scouts to daylight hours, and precludes retirement at assumed objective course and speed during conditions of low visibility. The action which aircraft scouts should take upon encountering reduced visibility is discretionary. If the reduction of visibility is such as to affect the thoroughness of the search under the plan ordered, but not sufficient to create a hazard to flight, aircraft should, if practicable, fly additional tracks as necessary to investigate the area of reduced visibility. When good visibility is again encountered, operation should be continued as originally planned. If the visibility in a small area is such as to prevent the safe flight of aircraft, pilots should fly around the dangerous area and then continue search on the original track. When conditions of widespread dangerous visibility are met, aircraft should search only the safe area. Upon return to parent vessel or base, report should be made of areas not searched.

In addition to the usual method of prescribing a sector search area (by means of limiting bearings), it may be prescribed by means of the angle included between the desired limiting bearings and the direction (bearing) of the median line of the sector; e.g. "search 60-degree sector whose median line is 085 degrees and radius 75 miles".

In addition to the usual methods of prescribing a rectangular search area (by means of geographical co-ordinates, etc.), it may be prescribed as follows:

(1) Prescribe point of origin, and

(2) Define the diagonal by direction (bearing from point of origin) and length. The sides of the rectangle are the parallels and meridians. Example: "Search rectangle whose diagonal has the direction (bearing) 145 degrees and is of length 115 miles from point of origin".

When search of a rectangular area is prescribed, it is initiated at that side of the rectangle which is most suitable.

NOTE:—General signals are provided in the SOPUS section of the General Signal Book for prescribing search sectors and rectangles.

SUBSECTORS

1-516 When sector search is ordered, the total sector assigned will be divided into sub-sectors, one for each scouting unit; the radius of the sector is the outward distance of the airplane's travel and does not include the range of visibility. Assignment of units to sub-sectors will be in accordance with the doctrine specified for the aircraft type involved.

SEARCH WHEN CHORD IS LESS THAN TWICE VISIBILITY

1-517 When the length of the maximum chord of the sub-sector is less than twice the visibility, each unit will search along the median of the sub-sector as illustrated in FIGURE 1-37.

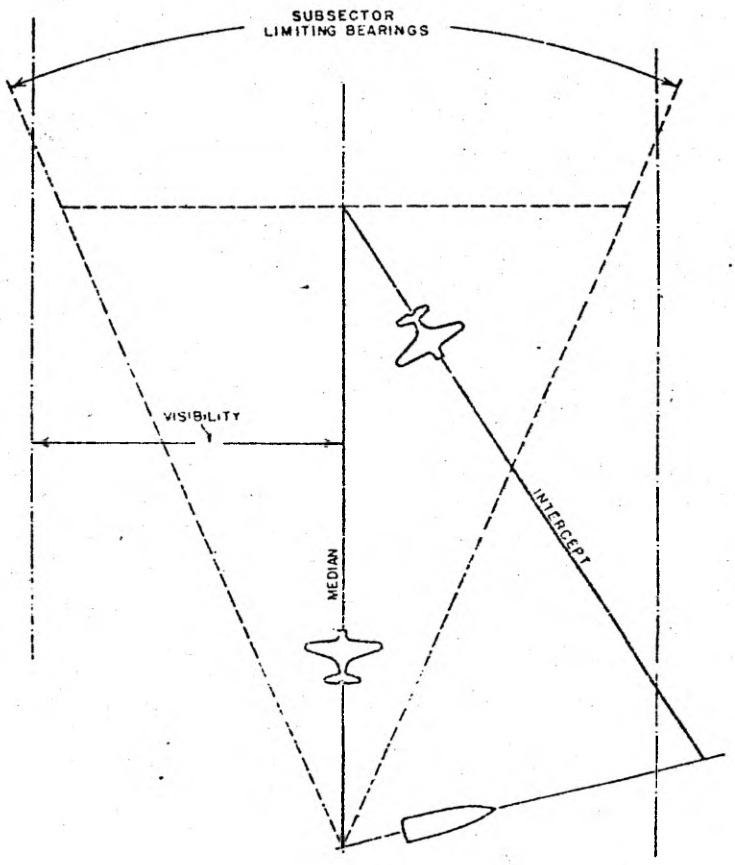


Fig. 1-37
Search when chord is less than Twice Visibility

SEARCH WHEN CHORD IS TWO TO FOUR TIMES VISIBILITY

1-518 (a) **When the intercept track completes the coverage of the sub-sector:**—When the length of the maximum chord of the sub-sector is greater than twice the visibility, and not greater than four times the visibility, the first leg will be from the Point of Origin to a point "A" on the maximum chord which is located at a distance equal to one-fourth the maximum chord from the rear side of the sub-sector (see Figure 1-38). The second leg will be along the maximum chord from the end of the first leg to a point "B" which is distant from the forward side of the sub-sector by the amount used for determining point "A". The third leg will be plotted to intercept the parent vessel. To determine if the sub-sector has been completely covered without a fourth leg, it is necessary to draw a line CD parallel to the first leg and at a distance forward of that leg equal to twice the radius of visibility. If the intercept track is to the rear of this line, the sub-sector is completely covered by three legs. However, if the intercept track crosses the line CD, further construction is necessary to determine the necessity for a fourth leg to cover the sub-sector.

(b) **When the intercept track does NOT complete the coverage of the sub-sector and fourth leg is necessary:**—The method of determining the necessity for a fourth leg is illustrated in Figures 1-39 and 1-40, and is as follows:

(1) Draw a line EF parallel to the first leg at a distance from the first leg equal to the visibility and toward the forward side of the sub-sector.

(2) Where EF crosses the forward side of the sub-sector, drop a perpendicular to the line CD intersecting CD at G.

(3) If the intercept track does not cross inside of or through point G a fourth leg is required.

(4) The third leg is then drawn from "B" to "G" and a fourth leg flown from the point "G" to intercept the parent vessel, (Figure 1-40).

1-519. Sectors with a maximum chord greater than four times the radius of visibility should never be assigned. The numerous courses necessary to search the entire sub-sector are too involved for aerial navigation.

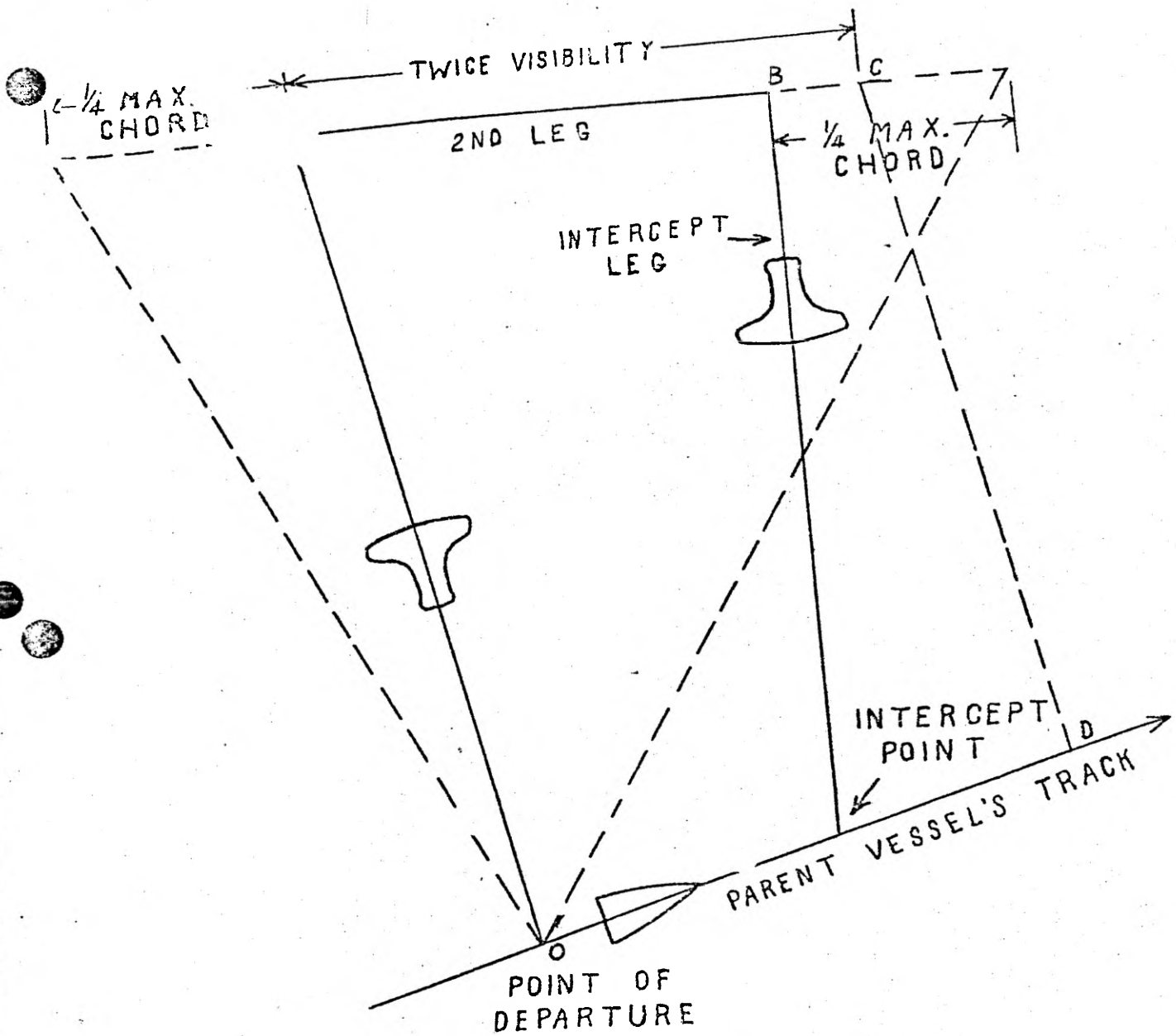


Figure 1-38

SEARCH

When Maximum Chord Greater Than Twice Visibility but Intercept Track Completes Coverage of Sector.

Article 1-518(a)

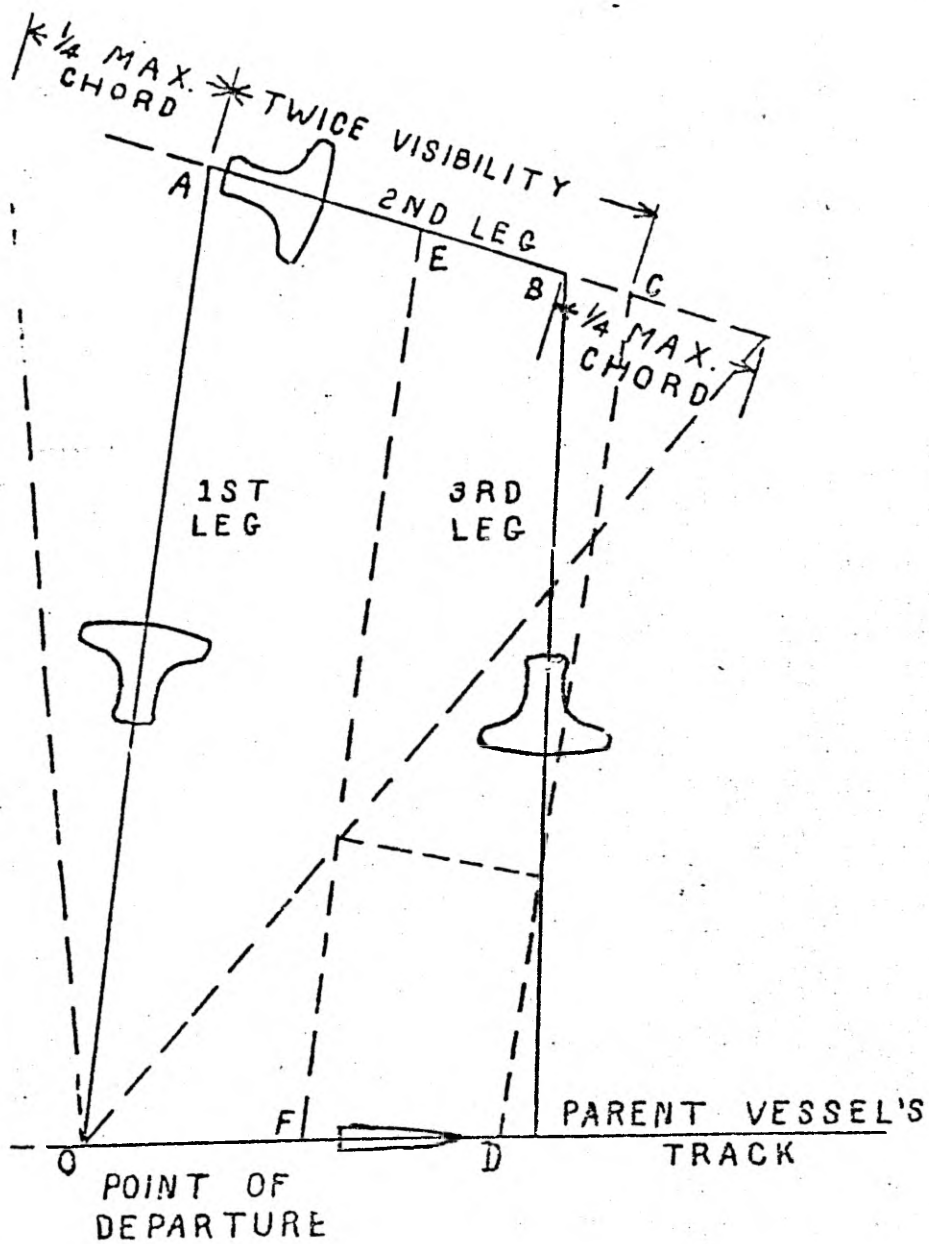


Figure 1-39.
Maximum Chord Greater than Twice Visibility,
Fourth Leg Not Necessary.
Article 1-518(b)

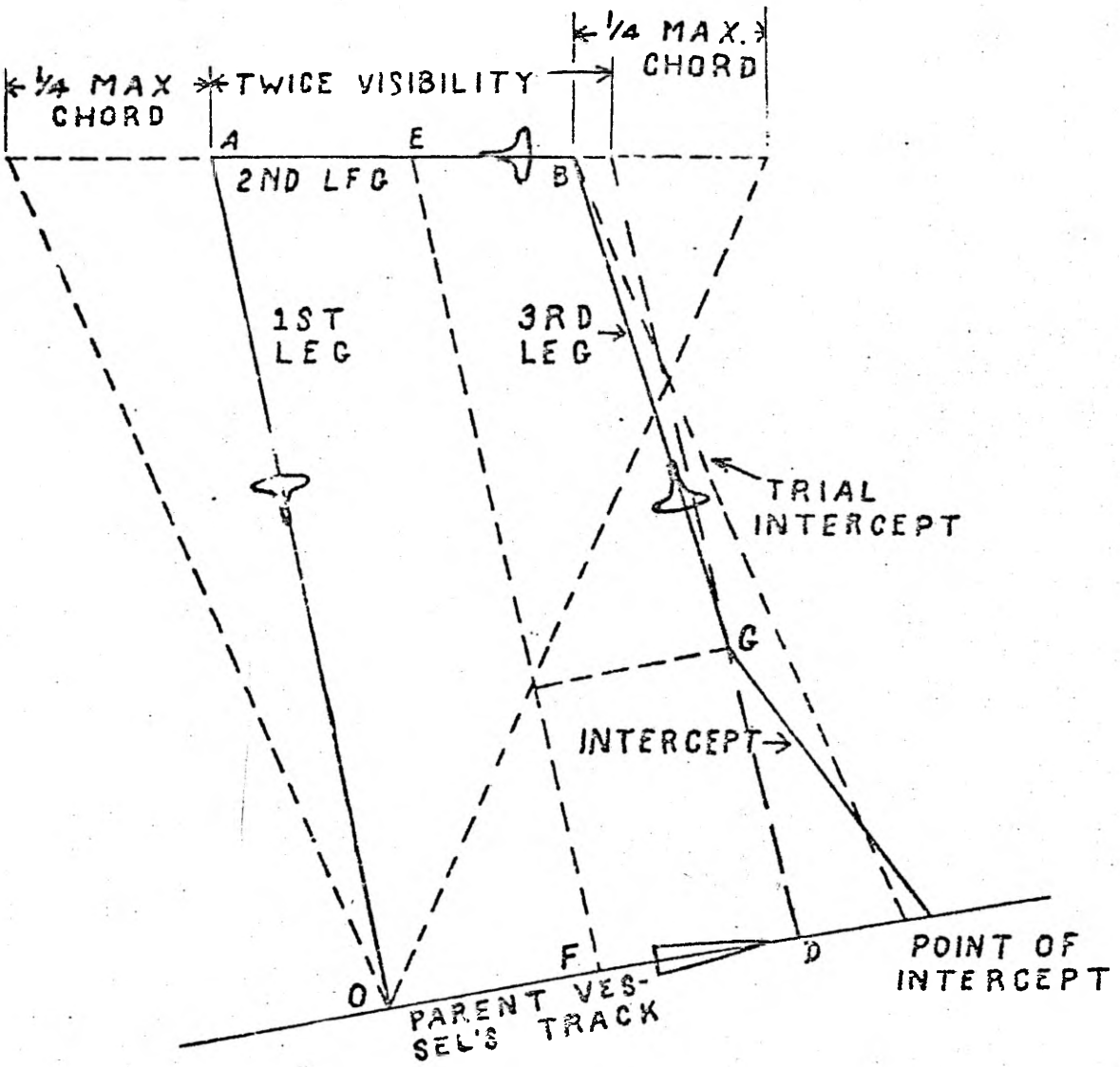


Figure 1-40.

Maximum Chord Greater Than Twice Visibility.
Fourth Leg Necessary
Article 1-518(b)

In an area of anticipated enemy contact where fighter opposition may be encountered, the scouting line should not be formed of individual planes. Sections should remain together for defense and to expedite rendezvous when contact is made.

ORDER OF TRACKS TO BE FLOWN

1-520 When searching a sector requiring more than two legs to complete the coverage of the area, the leg farthest away from direction of movement of the parent vessel (or fleet center), as the case may be, shall always be searched first.

VISIBILITY

1-521 A standard of 15 miles visibility will be used in determining tracks flown to cover the sector unless otherwise directed.

SECTION III

SCOUTING LINE

EMPLOYMENT

1-522 Whenever a flight of aircraft is seeking contact with a surface unit, in the absence of positive information as to the relative location thereof, aircraft shall employ the SCOUTING LINE to reduce the chances of missing contact. The primary application of this principle is to insure the interception of the parent vessel or own force upon return from a long flight.

FORMING SCOUTING LINE

1-523 Preparatory Signal: Leader shades eyes with hand and looks from side to side.

Execution Signal: Shake ailerons.

(a) On the signal of execution, following sections speed up to form line normal to the course with the leading section guide, in relative order as specified for the type.

(b) Sections diverge from leader's course until an interval of not more than two miles is reached. If visibility is low, the interval shall be such that two sections can be seen on each side.

(c) If leader deploys his wing planes on the scouting line, other sections shall similarly deploy. Distance between planes then becomes that given for sections.

(d) When line is established the guide is center (senior plane).

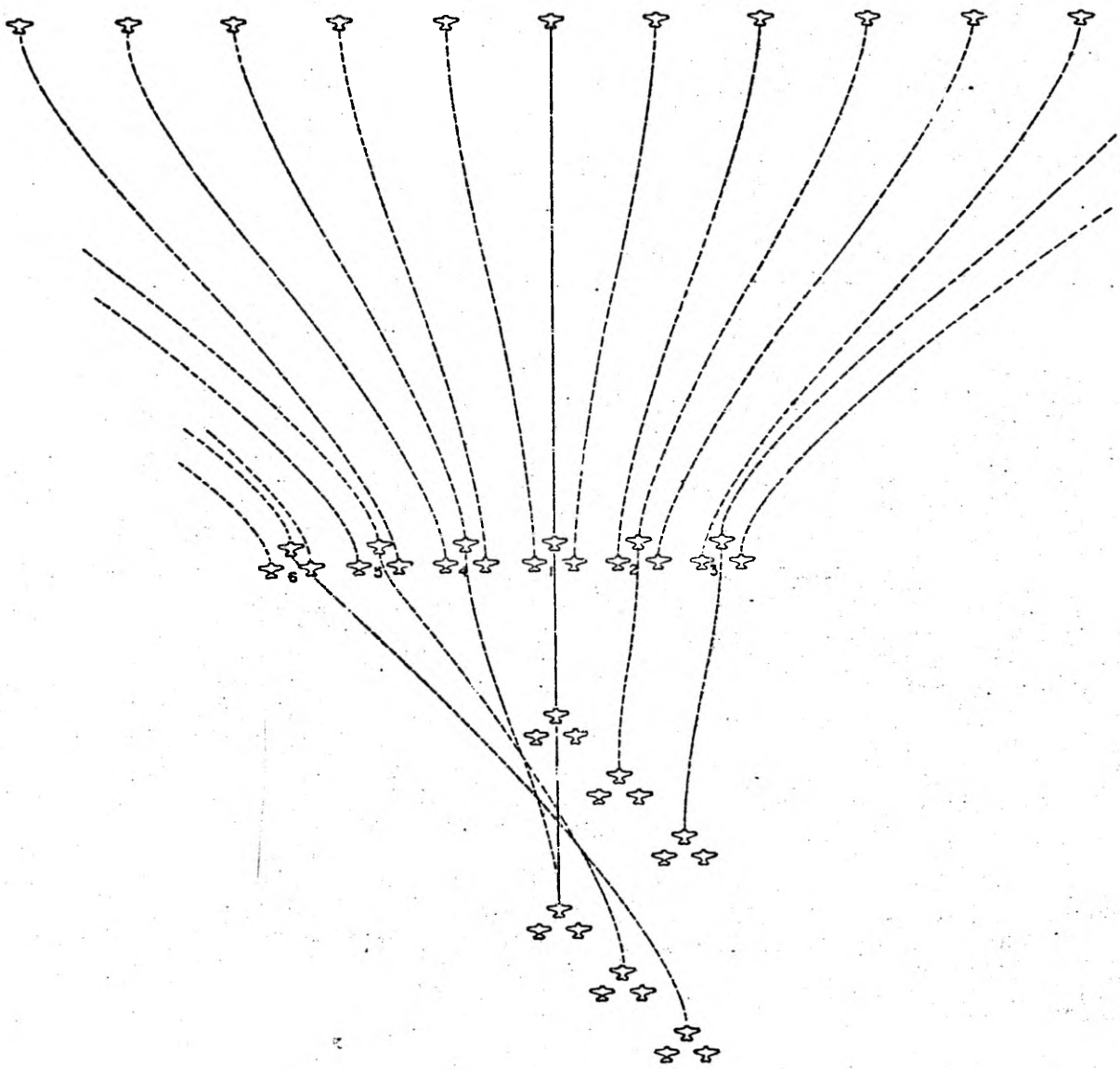


Fig. 1-41

Formation of Scouting Line

SCOUTING LINE — RENDEZVOUS

1-524 The plane or section making contact will make a series of pronounced zooms followed by circling to the left. This signal shall be repeated by all planes in the scouting line. The extreme outboard planes on each flank will move in toward the contact plane as soon as the rendezvous signal is observed and join the next inboard plane. No interior unit shall close toward the point of rendezvous until all outboard planes have closed in.

The plane or section giving the rendezvous signal may drop a float light and circle around the float light in order to hold a fixed point for the rendezvous.

SECTION IV

CONTACT SCOUTING

CONTACT SCOUTING

1-525 TRACKING AND TACTICAL SCOUTING are similar in aircraft scouting. These operations may often be combined with aircraft attrition attacks. TRACKING requires contact with the enemy after discovery, for the purpose of supplying continuous information as to position and direction of movement; and intermittent information as to disposition. TACTICAL SCOUTING is employed for the purpose of furnishing the O. T. C., with continuous information as to the detailed movements of the enemy, in order that he may make his own tactical disposition. It is especially important that the O. T. C., be kept informed of any changes in the enemy disposition, course and speed, and bearing and distance of enemy main body from own main body, whenever contact between surface vessels appears imminent.

DISPOSITION

1-526 Tactical scouts will operate in widely separated small units in order to reduce the probability of detection, and also to cover the complete enemy disposition. They should remain outside the anti-aircraft gun range of the enemy and clear of own gun fire. in position best calculated to observe the enemy while utilizing all possible concealment.

1-527. In shifting from AIRCRAFT SECTOR SEARCH to CONTACT SCOUTING it is normally inadvisable to attempt to effect any formal rendezvous between searching units. Adequate coverage and development of the enemy disposition while maintaining the best concealment possible are the primary considerations. However, in cases where the searching units are not widely separated and, hence, rendezvous is relatively easy, it may be advantageous to effect it. In so doing, the same principles as set forth in Article 1-507 apply. Again, where an enemy disposition covers only a small area, it may be best to recall all adjacent sections with a view to refueling and launching as an attack group or as relief scouts.

SECTION V

PATROL

1-528 Aircraft assigned the mission of observing and protecting areas are designated as PATROLS.

PRINCIPLES

1-529 Aircraft engaged on PATROL will continue to cover the assigned area until time set for relief. In patrolling a sector or other area, the principles of aircraft search insofar as method of coverage is concerned, apply.

GENERAL

1-530. The purposes of PATROLS are to:

(a) Give warning of aircraft, surface, or sub-surface attacks in sufficient time to allow counter measures to be initiated.

(b) Destroy attacking enemy forces.

(c) Detect, report, and if possible destroy mines in the path of own vessel.

FACTORS APPLICABLE TO ALL TYPES OF PATROLS

1-531. The following factors apply to all types of patrols:

(a) Patrols should be equipped with voice radio.

(b) The enemy force must be reported before it is attacked.

(c) Multi-seat aircraft should be armed with one hundred pound bombs or depth charges, and machine guns. If heavier armament is carried, the time on station will be materially reduced.

(d) Recognition signals must be used due to frequent contacts with own surface forces.

(e) Relief Patrols shall be on station at the time set for relief. Units being relieved will commence return to their parent vessels at the time set for relief, without waiting to be relieved on station.

(f) Patrolling should normally be done at the airspeed giving maximum endurance.

(g) Unless otherwise specified, the point of origin for all patrol sectors is the Fleet Center and the tracks flown will be relative to the Fleet movement.

(h) Although each type of patrol is for some designated primary purpose, all aircraft should be alert to detect, report and destroy any enemy forces encountered.

(i) The sector to be patrolled will be divided into sub-sectors equal in number to the patrol units available, and patrol units are assigned these sub-sectors in accordance with the doctrine for the particular type aircraft used.

(j) SECTOR ORIGIN FOR PATROLS — Air patrols and pickets will be stationed initially relative to the fleet course or other specified sector origin at the time patrols or pickets are established. They will NOT be re-oriented on subsequent changes of fleet course unless specifically ordered by the O.T.C.

ASSIGNMENT OF AIRCRAFT ON PATROL (Additional for Battleship and Cruiser Units)

1-532. When patrols must be maintained in watches, each watch may be made up of one or more planes from each ship concerned or each watch may be made up of all planes from a part of the ships concerned.

INFORMATION FOR PATROL UNITS (Additional for Battleship and Cruiser Units.

1-533. When aircraft are launched to patrol a given sector, the following will be specified by General Signal unless otherwise known:

(a) Number of aircraft to be launched by each unit addressed.

(b) (1) Course and speed of moving origin unless fixed origin is specified.

(2) Geographical position of fixed origin when specified.

(3) True or relative limits of sector.

(4) Outer radius in miles if not standard.

(5) Inner radius in miles if required.

(c) (1) Duration of watch and/or number of watches per day.

TYPES OF PATROL

1-534. The types of PATROL are:

(a) OUTER AIR PATROL — This form of patrol is established well ahead of the force protected to give timely warning of the approach of enemy forces — especially aircraft.

(b) INTERMEDIATE AIR PATROL — This form of patrol is established ahead of the force protected, with its primary purpose to force submergence, to track and to destroy submarines.

(c) INNER AIR PATROL — This form of patrol is established close to the force protected for the primary purpose of detecting submarines and mines.

(d) AERIAL PICKETS — This form of patrol is established to sight, report, and track high altitude air attacks.

(e) COMBAT PATROL — This form of patrol is established over and about the force protected to destroy enemy aircraft encountered.

* (c)(1) Intermediate Air Patrol (Modified) this form of patrol is a combination of intermediate and inner air patrol.

OUTER AIR PATROL

1-535. The primary mission of the OUTER AIR PATROL is to detect, report, and destroy enemy aircraft scouting or approaching for attack. This type of PATROL is used in conjunction with a circular screen of surface vessels, and in coordination with the Aerial Pickets and Combat Air Patrol.

(a) The patrol is formed on the arc of a circle twenty-five miles beyond the outer surface screen. Only that part of the circle from which attack is expected normally will be patrolled.

(b) The arc is divided into sub-arcs in the same manner as provided for Aircraft Sector Search, and units are assigned these sub arcs as provided in that doctrine.

(c) The Patrol unit will normally be three planes, modified under some conditions to two planes.

(d) When practicable, a surface vessel in the screen will be designated as reference vessel for each PATROL unit. Failing this, the senior pilot in each unit will select a reference vessel in his sub-arc of the surface screen. This vessel will be sighted as often as necessary to maintain station and at least once each hour.

(e) Units will patrol along the chord of the sub-arc assigned.

(f) Light conditions should be taken into consideration and the altitude chosen so that enemy scout or attack aircraft at low altitudes may be seen.

(g) In the case of other than a circular screen, modification of this plan may be used.

OUTER AIR PATROL

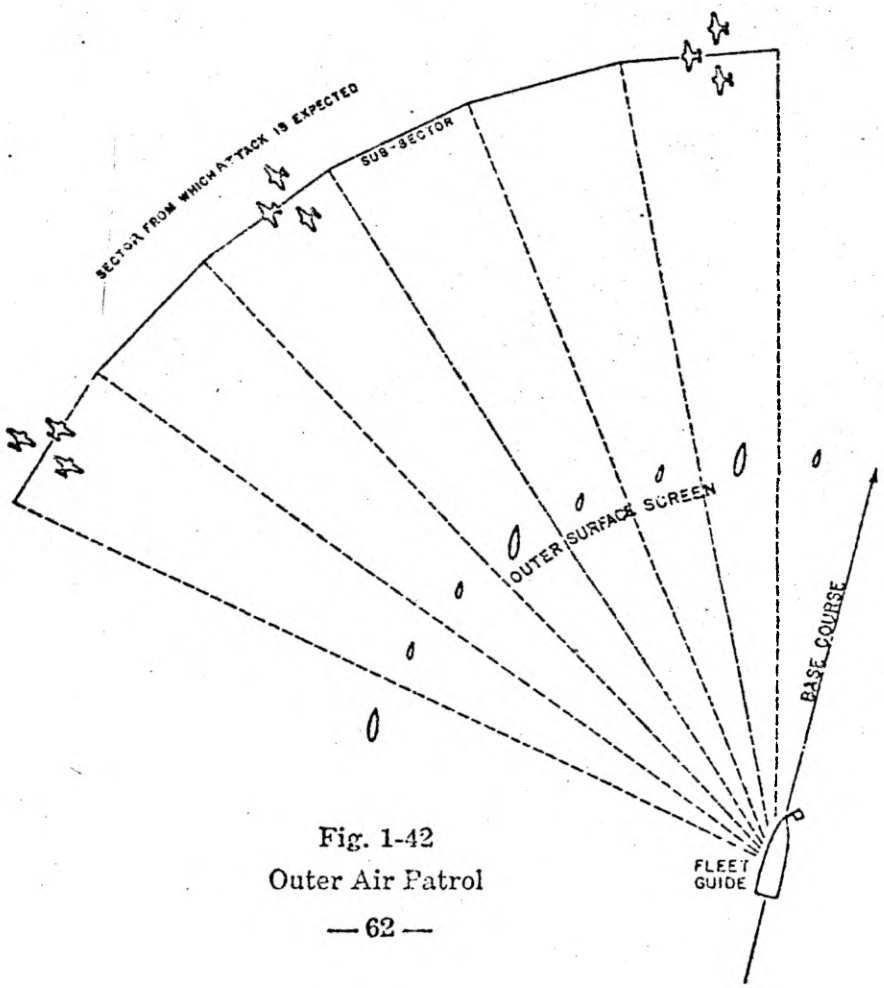


Fig. 1-42
Outer Air Patrol

INTERMEDIATE AIR PATROL

1-536. The primary mission of the INTERMEDIATE AIR PATROL is protection against enemy submarines, preventing them from gaining a favorable attack position. When the submarine has been reported and attacked, the INTERMEDIATE AIR PATROL should endeavor to keep the submarine in sight. This patrol is frequently used in conjunction with the INNER AIR PATROL. When own surface vessels approach, the location of the submarine should be indicated by repeated dives and by dropping float lights. The INTERMEDIATE AIR PATROL is organized as follows (see Figure 1-43):

(a) The patrol is maintained in sectors sixty degrees either side of the Fleet base course from five to forty miles from the Fleet Guide or other specified origin.

(b) The patrol unit is the same as for the OUTER AIR PATROL, three or two planes.

(c) A patrol unit should not be assigned a sub-sector greater than 30 degrees.

(d) The patrolling unit will cover the area in to the outer surface screen or to the five mile inner radius, whichever is farther from the origin, and will sight a unit of the Fleet after each investigation of its assigned area.

(e) The altitude, normally, should not be greater than two thousand five hundred feet. Under certain visibility conditions, however, submarines may be detected more readily at higher altitude and the patrol should change altitude occasionally to investigate visibility.

INTERMEDIATE AIR PATROL

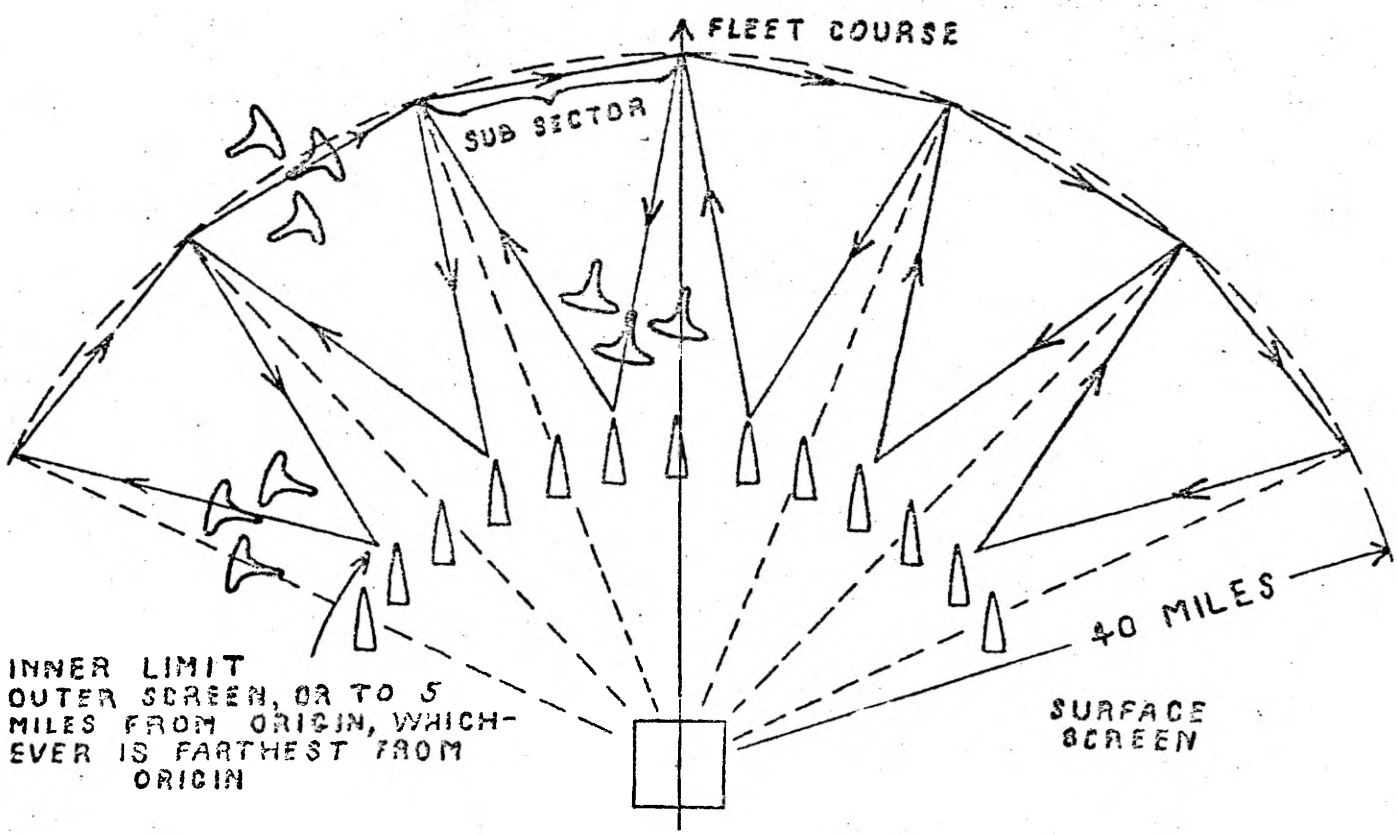


Fig. 1-43

INNER AIR PATROL

1-537. The primary mission of the INNER AIR PATROL is the establishment of a close anti-submarine and anti-mine screen about the center of the force protected. This protection consists of a warning to the surface vessels concerned, and destruction of the submarine or mine by machine guns or bombs where possible. When a patrolling aircraft sights a submarine it shall drop float lights and indicate position of the submarine by repeated dives. During these dives the submarine shall be attacked with machine guns and bombs. In case a mine is sighted, float lights shall be dropped and the position of the mine indicated by the patrolling aircraft circling the mine at very low altitude, just off the water, in a tight turn. When surface vessels have cleared the area the patrolling aircraft shall attempt to destroy or sink the mine with machine guns and bombs. Delayed action depth charge bombs where available shall be used by the inner air patrol in the attempted destruction of submarines and mines.

The patrol is established in accordance with the following principles (see Figure 1-44):

(a) A complete circle of about five miles radius about the force guide as a center is patrolled in this method.

(b) The patrol unit is the single plane. Each unit is assigned a sector between true bearings from the force guide.

(c) The density of units in the van semi-circle will be approximately twice that of the rear.

(d) The altitude of the patrol depends on the actual conditions of visibility encountered by the patrol. Variations in conditions of the sea, weather, clouds, haze, and sun glare prohibit the specifying of any altitude and the patrolling aircraft shall take such altitude as gives the best visibility under the conditions. It has been found by experience that under normal visibility conditions an altitude of about 1000 feet is best for sighting of mines and submerged submarines. However, after detection and marking of location by float lights it will probably be necessary to gain altitude in order to make an effective machine gun and bombing attack. In no case will a pilot proceed with his attacks until he knows the location of all other planes of the section or formation in which he is operating.

INTERMEDIATE AIR PATROL (MODIFIED)

1-537½. This is a combination of intermediate and inner air patrol in one patrol. The following principles obtained:

(a) A complete circle of about 20 miles radius from the center of the disposition is patrolled.

(b) Aircraft operate singly.

(c) One aircraft patrols the rear semicircle.

(d) Three or four aircraft patrol the forward semicircle, each responsible for a sector.

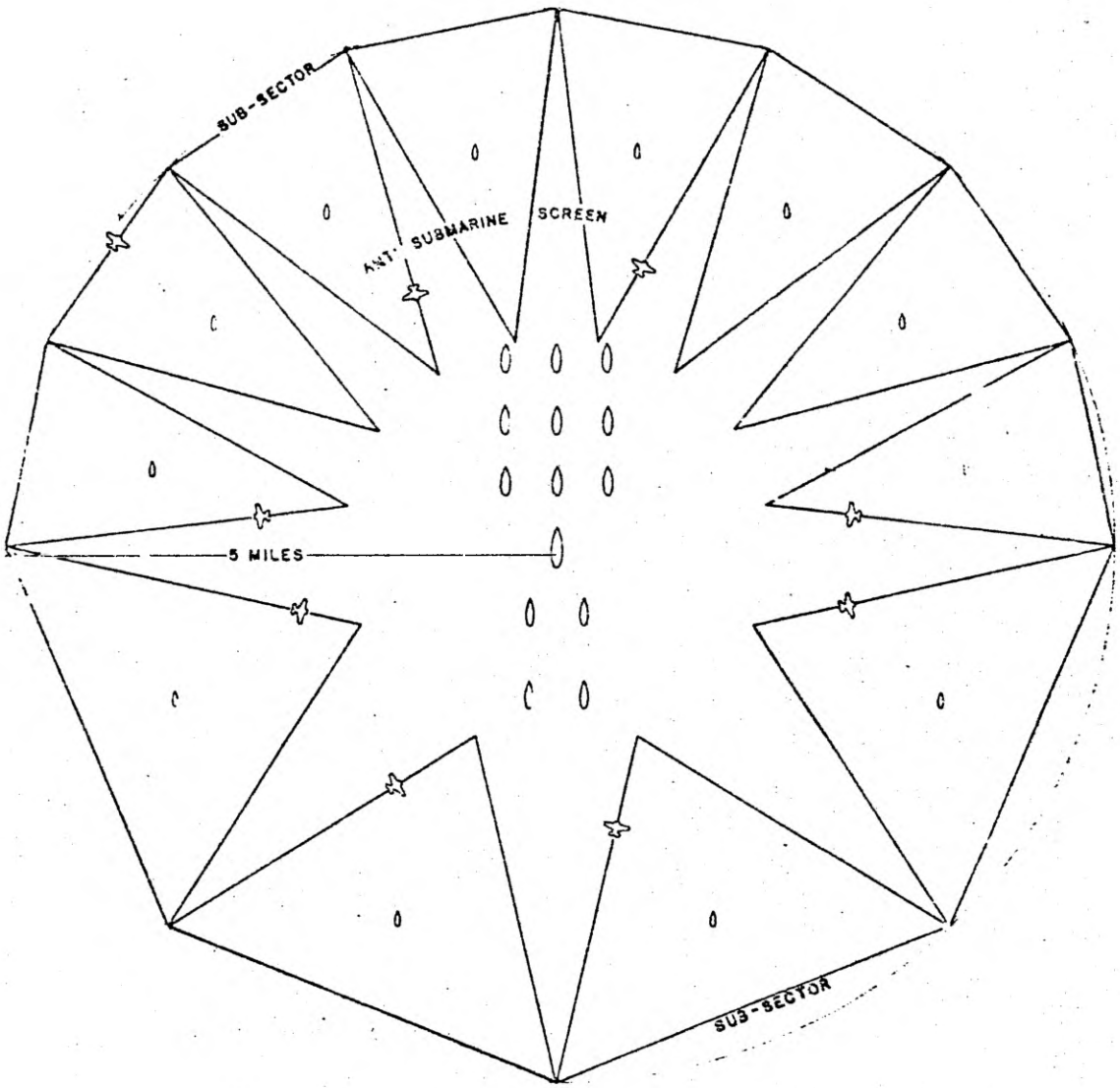


Fig. 1-44
Inner Air Patrol

AERIAL PICKETS

1-538. AERIAL PICKETS are aircraft disposed around a surface formation and beyond the surface picket vessels to sight, report, and track approaching enemy formations of aircraft until such time as the enemy formation can be intercepted and attacked by a combat patrol. Any type of plane may be used for this purpose. When conditions of weather and sea permit, cruiser and battleship planes may well perform this duty.

The following considerations should govern in stationing and instructing aerial pickets:

(a) Aerial pickets should (in time of war) operate singly in order that the pilot might give his entire attention to his lookout duties.

RADAR

1-540. Aircraft equipped with Radar may be used advantageously for scouting, tracking, patrol, and attack. The general principles laid down in this chapter apply.

(b) Aerial pickets should be relieved of any necessity of performing navigation. This may be accomplished in several ways. If the visibility is good, each picket can maintain a station at a given bearing and distance from a designated vessel of the screen. The aerial picket may be given a radius on which to patrol, returning at frequent intervals to re-establish contact with a vessel of the screen to verify position. If light surface vessels are available for stationing a thin picket circle at a considerable distance from the formation center, aerial pickets may be assigned to patrol between these surface reference vessels.

(c) Aerial pickets should entirely encircle the surface formation. The vertical and lateral densities as well as the radius of the aerial picket circle depend upon the number of aircraft available for this duty.

(d) Under normal conditions of good visibility, aerial pickets stationed at an altitude of 8,000 feet should be able to sight any aircraft approaching between that level and the surface. It is desirable that the vertical spacing of pickets extend upward to the highest altitude at which the approach of enemy aircraft may be expected. The vertical spacing between adjacent pickets should not exceed approximately 6,000 feet.

(e) Aerial pickets, if comprising aircraft of adequate performance and armament, should be prepared to attack enemy aircraft scouts immediately upon sighting them without waiting for the arrival of the combat patrol. Any delay might permit information to be transmitted to the enemy. However, disproportionate losses of aerial pickets should be guarded against.

COMBAT PATROL

1-539. Combat patrols are of two types:

(a) TO DENY ENEMY ATTACK — In this form of patrol, defending fighters should remain concentrated in units of at least ~~six~~ planes, ~~in order to have sufficient strength to attack any enemy air forces encountered~~. The number and type of enemy aircraft expected governs the size of the patrol unit. If enemy bombing attacks are anticipated, it may be necessary to retain the entire fighter strength available as one patrol, relying upon aerial pickets to report enemy aircraft in sufficient time for the patrol to engage the bombers before they have delivered their attack. Patrol altitude will normally be between twelve and twenty thousand feet, and above the level of broken clouds.

(b) TO DENY ENEMY OBSERVATION — In this form of patrol, it is expected that enemy aircraft encountered will be limited to patrol or scout planes. Small patrols will increase the number of patrolling units available, and since a small unit of fighters should be sufficient to destroy isolated scouts or patrol planes encountered, a three or four-plane unit is normally desirable.

Patrols may be assigned to definite sectors, or may conduct a continuous patrol about the force being screened.

Patrol altitude will be from seven to ten thousand feet, or below broken cloud layers or overcast.

1-540.

CHAPTER 6

TACTICAL DOCTRINES

SECTION I

CRUISING DOCTRINE

PRELIMINARY INSTRUCTIONS

1-600. Prior to take-off, squadron pilots should be given:

(a) OWN FLEET INFORMATION

(1) Disposition and composition.

(2) Fleet guide bearing, distance, and speed.

(3) Carrier prospective movements (Point Option).

(b) ENEMY FLEET INFORMATION

(1) Expected (or known) composition and location of forces.

(2) Enemy's intentions, estimated or known.

(3) Positions of neutral vessels.

(c) GENERAL INSTRUCTIONS

(1) Relative to attack on or concealment from enemy forces sighted.

(2) Relative to radio discipline, requirements as to contact and engagement reports.

(d) NAVIGATIONAL INSTRUCTIONS

(1) Navigational data, wind, etc.

(2) Required time of return to base or carrier.

NOTE: Before any aircraft unit is launched for a tactical mission its commander shall ascertain that all pilots of his command are in possession of such of the information enumerated above as is available and obtainable at the time.

CRUISING FORMATIONS — GOVERNING FACTORS

1-601. (a) The formation must be capable of quick conversion to any offensive or defensive formation.

(b) The formation must afford minimum strain and fatigue incident to formation keeping, but consistent with tactical concentration, and the tactical situation.

(c) Under war conditions airplanes proceeding in company shall take such disposition as affords mutual support, maximum protection against air attack and is consonant with the mission assigned. When the mission is one of attack the disposition shall be such as to permit prompt execution of the attack.

TYPES OF CRUISING FORMATIONS

1-602. Three satisfactory cruising formations are:

(a) Free cruising formation, a simple modification of division echelon of vees. (Par. 1-302) flown with open distance, suitable for use by all types.

(b) A-B-C formation (Par. 1-306), an open formation especially adaptable to small planes.

(c) Vee of vees formation (Par. 1-303), flown with open distance, especially suitable to large planes.

SHIFTING LEAD — TEMPORARY

1-603. The squadron commander will normally retain the lead of his squadron throughout the flight. If for any reason he desires to leave the formation temporarily, he will pat himself on the head, point to his number two and hold up one finger. Leader will signal course to be steered in his absence by holding forearm erect, hand open, and "chopping" in the direction to be steered. If he desires formation to circle, he so indicates by rotary motion of the forefinger held vertically down and rotated in the horizontal plane. Number two acknowledges by a nod of the head. Leader then "blows a kiss" and leaves formation.

SHIFTING LEAD TO SECOND DIVISION

1-604. (a) If the squadron leader wishes to leave the formation and have the leader of the second division take the lead, he will pat himself on the head, point to his number two and hold up two fingers. Number two acknowledges by a nod of the head. The leader then blows a kiss and leaves the formation. Number two then directs number three to cross over into the opposite echelon and back as a signal to the second division leader. After making this signal, number two will lead the first division off to one side to lose distance and fall in astern of the second division.

When the first division is approximately in position astern of the second division, number two followed by number three will break off and take position as the last section.

(b) If the squadron leader of a squadron of two or four plane divisions (VCS) wishes to leave the formation, he will:

(1) Signal the following divisions in to close distance.

(2) Point to the leader of the division which he desires to take the lead and hold up one finger.

(3) "Blow a kiss" and pull clear with his division.

(4) Turn over lead of his division to second section leader of first division who will haul out with the first division and fall in as last division of the squadron.

SHIFTING LEAD — FORCED LANDING

1-605. (a) If any plane in the first section has a forced landing, the other two carry out section procedure for the emergency; the leader of the second division takes command; the leader of the second section takes command of the first division and falls in astern of the second division.

(b) In squadrons of two or four-plane divisions, if a plane of the first division has a forced landing, the remaining plane or planes of that division carry out the forced landing procedure, the senior remaining division leader taking command of the squadron.

LOOKOUT DOCTRINE

1-606. (a) Aircraft formations and dispositions will maintain lookout either as a part, or in advance, of the main body of aircraft in order to:

(1) Insure immediate and effective announcement to all units of the sighting of enemy surface or air units, and their adequate observation.

(2) Insure location of the objectives of the operation or observation of the area covered.

(b) This doctrine is based on the principle that in every formation each section (two planes or three planes) will maintain a look-out covering all points of the sphere.

(1) THREE-PLANE SECTIONS — The personnel of the leading plane observes all the space forward of the beam (forward hemisphere). Wing planes observe all the space in the hemisphere towards each other from 0 degrees to 180 degrees relative, and from directly overhead to directly underneath. In multi-place planes the space assigned to each plane should be subdivided among the available members of the crew.

(2) TWO-PLANE SECTIONS — In two-plane sections, each observes the hemisphere towards the other from 0 degrees to 180 degrees relative.

It is essential that the assigned observation area be scanned in a systematic manner. A good plan is to draw imaginary vertical circles subdividing the hemisphere into about eight sectors and then to scan each sector from zenith to nadir. Sometimes it is helpful to focus the eyes on a distant object such as a cloud or the horizon in order to accomodate the eyes properly for seeing an airplane at a distance.

SECTION II

CONTACT DOCTRINE

CONTACT WITH SURFACE SHIPS

1-607. Pilots sighting ship should immediately estimate true bearing and distance and mark location with respect to cloud formation, bearing of the sun, or other ships. He should then endeavor to point it out to his section leader. If the latter immediately sights the ship, he will in turn point it out to the squadron commander, if not, the wingman concerned shall do so. Since radio traffic is always reduced to a minimum during tactical periods simulating war, reports to the unit

commander should be made by flying alongside and pointing or signaling the report by hand signals. A pilot leaving station to report in this manner should notify his section leader, if a wing man, or his number two man if a section leader by giving the leaving formation signal — "blowing a kiss". When this signal is acknowledged by a nod of the head, the pilot concerned breaks off and flies directly into position to make the report.

CONTACT WITH AIRCRAFT.

1-608. (a) DANGER OF ATTACK NOT IMMINENT — The procedure is the same as that in the preceding paragraph — sighting a ship.

(b) DANGER OF ATTACK IMMINENT — Since time is all-important, plane sighting enemy should immediately give break-off signal, leave formation without obtaining specific permission and dive past the formation to the vicinity of the squadron commander, giving the "attacked" signal — rocking wings from side to side, both during the approach to the squadron commander and after arrival in his proximity. The signal "violent rocking of wings" means, when given by the squadron commander, "attack"; given by any junior, "We are about to be or are being attacked". Supplement by radio alarm and burst of gunfire.

(c) COMBAT ORDERS — When in contact with enemy aircraft, unless use of radio is specifically prohibited, voice radio may be freely used by the pilot sighting enemy aircraft, and by the tactical commanders of the aircraft units in the proximity of the contact.

(d) MUTUAL ASSISTANCE — Airplanes in the same area shall take such steps to assist each other in repelling hostile air attack as time, the assigned mission, and their characteristics permit.

CONTACT REPORTS

1-609. The importance of promptness and accuracy in making Enemy Information Reports cannot be over-emphasized. To this end the pilots of all Fleet aircraft must become and remain thoroughly conversant with the procedure for the submission of "Enemy Information Reports," "Contact", and "Tactical" or "Amplifying Reports".

1-610. Enemy positions, particularly that of the enemy battle line, shall be reported in bearing and distance from O.T.C. when contact between surface main forces is imminent. Scouts will transmit all pertinent information concerning the enemy such as disposition, composition and maneuvers of the battle line, launching of aircraft, maneuvers of light forces, etc. If no changes develop in the tactical situation, scouts will so report every fifteen minutes. It is particularly important that information be supplied concerning the relative grouping of enemy forces such as may give indication as to probable direction of the enemy deployment. Ordinarily planes of designated heavy cruisers may be detailed for tactical scouting during the approach, and carrier planes detailed during the engagement. Fast carrier scouts with long endurance are particularly suitable for assignment.

1-611. Aircraft shall be equipped with suitable message bags and personnel instructed in accurately dropping them, so as to provide for delivery of necessary reports by message dropping in case of radio failure, or when radio silence is to be maintained or delivery of reports is so ordered.

ACTION ON CONTACT

1-612. An airplane sighting an enemy submarine when in visual contact with own vessels shall indicate the position of the submarine by repeated diving, shall attempt to destroy the submarine by bombs and machine gun fire, and mark the spot with float lights.

1-613. An airplane sighting a mine in the path of, or near own vessels, shall indicate the position of mine by circling the mine at low altitude, and attempting to destroy it by machine-gun fire.

1-614. Airplanes in the same area shall take such steps to assist each other in repelling hostile air attack as time, the assigned mission, and their characteristics permit.

SECTION III

ATTACK DOCTRINE

MISSIONS OF AIRCRAFT

1-615. Airplanes will carry such special equipment and armament as may be required for the execution of the mission assigned. Aircraft may be employed to perform the following attack missions:

(a) To destroy enemy surface craft.

(1) Capital ships — by bombs or torpedoes.

(2) Light forces — by bombs, or machine guns.

(b) To reduce battle efficiency of enemy surface craft.

(1) Capital ships — by bombs or torpedoes.

(2) Light forces — by bombs, or machine guns.

(c) To disrupt enemy fire control.

(1) All types — by bombs, machine guns, and use of smoke.

(d) To force enemy to maneuver, to join or break off engagement, or otherwise to conform to our will.

(1) By use of bombs, torpedoes, or machine guns.

(2) By threat of use of weapons in (1).

(3) By use of smoke.

(e) To deny enemy use of the air.

(1) By destruction of enemy carriers, tenders, and bases.

(2) By destruction of enemy aircraft.

PRINCIPLES OF ATTACK

1-616. (a) Aircraft attack may be opposed by:

(1) Anti-aircraft gun fire.

(2) By aircraft.

The approach, attack, and retirement must be accomplished in such a manner as to reduce the effectiveness of this opposition.

(b) No air attack should be made without support of some kind, viz:

SUPPORT OF ATTACK

(a) NATURAL

1-617. Aircraft have the following means available for self-support:

(1) SUN GLARE — May afford little concealment during approch, but effectively hampers anti-aircraft fire against dive bombers from the unit being attacked. Affords excellent concealment during approach of torpedo planes in early morning or late afternoon.

(2) CLOUDS — Afford excellent concealment for bombing and strafing aircraft especially as outlined under low ceiling attacks. Thin layers of clouds may conceal horizontal bombers from surface visibility without preventing bombers from seeing objective.

(3) RAIN SQUALLS — Afford concealment of dive bombing and strafing airplanes during approach.

(4) DARKNESS — Twilight or moonlight may permit surface craft to be seen when aircraft are invisible. Torpedo attacks at twilight may be delivered effectively from off-sun direction.

(b) ARTIFICIAL

(1) SMOKE SCREENS — LOW — Afford the primary means of concealment for torpedo planes. May also be used to cover straffing attacks, and retirement of dive bombers.

(2) SMOKE SCREENS — HIGH — May be used to support approach of horizontal bombers, by denying observation and gun fire from some enemy screening vessels.

(c) MANEUVER

(1) HIGH ALTITUDE APPROACH — Open formations will be almost invisibile above certain altitudes, while themselves readily able to approach and attack. Under clearest atmospheric conditions, this level may be as high as twenty-five thousand feet — under hazy conditions it may be much lower. Straight flying without maneuver enhances the value of this concealment.

(2) HIGH SPEED APPROACH — Highest practicable speed, consistent with the mission at hand, and permitting proper concentration and mutual support should be employed.

(3) ZIGZAG APPROACH — Tends to hamper enemy anti-aircraft fire, but should not be used until after discovery by defending anti-aircraft batteries.

(4) DIVIDED ATTACK — In delivering dive bombing attacks, units attacking the same target should endeavor to vary the angle of approach in such manner as to avoid enfilade fire. Divided or three-way attacks tend to hamper enemy return fire(but this consideration should not outweigh the principles of speed and surprise, and does not justify additional exposure to enemy anti-aircraft fire nor jeopardy of concealment while maneuvering to attain positions for divided attack). If complete surprise be effected, DIVIDED ATTACK tends further to harass enemy anti-aircraft control and fire. If surprise be not effected, DIVIDED ATTACK permits additional anti-aircraft batteries to be bought in action, and is of doubtful value.

(5) COORDINATION — of horizontal, dive bombing and strafing attacks tends to disrupt enemy morale, divide and hamper enemy return fire and fire-control, and reduce effectiveness of defense. When several groups are to attack in succession continuous attack prevents repair to damaged material and replacement of personnel casualties, and destroys morale.

(6) DECEPTION — It is to be anticipated that the first aircraft seen from a surface disposition will be fired on as soon as seen. This action may tend to draw the attention of all surface lookouts and batteries to the aircraft unit under fire. The use of a decoy attack group to draw attention and fire away from the main attack forces should be considered under conditions of high visibility.

(7) STRAFING SUPPORT — Since all anti-aircraft control stations are extremely vulnerable to machine gun fire, most effected support of heavy bombing or torpedo attacks can be afforded by strafing of enemy anti-aircraft gun crews and control stations. Such supporting fire should normally be directed at screening vessels in the path of our heavy attack, rather than at the objective.

(8) EARLY BREAK-UP — Early break-up of attack disposition into attack units reduces maneuvering while within sight or tactical contact with enemy forces, thus reducing chance of detection and aerial counter attack. When several enemy units are to be brought under simultaneous fire, early break-up into attack units facilitates coordination.

(9) TACTICAL CONCENTRATION — There is ever present the imperative need for tactical concentration. Minimum interval between planes in a dive bombing attack reduces effectiveness of enemy return fire, providing the attacking planes do not present an enfilade target.

(10) HIGH SPEED RETIREMENT ON ZIGZAG COURSES — reduces effectiveness of enemy anti-aircraft fire. Retirement for dive bombers and strafing planes should be made at lowest practicable altitude, thus giving maximum speed, minimum time in sight, and maximum hazard to enemy surface force from their own fire.

(11) RETIREMENT BEHIND NATURAL OR ARTIFICIAL SUPPORT — Low cloud ceilings, rain squalls and smoke screens may be used to cover retirement.

THE APPROACH

1-618. The approach formation should provide for:

(a) The least possible degree of visibility from the surface or the air. Contributing considerations are:

(1) Highest practicable altitude.

(2) Greatest spacing consistent with tactical control and proper developement of the attack.

(3) Highest speed consistent with (2) above.

(4) Minimum maneuvering during approach.

(5) Use of artificial or natural concealment.

(b) Maximum degree of protection from hostile fighters consistent with (a) above.

APPROACH FORMATION

1-619. (a) For dive bombers, an A-B-C, or open echelon formation, with distance between planes from ten to twenty times the wing span, approaching at maximum speed from the highest practicable altitude, with minimum change of course or maneuvering (until brought under enemy fire), is desirable.

(b) For horizontal bombers, an open approximation of the attack formation to be employed, with the planes separated by from eight to ten times the wing span, is preferable. As this formation will generally be some form of VEE, better protection against hostile fighters is thus afforded. The slower speed of horizontal bombers makes this defense consideration more vital than for dive bombers approaching at maximum speed.

THE ATTACK

1-620. (a) For dive bombers the attack must be delivered at maximum speed, directly from the approach formation, without maneuvering, and preferably on the approach course. Division of forces for fire distribution should be covered by doctrine and should be accomplished during the approach and early stages of the dive. Detailed instructions for the dive bombing attack appear in Chapter II of Part II of this volume.

(b) For horizontal bombers, the attack must be made with minimum change of formation or course after coming in sight contact of the enemy. Detailed instructions for the attack are covered in Chapter IV of Part II of this volume.

THE RETIREMENT

1-621. Retirement must be made at maximum speed, on zigzag courses, and with rapid changes of altitude. Formations will be opened to reduce effectiveness of anti-aircraft fire, or closed for defense against enemy fighters in accordance with the actual opposition encountered. The opportunity to use clouds or smoke concealment to cover retirement must not be overlooked.

Dive bombers should continue to lose altitude following pull-out, using the increased speed ined thereby to expedite retirement. Such low flight increases hazard to enemy surface craft

Immediate rendezvous of two or three airplanes during retirement is imperative when fighter opposition is encountered, in order to increase the volume of defensive fire.

by exposing them to anti-aircraft fire directed at retiring planes. When necessary to pass close aboard screening vessels, they should be brought under machine gun fire.

LIGHT FORCE ATTACKS

1-622. Light aircraft may be employed to make dive bombing and machine gun attacks on surface vessels under the following circumstances:

(a) As part of a coordinated aircraft attack on enemy capital ships.

(b) As a task group whose objective is the vessels of the screen over which the heavy bombers must pass to reach their objective.

(c) As a task group whose objectives are the enemy light forces.

(d) When operating as an Inner Air Patrol against submarines.

STRAFING OF SURFACE TARGETS

1-623. Strafing of light cruisers, destroyers, submarines, and smaller vessels may be expected to do considerable damage. Against destroyers free to maneuver radically, machine gun fire may be more effective than bombs. A series of short steep dives, started from an altitude of 3,000 feet, with fire directed against engine room hatches, torpedo tubes, and exposed personnel will prove most effective. Attacks delivered from ahead or astern reduce the effectiveness of enemy anti-aircraft fire.

Strafing attacks against larger vessels will be effective against exposed personnel such as A.A. gun crews and may be used ahead of torpedo and bombing attacks to reduce opposition.

~~(c) Against light cruisers, destroyers, and submarines, fifty caliber gunfire may be expected to do considerable material damage. Against a destroyer formation proceeding at high speed, or considerably dispersed, and thus free to maneuver radically, machine gun fire may often be more effective than bombs. A series of short steep dives, started from an altitude of approximately 3000 feet, with fire directed against engine-room hatches and gun and torpedo crews, will prove most effective. Attacks delivered from ahead or astern reduce the effectiveness of enemy anti-aircraft fire and should be effective against gun, torpedo, and ship control personnel.~~

~~(d) The six plane division of fighters or light aircraft is the ideal strafing unit, permitting continuous fire upon the target and avoiding delays between successive dives.~~

ATTACKS AGAINST SUBMARINES

1-624. Owing to the probable absence of effective anti-aircraft fire from submarines, attacks on them may be made from comparatively low altitudes and at close range, thus affording greater accuracy in bombing and machine gun fire. The danger of fragments, both from the bombs of the planes ahead and from one's own bombs should be kept in mind unless aircraft depth charges or delayed action fuzes are used.

LOW CEILING ATTACKS

1-625. Under conditions of low ceiling, or whenever a solid overcast exists at heights above two thousand feet, bombing and strafing attacks can be made from cloud concealment.

A properly executed diving attack from the base of a cloud layer offers excellent chance of surprise, and probable minimum effectiveness of enemy anti-aircraft fire.

The attacking unit takes an echelon formation, well closed up, with each plane stepped up, and only slightly on the quarter of the next ahead. All planes, except the leader, are continuously in the cloud layer, and unable to see the surface or be seen. The leader flys in the base of the clouds, being able to see just sufficiently well to make his approach upon the target. Attack is made by a diving turn away from the echelon, thus affording following planes an opportunity to gain some distance at the start of the dive.

ANTI-AIRCRAFT BOMBING

1-626. Large formations of heavy planes, especially horizontal bombers or torpedo planes just prior to release of bombs or torpedos, offer an excellent target for light bombs. Formations of light planes, armed with large numbers of small bombs (3 to 5 pound, with super-sensitive impact fuse) may reasonably expect to obtain a number of direct hits by diving or hover attacks. (The use of larger bombs, with time fuses, may prove preferable).

When defending fighters intercept heavy bombers just prior to reaching objective, it may well be that this form of attack will be the only means at the disposal of the light planes. This form of attack also offers that advantage of comparative safety from enemy free machine gun fire, as release may be effected above accurate machine gun range.

SECTION IV

DEFENSE DOCTRINE

DEFENSE AGAINST ANTI-AIRCRAFT FIRE

1-627. A squadron should be guided by the following instruction when subjected to anti-aircraft fire:

(a) Flight within range of anti-aircraft batteries should be made at such an altitude as to render detection by surface lookouts highly improbable. Full use should be made of the sun and clouds for concealment.

(b) Cruise in and make all attacks from an open formation.

(c) Avoid unnecessary maneuvers such as excessive rocking of wings, as these aid detection by producing sun flashes on the wings.

(d) Make approaches and attacks at high speed.

(e) Recover from attacks at high speed and in general direction away from the enemy's main anti-aircraft strength, zigzaging during the retirement and utilizing the remaining altitude to maintain a high speed.

(f) During retirement avoid passing an enemy vessel close aboard unless it is decided to bring such vessel under machine fire.

(g) Normally the volume of enemy fire from surface vessels is a minimum either directly ahead or astern.

(h) If the vessel attacked is engaged with our own vessel at short range, attack on the engaged side.

(i) When the attacking plane remains at a low altitude during retirement within the enemy screen, it is probable that enemy vessels cannot open fire on the retiring plane without endangering other vessels in the screen.

DEFENSE AGAINST AIRCRAFT

FORMATIONS

1-628. In general the best defensive measures are:

(a) CONCEALMENT — Employing high altitude, high speed, open formations with minimum maneuvering and maximum use of natural concealment.

(b) FIGHTER PROTECTION or ESCORTS — Should always be employed when available. Presence of escorts will not prevent enemy fighters from pressing home one attack, but will prevent repeated attacks against the formation.

(c) CONCENTRATION of defending machine gun fire. The most effective use of free gun protection by a formation of planes lies in mutual support against planes attacking in blind sectors. A plane becoming separated from its formation, and thus deprived of mutual support,

will fall easy prey to attacking fighters, or will at best be forced to abandon its mission in order to use its armament.

SINGLE PLANES

1-629. As with formations, the most effective defense against enemy fighters lies in speed and concealment. A two seater brought to action by fighters has little hope of defense except by circling in such a manner as to give a steady gun platform for the free gunner and preventing any fighter from gaining a position under the tail. If possible to gain a position close to the water or ground before being brought to action, it should be done, but a radical dive while engaged will prevent the free gunner from firing, and will present an easy target to the attackers.

THE LUFBERRY CIRCLE

1-630. Preparatory Signal: Leader circles hand horizontally.

Execution Signal: When leader circles.

Most planes are extremely vulnerable to attack from directly astern. Hence effort must be made to prevent opposing fighters from attaining this position. In the Lufberry circle, (the only defensive formation available to fighters), each plane is in a position to bear on an enemy plane occupying this position with respect to another plane of the circle. As the name implies, it is a circle of three or more planes in a tight turn, spaced equidistantly about the circumference. A plane attacking one plane of the circle must of necessity fall directly in the line of fire of the following plane. Two-place or multi-seater planes may also use this circle to advantage to afford mutual support when attacked. Guns of all planes will thus be able to bear on any enemy attackers seeking to obtain positions under the tails of planes in the circle.

CHAPTER 7

COMMUNICATION DOCTRINE

COMMUNICATIONS

1-700. (a) Standard procedure, as laid down by current Communication Instructions, U. S. Navy, governs all voice and key transmissions. The degree of radio discipline to be observed, calls to be used, type of transmission to be employed, and special communication instructions to be followed will be ordered for each operation. In general, all radio transmissions for which hand signals may be substituted, or which may be covered by doctrine or instruction prior to take-off must be avoided. Radio transmission reveals what frequencies our forces are using and permits the enemy to jam those frequencies. Strategic as well as communication security may also be jeopardized. Hence the rule: "If possible, avoid radio transmission."

(b) Means of reducing radio traffic are: use of visual signals, flag hoists and deck panels by ships, and message dropping by planes. Small sand bags, with message compartments, are available for this purpose

(c) In situations where advantage of speed outweigh the desirability of security, when in contact with enemy aircraft, the omission of formal calls and procedure in voice transmissions is considered justified, relying for authentication upon the recognition of voices of pilots or special, easily memorized code words.

RECOGNITION SIGNALS

1-701. No thoroughly satisfactory means of aircraft making known their identity has yet been evolved. The best practice is to remain out of sight and out of anti-aircraft range of own forces as much as possible. Recognition signals are promulgated by proper authority. Strict compliance with the signals is necessary. When the approach procedure is not known come in at an inoffensive altitude and from an inoffensive direction, normally 1,000 feet and from abaft the beam in case of ships and with wheels down. Immediately upon being challenged turn away until the challenge is answered and acknowledged.

INTER-PLANE SIGNALS

1-702. **Hand System of Morse Characters.**

A ready method of signaling is the use of the hand to send dots and dashes. A closed fist represents a dot, and an open palm a dash. Use of hand, tapping upon windshield or fuselage, with spacing of taps corresponding to spacing of key sending, may be used.

RADIO FAILURE SIGNALS

1-703. (a) Pilot or radioman taps earphones followed by holding his nose (bad odor) meaning "radio out of commission."

(b) Pilot or radioman taps earphones followed by patting head meaning, "I have taken over communications."

(c) Pilot or radioman taps earphones and nods head meaning, "radio is now in commission."

(d) Taps earphones and points to plane called meaning, "you are being called by radio."

(e) Press closed fist and thumb meaning, "check microphone button and keys."

In event of a radio failure of the leader's plane his duties, as regards communications, devolve on the next senior. The number two plane of the leader's section should endeavor to relay all important information to the leader by means of visual or blinker signal.

CHAPTER 8

FORCED LANDING PROCEDURE

1-800. There are two prescribed procedures for forced landings of airplanes: the NORMAL FORCED LANDING PROCEDURE AND SIGNALS (Procedure No. 1) and the WAR-TIME FORCED LANDING PROCEDURE AND SIGNALS (Procedure No. 2).

1-801. The NORMAL FORCED LANDING PROCEDURE (No.1) will always be USED IN TIME OF PEACE, regardless of the degree of radio silence which may be imposed during tactical exercises. This procedure may be amplified as necessary to cover local conditions or special operations. It will be used in time of war when prescribed by competent authority, as during operations when contact with the enemy is improbable.

1-802. NORMAL FORCED LANDING PROCEDURE AND SIGNALS:

Procedure No. 1

(a) A copy of this procedure will be carried in the cockpit of all Naval airplanes. It will always be used in time of peace regardless of the degree of radio silence which may be imposed during tactical exercises. It may be amplified as necessary to cover local conditions or special operations.

(b) Visual forced landing signals as prescribed below will be made by the personnel of a disabled Naval airplane when in company with other aircraft or within visual signal distance of a surface vessel.

I. Prior to forced landing.

DAY — Bend arm across forehead (weeping).

NIGHT — Fire red Very star.

II. After forced landing.

SIGNAL	MEANING TO AIRCRAFT	MEANING TO SHIP
DAY — One arm vertical NIGHT — White Very Star	Slight damage; can proceed shortly; wait if practicable	Slight damage; can proceed shortly; do not wait for me.
DAY — One arm horizontal NIGHT — Green Very Star	Long delay; need mechanic and tools; will then be able to proceed to base under own power; do not wait for me.	Long delay; need mechanic and tools. Stand by until I am ready to return to base.
DAY — Two arms vertical NIGHT — Green or White Very Stars alternated	Need tow, or plane will have to be disassembled and hauled back to base; do not wait for me.	Need tow, or plane will have to be hoisted; pick me up.
DAY OR NIGHT — No Signals at all or Red Very Star.	Emergency; immediate danger to personnel; land and assist if possible.	Emergency; immediate danger to personnel; send assistance immediately.

Aircraft or surface vessels noting the above signals shall be guided accordingly.

(c) When airplanes are in company and forced landing occurs, the duties as "stand-by plane" shall be assumed as follows: When airplanes are proceeding in pairs, either stands by the other in the event of forced landing. When air planes are proceeding in section, number three plane stands by numbers one or two; number two plane stands by number three. This will be varied as necessary to provide that the stand-by plane is equipped with radio if such a plane is available.

(d) The disabled plane, the stand-by plane, and the third plane of a section will, in case of a forced landing, be guided by the following instructions:

Conditions under which emergency occurs	Plane	Procedure
Overland or within gliding distance thereof.	Disabled Plane	Gives forced landing signal; proceeds toward best landing area available. Reports landing by radio to parent vessel, base, or such other unit as may be in position to render immediate assistance. After landing gives required arm or Very signal and makes required reports. (See arts. 1331, 1333, and 1334 Buaer Manual).
	Stand-by Plane	Accompanies disabled plane until landing is made and is then governed by arm or Very signal received. Makes radio report required above to parent vessel, etc., if disabled plane is unable to do so.
	Third Plane	Signals forced landing to senior pilot in immediate vicinity. If time element permits, investigates landing areas, selecting best available and directing disabled plane to that area. After landing of disabled plane, actions are governed by arm or Very signal received.
At sea — for seaplanes and landplanes unable to reach land or parent vessel.	Disabled Plane	Gives forced landing signal. Reports landing by radio to parent vessel, base or such other aircraft or surface vessel as may be in position to render immediate assistance, obtaining bearing thereof. If disabled plane is land plane, broadcasts "CRASH-CRASH" in plain English, giving location. Attempts to land close aboard off windward bow of best available surface vessel for rescue operations. Gives required arm or Very signal.

Conditions under which emergency occurs	Plane	Procedure
At sea — for seaplanes and landplanes unable to reach land or parent vessel.	Stand-by Plane	Make radio report required above to parent vessel, etc., if disabled plane is unable to do so. Render such aid to personnel as situation requires. Remain with disabled plane until forced to leave by exhaustion of fuel, or until personnel is rescued, maintaining sight contact except as essential to summon aid. Keeps rescue craft informed of position and general situation by radio.
	Third Plane	Signals forced landing to senior pilot in immediate vicinity. Summons aid as necessary by flying several times across the bow of nearest surface vessel, opening and closing the throttle and then flying in the direction of the plane in distress. The signal shall be repeated until the ship has acknowledged by following the plane. If possible, remains in sight of surface vessel until the vessel sights the plane in distress. All planes resort to the use of available pyrotechnics as necessary to attract attention of surface vessels.

1-803. WAR-TIME FORCED LANDING PROCEDURE.

Procedure Number Two:

The pilot of a disabled plane will:

(1) Seek to land in friendly territory.

(2) If over water attempt to land on carrier if in land plane, or off windward bow of nearest disengaged friendly light vessel.

(3) Sink plane if it is in danger of falling into enemy hands or cannot be salvaged.

(4) Destroy confidential and secret publications if there is danger of their falling into enemy hands.

(5) Make no radio or pyrotechnic signal except to report information vital to the success of own forces.

RESPONSIBILITY OF SENIOR STAND-BY PILOT

1-804. In amplification of the above procedure prescribed for forced landings at sea the following instructions shall apply to carrier based aircraft:

(a) It shall be the responsibility of the senior stand-by pilot to report to the base or carrier by radio as soon as practicable after a forced landing at sea the following information.

(1) Identification of disabled plane.

(2) Location of forced landing.

(3) Apparent condition of personnel.

(4) Landing facilities for rescue aircraft.

(5) Approach conditions for land or surface rescue operations.

(b) The senior pilot shall handle all voice communications and shall detail another stand-by plane to establish communication on key frequency if available. The latter plane shall act as a radio beacon by sending "MO's" to guide the rescue planes or vessels to the disabled plane.

DEPARTMENT OF COMMERCE DISTRESS SIGNALS

805. For the use of Aircraft, Battle Force pilots when no naval facilities are available, the folwing information from the Department of Commerce "Air Traffic Rules" is supplied:

(a) DISTRESS SIGNALS — The international signal "SOS" by radio; in radiotelephony, the expression "MAYDAY" corresponding to the French pronunciation of the expression "M'aidez."

(b) FORCED LANDING SIGNAL — When an aircraft is forced to land at night at an airport, it shall signal its forced landing by making a series of short flashes with its navigation lights if practicable to do so.

CHAPTER 9

SECTION I

SMOKE SCREENS

GENERAL

1-900. Smoke screens, while often of great tactical value, may work to the detriment of our own forces in a rapidly changing situation. For this reason smoke must not be laid except by orders of the O. T. C., or in accordance with approved operation orders. Wind has such a marked influence on the success of smoke laying operations that it must always be given major consideration.

SAFETY PRECAUTIONS FOR PEACE TIME

1-901. Smoke screens, unless specifically authorized, are prohibited when submarines are operating in the vicinity, and during darkness or low visibility. No aircraft shall fly through smoke screens or curtains except when approaching for or withdrawing from actual or simulated torpedo attack.

AIRCRAFT SMOKE LAYERS

1-902. Aircraft laying smoke have the following advantages as compared to surface vessels:

(a) Curtain may be laid very rapidly.

(b) Target presented to gunfire is small.

(c) Time under gunfire is short.

(d) Speed of aircraft presents greater fire control difficulties for enemy.

(e) Many screens are laid outside of effective anti-aircraft range.

(f) Valuable surface units are not hazarded by close exposure to the enemy.

(g) Better view of the general situation.

Disadvantages are:

(a) No facilities for rangefinding.

(b) Poor facilities for obtaining bearings.

(c) Mooring board problems, with regard to relative movement of forces and the effect of wind on the smoke curtain, present great difficulties because all factors must be estimated and the pilot must divide his attention between flying and working the problem.

(d) Visual signals between aircraft and surface vessels are unsatisfactory.

(e) Voice radio communication is the only satisfactory means of liaison between surface vessels and aircraft for smoke laying operations. Keyed messages will usually be too slow.

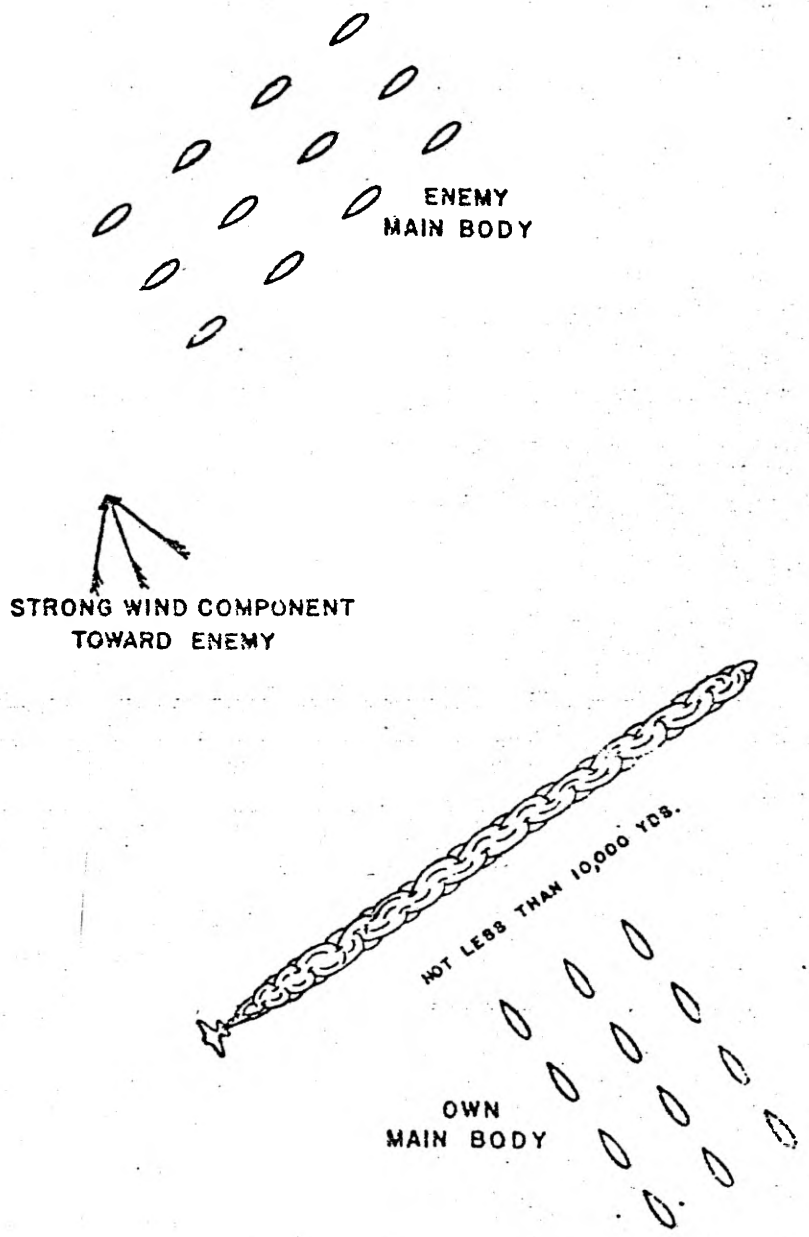


Fig. 1-45
To Hide Deployment

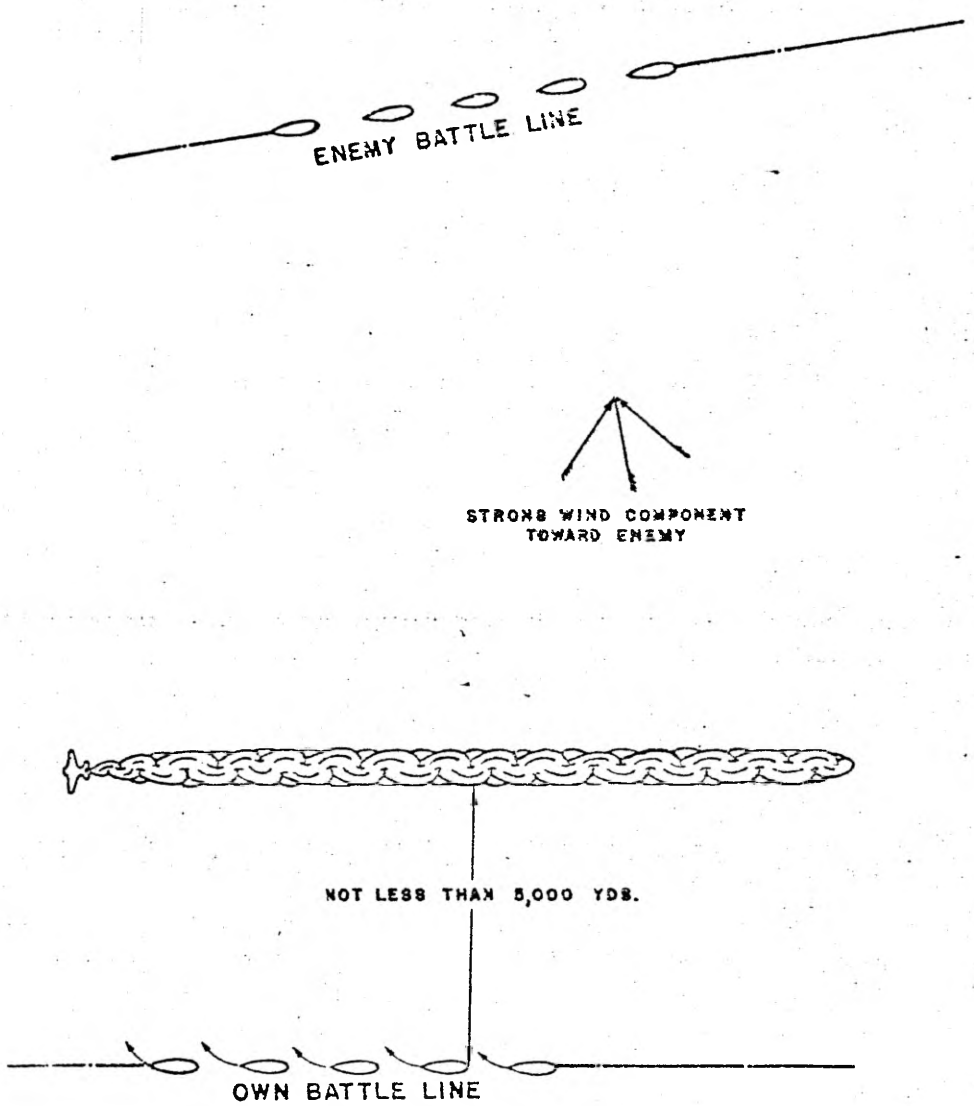


Fig. 1-46
To Hide Maneuvers of the Battle Line
During Main Engagement

Fig. 1-47
To Break Off Engagement

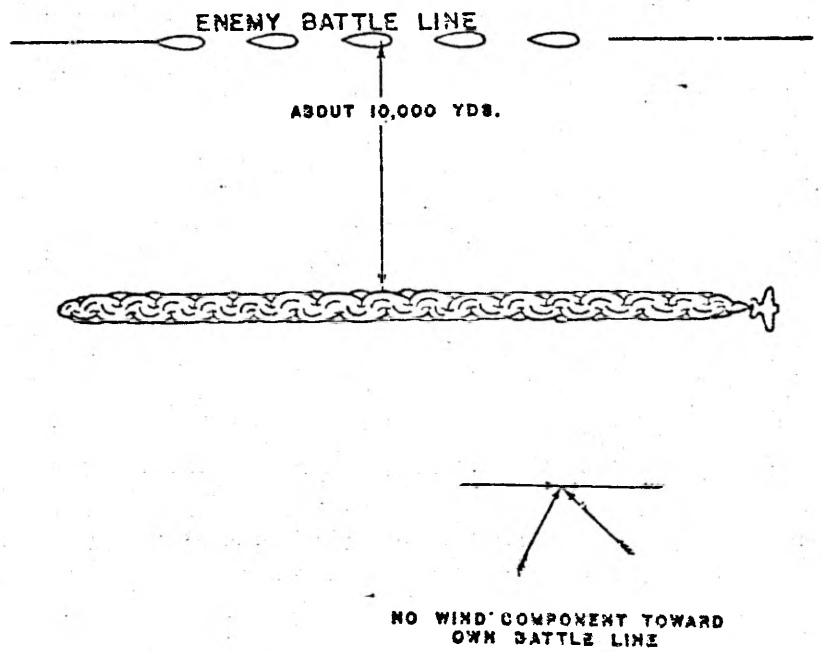


Fig. 1-48
To Interfere with Enemy Gunfire Observation
Case I

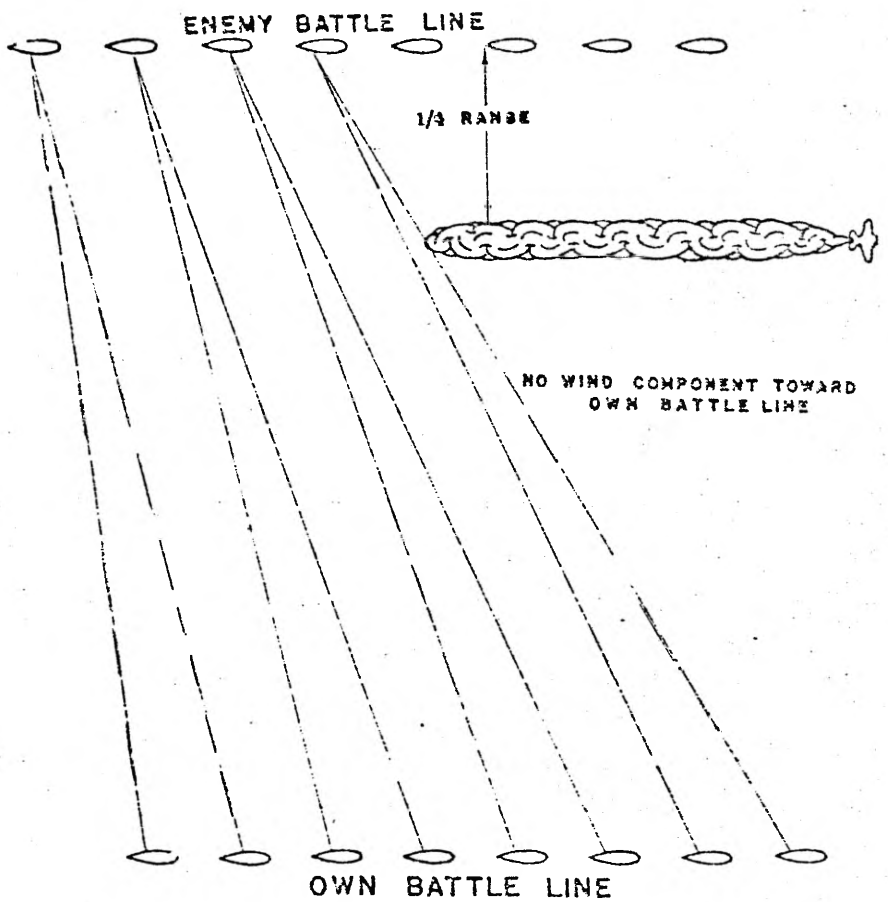


Fig. 1-49
To Interfere With Enemy Gunfire Observation
Case II

SECTION II

TYPES OF SMOKE SCREENS

TYPES OF SMOKE SCREENS

1-903. The following are types of smoke screens. Many of these screens should not be used unless our aircraft can provide the O. T. C. with continuous tactical information of the enemy. The effectiveness of screens is further greatly enhanced if the enemy is denied such aircraft tactical information.

(a) **TO COVER DEPLOYMENT OF OWN MAIN BODY** — (See Figure1-45). Smoke is laid at least 10,000 yards ahead of our own Main Body and normal to the general bearing line. There should be a strong wind component toward the enemy forces in order that own Main Body will not enter the smoke. Continuous aircraft tactical information of the enemy *MUST* be furnished the O. T. C.

(b) **TO COVER MANEUVERS OF OWN BATTLE LINE** — (See Figure 1-46). Smoke is laid at least 5000 yards on the engaged side of own battle line and parallel to it. There should be a strong wind component toward the enemy so that the O. T. C. is permitted to close the range if desired. Our aircraft will furnish continuous tactical information of the enemy to the O. T. C. Aircraft Spotting should be continuously effective.

(c) **TO BREAK OFF ENGAGEMENT** — (See Figure 1-47). Smoke is laid about 2500 yards on the engaged side of our own battle line and parallel to that line. Directions and force of the wind are not important for this type of screen. Enemy aircraft must be denied tactical information of own forces for this screen to be effective.

(d) **TO INTERFERE WITH ENEMY GUNFIRE OBSERVATION** — (See Figure 1-48). This screen is laid at about 10,000 yards on the engaged side of the enemy battle line and parallel to that line. The wind should have no component toward our own battle line. The enemy should be denied aerial observation of gunfire. If we have effective aerial observation of own gunfire, the complete enemy battle line may be covered. If our aircraft spotting is not completely effective only a portion of the enemy battle line should be blanked off. In this last case, the screen should be no more than one-fourth the range on the engaged side of the enemy battle line. It must be so laid that the van ships of the enemy battle line are not blanked off (See Figure 1-49).

(e) **TO FORCE A CHANGE OF COURSE OF THE ENEMY BATTLE LINE** — (See Figure 1-50). The screen should be laid across the course of the enemy's battle line normal to a bearing of broad on the bow; and on the opposite bow to which it is desired that the enemy will change course. Wind direction is not important except that the screen must remain across the course of the enemy and that for forcing more rapid change of course the wind should have a component toward the enemy. Aircraft tactical information and gunnery observations should be available lest the enemy battle line take advantage of the screen to break off the engagement. A screen laid normal to the enemy's course may force a reversal of course to avoid penetrating the screen.

(f) **TO COVER DESTROYER ATTACK FROM MAIN BODY GUNFIRE** — (See Figures 1-51 and 1-52). This smoke screen is laid so that it is normal to a bearing of broad on the bow on the engaged side of the enemy battle line. It should be timed so as to be about 8,000 yards from the enemy battle line. Wind conditions and enemy course and speed will have a marked effect on the time at which this screen is laid and on the distance from the enemy battle line at which it is laid as illustrated in Figures 1-51 and 1-52. A very important secondary mission of smokers assigned to the destroyers is that of supplying information to them. The smokers should keep the destroyers informed of the enemy position and movements. During the distant approach smokers should indicate the bearings of the enemy flagship from the leader of each destroyer squadron by flying directly on the bearing and zooming. After a screen is laid or if visibility is at all impaired, information should be given to assist the destroyer commander in his approach and to enable him to keep the proper set-up on the torpedo director.

(g) **TO COVER DESTROYER TORPEDO ATTACK FROM COUNTER LIGHT FORCES** (See Figure 1-53). This screen is laid so that it is normal to, and on the line of bearing between the opposing light forces. Attempt should be made to lay the screen at such a distance from enemy light forces that they cannot pierce the screen before our own force has delivered the attack. Factors of speeds and positions of three forces involved and wind force and direction so complicate this problem as to defeat any attempt to lay down other than general instructions for such an operation.

(h) INTERRUPTED SCREEN — (See Figure 1-54). This type of screen is laid to prevent an attacking column of destroyers from being sighted by enemy battle line. This screen is continuous but laid by individual planes at predetermined intervals. Number one plane lays a screen parallel to destroyer column, distance 2,000 yards, and between destroyers and enemy battleships. Just as the leading destroyer is about to become visible to enemy battleships around the end of the screen, number two plane lays its screen, etc. Smoking is discontinued upon order from the destroyer commander. This form of screen has one great advantage, in that the destroyer commander has control of the screen. There is no danger of the screen being laid in a position detrimental to the attacking destroyers.

(i) TO COVER ATTACKS AGAINST SHORE OBJECTIVES — This type of screening is covered in F. T. P. 167.

(j) TO COVER AIRCRAFT TORPEDO ATTACKS — (See Figure 1-55). This smoke scree is laid at about 4,000 to 6,000 yards from the leading ship of the enemy column on a line normal to a bearing broad on the bow, on the disengaged side of the enemy's battle line. Due to the fact that the attack follows closely behind the laying of the screen, wind has little effect on this operation. The screen is relatively much thinner than that required for surface vessels and consequently can be laid at much higher speeds and requires fewer smokers.

(k) LANE ATTACK — Lane approach to cover attack of torpedo planes through surface screening vessels. (See Figure 1-56). A direction of approach for the torpedo planes is selected and smokers lay screens on either side of this path so that the torpedo planes are protected from the fire of all vessels outside of the lane. An additional smoker is available to close the end of the lane. Supporting aircraft attack all enemy vessels enclosed in the lane so as to allow an unobstructed approach of the torpedo planes.

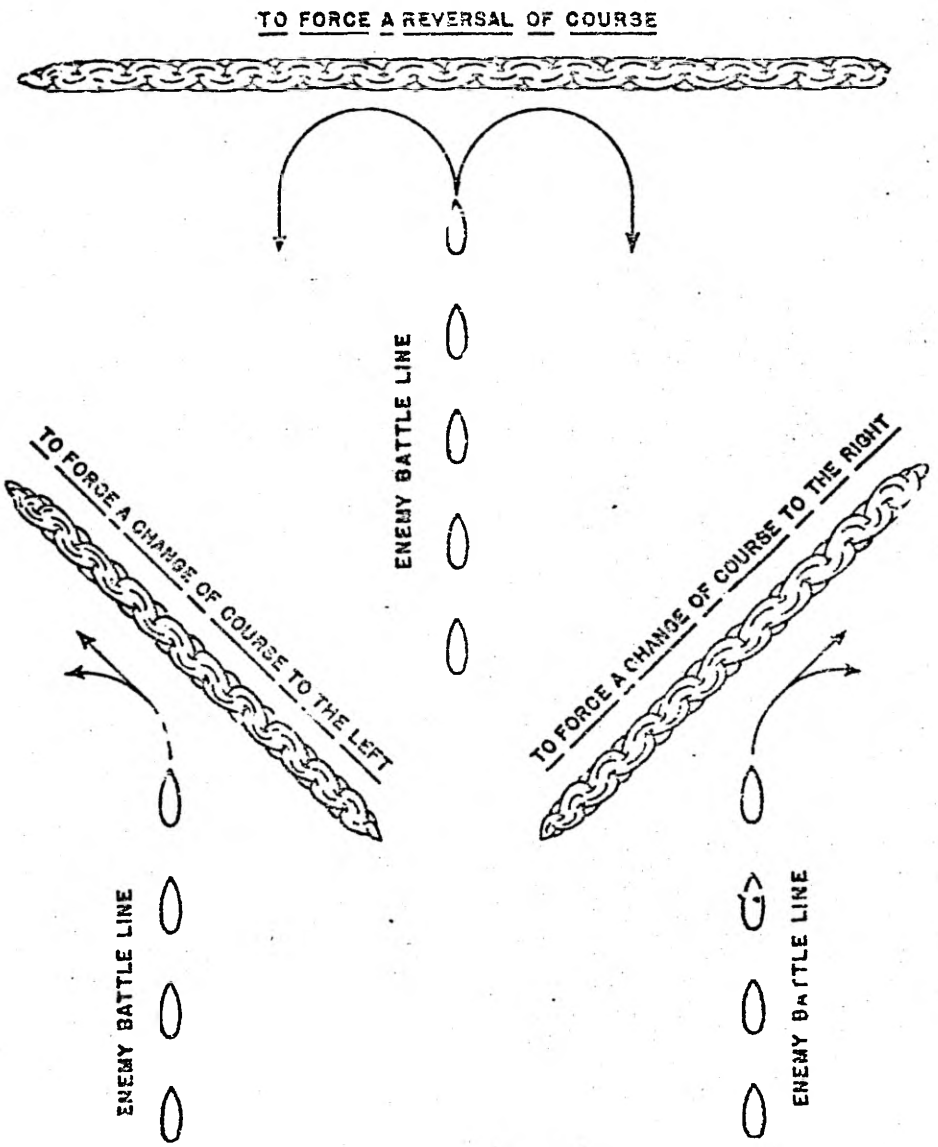


Fig. 1-50
To Force a Change of Course of the Enemy Battle Line

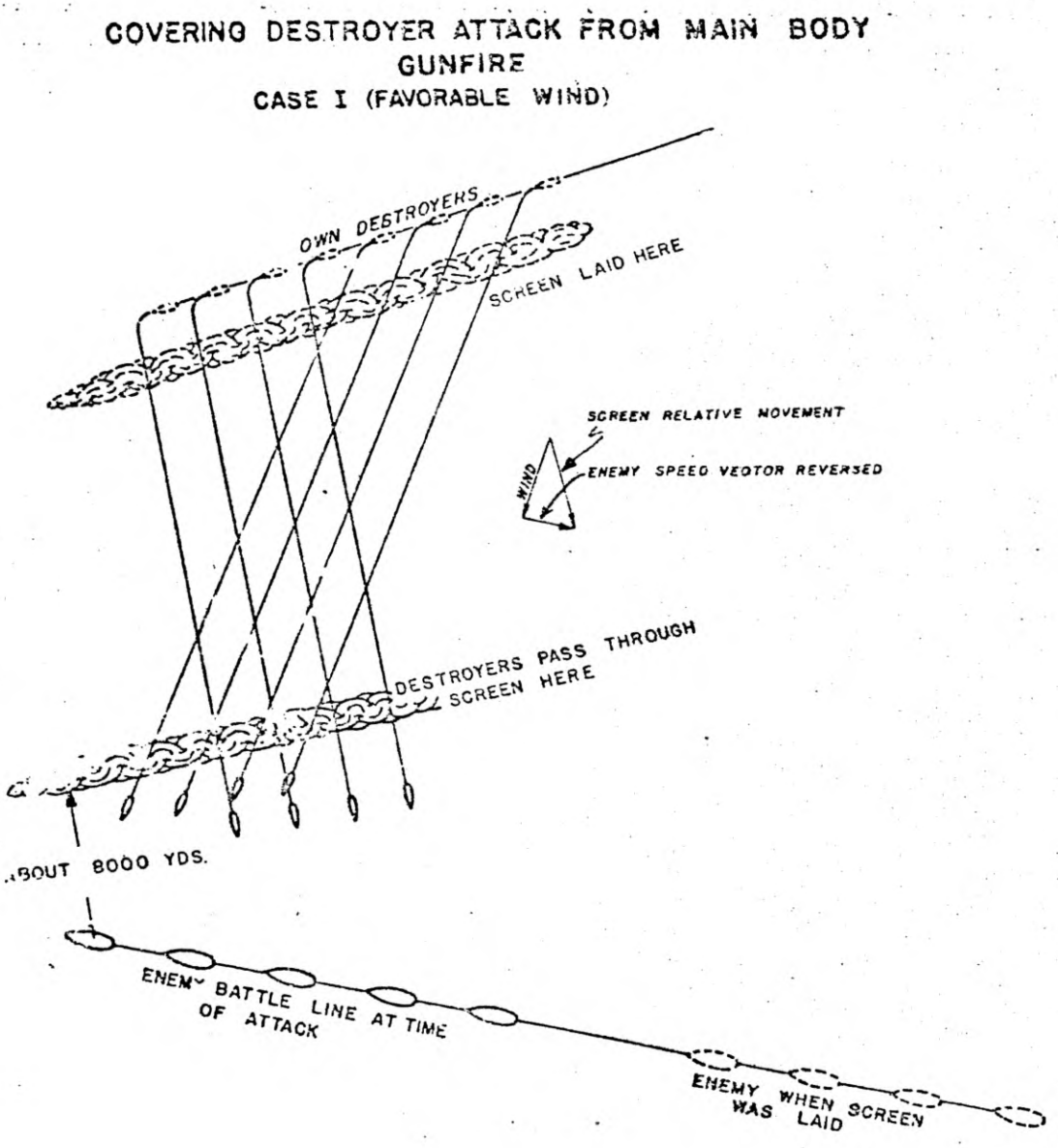


Fig. 1-51
To Cover Destroyer Attack From Main Body Gunfire
Case I (Favorable Wind)

COVERING DESTROYER ATTACK FROM MAIN BODY GUNFIRE

CASE II (UNFAVORABLE WIND)

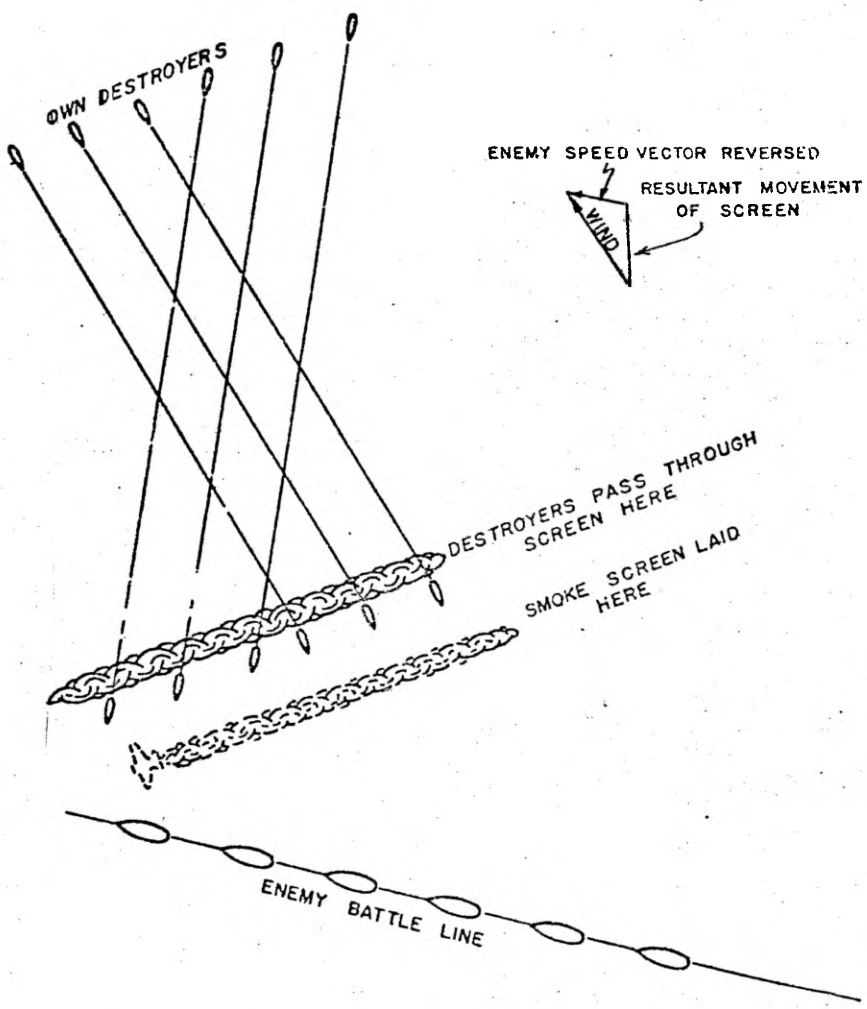


Fig. 1-52
To Cover Destroyer Attack From Main Body Gunfire

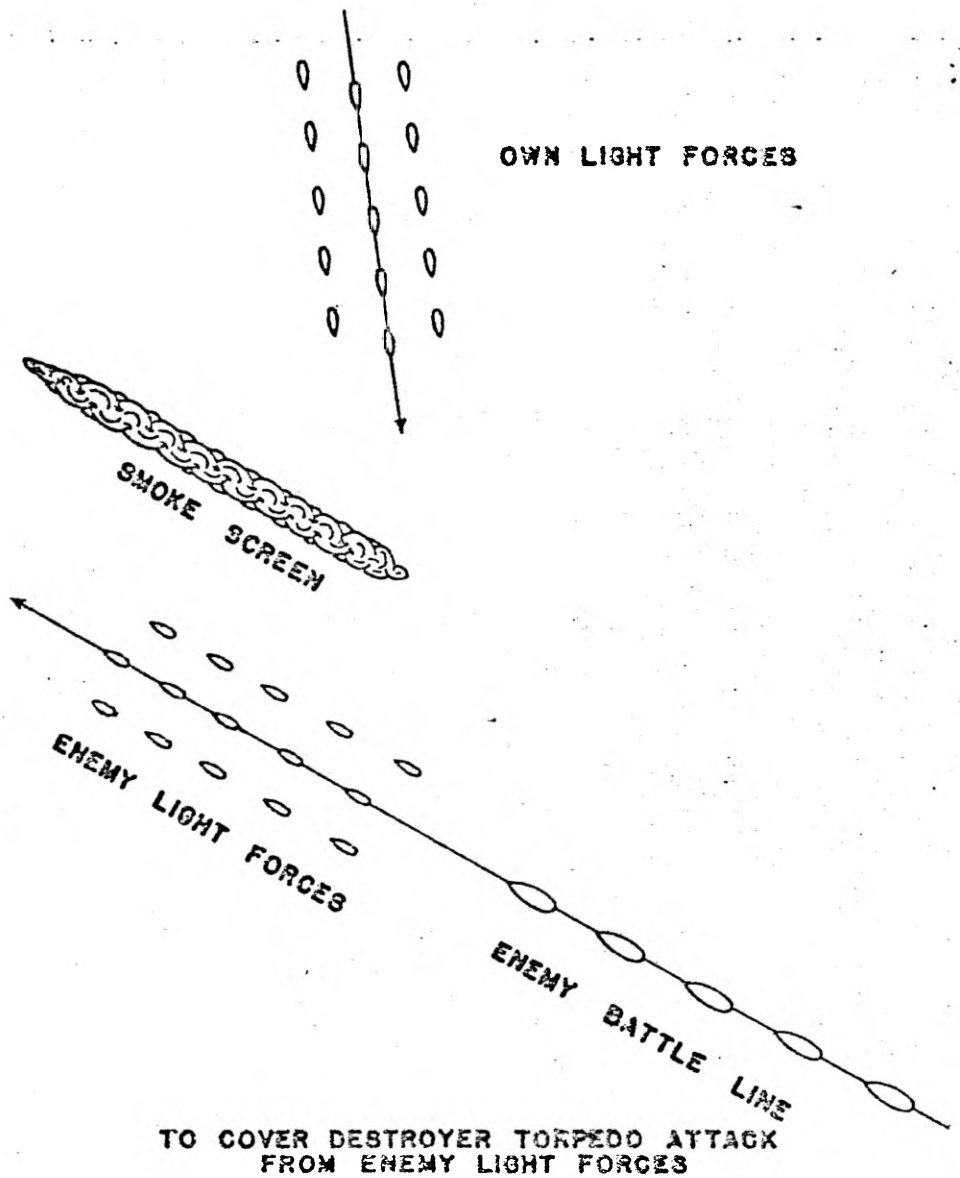


Fig. 1-53
To Cover Destroyer Torpedo Attack From Enemy Light Forces

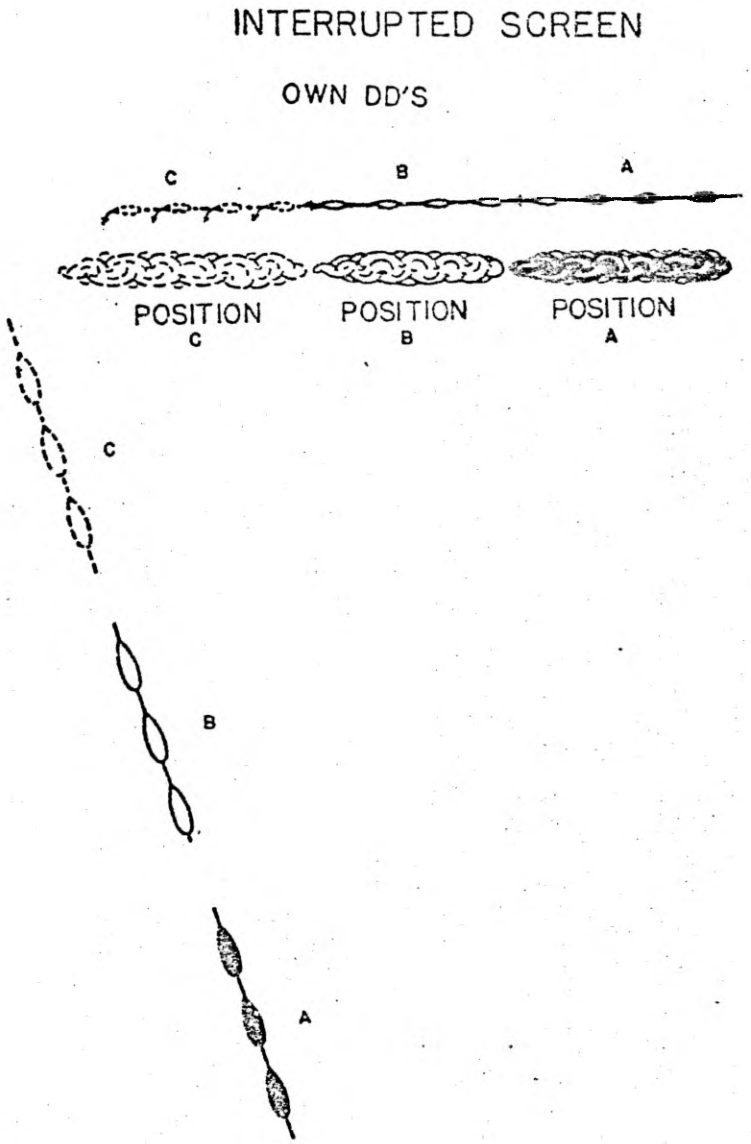


Fig. 1-54
Interrupted Screen

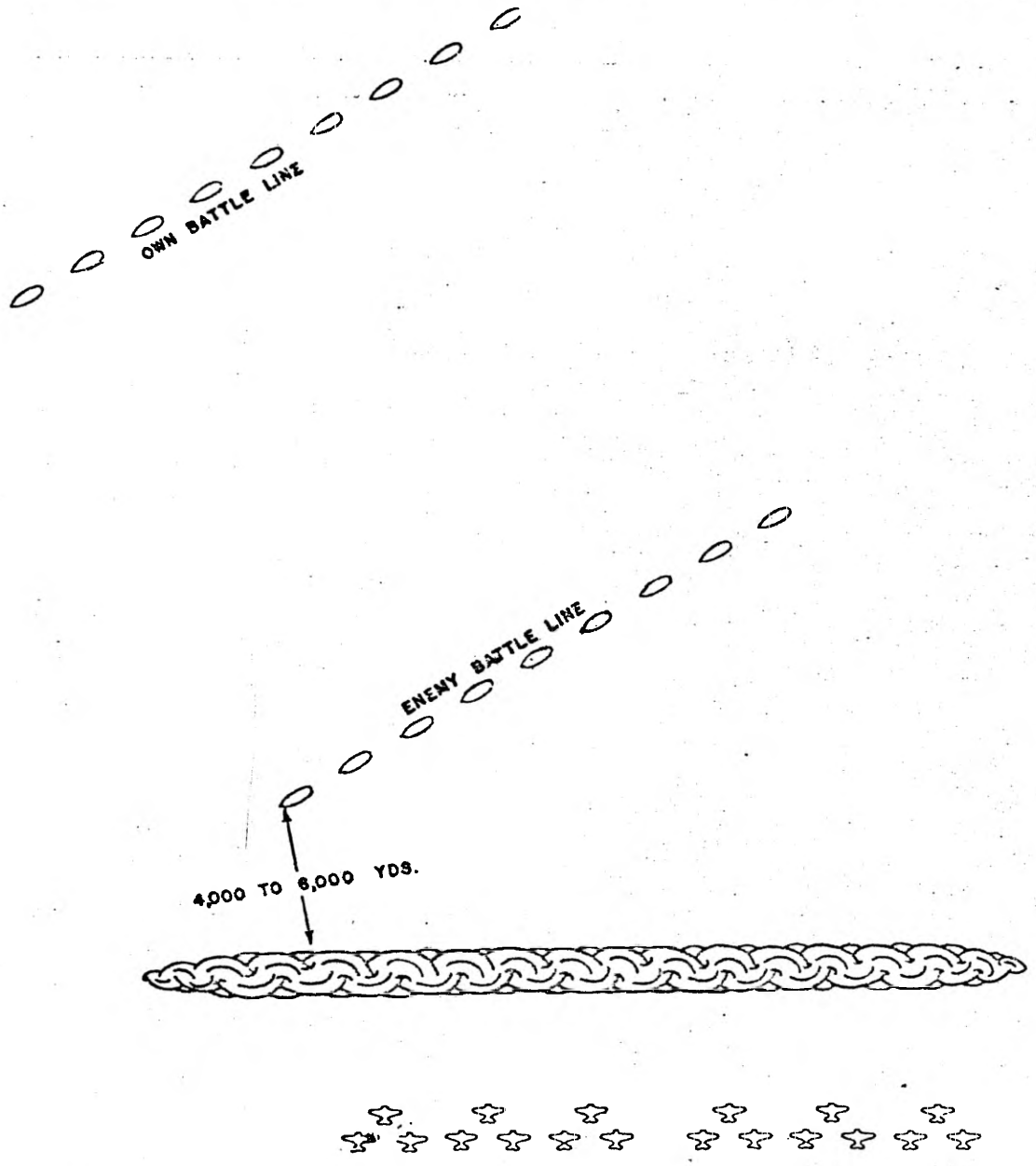
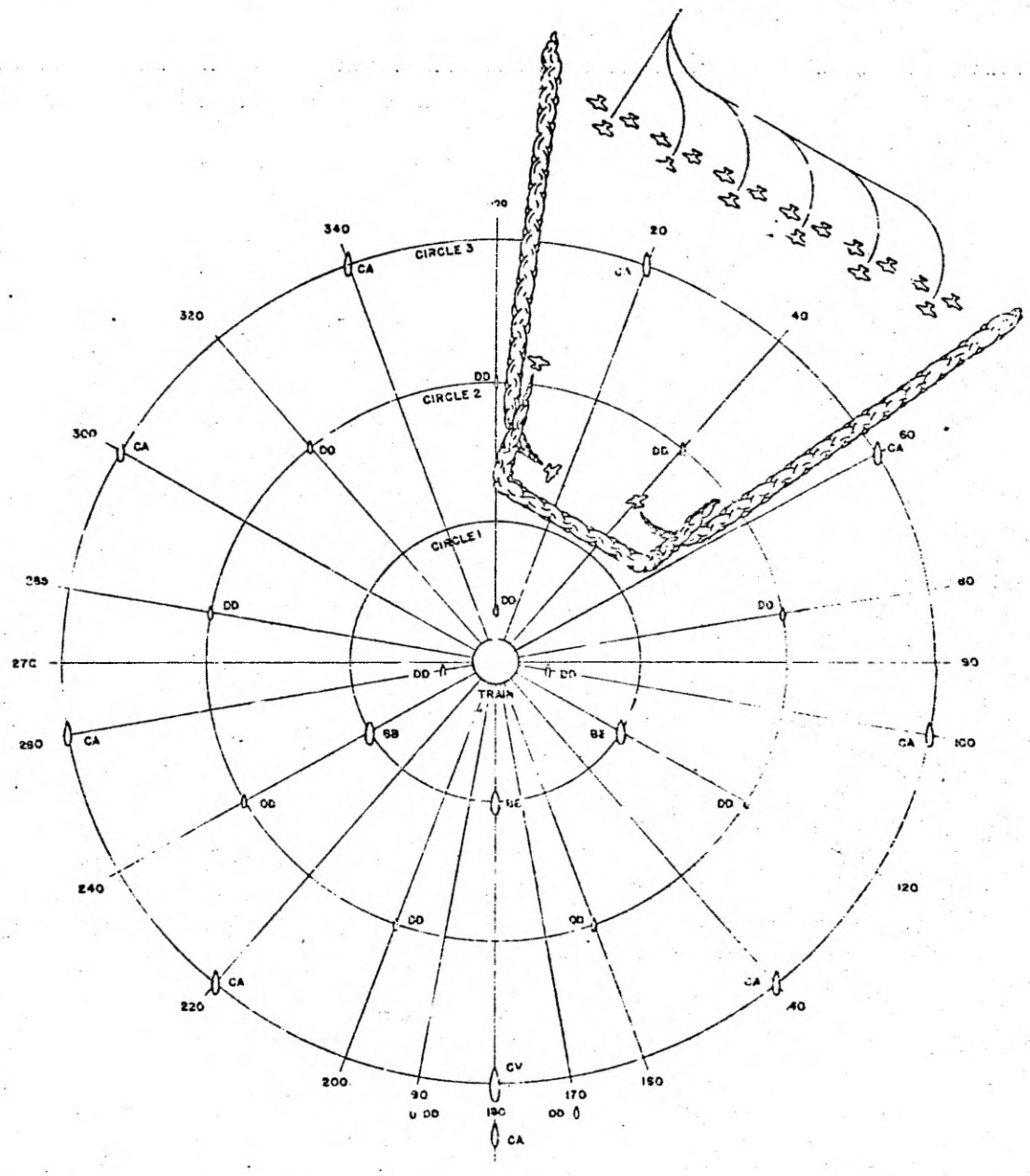


Fig. 1-55
To Cover Aircraft Torpedo Attack



LANE APPROACH TO COVER ATTACK THROUGH SCREEN

Fig. 1-56
Lane Approach to Cover Attack Through Screen

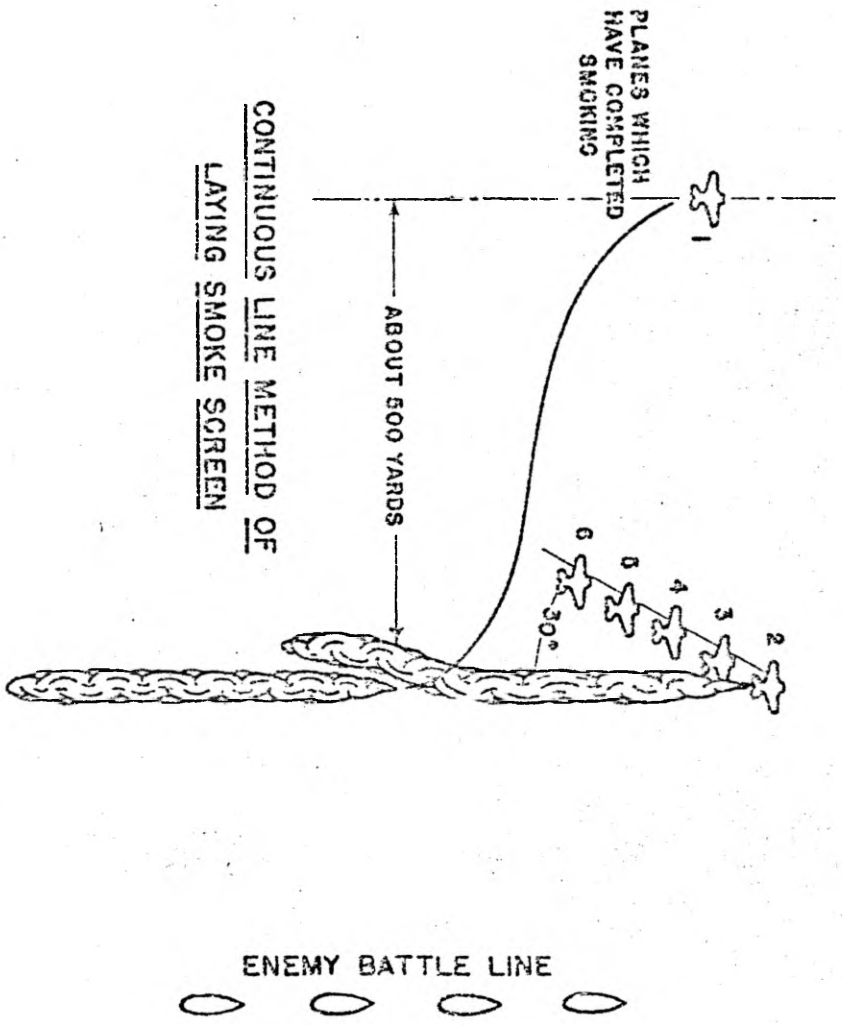


Fig. 1-57
Continuous Line Method of Laying Smoke Screen

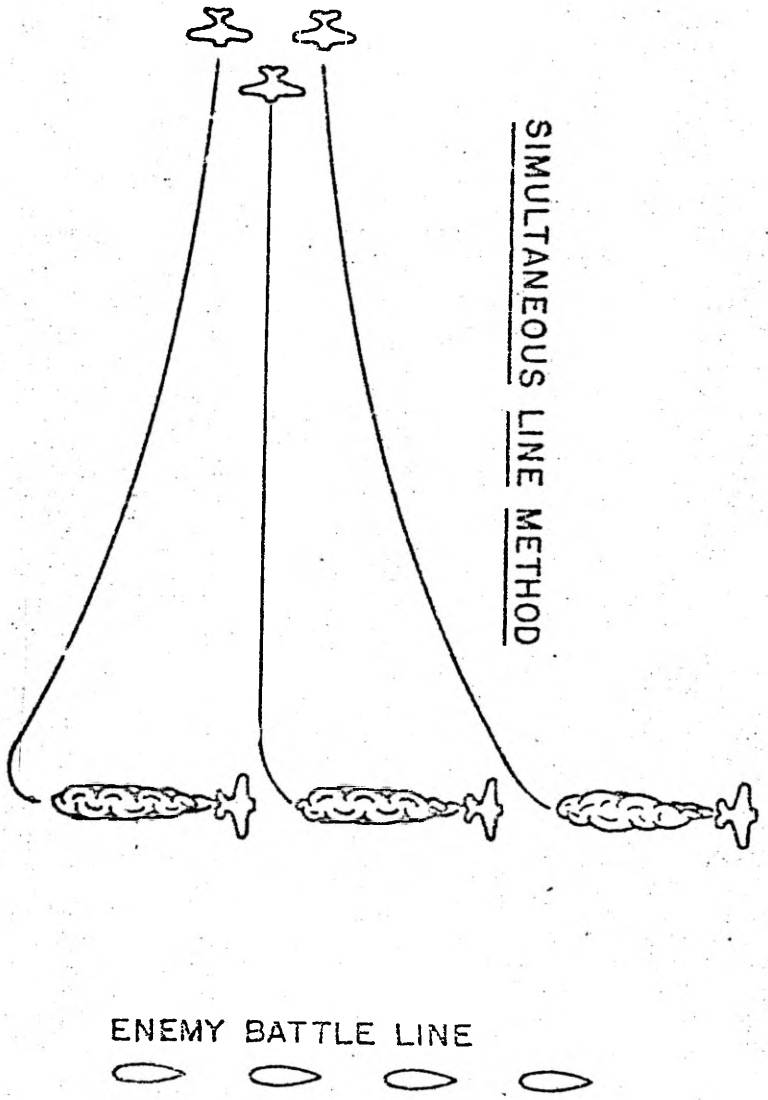


Fig. 1-58
Simultaneous Line Method

SECTION III

SMOKE LAYING TACTICS

METHOD OF LAYING SCREEN

1-904. There are two distinct methods for laying smoke screens:

(a) The CONTINUOUS COLUMN METHOD — (See Figure 1-57). This method of laying the screen is used when the screen is to be laid outside of the enemy gun range or at extreme ranges of enemy anti-aircraft fire. It is suitable for types described in sub-paragraphs (a), (b), (c) and (h) of paragraph 1-903. It consists of forming the smoking unit in a step-down echelon away from the enemy. Smoking speed, altitude, and pressure are designated prior to the flight in accordance with the type of screen to be laid. Smoking by successive planes will be done on a time schedule. Twenty-five seconds between planes will give a continuous screen when maximum allowed pressure is used with the Mark VI smoke tank. As planes exhaust their smoke they dive out and form echelon at 500 yards distance under cover of the screen. After the screen is completed, planes retire at maximum speed in the direction which gives maximum protection.

(b) The SIMULTANEOUS LINE METHOD — (See Figure 1-58). This method of laying the screen is used when under heavy enemy anti-aircraft gunfire. It is used in the type screens described in sub-paragraphs (d), (e), (f), (g), (i) and (j) of paragraph 1-903. The smoking unit is formed on a line of bearing normal to the approach course. The guide is in direction in which smoke will be laid and the senior pilot of the unit is the guide. The line of bearing is formed in the same manner and by the same signals as prescribed for forming scouting line in Part II, Chapter I, of this publication. Approach is made at high speed, guide slowing enough to permit extreme planes to form the line of bearing. Distance between smoking planes, smoking speed, altitude, and pressures are designated prior to the operation. When range has been closed to that desired, all planes turn 90 degrees in the direction which will give maximum deflection, take smoking altitude, assume smoking speed and start smoking. The leading plane of the column becomes the guide. Each smoker, upon reaching the screen of the plane ahead will take cover behind that screen. Retirement is laid down for CONTINUOUS COLUMN METHOD.

SMOKE SCREEN FACTORS

1-905. Many factors enter into the success of a smoke screen. A problem in tactical graphics has to be solved by the smoke leader, using wind force and direction, enemy course and speed and own force course and speed. The timing of both the laying of the screen and the employment of the screen must be nearly perfect. It must be realized that the relative movement of a screen with regard to an approaching enemy may amount to about 40 knots and, with regard to our own forces approach zero. For example, consider an enemy at 20 knots on course North, a wind at twenty knots from the Northern quadrant and our own forces attacking from ahead at twenty-five knots. The enemy approaches the screen at 40 knots while our own forces overtake at only five knots. Furthermore, even with more favorable wind conditions, it must be remembered that the screen moves, and that a definite range is obtained only once. If an attack force is even a few minutes late or early penetrating a screen, there may be a very large error in range. Orders for the smoke command should be very general and allow initiative to cover the unexpected which usually occurs. Likewise the limited gasoline supply and high rate of consumption of smokers should be borne in mind when an engagement or mission is delayed.

PART II

CHAPTER I

AIRCRAFT TACTICAL INSTRUCTIONS FOR CARRIER VS TYPE SQUADRONS

SECTION I

GENERAL

TACTICAL ORGANIZATION

2-100. The carrier scouting squadron has the same tactical organization as do other carrier squadrons. The three plane section is the normal peace time scouting unit. Under certain conditions, the unit may be reduced to two planes as provided in this chapter. In war, the scouting unit may be but a single plane.

MISSIONS

2-101. (a) The primary mission of the scouting squadron is SCOUTING.

(b) The secondary mission of the scouting squadron is DIVE BOMBING.

(c) Other missions which this type of squadron may be called upon to perform are:

(1) Relief spotting.

(2) Patrol.

(3) Smoke laying.

2-102. The principles set forth in Part I, Chapter 5 are applicable to the carrier scouting squadron in the execution of its primary mission.

2-103. The secondary mission, dive bombing, is covered in Part II, Chapter 2 "Aircraft Tactical Instructions for Carrier VB Type Squadron".

2-104. When sector search is ordered, the sector will be divided into sub-sectors for each scouting unit. Units are assigned sub-sectors of equal arc as illustrated in Figures 1-59 and 1-60. If there is an odd number of scouting units, the squadron commander (or senior section leader) will be assigned the center sub-sector. If there is an even number of units, the squadron commander will be assigned the first sub-sector to the right of the median of the squadron sector. The first division will be assigned sub-sectors to the right of the squadron commander, in numerical order of sections. The second division will be assigned sub- sectors to the left of the squadron commander.

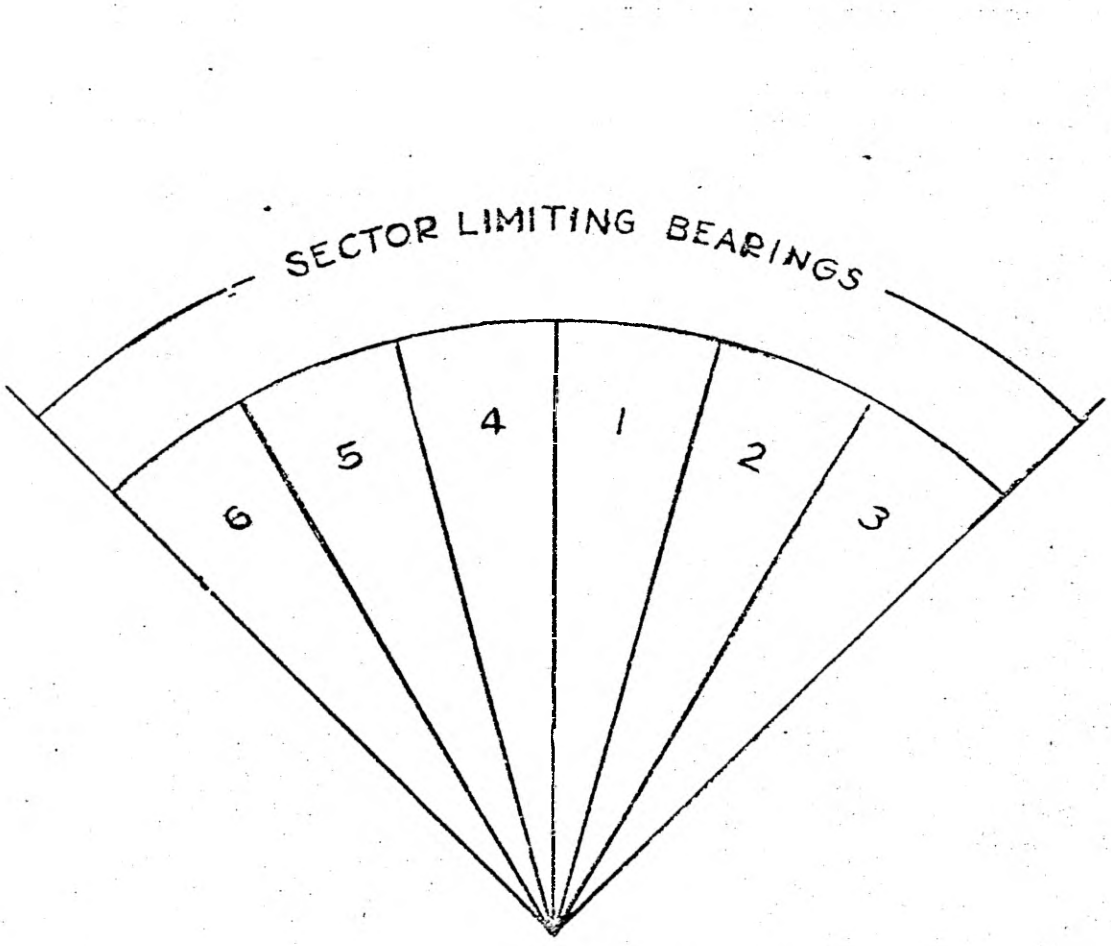


Fig 1-59
Even Number of Scouting Units

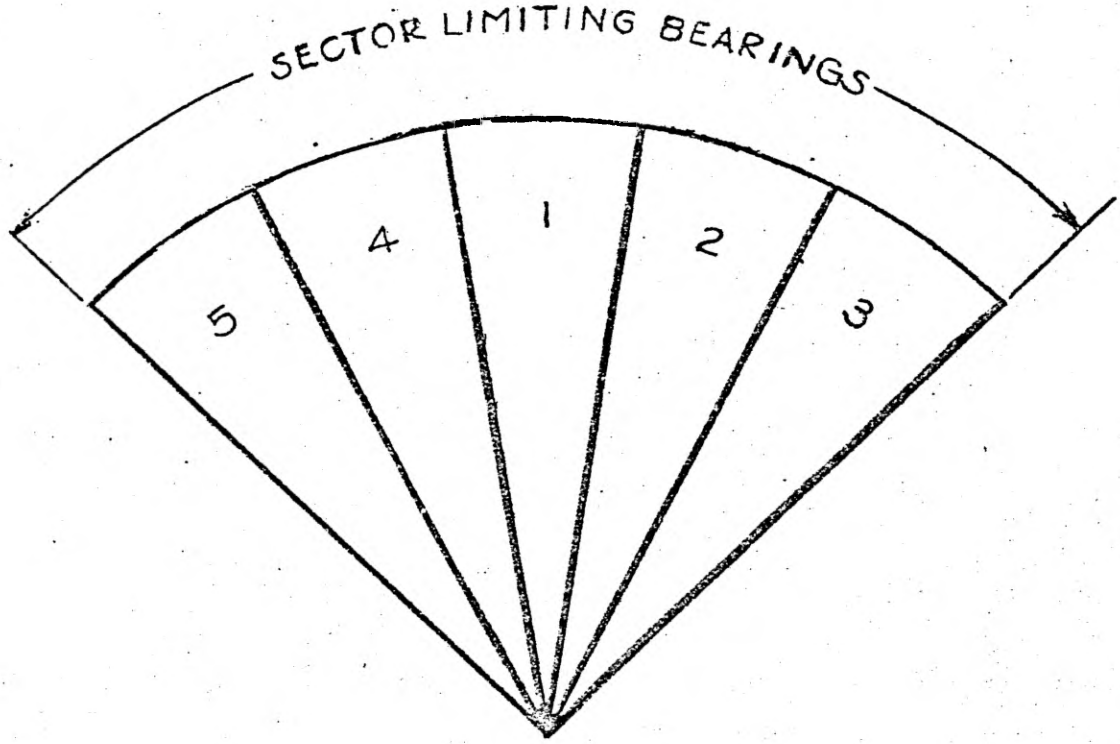


Fig. 1-60
Odd number of scouting units

SECTION II

OTHER FORMS OF SCOUTING

OBSERVATION

2-105. The principles of search are equally applicable to aircraft engaged in observation, except that airplanes will continue to cover the assigned areas until the time set for relief.

RELIEF SPOTTING

2-106. When a scouting squadron is directed to carry out relief spotting it will be governed by the doctrine as laid down for VO type aircraft.

RECONNAISANCE ASHORE

2-107. The general subject of reconnaisance is covered in F.T.P. 167.

CHAPTER 2

AIRCRAFT TACTICAL INSTRUCTIONS FOR VB TYPE SQUADRONS

SECTION I

GENERAL CONSIDERATIONS

MISSIONS

2-200. (a) The PRIMARY MISSION of a heavy dive bombing squadron is the rapid and effective delivery of heavy bombs on enemy objectives.

(b) The SECONDARY MISSIONS of a heavy dive bombing squadron include search, patrol, strafing and smoking.

OFFENSIVE POWER

2-201. Carrier based aircraft are essentially offensive weapons. Their major offensive power is the heavy bomb. All other missions of aircraft are therefore secondary to the delivery of heavy bombing attacks.

CONTROL OF THE AIR

2-202. It is highly improbable that control of the air can be gained by employing aircraft to shoot down enemy aircraft. The surest and quickest means of gaining control of the air is the destruction of enemy carriers, tenders and bases by bombing attacks.

EMPLOYMENT OF BOMBING ATTACKS

2-203. Heavy bombing attacks may be employed concurrently with the main engagement or in attrition tactics prior to main engagement, as the relative strengths of the opposing fleets or the tactical situation may demand.

GUIDING PRINCIPLES OF BOMBING ATTACKS

2-204. The guiding principles of aircraft attack on surface vessels are:

(a) Concentration of sufficient strength to sink or completely disable individual vessels, rather than dispersal of attack so as to inflict less damage on a greater number. This principle is subject to modification when the force available is only strong enough to accomplish subsidiary missions, such as the disabling of carrier flight decks, the disorganization of an impending attack by light forces, or interference with the effectiveness of ship and fire control crews during gun action.

(b) Delivery of attack in such a manner as to reduce the effectiveness of anti-aircraft fire against the principle element of the attack. Dependent upon conditions, reduced effectiveness of such fire may be attained (1) through surprise, (2) by attacking when the enemy is under heavy

gun or torpedo fire, (3) by employing light bombers in the bombing and strafing of vessels of the screen to clear the way for the attack of the principle element on the heavy vessels.

(c) Delivery of the attack when conditions are such that the target may find it difficult to maneuver freely at high speed.

SECTION II

TACTICS

GENERAL

2-205. In the development of dive bombing tactics the following factors must be considered:

(a) Opposition to be expected.
  (1) Aerial.
  (2) Anti-aircraft fire.
  (3) Target maneuvers.

(b) Concealment and surprise.

(c) Speed of delivery of attack.

(d) Direction of attack.

(e) Form of attack.

AERIAL OPPOSITION

2-206. Once a heavy bombing group is within striking distance of the enemy, it is extremely difficult for enemy fighters to stop their attack unless they be present in overwhelming numbers. It is essential, however, that the bombers maintain a type of formation which can be rapidly closed up for defense and that is readily maneuverable. At the same time the formation must be sufficiently open to minimize the possibility of detection by enemy surface craft.

ANTI-AIRCRAFT FIRE

2-207. The best defense against anti-aircraft fire is a vigorous, coordinated and speedy attack. delivered in such a manner as to place succeeding airplanes out of the stream of fire directed at the preceding ones. Speed of delivery is further discussed in paragraph 2-210. Surprise is also an important factor in reducing the effectiveness of anti-aircraft batteries.

TARGET MANEUVERS

2-208. The target may be expected to maneuver in order to reduce the effectiveness of the attack. If it be a vessel acting singly, it may maneuver violently. If the target should be in formation, maneuvers will necessarily be less radical and at longer intervals. To meet this opposition, the bomber. if he has already entered his final aiming dive, anticipates the position of the target at the instant of impact and makes the necessary aiming allowance; if he has not entered his final aiming dive, he alters his flight path to arrive at the desired point of push-over and must also make a slight allowance in his point of aim to compensate for the maneuver. It is well to remember that the speed of the target while maneuvering is reduced in proportion to the abruptness of the maneuvers.

SURPRISE

2-209. Surprise is not only an effective defense for the dive bomber but has a destructive effect on enemy morale. Cloud concealment is a fortuitous condition which should be utilized if available. Diving directly out of the sun provides concealment from the vessel being attacked. It further hampers anti-aircraft fire control. To be effective all airplanes of the squadron must dive directly out of the sun. Even a slight error in estimating the bearing of the sun allows the squadron to be sighted. When attacking vessels of an enemy fleet, surprise can be secured only by remaining

out of sight of all vessels of the enemy disposition. It can be assumed that warning of the impending attack will be broadcast by any enemy vessel sighting the bombers. Sun concealment is therefore not effective for this purpose. The most dependable form of concealment lies in approaching at maximum practicable altitude, keeping the formation opened out, and maintaining as nearly as possible a straight course to avoid sunlight glinting on fuselage, wing and tail surfaces during maneuvers.

SPEED OF DELIVERY

2-210. The time interval between dives is of major importance. Any interval of more than ten seconds practically eliminates the coordinated effect upon surface ship's morale, the more intense the concentration of bombs, the fewer shots the defending anti-aircraft batteries can fire, and the shorter the time allowed defending personnel to remedy casualties. An interval of from 2.5 to 4 seconds provides these advantages and at the same time allows each pilot, with practice, to concentrate upon his point of aim. Excellent preliminary training in diving at close intervals may be obtained by practice of the "snake dance."

DIRECTION OF ATTACK

2-211. (a) The dive from directly ahead, along the fore and aft axis of the ship tends to produce a steep dive and gives the maximum target in range with a minimum target in deflection. Range errors are normally greater than deflection errors (although this may no longer be true when sights now being developed are issued for service). A correction in point of aim for range is easily accomplished, whereas a correction for deflection is difficult and may require excessive corkscrewing which disconcerts the following planes.

(b) A dive from the beam gives a maximum target deflection, the most difficult correction to make, with a minimum target in the direction of range errors where the necessary correction, if correctly estimated, can be easily accomplished.

(c) A dive from astern, like the dive ahead, gives the maximum target in range and minimum in deflection. However, if the speed of the ship is greater that that of the wind at bombing altitudes, the dive from astern is in effect an upwind dive and errors in deflection may be corrected with much less corkscrewing than is necessary in the dive from ahead. The greatest disadvantage in the approach from astern is that the dives tend to flatten out.

(d) An approach of from 30 to 45 degrees on the bow gives a target area more nearly equal in range and deflection dimensions and has the additional advantage of off-setting the planes in the dives, placing them out of the stream of fire directed at the preceding planes.

(e) As a result of target maneuvers any predetermined direction of approach is subject to change. It is therefore essential that all pilots be able to make proper aiming allowances to produce hits from any direction of dive. An enemy fleet will usually be disposed over a large area. In general, the time required in circling such a large area outside of gun range and visibility is not justified in order to gain a desired direction of approach which is subject to immediate change by enemy's maneuvers. To do so increases the chances of detection and opposition.

FORM OF ATTACK

2-212. (a) Present experience seems to indicate that single-plane dives produce a large percentage of hits and are more difficult to combat than section dives. The section dive has some advantage in time required to complete the squadron attack. This time advantage is slight, the interval between successive fall of bombs is greater, and this form of attack is easier to combat. For these reasons it appears that the single-plane attack, producing a continuous rain of bombs at intervals of 2 to 4 seconds and presenting to the enemy gunners a confusing multiplicity of targets is more destructive to enemy morale and is on the whole more effective. However, present experience is insufficient to justify the exclusive use of single plane dives, and the comprehensive development of dive bombing tactics requires that section, and even division and squadron dives be perfected and used.

(b) Characteristics of different types of airplanes have an important bearing upon the type of dive to be employed. Speed retarding devices permit steeper dives from higher altitudes without gaining excessive speed.

THE APPROACH

2-213. (a) The approach should be initiated at a point out of range of visibility and anti-aircraft fire of vessels of the screen, at the maximum practicable altitude, not below 15,000 feet, and from a formation sufficiently loose to minimize chances of detection and sufficiently stepped up to permit rapid concentration for defense against other aircraft. Before starting the approach, the divisions are placed in echelon of echelons away from the objective. When the leader gives the attack signal and turns toward the objective individual planes follow behind at about 400 foot intervals in an approximate column, stepped DOWN slightly.

(b) If section dives are to be used, divisions are placed in echelon of V's away from the objective, sections remaining in V and taking an interval of 800 to 1,000 feet, in an approximate column, stepped DOWN, when the leader turns toward the objective.

(c) If the approach can be made in a straight line to the objective the probability of a well coordinated attack is increased and at the same time the chances of detection are minimized. The squadron commander should therefore select the point for initiating the approach after considering the possibility of sun or cloud concealment, time factor, base course of the objective, disposition of the screen, wind, opposition encountered or expected, and the general tactical situation. The approach should be made at high speed, losing altitude gradually to a minimum of 8,000 feet upon reaching the point of push-over for the final dive.

THE DIVE

2-214. The final dive should be initiated by all pilots at approximately the same altitude, a horizontal off-set in the direction of target movement being allowed by each succeeding plane to anticipate the target's position at the instant of impact. No off-set is required when diving down the fore and aft axis. Step-up must be avoided as it may result in losing sight of airplane ahead and will cause a steeper dive with consequent closing on the airplane ahead. Likewise each pilot should avoid pushing over too soon, which progressively flattens out the dive. A smooth and gradual push-over by the squadron leader is important. To increase the accuracy of bombing, the dive should be continued to the minimum altitude of release consistent with recovery above the danger space of the bombs carried and with pull-out restrictions upon the airplane. Violent corkscrewing disrupts the dive of the following airplanes and must be avoided. The pilot who finds his point of aim sufficiently off to require such corkscrewing has no choice but to withhold release, or release his bomb in the hope that it will fall near enough the target to cause damage by fragments. Before push-over each pilot should mentally compute his point of aim and upon push-over place his sight sufficiently ahead of the target so that, as a result of the target motion, his sight will drift on to the desired release point of aim during the dive. The accuracy of bombing is considerably increased if the altitude of release can be closely estimated and standardized. Using the sight as a rangefinder will assist greatly. The distance subtended on the target between the one hundred knot ring and the bead of the sight can be computed for any desired altitude. In section dives the wing planes fly formation on the section leader and release when he releases.

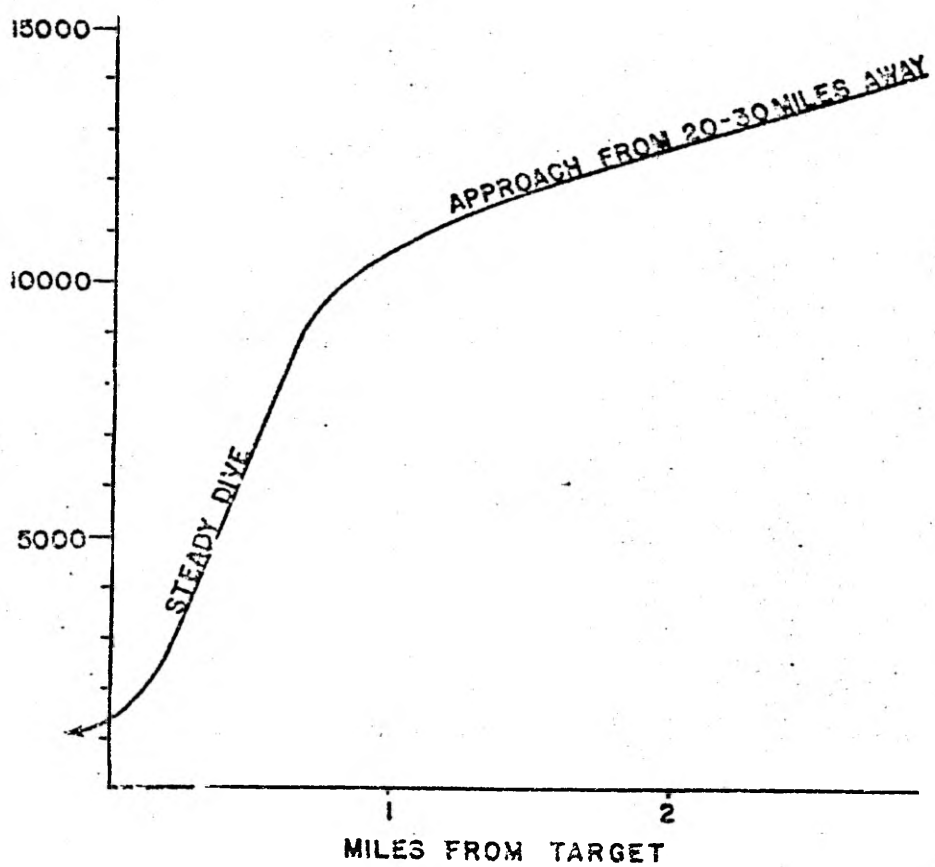


Fig. 1-61
Miles From Target

RECOVERY AND RETIREMENT

2-215. The pull-out should be gradual in order not to embarrass following airplanes. The retirement is made at high speed on divergent and varying courses to avoid anti-aircraft fire. The speed gained in the dive is used for rapid retirement and no attempt is made to gain altitude. Vessels of the screen should be avoided as much as possible.

RENDEZVOUS AFTER ATTACK

2-216. In a well coordinated attack units are at close intervals and there should be no difficulty in following the squadron leader to any rendezvous he may select. Factors to be considered in selecting a rendezvous are: (1) the direction of the attacking dive, (2) expeditious retirement from anti-aircraft fire, (3) avoidance of enemy aircraft, (4) next mission to be accomplished.

SECTION III

FIRE DISTRIBUTION

2-217. Normally a squadron of 18 heavy bombers would concentrate its fire as follows:

One Battleship	Three Light Cruisers
One Aircraft Carrier	Six Destroyers
Two Heavy Cruisers	Six Submarines

TARGET DESIGNATION

2-218. Target designation is in accordance with the following table, all airplanes of a *section* bombing the same target whether the dive is made by sections or by single airplanes. No. 1 target is the farthest away:

TARGET ASSIGNED EACH SECTION

No. of ships to be bombed	1st SEC.	2nd SEC.	3rd SEC.	4th SEC.	5th SEC.	6th SEC.
1	1	1	1	1	1	1
2	1	1	1	2	2	2
3	1	3	1	2	3	2
4	1	2	3	4	3	4
5	1	2	3	4	5	5
6	1	2	3	4	5	6

It will be noted that when the objective is two or three vessels, the squadron is correspondingly formed into two or three divisions and the target designation is by divisions.

IMPORTANT NOTE: When bombing **four** vessels the direction of dive must not coincide with **the line of bearing.** This precaution is necessary in order to avoid pulling out directly toward and over the target of following airplanes. While theoretically not necessary in other cases, it is well to observe this precaution at all times in order to take care of differences in diving speeds and of losing sight of the preceding planes.

CHAPTER 3

TACTICAL INSTRUCTIONS AND DOCTRINE FOR FIGHTING SQUADRONS

MISSION

2-300. (a) The primary mission of the fighting squadron is the destruction of enemy aircraft. Aerial combat for the accomplishment of this mission may occur in connection with the following classes of operations:

(1) Offensive operations which are opposed by enemy aircraft. The function of a fighting squadron is to engage and destroy the enemy aircraft so that our own forces may carry out their missions.

(2) Defensive operations against enemy aircraft endeavoring to attack our own forces.

(3) Attack on enemy aircraft engaged in scouting, spotting, reconnaissance or other activities.

(b) The secondary mission of the fighting squadron is attack on surface vessels. This may take any of the following forms:

(1) Attack on submarines and light forces with bombs and machine guns. The purpose in this case is destruction or complete disabling of the light forces.

(2) Attack on heavy forces with bombs and machine guns. The purpose in this case is the silencing of the anti-aircraft batteries in preparation for attack by heavy bombers.

INDOCTRINATION

2-301. The tactical situations which may confront the fighting squadron are so numerous and varied that definite tactical rules of procedure cannot be set down to cover them. It is for this reason that a fighting squadron, more than any other type of squadron, must depend upon proper and thorough indoctrination for the successful accomplishment of its mission. Drilled in fundamental principles of aerial combat, the pilots trained to think and act as a unit, a properly indoctrinated fighting squadron should meet any tactical situation without any commands from the leader other than the signal for going into action.

BASIC TRAINING

2-302. The basic air training of the pilots of a fighting squadron proceeds progressively through the following phases:

(a) FAMILIARIZATION FLIGHTS — To attain complete familiarity with the model airplane assigned the squadron under all conditions, and in every possible attitude of flight. This proficiency should be maintained by a frequent review of acrobatic and combat tactics.

(b) SECTION TACTICS — Intensive training in maintaining position in a section formation in every type of section maneuver. The section being the basic unit of the fighting squadron, every section must be thoroughly trained to maneuver as a unit at all times.

(c) DIVISION AND SQUADRON TACTICS — Training of the sections and divisions in the standard compound formations of Chapters 3 and 4 of Part I, including the rendezvous and break-up of the squadron and division.

(d) COMBAT TACTICS — The training of the squadron in fighting maneuvers such as formation dive bombing, formation machine gun attacks on aircraft and surface targets and defensive tactics.

BASIC PRINCIPLES OF AERIAL ENGAGEMENT

2-303. (a) Success in aerial combat depends upon one or both of the following:

(1) SUPERIORITY OF FIRE POWER — Determined or obtained by type and number of aircraft and armament available.

(2) SUPERIORITY OF POSITION — Is attained as a result of superior plane performance, skill, facility of maneuvering or advantage of initial position.

(b) In conforming to these principles, the side most skillfully employing the following elements of attack and defense will have the best chance of success.

(1) SURPRISE — Prevents the enemy from getting his force disposed for defense. Attained by using cloud or sun concealment, speed and direct dive to target.

(2) ALTITUDE ADVANTAGE — Permits choice of time and place of combat, and increases speed for pursuit of objective. This is normally an initial advantage, but may subsequently be obtained.

(3) CONCENTRATION — Insures continuity of leadership, mutual support, and volume of fire. Units must remain concentrated, within limits allowed by tactical flexibility, until the last possible moment. After attack, during which there will necessarily be some dispersion, the planes should immediately rendezvous. Avoid individual melees. Rendezvous should usually be toward, or in the vinicity of, the force protected in case of defensive missions, and towards the objective in cases of offensive missions.

(4) HIGH SPEED APPROACH — This allows the enemy a minimum of time to prepare for defense. The attack formation should take the most direct approach possible after reaching the probable range of enemy's visibility, and should then proceed at maximum speed.

(5) ATTACK ON LEADING ENEMY UNITS EXCEPT VF FORMATION — Destroys his leadership and tends to disperse his forces. This is accomplished by directing the opening fire, when possible, on the pivot of the enemy formation.

(6) ATTACK ON BLIND SECTOR — Confuses enemy as to direction of own movements, and proper counter action to take. Pilots will know the characteristics of various types of planes, but should likewise be familiar with the blind angles of the specific types employed by the enemy.

(7) SPLIT ATTACK — This provides that certain of the attack units will obtain the advantage of position if the enemy so maneuvers his formation that his maximum gun power is available in the initial direction of approach. The split, usually in three directions, insures at least one unit coming in on blind sector. Other units should not reach destructive gun range, and await more favorable opportunity for attack.

(8) USE OF ARMAMENT AT MAXIMUM RANGE — The first blow is the most important. If long range (.50 Cal.) guns are available, they should commence firing when there is the earliest reasonable prospect of hitting.

(c) In defense, the following elements should be applied:

(1) OBSERVATION OR LOOKOUT — Prevents surprise attack. This requires the disposition to be such that the maximum number of flight personnel can be free to observe approaching danger. Lookout doctrine must be carefully followed.

(2) RELATIVE ALTITUDE — To obtain altitude advantage *over the enemy, every* opportunity must be taken to increase altitude. If and when the altitude advantage is attained, it may be employed to initiate attack on the enemy, to avoid further action, or to aid in withdrawal.

(3) CONCENTRATION — Assures maintenance of leadership and mutual protection It is maintained by handling the formation in such a manner that dispersion will not be probable. If individual planes are forced out, the remainder must take such stations relative to the formation as a whole, as to make an effective concentration. Avoid individual melees.

(4) MOVEMENT RELATIVE TO ENEMY — This may be employed to reduce the attacker's superiority of position. If the attacker is in a radical dive, it will normally be sufficient to turn directly towards him, thus throwing him on his back, and preventing him coming into action. If enemy approaches at a moderate

dive angle, the defending units may either turn toward him to increase his angle of dive, or away to decrease it if so by doing, other guns of own formation can be brought to bear.

(5) ATTACK ON LEADING ENEMY UNITS—This tends to break up the attacking formation through destroying the leadership. Maximum concentration of gun fire should be directed at the pivot of the attacker.

(6) OBSERVE BLIND SPOTS OF OWN PLANES — Prevents enemy approach in favorable position. The type formation and the lookout maintained should be such that the formation is mutually protected in this respect.

TACTICAL ORGANIZATION

2-304. (a) The fighting squadron is organized tactically into either two nine plane divisions or three six plane divisions. The operations in progress will determine which organization is used. The two division organization is considered preferable for the following types of operations:

(1) Concentrated bombing attacks on surface targets.

(2) Rendezvous after launching, and break up prior to recovery when operating from the carrier.

(3) Operations during conditions of low visibility.

(4) Parades.

(b) The three division organization should be used for the following types of operations:

(1) All operations involving engagements with enemy aircraft.

(2) Bombing attacks on surface targets which are to be followed by straffing attack.

(3) All straffing attacks.

The six plane division is more adaptable to the tactical situations confronting the fighting squadron than is the nine plane unit. It is more maneuverable, and therefore, more easily controlled.

2-305. For maneuvering, the fighting squadron uses a standard formation consisting of each division in echelon of section vees with the divisions forming an approximate column. This formation is used, with either the nine plane or six plane division organization for:

(1) Rendezvous after launching from a carrier and just prior to break up for landing on board.

(2) Maintaining close contact within the squadron under conditions of low visibility or other circumstances in which close contact is desired.

The above formations are flown with any desired spacing and sections may shift from right to left echelon in order to facilitate rapid division turns and to obtain maximum flexibility with a moderately closed formation.

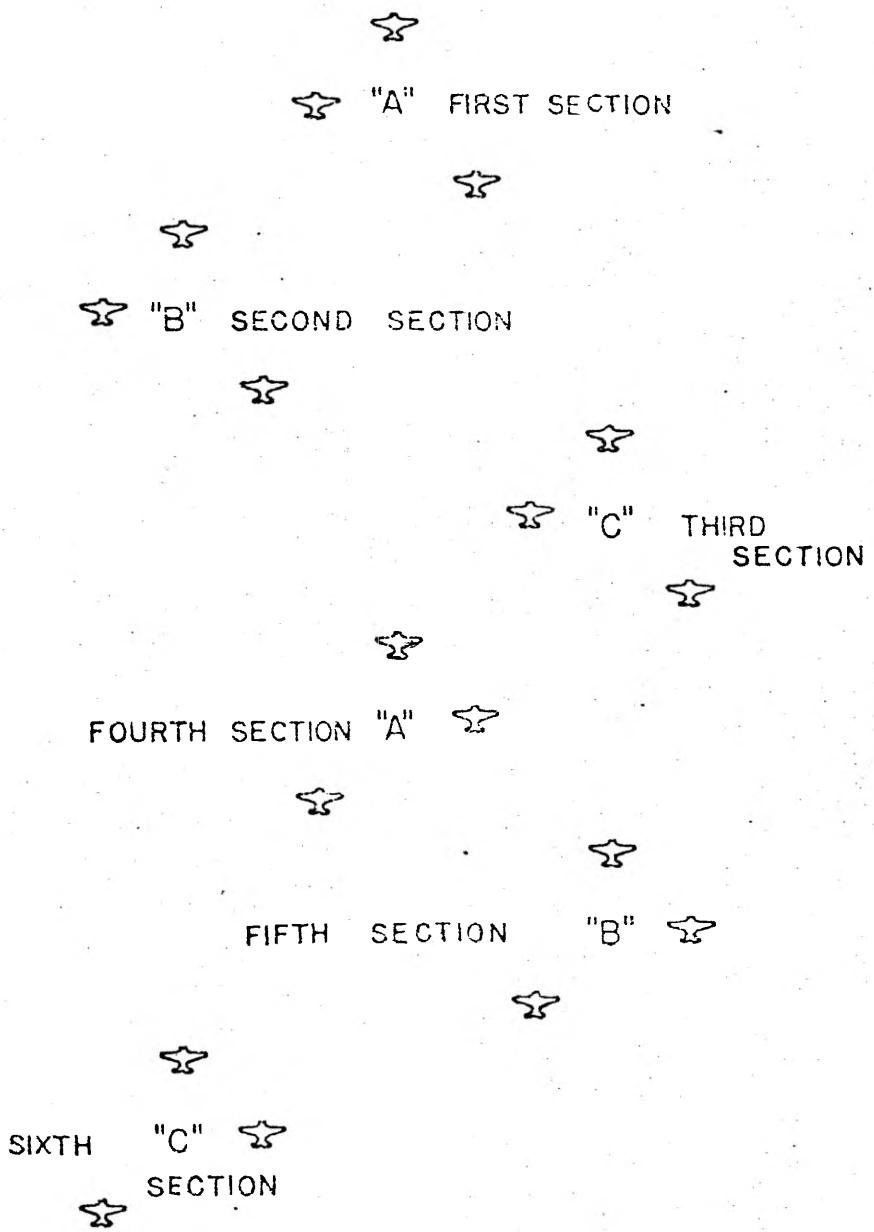


Fig. 1-62

A-B-C Formation As It Applies to the Nine Plane Division Organization of a Fighting Squadror

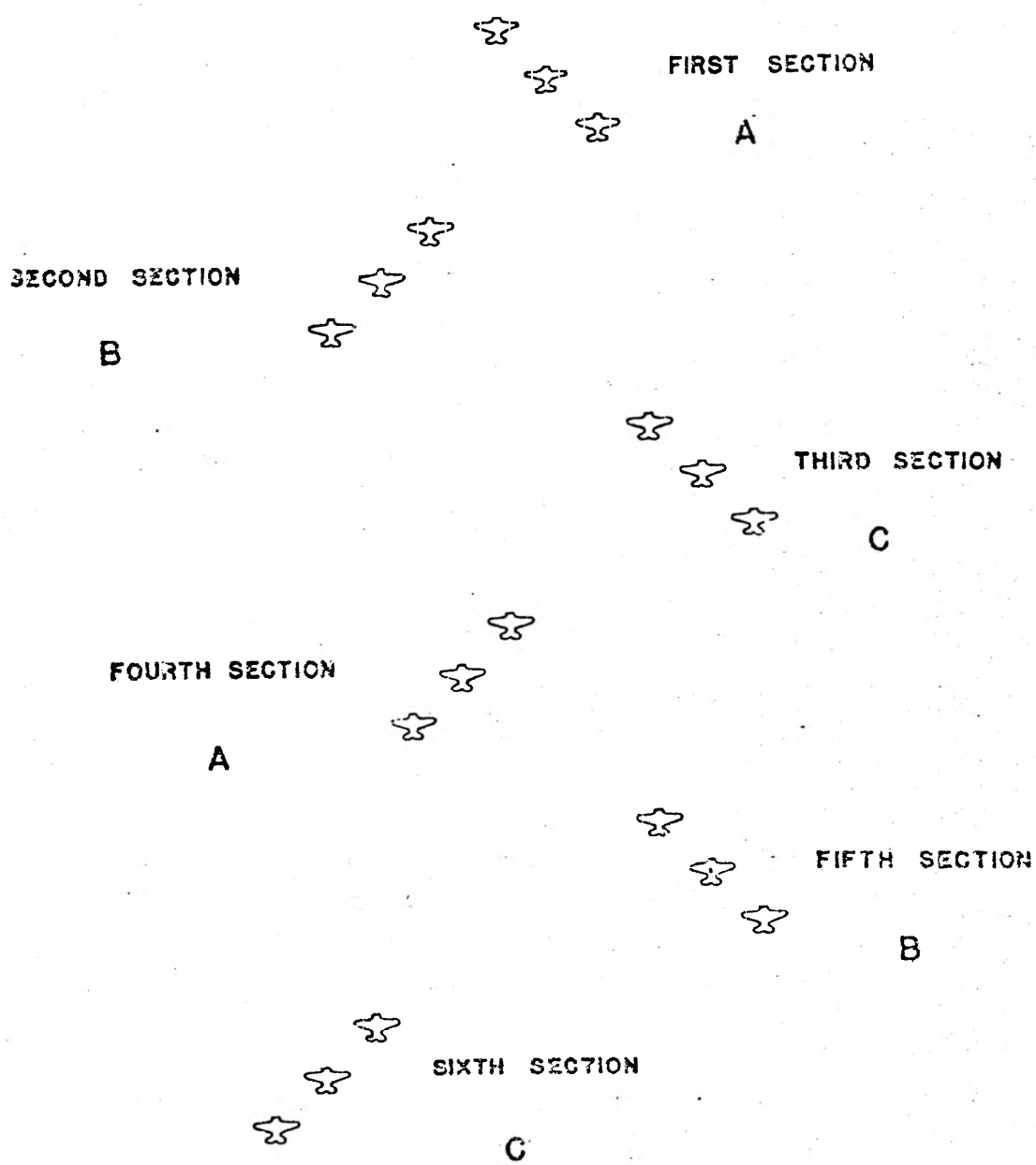


Fig. 1-63

A-B-C Formation As It Applies to the Nine Plane Division Organization of a Fighting Squadron

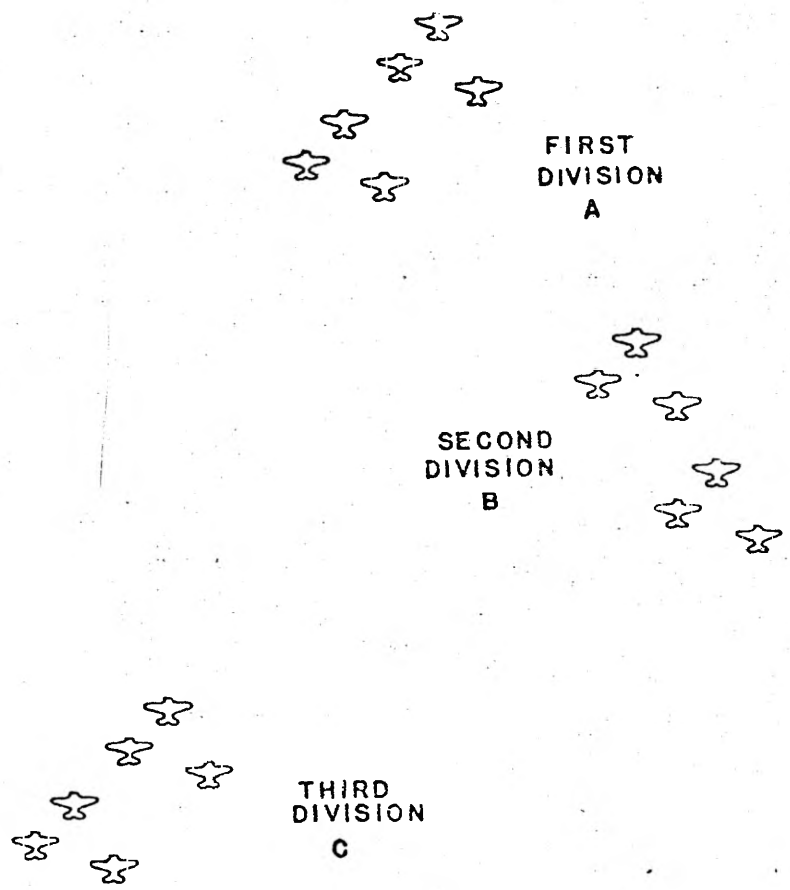


Fig. 1-64
A-B-C Disposition of the Squadron Organized as Three Six Plane Divisions

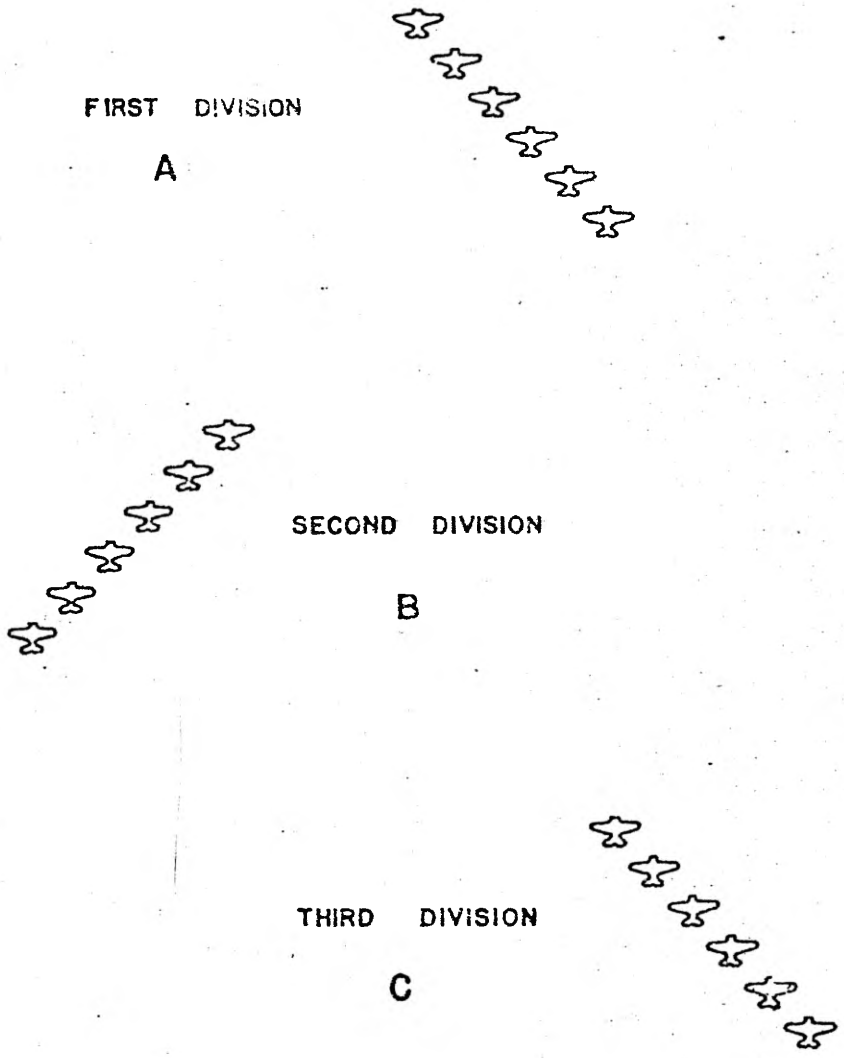


Fig. 1-65
A-B-C Disposition of the Squadron Organized as Three Six Plane Divisions

2-306. For high ceiling cruising, the A-B-C formation is normally used when proceeding to or from the objective, as part of an attack group, or as a protective escort for the group. The A-B-C formation, or modification thereof, is the most suitable formation from which to launch an attack on enemy aircraft formations. Therefor, it is used also by a division or a squadron of fighting planes on protective combat patrols over formations of surface vessels of our own fleet.

2-307. The standard A-B-C formation is described in Part I. Figures 1-62 & 1-63 illustrate the A-B-C formation as it applies to the nine plane division organization of a fighter squadron. Figures 1-64 & 1-65 show the A-B-C disposition of the squadron organized as three six plane divisions. The formations illustrated in Figures 1-62 and 1-64 are best suited to cover the lookout doctrine, and are, therefore, most useful when cruising. The formations shown in Figures 1-63 & 1-65 should be used when making an approach for an attack as they allow all pilots to observe the attack. Numerical order within the sections is maintained.

2-308. The formation in which the fighting squadron attacks depends upon the objective and the weapon to be employed. In dive bombing attacks, it may be either a column of individual planes, or a column of sections, entered in the A-B-C formation. In machine gun attacks on aircraft formations, it may be the standard A-B-C formation, or a modification thereof, in which the 2nd and 3rd divisions are stepped down below the division ahead, and the planes within the division are stepped down. This latter formation is well adapted to simultaneous machine gun attacks at long range on compound aircraft formations or surface light forces. The standard A-B-C formation is best adapted to close range attacks by sections or divisions in succession. The uses of both the standard and modified A-B-C formations are described in paragraph 2-315. However it is desired to emphasize the fact that the leader of a fighting squadron may attack from the A-B-C formation by simply signaling for and turning to the attack. In a well trained squadron, units will automatically place themselves so that all weapons will bear. When the units attack in succession, the A-B-C sequence is always maintained.

OFFENSIVE TACTICS AGAINST AIRCRAFT

GENERAL

2-309. (a) The fundamental principles of aerial combat as set forth in paragraph 2-303 form the basis of all offensive and defensive tactics against aircraft. With these principles clearly in mind, the following instructions should be studied by fighting squadron pilots as a guide in the training of the fighting squadron to operate effectively against aircraft in the various missions to which it is assigned.

(b) The types and characteristics of aircraft which may be encountered are so many and varied and change so frequently that specific instructions for attack against them cannot be given. The best method of attack can be determined only by actual combat experience with each individual type. There are several general rules, however, which will apply in practically all attacks against enemy aircraft.

(1) The attack should be started from above, when possible, even though ultimate firing position is from below the target.

(2) When maneuvering for, or approaching attacking position, sections should be well spaced to the sides. The attack should be initiated by the plane or section which is in the best position for attack. If the enemy planes do not maneuver to avoid the attack, it should be pressed home and followed in rapid succession by the remainder of the attacking squadron. Should the enemy maneuver to avoid the initial attack, his maneuvers should place one of the remaining sections in a favorable position for an attack which should be started instantly, while the section making the initial attack recovers and seeks a position for renewing the attack.

(3) Attacking planes should recover from each attack in the direction of the enemy's flight and attempt to climb to a position above him.

(4) The attack should usually be made in a succession of individual section dives in column, or the simultaneous attack described in paragraph 2-315 should be used, in which case, the division is the attacking unit. When more than three planes attack in succession in column, the reuslt is usually a stretching out of the column, loss of speed and flattening out of the dive, less favorable firing position for last few planes, and delay in recovery and re-organization for continuous attack.

(5) The tactical concentration of a squadron should be maintained as long as possible during the attack. Once the chain is broken, the squadron commander loses tactical control and the attack will quickly degenerate into a melee of individual combats in which all advantages of concentration and initial position are lost. Each pilot should follow closely the next ahead, delivering his attack in turn and then following on to maintain the chain.

(6) The direction from which an attack is launched will depend primarily upon the defensive characteristics of the enemy plane. It should be remembered that the defensive gunner, when his gun can be brought to bear, always has a "no deflection" shot when attacked by a plane mounting only fixed guns. Experience alone will determine the best direction of attack against any specific type of plane.

(7) The initial disposition of the squadron should be such as to provide for as many of the basic elements of attack and defense as possible. The units of the formation should be maintained at the maximum effective distance for mutual support (with ease of visual signaling). This makes the aircraft less easy to detect than when in close formation, allows maximum lookout by personnel and thus reduces danger of surprise or attack in blind sectors, and still retains leadership and concentration of fire power.

ATTACK ON ANOTHER SINGLE-SEATER — INDIVIDUAL COMBAT

2-310. Unless complete surprise can be effected in an approach from the rear and above, it is advisable to start the attack from a point approximately 1,500 feet above and slightly to one side of the opponent. Use should be made of the sun or the clouds for concealment. By a quick turn immediately upon passing over the target plane, the attacker attempts to gain a position above and slightly behind the opponent and on the same general heading or in the same turn. Once in this relative position, the attacker quickly dives or slips down to a firing position "on the tail" of the target plane, converting his altitude advantage into speed as necessary to turn outside of and close in on the opponent. The firing position should then be tenaciously held until the opponent is shot down. The altitude advantage should not be relinquished until the attacker is sure of gaining the firing position.

(a) COMMON FAULTS — Of attacking pilots that cause failure in an attack are:

(1) Not taking enough altitude advantage.

(2) Too much of a hurry, not waiting for the opportune moment to come down into the "saddle" position.

(3) Making turns too slowly. The most successful combat pilots do not attempt to turn with the ailerons, which is too slow, but "cartwheel" or "spin" the turns, using hard back flipper and hard rudder.

(4) Opening fire at too great a range. Remember that it is almost impossible to hit in a dog fight until you are close enough in. Let your opponent's plane fill the 50 knot ring on the sight before you start firing.

(5) Losing sight of an opponent.

ATTACK BY SINGLE-SEATER ON TWO-SEATER

2-311. (a) If possible, a surprise attack should be effected by taking advantage of the sun or any clouds for concealment. If not sighted, the approach to effective gun range should be made from astern and slightly below the tail of the two-seater.

(b) If the single-seater is sighted, an altitude advantage should be gained, and the initial attack should be then driven in at high speed in an attempt to turn outside of the target plane and to close to a firing position below and astern as the pilot of the two-seater turns to bring his rear gun to bear. Thereafter, the attacker should feint attacks from one side and then another, harassing the rear gunner by forcing him to swing his gun from side to side and by subjecting him to strong accelerations as the pilot of the two-seater is obliged to maneuver radically. Subsequent attacks are then driven in at blind angles or whenever it is apparent that the rear gunner is not ready to fire.

(c) The tactics described in the above sub-paragraph would, in all probability, be possible only against a two-seater whose performance is considerably inferior to that of the attacking fighter. Against a two-seater whose speed is comparable to that of the fighter, the initial altitude advantage, if held, should enable the fighter to make one high speed attack, but thereafter, any attempts to reach hitting range will result in a tail chase with the fighter exposed to the direct, no deflection fire of the flexible gunner.

ATTACK BY SINGLE ON MULTIPLACE PLANE

2-312. The attack should be made at high speed from directly overhead or from a blind angle.

ATTACK ON VF FORMATION

2-313. (a) Unless the attacking force is greatly superior to the force being attacked, the attack should not be launched until the altitude advantage has been gained. The approach to the attack must be direct and rapid. Tactical control must be maintained throughout the action.

(b) In attacking a fighting squadron, an approach from the flank is considered better than from directly above. Each section should attack in succession, the immediate objective being the highest enemy section. The attacking planes should dive in succession, firing a short burst and zooming to regain as much of the initial altitude advantage as possible. This method of attack is continued as long as the altitude advantage can be maintained. The attack should not be shifted to a lower section until the highest has been destroyed.

(c) If some of the lower sections of the enemy formation detach themselves, move off to one side, and attempt to climb above the attackers, one or more sections of the attacking squadron should attack these detached sections while the altitude advantage over them is held.

(d) If the attacking squadron is superior in number to the enemy, the last section should with-hold its attack to see if the enemy formation has been broken up. If any enemy planes or groups are not destroyed, this last section should destroy them before they have a chance to counter attack. The highest intact enemy groups should be destroyed first.

(e) If the formation attack is a unit of enemy fighters, the difficulties of maintaining an orderly controlled formation, will be increased, but the planes of each unit will be able to remain concentrated upon each other and to render mutual support. Success will depend largely on the maintenance of an effective tactical concentration and upon keeping straggling, and the pursuit of individual enemy planes, to a minimum as long as the decision is in doubt. The individual fighters must maintain concentration on their leader and conform to his movements in every way possible. As soon as a decision is reached, sections and divisions should reform in order to provide for further encounters. If a general pursuit is desired by the leader, he can so indicate by his own action.

ATTACK ON VSB, VSO (TWO PLACE) FORMATION

2-314. (a) In attacking an enemy two place formation, the most effective method will be to concentrate on the leader and the wing planes nearest the direction from which the attack is launched, endeavoring to destroy them first. If this is done, the remainder of the enemy planes can be destroyed more easily. If the enemy formation consists of two units, it will be advisable to concentrate the attack on the higher of the two units, while merely enough attention is devoted to the lower unit to keep it occupied. Thus a division could, in such a situation, assign two sections to the destruction of the upper enemy unit and one to contain the lower unit.

(b) If the enemy formation form a "Lufberry" circle, the attacks must be made from the outside of the circle, at high speed and from angles which will offer the flexible gunner the most difficult shots.

ATTACK ON VTB OR VBP (BOMBING) FORMATION

2-315. (a) The method of attack to be used by a squadron of fighters on a heavy bombing formation will depend upon many factors, such as:

(1) The existing tactical situation.

(2) Relative strength of opposing forces.

(3) Margin of superiority in performance of the fighters.

(4) Initial advantage of position. If the bombing formation menaces important surface forces, the attack must be pressed home at once, using methods which best develop the fire power of the attacking fighters, regardless of the return fire of the defensive gunners.

(b) Most methods of attack require a large excess of fighter speed over that of the bombers if the attacks are to be effective and sustained. If the fighters do not possess a substantial superiority in performance, they must attain an initial advantage of position before being sighted or no attack will be possible. This initial advantage can be utilized to launch one direct high speed attack followed by an attempt to attain a position to the rear of the enemy formation from which long range fire will be effective.

(c) The following general principles should be observed in attacking bombing formations:

(1) If the attacking squadron is superior in strength, the entire enemy formation should be attacked in force, all planes being brought under heavy fire with a heavy concentration on the leading units.

(2) If the enemy formation is superior in strength, the attack should be concentrated on the rear and the highest units in order to defeat it in detail. The altitude advantage must be maintained.

(3) If possible, attacks should be made from angles such that enemy planes will interfere with each other's fire.

(d) LONG RANGE SIMULTANEOUS ATTACK — The attack is launched from well above the enemy formation at a distance of about 1,000 yards. Using the three division organization, the squadron shifts on signal from A-B-C formation into a column of divisions, with the second and third divisions 500 feet below the division ahead. The planes within the division form in echelon and each drops down about 75 feet below the plane ahead. The leader is free to attack in any direction. When the attack signal (leader rocking wings) is given, each division leader opens slightly away from the echelon, placing the squadron in right echelon of left echelons or vice versa. When the leader is ready to start his dive toward the enemy, he rocks his wings again and pushes over without reducing his throttle, puts his sight on the leader of the enemy formation and commences firing at a range of 2,500 feet. Each plane in division pushes over with the leader, keeping his line of sight below the plane ahead. The leader of each following division pushes over when the last plane of the division ahead enters its dive. Thus, all planes can fire simultaneously, remaining in formation. The attack should be completed before the fire of the defending formation becomes effective, the fighters recovering altitude and taking position for another attack.

(e) Coordinated attack by sections or divisions in succession at moderate or close ranges:

(1) Initial positions are assumed as indicated in Figure 1-70, the attacking planes slightly above the level of the leader of the formation to be attacked. The attack is concentrated on the leading plane in an attempt to shoot down the tactical leader and the master bomber, thereby disrupting the formation and reducing its bombing effectiveness. Section A attacks the leader from ahead, pulls out sharply above, and recovers to the original relative position. Section B attacks the leader from the side, pulls out above, and recovers toward the opposite side. Section C attacks the leader from the side, pulls out above, and recovers toward the opposite side. These attacks are repeated as rapidly as starting positions can be regained. The approaches of the three sections follow each other as rapidly as possible without causing risk of collision between attacking planes as they pull out above the leader of the defending formation.

(2) Figure 1-71 indicates the attack procedure when the defending formation turns as the attack is about to be launched. Assuming a turn to the left, section B attacks from ahead and recovers toward a position on the same side from which the attack started. Section C crosses over, out of gun range to a new position on the left side of the formation and immediately drives in an attack from that side.

(3) Figures 1-70 and 1-71 represent an attack by one division of VF. If two divisions of VF are present, the sections of the second division alternate with those of the

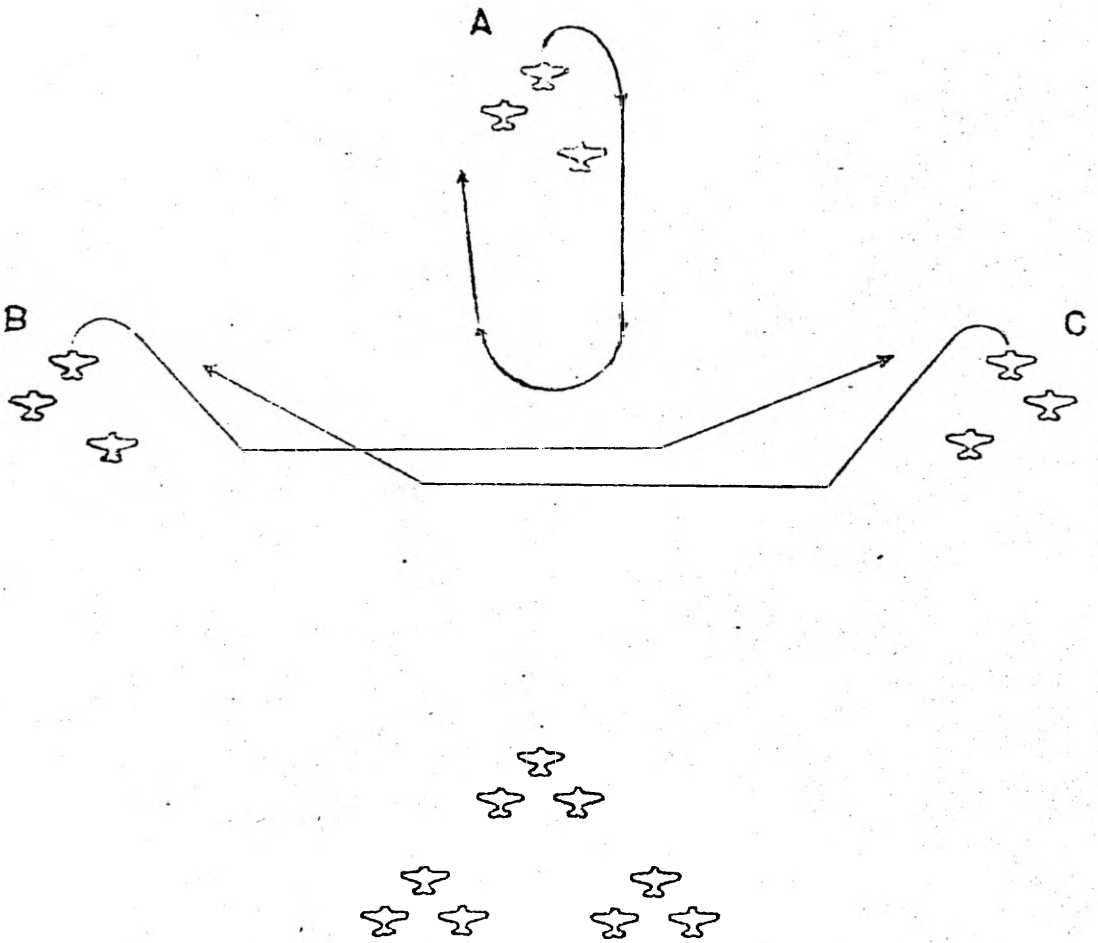


Fig. 1-66
Coordinated Attack By Sections or Divisions In Succession at Moderate or Close Ranges

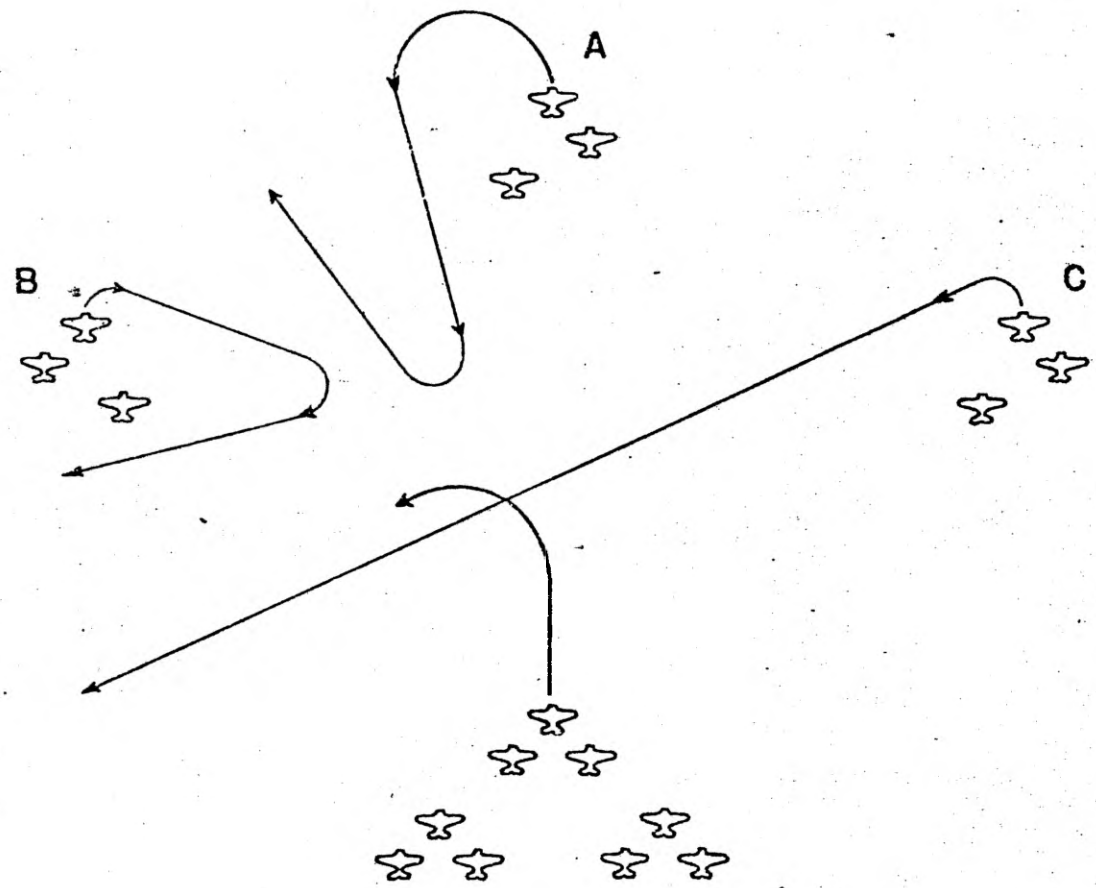


Fig. 1-67

Attack Procedure When Defending Formation Turns as the Attack is About to be Launched

first division to maintain a continuous anvil attack. The success of this method of attack depends upon the rapidity with which the successive attacking planes approach from the three directions.

ATTACK UPON PROTECTED FORMATION

2-316. (a) The leader of the attacking fighters must exercise good judgment as to the urgency of attacking the force protected. If the bombing formation is close to its objective, the attack should always be made immediately, without first destroying the protecting escort.

(b) Under certain conditions, such as may obtain when time is not so pressing, it may be desirable, to avoid excessive losses from counter attack by escorts, to destroy the protective forces before attacking the force protected. If the protective escort is scattered, it is probably best to endeavor to destroy it in detail, attacking the higher units first. If the escort is well concentrated, it is usually necessary to apply the same principles of attack as upon a concentrated fighting squadron.

(c) Maneuvers have clearly demonstrated that fighters attacking VTB planes which are under fighter protection, may almost certainly count on delivering one effective attack, without opposition, on the forces protected, but that thereafter, protecting planes coming down are in position to destroy the attacking fighters.

DEFENSIVE TACTICS AGAINST AIRCRAFT

DEFENSE OF SINGLE-SEATER AGAINST SINGLE-SEATER

2-317. Assuming that the opponent has the altitude advantage, the defending pilot should first head for a point directly beneath the attacking plane and start climbing. If, after passing overhead, the attacking plane immediately turns, the defending pilot executes a quick turn in the opposite direction and again heads for a point beneath the attacker. If the attacker delays his turn after the first pass-over, the defender quickly turns and heads to meet the attacker when the latter does turn. The defender continues this "scissors" maneuver until he has gained an equal altitude with the attacker. Then, by beating the attacker to the turns or by gaining an altitude advantage through outflying him, it is possible for the defending pilot to assume the offensive.

DEFENSE OF VF SQUADRON AGAINST VF SQUADRON

2-318. The defending VF Squadron will normally be in the A-B-C formation. When attacked, planes of each section should drop down to the level of the section leader, or, if time permits, climb to a level of the uppermost plane of the section, and immediately start a climbing Lufberry circle. The higher sections should take advantage of any lull in the attack to ease the turn and gain altitude more rapidly, or to gain distance toward friendly territory or other aircraft support, depending upon the tactical situation and relative strength of attacking and defending forces. The lower sections not being attacked should immediately gain distance to the side and climb to gain an altitude advantage over the attackers and then assume the offensive.

AIRCRAFT PROTECTION — GENERAL

2-319. Fighting squadrons may be assigned to the protection of surface vessels, areas, or aircraft formations. The primary function of all protective aircraft is the detection of hostile aircraft, attack on them and a prompt warning to own forces in danger.

2-320. Subject to restrictions on the use of radio, all reports of sighting hostile aircraft should be announced by radio in a brief explicit report giving the nature, and the true bearing of the enemy aircraft from the forces protected. A unit of fighters, assigned to protection of other aircraft, escort duty, aerial picket duty, or combat on patrol for the protection of surface vessels must remember that it is most essential, once the enemy force has been sighted, to get the information out to proper authority at once in a clear, consice, accurate manner.

2-321. Counter attacks should endeavor to intercept at the earliest possible moment enemy aircraft which are in a position to attack the protected area, vessel or formation. However, care should be exercised not to be drawn off beyond protective distance by feints, as such tactics may permit the enemy to evade the counter attack.

2-322. Protective aircraft should regain station immediately an attack is withdrawn. Unless their orders require it, they should not pursue retreating airplanes, since this separation from the protected area or formation leaves it exposed to further attack.

2-323. AN ATTACK SHOULD NEVER BE PERMITTED TO COME IN ENTIRELY UNOPPOSED. THE EFFORT TO COUNTER, EVEN IF APPARENTLY INEFFECTIVE, WILL HURRY THE ATTACK AND REDUCE ITS EFFECTIVENESS.

PROTECTION OF AIRCRAFT — ESCORT DOCTRINE

2-324. (a) Escorts are fighters assigned to protect a formation of aircraft. They may be classified as high or low escorts. Their mission is to sight, report, and counter attack enemy planes which threaten the formation escorted. Counter attack methods are governed by (1) relative strength of forces, including vulnerability of the forces escorted, (2) relative positions of forces, and (3) distance of the force escorted from the objective or the friendly base. Enemy fighters attacking the formation will endeavor to penetrate the escorts and attack directly the force escorted, or will engage the escorts in order to draw them away or to destroy them so as to permit an unopposed attack on the force escorted. Direct attack on the protected formation may be expected when in close proximity to their objective or when no other enemy attacking force is in vicinity. Such an attack can only be countered by direct plane for plane attack as the enemy fighters come in. A general melee following such an attack will probally be unavoidable. Engagement of the escorts prior to the attack on force escorted may be expected if interception has occured at some distance from the objective or if other enemy forces are available to attack. If escorts are drawn away from the force protected, the mission of the attacking group will have been accomplished, and hence, every endeavor must be made to remain between attackers and the force being protected. Escorts must be prepared to pursue the attacking force if they suddenly break off the attack on them to attack the force escorted. Escorts may logically expect a division of enemy forces, part to engage the escorts until well separated from the force escorted, and part to proceed to the attack of the latter. Hence, all escorts must be alert to proceed to the attack of such a detached group with part or all of the escort strength.

(b) For all counter attacks, the section is the basic tactical unit. The section sighting the attack must commence action immediately. Wing men must remain with and support their section leaders. Tactical subdivisions of more than three planes probably will be impracticable under these conditions.

2-325. Escorts should cover one or more of the stations shown below:

(a) Low escort. These should operate approximately 1,500 feet directly above the formation protected. Close visual contact with the protected formation must be maintained. The protective strength assigned to this task force will depend upon the type and defensive strength of the formation being defended. If this formation consists of planes of great defensive strength, the smaller part of the escort strength should be assigned to the low escort. If the formation consists of planes with little defensive strength, the main escort strength should be assigned to the low escort. If the escort strength is so small that it becomes undesirable to divide it, the entire strength should always be assigned to this station to insure that all attacks are seen and countered.

(b) High escort. These should operate at relatively high altitudes above the protected force and should investigate any recognizable danger bearing such as sun-up, cloud concealment and land backgrounds. The decision as to whether or not to station high escorts should depend on:

(1) Escort strength available.

(2) Weather conditions.

PROTECTION OF SURFACE VESSELS FROM AIRCRAFT ATTACKS

2-326. (a) The effectiveness of the defense against horizontal and dive bombing attacks upon surface vessels depends upon (1) the distance from the fleet disposition at which the enemy aircraft can be intercepted, (2) the relative strength and position of the opposing aircraft groups, and (3) the volume and accuracy of anti-aircraft fire from defending surface vessels.

(b) Defending aircraft should, if possible, attack incoming bombers before they come within effective anti-aircraft gun range. An aircraft protection patrol, concentrated over the center of the fleet formation, cannot always sight and intercept a force of enemy bombers in time to deliver an effective counter attack. The combat or protective patrol must, therefore, depend upon early information on the approach of hostile aircraft from aerial pickets.

(c) **COMBAT (PROTECTIVE) PATROL** — The most important duty, and the duty which a fighting squadron is most often assigned, is that of combat patrol. The function of the combat patrol is identical with that of the anti-aircraft batteries and is therefore, a part of the anti-aircraft defense of the fleet. The combat patrol should take station in A-B-C formation above the surface vessel formation to be protected, and at an altitude above the highest altitude at which the approach of the enemy bombers may be expected. If the patrol is small relative to the expected enemy opposition, it should remain concentrated. If the combat patrol is large (more than one squadron), it may be advisable to divide the patrol into two or more groups and to station these groups equally distant around the circumference of a small circle above the formation center. Upon receipt of information on the approach of hostile aircraft, the combat patrol should proceed at high speed to intercept and attack the enemy in force. Any unit of the combat patrol sighting enemy aircraft should immediately broadcast the contact report, and should then endeavor to point out the enemy formation to the division or squadron commander who will lead the attack. Individual units or sections of the combat patrol should not be permitted to detach themselves at will to attack any and all enemy aircraft sighted, as to do so might reduce the effectiveness of the patrol to such a point that the main enemy attack cannot be frustrated when it takes place. Furthermore, the combat patrol must guard against being drawn away from its station by possible enemy decoys.

INNER AIR PATROL AGAINST SUBMARINES

2-327. (a) The fighting squadron may be assigned the task of maintaining an Inner Air Patrol against enemy submarines and mines. A secondary mission of this assignment is the detection, warning and counter of enemy surface and low altitude air attacks.

(b) Each section of the fighting squadron is a patrol unit. The squadron will normally be assigned a definite area or sector beyond the outer circle of the fleet disposition. The patrol will cover the entire area to ten miles (or other specified distance) beyond the outer circle. Each section is assigned a sub-area. The density of the patrols should be twice as great in the forward as the rear hemisphere.

(c) The patrol is flown at a low altitude with the planes in the section disposed in A-B-C formation. Upon sighting an enemy submarine, a report should be made by voice radio and the submarine attacked with bombs and machine guns. If surface vessels approach, the location should be indicated by repeated dives. Mines should be reported, and their location indicated by circling, and should be destroyed by machine gun fire from safe distance.

ATTACK AGAINST SURFACE VESSELS

2-328, The fighting squadron will normally make dive bombing and machine gun attacks on surface vessels under the following circumstances:

(a) As a part of a coordinated aircraft attack on enemy capital ships.

(b) As a task group whose objective is the vessels of the screen over which the heavy bombers must pass to reach their objectives.

(c) As a task group whose objectives are the light enemy forces.

(d) When operating as an Inner Air Patrol against submarines.

DIVE BOMBING ATTACK

2-329. (a) In dive bombing attacks on surface targets, the fighting squadron employs, in general, the tactics described in the chapter devoted to tactics of a dive bombing squadron. However, in the case of the fighting squadron, the approach is usually made, and the attack launched from A-B-C formation, or modification thereof.

MACHINE GUN (STRAFING) ATTACK

2-330. (a) Machine gun attacks (strafing) on surface vessels are described in Part I.

(b) When the fighting squadron is assigned as an objective those vessels of the screen over which our heavy bombers must pass to reach their objectives, a machine gun attack against such vessels would normally follow immediately after the release of bombs and should be so timed as to take place just prior to the time at which our heavy bombers enter the effective anti-aircraft gun range of the screening vessels being attacked. Firing should be done during a steep dive, the attacking plane then pulling out and zooming to regain altitude from which to make another attack. Such attacks should be continued until our heavy bombers have passed beyond effective anti-aircraft range.

CHAPTER 4

AIRCRAFT TACTICAL INSTRUCTIONS FOR VTB TYPE SQUADRONS

SECTION I

GENERAL INSTRUCTIONS APPLICABLE TO VTB TYPE SQUADRONS

MISSION

2-400. The VTB type is the heaviest striking arm with which a carrier is equipped. When used as a heavy bomber or as a torpedo plane, it constitutes a major aerial threat and is capable of inflicting decisive damage. While its primary purpose is to destroy enemy vessels, it may be used, should the general tactical situation require, to impose desired maneuvers upon the enemy. Its use as a smoke layer should be kept to a minimum, as other types are able to perform this mission.

TARGETS

2-401. The usual objective for a VTB squadron is a formation of capital ships or a formation of vessels of the train. The van or flagships are the most important targets. Light forces are usually not sufficiently important for this type of attack; further, their high speed and maneuverability render them difficult targets. An aircraft carrier, in the event of surprise, is an ideal target, particulary if the attack can be consummated prior to its launching of planes.

FORMATIONS AND MANEUVERS

2-402. (a) With a few exceptions, VTB squadrons use the same formations and maneuvers as other aircraft. To provide the greatest flexibility, the organization of this type of squadron should provide for tactical organization consisting of three divisions of two sections each as well as the standard two divisions of three sections each. There must be special torpedo and bombing formations as discussed later under the heading TORPEDO DOCTRINE and BOMBING DOCTRINE.

(b) The normal cruising formation consists of two nine-plane Vee of Vees divisions in column. When air attack is imminent, distances and intervals must be closed to "close order" in order to procure the maximum cross-fire on attacking aircraft. It has been definitely proven that close order formations may be seen at much greater distances than can open order ones, therefore, when approaching a formation of enemy surface craft, "open order" should be assumed.

(c) The A-B-C formation is not ordinarily used with VTB type aircraft as there is little gain in maneuverability and there is great loss of defensive gun power, Cross-over turns are not used in VTB squadrons. Planes or sections ease over as necessary to facilitate large course changes; in turns against an echelon, all following sections ease over to the opposite echelon.

STEP-DOWN FORMATIONS

2-403. The value of a step-down formation should not be overlooked and development of this type of formation is encouraged. For low wing monoplanes visibility is far better above than below. VTB type squadrons should experiment with step-down formations and submit changes to this publication as developments occur. It is believed that all formations can be flown successfully with a step-down instead of a step-up, thus giving improved visibility and much greater defensive gunfire against any attack in the after quadrant.

MISSION

2-404. In addition to the direct destruction or damaging of enemy vessels, aircraft torpedo attacks are capable of the following:

(a) Reducing speed of one or more enemy vessels; this may retard or prevent the enemy purpose, or may result in the necessity for his abandoning crippled units.

(b) Causing confusion; this may be of particular importance in a battle line during an engagement or in a large train or convoy.

(c) Forcing undesired maneuver on the enemy's part.

(d) Serving as a correlated or "anvil" attack in conjunction with destroyer attack.

(e) Quick finishing of isolated damaged enemy units.

Aircraft torpedo attack may be ordered for any one or more of the above purposes.

TARGETS

2-405. Normally, the targets for an aircraft torpedo attack will be heavy and important enemy units such as battleships or aircraft carriers. Attack may, however, be ordered and delivered against vessels of the convoy or train, or against cruisers or even destroyers under special conditions rendering chances of success particularly good or where such attack is dictated by circumstances.

TIME OF ATTACK

2-406. Time of attack is normally governed by other tactical considerations. Where such considerations permit sufficient latitude in the choice of the time for attack, this should be selected to favor concealment and surprise by the planes. Favorable light conditions, clouds, land backgrounds, etc., should be exploited. Vessels in restricted waters are particularly vulnerable, anchored vessels being an extreme example. The ideal time for torpedo attack in an encounter between major forces is when main engagement is imminent or already in progress.

TACTICS OF ATTACK

2-407. (a) There is no set form for a torpedo attack. It must at all times be flexible and capable of change to suit conditions. Various types of attacks are described below. Every advantage must be taken of haze, low clouds, rain, dawn, dusk, smoke screens or sun lane in order to push the attack home. Great care must be taken to avoid silhouetting a torpedo squadron against the horizon. In several cases, approaches of sections at 100 feet have been clearly visible to the ships attacked, whereas those sections higher or lower were almost invisible. Whether an attack is to be initiated from high altitudes or from an altitude just off the water depends upon which course will give the maximum protection and surprise.

(b) Torpedo plane attacks must conform to the essential requirements of successful torpedo fire which are:

(1) THE ATTACK MUST BE PUSHED HOME.

(2) The torpedoes must have favorable track angles, that is, 90 degrees or less.

(3) The spread of torpedo water must be sufficient to counteract maneuvers by the target.

(4) The density of torpedo water must be sufficient to insure hitting.

(5) The approach must be made at maximum speed and in such a manner as to minimize exposure to hostile fire.

VULNERABILITY

2-408. Torpedo planes are extremely vulnerable just before launching a torpedo attack. The success of an unsupported torpedo attack upon the enemy main body with good visibility is considered doubtful, especially if there is a protecting screen. To be successful a torpedo plane attack requires the assistance of one or more such factors as surprise, low visibility, haze, main body gunfire, destroyer attack, smoke screens or powerful aircraft support. A torpedo attack that can be met by strong gunfire will seldom be successful. The range of torpedo planes is greatly reduced when carrying torpedoes.

ANVIL ATTACK

2-409. (a) Anvil torpedo attack comprises closely coordinated attack with torpedoes from two or more directions such that attempt on the part of the target vessel(s) to evade attack from one direction by turn away will increase his exposure to the attacks from other directions.

(b) Torpedoes should arrive at the target as nearly simultaneously as practicable. Exact coordination of this feature of such attacks is extremely difficult and can seldom be achieved. Nevertheless every effort should be made to reduce the interval between arrival of the various spreads at the target. The acceptable length of this interval consistent with effective anvil attack varies inversely as the speed of the target.

(c) All divided aircraft torpedo attacks are essentially anvil attacks in form.The classic example of anvil attack is that of coordinated destroyer attack on the engaged bow of an enemy battle line and aircraft attack on the unengaged bow.

GENERAL TYPES OF ATTACKS

2-410. (a) **Attack Plan "A",** Figs. 1-68 (a) and 1-69 (a).

Divided attack — Attack in two nine-plane or three six-plane divisions on both bows of the enemy formation. Preparatory signal: "A" on searchlight.

(b) **Attack Plan "B".** Figs. 1-68 (b) and 1-69 (b).

Wave attack — An attack in succession in two nine-plane divisions or three six-plane divisions from same flank of enemy formation. In this attack plan there is a possibility of some confusion as to which bow to attack. This can be avoided without using any additional signals even when break-up is initiated from directly ahead if each division leader will proceed to a point broad on the bow before making final attack signal. Preparatory signal: "B" on searchlight.

(c) **Reverse Attacks.** Figs. 1-70 and 1-71.

Under certain conditions, as where the enemy is in contact or approach disposition, it may be desirable to initiate the attack from abaft the beam in order to avoid passing over the concentrated screen. This is a reverse attack, reversing the target angle assignment and direction of retirement. In a reverse attack, the leader's target angle is nearest directly ahead and the last plane of division nearest the beam. The retirement is toward the bow in the direction toward the leader. Whether the attack is to be a "Reverse Attack" or "Normal Attack" is indicated by the point at which the squadron "Break-up" is executed, i.e., if astern of the target a Reverse Attack— if ahead of target, a Normal Attack.

(d) When the target ships are not clearly visible from the point of "Break-up", or have not been sighted and identified by the division leaders before the "Break-up", more detailed orders for the attack must be given by visual or radio. Such orders should include:

(1) Number and type of ships in target formation.
(2) Bearing and distance from squadron at time.
(3) Estimated target course and speed.
(4) Plan of Attack ("A" or "B").
(5) "Reverse" attack (if attack is not to be "Normal".)

TARGET DISTRIBUTION

2-411. (a) Single Ship. Figs. 1-68 and 1-70.

(1) Plan "A" — Divisions attack simultaneously with first division on starboard bow and second division on port bow. If in three divisions, the third division will attack that bow which appears to offer most favorable opportunity for a successful attack.

(2) Plan "B" — Divisions attack in succession from same bow. Distance between divisions should be of the order of ½ to ¾ of a mile in distance or 15 to 20 seconds in time. This type of attack is indicated when target is screened only on one side.

(b) Two or more ships in column or approximate column (Figs. 1-69 and 1-71).

(1) Plan "A" — Divisions attack second ship simultaneously, first division on starboard bow and second division on port bow. If in three divisions, third division will attack that bowof leading ship which appears to offer the most favorable opportunity for a successful attack.

(2) Plan "B" — Divisions attack in succession from same bow. First Division will attack second ship in column and second division will attack leading ship. If in three divisions, third division will attack second ship in column.

DETAILED PROCEDURE FOR ATTACK

2-412. (a) In preparing to launch a torpedo attack, the squadron commander should conduct his squadron to an initial position ahead (for Normal attack) or astern (for Reverse attack) of the target formation. This position should, if practicable, be outside of sight range from the enemy, but such that the target vessels can be seen. It should not, normally, be less than ten (10) miles from the target for Normal attack. Under some circumstances, this may require the squadron commander to initiate the break-up and attack with the target vessels not visible. (See article 2-410 (d) above). While approaching this position the squadron commander should give his preparatory attack signal to signify type of attack he wishes to make. When ready to initiate attack he should give "BREAK-UP" signal which orders division leaders to take charge of their divisions and proceed independently to the attack. If Plan "A" is ordered, the first and second division leaders should immediately proceed with their divisions to positions about 30°- 35° on the starboard and port bows respectively at a distance of about 6 miles from the target. Upon arrival at these positions the division leaders should execute "ATTACK" signal. From this time on each plane acts independently and proceeds to launching position on prescribed target angle as shown in Figures 1-72 and 1-73. If Plan "B" is ordered the procedure is the same except that after "BREAK-UP" signal is given the second division leader (and third division leader if present) will maneuver to take the 15-20 second interval between divisions required for a wave attack and will then follow behind first division.

(b) Figures 1-72 and 1-73 are drawn to a scale and show torpedo tracks, target tracks, and target angles for a set up with target speed of 18 knots, torpedo speed of 30 knots and dropping range of 3000 yards. This is a typical set up for a battleship target using a Mark XIII torpedo. For a cruiser or aircraft carrier target it would be desirable to reduce angular spread between aircraft and put division leader about 45 degrees on the bow so as to avoid an overtaking run for the torpedo. The widely varying target angles and the variation in each pilot's estimate of target angle and speed should give ample dispersion of torpedoes to allow for reasonable maneuvers by the target. Each pilot before reaching launching position will set up his director for estimated target angle and speed and will make an independent run on assigned target.

(c) During approach all pilots ascertain by visual observation the number of ships in the target group. Since each pilot knows the number of ships, the attack plan and his own relative position, there should be no doubt in his mind as to his exact target, and his launching position relative to that target. Each pilot should endeavor to reach launching position at the same time as his division leader and should launch his torpedo within a few seconds of leader's drop. The retirement should be made toward the division leader turning back approximately 180 degrees and climbing slightly in order to allow succeeding divisions to pass underneath. Erratic zigzag courses may be steered while opening range and normally no attempt should be made to go into close formation with division leader until outside of gun range.

MANEUVERS OF TARGET

2-413. If target begins a turn while attacking division is still a considerable distance away, each aircraft should attempt to maneuver to arrive at dropping points indicated in Figs. 1-72 and 1-73. If turn of target is detected promptly and each pilot immediately starts his own maneuver to arrive at prescribed dropping point there should be little delay in launching attack. However, if the division is close to dropping point it will be impracticable to attempt to re-orient the attack. In such case each pilot should stand in toward target on his original course but will change his director set up for new estimated target angle and drop his torpedo when he reaches the firing range. If new target angle results in a following shot for certain planes, those planes should close the range as much as possible in order to insure that torpedo will overtake the target.

USE OF SMOKE SCREENS

2-414. (a) A smoke screen is probably the most frequent form of support for a torpedo attack. The tactics of the smoke screen are discussed elsewhere in USF-74.

(b) The value of a smoke screen to cover the retirement of aircraft should be borne in mind. The indiscriminate use of smoke screens may, however, interfere with the plans of the O.T.C. and they should never be used in a major engagement without specific orders, or authority.

(c) For torpedo plane attacks, two additional uses of smoke screens have been developed.

(1) To cover the approach (Lane screen).

(2) To deceive the enemy (False screen).

The former simply screens the attacking planes during the approach. The latter attracts the attention of anti-aircraft batteries while the approach is being made from another direction.

(d) The value of a smoke screen in support of an aircraft torpedo attack during a main engagement, if the visibility is reduced, is questionable. The smoke screen acts as a signal to the enemy to expect an aircraft torpedo attack and may ruin all chance of surprise. Frequently, in the heat of battle, a surprise attack on the enemy battleline without the use of smoke will have excellent chance of success.

ATTACK ON DISABLED VESSELS

2-415. Disabled vessels may be destroyed by torpedo planes operating singly or in sections according to the opposition such vessels can offer and the speed they are able to attain. In attacks on vessels whose speed has been markedly reduced, an attack may be initiated from any desired relative bearing.

VF PROTECTION

2-416. VF escort or patrol protection of VT aircraft in attack may be available. While such employment of VF is not normally desirable, under certain circumstances such protection becomes of prime importance. These circumstances are, in general:

(a) Where the attack is delivered in the face of known strong enemy VF patrols.

(b) When delivering coordinated attack under circumstances which are likely to require holding the VT attack units in an area outside the initial point for their break-up, in order to secure "anvil" effect.

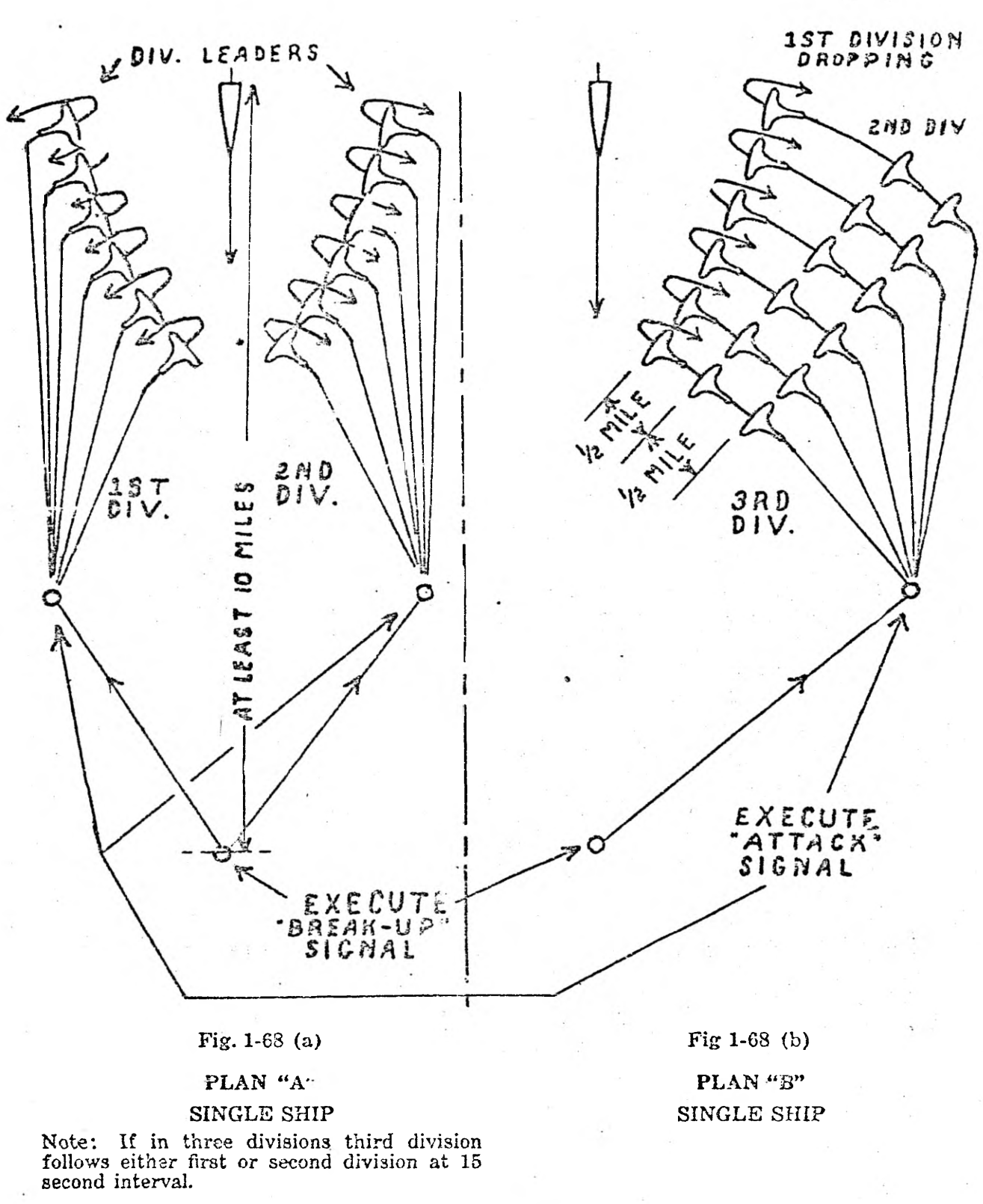


Fig. 1-68 (a)

PLAN "A"

SINGLE SHIP

Fig 1-68 (b)

PLAN "B"

SINGLE SHIP

Note: If in three divisions third division follows either first or second division at 15 second interval.

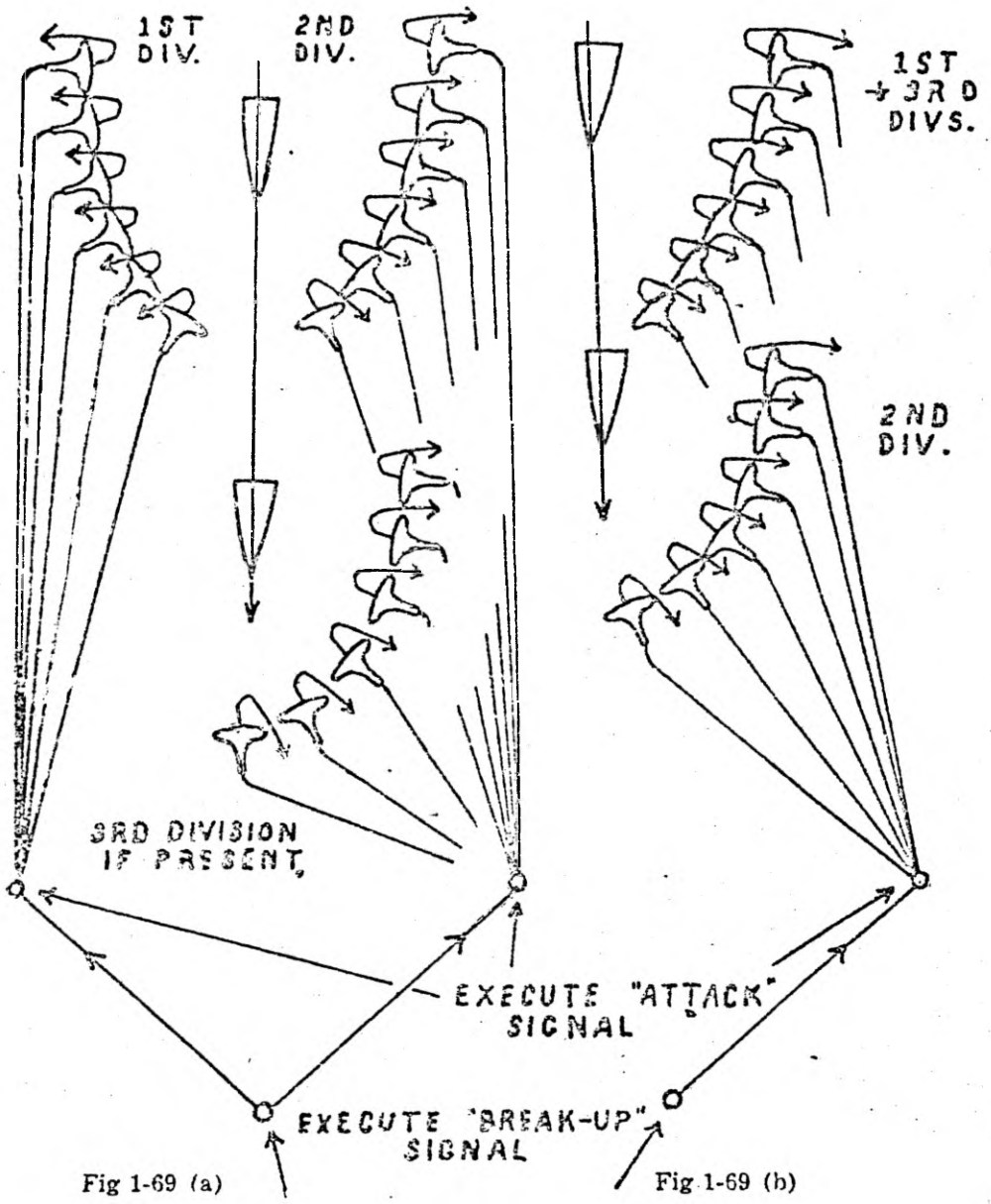


Fig 1-69 (a)

PLAN "A"

TWO OR MORE SHIPS

Note: Third division follows either first or second division at 15 second interval and attacks either bow of first ship.

Fig 1-69 (b)

PLAN "B"

TWO OR MORE SHIPS

Note: Divisions follow each other in numerical order while proceeding to assigned targets.

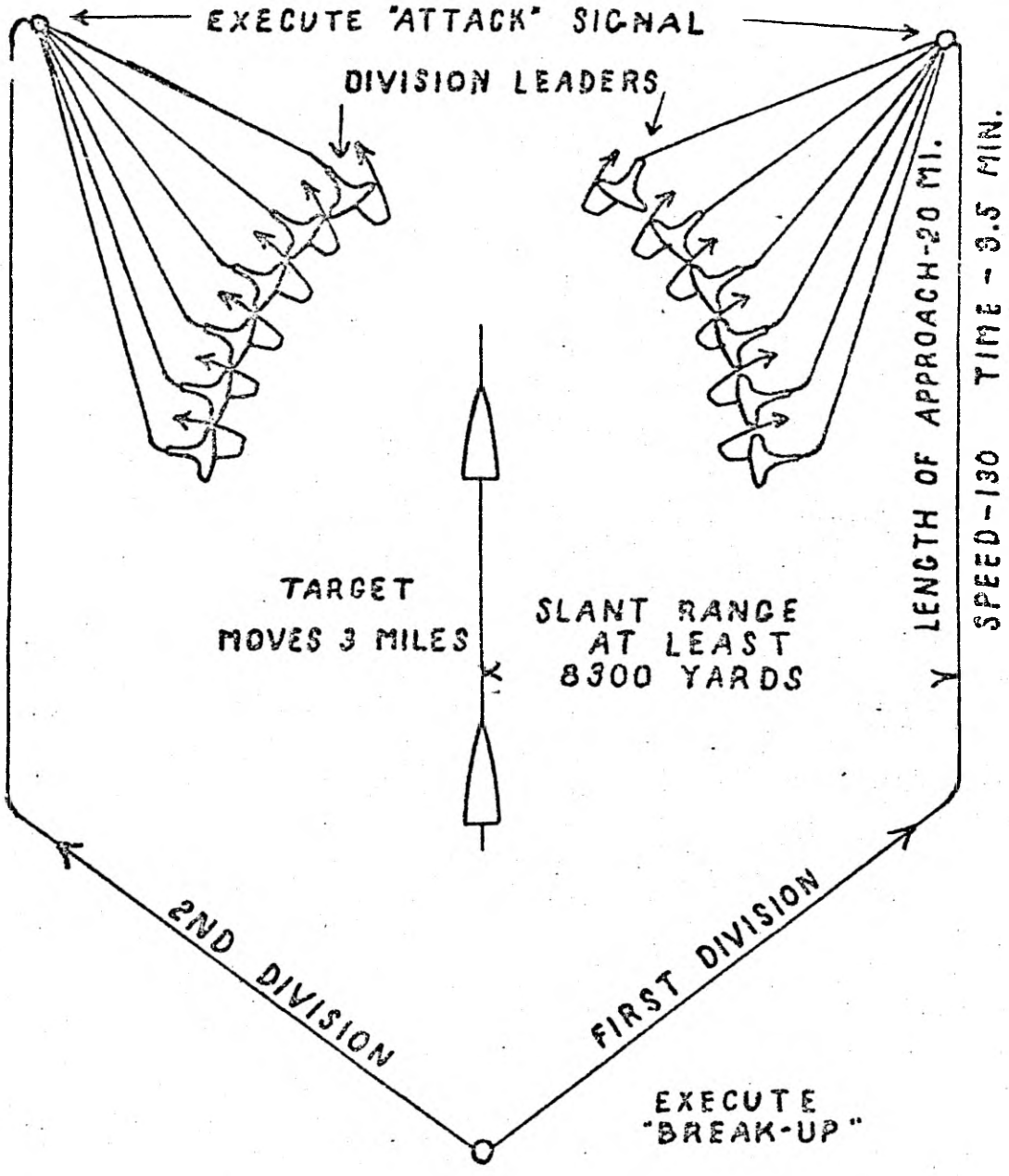


Fig. 1-70

REVERSE ATTACK PLAN "A" - SINGLE SHIP

NOTE: If in three divisions, third division follows either first or second division at 15 second interval.

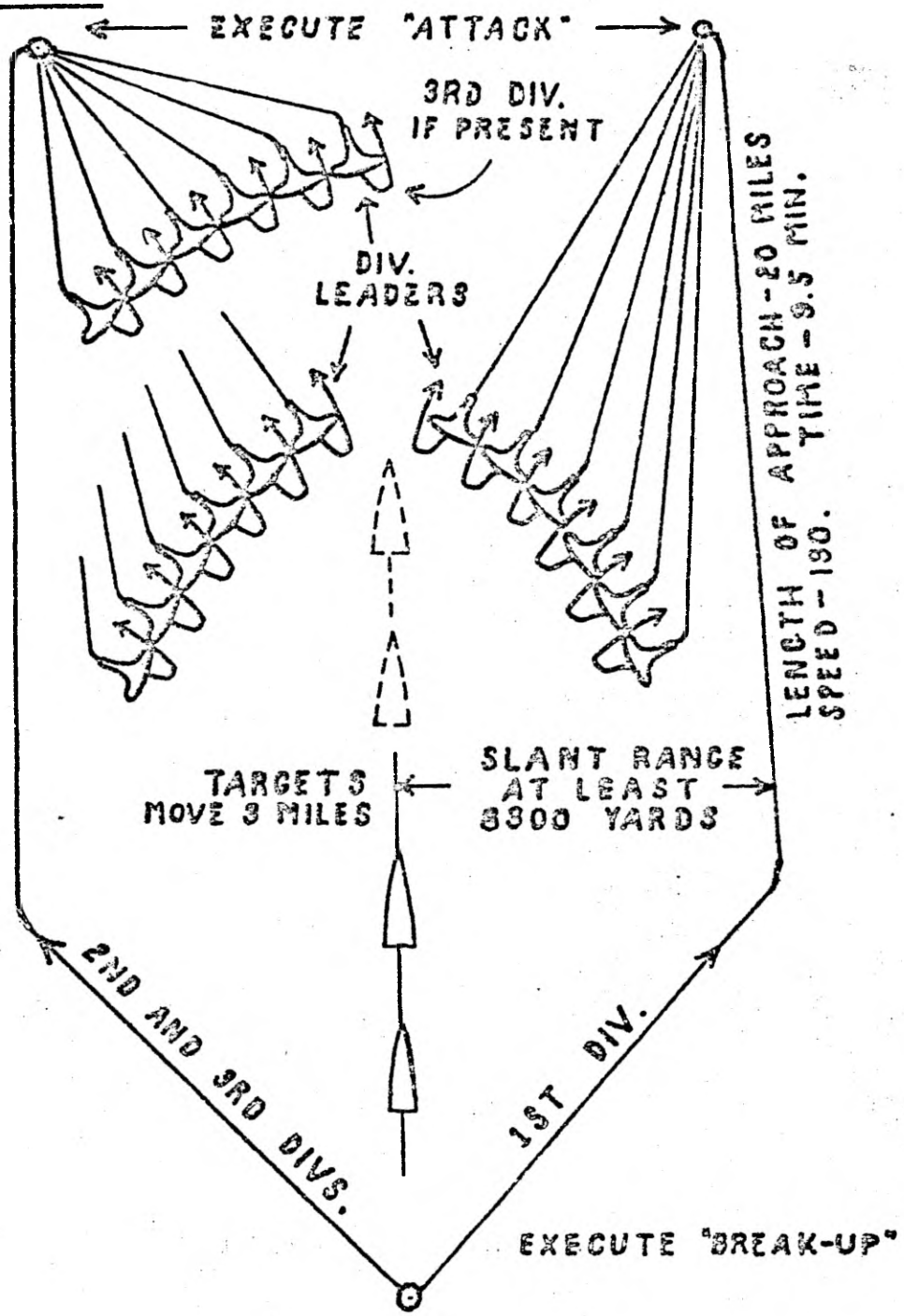


Fig. 1-71

REVERSE ATTACK PLAN "A" - TWO OR MORE SHIPS

NOTE: *If* in three divisions, 3rd division follows either first or second division at 15 second interval and attacks either bow of leading ship

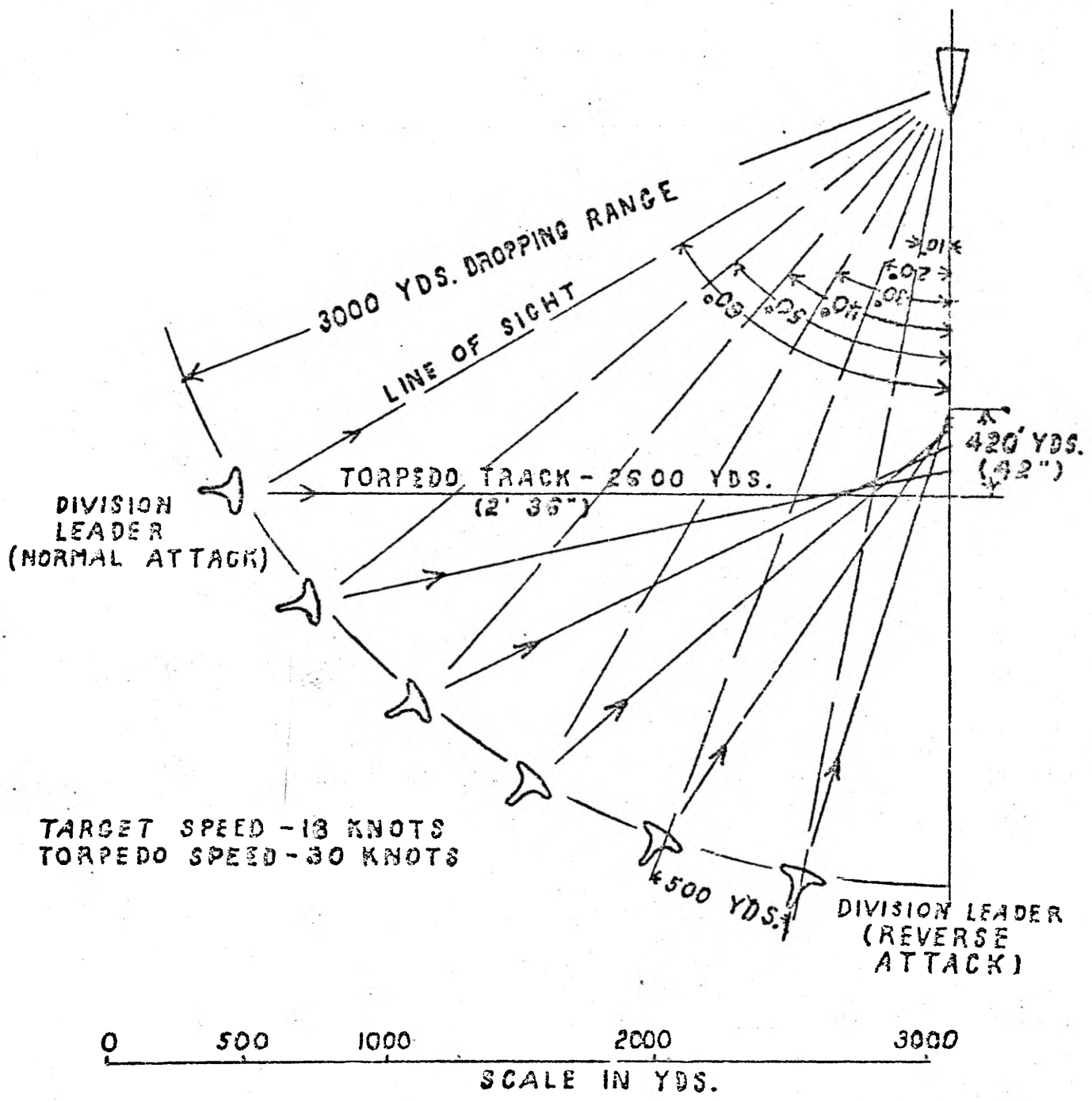


Fig 1-72

SIX PLANE ATTACK

IMPORTANT: The 10-degree spread between planes is approximate and is to be a "Seaman's eye" estimate. No time or effort is to be wasted during the attack in making minor corrections to obtain accurate and even spacing.

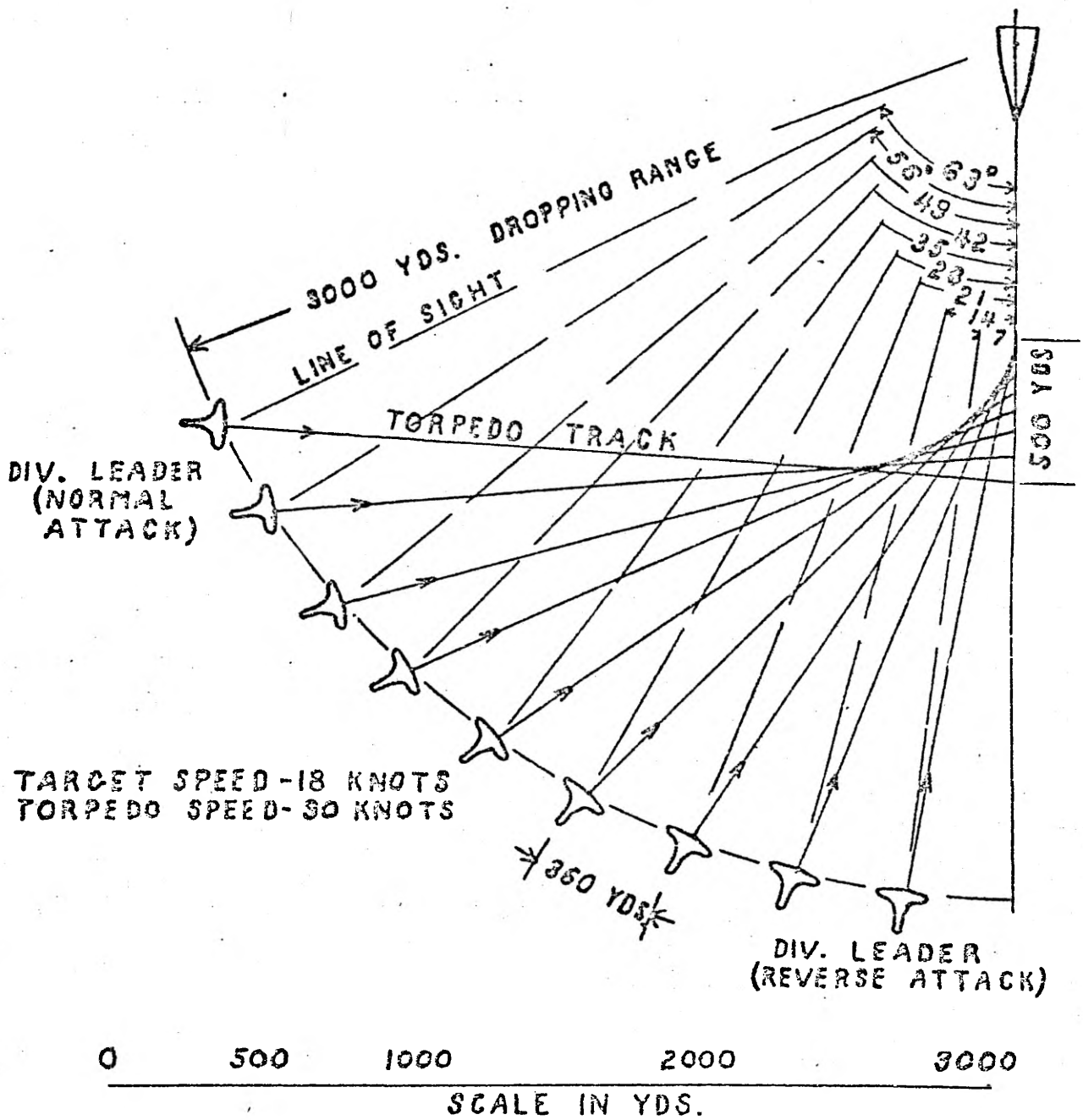


Fig. 1-73

NINE PLANE ATTACK

IMPORTANT: The 7-degree spread between planes is approximate and is to be a "Seaman's eye" estimate. No time or effort is to be wasted during the attack or in making minor corrections to obtain accurate and even spacing.

SECTION II — A
HORIZONTAL AIRCRAFT BOMBING DOCTRINE

BOMBING FORMATION

2-417. The bombing formation used should be such as to obtain a reasonably high probability of hitting without reducing too much the percentage of hits. For bombing altitudes of 12,000 feet or less against a maneuvering target, a six-plane closed Vee with planes ninety (90) feet apart is considered most satisfactory. With this formation, the mathematical probability of obtaining at least one hit should be about fifty percent. A larger formation only slightly increases this probability and is difficult to maneuver, resulting in ragged patterns. For bombing altitudes above 12,000 feet against a maneuvering target larger formations should be used. A smaller formation reduces markedly the probability of hitting. For use against a stationary target or against one which is maintaining a steady course and speed, a three-plane or a four-plane closed Vee with 100 feet between planes is best. For approach from ahead or astern, the formation should be larger in deflection than in range, and for approaches from the beam, larger in range than deflection. For all bombing formations all planes of a group should fly at the level of, or slightly below, the level of the leader. Station-keeping must be as nearly perfect as possible in order to obtain satisfactory patterns. Even a very slight skid or minor change of speed at the time of dropping has a very adverse effect on the bomb pattern. Figure 1-74 shows typical bombing sections and the pattern which should be realized. When a wave attack is desired, an echelon of divisions with altitudes varying at least 500 feet is formed in order that divisions may follow in succession over the target.

BOMBING ATTACK FACTORS

2-418. The following are factors which are helpful during daylight in making an effective bombing approach and attack:

(a) Target not protected by aircraft.

(b) Target under effective fire from surface vessels.

(c) Bombers supported by light bombers.

(d) Attack from the sun.

(e) Attack from ahead or astern.

(f) Low broken clouds not exceeding six on the scale of zero to ten.

(g) Attack at dusk or dawn from the dark semi-circle.

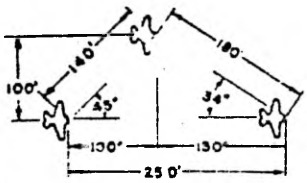
THE APPROACH

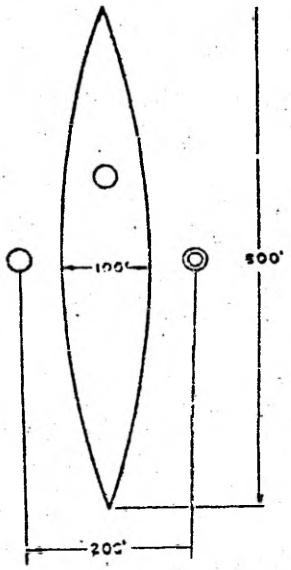
2-419. The direction of approach is dependent upon the following factors which vary widely in importance in different situations:

(a) TIME — If the attack must be delivered at the earliest possible moment, the approach must necessarily be made without maneuvering for a favorable position.

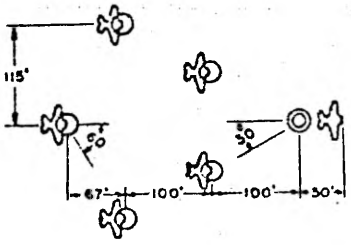
(b) CONCEALMENT — Surprise is important not only to avoid gunfire, but also to avoid dodge maneuvers on the part of the target. Broken clouds are usually effective in avoiding detection and often do not interfere seriously with effective bombing. Approach down the sun lane is very effective. At dawn and during evening twilight, approach from the darkest side of the sky usually prevents discovery.

(c) A. A. FIRE — Approaches from dead ahead or from astern are best for reducing A. A. fire from the target. However, fire from other sources in the vicinity must be considered in evaluating this factor. If effective AA fire must be accepted, the time under fire should be kept at a minimum. This is best accomplished by attacking downwind, or from ahead of the target, and at the highest practicable speed. Whether the attack should be made by all divisions from approximately the same direction in close succession, or by divisions from different sectors, will depend upon the opposition.



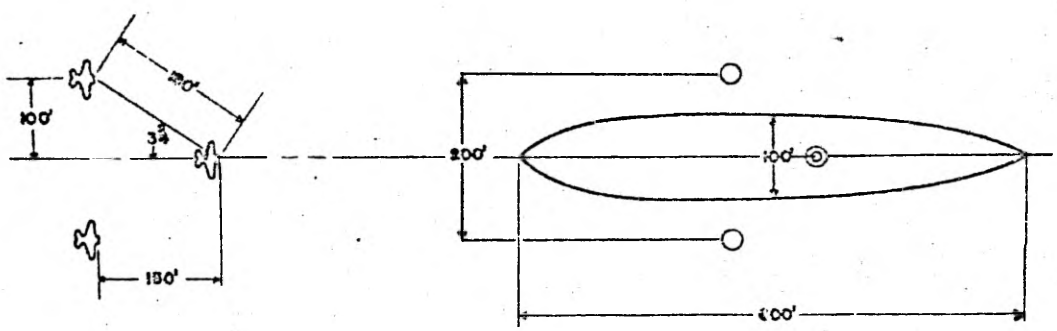


MASTER BOMB •
OTHER BOMBS •



FORMATION FOR
APPROACH ABEAM

Fig. 1-74
Non-Maneuvering Target
Approach Abeam



◎ MASTER BOMB

○ OTHER BOMBS

FORMATION FOR APPROACH AHEAD OR ASTERN

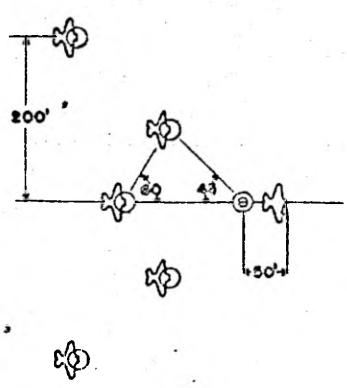


Fig. 1-75
Non-Maneuvering Target
Approach Ahead or Astern

BOMBING ALTITUDE

2-420. The bombing altitude to use depends to a considerable extent on the visibility conditions. With unlimited visibility, bombing should be done from maximum altitude to avoid detection and to reduce the effectiveness of anti-aircraft fire. If surface haze, low broken clouds, or a bright sun lane afford good protection, the bombing altitude might be lowered in order to increase the probability of hitting. Below 4,000 feet, fifty caliber machine gun fire becomes very effective and the solution of the bombing problem becomes very difficult with the present bombsight due to the high apparent rate of closing. Therefore, 4,000 feet may be considered the minimum effective altitude. The increased chances of hitting from lower altitudes make it desirable to lessen the distance between planes in the formation under these conditions.

DROPPING

2-421. In order to obtain satisfactory bomb patterns, all planes in the formation must maintain accurate station, steady speed and correct flying attitude (no skid or slip) immediately before, and at the time of the drop. All planes in the formation must drop simultaneously with the leader. This is accomplished by watching the flash bulb release signal, and the bomb(s) leaving the leader's plane. A standby signal (either arm or flag) may be given by the rear seat men. In order to place the mean point of impact of the pattern on the point of aim, the leader must spot his bomb up one-half the pattern length.

THE RETIREMENT

2-422. Having dropped, each division leader should at once turn and retreat on erratic courses with varying altitude taking either close Vee of Vees or open formation depending upon whether enemy fighters or A.A. fire constitute the greater menace. The retirement should be effected at maximum speed, taking advantage of any available concealment, and downwind if practicable. The squadron should reform at the earliest practicable moment after getting outside of gun range. If under attack by hostile aircraft, it may be advisable to lose altitude quickly and retire from the hostile area close to the surface of the water.

COMPOSITE BOMBING

2-423. The practicability of using heavy dive bombers as horizontal bombers by flying as wing planes on a plane of the VTB type has been demonstrated. Experimental practices indicate that very satisfactory drops may be so made. The problem simply resolves itself into one of proper rendezvous of the composite group. The rendezvous is usually accomplished by putting the horizontal bombers into echelon of Vees and the dive bombers join up in similar formation. Thus similar sections are paired. Section and division drops are made by wing planes dropping with the leader. It must be remembered that to obtain a satisfactory pattern, the ballistic coefficient of all bombs must be similar.

SECTION II — B

NIGHT HORIZONTAL BOMBING.— TARGET IMMOBILE

2-424. The tactical situation covered in this section is that of a night horizontal bombing attack on a heavy unit at anchor using flare illumination.

2-425. In general the preceding doctrine for formation horizontal bombing applies when bombing at night with the following important exceptions:

(a) The necessity for coordination between bombing and illuminating groups.

(b) The necessity for a well indoctrinated and boldly-led illuminating group.

(c) Lesser importance of concealment allowing the use of lower bombing altitudes which in turn permits the use of smaller formations.

(d) Probability of brief period available for bombsight set up.

2-426. Altitude and Formations — The problem of concealment is covered by: (1) approaching with planes darkened and, if practicable, camouflaged with lamp black; and (2) the blinding effect upon gun and director crews of the flares, the first of which are released while the bombers are out of, or at extreme, gun ranges. It is doubtful if high altitude would materially increase concealment. In any event its value is far outweighed by increased bombing accuracy and a simpler problem of coordination when using lower altitudes. A bombing altitude of 8,000 feet to 10,000 feet is desirable. This in turn permits the use of six-plane bombing formations. The reasons for the desirability of small, successive formations at night are obvious.

2-427. **Approach** — The possible presence of shore-based gun and search light batteries must not be overlooked. Avoid crossing or approaching the shore if possible both for safety and to prevent disclosing the group's presence. When within about five minutes of the objective, the illuminating group is detached and the bombing group executes a wide circle to delay until illumination is started. Start the bombing approach immediately after the first row of flares is dropped, adjusting position slightly as necessary to line up with flares and target. Approximately 30 seconds before reaching the release point broadcast some prearranged one word signal as a warning to the illuminating group. If practicable, determine approximate position by having one plane go ahead and drop a float light while well away from objective and on probable bombing course.

2-428. **Release Signals** — Colored flash lights operated by the radioman in the guide plane may be used as standby signals. The standard photo flash bulb dipped in black paint except for ½ inch at the socket end is an efficient salvo release signal.

2-429. **Illuminating Section** — Three planes manned by experienced crews can provide continuous and satisfactory illumination for about six minutes. Each plane is loaded with 12 flares mounted on the bomb racks and three Carston float lights.

2-430. **To Locate the Target** — When detached the illuminating group proceeds at high speed, losing altitude, toward the objective. Locating and identifying a darkened ship at night is extremely difficult. This is true even if previous information as to the berth is available. The illuminating group should approach at low altitude and make a wide arc about the approximate position of the target. In this way the target may be picked up in the light lane of the moon, a planet or a light ashore. However, on a moonless or overcast night it may be necessary to drop flares to locate the target. In this case, one plane (No. 3) should be detached, No. 3 proceed to the left of the target while No. 1 and 2 proceed to the right. When the approximate position of the target is nearly on the line between No. 3, and No. 1 and 2, No. 3 releases three flares, 15 seconds apart, at 2,000 feet altitude. These flares should be two to three miles from the target. As 1 and 2 circle, the targets should be picked up in the light lane of the flares. These "search" flares obviously provide a warning to the target and should be used only when other means of locating the objective are impracticable or have failed. See Figure 1-76 for search procedure.

2-431. **Illuminating Group Tactics** — The best available information on target illumination for horizontal bombing points definitely to the fact that best illumination is obtained when the flares are dropped at about 2,000 feet altitude close aboard the target but between the target and the bombing group. It has been reasonably determined that reflection from the target itself in direct illumination provides a clearer point of aim than does silhouetting. To achieve this, plane No. 1 proceed immediately upon sighting the target to lay a row of six flares 1 second apart as shown in figure 1-77. Plane No. 2 follows 1 minute later releasing 9 flares. Plane No. 1 circles wide away from the target and as soon as possible lays his remaining six. Plane No. 2 follows with his remaining 3 flares or not depending upon position of the bombing group as indicated by the prearranged "30 seconds to go" signal. In this procedure, Plane No. 3 has two functions, (1) as standby in case No. 1 or No. 2 are shot down and (2) as soon as target is located drop three float lights 10 seconds apart as shown in figure 1-76. These float lights assist the bombers to "line up", provide a point of aim to start setting up drift, and assist illuminating planes to drop rows of flares normal to the line of the bomber's approach. (NOTE: The flare release altitudes mentioned in this and the preceding paragraph will be read as opening altitudes when delayed - opening flares become available.)

2-432. **Flare Release** — Flares can best be spaced by having the second pilot operate the bomb racks from the bomber cockpit. The bomber starts releasing on orders from the pilot. Obviously wind force and direction must be considered in spacing flares.

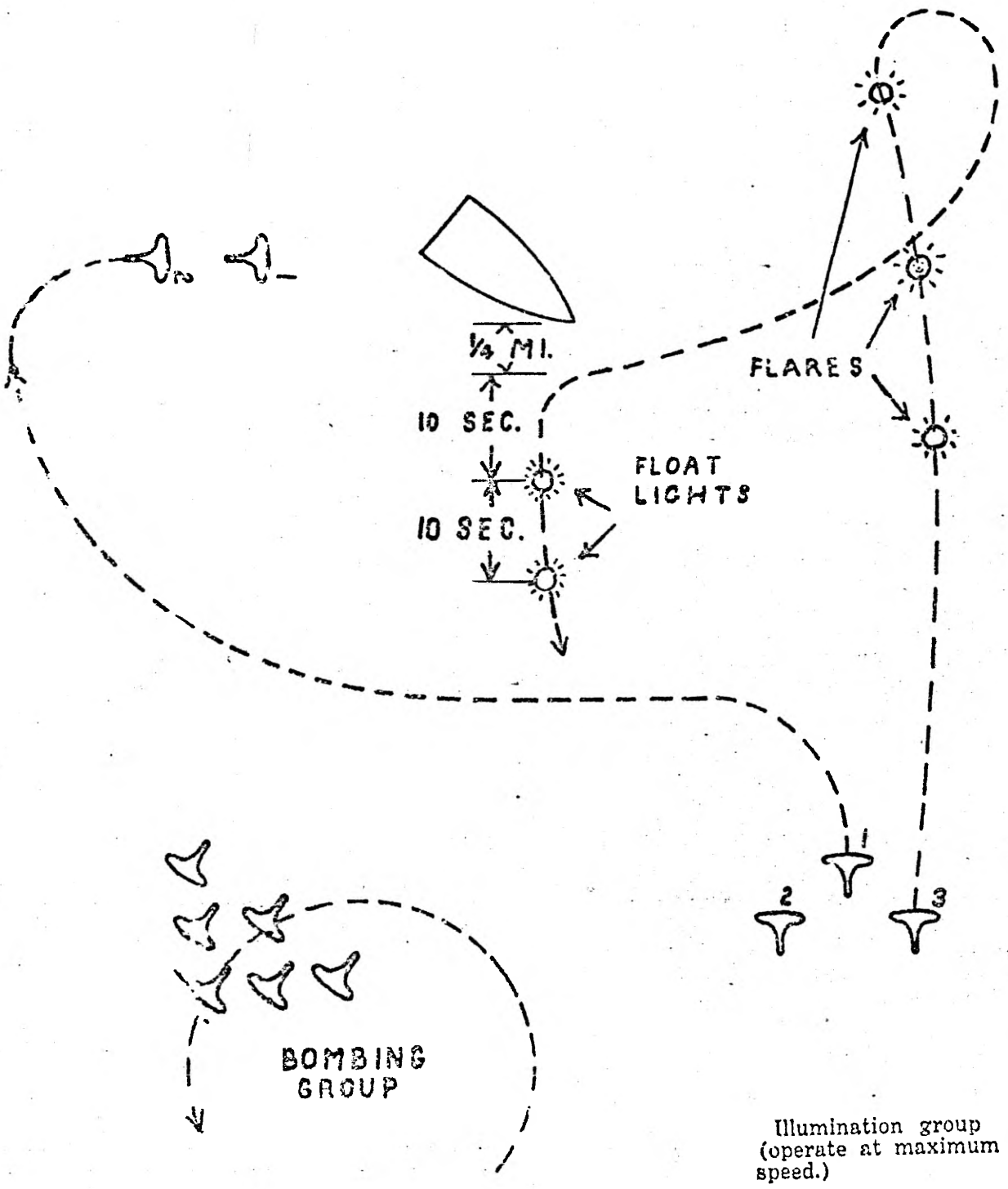
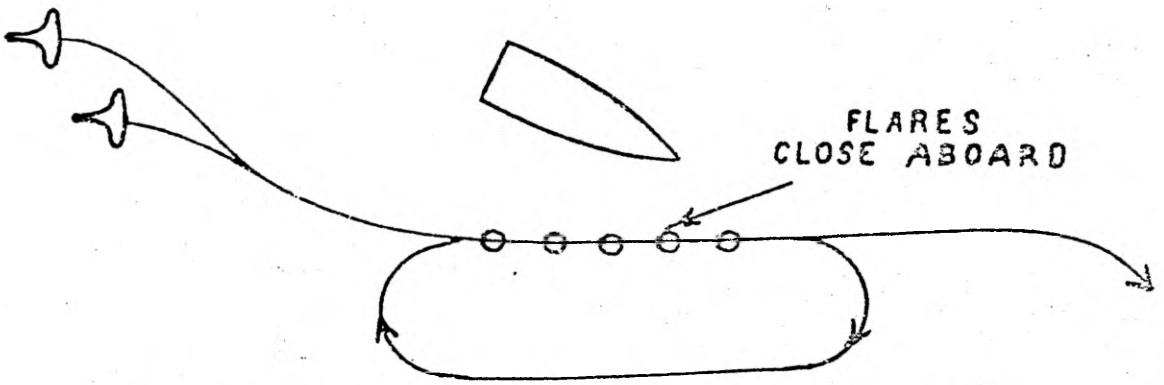


Fig 1-76
Locating the target



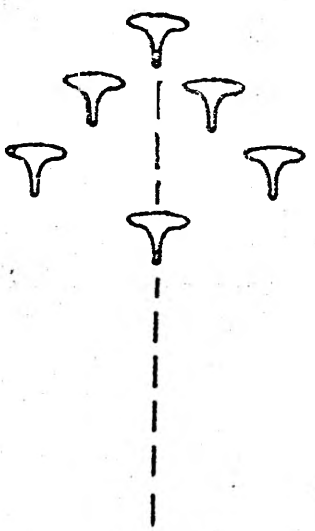


Fig. 1-77
Illuminating and the bombing approach.

SECTION III

AIRCRAFT AND SURFACE CRAFT COORDINATION

COMBINED ATTACKS

2-433. It is often advantageous to combine aircraft attacks with surface craft attacks. This is particularly true in the case of destroyer and torpedo aircraft. The combined attack serves to divert fire each from the other, and by exposing the enemy to additional hazard, reduces his effectiveness. When destroyers attack with torpedoes on the engaged bow of the enemy, torpedo aircraft can form an "anvil" by attacking from the disengaged side.

SYNCHRONIZED ATTACKS

2-434. If the enemy is free to maneuver, synchronization of the air attack with that of the destroyers is very difficult but can usually be achieved. Since the aircraft have much greater speed and maneuverability than the surface craft, the burden of effecting proper synchronization rests with the torpedo plane commander. If air opposition is so heavy as to greatly endanger the success of the combined attack, the aircraft commander shall deem it proper to launch his attack immediately even though the advantages of the combined attack are lost.

ATTACK PROCEDURE — GOOD VISIBILITY

2-435. With good visibility, aircraft may remain outside of effective A.A. range until light forces have launched their torpedoes. After the light forces have launched, the aircraft will close the range, gain firing position and drop so that all torpedoes will cross the line at approximately the same time. The launching of torpedoes by the destroyers may be recognized by the aircraft at quite great distances by the maneuvers of the destroyers.

ATTACK PROCEDURE — POOR VISIBILITY

2-436. With reduced visibility, some form of communication between destroyers and aircraft is necessary. If voice radio is available to the destroyers and can be used, almost perfect synchronization can be achieved; otherwise, it is necessary to use liaison planes or aircraft smokers, particularly those which have expended their smoke, to relay information to the attacking torpedo planes. If no such craft are available, the torpedo plane squadron can remain with the destroyers until they launch and still make a perfect "torpedo anvil" since destroyer torpedoes have more than twice the range of those used by aircraft.

PART III

CHAPTER I

ATTACK OPERATIONS

3-100. (a) Group attacks, which comprise all forms of coordinated offensive action on the same surface objective by two or more squadrons or units, are classified as to "Departure Procedure" and "Attack Procedure". Departure Procedure covers rendezvous following launching, or take-off, and the first part of transit from launching point to objective. Attack Procedure covers the tactics of approach to and attack upon the objective.

(b) ANY ATTACK PROCEDURE USED MUST BE SO FLEXIBLE THAT UNEXPECTED TARGET DISPOSITIONS, SURPRISE CONTACTS, COMMUNICATION FAILURES, ETC., WILL NOT DEFEAT ITS FUNCTIONING. ACTUAL CONDITIONS AT THE TARGET WILL SCARCELY EVER BE EXACTLY AS PICTURED IN THE MINDS OF PILOTS IN THE ATTACK GROUP.

(c) Attacks which achieve surprise thereby multiply their effectiveness. Surprise may be achieved as to any one or more of the following:

(1) Time of attack.
(2) Weapons used (Bombs, torpedoes, gas, guns, etc.)
(3) Strength of ~~attack~~ attack.
(4) Direction(s) of attack.
(5) Altitude(s) of attack.

Variations in the directions and altitudes of attack constitute one of the most important and effective means of contributing to success. These VARIATIONS MUST BE MADE BY GROUP, SQUADRON AND SUB-DIVISION COMMANDERS PARTICIPATING IN THE ATTACK. Intelligent use of this initiative marks the proficient aircraft commander. Air warfare abroad has demonstrated emphatically that repeated blind adherence to rigid procedures of any kind in the presence of opposition brings quick retribution.

(d) The Air Group Commanders shall be prompt to order changes of a previously ordered attack procedure when conditions make this necessary or desirable.

DEPARTURE PROCEDURES

3-101. Three (3) general procedures are prescribed below for effecting rendezvous and departure of carrier groups. In each case, actual departure of the units on their outward track for the mission will be conducted without further orders as a continuing phase of the operation immediately following section, squadron or group rendezvous as the case may be. Should the Task Force or Unit Commander desire to delay actual movement of units outward from the carrier(s) after launching and rendezvous, specific orders must be issued to this effect in each case.

(a) URGENT DEPARTURE — is designed to reduce to the minimum the time required to start units toward the objective. It requires immediate rendezvous and departure toward the target by each section as soon as launched. Where practicable (without *delaying the attack*), sections should join for mutual support to form attack elements of the numerical strength suited to the attack procedure intended. Urgent departure should NOT, normally, be ordered unless the target is within close striking distance.

(b) NORMAL DEPARTURE — requires rendezvous of squadrons and their immediate departure without delaying to effect group rendezvous. Enroute and prior to attack, such degree of group concentration should be effected as may be practicable and suited to the intended attack procedure.

(c) DEFERRED DEPARTURE — requires rendezvous and departure of the entire attack group as a concentrated tactical unit immediately following launching.

ATTACK PROCEDURES.

3-102 Five (5) general procedures are prescribed below for group attacks. These procedures cover the conduct of both the approach and the actual attack. They are purposely general in nature; the flexibility thereby provided is intended to foster the exercise of initiative.

(a) SEARCH ATTACK — Used when the location of the objective is indefinite to such degree as to necessitate preliminary search.

(1) The searching squadron forms scouting line and searches the designated sector or area. Where URGENT or NORMAL Departure is ordered, sections of the scouting squadron proceed on this search immediately after launching and without effecting squadron rendzevous. When DEFERRED Departure is ordered, the scouting squadron is rendezvoused before proceeding on the search. Contact is broadcast.

(2) The remainder of the attack group (rendezvoused as required by the Departure Procedure) proceeds along the median line of the sector, or towards the focal point of a search area not a sector. The group circles at a point 2/3 of the radius of the sector from origin (or at focal point of the area), until contact is made; then proceeds to attack. The procedure from this point on may be any one of four (4) forms of attack listed below and will be prescribed by the Group Commander.

(b) URGENT ATTACK — Used to get fire on the target at the earliest possible instant. Urgent Attack may be the continuation of Urgent Departure, or it may be ordered at any time in an operation which commenced with Normal or Deferred Departure. When ordered, Urgent Attack requires immediate attack on the objective by each unit of the group by the shortest route and at top speed from whatever position the order finds it in.

(c) MASS ATTACK — Used to deliver the heaviest possible volume of fire on the target in the shortest practicable interval. It is particularly applicable to attack upon an already engaged enemy. Mass Attack requires continuous visual contact between units of the attack group. When ordered, the squadrons of the group remain concentrated and attack in as rapid succession as practicable. All approaches are normally through one relatively narrow sector. For this reason, Mass Attack is particularly suited to exploiting favorable approach conditions in any one sector; e. g. — cloud cover; attack from sun; weak sector in enemy AA screen; etc.

(d) DIVIDED ATTACK — Attack in which the air group is held in close tactical concentration until an initial point, either with the objective in sight or such that its location is accurately known, has been reached. At this initial point the Group Commander executes the attack signal and the units of the air group split up in such a manner as to make the final approaches and actual attacks from different relative directions around the objective. Divided Attack provides concentrated heavy fire on the target in brief period while taking advantage of the confusion resulting from simultaneous or rapidly successive attacks from widely separated directions. It is well suited to attacks on individual vessels or small dispositions which do not possess strong outlying AA screen. When the attack order is executed, the attack group divides into squadrons or smaller elements, as may be indicated by the circumstances and the nature of the target. Following the group split-up, adjacent attack elements endeavor to retain visual contact as far as practicable in order to insure continuity in and expeditious completion of the group attack. Variations in the altitudes at which the elements of the group make their final approach will normally increase the difficulty of the target's AA defenses.

(e) DISPERSED ATTACK — A form of attack to which attention has been forcefully drawn by European operations. The attack group splits up at the outset of the operation into a number of small units (six to nine plane units appear to be the best). The dispersion should be made as far as practicable from the objective. These units proceed independently to the general vicinity of the target, occupying as wide as practicable a spread, both laterally and in altitude, throughout their transit to and approach upon the objective. An attack group should occupy, during the latter part of its transit to the vicinity of the target, an air front on the order of fifty miles or more. Approach to and attack upon the target is made independently by each unit and should be spread throughout 360° in azimuth unless particular conditions dictate narrowing the sector

within which the approaches and attacks are finally accomplished. Some measure of time coordination can be effected by the establishment of a zero hour; however, this will not normally be found desirable in wartime attacks at sea. In training and peacetime exercises, time schedules will be necessary to reduce risk of collision since visual contact is not normally maintained between adjacent elements. In wartime, the risk of collision is accepted; this fact, combined with the information afforded by actual bomb detonations, gunfire, etc., normally renders time schedules unnecessary. Whether time schedules are used or not, Dispersed Attack must be expected to require considerably more time to complete than in the case of Mass Attack or Divided Attack. Dispersed Attack imposes maximum difficulty upon enemy picket and combat patrol defenses and is therefore particularly well suited to attacks on objectives so protected. It is a form of attack well suited to area-type objectives on land (bases, naval and air stations, organized positions, etc.)

Dispersed attack, due to the wide front of the group in transit, may be used where the location of the target is not accurately known and where for any reason it is preferred over Search Attack. When so used the objective must be known to lie within the limits of the extended front of the group in transit. The element making contact broadcasts this fact and the attack is developed to and around the target so located.

SUPPORTING THE PRIMARY AIR ATTACK

3-103 (a) In attacks on dispositions having strong surface A.A. screens, it may be necessary to attack enemy vessels on the line of approach to the main objective. Support of this character should be made by the lighter attack units. In general VF, if present and not required to engage enemy VF, should attack destroyers, and VSB should attack cruisers. The main purpose of such attacks is to neutralize the A.A. fire of these ships; accordingly, most attention should be given to ships with strong A.A. batteries and located close to the path of the main attack.

(b) Instantaneous-fuzed bombs and m.g. fire are highly effective for reducing interference in the path of the attack group.

(c) Where the main attack — or part of it — consists of torpedo attack, strong air support may be of vital importance.

COORDINATION OF BOMBING AND TORPEDO PLANE ATTACKS.

3-104. (a) Air attack with torpedoes may be included as part of, or comprise entirely, the main effort of a group attack. When torpedo attack is combined with bomb attack on the same objective the bomb attack should be adjusted to support and cover the torpedo approach. Supporting attacks on screening vessels should be delivered during passage of the torpedo planes through the screen.

(b) During approach it is advantageous to retain visual contact between the torpedo units and the remainder of the attack group as long as practicable. Torpedo carrying aircraft should not normally be required to climb to altitudes in excess of about 5000 feet; to do so wastes precious fuel and needlessly increases their vulnerability to enemy VF.

(c) The torpedo units should be conducted by the shortest practicable route to a favorable spot for initiating their attack. This may be done by the Group Commander with the entire group. The Commander of the torpedo squadron(s) must know the location, disposition and approximate course of the objective before he can initiate his attack. The Group Commander must inform him of these or provide opportunity for him to ascertain them before commencing the attack.

(d) When the torpedo units are in position and ready to initiate their final approach and attack, they will so report by radio broadcast; the remainder of the attack group then proceeds with attacks, timing actual arrival at objective(s) to provide best support for the torpedo thrust. The timing of these attacks is the essence of the problem of coordination.

(e) Except as a matter of accident, proper coordination between bomb and torpedo attack can not be expected unless recent training (rehearsal) has been held.

DISTRIBUTION OF TARGETS

3-105. (a) Main Objective Targets:

(1) If the number of main objective targets to be attacked has not been specified by higher authority, the Group Commander will do so either before take-off or prior to ordering the attack.

(2) Each squadron will normally divide planes equally among the main objectives assigned.

(b) In supporting attacks squadron commanders will determine and direct the distribution of targets to the planes of their respective squadrons. In general, the following is considered adequate distribution for a supporting attack on secondary objectives:

Capital ships — six to nine planes

Cruisers or destroyers — six planes

(1) In strafing destroyers, attacks should be continuous until all other planes have passed out of A.A. range or ammunition is exhausted.

RETIREMENT, RENDEZVOUS, AND RETURN FROM ATTACK

3-106. (a) Waste no time in getting outside of both antiaircraft and visual range of any enemy ships. Unless menaced by enemy VF do not attempt to rendezvous until this has been accomplished.

(b) Watch all sectors for trailing enemy aircraft.

(c) If enemy aircraft or ships are in sight, do not head directly toward base or carrier; attempt to outdistance the hostile observers before heading for home.

SIGNALS

3-107. Attack operations may be specified by General Signal, ~~which contains SOPUS and four (4) numerals in accordance with the tables below:~~

(a) 1st Numeral — Objective

1. Main body
2. Heavy ships
3. Carrier(s)
4. Light Forces
5. Auxiliaries
6. Submarines
7. Shore base(s)
8. .....
9. .....
0. Best available

(b) 2nd Numeral — Means (weapons) of attack.

1. Bombing
2. Torpedoes
3. Bombing and Torpedoes
4. Composite bombing
5. 1 plus strafing
6. 2 plus strafing
7. 3 plus strafing
8. Make repeated attacks
9. Make TACTICAL smoke screen
0. Most suitable

ANS. PENNANT — if added to 2nd numeral — use smoke in attack.

(c) 3rd Numeral — Departure Procedure.

1 — Urgent
2 — Normal
3 — Deferred
0 — Most suitable

(d) 4th Numeral — Attack Procedure.

1 — Urgent
2 — Search
3 — Mass
4 — Divided
5 — Dispersed
0 — Most suitable

POSITION OF THE GROUP COMMANDER

3-108. Position of the Group Commander in all formations is discretionary, being dependent to a certain extent upon the maneuver which is being conducted. Under normal cruising conditions it will be advantageous for the Group Commander to be leading in a separate section of planes with the remainder of the group following his movements. From this position the Group Commander can best control the movements of the group with minimum use of radio.

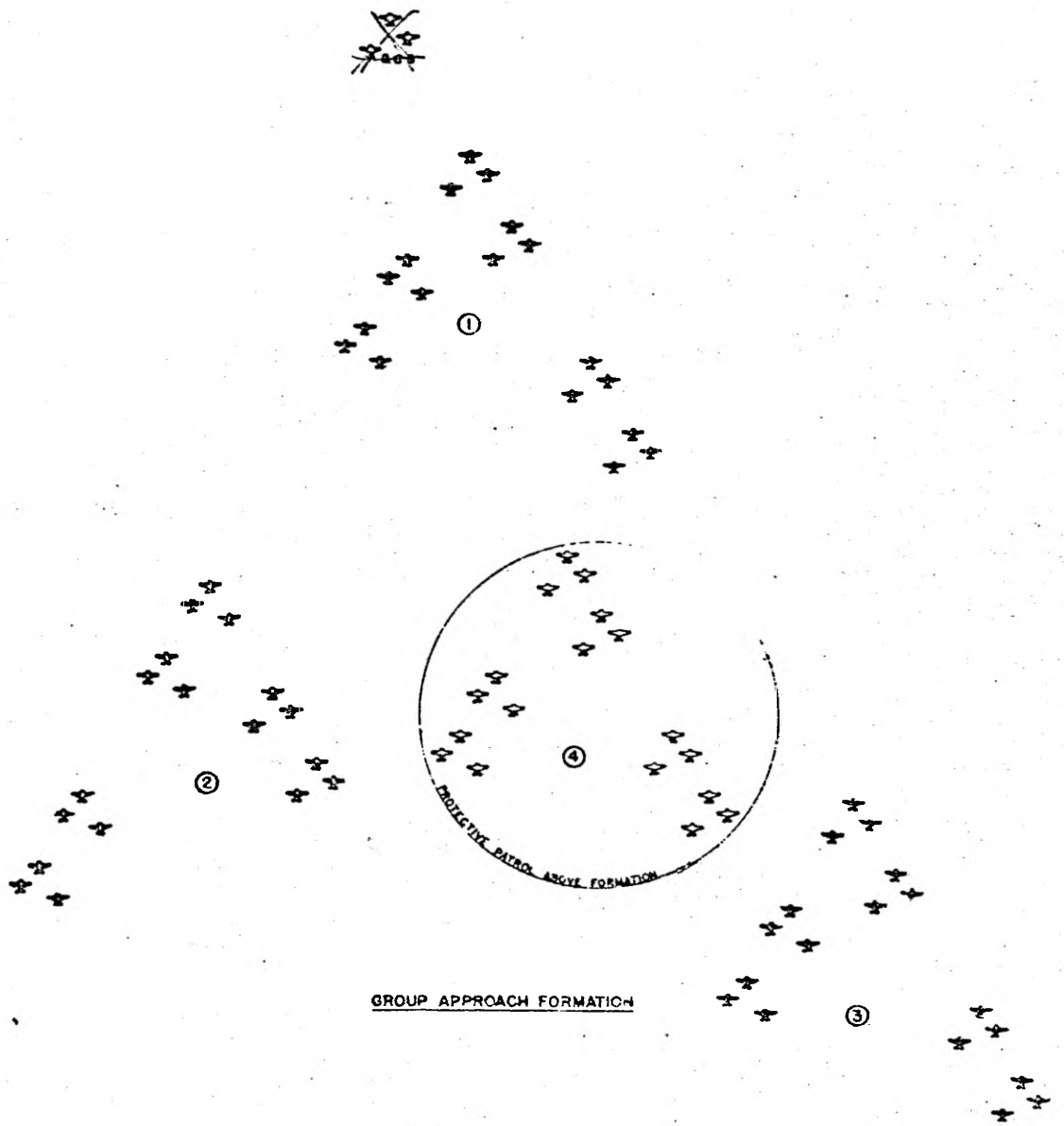


Fig. 1-78
Group Approach Formation

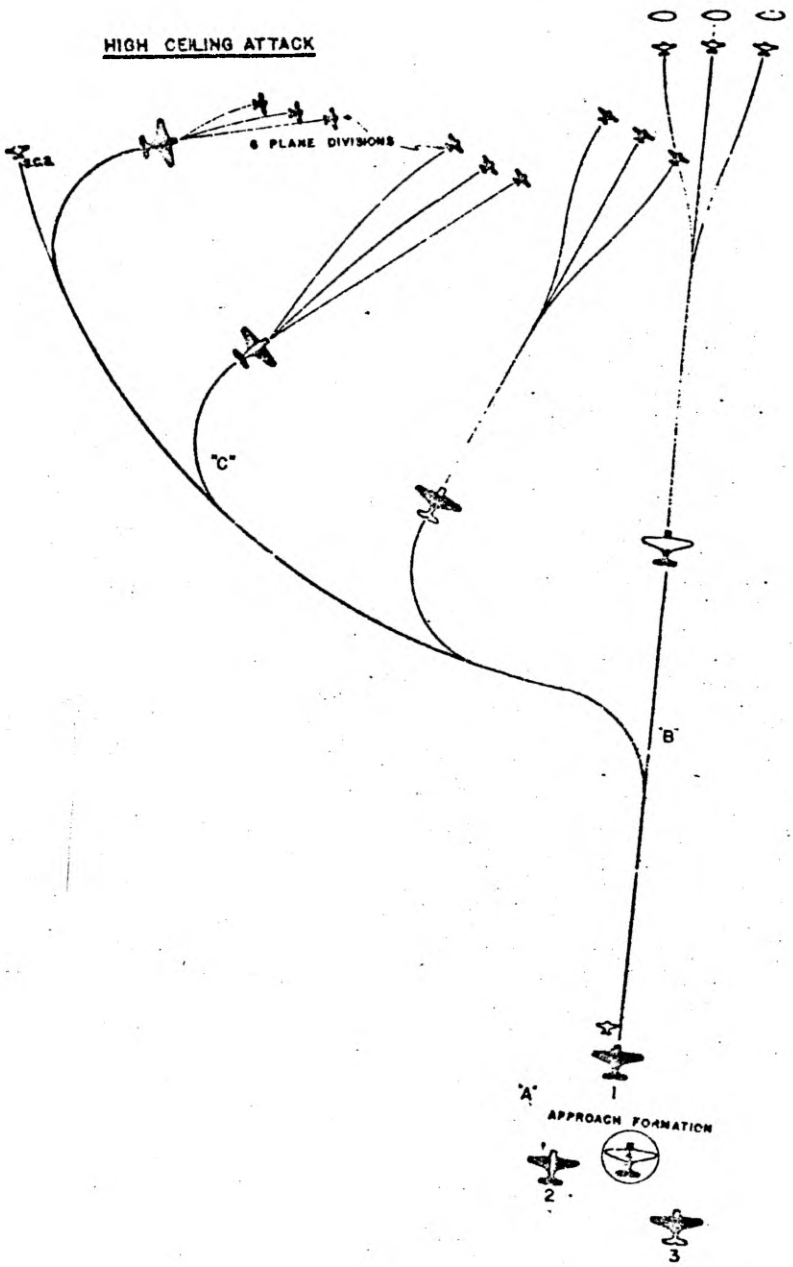
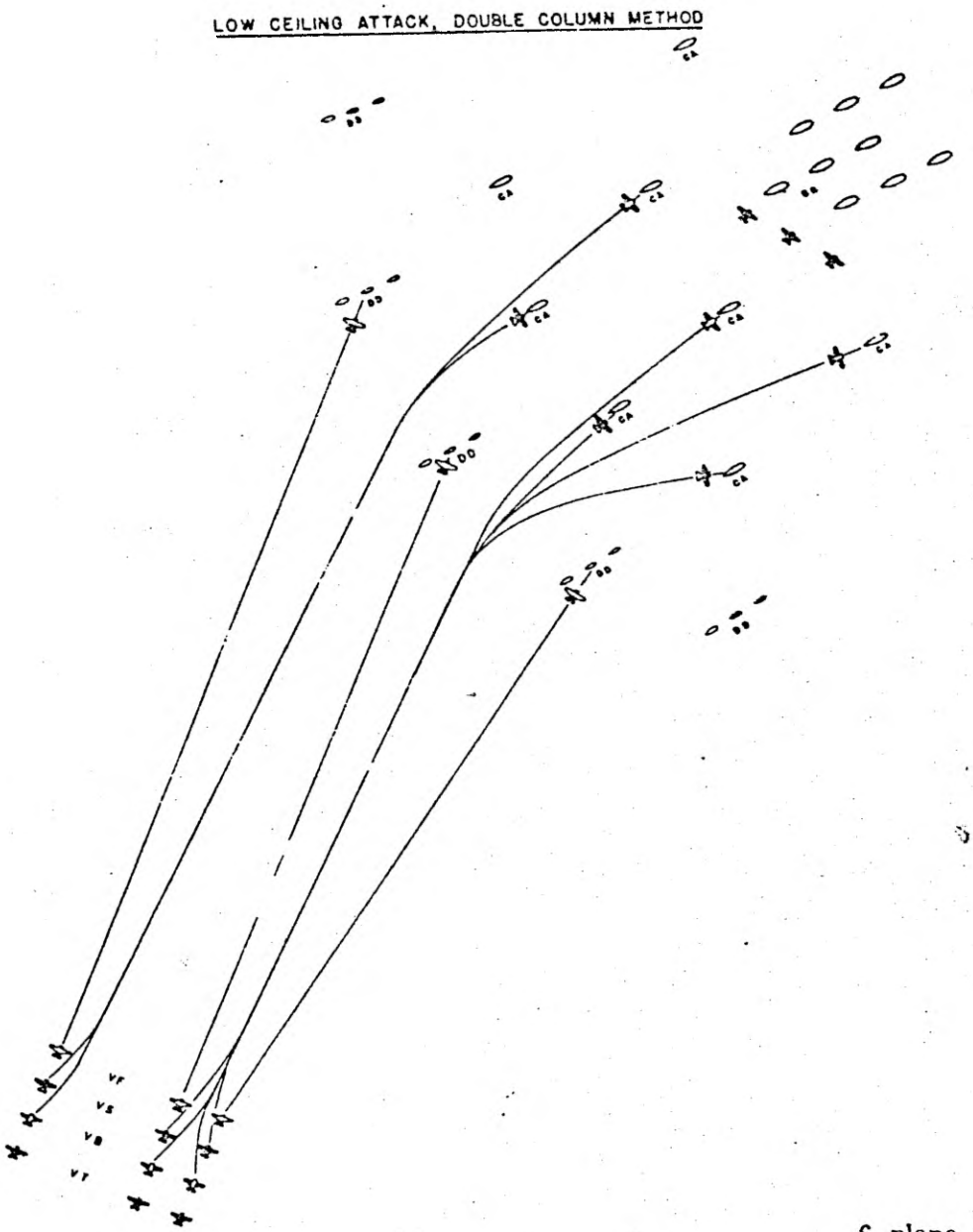


Fig. 1-79
High Ceiling Attack



6 plane divisions represented by single plane.

Fig. 1-80
Low Ceiling Attack — Double Column Method

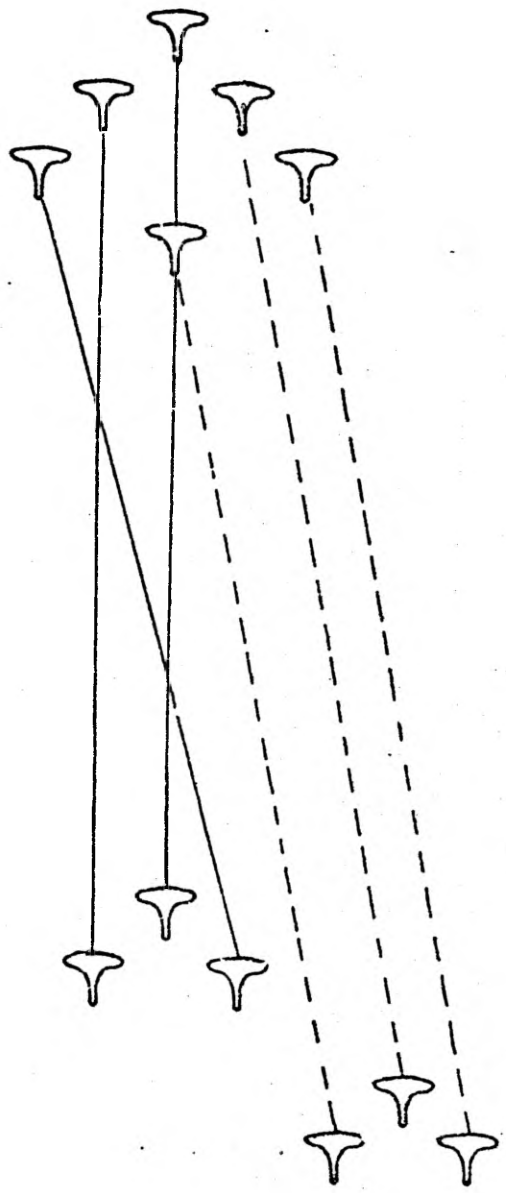


Fig. 1-81
Showing Evolution of Closed Vee Formation

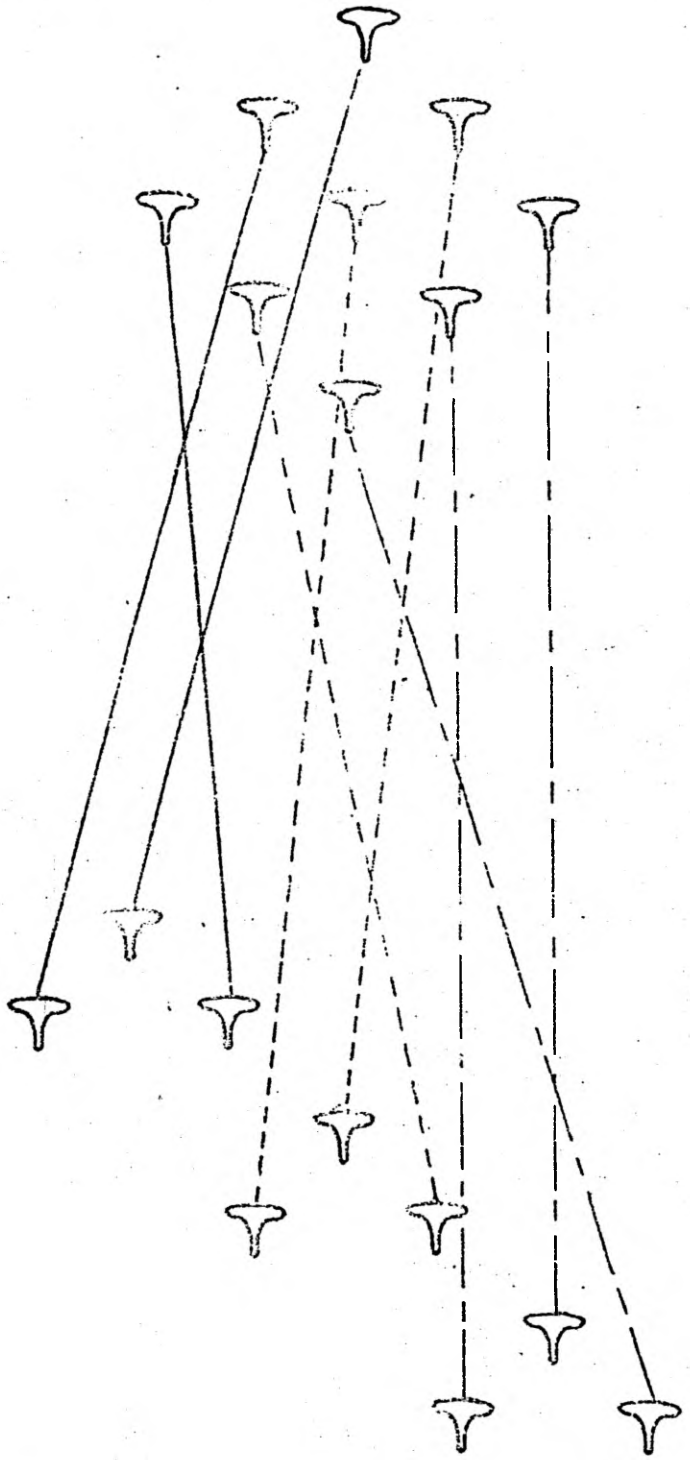
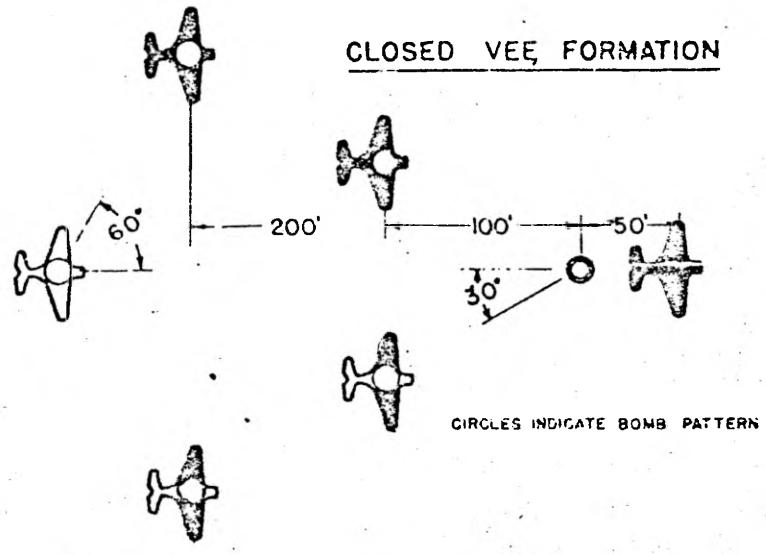


Fig. 1-82
The Evolution of a Diamond Formation


CLOSED VEE FORMATION
60°
200'
100'
50'
30°
CIRCLES INDICATE BOMB PATTERN

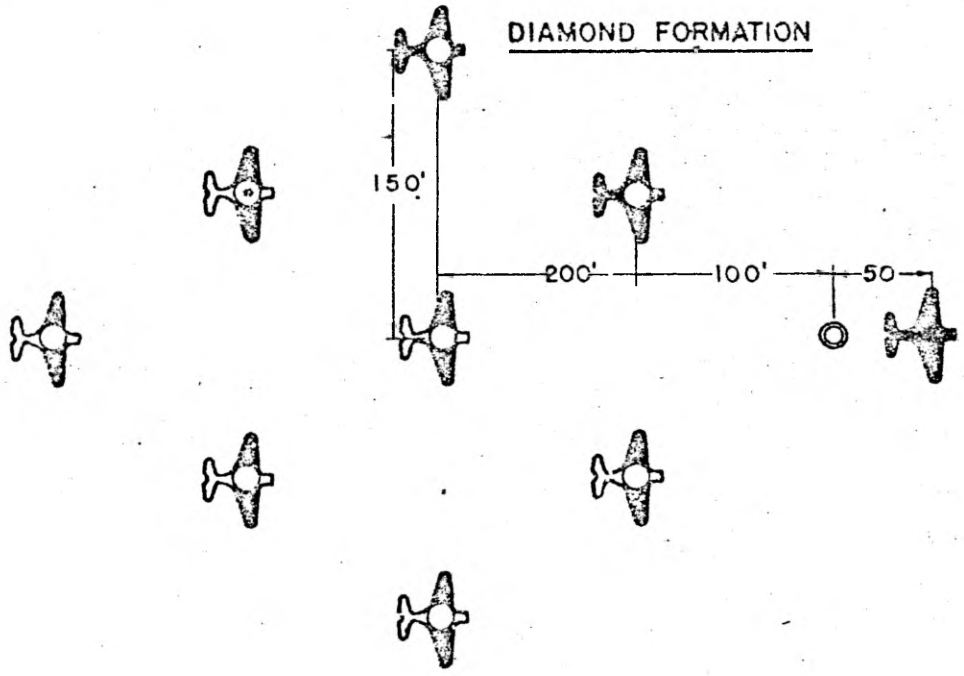

DIAMOND FORMATION
150'
200'
100'
50

Fig. 1-83

SEVEN-PLANE BOMBING FORMATION

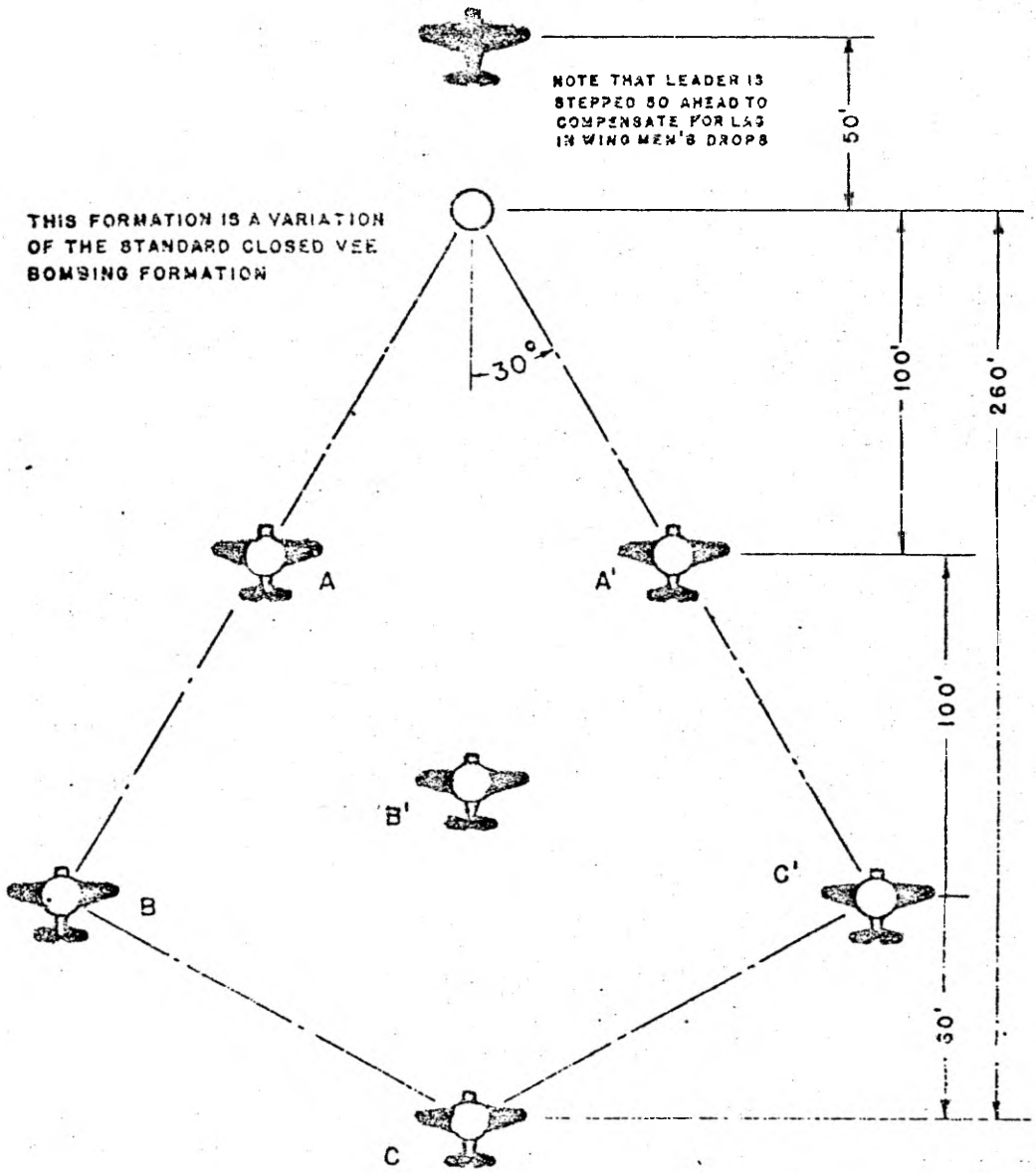


Fig. 1-84

GROUP COMMANDER'S VISUAL SIGNALS

3-109. (a) ATTACK; Group Commander rolls wing in full view of group, ~~then dives directly at target.~~ (b) SHIFT FORMATION (cruising to protective, or protective to cruising). Group Commander gives echelon signal to base unit leader who executes change of disposition within his squadron. Following squadrons execute similar movements. (c) FOLLOW ME. Group Commander takes position abreast of base unit and zooms several times. (d) CIRCLE — REMAIN HERE: Group Commander closes base unit leader and rotates arm vertically overhead.

POSITION OF SQUADRONS

3-110. The standard position of squadrons in each carrier group will be designated by the Group Commander and will be indicated by a number. In case occasional changes are necessary due to unusual circumstances, all squadrons will be advised prior to take-off.

CRUISING FORMATION

3-111. Cruising formation (used when no attack from opposing aircraft is probable).

(a) Group formation will be an "open order" column of squadrons following the movements of the group ~~command section~~ or the guide squadron.

(b) Squadron formations are optional except that they must be flexible and capable of making quick turns, following without warning any sudden maneuver of the group leader.

(c) Squadrons in even numbered positions in the Group Formation will take station above and to the left of the squadron next ahead; odd numbered positions above and to the right. Squadrons slide over on turns as necessary to maintain proper distance.

(d) In the event of low ceiling preventing Step-up beteween squadrons, open out to the side as necessary to keep clear of slip streams. In cruising with a low ceiling, in order that the group formation may be capable of making a quick turn, it is important that a following squadron does not get ahead of the last plane of the squadron in the next preceding position in the formation.

(e) The cruising formation must be sufficiently flexible to permit quick turns, but in general planes and squadrons should not open out more than necessary.

COMPOSITE BOMBING

3-112. (a) Composite Bombing is the use of heavy dive bombers, led by a VTB type horizontal bomber. The bombs used by both types of planes must have the same trajectories. The altitudes used, the probable error, and the number of bombers available will dictate the formations to be used.

(b) The size and type of formation selected should be governed by the size of pattern desired. The pattern should be such as to give the greatest product of the two contrasting functions; namely, reasonable expectancy of hitting salvos, and percentage of hits per salvo. To this end the pattern should be such that it will be twice the expected error of the control bomber and still have density of (1) bomb per 100 feet (the beam of a capital ship). Above 12,000 feet a nine plane formation will be necessary to fulfill the requirements outlined above. When the VTB planes are required for other missions such as torpedo attacks a minimum of control bombing planes will be supplied and the formation taken will be that given in Figure 1-84.

(c) When Composite Bombing is ordered the sequence of evolution is as follows.

SIX PLANE FORMATION

(1) Squadrons in close proximity in cruising formation.

(2) Control bombing squadron deploys to column of control bombing units (normally sections) and opens out. Wing squadron takes station above and in vicinity of control bombers and joins up when signalled by control bombers deploying to left echelon.

NINE PLANE FORMATION

(1) Squadrons in close proximity.

(2) Control bombing squadron deploys to column of control bombing units and opens out (normally sections). Wing bombing squadrons take station above and in vicinity of control bombers and join up when signalled by control bombing unit deploying to left echelon.

(3) The two wing bombing squadrons are likewise deployed in left echelon and closed in on the control bombers to form a diamond formation.

(4) Control bombing section deploys to left echelon. Wing bombing sections do likewise and close in forming nine plane diamond formation as shown in Figures 1-82 and 1-83.

The right wing bombing squadron joins the second division of the control bombing squadron in a similar fashion.

ALTERNATE METHOD

(1) Nine plane Vee of Vees, spacing such as to obtain a density of one bomb per 100 feet.

SEVEN PLANE FORMATION

(1) One section of control bombing planes are detached for each squadron of heavy dive bombers.

(2) Two sections of Heavy Dive Bombing Squadron join each control bombing plane with sections in A-B-C formation as shown in Figure 1-84.

Exchange of lead: In event of bombsight failure, the leader gives the following signal: Points to bombsight, holds nose, points to Number 2 plane, blows kiss, and drops down and to the left. In a nine plane diamond, if time permits, he takes the number three position of the first section. In Vee of Vees, he takes Number 2 position of second section. In either case the Number 2 man takes the lead and the entire flank moves up one station, wing planes guiding on Number 2. In a six plane formation the exchange of lead is similar to that of a nine plane diamond formation. There is no provision for an exchange of lead in the seven plane formation.

(d) When control sections form right echelons, the wing sections do likewise and close in forming the Diamond formation. (See Figure 1-82).

(e) These maneuvers form six diamond bombing formations of nine planes each.

GROUP PARADE FORMATIONS (See Figure 1-84).

3-113. (a) Closed Group Vee formed as follows: (three squadrons only, plus Group Commander ~~Section~~ - 5 planes).

Positions

(1) Group ~~Command Section~~ Commander leading.

(2) Left echelon of vees on leading section.

(3) Right echelon of vees on leading section.

(4) In formation of closed squadron vee, take station so as to close the Group Vee.

Positions in the formation will be assigned squadrons at the time the parade formation is ordered.

(b) Diamond Vee of Vees (four squadrons 72 planes). Group Commander will designate position of squadrons by number prior to take-off. Squadrons will be in close order Vee of Vees formations with the Vees closed by the sixth section if present. The squadron in number four position will close the large vee. Step-up and interval between planes and squadrons should be the minimum consistent with safety. The group ~~command section or plane~~ Commander if present will lead.

(c) Diamond of Division Vees (four squadrons - 72 planes).
Squadron will be in column of divisions vees otherwise the formation is similar to Parade Formation (b).

BREAK-UP FROM PARADE FORMATION

3-114. Break-up from parade formation will be executed by shifting to "Cruising Formation" upon orders from the Group Commander. Procedure will be as follows unless otherwise directed:

(a) Order will be given by the group Commander "Take Cruising Formation". This will be the preparatory signal.

(1) Squadrons increase interval in succession, rear squadron opening out first, leaving sufficient interval for the squadron occupying next numerical position ahead to slide over on turns.

(b) Formation leader will wobble wings followed by a gradual turn and slight dive to the left. This will be the signal of execution.

(1) Squadrons on the left flank slide across to the right flank on the turn. Group take cruising formation when straight course has been resumed.

(c) Should it become necessary to make a right turn instead of a left turn, preparatory order to this effect will be given by the Group Commander in which case following squadrons will slide across to the left instead of the right.

(d) It is important that no turn other than a slight change of course be attempted with the group in a close parade formation.

COMMUNICATIONS

3-115. (a) Use of radio will be reduced to a minimum consistent with the proper execution of the operation.

(1) Visual signals will be substituted for voice commands if practicable.

(2) Voice procedure within the group will be abbreviated as much as practicable, leaving out unnecessary words and procedure signs not needed for a clear understanding of the message.

(3) Limited use of voice communication is essential to effectively coordinated group operations.

I

CLOSED GROUP VEE

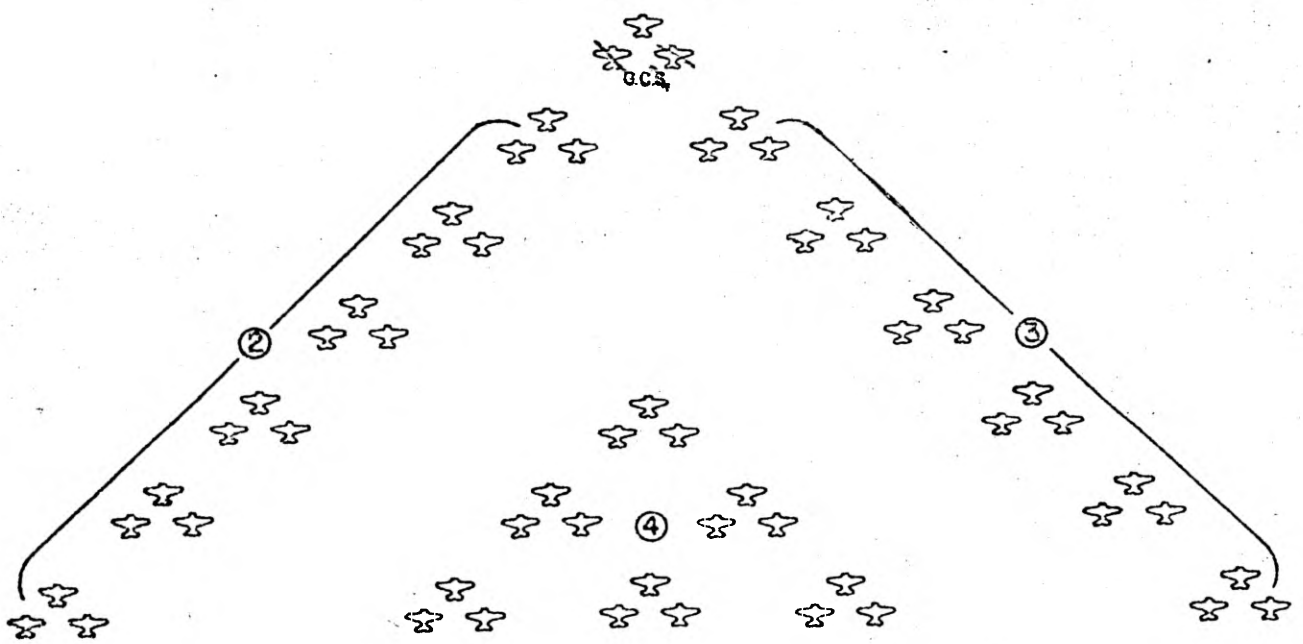


Fig. 1-35
Closed Group Vee

II

DIAMOND VEE OF VEES

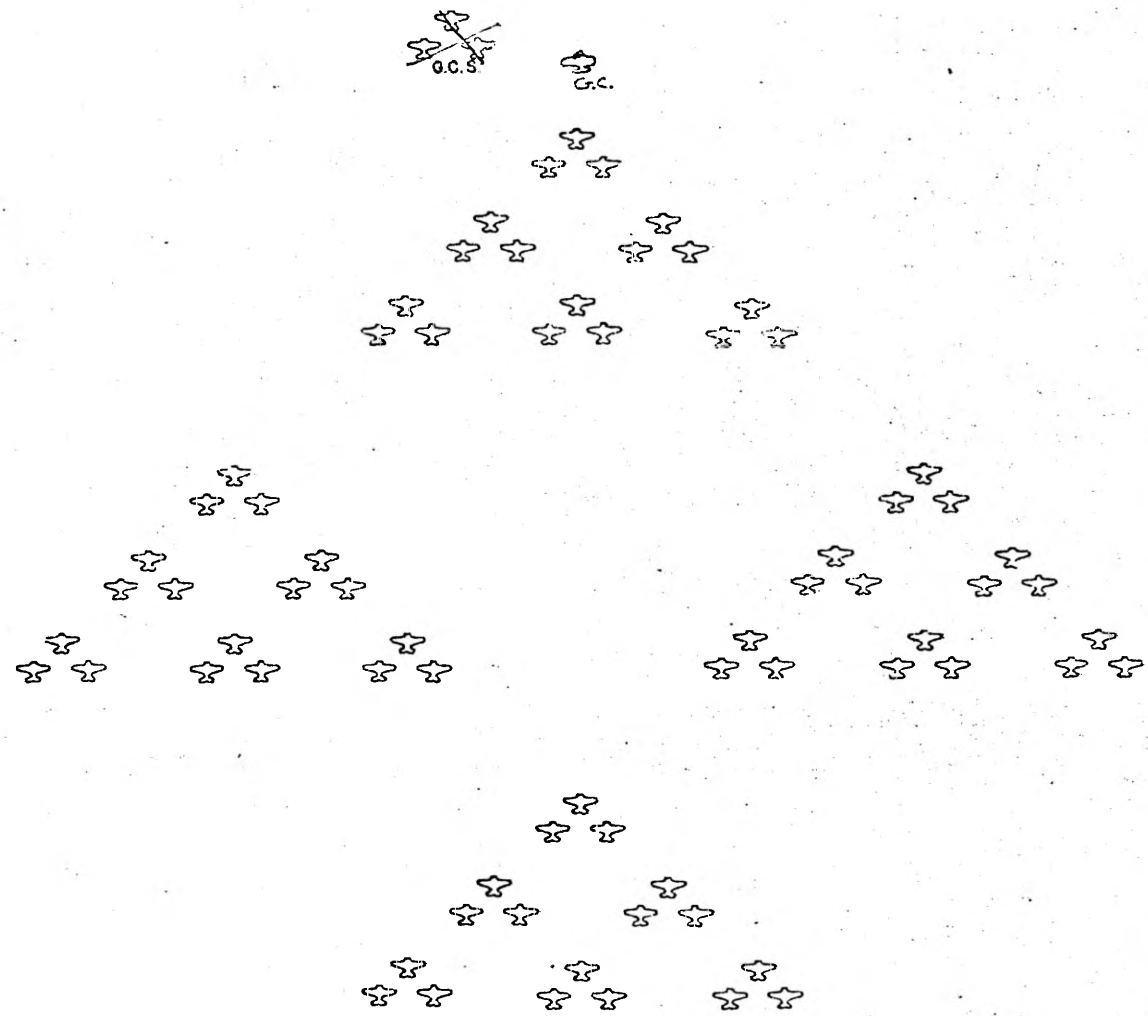


Fig. 1-86
Diamond Vee of Vees

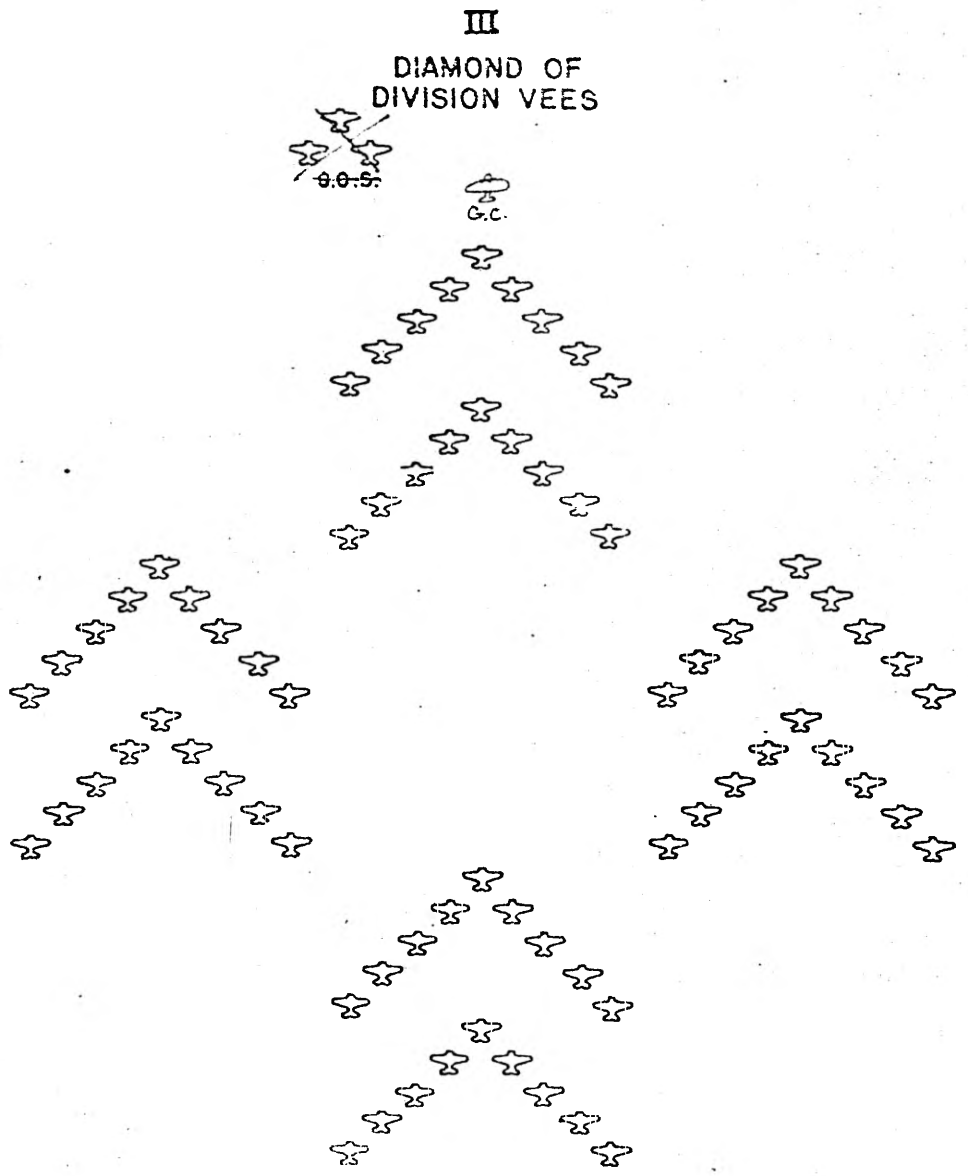


Fig. 1-87
Diamond of Division Vees

CHAPTER 2

WING TACTICS

GENERAL DISCUSSION

3-200. The principle involved in conducting wing tactics is to so coordinate the movements of the individual groups that maximum effectiveness is attained in conducting an attack, at the same time avoiding interference between groups. This is acomplished by a combined formation of groups in succession; each group following the movements of the group ahead while cruising and during the approach to the objective. Upon arrival within striking distance of the objective, each group attacks in succession. A simultaneous attack may be possible should objectives be sufficiently separated that no interference results. This method retains the tactical organization of the individual group intact and provides a flexible formation and task organization.

ORGANIZATION

3-201. (a) Each group will operate under the tactical command of its own group commander.

(b) The senior group commander will assume command of the wing and will coordinate the movements of all groups operating in same area issuing such orders as may be necessary for the proper conduct of the operation.

RENDEZVOUS AFTER TAKE-OFF

3-202. (a) In taking off from carrier each group will rendezvous independently.

(b) If practicable a wing rendezvous will be made and unless otherwise directed it will be made over the carrier of the wing command at 5,000 feet altitude, ceiling permitting.

(1) It is highly desirable for the groups which are operating together to proceed in company. This simplifies the coordination of their movements with minimum use of radio.

(c) If taking off from a field, rendezvous will be as directed by the wing commander.

(1) Take-off from a field, on account of the large number of planes involved, must be expedited as far as possible. To this end, when the size of the field permits, such as at North Island on a one or two ball course, take-off will be by divisions.

(d) Group Comanders report to the wing commander when their groups are in position in the wing formation.

CRUISING AND APPROACH

3-203. (a) The wing formation will be a column of groups following the movements of the leading group and maintaining sight contact.

~~(1) The leading group should preferably be that of the wing commander.~~

HIGH CEILING ATTACKS

3-204. (a) Groups will attack in succession in the order specified maintaining sight contact as far as practicable with squadrons of the group ahead and attacking as rapidly thereafter as possible.

(b) To insure proper coordination and to avoid interference, Group Commanders will broadcast the report: "..... Group Clear" when all planes are sufficiently clear to permit of the next group starting its attack. The Group Commander of the next group to attack will receipt for this report.

(c) When torpedo planes equipped with torpedoes are present in the formation, they will be detached from the wing formation sometime during the approach, probably just after the objective is sighted, and will proceed to position for delivering their attack.

(1) Signal for this will be the order from the Wing Commander "TORPEDO SQUADRONS PREPARATORY."

(2) Torpedo squadron commanders acknowledge this order.

(2) The torpedo planes will then coordinate their attack, under the direction of the senior torpedo squadron commander, with the attacks of the other groups or with that of the surface vessels as the case may be.

(d) The Group Commander of the last group to attack will report when his attack is completed.

LOW CEILING ATTACKS

3-205. (a) Groups will approach to the attack in column, each group in low ceiling cruising or attack formation remaining at least 500 feet below clouds, until the attack has been ordered by the leading group.

(b) Each group attack and deploy in succession. Avoid over-running the group ahead while its squadrons are deploying, circling if necessary.

(1) Group Commanders report "CLEAR" when their squadrons have deployed and are proceeding in.

(2) Group Commanders of the next group to attack receipt for this report.

(c) Torpedo squadrons will attack with their respective groups in order to be in a position to obtain the maximum support from the bombing and strafing attack.

GROUPS NOT IN COMPANY

3-206. (a) When it has not been practicable for the different groups to effect a wing rendezvous, groups will proceed to the attack independently.

(b) The first group to arrive within striking distance attacks first, etc.

(1) Group commanders of following groups receipt for the order to attack given by the group commanders of preceding groups.

(2) When attack has been completed by a group, that group commander will report to the next groups the objectives which have been attacked: "..... GROUP ATTACK COMPLETED ON (such and such objectives)."

DISTRIBUTION OF TARGETS

3-207. (a) In all of the above attacks group commanders will determine and direct the distribution of targets to the squadrons of their respective groups. This will be dependent to a certain extent upon what targets have been attacked by the groups ahead.

COMMUNICATIONS

3-208. (a) It is important that all planes of all groups be on the same voice frequency which, unless otherwise directed, will be the frequency of the senior group.

(1) For properly coordinated attacks it is important that all pilots know what is going on. To this end, whenever it be known that more than one group is operating in the same area or against objectives in the same vicinity, all other groups will immediately shift to the voice frequency of the Senior Group Commander.

PART IV

EXPEDITIONARY OPERATIONS

(The Landing Operations Doctrine, U. S. Navy (F.T.P. 167) contains instructions governing the employment of aircraft landing operations.)(Also see USF 78.)

PART V

CARRIER — SQUADRON PROCEDURE, GROUP ORDERS AND INSTRUCTIONS INCLUDING PLANE GUARDS AND OTHER SUPPORTING VESSELS

CHAPTER I — Day Carrier Procedure (See USF-77$_A$ (Revised) Chapter IV)

CHAPTER II — Night Carrier Procedure (See USF-77$_A$ (Revised), Chapter V)

CHAPTER III — Aircraft Carriers and Attached Squadrons (See USF-77$_A$ (Revised), Chapter III)

CHAPTER IV — Responsibility of Task Force, Task Group Commanders and Carrier Commanding Officers (See USF-77$_A$ (Revised), Chapter I)

CHAPTER V — Safety Precautions — Aircraft (See USF-10 (Revised))

CHAPTER VI — Operating Instructions to Carriers, Plane Guards and other Vessels Comprising a Carrier Group (See USF-77$_A$ (Revised), Chapter II)

CHAPTER VII — Section I — Carrier-Aircraft Navigational Procedure (See USF-77$_A$ (Revised) Chapter VII)

Section II — Lost Plane and Homing Loop Procedure (See USF-10$_A$ (Revised), Chapter V, Part II)

CONFIDENTIAL

CURRENT TACTICAL ORDERS AND DOCTRINE U.S. FLEET AIRCRAFT

Volume Two

BATTLESHIP AND CRUISER AIRCRAFT

USF 75

Prepared by Commander Aircraft, Battle Force and other Type Commanders concerned under the supervision of the Commander-in-Chief, U.S. Fleet

CONFIDENTIAL

REGISTER NO. 2197

A7-3

AIRCRAFT, BATTLE FORCE,
U.S.S. SARATOGA, Flagship,
U.S. FLEET.

San Diego, California,
16 August, 1938.

From: Commander Aircraft, Battle Force.
To : HOLDERS OF USF-75.

Subject: Current Tactical Orders and Doctrine, U. S. Fleet Aircraft — Volume II, Battleship and Cruiser Aircraft, USF-75.

1. This publication, Current Tactical Orders and Doctrine, U. S. Fleet Aircraft — Volume II, Battleship and Cruiser Aircraft, USF-75, is one of three volumes of Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, prepared under the supervision of Commander Aircraft, Battle Force in accordance with the authority contained in F.T.P. 142. In accordance with directives from the Commander-in-Chief, U. S. Fleet they are issued for the use and guidance of the Fleet. The short and long titles for these publications are listed below:

(a) USF-74. Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume I, Carrier Aircraft (Parts 1 to 5 inclusive).

(b) USF-75. Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume II, Battleship and Cruiser Aircraft (Parts 6 and 7).

(c) USF-76. Current Tactical Orders and Doctrine U. S. Fleet Aircraft, Volume III, Patrol Aircraft (Part 8).

2. The material for this volume was prepared jointly by Commander Battleships, Commander Cruisers, Battle Force and Commander Cruisers, Scouting Force under the supervision of the Commander-in-Chief and is applicable to the aircraft of battleships and both heavy and light cruisers. All recommended changes to this volume shall be forwarded to the Commander-in-Chief for approval.

3. Part 1 of Volume I (USF-74) is applicable to all Fleet Aircraft. The parts of these three volumes have been numbered consecutively throughout the three volumes for continuity.

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E. J. KING,
VICE ADMIRAL, U. S. NAVY,
COMMANDER AIRCRAFT, BATTLE FORCE.

CURRENT TACTICAL ORDERS AND DOCTRINE
U. S. FLEET AIRCRAFT
VOLUME TWO — USF-75

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PART VII

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Chapter III	21 to 25 inclusive,	original
Chapter IV	26 to 28 inclusive,	original
Chapter V	29	original

PART VI

CHAPTER 1.

GENERAL INSTRUCTIONS.

Section 1. GENERAL.

6-101. The operation of battleship and cruiser aircraft shall be governed by the General Tactical Instructions and War Instructions, and current Fleet and Type Tactical Orders and Doctrine. Unless otherwise specifically directed in this publication, the signals for air evolutions and the operating methods prescribed in USF-74, Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume I, apply to the air operations of the aircraft carried in battleships and cruisers.

6-102. Commanding Officers of parent vessels are directly responsible to higher authority for the efficiency of their aircraft and for their readiness for operations. After aircraft are launched, and rendezvous with the squadrons to which assigned or with a task group created by higher authority is completed, the squadron or task organization becomes effective and the Squadron Commander or other Task Group Commander becomes responsible for their operation.

6-103. When battleship or cruiser aircraft are in the air operating by Wings, Squadrons, or other flight including the aircraft of two or more parent vessels, the surface commander immediately superior to the leader of the Flight is responsible for their safety, for supplying the flight leader with necessary information and for directing the flight. When a ship's aircraft are operating as a separate flight, the Commanding Officer has similar responsibility, and he must at all times be ready promptly to take over control of his aircraft when so directed by higher authority, or when planes require radio assistance in returning to their parent vessel.

6-104. When aircraft from several ships are operating as a tactical unit but communicating with their parent ships on spotting frequency, parent ships are responsible for the maintenance of the radio guard as provided in paragraph 6-111(c)(2).

Section 2. SAFETY PRECAUTIONS.

6-111. The safety precautions contained in Current Tactical Orders, U. S. Fleet, are fully in effect for battleship and cruiser aircraft. Pertinent portions are repeated herewith for ready reference:

(a) To promote safety during peace time operations, while conforming to procedures that might be practicable during war, the rules in the following paragraphs will be followed regardless of any instructions as to prohibiting the use of radio.

(b) In their application to airplanes, a parent vessel is the vessel from which an airplane was launched. A radio guard vessel is a vessel detailed as the radio guard for the flight of an airplane or group of airplanes. A flight is a general term used to refer to any or all aircraft in the air.

(c) Radio communication shall be a minimum, short code messages employed when practicable. Lost planes may be brought in through bearings of them obtained by vessels or through bearings of the vessel obtained by plane loop direction finders; choice depending upon details of equipment available. Whenever it becomes necessary to return airplanes to parent vessels by radio bearings, all other airplanes in the air must avoid use of such frequencies as may possibly interfere with return of lost plane.

(1) In every flight of airplanes of other than patrol or utility types sent beyond visibility distance of surface vessels and of land, there shall be at least two radio equipped airplanes; in case of radio communication failure the flight shall at once join another flight with radio which is effective or return to its parent vessel. When a flight which has had communication failure joins another flight capable of con-

tinuing communications, the latter shall report the juncture to the parent or guard vessel at once.

(2) Radio guard vessels will plot all bearings of their planes obtained through normal messages or on request; will require flights to supply information as to their situation when delays occur; and will inform their immediate tactical superiors as soon as it appears that planes are overdue either at objectives or on return. Tactical superiors may, if desirable, place three vessels in triangle formation within visual distance and require them to report bearings for plotting plane tracks.

(3) All flights of aircraft which extend beyond visibility distance of surface vessels and of land shall be covered by the radio direction finders of parent vessels or of radio guard vessels. Radio direction finders shall be manned before planes are launched.

(4) Planes operating in the vicinity of a Fleet will identify their positions hourly through sight of surface vessels, but reports of positions and commencement of return are not required.

(5) The leader of each flight, except patrol planes, on more distant missions will, upon starting to return, report that fact and the time of expected arrival at parent vessel by "I" "No receipt" method, but without reporting his track. Receipting for such messages is discretionary with the parent vessel and will depend upon existing conditions. When two-thirds of the way back a flight will normally extend into scouting line with adjacent units within easy visual distance, if any difficulty in locating parent vessel is anticipated. The radio guard ship detailed to receive these reports will endeavor to establish communication with any plane or flight of planes whose scheduled report has not been received.

(6) Radio transmissions resulting from compliance with the safety provisions of this paragraph are to be considered inviolable and not subject to direction finding by opposing units in Fleet exercises.

(7) Aircraft must bear in mind the fact that radio antennas of other planes may trail about 400 feet below and astern, and must operate to avoid this danger area.

(d) Prior to departure from parent vessel all airplanes will be informed as to the probable future movements of the vessel and the probable rendezvous. The bearing and distance of the nearest land shall always be given. When operating near the Fleet, its disposition and position of the Fleet center should be given.

(e) Parent vessels shall maintain a chart of the tracks assigned all their aircraft operating beyond visibility distance. Any marked or definite departure from its assigned track shall be reported by the aircraft to its parent vessel. Parent vessels shall inform aircraft operating beyond visibility distance of material changes in weather conditions which may affect their safety or navigation.

(f) In general, and except in special cases when safety considerations warrant, flights will be so planned as to return battleship and cruiser aircraft to the vicinity of their parent vessels with sufficient fuel to remain in the air at least one hour.

(g) The leader of a flight, when in doubt as to effecting rendezvous promptly, will obtain the correct return track from the radio guard vessel, and proceed on that track, verifying its correctness from time to time as necessary.

(h) A flight not making prompt contact with parent vessel at expected time and position will circle about a point fixed by float lights for ten minutes during which thorough check of navigation data and computations will be made and then, if no errors are found, initiate the conduct of lost plane procedure. Patrol planes will follow this procedure only when they can not reach sheltered water.

(i) All vessels will be prepared to turn on searchlights, make smoke, and fire star shells to assist in establishing their positions.

(j) In all operations and maneuvers involving the operation of aircraft, the officer in tactical command shall receive prompt report and adequate information in regard to air-

planes overdue. The officer in tactical command shall take timely and appropriate action with any, or all, vessels at his disposal to insure the security of the personnel of operating aircraft.

(k) Whenever planes, attached to a ship, are reported to have made forced landings at sea so as to require immediate assistance, the ship to which the plane belongs shall report to the officer conducting the rescue operations and other vessels concerned the number of all planes unaccounted for. Each vessel rescuing a plane shall report its number to the officer conducting the operation and the ship to which the plane is attached. The latter shall report to all concerned when all its planes are accounted for.

(l) When an aircraft repeatedly zooms a surface vessel and heads in a certain direction, it is a signal to the vessel that an aircraft has landed in the water on the bearing which the plane heads after zooming and that immediate assistance is required.

(m) When an airplane crashes, or makes a forced landing, the nearest vessel, or, sea conditions permitting, patrol planes shall render immediate assistance.

(n) Aerial combat shall be limited to one approach for each attacking plane. After such attacks, opposing formations shall be withdrawn and reformed. The distance between opposing aircraft shall not be reduced below 500 feet. In simulating engagements between aircraft, formation leaders may sound one plane to fly close alongside the leader of the opposing formation and thereby indicate the attack. The provisions of this paragraph do not apply to the training for and the firing of prescribed Gunnery Exercises, but are applicable during Tactical Exercises and at such other times when large numbers of airplanes of different types or from different squadrons may be involved. No minimum distances are prescribed for camera gun practices. The burden of responsibility for avoiding collision is placed on the attacking aircraft but the defending aircraft is cautioned against increasing the possibility of collision by employing maneuvers that cannot be seen by the attacking aircraft.

(o) Dive bombing attacks on ships actually firing guns are prohibited. When simulating attacks on ships not firing guns, aircraft shall complete recovery from dives at an altitude greater than 500 feet.

(p) No aircraft shall fly through smoke screens or curtains, except when approaching for or withdrawing from an actual or simulated torpedo attack.

(q) Aircraft operating over water at night shall proceed in units of not less than two except in emergency. Aircraft operating singly during daylight should if practicable rendezvous, at least by pairs, before darkness or before the approach of bad weather. When, however, it is impossible to effect the rendezvous promptly and safely, single aircraft should return promptly to base rather than incur increased hazards by remaining at sea attempting to effect the rendezvous and should notify tactical superiors and other aircraft concerned of this action.

(r) Aircraft operating darkened at night may use low-candle power lights not visible from below for the purpose of formation station keeping. Aircraft operating darkened shall turn on normal navigation lights upon close approach of other aircraft not a part of the same formation) and shall use normal navigation lights during rendezvous.

(s) During night operations the senior aviator in flight in a given area shall take immediate positive action whenever weather or other considerations so indicate to reduce the number of aircraft in the area to safe limits.

Section 8. CONDITIONS OF READINESS.

6-131. When conditions of readiness are prescribed, all aircraft shall be kept fully armed and serviced for their most probable employment. In peacetime, arming shall be constructive. Task Force Commanders, in the absence of specific advice from Commanding Officers to the contrary, will assume that all aircraft are in all respects in condition to operate.

6-119. Airplanes may be ordered to assume a condition of readiness, irrespective of that set for the ship, as follows:

(a) CONDITION 1.

Airplanes will be kept warmed up, catapults will be kept ready for firing. Aviation and catapult personnel will be at hand and ready. Catapult, airplanes and personnel shall be ready for launching on ten (10) minutes' notice.

(b) CONDITION 2.

Aviation and catapult personnel may be below decks but ready for call on short notice. Catapults, airplanes and personnel shall be ready for launching on twenty (20) minutes' notice.

(c) CONDITION 3.

Catapults, airplanes and personnel shall be ready for launching on thirty (30) minutes' notice.

Section 4. ONE LETTER VISUAL SIGNALS.

6-123. The following signals by visual are standard in the aeronautical organization and always have the same meaning:

C — Land.

D — Delay — reform and gain altitude.

F — Flaps not down.

K — Proceed on mission assigned.

L — Landing gear (float) is damaged.

M — Proceed to shore base in accordance with doctrine or orders. "M" alone means home shore base. "M" followed by long dash means shore base or station other than "home" will be specified. The name of this base or station will then be spelled out immediately after "M dash" signal.

R — Group Commander fly alongside to read signals.

U — Running lights not turned on.

Z — Rendezvous in zones prescribed.

SIX Flag (SIX FLASHES) RECALL.

Conventional one letter governing signals (A, P, I, N, O) may be used with the above.

Section 5. CRASH UPON LAUNCHING OR LANDING.

6-128. The prescribed procedure for "MAN OVERBOARD" shall be carried out in all cases, except that the ship to which the aircraft is attached shall also shear out of column on the same side as the crashed aircraft and lower a boat as soon as possible to render assistance in the recovery of personnel first, and then the salvage of the aircraft. The ship shearing out to rescue personnel and to recover the aircraft must keep clear of the ships astern.

Section 6. FORCED LANDING PROCEDURE.

6-130. The normal forced landing procedure prescribed in paragraph 402-3 of FTP 142 and reprinted in paragraph 902, U. S. Fleet Regulations, will always be used in time of peace.

6-181. The Wartime Forced Landing Procedure will be used only in time of war in proximity to enemy forces and is as follows. The pilot of the disabled plane will:—

(a) Seek to land in the coastal waters of friendly territory.

(b) Attempt to land on windward bow of nearest disengaged friendly light vessel.

(c) Sink plane if it is in danger of falling into enemy hands or cannot be salvaged.

(d) Destroy confidential or secret publications if there is danger of their falling into enemy hands.

(e) Make no radio report or pyrotechnic signal except to report information vital to the success of own forces.

CHAPTER II.

LAUNCHING.

Section I. CATAPULTING, GENERAL.

6-201. Whenever airplanes are to be used in an operation the officer in command of the group shall specify the number of airplanes to be catapulted and their mission at least 30 minutes before the expected time of launching, to enable ships to make necessary preparations. Normally a five (5) minute interval shall be used between the hoisting of the signal "Launch Aircraft" and its execution. However, in emergency the signal will be executed immediately and ships shall catapult planes expeditiously.

6-202. Catapults, and catapult ok rates and catapult air pressures are designed to permit safe launching of a fully-loaded plane in a flat calm, ship at anchor. Current Bureau of Aeronautics instructions relative to condition of loading and wind components against the line of flight will be observed. As a safety factor, planes should normally be launched into an apparent wind which has a component of not less than five (5) knots against the line of fire. Planes will be launched so that they leave the catapult when it is inclined slightly above the horizontal on the up roll.

6-203. Planes should not be launched with catapults pointed directly at any ship which is closer than 1000 yards.

6-204. The detailed procedures prescribed in this publication will be followed for launching and recovery but may be modified by Type Commanders when material characteristics necessitate doing so.

Section 2. GENERAL SIGNALS FOR THE CONDUCT OF LAUNCHING.

6-210.

(a) "Prepare to launch aircraft."

Number of aircraft, task, armament and equipment (or mission) should be indicated; side for first launching may be indicated.

(b) "Corpen Signal" if necessary to place vessels on a proper course for launching planes.

(c) "Launch aircraft."

(Number to be launched may be indicated. Where no number is indicated all aircraft will be launched).

Until signal is executed, aircraft on catapults will be in battery with engines warmed up and tested and idling at sufficient speed to prevent plugs fouling.

Upon execution of this signal the first aircraft shall be catapulted as soon as possible, followed by the others which will be launched expeditiously having due regard for safety precautions. Compliance with safety precautions is strictly enjoined and no precaution will be neglected in an effort to attain speed in launching. A minimum time of five minutes between shots from the same catapult is considered requisite to avoid undue haste.

(d) Each vessel on completing launching will hoist AFIRM at the dip, two-blocking in succession up the channel of visual responsibility.

(e) CORPEN or TURN signal to resume base course, regain station in disposition or to new firing course as necessary.

(f) Vessels launching less than the number of aircraft ordered by signal (or more in the case of certain flagships) will so inform their Division Commander by general sig-

nal, who will in turn report to the OCL (Officer Conducting Launching) the number of aircraft launched.

(g) When the Fleet (or Force Commanders) plane is to be launched from the Fleet (or Force) flagship in formation, or during a period in which catapulting and recovery of other aircraft are involved, advance information of this intent will be furnished to the Type and Division Commanders concerned, by adoption of the following procedure:

(1) Under the condition that no preliminary signal has been sent by the OTC of the formation indicating that aircraft are to be launched, the Fleet (or Force) flagship will signal that one plane is to be launched.

(2) Under the condition that a preliminary signal has been sent by the OTC of the formation indicating that one or more aircraft per ship are to be launched, the Fleet (or Force) flagship will signal the number which it will launch, i.e., 5, 4, 3 or 2 as appropriate.

Section 3. STANDARD SHIPBOARD PROCEDURE FOR CATAPULTING

DAY CATAPULTING.

6-231. Calls.

Flight quarters. (Flight quarters will be sounded and catapult and aircraft crews man stations in sufficient time, normally 30 minutes, to complete catapult check-off list and aircraft tests before launching. Meticulous compliance with catapult check-off lists is necessary to insure safe launchings).

Word passed over loud speaker system as to operations contemplated.

6-232. Communications.

Battle telephone between bridge and catapults.

Two sets of Red and Green flags for use between bridge and vicinity of lower catapult. (Where ship structure does not allow direct visual sight between above two locations it may be necessary to use a third set of signals at a repeating station).

6-233. Reports and Personnel.

An officer, not an aviation officer, will be placed in charge of catapulting operations.

Plane pilot reports plane "Ready" to catapult officer.

Catapult officer reports plane and catapult "Ready" to officer in charge of catapult operations, who reports to bridge.

6-234. SHIP SIGNALS (Daylight). Control of actual time of launching shall be maintained by each Commanding Officer by the use of red and green flags or paddles displayed on the bridge and repeated by the catapult control stations in locations visible to the pilot.

(a) Signal: Red flag displayed and held steady.
Meaning: Prepare to launch airplanes. Is normally made five minutes before first plane is launched.

(b) Signal: Red flag waved vigorously from side to side.
Meaning: Do not launch airplanes. Made to negate signal (a).

(c) Signal: Red flag displayed after green flag.
Meaning: Do not catapult.

(d) Signal: Red and green flag displayed and waved simultaneously.
Meaning: Secure, catapult launchings completed or discontinued.

Section 4. CATAPULT PROCEDURE. (Daylight).

6-240. Signals between Catapult Officer and Pilot.

(a) Signal: Catapult officer waves right arm overhead with circular motion.
Meaning: You may turn up and test your engine at full throttle.

(b) Signal: Pilot reduces RPM to 1,000 or below and responds with similar motion in affirmation.
Meaning: My engine and airplane are ready for catapulting.

(c) Signal: Pilot shakes his head from side to side in negation, in view of catapult officer.
Meaning: I am not ready for catapulting. Keep car locked and do not catapult me. Await further signals.

(d) On receipt of signal (b), catapult officer supervises loading of gun and adjusts firing lock. Loading will be indicated to the pilot by showing him a charge. He will respond by nodding his head.

(e) Signal: With green flag showing, catapult officer waves right arm overhead with circular motion.
Meaning: I am ready to launch you and will do so when you make launching signal.

(f) When pilot is in all respects ready to be launched he opens throttle full out.

(g) Signal: Pilot extends his arm horizontally with palm open in view of catapult officer and withdraws arm.
Meaning: I am ready to be launched and when I withdraw my arm you may catapult me.

(h) Catapult officer assures himself that safety pins are released, answers pilot's signal by extending one arm horizontally and fires on the next up roll.

(i) Signal: Pilot waves hand horizontally over the side of the cockpit.
Meaning: Hold fire. I will keep engine turning up until you exhibit powder charge.

(j) Signal: Catapult officer draws his hand across his throat.
Meaning: Close your throttle. If repeated with engine idling, it means cut your ignition switch. This signal must never be made unless safety pins are in.

(k) Signals indicating the number of minutes to go before the expected time of launching may be made by the catapult officer by holding up an appropriate number of fingers with arm held vertically. Crossed fingers indicate a half minute.

Section 5. CATAPULT PROCEDURE AND SIGNALS. (Night).

6-250. General.

(a) When night catapulting operations are to be undertaken at least two hours of daylight preparatory notice should be given.

(b) Planes shall not be catapulted at night unless visibility conditions are good and a clear horizon can be seen by the pilots so that they may quickly orient themselves when leaving the catapult.

(c) All signals made on the bridge are to be repeated in a conspicuous location, visible from the catapult.

(d) Suitable red and green lights in lieu of the red and green flags or discs will be used to signal.

(e) Launching signals from division flagships by blinker and/or radio.

(f) Minimum use of lights for catapulting signals.

(g) Minimum use of lights during preparation of planes and catapults.

(h) Man all searchlights and keep ready for immediate use while planes are in the air during darkness.

(i) Planes carry float lights in addition to regular Very pistol equipment and assure landing lights are functioning.

(j) Existing and necessary additional catapult safety precautions will be complied with.

(k) No flashlights will be used by any except authorized persons. The following persons will provide themselves with flashlights and use them only as necessary during preparation for catapulting: catapult control officer; catapult captain; pilot of plane; safety pin man; plane captain; radio operator or observer of plane.

(l) Signals displayed from bridge are the same as daytime except that red and green lights are used instead of red and green flags.

8-232. Catapult, Signals and Procedure.

(a) Signal: Catapult officer waves white flashlight with steady, slow, circular motion in view of the pilot. (Red flashlight may be used here if desired).

Meaning: You may test your engine at full throttle and your flying controls and ascertain that everything is functioning properly.

NOTE: When satisfied the pilot reduces R.P.M. to 1,000 or below.

(b) Signal: Pilot makes one long dash with running lights.

Meaning: My engine and airplane are functioning properly.

(c) Signal: Pilot does not turn on running lights as expected.

Meaning: I am not ready for launching. Keep car locked and do not catapult me. Await further signal.

NOTE: This signal is used when for any reason the pilot must delay or cancel launching.

(d) Signal: Pilot makes two long dashes with running lights.

Meaning: I want permission to test my engine at full throttle.

NOTE: This signal is used when for any reason the pilot desires to run the engine faster than 1,000 R.P.M. which must never be done without permission of the catapult officer. The catapult officer must assure himself that the car and the airplane are securely locked before granting this permission.

(e) Signal: Catapult officer waves white flashlight overhead with slow circular motion. (Green flashlight may be used here if desired).

Meaning: Turn up engine to full throttle. Crew get set for catapulting. I await execution of your signal to launch. Pilot turns up engine to full throttle. Pilot and passenger get set for launching.

(f) Signal: Pilot turns on running lights and leaves them on.

Meaning: I am ready to be launched. You may load, unlock and launch me at the middle of the next up roll.

(g) Signal: Pilot does not turn on running lights as expected.

Meaning: Something is unsatisfactory, do not launch me. Lock car and await results of investigation.

NOTE: This signal is given when the pilot at this point of the procedure discovers that he must not be launched.

(h) Signal: Pilot blinks running lights rapidly or moves flashlight in horizontal plane.

Meaning: "Hold Fire," I will keep engine turning up and braced for shot until you exhibit to me the powder charge, or for air catapults the detached firing lanyard, by turning your white, or red if used, flashlight upon it.

(i) Signal: Catapult officer waves flashlight back and forth horizontally and vigorously, or red flashlight drawn across the throat.

Meaning: Close your throttle.

NOTE: This signal is given when for any reason the catapult officer desires that the pilot kills his engine. If the signal is made when the engine is idling, it means "turn off the ignition switch."

Section 6. CATAPULT SAFETY PRECAUTIONS.

6-260. Ready boat with crash kit in it shall be manned and ready to hoist out (at sea) or called away and manned (in port) when planes are to be catapulted.

6-261. Catapult officers must always wait until area (surface or air) in direction of catapulting is clear before firing.

6-262. Planes must never be fired when the launching end of the catapult is moving down with the ship's roll or when there is a perceptible list downward or an upward list of greater than five degrees on the catapulting side. For low catapults, the firing of the gun should be timed to start as the ship reaches the middle of the up roll.

6-263. After pilot has given his "ready-to-go" signal, catapult officer must listen for the plane engine's regularity until the gun is fired.

6-264. Never fire a catapult shot (live) when there is any relative down wind component along the length of catapult.

6-265. Never fire a live shot from a catapult unless either a "live," or "No-load" shot has been fired from the same catapult during the previous seven (7) days.

6-266. Never use a powder charge other than the one specified (and so labeled on the case) for the Mark of catapult gun and total weight of plane and car in question. Observe safety precautions concerning air pressure requirements for air catapults.

6-267. Never report or consider a catapult ready to fire until each item of a prepared check-off list has been carefully checked. This is particularly to be guarded against when getting ready for second shots from the same catapult.

Section 7. CATAPULT CASUALTIES.

6-270. Lock shot. A lock shot stretches the cable taut and the car remains locked to the catapult.

(a) One and a half (1½) minutes after gun is fired unscrew the vent plug on the expansion chamber until the vent hole shows above the surface of the expansion chamber to allow the built-up pressure to start venting.

(b) Allow venting to continue for not less than ten minutes to relieve all pressure inside the gun before opening the breech of the gun.

(c) In the case of air catapults (1) close the control valve and lock, (2) close piston valve (be sure that valve is tightly seated), (3) when pressure has leaked past piston sufficiently, slack tension on cable, (4) renew tension bar, (5) push safety pins in all

the way, and (3) proceed from this point as for a normal shot reloading safety precautions.

9-271. Hang-fire or misfire.

(a) If gun fails to fire, wait until next up roll before again attempting to fire. After a misfire, if roll is approachable, look out to catapult to avoid possibility of a hang-fire occurring while catapult is in a dangerous part of the ship's roll.

(b) If two attempts to fire are failures, lock catapult out with safety pins and proceed with the usual thirty minute safety precautions for a loaded gun before opening breech. If a hang-fire occurs during the thirty minutes wait, follow the previously given procedure for a locked shot.

(c) In the case of all catapults follow catapult instruction (Catapults, Type A, Mark IV).

CHAPTER III.

RECOVERY.

Section 1. GENERAL CONSIDERATIONS.

6-800. When vessels of any or all types in the Fleet have aircraft in the air, they must eventually be recovered. It may or may not be desired to recover by all types simultaneously. If it is so desired, it is unlikely that ships of different types will be close enough to interfere with each other, or require the operations to be performed on signal from a common senior.

6-801. In the recovery of aircraft at sea, there are certain matters that must be taken into consideration:

(a) Safety of recovering ships (from attack by submarines, air, or surface craft).

(b) Recovery of aircraft without damage to material or injury to personnel.

(c) Recovery of aircraft in minimum time.

(d) Prevention of dispersion of fleet during recovery.

(e) Minimum interference with movement of fleet in the desired direction.

6-802. Primarily to meet the different conditions of wind and sea that may be encountered, three methods of recovery have been developed, which are designated as "BAKER", "OART" and "DOG".

6-803. The BAKER method renders ships most vulnerable to attack. It is probably the best method of safe recovery under adverse wind and sea conditions. In time, there is not much choice between BAKER and OART methods. As vessels are stopped, there would be no dispersion of the fleet if all types conformed to the movements of those recovering aircraft. If the fleet desires to move to windward, this method would be undesirable, but it would be desirable if the desired movement is to leeward.

6-804. The OART method gives the greatest protection against attack, as ships are constantly changing both course and speed. In normal weather aircraft should be recovered quickly and safely, but BAKER method could probably be used in a little rougher sea. Progress of the ship is to windward, so that this method may be favorable or unfavorable as regards dispersion and fleet progress, depending on circumstances.

6-805. The DOG method, which is really a modification of the OART method, can only be used under very favorable wind and sea conditions, when no slick is necessary for landing. It has the disadvantage from a ship safety standpoint of maintaining a steady course and speed, but it is quicker than any other method, and under proper conditions, equally safe to aviation personnel and material. It is the same as the OART method as far as dispersion and fleet progress are concerned.

6-806. Dispersion can always be avoided or reduced to a minimum by having the whole fleet follow the movements of the vessels recovering aircraft.

6-807. The choice of BAKER, OART, or DOG methods as governed by weather conditions cannot be laid down, but must be decided from experience.

6-808. The Principal Requirements for Aircraft Recovery at Sea are:

(a) A large sea area for ship maneuvers.

(b) An amount of slick parallel to the direction of the wind sufficient for a smooth landing.

(c) A condition that requires a minimum turn away from the wind, for water borne planes, in order to taxi upwind to a recovery position.

(d) A range of speed in taxiing to a recovery position that will lessen the plane's chance of bounding.

(e) All recovery ships to be in such position, with reference to the landing part of a slick, that aircraft are not required to head directly toward a ship while landing.

(f) A sufficient lee with minimum roll on a ship while recovering.

(g) A formation which insures:

(1) That a slick of one ship is not crossed by the active wakes of other ships.

(2) That one ship does not interfere with the landing of aircraft of another ship.

(h) A minimum number of ships or formations of ships recovering in one area independently.

(i) A wind of strength such that seaplanes can be handled with safety.

(j) A smooth or moderate sea condition without excessive swell.

6-509. The requirements listed in the paragraph above will be considered individually:

(a) There should be sufficient sea area so that the unit recovering planes may be free to maneuver on the surface, and their planes free to maneuver in the air, without interference. The possibility of special action in the case of casualty to a plane must be considered.

(b) The methods of making a slick are well understood. The normal turn of 90 degrees through the wind is sufficient for ordinary conditions. The slick, when the ship follows this practice, is sufficient for the plane to land into the wind.

(c) The practice of stopping the turn with the wind 45 degrees on the bow requires the plane to taxi with a considerable cross wind component; but this component has been found to be practicable for the planes to handle. Beginning and ending the turns with the wind 45 degrees on the bow has the advantage of leaving the ship at the end of one turn on the proper course for beginning the next one.

(d) In using the CAVT method, when there is considerable sea or swell, even when smoothed by the slick there may be enough irregularity of the surface to cause the plane to bounce on landing, and to be buffeted considerably in taxiing to recovery position. It is desirable to have the plane taxi at a low speed under such conditions, and at the same time have such excess over ship's speed that a long time is not required for the plane to catch up. A few knots difference in speed of ship makes a big difference to the plane under adverse conditions.

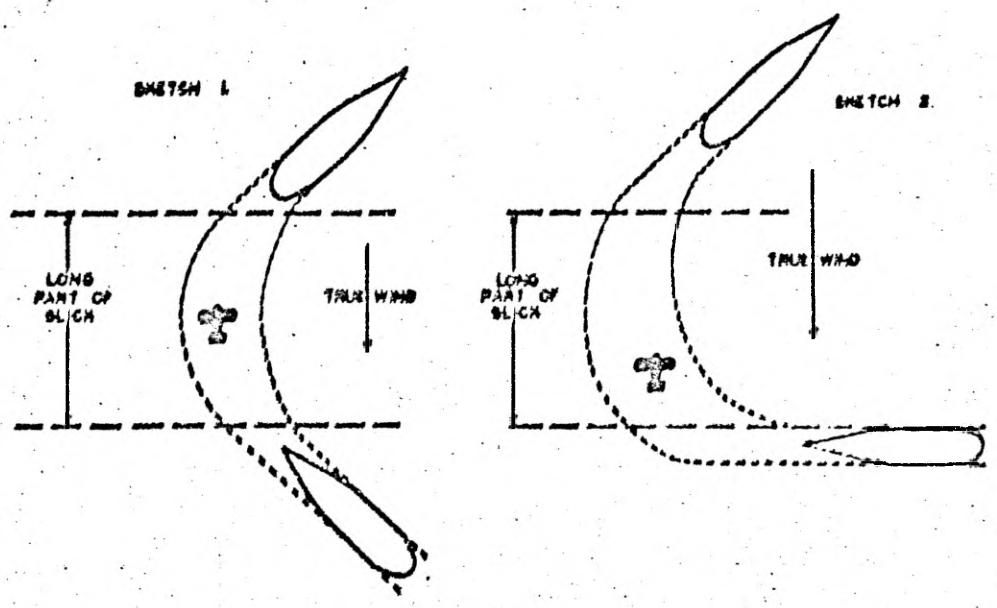
(e) The 45 degree to 45 degree turn, with reasonable skill on the part of the pilot, enables the plane to land without being headed directly for the ship. The ability of aircraft to land without heading directly for the ship, so that flight may be resumed or a take-off made, is largely a matter of timing on the part of the aviator.

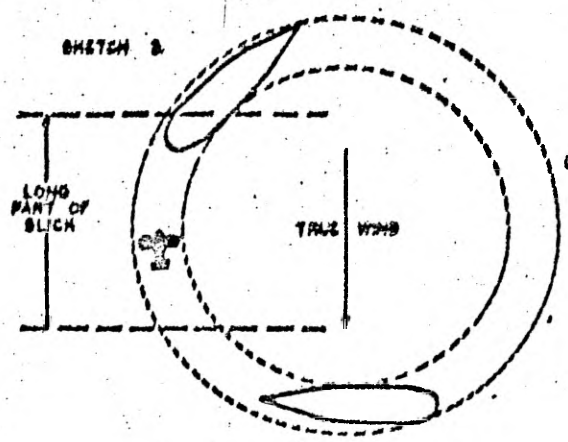
(f) Finishing the turn with the wind 45 degrees on the bow gives a sufficient lee for hoisting planes. Sometimes, particularly in the cruisers, there is sufficient roll on this course to render difficult the landing of the plane in its cradle.

(g) The present recommended formation is a line of bearing of the ships of each division, normal to the true wind.

(h) One principle can be laid down that applies to all methods of recovery. When two or more ships are acting together and are to recover aircraft, they should do it as a simultaneous evolution in formation. It is true that in formation all ships are restricted in recovery to the time made by the slowest ship (in CAVT method to the slowest ship on each turn), but after the last plane is recovered the ships are in formation and ready to proceed. If ships operate independently, there is bound to be interference, vessels must scatter widely to have operating room, and much time must be taken to resume formation.

AIRCRAFT RECOVERY





(3) IN ROUGH WEATHER SHIP OPERATING SHOULD AND ONLY USED WITH "B" METHOD OF RECOVERY.

(i) It is difficult to fix a mathematical limit for maximum wind strength in which it is safe to recover aircraft at sea. Consensus of opinion seems to be that 22.5 knots is about the upper limit, except when sea is smooth. It is possible that a wind of this strength would be too great if it had been blowing in one direction long enough to create its maximum sea.

(j) Planes cannot be recovered safely at sea with more than a moderate sea or swell. There is no way of measuring the maximum allowable, and experience must govern, as it must in the choice of the method of recovery to be used.

6-310. Guide for speeds during recovery: ("C" METHOD).

TRUE WIND IN KNOTS	SHIPS SPEED IN KNOTS BEFORE EXECUTING TURN	SHIPS SPEED IN KNOTS ON EXECUTING TURN
Under 8	12 — 15	Same as before turn
13 — 17	12 — 15	10 — 13
Over 17	12 — 15	8 — 11
Over 22.5 knots, "B" METHOD of recovery is often necessary.	12 — 15	8 or less depending on stability of sled.

6-311. The procedures herein prescribed for aircraft recovery are to be used under normal sea conditions. In heavy weather higher speed on the turns may be desirable. In smooth weather it may be unnecessary to make a slick. The officer conducting the recovery may modify the standard procedure as judgement dictates in order to expedite the maneuver and to insure SAFE recovery. Permanent modifications may be made by Type Commanders when material characteristics necessitate doing so.

Section 2. BAKER METHOD.

6-312. "B" METHOD (ships stopping).

(a) OCR: (Officer Conducting Recovery). MAKE SIGNAL AND EXECUTE — "RECALL AIRCRAFT AND RECOVER THEM BY "B" METHOD.

EACH SHIP:

(1) ON EXECUTION of the above signal, recall aircraft by that method (Searchlight or radio) permitted by the restrictions on communications in effect at the time.

(2) Hoist "AFIRM" at main yardarm, at the dip. If all planes are not to land on one slick hoist appropriate numeral flag under AFIRM.

(3) Two-block "AFIRM" when:

(a) Own aircraft have returned; (aircraft in squadron formation).

(b) The next adjacent ship away from the OCR has two-blocked "AFIRM".

(4) Haul down "AFIRM" following movements of OCR.

(b) OCR: DURING THE PROGRESS of the foregoing TAKE FORMATION or DISPOSITION SUITABLE for RECOVERY, normally on course 45° from the true wind.

(c) OCR: HOIST "BAKER" at the dip at the fore-truck. This signifies "I will MANEUVER TO MAKE SLICK FOR RECOVERING AIRCRAFT, SHIPS STOPPING. "NUMERAL" flag under "BAKER", if used, indicates number of planes to land per slick.

EACH SHIP: Follow movements of OCR in hoisting "BAKER" at the dip.

GUIDES: Haul down "GUIDE" flag when "BAKER" is hoisted. This does not change the guides.

(d) OCR: (1) MAKE SIGNAL and EXECUTE: "SHIPS RIGHT (LEFT)" an amount that meets the requirements for making a proper slick.

(2) TWO-BLOCK "BAKER." This signifies: "I HAVE BEGUN MANEUVER TO MAKE SLICK." OCR and Division Commanders make "C" by light to Squadron Commanders.

EACH SHIP: Follow movements of OCR in two-blocking "BAKER."

EACH SHIP'S PLANES: Get into position and land as soon as slick has formed and ship has moved clear.

(e) OCR: MAKE SIGNALS "BACK" and "ACT INDEPENDENTLY." EXECUTE these signals as his flagship passes through the true wind.

EACH SHIP:

(1) Pick up aircraft. During the pick-up hold ship approximately on last signaled heading. If the ship is allowed to swing to bring the true wind near the beam, the difficulty of the pick-up is greatly increased. If the inboard engine is stopped as soon as way is reduced, plane can come alongside much sooner.

(2) Haul DOWN "BAKER" when:

(a) All of her own planes have been hoisted clear of the water, and;

(b) The adjacent ship away from the OCR has hauled down "BAKER".

(f) OCR: HAUL DOWN "BAKER" on completion of the recovery.

GUIDES: HOIST "GUIDE" flags when OCR hauls down "BAKER."

6-313. REPORTS: IMMEDIATELY upon completion of recovering aircraft, each ship report to Division Commander and Division Commanders report to OCR: "ALL AIRCRAFT RECOVERED or ACCOUNTED FOR," or the number which are accounted for and if any aircraft are damaged a report stating number of "USABLE" aircraft should be made. Use appropriate general signals.

Section 3. CAVT METHOD (plane nets — ships making slicks).

NOTE: IF PROPERLY EXECUTED, THIS METHOD SHOULD, FOR BATTLESHIPS, RECOVER TWO PLANES PER SHIP MAKING ONE TURN and THREE or FOUR PLANES PER SHIP MAKING TWO TURNS.

6-314. (a) OCR: MAKE SIGNAL AND EXECUTE — "RECALL AIRCRAFT, AND RECOVER THEM BY "C" METHOD," side for first recovery may be indicated in same signal. Preparatory signal may be made without specifying side of first recovery. Nets are not to be streamed when preparatory signal is made.

EACH SHIP:

(1) ON EXECUTION of above signal, STREAM ONE MORE NET THAN PLANES IN THE AIR OR STREAM ALL NETS: (battleships two nets on each side).

(2) RECALL aircraft by that method (searchlights or radio) permitted by the restrictions on communications in effect at the time.

(3) Hoist "AFIRM" at main yardarm, at the dip. (If battleships desire that only one plane land per slick, hoist "ONE" flag under "AFIRM").

(4) Two-block "AFIRM" when:

(a) Own aircraft have returned: (aircraft in squadron formation).

(b) The ship is ready to pick them up, and;

(c) The next adjacent ship away from the OCR has two-blocked "AVIRM".

(5) Haul down "AVIRM" following movements of OCR.

(a) OCR: DURING THE PROGRESS of the foregoing, TAKE FORMATION or DISPOSITION SUITABLE for RECOVERY. Line of bearing of ships of each division normal to true wind is a satisfactory one.

(b) OCR: HOIST "CART" at the dip at fore-truck. This signifies "I WILL MANEUVER TO MAKE SLICK FOR RECOVERING AIRCRAFT, USING PLANE NETS." "ONE" flag under "CART" indicates for battleships that only one plane is to land per slick.

EACH SHIP: Follow movements of OCR in hoisting "CART" at the dip.

GUIDES: Haul down "GUIDE" flag when "CART" is hoisted. This does not change the guides.

(c) OCR: MAKE SIGNAL and EXECUTE: "SHIP'S RIGHT (LEFT)" an amount that meets the requirements for making a proper slick; for example, if in step (b) the wind was on the port beam, the proper turn signal would be: "SHIP'S LEFT 135 DEGREES."

(d) OCR: Two-block "CART" — This signifies "I HAVE BEGUN MANEUVER TO MAKE SLICK." OCR and Division Commanders make "C" by light to Squadron Commanders.

(e) OCR: MAKE SIGNAL and EXECUTE "SPEED ....." if change of speed is advisable for recovery.

EACH SHIP: Follow movements of OCR in two-blocking "CART."

(f) EACH SHIP'S PLANES: First and second planes (or first only if previous signal so indicated) get into position and land as soon as slick has been formed and ship has moved clear of the optimum landing area. The second plane shall land after the first has taxied clear of the landing area. Simultaneous landings shall not be attempted. When a plane is to be hoisted in with midship cranes, the engine will be kept running until the plane is hooked on. When a plane is to be hoisted by an after crane, the engine will be stopped when the crane hook approaches the reach of the observer. A plane will not engage in an after sled until the plane on the midship sled has been hooked on the crane and hoisted clear of the water.

(g) EACH SHIP: Lower "CART" to the dip immediately when:

(1) Own aircraft landing on this maneuver is/are hoisted clear of the water, and;

(2) The adjacent ship away from OCR has lowered "CART" to the dip.

(h) OCR: LOWER "CART" to the dip when all ships participating have lowered to the dip.

(i) OCR: MAKE SIGNAL and EXECUTE: "SPEED ....." if necessary.

(j) REPEAT (d) THROUGH (i) UNTIL ALL AIRCRAFT ARE RECOVERED.

(k) OCR: HAUL DOWN "CART" on completion of the recovery.

EACH SHIP: FOLLOWS MOVEMENTS OF OCR in hauling down "CART."

GUIDES: HOIST "GUIDE" flags when OCR hauls down "CART."

6-315. REPORTS: IMMEDIATELY upon completion of recovering aircraft, each ship report to Division Commander and Division Commanders report to OCR: "ALL AIRCRAFT RECOVERED or ACCOUNTED FOR," or the number which are accounted for and if any aircraft are damaged a report stating number of "UNABLE" aircraft should be made. Use appropriate general signals.

6-316. STATION KEEPING. Although guide flags are hauled down during "CART" recoveries the ship that had the guide prior to the commencement of the maneuver shall be the guide throughout the maneuver. During recovery operations, ships should keep station as accurately as possible consistent with accomplishing task.

Section 4. DOG METHOD. (Plane nets — no elicks).

6-317. (a) OCR: MAKE SIGNAL and EXECUTE: "RECALL AIRCRAFT, AND RECOVER THEM BY DOG METHOD."

EACH SHIP:

(1) ON EXECUTION of above signal, STREAM ONE MORE NET THAN PLANES IN AIR, UP TO TOTAL AVAILABLE.

(2) RECALL aircraft by that method (searchlight or radio) permitted by the restrictions on communications in effect at the time.

(3) Hoist "AFIRM" at the main yardarm, at the dip.

(4) Two-block "AFIRM" when:

(a) Own aircraft have returned; (Aircraft in squadron formation)

(b) The ship is ready to pick them up, and;

(c) The next adjacent ship away from the OCR has two-blocked "AFIRM."

(5) Haul down "AFIRM" following movements of OCR.

(b) OCR: DURING THE PROGRESS OF THE FOREGOING, TAKE FORMATION OR DISPOSITION SUITABLE FOR RECOVERY. (Any formation is suitable if there is little probability of any ship endangering a plane being recovered by a ship ahead and aircraft do not have to land in active wake of adjacent ships).

(c) OCR: HOIST "DOG" at the dip at the fore-truck. This signifies "I WILL HEAD INTO THE WIND TO RECOVER AIRCRAFT, USING PLANE NETS, NO BLICK."

EACH SHIP: Follow movements of OCR in hoisting "DOG" at the dip.

GUIDES: Haul down "GUIDE" flag when "DOG" is hoisted. This does not change the guides.

(d) OCR: MAKE SIGNAL AND EXECUTE: "SHIPS RIGHT (LEFT)" to a course that will head into the wind.

(e) OCR: MAKE SIGNAL AND EXECUTE: "SPEED....." if a change of speed is advisable for recovery.

(f) OCR: TWO-BLOCK "DOG" when ships are headed into the wind. OCR and Division Commanders make "C" by light to Squadron Commanders.

EACH SHIP'S PLANES: Land.

(g) EACH SHIP: HAUL DOWN "DOG" when:

(1) All of her own planes have been hoisted clear of the water, and;

(2) The adjacent ship away from the OCR has hauled down "DOG."

(h) OCR: HAUL DOWN "DOG" on completion of the recovery.

GUIDES: HOIST "GUIDE" flag when OCR hauls down "DOG."

6-318. REPORTS: IMMEDIATELY upon completion of recovering aircraft, each ship report to Division Commander and Division Commanders report to OCR: "ALL AIRCRAFT RECOVERED OR ACCOUNTED FOR," or the number which are accounted for and if any aircraft are damaged a report stating number of "UNABLE" aircraft should be made. Use appropriate general signals.

PART VII

AIR OPERATIONS.

CHAPTER I.

ORGANIZATION AND RESPONSIBILITIES.

7-100. The basic tactical elements in battleship and cruiser aviation are the two, three and four plane units attached to the various parent vessels. These elements are combined into Squadrons within each surface ship division. The Squadrons of each surface type command are in turn combined into Wings at present as follows:

Type Command	Wing
Battleships, Battle Force	Observation Wing
Cruisers, Battle Force	Light Cruiser Scouting Wing
Cruisers, Scouting Force	Heavy Cruiser Scouting Wing

7-101. The two, or four, airplanes in the aviation unit of each cruiser comprise one or two 2-plane sections and will be known as a division of the aircraft squadron to which it is assigned. The employment of airplanes for scouting or gunnery observation missions is dependent upon the requirements of existing circumstances. No distinction is made between the two sections either by squadron identification numbers or by qualifications of the crews, as to whether they are scouting or gunnery observation sections. One or both sections may be used with or without other sections or units to form a group or a squadron for attacking enemy light forces with bombs and machine guns.

7-102. Flights of battleship and cruiser aircraft normally operate under command of the senior naval aviator in the flight who is in turn under the command of the surface commander who commands the parent vessels concerned. The commander or leader of the flight may be a regularly ordered Wing or Squadron Commander or he may be a Task Group Commander created by the orders concerning the flight. In any case, for the purpose of the flight, his status becomes that of a Task Group Commander operating directly under the Senior Officer controlling the flight who may be a Type Commander, Division Commander or the Commanding Officer of a single ship (See paragraph 505, FTP 143).

7-103. Orders to aircraft in flight shall be transmitted through the flight tactical chain of command where applicable. Except in emergency, no orders should be issued direct to subordinates in the flight tactical organization as constituted for the operations concerned (See paragraphs 514 and 515, FTP 143).

The leader of a flight of aircraft units in the air, and engaged in the same mission, is responsible for the tactical disposition, coordination of movements and the safe navigation of the flight as a whole.

In the ensuing chapters of Part VII of this publication there will be found tactical orders and doctrine applicable primarily to battleship and cruiser air operations. In conducting air operations or accomplishing missions common to various types of aircraft they will conform to the orders and doctrine contained in Volume I (USF-74).

CHAPTER II.

RENDEZVOUS AND BREAKUP.

Section 1. RENDEZVOUS PROCEDURE.

7-200. Rendezvous by squadrons will normally be effected in standard rendezvous stations which are as follows:

(a) Battleship or Cruiser Division operating singly in formation — at 1000 feet over the division.

(b) Battleship or Cruiser Division with vessels separated — at 1000 feet over the division flagship.

(c) Two or more Battleship or Cruiser Divisions in formation — aircraft of each squadron will make left turns over the division to which assigned.

Van or right flank division — altitude 1000 feet.

Van center or right center division — altitude 1500 feet.

Rear center or left center division — altitude 1000 feet.

Rear or left flank division — altitude 1500 feet.

7-201. Each airplane will fly straight for two hundred yards after leaving the catapult. Rendezvous of ship units will be effected in the squadron rendezvous stations, each airplane proceeding promptly to its position relative to the Squadron Leader as soon as he arrives on station. The rendezvous will be effected in an easy left turn, sections echeloned away from the turn and in the same formation as the leading section.

7-202. When catapulted in the presence of enemy aircraft, a defensive fighting formation must be assumed immediately with free guns manned and ready.

Section 2. BREAKUP PROCEDURE.

7-210. When directed to return for recovery the flight involved will proceed to the vicinity of its parent vessels, dividing as necessary if parent vessels are separated. If out of sight contact, each returning flight will follow the procedure prescribed in Chapter I, Section 2 of Part VI of this publication.

7-211. Preparatory to landing, the Flight Leader will direct Squadron Commanders to proceed to rendezvous stations which are the same as after takeoffs. Here each squadron will be kept in formation as long as practicable without interfering with effective recovery. Under ordinary conditions the squadron should break up at approximately the time that the first turn signal is executed or shortly before. If the breakup occurs too early, an unnecessary hazard of collision between detached planes is created. If the breakup is too late, pilots may have too little time to estimate the conditions for landing and time their approach. The decision must be made by the Squadron Commander with due regard to all existing circumstances.

CHAPTER III.

GUNNERY OBSERVATION.

Section 1. GENERAL.

7-300. The following sections are intended primarily for the guidance of battleships observation squadrons. Due to the nature of cruiser operations and the rapid shifting of conditions with which they are confronted, specific spotting formations for cruiser aircraft are not prescribed. They will take up such positions as will enable them best to observe the fall of shot, conforming as far as appropriate to the methods prescribed for battleship squadrons.

Section 2. SPOTTING FORMATION.

7-301. GROUPS AND STATIONS: The spotting formation of the Observation Wing shall consist of two groups; a right flank group and a left flank group.

(a) When FOUR Battleship Divisions are present: The right flank shall consist of the aircraft from the right and right center battleship divisions and the left flank group of aircraft from the left and left center battleship divisions. Spotting station for right flank group is on the enemy flank opposite own right and for the left flank group the flank opposite own left, exact stations depending on visibility and support by other forces.

(b) When THREE Battleship Divisions are present: Aircraft from the center division will normally operate on the flank towards the line of advance unless visibility or other conditions render operation on the other flank more advantageous.

(c) When TWO Battleship Divisions are present: Normally aircraft from the right division form the right flank group and those from the left division form the left flank group, unless other considerations render operation of both squadrons on the same flank more advantageous.

(d) When ONE Battleship Division is present: The aircraft will take station as directed by the squadron commander.

7-302. FORMATION AND MANEUVERS:

(a) While flying the spotting circuit the group on own left flank makes left turns and that on own right flank, right turns.

(b) The radius and altitude used for the spotting circuits cannot be definitely fixed as both will vary with the effective range of antiaircraft gunfire, the visibility conditions and aircraft opposition.

(c) When two squadrons form a spotting group they will fly 180° apart in the spotting circuit.

(d) The formation within each squadron on spotting station will be cruising formation of section VEES, (A1C) distance 75 feet, height 25 feet, interval 200 feet, height interval 75 feet. Sections must keep closed up to afford mutual machine gun protection. Sections shall be maintained in same formation as leading section.

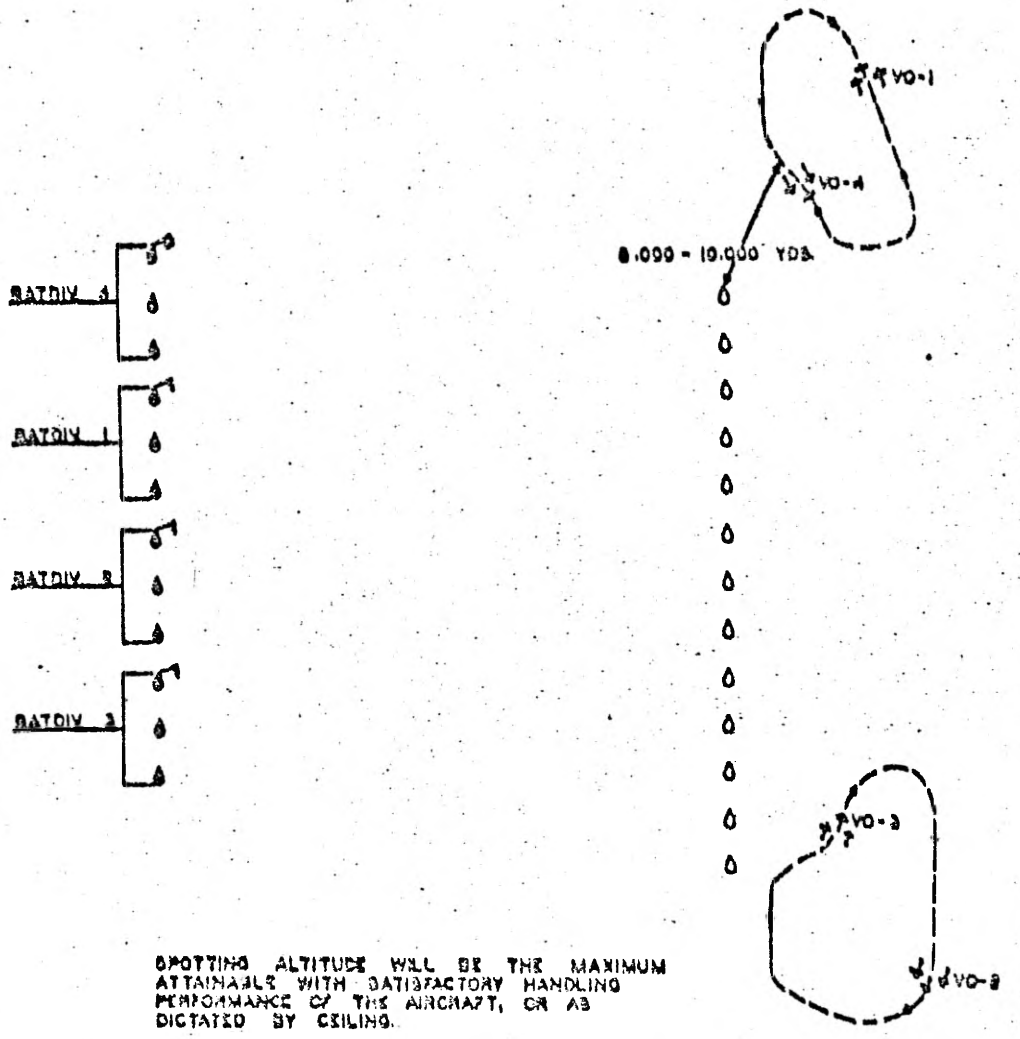
7-303. Signal for taking Spotting Formation will be that given for A-II-C formation, USF-74, "Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume I." — "Thumb jerked back over shoulder several times."

Section 3. SPOTTING PROCEDURE.

7-304. COMMUNICATIONS. During the period while effecting rendezvous all aircraft will establish communication with their respective parent vessels. Immediately following establishment of communications, number two and number three aircraft of all ships will maintain an intercept watch on fixed antenna. All subsequent communication with parent vessels will be main-

SPOTTING FORMATIONS

A TYPICAL SPOTTING CIRCUIT WHEN FOUR BATTLESHIP DIVISIONS ARE PRESENT IS AS SHOWN IN THE ACCOMPANYING DIAGRAM.



SPOTTING ALTITUDE WILL BE THE MAXIMUM ATTAINABLE WITH SATISFACTORY HANDLING PERFORMANCE OF THE AIRCRAFT, OR AS DICTATED BY CEILING.

tained by number one aircraft as long as the radios are in communication. If any number one aircraft loses communication, the corresponding number two aircraft will be signalled to take over communications and will shift places in the formation with number one. The corresponding number three aircraft is the standby for number two.

(a) Carrier based aircraft shall normally employ the relief spotting frequencies assigned by U. S. Fleet Radio Frequency Plans and Instructions when operating as relief spotters for battleships.

(b) Battleship observation aircraft (if operating at the same time) shift to receive on the relief spotting frequency. Continue to use the normal spotting frequency for transmitting as may be necessary. This requires an additional receiver watch on the parent ship and that the battleship observation planes carry the necessary receiver coil to permit the frequency shift.

7-805. SIGNALS FOR INDICATING SHIFT OF COMMUNICATION: See Article 1-803, USF-74, "Current Tactical Orders and Doctrine, U. S. Fleet Aircraft, Volume I."

7-806. DUTIES ON STATION: After arrival on spotting station, Group Commanders will order that spotting formation be assumed. From this time on, the primary duty of number one aircraft is to maintain communication and supply complete information relative to fall-of-shot, enemy course, speed, and formation to parent vessels. The primary duty of number two and three is to protect the number ones by the maintenance of vigilant look-out and protective gunfire; they shall also be prepared to take over radio communications in case of casualty.

7-807. INFORMATION FROM SHIP: Each ship will designate the target to the observer, signal "Commence firing," indicate the firing of each salvo by the transmission of a dash, and indicate the estimated time of landing of each salvo by the transmission of a rapid series of dots. Each ship will keep the observer informed as to the target and fire distribution in accordance with the following signals:

(1) Letter — Indicating type of concentration.

(2) Numeral(s) — Indicating position in enemy battle line of ship or ships comprising target.

(3) Letter — Indicating end of enemy battle line from which target count is made.

EXAMPLE — B 4 R

Single concentration firing at fourth ship from right.

D 3 L

Double concentration firing at third ship from left.

H 1 H 2 R

Divided fire — firing at first and second ships from the right.

7-808. OBSERVER'S PROCEDURE: The observer, as each salvo lands, transmits a dash followed immediately by a fall-of-shot observation of the salvo made up in accordance with the following instructions:

(a) Observer sends observation for each salvo, with proper colored splash, falling near own ship's target. SPOTS are reported as follows:

D — Down	K — Straddle
U — Up	KU — Straddle short
L — Left	KD — Straddle over
R — Right	NOB — No observation

(b) Corrections in range shall be accompanied by one or two numbers indicating hundreds of yards, as — D3 means, "down 300 yards," KU2 means, "Straddle short 200 yards," U12 means, "Up 1200 yards."

(g) Corrections in deflection shall be accompanied by one or two numbers indicating tens of yards, as — R3 means, "Right 30 yards," L14 means, "Left 140 yards."

(d) Observers must keep the parent ship informed of any changes in enemy course, speed or formation without interrupting the transmission of fall-of-shot observations.

7-809. EXAMPLES: The above reports are repeated once and followed by the aircraft's call or color designation as follows:

(a) D 6 D 6 H ZZ means the correction to be applied to the salvo is down 600 yards, and that the observation was sent by aircraft whose designating letter is Z.

(b) U 7 L 5 U 7 L 5 H YY means that the correction to be applied to the salvo is up 700 yards left 50 yards, and that the observation was sent by aircraft whose designating letter is Y.

(c) KK H YY means that no correction is to be applied to the salvo and that the observation was sent by aircraft whose designating letter is Y.

(d) K U 2 K U 2 H ZZ means that the salvo straddled but required a correction of up 200 yards to center the pattern.

Section 4. RECALL.

7-813. Squadron commanders will reform their squadrons in VIC of VICN and proceed immediately to rendezvous over their respective divisions and prepare to be recovered. Rendezvous station upon recall will be the same as prescribed for takeoff. Van and rear squadrons will circle in such a manner that center squadrons have room to maneuver for landing.

Section 5. SPECIAL TASKS.

7-818. Detachment of observation aircraft from spotting station to perform special tasks will not normally be done except to accompany their parent vessels on assigned special tasks. Such detachment would deprive parent vessels of aircraft observation. Furthermore, when launched for gunnery observation, observation aircraft are unable to operate offensively, except with machine guns.

Section 6. INDIRECT FIRE FORMATION AND PROCEDURE.

7-820. Preparatory to indirect fire, the aircraft of the second ship within a division will take stations as follows:

(a) One aircraft, identified as the "bearing designating aircraft" take station, either:

(1) Between flagship and target at the lowest altitude at which both ships can be clearly seen;

(2) On the disengaged side of flagship;

(3) Over the target; or,

(4) On the disengaged side of the target as circumstances indicate.

(b) One aircraft, identified as the "ranging aircraft" take station between flagship and target at an altitude of not less than 8,000 feet.

(c) One aircraft take normal spotting station and be prepared to relieve either the "bearing designating aircraft" or the "ranging aircraft."

7-821. Other aircraft of the division will take normal spotting formation.

7-822. The most that can be expected of the ranging and bearing procedure in indirect fire is that the first salvo fall close enough to the target to allow accurate spotting to put succeeding

salvos on. It is therefore necessary that spotting planes be available after the initial bearing and range information is furnished.

7-059. Ranging and bearing designating aircraft should maintain their assigned stations, if such station continues tenable, until directed to take normal spotting stations and always until the firing ship indicates sufficient information has been obtained to open fire. Accurate estimates of enemy course and speed are essential to the quick solution of the indirect fire problem.

CHAPTER IV.

SCOUTING.

Section 1. PATROLS.

7-400. The following specific orders govern the operation of battleship and cruiser aircraft when assigned to duty as Outer Air Patrol, Intermediate Air Patrol, Inner Air Patrol or as Aerial Pickets. General orders and doctrine for these patrols are contained in Part I, Chapter V of U.S.F. 74.

7-401. Outer Air Patrols, Intermediate Air Patrols and Aerial Pickets will operate in sections of at least two seaplanes.

7-402. The following table indicates the fuel endurance of SOC type aircraft at 3/4 maximum speed and specifies the length of watch for patrols, unless changed by specific orders:

Condition	Fuel	Endurance	Normal Watch
Bomber Normal Load	100	4	2½
Scout Normal Load	140	6	4
Bomber Over Load	140	5½	4
Scout Over Load	170	7.2	5

While on patrol fuel will be conserved by use of mixture control and low speeds except when high speed is required.

7-403. Unless otherwise specified, SOC type aircraft catapulted for duty as patrols during peace time, will be in the SCOUT normal load condition. Radio will always be carried.

7-404. Unless otherwise specified, the point of origin for all patrol sectors is the Fleet Center.

7-405. Aircraft not actually on patrol will be maintained in Condition of Readiness Two.

7-406. Aircraft shall be over their parent vessels ready for recovery at the termination of their watch. Aircraft on patrol shall, when in sight contact with parent vessels or other surface vessels of own disposition, be alert for changes of course and for recall or other signals by visual methods.

7-407. When patrols must be maintained in watches, each watch may be made up of one or more planes from each ship concerned or each watch may be made up of all the planes from a part of the ships concerned.

7-408. When aircraft are launched to patrol a given sector the following will be specified by General Signal:

(a) Number of aircraft to be launched by each unit addressed.

(b) (1) Fixed or moving origin.
(2) True or relative limits of sector.
(3) Outer radius in miles.
(4) Inner radius in miles. (If required)

(c) Duration of watch or number of watches per day.

7-409. The sector to be patrolled will be divided into subsectors equal in number to the sections available. Unless otherwise signalled assignment of sections to subsectors will be clockwise, the lowest numbered section in the lowest numbered squadron to the left.

7-410. The assignment of single aircraft to subsectors for Inner Air Patrol to form a close anti-submarine screen (see article 1-433 and Figure 10, U.S.F. 74) shall be numerically by squadron number, section number and plane number within the section. If the division organization is other than standard the temporary organization (including division number and ship number within the division) shall govern the assignment of patrol and search units to sectors. For this purpose the origin will be a line 90° to the left of the fleet course. The number of subsectors in each semicircle will be established by assigning one-third of the available number to the after semicircle and two-thirds to the forward semicircle.

Section 2. SEARCH.

7-420. The basic unit for search operations shall be the section (2 or 3 VO or 2 VCS). For cruiser aircraft the natural order of aircraft scouting sections or units on the scouting line or in scouting sectors shall be the same as that of the parent vessel when on the scouting line regardless of the sequence of squadron identification numbers. For aircraft launched from battleships in formation the order prescribed in paragraph 4-409 for patrol sectors will be used.

7-421. Search operations will conform to the applicable requirements of FTP 146 and of Part II, Chapter I, U.S.F. 74. Parent vessels are particularly charged with maintaining a navigational plot of position of attached aircraft while engaged in search operations, and with the operation of all measures designed to safeguard their flight, including the homing of lost planes and the radio guard vessel (see article 6-111) with informing them of changed rendezvous conditions.

Section 3. LOST PLANE AND HOMING PROCEDURE.

7-430. A flight not making prompt contact with parent vessel at expected time and position will circle about a point fixed by float lights for ten minutes during which a thorough check of navigation data and computations will be made and then, if no errors are found, initiate the conduct of lost plane procedure.

7-431. The choice between lost plane procedure and homing procedure depends upon equipment available and the tactical and strategical situation. In time of peace lost plane procedure will be conducted normally on intermediate frequency between ship and planes. When the assigned frequency of all aircraft operating from a ship is in the high frequency band the lost plane procedure will be conducted with all transmissions by the ship on high frequency and plane transmissions on homing frequency.

7-432. The senior plane of a lost group shall carry out the applicable procedure, or shall direct a properly equipped plane to do so. All other planes than the one conducting the procedure will remain on the frequency assigned for the flight. When squadrons or units are guarding voice or other assigned frequency only, all transmissions by the parent vessel on intermediate frequency shall be paralleled by the same transmissions on the common frequency whether it be voice or key.

7-433. LOST PLANE PROCEDURE:

(a) Plane sends ZDO ZDB (What is my bearing in plain language).

(b) Ship replies ZDA (Make MO's).

(c) Plane makes MO's including plane call once a minute until broken by ship. Plane will fly in a small circle and each minute will cease MO's momentarily to listen for ship.

(d) Ship directs plane to fly ten minutes on heading 90° from the bearing: "Fly on heading.....for ten minutes."

(e) Plane turns to heading ordered and sends "My heading .....(Time Group)."

(f) Plane flies the directed heading and at end of ten minutes again circles and makes MO's as in (c) above.

(g) Ship sends "Ship's Bearing.....degrees from you. Ship course....., speed....."

(h) Pilot applies wind and ship motion to this bearing to determine interception heading and course.

(i) Plane turns to intercept and reports, "My course.....(Time Group)."

(j) Ship continues to take bearings at intervals directing plane to make MO's as desired.

NOTE: Time Group shall be actual time of starting on courses indicated. All bearings, headings, and courses are true.

7-434. HOMING PROCEDURE:

(a) Plane requests ship to make MO's (ZDA) then shifts receiver to homing frequency, CW.

(b) Ship sends MO's on homing frequency and plane takes bearing.

(c) Plane turns to head 90° from bearing and flies 10 minutes, reporting to ship "My heading.....(Time Group)."

(d) Plane takes second bearing, determines bearing of ship and turns to proper course.

(e) Plane reports "My course.....(Time Group)."

(f) Ship continues to make MO's during the following periods of the hour: 0—10, 15—25, 30—40, 45—55. During each five minutes pause each group leader will report course.

NOTE: All bearings and courses are true.

7-435. The following additional procedure is applicable to seaplanes equipped with OF-RU radio apparatus:

(a) When a plane (or planes) is missing and reason exists to believe a forced landing has occurred, the parent ship shall immediately establish a receiving watch on the frequency in the 2000-6000 kc band assigned for use when engaged in squadron formation flying. Planes on the water can transmit on a high frequency for a short time. They can take bearings of the ship on the frequency previously in use and transmit these bearings on the high frequency. The length of time the small storage battery will operate the plane's radio is very limited and necessary communications must be expeditiously carried out.

CHAPTER V.

ATTACK.

Section 1. GENERAL COMMENT.

7-500. The offensive armament of the 300 type aircraft now assigned to battleships and cruisers consists of only thirty caliber machine guns and 116-pound bombs with instantaneous fuses. This armament is suitable only for attacking light vessels and exposed aircraft and personnel. However, due to the very large number of these aircraft in the Fleet their total attack strength is quite large and should be used.

7-501. The structural characteristics of these aircraft necessitate keeping diving speeds and flight maneuvers within moderate limits.

7-502. Suitable objectives for attack by VHO aircraft include:

(a) Enemy aircraft carriers when found with aircraft on deck under conditions when slight damage may seriously disrupt enemy plans by delaying launching.

(b) Enemy patrol planes on the water or at shore bases.

(c) Enemy submarines on the surface.

(d) Enemy destroyers.

(e) Enemy troops during landing operations when air opposition is weak.

7-503. VHO type aircraft should be alert to take advantage of the many opportunities which may arise to inflict damage on the enemy either by small units on objectives encountered during routine operations or in planned operations against suitable objectives of major importance.

Section 2. DIVE BOMBING TACTICS.

7-510. Dive bombing tactics should conform to the general doctrine of action set forth in paragraph 524 of FTP 143 and to the principles of the Aircraft Tactical Instructions for VB type squadrons (Chapter II, Part II, USF-74) insofar as they are applicable and consistent with the equipment available.

CHAPTER 1
INTRODUCTORY

FORMATIONS — GENERAL

1-100. The basic aircraft tactical organization is the section of two or three planes. The aircraft division may consist of either two or three sections depending on the size of the squadron and the task assigned. If the number of planes available exceeds three sections, increased striking power is obtained by forming the squadron into two or three divisions. As types, models and missions vary so widely, distances, intervals and heights, (step up or step down), for formations are not specified, nor are there prescribed formations for any particular purpose.

FORMATIONS — GOVERNING FACTORS

1-101. (a) The formation must accomplish the purpose for which it is intended.

(b) The formation must be flexible, so that it may be readily altered to meet a different purpose and so that it may be readily closed up in event of vacancies.

(c) The formation must be simple, to provide for easy control, facilitate station keeping, and afford best lookout efficiency.

(d) The formation must be maneuverable.

(e) The formation must provide for the rapid development of the combined offensive and defensive power.

(f) The formation must be able to defend itself from attacks from any direction.

(g) The formation must offer the least possible degree of visibility from the surface.

DEFINITIONS

1-102. (a) DISTANCE — The horizontal space between planes within a section.

(b) HEIGHT — The vertical space between planes within a section. Height may be above or below the plane ahead depending upon whether the formation is stepped up or stepped down.

(c) INTERVAL — The horizontal space between the section leader's plane and the plane next ahead in the formation.

(d) STANDARD DISTANCE, HEIGHT AND INTERVAL — That distance, height and interval specified by a squadron commander as standard for his particular squadron.

(e) OPEN DISTANCE, HEIGHT AND INTERVAL — That distance, height and interval at which aircraft, while concentrated, can be flown with minimum attention to strict formation keeping.

~~(f) SECTION — The basic tactical unit of the aircraft division. It consists normally of three planes, a section leader and two wing planes. The leader is referred to as number one, with number two on the left and number three on the right. These numerical designations of the wing planes remain unchanged and follow them to subsequent positions.~~

(g) DIVISION — An organization consisting of two or more vessels of the same type, or two or more sections of aircraft of the same type. The aircraft division is normally the basic tactical unit of the squadron, for cruising, attack, or defense.

(h) SQUADRON — An organization consisting of two or more divisions of vessels or one or more divisions of aircraft. It is normally composed of vessels or aircraft of the same type. The term "squadron" may also be applied to a separate organization of minor strength whose commander operates directly under the instructions or orders of the department. The aircraft squadron is the basic administrative and tactical unit of AIRCRAFT, U. S. FLEET.

(i) FORMATION — A prescribed arrangement of airplanes in a section, division, or squadron for maintaining concentration in the execution of a mission. Within any formation, it should be possible to transmit visual orders and instructions rapidly and positively.

PREPARATION FOR MISSION

1-503. Prior to manning planes for any scouting mission, scouts must be allowed ample time for navigation after receiving all necessary navigational information, or from time of receiving information requiring a change of tracks to be flown.

ATTACK INSTRUCTIONS

1-504. Scouting aircraft will not attack unless:

(a) Specifically directed in the orders for operation.

(b) Enemy aircraft are headed so as to make initial contact with own important surface forces.

(c) Scouting mission is completed and considerable damage can be inflicted by the armament carried. However, such attack will not be carried out if there is reason to believe that the presence of own force is unknown to the enemy.

(d) Air operations from an enemy carrier can be delayed. Own forces must be definitely informed of the carrier's position and the condition of its deck prior to such attack.

ENCOUNTERING OPPOSITION

1-505. Scouts will be governed by the following principles when air opposition cannot be avoided:

(a) Close up.

~~(b) Form Lufberry Circle if performing contact scouting or observing gun fire.~~

(c) Fly close to water if practicable.

CONCENTRATION

1-506. Scouts will not concentrate upon objective unless all the units composing the objective are known to have been located, and unless previously directed. Unless otherwise ordered, they will continue to search to the end of assigned area, even though forces have been located in that area. If enemy forces other than the primary objective of the search are located in sufficient number and suitable position to threaten own forces, they should be tracked and the parent vessel informed as to this action. In any case, the required contact reports will be made.

RENDEZVOUS FOR ATTACK

1-507. When the operation order indicates that scouting units should rendezvous for attack each section leader will be responsible for the decision as to proceeding to the contact and rendezvous, depending upon time and distance involved, weather conditions, and fuel available. All sections for whom it is practicable should attempt to rendezvous at the contact and should return to the carrier immediately if the rendezvous is missed.

INFORMATION TO ATTACK GROUP

1-508. Scouts in contact with the objective of an air attack must be prepared to direct the attack to the objective by supplying continuous information as to the position of the enemy and by radio transmissions that will permit homing by the attack group. Scouts watching important forces should be relieved on station so that continuous contact may be maintained.

REPORTS

1-509. Contact, amplifying and tactical reports will be made as outlined in the section on Contact Doctrine, Part One, Chapter 6, Section Two, of this publication.

AVOID DETECTION

1-510. Aircraft making contact shall act to avoid detection by enemy ships unless this avoidance is definitely no longer appropriate.

SCOUTING UNIT

1-511. The normal peacetime scouting unit will be as designated for the particular type of scouting and type of aircraft used.

commander should be made by flying alongside and pointing or signaling the report by hand signals. A pilot leaving station to report in this manner should notify his section leader, if a wing man, or his number two man if a section leader by giving the leaving formation signal — "blowing a kiss". When this signal is acknowledged by a nod of the head, the pilot concerned breaks off and flies directly into position to make the report.

CONTACT WITH AIRCRAFT.

1-608. (a) DANGER OF ATTACK NOT IMMINENT — The procedure is the same as that in the preceding paragraph — sighting a ship.

(b) DANGER OF ATTACK IMMINENT — Since time is all-important, plane sighting enemy should immediately give break-off signal, leave formation without obtaining specific permission and dive past the formation to the vicinity of the squadron commander, giving the "attacked" signal — rocking wings from side to side, both during the approach to the squadron commander and after arrival in his proximity. The signal "violent rocking of wings" means, when given by the squadron commander, "attack"; given by any junior, "We are about to be or are being attacked". Supplement by radio alarm and burst of gunfire.

(c) COMBAT ORDERS — When in contact with enemy aircraft, unless use of radio is specifically prohibited, voice radio may be freely used by the pilot sighting enemy aircraft, and by the tactical commanders of the aircraft units in the proximity of the contact.

(d) MUTUAL ASSISTANCE — Airplanes in the same area shall take such steps to assist each other in repelling hostile air attack as time, the assigned mission, and their characteristics permit.

CONTACT REPORTS

1-609. The importance of promptness and accuracy in making Enemy Information Reports cannot be over-emphasized. To this end the pilots of all Fleet aircraft must become and remain thoroughly conversant with the procedure for the submission of "Enemy Information Reports," "Contact", and "Tactical" or "Amplifying Reports".

1-610. Enemy positions, particularly that of the enemy battle line, shall be reported in bearing and distance from O.T.C. when contact between surface main forces is imminent. Scouts will transmit all pertinent information concerning the enemy such as disposition, composition and maneuvers of the battle line, launching of aircraft, maneuvers of light forces, etc. If no changes develop in the tactical situation, scouts will so report every fifteen minutes. It is particularly important that information be supplied concerning the relative grouping of enemy forces such as may give indication as to probable direction of the enemy deployment. Ordinarily planes of designated heavy cruisers may be detailed for tactical scouting during the approach, and carrier planes detailed during the engagement. Fast carrier scouts with long endurance are particularly suitable for assignment.

1-611. Aircraft shall be equipped with suitable message bags and personnel instructed in accurately dropping them, so as to provide for delivery of necessary reports by message dropping in case of radio failure, or when radio silence is to be maintained or delivery of reports is so ordered.

ACTION ON CONTACT

1-612. An airplane sighting an enemy submarine when in visual contact with own vessels shall indicate the position of the submarine by repeated diving, shall attempt to destroy the submarine by bombs and machine gun fire, and mark the spot with float lights.

1-613. An airplane sighting a mine in the path of, or near own vessels, shall indicate the position of mine by circling the mine at low altitude, and attempting to destroy it by machine-gun fire.

1-614. Airplanes in the same area shall take such steps to assist each other in repelling hostile air attack as time, the assigned mission, and their characteristics permit.

will fall easy prey to attacking fighters, or will at best be forced to abandon its mission in order to use its armament.

SINGLE PLANES

1-629. As with formations, the most effective defense against enemy fighters lies in speed and concealment. A two seater brought to action by fighters has little hope of defense except by circling in such a manner as to give a steady gun platform for the free gunner and preventing any fighter from gaining a position under the tail. If possible to gain a position close to the water or ground before being brought to action, it should be done, but a radical dive while engaged will prevent the free gunner from firing, and will present an easy target to the attackers.

THE LUFBERRY CIRCLE

1-630. Preparatory Signal: Leader circles hand horizontally.

Execution Signal: When leader circles.

Most planes are extremely vulnerable to attack from directly astern. Hence effort must be made to prevent opposing fighters from attaining this position. In the Lufberry circle, (the only defensive formation available to fighters), each plane is in a position to bear on an enemy plane occupying this position with respect to another plane of the circle. As the name implies, it is a circle of three or more planes in a tight turn, spaced equidistantly about the circumference. A plane attacking one plane of the circle must of necessity fall directly in the line of fire of the following plane. Two-place or multi-seater planes may also use this circle to advantage to afford mutual support when attacked. Guns of all planes will thus be able to bear on any enemy attackers seeking to obtain positions under the tails of planes in the circle.

CHAPTER 7

COMMUNICATION DOCTRINE

COMMUNICATIONS

1-700. (a) Standard procedure, as laid down by current Communication Instructions, U. S. Navy, governs all voice and key transmissions. The degree of radio discipline to be observed, calls to be used, type of transmission to be employed, and special communication instructions to be followed will be ordered for each operation. In general, all radio transmissions for which hand signals may be substituted, or which may be covered by doctrine or instruction prior to take-off must be avoided. Radio transmission reveals what frequencies our forces are using and permits the enemy to jam those frequencies. Strategic as well as communication security may also be jeopardized. Hence the rule: "If possible, avoid radio transmission."

(b) Means of reducing radio traffic are: use of visual signals, flag hoists and deck panels by ships, and message dropping by planes. Small sand bags, with message compartments, are available for this purpose

(c) In situations where advantage of speed outweigh the desirability of security, when in contact with enemy aircraft, the omission of formal calls and procedure in voice transmissions is considered justified, relying for authentication upon the recognition of voices of pilots or special, easily memorized code words.

RECOGNITION SIGNALS

1-701. No thoroughly satisfactory means of aircraft making known to friendly ships their identity has yet been evolved. At present, and until a better method is promulgated, units and groups of Aircraft, Battle Force, will remain out of sight and out of anti-aircraft range of own forces as much as practicable. When closer approach is necessary, and when returning to the carrier, they will approach at an inoffensive altitude, too low for a bombing attack and too high for a torpedo attack. This altitude is designated at 1,000 feet. Immediately upon being challenged, the unit or group will turn away from the force approached until the challenge is answered and acknowlegement received. Challenges, answers and acknowledgments will be promulgated for individual exercises.

INTER-PLANE SIGNALS

1-702. **Hand System of Morse Characters.**

A ready method of signaling is the use of the hand to send dots and dashes. A closed fist represents a dot, and an open palm a dash. Use of hand, tapping upon windshield or fuselage, with spacing of taps corresponding to spacing of key sending, may be used.

RADIO FAILURE SIGNALS

1-703. (a) Pilot or radioman taps earphones followed by holding his nose (bad odor) meaning "radio out of commission."

(b) Pilot or radioman taps earphones followed by patting head meaning, "I have taken over communications."

(c) Pilot or radioman taps earphones and nods head meaning, "radio is now in commission."

(d) Taps earphones and points to plane called meaning, "you are being called by radio."

(e) Press closed fist and thumb meaning. "check microphone button and keys."

In event of a radio failure of the leader's plane his duties, as regards communications, devolve on the next senior. The number two plane of the leader's section should endeavor to relay all important information to the leader by means of visual or blinker signal.

CHAPTER 8

FORCED LANDING PROCEDURE

1-800. There are two prescribed procedures for forced landings of airplanes: the NORMAL FORCED LANDING PROCEDURE AND SIGNALS (Procedure No. 1) and the WAR-TIME FORCED LANDING PROCEDURE AND SIGNALS (Procedure No. 2).

1-801. The NORMAL FORCED LANDING PROCEDURE (No.1) will always be USED IN TIME OF PEACE, regardless of the degree of radio silence which may be imposed during tactical exercises. This procedure may be amplified as necessary to cover local conditions or special operations. It will be used in time of war when prescribed by competent authority, as during operations when contact with the enemy is improbable.

1-802. NORMAL FORCED LANDING PROCEDURE AND SIGNALS:

Procedure No. 1

(a) A copy of this procedure will be carried in the cockpit of all Naval airplanes. It will always be used in time of peace regardless of the degree of radio silence which may be imposed during tactical exercises. It may be amplified as necessary to cover local conditions or special operations.

(b) Visual forced landing signals as prescribed below will be made by the personnel of a disabled Naval airplane when in company with other aircraft or within visual signal distance of a surface vessel.

I. Prior to forced landing.

DAY — Bend arm across forehead (weeping).

NIGHT — Fire red Very star.

by exposing them to anti-aircraft fire directed at retiring planes. When necessary to pass close aboard screening vessels, they should be brought under machine gun fire.

LIGHT FORCE ATTACKS

1-622. Light aircraft may be employed to make dive bombing and machine gun attacks on surface vessels under the following circumstances:

(a) As part of a coordinated aircraft attack on enemy capital ships.

(b) As a task group whose objective is the vessels of the screen over which the heavy bombers must pass to reach their objective.

(c) As a task group whose objectives are the enemy light forces.

(d) When operating as an Inner Air Patrol against submarines.

STRAFING OF SURFACE TARGETS

1-623. [illegible]

(a) Against capital ships - battleships and heavy cruisers - strafing should be employed only during the bombing dive and before the bombs are released. Machine gun fire will be effective only against anti-aircraft crews and fire-control personnel in the tops. The results to be expected from this type of attack do not warrant exposure of our planes unless primarily attacking with bombs of sufficient size to inflict serious structural damage.

(b) Against aircraft carriers, with planes on deck, repeated strafing attacks should be made following the bombing-strafing dive. Exposed personnel and planes on deck furnish excellent targets with the expectation of doing considerable direct material damage or indirect damage through the use of incendiary bullets. Carriers with planes not on deck should be straffed only in the bombing dive.

(c) Against light [illegible] destroyers, and submarines, fifty caliber machine gun fire may be expected to do considerable material damage. Against a destroyer formation proceeding at high speed, or considerably dispersed, and thus free to maneuver radically, machine gun fire may often be more effective than bombs. A series of short steep dives, started from an altitude of approximately 3000 feet, with fire directed against engine-room hatches and gun and torpedo crews, will prove most effective. Attacks delivered from ahead or astern reduce the effectiveness of enemy anti-aircraft fire, and should be effective against gun, torpedo, and ship control personnel.

(d) The six plane division of pursuit or light aircraft is the ideal strafing unit, permitting continuous fire upon the target and avoiding delays between successive dives.

ATTACKS AGAINST SUBMARINES

1-624. Owing to the probable absence of effective anti-aircraft fire from submarines, attacks on them may be made from comparatively low altitudes and at close range, thus affording greater accuracy in bombing and machine gun fire. The danger of fragments, both from the bombs of the planes ahead and from one's own bombs should be kept in mind unless aircraft depth charges or delayed action fuzes are used.

LOW CEILING ATTACKS

1-625. Under conditions of low ceiling, or whenever a solid overcast exists at heights above two thousand feet, bombing and strafing attacks can be made from cloud concealment.

A properly executed diving attack from the base of a cloud layer offers excellent chance of surprise, and probable minimum effectiveness of enemy anti-aircraft fire.

The attacking unit takes an echelon formation, well closed up, with each plane stepped up, and only slightly on the quarter of the next ahead. All planes, except the leader, are continuously in the cloud layer, and unable to see the surface or be seen. The leader flys in the base of the clouds, being able to see just sufficiently well to make his approach upon the target. Attack is made by a diving turn away from the echelon, thus affording following planes an opportunity to gain some distance at the start of the dive.