TORPEDO TRAINING DOCTRINE

UNITED STATES ATLANTIC FLEET
AIR FORCE
TORPEDO SQUADRON NINETY SEVEN

APRIL 1945
VT-97/P11-1
Serial: 043

UNITED STATES ATLANTIC FLEET
TORPEDO SQUADRON NINETY-SEVEN

CONFIDENTIAL

c/o Fleet Post Office,
New York, N. Y.
30 March 1945.

From: The Commanding Officer.
To: Torpedo Squadrons Under Training, Commander Fleet Air,
Quonset Point.
Via: The Commander Fleet Air, Quonset Point.

Subject: Tactical Doctrine for Torpedo Training.

Reference: (a) VT-97/P11-1, 21 November 1944, Range Instructions.
(b) Conf. Airmailgram 141855 of February 1945.
(c) ComFAir, W. C. Conf. serial 0515, PA1/04-JWE of 2/15/45.

Enclosure: (A) Tactical Doctrine and Instructions for Torpedo Range and
Air Work.
(B) Diagrams of four (4) exercises used in correct launching
procedure of torpedoes.

1. Reference (a) is cancelled. The instructions contained in
enclosures (A) and (B) are in effect.

2. Reference (b) directs that 260 knots speed and up to 800 feet
altitude be used for training drops.

3. Excellent information is contained in reference (c) on shallow
water drops with shroud-ring tail torpedoes. Pertinent points are incorporated
for training in enclosure (A).

G. N. OWENS

U. S. Naval Air Station,
Quonset Point, R. I.
11 APR 1945

FIRST ENDORSEMENT to
VT-97 conf serial 043
dated 30 March 1945.

From: The Commander Fleet Air, Quonset Point.
To: Torpedo Squadrons Under Training, Commander Fleet Air, Quonset Point.

1. Forwarded, compliance with enclosure (A) is hereby directed.

Copy to: CNAOTC
ComAirLant
ComFAir, W. C.
ComFAir, Alameda
ComFAir, Seattle

D. HARRIS
Chief of Staff
UNIVERSAL STATES ATLANTIC FLEET
TORPEDO SQUADRON NINETY-SEVEN

C/o Fleet Post Office,
New York, N.Y.

A. SYLLABUS

GROUND SCHOOL

To be completed prior to commencement of torpedo launching.

1. Pilots and Crews

(a) Movie and lecture on "Preparation of Fully Ready Torpedoes" and "Adjustment at the Plane".
(b) Movie and lecture on "TBF - TBM Torpedo Loading Procedure".
(c) Movie and lecture on stabilization of Mk 13 Torpedo.
(d) Actual Loading of Torpedoes.
(e) Aerial torpedo attack new technique MN 4378A revised.

2. Pilots

(a) Lecture on sighting problems. (Proper radar ranges, actual ship length, lead, etc.)
(b) Lecture on the use of radar range finding in torpedo attack.
(c) Lecture on exercises to be used and on tactics.

AIR WORK

1. On all runs pictures are taken with the F46 Torpedo Camera and the indicated air speed on each run is recorded and turned in for assessment of these pictures.

2. Each pilot drops three cement dummy torpedoes using exercise one as shown in the back of this pamphlet.

3. Each pilot drops as many exercise head torpedoes as time and availability permit, receiving a minimum of five drops.

(a) The first two torpedoes per pilot will be individual runs in four plane groups, using 220 knots (plus or minus 10 knots) and 500 feet altitude, 1250 yards range, employing exercise one. The third torpedo per pilot will be a shallow water altitude-speed combination using exercise one, and release will be at 220 knots, (plus or minus 10 knots, 250 feet altitude and Range of 850 yards, or 250 knots and 250 - 300 feet depending on condition of aircraft.) The fourth and fifty drops per pilot will be tactics and formation drops. During these last two drops and also during subsequent Group Refresher Exercises 260 knots and up to 800 feet altitude will be used for drops.

ENCLOSURE (A)
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TORPEDO SQUADRON NINETY-SEVEN

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AIR WORK (cont)

4. When conditions are not favorable for torpedo launching and recovery, dummy runs will be made using exercises shown in this pamphlet as indicated by progress of squadron's training.

5. Upon completion of Squadron Torpedo Training, Air Group coordinated attacks are conducted with the VT squadron launching six torpedoes, using exercises four or five.

TORPEDO RANGE INSTRUCTIONS

1. If a pilot finds that just prior to launching point he has erred in speed or altitude, this altitude-speed combination should be accepted and launching range adjusted to correct the error.

2. Squadrons shall contact the Controlling Officer upon arrival on the range, and stand by for instructions. Torpedoes WILL NOT be launched when a Controlling Officer is not present and in radio communications with group.

3. All Pilot's Torpedo Reports shall be delivered to the Torpedo Training Unit immediately after dropping.

4. If an Air Group exercise is not to be carried out as scheduled concerning the number and types of aircraft involved, and type of attack to be employed, the Controlling Officer on the Range shall be informed so that safety precautions may be observed.

5. Prior to reporting for torpedo dropping each squadron will draw and have properly boresighted sufficient F46 Torpedo Cameras from the supporting CASU to equip all planes. At least two dummy exercises will be completed to test camera and pilots flight technique to drop by film assessment.

EXERCISES

In the descriptions and drawings of the following exercises arbitrary headings and corresponding plane courses have been used. These can, naturally, be altered to fit any situation. The exercises are: No.1, No.3, No.4 and No. 5. No. 2 has been omitted due to a combination of tactics in other exercises.

EXERCISE NO. 1:

This is a basic training exercise to familiarise pilots with the fundamental problems involved.
EXERCISE NO. 1: (cont)

A four plane division is used with each pilot making IBP runs. This exercise is pictured by the diagram for No. 1 exercise in the back of this pamphlet.

The target vessel will be within a designated area and will steam at 20 knots on a steady course of heading 270° or 090°.

A division of four planes proceeds to the target ship at 3500 feet and reports "ON STATION" to the Controlling Officer. The division circles the target ship at this altitude until informed by the Controlling Officer to commence the exercise. Upon being directed to execute dummy runs, the division shall maintain altitude and proceed five miles ahead of the target’s course then make a standard 90° turn north. The division proceeds on this course 5000 yards and makes a 90° standard turn east, thus paralleling the target on reverse course. As soon as this turn is completed the division forms an outside stepped-up echelon, with planes 500 yards slant range apart bearing 45° from each other.

When the lead plane has a bearing of 70° from the target, a simultaneous diving turn is executed by all planes toward the target, heading for an imaginary position in front of the target corresponding to the necessary lead in yards. All planes are making IBP runs from this point.

A recommended altitude range-speed-angle combination for this is as follows:

- Aircraft speed: 220 knots
- Aircraft altitude: 500 feet
- Slant range: 1250 yards
- Target angle (lead plane) 60 (which gives a torpedo track of 80° - 85°)

The above combination will give the lead plane:

15° Lead angle
269 miles lead
300 yards lead. (This should be applied to actual ship length’s lead by the pilot according to the length of the target).

The other planes will have a slightly smaller TARGET and LEAD angle, but not much so.

Upon passing the launching point each plane turns as shown on the diagram for No.1 exercise to effect a rendezvous and the division proceeds to execute another run.

On all runs pictures with the F-46 camera are taken, and the bomb-bay doors are opened, but the bomb-bay doors must be closed immediately after pushing the button. Planes must not fly over the target except in an emergency.
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TORPEDO SQUADRON NINETY-SEVEN

EXERCISE NO. 1: (cont)

The above runs are predicated upon the target's course being 270°. If it is 090° the same procedure is used, with turns and echelons being reversed. If the target indicates that it will reverse course after a run is completed the turn is then made in the direction that the ship will be heading for the next turn.

EXERCISE NO. 3:

This is the basic Formation Attack recommended for training. Its fundamental purpose is to teach co-ordination of three divisions in a modified anvil attack. The target maintains a steady course and the attack commences from head-on.

The object of this attack, as shown by the diagram for No. 3 exercise is to have the three divisions arrive at the launching point at the same time, forming a 120° arc around the target. This is arrived at as follows:

The target stands by on a heading of 270° and upon receiving the "Execute" signal from the flight leader proceeds at full speed on a straight course.

The formation commences its approach for the attack from a point 10 miles west of the target and from an altitude of 6000 feet, and proceeds along its base course, which is directly toward the target, letting down so as to be at 4000 feet when seven miles from the target.

When the formation is 7½ miles from the target all divisions set their gyros on zero. (Note: It is imperative that all radars be in perfect operation for correct ranging)

When the formation is seven miles from the target the flight leader gives an "Execute" signal. When the execute signal is given the formation splits simultaneously and each division proceeds as follows:

1. FIRST DIVISION:

Upon giving the "Execute" signal the first division makes a 90° standard turn in one direction and then turns 180° in the other direction. In this 180° turn the planes open out into a column 500 yards apart. When the division leader is approximately 5° past the course of the target, all planes simultaneously turn 90° back onto the BASE COURSE, and proceed at 180 knots in a line formation toward the target, letting down so that when they reach a point 5000 yards from the target they will be at 3000 feet. When this 5000 yard point is reached, all planes conduct an IFF attack.

At launching point:
Air speed will be 240 knots
Altitude will be 600 feet
Range, approximately 1500 yards.
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TORPEDO SQUADRON NINETY-SEVEN

1. FIRST DIVISION: (cont)

After launching the first division maintains a 600 feet altitude until the other two divisions are well clear. The division may take evasive action by turns in either direction after launching.

2. SECOND DIVISION:

The second division turns 20° off base course to the left and proceeds on this course. As this turn off base course is made the planes fan out, forming an inside echelon with planes 500 yards apart and bearing 45° from each other. The division maintains steady course at 180 knots until the lead plane reaches a bearing 70° from the target (at which time all planes in this division will be 5000 yards from the target, and should be at 3000 feet altitude.) When the lead plane reaches this 70° bearing, a simultaneous diving turn toward the target is executed by all planes, heading for an imaginary position in front of the target corresponding to the necessary lead in yards. All planes make IBP runs from this point.

At the launching point, the second division has:

Aircraft speed: 240 knots
Altitude: 500 feet
Range (lead plane) 1300 yards, and the range of the other planes increases as their respective target angles decrease.

After launching, this division lets down slightly, and if there is any question between planes of the other divisions the 2nd always lets down instead of up.

3. THIRD DIVISION:

When the "Execute" signal is given the third division follows the exact same procedure as the second division but turns right instead of left upon leaving the base course, and:

(a) At launching the speed is 240 knots
Altitude 700 feet
Range (lead plane) 1400 yards, other planes in division increasing their ranges as respective target angles decrease.

(b) After launching, third division pulls up, and if there is any question between planes of the other divisions, the 3rd always pulls up.

By both the second and third divisions following the same pattern, and the first division following the pattern set down for it, all divisions will reach the point 5000 yards from the target, and the launching point, at exactly the same time.
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TORPEDO SQUADRON NINETY-SEVEN

3. THIRD DIVISION: (Cont)

When the attack is conducted in the above manner the target is effectively trapped, all torpedoes enter the water at the same time and have the same water travel. None run parallel.

EXERCISE FOUR:

This exercise is a fluid adaptation of exercise three to counter the evasive action of the target, and it requires a thorough understanding of exercise three.

This is a formation attack which establishes a doctrine of shifting the entire formation to accomplish the basic plan of boxing the target by a $120^\circ$ arc of planes at the launching point regardless of the evasion of target, and regardless of what position relative to the bow or stern of the target that the attack comes from.

For this attack it is necessary to regard the target as a movable point or ball, eliminating the bow or stern aspect until the final IBF runs commence from the 5000 yard points.

The altitudes and speeds of any phase of the attack, and the distance of the break-up from the target, can be altered at will. When the break-up distance is changed, however, the departure angles from the base course of the second and third divisions will have to be changed accordingly in order to reach the 5000 yard point with the proper distance between all planes of all divisions.

For localization purposes this attack is conducted as follows in training:

1. The target is in a 1400 yard diameter circle when the attack commences or is standing by on a steady course and maneuvers at will when the "Execute" signal is given, at a speed of 20 knots.

2. The attack commences exactly as it does in exercise three through the point where the second and third divisions are proceeding on their courses which are $20^\circ$ off the base course, and the first division is in a line proceeding on the base course. As soon as the target starts evading, and definitely commits itself to a right or left turn then each division shifts accordingly. In the diagram for No. 4 exercise the target has committed itself to a right turn. Therefore, the second division adds $10^\circ$ to its deviation from base course and will then head $30^\circ$ from base course. The third division will cut down its deviation from base course by $10^\circ$ and will be on a heading only $10^\circ$ from the base course. The first division will shift its heading to $5^\circ$ left of the base course. After this heading change, the attack is completed exactly the same as in exercise three.

NOTE: Exercises No. 3 and No. 4 and subsequent refresher drops will employ a speed of 260 knots and an altitude of 600-800 feet depending on the number of divisions in attack.
UNITED STATES ATLANTIC FLEET
TORPEDO SQUADRON NINETY-SEVEN

2. EXERCISE FOUR (cont)

The time element from this point on is so small that an attempt by
the target to reverse its turn will not affect the results of the attack.
When the planes reach the 5000 yard point, they simultaneously ex-
cecute TBP runs. At this point they eliminate the circle or rubber ball
idea and consider the bow and stern of the target and adjust lead and
range accordingly. They are still covering a 120° arc around the target
and regardless of where the center is the arc is relative to the bow, beam,
or stern of the target. The attack is still effective even if it is di-
rectly astern.

This attack succeeds or fails depending on the ability of the division
leaders to observe a course change of the target and knowing what to do about
it, and the ability of wing pilots to get into position and maintain proper
position.

EXERCISE NO. 5:

Exercise five is designed for flexibility and may, or may not be done
from formation. The attack is made by individual divisions and its success
depends entirely upon each of the division leaders. If squadron formation
is used the time of launching by divisions is staggered, but launching with-
in divisions is simultaneous. It is a Modified Wave Attack.

The attack originates from a high speed approach toward the target
position. At the six mile slant range position tactics depend on the evasive
action employed by the target. From this point the initiative rests with
each of the division leaders:

PROCEDURE WHEN TARGET SHIP IS USING RIGHT EVASIVE ACTION:

1. First Division:

At the six mile point the division leader starts a gentle turn to the
starboard and then heads on a course which will be tangent to an imaginary
circle of 5000 yards radius, with the target as its center. At the begin-
ing of his turn the number three and four planes cross under into left
echelon. The planes then open out at a 45° bearing from each other, and
500 yards apart. The leader plans his course so as to have a 60° target
bearing when he reaches the imaginary circle. At this point the division
executes a sharp turn to the left and commences the final attacking FBP run.
Numbers 2, 3, and 4 are on the inside of the turn and have no trouble staying
with the leader. Correct timing by the division leader and the turning of
the target ship largely solve the target angle for numbers 2, 3 and 4.
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TORPEDO SQUADRON NINETY-SEVEN

2. Second Division:

The second division makes practically the same maneuvers, winding up tangent to the imaginary circle 1000 yards behind the No. 4 plane in the first division. The sharp left turn, which then commences the attacking run puts the planes in a scouting line 500 yards apart, and they converge on the target simultaneously. From the diagram for No. 5 exercise it is apparent that the second division on reaching the six mile point must make a slight left turn and then continue straight in order to get the proper spacing behind the first division. The second division does not go into left echelon until they start their right turn preparatory to reaching the circle. As the first division reaches the launching point, the second division is in its final approach, the division leader is on a 60° bearing on the turning ship, and they drop their torpedoes a short interval after the first division.

3. Third division:

The third division on reaching the six mile point must make a 30° turn to the left and continue straight in order to get proper spacing behind the second division. They, too, go into left echelon while executing the right turn which puts them tangent to the circle. In executing the left turn to start their final approach they go into a scouting line with the planes 500 yards apart.

The planes of all divisions are 500 yards apart, and the divisions are 1000 yards apart.

Should the target stop its turn to the right and straighten out, or "S" turn the third division is the only one whose tactics must change. To take care of this condition, the third division leader immediately when he observes the ship changing tactics proceeds straight to the circle and commences his attack.

ESTIMATION OF BEARING ANGLE

When a pilot comes in on a torpedo run on any but a dead target the target will either be on a straight course or on a turning course. A relatively simple way to estimate the aircraft's bearing is to draw an imaginary line through the ship's wake and axis if going straight and through the ships tangent to the circle being described if the ships is turning. From this line in either case the pilot can easily determine his bearing angle in order to start his final approach.
EXERCISE ONE

3000FT ALT
5000YDS RANGE
60° TARGET BEARING

5000YDS

500YDS

45° STEP UP

FIVE MILES

500YDS

LAUNCHING POINT

LEAD ANGLE

LINE OF SIGHT

BEARING ANGLE

LEAD IN YDS
EXERCISE FOUR

7 MILES

5000 YARDS

20° TURN

10° TURN

5° TURN

10° TURN