CONFIDENTIAL

HANDBOOK

FOR

DESTROYERS

PACIFIC FLEET

DESTROYERS, PACIFIC FLEET

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CONFIDENTIAL

From: Commander Destroyers, Pacific Fleet.
To : Destroyers, Pacific Fleet.

Subject: Combat Information Centers for Destroyers.

1. This handbook is distributed as a guide for the orderly development of Combat Information Centers in Destroyers. It enlarges on the C. I. C. section of the Destroyer Radar Gunnery Notes, and those Notes will, in the future, be concerned primarily with the radar phases of gunnery and torpedo problems.

2. The inclusion of a Combat Information Center in the ship's internal organization is admittedly a drastic change, particularly during time of war. For that reason it is essential that the developments and experiences of individual ships be available for the information of others. Commanding Officers are urged to forward to the Type Commander both their ideas and the results of their practical experiences.

3. It is anticipated that detailed amplifications of the various sections of this handbook will be issued from time to time by the Type Commander. Local Commanders are encouraged to submit recommended changes to this pamphlet.

M. S. TISDALE

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C. M. SUGARMAN,
Flag Secretary.

538
Plan Pac DDs

PREFACE

Review of the C. I. C. Background:

The development of the Combat Information Center as an integral unit of the ship's organization is possibly one of the most drastic and rapid changes in our shipboard experience. Apparently the need for such an agency, a tactical plot or a ship's operations officer, existed before the war without our general realization of that fact. When radar was developed, it simply furnished us with more information than we were able to handle in any way other than with this tactical plotting and evaluating agency. This is the origin of the C. I. C. It is not a child of theory, it is a proven result of combat experience.

As the importance of the C. I. C. was realized, battle experiences were drawn on and a summary of the essential requirements was made. Included were: graphic plots for both high and low speed (air and ship) targets, air and surface search radars with PPI screens, sound gear, better and quicker control of identification, close liason with Conn, and with gun and torpedo controls, and adequate room for newer and larger equipment. With all these in mind, and weighing the admitted inadequacies of the arrangements then in use, plans were submitted for all classes of destroyers. First attempts followed the current shipboard practice of having the entire unit on the bridge level. All captains wanted it there, though very few of them ever went into the C. I. C. in battle themselves. Closer investigations showed that there was no apparent governing reason for keeping it on the bridge level other than the need for easy and positive communication and a desire to actually see the screens. Provision of voice tubes, speaker-type telephones, and a bridge PPI repeater seemed to answer most of the immediate communication and supervision requirements.

On most classes of destroyers the required larger space was found immediately below the bridge, though in one class it was necessary to use the division commander's cabin on the main deck. The decisions as to the final locations were reached only after a lengthy study of all factors involved by the Department and all commands concerned in the Atlantic and Pacific Fleets. Since these decisions, based on operating requirements and need for future expansion, have been made for the entire fleet, it is incumbent on the individual ships to be so organized and trained that they utilize to the fullest the potential offensive assistance of the C. I. C. In this respect not only must the C. I. C. itself be proficient, but the Commanding Officers and the weapon control parties must take fullest advantage of the information furnished by C. I. C.

INDEX

I. OBJECT OF COMBAT INFORMATION CENTER

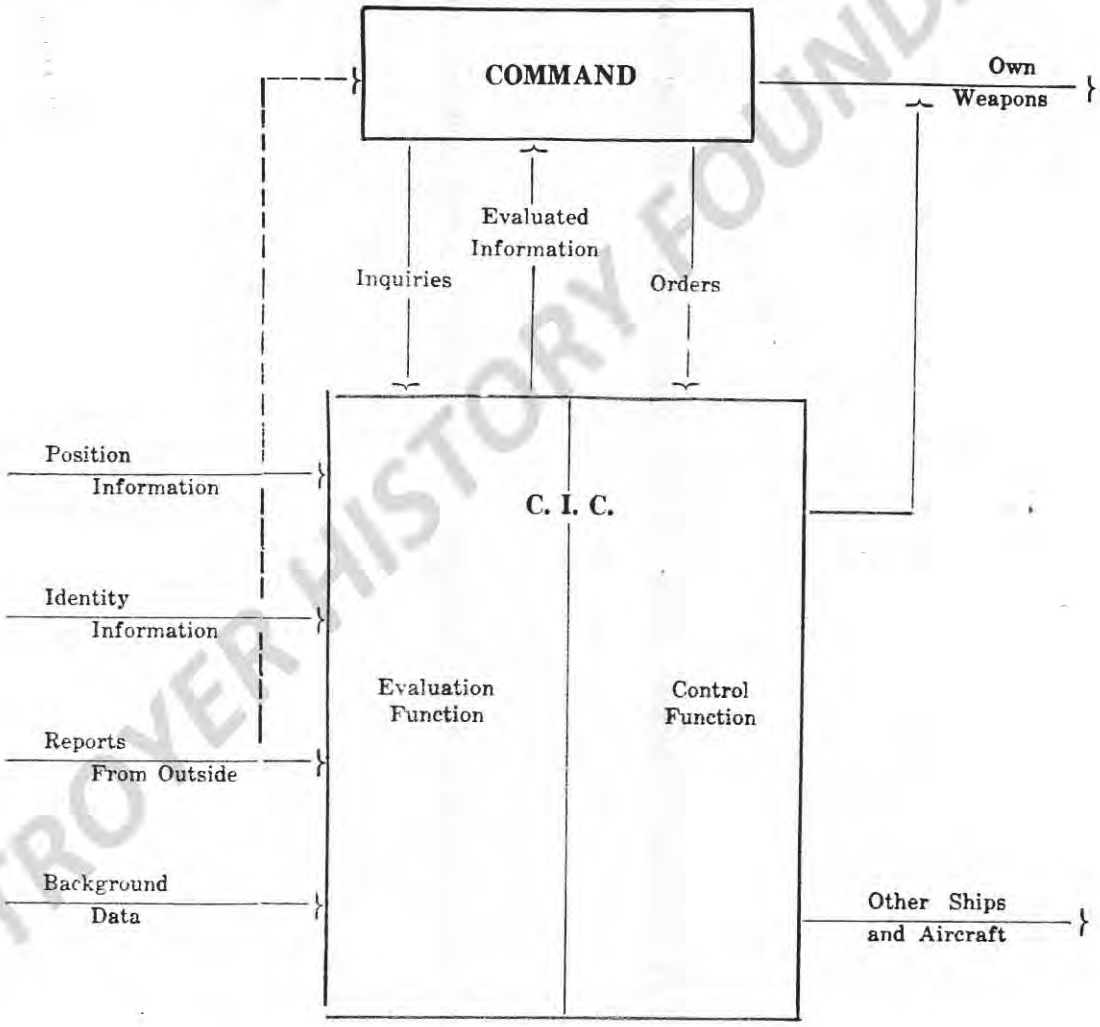
101. **The object of the Combat Information Center** is to assist the Command in planning a correct course of action, and to assist the Command and weapon-control in execution of that plan.

II. FUNCTIONS OF COMBAT INFORMATION CENTER

201. The Combat Information Center is, briefly, an agency for the collection, evaluation and distribution of combat information, and an agency for facilitating the use of that information. It is not something strange and complex, nor is it merely a radar plot or an anti-submarine plot under a new name. It provides, however, a marked clarification and simplification of work for the Command.

The following paragraphs in this section show how complex a captains life used to be, and how relatively simple it can be now. They show the vast number of items that once went only to the captain, who had to weigh each bit of data himself and decide whether to use it, discard it, or file it in the back of his mind for future use. They show that the Combat Information Center is now the agency whose primary function is to filter and evaluate nearly all of this material for him. The captain receives the information he needs when he needs it; and he is free to concentrate on his decisions and carry the burden of command. He has, in addition, in the C. I. C., an organization to which he can delegate secondary decisions and control duties as the occasion may require.

202. For purposes of functional analysis the Combat Information Center may be imagined as divided into two sections: the Evaluation and the Control. On this basis the relation between Command and C. I. C. can be schematically shown as follows:



203. To aid in realization of the surprising mass of information available the following lists are included. Obviously much of the data will still go direct to the captain, but details of sifting and correlating all of it need no longer distract him.

(a) **Position Information.**

1. Visual ranges and bearings.
2. Optical ranges and bearings.
3. Radar ranges and bearings.
4. Sound ranges and bearings.
5. Direction Finder bearings.
6. Radar detection receiver bearings.
7. Fathometer depths.
8. SMSD indications.

To make full use of this information in the C. I. C., it is displayed graphically on the DRT, Summary, and Air Plots.

(b) **Identity Information.**

1. Visual identification.
2. Radar identification (IFF).
3. Signal identification.
4. Underwater sound signal identification.
5. Maneuver identification.

At first thought, this identification may seem rather out of place in C. I. C. But the plot can show more readily than other way, for instance, whether a plane sighted and reported by a lookout has previously been detected and identified by radar. It can show more easily if the maneuvers of an otherwise unidentified ship or plane are hostile.

(c) **Reports from Outside the Ship:**

1. Own forces' position reports.
2. Own movement reports.
3. Enemy contact, position, and movement reports.
4. Reconnaissance reports, positive or negative.
5. Intelligence reports.

These reports are filtered and sifted in the C. I. C. and the captain receives, not a series of disconnected facts, but an evaluated report fitted into the entire tactical or strategical picture in its proper perspective.

(d) **The Background Data; merely a partial listing for illustrative purposes:**

1. Own ships characteristics.
2. Friendly ship and plane characeristics.
3. Enemy ship and plane characteristics.
4. Own orders, plans, and objectives.
5. Assumed enemy plans and objectives.
6. Enemy habits and past performances.
7. Navigational information.
8. Geographical information.
9. Weather information.
10. Underwater sound condition data.
11. Own and enemy frequency plans.

To indicate the increased effectiveness of a ship where all this information is available in one place and is sifted with greater thoroughness than the captain has normally been able to do it, a hypothetical example is given: A destroyer is escorting a seaplane tender and aircraft patrols have reported an enemy destroyer of the TOGO class on a course such that she will intercept during the night. The C. I. C. can determine that the enemy carries few small guns but many torpedoes. Intelligence reports indicate effective enemy gun and torpedo ranges. The captain can therefore plan how best to keep the enemy outside his effective torpedo firing range. He can anticipate under what conditions his own guns are most effective and the enemy's least effective. He can decide by comparison of speeds whether pursuit is advantageous, and he can plan his use of clouds and weather fronts for evasion if that action is advisable.

204. **The C. I. C. is the source to which the captain turns for a specific tactical or operational fact, for a general summary, or for an opinion or suggestion. The C. I. C. through the Evaluator, should provide the captain with:**

(a) **Filtered contact, position and identity information presented according to the captain's requirements at the time.**

(b) **Tactical and strategical summaries which include facts necessary for the captain's information and decisions and which are not complicated with irrelevant material.**

(c) **Pertinent reports and background data which contribute to his understanding of the problem at hand and to the resultant decisions.**

(d) **Evaluated comment, suggestions and opinions, based upon the greater availability of information in the C. I. C.**

205. The control function of the C. I. C., with its detecting, tracking and communication equipment can be of inestimable assistance with respect to both own armament and other units.

(a) The details of operation with own weapons are discussed later. Briefly, however, the C. I. C. can:

1. Designate or suggest gun and torpedo targets.
2. Coach gun control on to targets.
3. Provide initial solution for gun computers.
4. Provide either point of aim and target data in torpedo fire or actually select torpedo course.
5. Control, designate, or warn automatic weapons in fire against planes and torpedo boats.
6. Aid in delivering repeated anti-submarine attacks.
7. Control laying of smoke screen with respect to relative positions of own and enemy forces.

(b) With respect to coordination with or control of other units, the C. I. C. can:

1. Control the details of radio communications, particularly voice radio, with other units in tactical company rather than have the captain burdened by this on the bridge. This includes use of such codes as enciphered General Signals and the TBS and Fighter codes.
2. When own ship is senior, provide assistance in directing tactical movements of other ships in company.
3. Provide fighter direction, designation of target for strafing and bombing of shore objectives, or homing for aircraft.
4. Control movements of small craft, such as torpedo boats, landing craft, small minesweepers or minelayers.
5. Participate in coordinated radar and sound search and tracking.

III. EQUIPMENT OF C. I. C.

301. **Plotting Equipment.**

(a) Surface Plot. Dead Reckoning Tracer mounted horizontally with following refinements:

1. Glass top.
2. Moving point of light to indicate own ship's position. The compass rose, designed for A/S tracking is also useful when rapid plotting of several surface targets is necessary.
3. Translucent paper over glass top.
4. Distance or scale change gears. For A/S tracking 200 yds/inch is best, 500 yds/inch acceptable. For surface targets 1000 yds/inch desirable, other scales acceptable according to requirements of problem at hand.
5. Universal-type drafting machine mounted to be usable on any part of glass top.
6. Rulers for drafting machine marked with frequently used range scales.
7. Speed-distance scale for graphic determination of target speed (one for each commonly used scale, see page 11, DesPac Radar Gunnery Notes of May 1943).

(b) Air Plot and Summary Plot.

1. 30" or 36" maneuvering board adjacent to surface plot. If possible should be covered with transparent plastic lightly sanded or otherwise prepared to permit pencil marking. The Summary Plot may be kept on a separate plot if desired.

(c) Gyro repeater and target bearing indicator.

(d) Customary small maneuvering board for incidental work.

(e) Torpedo effective range indicator (see page 12, DesPac Radar Gunnery Notes of May 1943).

302. Search and Identification Equipment.

(a) Air Search Radar.

(b) Surface Search Radar.

(c) Radar identification units.

(d) Radar detection receivers.

(e) Sound gear and recorder (if not in CIC provide communication).

(f) HF/DF and LF/DF (if not in CIC provide communication).

303. Interior Communication Equipment.

(a) Speaker-type telephone (21MC) Outlets.

1. C. I. C. evaluator.
2. Pilot house and exposed conning station.
3. Radar operators.
4. Sound operator.
5. Gun director.
6. Torpedo directors (optional).
7.

(b) Voice tubes.

1. CIC - Bridge.
2. CIC - Sound operator - range recorder (these two may be combined, provided it does not reduce the clarity in 1).
3.

(c) Telephone circuits.

1. Information circuit. (JW) (See note "A" below—CIC—Bridge—Gun Control—Torpedo Control—Plot.
2. Plotting and Range circuit. (X10J1—X10J2).
   (a) Surface radar - surface plot recorder - sound gear.
   (b) Air radar - air recorder.
   (c) Gunnery radar - rangekeeper.—There should be methods of cross-connecting any of these three range circuits as desired.
3. Command circuit—(JA)—CIC—Conn—Lookouts customary key stations.
4. Gun control circuit (JP) outlet should be installed for local control.
5. CIC - Radio (JX handset).
6. The evaluator should have headset or handset with selector switch to any of these circuits.
7.

NOTES: "A" Until special circuits are provided most destroyers will use either the JA or the JW as the evaluators circuit. Choice dependent on each ship's installation. Other circuits may be included as need arises.

"B" The two radar maintenance circuits, X10J1, X10J2, may be tapped on to the X1JV degaussing control line. With this latter transferred from the JV row to a blank row in the plotting room switchboard, the plotting and range circuit may be led to the rangekeeper without much difficulty.

304. **Exterior Communication Equipment.**

(a) Ultra-high frequency tactical voice circuit (TBS).

(b) Intermediate frequency tactical voice circuit (TBL).

(c) Warning net (RBH).

(d) Fighter net (TBL or TBK, RBH, etc.).

(e) Remote control key position.

(f)

305. **Indicators and Designators.**

(a) Clock with sweep second hand.

(b) Gyro repeater.

(c) Pit log speed repeater.

(d) Target bearing indicator.

(e) Target bearing designators mounted on master and remote PPI's, both air and surface, with selective indication to gun control, torpedo control, and auto-weapon control radars as necessary.

(f)

306. **Ready Reference Data** (Illustrative but incomplete list).

A. **Codes and Ciphers**

1. General Signal Book.
2. Signal Cipher.
3. Voice Radio Code (TBS Voice Card, etc.).
4. Fighter Direction Code.
5. Contact Codes.
6. Authenticators.
7. Simple Weather Codes.
8.

B. **Operation Folder**

1. Own Operation Plans, Orders, etc.
2. Operation Plans, Orders, etc., of friendly units.
3. Friendly Movement Reports.
4.

C. **Reports of Enemy**

1. Contact and Reconnaissance Reports.
2. Intelligence Reports where pertinent.
3.

D. **Tactical Publications**

1. Appropriate FTP, Pac and USF Publications.
2. Appropriate DTBs.
3. Special Publications such as "Escort of Convoy."
4. Standard Fleet Cruising Instructions.
5. Type, Force and Unit Cruising Instructions.
6.
7.
8.

E. **Characteristics**

1. Own ship's salient characteristics - gun range, maximum altitude, torpedo speeds and ranges, speed-distance-fuel-consumption curves, minimum turning circle, etc.
2. Friendly ship's characteristics.
3. Friendly plane's characteristics.
4. Enemy ship's characteristics.
5. Enemy plane's characteristics.
6. Intelligence tactical notes: (probable submarine evasive tactics, etc.).
7.
8.

F. **Technical-Operation Data—Sound**

1. Instructions for A/S Warfare, Surface Craft.
2. Supplements on same subject.
3. Sound Operators Handbook.
4. Bathythermograph Charts and Data.

5. **Operating Instructions for units installed.**
6.
7.
8.
9.

G. **Technical-Operation Data—Radar**

1. **Fade (or Null) Charts.**
2. **Operating Instructions for Units installed.**
3. **Radar Operator's Handbook.**
4. **RadONE, RadTWO, etc.**
5.
6.
7.
8.

E. **Miscellaneous**

1. Weather data as desired.
2. Applicable navigation charts.
3. Local and area grid charts.
4. Routing point code lists.
5. Code names and shipping designators where needed.
6. CIC watch bill.
7.
8.
9.
10.

807. **Suggested or projected equipment.** This section is included to suggest the projects and ideas of others. Comments on the feasibility and usefulness of these and other items are requested.

(a) Camera for successive photos of PPI screen, to preserve records of action.

(b) Target bearing designator on bridge PPI.

(c) Plotting table "view-plots" from bridge to DRT—fitted with red screen for night use.

(d) Automatic tracker built into the DRT to receive ranges and bearing electrically from radar and sound units—similar to A/S attack teacher's projections.

(e) A universal-type drafting machine with the bearing control device in the anchor instead of the free end of the drafting machine to permit more rapid plotting.

(f) Same as (e) but incorporating mechanical solution of vector problems, similar to the Craig Computer for vector solutions.

(g) Mirror arrangement at PPI screen to permit pencil tracing of screen at any instant.

IV. ORGANIZATION OF C. I. C.

401. **General Quarters.**

(a) Evaluator.

(b) Ass't to evaluator (if desired).

(c) Surface plotter (DRT).

(d) Surface plot recorder (phones to radar).

(e) Air plotter.

(f) Air plot recorder (phones to radar).

(g) Air search radar operator (one or two men).

(h) Surface search radar operator (one or two men).

(i) Sound operator.

(j) CIC control circuit talker (usually JW).

(k) TBS recorder.

(l) RBH recorder.

(n) Other IC or radio talker-recorders as desired.

402. **Cruising Watches.**

(a) CIC Watch Officer.

(b) Air search radar operator.

(c) Surface search radar operator.

(d) Sound operator.

(e) Plotter.

(f) Standby operator - ready to plot, man phones, etc. as need arises.

NOTE: — In destroyer cruising watches in the Pacific one successful system has been the rotation of sound and radar operators and plotters. Under these circumstances there should be an excellent "attack" operator for each instrument in each watch, ready to take over as needed when contact is made. It is the present opinion of the Type Commander that this plan of rotation is the best.

Other systems provide for more limited interchange of duties such as radar-and-plotter and sound-and-messenger watches. Conditions are so varied in the individual ships and task forces that no specific directive is issued, though it should be noted that the search-gear operators should not stand night lookout watches because of the delay in adaption of eyes to night vision.

Regardless of the system in use, however, search operators should be relieved at all instruments about every half-hour to prevent their becoming screen-blinded or ping-dizzy, and to increase their alertness by relieving the monotony of apparently endless watches without contact.

V. OPERATIONS OF COMBAT INFORMATION CENTER

501. Search and Detection.

(a) **Early detection** of the enemy is obviously such a vital factor in the success of any action that the need for it requires no elaboration. Early detection provides a means and a counter for the "surprise" element which, down through history, has so often proved decisive. With respect to the CIC search and detection, there are two governing factors. First, the search must be as extensive as possible, it must reach out to cover the greatest area. Second, the limits of dependable search must be known in order that plans and decisions be based on sound fact rather than on insecure premise.

(b) **Adequate materiel performance** is the first step towards attaining this high search efficiency. The instruments must be adjusted and tuned to insure their operation at full effectiveness. Then the outside factors governing their performance must be known and appreciated. For instance, the sub-surface water conditions limit the sound search effectiveness; the state of the sea limits, in a measure, the probability of periscope detection; and the proximity of land may influence aircraft detection reliability. The CIC Watch Officer must know and consider such conditions and must, at all times, keep the captain informed of the dependable limits of the searches.

(c) **The alertness** of the search equipment operators is a vital factor in insuring that the enemy will be detected in time to employ the full fighting power of the ship against him. The responsibility for the alertness of the operators should be placed upon the CIC Watch Officer. He should be given power to enforce alertness. His tools are, (1) Insure that search watches are brief and promptly relieved, (2) remedy conditions which cause monotony and fatigue to operators, and (3) foster the interest of the operators.

(d) **Guidance of the search** must be intelligent and in accordance with the requirements of the OTC, the ship's responsibility, and the Type Doctrines. The CIC Watch Officer must interpret these and insure that each operator is made to understand his part in the search.

502. **Plotting procedure.**

(a) Standard symbols have been adopted by air units and should be used by all ships.

1. A dot (.) indicates own ship.
2. A circle (O) indicates definitely identified friendly ships or planes.
3. A cross (X) indicates hostile or unidentified ships or planes. When an unidentified unit is determined to be friendly the plot is continued using circles instead of crosses.
4. A zero (Ø) for IFF indication only, probable bearing error.

(b) Positions of all ships in company should be kept on Summary Plot. Radar operators should memorize this and be able at any time to identify, by name, any ship on PPI screen. Radical changes of position of any ship in company should immediately be reported.

(c) Rough tracks of all friendly aircraft should be kept on Air Plot at all times. This will facilitate immediate realization of presence of strangers.

(d) All new radar contacts, air or surface, should be tracked as soon as located. This will provide a running start for batteries if they are hostile and will be good practice if they are friendly.

(e) Under normal conditions (when hostile surface craft are not expected), the DRT scale should be set for submarine tracking.

503. **CIC and Conn.**

(a) In the coordination of its detecting and locating instruments and in its facilities for tracking and plotting, it will frequently happen that the CIC will have a better picture of the tactical or navigational situation than does the conning officer on the bridge. In these circumstances the CIC can and should be of marked assistance both in furnishing Conn with information and in presenting solutions to current tactical and navigational problems. As a further step in this direction, there have been several occasions when it has been expedient to actually conn the ship from CIC.

(b) For station keeping.

1. For normal station keeping requirements, a PPI repeater on the bridge will supply all necessary information.
2. When this instrument is not available or when it is inadequate, the CIC should supply the desired data; ranges and bearings of guide and other ships, appreciable changes in relative positions of ships, summaries of existing conditions, and evaluated comment thereon.

(c) For tactical maneuvering the CIC can:

1. Locate own ship with respect to others, friendly or hostile.
2. Predict future location of own and other ships by inspection of the plot.
3. Locate proper position with respect to own forces or most advantageous position with respect to enemy forces; then determine how to reach these positions.
4. With its rapid, up-to-the-minute plot the CIC has a complete picture of the tactical situation. This picture is presented to the captain, in whole or in part, as his needs of the moment require. It is here that a competent evaluator, unburdened by the responsibilities of decision and command, can be of inestimable value to the captain. His reports, summaries, comments, opinions and suggestions, all coupled with an understanding of what not to say at a critical time, may well mean the difference between success and failure.

(d) For navigation, the intelligent use of various instruments in CIC should be distinctly helpful.

1. The radars can supply not only bearings but ranges on navigational reference points.
2. The sound gear can often be used to locate shoals and beaches.
3. The DRT, designed as a navigation instrument, is of obvious assistance. In this connection it should be noted that the navigator can frequently do without the actual tracking table, by obtaining all needed information from the course component solver (North and East readings) and from the latitude and longitude computer.

(e) Communication with other units is a definite portion of the ship-control problem. CIC can aid Conn in this matter by taking over routine control of the voice radio circuits, particularly when they are complicated by codes and ciphers or by lengthy and detailed messages.

(f) The value of this ship-control assistance to Conn will be in direct proportion to the abilities of the CIC Officer and operators. For instance they should be able to differentiate between the rolling reverberation of shoal water and the sharper return of a steep-to reef. They should be able to recognize land contours on the screen by having inspected the charts. They should be able to detect and recognize changes in formations or dispositions, and they should be quick and accurate in the use of voice-radio and contact codes. Careful study and patient instruction are well worth the effort in CIC.

504. **CIC and Gunnery.**

(a) **Selection of Targets.**

1. The coordination of CIC and Command in selection of targets is very close. CIC should therefore be well acquainted with fire distibution doctrine, should understand the relative importance of various types of targets, and should be able from the plot or from the PPI screen to recognize the targets most dangerous to own forces.
2. The selection of targets is essentially a Command prerogative, but, in the confusing rapidity of battle, the selection of targets for the several batteries may be specifically or tacitly delegated to the CIC.

(b) **Target designation.**

1. **Target designation in bearing** may be done either electrically, by repeaters, or by telephone. The electrical designation systems, with many refinements, are being installed as fast as they are available.
2. **Target designation in elevation** is a much more uncertain problem. The use of fade or null charts in CIC to determine altitudes and thence approximate position angles is one solution. The use of reports from other ships, planes, or shore units to determine altitude may be of help. Visual observation by lookouts is the simplest. All of these elevation designations must go to gun control verbally, since no elevation designation instruments are yet in general use in destroyers.
3. **Target designation in range** was not an important factor until the advent of radar. The inherent peculiarities of search and fire-control radars are such that range designation can be of definite help in at least two ways. Against air targets an accurate range designation can expedite locating the target in elevation by bringing the pips into the elevation pointer's scope. Against surface and air targets, a designation in range is necessary if there are two or more targets in the line-of-sight. Without range designation the fire-control radar operator would find it difficult to select one of a group of ships or one group of a flight of planes, or to locate a target close to land background.

(c) **Target Tracking.**

1. Destroyer fire-control computers were designed to furnish rapid solutions of high-speed targets. They are neither rapid nor particularly accurate when the relative speed of the target is very low. For fire against surface craft, then, the CIC can provide valuable service to the fire-control party by providing an initial solution of target course and speed, and by keeping them informed as the target maneuvers.

(d) **Incidental assistance.**

1. CIC should be prepared for radar spotting in event of failure of the fire-control radar. The primary burden of spotting, however, remains in the gunnery organization.
2. CIC should also be prepared to furnish gun range and deflection for local control of guns in event of failure in the primary gun control systems.

505. CIC and Shore Bombardments.

(a) **General.**

1. Shore bombardments, both in isolated harrassing attacks and when coordinated in amphibious warfare, have proven to be an appreciable part of destroyer employment during the current war. Gunnery control against shore targets differs in two major respects from that against ships and planes. First, there is no problem of solving for target movement. Second, it is much more difficult to determine a point of aim. It is this second factor in which CIC plays a prominent part.
2. Shore targets are roughly divided into three classes: previously designated spot and area targets, targets of opportunity, and targets for "called" fire from forces ashore. The targets of opportunity usually furnish a point of aim by their nature, such as smoke or a visible gun or body of troops. The range may be measured optically or as described below.
3. Normally shore targets must be located on charts, and the procedures below have been developed by various ships in combat operations. No specific procedures are yet prescribed and information as to the advantages and disadvantages of these and other methods is requested.

(b) Method "A." Coast of such nature that its outlines are readily visible on PPI screen.

1. Locate target on chart.
2. Select point-of-aim in area prescribed. Lay off on chart probable firing course, probable commence firing point, and, with commence firing at zero, times along firing course. Gunnery department make up table of arbitrary range and deflection spots to cover area as required. The point-of-aim remains fixed.

SAMPLE SPOT TABLE

Time	Range	True Bearing	Range Spot	Deflection Spot	Target Notes
00	14800	038	0	0	Center
01					
02		(This table may be entered			
03		with time-range or true bear-			
04		ing to determine desired arbi-			
05		trary spots).			
06	14250	047	+450	R35	Oil tank
07					

3. With the SG operator, study the coastal outline on the chart carefully so that from any probable bearing the SG beam may be trained on the point-of-aim merely from observation of the coastal outline on the screen.
4. Determine in advance the range from the point-of-aim to the coastline along the probable firing bearings. Tabulate these so that from any bearing the additional range from the coastline to the point-of-aim may be determined.
5. On approach to firing position-line, use SG as necessary for navigation (in daylight it may not be needed).
6. Steady near firing course.
7. SG train on point-of-aim.
8. Director match in train thus automatically transmitting bearing to computer **OR** transmit bearing of point-of-aim to computer by telephone, leaving director out of problem.
9. Measure SG range to coastline. Add range to point-of-aim (item 4, above) and telephone total range to computer (rangekeeper).
10. Computer set up problem, tracking point-of-aim as a zero-speed target, generating gun elevation and train.
11. Commence firing.
12. Check with SG at intervals during the firing the generated range and bearing. Correct any appreciable errors.

18. If plane spotting is available, planes should always spot to point-of-aim. When firing to cover the area, the error is the difference between the plane spots and the spots deliberately applied on the computer.
14. Do not let bombardment interfere with search.

(c) Method "B." Procedure same as for Method "A," except:
1. Ships position accurately maintained on chart at all times.
2. True bearing of point-of-aim determined from chart and telephoned to computer.
3. Range to point-of-aim picked from chart and telephoned to computer.
4. This method must be used where coastal outlines are not sharp on PPI. Navigation must be accurate. Requires a little more complex organization during firing.

(d) Other methods may combine a visual point-of-aim with stereo or radar ranges. The combinations are many and it is quite possible that the best plan is to have a tailor-made procedure for each operation. For example, one destroyer in bombarding an aircraft landing strip, selected one end of the strip as initial point-of-aim. Then they set in the computer a target course and speed such that the point-of-aim travelled from one end of the strip to the other in the time it took the firing destroyer to travel the length of the firing course.

506. **C. I. C. and Torpedo Fire.**

(a) **General.**

1. **The problems arising in torpedo fire may be considered to fall into two main categories:**
   - **(a) The torpedo attack. which deals with positioning the attack units for torpedo fire.**
   - (b) **Torpedo control,** which deals with directing torpedoes.
2. The planned torpedo attack is primarily a problem of maneuvering our own attack units with relation to the enemy. Combat Information Center can, from a plot of the positions and movements of the opposing forces, assist the Command to determine the attack maneuvers best suited to the existing tactical situation.
3. Torpedo control is primarily a problem of directing a relatively slow speed weapon of limited range to intercept a moving enemy. Combat Information Center can, from a plot of the positions and movements of the enemy objective, furnish Torpedo Control with the information of enemy movement necessary to an accurate solution of the torpedo control problem.

(b) **Torpedo Attacks.** In a planned torpedo attack, CIC contributes in two ways:

1. By presenting an accurate plot of the positions and movements of both own and enemy forces, CIC can materially assist the Command to determine the correct basic maneuvers. Refer to Destroyer Tactical Orders and Bulletins for details.
2. Once the command has directed the basic maneuvers for the attack, CIC works out the following details:
   - (1) Attack courses and speeds.
   - (2) Coordination of torpedo fire with that of other attack units.
   - (3) Position of attack unit with respect to effective range zones.

(c) **Torpedo Control.** Under conditions of reduced visibility the C. I. C. furnishes all essential information for torpedo fire. The various steps are enumerated:

1. Locate target. Receive target designation from Captain or select target in CIC as ordered. Track and determine course and speed.
2. Transmit to torpedo control:
   - (a) Target course.
   - (b) Target speed.
   - (c) Torpedo speed recommendations—dependent on effective range zone (to Captain who makes decisions as to whether to change).
   - (d) Unit of spread—dependent on range and torpedo track angle. Use 2° if in doubt.
   - (e) Basic depth setting. If governing conditions are unknown, use 10 feet.
   - (f) Target bearing, either by electrical designator or telephone.
3. Transmit to bridge the target range, bearing, course and speed.
4. The actual orders to change torpedo speeds, the number of torpedoes to be fired, and the actual order to fire, all remain decisions of the Commanding Officer.
5. Under conditions of intermittent visibility, CIC may furnish all or part of the information listed. It should be remembered that a visual aim is always preferred to a radar aiming.
6. In some cases, such as the base torpedo course plan, or with casualty at the torpedo director, it may be necessary for the CIC to determine the base torpedo course. This is done using the plotted information and a maneuvering board or a device constructed to solve this problem.
7. **The applicable Destroyer Tactical Bulletins** on Torpedo Fire must be studied. It contains much that the CIC should know.

507. CIC and Anti-Submarine Attacks.

(a) Prior to contact.

1. The DRT should be set on the largest scale available during ordinary daylight operations. During low visibility, when surface radar contact is the most likely method of detection, a medium scale (500 or 1000 yards/in) should be set.
2. The Summary Plot should show at all times the locations of friendly vessels in company. The sound operator must be informed each time a friendly vessel comes within the area covered by his search.
3. The Sound operator should also be informed of all known sources of return-echoes such as wakes, schools of fish, kelp, etc.
4. Check, during the watch, to be sure that operator is searching prescribed sector; and that sector prescribed is correct.

(b) On Contact.

1. Start DRT Plot.
2. Check to be sure contact is not on friendly ship.

(c) During Approach.

1. Track target, informing Conn if contact plots regularly, as a target should, and of target course and speed.
2. The form below is suggested for conversion of right and left "cut-ons" to center-bearing. All cruising watch teams must be drilled to keep this track; time is too short to wait for experts. Both a plotter and recorder are needed.
   The range-rate and ship's-course columns need not be filled out if the recorder is over burdened. They are included for use in analyzing the attack after the action is over.

ANTI-SUBMARINE ATTACK RECORD

Left	Center	Right	Range	Time	Range Rate	Ship's Course

3. While the range recorder remains the primary source of information for conning officer, the DRT plot may frequently be the first to notice changes of course or speed.
4. If the Fathometer is in CIC, any information from it obviously must be sent to Conn.
5. In event of chemical range recorder failure, be prepared to advise Conn of best dropping time from DRT Plot.

(d) Regaining Contact.

1. The DRT is the best method of regaining contact. CIC can recommend when to return and on what course to return to intercept the submarine.
2. DRT should have a transparent overlay etched with circles to indicate submarine travel at eight knots for each minute up to ten.
3. Using this or a similar device, determine arcs of search for regaining contact.
4. Various types of planned searches can best be controlled from DRT plot.
5. Sketch-tracks of assisting ships may be kept on DRT plot to aid in directing attacks by other ships which may be in favorable position.

(e) Radar periscope search notes.

1. Speed of normal automatic rotation of antenna is too great for dependable peris-

cope detection. The degree of operator-alertness required for periscope detection is greater than that required for any other type of search.

2. When conditions are such that periscope approaches, rather than "awash" approaches, may be expected, the antenna should be trained by hand through the normal approach arc of sixty degrees on one bow through sixty degrees on the other. Then sweep automatically through two-thirds or one-and-two-thirds rotation and repeat the hand sweep.
3. In fairly calm seas and with good tuning, periscopes should be detected at an appreciable distance. Operators must be drilled until adequate coverage can be depended upon.
4. Caution operators that the periscope exposures seldom last more than 20 to 30 seconds and are spaced from two to five minutes apart. Report even the briefest of pips.
5. Check all possible periscope pips with sound gear and inform lookouts. (See (f) 6. below).

(f) **Coordination of Radar and Sound.**

1. With radar detection of surfaced and awash submarines expected up to 20,000 yards, coordination of radar, sound, and DRT plot is vital.
2. Commence plot, as usual, on first contact.
3. It may be advisable to close at high speed or to ease in gradually in order not to alarm the submarine. This decision will be based on existing circumstances and on doctrines.
4. Designate target bearing to gun and torpedo directors.
5. Transmit to computer and torpedo director the target course and speed data from DRT plot.
6. As range closes, coach sound gear on to target. Whether or not to ping directly on target before it submerges depends on circumstances and local doctrine. Direct pinging before submarine submerges may warn him of approach.
7. As pip disappears on screen, pick up target with sound gear.
8. Inform Conn as range decreases and of time to slow for sound attack.
9. Be ready to select torpedo firing course if such action is called for.
10. If searchlights are not automatically controlled in train, be ready to furnish relative bearing to them.
11. How soon to open fire on an unaware surfaced submarine is rather a complex decision. Among factors to be considered are: The anticipated gun accuracy and expected pattern, the effectiveness of flashless powder which may be seen by target or other hostile units, the visibility, the assumed effectiveness of the submarine's detecting equipment (radar, sound and visual), the relative position of submarine with respect to her target (how urgent is the attack), the relative position of friendly units with respect to own gun and torpedo lines of fire.

(g) Communications.

1. There is no special problem in exterior communications. Contact and amplifying reports should be made in accordance with current doctrine, with due regard to the urgency of reporting submarines which are in attack position.
2. In some destroyers the sound stacks and recorder are in the CIC. This permits the most effective coordination of all units with the least effort.
3. With the DRT and the sound gear and recorder in separate spaces, 21MC, voice tube, and telephone circuits must be used both to connect those units and to talk to Conn. Destroyer installations are so varied that no specific instructions are possible. Remember only that, once sound control means has been shifted to the recorder, positive means must be provided to get ranges to the DRT. Communications must be organized to provide these ranges to the plot without delay.

508. **C. I. C. and Fighter Direction.**

(a) **Fighter direction is the process of assisting own fighter planes to intercept enemy aircraft, either by informing the fighters of the respective relative positions or by prescribing for them the courses and speeds to intercept. The primary source of information is a radar plot.**

(b) **Preliminary Information.**

1. All courses and bearings transmitted to fighters are magnetic.
2. Always keep fighters between enemy planes and the enemy's target.
3. Always keep VF above enemy, if in doubt put them higher—it takes a minute to gain 1,000 feet, a few seconds to lose it.
4. Use fighter code (CSP 1291A).
5. If in doubt, direct fighters to retire at maximum speed toward enemy's most probable target.
6. Remember, there is always an appreciable time lag. One minute means 3 to 5 miles, or with planes on opposite courses it is 6 to 10 miles per minute.
7. Keep continuous plot of own and enemy planes and keep it up to the minute by DR if necessary.
8. Unless there is good reason to the contrary, keep fighters in orbit overhead until they are needed.
9. On other than crossing raid put VF in orbit in path of raid when plots are approximately 15 miles apart.
10. Directing VF to orbit to port or starboard allows FDO to make last minute correction in placing of VF in path of raid.
11. Keep fighters fully informed at all times.

(c) **The Informative Method** requires less previous experience or training and may be effective on simple direction problems.

1. Inform fighters of enemy bearing and distance from directing ship, if possible of enemy course, altitude, numbers, type and probable objective.
2. The fighters will do their own navigation.
3. Keep fighters informed of enemy bearing and distance as they close.
4. Inform fighters when target is nearing, and before the pips merge in the scope, be sure to alert them.
5. Never let the enemy get between the fighters and the principal target.

(d) **The Direct Method** is simpler for the fighters and is more accurate when handled by experienced personnel. Control of fighter movements remains with Fighter Director Officer who has a better picture of the situation as a whole. This method, in addition, relieves the fighters of the burden of navigation.

1. Plot track of enemy planes, and locate own fighters on Air Plot. If fighters are overhead they will not be seen on radar screen.
2. Direct VF on course to intercept enemy planes. Give them speed and altitude at which to fly.
3. As fighters proceed on this course, inform them of enemy's distance from the fighters.
4. Normally, when plot shows friendly and enemy indications are approaching to within 15 miles of each other the fighters should be orbited and held in a position between the enemy and his expected target.
5. As pips on the scope converge keep fighters informed of the distance apart.
6. If pips merge and no contact is reported, **do not hesitate**, direct fighters to retire toward enemy's objective at maximum speed.
7. **Never** let the enemy get between the fighters and the principal target.

(e) **Miscellaneous.**

1. The standard procedures used in carriers and shore stations are vastly more complex than that outlined here. This outline is simplified to present to destroyers

without trained fighter-director personnel the bare essentials of the process adapted for such use. It is admittedly a stop-gap procedure and will be amplified as trained fighter-director officers become available for general destroyer assignment. Destroyer personnel should familiarize themselves with this procedure vocabulary as well as the Pacific Fleet Radar Doctrine so as to be valuable as a guardship, and also to aid in clarifying their own air plot when a carrier is directing.

2. Possible Destroyer-fighter-director operations are:
   (a) Anti-snooper fighter-direction. In this case, where destroyers are well out from the screened unit, the fighter-direction may even be done by visual means.
   (b) Destroyer Anti-aircraft pickets, where destroyers are stationed 15 to 30 miles from carriers, and are given fighter control to provide intercept at greater distances from enemy objective.
   (c) Destroyer control of shore based fighters for protection of convoys or destruction of enemy patrol and scouting aircraft.
   (d) Destroyer's succession to fighter control in event of casualties in larger ships.
   (e) Coordination with Argus Units, particularly in the initial stages of amphibious operations when their radar and communications are not yet fully established on the beach.

VI. TRAINING AND INSTRUCTION

601. Shore Based Training.

(a) Radarmen.

1. The various bureau, Fleet and Type publications list in detail the schools available for radar operation and maintenance.
2. For those ships in which the rotation of radar and sound operators is considered desirable, the sound-school at Pearl Harbor, as well as the sound-training units at the advanced bases, are prepared to assist with short courses from one hour to one week whenever ship schedules permit.
3. The Fleet Radar Center and the Destroyer Schools in Noumea are instructing radar and sound operator students in the essentials of plotting and CIC background as limited personnel and material equipment will permit. These schools are attempting to exchange dual-trained operators, when available, for shipboard operators not so trained to those ships which want them.

(b) Soundmen.

1. Essentially the same facilities are available for sound operator training, with the notation that the schooling facilities are probably more complete.
2. Soundmen should, whenever possible, be sent to the Fleet Radar Center or to mainland operator schools for short basic plotting instruction as soon as practicable.

(c) Officers.

1. Schools are being organized both in Pearl Harbor and Noumea for the training of CIC watch officers. Details are not yet definite and the schools themselves should be consulted.
2. CIC watch officers should utilize every opportunity to attend shore-based schools and become familiar with basic radar and sound operation.

602. **Training within the Ship.**

(a) **Tracking.**

1. All radar and sound operators should be taught how to plot. This can readily be done aboard ship either in port or at sea.
2. All radar contacts outside the immediate formation should be tracked as soon as detected, both as preparation for action, and as good practice. Under normal conditions the duty plotter should do this. The men will soon become surprisingly proficient—there is no reason why they shouldn't—and as skill increases they can be used during critical situations, releasing officers for other duties.
3. Any man intelligent enough to stand radar and sound watches is smart enough to solve maneuvering board problems. All of them should be taught aboard ship and it will be both gratifying and surprising to learn how useful they can be.

(b) **Synthetic Computer (rangekeeper) problems.**

1. For synthetic tracking problems when no targets are available, set up an imaginary target in the computer. With own course and speed inputs operating, the computer will generate continuous ranges and bearings.
2. Transmit these ranges and bearings to the plotter by telephone, as though they originated at the radar, and the synthetic target can be tracked through any maneuvers of own ship or target.
3. This type of drill may also provide opportunities for CIC and Conn to simulate ship-control problems.

(c) **Telephone talker drills.**

1. Telephone talkers have always been a headache. Do something about it.
2. Instruct all talkers in terminology, methods of addressing and delivering messages, and in voice-control. Impress upon them they are talkers, not re-phrasers and normally not originators of messages. Make them deliver messages as they hear them.
3. Lastly, train the officers to give the messages to the talkers as they want them delivered.

(d) Coordination of gun and control parties.

1. Any available targets may be used to exercise at target tracking and designation. Any part of complete control problems may be run through during cruising watches.

(e) School and Instruction.

1. Group instruction in radar theory, operation and maintenance.
2. Group instruction in sound theory, operation and maintenance.
3. Group instruction in plotting and use of maneuvering board.
4. Instruction for all sound operators in use of Morse code in underwater sound.

608. Training with other Units.

(a) Tracking and Plotting. Whenever feasible at sea, Task Forces may conduct mutual tracking and plotting exercises, transmitting course and speed data to other ships during the runs or afterwards. Obviously other ship units, gun and torpedo, may be exercised simultaneously.

(b) Maneuvering without visual observation. Conduct simulated night gun and torpedo attacks during daylight by having Commanding Officer maneuver "blind," with the Officer-of-the-Deck on the bridge intervening only in event of imminent collision, grounding, or enemy contact.

(d) The CIC activities can be coordinated with those of other units in simulated gun, torpedo, anti-submarine, anti-aircraft, and fighter direction exercises.