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Bureau of Naval Personnel

• RESEARCH REPORT •

THE DEVELOPMENT OF A MULTI-PURPOSE ANALYSIS TECHNIQUE FOR NAVY RATINGS

Technical Bulletin 53-1

PART I

by

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So many persons have contributed to this study that it is difficult to be sure that all individuals and their organizations received due credit. If any have been omitted, we express our regrets.

SUMMARY

Due to rapid technological advances in weapons and equipment in the Gunner's Mate Rating, the occupational content of this rating has become extensive and complex. Comprehensive data, including accurate and up-to-date information on specific weapons and equipment, are needed.

The purpose of this research contract was the development of a multi-purpose analysis procedure for the Gunner's Mate Billet with particular emphasis on data collection for maintenance, casualty diagnosis and rectification procedures, and operational sequences of new weapons in the field of ordnance.

The 3"/50 Rapid Fire Twin Mount was selected as the vehicle for the study because of its relative newness and because of the existing immediate need for information relative to selection, assignment, and training of new personnel.

Based on the expressed needs of current and potential consumers within the Bureau of Naval Personnel, methods, instruments, and techniques were developed and applied in the field. These were revised and modified as necessary as indicated by field experience.

The result of this study includes a detailed comprehensive breakdown of the weapon casualties in terms of frequency, casualty analysis, rectification procedure, time requirements, personnel proficiency, battle station assignments of 3"/50 gun crew members, verification of ordnance publications, etc..

It is believed that the methodology developed as a result of

this study could in the main be adapted to Navy use with such conditions as are elaborated upon in the body of the report.

It is recommended that this methodology be validated in-service using the remainder of the weapons in the Gunner's Mate Billet, with the above mentioned stipulations, and a complete follow-up to the eventual consumers be made. This was not possible, in this study, because of the necessary contract limitations.

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Part II

CONSOLIDATION OF CASUALTY REPORTS
(Under Separate Cover)

Part III

FACTUAL DATA RECORDED DURING FIELD TRIPS
(Under Separate Cover)

CHAPTER I

THE PROJECT AND ITS SIGNIFICANCE

The Problem

Simplicity in design, operation, and maintenance of ordnance equipment is becoming as outmoded as the bow and arrow or the crude fighting equipment of the Stone Age. With the advent of rapid technological strides in the design, automation, and manufacture of modern weapons of warfare, the Navy faces the increasingly urgent problem of determining occupational content for existing ratings as these become broader in scope and more complex in structure.

Semi or complete automation of weapons and mechanisms has largely removed the heavy physical demands of, for example, a Gunner's Mate Rating. Director and, in many cases, remote control have taken over the operational phases of many weapons. However, it is erroneous to assume that, as a result of automation, the need for the technical knowledge and responsibilities of the Gunner's Mate is lessened.

The present age has aptly been characterized as the "push-button age," but the implications of this nomenclature can be misleading and often are. The mistaken inference that automation will ultimately relegate the man to the low order of the "button pusher" is too frequently accepted without reservation, and re-

sults in a philosophy of training which holds that a person, if taught to react automatically to specific patterns of action, will be adequately prepared to do a competent job.

Let it be conceded that as long as the machine functions properly this operational pattern of thought is justified. What happens when the "button" is pushed and the machine does not respond? What is now required of the individual in order to make the correct analysis of the casualty responsible for the malfunction of the equipment, and to take the proper steps to rectify the casualty? The complexity of mechanisms dependent upon electronic devices--complicated instruments in themselves--provides further involvement. It becomes a matter of deep concern to those responsible for training personnel to provide, within a stipulated period of instruction, the essential skills and knowledge or "tools" for the satisfactory conduct of a complete job. How can this best be done with reasonable assurance that, at the conclusion of the training period, the trainee will be able to fulfill the requirements of the job? Where does one start; in what direction does one proceed; and when does one cross the "finish line" so as to meet these immediate objectives?

Project Defined

This project was undertaken for the purpose of developing a methodology of analysis, action, and procedure designed to facilitate the gathering of information and data for a specified rating with particular emphasis to be placed on the casualty analysis aspects. The methodology and techniques developed were

to be fixed and validated utilizing the 3"/50 Rapid Fire Twin Mount as the initial vehicle for the research.

Occupational analysis for a single consumer tends to establish specific guideposts for direction and limitations. A multiple-type analysis framed to meet the needs of many distinct but related consumers further complicates the structuring of the procedure and formats. Extensive specificity in the collection of data tends toward accumulation of volumes of detailed material. This is undesirable, as expressed by the consumers (Chapter II). Interpretation of data, as a postanalysis function, seems to be an accepted alternative. To this end, the efforts to structure a workable methodology have been directed.

The original concepts of the research area involved the entire Gunner's Mate Rating. This was, however, modified to apply to a specific weapon, as indicated, to be more feasible and within terms and limitations of the contract.

A review of the original project shows, with striking emphasis, the total scope of the research anticipated before a complete analysis of the Gunner's Mate Rating can be achieved. The impossibility of performing the research on the total number of weapons in this rating, within the time limitations imposed by the terms of the contract, was soon realized. As a result, the problem was delimited to a specific weapon stressing methodology. This received approval as a realistic and practical plan for providing the limits within which the framework for the research would be erected. The realization of the aims and objectives of the study has been pursued to this end.

As redefined, the main purpose and objectives of the research were: (1) to develop a methodology of analysis and procedure of data collection feasible for use on new-type weapons. Particular emphasis was to be placed on casualty analysis aspects. (2) The methodology and techniques developed were to be fixed and validated using the 3"/50 Rapid Fire Twin Mount as the initial vehicle for the study. (3) Recommendations were to be made concerning the usability of the methodology by the Navy and its potential use as revealed by the results of the research.

Terms and Definitions

The terms "occupational analysis" and "job analysis" are interpreted in this study as follows:

Occupational analysis

> Naval Occupational Analysis is the scientific determination, by means of a job analysis and other investigative techniques, of the nature of Navy jobs and their relationship to each other with respect to organizational, economic, sociological, psysiological, and psychological factors. Naval Occupational Analysis assists in the formulation of policies and the implementation of procedures concerned with the effective management and utilization of Naval personnel, including such functions as selection, classification, detailing, advancement, separation and civil adjustment. 1/

Job analysis

> Analysis is defined as the separation of a thing into its constituent elements ... and a statement exhibiting the results of the analytical process. Job Analysis is defined as the process of ascertaining and reporting basic information relating to the nature of a specific job.2/

1. Bureau of Naval Personnel, Billet and Qualifications Branch, Research Division, Manual of Instruction for Naval Occupational Analysis, p. iv.
2. Ibid., p. 2.

> Job Analysis is defined as the process of determining, by observation and study, and reporting pertinent information relating to the nature of a specific job. It is the determination of the tasks which comprise the job and of the skills, knowledges, abilities, and responsibilities required of the worker for successful performance and which differentiates the job from all others. 3/

The above definitions of job analysis are generally accepted as complete for industrial usage but for the purposes of this study the word "job" shall be used to mean a "duty assignment" within an overall naval billet. To illustrate, a "job" or "duty assignment" within the Gunner's Mate Rating would be the duties performed by an individual during the different operating conditions and watches of the ship. These may include conditions such as Routine, Underway, In-Port, and General Quarters. A "naval billet" would be the composite of all of the jobs or duty assignments performed.

Since the stressing of methodology of procedure is of prime significance, the detailed gathering of information on "skills, knowledges, abilities and responsibilities" shall not be attempted. It is understood that these specific areas will be dealt with in greater detail, at a later date, by Navy analysts.

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3. War Manpower Commission, Bureau of Manpower Utilization, Division of Occupational Analysis and Manning Tables, Job Analysis, p. 1.

CHAPTER II

DETERMINING CONSUMER NEEDS

To coordinate and facilitate the preliminary planning for this study a general conference and series of personal interviews were held during the period of August 25--28, 1952, at the Bureau of Naval Personnel, Washington, D.C.

A general session was held on the morning of August 25, 1952, during which the specific objectives in terms of the end products and desired by products of the contract were reviewed and discussed in detail. The objectives of this general meeting were fourfold:

1. To bring together current and potential consumers for a period of orientation and clarification of contract terms and objectives.
2. To arrange meetings with consumer groups, or sections, to discuss specific needs of their activity with reference to contract objectives.
3. To recognize the limitations a multiple-purpose study would encounter in attempting to meet all the needs of all consumers.
4. To encourage the consumer groups to study and evaluate their needs with respect to establishing a priority listing of these needs.

It was a generally accepted group understanding that a job analysis of a multiple objective type, structured to seek information and data for a number of consumers, would eventually have to develop limits and curtailment in keeping with the contract period, man-hour availability, and the field work requirements. Methodology was to receive primary consideration, with the practical data-collection phase to be stressed in keeping with sound research practices.

Extensive detail in the collection and presentation of data was necessarily to be discouraged. Actual Fleet practice as to task assignments was to be reported. Interpretation of data, by specific consumers, as a postanalysis function was generally agreeable to the consumers consulted.

The Cornell University personnel who attended the conference and conducted personal interviews were:

Dr. C. Kenneth Beach, Director of the Project.
Daniel J. Paolucci, Research Associate.
Louis Vrettos, Research Associate.

Representatives of the Bureau of Naval Personnel attending the general meeting, or interviewed during the visit, were:

Bureau of Naval Personnel

Personnel Analysis Division

Director, Capt. E. K. Van Swearingen
Head, Training Research Branch

Billet and Qualifications Research Branch

Head, Organizational Analysis Section
Head, Navy Classification Section
Head, Manpower Analysis Section

Enlisted Personnel Division, Distribution Branch

Head, Classification Section
Head, Promotions Section

Training Division

Standards and Curriculum Branch

Assistant Head and Senior Training Specialist
Head, Curriculum and Instructor Training Section
Ordnance Curricula, Curriculum and Instructor Training Section
Ordnance and Gunnery, Training and Publications Section

Field Administration Branch

Ordnance and Navigational Equipment, Equipment and Facilities Section

U. S. Naval Personnel Research Field Activity, Washington

Head, Manpower Analysis Division
Head, Enlisted Qualifications Analysis Division
Project Supervisor, Navy Classification Division

Bureau of Ordnance

Head, Training Section

U. S. Navy Training Publications Center

Officer in Charge
Head, Training Publications Department

Comments by Consumers

Research Division

Director, Capt. E. K. Van Swearingen 1/

1. Recommendation concerning the selection of the vehicle for the study:

   a. The weapon to be analyzed should be the 3"/50 RFTM, and if time permits the 3"/50 RFSM. Since this is a relatively new weapon the results of the study could be utilized to

1. Information obtained August 25-28, 1952, personal interview.

evaluate the present 3"/50 Gunner's Mate, Class "B" Training Program. The data would also assist the Qualifications Analysis Section, at present engaged in revising the qualifications for advancement in rating for the Gunner's Mate Rating and the Navy Classification Section.

2. In reference to the specific weapon recommended, what tasks do the Gunners' Mates actually perform?

3. Data collected will be utilized primarily by the Training Division, ships, tenders, Navy Yards and the 3"/50 Gunner's Mates, Class "B" School.

4. Determine, if possible, whether OP procedures and Fleet practices are the same. If they are not, what specific recommendations for OP changes does the Fleet suggest?

Head, Training Research Branch 2/

In a multi-purpose billet analysis, of the type undertaken by Cornell University, we would suggest consideration be given to the following items:

1. Positive recognition of the consumers.

2. What are their respective needs?

   a. How will the consumers use what they hope to get?

3. To what extent do the consumer needs coincide?

   a. Same information for all or several?

   b. If one requires more detail of same general kind as others -- do both the detailed and the more general need to be recorded during data collection?

   c. Will some of the needs be specific to one consumer?

4. What categories of data, and in what detail, will fill these needs?

5. Is the sum of all these feasible of accomplishment by occupational analysts?

   a. What are the limitations of analysts?

2. Information obtained August 25-28, 1952, personal interview.

b. What special or supplementary training needs to be provided (the analysts) in order to get the nearest approach to what is needed?

c. How much and what kind of "supervision" of their work (analysts) will be required?

6. What techniques of data collection ... verification ... review?

7. What sampling requirements will be established?

8. What procedures for summary, analysis, identification, classification, filing, culling obsolete, revision, etc. (library function)?

Enlisted Personnel Division, Distribution Branch

Head, Classification Section 3/

1. Analysis to have simplicity and clarity of presentation.

2. The "must do" is of primary importance to this activity.

3. The relationships and differences of jobs to be stressed.

4. The General Service Ratings (GSR) and Emergency Service Ratings for wartime to also be considered.

Head, Promotions Section 4/

1. Enlisted Men's Promotions uses the Manual for Qualifications for Advancement in Rating, 1C446A. This is under revision at present.

2. The examinations are too broad and do not cover a few specific ratings.

3. At present it appears that qualifications are not sufficiently detailed. The ability to read "blueprints" cited as a specific example of lack of specificity.

4. Key questions to specific job duties would be extremely helpful.

5. Quals too broad at present and some ratings are too fully covered. This makes testing and test preparation very difficult.

3. Information obtained August 25-28, 1952, personal interview.
4. Information obtained August 25-28, 1952, personal interview.

6. The exam center requires nine (9) months to one (1) year notice of changes desired.

Training Division

Standards and Curriculum Branch

Assistant Head and Senior Training Specialist 5/

1. Past curricula has been based on experience.
2. Primary interest in developing "base block" and several options plan.
3. The form of the analysis should be simple.
4. Analysis could be utilized as a check-off list.
5. What are the jobs in running a ship? Operating a gun is a job on a ship.
6. Significant "Whys" -- critical points.
7. Detail to satisfy the consumer who needs the most detail.

Curriculum and Instructor Training Section

Ordnance Curricula 6/

1. What is taught and how is it taught?
2. Related equipment -- new gear demands statement of required knowledge.
3. Performance equipment -- specific knowledges and skills required of school graduates soon after graduation.
4. Equipment-centered analysis preferred.

Ordnance and Gunnery, Training Publications Section

This section has the responsibility for preparing training publications for each specific rate. What tasks does each rate perform or assume responsibility for performing? The specifics of each task are to be found in various OP's--but these are frequently too design-centered and technical to be helpful for preparing training manuals.

5. Information obtained August 25-28, 1952, personal interview.
6. Information obtained August 25-28, 1952, personal interview.

U. S. Naval Personnel Research Field Activity, Washington

Head, Manpower Analysis Division 7/

1. Submit a project plan for the contract when procedure has been determined.

   a. Clear problem statement and subproblems (purpose).

   b. Method of procedure (approach).

   c. Remarks -- qualifications, limitations, etc.

   d. Precise statement of end products.

Scientific Liaison Officer 8/

1. New Quals (Qualifications) to be published soon. All Quals are considered minimum and are uniform for the entire Navy.

2. The Navy Job Classification Manual is general in treatment and is derived from billet description.

3. New equipment, (i.e., equipment not in general use) ignores the personnel picture. What is the equipment demand for proper functioning?

4. Schools tend to set too high standards to be objectively useful; therefore it would seem more realistic to gather data and information in the practical environment.

Head, Enlisted Qualifications Analysis Section 9/

Development of Qualifications for Advancement in Rating, information required:

The Enlisted Qualifications Section had been requested to submit a statement of the types of information that they find helpful in writing qualifications for advancement in rating.

For purposes of reference we have selected a typical task from the GM rating, which reads as follows:

"Repair and adjust a breech mechanism on a gun not exceeding five inches."

This item will be used as a point of reference for the purpose of illustrating the types of information needed in

7. Information obtained August 25-28, 1952, personal interview.
8. Information obtained August 25-28, 1952, personal interview.
9. Information obtained August 25-28, 1952, personal interview.

order to accept this task as a qualifications item. In order to structure a hypothetical situation, we will assume that this item is being evaluated by the enlisted Qualifications Section.

The following are typical questions we would ask to solve the basic problem: Is this task minimum and essential to advancement?

I. Validity of Study

A. Sampling

1. Was there a sampling procedure used in conducting this study?

2. Was the sample obtained representative of the entire population?

3. What was the general makeup of the population from which the sample was obtained?

4. What is the distribution of the population and sample among the various services, i.e. submarine, aviation, surface craft and shore installations?

5. What is the percentage breakdown of sample by pay grade? Of the population by pay grade?

6. Does the sample include a representative cross section of the activities where this task is performed?

7. Does the sampling reflect the amount and type of equipment used?

B. How was the data obtained?

1. What methods were used in obtaining data (observation, interview, questionnaire)?

2. Was the information obtained verified? How?

3. Is the information current?

II. Task Performed

A. Universality

1. Is the task being performed primarily by one rating? Are any other ratings performing this task?

2. How long has this task been considered a function of a particular rating?

3. What percentage of the sample were performing this task?

4. What is the amount of time devoted to this task?

5. Frequency of performance?

B. Purpose and relationship of task

1. Why is the task done?

2. Is this task performed in sequence with other tasks?

3. What is the relationship of the task to other tasks in the sequence? To the total job?

4. Is the task essential to the performance of the total job? How? Why?

5. What is the relative difficulty of the task as compared with other tasks in the sequence?

C. How is task performed?

1. What tools, materials, and equipment are used to accomplish job?

2. Is supervision received or assistance rendered in performing task? How is supervision given? How is assistance rendered? Why?

D. Training

1. What formal training (schools) is available for this task?

2. What percentage of the sample have received formal training?

3. What types of informal training are available?

4. What percentage of the sample have received informal training?

5. How long does it take the worker to achieve competency in the task?

E. Differentiation of pay grade level

1. Does this task distinguish assignments by pay grade?

2. What is the sample breakdown by pay grade of personnel performing this task?

3. Is this task assigned by a pay grade as a primary duty, collateral duty, or as an expedient?

4. Does task have counterpart in other armed services, government agencies, or civilian industries? If yes, how do pay grades compare?

5. In what way does the type of service involved (submarine, aircraft, and surface craft) affect the assignment of this task to rating and a rate (pay grade)?

III. Equipment

A. Worked on

1. Current status, new standard obsolescent or obsolete?

2. Are implied skills and knowledges applicable to all equipments involved?

3. Need for and availability of testing equipment.

IV. Subject matter content

A. What is the meaning of specialized terms used in task description?

V. Organizational interrelationships

A. What is the internal organization and general work flow of each of the different type activities covered in the study?

B. What are the work responsibilities of the various units within each of the activities which were covered?

C. What is the compliment and/or allowance of the ratings concerned with this task in the activities covered in the study?

D. What effect does the compliment and/or allowance have upon the distribution or work loads in the activities covered?

Project Supervisor, Navy Classification Division 10/

Development of material required for Navy Job Classification Section.

I. Section in Each Schedule Devoted to the Relationship of This Job to the ENJC Manual

A. Check items below which most adequately described the relation of this billet to the enlisted NJC:

1._____ There is no NJC in which the duties of this billet are included.

2._____ This billet is adequately covered in all essentials by NJC No._____.

3._____ This billet is a segment of NJC No._____ but personnel who perform this job are qualified to perform the other segments of the NJC, and vice versa, and a new NJC is not considered necessary. (This may be true for either of two reasons: (1) the skills are transferable or (2) personnel are rotated from one segment to another.)

4._____ This billet is a segment of NJC No._____. However, personnel who perform this segment of the job are not qualified to perform other segments of the NJC or vice versa and a new classification should be established. (This would be true if the skills are not transferable and if, in practice, personnel do not rotate between segments.)

5._____ This billet is adequately covered by title, but revision of the definition appears to be required for the following reasons:

6._____ This billet is broader in scope than indicated by NJC No._____ (Check only if the additional duties involve skills worthy of identification).

7._____ Other (Check when none of the above items shows the proper relation of this billet to NJC and give reasons).

10. Information obtained August 25-28, 1952, personal interview.

II. Job Analysis Summary

A. Narrative summary

1. Is breakdown of major headings within a rating realistic? For example, is the work "hydraulic" in the Gunner's Mate rating a distinguishing feature?

2. Are the codes too broad? Are persons actually performing all the duties described?

3. Are breakdowns too fine, remembering that only two codes can be entered on personnel accounting cards, and, therefore, we frequently find people who could be given four or five codes, thus presenting classifiers with the problem of which two codes to assign?

4. Do the special program job codes represent jobs which in fact require extensive training not normally required of a person in the rating?

5. No billets were found to exist under the following NJC numbers. Indicate NJC and reason, if possible, such as:
   a. Obsolete
   b. Unrealistic from organization point of view.
   c. Personnel in this rating do not perform these duties; they are always performed by some other rating.
   d. Job always exists in combination with other duties.

6. Other pertinent comments. Give details.

B. Statistical Summary

Summary of items 1-3 on the section of schedule devoted to NJC's together with schedule numbers involved in all items except 2 and 3.

Example: Of___ schedules_____ jobs were found not to be covered by an NJC. See schedules no._____, no._____, no._____, etc.

Bureau of Ordnance

Head, Training Section 11/

11. Information obtained August 25-28, 1952, personal interview.

1. The factory courses have been the basis for curricula on new equipment.

2. The Navy schools send out evaluation teams (for new equipment) to the ships.

3. Many ships do not report troubles and breakdown of equipment.

4. Trouble report forms, similar to the electronic reports, are recommended.

5. The Mobile Ordnance Service Unit should be consulted in reference to 3"/50 RFTM consideration.

A careful review of the stated needs of the consumers interviewed, as noted under consumer comments, reveals with striking impact the variable aspects of a complete billet analysis. In view of the wide range of needs expressed by the consumers, the Project Director was emphatic in bringing to the attention of the consumers the fact that the research could not meet all of their expressed needs. Generally speaking, the consumers were also aware of this situation and realized that the solution of total problem was a long-range project.

The conferences served as a fact-finding medium to assist the research team in setting forth guidelines and formulating data-recording formats. The projected field trips were to be used as proving grounds to test the methodology of data collection and record the Fleet practices. It is important to mention that the flexibility of the analysts performing the field work was considered to be a significant factor in the final outcome of the project. Research procedures, carefully planned formats, and a knowledge of the equipment are only "tools" in the hands of the analysts. The manipulation of these "tools" in a skillful manner

is a factor which should not be relegated to a position of secondary importance. The human relations aspect of the analyst's job would, it was anticipated, have a strong bearing on the accuracy and completeness of the data collected. The opportunity to meet the consumers, listen to their comments, discuss their problems, and reach a common ground of interpretation strengthens the analyst's grasp of his own work and assists him to establish appropriate analyst-ship personnel relationships.

Briefly, the following are the outcomes of the consumer-research team meetings:

1. A mutual understanding of the objectives of the contract.
2. An awareness on the part both of consumers and research team of the total scope of the project.
3. Delimitation of the problem and selection of the vehicle for the study.
4. The realization that <u>all needs of all consumers</u> would not be met.
5. The opportunity to reach through discussion general agreement on many facets of individual consumer needs not spelled out in contract.
6. Placing emphasis on development of methodology, techniques and procedures.

CHAPTER III

APPRAISAL OF FACTORS RECOMMENDED FOR EMPHASIS

The following is an appraisal and review of the factors selected for emphasis in the collection and presentation of data. The interpretations and emphasis placed upon these factors may vary to a great degree depending upon the person interviewed--his specific area of work, background of interest, and general experience.

For the purposes of concentration of effort two main consumers were selected toward which to direct the primary emphasis of the research although consideration would be given to all other current and potential consumers to the degree feasible. The two consumers selected were the TRAINING DIVISION and the QUALIFICATIONS ANALYSIS SECTION of the PERSONNEL ANALYSIS DIVISION. Because of the division of diversified interests represented by the combined consumers, certain areas of interest not necessarily of prime concern to the two main consumers were also included in the study. It is with this understanding that the formats and charts, included in the appendices, were developed and data collected.

It is desirable that a common concept and basic scope of interpretation should be agreed upon prior to arranging the for-

mats for the schedules. Otherwise, the "shotgun" approach toward the end product or objectives would result in failure to achieve the needs of the primary consumers. To achieve this common concept and basic scope of interpretation, it becomes necessary to meet with all indicated consumers of the research and to discuss fully their specific needs within the framework of the projected study. The resultant multiple-type approach must of necessity omit details which would be entirely feasible if research were undertaken for a single consumer.

Prior to a more detailed application of the "factors selected for emphasis" it is felt that each should be carefully scrutinized in reference to how it will affect the material-gathering procedure and sequence. For this specific purpose, the following appraisal has been given critical consideration.

Factors Recommended for Emphasis

Factor 1: Work performed with critical steps identified.

A comprehension of what differentiates a critical from a noncritical step in the job being analyzed may be influenced by the perspective with which one views the work performed. Thus one may safely state that it is difficult to differentiate between critical and noncritical procedures. To serve as a basis for the interpretation and use that will be made by the consumers, information as to the relative criticalness of the tasks performed is provided by the data collected. In the case of casualty analysis procedures, as exemplified by the 3"/50 Rapid Fire Twin Mount, evaluation of the importance of the duties can be gleaned from

such information as (a) the rate performing the duty, (b) supervision received and exercised, (c) the frequency of occurance, (d) hours required for rectification of malfunction, etc. This information appears in summary form as spread sheets in PARTS II AND III of the report and can be extracted for use as desired. While these factors are not necessarily all inclusive they would be of primary importance in determining criticalness and further references that are necessary can be developed to suit individual consumers represented.

To assist in the interpretation of the data an analyst from the team performing the analysis should be assigned to work jointly with the consumers.

The Personnel Analysis, Training Division and their component branches will be interested in voicing specific opinions concerning identifications of critical or noncritical steps in the analysis as viewed by their departmental needs.

Factor 2: Knowledges and skills required—critical steps identified.

While it is not possible because of contract time limitations to give extensive attention to all items that should be contained in a full scale analysis, it is felt that information should be gathered on such factors as Skills and Knowledges to assist the consumers use and interpretation. The importance of the skills and knowledges required would appear to be to a great degree correlated with the criticalness of the duties performed. In the case of this study, after determination has been made of the re-

lative importance of the duties, the significant knowledges and skills can be obtained with the assistance of subject matter technicians from the description of such duties.

In subsequent studies information that would be valuable in identifying such skills and knowledges could be obtained from the individual performing the duty and/or his immediate superior in conjunction with an experienced analyst capable of providing guidance and assistance.

Factor 3: Supervision received and exercised.

The allocation of supervision, received and exercised, would appear, as such, in the data collection format and is a product of the interviewing by the analyst and the technician performing the duty. The information incorporated in the data collection format should be of such a nature as to lend itself to the detailed extraction to serve consumers purposes.

A postanalysis discussion with consumers concerned may be instrumental in establishing the types of information which would secure for instruction the kind of supervision exercised and received. This postanalysis discussion could be a regular aftermath of such an analysis and would be instrumental in gaining greater understanding of the detailed needs of the consumers. It would also assist in the development of refinements in instruments and techniques furnishing the desired information.

Factor 4: Responsibility - for materials, tools, and equipment.

Inasmuch as responsibility is contingent upon such factors

as ship type and manpower demands. It represents an area that was not, as such, covered in the analysis. Direct responsibility is difficult to affix because of lack of policy to pay for lost tools and specific requirements to replace tools. A sufficient period of time could not be devoted to this particular aspect without sacrificing effort directed toward casualty information more urgently needed. No concrete recommendations are therefore made.

Factor 5: Responsibility - for safety precautions.

Cautions and safety precautions should be prominently and thoroughly displayed. Specific references to the appropriate ordnance publications and page number on which the safety precaution appears should be made and wherever possible related directly to the duty performed. The casualty analysis forms used in this study will furnish such information and when used in conjunction with the relative criticalness of the tasks prove a valuable guide for training purposes.

Factor 6: Physical demands.

The analysis should disclose data relative to physical demands. The weight, location, and adjustment of parts and components should directly relate to the physical demands required therein.

Due to the various locations and climatic differences found in the Fleet, the physical demands, where obtainable, should be confined to those demands of the equipment under analysis. It is difficult to envision, within the stipulated contract period, the collection of this information in a form that would bear

accurately on all situations that would be encountered.

Factor 7: Working conditions.

Working conditions, too, are subject to the same qualifications found in physical demands; that is, the data found in both of the above categories should be objective, constant, and unaffected by external variations such as type of installation or vessel.

Factor 8: Definitions of equipment, tools, publications used, and similar items.

The listing of equipment, tools, and publications used, and where and when they are used, is a direct product of a detailed analysis. Similarly, any errors and deficiencies found in publications, references, and materials should be prominently displayed. Task or job work sheets, that are utilized in a detailed analysis may have such columnar headings as (a) must do, (b) key points (as viewed by the rate performing task and analyst), (c) specific ordnance pamphlet references, (d) deficiencies in OP references, (e) maintenance tasks, (f) tools and materials, (g) casualty analysis, and (h) remarks.

Factor 9: Training and Education requirements.

There are definite limits to the setting down of specific training and educational requirements. To know the training and educational background of the rates performing the tasks is helpful. Such biographical information is obtainable in a number of ways. Service records and/or questionnaires to be filled out by the incumbent are only two of many possible methods.

In addition to either of the above it is recommended that existing proficiency tests be used, or tests developed to obtain efficient selection and assignment of personnel.

It is felt that additional thought should be given to specific tasks on weapons, not performed by GM's at present but which may be required of them in the near future. Power Drives on the 3"/50 RFTM's may be taken as a singular case to illustrate the point. Training and educational requirements would be essentially raised if the electronics area were to be handled by Gunner's Mates.

CHAPTER IV

PLANNING AND METHODOLOGY FOR COLLECTION OF DATA

A period of approximately one month prior to the conferences held with the consumers, 25-28 August, 1952, and a similar period after the conferences were utilized by members of the research staff for an intensive study of the ordnance pamphlets pertaining to the 3"/50 Mounts (OP's 1753, 1566 (1st Revision), and 1698). It was strongly felt that a working and speaking knowledge of the weapon, its function, operation, mechanism, and terminology would be a basic and essential point of departure from which one could view in proper perspective the expressed needs of the consumers.

The alternative, of including a Chief Gunner's Mate with practical shipboard experience on the specific weapon to serve in the capacity of a permanent technical adviser on the research team, was thoroughly investigated and discussed. The idea was rejected--first, to avoid undue influence of the technician's personal views and experience which might be in conflict with "shipboard opinion" and, secondly, to avoid any possibility of preformed conclusions.

It was ultimately agreed to present the information, as reported, and then to review the material in conjunction with the

instructional staff of the 3"/50 Gunner's Mate, Class "B" School for technical accuracy. The instructors have had Fleet experience on the weapon and have supplemented this experience with teaching. This is an ideal combination for technicians. The workability of this plan is dependent largely upon an understanding of the weapon by the personnel performing the analysis.

Methods of Collecting Data

The extensiveness and intensiveness of the data to be collected are important factors to be considered before setting up formats and experimenting with methods of collection. Sampling requirements also merit consideration since validity is a major concern of the study. How many vessels should be visited during the course of the field work? What types of ships have the weapon being used as the vehicle for the study? When, where, and for how long a period of time will the vessels be available? Will responsible and experienced 3"/50 personnel be available at the installation? How long have the weapons been installed on the vessel, and how many rounds have been fired from each gun? How many Gunner's Mates servicing or manning the weapon have been to the 3"/50 Gunner's Mate, Class "B" School? These and many other questions need to be given ample thought prior to the preparation of the material for conducting the survey. The methodology of obtaining data, (observation, interview, questionnaire, or any combination thereof) must take all of the above-mentioned factors into account.

It was originally hoped that a wider sampling might be made

utilizing the questionnaire method, but this procedure was discarded after the first visit to Newport (see schedule of visits, p. 31). The original formats (Appendix A) were given to the personnel interviewed with specific instructions as to how they were to be filled out. This involved (a) frequent reference to the ordnance pamphlets for check of accuracy of literature in reference to procedure followed aboard the vessel, (b) review of the weapon logs, and (c) survey of check-off lists. The straight questionnaire procedure proved unsatisfactory and field work to date leads to the conclusion that the use of the straight questionnaire procedure, for gathering the diversified type of information sought by the consumers, is impractical from a point of view of accuracy, and unrealistic because of unaccountable misinterpretations that arise.

The need for orientation of installation personnel and the necessity for engendering wholesome and cooperative attitudes can not be accomplished by "written instructions." A period of clear explanation of the purposes of the research, of the immediate need for obtaining data enabling the training personnel to evaluate their course content in reference to Fleet requirements, and of the immediate objective of surveying weapon casualties in an analytical manner served to elicit sincerity from ship personnel. The fruitfulness of this splendid relationship can not be overemphasized and cold print will never satisfactorily serve to accomplish this objective.

The guided interview-questionnaire procedure, supplemented by the observation method, were the two basic means used to obtain

information. Conferences, discussions, and casualty rectification demonstrations were the primary procedures used to record and analyze shipboard 3"/50 casualties.

Every attempt was made to obtain the information from the rates performing the specific task or tasks as listed in the formats. The rate performing the supervision, as well as the degree of supervision exercised, was carefully checked. In addition the Gunnery Officer, the Gunner, and/or the Chief were given an opportunity to review all data obtained, and signed approval was considered a final check of data accuracy.

Ship Sampling

The selection of ships having the weapon for a substantial period of time, the availability of the vessels for reasonable periods to conduct a thorough research, and the presence of responsible ship personnel experienced on the weapon are all factors to be given weight and consideration for research team visitation. The coordination of personnel time, correlation of services, planning for visits, orientation of research team at installation, and arrangements for proper working relations between ship and research team was handled by the Scientific Liaison Officer. The sampling taken during this study was approximately 10% of the 3"/50 RFTM's in operation and believed to be a valid sampling.

The vessels visited during the conduct of the research, by code, are as follows:

Destroyers

Ship (Code)	Date	Installation
1	19-20 November 1952	Newport, R. I.
2	24 November 1952	Newport, R. I.
3	25 November 1952	Newport, R. I.
4	9-10 December 1952	Newport, R. I.
5	11-12 December 1952	Newport, R. I.
6	15-16 December 1952	Newport, R. I.
7	17-18 December 1952	Newport, R. I.
8	27-28 January 1953	Newport, R. I.
9	28-29 January 1953	Newport, R. I.
10	3--4February 1953	Fall River, Mass.
11	5-6 February 1953	Newport, R. I.

Cruisers

Ship (Code)	Date	Installation
101	25-27 February 1953	Boston, Mass.
102	2-3 March 1953	Boston, Mass.
103	4-5 March 1953	Boston, Mass.
104	16-23 April 1953	Norfolk, Va.

The sampling of eleven destroyers and four cruisers, representing a total of seventy-one 3"/50 Rapid Fire Twin Mounts, provided an excellent coverage for the casualties.

Preparation of Formats

In view of the diversity and apparent volume of the data required by the consumers, the importance of a practical procedure and format for the collection, recording, and consolidation of the information in a rapid manner was given primary consideration.

Procedure

Experience aboard the first vessel at Newport verified the need for a time-saving method other than the straight questionnaire procedure attempted. A ship, whether in dry dock or active service, operates on a rather close working schedule and the availability of ship personnel for a study of this type must be integrated with that schedule to avoid unnecessary conflict with planned vessel activities. Advanced notification and planning are mandatory requirements if the research team and ship personnel are to make effective use of time allotted aboard ship. If the vessel is in dry dock, advance notice is doubly important, otherwise the responsible, experienced ship personnel needed for the proper conduct of the research might not be available because of scheduled leaves. This single item is sufficiently significant to warrant first consideration. Experience has proven that, if it is neglected, much effort, time, and money can be spent without appropriate results. It is recommended, for future projects of this type requiring field work and close working association with installation, that a minimum notification period of two weeks be instituted.

Field experience substantiates the original contention that two, or a maximum of three, days would be an effective time target, per vessel. Beyond this period, interference with daily ship working schedules causes a drastic reduction in the actual work hours of the research team aboard ship.

Check-off type formats should be used wherever and whenever possible. Routine collection of information is simplified by this approach, thus leaving sufficient time for those areas of the study requiring guided thinking, discussion, and written reports.

Utilizing the OP's 1566 (1st Revision) and 1753 as a central source of literature for the 3"/50 Rapid Fire Twin Mounts, the areas of activity, namely: Maintenance and/or lubrication, adjustment, disassembly and reassembly, trouble analysis and weapon casualties were studied as separate unit areas. Within each unit area the tasks performed on the weapon were listed. (See Appendix A). These were broken down to a degree deemed realistic and practical to be handled in a field situation. Every attempt was made to avoid the "nuts and bolts" detailing which would impose time-consuming demands to the detriment of the survey. It will be noted that "volume collection" for the mere sake of data is avoided wherever possible. Tasks ordinarily a concern of the yard crews were included to establish who, on the vessel, would perform the task if it had to be done at a time when yard facilities were not available. An effort was made to include, in each unit area, items that would reflect the informal on-board training existing on each vessel.

The formats (Appendix A) were used in conjunction with the OP's during the data-collecting period. This procedure provided a double check, namely: (1) Was the ordnance pamphlet literature being followed by the personnel; (2) Was the ordnance pamphlet material correct? General criticism as voiced by ship personnel was recorded and is listed in Chapter VII.

The following information was recorded for each task listed in the maintenance and/or lubrication unit:

1. Rate performing task.
2. Rate supervising task.
3. Degree of supervision exercised or received.
4. Frequency of maintenance and/or lubrication.
5. Correctness of OP procedure.
6. Variation, if any, from OP procedure.

The adjustment unit lists the following items for which information was sought:

1. Rate performing task.
2. Rate supervising task.
3. Degree of supervision exercised or received.
4. Number of times adjustment has been made.
5. Correctness of OP procedure.
6. Casualties resulting (not listed in OP) from improper adjustment.

The disassembly and reassembly of various subassemblies within weapon components present a phase of both ship and school training requiring and meriting attention. It is impractical and unrealistic

in view of the size of the classes, lack of facilities, and time, for the 3"/50 Gunner's Mate, Class "B" School to attempt to teach every component. The feeling that "teaching theory" and then depending upon ship training to complete the "theory-demonstration" cycle too often prevails. An effort has been made to obtain frequency of performance, in the Fleet, as a means of providing reliable information for establishing a priority. Thus concentration on those units with high frequency, at school, will give the trainee a target of "must know" knowledge.

The following information was obtained in reference to this unit or activity:

1. Rate performing task.
2. Rate supervising task.
3. Degree of supervision exercised.
4. Number of times disassembly and reassembly performed (aboard ship).
5. Correctness of OP procedure.

The trouble analysis unit of activity is probably the area most frequently delved into by ship personnel. The variety of casualties occurring are numerous. The causes of any single casualty may be multiple. Analytical ability to diagnose the cause and take appropriate action to rectify the casualty is, according to school and vessel training personnel, difficult to predict. Therefore an attempt has been made to establish specific data concerning the frequency of specific troubles which have occurred. If the teaching is concentrated on those specific areas the

school graduate will have a hard core of knowledge for immediate use.

The data collected in this activity concerned:

1. Rate performing task.
2. Rate supervising task.
3. Degree of supervision exercised or received.
4. Number of times trouble has occurred (aboard ship).
5. Correctness of OP instruction for casualty analysis.
6. Variations, if any, from recommended OP procedure.

Development of Casualty Reporting Formats.

A glaring weakness in existing working relations between the Fleet and 3"/50 Gunner's Mate, Class "B" School is the lack of official reporting of Fleet weapon casualties. Every school program should be evaluated periodically and casualty reports, properly prepared, would be one medium whereby the instructional staff could take inventory of the course content, apportionment of time, and effectiveness of its teaching. Visits to ships and general comments concerning school graduates is very likely to end in superficial generalizations of little real value for reorganization of course content.

The original casualty reporting form (Appendix A) was prepared and used during the first visit to Newport. As noted, emphasis was placed on the following:

1. Symptom or symptoms of casualty.
2. Procedure or method of locating casualty.
3. Action taken to effect adjustment or casualty rectification.

to present and discuss findings of research and data gathered. The casualty formats and instruction sheets were selected topics for the meeting. Bureau of Naval Personnel representatives have attempted further refinement and experimentation using the formats developed as a frame of reference in a study conducted in another area.

The worst mistake an analyst can make, during the casualty reporting investigations, is to become impatient. Reporting is a slow process and there is a tendency on the part of the analyst to assist the person writing the report. This eventually leads to the analyst writing the report with the assistance of the Gunner's Mate, a process which should be reversed. "Putting words in the rate's mouth," a phrase coined by analysts, is an occupational disease which leads to inaccuracies.

Weapon Personnel Organization Format

The Training Section and the officer-in-charge of the 3"/50 Gunner's Mate, Class "B" School were interested in comparative figures of rates, in the Gunner's Mate Rating, performing operational tasks in the gun crews; with reference to Class "B" School background, and the Fleet recommendations concerning on-board training and/or experience required to attain proficiency at the position.

The Weapon Personnel Organization format (Appendix A) was devised to obtain this data in a form that would lend itself to (1) a rapid manner of collection, and (2) ease of consolidation. Column "A", dealing with time required (on-board training) to attain proficiency at position is the only item requiring explanation.

The Stations and Duties chart (Appendix C) served to clarify and interpret for vessel personnel the requirements of each position. Variations from this concept of position responsibilities, devices, and the like, were found to be rather inconsequential as far as data recording was concerned.

The informal on-board training period fluctuated greatly depending on the length of time weapon personnel had been on board. In some cases crews had been with the weapon nearly two years and this varied downward to a minimum period of three weeks on a ship recently commissioned.

The Stations and Duties chart consolidates specific information found in the 3"/50 OP's and serves as a ready reference for trainee and training personnel. Fleet training personnel have been generous in their praise and constructive criticism of this chart for its usefulness in simplifying the task both for the instructor and the learner. It was recommended that this chart be reproduced for Fleet training purposes.

CHAPTER V

WEAPON PERSONNEL ORGANIZATION REPORT AND FLEET RECOMMENDATIONS CONCERNING ON-BOARD TRAINING REQUIRED FOR STATION POSITIONS

The Training Section and the Officer-in-Charge, U. S. Naval School, Gunner's Mate, Class "B," expressed a desire for information relative to the crews operating the 3"/50 Rapid Fire Twin Mount and Fleet recommendations concerning on-board time required for personnel to attain proficiency at mount positions.

The school course outline for the 120 hour 3"/50 RFTM program contains a listing of units or subjects covered in the curriculum. The "Stationing and Duties of Personnel," "Unit II," of the course of study is allotted one clock hour. It was generally agreed that this is not a sufficient period of time to do much more than provide a brief period of orientation. Though the task is, in reality, an on-board training responsibility, proper emphasis at the school may establish a basis to provide greater operational consistency in the Fleet. The Gunnery Officers, Gunners, and/or the Chief Gunner's Mates were asked to establish, from experience, a period of time, in hours, essential to train a top-notch gun crew.

Their recommendations are noted in Table 3. To establish a common understanding of the specific tasks and responsibilities for each gun position the "Stations and Duties" chart (Appendix C) was prepared and used as a reference. This material in the ordnance pamphlets was not written for operational purposes. It is brief, sketchy, and appears to be rather indiscriminately placed. Consolidating it in the chart form enabled the research team and ship personnel to arrive quickly at a common interpretation and establish limits to position responsibilities. Without prior preparation of this device and establishment of common interpretation, the task would have been time consuming and the estimated training time could not have been definite.

Consolidated Personnel Report

Destroyers

The data on crew personnel for destroyers (Appendix B) reveals that twenty-eight gunner's mates were included in the combined totals for personnel servicing the twenty-six 3"/50 RFTM's surveyed. Twenty-two of these gunner's mates serve in the capacity of gun captain (mount captain). It is significant to note that only six of these rated men have had the 3"/50 formal training RFTM program. Five of the six are graduates of the 3"/50 Gunner's Mate, Class "B" School, and one has had the twenty-week course. Percentagewise, one may conclude that approximately 25 percent of the gun captains have been through a formal period of school training and the remaining 75 percent

have been through informal on-board training Fleet program. It would appear, judging from the fact that the school has been in operation nearly three years, that the figures might be reversed, but this is not the situation presented by the data.

Table 1 provides a quick survey of Naval personnel distribution in reference to the operational phase of the weapon. It is noted that there is a preponderance of Seamen and Seamen Apprentices. This is true on both destroyers and cruisers. Because of the difficulty experienced in changing a rate designator, it is common practice to give the man a trial period in a rate before listing the designation in his records. Trial periods work to the advantage of both parties, serving as an exploratory time for the individual and giving the ship training personnel an opportunity to observe and test the person for proper placement.

TABLE 1

DESTROYERS
NAVAL PERSONNEL DISTRIBUTION
ON
TWENTY-SIX 3"/50 MFTM's
(ELEVEN VESSELS)

Rates	Destroyers (By Code)											Totals by Rates
	1	2	3	4	5	6	7	8	9	10	11	
GM1	0	0	0	0	0	0	0	0	1	0	0	1
GM2	0	2	0	0	0	1	1	1	0	0	0	5
GM3	2	0	2	3	2	2	3	2	2	2	2	22
GMSN	1	0	0	2	1	2	1	0	2	3	0	12
SN	32	10	14	9	8	8	8	6	17	11	7	130
SA	0	12	8	7	8	10	17	11	8	0	7	88
BM2	0	0	0	0	0	0	1	0	0	1	0	2
BM3	1	0	0	1	1	0	1	0	1	0	1	6
BMSN	0	0	0	0	1	1	0	0	0	2	0	4
CS	0	0	0	0	1	0	0	1	0	1	0	3
FA	0	0	0	0	0	9	0	1	2	0	0	12
TM	0	0	0	0	0	0	1	0	0	0	1	2
SKSN	0	0	0	0	0	0	0	0	0	0	1	1
YNSN	0	0	0	0	0	0	0	0	0	0	1	1
CSSN	0	0	0	0	0	0	0	0	0	1	2	3
PNSN	0	0	0	0	0	0	0	0	0	1	0	1
SHSN	0	0	0	0	0	0	0	0	0	2	0	2

Cruisers

The consolidated data on crew personnel for cruisers (Appendix B) indicates that there are thirty-six gunner's mates on the combined crews of forty-five 3"/50 RFTM's. Thirty-two of these gunner's mates are listed as gun captain (mount captain). Eleven are graduates of the 3"/50 Gunner's Mates, Class "B" School, and two are graduates of the twenty-week course. Thirty-eight percent of the gun captains have had formal school training and 62 percent have received their training aboard ship.

The "Weapon Personnel Organization" for cruisers (Appendix B) reveals that five 3"/50 RFTM's are manned and operated by Marines. These weapons are maintained by Naval personnel. The research team was notified by the Gunnery Officers that the weapon operational training for this group was done aboard ship since no Marine quotas for the 3"/50 Gunner's Mate, Class "B" School were permitted. It does seem unusual, and it is mentioned because split responsibilities resulting from this arrangement do not lend themselves either to efficient operation or to maintenance of the weapon.

Table 2 provides a breakdown of Naval personnel and Marines assigned to the operation of the 3"/50 RFTM's on cruisers.

TABLE 2

CRUISERS
NAVAL PERSONNEL DISTRIBUTION
ON
FORTY-FIVE 3"/50 RFTM's
(FOUR VESSELS)

Rates	Cruisers (By Code)				Totals by Rates
	101	102	103	104	
GM2	3	0	2	2	7
GM3	10	7	6	6	29
GMSN	9	2	53	2	66
BM2	1	0	0	0	1
BM3	5	3	0	0	8
SN	49	72	11	75	207
SA	33	11	56	35	135

Note: In addition, to above Naval personnel distribution, sixty-four Marines served as 3"/50 RFTM crew members on the four cruisers.

Fleet Recommendations Concerning On-Board Training Time Required for Station Positions

The gun captain is the responsible and key member of the gun crew under automatic, or local control. He should be capable of performing the duties required at all stations and of training the crew personnel. In addition to the above-mentioned responsibilities, the Gunnery Officers and/or Chief Gunner's Mates recommend

that the gun captain should be capable of casualty identification, analysis, and rectification. The total scope of the task, as established above, requires a person with experience and a thorough knowledge of the weapon and weapon literature. Without the advantage of formal schooling, it is difficult to envision a rate capable of performing the gun captain's duties in an efficient manner within a reasonable calendar period of time in relation to the stated opinions shown in Table 3.

It is recognized that Navy policy advocates that 90 percent of training be conducted aboard ship and on watch. However, it appears that, because of the complexity of the equipment (3"/50 RFTM), the varied duties and watch schedules, the trend toward automation, the preparation of specialists and technicians can be done more quickly and efficiently in a formal training situation. It should be understood that Fleet experience on the weapon is also considered essential to provide the realistic work experience that cannot be adequately provided at school.

Table 3 presents, by mount positions, the recommended period in hours to attain proficiency at mount positions. These recommendations were made by training personnel on fifteen separate vessels. At no time was a specific group aware of the time recommendation proposed by other groups. The individual recommendations displayed only a small variance from the average shown in the chart.

TABLE 3

FLEET RECOMMENDATIONS
CONCERNING
ON-BOARD TRAINING TIME REQUIRED
FOR
STATION POSITIONS

Position	Destroyers (11) Average Hours Recommended	Cruisers (4) Average Hours Recommended	Average Hours Recommended
Mount Captain	60.4	100.	80.2
Right Gun Layer	20.4	17.5	18.9
Sight Setter	1.	11.2	6.1
Left Gun Layer	17.3	15.	16.1
Left Shellman, L.G. . .	20.5	12.5	16.5
Right Shellman, L.G. . .	20.5	12.5	16.5
Left Shellman, R.G. . .	20.5	12.5	16.5
Right Shellman, R.G. . .	20.5	12.5	16.5
First Shell Passer . .	5.	7.7	6.3
Second Shell Passer . .	5.	7.7	6.3
Third Shell Passer . .	5.	7.7	6.3
Fourth Shell Passer . .	5.	7.7	6.3

CHAPTER VI

CASUALTY REPORTS AND STATISTICAL DATA CONCERNING CASUALTIES BY WEAPON COMPONENTS

The collection of casualty reports, Part II, is a consolidation by components, type and frequency, of all casualties recorded in the logs of vessels visited (eleven destroyers and four cruisers). Each report has been carefully reviewed, is representative of Fleet practice and composite thinking of Fleet personnel and is aimed specifically at the diagnostic or problem-solving procedure recommended for training purposes.

Objectives for Preparing and Reporting Casualties

The objectives for the preparation of these casualties in this form are:

1. To present a list of casualties indicative of actual shipboard experiences, cataloged by total frequency and component.
2. To provide, for the 3"/50 Gunner's Mate, Class "B" School, factual information which will enable its staff to establish a priority for teaching these casualties based on shipboard needs. This

will enable the school staff to evaluate its present program in terms of actual shipboard casualties instead of design-centered OP casualties, thus utilizing the casualty instruction period more effectively.

3. To utilize shipboard experiences to enrich the school training program with additional realistic and practical instruction which will enable the trainee to return to his ship better qualified to handle his job.
4. To provide the trainee with problem-solving techniques which he may use to train new personnel when he returns to his ship.
5. To compile casualty reports on the weapon, enabling on-board training personnel to anticipate training needs based on actual shipboard experiences, thus presenting an opportunity to curtail the diagnostic and rectification period. This, it is anticipated, should reduce the inoperative period of the weapon and result in greater firing efficiency.
6. To encourage issuance to the Fleet of a copy of the casualty report in bulletin form. Shipboard training personnel, interviewed during the study, highly recommend this medium for correlating shipboard instructional procedure with reference to casualty diagnosis and remedial action taken.

A complete report, containing copies of the written casualties obtained at the installation, was sent to each ship visited and to the 3"/50 Gunner's Mate, Class "B" School.

Remarks from Fleet and Gunner's Mate, Class "B" School Personnel

The following excerpts from correspondence received are indicative of typical comments and reflect the attitude of shipboard and school personnel.

> ... and I was most pleased to receive the copies of the 3"/50 gun Casualties Report Forms. The information should be most helpful in preparing a training course on the guns and their typical casualties. 1/

> It is our belief that this correlation between Fleet and Schools which is made possible by teams such as yours is of great value to the service. 2/

> I wish to thank you for the compiled list of casualties which you sent us as a result of the three Cruisers having the 3"/50 twin installation. We hope these casualties will serve two purposes. First, they will serve as a trouble shooting guide in the repair of future casualties, and secondly, they will serve as indicators for preventive maintenance to avoid casualties already experienced by other ships. 3/

> We appreciate your efforts in condensing the information obtained from our logs and through conversation with our petty officers. The casualty reports will be a useful aid in preparing lectures and forming an outline for practical instruction. 4/

1. Letter from Lt. Damon P. Tunnicliff, March 14, 1953.
2. Letter from Commander Alan M. Nibbs, April 6, 1953.
3. Letter from Commander Alan M. Nibbs, May 14, 1953.
4. Letter from Captain C. K. Bergin, May 27, 1953.

My personal reaction has been that what you have sent us is exactly what we are after. 5/

It is believed, by this instructor, that these casualty reports are the most efficient training aids available for use in the classroom. Subject to time available for casualty instruction, they aid the instructor in knowing which casualties to spend time on and also which maintenance problems to stress.

x x x

It is my opinion that these casualties are very beneficial to this school and its instructors in that they furnish proof of what casualties have happened in the fleet and can be given to each student, in list form, as a warning of what precautions to take in normal maintenance procedure.

x x x

I believe that it would prove very helpful to the Fleet if a list of these casualties were given to each student under instruction at this activity to add to his school notes.

I feel that the action taken on these casualties was good.

x x x

Those reports giving nature of trouble and corrective action taken are considered to be good information.

x x x

It is believed that a greater technical accuracy should be maintained in the description of casualties particularly in nomenclature. It is further believed that a conclusion should be reached on each casualty. 6/
(Note: This recommendation was discussed with the school instructing staff and proper action taken to comply.)

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5. Letter from LCDR D. A. Homrighausen, January 7, 1953.

6. Letter from LCDR D. A. Homrighausen, January 21, 1953. (Comments by instructors).

Statistical Data on Type and Number of Vessels Visited; Number of 3"/50 RFTM's, Rounds Fired, and Casualty Frequency

The following data are presented with the thought of establishing a relationship between the total rounds fired and the resulting casualties per component. A more detailed survey may reveal occasional casualties not listed in this report, but it is felt that diminishing returns, due to repetition, will discourage rather than encourage further work in this specific area.

It is highly recommended that a study of casualties, on this weapon, occurring at Dam Neck Firing Grounds be made to ascertain whether or not the comparative relationships are significant. If a direct and comparative relationship does exist, a conclusion may be drawn, with reference to casualty collection, which may prove to be a time-saving factor for future projected studies in this rating.

It would seem advisable at this time to caution against an all-inclusive recommendation without first studying the personnel problem in relation to the total experience on the specific weapon. A well-trained and experienced "trouble-shooting team" will, because of extended association with the weapon, be in a position to anticipate trouble and take appropriate preventive steps to circumvent the casualty. A relatively "green" team will not have this background of experience. This would lead to the assumption that fewer casualties might be forthcoming from Dam Neck because of a more stable personnel servicing the weapons.

Table 4 provides a rapid review of the data concerning the number of destroyers visited, the 3"/50 Rapid Fire Twin Mounts on each vessel, and the rounds fired by each ship. The eleven destroyers have twenty-six twin mounts and have fired a total of 5,405 rounds. The distribution of rounds fired, per ship, is noted in the last column of the Table. The relatively low number of total rounds fired on some destroyers is directly traceable to the fact that the 3"/50 RFTM's have only recently been installed. The recent installation of the weapons may be a consideration reflecting upon the experience of the mount crews and, in a more direct sense, on the resulting casualties.

The comparative relationship of number and type of casualties, between destroyers and cruisers, by weapon components, is shown in Table 6. This relationship will be discussed in detail later in this chapter, and an effort will be made to relate this phase to the experience of the personnel servicing the weapons. The fluctuation of Navy personnel during any specific period would influence the results of this phase of the study, and it is imperative that one is cognizant of this factor at all times.

TABLE 4

ROUNDS FIRED
(DESTROYERS)
3"/50 RFTM's

Vessel (Destroyer Code)	Number of RFTM's on Vessel	Rounds Fired per Vessel
# 1	3	1000 (approx.)
# 2	2	600 (approx.)
# 3	2	800 (approx.)
# 4	2	450 (approx.)
# 5	2	1149
# 6	3	541
# 7	3	492
# 8	2	309
# 9	3	36
#10	2	401
#11	2	727

Total Rounds Fired (Destroyers) 5,405

Total Number of Vessels (Destroyers) 11

Total Number of 3"/50 RFTM's (Destroyers) 26

Table 5 gives statistical data for the cruisers visited during the study. The four vessels have forty-five 3"/50 Rapid Fire Twin Mounts and have fired 35,935 rounds. A quick comparison of destroyer and cruiser data reveals that the forty-five mounts on cruisers have fired approximately seven times the total number of shells recorded for the twenty-six weapons on the destroyers. A more realistic comparison may be obtained by dividing the total rounds fired, by type of vessel, by the total gun barrels. This result shows that each barrel of the 3"/50 RFTM's, on cruisers, has fired nearly four times as many shells as a gun barrel on a destroyer. The approximate figures are 399 vs. 104. One could very easily be mislead into making the assumption that there might be a 4 to 1 ratio in resulting casualties, but this would be erroneous as indicated by data in Table 6. The weapons on destroyers are far more susceptible to salt spray and, therefore, require maintenance far in excess of those installed on cruisers. This factor alone would further reduce the casualty ratio, without further consideration of personnel experience or job specialization found on cruisers and not, to the same degree, on destroyers. Recognition of these external facets should aid considerably in arriving at a sound and realistic judgment as to reasons for a comparative ratio of casualties occurring on the two types of vessels.

TABLE 5

ROUNDS FIRED
(CRUISERS)
3"/50 RFTM's

Cruisers (By Code)

101		102		103		104	
Mount	Rounds Fired	Mount	Rounds Fired	Mount	Rounds Fired	Mount	Rounds Fired
# 1	463	# 1	319	# 31	820	# 31	1445
# 2	797	# 2	279	# 32	552	# 32	1326
# 3	829	# 3	514	# 33	1108	# 33	1669
# 4	745	# 4	259	# 34	779	# 34	1534
# 5	848	# 5	468	# 35	1071	# 35	1657
# 6	806	# 6	409	# 36	826	# 36	1389
# 7	866	# 7	577	# 37	408	# 37	969
# 8	893	# 8	292	# 38	323	# 38	1200
# 9	1058	# 9	345	# 39	865	#39	1028
#10	934	#10	435	#310	742	#310	761
#11	1125			#311	273	#311	786
				#312	393	#312	750
Rounds Fired 9,364		Rounds Fired 3,897		Rounds Fired 8,160		Rounds Fired 14,514	

Total Rounds Fired (Cruisers) 35,935

Total Number of Vessels (Cruisers) 4

Total Number of 3"/50 RFTM's 45

Table 6 has been prepared to present by weapon components a numerical frequency of the casualties listed in the battery logs of destroyers and cruisers surveyed. Every effort has been made to provide a thorough, accurate, and detailed report which could be relied upon by training to apportion more effectively the periods of instruction related to casualty analysis and rectification. It may be noted that not every casualty is reported in the written reports. In general, this specific area of the training period—either formal (at school) or shipboard (on-the-job)—is considered by fleet training personnel to be an extremely critical one. An inoperative weapon, regardless of potential firing power, is worthless on a fighting ship. Every effective training period should be instrumental in reducing the inoperative time resulting from common casualties as noted in the reports.

The personnel responsible for training might well make a careful study of the data provided in Table 6, and the casualty reports, with reference to reapportioning course time or extending, if necessary, the present 120-hour period of instruction devoted to the weapon.

Consolidation of the frequency of casualties, by components, is highlighted for rapid review in Table 6. For detailed investigation, the reader is referred to Table 1 of Part II. The breakdown of components into subassemblies and, in some instances, specific parts focuses attention on the fact that a single part may cause as much as 90 percent of the trouble. To illustrate:

the "firing lead" in the housing assembly is responsible for 450 of 508 recorded casualties in the gun assembly component. Further, the "rounds fired counter" of the Slide component is noted as the items causing 512 of 522 casualties mentioned for the Slide. In the latter case, the malfunction does not impair the operation of the gun.

A grand total of 8,128 casualties have been recorded for the seventy-one mounts included in the survey. The forty-five 3"/50 Rapid Fire Twin Mounts on four cruisers have had 6,767 casualties, and the twenty-six mounts on eleven destroyers have logged 1,361. These figures should be given thought before assumptions and/or interpretations are drawn. In the preceding paragraph, the need for analyzing the casualties by further detailing of the components, as presented in Table 7 of Part II, has been recommended. Carefully considered, the factors listed below should also be given proper weight when final conclusions are drawn:

1. A "green crew" will, because of lack of specific weapon experience, encounter a greater number of casualties during initial training and firing exercises. This is revealed in the battery logs.
2. More casualties will occur during firing practice than in routine exercising of equipment. Therefore, inclusion of this factor is important.

3. Vibration due to firing of larger caliber guns frequently results in relays "kicking out" and tube malfunctions on the 3"/50 RFTM's. This should be noted in the battery logs.

4. Long exposure to elements will cause casualties in electrical switches and short-circuiting due to moisture seepage. Neither is very serious, but both can be time-consuming.

5. Wear of mechanical parts after a period of firing is to be expected. An awareness of this and periodic inspection, followed by subsequent preventive maintenance by experienced trouble shooting crews, will drastically reduce frequency of mechanical failures. Keeping records of this information and correspondence with the 3"/50 Gunner's Mate, Class "B" School and newly commissioned vessels having this equipment will assist in profitable sharing of experience.

6. The frequency of a casualty should be correlated, in a comparative manner, so that the seriousness of the malfunction and the inoperative period of the weapon can be recognized. A certain casualty may happen rather infrequently but emphasis upon it during formal school is desirable in order that the actual repair time for effecting rectification may be realized.

TABLE 6

3"/50 RFTM CASUALTIES
BY
WEAPON COMPONENT

(Seventy-one 3"/50 RFTM's)
(41,340 Rounds Fired)

Components	Cruisers	Destroyers	Component Total
Carriage	13	20	33
Stand	2	5	7
Elevating Gear			
3" MK 2 MOD 1	6	14	
3" MK 4 MOD 1	1	2	23
Power Drives			
Elevation Power Drive (MK 35 MODS 0,1)	17	7	
Train Power Drive (MK 35 MODS)	90	18	
Amplifier (MK 40 MOD 0)	2097	956	3185
Sights	0	0	0
Gun Assembly	441	67	508
Slide	510	12	522
Loader			
Loader Drive Unit	197	46	243
Left Side Plate	158	12	170
Right Side Plate	373	54	427
Hopper	600	50	650
Gate Operating Mechanism	289	24	313
Transfer Tray and Shell Carriage	650	23	673
Buffer Bar and Shell Deflector	590	19	609
Breech Interlock Mechanism	602	16	618
Control System	131	16	147

CHAPTER VII

ORDNANCE PAMPHLET DEFICIENCIES

OP 1566, 1st Revision

During visitations to various installations, a concerted attempt was made to garner all opinions and factual cases on misinterpretations and actual Ordnance Pamphlet deficiencies. In the process of collecting casualty data, interviewed personnel were questioned as to the correctness and completeness of the procedure presented for casualty rectification, and for accuracy of other instructions with reference to disassembly and assembly, maintenance and/or lubrication, trouble analysis, and adjustments. Variance and omissions, as well as inaccuracies, were sought.

The acquisition of this data proved to be a difficult task since practically none of the personnel had written records concerning this information, and in almost all instances it was necessary to rely upon memory and experience. Criticism of OP procedures was proportional to the individual knowledge and experience of the interviewee based upon the number of rounds fired, casualties rectified, and length of service on the mount.

Deficiency Defined

In order to establish a common ground of understanding, the factors which determine a deficiency were explained to personnel.

For the purpose of this study, the analysts proposed their own definition since the term is not defined by Navy authorities. "A deficiency is the omission of a critical part, step or sequence necessary to successful completion of a task and/or errors in terminology, nomenclature, steps and sequence necessary for successful completion of a task; all objectively related to the purposeful operation of the 3"/50 RFTM."

Purpose of Ordnance Pamphlets

The definition given does not consider the omission of step-by-step casualty rectification for all malfunctions to be a deficiency. It should be understood that Ordnance Pamphlets are design-centered and based on manufacturer's information. The common complaint voiced by personnel that many common casualties are not covered in the OP may be countered by reference to the general instructions for trouble shooting. "It is not the intent of these instructions to cover all possible troubles which can occur in operation of power drive ..."[1] "Instead, the instructions demonstrate the reasoning involved in trouble shooting."[2] "The purpose of this text [Analysis of Errors and Trouble Shooting] is to illustrate systematic trouble-shooting procedures by giving examples of some common casualties and the steps necessary to correct each condition."[3]

1. Navy Department, Bureau of Ordnance. 3-Inch Mounts, MK 34 MODS 0 and 1 Ordnance Pamphlet 1698. Washington, D. C. 1950, p. 270.
2. Ibid.
3. Ibid., p. 271.

Though these statements are not contained in OP 1566, it is obvious that the purpose is identical, and complete coverage would be impractical and a detriment to the objective of the publication. The stress, rather, is placed upon design and function, maintenance, assembly and disassembly, with sufficient casualty rectification examples intended to promote the analytical and diagnostic approach.

Other Personnel Comments

Other protests regarding the inadequacies of the OP's, together with the request for more step-by-step casualty rectification, sharply point up the need for a manual specifically written to aid and supplement training. A brief summary of other major objections emanating from 3"/50 RFTM personnel is that:

1. The language is difficult and above the level of the reader.
2. The material appears to be scattered and is difficult to use as a reference for on-board training because of the necessity to refer to many sections for complete information.
3. The material is not in a learning sequence.
4. Many of the charts and drawings are too small to read.

It should be noted, however, that in general Gunner's Mates agreed that both Ordnance Pamphlets 1566 and 1753 were a great improvement over some former publications and, when viewed objectively with the purpose for which they were written in mind, the publications are considered to be superior. "The illustrations, indexing and printing are considered to be excellent. That section concerning operation is the outstanding feature of this OP [1566]."[4]

4. Letter from T. Branchi, LCDR, USN Officer in Charge, U. S. Naval School, Gunner's Mate, Class "B", to Daniel J. Paolucci, Research Associate, Cornell University, June 11, 1953.

The referenced letter was result of a request that the instructional staff of the school submit deficiencies to supplement those obtained from the Fleet personnel. Criticisms from the school were more numerous and within the limitations of the definition. The listing of the deficiencies which follow is a composite of all those collected from both sources—Fleet and School.

Specific Deficiencies

The deficiencies listed are grouped under three general classifications: Nomenclature differences, Errors and omissions, and Insufficient explanation. The bulk of the recorded findings are within the scope of errors and omissions.

Nomenclature differences

The first six listed below refer to a single unit which is indicated by several different names in the text. The last one of this group is the reverse in that several units or parts have an identical name.

1. Breech opening cam - p. 40, fig. 48.
   Breech operating cam - p. 381, fig. 303.

2. Firing lever (Electric percussion lever) - p. 48, fig. 55.
   Safe lever arm - p. 86, fig. 99.
   Firing mechanism safety lever - p. 107, fig. 115.
   Firing lever - p. 205 (see text, Step 7 under Operating Instructions).

3. Interlock finger - p. 144, fig. 140.
   Bore clear lever - p. 222, fig. 250.
   Breech interlock latch lever - p. 232, fig. 267.

4. Breech interlock cam - p. 144, fig. 140.
   Cam guide bracket - p. 222, fig. 250.
   Housing cam track - p. 194 (see text, Breech Interlock Reset Action, second paragraph).

5. Hand reset lever - p. 188, fig. 199.
   Elevating lever - p. 222, fig. 250.
   Hand reset lever - p. 254, fig. 282.

6. Round feed shaft - pp. 268-269, fig. 294, pieces 20, 32, 62.
   Hopper shipper shaft - p. 106 (see text, Slide Bar and Gear Shipper, second paragraph).

7. Latch lever - This term is applied to several different levers in the breech interlock mechanism of both MOD 5 and MODS 4 and 6 loaders, and is confusing to personnel.
   Breech interlock mechanism - p. 143, fig. 139.
   Breech interlock mechanism - p. 144, fig. 140.
   Breech interlock mechanism - p. 222, fig. 250.
   Breech interlock mechanism - p. 254, fig. 282.

Errors and omissions

Throughout Ordnance Pamphlet 1566 there are occasional errors in labeling parts, important steps omitted, all of which cause confusion and are a deterring factor in the training of personnel. Examples of some of the more flagrant errors in this area are cited.

1. Front gates - p. 131.
   Interlock switches - pp. 160-164.

If a unit or part has a definite purpose, it should be stated briefly along with other pertinent data, i.e. front gates — support the round in the index position when the transfer tray is down.

2. Breech interlock mechanism arrangement - p. 144, fig. 140.

The part named "loader drive clutch" at the top of the illustration, is incorrectly labeled. The indicated assembly is the clutch shipper shaft assembly; the part is the declutch shipper sleeve.

3. Breech interlock reset action - p. 194.

The reset action described for MK 2 Loaders MOD 5 and MODS 4 and 6 in the text differs from the manual reset and, since the actions are opposite in result, the explanation tends to confuse.

The second paragraph concerning the drive control mechanism operation is inaccurate.

The stated action of the breech interlock reset action in the third paragraph is false.

4. Schematic arrangement -

3-inch Loader MK 2 MODS 4 and 6. Face p. 198, No. 1, fig. 211.

3-inch Loader MK 2 MOD 5. Face p. 198, No. 2, fig. 212.

The arrows on the shipper cam gears, #127 and LS(L) and LS(R) in both schematics should be shown rotating in a counter clockwise direction rather than the indicated clockwise direction.

5. Loader unloading instructions - p. 207, second paragraph.

Unloading the loader via energized motor is not a recommended procedure. Use of the hand cycle is almost universally followed

by gun personnel.

Because of the inadequacy of performance of the rear gate wrench, its use has been discontinued aboard most ships.

6. Loader timing protractor - p. 208, fig. 228; pp. 208-209; p. 298.

The protractors shown in these two illustrations are different types. The protractor in figure 228 attaches to the driving sprocket and the one on page 298 screws on to the main cam shaft. If the one on page 298 is used when making the main cam shaft coupling adjustment, each change of the coupling will drive the protractor off its "zeroed" position.

7. Refilling control mechanism buffer - p. 208; pp. 102-103; p. 102, fig. 109.

a. Figure 109 shows buffer piston in an "out" position which is opposite to the BuOrd Drawing #513449 (LVB Chart, OP 1753.). Illustrations and instructions should be specific and consistent in lubrication charts and applicable Ordnance Pamphlets.

b. Directions for filling control mechanism buffer are incomplete (p. 208). Instructions should elaborate "fill to level at 0° elevation; loader at zero position; clutch disengaged."

8. Feeder drive gear shaft coupling shear pin replacement - pp. 212-213.

a. Casualty Type 3 — this condition will not occur on all loaders — it seems more likely that the shear pin

coupling will unscrew and sprocket alignment could be lost.

b. In replacing the shear pin in the above condition, first rotate the sprockets until the shear pin holes line up. If sprocket alignment is lost, unscrew the coupling and rotate the sprockets until the driven flange is rotated one complete turn. This will advance the sprocket 18°. Continue by trial and error; a maximum of four changes may be necessary to cause the sprockets to come into alignment. (Caution: The rotation of the sprockets when making changes must always be in the same direction.)

9. Loader drive unit clutch adjustment - pp. 213-214.

The text falsely suggests that a slipping clutch may be recognised by operating with the hand crank.

10. Shipper shaft clutch drive spring adjustment - p. 214, fig. 237.

No apparent reason for mechanism in this position except for having power off. The reason should be stated.

11. Buffer step mechanism adjustment - pp. 216-217.

The formula and instructions are too difficult and complicated to understand and follow. A suggested formula is: X = .169 -+- Y. Y represents the clearance between the piston cam and the step plate.

12. Main cam shaft coupling adjustment - p. 217, fig. 242.

A change in this setting may cause the shell feed drive and the shipper cam gear synchronisation to be driven out of

adjustment. A precaution to this effect should be given. It is further suggested that the proper securing of the clamp cap screw be emphasized with the precaution that failure to do so may result in recurring maladjustment.

13. Control mechanism housing outboard parts. Disassembled. - p. 265, fig. 291.
Loader drive unit control mechanism - p. 101, fig. 108.

In these two illustrations, the names of parts are confu[sed] in that "connecting link" in figure 108 appears to be the [assembly] of links, stud, and locknuts. The illustration of part[s] assembled, figure 291, clearly indicates the term "c[onnecting] link" applies to the end pieces only (pieces 6, 8[, 9]) has been suggested that the [assembly] of links b[e] connectors" and the sub[assembly] unit."

14. Transfer [unit]

15

consistent with

rather than clarifies.

good, but it is not used

se text, Front Gates, last

p. 134.

e shell fingers are locked in the closed

t be opened when the transfer tray is up.

this fact is made and no reason is stated.

fer operation is not defined."

osition - p. 190; p. 196, p. 211.

No definition or explanation of this position is given,

lock lever in notch of unlatch and lock cam.

position is important since it is used for adjustment purposes and may vary in power by needle valve setting on the control buffer or in manual operation.

6. Automatic firing operating instructions - p. 205, Step 8.

When loading hopper only, position ASF to "single" to nullify possibility of round being rammed into chamber and being fired. This information should be added to Step 8.

7. Single round percussion firing operating instructions - p. 206.

After Step 7 should be added "Release bore clear switch."

8. Operating precautions - pp. 206-207, Step 6.

This step should include the statement "keep the mount trained in a safe direction." More important, there should be a precautionary statement concerning securing of elevation lock. Since some malfunctions may require personnel to crawl beneath the loader to investigate or rectify a casualty, failure to secure the elevation lock in such instances may result in fatal or serious injury.

[It has been found that some ships do not stop the gun laying movement under similar circumstances--a dangerous procedure. In one instance, a gunner's mate who was repairing a casualty on an unmanned mount narrowly escaped serious injury because he had failed to observe the necessary precautions and someone manipulated the director controls.]

9. Control mechanism buffer -- needle valve adjustment - p. 216, first paragraph.

The term "overtravel" should be defined.

CHAPTER VIII

INTERPRETING WEAPON DATA

Performing an analysis of all other weapons in the Gunner's Mate Rating, utilizing the methodology developed and proposed, would provide an end-product fully capable of meeting a majority of the expressed needs of the consumers. There appears to be no short-cut which may be used to furnish the complete information required. Approaching the problem by the individual weapon procedure and then consolidating the data for the entire Gunner's Mate Rating has distinct advantages to recommend it. These benefits would apply equally to training, qualifications, testing and selection, classification, and other consumers who have voiced an interest in the study.

Advantages to Consumers of Single Weapon Analysis Approach

Development of Training Courses and Curricula

The data would provide information on minimum tasks performed on each weapon, the rate responsible for the task, the frequency of performance, and the degree of supervision exercised. Training courses, for each weapon, could be evaluated and structured to concentrate on "must know" knowledge of immediate use to the trainee.

Development of Qualifications for Advancement in Rating

This would provide accurate data on weapon tasks performed in the Fleet by each rate in the Gunner's Mate Rating. The qualifications, as prepared from the consolidated data, of all weapons, would be realistic for they would reflect Fleet conditions and practice.

Test Development

The written examinations for each rate could be prepared to test purposefully for minimum requirements. Greater specificity in the questioning would result from this type of approach.

The analysis for any new weapon may be made and the additional material simply added to the accumulated data on the Gunner's Mate Rating. By like reasoning, the data on obsolete equipment could be culled. Systematized in this manner, cataloging, inventorying, and revision of basic material for the Gunner's Mate Rating may be reduced to a clerical operation. The advantages of the system would be to keep the consumers abreast of current Fleet practices and avoid the expense of extensive field work without proportional results.

Interpreting Data

The interpretation of the collected material is most critical for the analysis. It is a task that demands profound deliberation. Each consumer should survey the data in the light of his specific needs and then discuss his findings in conjunction with all other consumers. A synthesis of the total group thinking is in essence the end-product desired.

To illustrate the procedure recommended, an attempt is made to interpret the data collected in the unit area "Adjustment Factors" (Part III).

Unit area: Adjustment Factors (rate performing task)

Each task performed in this area is listed in the right-hand column of the data sheets (Part III). In columns A, B, and C of the format, the consolidated results of questioning as noted in the instruction sheets accompanying the "Adjustment Factors" format (Part I, Appendix A) are listed.

Column A, Section 1, Part III, gives the consolidated data to question #1, "The adjustment performed by what rate?" Sections 2 and 3 of column A, column B, and column C likewise follow this pattern.

Consider the task "firing stop test" under adjustments performed on the "carriage" component as an example for interpretation of information. Column A, Section 1, provides an answer to the ratings and rates performing the task. On the four cruisers, the task was the sole responsibility of the Gunner's Mates. On twenty-three mounts it was done by the GM1 and on twenty-two mounts by a GM3. On the eleven destroyers visited, the task was spread over the Gunner's Mates, Fire Control Technicians, and Fire Controlmen ratings as noted in the data. For clarity, the figures are extracted from the data sheets (Part III) and listed below:

FIRING STOP TEST

(Rating Performing Task)

Type Vessel	Ratings and Rates											
	GM				FT				FC			
	C	1	2	3	C	1	2	3	C	1	2	3
Destroyers . .	10	9	6	6			6		3			
Cruisers . . .		23		22								
Totals . . .	10	32	6	28			6		3			

The task is primarily a Gunner's Mates responsibility, despite the fact that on some destroyers, it is the dual responsibility of Gunner's Mates, Fire Control Technicians and/or Fire Controlmen. The lowest rate in the Gunner's Mate Rating performing the job is the GM3. There was no reasonable explanation as to why six GM2's, thirty-two GM1's, and ten GMC's performed the same job. A review of the rates and complements within the Gunner's Mate Rating revealed that the GM2 complements were unfilled. Did this explain why so many GMC's and GM1's were performing the task? Further questioning of personnel brought forth the answer that only experienced personnel could be "trusted" to do the job "correctly." It is felt, however, that the answer lies in the lack of training received. A relatively low percentage of Gunner's Mates serving as members of the 3"/50 RFTM crews have been to the 3"/50 Gunner's Mates, Class "B" School. The actual numbers are noted in Part I, Chapter V, pp. 41, 44.

Unit area: Adjustment Factors (supervision exercised by what rate?)

Column A, Section 2, Part III, furnishes the consolidated data with reference to rate providing the supervision for the task "firing stop test." The figures from the data sheets (Part III) are listed below.

FIRING STOP TEST

(Supervision Exercised by What Rate?)

Type Vessel	Ratings and Rates											
	GM				FT				FC			
	C	1	2	3	C	1	2	3	C	1	2	3
Destroyers . .	21	12				6			3			
Cruisers . . .	23	22										
Totals . . .	44	34				6			3			

The supervision of the task is basically a Gunner's Mate Rating responsibility. The task is performed by either the GMC or GM1 rates. The minimum rate amenable for the supervision of the job would be the GM1.

Unit area: Adjustment Factors (degree of supervision)

The degree of supervision exercised for a task is frequently an indication of the importance or criticalness of the job. To avoid complications arising from excessive detailing or breakdown of degrees of supervision, the following system for measuring the amount of assistance given was devised and followed.

Degree No. 1 - Close supervision: The supervisor is present during the performance of the task, giving step-by-step instructions and checking the results at the conclusion of each step. This, from the research team's point of view, is closely related to training on-the-job.

Degree No. 2 - Giving orders as to job to be done and following up after completion of task: This type of supervision is indicative of the fact that the job is critical, the rate performing the task is competent and has had qualified training to perform the job.

Degree No. 3 - Giving instructions concerning task to be performed: The assumption here drawn is that the rate has previously performed the task satisfactorily, is a reliable and responsible person, and the job is not critical in the sense that failure to perform it to perfection will result in a serious weapon casualty. Thus the task is assigned and checked off when the rate signifies that the job has been properly performed.

The data concerning the degree of supervision exercised for "firing stop test" have been extracted from Part III and are consolidated below:

FIRING STOP TEST

(Degree of Supervision)

Type Vessel	Degrees of Supervision		
	1	2	3
Destroyers . . .	23	4	2
Cruisers	22	23	
Totals	45	27	2

The evidence, as represented by the totals on degrees of supervision exercised for the specific task, would lead to these conclusions:

1. The job performance is important and/or critical.
2. Well-trained and qualified personnel are necessary.
3. The task rates high on the need for close checking for satisfactory completion.

Unit area: Adjustment Factors (number of times adjustment made on vessels)

The figures (Column B, Part III) reveal that the task was performed eighty times on destroyers and 1260 times on cruisers, a total of 1340 performances. This frequency would establish a high priority rating for both training, qualifications and classification. The 3"/50 Gunner's Mate, Class "B" School staff and the responsible ship training personnel would profit from this knowledge.

Unit area: Adjustment Factors (correctness of OP procedure)

The check in Column C, Part III, is self-explanatory. Every attempt was made to be critical of the ordnance pamphlet literature and much time was spent in having the rate read this material carefully. Very little Fleet criticism was forthcoming for recording. Chapter VII, Part I, is devoted to the coverage of deficiencies, of all types, noted during the field work.

CHAPTER IX

TRAINING OF ANALYSTS

Much has been written in the field of job analysis pertaining to mechanics and principles and excellent publications 1/ are available for both naval and civilian occupations. It is the purpose here to supplement that literature with information pertaining to the methodology presented to obtain a more comprehensive overview of the jobs.

Emphasis may be placed also on the procedures, methods and techniques necessary for the analyst to establish rapport at the visited installations so that mutual understanding, common purpose and complete cooperation may be secured. Presented here are guideposts for the selection and training of analysts, with direction toward the use of the methodology contained in this study.

Suggested Prerequisites and Training

Basic to the training of analysts is the purpose, objectives

1. Bureau of Naval Personnel, Manual of Instructions for Naval Occupational Analysis. NavPers 15,803. Billet and Qualifications Research Branch, Research Division, 1949. 48 pp.
War Manpower Commission, Bureau of Manpower Utilization, Division of Occupational Analysis and Manning Tables, Training and Reference Manual for Job Analysis, Washington, D. C., 1944. 104 pp.
Fryklund, Verne C., Trade and Job Analysis. Milwaukee: Bruce Publishing Company, 1942. 167 pp.

and practical applications of job analysis and its relationship to job classification, evaluation, specifications and descriptions. Further, he should understand the part it plays in placement, counseling, training, utilization of manpower, work schedules and all other areas involving the study of jobs.

Industrial education

The analyst should be familiar with industrial education to the extent that he is aware of the problems, teaching methods and techniques, and aims of terminal-type technical and vocational programs. This awareness will give him direction in his analysis, help define the limits and aid him in modifying, revising or establishing new formats, methods and techniques to attain the established objectives. If the analyst is involved in the interpretation as well as the collection of data, then the need for the foregoing becomes essential because proper interpretation and understanding of the data may not be achieved without knowing the basic concepts.

Study of the vehicle

One of the most important phases of the analyst's preparation is that he be thoroughly familiar with the vehicle of the study. He should know the applicable literature and references such as the ordnance pamphlets and have a working knowledge of principles and operation. He should be familiar with the nomenclature, terminology and types of equipment under survey. A background of this knowledge places the analyst in the favored position, through

discreet questioning, to aid the interviewed personnel in expressing themselves more clearly, provides for greater accuracy and detail. It alleviates the possibility of acceptance of incorrect information and facilitates reference to the technical publications for verification, exact nomenclature and most suitable examples in listed references.

Interviewing skill

Training and experience in interviewing are essential to the degree that the analyst be skilled in the use of leading questions, listening and techniques of guided interviews. The developed formats, casualty forms, and other data-collecting forms do, in essence, perform the same function as interview guides. Good listening and aiding personnel, if necessary, to express themselves more clearly and accurately are essential to collection of pertinent information.

One of the pitfalls of job analysis is the temptation for the analyst to put words into the mouths of interviewees. Oftentimes, personnel are not able to express themselves rapidly and the choice of expressions and words appear to be unsuited to the study. Because of these time-consuming factors, the analyst in his attempt to speed up the procedure, finds himself supplying information and the interviewee gradually withdraws. When this occurs the analyst has lost control and the interviewee becomes resistant to further questioning. It is essential that the language of the personnel be recorded. However, the accuracy of nomenclature and operations should be checked against the ordnance pamphlets. The interviewee should verify the information; otherwise the analyst will find

himself doing the work instead of the personnel who are the experts on the vehicle of study.

Knowledge of interviewing methods and techniques will facilitate data collection, maintain rapport, and insure accuracy and close adherence to accepted practices of job analysis.

Knowledge of purpose of analysis

Many analyses may fall short of the objective if the analyst is not able to explain fully its eventual use and how it will benefit directly those who are supplying the information. The explanation should be made to all personnel involved, enlisted and commissioned. Enthusiastic cooperation may be lacking unless there is complete understanding as to how the survey will benefit through better training, efficiency of operation, improved casualty rectification and better placement. Cooperation can not be commanded.

If possible, a copy of the information that has been gathered at the installation and which may be immediately helpful should be sent to the installation within a short period of time. This action alone will elicit cooperation and support throughout the organization.

Organization of the Navy

A knowledge of the organizational structure of the Navy is important for all analysts. Chain-of-command, official channels, shipboard organization, assignment of duties and responsibilities, limits of authority and relationships between ranks and rates--a familiarity with all of these factors may reduce possible

friction and secure at all levels the support needed to attain the objectives of the study.

Personal characteristics

The personality and appearance of the analyst may be a real factor in the final determination of the success of the survey. Unless he is of the type who commands immediate face acceptance and confidence, he may experience difficulty in establishing rapport. The manner and style of dress of civilians has an effect upon personnel acceptance. Conservative clothes, in keeping with the type installations visited, will help materially in gaining acceptance. Since the time spent with personnel is relatively short, there is little opportunity for the analyst to overcome initial resistance.

The analyst should be of a friendly nature, a student of human relations, have a sincere interest in people and a sympathetic attitude toward the problems which will be posed during the interviews. Fear and suspicion must be allayed before work may progress; sincerity and an attitude of service on the part of the analyst will further this end.

The process of extracting the data is a task requiring patience and understanding. The analyst can render immeasurable aid if he is articulate and can tactfully help personnel to express themselves clearly.

Navy Analysis Program

The use of military personnel for job analysis, it is be-

lieved, may not be conducive to obtaining the best results unless cautions are observed. Because of the conciousness of rank, status, and position of all personnel in the process of data collection, the uniform may be a detering factor.

The visiting analyst may not, in the time allotted, establish equal relationships with officers who outrank him and he may be unable to get an honest and complete factual history from the enlisted personnel. There is a deference on the part of those who are outranked and such an attitude is not compatible with the objectivity of the survey. Suspicion of the motives of the study and fear of detrimental effect by those interviewed may result in the withholding of vital information. Because the garnering of data, the chore of recording pertinent information, constant reference to ordnance pamphlets and other details connected with the analysis are tedious, breaks in the task are beneficial. It is during this period that personnel often air their personal feelings. The opportunity to express themselves, confident there are no reprisals or sanctions, elicits greater cooperation and accurate details from personnel. Often the conversations during these breaks are leads to important data previously unrevealed.

Selection of analysts

It is understood that three main categories of personnel involved in analyses are: civilians, enlisted men, officers. It is believed that all may participate in the use of the methodology presented providing special attention is given to the previously stated reservations and those which are listed

below. The resistance which may be met at the initial stages of a program using military personnel may gradually disappear with time, custom and confidence in the work performed.

It is recommended that definite criteria be established and adhered to in the selection of analysts. In general, all three categories whenever possible should have some background and experience in the following:

1. Related experience in the personnel field.
2. Related experience in industrial trades, either as a trainee or in an associated job.

Civilian employees

The civil service requirements make a college degree almost mandatory for the journeyman grade. This in addition to above general recommendations seems to be a sufficient base from which to start.

Military personnel

For military personnel, the following requisites are recommended to supplement the experience in personnel and industrial trades:

1. High school graduation or its equivalent.
2. Intelligence as indicated by test scores equal to that of college freshmen level.

It is further recommended that appropriate tests be utilized over a sufficient period of time to aid in a more scientific method of selection. Present employee--new employee test procedure may be one of the effective and valid methods employed.

Training Program

To insure effectiveness of results, an extensive training program of approximately six months appears to be mandatory for analysts. The content of the course should include those areas stated in this chapter covering background and preliminary training in analysis, use of the methodology presented and procedure in performing analyses. It is suggested that the Manpower Analysis Section be responsible for the initiation and direction of the training program.

Training in Methodology

The recommended six months course for analysts should be closely related to an on-the-job training program so that in addition to the suggested areas, the analyst may be involved in the actual "doing" to increase his understanding and knowledge. In so doing, the training program may be also a period of preparation for a new study to be made preferably on weapons other than the 3"/50 mount and offers an opportunity for the in-service evaluation previously recommended.

If the analyst is responsible for devising and modifying existing formats, the importance of the study and knowledge of the vehicle is amplified. The same type format (Appendix B) listing who performed the task, under what conditions, supervision given and received and frequency of task performance may be devised for every job in the billet as well as those which pertain to various weapons. The listing of the tasks within the jobs makes it imperative that the analyst have thorough knowledge and understanding

of the billet so that all jobs are covered and properly grouped in areas of administration, clerical, watch standing, etc..

Similarly the present casualty forms (Appendix A) for weapons may be modified and redesigned to meet the requirements of other jobs. Those tasks which are representative of the billet may be described under major headings. For example, clerical tasks in the rate may be delineated under: the task; reason for the task; conditions under which it is performed; frequency; procedure and references to publications; checking required; disposition and time required for the work. Since the first referenced format lists who performed the task, supervision given and received, etc., such information may not be required here, but may be included as desired. The compilation of all reports on all jobs in the billet may be utilized to establish the typical duties of the rate. It is to be expected that these jobs will vary widely with the installation. The Gunner's Mate's prime duty is the maintenance and operation of the weapons. All other jobs in the billet will vary according to ship and abilities of the individual petty officer.

Planning

To devise a format covering all tasks within all jobs under major areas, it becomes a necessity for the analyst to acquire and to study, well in advance, the organization and billet assignments of the proposed ships to be visited. The resulting formats then serve to refresh the memories of the personnel during the interview and reporting on each of the tasks is accomplished

during shipboard visitation. Since this type information is not so specifically organized as that in the detailed ordnance pamphlets, space must be provided for specific tasks and duties overlooked or not indicated in the obtained references and which are brought out in the interview.

Additional background knowledge

The basic fundamentals for the organization of the reports that parallel the casualty reports are contained in the formats and purposes of job sheets, operation sheets, information sheets and assignment sheets. These sheets, 2/ commonly used in industrial and technical education in varying and composite forms, are fundamental in the training of analysts so that they may better understand the objectives, devise and modify formats to fit the needs. This supplements the previously stated information on industrial education.

The training of the analyst should include the interpretation of the data so that not only may he be able to discriminate and evaluate the accumulation of data, but to explain also to responsible personnel why the study is being made and how they will benefit through its use, immediate and future. For example, using the data in Parts 2 and 3 of this study, the reports may be used to illustrate its implications for the consumers.

The recording of who does the job, supervision given and received and number of times performed has meaning to consumers.

2. Emerson, Lynn A., How to Prepare Training Manuals. Albany, New York: The University of the State of New York, The State Education Department, Bureau of Vocational Curriculum Development and Industrial Teacher Training, 1952. pp. 52-66.

The frequency in conjunction with the complexity of the job and combined with other data such as rounds fired, may be used to establish priority of training. Criticalness may be determined by a study of the data with relationship to the performance of the task, supervision and consequences. In the case of weapons, as the result of a casualty, the period of time the equipment is inoperative, the period of time for actual repair, combined with the degree of difficulty in determining the cause of malfunction (visual inspection vs. analytical or diagnostic thinking) may determine the criticalness of the job or task within the job.

The reports on the tasks may be used in training for individual instruction, recording of malfunction, compiled into training manuals, used as a basis for a course of study by instructors and to develop the analytical thinking of personnel.

From the accumulated data and reports, specialists from the fleet in the particular areas, preferably with several years experience and training as an instructor, along with a specialist in writing this type information, may then write from these factual records the knowledges, skills, and responsibilities required. This is not armchair analysis since it is based on actual conditions in the fleet. Analysts should be aware of these factors, be prepared to work within its framework and be articulate on the topic.

Visitation Procedures

The planning for actual shipboard visitations should be

organized and accomplished well in advance to insure maximum utilization of time, presence of responsible personnel, and following proper procedures and channels.

Establishing initial contact

In order that a survey be accomplished within reasonable time limits and that proper arrangements may be made for all concerned, a letter from the proper bureau or activity should be in the hands of the installation to be visited at least two weeks prior to the proposed date of visitation. The letter should contain the names of the analysts, the purpose of the study, some information concerning its value to the Navy, the personnel who will be interviewed, and facilities desired. The letter will assure that arrangements are made, the responsible personnel are aboard, and that all action is properly cleared. A copy of the letter should be forwarded to the commanding officer of the base with a copy to the analyst so that he may have it as a letter of introduction and identification.

Reporting to the base

The commanding officers of bases should be informed of what is taking place within their areas of command and analysts should report to that office before boarding the proposed ships. This is not merely an act of courtesy and respect, but more a requirement and an important cog in the chain of good relations with all concerned.

Through the office of the base commander, the analyst may obtain necessary transportation, required passes and, in some in-

stances, nearby living quarters. If so invited, he may have the opportunity to explain further the nature of his work and its objectives so that the purpose of his visit is fully understood.

Upon completion of his work at the base, good manners dictate a visit to the base commander to return the pass and to express appreciation for any accommodations provided.

Reporting aboard ship

To facilitate the conduct of the study, the analyst is advised to report aboard ship one day prior to the date established by letter. At that time, he may introduce himself, meet the responsible officers, arrange to meet other personnel, request needed facilities such as work space in a room where they will be undisturbed, logs, ordnance literature, and to explain further his mission and its value to the Navy.

He should emphasize the immediate value to the personnel aboard ship and indicate what information, if any, he will forward to them. He should indicate how he expects to gather the data, display the forms to be used and explain the use to which they may be applied in training, casualty rectification, and similar shipboard functions. With these preliminaries accomplished, a definite time for arrival the next day may be set, and the analyst is then prepared to begin his work.

Collection of data

Presence of responsible personnel who have both the knowledge and experience with the vehicle of study is essential for complete coverage of data sought. Perhaps this admonition may appear super-

fluous, but experience has indicated that not all personnel are qualified to impart the required information. Because of leave schedules, shipboard duties and other pressures common to ships coming into port, the best qualified men may not be assigned to him. The analyst will benefit by inquiring into the qualifications of the personnel assigned and whether they are the most capable.

During the process of gathering the essential information, the analyst should make use of all available resources. Logs, reports, and training records are invaluable aids. Memory is not sufficiently reliable. Often it has been discovered that common, recurring casualties are not considered sufficiently important, by personnel, to be recorded in logs. Good listening will reveal a number of casualties in one recital. Here again, if the analyst is familiar with the vehicle and its operation, he can recognize and record separately multiple-type breakdowns.

Informal discussion of the vehicle under study will occasionally remind personnel of incidents which have not been recorded in the logs and which are important additions. The analyst should not overlook any possible source of information. For clarity and accuracy, he may, in some instances, ask to inspect the part or component under discussion.

Throughout his interviews, the analyst should question personnel on the correctness of ordnance pamphlet procedures and accuracy of statements, illustrations, and operational steps. Since few shipboard personnel were found to have recorded errors and omissions, the most opportune moment to uncover inaccuracies

is when the component is being discussed and the reference in the ordnance pamphlet or other literature is being checked.

The analyst should be trained to be entirely objective in his collection and recording of data. He should refrain from passing judgement, evaluating, or comparing. His work is to record the job or task as it is; not as it should be. He should not attempt to correct a procedure, even though he may know it to be in error. To violate these principles of interviewing for analysis is to cause the interviewee to withhold cooperation and information. Further, the analyst should describe the job and not the incumbent.

Anonymity

A useful device to gain cooperation and confidence is to use code rather than ship names. Assurance that anonymity will be observed furthers interest in the study and gives evidence that the facts are to be used objectively to aid all personnel and ships concerned rather than to attempt to expose unfavorable practices or personnel weaknesses. Breach of confidence under the circumstances may sound the death knell in so far as future study is concerned. Communication via the grapevine is rapid.

Check by division officer

Before leaving the ship, when all information has been collected, the analysts should arrange to meet with the division officer and his subordinates to review the data collected, receive signed or verbal approval (signature preferred) and to again discuss its immediate and eventual use in the light of findings.

Arrangements for the forwarding of copies of desired data to the ship may be made and expressions of appreciation offered.

Team of analysts

The assignment of analysts by teams is recommended. Each should be familiar with the entire vehicle but specialize in component areas. A division of work and responsibility allows each analyst to interview personnel separately, compile his data more quickly and most important, permits ship personnel to carry on their regular functions with minimum disruption. If personnel know the analysts are anxious to interrupt as little as possible the established routine, they tend to be more cooperative and to minimize other duties.

There should be the understanding with the ships' officers, nevertheless, that the information sought is important and that the personnel released for interviews should not be disturbed except in extreme emergency. Interruptions are irritating, time consuming, disrupt continuity and a hindrance to desired results.

The team should remain intact and gather all of the data on the vehicle of study at all scheduled installations to insure consistency of interpretation, impetus of experience and knowledge, continuity to the survey and elimination of lost time and errors. Even to experienced analysts, the printed word has different connotations and the existence of a continuing team promotes consistency in the study.

CHAPTER X

RECOMMENDATIONS FOR FURTHER RESEARCH

The recommendations for further research in this area are based upon problems identified during this project. The following recommendations are based upon problems noted in the Fleet and at formal training centers visited.

1. The development of material for and preparation of a training manual for the 3"/50 Rapid Fire Twin and Single Mounts. The Ordnance Pamphlets 1566 (1st Revision), 1698 and 1753 can be utilized as a source of reference. The ordnance pamphlets are based on manufacturer's information and as such are equipment-centered. A training manual will make for effective teaching and learning, and can be used with equal facility by either Fleet training or 3"/50 Gunner's Mate, Class "B" School instructional personnel, and may be supplemented by the recommended development of the casualty reports.
2. The preparation of check-off lists, in pamphlet form, for required maintenance, lubrication, adjustments, pre-firing and postfiring checks for the 3"/50 Rapid

Fire Twin and Single Mounts. The field work revealed a lack of standardization and uniformity of procedure, resulting in variables that add up to a generally confused record-keeping picture. This function should be a correlated effort, shared equally by Fleet, 3"/50 Gunner's Mate, Class "B" School and weapon manufacturer's personnel.

3. A progress chart for weapon personnel. This record would be used by training personnel to ascertain areas of work performed by rates and dates of performance and to assure complete coverage by all personnel. Records of this type are invaluable for training purposes and focus attention on training needed as well as on personnel accomplishments on the weapon.
4. A comparative study of the effectiveness of teaching procedures utilizing control groups and recommendations for changes in course content as indicated by survey data.
5. A survey to establish the effectiveness of the present 3"/50 Rapid Fire Twin Mount program in the Gunner's Mate, Class "B" School to determine how the training may better meet the needs of the Fleet.
6. The methodology developed be subjected to an in-service evaluation, preferably utilizing the Gunner's

Mate Rating and the remainder of the weapons involved as the area of application.

7. Consideration be given to revising or modifying current casualty analysis forms in the light of the result of this study. The forms developed and the information obtained could be submitted to the Bureau of Ordnance for revision and comment. If approved and adapted the information desired for personnel purposes could be obtained from monthly or quarterly summaries.

APPENDIX A

UNIT AREA FORMATS

Maintenance and/or Lubrication

Adjustment

Disassembly and Reassembly

Trouble Analysis

WEAPON, PERSONNEL ORGANIZATION FORMAT

CASUALTY REPORT FORMS

Original

Revised

Instructions for Casualty Reporting

RESEARCH PROJECT

DETAILED BILLET SPECIFICATIONS
for
NAVY RATINGS (GUNNER'S MATE)
CONTRACT NONR-401(10)

SELECTED WEAPON: 3"/50 RFTM

Base: _____

Name, Type and Number of Vessel: _____

Number of 3"/50 RFTM's on Vessel: _____

Inclusive Dates for Interview: _____

Analysts: _____

_____

_____

Personnel Interviewed: _____

_____

_____

Material Cleared By: _____

Position: _____

Date: _____

UNIT AREA: MAINTENANCE AND/OR LUBRICATION

The items covered in this format deal with OP considerations. As will be noted, lubrication is considered, in this case, as a maintenance factor and it is thus placed primarily because we consider lubrication, like maintenance, to be a positive approach.

The information sought has been listed in columnar form, as follows:

Column A -

1. The maintenance and/or lubrication performed by what rate?
   (Note: Be sure the task is the shipboard responsibility of the rate under normal working conditions)
2. Supervision exercised by what rate?
3. Degree of supervision?

Column B -

Frequency of maintenance and/or lubrication.

Column C -

Correctness of OP procedure concerning maintenance and lubrication.

Column D -

Variations, if any, observed in reference to OP instructions.

Note: Other columns as required.

SYMBOLS AND INTERPRETATION

Column A -

1. As noted in U. S. Navy Occupation Handbook. (Illustration: GM3, GM2, GM1).

2-3. Supervised by, and extent of supervision, would list the rate performing the supervision, (Illustration: GMC - Gunner's Mate Chief) and degrees would be listed as 1, 2, and 3. No. 1 would be close supervision, No. 2, giving orders and follow-up after completion of task, and No. 3 would mean giving instructions concerning work.

Column B -

Frequency of maintenance and/or lubrication -

AR - as required

D - daily

W - weekly

M - monthly

Q - quarterly

SA - semi-annually

Y - yearly

Column C -

X indicates correctness of OP procedure as listed.

D indicates difference in procedure.

Column D -

X - Variation from OP instruction, X as is.

V - Indicates variation and extent to be listed in note form.

OP 1753 - 3"/50 RFTM
MARK 27 MOD 3
MARK 33 MOD 0

MAINTENANCE AND/OR LUBRICATION FACTORS

Rate Performing Task	Supervision Exercised By	Degree of Supervision	Frequency of Maintenance and/or Lubrication	Correctness of OP Procedure	Variation, if any, from OP Procedure	
1	2	3				
A			B	C	D	E

1. CARRIAGE - MK 22 MOD 3
Chapter 3, pp. 19-40

Preservation instructions (p. 33)
Inspection (p. 33)
Lubrication (p. 33) (pp. 305-308)
Water seal maintenance and replacement (pp. 33-34)
Limit stop buffer servicing (p. 34)
Train centering pin (p. 34)
Elevation lock (p. 34)
Fire interrupter mechanism (p. 34)

2. STAND - MK 22 MOD 1 - Chapter 4, pp. 41-50

Inspection periodically (pp. 45-46)
Inspection - before and after firing (pp. 45-46)
Lubrication (p. 47) (p. 307) (513454)
Preservation (p. 47)
(*) Carriage bearing maintenance (p. 47) (YARD)

A	B	C	D	E

3A. ELEVATING GEAR - MK 2 MOD 1
Chapter 5, pp. 51-72

Inspection periodically (p. 65)
Lubrication (pp. 65-66) (pp. 307-308) (513452) (513455)
Operating precautions (p. 66)
Maintenance instructions for power-off brake (p. 66)
Maintenance instructions for elevation and depression buffers.

3B. ELEVATING GEAR - MK 4 MOD 1
Chapter 13, pp. 309-327

Note: This gear is installed in all 3" mount MK 33 assemblies, replacing the elevating gear described in Chapter 5 — Mark 2 MOD 1

Inspection (p. 321)
Lubrication (p. 321)
Preservation (p. 321)
Maintenance instructions for Power-off brake (p. 322)
Maintenance instructions for elevation and depression buffers (p. 322)

4. TRAINING GEAR - MK 2 MOD 1 - Chapter 6, pp. 73-96

Inspection periodically (p. 87)
Lubrication (pp. 87-88) (pp. 307-308) (513452) (513455)
Pinion drive unit, maintenance (p. 88)
Power-off brake maintenance (p. 88)

5. POWER DRIVES (Chapter 7, pp. 97-238)

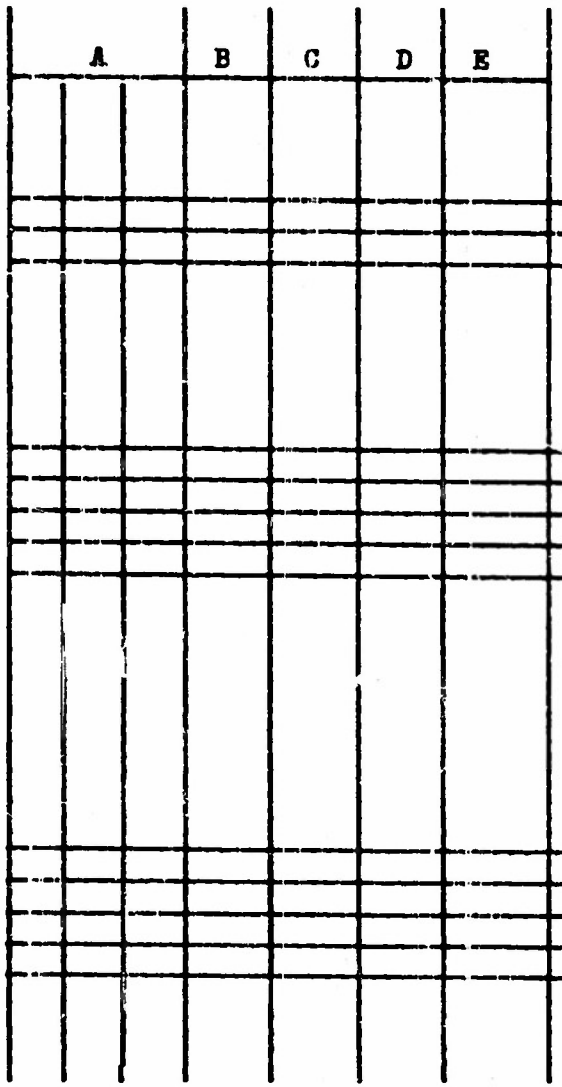
Elevation Power Drive MK 35 MODS 0, 1
- Elevation receiver - regulator MK 21 MODS 0, 1
- Motor-generator (Amplidyne) MK 6 MOD 0
- Elevation motor (Drive) MK 1 MOD 0

Train Power Drive MK 35 MODS
- Train receiver - regulator MK 29 MODS
- Motor-generator (Amplidyne) MK 6 MOD 0
- Train motor (Drive) MK 1 MOD 0

Equipment common to both drives
- Amplifier MK 40 MOD 0
- Control panel MK 65 MOD 0
- Control panel MK 62 MOD 0
- One-man control MK 2 MOD 0, right
- One-man control MK 2 MOD 0, left
- General maintenance (p. 188)

Periodic Lubrication
- Receiver-regulator (p. 188)
- Drive motor (p. 188)
- Train and elevation drive shaft coupling (p. 188)
- Motor-generator set (p. 188)
- One-man control (p. 189)

Overhaul Lubrication
- Train and elevation motors (p. 189)
- Train and elevation drive shaft coupling (p. 189)
- Elevation receiver-regulator (pp. 189-190)
- Train receiver-regulator (p. 190)
- Amplifier ventilating motor (p. 190)



Electrical Maintenance

Motors, amplidynes, and tachometers (p. 190)
Amplifiers (p. 190)
Control panels (p. 190)

6. SIGHTS - Chapter 8, pp. 239-270

3" Sight MK 40 MOD 1
Ring Sight MK 16 MOD 0

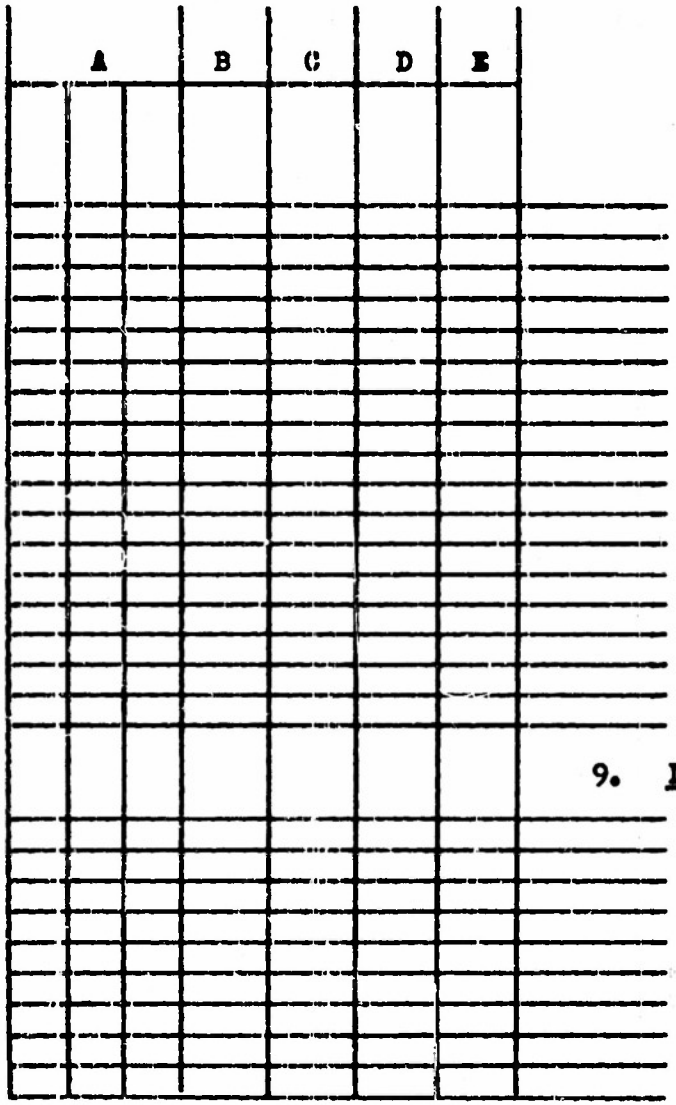
General Maintenance (p. 255)
Inspection (p. 255)
Lubrication (p. 255)
Servicing (p. 255)
Operating precaution (p. 255)

7. MOUNT FIRE CONTROL - Chapter 9, pp. 267-270

Note: Only Gun Fire Control System MK 63 MOD 11 requires additional equipment to be installed on the gun mount.

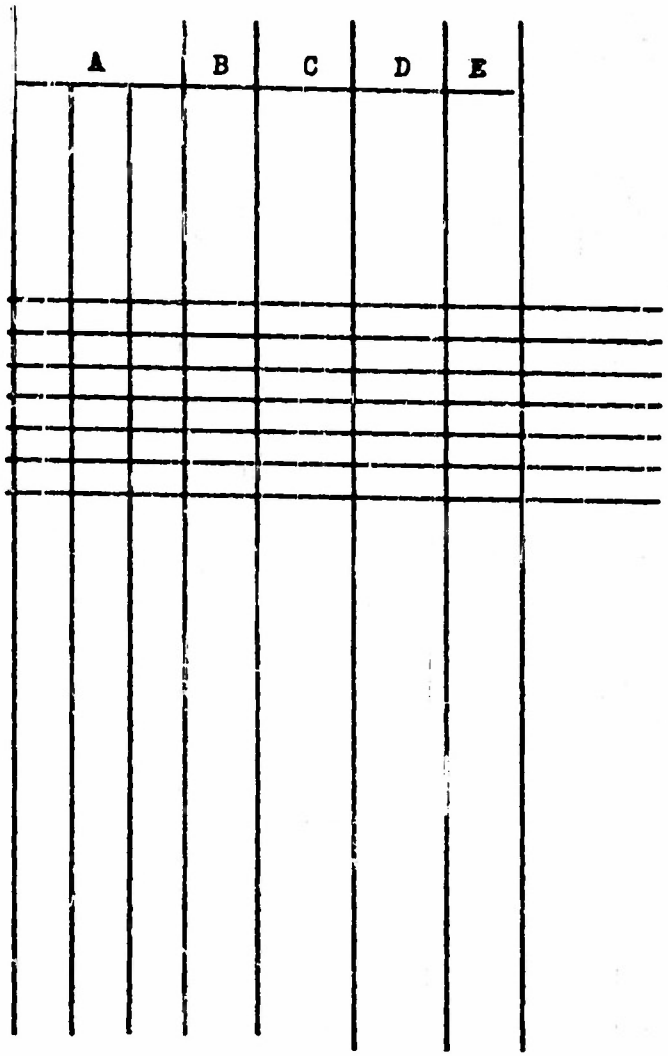
8. ELECTRICAL INSTALLATIONS - Chapter 10, pp. 271-292

Loader electrical equipment
Power drive electrical equipment
3" Lighting circuit Mark 16 MOD 0
Fire control equipment (equipment units)
Communications circuits



Maintenance and Safety
- Safety - live circuits (pp. 289-290)
- Moisture (p. 291)
- Lubrication damage (p. 291)
- Oil on panels (p. 291)
- Open-circuited conductors (p. 291)
- Loose terminals (p. 291)
- Corrosion (p. 291)
- Abrasions (p. 291)
- Pitted contacts (p. 291)
- Fuses (p. 291)
- Maintenance tools (p. 291)
- Controller maintenance (p. 291)
- Motor maintenance (p. 291)
- Fire control system maintenance (p. 292)
- Fire circuit maintenance (p. 292)
- Communications system maintenance (p. 292)
- Care of telephone (p. 292)
- Instrument lighting system maintenance (p. 292)

9. LUBRICATION INSTRUCTIONS - Chapter 12, pp. 305-308
- Charts
- Lubrication access
- Lubricants
- Lubricant reference information
- Lubrication frequency
- Distribution
- Excessive lubrication
- Lubrication of instruments
- Cleanliness
- Preservation



Adulterants - Detection of Harmful Materials
Check off lubrication procedures
Specific Instructions
(Warnings and Instructions) for:
Carriage and stand bearing lubrication
Carriage lubrication
Fire interrupter mechanism lubrication
Elevating gear lubrication
Power drive lubrication
Sight lubrication
Loader lubrication
Training gear lubrication

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MAINTENANCE AND LUBRICATION

FACTORS

Rate Performing Task	Supervision Exercised By	Degree of Supervision	Frequency of Maintenance and/or Lubrication	Correctness of OP Procedure	Variation, if any, from OP Procedure	
1	2	3				
A			B	C	D	E

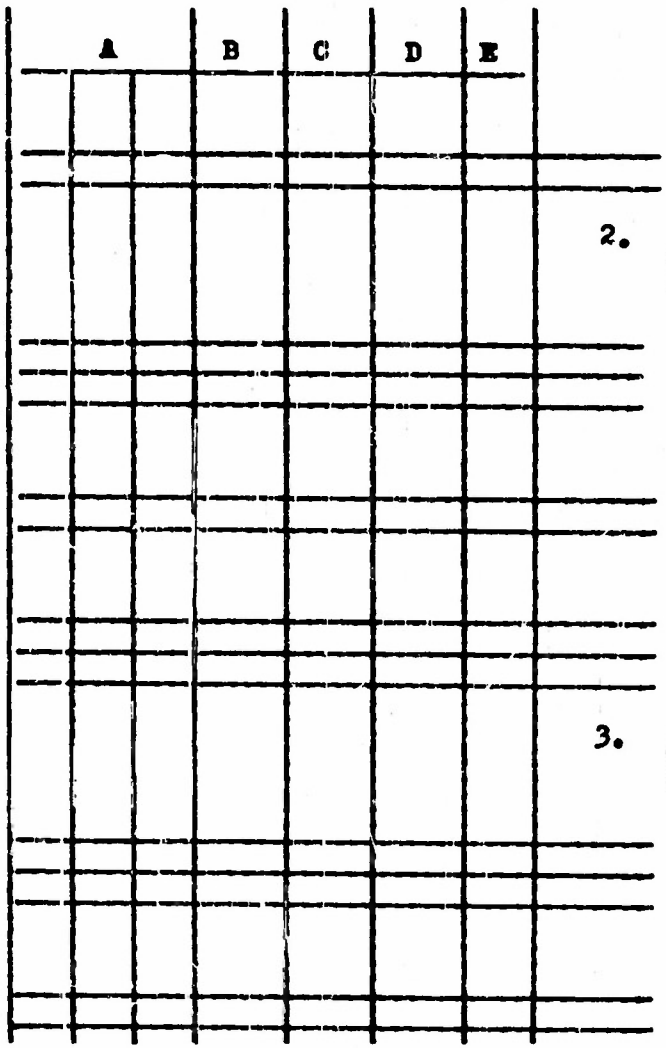
1. GUN - MK 22 MODS 4, 5, 6, 7, 8.
Chapter 2, pp. 11-56

Inspection (pp. 42-43)

Lubrication, Preservation and Cleaning (pp. 43-44)
Exercise (p. 44)
Servicing the gun (p. 44)
Velocity loss determination (pp. 44-45)
Servicing the breech mechanism (pp. 45-46)

Operating Precautions (pp. 47-48)

Misfire Unloading Instructions (pp. 48-49)
Percussion firing action (p. 49)
Sear resetting action after percussion firing (p. 50)



Manual Case Extraction Instructions (p. 50)
Manual breech closing instructions (p. 50)

2. SLIDE-MK 26 MODS 0, 1 and MK 27 MODS 0, 1.
Chapter 3, pp. 57-84

Inspection (pp. 68-69)
Preservation (p. 69)
Lubrication (p. 69)

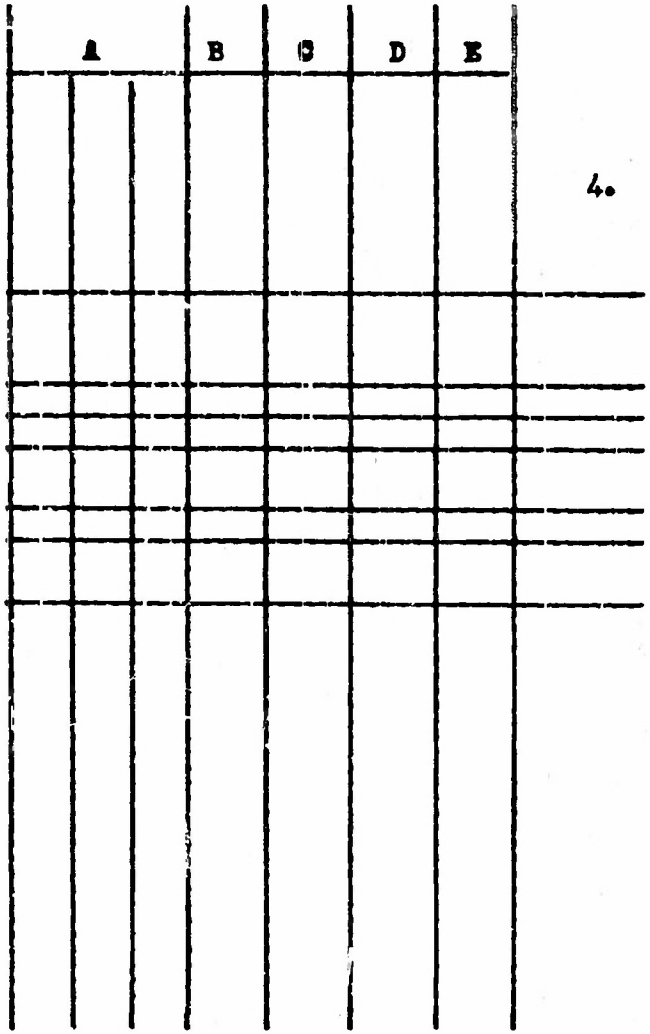
Operating Precautions
Preparation for firing (p. 69)
Stowing instructions (p. 69)

Recoil System Servicing Instructions
Filling the recoil cylinder (p. 69)
Draining the recoil cylinder (p. 69)
Recoil piston rod packing replacement (pp. 70-71)

3. LOADER - MK 2 MODS 4, 5, 6.
Chapter 4, pp. 85-284

Maintenance, general instructions (p. 204)
Inspection, preparing for operation (pp. 204-205)
Exercise (p. 205)

Servicing Instructions
Lubrication (pp. 207-208)
Buffer fluids (pp. 208-209)



4. SAFETY PRECAUTIONS
Appendix, pp. 306-307

Danger to personnel (p. 306)

Misfire Safety Precautions
Cook-off hazard (p. 306)
Breech closed conditions, cook-off prevention (p. 306)
Breech open condition, cook-off prevention (p. 307)

Danger to equipment (p. 307)
Before firing the guns (p. 307)

Stowing Precautions (p. 307)

UNIT AREA: ADJUSTMENT FACTORS

The items listed in this format deal with OP considerations in the exact manner covered in the literature. Adjustment, like maintenance and/or lubrication, is a positive step in the reduction of casualties.

The information sought has been listed in columnar form, as follows:

Column A -

1. The adjustment performed by what rate?
   (Note: Be sure the task is the shipboard responsibility of the rate under normal working conditions)
2. Supervision exercised by what rate?
3. Degree of supervision?

Column B -

Frequency of adjustment or number of times adjustment performed on board vessel.

Column C -

Correctness of OP procedure concerning adjustment.

Note: Other columns as required.

SYMBOLS AND INTERPRETATION

Column A -

1. As noted in U. S. Navy Occupation Handbook. (Illustration: GM3, GM2, GM1).

2-3. Supervised by, and extent of supervision, would list the rate performing the supervision, (Illustration: GMC - Chief Gunner's Mate) and degrees would be listed as 1, 2, and 3. No. 1 would be close supervision, No. 2, giving orders and follow-up after completion of task, and No. 3 would mean giving instructions concerning work.

Column B -

Frequency of adjustment -

AR - as required (mention number of times)

D - daily

W - weekly

M - monthly

Q - quarterly

SA - semi-annually

Y - yearly

Column C -

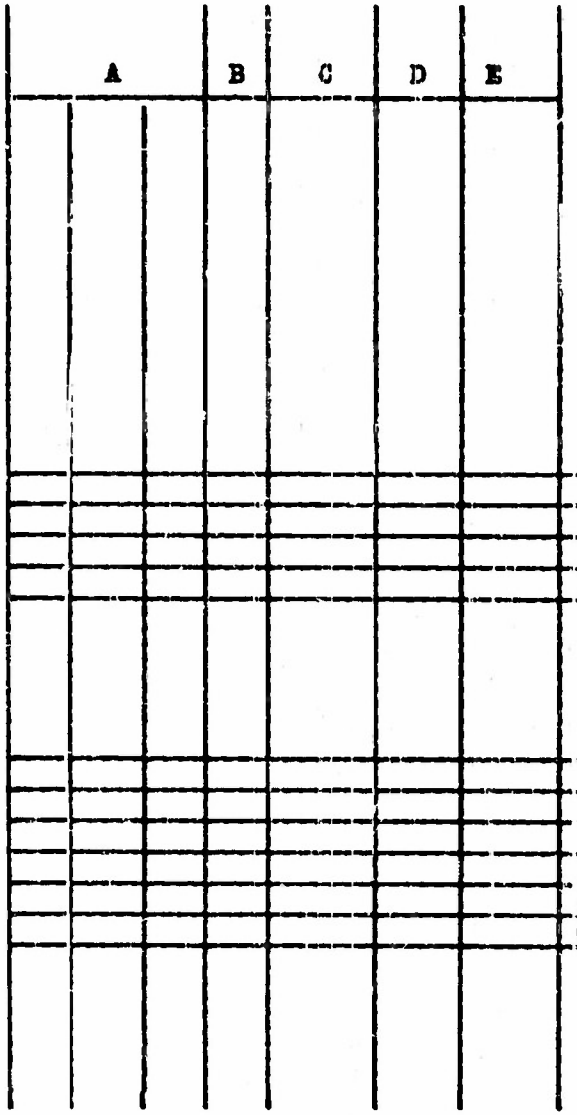
X indicates correctness of OP procedure as listed.

D indicates difference in procedure, the extent of difference to be listed in note form.

OP 1753 - 3"/50 RFTM
MARK 27 MOD 3
MARK 33 MOD 0

ADJUSTMENT FACTORS

Rate Performing Task	Supervision Exercised By	Degree of Supervision	Number of Times Adjustment Performed	Correctness of OP Procedure			
1	2	3					
A			B	C	D	E	
							1. ADJUSTMENTS - CARRIAGE All parts of the carriage, with the exception of the control station seats add the fire interrupter mechanisms are fixed by design. MK 22 MOD 3.
							FIRE INTERRUPTER MECHANISM ADJUSTMENTS
							(*) Cam tracing (p. 34) (OD-6438) (YARD)
							Firing stop test (pp. 34-35)
							Worm shaft synchronization (pp. 35-36)
							Cross feed synchronization (p. 36)
							2. STAND - 3" STAND MK 22 MOD 1-Chapter 4, pp. 41-50
							(*) Adjustment - carriage bearings - lost motion (pp. 47-48) (OP-762 dry dock procedure) (YARD)
							3A. ELEVATING GEAR (WORM DRIVE TYPE) 3" MK 2 MOD 1 Chapter 5, pp. 51-72
							Power-off brake adjustments
							A. Brake spring load adjustment (pp. 67-68)
							B. Brake release action adjustment (p. 68)
							Hand drive interlock switch adjustment (p. 68)
							Cross shaft adjustment (pp. 68-69)
							(*) Lost motion correction (pp. 69-71) (YARD)

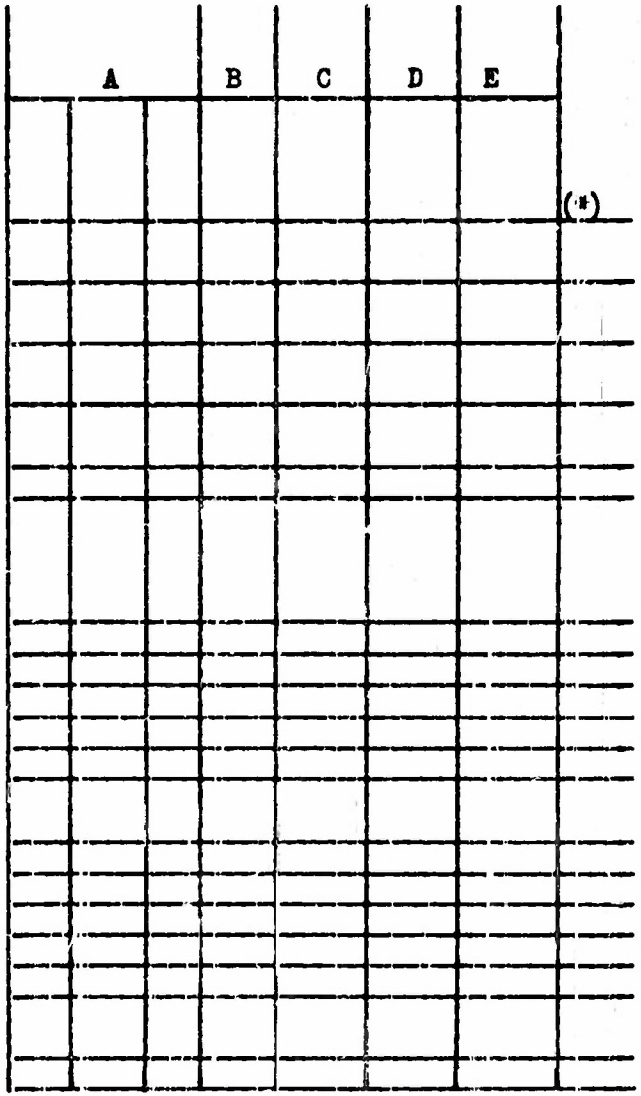


3B. ELEVATING GEAR MK 4 MOD 1-Chapter 13, pp. 309-327
(This equipment is installed in all 3" Mount Assemblies, replacing the elevating gear described in Chapter 5 (3" Elevating Gear MK 2 MOD 1). An elevation power drive motor (Chapter 7, p. 97) drives both reduction units.

Adjustments - Power Off Brake
A. Brake spring load adjustment (p. 323)
B. Brake release action adjustment (p. 323)
Hand drive interlock switch adjustments (p. 324)
Cross shaft adjustment (pp. 324-325)
Lost motion correction (pp. 325-326) (YARD) (*)

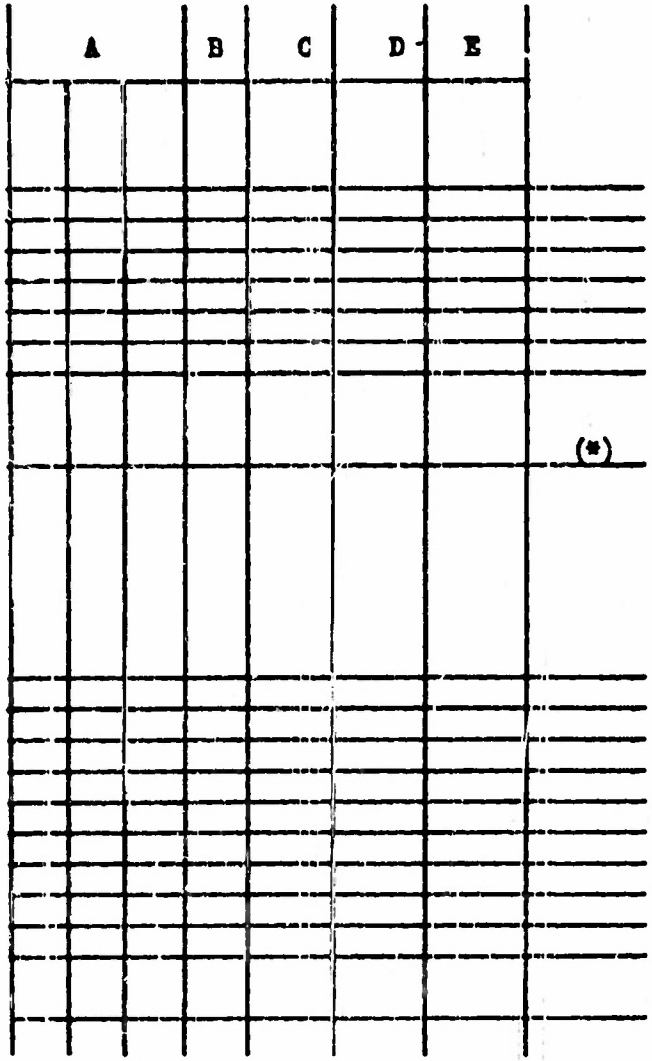
4. TRAINING GEAR - TRAINING GEAR MK 2 MOD 1
Chapter 6, pp. 73-96
Power-off brake adjustments
A. Brake spring load adjustment (p. 89) (Tool 8-Z-956-7)
B. Brake release action adjustment (p. 89)
Hand drive interlock adjustment (pp. 89-91)
Cable twist indicator adjustment (p. 91)
Lost motion adjustment (pp. 91-92) (YARD) (*)
Pinion drive unit lost motion (pp. 92-93) (YARD) (*)
Response gear lost motion correction (p. 93) (YARD) (*)

5. POWER DRIVE - Chapter 7, pp. 97-238
Train Power Drive MK 35 MODS
Elevation Power Drive MK 35 MODS 0, 1



Power Drive Test and Adjustment
Installation of parallax change gears (p. 191) OP 1303 (YARD)
Adjustment zero of elevation receiver-regulator to mount position (pp. 191-192)
Setting elevation limit stop (pp. 192-193)
Shipboard Installation
Adjustment zero of train receiver-regulator to mount position (p. 193) (OP 762)
Setting train limit stop (pp. 193-194)
Adjusting the roller-path corrector (pp. 194-195)

CHECKING INSTRUCTIONS, STARTING NEWLY INSTALLED OR REASSEMBLED EQUIPMENT
Checking control circuits (pp. 195-196)
Checking local-power circuits (pp. 196-197)
Checking motor field control (p. 197)
Checking motor armature circuits (pp. 197-198)
Stabilizing tachometer check (p. 198)
Quadrature field and acceleration - generator input check (p. 198)
Current feed-back and current limit check (pp. 198-199)
Checking motor back e.m.f. (p. 199)
Motor operation check (pp. 199-200)
Checking position-limit operation (p. 200)
Checking effect of gun-order signals (pp. 200-201)
Zero-signal circuit balance and synchronizing relay checks (p. 201)
Correspondence indicator check (p. 201)
Automatic operation check (pp. 201-202)



Field dropping check (p. 202)
Speed limit checks (pp. 202-203)
Check for loss of synchro power (p. 203)
Final test of position limit (p. 203)
Checking effect of parallax order signals (p. 203)
Parallax correspondence indicator check (pp. 203-204)
Check for effect of parallax order (p. 204)

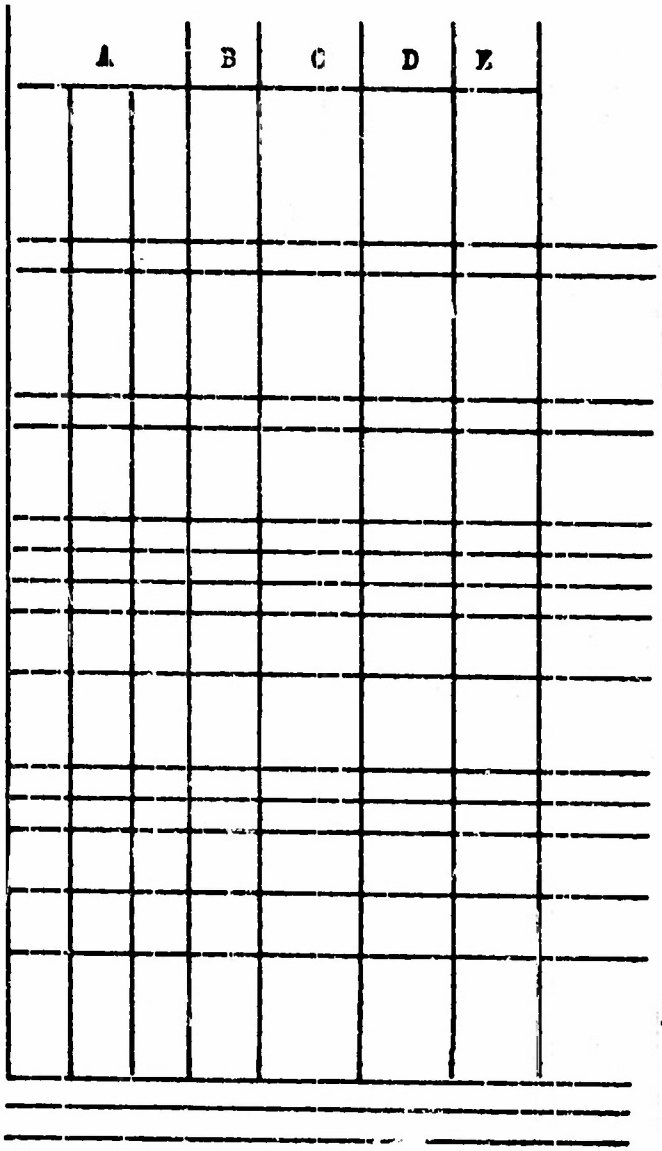
Power Drive Tests

Dummy director and error recorder check (O.D.'s 3143, 4166, 7257) (p. 204) (YARD)

Installation Adjustment Instructions

Note: Adjustments usually done at factory—but damage to equipment in shipment or replacement will require adjustment instructions.

Timing relay adjustment (p. 205)
Amplidyne control field adjustment (p. 205)
Motor field excitation adjustment (p. 205)
Current-limit adjustment (p. 206)
Train motor back e.m.f. adjustment (pp. 206-207)
Synchronizing relay adjustment (p. 207)
Low-speed stabilization adjustment (pp. 207-208)
Speed limit adjustments (p. 208)
Parallax amplifier balance adjustment (p. 208)
Parallax standstill circulating current adjustment (pp. 208-209)
Parallax amplifier stability adjustment (p. 209)



ADJUSTMENTS AND CHECKS,
ELEVATION POWER DRIVE MK 35 MOD 1
Mechanical adjustments (pp. 209-210)
Electrical checks and adjustments (pp. 210-211)

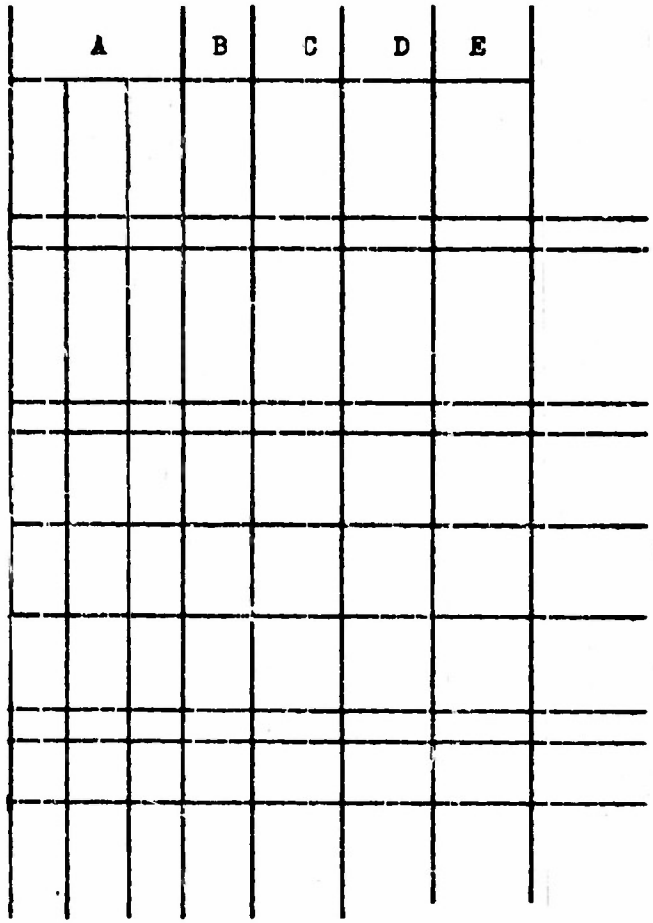
SERVICE ADJUSTMENTS, MECHANICAL
Zeroing of Synchro Units
Synchro generators (p. 228) (OP 1303)
Synchro control transformers (pp. 228-229)

Train Receiver - Regulator Adjustments
Zeroing parallax mechanism (p. 229)
Zeroing gun-training synchros and dials (pp. 229-230)
Setting parallax limit switches (p. 230)
Adjusting zero of train receiving - regulator to mount position (p. 230)
Setting the train stop-mechanism (pp. 124 and 193) (p. 203)

Elevation Receiver-Regulator Adjustments
Zeroing roller-path corrector (p. 230)
Zeroing gun-elevation synchros and dials (pp. 230-231)
Adjusting zero of elevation receiver - regulator to mount position (p. 231)
Setting the elevation limit stop mechanism (p. 231)

One-Man Control Adjustments (pp. 231-232)

SERVICE TESTS AND ADJUSTMENTS, ELECTRICAL
Checks of Amplifier Relays
Local-power relay check (K 101 or K 202) (p. 232)
Synchronizing relay check (K 102 or K 202) (p. 232)
Motor field relay check (K 301 or K 302) (p. 232)



Preliminary Settings of Adjustable Potentiometers (Train and Elevation Amplifiers)
The first method (p. 233)
The second method (pp. 233-234)

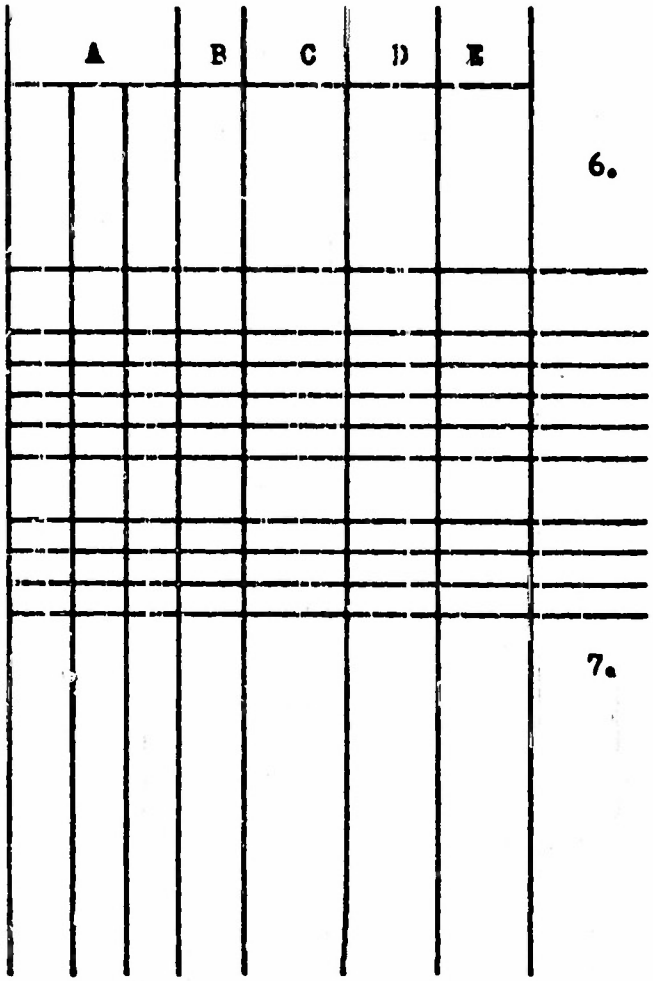
Preliminary Settings of Adjustable Potentiometers (Motor Field Control and Parallax Amplifier) (pp. 234-235)
Adjustment of potentiometers R118 and R218 (p. 235)
Checks of acceleration generator, compensating field, and quadrature field circuits (p. 235)

Preliminary Settings of Adjustable Potentiometers (One-Man Control) (p. 236)

Adjustment of Correspondence Indicator Meters (p. 236)

Amplidyne Brush Adjustment
Load brushes (p. 237)
Short-circuited brushes (pp. 237-238)

Drive Motor Brush Adjustment (p. 238)



6. SIGHTS - Chapter 8, pp. 239-270
3" MK 40 MOD 1
Ring Sight MK 16 MOD 0
Sight angle limit stop adjustment (p. 256)
(MK 40 MOD 1)
Sight deflection limit stop adjustment (pp. 256-257)
Worm-wheel segment thrust adjustments (p. 257)
Dial adjustments (pp. 257-258)
Ring sight deflection adjustment (p. 258)
Ring sight elevation adjustment (p. 258)
Bore sighting (p. 258)
Preparing for bore sighting (pp. 258-260)
Bore sighting procedure
Removing bore sight
Lost motion in 3" sight MK 40 MOD 1

7. MOUNT FIRE CONTROL - Chapter 9, pp. 267-270

Note: Mount Fire Control information not complete in this publication.

Note: Only Gun Fire Control System MK 63 MOD 11 requires additional equipment to be installed on the gun mount.

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ADJUSTMENT FACTORS

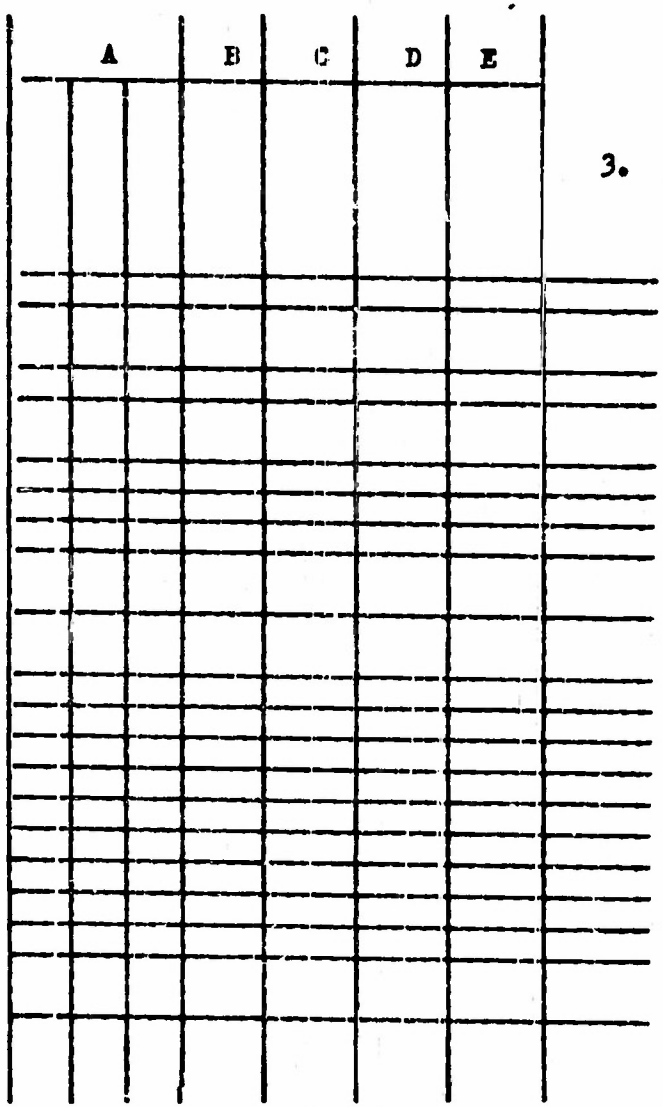
1	2	3				
Rate Performing Task	Supervision Exercised By	Degree of Supervision	Number of Times Adjustment Performed	Correctness of OP Procedure		
	A		B	C	D	E

1. GUN - MK 22 MODS 4, 5, 6, 7, 8.
Chapter 2, pp. 11-56

All parts of gun and breech have arrangements fixed by design, with exception of the breech operating spring.
Breech operating spring adjustment (pp. 50-51)

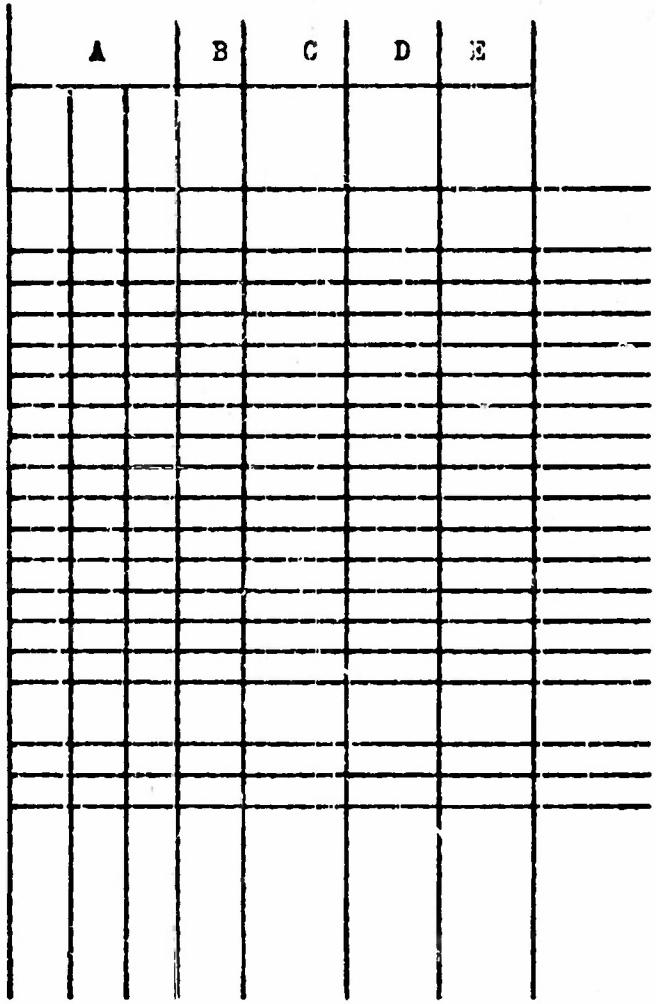
2. SLIDE - MK 26 MODS 0, 1 - MK 27 MODS 0, 1
Chapter 3, pp. 57-84

Slide trunnion bearing adjustments (p. 72)
Recoil piston adjustment (pp. 72-73)
Counter-recoil buffer adjustment (p. 73)



3. LOADER - MK 2 MODS 4, 5, 6.
Chapter 4, pp. 85-284

Loader synchronization data (p. 209)
Hopper front frame feed sprocket drive synchronization (pp. 209-211)
Feeder drive gear adjustment (pp. 211-212)
Feeder drive gear shaft coupling shear pin replacement; synchronization instructions (pp. 212-213)
Loader drive unit clutch adjustment (pp. 212-214)
Loader drive worm shaft clutch clearance adjustment (p. 214)
Shipper shaft clutch drive spring adjustment (p. 214)
Clutch solenoid interlock mechanism adjustment MK 2 MOD 5 (pp. 214-215)
Clutch solenoid interlock mechanism adjustment MK 2 MODS 4 and 6 (pp. 215-216)
Control mechanism buffer needle valve adjustment (p. 216)
Buffer stop mechanism adjustment (pp. 216-217)
Gate operating linkage turnbuckle adjustment (p. 217)
Rear gate latch adjustment (p. 217)
Gate operating linkage connecting rod adjustment (p. 217)
Main cam shaft coupling adjustment (pp. 217-218)
Shell feed drive synchronization (pp. 218-219)
Shell feed shipper cam gear synchronization (p. 219)
Breech interlock mechanisms adjustment MK 2 MOD 5 (p. 219)
Breech interlock mechanisms adjustment MK 2 MODS 4 and 6 (pp. 220-224)
Transfer tray and shell carriage drive segments installation instructions; initial assembly or replacement adjustment (pp. 224-226)



Transfer tray and shell carriage drive cams synchronizing instructions (p. 226)
Loader drive chain sprocket adjustment (pp. 226-227)
Loader drive chain take-up adjustment (p. 227)
Tray upper buffer plunger adjustment (pp. 227-228)
Tray lower buffer plunger adjustment (pp. 228-229)
Ramming chain sprocket adjustment (pp. 229-230)
Ramming chain tension adjustment (p. 230)
Tray shell finger link adjustment (pp. 230-231)
Breech shell lock spring adjustment (p. 231)
Breechblock-down switch adjustment (pp. 231-232)
Bore clear switch actuator adjustment (pp. 232-233)
Shell feed switches adjustment (p. 233)
Hopper switch actuating bolt adjustment (p. 234)
Shell retaining latch adjustment (p. 234)
Loading switch cam adjustment MK 2 MOD 5 (p. 234)
Loading switch actuating levers adjustment MK 2 MODS 4 and 6 (pp. 235-236)
Tray-up switch adjustment (pp. 236-237)
Electric firing interlock switch adjustment (p. 237)
Shell deflector lines extension adjustment (p. 237)

UNIT AREA: DISASSEMBLY AND ASSEMBLY

The items listed in this format deal with OP considerations in the exact manner covered in the literature. For the purpose of this analysis, it shall be considered that the weapon has been fully installed on the ship and the disassembly and reassembly factors continue from this point on.

The information sought has been listed in columnar form, as follows:

Column A -

1. Disassembly and assembly performed by what rate? (Note: Be sure the task is the shipboard responsibility of the rate under normal working conditions)
2. Supervision exercised by what rate?
3. Degree of supervision?

Column B -

Number of times disassembly and reassembly performed on board ship.

Column C -

Correctness of OP procedure -

1. Shipboard practice differs from OP procedure.
2. Shipboard practice same as OP procedure.

Note: Other columns as required.

SYMBOLS AND INTERPRETATION

Column A -

1. As noted in U. S. Navy Occupation Handbook. (Illustration: GM3, GM2, GM1).

2-3. Supervised by, and extent of supervision, would list the rate performing the supervision, (Illustration: GMC - Gunner's Mate Chief) and degrees would be listed as 1, 2, and 3. No. 1 would be close supervision, No. 2 giving orders and follow-up after completion of task, and No. 3 would mean giving instructions concerning work.

Column B -

Frequency: (Number of times performed on board ship)

Column C -

X in either column as indicated.

OP 1753 - 3"/50 RFTM
MARK 27 MOD 3
MARK 33 MOD 0

DISASSEMBLY AND ASSEMBLY

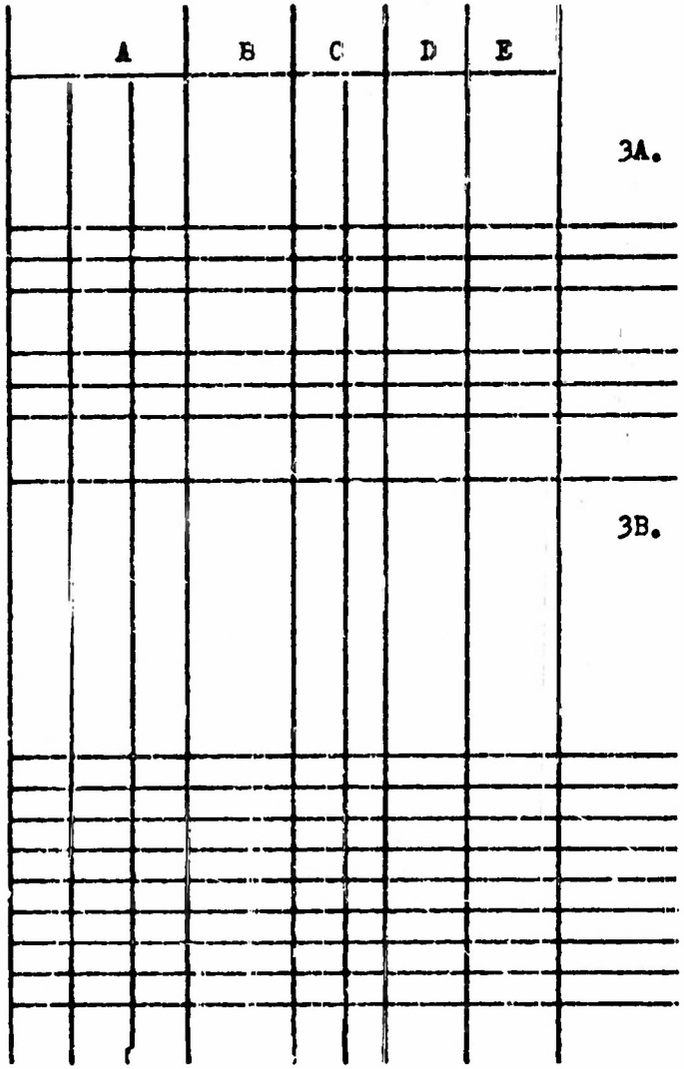
Rate Performing Task	Supervision Exercised By	Degree of Supervision	Frequency of Disassembly and Assembly On Board Ship	Correctness of OP Procedure			
1	2	3		Yes	No		
A			B	C		D	E

1. CARRIAGE - MK 22 MOD 3 - Chapter 3, pp. 19-40

General instructions (pp. 36-37)
Disassembly of limit stop buffer (p. 37)
Reassembly of limit stop buffer (p. 37)
Disassembly of elevation lock (p. 37)
Reassembly of elevation lock (p. 37)
Disassembly of train centering pin (pp. 38-39)
Reassembly of train centering pin (pp. 38-39)
Disassembly of the fire interrupter (pp. 39-40)
Reassembly of the fire interrupter (p. 40)

2. STAND - MK 22 MOD 1 - Chapter 4, pp. 41-50

(*) Lifting devices (p. 48) (YARD)
Disassembly of stand (pp. 48-50)
Reassembly of stand (p. 50)
Disassembly of limit pawl (p. 50)
Reassembly of limit stop (p. 50)



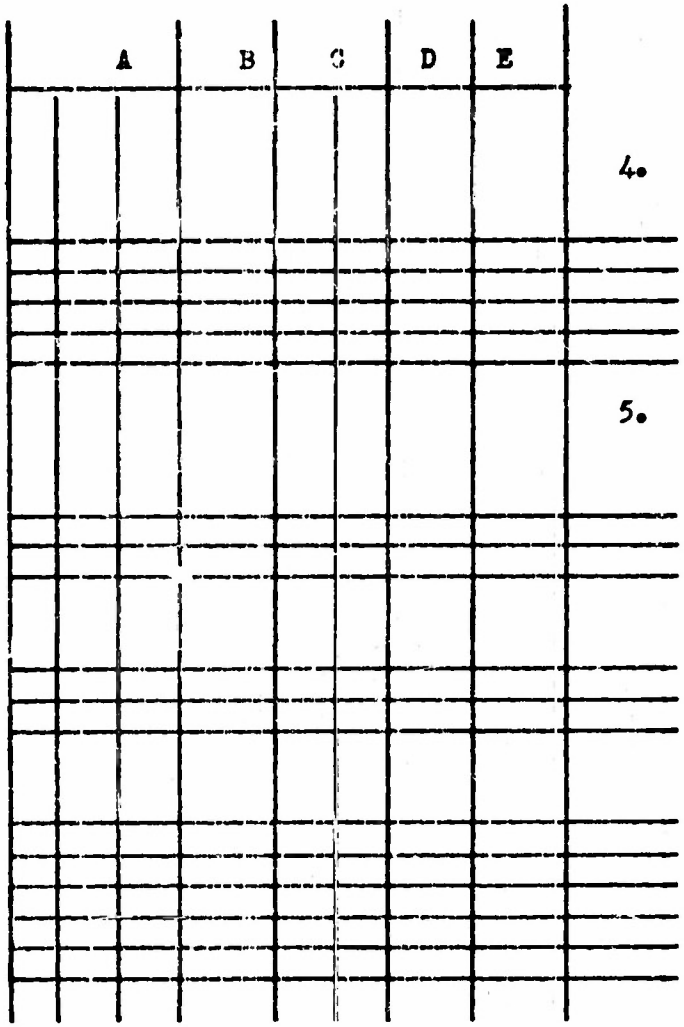
3A. ELEVATING GEAR - MK 2 MOD 1 - Chapter 5, pp. 51-72

Removal of principal components from carriage (p. 71)
Disassembly of worm and pinion unit (p. 72)
Disassembly of bevel gear housing and cross shaft unit (p. 72)
Disassembly of speed reducer (p. 72)
Disassembly of power-off brake (p. 72)
Disassembly of hand drive mechanism and elevation and depression buffers (p. 72)
Reassembly procedures (p. 72)

3B. ELEVATING GEAR - Chapter 13, pp. 309-327
3" Elevating Gear MK 4 MOD 1

Note: This gear is installed in all 3" Mount MK 33 assemblies, replacing the elevating gear described in Chapter 5 — MK 2 MOD 1

Removal of principal elements from carriage (p. 326)
Disassembly of elevation and depression buffers (p. 327)
Disassembly of cross shaft and adjustable coupling (p. 327)
Disassembly of power-off brake. (p. 327)
Disassembly of hand drive (p. 327)
Disassembly of lower reduction unit housing (p. 327)
Disassembly of reduction unit - main housing (p. 327)
Disassembly of pinion shaft unit (p. 327)
Reassembly (p. 327)



4. TRAINING GEAR - MK 2 MOD 1 - Chapter 6, pp. 73-96

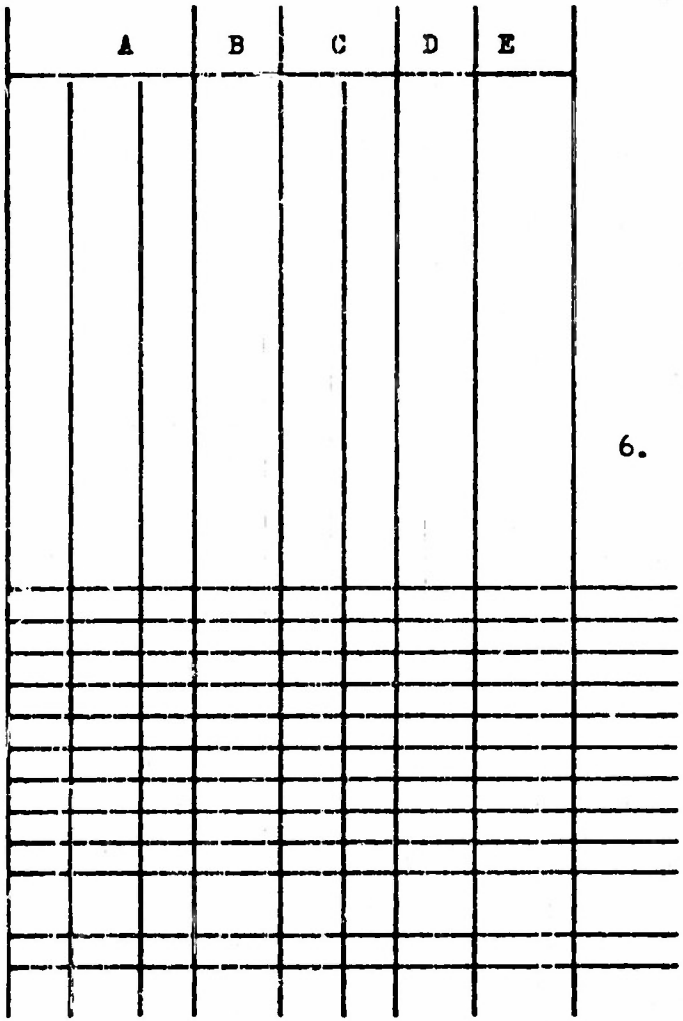
Removal of principal components from carriage (pp. 94-95)
Disassembly of pinion drive unit (p. 95)
Disassembly of power-off brake (p. 95)
Disassembly of response gear and hand drive mechanism (p. 95)
Reassembly procedures (p. 95)

5. POWER DRIVES - Chapter 7, pp. 97-238

Elevation Power Drive MK 35 MODS 0, 1
Elevation receiver - regulator MK 21 MODS 0, 1
Motor-generator (Amplidyne) MK 6 MOD 0
Elevation motor (Drive) MK 1 MOD 0

Train Power Drive MK 35 MODS
Train receiver - regulator MK 29 MODS
Motor-generator (Amplidyne) MK 6 MOD 0
Train motor (Drive) MK 1 MOD 0

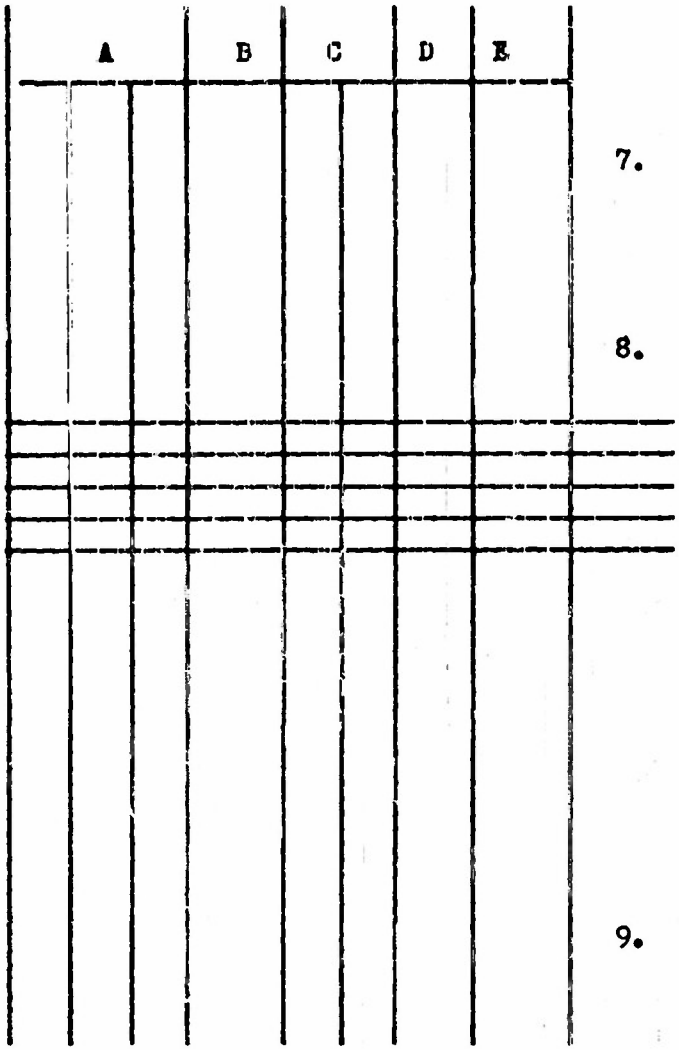
Equipment common to both drives
Amplifier MK 40 MOD 0
Control panel MK 65 MOD 0
Control panel MK 62 MOD 0
One-man control MK 2 MOD 0, right
One-man control MK 2 MOD 0, left
General maintenance (p. 188)



Comments on assembly and disassembly:

6. SIGHTS - Chapter 8, pp. 239-270
3" Sight MK 40 MOD 1
Ring Sight MK 16 MOD C

General instructions (p. 261)
Telescope removal (p. 261)
Peep sight removal (p. 261)
Removal of the sight from the slide (p. 261)
Telescope bracket disassembly (pp. 261-262)
Sight bracket disassembly (p. 262)
Sight angle worm-wheel segment of disassembly (p. 262)
Deflection bearing cartridge gear disassembly (p. 262)
Sight angle shaft disassembly (p. 262)
Sight angle and sight deflection dial shafting disassembly (pp. 262-263)
Differential disassembly (p. 263)
Deflection spur and bevel gear disassembly (p. 263)
Sight angle handwheel shaft disassembly (p. 263)



7. MOUNT FIRE CONTROL - Chapter 9, pp. 267-270

Note: Only Gun Fire Control System MK 63 MOD 11 requires additional equipment to be installed on the gun mount.

8. ELECTRICAL INSTALLATION - Chapter 10, pp. 271-292

Loader electrical equipment
Power drive electrical equipment
3" lighting circuit MK 16 MOD 0
Fire control equipment electrical units
Communications circuits

Note: Seek information in reference to assembly and disassembly of electrical installations noted above.

Comments: _____

9. LUBRICATION INSTRUCTIONS - Chapter 12, pp. 305-308
Only general information in reference to lubrication -- none on disassembly or assembly.

OP 1566 (1st Rev.) 3"/50 RFTM

DISASSEMBLY AND ASSEMBLY

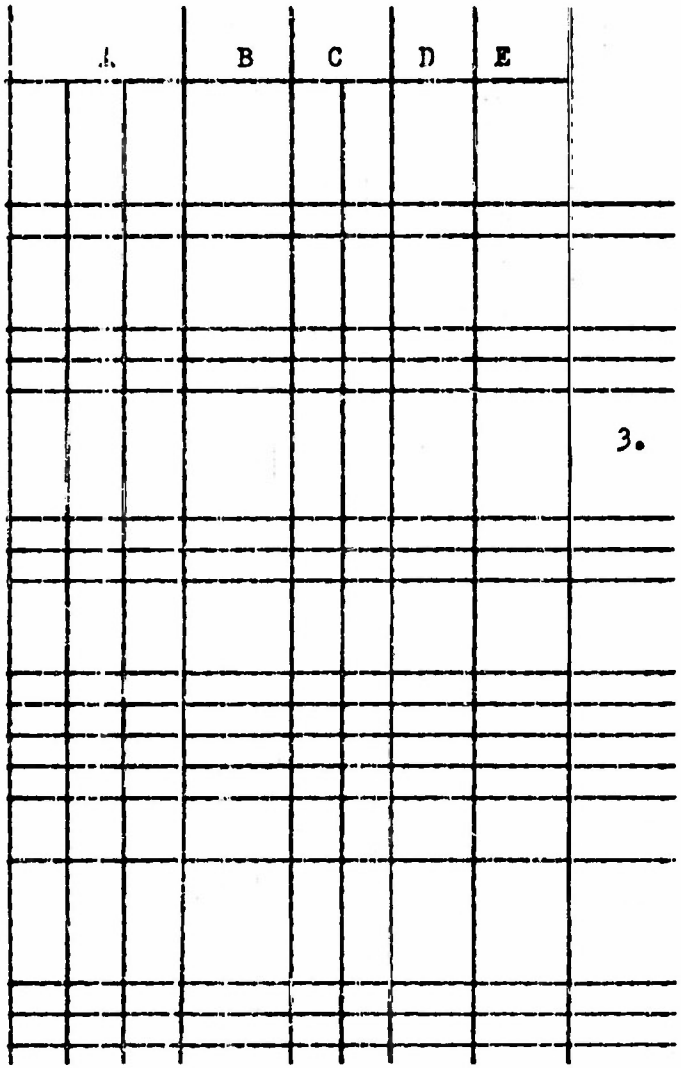
Rate Performing Task	Supervision Exercised By	Degree of Supervision	Frequency of Disassembly and Assembly On Board Ship	Correctness of OP Procedure			
				Yes	No		
1	2	3					
A			B	C		D	E

1. GUN MK 22 MODS 4, 5, 6, 7, 8.
Chapter 2, pp. 11-56

Breech Mechanism Disassembly
- Breechbock removal (p. 51)
- Breechblock disassembly (pp. 54-55)
- Firing pin disassembly (p. 55)
- Disassembly of firing circuit cable and contacts from housing and sideplate (pp. 55-56)

2. SLIDE MK 26 MODS 0, 1 and MK 27 MODS 0, 1
Chapter 3, pp. 57-84

- General dismantling instructions (p. 73) (p. 77)
- Trunnion bearing disassembly instructions (p. 73)
- Trunnion bearing reassembly (p. 73)
- Recoil cylinder disassembly instructions (pp. 73-75)
- Recoil cylinder reassembly instructions (p. 75)
- Slide adapter disassembly instructions (pp. 75-76)

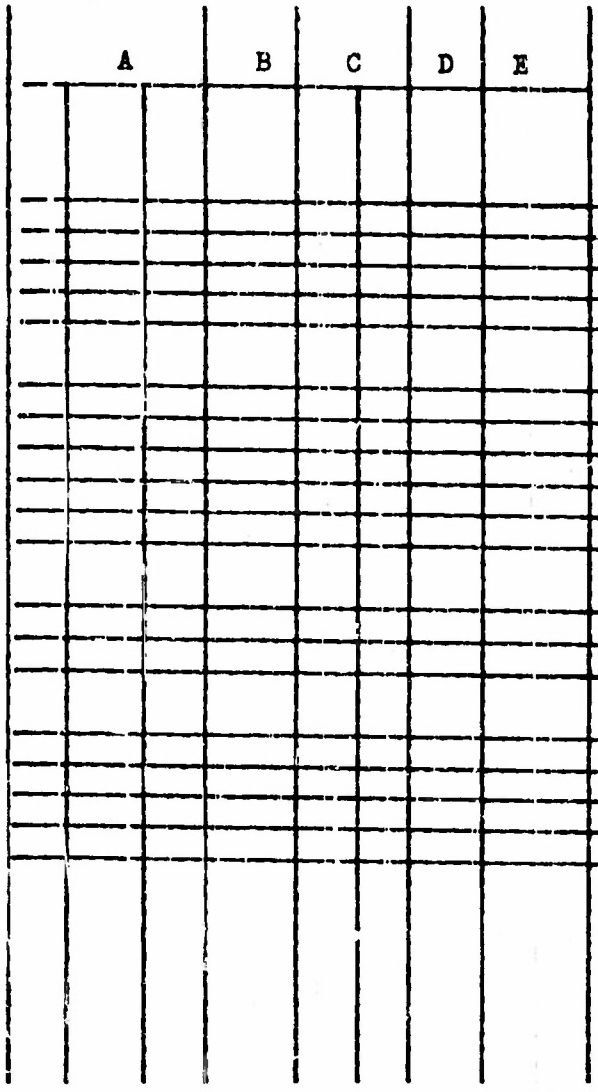


Regunning Instructions, Rear Method
Gun replacement, 3" MK 27 MODS (pp. 77-80)
Gun installation instructions (p. 80)

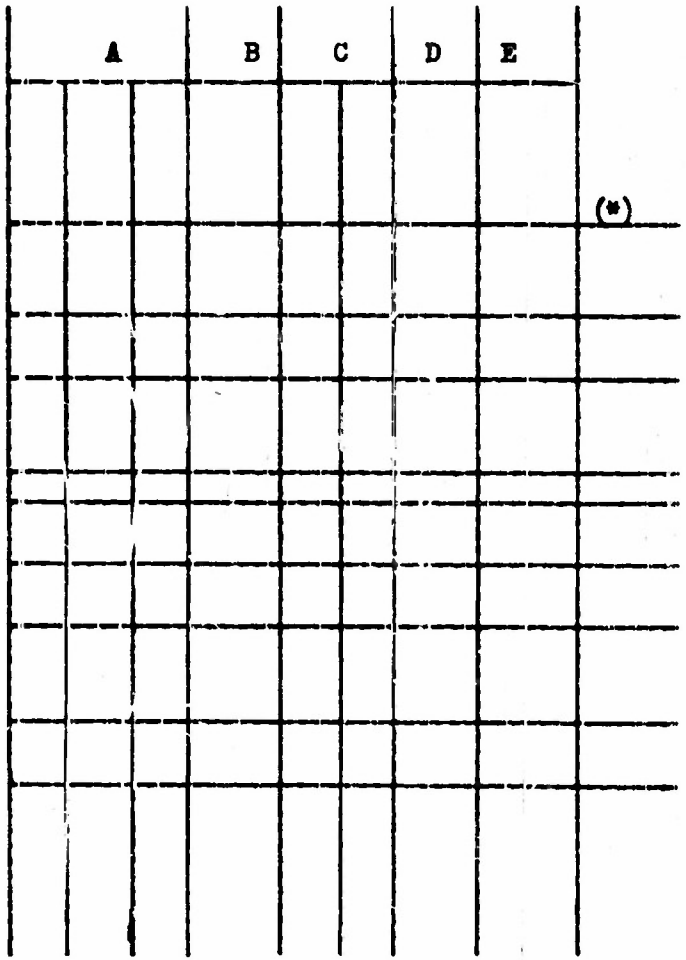
Regunning Instructions, Front Method
Gun replacement, 3" MK 33 MODS and MK 34 MODS (pp. 80-84)
Installation of new barrel (p. 84)
Housing removal (p. 84)

3. LOADER DISASSEMBLY (pp. 247-284)

General Instructions (p. 247)
Sequence of Loader Dismantling (p. 247)
1. Preparations for dismantling the loader; instructions and routines for removing covers, and power and control connections (pp. 247-249)
2. Hopper rear frame disassembly (p. 249)
3. Loading solenoid disassembly (p. 251)
4. Feed sprocket and attachments disassembly (pp. 251-252)
5. Hopper round aligning attachment disassembly (p. 252)
6. Loader drive unit; main housing and motor dismantling and disassembly (pp. 252-253)
7. a) Breech interlock mechanism disassembly MK 2 MODS 4 and 6 (pp. 254-255)
   b) Breech interlock mechanism disassembly MK 2 MOD 5 (pp. 253-254)
8. Clutch solenoid disassembly (pp. 255-257)
9. Main housing disassembly (p. 257)
10. Main housing lubrication system disassembly (pp. 258-260)



11. Shell feed drive disassembly (pp. 260-262)
12. Control mechanism disassembly (pp. 262-263)
13. Control mechanism buffer disassembly (pp. 263-264)
14. Buffer mechanism plate disassembly (p. 264)
15. Control mechanism (inboard parts) disassembly (pp. 264-267)
16. Main cam shaft disassembly (pp. 267-268)
17. Loader drive gearing disassembly (pp. 268-270)
18. Hopper front frame disassembly (p. 270)
19. Right and left gate brackets disassembly (p. 272)
20. Tray upper buffer disassembly (p. 273)
21. Firing mechanism disassembly (loader parts only) (p. 273)
22. Buffer bar disassembly (p. 273)
23. Shell deflector chute disassembly (p. 273)
24. Transfer tray and shell carriage disassembly (pp. 274-278)
25. Shell carriage disassembly (p. 278)
26. Right side plate, inboard parts disassembly (p. 278)
27. Tray lower buffer disassembly (pp. 278-280)
28. Right side plate, outboard parts disassembly (p. 280)
29. Left side plate disassembly (pp. 280-284)



ADDITIONAL AREAS COVERED BY JOB SHEET (GM "B" SCHOOL)

1. Fire interrupter unit (cutting of cam plate) O.D. 6438 (slippage necessitated tightening of vernier) (YARD)
2. Disassembly, reassembly and adjustment of the breech mechanism OP 1566 (pp. 11-56)
3. Disassembly, reassembly of counter-recoil spring and procedure for jacking gun out of battery OP 1566 (pp. 57-84)
4. Sight mechanism, bore sighting OP 1753 (pp. 239-266)
5. Adjustment of train and elevation power-off brakes OP 1753 (pp. 67-68, 89-91)
6. Adjustment of elevation and train limit stops OP 1753 (pp. 124-129, 160, 192-193, 209-210)
7. Hopper and feeder drive gear disassembly, reassembly and adjustment OP 1566 (1st Rev.) (pp. 249-250, 270-271)
8. Disassembly and reassembly of the loader drive unit, OP 1566 (1st Rev.) (pp. 257-270)
9. Disassembly, reassembly and adjustment of the left side plate, OP 1566 (1st Rev.) (pp. 280-284)

UNIT AREA: TROUBLE ANALYSIS

As will be noted from the format, the listing of "Casualty Factors" or "Trouble Analysis" appears to be limited to the power drives and electrical installation sections. This seems to the observer to indicate one of two things — (a) either the mechanical casualties are few and far between, or (b) there has been little, if any, reporting back to BuOrd or the Gunner's Mate Class "B" School in reference to these casualties.

Perhaps it might be advisable to ask questions, at the installations, focusing upon the terminology "trouble analysis" in reference to these mechanical areas, and then associating their responses with the information obtained in the adjustment factors format. It might be quite possible that in their thinking the terms "Adjustment Factors" and "Trouble Analysis" mean two different things, not considered in our thinking.

The items listed in this format deal with OF considerations. For the purpose of this analysis, it shall be considered that the weapon has been fully installed on the vessel and the "Trouble Analysis" factors continue from this point on.

The information sought has been listed in columnar form, as follows:

Column A -

1. Trouble analysis performed by what rate?
   (Note: Be sure the task is the shipboard responsibility of the rate under normal working conditions)

2. Supervision performed by what rate?

3. Degree of supervision exercised?

Column B -

Frequency of trouble on specific gun.

Column C -

Is CP procedure followed in correcting trouble?

Note: Other columns as required.

SYMBOLS AND INTERPRETATION

Column A -

1. As noted in U. S. Navy Occupation Handbook. (Illustration: GM3, GM2, GM1).

2-3. Supervised by, and extent of supervision, would list the rate performing the supervision, (Illustration: GMC - Gunner's Mate Chief) and degrees would be listed as 1, 2, and 3. No. 1 would be close supervision, No. 2, giving orders and follow-up after completion of task, and No. 3 would mean giving instructions concerning work.

Column B -

Self explanatory.

It might be well to note amount of firing for specific gun, as this will have a bearing on frequency of casualty.

Column C -

This can be answered as Yes or No.

OP 1753 - 3"/50 R!TM
MARK 37 MOD 3
MARK 33 MOD 0

TROUBLE ANALYSIS

1	2	3				
Rate Performing Task	Supervision Exercised By	Degree of Supervision	Frequency of Trouble on Specific Gun	Is OP Procedure Followed in Correcting Trouble?		
A			B	C	D	E

1. CARRIAGE - MK 22 MOD 3 - Chapter 3, pp. 19-40

Note: No trouble analysis listed - question at installation.

2. STAND - MK 22 MOD 1 - Chapter 4, pp. 41-50

Note: No trouble analysis listed - question at installation.

A	B	C	D	E

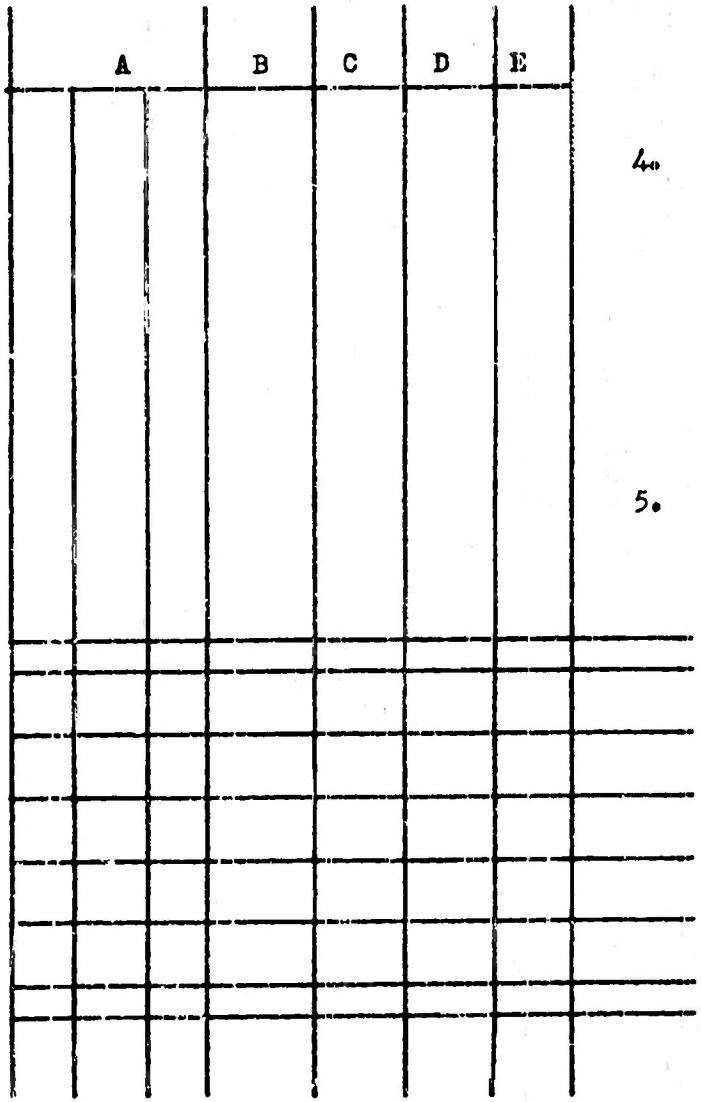
3A. ELEVATING GEAR - MK 2 MOD 1 - Chapter 5, pp. 51-72

Note: No trouble analysis listed - question at installation.

3B. ELEVATING GEAR - MK 4 MOD 1 - Chapter 13, pp. 309-327

Note: This gear is installed in all 3" Mount MK 33 assemblies, replacing the elevating gear described in Chapter 5 — MK 2 MOD 1.

No trouble analysis listed - question at installation.

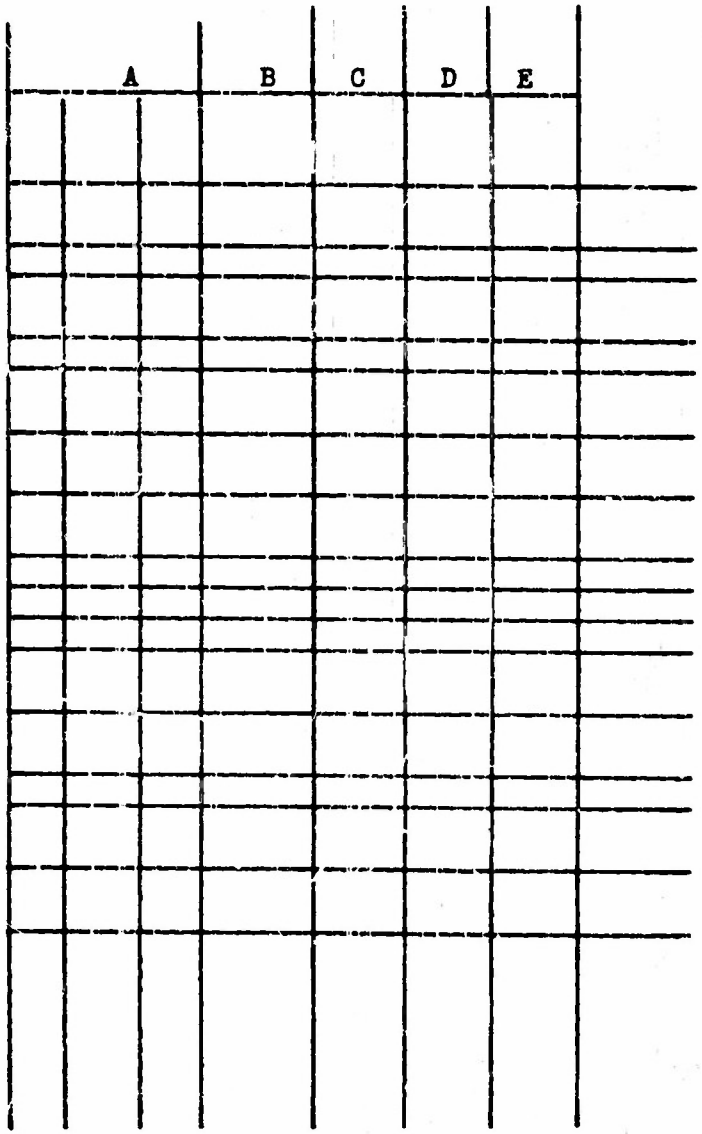


4. TRAINING GEAR - MK 2 MOD 1 - Chapter 6, pp. 73-96

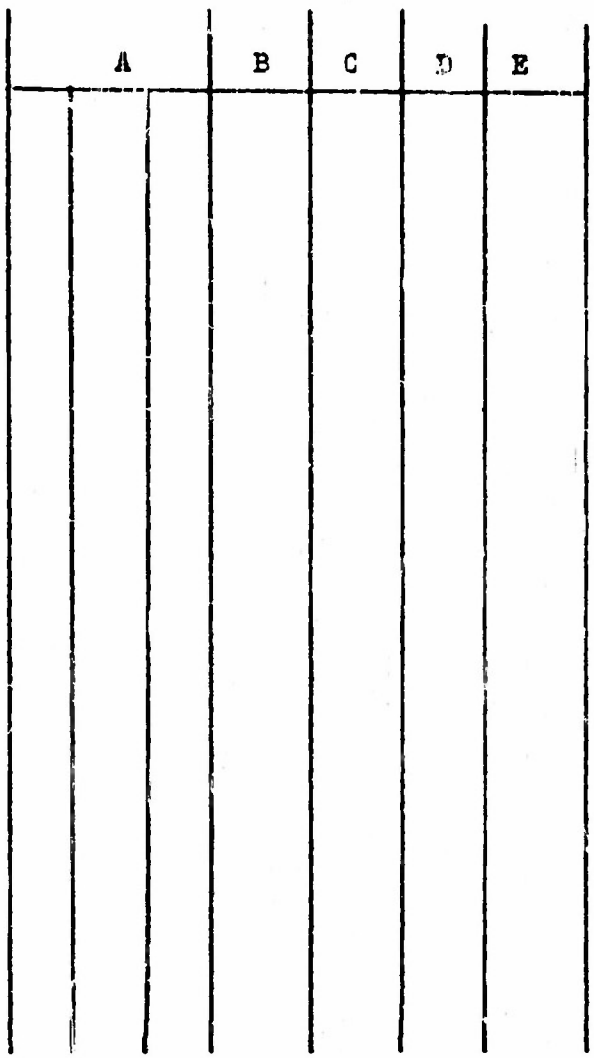
Note: No trouble analysis listed - question at installation.

5. POWER DRIVES - Chapter 7, pp. 97-238
TRAIN POWER DRIVE MK 35 MODS
ELEVATION POWER DRIVE MK 35 MODS 0, 1

No response to start button (pp. 213-215)
No response of either power drive to one-man control (pp. 215-216)
One power drive responds but other does not in local (pp. 216-217)
Mount runs away at full speed into the limit stops when the safety switch is closed (p. 217)
Mount wanders in local when the safety switch is closed and the one-man control is held on neutral (pp. 217-218)
Mount responds sluggishly to movements of one-man control (pp. 218-219)
Mount travels at an excessive speed in local (p. 219)
Mount responds violently to sudden movements of the one-man control (p. 219)



Mount fails to stop at the electrical position limit (pp. 219-220)
Mount does not respond to AUTO orders (p. 220)
Mount runs away when the control selector switch is shifted to AUTO (p. 220)
Mount synchronizes at wrong point (pp. 220-221)
Mount follows gun order signal, but with large errors. (p. 221)
Mount oscillates about the correspondence point (pp. 221-222)
Rough operation or excessive overswing at synchronizing (p. 222)
Parallax motor fails to run (pp. 222-223)
Parallax motor runs in only one direction (p. 223)
Parallax motor runs away (p. 223)
Parallax motor follows the order signal, but with large errors (p. 223)
Parallax motor oscillates about the correspondence point (pp. 223-224)
Motor field excitation fails (p. 224)
Motor field excitation is not maintained at the specific values (p. 224)
Train motor field excitation is not diminished at speeds above 15° per second (p. 224)
Reference voltage reading when operating satisfactorily (pp. 224-227)

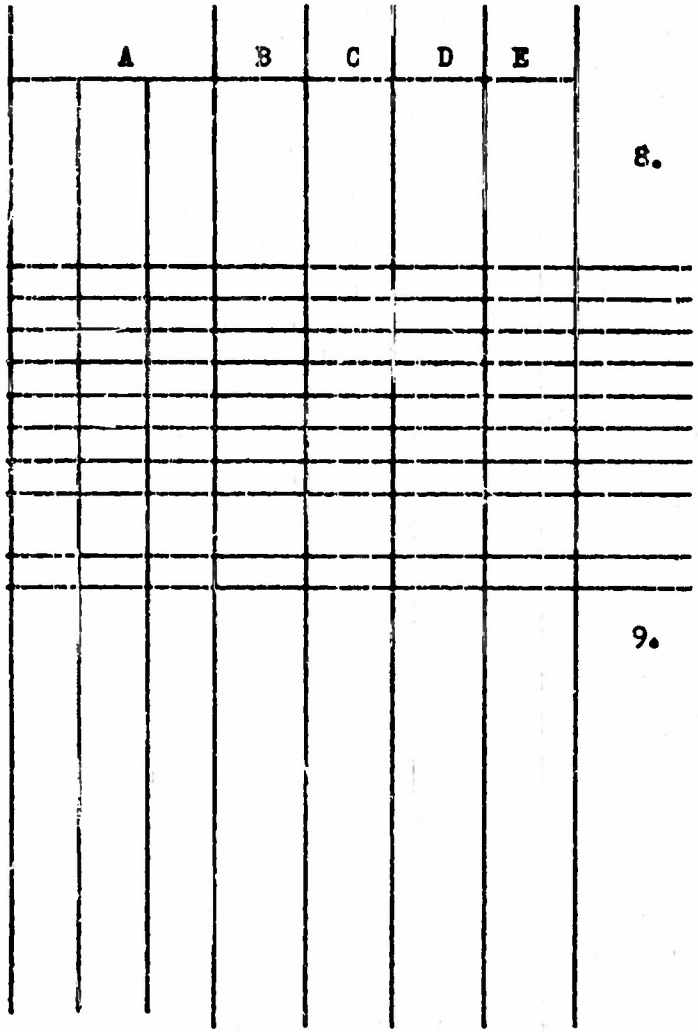


6. SIGHTS -- Chapter 8, pp. 239-270
3" - Sight MK 40 MOD 1
Ring Sight MK 16 MOD 0

Note: No trouble analysis listed - question at installation.

7. MOUNT FIRE CONTROL - Chapter 9, pp. 267-270

Note: No trouble analysis listed - question at installation.



8. ELECTRICAL INSTALLATION - Chapter 10, pp. 271-292

Trouble Analysis
- Absorption of moisture
- Lubrication penetration
- Loose connections, hidden cable breaks
- Loose terminals
- Shock
- Corrosion
- Abrasive wear of insulation
- Pitted contacts in circuit breakers, switches and contact makers
- Fuse failures
- Overload functioning of circuit breakers

9. LUBRICATION INSTRUCTIONS - Chapter 12, pp. 305-308

J-942
TAF-L-1

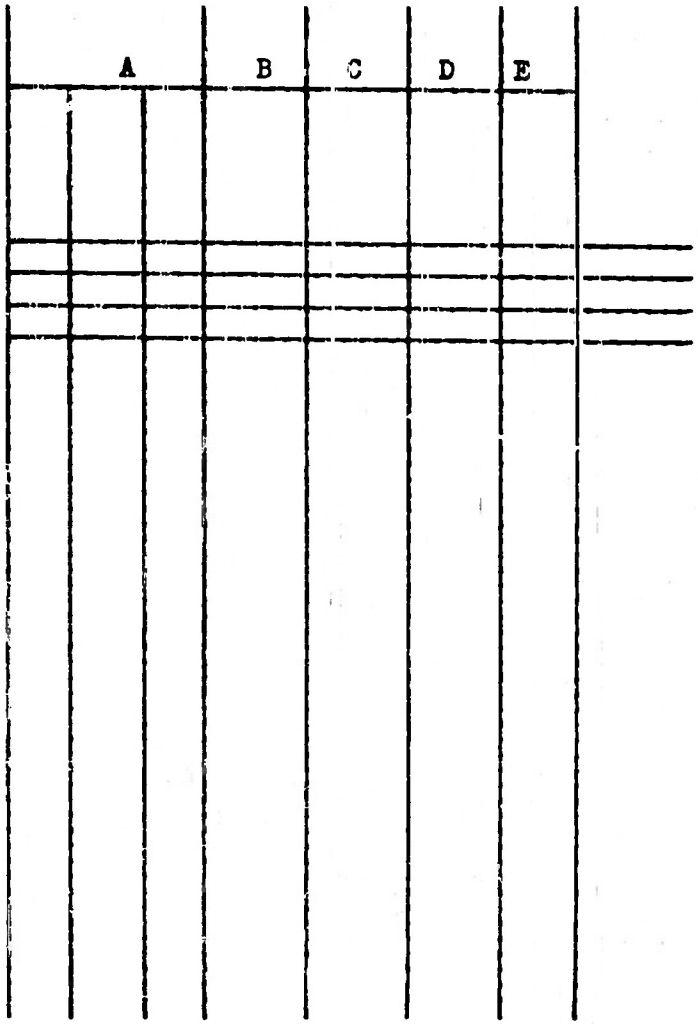
LOADER

OP 1566 (1st Rev.)

TROUBLE ANALYSIS
(Chapter 4, pp. 237-245)

A			B	C	D	E
Rate Performing Task	Supervision Exercised By	Degree of Supervision	Frequency of Trouble on Specific Gun	Is OP Procedure Followed in Correcting Trouble?		
1	2	3				

1. Motor does not start (p. 238)
2. Motor starts and stops (p. 238)
3. Loader does not start (pp. 238-239)
4. Loader is slow (p. 239)
5. Gun firing rate is slow (pp. 239-240)
6. Loader runs away (p. 240)
7. Loader stops (p. 240)
8. Clutch does not operate (pp. 241-242)
9. Slow extraction (p. 242)
10. Ammunition jams (pp. 242-244)
    a) Jam at initial feed position (p. 242)
    b) Jam at center hopper (index) position (pp. 242-243)
    c) Jam in tray transfer action (p. 243)
    d) Jam at the breech (pp. 243-244)
11. Live round not retained in gun (p. 244)
12. Cycle overtravel (p. 244)



13. Hopper gate failure (p. 244)
14. Ammunition does not index (p. 245)
15. Faulty case ejection (p. 245)
16. Shell carriage thrown from tray (p. 245)

WEAPON
PERSONNEL ORGANIZATION

BASE _____ NAME, TYPE, NUMBER OF VESSEL _____

WEAPON: 3"/50 RFTM No. _____ MARK _____ MOD _____

DATE OF INSTALLATION _____

ROUNDS FIRED: LEFT GUN _____ RIGHT GUN _____

DATE OF INTERVIEW _____ INFORMATION GIVEN BY _____

RATE	POSITION	TRAINING		A
		FORMAL	INFORMAL	
	Mount Captain			
	Right Gun Layer			
	Sight Setter			
	Left Gun Layer			
	Left Shellman, Left Gun			
	Right Shellman, Left Gun			
	Left Shellman, Right Gun			
	Right Shellman, Right Gun			
	First Shell Passer			
	Second Shell Passer			
	Third Shell Passer			
	Fourth Shell Passer			

CODE:
TRAINING:
FORMAL: School and period of weeks or hours.
INFORMAL: On-board training in hours.
A - Time required (on-board training), in hours, to attain proficiency at position.

QUESTIONS:
1. Who is responsible for on-board training?

_____

2. Who conducts the on-board training?

_____

CASUALTY REPORT
(Original)

Name, Type, and Number of Vessel _____

Date _____ Analyst _____

Major Equipment Component of 3"/50 RFTM _____

Specific Part Involved in Adjustment or Casualty _____

Frequency of Adjustment or Casualty per Round or per Firing Exercise _____

Name and Rank of Person Interviewed _____

---

1. Symptom or Symptoms of Casualty:

2. Procedure or Method of Locating Casualty, by Step Sequence: List Results at End of Each Step of Analysis.

3. Action Taken to Effect Adjustment or Casualty Rectification:

4. Tools and Equipment Used to Locate and Effect Adjustment or Casualty Rectification:

5. Who Made Adjustment? (Rate)

6. Who Supervised Adjustment? (Rate)

7. Degree of Supervision Given:

8. Circle one Casualty believed caused by:
   (a) Personnel
   (b) Material

9. Judging from your experience, and education (formal or informal), what would a person have to know in order to be capable of:
   (a) Recognizing and locating source of casualty?
   (b) Effecting adjustment of Casualty?

CASUALTY REPORT FORM
(Revised)
(Please Refer to Instruction Sheet)

From: _____

To: _____

Ship: _____

1. Major Unit: _____

2. Main Assembly: _____

3. Sub-Assembly: _____

4. Part or Piece: _____

5. Description of Casualty: _____

6. Conditions Under which Casualty Occurred: _____

7. Casualty Analysis: _____

8. Remedial Action Taken: _____

CASUALTY REPORT FORM (Cont'd)

9. Time Involved:
   (a) Equipment inoperative: _____
   (b) Actual Repair Work Time: _____

10. Cause:

11. Remarks and Recommendations:

Signed: _____
(Gunnery Officer)

INSTRUCTIONS FOR CASUALTY REPORTING

NOTE: The item numbers of these instructions correspond to the block numbers on the Casualty Report Form.

Item 1. Identify major unit to which casualty occurs:
Example: "3"/50 Rapid Fire Single Mount, MK 34 MOD 1"

Item 2. Identify main assembly in which casualty occurs:
Example: "Train Receiver Regulator, MK 31 MOD 1"

Item 3. Identify sub-assembly in which casualty occurs:
Example: "Magnetic Brake"

Item 4. Identify part or piece involved in casualty:
Example: "Solenoid Coil"

Item 5. Enter here a brief, factual statement of equipment malfunction.
Example:
(a) "Mount responded sluggishly to movement of one-man control."
(b) "Breech block failed to close."
(c) "Live round of ammunition ejected." (etc.)

Item 6. A brief, factual statement of use to which equipment was being put when casualty occurred.
Examples:
"Firing at enemy mines in water, had fired 50 rounds single fire when casualty occurred."
"Firing routine AA training practice. Had fired 20 rounds on two previous runs and 5 rounds on run in which casualty occurred."
"Routine exercising of equipment during daily transmission checks." (Specify type of control being used).

Item 7. Step by step procedure followed in locating cause of casualty or defective material, and results encountered on each step.
Example:
(a) "Checked Manual train - Normal."
(b) "Checked Local train - Sluggish, Overload Relays kicked out."
(c) "Reset Overload Relays, Checked operation of magnetic brake by closing safety switch and listening for click. No click apparent."

INSTRUCTIONS FOR CASUALTY REPORTING (Cont'd)

Item 8. Brief, factual statement of procedure followed in correcting casualty, including who accomplished work; sources of information for disassembly, reassembly, adjustments; etc.

Example:

"Battery GM's disassembled magnetic brake following procedure outlined in OP 1698. Removed burned out solenoid coil. No spares in ship's allowance. Ship's EM's rewound coil. Reassembled unit. Operation satisfactory.

Item 9. Under (a), enter actual time equipment could not be used. (1 day; 1 hour; 2 weeks; etc.)
Under (b), enter approximate time actually devoted to the work of repairing this casualty.
(15 min.; 2 hours; 30 hours)

Item 10. If general statements of cause are used, such as "Improper Maintenance"; "Defective Material"; "Improperly Trained Personnel"; "Inclement Weather"; etc.; clarify the statement by giving specific examples.

Examples:

(a) "Improper maintenance - Battery GM's failed to lubricate equipment in accordance with routine check-off lists."

(b) "Defective material - Insulation on solenoid coil broke down from heat of normal operation."

Item 11. Enter here any remarks having a direct bearing on this particular casualty that are not included in the foregoing items.
Make any recommendations deemed advisable to prevent recurrences of this particular casualty.

APPENDIX B

PERSONNEL DISTRIBUTION ON 3"/50 RFTM's

Cruisers

Destroyers

CRUISERS

Naval Personnel Distribution

on

Forty-five 3"/50 Rapid Fire Twin Mounts

(Four Vessels)

Significant Facts:

1. There are thirty-six Gunner's Mates serving in the operational phase of the mounts.
2. Thirty-two of the thirty-six Gunner's Mates serve in the capacity of gun captains.
3. Eleven of the thirty-two Gunner's Mates serving as gun captains are graduates of the 3"/50 Gunner's Mate, Class "B" School.
4. Two of the thirty-two are graduates of twenty week Gunner's School.

Chart Symbols:

(*) Graduates of 3"/50 Gunner's Mates, Class "B" School (120 hour course).

(**) Graduates of twenty week Gunner's Mate School.

(X) Personnel assigned to position only under "Local Control". Because training period for position is quite short, crew assignment to this station not considered permanent member of weapon crew.

RATING ABBREVIATIONS

NAV PERS 18D68

MANUAL OF QUALIFICATIONS FOR ADVANCEMENT IN RATING

Abbreviations	Title or Rating	Page No.
GM	Gunner's Mates	II-8
GMSN	Gunner's Mates Seamen	VI-25
SN	Seaman	VI-25
SA	Seaman Apprentice	xii
BM	Boatswain's Mates	I-6
BMSN	Boatswain's Mates Seaman	VI-25
CS	Commissarymen	V-51
QMSN	Quartermasters Seamen	VI-25
FA	Firemen Apprentice	xii
TN	Stewardsmen	XI-4
GMM	Gunner's Mates (Mounts)	II-8
GMSA	Gunner's Mates Seamen Apprentice	xii
SKSN	Storekeepers Seaman	VI-25
YNSN	Yeomen Seaman	VI-25
CSSN	Commissarymen Seaman	VI-25
PNSN	Personnel Men Seaman	VI-25
SHSN	Ships Servicemen Seaman	VI-25

WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM

CRUISERS Code 101	Mount Captain	Right Gun Layer	Sight Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Mt. 1	Manned and Operated by Marines --- Maintained by Naval Personnel											
2	GM2*	GM3	(X)	BM2	SN	SN	SN	SN	SA	SA	SA	SA
3	GM3	SN	(X)	SA	SN	SN	GMSN	GMSN	BM3	BM3	SN	SN
4	GM2*	SN	(X)	SN	SN	SA	SN	SN	SN	SA	SA	SA
5	GM2**	GM3	(X)	SN	SA	SN	SN	SN	SA	SN	SN	SN
6	GM3*	SN	(X)	GM3	BM3	SN	SN	SN	SA	SA	SA	SN
7	GM3*	GM3	(X)	SN	SN	SN	BM3	SN	SA	SA	SA	SA
8	GMSN	SN	(X)	SN	GMSN	SN	SN	SN	SA	SN	SA	SN
9	GM3	GMSN	(X)	SN	SN	SA	SN	SA	SA	SA	SA	SA
10	GM3*	GMSN	(X)	BM3	SN	GMSN	SA	SN	SN	SA	SN	SA
11	GM3	GMSN	(X)	SN	SN	SN	GMSN	SN	SA	SA	SA	SA

CRUISERS Code 102	WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM											
	Mount Captain	Right Gun Layer	Sight Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Mt. 1	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
2	Manned and Operated by Marines — Maintained by Naval Personnel											
3	Manned and Operated by Marines — Maintained by Naval Personnel											
4	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
5	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SA
6	GM3	GMSN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
7	SN	SN	SN	—	BM3	SN	SN	SN	SA	SA	SN	SA
8	GM3	GMSN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
9	GM3	SN	BM3	SN	SN	SA	SA	SN	SN	SN	SA	SA
10	GM3	SN	BM3	SN	SN	SN	SN	SN	SA	SA	SA	SN

CRUISERS Code 103	WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM											
	Mount Captain	Right Gun Layer	Sight Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Mt. 1	GMSN	GMSN	GMSN	GMSN	GMSN	GMSN	GMSN	GMSN	SA	SA	SA	SA
2	GM3	GMSN	GMSN	GMSN	GMSN	GMSN	GMSN	SA	SA	SA	SA	SA
3	GM3*	GMSN	GMSN	GMSN	Marines							
4	GM3	GMSN	GMSN	GMSN	Marines							
5	GMSN	GMSN	GMSN	GMSN	GMSN	SN	SN	SA	SA	SA	SA	SA
6	GM3*	GMSN	GMSN	GMSN	SN	SA	SN	SA	SA	SA	SA	SA
7	GM3	GMSN	GMSN	GMSN	SN	SN	SA	SA	SA	SA	SA	SA
8	GM2*	GMSN	GMSN	GMSN	SN	SN	SA	SA	SA	SA	SA	SA
9	GM2*	GMSN	GMSN	GMSN	SN	SN	SA	SA	SA	SA	SA	SA
10	GM3**	GMSN	GMSN	GMSN	SN	SN	SA	SA	SA	SA	SA	SA
11	GMSN	GMSN	GMSN	GMSN	SN	SA	SN	SA	SA	SA	SA	SA
12	GMSN	GMSN	GMSN	GMSN	SN	SA	SN	SA	SA	SA	SA	SA

CRUISERS Code 104	WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM											
	Mount Captain	Right Gun Layer	Sight Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Mt. 1	SN	SN	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA
2	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SN	SA	SA
3	GM3	SN	SN	SN	SN	SN	SN	SA	SA	SA	SA	SA
4	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA
5	GM2*	SN	SN	SN	SN	SN	SN	SA	SA	SA	SA	SA
6	GM3	GMSN	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA
7	Manned and Maintained by Marines -- Instruction and Supervision by GM1 and GM2											
8	Manned and Maintained by Marines -- Instruction and Supervision by GM1 and GM2											
9	SN	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA	SA
10	GM3*	GMSN	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA
11	GM2	SN	SN	S N	SN	SN	SN	SN	SA	SA	SA	SA
12	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA

DESTROYERS

Naval Personnel Distribution

on

Twenty-six 3"/50 Rapid Fire Twin Mounts

(Eleven Vessels)

Significant Facts:

1. There are twenty-eight Gunner's Mates serving in the operational phase of the mounts.
2. Twenty-two of the twenty-eight Gunner's Mates serve in the capacity of gun captains.
3. Five of the twenty-two Gunner's Mates serving as gun captains are graduates of the 3"/50 Gunner's Mate, Class "B" School.
4. One of the twenty-two is a graduate of the twenty week Gunner's School.

Chart Symbols:

(*) Graduates of 3"/50 Gunner's Mates, Class "B" School (120 hour course).

(**) Graduates of twenty week Gunner's Mate School.

(X) Personnel assigned to position only under "Local Control". Because training period for position is quite short, crew assignment to this station not considered permanent member of weapon crew.

DESTROYERS (By Code)	WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM											
	Mount Captain	Right Gun Layer	Right Gun Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Code 1	BM3	GMSN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
1	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
1	GM3	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN	SN
Code 2	GM2*	SN	SN	SN	SN	SA	SA	SA	SA	SA	SA	SA
2	GM2*	SN	SA	SN	SN	SN	SN	SN	SA	SA	SA	SA
Code 3	GM3*	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA	SA
3	GM3	SN	SN	SN	SN	SN	SN	SN	SA	SA	SA	SA
Code 4	GM3	SN	(X)	SN	GMSN	GMSN	SA	SN	SN	SA	SA	SA
4	GM3	GM3	(X)	SN	BM3	SA	SN	SN	SN	SN	SA	SA

WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM

DESTROYERS (By Code)	Mount Captain	Right Gun Layer	Sight Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Code 5	GM3*	GMSN	(X)	SN	SN	SN	SN	CS3	SA	SA	SA	SA
5	GM3	GMSN	(X)	BM3	SN	SN	SN	SN	SA	SA	SA	SA
Code 6	GM2	GMSN	(X)	SN	SN	SA	SA	SA	SA	FA	FA	FA
6	GM3	GMSN	(X)	SN	SN	SN	SN	FA	FA	FA	SA	SA
6	GM3	SN	(X)	SN	GMSN	SA	SA	SA	SA	FA	FA	FA
Code 7	GM2	GM3	(X)	SA	GMSN	SN	SA	SN	SA	SA	SA	SA
7	BM2	SN	(X)	SN	SA	SN	BM3	TN	SA	SA	SA	SA
7	GM3**	GM3	(X)	SN	SN	SN	SA	SA	SA	SA	SA	FA

DESTROYERS (By Code)	WEAPON PERSONNEL ORGANIZATION: 3"/50 RFTM											
	Mount Captain	Right Gun Layer	Sight Setter	Left Gun Layer	Left Shellman Left Gun	Right Shellman Left Gun	Left Shellman Right Gun	Right Shellman Right Gun	First Shell Passer	Second Shell Passer	Third Shell Passer	Fourth Shell Passer
Code 8	GM2*	SN	(X)	SN	SA	SA	SN	SA	FA	SA	SA	SN
8	GM3	GM3	(X)	CS3	SA	SA	SA	SA	SN	SA	SA	SN
Code 9	GMM1	BM3	(X)	GMSA	SA	SN	SA	SN	SN	SN	SN	SA
9	GM3	GMSN	(X)	GMSA	SN	SN	SN	SN	SA	SN	SA	SN
9	GM3	SN	(X)	GMSN	SN	SN	SN	SN	FA	SA	SN	FA
Code 10	BM2	GMSN	SN	PNSN	BMSN	BMSN	SN	SHSN	SN	SN	SN	CSSN
10	GM3	SN	GMSN	SN	SN	SHSN	GM3	GMSN	SN	SN	CSSN	SN
Code 11	GM3	SN	(X)	SN	SA	SN	SN	TN	SA	SKSN	YNSN	SA
11	GM3	BM3	(X)	CSSN	SN	SCSN	SN	SN	SA	SA	SA	SA

APPENDIX C

STATIONS AND DUTIES CHARTS

STATIONS AND DUTIES — 3"/50 RFTM

STATION	REFERENCES	DEVICES	INITIAL DUTIES IN LOADING FOR ALL TYPES OF FIRING	AUTOMATIC REFERENCES	AUTOMATIC CONTROL	LOCAL SURFACE REFERENCES	LOCAL SURFACE CONTROL	LOCAL AA REFERENCES	LOCAL AA CONTROL
Mount Captain	OP 1566, (p. A, fig. 7)(p. 153, fig. 150) (p. 165)(p. 141) (p. 51)(p. 89) OP 1753, (p. 8, fig. 7)(p. 9, fig. 8)(p. 9) (p. 27)(p. 202)(p. 203, fig. 167)	MOUNT CAPTAIN'S STATION	1. Mans station		Receives & carries out initial duties in loading (1 through 14)		Carries out initial duties in loading (1 through 14)		Carries out initial duties in loading (1 through 14)
	OP 1753, (p.9)(p. 206)(p. 208, fig. 172) (p. 209)	TELEPHONES CEASE FIRING BOMB	2. Mans Telephones 3. Orders - (a) stations, (b) Reports Gun Number & ready condition to control officer		Receives and carries out orders from control officer (Received by telephone)		Receives and carries out orders from control officer (Received by telephone)		Receives and carries out orders from control officer (Received by Telephone)
	OP 1566, (p. 153, fig. 150)(p. 153)(p. 154) (p. 165)	MASTER SWITCH(ES) for Starting and Stopping Loader Motors	4. Starts Loader Motors						
	OP 1753, (p. 9, fig. 8)(p. 208) OP 1566, (p. 153, fig. 150)(p. 159)(p. 157)	Indicator Lights, READY, ROPE CLEAR, BREECHBLOCK OPEN, SHELL, SHELL FEED RIGHT, SHELL FEED LEFT, and FIRING CIRCUIT LIGHT	5. Checks Indicator Lights, ROPE CLEAR, BREECHBLOCK OPEN, SHELL FEED RIGHT, SHELL FEED LEFT, FIRING CIRCUIT LIGHT, for readiness & Performance of duties						
	OP 1753, (p. 9, fig. 8)(p. 9) (p. 202) (Facing p.204, figs. 158,159) OP 1566, (p. 153, fig. 150)(p. 154) (p. 204)(p. 205)(p. 157)	(GSS) Three position, GUN SELECTOR SWITCH	6. Upon orders from control, positions (GSS) to Gun or Guns ordered	OP 1566, (p. 205)	Upon Orders from control, (GSS) positioned to proper Gun or Guns	OP 1566, (p. 205) (p. 206)	Upon orders from control (GSS) positioned to proper gun or guns.	OP 1566, (p. 205) (p. 206)(p. 202) (p. 203)(p. 156) (p. 159)	Upon orders from control (GSS) Positioned to proper gun or guns.
	OP 1753, (p. 9, fig. 8)(p. 9)(p. 206) (Facing p. 204, figs. 158, 159) OP 1566, (p. 153, fig. 150)(p. 157)(p. 165) (p. 204)(p. 205)	(ASF) Two positions, AUTOMATIC and SINGLE FIRE Switch	7. Positions (ASF) Switch to Single Fire	OP 1566, (p. 205)	Positions (ASF) to Automatic	OP 1566, (p. 205)	Positions (ASF) to single fire (Single fire preferred. If in automatic, gun smoke makes tracking target difficult.)	OP 1566, (p. 205)	Positions (ASF) to AUTO. if not ordered otherwise.
	OP 1753, (p. 9, fig. 8)(p. 9)(p. 206) (Facing p. 204, figs. 158, 159) OP 1566, (p. 153, fig. 150)(p. 157)(p. 165) (p. 204)(p. 205)	(FSS) Four positions, FIRING SELECTOR SWITCH	8. Positions (FSS) to LOCAL SURFACE 9. 'Orders', Local Surface Operator, to shift to 'LOCAL SURFACE Control' (FSS) and Local Surface Switch should be positioned the same 10. 'Orders', First Shellman to Load Observes loading to insure rounds are inserted in Hopper		Upon order, 'STANDBY', from control, position (FSS) to Director. 'Standby to be repeated 'Verbally' to crew	OP 1566, (p. 205) (p. 206)	Upon 'Order', 'STANDBY from control. Positions (FSS) to local surface. Repeat 'Order' STANDBY to crew verbally.	OP 1566 (p. 205)	Upon 'Order', STANDBY from control position (FSS) to Local AA. Repeat order STANDBY verbally to crew.
	OP 1566, (p. 145)(p. 146, fig. 141)(p. 150) (p. 154, fig. 151)(p. 157)(p. 153, fig. 150)(facing p. 164, no. 2, fig. 161) (p. 165)(p. 205)(p. 203) OP 1753, (p. 9)(p. 9, fig. 8)	(GCK) Gun Captain's Key	11. Closes (GCK) to initiate cycle	OP 1566, (p. 150) (p. 157)(p. 173) (p. 204)(fs. 156) (p. 206) OP 1753, (p. 202)	After positioning (FSS) to Director (GCK) locked. GCK after removed & Ordered from control, and gun bore is clear (GCK) is opened. (This is to prevent firing loaded gun after 'cease fire')	OP 1566, (p. 205) (p. 206)	After positioning (FSS) Local Surface (GCK) closed to load gun or guns. Note: Release GLK after gun fires (FFK must also be released.) To reload, GCK must first be closed; otherwise loader will not cycle.	OP 1566, (p. 205) (p. 206)(p. 202) (p. 203)(p. 156)	After positioning (FSS) to Local AA (GCK) closed. After cease fire order and gun bore is clear, open (GCK)
	OP 1566, (p. 166, fig. 163)(p. 169, fig. 168)(p. 169)(p. 170, fig. 169)		12. Gun Captain presses (GCK) to initiate a firing cycle after each round is inserted, until 5 rounds are in each Hopper		Commence Fire and Cease Fire orders are repeated verbally to crew		Commence Fire and Cease Fire orders are repeated verbally to crew		Commence Fire and Cease Fire orders are repeated verbally to crew.
	OP 2133, (p. 8, fig. 5)(p. 91)(p. 206) OP 1566, (p. 153, fig. 150)(p. 157)(p. 203)	(FSS) Firing selector switch (Repeated) GUN & HOIST POWER DRIVE STOP Button EMERGENCY POWER GUN Button	13. Positions (FSS) to OFF (Safety Precaution) 14. Reports, 'Gun Number', to control 'Hopper loaded' POWER DRIVE STOP and EMERGENCY GUN Button used in emergency	OP 1566, (p. 204) (p. 205)	After 'Cease Fire' position (FSS) to OFF as a Safety Precaution	OP 1566, (p. 205) (p. 206)	After 'Cease Fire' position (FSS) to OFF as a Safety Precaution	OP 1566, (p. 203)	After 'Cease Fire' position (FSS) to OFF as a Safety Precaution
		Where found in explanation and practice Reference to Chapter XI 1. Position(s) of mount station 2. Safety precautions for this equipment 3. Use of sound powered telephones and talker procedure 4. How to give orders and commands and report cease fired to MA 5. Location and use of devices at all stations 6. Position and use of (GSS) and how to operate 7. Position and use of (ASF) and how to operate 8. Operation of loaders 9. Commands silence in case of stoppage of fire. Check for readiness if any, and cause of casualty. Report to control. All firing stations are to be opened quickly and a thorough investigation made. Safety precautions.				Reports 'Gun Number', Number of Rounds fired, bore clear condition and casualties, if any, to control		Reports 'Gun Number', Number of Rounds fired, bore clear condition and casualties, if any, to control.		Reports 'Gun Number', Number of Rounds fired, bore clear condition and casualties, if any, to control.

ORGANIZED AND PREPARED BY O. J. PAOLUCCI, J. E. MILANO, AND B. WILEY, GMC, USN FOR TECHNICAL BULLETIN 53-1 CONTRACT NONR 401(10)

STATIONS AND DUTIES — 3"/50 RFTM

STATION	REFERENCES	DEVICES	INITIAL DUTIES IN LOADING FOR ALL TYPES OF FIRING	AUTOMATIC REFERENCES	AUTOMATIC DUTIES	LOCAL SURFACE REFERENCES	LOCAL SURFACE CONTROL	LOCAL AA REFERENCES	LOCAL AA CONTROL		MUST KNOW
LOCAL SURFACE OPERATOR	OP 1566 (p. 9, fig. 8)(p. 165) OP 1753 (p. 6, fig. 7)(pp. 10-11)(p. 268)(p. 287)	Local Surface Station	Mess Station		**Duties** 1. Observes correspondence indicators for synchronization of gun position with respective signals and is prepared to take over gun laying control. 2. Watches gun pointing and shell bursts for interference and is prepared to stop gun firing.	OP 1753 (pp. 10-11)(p. 187)	**Duties** 1. Operates one man control while holding target on cross wires of sight. 2. Controls gun fire.	OP 1753 (p. 11)(p. 187)	**Duties** 1. Standby. 2. Observes correspondence indicators.		Position of station. Preparatory and loading procedure.
	OP 1753 (pp. 29-30)(p. 189)(p. 29, fig. 25)	Train Centering Pin	Release Pin	OP 1753 (p. 10)(p. 187)							Location and purpose of Train Centering pin operation.
	OP 1753 (p. 18, fig. 17)(p. 20, fig. 18)(p. 28, fig. 24)(p. 26)(p. 187)	Elevation Lock	Release Lock								Location, operation and purpose of Elevation Lock.
	OP 1753 (p. 10)(p. 288)(p. 253, fig. 172)	Telephone	Dcms Telephone								Use of sound powered telephones. Talker procedure.
	OP 1753 (pp. 106-109)(p. 106, fig. 80)(p. 201)(pp. 202-203)(p. 208-209) OP 1566 (pp. 277-280)(pp. 142-147)	Control Panel MK 62									Location, purpose and use of all switches and indicators of MK 62 control panel.
	OP 1753 (p. 106)	Manual Selector (PNS, 3 position Local AA, Local Surface, Auto.	Positions switch to ordered type of control	OP 1566 (p. 205) OP 1753 (p. 187)	Switches to "Auto"	OP 1753 (pp. 11-11)	Switches to local surface	OP 1753 (p. 11-12)	Switches to Local AA		Operation's director and telephone
	OP 1753 (p. 10)(pp. 167-168)	Master Push Buttons (3) Start, Stop, Reset	Starts Elevation and Train power drives								Position, purpose and use of Start, Stop and Reset push buttons.
	OP 1753 (p. 10)(pp. 106-109)(p. 187)	Visual Indicators Power on (2 - Train and Elevation)	Checks Power On								Purpose, use and interpretation of visual indications.
	OP 1753 (p. 10)(p. 106)(p. 268)	Correspondence Indicator									
	OP 1753 (p. 10)(pp. 268)(p. 106)	Gun Firing Cut-out Lights (2)									Safe firing conditions when illuminated.
	OP 1753 (pp. 111-113)(pp. 10-11)(p. 287)	One-Man Control		OP 1753 (p. 187)	Trains and elevates gun to director position when switches to "Auto".						
	OP 1753 (pp. 10-11)(p. 269)(pp. 111-112)	Safety or "Dead Man" Switch				OP 1753 (pp. 10-11)	Opens "Dead Man" Switch to stop gun laying movement when on target.				Operation of one man control. Purpose and use of Safety or "Dead Man" switch.
	OP 1753 (pp. 10-11)(p. 112)(p. 283, fig. 167)(p. 269) OP 1566 (pp. 145-148)(pp. 205-207)(p.154, fig. 151)	Right Firing Key (RFK)	Open Firing Key	OP 1566 (p. 205)	Closes firing key on "Commence Fire" open key on "Cease Fire"		Closes firing key when target is on cross wires of the sight.				Purpose and use of firing key. How to track target.
	OP 1753 (pp. 239-241)(p. 254)(p. 11)	Sights Telescope and Open Illumination Control				OP 1753 (p. 12)	Aligns target on cross wires of sight.				Unloading and securing procedure. Station action when casualty occurs (securing of locks, shut-down of drives).
	OP 1753 (p. 10)(p. 10, fig. 9)	Twist Indicator									Operation of Sight controls. Purpose and use of Twist Indicator.
LOCAL AA OPERATOR	OP 1753 (p. 8, fig. 7)(pp. 11-12)(p. 284) OP 1566 (p. 166)		Mess Station	OP 1753 (p. 11)	**Duties** 1. Standby.	OP 1753 (p. 11)	**Duties** 1. Standby.	OP 1753 (p. 13)(p. 187)(pp. 253-254)	**Duties** 1. Operates One Man Control while holding target in sight. 2. Controls gun fire.		Position of station. Preparatory and loading procedure.
	OP 1753 (p. 288, fig. 172)	Telephone	Dcms Telephone								Use of sound powered telephones, talker procedure.
	OP 1753 (p. 29)(p. 187)(p. 18, fig. 17)(p. 20, fig. 18)(p. 28, fig. 24)	Elevation Lock	Releases Elevation Lock								Location, purpose and use of elevation lock.
	OP 1753 (p. 11)(p. 284) OP 1566 (p. 159)	Fire Cutout Indicators (2)									Position, function and use of indicator lights.
	OP 1753 (p. 11, fig. 11)	Emergency Stop Control									Unloading and securing procedure. Station action when casualty occurs.
	OP 1753 (pp. 11-13)(pp. 111-113)(p. 287)	One-Man Control									How to track target.
	OP 1753 (p. 13)(p. 168)(p. 174)(pp. 111-112) OP 1566 (pp. 145-149)(pp. 204-207)	Left Firing Key (LFK)	Operates Firing Key to open						Tracks target (usually air-borne), giving necessary lead in ring sight. Closes firing key when on target. Stops gun laying movement if necessary.		Purpose and use of firing key.
	OP 1753 (pp. 11-13)(p. 269)(pp. 111-113)	Safety or "Dead Man" Switch									Purpose and use of safety or "Dead Man" switch.
	OP 1753 (pp. 11-13)(pp. 253-254)(pp. 151-154) OP 1566 (p. 8)	Ring Sight									Purpose and use of ring sight. Estimation of speed and direction of air-borne targets. Proper positioning in quadrants of ring sights.
SIGHT SETTER	OP 1753 (p. 11)(pp. 11, 239, 241)(p. 8, fig. 7)(p. 240, fig. 165)	Sight Setter's Station	Mess Station			OP 1753 (p. 254, p. 11)	Sets sights according to orders. Changes are unrestricted.				Position of station. Operation of sight and deflection hand wheels.
	OP 1753 (p. 11)(pp. 288-289)	Telephones	Dcms telephones.								How to use sound powered telephones. Talker procedure.

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CONTRACT NONR: 401(10)

STATIONS AND DUTIES — 3"/50 RFTM

STATION	REFERENCES	DEVICES	INITIAL DUTIES IN LOADING IN ALL TYPES OF FIRING	AUTOMATIC REFERENCES	AUTOMATIC CONTROL	LOCAL SURFACE REFERENCES	LOCAL SURFACE CONTROL	LOCAL AA REFERENCES	LOCAL AA CONTROL		MUST KNOW
LEFT SHELLMAN	OP 1753 (p. 13) (p. 8, fig. 8)	Left Shellman's Station	Mans station.								Position of Station.
	OP 1566 (p. 25) (p. 41) (p. 41, fig. 9) (p. 33) (p. 13, fig. 10) (p. 12, fig. 9)	Salvo Latch	Trips Salvo Latch.								Position, use and how to operate.
	OP 1566 (pp. 121-123) (p. 120, fig. 126)	Shell Retaining Latch	Insure that shell retaining latch is released.								Position, use and how to look and release.
	OP 1566 (p. 142) (p. 143, fig. 139) (p. 168) (p. 205) (p. 188, fig. 197)	Hand Reset Lever	Resets Bore Clear Interlock on MK 2 MOD 5 Loaders.								Position, use and how to operate.
	OP 1566 (p. 205) (pp. 187-188) (p. 107, fig. 115) (p. 114, fig. 120) (p. 86, fig. 99)	Firing Mechanism Safety Lever Arm	Insures firing lever is in electric position.								Position, use and how to operate.
	OP 1566 (pp. 164-172, including illustrations) (p. 205) OP 1753 (pp. 12-13)	Loader Hopper	On orders from gun captain serves ammunition into hopper.	OP 1566 (pp. 165-168) OP 1753 (p. 13)	Keeps hopper filled.	OP 1566 (pp. 165-168) OP 1753 (p. 13)	Keeps hopper filled.	OP 1566 (pp. 165-168) OP 1753 (p. 13)	Keep hopper filled.		Position, use and how to load and unload hopper.
RIGHT SHELLMAN	OP 1753 (p. 13) (p. 8, fig. 7)	Right Shellman's Station	Mans Station.								Position of station.
	OP 1566 (p. 27) (p. 33) (p. 40) (pp. 119-120) (p. 19, fig. 16) (p. 28, fig. 21) (p. 87, fig. 100) (p. 88, fig. 101)	Breech Opening Handle	Lowers breechblock.								Position, use and how to operate breech opening handle.
	OP 1566 (pp. 121-123) (p. 120, fig. 126)	Shell Retaining Latch	Insures shell retaining is released.								
	OP 1566 (p. 183) (p. 187) (p. 305) (p. 184, fig. 190) (p. 187, fig. 196) (p. 186, fig. 199)	Hand Reset Lever	Resets bore clear interlock on MK 2 MODS 4 and 6 Loaders.								Position, use and how to operate.
	OP 1566 (pp. 165-172, including illustrations) (p. 205) OP 1753 (pp. 12-13)	Loader Hopper	On orders from Gun Captain serves ammunition into hopper.	OP 1566 (pp. 165-168) OP 1753 (p. 13)	Keeps hopper filled.	OP 1566 (pp. 165-168) OP 1753 (p. 13)	Keeps hopper filled.	OP 1566 (pp. 165-168) OP 1753 (p. 13)	Keep hopper filled.		Position, use and how to load and unload hopper.

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