COMMENTS AND CORRECTIONS ON THE CD-ROM VERSION OF *NAVAL AVIATION COMBAT STATISTICS—WORLD WAR II*

The CD-ROM version of this publication was prepared using a scanner and Adobe Acrobat Capture 1.0 software. Several problems were encountering during the scanning and correcting of the scanned text. Since the document was not originally type set the scanning software and equipment had some difficulty reading the typewriter letters and numbers used in 1946. However, the major problems usually dealt with the table headings, underlining and column lines being to close to numbers or letters. These three problems usually resulted in data that could not be read accurately. If a group of numbers could not be corrected they were usually left in a digitized format. Occasionally the digitized data would not include letters or numbers that were close to column lines and incomplete column lines. Hence, the quality of software and hardware available to the Naval Historical Center limited true reproduction of the monograph.

Following the initial scanning of the document the scanned and processed text was proof read several times. After each reading, corrections were made to the text. The primary emphasis was, of course, on accuracy and trying to make the text word searchable without spending an inordinate amount of time making corrections and proof reading. Data that was left in the digitized format will normally appear to be in **bold** and may not be the same type of font.

The monograph is being presented on the CD-ROM just as it was originally published. If there were any spelling errors or grammatical mistakes they were not corrected. Terminology that would not be acceptable today was not changed. The flavor of the document comes from the time it was written, 1946.

A tabulation of commonly used words in the table headings is provided to help clarify words that may have not have been read correctly by the software, could not be corrected or a letter was left off a word and could not be corrected. The following list of words or abbreviations may be found in the monograph as a single heading or in various combinations: A/A, A/C, Action, Air, Aircraft, Airfield, Ammunition, Areas, Armored, Attack, Attacking, Base, Boat, Bombers, Bombs, Carrier, carrier designations (CV, CVE, CVL), Casualties, Combat, Complement, Dates, Defensive, Dest. (Destroyed), Destroyed, Enemy, Engaged, Engine, Expended, Expenditures, Fighters, Fl’ts (Flights), Flights, Float, Single, Flying, Force, Forces, Ground, Hand, Harbor, Hit, Including, Land, Local, Loss, Losses, Lost, Merchantmen, Military, Misc. (Miscellaneous), Mission, Month, Night, No. (number), Number, Offensive, On,

Operating, Operational, Other, Over, Own, Patrols, Per, Percent, Plane, Purpose, Ratios, Rec. (Reconnaissance), Reconnaissance, Rockets, Search, Ship, Sorties, Sqdns. (Squadrons), Squadrons, Strike, Support, Sweep, Targets, Tons, Total, Trainer, Transport, Transportation, Twin, Type, Unarmored, Under, Unknown, and Warships. See the books *United States Naval Aviation 1910-1995* or *Dictionary of American Naval Aviation Squadrons - History of VA, VAH, VAK, VAL, VAP and VFA Squadrons* for any questions regarding aircraft designations or aircraft class designations.

The original document did not have page numbers 12 or 128. There is no page number listed in the CD-ROM document for the page with Table 19. The scanner did not pick up this page number which should be 59.

THE FOLLOWING ARE CORRECTIONS BY PAGE NUMBER:

PAGE 31: In the 3rd column GHT should read **FLIGHTS,**

PAGE 35: In the 2nd column the last entry is blank and should read **997**

In the 3rd column the number for February-June 1945 Period Total should read **48,831**

In the 4th column the number for February-June 1945 Period Total should read **43,383** and the number for July-August 1945 Period Total should read **11,494**

In the 5th column the number for February-June 1945 Period Total should read **14,794**

In the 6th column the number for February-June 1945 Period Total should read **121,302**

PAGE 41: In the 2nd column the Dates of Action for Guadalcanal Support should read **10/12-10/16** and the Dates of Action for Guadalcanal Battle should read **11/13-11/14**

PAGE 43: In the 7th column under Air, the Okinawa Campaign number should read **1692**; the CV-CVL Total number should read **1563** and the Ryukyus Total number should read **1277**.

PAGE 47: In the 6th column the heading should read **On Ground**

PAGE 49: In the 2nd column an ***** should be in the space for 1943 Total

PAGE 50: In the 4th column the head should read **OWN LOSSES**

PAGE 53: The first sentence below the table should begin with an *****

PAGE 59: This page is missing the page number. The last column for Table 19, under Lost: the number for Land-Based should read **10.1**, the number for F4F should read **18.6**, the number for F2A should read **82.4**, the number for SBD should read **22.1** and the number for PBY should read **35.6**

PAGE 61: In the column head Sorties Engaging Enemy Aircraft with the sub-head Number, the number for Carrier-Based VF for 1944 should read **4127** and the number for 1945 should read **3844**

PAGE 62: In the last column under Lost, the entries for 1942 February, May, June, August and October should read **11.5**, **15.8**, **29.7**, **16.2** and **17.2**

PAGE 63: In the last column under Lost, the entry for 1942 February should read **100.0**

PAGE 66: In the 3rd column under Grand Total the number should read **3019**

PAGE 67: In the 2nd column, Action Sorties, the entry for Carrier-Based Ryukyus should read **37,421**, for Marianas it should read **18,747**, for Western Carolines it should read **10,234** and for Philippines it should read **22,323**. In the 2nd column under Action Sorties, the entry for Land-Based Western Carolines should read **11,456**, for Marshalls it should read **21,552** and for Bismarcks, Solomons it should read **62,628**.

PAGE 71: In the 2nd column the entry for Carrier-Based should read **20,499**.

PAGE 72: The headings should read **SINGLE-ENGINE FIGHTER OR RECONNAISSANCE** and **SINGLE-ENGINE BOMBER** and the Allied Code Names should read **ZEKE, HAMP; OSCAR; TONY; TOJO; NATE; FRANK; JACK; GEORGE; MYRT; OTHER & U/I; VAL; JUDY; KATE; JILL** and **OTHER**.

PAGE 74: In the 2nd column under the entry for 1945 August the number should read **35**.

PAGE 76: In the 2nd column under the entry Grand Total the number should read **3518**. In the 3rd column the aircraft designation should read F4U and the last entry under Grand Total should read **1042**.

PAGE 78: The heading for the 5th column should read **% LOST OF A/C HIT**

PAGE 93: In the 2nd column the letter **L** should be under the heading KOREA, NO. CHINA.

PAGE 103: In the 2nd column under Grand Total the number should read **121,482**.

PAGE 106: In the 4th column under Total the number should read **21,052**.

PAGE 109: The two major headings should read LAND TARGETS and **SHIPPING TARGETS**

PAGE 110: The second major heading should read **LAND-BASED** and the 4th column heading should read SBD with the second part of the column heading as **% Total**.

PAGE 111: The 3rd column (TRUK, MARIANAS) under the entry for 500-lb. GP the number should read **197**, the entry for 1000-lb. GP should read **117**, the entry for the 1000-lb. SAP should read **124** and the TOTAL entry should read **610**.

PAGE 113: The 3rd column (Carrier VTB) under TOTALS the number should read **1311** and under the 5th column (VPB) the entry for TOTALS should read **41**.

PAGE 120: The aircraft designation heading after F6F should read **F4U**.

BACKGROUND ON THE MONOGRAPH
NAVAL AVIATION COMBAT STATISTICS—WORLD WAR II

The publication *Naval Aviation Combat Statistics—World War II* was compiled during the winter of 1945—1946 and the following spring by a group of some 30 officers, enlisted men, and civilians headed by Lieutenant Commander Stuart B. Barber, USNR.[1] The group, a section within the Air Branch of the Office of Naval Intelligence (ONI), had the function of IBM tabulation of naval air action. It began declining rapidly in size as wartime coding backlogs were eliminated and current tabulations were kept up to date, and the production of this volume soon became its principal task.

Barber personally designed the final series of some 160 tabulations for this report and wrote the accompanying text. He was uniquely experienced for this task. Originally assigned to the Bureau of Aeronautics to develop a standardized action reporting system, in 1943 Barber designed the Aircraft Action (ACA-1 and -2) forms and drafted the instructions to be used in completing them. Following a training tour at the Navy's Air Combat Intelligence School, he served at Pearl Harbor on the staff of Commander Air Force, Pacific Fleet (COMAIRPAC) from November 1943 until July 1945. For most of that period, he was responsible for producing the COMAIRPAC Analysis of Pacific Air Operations, from the incoming squadron ACA and higher-echelon reports which covered aircraft carrier operations in detail, as well as providing a monthly statistical summary and an analysis and overview of all other Pacific air operations. During the final months of the war, Barber also initiated and wrote a series of COMAIRPAC Ordnance and Target Selection Bulletins, as a way of highlighting the important points raised in the Pacific Air Operations analyses.

The report included herein was completed in May 1946, and by the time Stuart Barber left active duty in June of that year, hundreds of copies were in the process of being printed for distribution throughout the Navy and Marine Corps.[2] It was at this point that the document fell afoul of postwar service politics.

In the wake of the Navy Department's ongoing fight with the War Department over service unification, Secretary of the Navy James Forrestal had set up an organization in the fall of 1945 designated SCOROR (Secretary's Committee on Research on Reorganization) to review unification and other issues. In July 1946, SCOROR was given a copy of Barber's report for review. A highly critical memorandum resulted from this examination. In this paper, an anonymous SCOROR staff

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[1]Information concerning the compilation of this document comes from an interview conducted by the author with Mr. Barber on 25 February 1989; from a copy of a portion of a draft memoir by Stuart Barber on his Navy service that was loaned to the author by Mr. Barber in May 1996; and from additional information supplied by Mr. Barber in a review of a draft of the introduction.

[2]For the proposed distribution, see *Naval Aviation Combat Statistics—World War II* OPNAV-P-23V NO. A129 (Washington, D.C.: Air Branch, Office of Naval Intelligence, Office of the Chief of Naval Operations, 17 June 1946), ii.

member, apparently acting as a devil's advocate, asserted that the study had been "compiled for Navy propaganda purposes" and took the accompanying text to task for containing a number of apparent errors of interpretation. Because of the Army Air Forces' express concern over the Navy's continuing use of land-based aircraft, the reviewer seemed particularly upset that some of the tables illustrated the Navy's extensive (and successful) operation of land-based air in the Pacific War.[3]

As a result of this review, Rear Admiral Thomas H. Robbins, Jr., the Assistant Head of SCOROR, sent a memorandum to the Chief of Naval Intelligence on 2 August 1946 providing his comments on *Naval Aviation Combat Statistics—World War II*. In this paper, Robbins stressed:

(a) As a compilation of statistics it is an excellent work containing much information of value to those concerned with Operations Planning. In addition it serves as an excellent source of information for historical and other purposes.

(b) Page iv contains statements which, while probably not intended to give the implications which they do, nevertheless in my opinion would reflect discredit upon the Navy Department and the Naval Service. . . .

(c) Many of the tables of statistics could be misused, from the point of view of merger [of the services], were the publication to be given wide distribution among the armed services.

In light of these concerns, Robbins recommended that the publication not be distributed at that time, although he noted that pertinent excerpts could be made available on a "need to know" basis by the head of the Air Branch of the Office of Naval Intelligence.[4] Agreeing with Robbins's recommendation, ONI ordered the destruction of all but a handful of copies of the printed report, which it kept for its files.

Barber first discovered this fact when he returned to the Office of the Chief of Naval Operations (OPNAV) in mid-September 1946, as one of a dozen or so Reserve Air Combat Intelligence Officers (ACIOs) specially selected to support a project set up by Vice Admiral Forrest Sherman, the Deputy Chief of Naval Operations for Operations. The idea behind the project was that such a group of officers, possessing wide-ranging wartime experience, could assemble from the mass of facts about Naval Aviation during the war material of great potential value for supporting Navy positions during the ongoing fight over unification. Each man was ordered to two weeks of temporary duty, reporting to Captain Wallace Beakley and his assistant, Captain George W. Anderson, Jr.

At the end of the two weeks, Barber was given an additional week of active duty to enable him to pull the material together. While its final destination after delivery to Captain Anderson is not

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[3]Copy of [SCOROR] memo entitled "'Naval Aviation Combat Statistics,' Comments on," no serial, 29 July 1946; "A21/1-1 Navy (1917 thru July 1948) /S&C/" Folder, Series II, Op-23 Records, Operational Archives, Naval Historical Center (hereafter OA).

[4]Copy of memo from RADM Robbins to the Chief of Naval Intelligence, no serial, 2 August 1946; "A21/1-1 Navy (1917 thru July 1948) /S&C/" Folder, Op-23 Records, OA. Robbins had suggested in his memo that all copies of page iv of the report be burned. This apparently was carried out, since no page iv is present in the copy reproduced here.

known, this material appears to have provided the main factual input to a thin, unclassified, hard-cover volume published in 1947 entitled U.S. Naval Aviation in the Pacific, for which Admiral Sherman wrote a preface.[5] It contains many verbatim extracts from the material assembled by the group, including Stuart Barber's comparison of carrier and Army Air Forces air-to-air combat results.

Although all members of the Reserve ACIO group had had access to the suppressed report during their time in OPNAV, when a copy turned up missing, Miss Eleanor Linkous, the Air Branch's secretary, rightly suspected that Barber was the culprit. Fortunately, however, no one in the office took any action to retrieve it, because this is the copy that he turned over to the Naval Historical Center more than forty years later—the one from which this CD-ROM version is being reproduced.

The fate of the other file copies of Naval Aviation Combat Statistics remains unknown. For many years, the Air Branch employed Miss Blanche Berlin, the only member remaining from the wartime coding and tabulation crew, whose knowledge was invaluable for filling special requests for action report data from the files. But so far as is known, no broad release of statistical data from the suppressed report has ever been made—with the conspicuous exception of the air-to-air combat data released in the spring of 1948 and described in the author's book, *Revolt of the Admirals*.[6]

While historians may still find the data in this report to be of great value, the fifty years of its suppression undoubtedly have reduced its usefulness for other purposes. For example, one of its important original objectives—documenting the reasons for the naval aviators' evident pride in their wartime accomplishments—is no longer of concern for the majority of the participants.

What remains inexplicable to this day is why the Navy made no effort to prepare and issue a carefully edited version of the study, at least once the heat of the unification controversy had died down. It is particularly baffling since Stuart Barber served as a senior civilian employee in OPNAV from 1947 to 1970 and since as the report's author he was in a favorable position to have at least proposed this course, but he never attempted to do so.

Whatever the report's current value, however, it is unthinkable that this mass of descriptive and interpretative data covering the efforts of so many thousands of men—constituting one of history's greatest and most decisive striking forces—should not be released in full as originally written. One of the best lessons to be learned from this story may well be that rather than suppress information to prevent its possible misuse, the best course of action may be to aggressively use the information to confound opponents, once it has been reviewed for accuracy.

This section, **Background on the Monograph**, was written by Dr. Jeffrey G. Barlow, a Historian in the Naval Historical Center's Contemporary History Branch. Dr. Barlow is the author of *Revolt of the Admirals: The Fight for Naval Aviation, 1945—1950*.

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[5]See *U.S. Naval Aviation in the Pacific* (Washington, D.C.: Office of the Chief of Naval Operations, United States Navy, 1947).

[6]Jeffrey G. Barlow, *Revolt of the Admirals: The Fight for Naval Aviation, 1945—1950* (Washington, D.C.: Naval Historical Center, Department of the Navy, 1994), 62—63.

OPNAV-P-23V NO. A129
17 JUNE 1946

NAVAL AVIATION COMBAT STATISTICS

WORLD WAR II

AIR BRANCH
OFFICE OF NAVAL INTELLIGENCE
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
NAVY DEPARTMENT
WASHINGTON, D. C.

NAVAL AVIATION COMBAT STATISTICS
WORLD WAR II

CONTENTS

EVALUATION SECTION
AIR BRANCH

NAVAL AVIATION COMBAT STATISTICS, WORLD WAR II.

GENERAL INTRODUCTION

1. GENERAL SCOPE OF REPORT

This report contains air combat, attack, and combat operations statistics of Naval and Marine aviation during the war. It is designed as a basic reference document, compressing into one volume the most pertinent statistical data compiled in the IBM tabulation system maintained by Air Branch, ONI, and its predecessors, Air Intelligence Group, ONI, and Air Technical Analysis Division, DCNO(Air). Certain related data from other sources, compiled on statistical bases comparable to those used in the Op-23-V tabulation system, have been added.

The 60 statistical tables herein are supplemented by an interpretive text, tied closely to the data presented. In no sense is any attempt made in this text to present a connected narrative account of the war record of Naval aviation. The essence of the report is combat statistics, and the story is told solely as the statistics themselves may be led to tell it. The story told is also limited to the overall story, a perspective of Naval aviation and its many components as a whole, and data for individual ships, squadrons or other units are not provided.

2. DATA NOT INCLUDED

Not all the story of Naval aviation, which could be told in statistical terms, is covered in this report. The reasons for the omissions arise from the history and assigned functions of the statistical unit preparing the data, and from the lack of any integrated statistical organization covering all naval air operation. Postwar personnel shortages prevented this Branch from making good these deficiencies.

Naval air anti-submarine warfare is the first exclusion. This results from the establishment, many months prior to initiation of the general air combat statistical analysis program, of a special ASW statistical analysis unit, (directly under CominCh, and later under Tenth Fleet). To avoid duplication of a field well covered elsewhere, no records of air ASW activity were kept by this Branch or its predecessors.

The second principal exclusion is complete, detailed data on flights not involving actual action with the enemy (for search, reconnaissance, defensive, or other purposes), and losses sustained on such flights. This arose from (a) the prior existence of another office (Flight Statistic, DCNO(Air)) primarily concerned with data on non-action flights, (b) the primary importance of devoting the limited manpower and facilities available to the analysis of action statistics not compiled elsewhere and (c) a lack of complete, uniform and detailed incoming reports on non-action flights. This exclusion has been partly compensated by including in some tables herein data on total flights reported monthly (for 1944-45 only) by squadrons which were engaged in action during any month, and non-action losses by such squadrons during the entire war.

These items, however, do not give a full picture of the extent of naval air defensive or reconnaissance patrol activity or losses sustained therein. It is doubtful whether data exist which would permit a full and accurate statistical presentation of this activity.

A further exclusion is data on the operations of VO-VS aircraft. These operations were not regularly reported by the units involved, in a manner permitting their tabulation by the IBM card system.

The final major exclusion is data on losses of flying personnel. Losses as reported in action reports are not final, because of subsequent rescues, or return of captured airmen. Data on these is maintained by BuPers, but is not compiled and reported on a basis comparable with the aircraft loss data herein.

3. SCOPE OF THE DATA

Despite the exclusions listed, the bulk of Naval aviation's achievements, at least in the Pacific war, are covered by the data herein. Included are full data on all reported aerial combat, and all reported attacks on enemy targets other than submarines, by all Navy and Marine carrier and land-based aircraft. The following general categories of figures are provided:

Total Flights, by squadrons reporting action against the enemy

Action Sorties

Losses and damage from enemy action

Losses from operational causes

Own planes engaging enemy aircraft

Enemy aircraft engaged

Enemy aircraft destroyed, air and ground

Planes attacking targets

Bomb and torpedo expenditures on targets

Rocket expenditures

Ammunition expenditures.

And, with respect to each of the above items, one or more of the following cross-classifications of data are provided:

Carrier-based vs. land-based
Type of carrier
Navy vs. Marine
Theater of operation
Year, month
Carrier raid or campaign
Type or model of own aircraft
Type or model of enemy aircraft
Mission of own aircraft
Location of action, by general areas
Type of target attacked
Type of ordnance used
Night operations.

4. SOURCES AND METHODS

The method used in compiling these data deserves brief description. The basic source material for most actions was the squadron ACA-1 report for each mission, or the individual squadron or mission action report for actions prior to adoption of the ACA-1 form. Where no action reports were available, carrier battle narratives or squadron monthly war diaries were used. A check list of all carriers and squadrons in combat areas was maintained, and the war diaries of all such squadrons, and battle narratives of all such ships, were checked for possible actions in the event that no action reports had been received from any of these units.

The statistical items from these primary and secondary sources were then punched on IBM cards. The mechanical unit, for card-punching purposes, was the action of one squadron on one mission. From the file of these cards, numbering some 48,300 in all, have come most of the tabulations and cross-tabulations in this report. Additional supplementary files of summary cards, some 5,500 in number, prepared from the main card file, have also been used in preparing some of the tables.

Statistical tabulation was begun in early 1944, starting with the air operations of January 1944 and following with those of subsequent months in order. For 1944 operations a card system was used which required filling out not only one card covering each squadron on each mission, but also supplementary cards covering each separate engagement with enemy aircraft, and each separate attack on a major type of target, in addition to the primary engagement or attack participated in by the squadron.

This system was eventually found unwieldy for handling the large-scale operations of late 1944, and beginning with the operations of January 1945 a simplified card system was used in which all engagements and attacks by one squadron on one mission were covered on one card. The change of card coding systems resulted in some lack of comparability between 1944 and 1945 statistics (discussed in connection with individual items under appropriate headings hereafter), and in an inability to secure certain breakdowns of data for one year or the other. This will explain the limitation of some tables to 1944 only, or 1945 only.

Because of time and personnel limitations, 1942-43 actions were not placed on machine cards until after the end of the war, and the simplified 1945 coding system was therefore used for these years.

Of the data appearing in the tables, all were taken from the IBM cards except the following, whose origin is described briefly:

(a) Aircraft on hand, and total flights, for squadrons in action:

These figures, on a monthly basis, were obtained from Flight Statistics Section, DCNO(Air), from the monthly report of each squadron which reported engaging in action against the enemy (other than ASW) during the month. Data were not obtained for squadrons which reported no action during a given month, even if they were in action during the preceding or following month and were known to have been in an active area. Thus these figures are not complete records of plane strength, patrols or other flights in war areas, but are, as the name implies, figures for squadrons in action, directly comparable with the action data on a squadron basis. Where number of flights was not reported, or was obviously incorrect as reported, an estimate was made, based on the performance of comparable units, and the squadrons combat activity. Where number of planes reported on hand differed excessively from normal strength and was also out of line with the number of flights and action sorties reported, normal complement was substituted. These figures are given for 1944-45 only, as they were not available on a monthly basis for earlier years.

(b) Losses on other (non-action) flights, and losses on ship or ground:

These figures were obtained from Aircraft Records Section, DCNO(Air), and also cover, on a monthly basis, only squadrons reporting action during the month of the loss. Thus they would not cover losses on negative patrols by units flying no action sorties, nor even losses on the ground or ship to enemy action if the planes were not assigned to a squadron reporting action during the month.

(c) Number of Carriers in Action; Carrier Complement:

The number of carriers in action was taken from action reports. Carrier complement is based on the apparent normal number of planes carried at the beginning of the month's operations by carriers of each class.

(d) Enemy Aircraft Destroyed on Ground

In the case of planes destroyed on ground by carrier-based aircraft, the final evaluations of the carrier task force commanders were used in lieu of the claims advanced in squadron action reports. Squadron claims have been used, however, for grounded planes destroyed by our land-based aircraft, in view of the small numbers involved, and the general lack of final evaluations. (Squadron claims have been used consistently for enemy aircraft destroyed in air combat, since in few instances have higher commands reduced these claims).

All statistical data, except the types listed in (a) to (d) above, have come from the basic sources previously listed.

DEFINITIONS

NUMBER OF PLANES ON HAND Number of aircraft reported assigned to a unit during a month in which that unit reported having action against the enemy (other than ASW). Data have been checked for erroneous reporting and adjustments made on basis of normal complement and volume of operations. Not presented for months prior to January 1944.

CARRIER COMPLEMENT Number of aircraft normally carried by carrier of the class at beginning of the operations in question.

NUMBER OF CARRIERS IN ACTION Total number whose aircraft engaged in action against the enemy other than ASW) at any time during the period in question.

FLIGHTS, SQUADRONS IN ACTION Number of flights, for all purposes including combat and attack, reported for a calendar month by a squadron reporting action against the enemy (other than ASW) during the same month. Data have been checked for erroneous reporting and failure to report and adjustments made. Not available on monthly basis prior to January 1944.

ACTION SORTIES Number of planes taking off on a mission which eventuated in an attack on an enemy target or in aerial combat, or both. This basis of tabulation was the number of planes of one squadron taking off on the mission. If any of these planes had action, the entire squadrons's planes on the mission were counted as action sorties, including abortive planes, planes which reached the target but did not attack, and planes which escorted or patrolled but did not engage in combat. Thus if 16 VF took off as escort, 2 returned early, 2 engaged in combat, and 4 strafed, all 16 were counted as action sorties. Likewise if 8 planes took off for CAP, and only 2 engaged in combat, all 8 were action sorties. On the other hand, if 8 VF took off for escort, and none engaged in any sort of attack or combat, then none were counted as action sorties, even though they reached the target, and even though the escorted bombers attacked the target. Likewise, CAP planes missions, none of whose planes engaged in combat were not counted as action sorties.

LOSSES OF OWN AIRCRAFT Loss data have come primarily from two sources: (1) action reports, squadron and ship, covering losses from all causes on missions involving actual combat with the enemy, and (2) loss reports, covering losses from all causes whatsoever.

The losses on action sorties reported herein have been taken primarily from action reports, in which the exact cause of loss can be determined more accurately. Two major exceptions to this practice may be noted.(a) losses on unreported or poorly reported combat missions have been added from loss report sources; these may sometimes be inflated, because of a tendency in the early loss reports to ascribe to "combat" or "enemy aircraft" losses whose cause was unknown; (b) aircraft listed in action reports as seriously damaged rather than lost, and later indicated in loss reports to have been scrapped or jettisoned because of this damage; these have been added as losses on action sorties.

Losses other than on action sorties have been taken from the loss reports, with some confirmation from carrier and squadron reports. The accuracy of loss reports, particularly with respect to cause of loss and date of loss, is frequently debatable, and many adjustments have been made where indicated.

LOSSES ON ACTION SORTIES Includes all planes counted as action sorties, which failed to return to a friendly base or were destroyed in landing at base, plus planes returning and later destroyed because of damage sustained during the mission, plus planes lost on unreported missions which apparently involved action with the enemy. All losses on action sorties have been classified by cause under the three categories Enemy A/A, Enemy A/C, and Operational. Where the exact cause was not given in the action report (planes reported missing) the cause most likely under the circumstances of loss described was arbitrarily assigned, or if the circumstances were not stated, the cause stated in the loss report was assigned.

Losses on Other Flights These are limited to losses, during each month, of planes assigned to squadrons which reported engaging in action against the enemy during that month. For these squadrons these figures represent all operational losses of airborne planes, on missions not involving action against the enemy; they include also planes later stricken because of operational damage sustained on such flights.

Losses on Ship or Ground These figures are also limited to losses, during each month, by squadrons reporting action during the same month. For these squadrons they included all losses, regardless of cause, of planes not airborne at the time of the loss, or at the time the damage was sustained that ultimately resulted in the loss of the plane. Principal causes of these losses included: Struck by aircraft landing, taking off or taxiing, or by automotive vehicles; explosions and fires; storms, typhoons; enemy bombing or strafing or suicide attacks on carriers; own gunfire. It should be noted that all losses of grounded aircraft to enemy action are not included (some such losses were of aircraft assigned to pools or to squadrons not in action), nor is the greater part of the listed losses on ship or ground attributable to enemy action. The carrier losses in this category, however, do include all carrier planes lost in enemy attacks on carriers.

It should be noted, in connection with all categories of loss, that the figures for carriers represent all losses in active carrier combat operations (excluding strictly patrol and escort operations) in Pacific combat areas, while the land-based figures represent the bulk of, but not all, the losses of squadrons in active combat areas.

DAMAGE BY ENEMY A/A AND ENEMY A/C Planes receiving major and minor damage from the causes stated, as reported in squadron action reports only.

OWN PLANES ENGAGING ENEMY AIRCRAFT Number of airborne aircraft firing guns at, or fired at by, airborne enemy aircraft. In fact, probably a number of planes are included which do not meet this definition, but were in flights, or in sections or divisions of flights, of which other planes did fire guns or were fired at. Also, reports for many early actions did not specify the actual number of planes engaging in combat by any definition, and it was frequently necessary to make arbitrary assumptions based on own and enemy losses in the engagement. On the whole, however, these figures reflect with fair accuracy the number of aircraft engaging in and/or exposed to action with enemy aircraft.

ENEMY AIRCRAFT ENGAGED In general, this figure tends to approximate the number of enemy aircraft observed in formations which were actively engaged in aerial combat. An attempt has been made to exclude formations or parts of formations which were not actively engaged by the reporting squadron, but frequently the action reports were so vague with respect to the number of enemy planes actually engaged that it was necessary to use the total number of enemy planes observed in the area, or to adopt an arbitrary figure based on the number shot down.

It should also be noted that the figures on enemy planes engaged were compiled on a squadron basis. In engagements involving two or more of our squadrons at one time and place it is therefore likely that the same enemy formations may have been reported as engaged by each of the squadrons. Thus from the viewpoint of our mission as a whole, the number of enemy planes engaged is inflated by duplication. On the other hand, from the viewpoint of the number of individual plane-to-plane engagements, the figures on enemy planes engaged probably represent an understatement.

It should be noted that data on number of enemy planes engaged are inherently the least accurate of any data in this report, because of the natural inaccuracy of aerial observation; estimates of the size of enemy formations may vary by 50 percent or more depending on the observer and the circumstances.

TYPES OF ENEMY AIRCRAFT ENGAGED AND DESTROYED:

BOMBERS Includes identified types of single-engine and twin-engine bombers; all unidentified twin-engine aircraft; flying boats; and for 1942, 1943 and 1945 only, transports. Approximately 90% of the total consists of identified single-engine and twin-engine bombers, though the proportion varies from period to period.

FIGHTERS (More properly entitled "Fighters and other types") includes identified types of single-engine and twin-engine fighters; all unidentified single-engine aircraft, all float planes; all trainers; and for 1944 only, transports. Approximately 90% of the total consists of planes identified as single-engine fighters, though the proportion may vary from operation to operation.

It may be noted that identification was frequently deficient, many instances having been noted of Japanese Army planes reported in exclusively Navy theaters, of confusion between dive

bombers and fighters, and between various models of single-engine fighters, and twin-engine fighters and bombers.

ENEMY AIRCRAFT DESTROYED IN COMBAT Airborne enemy aircraft claimed destroyed by naval aircraft, in aerial combat only. Planes destroyed by own anti-aircraft fire or in suicide crashes are not included. Enemy aircraft reported as "probably destroyed" are not included. Squadron claims, as made in ACA-1 or other action reports, are the basis for these figures. They thus represent the evaluations only of the squadron intelligence officer, squadron commander, and in some cases the air group commander. However, rarely was there any further evaluation by higher authority of squadron claims with respect to airborne enemy aircraft.

In evaluating pilot claims for ACA-1 reports squadron intelligence officers were instructed to follow the definitions of "destroyed" established for the command or theater. Subsequent to early 1944 this was the standard Army-Navy definition that the plane must be seen to crash, disintegrate in the air, be enveloped in flames, descend on friendly territory, or that its pilot and entire crew be seen to bail out. Prior to this time the definitions varied between commands, but the definitions used in the principal naval theater (SoPac) were at least equally stringent.

The degree to which squadron intelligence officers and commanders succeeded in eliminating duplicating and optimistic pilot claims is not known, but it is believed the amount of overstatement is relatively low. Since 93% of all enemy aircraft claimed destroyed by Naval aircraft were claimed by single-seat fighters and the bulk of the remainder were claimed by two-place dive bombers and by lone search planes, the tremendous duplication of gunners' claims experienced by air forces operating large formations of heavy bombers with multiple gun positions is largely eliminated. Duplication of claims between fighter planes can be more easily controlled by careful interrogation.

Over-optimism has always been difficult to control. During the early part of the war, before standard definitions were in force, before full-time trained Air Intelligence Officers were available to apply them, and before the need for conservative operational intelligence was fully appreciated, action reports may often have overstated enemy losses. Evidence from the Japanese has tended to indicate that in some of the early actions, and even as late as the Rabaul raids of early 1944, there was such overstatement.

It must be remembered, however, that the bulk of Naval aerial engagements in the Pacific did not involve the mass combat of Europe. Even the large-size engagements seldom involved more than 30 of our planes against 30 of the enemy's at any one time within visible range of any one point. By far the greatest number of engagements involved only 1 to 8 of our planes, or the same number of the enemy's. Thus in the main the claims under this heading, off set as they are by the exclusion of planes classified as "probably destroyed", are believed to be near the truth, with only local exception, and to be as conservative as those of any major airforce.

ENEMY AIRCRAFT DESTROYED ON GROUND In the case of carrier operation, these figures represent the number of non-airborne enemy aircraft reported by the task force commander as destroyed on ground or water, or on enemy carriers. These figures were normally based largely on photographic assessment, and only planes visibly burned out or obviously unrepairable were included unless there was other positive evidence to warrant their classification as destroyed. Assessment was on a field-by-field basis, eliminating duplication of squadron claims. For small-scale early operations, where no report was available from the tack force commander, an estimate was made by Op-23-V-3, based on all available squadron and ship action reports, eliminating duplication of claims. For land-based operations, in view of the small volume involved, the claims in action reports were used.

TONS OF BOMBS ON TARGETS Calculated for each mission by taking the number of bombs of each type (plus clusters, torpedoes and mines) expended on targets, multiplying by the nominal weight of each, and rounding the total to the nearest ton. Bombs jettisoned are not included, nor bombs in abortive planes, nor bombs hanging up, nor rockets fired. In the case of search planes, particularly PB4Ys on single-plane long-range searches, tonnage dropped is understated by these figures, because of the large number of missions wherein less than ½ ton was dropped per mission, the tonnage being rounded down to zero in the figures. For 1945 this difference is approximately 120 tons for PB4Ys, and less for other types of VPB. For other types of planes there may be small differences in either direction, due to this rounding of tonnages.

THEATER OF OPERATIONS For operations by land-based Naval and Marine aircraft, the breakdown by theater of operations (Tables 4 and 18) is based on the area command under which the operations were conducted. Thus operations by planes based in the South Pacific Area were included under that area even though they attacked targets in the Southwest or Central Pacific. The official limits of each command ware used throughout, except that actions in the first few months of the war, before establishment of the area commands, were distributed on the basis of the commands subsequently established.

The method of assigning carrier operations to areas is explained in the text referring to Table 4.

AREA (GEOGRAPHICAL) OF TARGET OR ENGAGEMENT Each geographical area includes not only the land areas covered by its name, but all coastal waters. Engagements and shipping attacks far at sea were allocated to the nearest area. Most area names are believed self-explanatory, but the following additional explanations are given:

Hokkaido, No. Honshu	Japan, N. of 40°N.
Tokyo Area	Japan, S. of 40°N., E. of 138°E.
Central Honshu	Japan, S. of 40° between 133°E. and 138%.
Kyushu, Kure Area	Japan, W. of 133°E.
Ryukyus	All islands in area bounded by 123°E, 24°N., 132%, and 31°N., including Tanega, Minami, Daito, Miyako and Sakishima groups.
Formosa	Includes Pescadores
Bonins	Includes Iwo Jima, in addition to main group, plus the sea areas within about 300 miles of Chichi Jima.
Western Carolines	West of 150°E., including Palau, Yap, Woleai and intervening sea areas.
Eastern Carolines	East of 150°E., including Truk, Ponape, Kusaie, Nomoi Group.
Solomons, Bismarcks	Includes New Britain, New Ireland, Emirau and Bismarck Sea.
Korea, North China	Includes Manchuria end Shantung province.
Central China	Chekiang and Kiangsu provinces.
South China	Fukien and Kwangtung provinces, Hainan Island, Hong Kong.

PURPOSE OF MISSION OF OWN AIRCRAFT Assigned primary mission of aircraft at time of takeoff, regard less of later changes. Thus a search mission which finds and attacks shipping is classified as a search mission, a fighter sweep diverted to defense of force is still an attack mission. Note that in this report only action sorties - planes in actual action against the enemy - are classified by purpose of mission, and the large volume of negative patrols and searches, as well as the small volume of abortive offensive aircraft, are not included in the data. Classifications by purpose of mission differed in the 1944 machine tabulations from those for other years, and additional detail is thus provided for 1944, not available for other years.

BASE OF OWN AIRCRAFT The base is that from which the planes operated on the mission in question. Thus carrier aircraft temporarily operating from land bases are classified as land-based.

PLANE MODEL OF OWN AIRCRAFT Because of lack of detail in many action reports and limitations in the IBM system it has not been possible to distinguish between modifications or different manufacturers of the same basic aircraft. Thus "F4U" in the tables may include F4U and FG aircraft of all modifications, "F6F" will include the -3, -5, -3N and -5N, "TBF" or "TBM" may include modifications of either or both. However, the F4F and the FM-2 have been distinguished throughout.

SORTIES ATTACKING TARGETS There are two definitions for this item, one for 1944, and one for other years, because of the differing methods used in preparing IBM machine cards:

1942, 1943, 1945 Each plane attacking targets is counted only once per mission, regardless of how many targets it attacked successively, with bombs, rockets or guns.

1944 Each plane attacking targets is counted once for each major type of target attacked with bombs, rockets or guns. This permits one plane to be counted as making two or more attacks on one mission. The number of "sorties attacking targets" as reported on this basis for 1944, is believed on the average to be about 15% greater than if recorded on the 1945 basis.

Note that "sorties attacking targets" differs from "action sorties" in all years, by excluding planes taking off which did not individually attack targets.

ROCKETS ON TARGETS Number of aircraft rockets (of all sizes) expended on targets by planes attacking targets, as defined above.

AMMUNITION EXPENDITURES For 1944 these figures represent expenditures on enemy targets, by planes attacking targets, and expenditures in aerial combat are excluded. For 1943 and 1945 the figures represent total expenditure on targets and in aerial combat. Because of a general failure to report rounds expended prior to late 1943, ammunition expenditures for 1942 and early 1943 are not given herein.

TARGET TYPE CLASSIFICATION Two moderately diverse systems of classifying the types of targets attacked have been used in compiling these statistics, one for 1944, the other for the remainder of the war. These differences, combined with the varying methods of counting sorties attacking targets, require some discussion as to their effect on the statistics.

For 1944, as has been noted, planes attacking targets were counted once for each major type of target attacked on the same mission. In carrying out this tabulating procedure the exact number of planes making primary or secondary attacks on a target was allocated to that precise type of target. Thus if from one 8 plane fighter mission 6 planes bombed a destroyer, 2 bombed a large tanker, and 4 in addition strafed small fishing craft, the statistics on the 1944 basis would show 6, 2 and 4 planes attacking unarmored warships, large merchant vessels, and small merchant vessels, respectively, and the ordnance expended would be distributed accordingly.

The simplified tabulating system adopted for 1945, and carried back to 1942 and 1943, provided for counting only once per mission each plane attacking targets, and for assigning only one target per squadron per mission. The target classification assigned was that receiving the greatest weight of attack. Thus the example above, if included in 1945 statistics, would show 8 sorties, and all ordnance, expended on unarmored warships.

The 1944 system undoubtedly provided much greater statistical precision, but involved an inordinate amount of labor in tabulation. There is some question whether, in the end, the precision was much greater than in the 1945 system, because: (a) the number of missions splitting targets, while substantial, is not a large proportion of the total, and (b) over a number of missions the errors may well cancel, e.g. *a* target type which is secondary on one split mission becomes primary on another split mission.

A rough estimate of the relative statistical effects of the two systems is as follows: the 1944 system, by giving full weight as attack sorties to secondary strafing and rocket runs on the types of targets normally attacked on such runs over-emphasized the weight of attack on such targets; the 1945 system, ignoring those types of targets which seldom receive the major weight of attack, under-emphasizes the amount of effort expended on them. The principal type of target affected is undoubtedly small shipping under attack by carrier aircraft; there is probably a major effect in the case of minor military targets but this is small when compared to the total weight of attack on military targets; there is probably a minor effect on the "harbor areas" and "land transportation" target classifications. On the whole, it is not believed that these factors unduly distort the overall picture of the proportion of the Naval air offensive expended against the various classes of enemy targets.

Major differences in classification of specific items between 1944 and the other years may be briefly noted as follows:

(1) The 1945 classification "Airfields" includes parked aircraft, runways, hangars and other airfield buildings, and all airfield defenses. The 1944 figures for airfields probably exclude most, but not all attacks on airfield buildings, but include all the other target sub-types listed. (The 1944 attacks on "airfield runways" undoubtedly include some attacks on buildings and guns also). Airfield buildings not included under airfields for 1944 are covered under "Other Military Targets".

(2) "Harbor Areas" for 1945 includes waterfront A/A defenses. For 1944 some of these may be included in "Other Military Targets".

COMPLETENESS OR ACCURACY OF DATA

1. Completeness and Accuracy In General

Accuracy of Machine Tabulation: All general tables, and special tables of aerial combat and anti-aircraft data (Tables 1 - 29 inclusive) have been cross-checked to assure complete internal consistency within each table and between tables, except as specifically noted in individual cases.

All tables containing breakdowns by type of target, by geographical area, and by type of ordnance, have been checked to insure that no significant discrepancies are present. In the case of these tables the complications of machine tabulation have made a certain number of minor discrepancies inevitable; these were considered not to warrant expenditure of the inordinate mount of time required to correct them, since none can have any effect on conclusions to be drawn from the data.

For data on night operations no master check data were available. Spot checks were made, and the totals and breakdowns appear to be generally reliable.

Accuracy of Compilation: Human error, when thousands of coding cards are prepared from action reports of variable and confused patterns by personnel of clerical grade, is inevitable. The most thorough preparation of definitions and instructions, and constant supervision, do not eliminate the need for constant exercise of judgment by such personnel, when reducing to simple statistics an operation as complex as an action by Naval aircraft bombing, rocketing and strafing a multiplicity of targets and engaging in aerial combat. To this inherent difficulty the lack of uniform report forms during the first half of the war, and the lack of uniform quality of reports in the last half, contributed. However, every possible source of error has been either (a) anticipated and provided against, (b) checked and corrected, (c) checked and the data eliminated as not susceptible to accurate compilation, or (d) checked and presented with footnotes and reservations as expressed hereafter. It is the opinion of those responsible for this compilation that the data contain no significant biases resulting from the statistical compilation methods used, which are not fully noted in connection with the items affected.

Accuracy of Reporting: It is axiomatic that observations made in the heat of fast-moving air action are subject to a large margin of error. It is also well known to those who have participated in carrier operations, and in land-based operations under the front-line conditions which have prevailed in such areas as the Solomons and Okinawa, that the obstacles in the way of full interrogation of pilots, evaluation of the data received, and preparation of thorough action reports, have been extreme. The data herein suffer much more from the latter factor than from the basic difficulty of inaccurate observation, since the bulk of the statistical items do not depend upon aerial observation.

Accuracy of observation enters into only two major items in these tables; enemy aircraft engaged and enemy aircraft destroyed in combat, and the second of these has generally been the subject of the most careful interrogation and evaluation prior to reporting. The inability of the intelligence officer to perform his duties at an optimum quality level may affect a larger number of items, particularly those concerning attacks on targets; the number of planes actually attacking each target, and the number and type ordnance actually expended on each. The effect of these deficiencies on the statistics herein cannot be measured; items wherein it was believed to be large have been eliminated from the tabulations, and in the remaining items it is believed to be moderate, subject to a few specific exceptions described under individual items.

Completeness of Reporting: So far as is known, all carrier air action against the enemy during the entire war is completely covered herein. It is believed that 98% or more of every category of action by land-based planes is covered for the period from the latter months of 1943 to the end of the war. For the period from 7 December 1941 to mid-1943 it is known that a substantial amount of action by land-based planes has not been covered by the reports available, and is thus not included. The amount excluded is not believed to exceed 10% of the total reported for this period. Practically all of this deficiency was in the Solomons area.

For 1942 and 1943 particularly, and to a limited extent in later years, data were not always available to indicate whether escort fighters on a given mission strafed or were fired at by enemy A/A. Where no information was available it was assumed that escort fighters did not meet the definition for action sorties. Thus the number of fighter action sorties, and fighter sor-

ties attacking targets, may be understated for the early part of the war. It should be noted that the number of fighter sorties attacking targets (and offensive fighter action sorties), as reported herein will in all years be less than the number of fighters over target (a figure not compiled), by the number of escort fighters not actually attacking or engaging the enemy. The difference became progressively smaller in 1944 and 1945, however, as the increased ratio of fighters to bombers, the emphasis on strafing of parked aircraft and A/A guns, and the installation of bomb racks and rocket launchers on VF, resulted in attacks by a larger proportion of the fighters reaching a target area.

2. Accuracy and Completeness with Respect to Specific Items

(Items not mentioned have no specific individual deficiencies, but are subject to the general qualifications above).

Planes on Hand, and Flights: Original data have been arbitrarily edited to remove obvious errors; *see* discussion under Definitions. Items are subject to inaccuracy in reporting, but no particular bias is suspected.

Action Sorties: Subject to incomplete reporting (for land-based units only), and undercounting of fighters over target, as noted above.

Own Aircraft Losses: Losses to enemy aircraft are probably overstated by up to 25% for 1942-43, because of the lack of an adequate system for reporting cause of loss accurately. Operational losses are probably understated, but to a lesser amount, the difference being chargeable to losses on ground. This item is not affected by incompleteness of action reports, because of the check available in the independent strike reports.

Own Aircraft Engaging in Air Combat: Probably slightly understated for 1942-43, because of failure of action reports to specify exact number engaging, and slightly overstated thereafter because of inclusion of entire flight in some cases where only a part actually engaged.

Enemy Aircraft Engaged: Overstated throughout. See discussion under Definitions.

Enemy Aircraft Destroyed: See discussion under Definitions. Also, slight understatement for 1942-43 (land-based only) because of incomplete reporting.

Bomb Tonnage on Targets: Believed slightly understated for 1942-43, because of incomplete reporting (land-based only), and failure to report full bomb load in some instances (carrier-based and land-based). Affected somewhat by rounding bomb tonnage per mission to nearest ton; see discussion under Definitions.

No. of Squadrons in Action: Affected in 1942-43 by failure of some land-based squadrons to report action.

Sorties Attacking Targets: Affected by incomplete reporting, by inadequate reports (especially VF, see above), and by difference between 1944 and 1942-43-45 coding systems (see discussion under Definitions). Note that, even for 1944, and increasingly for other years, the total number of sorties attacking targets is greater than the number attacking either with bombs, or with rockets, or strafing, considered separately, because included *in* the figure are sorties which attacked with only one of these three types of attack, as well as sorties combining two or three methods.

Rocket Expenditures: Subject to some under-reporting, particularly by CV fighter squadrons in late 1944 and early 1945, and to considerable carelessness in the reports of some squadrons.

Ammunition Expenditures: Not shown for period prior to late 1943 because of almost total failure to report this item. Believed partially incomplete for late 1943 and first half of 1944, for land-based VSB and VTB operating in the Solomons. A tendency to report expenditures on an arbitrary basis, such as 1000 rounds per plane per mission, has been observed in the case of some fighter squadrons, and it is certain that for a large proportion of the action reports the ammunition expenditure figures were the roughest of estimates. To what extent this may bias the overall figures or figures for any single plane model, it is impossible to say, but it is doubted that the error is in excess of 25‰ low or high.

Own Planes Damaged by A/A or Enemy A/C: These figures are probably considerably understated for many 1942-43 actions, and slightly understated for 1944-45, because of failure to report all instances of minor damage, and damage inflicted by one of these agents to planes lost from another cause.

Purpose of Mission: Subject to personnel error in coding. The only probable general bias would be to favor an offensive classification at the expense of reconnaissance, but the extent of this would be small. It should be noted that defensive and reconnaissance missions are included in these tables only if they actually engage or attack the enemy, and thus are considerably understated from the point of view of total missions flown.

Type of Target: Subject to errors of classification in coding, and to systematic errors resulting from the two coding systems used (see discussion under Definitions). The net effects of these factors are approximately as follows:

1944: An overstatement of attack activity in comparison with other years, but a relatively accurate distribution of attacks, bombs and rockets by target type. Ammunition, usually arbitrarily distributed by the coding clerk between the several targets on a mission, is subject to considerable error, but the direction of the bias, if there is any general bias, cannot be estimate d.

1942-43-45: A general bias in favor of large assigned primary targets attacked in force by the majority of a mission's planes, at the expense of small secondary targets attacked by one or two of the mission's planes or on second runs over target. The net effect is probably to understate the amount of attacks, bombs, rockets and ammunition expended on small merchant vessels, on land transportation targets, and on harbor areas, and to overstate expenditures on large vessels, airfields, and military targets.

Type of Bomb: This item was subject to coding errors, which have been largely detected and corrected. However, instances of inadequate reporting may also have resulted in slight errors as to size and type of bomb, and number expended on target, but not sufficiently to affect the general validity of the figures.

Models of Enemy Aircraft Destroyed: Subject to a major degree to mis-identification by pilots, and presented only as a matter of general interest, and as reliable only with respect to the major type classifications (fighters, bombers, float planes, etc.).

PART A. GENERAL DATA ON FLIGHTS, ACTION SORTIES, BOMB TONNAGE DROPPED, ENEMY AIRCRAFT DESTROYED, AND OWN AIRCRAFT LOSSES

The tables in this section of the report (Tables 1-18) provide a broad overall picture of Naval and Marine air operations as a whole. There are three general subdivisions in this section;

1. General summaries of both carrier and land-based air operations, including breakdowns between carrier and land-based, between Navy and Marine, by plane model, by theater, and by months. (Tables 1-7).

2. General data on carrier operations, including breakdowns by plane model and by type of carrier, by operations, by areas, and by months, plus special tabular analyses of carrier operating ratios during various periods. (Tables 8-15).

3. General data on land-based air operations, including data broken down between Navy and Marine, by plane model, by theater, and by months. (Tables 16-18).

In general the tables will be allowed to tell their own story, but for each table or group of related tables a narrative commentary will call attention to significant items or relationships, and note any special qualifications applying to the data presented.

1. General Summaries of Carrier and Land-Based Operations

NOTES TO TABLES 1 AND 2

Tables 1 and 2 assemble, for the entire war, all the basic general statistics of Naval and Marine carrier and land-based combat operations included in this report. Table 1 breaks down the data between land-based and carrier operations, and between Navy and Marine aviation; Table 2 consolidates the data by plane model without reference to base or arm of service.

A further breakdown of the carrier figures by type of carrier will be found in Table 8.

Table 1 shows the overall combat effort exerted by Naval Aviation: 284,073 sorties engaging in attacks or aerial combat, or both, and 102,917 tons of bombs, torpedoes and mines expended on targets. Of these totals the carrier forces held a slight edge in number of action sorties, while land-based aviation (with a lesser proportion of fighters to bombers) held a slight advantage in bomb tonnage.

58% of the combat effort, about 165,000 sorties out of 284,000, was by planes attached to Navy units. From carriers, 98‰ was by Naval planes; from land bases 84% was by Marine aircraft. Of the Navy's share of the land-based action sorties, about 40% were flown by VPB, the remainder by carrier squadrons temporarily based ashore in emergency or when opportunities for carrier employment were lacking, and by a few land-based Naval support squadrons employed in 1943 and early 1944.

The overall loss rate for Navy and Marine aircraft on action sorties was 1.5 percent. Of the losses on action sorties, 47 percent resulted from enemy antiaircraft, 21 percent from combat with enemy aircraft and 32 percent from operational causes. The loss rate on action sorties by carrier aircraft was 2.0 percent (49% to antiaircraft, 16% to enemy aircraft, and 35% operational causes). The action loss rate for land-based aircraft was only 1.0 percent of sorties; this difference reflects the greater employment of carrier aircraft against heavily defended advanced targets, while a major employment of land-based planes was in clean-up operations against by-passed enemy bases or secondary targets.

Operational losses of Naval and Marine aircraft on flights not involving action (but made by squadrons having other action during the same month) were 3,045 in number; these are chargeable against an estimated 600,000 non-action flights by these squadrons, indicating an operational loss rate of about 0.5 percent on the patrol and search missions which made up the bulk of this non-action flying by combat squadrons. 1313 planes attached to the same squadrons were

(Cont. on p. 15)

TABLE 1. CONSOLIDATED SUMMARY OF NAVY AND MARINE
CARRIER AND LAND-BASED AIR OPERATIONS AND RESULTS FOR ENTIRE WAR.
By Model of Aircraft Employed

BASE, SERVICE, PLANE MODEL	TOTAL ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER LIGHTS	ON SHIP OR GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
CARRIER-BASED, TOTAL	147,094	1428	452	1001	1988	974	1997	4487	45,659
Navy Total	143,357	1377	436	979	1932	936	1938	4328	44,972
F6F	62,240	538	245	321	829	403	1387	3568	5,967
F4U, FG	6,488	93	18	48	182	76	100	260	954
FM	12,925	62	13	75	283	71	194	228	148
F4F	1,102	17	47	31	49	22	190	112	6
SB2C, SBW	18,808	268	18	218	184	88	13	30	10,994
SBD	6,048	40	43	48	65	35	31	75	2,524
TBF, TBM	35,564	348	27	231	339	227	22	50	24,245
TBD	182	11	25	8	1	14	1	5	134
Marine Total	3,737	51	16	22	56	38	59	159	687
F4U, FG	3,093	44	16	21	47	38	59	159	358
F6F	146	2	0	0	8	0	0	0	25
F4F	2	0	0	1	0	0	0	0	0
TBM	496	5	0	0	1	0	0	0	304
LAND-BASED, TOTAL	136,979	554	455	344	1057	339	759	2048	57,258
Marine Total	114,127	386	270	259	724	135	533	1484	47,269
F4U, FG	52,852	207	141	157	458	48	300	1100	14,305
F6F	1,646	5	2	3	27	5	46	47	284
F4F	1,074	4	75	11	34	26	175	281	0
F2A	25	0	14	0	0	0	6	4	0
SBD	40,872	96	24	56	104	36	0	22	18,147
SB2C, SBW	2,023	1	0	3	13	0	0	0	1,086
SB2U	17	1	1	3	1	0	0	6	5
TBF, TBM	7,151	53	11	14	56	16	1	18	5,437
PBJ	8,390	18	0	12	23	2	0	0	8,002
PV	52	1	1	0	5	2	5	6	2
PB4Y	16	0	0	0	0	0	0	0	0
PBY	9	0	1	0	3	0	0	0	1
Navy Total	21,373	168	185	84	333	202	225	562	9,796
F6F	2,470	8	23	16	21	5	12	103	227
F4U	1,269	5	14	4	5	0	19	141	4
F4F, FM	450	3	56	7	29	20	53	94	0
SBD	5,283	17	12	4	55	19	0	10	2,185
SB2C, SBW	332	2	0	1	2	6	0	0	104
TBF, TBM	3,290	16	9	15	20	3	0	7	2,701
PB4Y	3,624	60	28	18	85	72	125	181	1,413
PV	2,636	28	5	12	34	22	3	6	1,912
PBY	1,371	15	35	5	47	43	0	9	949
PBM	506	13	3	1	33	9	6	10	204
PB2Y	142	1	0	1	2	3	7	1	97
Service Unknown	1,479	0	0	1	0	2	1	2	193
F4U	349	0	0	0	0	2	0	2	0
F6F	28	0	0	0	0	0	0	0	0
VF, type unknown	440	0	0	0	0	0	1	0	14
SBD	484	0	0	1	0	0	0	0	86
TBF	137	0	0	0	0	0	0	0	50
VPB, type unknown	41	0	0	0	0	0	0	0	43
GRAND TOTAL	284,073	1982	907	1345	3045	1313	2756	6535	102,917

TABLE 2. SUMMARY OF AIR OPERATIONS AND RESULTS, FOR ENTIRE WAR
By Type and Model of Aircraft
(Land and Carrier, Navy and Marine Combined)

PLANE MODEL	TOTAL ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER FLIGHTS	ON SHIP OR GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
VF Total	146,599	988	664	694	1972	716	2542	6099	22,292
F6F	66,530	553	270	340	885	413	1445	3718	6,503
F4U, FG	64,051	349	189	230	692	164	478	1662	15,621
FM	12,925	62	13	75	283	71	194	228	148
F4F	2,628	24	178	49	112	68	418	487	6
F2A	25	0	14	0	0	0	6	4	0
Type Unknown	440	0	0	0	0	0	1	0	14
VSB Total	73,867	425	98	334	424	184	44	143	35,131
SBD	52,687	153	79	109	224	90	31	107	22,942
SB2C-SBW	21,163	271	18	222	199	94	13	30	12,184
SB2U	17	1	1	3	1	0	0	6	5
VTB Total	46,820	433	72	268	417	260	24	80	32,871
TBF, TBM	46,638	422	47	260	416	246	23	75	32,737
TBD	182	11	25	8	1	14	1	5	134
VPB Total	16,787	136	73	49	232	153	146	213	12,623
PB4Y	3,640	60	28	18	85	72	125	181	1,413
PV	2,688	29	6	12	39	24	8	12	1,914
PB J	8,390	18	0	12	23	2	0	0	8,002
PBY	1,380	15	36	5	50	43	0	9	950
PBM	506	13	3	1	33	9	6	10	204
PB2Y	142	1	0	1	2	3	7	1	97
Type Unknown	41	0	0	0	0	0	0	0	43
GRAND TOTAL	284,073	1982	907	1345	3045	1313	2756	6535	102,917

(Cont. from p. 13)

lost to enemy action or in accidents while not in flight. More detailed analyses of loss rates, for the years 1944 and 1945 only, are given in Tables 9 and 16 of this report.

Over ten enemy aircraft were shot down by Naval and Marine aircraft for each loss in air combat. The great bulk of the destruction of enemy aircraft in aerial combat is credited to the F6F, which shot down 5,163 enemy planes (56% of the total for Naval aviation) in exchange for 270 air combat losses, or over 19 enemy planes destroyed per loss in air combat. The F4U was second, with 2,140 enemy planes to its credit, the F4F, FM, and PB4Y following next in order with 915, 422 and 306 respectively. Only 355 enemy planes were shot down by all other types of naval aircraft combined. It may be noted that all types of bombers combined shot down 650 enemy planes, and lost 243 in combat, a superiority of over 2½ to 1, evidencing superior equipment, tactics, and gunnery training. Less than 1/5 of one percent of all naval bomber sorties attacking or engaging the enemy were shot down by enemy aircraft. (Most of these were in the early stages of the war, as Table 21 will indicate).

For carrying the maximum weight of explosives against the enemy the TBF (and TBM) aircraft was the Navy's workhorse. Flying only 16 percent of the total action sorties, it delivered 32 percent of the total tonnage (plus 29% of all rockets expended on targets; see Table 50). Dive bombers accounted for 34% of total bomb tonnage, but in a 58% greater number of action sorties than the VTB flew. Fighters, flying over 50% of all action sorties, delivered only 22% of total bomb tonnage; only 30% of this (or 16% of total carrier bomb tonnage) was dropped by carrier-based fighters, which flew nearly 60% of all carrier action sorties. Fighters, however, fired over 138,000 rockets at targets, two-thirds of the Navy total, and fired offensively over 50,000,000 rounds of ammunition, which was also over two-thirds of the total for Naval aviation.

Patrol bombers, flying 6% of the Navy's action sorties, dropped 12% of the bomb tonnage. Half of these sorties and nearly two-thirds of this tonnage is credited to Marine PBJ attack bombers. The Navy VPB, being primarily search planes, seldom carried or used their maximum bomb loads, and engaged in action against the enemy on only a small fraction of their missions.

TABLE 3. SUMMARY OF MONTHLY OPERATIONS AND RESULTS
FOR ALL CARRIER-BASED AND ALL LAND-BASED NAVAL
AND MARINE AIRCRAFT

MONTH	CARRIER-BASED					LAND-BASED				
	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY PLANES DESTROYED		FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY PLANES DESTROYED	
				Air	Ground				Air	Ground
1941-December	*	0	0	0	0	*	70	5	12	0
1942-January	*	0	0	0	0	*	13	0	1	0
February	*	243	77	33	12	*	6	0	1	0
March	*	142	51	1	0	*	4	0	1	0
April	*	6	1	0	0	*	0	0	0	0
May	*	332	139	66	21	*	6	3	0	0
June	*	374	100	69	140	*	100	20	21	0
July	*	0	0	0	0	*	4	1	0	0
August	*	681	181	88	30	*	98	18	56	0
September	*	0	0	0	0	*	514	74	111	1
October	*	287	60	90	21	*	848	157	177	7
November	*	608	98	37	30	*	606	184	77	0
December	*	0	0	0	0	*	334	83	19	0
1943-January	*	78	23	11	0	*	396	97	54	4
February	*	20	0	4	0	*	430	248	21	2
March	*	0	0	0	0	*	361	211	1	0
April	*	0	0	0	0	*	416	159	46	0
May	*	86	4	0	0	*	454	226	15	0
June	*	0	0	0	0	*	775	344	128	0
July	*	7	0	0	0	*	3,144	1,675	186	3
August	*	290	116	0	7	*	1,135	427	109	21
September	*	196	83	5	15	*	1,643	599	108	9
October	*	933	335	43	27	*	1,602	689	69	23
November	*	2,989	962	191	43	*	2,835	1,181	98	6
December	*	528	198	46	32	*	2,924	1,379	106	1
1944-January	17,045	2,793	870	52	106	14,378	3,293	869	370	20
February	13,111	4,772	1,464	162	154	14,175	4,203	1,146	149	5
March	8,603	1,787	608	111	39	20,228	6,837	2,837	20	2
April	13,906	5,270	1,778	94	215	18,959	5,549	2,407	14	0
May	3,496	902	343	3	21	19,205	5,638	2,289	18	8
June	20,932	8,766	2,435	797	215	16,748	3,591	1,027	21	0
July	24,142	12,549	4,266	113	84	15,287	5,458	1,955	4	10
August	6,805	1,716	473	24	20	19,883	7,326	2,847	4	2
September	25,479	13,166	4,207	373	557	18,573	6,195	2,282	9	8
October	24,911	10,948	3,339	1,189	662	24,776	7,270	2,802	19	37
November	11,087	4,397	1,517	272	498	25,395	7,098	2,511	10	12
December	11,005	2,062	333	111	230	25,019	4,457	2,133	90	23
1945-January	25,747	8,637	2,308	243	474	20,377	3,744	1,516	15	20
February	20,896	5,959	1,246	432	238	20,417	8,562	3,753	27	21
March	28,312	12,132	3,162	349	369	22,863	8,733	4,039	26	30
April	41,248	16,052	5,033	1,049	304	27,012	8,527	4,128	156	15
May	30,197	9,053	3,525	278	122	30,445	8,094	4,499	261	10
June	19,793	5,635	1,828	21	66	34,853	6,898	3,276	138	5
July	24,089	8,468	2,969	62	492	28,761	5,446	2,643	28	22
August	17,726	4,230	1,527	65	610	17,207	1,312	519	11	1
1941-42 TOTAL	*	2,673	707	384	254	*	2,603	545	476	8
1943 TOTAL	*	5,127	1,721	300	124	*	16,145	7,235	941	69
1944 TOTAL	180,522	69,128	21,633	3301	2801	232,626	66,915	25,105	728	127
1945 TOTAL	208,008	70,166	21,598	2499	2675	201,935	51,316	24,373	662	124
GRAND TOTAL	388,530	147,094	45,659	6484	5854	434,561	36,979	57,258	2807	328

* No data available.

NOTES TO TABLE 3

This table presents condensed monthly data for carrier and land-based operations. In parallel columns it illustrates:

(a) the slow growth of air activity from 1942 to the peak in April 1945;

(b) the great preponderance of land-based operations during the rebuilding of the carrier force in 1943;

(c) the rapid rise of the carrier force during 1944 to the point where its major operations far exceeded the more regular monthly volume of effort of the land-based air forces.

Revealed in the table are the peak performances of Naval aviation:

(a) the 41,248 flights made from carriers in combat in April 1945, the 16,052 action sorties flown that month, and the 5,033 tons of bombs dropped on target (40,870 rockets and about 6,500,000 rounds of ammunition were expended by carrier planes during the same month);

(b) the tremendous destruction of enemy planes by the carrier forces in June 1944 (1,012), October 1944 (1,851), and April 1945 (1,353);

(c) the seven other months in which carrier aircraft destroyed more than 500 planes per month (9,250 enemy planes were destroyed by carrier aircraft in their 10 peak months, and 10,319 in the last 15 months of the war alone);

(d) the exceptional feat of increased performance by the small South Pacific air force for the New Georgia operation of July 1943;

(e) the relatively high destruction of enemy planes by the small forces engaged in the brief carrier operations of 1942, and the land-based Solomons operations of late August to November 1942;

(f) the air-combat peaks by land-based aircraft over Rabaul in January-February 1944, and at Okinawa in April-June 1945.

The table also shows the superior record of carrier-based planes over land-based planes in destroying enemy aircraft: over twice as many in air combat, 18 times as many on the ground and 4 times as many in total. The ruling factor here was the mobility of the carrier forces, their ability to penetrate deep into enemy territory, concentrating. overwhelming force in surprise strokes against large sectors of the enemy's secondary air defenses. Land-based aircraft, on the other hand, were seldom within reach of main concentrations of enemy air strength, except for a time at Rabaul, where the heavy defenses precluded successful attack on grounded aircraft. Thus the land-based Marine and Naval air forces, while effective against enemy airborne aircraft both in a defensive capacity and as bomber escorts, could not be the main agent of their wholesale destruction. It is doubted that any other airforce has been as effective in destroying grounded enemy aircraft (or grounded and airborne enemy aircraft combined) as the Naval carrier force; in the last year of the war our carrier aircraft destroyed 4,622 grounded enemy aircraft, and 4,944 airborne aircraft, for a total of 9,566.

TABLE 4. COMBAT AIR OPERATIONS AND RESULTS,
CARRIER-BASED AND LAND-BASED, BY THEATRE AND BY YEAR.

THEATRE, YEAR	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED		OWN LOSSES ON ACTION SORTIES			PERCENTAGES OF TOTALS			
			In Combat	On Ground	To Enemy A/A	To Enemy A/C	Operational	Action Sorties	Tons of Bombs	Enemy A/C Dest.	Own Action Losses
CARRIER-BASED	147,094	45,659	6484	5854	1428	452	1001	100.0	100.0	100.0	100.0
Central Pacific	108,108	34,181	3772	3204	941	245	635	73.5	74.8	56.5	63.3
1941-42	634	189	85	152	24	46	25	0.4	0.4	1.9	3.3
1943	4,071	1,433	142	105	29	8	33	2.8	3.1	2.0	2.4
1944	41,956	13,298	1289	746	317	81	248	28.5	29.1	16.5	22.4
1945	61,447	19,261	2256	2201	571	110	329	41.8	42.2	36,1	35.2
South Pacific	2,184	604	367	70	19	74	35	1.4	1.4	3.5	4.4
1942	1,064	262	185	51	7	44	25	0.7	0.6	1.9	2.6
1943	915	268	156	19	12	26	10	0.6	0.6	1.4	1.7
1944	205	74	26	0	0	4	0	0.1	0.2	0.2	0.1
Southwest Pacific	35,496	10,657	2300	2509	434	132	316	24.1	23.3	39.0	30.6
1942	463	179	84	21	2	23	11	0.3	0.4	.9	1.3
1944	26,314	8,141	1973	2014	323	99	239	17.9	17.8	32.3	22.9
1945	8,719	2,337	243	474	109	10	66	5.9	5.1	5.8	6.4
North Pacific	86	4	0	0	0	0	7	0.1	*	0.0	0.2
Atlantic	1,103	174	40	30	31	1	8	0.8	0.4	0.6	1.4
Southeast Asia	117	39	5	41	3	0	0	0.1	0.1	0.4	0.1
LAND-BASED	136,979	57,258	2807	328	554	455	344	100.0	100.0	100.0	100.0
Central Pacific	44,335	15,421	677	57	199	58	92	32.4	27.0	23.4	25.8
1941-42	144	18	32	0	4	31	6	0.1	*	1.0	3.0
1943	165	33	13	1	3	4	1	0.1	0.1	0.5	0.6
1944	25,158	9, 043	63	26	77	3	36	18.4	15.8	2.8	
1945	18,868	6,327	569	30	115	20	49	13.8	11.1	19.1	13.6
South Pacific	39,020	15,086	1897	109	205	342	149	28.5	26.3	64.0	51.4
1942	2,379	512	438	8	20	96	25	1.7	0.9	14.2	10.4
1943	15,737	7,045	926	68	78	190	76	11.5	12.3	31.7	25.4
1944 (to 6/30)	20,904	7,529	533	33	107	56	48	15.3	13.1	18.0	15.6
Southwest Pacific	52,862	26,451	226	161	134	30	96	38.6	46.2	12.3	19.2
1941-42	40	5	4	0	0	14	0	*	*	0.1	1.0
1943	118	104	0	0	1	0	1	0.1	0.2	0.0	0.1
1944	20,383	8,316	129	67	59	10	27	14.9	14.5	6.0	7.1
1945	32,321	18, 026	93	94	74	6	68	23.6	31.5	6.2	11.0
Atlantic	58	3	2	0	3	9	1	*	*	0.1	1.0
North Pacific	704	297	5	1	13	16	6	0.5	0.5	0.2	2.6
TOTAL	284,073	102,917	9291	6182	1982	907	1345	100.0	100.0	100.0	100.0
Central Pacific	152,443	49,602	4449	3261	1140	303	727	53.7	48.2	49.8	51.2
South Pacific	41,204	15,690	2264	179	224	416	184	14.5	15.2	15.8	19.5
Southwest Pacific	88,358	37,108	2526	2670	568	162	412	31.1	36.1	33.6	27.0
North Pacific	790	301	5	1	13	16	13	0.3	0.3	*	1.0
Atlantic	1,161	177	42	30	34	10	9	0.4	0.2	0.5	1.2
Southeast Asia	117	39	5	41	3	0	0	*	*	0.3	0.1

* Less than 1/20 of one percent.

NOTES TO TABLE 4

This table measures the contributions of the Naval carrier and land-based air forces to the campaigns in the various theaters of war. Land-based operations are allocated to theaters on the basis of the command under which the individual squadron operated, regardless of the location of the target attacked. Thus operations by South Pacific aircraft against the Bismarck Archipelago (in the SoWesPac area) are classified under SoPac (and in fact they were normally in support of SoPac objectives); in few other cases were attacks made over theater boundaries.

In the case of carrier operations, the fact that the fast carriers remained under CinCPOA command in all operations, though actually directly supporting campaigns in other areas, has necessitated adopting a geographical basis of classification. Thus all carrier operations are allocated to areas in accordance with (a) the theater in which the target area was located, or (b) the theater whose current campaign the carriers were primarily supporting.

Under these definitions all carrier operations against New Guinea, Halmahera, Morotai and the Philippines, the Coral Sea Battle, and the Formosa-Ryukyus-China Sea operations of October 1944 and January 1945 have been classified as Southwest Pacific. The Palau and Truk operations of March and April, though partly subsidiary to the Hollandia strikes, have been classified as Central Pacific; the carrier strikes on Rabaul and Kavieng as South Pacific. It is believed that all other carrier operations fell clearly within one theater.

The overall picture presented by this table shows that slightly over half of Naval air combat operations, in terms of sorties and enemy planes destroyed, were conducted in the Central Pacific theater, about one-third in the Southwest Pacific, slightly less than one-sixth in the South Pacific, and less than one percent in other theaters. (Addition of ASW activity would of course substantially alter the balance in favor of the Atlantic).

These figures should dispel any impression that naval aviation's primary war contribution was in the South Pacific theater. Less than 2% of the total carrier action was in this theater, though most of this minor total consisted of critical actions involving all our carriers available at the time. Of the total land-based action, only slightly over one quarter was carried on by aircraft under SoPac command (an additional 15% was action by Marine aircraft in the Solomons-Bismarcks area after command passed to SoWesPac).

The carrier force was primarily a Central Pacific force, the spearhead of the main advance against Japan. Nearly three-fourths of its action was in this theater. Yet its contribution to the Southwest Pacific theater, accounting for nearly a quarter of total action sorties, was vital, and was the action which in fact culminated the military defeat of Japan as an air-sea power.

The bulk of the carrier contribution to the Southwest Pacific campaign occurred in the five months from September 1944 to January 1945. In these five months practically all of the fast carrier offensive, and the majority of the CVE effort, was employed against Southwest Pacific targets. In these five months over 4500 enemy aircraft were destroyed by the carrier forces in the campaigns supporting SoWesPac operations; this represents nearly three-eighths of the total enemy planes destroyed by carrier forces during the war in all theaters. This contribution (involving also a wholesale destruction of shipping in the Philippines-Formosa-Chine Sea area, and the destruction of the bulk of the remaining Jap battle fleet) assured the capture of the Philippines by Southwest Pacific Forces.

The contribution of Naval and Marine land-based aircraft to the Southwest Pacific campaign has not been fully recognized. Leaving aside the 22,000 attack sorties flown against targets in the Bismarcks and Solomons after control of the Solomons air force passed to SoWesPac, Naval and Marine planes flew some 30,000 sorties in the Southwest Pacific area. The bulk of these 26,000 were attacks by Marine aircraft on targets in the Philippines. Marine fighters were based at Leyte from late November 1944, and took part in assuring the conquest of that island and defending it from Jap suicide attackers and reinforcing sea convoys. These fighters later assisted in the recapture of the Central and Southern Philippines. Marine dive bombers went ashore at Lingayen in January 1945 and provided air support to Army ground forces in Luzon until their later diversion to assist the reconquest of the Central Philippines and Mindanao. Navy patrol bombers extended their searches to the Philippines and began their single-plane attacks on shipping as early as August 1944, and continued them until capture of Philippines bases and the end of Jap shipping movements in the area enabled them to extend their searches and attacks to Formosa, the China Coast, Indo-China and Malaya, protecting all enemy paths of approach to the Philippines. For the year 1945 well over half the offensive operations of Naval land-based air were carried on in the forward sectors of the Southwest Pacific theater.

TABLE 5. NUMBER OF SQUADRONS IN ACTION, AND ACTION SORTIES FLOWN, MONTHLY, By Model of Aircraft

A. CARRIER-BASED AIRCRAFT

MONTH	F4F, FM*		F4U, FG		F6F		SBD		SB2C, SBW		TBD, TBF, TBM#	
	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties
1942-February	3	49					5	147			2	47
March	3	24					6	93			2	25
April							2	6				
May	2	83					4	183			2	66
June	4	91					6	239			3	44
August	3	181					6	422			3	78
October	2	143					4	82			2	62
November	6	367					5	198			4	43
1943-January	2	38					2	24			1	16
February	1	20										
May	2	86										
July							1	7				
August					3	108	2	88			3	94
September					3	85	1	50			3	61
October	1	21			6	378	4	294			7	240
November	1	14			15	1382	7	642	1	179	14	768
December	1	4			7	208	4	105	1	68	7	147
1944-January	2	23			13	1386	8	550	1	152	17	682
February	5	84			15	2166	8	1027	1	197	20	1298
March	2	14			11	907	3	314	2	145	13	407
April	5	43	1	2	16	2607	4	768	2	558	21	1292
May					7	402	1	19	3	275	7	206
June	8	517	1	6	18	4538	2	636	5	1131	26	1938
July	9	748	1	1	19	5804	2	154	7	2698	28	3144
August					12	1122			6	316	11	278
September	13	1535			19	5546			8	2903	32	3182
October	15	1273			20	4972			9	2196	35	2507
November					17	2453			11	1008	17	936
December	6	191			13	1600			7	108	19	163
1945-January	18	1165	2	131	13	4482			5	703	31	2156
February	11	1132	9	652	20	2465			7	500	27	1210
March	18	1803	17	2274	19	3853			10	1231	38	2971
April	16	2473	11	1916	20	5652			9	1515	36	4496
May	14	474	10	1021	22	3583			8	921	35	3054
June	12	1409	8	520	18	1425			7	288	29	1993
July			11	2012	18	3473			9	1162	20	1821
August	2	23	11	1047	18	1789			10	554	22	817
1942 Total		938		0		0		1,370		0		365
1943 Total		183		0		2,161		1,210		247		1,326
1944 Total		4,428		9		33,503		3,468		11,687		16,033
1945 Total		8,479		9,573		26,722		0		6,874		18,518
GRAND TOTAL		14,028		9,582		62,386		6,048		18,808		36,242

* F4F through October 1943, FM thereafter.
\# TBD through June 1942, TBF and TBM thereafter.

NOTE: No carrier action was reported for the months not listed in the table. Composite squadrons are counted once for each type of plane included.

(Notes to this table are on p.23)

TABLE 5. Continued

B. LAND-BASED AIRCRAFT, OF CARRIER TYPES

MONTH	F4F, FM		F4U, FG		F6F		SBD		SB2C, SBW		TBF TBM	
	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties
1941-December	1	49										
1942 -March*												
June#	1	6					1	22			1	6
August	2	57					2	31				
September	3	259					6	225			1	22
October	7	478					5	311			1	49
November	6	175					7	359			3	72
December	3	40					4	284			1	7
1943-January	2	84					3	284			1	26
February	3	10					5	357			2	29
March	1	8					5	157			4	159
April	1	79	3	118			4	88			4	152
May	1	3	4	113			2	128			2	203
June	4	81	6	156			4	270			6	218
July	3	167	6	358			9	1430			6	1125
August			5	414			5	374			4	315
September			5	430	4	169	8	558			5	393
October			7	384	3	72	8	646			4	353
November			9	821	4	100	9	1077			6	646
December			6	467	3	261	10	1232			5	751
1944-January			10	1151	3	254	6	915			5	427
February			9	1750	1	149	7	1322			4	661
March			14	1108	4	402	11	3046			5	1439
April			13	1159	4	405	11	2516			5	943
May			12	1594	1	358	10	2421			3	600
June			13	1332	1	231	10	1526			1	48
July			14	2901	1	23	8	2112			1	4
August			20	4287	2	44	9	2324			1	28
September			21	3563	2	44	10	1997			1	21
October			23	4724	3	23	9	1920			2	18
November			23	4875	2	273	9	866			3	161
December			24	2932	2	26	10	370			3	97
1945-January			19	2365	2	68	7	384			2	270
February			17	3118	2	206	8	3999			2	129
March		1	18	2775	3	245	7	4350	2	50	4	164
April		1	19	3463	4	164	7	3017	4	281	2	132
May			21	2431	6	232	8	2912	5	379	2	374
June			19	2711	4	274	6	1797	5	768	3	270
July		1	19	2423	6	116	6	1012	5	556	4	217
August	1	25	15	547	3	5			4	321	3	49
194142 Total		1,064		0		0		1,232		0		156
1943 Total		432		3,261		602		6,601		0		4,370
1944 Total		c		31,376		2,232		21,335		0		4,447
1945 Total		28		19,833		1,310		17,471		2,355		1,605
GRAND TOTAL		1,524		54,470		4,144		46,639		2,355		10,578

* 1 F2A squadron flew 4 action sorties.
# 1 F2A squadron flew 21 action sorties and one SB2U squadron 17 action sorties.

NOTE: No action by these types of planes was reported for the months not listed above. Composite squadrons are counted once for each type of plane included.

TABLE 5, Continued

C. PATROL AIRCRAFT

MONTH	PBY		PBM		PB2Y		PB4Y		PV		PBJ	
	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties	No. of Sqdns. in Action	Action Sorties
1941-December	4	21										
1942-January	3	13										
February	2	6										
May	2	6										
June	9	28										
July	2	4										
August	3	10										
September	4	8										
October	3	10										
November	1											
December	2	3										
1943-January	1	2										
February	4	16					1	18				
March	4	14					1	23				
April	2	5					1	4				
May	5	7										
June	2	8					1	4	2	38		
July	5	25					3	25	3	14		
August	4	10					2	17	3	5		
September	3	17					3	64	2	12		
October	3	35					5	51	5	61		
November	6	54					6	93	3	44		
December	9	63					6	96	5	54		
1944-January	6	145	1	2	2	17	5	100	7	96		
February	9	64	1	5	2	18	6	110	6	123		
March	6	125	1	1	1	5	7	63	5	256	1	129
April	3	62			1	6	5	116	5	169	1	142
May	5	107			1	21	8	82	6	302	2	153
June	6	63	2	6	1	5	6	87	4	152	1	141
July	3	54	1	4			6	97	5	81	3	182
August	5	73	1	2	1	19	8	104	6	212	4	233
September	6	94	1	1			4	46	6	96	4	333
October	3	73	1	1			5	84	7	105	4	322
November	6	58					8	105	7	105	6	655
December	3	39	2	22			6	145	4	141	6	685
1945-January	2	33	1	4			8	52	5	53	6	515
February	4	19	2	4			7	171	6	71	7	845
March	3	4	7	73			11	261	7	112	5	698
April	1	1	8	100	1	15	12	259	5	74	7	1020
May			7	133	1	24	14	408	4	178	7	1023
June	1	1	8	87	1	2	14	356	4	106	7	526
July			6	47	1	8	16	425	3	13	7	628
August			2	14	1	2	15	174	4	15	6	160
1941-42 Total		109		0		0		0		0		0
1943 Total		256		0		0		395		228		0
1944 Total		957		44		91		1,139		1,838		2,975
1945 Total		58		462		51		2,106		622		5,415
GRAND TOTAL		1,380		506		142		3,640		2,688		8,390

NOTE: No action by VPB aircraft was reported for March and April 1942.

NOTES TO TABLE 5

Among the items worthy of note in this table are the following:

(a) The predominance of dive bombers, and the relatively small number of fighter sorties, in the carrier actions of 1942, resulting from the relatively low fighter complements of the time.

(b) The transfer from the F4F to the F6F in the rebuilt carrier force of 1943, the gradual transfer from SBD to SB2C in 1944, and the decrease in SB2C use in late 1944 and 1945 as Complements changed to meet the kamikaze threat.

(c) The slow emergence of the FM as an offensive aircraft, beginning in June 1944, after 6 months of primarily defensive use.

(d) The sudden rise of the F4U as a major carrier aircraft in early 1945.

(e) The predominance of the TBF as the primary carrier bomber from 1944 on.

(f) The shift, in land-based aircraft, from the F4F to the F4U, and the later addition of the F6F. (Note that land-based F4F action sorties are probably seriously understated, because of inadequate reports of most of their offensive missions; the same applies, to a lesser extent, to land-based F4Us for 1943).

(g) The decline and subsequent rise of land-based F6F combat activity. The decline resulted from the abolition of land-based Navy support squadrons in early 1944 (and the increasing problem of supplying a larger number of carriers with F6Fs). The later return of the F6Fs was as Marine land-based night fighters.

(h) The decline in use of the land-based F4U in 1945, as carrier demands for fighters increased.

(i) The persistence of the land-based SBD in combat until nearly the end of the war.

(j) The withdrawal of the TBM from general land-based combat duty after the peak of the Solomons campaign, and its restriction to a few Marine squadrons engaged principally in local anti-submarine patrol and special support duties, including supply dropping.

(k) The persistence of the PBY in combat (largely night attacks on shipping and by-passed Japs) until early in 1945.

(1) The sudden expansion of PBM combat activity in March 1945 after 14 months of largely negative patrols.

(m) The considerable volume of offensive activity by PB4Y patrols and anti-shipping missions in early 1945.

(n) The diversion of PVs from offensive to more routine missions in 1945.

(o) The sizeable offensive volume flown by the relatively small force of Marine PBJs.

NOTES TO TABLES 6 AND 7

These tables classify, by assigned mission of own aircraft at time of takeoff, all sorties which actually attacked or engaged the enemy. It should be noted that sorties which did not actually engage the enemy are not included; thus the bulk of defensive patrols, search and reconnaissance missions, and a relatively small number of abortive offensive sorties, are not reflected herein. The purpose of the table is to show the origins of the missions that resulted in action.

It has been necessary to make this presentation in two tables because of differences between the classification methods employed for 1944 and for other years. Table 6 presents yearly data by plane type, with a little less detail for 1944 because of inability to make the 1944 classifications fit those available for other years. Table 7 presents the expanded detailed classification available for 1944 only.

The following explanatory material will assist in an appreciation of the data in Table 6.

(a) Ground Support: The considerable increase in the volume of direct air-ground support missions flown by carrier aircraft from less than 15% of total action sorties in 1942-43, to over 20% of a greatly increased total in 1945, deserves notice. In the case of land-based VF and VSB-VTB the increase was from 2% in 1942 to over 30% in 1945. This reflects the increasing perfection of air-ground teamwork between Naval aviation and Army-Marine ground forces, - the function of direct air support having always been recognized as a primary mission of Naval and Marine aviation. The record of Naval aviation's destruction of such primary enemy strategic targets as aircraft and shipping indicates that this large volume of air-ground support was supplied with no loss of strategic effectiveness.

In fact the number of action sorties on missions classified in the Table as "Air-Ground Support" does not reflect the full weight of offensive put forth by Naval aviation, and particularly by the carrier forces, on behalf of ground forces. Carrier offensive missions were classified as air-ground support only when flown under the control of air support commanders. A number of pre-invasion offensive missions were flown against beach defenses, gun positions, and other ground targets, which were not controlled by air support commands, and are thus classified as strike or sweep missions.

Also, the bulk of the carrier VF action sorties listed under "Defensive patrols Over Target or Other Forces" involved attacks by patrolling VF on enemy ground forces, under the direction of air support commanders, rather than merely defensive engagements with enemy aircraft. It was a normal practice for fighter combat patrols over invasion beachheads to carry bombs and rockets, and to report to the air support commander for assignment of targets on completion of the patrol period. It is estimated that a total of some 40-45,000 carrier action sorties, and some 20-25,000 land-based action sorties, were flown in effective direct support of ground forces.

(b) Search or Reconnaissance Missions, A noteworthy trend was the increasing displacement of carrier bombers by carrier VF on search missions. In part the large volume of carrier VF missions in this category in 1944 and 1945 reflects a vast increase in number of photographic missions, including escort fighters which often strafed guns and other targets. However, there was also an increased use of VF for sector search in place of VSB and VTB.

It should be noted that the action engaged in by most search action sorties was attack on targets of opportunity, rather than combat with enemy aircraft. Only 425 carrier-based search and reconnaissance action sorties out of 4,672, and 789 land-based (mostly VPB) out of 8,431, actually engaged enemy aircraft in combat (See Table 23). Some of those which engaged in combat, and all of the remainder, attacked land or ship targets in addition to carrying out their reconnaissance functions.

(c) Defensive Patrols: The increasing predominance, as the war advanced, of action by defensive patrols over invasion forces afloat and ashore, as against action restricted to defense of base, is clearly illustrated by figures for both carrier and land-based VF. In 1942 our fighters were devoting most of their defensive energies to warding off attacks on their own bases. By 1945 the bulk of the defense could be diverted to keeping the enemy from attacking other land installations or friendly forces.

The relative lack of defensive action by land-based VF in 1944 deserves notice. During

(Cont. on next page)

TABLE 6. ACTION SORTIES, BY PURPOSE OF MISSION
By Plane Type, Carrier-Based and Land-Based., by Years.

BASE, PLANE TYPE, YEAR	ACTION SORTIES, BY PURPOSE OF MISSION							
	OFFENSIVE		SEARCH OR RECONNAISSANCE	DEFENSIVE PATROLS		OTHER OR UNKNOWN	TOTAL
	Strike or Sweep	Air Ground Support		Carrier Force, Base, other Local	Target, or other Forces		
CARRIER VF:							
1942	396	109	6	427	0	0	938
1943	1,547	257	5	406	125	0	2,340
1944	32, 241*		969	4,633*		97	37,940
1945	26,371	6,512	2,388	2,528	6,758	217	44,774
CARRIER VSB-VTB:							
1942	1,274	287	128	31	0	15	1,735
1943	2,396	342	22	21	0	6	2, 787
1944	29,499*		764	842*		83	31,188
1945	15,126	9,590	390	90	27	169	25,392
LAND-BASED VF:							
1941-42	411	0	7	652	13	6	1,089
1943	3,050	56	67	815	290	17	4,295
1944	32,848*		931	147*		122	34,048
1945	14,408	4,480	94	67	2,066	56	21,171
LAND-BASED VSB-VTB:							
1942	1,165	52	164	0	0	4	1,405
1943	10,215	384	125	0	7	240	10,971
1944	25,016*		719	0	0	47	25,782
1945	11,459	9,372	530	30	10	30	21,431
PATROL BOMBERS							
1941-42	27	0	69	0	0	13	109
1943	334	0	484	4	28	33	883
1944	4,513*		2,423			125	7,085
1945	5,850	64	2,818	5	24* 3	74	8, 714

*1944 data are not separable between these types of Offensive or defensive missions.

(Cont. from preceding page)

this year the enemy was unable to bring any appreciable offensive effort to bear against the bases (largely in the Solomons, Marshalls, Marianas and Palau) garrisoned by Naval aircraft. The 1945 increase reflects the use of Marine VF at Okinawa.

Another interesting variation is the high rate of action by carrier bombers on defensive patrols in 1944. These were largely anti-submarine patrols by VTB over landing force areas; after completion of patrols the planes bombed nearby shore targets. In 1945 this practice generally ceased, or the duties were taken over by fighters.

(d) General: The predominance of offensive missions among sorties involving action with the enemy, for all types of planes other than VPB, is clearly shown. Even in the case of carrier VF, nearly 80% of their missions which eventuated in action were offensive. For single-engine bombers, and land-baaed fighters, offensive missions resulted in all but 5% to 10% of their action against the enemy. In the case of patrol bombers, over one-third of their action was on search missions; if the primarily offensive Marine PBJs were deducted, well over half of their action would be on search missions.

TABLE 7. ACTION SORTIES, BY DETAILED PURPOSE AND OBJECTIVE OF MISSION, 1944 ONLY
By Type of Aircraft, Carrier-Based and Land-Based

PURPOSE OF MISSION	ACTION SORTIES, BY BASE AND TYPE OF AIRCRAFT								
	CARRIER-BASED			LAND-BASED					
	VF	VSB	VTB	VF	VSB	VTB	PBJ PV	PB4Y	Flying Boats
BOMBING OR ROCKET ATTACK:									
Land Objective	21,061	9,851	10,544	27,955	20,253	4,025	3,912	92	322
Ship Objective	3,594	2,567	2,234	627	440	193	81	30	19
Land and/or Ship	3,916	2,266	1,947	359	100	0	13	1	42
SWEEP, OR STRAFING ATTACK:									
Land Objective	3,073	20	30	2,259	1	4	1	0	0
Ship Objective	77	26	8	1,116	0	0	0	0	0
Land and/or Ship	520	4	2	532	0	0	0	0	0
RECONNAISSANCE WITH BOMBS	630	325	346	651	530	179	726	825	681
RECONNAISSANCE WITHOUT BOMBS	339	45	48	280	2	8	35	150	6
DEFENSIVE STANDING PATROLS#	3,969	43	793	139	0	0	16	3	5
INTERCEPTION OF ATTACK	664	0	6	8	0	0	0	0	0
MINELAYING*	31	0	53	0	0	27	14	32	28
MISCELLANEOUS	61	8	15	80	0	0	3	4	22
UNKNOWN	5	0	7	42	9	11	12	2	8
TOTALS	37,940	15,155	16,033	34,048	21,335	4,447	4,813	1,139	1,133

Includes CAP, ASP, and patrols over target.

* Some additional minelaying attacks may have been classified as bombing attacks on ship objectives.

NOTE: This detailed breakdown of purpose of mission is not available for years other than 1944. It should be noted that the targets ultimately attacked may have differed from the original objectives listed in the table.

Table 7 provides a more detailed analysis, for 1944 only, of the missions flown by Naval aircraft which resulted in action. Of interest are the following items;

(a) The high proportions of carrier bombers sent out against shipping targets, and of carrier fighters against land targets.

(b) The relatively small number of fighters sent up especially to reinforce the standing patrols in warding off enemy attacks. Naval air defense was largely by standing patrols already in the air.

(c) The relatively small volume of anti-shipping attacks by land-based VF, VSB and VTB (generally based out of reach of major enemy shipping). A partial exception is noted for VF, which flew many strafing missions against small craft in the Solomons area.

(d) The contrast between the employments of the various types of patrol bombers. The Marine PBJs were used predominantly as formation bombers and night hecklers, rather than as single search planes, while the PVs were used extensively for small strikes by 2 to 6 planes against minor land targets in the Solomons area, at Nauru, in the Southwest Pacific, and in the Kuriles. Both types were used for search, but principally in negative sectors. PB4Ys, on the other hand, were used mainly for sector search. The flying boats were used for a variety of purposes, and the 1944 data reflect such diverse missions as night anti-shipping searches by PBY Black Cats, PBY missions against barges and coastal targets in the Solomons in cooperation with PT boats, sector searches by PBMs and PB2Ys, night heckler missions over enemy bases by PBYs, and bombing strikes on Wake by PB2Ys.

TABLE 8. SUMMARY OF CARRIER AIR OPERATIONS AND RESULTS FOR ENTIRE WAR,
By Type of Carrier, by Plane Model, and by Service (Navy-Marine)

TYPE CARRIER PLANE MODEL, SERVICE	TOTAL ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER FLIGHTS	ON SHIP	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
CV Total	94,917	1,028	370	719	1,148	610	1,328	3,317	31,755
F6F	41,715	366	185	212	509	233	933	2,641	3,466
F4U (Navy)	6,488	93	18	48	182	76	100	260	954
F4U (Marine)	2,650	40	16	21	42	37	53	159	277
F4F	968	11	44	22	42	20	185	109	2
SB2C, SBW	18,808	268	18	218	184	88	13	30	10,994
SBD	5,852	40	43	43	61	33	30	75	2,467
TBF, TBM	18,254	199	21	147	127	109	13	38	13,461
TBD	182	11	25	8	1	14	1	5	134
CVL, Total	21,478	200	62	131	364	179	410	882	6,323
F6F	15,099	128	58	91	279	122	406	876	1,492
TBF, TBM	6,379	72	4	40	85	57	4	6	4,831
CVE, Total	30,699	200	20	151	476	185	259	288	7,581
FM	12,925	62	13	75	283	71	194	228	148
F6F (Navy)	5,426	44	2	18	41	48	48	51	1,009
F6F (Marine)	146	2	0	0	8	0	0	0	25
F4U (Marine)	443	4	0	0	5	1	6	0	81
F4F	136	6	3	9	7	2	5	3	4
SBD	196	0	0	5	4	2	1	0	57
TBF, TBM (Navy)	10,931	77	2	44	127	61	5	6	5,953
TBF, TBM (Marine)	496	5	0	0	1	0	0	0	304
GRAND TOTAL	147,094	1,428	452	1,001	1,988	974	1,997	4,487	45,659

NOTE: Unless otherwise noted, all planes are Navy.

NOTES TO TABLE 8

The table indicates that some 65% of all action sorties were flown from CVs, 15% from CVLs, and 20% from CVEs. CVLS accounted for 20% of all enemy aircraft destroyed in combat, CVBs for less than 9%, while CVS were credited with over 70%.

Attention is invited to the low CVE plane losses to enemy aircraft in comparison with the numbers destroyed in combat: 20 losses as against 547 destroyed. The CVE F6F record of 99 enemy planes destroyed against 2 air combat losses, and the FM record of 422:13, far exceed the fast carrier records, and only 2 CVE bombers are credited as lost in air combat.

TABLE 9. LOSSES, LOSS RATES, AND OPERATIONAL DATA,
CARRIER-BASED NAVAL AND MARINE AIRCRAFT. PACIFIC ONLY. 1944-1945 ONLY
By Carrier Type, Plane Model, and Service (Navy-Marine)

TYPE CARRIER, PLANE MODEL, SERVICE	AIR-CRAFT ON HAND *	FLIGHTS SQUAD-RONS IN ACTION	ACTION SORTIES	OWN LOSSES OPERATIONAL: Action Sorties	OWN LOSSES OPERATIONAL: On Other Fl'ts	OWN LOSSES ON SHIP	TOTAL, Including Enemy Action	OWN LOSS RATES OPERATIONAL: Per 100 Action Sorties	OWN LOSS RATES OPERATIONAL: Per 100 Other Fl'ts	OWN LOSS RATES SHIP: Per 100 Planes Per Month	TOTAL Per 100 Planes Per Month	FLIGHTS Per Plane Per Month	FLIGHTS Per Action Sortie
CV TOTAL	15430	209,150	88,335'	619	1013	540	3366	0.70	0.84	3.5	21.8	13.6	2.4
F6F	7369	108.667	40,178	200	481	229	1436	0.50	0.70	3.1	19.5	14.7	2.7
F4U , Navy	1384	22,266	6,489	48	182	76	417	0.74	1.15	5.5	30.1	16.1	3.4
F4U, Marine	539	7,554	2,650	21	42	37	156	0.79	0.86	6.9	28.9	14.0	2.9
SB2C, SBW	2764	30,506	18,561	216	182	88	768	1.16	1.52	3.2	27.8	11.0	1.6
SBD	633	7,786	3,331	8	17	3	46	0.24	0.38	0.5	7.3	12.3	2.3
TBF, TBM	2741	32,371	17,126	126	109	107	543	0.74	0.71	3.9	19.8	11.8	1.9
CVL TOTAL	3892	69,274	20,679,	125	325	175	862	0.60	0.67	4.5	22.1	17.8	3.3
F6F	2846	52,175	14,617	86	247	120	622	0.59	0.66	4.2	21.9	18.3	3.6
TBF, TBM	1046	17,099	6,062	39	78	55	240	0.64	0.71	5.3	22.9	16.3	2.8
CVE TOTAL	5914	100,075	29,744	138	450	179	963	0.46	0.57	3.0	16.3	18.4	3.7
FM	2898	51,312	12,907	75	280	69	499	0.58	0.73	2.4	17.2	17.7	4.0
F6F, Navy	670	14,727	4,748	18	39	47	137	0.38	0.39	7.0	20.4	22.0	3.1
F6F, Marine	24	513	146	0	8	0	10	0	2.18	@	@	@	3.5
F4u, Marine	118	2,236	443	0	5	1	10	0	0.28	0.8	8.5	18.9	5.0
SBD	54	903	137	4	3	2	9	2.92	0.39	@	@	@	6.6
TBF, TBM, Navy	2078	37,770	10,867	41	114	60	292	0.38	0.42	2.9	14.1	18.2	3.5
TBM, Marine	72	1,614	496	0	1	0	6	0	0.09	@	@	@	3.3
GRAND TOTAL	25236	387,499	138,758	882	1788	894	5191	0.64	0.72	3.5	20.6	15.4	2.8

* In terms of plane months: sum of aircraft reported on hand each month by squadrons in action. Where no suitable figure was reported for aircraft on hand, authorized complement was used. A monthly average strength in action can be Obtained by dividing by 20.

@ Ratio not calculated; less than 100 planes on hand.

NOTE: All planes are Navy unless otherwise specified.

NOTES TO TABLE 9

This table is of primary interest as a source of overall carrier aircraft loss rates in combat operations for the last 20 months of the war - the months of full-scale, regular carrier operations. Included are all flights, action sorties and losses for each carrier, for the whole of each month that the carrier reported any air action against the enemy.

Many interesting comparisons between loss rates are invited by the table:

(a) Operational loss rates, both on action sorties and on other flights, are highest on CVs, lowest on CVEs. This is true for all types of planes combined and also for the F6F and TBF separately; the F6F and TBF were used on all three types of carrier. When these two types alone are considered, the margin of the CVL over the CV is very slight and the superiority of the CVE more pronounced.

(b) Operational loss rates are almost invariably lower for sorties involving action against the enemy than for other flights. This may reflect only the erroneous attribution to enemy action of mission planes actually lost for operational causes; this factor is more likely to apply to fast carriers than to CVEs.

(c) The SBD was the safest plane, operationally, followed in order by the F6F and TBF. F6F operational loss rates were far lower than those for the FM and F4U. The SB2C ranked a poor last operationally.

(d) No particular pattern is discernible in loss rates for non-airborne aircraft aboard ship, other than that CVLs had the highest losses, and CVEs the lowest. These are influenced heavily by the accidents of kamikaze attack (which affected the CVEs least) and typhoons.

(e) In total losses to all causes, including enemy action, CVES again fared best, partly because of their lower rate of losses to enemy action, and their lower proportion of action sorties to total flights. The relatively low operational loss rates of the F6F and TBF help them to maintain their superiority over the F4U and SB2C in total losses. SBD and FM total losses remain the lowest, however.

From the table it will be seen that the average carrier aircraft in combat operations made about 15 flights per month, about 5 or 6 of which resulted in action against the enemy. For CVES and CVLS these figures would read 18 and 5, for CVS 14 and 6. These averages, however, include months of very light operations; figures for peak months are given in Tables 12 and 13. In general, fighters made more flights and had less action sorties per month than the overall average, while bombers had more action in a smiler number of flights. The highest average of action sorties per plane per month, however, was reported for CVE F6Fs (7.1) which also had the highest average flights per month, showing the heavy reliance placed upon the SANGAMON class carriers during amphibious operations; SB2Cs were next with 6.7.

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TABLE 10. SUMMARY OF CARRIER AIR OPERATIONS AND RESULTS, MONTHLY

A. LARGE CARRIERS (ESSEX Class and other CVs)

MONTH	CVs IN Action	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER FL'TS	ON SHIP	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
1941-December	#	*	#	0	1	0	0	0	#	#	#
1942-February	3	*	243	3	6	9	6	2	23	10	77
March	3	*	142	2	0	0	4	0	1	0	51
April	1	*	6	0	0	0	5	0	0	0	1
May	2	*	332	1	21	11	3	37	24	42	139
June	3	*	374	20	41	16	25	11	33	36	100
August	3	*	681	6	23	6	14	1	65	23	181
October	2	*	287	1	20	19	5	15	48	42	60
November	2	*	494	9	2	2	5	0	3	25	74
1943-January	2	*	78	0	0	0	3	0	11	0	23
February	1	*	20	0	1	0	1	0	4	0	0
July	1	*	7	0	0	0	1	0	0	0	0
August	2	*	270	3	0	1	6	0	0	0	109
September	1	*	128	1	0	2	4	0	0	0	55
October	4	*	763	7	0	12	9	0	3	26	298
November	6	*	2,286	12	16	21	27	2	83	82	767
December	5	*	471	5	3	1	17	2	6	35	183
1944-January	6	10,314	1,952	9	2	7	23	1	9	25	627
February	6	5,938	3,115	16	6	13	20	3	18	125	1,008
March	5	5,642	1,415	18	2	9	19	0	6	47	543
April	6	6,044	3,747	21	4	21	15	3	21	31	1,377
Hay	4	2,220	815	8	0	1	11	0	2	1	323
June	7	9,474	5,492	75	31	98	23	11	165	353	1,730
July	8	11,923	6,320	48	10	34	30	7	9	75	3,068
August	6	4,322	1,036	21	3	3	15	2	5	11	355
September	8	12,269	8,779	51	10	29	21	15	27	211	3,332
Ootober	9	12,290	7,276	113	57	72	64	56	196	555	2,590
November	10	8,446	3,830	73	9	29	40	27	29	189	1,349
December	7	7,416	1,551	23	0	18	38	8	13	46	263
1945-January	8	12,768	5,784	82	8	46	61	54	44	75	1,581
February	11	12,046	3,865	35	35	34	88	48	45	332	915
March	10	15,004	7,280	84	31	61	89	89	73	206	2,010
Apri1	10	19,630	7,795	71	11	42	77	89	290	455	2,816
May	9	14,263	4,623	38	5	22	26	110	41	190	1,817
June	8	7,783	1,335	10	4	15	22	9	0	17	452
July	10	17,852	6,885	129	4	47	248	7	10	29	2,281
August	11	13,506	3,440	33	4	18	83	1	21	23	1,200
1941-42 Total		*	2,559	42	114	63	67	66	197	178	683
1943 Total		*	4,023	28	20	37	68	4	107	143	1,435
1944 Total		96,298	47,328	476	134	334	319	133	500	1,669	16,565
1945 Total		112,852	41,007	482	102	285	694	407	524	1,327	13,072
GRAND TOTAL		209,150	94,917	1028	370	719	1148	610	1,328	3,317	51,755

No action reported; loss reported maybe from unreported action, or may be an erroneous report.

* No data available.

TABLE 10.Continued

B. SMALL CARRIERS (CVLs, INDEPENDENCE Class)

MONTH	CVLs IN Action	GHT SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER FL'TS	ON SHIP	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
1943-August	1	*	20	0	0	0	0	0	0	0	7
September	2	*	68	4	0	0	9	0	5	0	28
October	3	*	170	6	1	2	5	0	6	8	37
November	5	*	484	3	10	4	19	4	8	17	160
December	2	*	57	1	0	0	6	0	4	1	15
1944-January	6	4,588	723	3	3	4	15	1	1	17	187
February	6	3,074	1,136	2	0	5	10	2	13	6	234
March	6	2,248	345	4	1	2	7	1	15	42	64
April	7	3,937	1,276	11	1	3	15	0	11	30	284
May	3	1,276	87	0	0	1	5	0	0	0	20
June	8	5,938	2,054	22	13	15	21	2	63	165	468
July	7	4,519	1,559	8	4	8	13	3	1	28	537
August	3	843	135	1	0	0	5	0	0	0	34
September	8	5,273	1,729	13	3	10	11	2	19	115	382
October	8	5,209	1,177	16	10	9	38	67	121	116	219
November	6	2,641	567	9	2	7	10	2	20	34	168
December	6	2,133	309	5	0	9	16	35	2	5	67
1945-January	5	2,680	921	16	0	7	21	14	7	26	261
February	5	2,577	487	5	5	7	21	2	4	50	110
March	6	4,132	2,015	25	1	18	19	17	29	35	599
April	6	5,120	2,277	13	5	6	17	2	67	125	796
May	6	3,707	1,349	8	0	5	13	8	10	29	500
June	4	1,608	339	1	0	1	7	14	0	0	163
July	6	4,481	1,447	20	3	7	47	2	2	18	656
August	7	3,290	747	4	0	1	14	1	2	15	327
1943 Total		*	799	14	11	6	39	4	23	26	247
1944 Total		41,679	11,097	94	37	73	166	15	266	558	2,664
1945 Total		27,595	9,582	92	14	52	159	60	121	298	3,412
GRAND TOTAL		69,274	21,478	200	62	131	364	179	410	882	6,323

* No data available.

NOTES TO TABLE 10

High points in the 3 pages of this table are:

(a) The peak CV flight performance of April 1945, when 10 CVs averaged 1963 flights per ship for the month.

(b) The peak CV combat performance of September 1944, when 8 CVS, during 11 or 12 strike days per ship, flew an average of 1,534 flights and 1,097 action sorties per ship, and placed an average of 416 tons of bombs on target per CV, with a loss of only 16 planes per ship, a record not equalled subsequently, but approached in July 1944.

(c) The peak CV records for planes destroyed in combat per month: 518 by 8 CVs in June 1944, 751 by 9 CVs in October 1944, and 745 by 10 in April 1945.

(d) The peak CVL performance record of April 1945, when 6 CVLs averaged 853 flights, 380 action sorties, 753 rockets and 133 tons of bombs per CVL for the month, with 7 plane losses per CVL.

(Cont. on next page)

TABLE 10. Continued

c. ESCORT CARRIERS (All Classes)

MONTH	CVEs IN AC-TION	FLIGHTS, SQUAD-ONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Opera-tional	ON OTHER FL'TS	ON SHIP	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF OMB ON TARGETS
1942-November	3	*	114	5	0	5	11	2	6	3	24
1943-March	#	*	#	0	1	0	0	0	#	#	#
May	1	*	86	0	0	7	2	0	0	0	4
August	#	*	#	2	2	0	1	0	#	#	#
November	5	*	215	0	0	1	10	2	1	0	35
December	1	*	4	0	0	0	0	0	0	0	0
1944-January	5	2,143	118	0	0	3	9	7	0	0	56
February	8	4,099	521	1	0	2	14	0	0	0	222
March	2	713	27	0	0	0	1	0	0	1	1
April	8	3,925	247	0	0	2	14	3	1	0	117
June	11	5,520	1,220	18	4	14	35	9	26	25	237
July	11	7,700	2,670	8	0	6	30	0	0	0	661
August	4	1,640	545	14	0	0	2	1	5	3	84
September	16	7,937	2,658	8	0	8	23	3	0	1	493
October	18	7,412	2,495	38	7	46	48	37	92	109	530
December	6	1,456	202	0	2	0	8	1	10	35	3
1945-January	18	10,299	1,932	10	2	13	94	22	23	68	466
February	11	6,273	1,607	13	0	3	24	30	1	0	221
March	15	9,176	2,837	12	0	11	41	2	4	2	553
April	20	16,498	5,980	39	2	14	44	19	74	38	1,421
May	20	12,227	3,081	16	0	9	42	36	8	0	1,208
June	17	10,402	3,961	14	0	7	16	11	1	3	1,213
July	4	1,756	136	1	0	0	4	0	3	0	32
August	3	930	43	1	0	0	3	0	4	0	0
1942-43 Total		*	419	7	3	13	24	4	7	3	63
1944 Total		42,545	10,703	87	13	81	184	61	134	174	2,404
1945 Total		67,561	19,577	106	4	57	268	120	118	111	5,114
GRAND TOTAL		110,106	30,699	200	20	151	476	185	259	288	7,581

* No data available.
# NO action reported; losses reported may be from unreported action or may be erroneous reports.

(Cont. from preceding page)

(e) Also during April, the 192 enemy planes destroyed in combat by aircraft of the 6 CVLs in action. Other peak CVL performances were in June 1944, when 8 CVLs destroyed 228 planes, and in October 1944, when 8 CVLs destroyed 237 of the enemy.

(f) CVE peak performance in April 1945, when 20 CVEs averaged 825 flights, 299 action sorties, 71 tons of bombs and 1,335 rockets per ship for the month, and shot down 112 enemy planes with only 2 air combat losses.

(g) The CVE air combat record of October 1944, when 201 enemy planes were shot down against 7 losses to enemy aircraft.

NOTES TO TABLES 11, 12 AND 13

These three tables provide analyses of some aspects of carrier operations for successive months or periods, during the major part of the Pacific war (early actions and Atlantic operations excluded). Percentages and averages have been calculated, to show trends in performance with respect to:

(a) Relative volume Of flights, action sorties, and ordnance on target, credited to each type of carrier and type of aircraft.

(b) Average bomb and rocket load delivered to target by each type of aircraft and each type of carrier.

(c) Flights and action sorties flown per plane of complement, for each type of aircraft and each type of carrier.

The data will be useful to show, among other items

(1) The composition and employment of the combat carrier forces during various periods.

(2) The physical capabilities of the force and its components during varicus types of operations, and for periods of various lengths.

(3) The extent to which the offensive potentialities of the force or any of its components were less than fully utilized during various periods.

(4) The relative parts played by various components of the force in providing the air effort necessary for the operation.

Most of the information in these tables is of technical rather than general interest., and no detailed analysis will be made, but the following will be of general interest:

(a) The increased utilization of carrier VF for bombing and rocket attacks, particularly CVL and CVE fighters, which during some periods averaged as much as a quarter ton of bombs per F6F attack sortie, and 3 or 4 rockets per attack sortie.

(b) The average loading of over 5 rockets (plus over 1000 pounds of bombs) per attack sortie carried by CVE TBMs in the Iwo Jima and Okinawa operations.

(c) The general tendency for CVL and CVE ordnance loadings per sortie to equal or exceed those of CV planes of the same types, particularly in 1945 operations, despite the smaller size of the carrier.

(d) The general reliance on CVL and CVE planes for the bulk of the patrols not involving action, and on CVs for the major weight of offensive activity. This practice was partially reversed during the Okinawa operations, when the offensive capabilities of the CVLS were for the first time fully utilized on a scale comparable with the CVs, the CVEs took over a major share of the offensive, and the CVs increased their relative volume of patrol activity.

(e) The parallel tendency of requiring CVLs (and the CVEs in months of major amphibious operations) to fly a higher number of flights per plane per month than the CVs, and a lower number of action sorties per plane. Even in the Okinawa operations this tendency was not eradicated (see Table 12 for April 1945, when CVLs and CVEs not only made 26 flights per plane against the CVs' 20, but flew far more action sorties as well).

(f) The record performances in flights per plane per month:

F6F: 37.1 from CVEs, 30.3 from CVLs, and 24.2 from CVs, in April 1945.

TBM: 28.7 from CVEs in July 1944, 20.0 from CVs in October 1944, 21.3 from CVLs in July 1944.

TABLE 11. ANALYSIS OF CARRIER AIR OPERATIONS DATA, FOR SUCCESSIVE PERIODS IN 1944-45 (PAIFIC ONLY)
By TYPE Carrier and by Model Aircraft

TYPE OF CARRIER, PLANE MODEL	FLIGHTS, SQUAD-RONS IN ACTION	ACTION SORTIES	SORTIES ATTACK-ING TARGETS	TONS OF BOMBS ON TARGETS	ROCKETS EXPEND-ED ON TARGETS	PEECENT OF PERIOD TOTAL				AVERAGES	
						Fl'ts	Ac-tion Sor-ties	Tons of Bombs	Rock-ets	Tons per Attack Sortie	Rockets per Attack Sortie
January - May 1944											
PERIOD TOTAL	56,161	15,524	15,372	5,063	1,153	100.0	100.0	100.0	100.0	0.33	0.07
CV F6F	14,180	4,790	4,790	202	0	25.2	30.8	4.0	0.0	0.04	0.00
SBD	6,566	2,541	2,610	1,119	0	11.7	16.3	22.1	0.0	0.43	0.00
SB2C	3,025	1,327	1,462	714	0	5.4	8.5	14.1	0.0	0.49	0.00
TBF, TBM	6,226	2,384	2,402	1,843	769	11.1	15.4	36.4	66.7	0.77	0.32
F4U	161	2	0	0	0	0.3	0.0	0.0	0.0	0.00	0.00
CVL F6F	10,315	2,606	2,107	78	0	18.4	16.8	1.5	0.0	0.04	0.00
TBF, TBM	4,808	961	926	711	0	8.5	6.2	14.0	0.0	0.77	0.00
CVE F6F	2,291	72	77	0	0	4.1	0.5	0.0	0.0	0.00	0.00
FM	3,152	164	188	8	0	5.6	1.1	0.2	0.0	0.04	0.00
SBD	903	137	140	39	0	1.6	0.9	0.8	0.0	0.28	0.00
TBF,TBM	4,534	540	524	349	384	8.1	3.5	6.9	33.3	0.67	0.73
June - August 1944											
PERIOD TOTAL	50,848	22,495	22,294	7,093	5428	100.0	100.0	100.0	100.0	0.32	0.24
CV F6F	12,614	6,834	6,7797	446	1,487	24.8	30.4	6.3	27.4	0.07	0.22
SBD	1,220	790	789	371	0	2.4	3.5	5.2	0.0	0.47	0.00
SB2C	6,610	4,145	4,204	2,276	0	13.0	18.4	32.1	0.0	0.54	0.00
TBF, TBM	5,099	3,072	3,047	2,060	1,870	10.0	13.7	29.0	0.0	0.68	0.61
F4U	176	7	0	0	0	0.4	0.0	0.0	0.0	0.00	0.00
CVL F6F	6,874	2,220	2,178	233	0	13.5	9.9	3.3	0.0	0.11	0.00
TBF,TBM	3,424	1,128	1,118	794	0	6.7	5.0	11.2	34.5	0.71	0.00
CVE F6F	4,220	1,874	1,886	323	0	8.3	8.3	4.6	0.0	0.17	0.00
FM	4,480	1,265	1,141	0	56	8.8	5.6	0.0	1.0	0.00	0.05
TBF . TBM	6,131	1,160	1,134	590	2,015	12.1	5.2	8.3	37.1	0.52	1.78
September - October 1944											
PERIOD TOTAI	50,390	24,114	24,728	7,546	13,770	100.0	100.0	100.0	100.0	0.31	0.56
CV F6F	13,446	7,777	7,944	499	5,513	26.7	32.3	6.6	40.0	0.06	0.69
SB2C	6,834	5,099	5,556	3,151	0	13.6	21.1	41.8	0.0	0.57	0.00
TBM	4,279	3,179	3,246	2,272	1,024	8.5	13.2	30.1	7.4	0.70	0.32
CVL F6F	7,737	2,219	1,984	88	2,019	15.4	9.2	1.2	14.7	0.04	1.02
TBM	2,745	687	692	513	0	5.4	2.8	6.8	0.0	0.74	0.00
CVE F6F	1,933	2,808	2,867	30	0	3.8	11.6	0.4	0.0	0.01	0.00
FM	7,666	522	644	51	4	15.2	2.2	0.7	0.0	0.08	0.01
TBM	5,750	1,823	1,795	942	5,210	11.4	7.6	12.4	37.9	0.52	2.90

NOTE : Sorties attacking targets, end averages based thereon, are not comparable between 1944 and 1945, since attacks on multiple targets were counted as multiple attacks in 1944 end single attacks in 1945.

TABLE 11. Continued

TYPE OF CARRIER, PLANE MODEL	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	SORTIES ATTACKING TARGETS	TONS OF BOMBS ON TARGETS	ROCKETS EXPENDED ON TARGETS	PERCENT OF PERIOD TOTAL				AVERAGES	
						Flts	Action Sorties	Tons of Bombs	Rockets	Tons per Attack Sortie	Rockets per Attack Sortie
November 1944 - January 1945											
PERIOD TOTAL	47,839	15,096	13,912	4,158	17,981	100.0	100.0	100.0	100.0	0.30	1.29
CV F6F	21,187	7,264	6,959	685	10,463	44.3	48.1	16.5	58.2	0.10	1.50
F4U	600	131	101	12	0	1.3	0.9	0.3	0.0	0.11	0.00
SB2C	3,410	1,819	1,709	1,087	43	7.1	12.0	26.1	0.2	0.64	0.03
TBM	3,433	1,951	1,839	1,409	387	7.2	12.9	33.9	2.2	0.77	0.21
CVL F6F	6,264	1,271	1,175	117	2,290	13.1	8.4	2.8	12.7	0.10	1.95
TBM	1,190	526	507	379	0	2.4	3.5	9.1	0.0	0.75	0.00
CVE FM	8,301	1,356	896	4	2,475	17.4	9.0	0.1	13.8	0.00	2.76
TBM	3,454	778	726	465	2,323	7.2	5.2	11.2	12.9	0.64	3.20
February - June 1945											
PERIOD TOTAL	140,446	48,831	43,383	4,794	21,302	100.0	100.0	100.0	100.0	0.34	2.80
CV F6F	34,350	9,665	7,431	1,004	14,418	24.5	17.1	6.8	11.9	0.14	1.94
F4U,FG	18,820	6,033	4,824	728	14,011	13.4	11.1	4.9	11.6	0.15	2.90
SB2C	6,337	4,455	4,321	2,800	3,954	4.9	10.0	18.9	3.3	0.65	0.92
TBM	8,719	4,745	4,562	3,478	3,116	6.2	10.5	23.5	2.6	0.76	0.68
CVL F6F	13,945	4,516	3,670	676	10,140	9.9	8.5	4.6	8.4	0.18	2.76
TBM	3,199	1,951	1,899	1,492	1,756	2.3	4.4	10.1	1.4	0.79	0.92
CVE F6F	7,495	2,797	2,697	609	10,348	5.3	6.2	4.1	8.5	0.23	3.84
F4U,FG	1,190	350	339	76	1,389	0.8	0.8	0.5	1.1	0.22	4.10
FM	27,373	7,291	6,818	85	25,707	19.5	15.7	0.6	21.2	0.01	3.77
TBM	18,518	7,028	6,822	3,846	36,463	13.2	15.7	26.0	30.0	0.56	5.34
July - August 1945											
PERIOD TOTAL	41,815	12,698	11,494	4,496	22,226	100.0	100.0	100.0	100.0	0.39	1.93
CV F6F	12,890	3,848	3,311	630	9,131	30.8	30.3	14.0	41.1	0.19	2.76
F4U,FG	10,063	2,966	2,666	491	8,096	24.1	23.4	10.9	36.4	0.18	3.04
SB2C	3,790	1,716	1,644	855	581	9.1	13.5	19.0	2.6	0.52	0.35
TBM	4,615	1,795	1,730	1,505	46	11.0	14.1	33.5	0.2	0.87	0.03
CVL F6F	6,038	1,385	1,217	288	3,841	14.4	10.9	6.4	17.3	0.24	3.16
TBM	1,733	809	790	695	113	4.2	6.4	15.5	0.5	0.88	0.14
CVE F6F	303	29	24	3	54	0.7	0.2	0.1	0.3	0.13	2.25
F4U,FG	1,046	93	63	5	173	2.5	0.7	0.1	0.8	0.08	2.75
FM	340	23	15	0	95	0.8	0.2	0	0.4	0.00	6.33
TBM		34	34	24	96	2.4	0.3	0.5	0.4	0.71	2.82

See note on previous page.

TABLE 12. CARRIER AIR OPERATIONS DATA AND OPERATING RATIOS,
By Type of Carrier, Monthly from August 1943 to August 1945, Pacific only.

MONTH	CARRIERS IN ACTION	COMPLEMENT	FLIGHTS SQUADRONS IN ACTION	ACTION SORTIES	TONS OF BOMBS ON TARGETS	OPERATING RATIOS: FLIGHTS PER PLANE	ACTION SORTIES PER PLANE	ACTION SORTIES PER FLIGHT	TONS PER ACTION SORTIE	PERCENT OF MONTH TOTAL: FL'TS	ACTION SORTIES	TONS OF BOMBS
1943												
August	2 CV	180	*	270	109	*	1.5	*	0.40	*	93	94
	1 CVL	33	*	20	7	*	0.6	*	0.35	*	7	6
September	1 CV	90	*	128	55	*	1.4	*	0.43	*	65	66
	2 CVL	66	*	68	28	*	1.0	*	0.41	*	35	34
October	3 CV	270	*	712	282	*	2.6	*	0.40	*	81	88
	3 CVL	99	*	170	37	*	1.7	*	0.22	*	19	12
November	6 CV	510	*	2,286	767	*	4.5	*	0.34	*	77	80
	5 CVL	165	*	484	160	*	2.9	*	0.33	*	16	16
	5 CVE	128	*	215	35	*	1.7	*	0.16	*	7	4
December	5 CV	430	*	471	183	*	1.1	*	0.39	*	89	92
	2 CVL	66	*	57	15	*	0.9	*	0.26	*	11	8
1944												
January	6 CV	513	10,314	1,952	627	20.1	3.8	0.19	0.32	61	70	72
	6 CVL	198	4,588	723	187	23.2	3.7	0.16	0.26	27	26	21
	5 CVE	138	2,143	118	56	15.5	0.9	0.06	0.47	12	4	7
February	6 CV	513	5,938	3,115	1,008	11.6	6.1	0.52	0.32	45	65	69
	6 CVL	198	3,074	1,136	234	15.5	5.7	0.37	0.21	24	24	16
	8 CVE	210	4,099	521	222	19.5	2.5	0.13	0.43	31	11	15
March	5 CV	430	5,642	1,415	543	13.1	3.3	0.25	0.38	66	79	89
	6 CVL	198	2,248	345	64	11.4	1.7	0.15	0.19	26	19	11
	2 CVE	56	713	27	1	12.7	0.5	0.04	0.04	8	2	0
April	6 CV	524	6,044	3,747	1,377	11.5	7.2	0.62	0.37	44	71	77
	7 CVL	231	3,937	1,276	284	17.0	5.5	0.32	0.22	28	24	16
	8 CVE	232	3,925	247	117	16.9	1.1	0.06	0.47	28	5	7
May	4 CV	338	2,220	815	323	6.6	2.4	0.37	0.40	64	90	94
	3 CVL	99	1,276	87	20	12.9	0.9	0.07	0.23	36	10	6
June	7 CV	617	9,474	5,492	1,730	15.4	8.9	0.58	0.32	45	63	71
	8 CVL	264	5,938	2,054	468	22.5	7.8	0.35	0.23	29	23	19
	11 CVE	311	5,520	1,220	237	17.7	3.9	0.22	0.19	26	14	10
July	8 CV	706	11,923	8,320	3,068	16.9	11.8	0.70	0.37	49	66	72
	7 CVL	231	4,519	1,559	537	19.6	6.7	0.34	0.34	19	13	13
	11 CVE	311	7,700	2,670	661	24.8	8.6	0.35	0.25	32	21	15
August	6 CV	533	4,322	1,036	355	8.1	1.9	0,24	0.34	75	88	90
	3 CVL	99	843	135	34	8.5	1.4	0.16	0.25	15	11	9
	2 CVE	57	609	9	3	10.7	0.2	0.01	0.33	10	1	1
September	8 CV	728	12,269	8,779	3,332	16.9	12.1	0.72	0.38	48	67	79
	8 CVL	256	5,273	1,729	382	20.6	6.8	0.33	0.22	21	13	9
	16 CVE	452	7,937	2,658	493	17.6	5.9	0.33	0.19	31	20	12

* Data not available.

TABLE 12. CONTINUED .

MONTH	CARRIERS IN ACTION	COMPLEMENT	FLIGHTS SQUADRONS IN ACTION	ACTION SORTIES	TONS OF BOMBS ON TARGETS	OPERATING RATIOS: FLIGHTS PER PLANE	ACTION SORTIES PER PLANE	ACTION SORTIES PER FLIGHT	TONS PER ACTION SORTIE	PERCENT OF MONTH TOTAL: FLIGHTS	ACTION SORTIES	TONS OF BOMBS
1944												
October	9 CV	805	12,290	7,276	2,590	15.3	9.0	0.59	0.36	49	66	77
	8 CVL	256	5,209	1,177	219	20.3	4.6	0.23	0.19	21	11	7
	18 CVE	506	7,412	2,495	530	14.6	4.9	0.34	0.21	30	23	16
November	10 CV	960	8,446	3,830	1,349	8.8	4.0	0.45	0.35	76	87	89
	6 CVL	190	2,641	567	168	13.9	3.0	0.21	0.30	24	13	11
December	7 CV	721	7,416	1,551	263	10.3	2.2	0.21	0.17	67	75	79
	6 CVL	190	2,133	309	67	11.2	1.6	0.14	0.22	20	15	20
	6 CVE	198	1,456	202	3	7.4	1.0	0.14	0.01	13	10	1
1945												
January	8 CV	775	12,768	5,784	1,581	16.5	7.5	0.45	0.27	50	67	69
	5 CVL	157	2,680	921	261	17.1	5.9	0.34	0.28	10	11	11
	18 CVE	574	10,299	1,932	466	17.9	3.4	0.19	0.24	40	22	20
February	11 CV	1,055	12,046	3,865	915	11.4	3.7	0.32	0.24	58	65	73
	5 CVL	165	2,577	487	110	15.6	3.0	0.19	0.23	12	8	9
	11 CVE	350	6,273	1,607	221	17.9	4.6	0.26	0.14	30	27	18
March	10 CV	981	15,004	7,280	2,010	15.3	7.4	0.49	0.28	53	60	64
	6 CVL	198	4,132	2,015	599	20.9	10.2	0.49	0.30	15	17	19
	15 CVE	474	9,176	2,837	553	19.4	6.0	0.31	0.19	32	23	17
April	10 CV	981	19,630	7,795	2,816	20.0	7.9	0.40	0.36	48	49	56
	6 CVL	198	5,120	2,277	796	25.9	11.5	0.44	0.35	12	14	16
	20 CVE	634	16,498	5,980	1,421	26.0	9.4	0.36	0.24	40	37	28
May	9 CV	878	14,263	4,623	1,817	16.2	5.3	0.32	0.39	47	51	52
	6 CVL	198	3,707	1,349	500	18.7	6.8	0.36	0.37	12	15	14
	20 CVE	630	12,227	3,081	1,208	19.4	4.9	0.25	0.39	41	34	34
June	8 CV	775	7,783	1,335	452	10.0	1.7	0.17	0.34	39	24	25
	4 CVL	132	1,608	339	163	12.2	2.6	0.21	0.48	8	6	9
	17 CVE	536	10,402	3,961	1,213	19.4	7.4	0.38	0.31	53	70	66
July	10 CV	981	17,852	6,885	2,281	18.2	7.6	0.39	0.33	74	81	77
	6 CVL	198	4,481	1,447	656	22.6	7.3	0.32	0.45	19	17	22
	4 CVE	122	1,756	136	32	14.4	1.1	0.08	0.24	7	2	1
August	11 CV	1,084	13,506	3,440	1,200	12.5	3.2	0.25	0.35	76	81	79
	7 CVL	231	3,290	747	327	14.2	3.2	0.23	0.44	19	18	21
	3 CVE	94	930	43	0	9.9	0.5	0.05	0.00	5	1	0

TABLE 13. CARRIER AIR OPERATIONS DATA AND OPERATING RATIOS,
By Type of Carrier and by Model of Aircraft,
for Selected Months of Major operations (Pacific Only)
A. FAST CARRIES FORCE

MONTH	CARRIERS IN CTION	PLANE TYPE AND COMPLEMENT	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	TONS OF BOMBS ON TARGETS	OPERATING RATIOS: Flights Per plane	Action Sorties Per Plane	Action Sorties Per Flight	Tons per Action Sortie	PERCENT OF MONTH TOTAL: Complement	Flights
1943 November	6 CV	216 F6F	*			*	4.4	*	0.00	32	*
		160 SBD	*	957	0	*	3.8	*	0.42	23	*
		32 SB2C	*	615	256	*	5.6	*	0.44	5	*
		105 TBF	*	179	78	*	5.1	*	0.81	15	*
				535	433						
	5 CVL	120 F6F	*	283	0	*	2.4	*	0.00	18	*
		45 TBF	*	201	160	*	4.5	*	0.80	7	*
1944 July	8 CV	304 F6F	5690	3640	292	18.7	12.0	0.64	0.08	33	35
		3 F4U	13	1	0	4.3	0.3	0.08	0.00	0	0
		40 SBD	252	154	70	6.3	3.9	0.61	0.45	4	2
		218 SB2C	3465	2698	1506	15.9	12.4	0.78	0.56	23	21
		141 TBF	2503	1827	1200	17.8	13.0	0.73	0.66	15	15
	7 CVL	168 F6F	3176	1074	192	18.9	6.4	0.34	0.18	18	19
		63 TBF	1343	485	345	21.3	7.7	0.36	0.71	7	8
October	9 CV	374 F6F	7237	3721	255	19.4	9.9	0.51	0.07	35	41
		272 SB2C	3146	2196	1359	11.6	8.1	0.70	0.62	26	18
		159 TBM	1907	1359	976	20.0	8.5	0.71	0.72	15	11
	8 CVL	184 F6F	3913	921	22	21.3	5.0	0.24	0.02	17	22
		72 TBM	1296	256	197	18.0	3.6	0.20	0.77	7	8
1945 January	8 CV	551 F6F	9673	3870	435	17.6	7.0	0.40	0.11	59	62
		36 F4U	600	131	12	16.7	3.6	0.22	0.09	4	4
		75 SB2C	1001	703	381	13.3	9.4	0.70	0.54	8	6
		113 TBM	1494	1080	753	13.2	9.6	0.72	0.70	12	10
	5 CVL	112 F6F	2248	612	49	20.1	5.5	0.27	0.08	12	15
		45 TBM	432	309	212	9.6	6.9	0.72	0.69	5	3
April	10 CV	390 F6F	9426	2779	292	24.2	7.1	0.29	0,11	33	38
		303 F4U	6017	1916	250	19.9	6.3	0.32	0.13	26	24
		135 SB2C	1929	1515	984	14.3	11.2	0.79	0.65	11	8
		153 TBM	2258	1585	1290	14.8	10.4	0.70	0.81	13	9
	6 CVL	144 F6F	4365	1644	259	30.-3	11.4	0.38	0.16	12	18
		54 TBM	755	633	537	14.0	11.7	0.84	0.85	5	3
July	10 CV	412 F6F	7347	2554	387	17.8	6.2	0.35	0.15	35	33
		281 F4U	5374	1937	319	19.1	6.9	0.36	0.16	24	24
		135 SB2C	2362	1162	569	17.5	8.6	0.49	0.49	11	11
		153 TBM	2769	1232	1006	18.1	8.1	0.44	0.82	13	12
	6 CVL	144 F6F	3499	892	197	24.3	6.2	0.25	0.22	12	16
		54 TBM	982	555	459	18.2	10.3	0.57	0.83	5	4

* Data not available.

TABLE 13. continued

B. ESCORT CARRIERS

MONTH	CVEs IN IN AC- TION	PLANE TYPE AND COMPLE- MENT	FLIGHTS, SQUAD- RONS IN ACTION	ACTION SORTIES	TONS OF BOMBS ON TARGETS	OPERATING RATIOS				PERCENT OF MONTH TOTAL	
						lights Per Plane	Action Sorties Per Plane	Action Sorties Per Flight	Tons Per Action Sortie	Comple- ment	Flights
1944											
February	8	36 F6F	735	41	0	20.4	1.1	0.06	0.00	17	18
		60 FM	965	84	8	16.1	1.4	0.09	0.10	29	23
		27 SBD	522	108	33	19.3	4.0	0.21	0.31	13	13
		87 TBF	1877	288	181	21.6	3.3	0.15	0.63	41	46
July	11	60 F6F	1713	1090	236	28.6	18.2	0.64	0.22	19	22
		128 FM	2454	748	0	19.2	5.8	0.30	0.00	41	32
		123 TBF	3533	832	425	28.7	6.8	0.24	0.51	40	46
October	18	54 F6F	893	330	13	16.5	6.1	0.37	0.04	11	12
		248 FM	3897	1273	5	15.7	5.1	0.33	0.00	49	53
		204 TBF	2622	892	512	12.9	4.4	0.34	0.57	40	35
1945											
January	18	364 FM	7137	1165	4	19.6	3.2	0.16	0.00	63	69
		210 TBM	3162	767	462	15.1	3.7	0.24	0.60	37	31
April	20	84 F6F	3117	1229	236	37.1	14.6	0.39	0.19	13	19
		328 FM	8039	2473	16	24.5	7.5	0.31	0.01	52	49
		222 TBM	5342	2278	1169	24.1	10.3	0.43	0.51	35	32

NOTES TO TABLE 14

In this table all carrier combat activity is broken down into campaigns, raids and battles, and the longer campaigns into major periods and areas of activity.

Especial attention is invited to the known overstatement, in these data, of the number of enemy planes engaged (see Definitions), which will be obvious in some of the smaller operations herein.

Among the interesting items in this table are the figures showing the relatively small scale of operations, compared with results accomplished, in some of the operation, including Coral Sea, Midway, the Solomons actions, the North Africa landings, the Tarawa raid, the Rabaul raids, the first Truk strike and Marianas raid, and the Bonins strikes of June-July 1944 (particularly the second, on 24 June).

Also worthy of note is the tremendous destruction of enemy aircraft. achieved in the Philippines in the operation of September-December 1944, against Japan on three days of February 1945, in the Okinawa campaign, end in the final assault on Japan.

TABLE 14. AIR OPERATIONS AND RESULTS. FOR INDIVIDUAL CARRIER OPERATIONS AND PHASES THEREOF.

RAID, BATTLE, OR CAMPAIGN: Target Area, Type of Carrier	DATES OF ACTION	NUMBER OF CARRIERS IN ACTION CV	CVL	CVE	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIR-CRAFT ENGAGED	ENEMY AIRCRAFT DESTROYED Air	Ground	OWN LOSSES ON ACTION SORTIES To Enemy A/A	A/C	Operational
1942-43:												
EARLY RAIDS	2/1-4/19	3	-	-	391	129	53	34	12	7	5	7
Marshalls Raids	2/1	2	-	-	165	59	21	15	10	4	4	6
Rabaul Raid	2/20	1	-	-	27	0	30	17	0	0	2	0
First Wake Raid	2/24	1	-	-	51	18	1	1	2	1	0	1
First Marcus Raid	3/4	1	-	-	38	11	0	0	0	1	0	0
Salamaua Raid	3/10	2	-	-	104	40	1	1	0	1	0	0
Tokyo Raid	4/19	1	-	-	6	1	0	0	0	0	0	0
CORAL SEA BATTLE	5/4-5/8	2	-	-	332	139	178	66	21	1	21	11
Tulagi Raid	5/4-5/5	1	-	-	107	59	6	5	1	0	1	3
Main Battle	5/7-5/8	2	-	-	225	80	172	61	20*	1	20	8
BATTLE OF MIDWAY	6/4-6/6	3	-	-	374	100	294	69	140*	20	41	16
SOLOMONS CAMPAIGN	8/7-2/4	4			1.162	285	610	200	51	7	43	25
Guadalcanal Landing	8/7-8/8	3	-	-	503	153	126	29	20	0	11	1
Eastern Solomons	8/24	3	-	-	178	28	200	59	10*	5	10	5
Tonolei Raid	10/5	1	-	-	69	12	6	4	4	0	0	0
Guadalcanal Support	.0/12-10/16	1	-	-	89	19	6	5	12	0	0	1
Battle of Santa Cruz	10/26	2	-	-	129	29	216	81	5*	1	20	18
Guadalcanal Battle	.1/13-11/14	1	-	-	96	21	28	7	0	1	1	0
Kolombangara Raid	1/24	1	-	-	58	23	0	0	0	0	0	0
Rennell I. Battle	1/30	1	-	-	16	0	22	11	0	0	0	0
Solomons Support	1/30-2/4	1	-	-	24	0	6	4	0	0	1	0
NORTH AFRICA LANDING	11/8-11/11	1	-	3	512	77	61	30	30#	14	1	7
ATTU LANDING	5/11-5/20	-	-	1	86	4	0	0	0	0	0	7
SECOND MARCUS RAID	8/31	2	1	-	290	116	0	0	7	3	0	1
BAKER ISLAND LANDING	9/1-9/8	-	2	-	12	0	3	3	0	0	0	0
TARAWA RAID	9/18	1	2	-	184	83	2	2	15	4	0	2
NORWAY RAID	10/4	1	-	-	51	16	2	2	0	3	0	1
SECOND WAKE RAID	10/5-10/6	3	3	-	882	319	97	41	27	10	1	13
BOUGAINVILLE SUPPORT	11/1-11/11	3	2	-	707	210	371	138	19	8	22	10
Buka-Bonis Strikes	11/1-11/2	1	1	-	251	88	1	1	19	4	0	7
First Rabaul Raid	11/5	1	1	-	97	25	118	28	0	1	8	0
Second Rabaul Raid	11/11	3	2	-	359	97	252	109	0	3	14	3
GILBERT IS. CAMPAIGN	11/19-12/8	6	5	8	2,703	915	195	96	56	12	7	17
Gilbert Is., CV-CVL	11/19-12/5	5	4	-	1,401	443	60	39	3	3	2	7
CVE	11/19-11/22	-	-	8	215	35	1	1	0	0	0	1
Southern Marshalls	11/19-11/26	2	1	-	460	193	21	13	19	4	1	7
Nauru Strike	11/19	1	1	-	210	81	10	2	2	0	1	1
Kwajalein Raid	12/4	4	1	-	287	115	102	40	27	2	3	1
Nauru Strike	12/8	1	1	-	130	48	1	1	5	3	0	0
FIRST KAVIENG RAID	12/25/43	1	1	-	103	35	4	3	0	1	0	0
SECOND KAVIENG RAID	1/1/44	1	1	-	88	38	60	14	0	0	3	0
THIRD KAVIENG RAID	1/4/44	1	1	-	90	35	27	11	0	0	1	0

* Estimated lost aboar i enemy ca rriers, or be cause of sinking of enemy carriers.
# Estimated.

TABLE **14.** Continued

RAID, BATTLE, OR CAMPAIGN Target Area, Type of Carrier	DATES OF ACTION	NUMBER OF CARRIERS IN ACTION CV	 CVL	 CVE	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIR-CRAFT ENGAGED	NEMY AIRCRAFT DESTROYED Air	 Ground	OWN LOSSES ON ACTION SORTIES To Enemy A/A	 A/C	 Opera-tional
1944												
MARSHALLS CAMPAIGN	1/30- 2/23	6	6	8	7,387	2,261	308	189	260	31	7	34
Marshall Is., CV-CVL	1/30- 2/23	6	6	-	4,948	1,382	43	27	106	15	1	20
" CVE	2/1 - 2/21	-	-	8	639	278	0	0	0	0	0	5
First Truk Strike	2/16- 2/17	5	4	-	1,456	499	213	123	82	13	3	8
Marianas Raid	2/23	3	3	-	344	102	52	39	72	3	3	1
MILLE STRIKE	3/19	1	-	-	111	46	0	0	0	3	0	0
EMIRAU SUPPORT	3/20- 3/29	-	-	2	27	1	1	1	0	0	0	0
PALAU, YAP, WOLEAI	3/30- 4/1	5	6	-	2,172	712	203	111	46	20	3	15
HOLLAND IA-AITAPE	4/21- 4/26	5	7	8	2,541	830	40	30	103	5	0	20
Fast Carriers	4/21- 4/26	5	7	-	2,314	713	39	29	103	5	0	18
CVEs	4/22- 4/23	-	-	8	227	117	1	1	0	0	0	2
SECOND TRUK STRIKE	4/30- 5/2	5	7	-	2,283	815	127	60	85	25	5	3
SABANG RAID	4/19	1	-	-	62	19	3	3	20	2	0	0
SOERABAJA RAID	5/17	1	-	-	55	20	2	2	21	1	0	0
THIRD WAKE & MARCUS	5/20- 5/24	2	1	-	708	286	1	1	0	6	0	1
MARIANAS CAMPAIGN	6/11- 8/8	8	8	12	22,432	7,090	1,791	917	306	203	65	178
Marianas, CV-CVL	6/11- 6/30	7	8	-	6,982	2,045	1,263	595	115	82	37	105
" , CVE	6/11- 6/30	-	-	11	1,220	237	130	51	20	19	4	15
" , CV-CVL	7/1 - 8/8	8	8	-	7,455	2,726	14	14	0	28	1	27
" , CVE	7/1 - 8/1	-	-	11	2,679	664	0	0	10	9	0	6
First Bonins Strike	6/15- 6/16	3	4	-	478	152	67	41	80	14	2	8
Second Bonins Raid	6/24	2	2	-	86	1	141	110	0	0	5	0
Third Bonins Strike	7/3 - 7/4	4	3	-	873	309	157	92	27	13	13	5
Fourth Bonins Strike	8/4 - 8/5	4	2	-	872	307	11	7	7	15	1	3
Western Carolines	7/25- 7/28	6	2	-	1,787	649	8	7	47	23	2	9
SOUTHERN FRANCE	8/15- 8/29	-	-	2	536	81	8	8	0	13	0	0
FIFTH BONINS STRIKE	8/31- 9/2	2	1	-	533	199	11	11	43	7	0	4
FOURTH WAKE RAID	9/3	-	1	-	61	34	0	0	0	0	0	0
PALAU-MOROTAI	9/6 -10/3	8	8	16	12,653	3,980	756	372	527	65	13	43
W. Carolines, CV-CVL	9/6 - 9/18	8	8	-	3,889	1,369	0	0	5	19	1	7
W. Carolines, CVE	9/12-10/1	-	-	10	2,282	440	0	0	1	2	0	6
Philippines, CV-CVL	9/9 - 9/24	6	7	-	6,025	2,115	752	370	463	39	12	28
Halmahera-Morotai	9/15-10/3	2	1	6	423	56	4	2	30	5	0	2
Celebes, Borneo	9/15	-	2	-	34	0	0	0	28	0	0	0
LEYTE CAMPAIGN	10/10-11/25	10	8	18	15,327	4,853	2,806	1460	1160	248	85	162
Ryukyus Area	10/10-10/16	9	8	-	1,538	567	130	77	88	10	2	6
Formosa Area	10/12-10/16	9	8	-	2,808	963	674	361	278	44	23	9
Philippines, CV-CVL	10/11-10/30	9	8	-	4,100	1,282	1,039	539	179	74	42	66
" CVE	10/17-10/29	-	-	18	2,484	524	419	211	117	38	7	45
" CV-CVL	11/5 -11/25	10	6	-	4,299	1,471	544	272	498	81	11	36
Western Carolines	11/22	2	2	-	98	46	0	0	0	1	0	0
MINDORO CAMPAIGN	12/13-12/17	7	6	6	2.062	333	145	111	230	28	2	27
Fast Carriers, Luzon	12/14-12/16	7	6	-	1,852	330	84	66	208	28	0	27
CVEs, Visayas	12/13-12/17	-	-	6	210	3	61	45	22	0	2	0

TABLE 14. Continued

RAID, BATTLE, OR CAMPAIGN Target Area. Type of Carrier	DATES OF ACTION	NUMBER OF CARRIERS IN ACTION CV	 CVL	 CVE	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIR-CRAFT ENGAGED	ENEMY AIRCRAFT DESTROYED Air	 Ground	OWN LOSSES ON ACTION SORTIES To Enemy A/A	 A/C	 Operational
1945												
LINGAYEN CAMPAIGN	1/3 -1/30	8	5	19	8,637	2,308	372	243	474	108	10	66
Philippines, CV-CVL	1/6 -1/7	8	5	-	1,426	288	41	25	93	9	1	26
CVE	1/4 -1/30		-	19	1,932	466	151	91	10	10	2	13
Formosa	1/3 -1/21	8	5	-	2,894	834	120	93	243	36	3	15
Indo China	1/12	8	5	-	910	324	18	14	97	19	0	4
South China	1/15-1/16	8	5	-	799	235	42	20	3	26	4	6
Ryukyus	1/22	7	5	-	676	161	0	0	28	8	0	2
IWO JIMA CAMPAIGN	2/16-3/8	11	5	12	8,091	1,691	1,262	437	275	77	40	51
Japan	2/16-2/25	11	5	-	2,493	376	1,241	420	228	25	38	27
Bonins, CV-CVL	2/18-3/8	11	5	-	1,932	667	15	11	1	15	2	14
" CVE	2/16-3/8	-	-	12	2,746	441	2	2	9	25	0	5
Ryukyus	3/1	7	3	-	920	207	4	4	37	12	0	5
OKINAWA CAMPAIGN	3/18-6/22	14	8	28	40,157	12,888	2,756	692	824	305	59	202
Ryukyus, CV-CVL	21-31 March	8	6	-	5,248	1,640	129	87	40#	48	2	36
" CVE	25-31 March		-	13	1,698	333	7	5	29#	1	0	9
Japan	8-29 March	10	6	-	3,054	744	580	252	263#	48	30	38
Ryukyus, CV-CVL	1-30 April	10	6	-	9,442	3,374	1,155	850	124#	59	16	45
" CVE	1-30 April	-	-	20	5,980	1,421	147	112	103#	39	2	14
Japan	7-17 April	7	6	-	630	238	130	87	77#	25	0	3
Ryukyus, CV-CVL	1-31 May	9	6	-	4,000	1,581	337	204	22#	28	3	25
" CVE	1-31 May	-	-	20	3,081	1,208	9	8	7#	16	0	9
Japan	3-24 May	5	4	-	1,777	656	146	66	93#	18	2	1
Ryukyus, CV-CVL	1-10 June	6	3	-	855	426	17	7	0	2	0	5
" CVE	1-22 June		-	17	3,961	1,213	5	4	13#	14	0	7
Japan	3-8 June	5	3	-	431	54	94	10	53	7	4	10
CV-CVL TOTAL	3/18-6/10	14	8	-	25,437	8,713	2,578	563	672	235	57	163
CVE TOTAL	3/25-6/22		-	28	14,720	4,175	168	129	152	69	2	39
RYUKYUS TOTAL	3/21-6/22	13	8	28	34,265	11,196	1,796	277	338	206	23	150
JAPAN TOTAL	3/18-6/8	13	8	-	5,892	1,692	950	415	486	98	36	52
ASSAULT ON JAPAN	7/10-8/15	10	6	1	12,153	4,382	207	121	1102	186	11	72
Hokkaido	7/14-8/10				2,349	982	2	1	79	32	0	16
Tokyo, N. Honshu	7/ 10-8/15				5,668	1,882	104	64	762	53	7	28
Central Honshu	7/24-8/ 10				2,665	899	75	36	233	67	3	13
Kyushu, Kure Area	7/24-7/28				1,471	619	26	20	28	34	1	15
MINOR 1945 ACTIONS	5/17-8/6	5	2	5	1,128	329	7	6	0	4	0	4
Maloelap Strike	5/17	1	-	-	195	80	0	0	0	0	0	1
Fifth Wake Strike	6/20	2	1	-	388	135	0	0	0	2	0	1
Balikpapan Landing	7/1 -7/3	-	-	1	82	29	0	0	0	1	0	0
Actions off Okinawa	7/6, 7/23	-	-	1	16	0	3	3	0	0	0	0
Sixth Wake Strike	7/18	1	-	-	167	31	0	0	0	0	0	0
Marianas Strikes	7/24, 7/ 26	-	-	1	38	3	0	0	0	0	0	0
Seventh Wake Strike	8/1		1	-	39	9	0	0	0	0	0	0
China Sea Strikes	8/4 -8/6	-	-	3	35	0	4	3	0	1	0	0
Eighth Wake Strike	8/ 6	1	-	-	168	42	0	0	0	0	0	2

Approximations based on proration of Force total for campaign.

TABLE 15. MARINE CARRIER AIR OPERATIONS AND RESULTS, 1945
Monthly, By Model of Aircraft and Type of Carrier

TYPE CARRIER, TYPE PLANE, MONTH	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER FLIGHTS	ON SHIP	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
CV F4U January	600	131	1	1	7	4	1	9	0	12
February	1780	498	8	6	5	21	0	5	24	52
March	1849	897	14	7	3	7	11	3	41	53
April	2025	702	11	2	6	6	2	31	87	84
May	1000	399	6	0	0	2	23	5	7	73
June	300	23	0	0	0	2	0	0	0	3
TOTAL	7554	2650	40	16	21	42	37	53	159	277
CVE F4U May	586	62	2	0	0	3	1	1	0	13
June	604	288	2	0	0	0	0	0	0	63
July	887	75	0	0	0	1	0	3	0	5
August	159	18	0	0	0	1	0	2	0	0
TOTAL	2236	443	4	0	0	5	1	6	0	81
CVE F6F May	287	59	0	0	0	6	0	0	0	10
June	157	77	1	0	0	1	0	0	0	15
July	55	8	1	0	0	1	0	0	0	0
August	14	2	0	0	0	0	0	0	0	0
TOTAL	513	146	2	0	0	8	0	0	0	25
CVE TBM May	473	181	3	0	0	0	0	0	0	106
June	513	298	2	0	0	1	0	0	0	186
July	399	17	0	0	0	0	0	0	0	12
August	229	0	0	0	0	0	0	0	0	0
TOTAL	1614	496	5	0	0	1	0	0	0	304
GRAND TOTAL	11917	3735	51	16	21	56	38	59	159	687

NOTES TO TABLE 15

This table shows the separate activity of Marine carrier aircraft, which has been included in all previous tables but not shown separately. A total of twelve 18-plane F4U squadrons operated from CVs for varying periods, and four CVEs fully complemented by Marine VF, VF(N) and VTB were in action during the last four months of the war.

TABLE 16. LOSSES, LOSS RATES, AND OPERATIONAL DATA,
LAND-EASED NAVAL AND MARINE AIRCRAFT, PACIFIC ONLY, 1944 - 1945 ONLY,
By Service (Navy-Marine) and Plane Model

SERVICE, PLANE MODEL	AIR-CRAFT ON HAND *	FLIGHTS SQUAD-RONS IN ACTION	ACTION SORTIES	OWN LOSS OPERATIONAL Ac-tion Sor-ties	OWN LOSS OPERATIONAL On Other Fl'ts	OWN LOSSES ON GR'D	TOTAL, Inclu-ding Enemy Action	OWN LOSS RATES OPERATIONAL Per 100 Action Sor-ties	OWN LOSS RATES OPERATIONAL Per 100 Other Fl'ts	OWN LOSS RATES GROUND Per 100 Planes Per Month	OWN LOSS RATES TOTAL Per 100 Planes Per Month	FLIGHTS Per Plane Per Month	FLIGHTS Per Ac-tion Sor-tie
MARINE SQUADRONS	13873	346,342	102,324	189	523	90	1169	0.19	0.21	0.7	8.4	25.0	3.4
F4U, FG	7715	201,352	50,118	131	372	43	788	0.26	0.25	0.6	10.2	26.1	4.0
F6F	511	11,038	1,646	3	27	5	42	0.18	0.29	1.0	8.2	21.6	6.7
FM#	1	25	3	0	1	0	1	@	@	@	@	@	@
SBD	3115	69,526	35,341	33	51	25	173	0.09	0.15	0.8	5.6	22.3	1.7
SB2C, SBW	418	13,796	2,023	3	13	0	17	0.15	0.11	0.0	4.1	33.0	6.8
TBF, TBM	995	28,118	4,758	7	31	15	87	0.15	0.13	1.5	8.7	28.3	5.9
PBJ	1048	20,770	8,390	12	23	2	55	0.14	0.19	0.2	5.2	19.8	2.5
PBY#	3	61	8	0	0	0	0	@	@	@	@	@	@
PV	46	1,413	21	0	5	0	6	@	0.36	@	@	@	@
PB4Y	21	243	16	0	0	0	0	@	0.00	@	@	@	@
NAVY SQUADRONS	6751	88,219	14,414	44	186	120	521	0.31	0.25	1.8	7.7	13.1	6.1
F6F	362	7,707	1,868	12	13	4	41	0.64	0.22	1.1	11.3	21.3	4.1
F4U, FG	109	2,123	742	2	4	0	19	0.27	0.29	0.0	17.3	19.5	2.9
FM	18	242	25	0	1	0	1	@	0.46	@	@	@	@
SBD	396	7,230	2,981	1	16	0	29	0.03	0.38	0.0	7.3	18.3	2.4
SB2C, SBW	82	2,009	332	1	2	6	11	0.30	0.12	@	@	24.5	6.1
TBF, TBM	128	2,421	1,157	3	4	3	16	0.26	0.32	2.3	12.5	18.9	2.1
PB4Y	2244	26,987	3,215	13	68	70	224	0.40	0.29	3.1	10.0	12.0	8.4
PV	1406	16,896	2,439	9	23	18	79	0.37	0.16	1.3	5.6	12.0	6.9
PBM	730	7,672	506	1	33	9	59	0.20	0.46	1.2	8.1	10.5	15.2
PBY	1063	12,600	1,007	1	20	7	35	0.10	0.17	0.7	3.3	11.9	12.5
PB2Y	213	2,332	142	1	2	3	7	0.70	0.09	1.4	3.3	10.9	16.4
GRAND TOTAL	20624	434,561	18,217	234	709	212	1693	0.20	0.22	1.0	8.2	21.1	3.7

* In terms of plane-months; sum of aircraft reported on hard each month by squadrons in action. Where no suitable figure was reported for aircraft on hand, authorized complement was used. A monthly average strength in action can be obtained by dividing by 20.

\# Attached to Hedrons.

@ Ratio not calculated; less than 100 action sorties, flights, or planes on hand.

NOTE: 1481 action sorties by planes not identified as to branch of service are excluded from all figures in this table except the grand total. These are broken down by plane model as follows: 349 F4U, 28 F6F, 440 unidentified VF, 484 SBD, 137 TBF, 41 unidentified VPB. Also in the same category are 2 F4US destroyed on ground, and 1 SBD lost operationally on an action sortie.

NOTES TO TABLE 16

This table presents detailed data on loss rates and flight activity for land-based aircraft in combat operations, for the years 1944-45 and in the Pacific only. The data are comparable with those for carriers given previously in Table 9.

Attention is invited to the low operational and overall loss rates for land-based planes, particularly for SBD, PBJ and PBY aricraft. Overall loss rates were influenced by the low losses to enemy action sustained by land-based aircraft, which made a large proportion of their attacks on lightly defended or undefended targets, with little airborne opposition in the period covered by this table. The higher lees rates for Navy planes of same types than for Marine planes of the same types are not especially significant; the Navy planes in these cases were frequently used in more demanding operations, and in any event the volume of Navy action in this period was relatively small.

(Cont. on next page)

(Cont. from preceding page)

It will be noted that land-based VF, VSB and VTB generally made far more flights per month than carrier planes; about 25 per VP, 22 per VSB, 27 per VTB, compared with carrier averages of about 17, 11, and 15 respectively. Land-based planes of these types also flew more action sorties per month over 6 per VF, 10 per VSB, 5 per VTB, as against 5, 6, and 6 respectively.

Patrol bombers, other than the Marine PBJs, averaged 10 to 12 flights per month; only from 6 to 17 percent of these resulted in action. PBJs, used primarily as short-range formation bombers, averaged 20 flights per month, 40 percent of which resulted in action.

Marine F6Fs were almost entirely night fighters, and flew a higher ratio of patrol to action flights than the F4U day fighters. Marine TBMs were also largely used for patrol work, as were the Navy SB2Cs in inshore patrol squadrons.

NOTES TO TABLE 17 (The purpose of this table is primarily to provide a historical record. A number of interesting observations may be made from the tables:)

(a) Marine fighters carried the greatest burden of aerial combat activity of any of the land-based planes. Part A shows their defensive and offensive combat record through the Solomons-Rabaul campaign. In few months from August 1942 to February 1944 did their relatively small force fail to shoot down 50 or more Jap planes. In December 1944 a Marine fighter group went to the rescue at Leyte. In April-June 1945 at Okinawa Marine VF renewed their early performances by accounting for 479 Jap planes in 3 months, this time without the high losses that had marked their successes under the difficult conditions of Guadalcanal (when the combination of F4Fs, poor airstrips, and superior enemy forces had held them to a 5 or 6-to-1 combat superiority over the Japs instead of their 36-to-1 ratio of 1945).

(b) After the removal of the enemy air force from the Bismarcks area, the Marine VF took to bombing, and after the middle of 1944 averaged nearly a third of a ton of bombs on each of their low-level sorties against the Japs.

(c) The Marine dive and torpedo bomber force, building up from small beginnings to a substantial striking power, was the backbone of the anti-shipping and tactical striking force in the Solomons, contributed greatly to the reduction of the Jap bases in the Marshalls, and later contributed the bulk of its strength to give tactical air support in the reconquest of Luzon and the southern Philippines. During late 1942 and early 1943 its few planes were devoted mainly to stopping Jap naval and transport vessels from reinforcing Guadalcanal. Later it carried its anti-shipping strikes to Bougainville, and in early 1944 cleaned the last Jap ships out of Rabaul. Meanwhile as its force expanded it built up its attacks on nearby airfields (Munda and Vila), gave heavy direct support in the New Georgia and Bougainville campaigns, and made the most accurate and effective attacks in the campaign for destruction of the Jap base at Rabaul. In March and April 1944 it was a major factor in turning back the Jap counter attacks on Bougainville, doubling its previous volume of activity, then returned to neutralization of the entire Bismarck area. In late 1944 the Marine SBDs were largely withdrawn from the Bismarcks area for transfer to Luzon, where they began their biggest, though not their most important, job of the war.

(d) Navy fighters and single-engine bombers were used ashore largely to supplement the Marines in critical periods. Some of the shore-based naval squadrons were from sunk, damaged or non-available carriers; others were merely surplus carrier groups for which there was no current need afloat; a few in late 1943 and early 1944 were specially formed as shore-based support squadrons. After June 1944 the latter were decommissioned, and the surplus of carrier groups disappeared; thereafter the only Navy VF, VSB and VTB in shore-based action were from carrier groups conducting training exercises in forward areas, or Navy inshore patrol squadrons patrolling in the Marshalls.

Navy shore-based fighters provided the extra strength needed in the Solomons in late 1942, in the New Georgia and Bougainville campaigns, and against Rabaul. In these campaigns they accounted for 422 Jap planes (in some 2,500 action sorties flown). In addition, one squadron aided in the early neutralization of the Marshalls.

Navy shore-based bombers, while used more continuously than the fighters, were also employed to bolster our Marine forces for major encounters. Thus in September-November 1942 carrier bomber squadrons were used ashore in the critical struggles on Guadalcanal, then withdrawn when the emergency ended. From March to June 1943 (when the Marines had few VTB) Navy squadrons provided most of the weight of attack in the Solomons. In July reinforced Navy squadrons delivered a remarkable total of 1,238 tons to support the New Georgia campaign (against the Marine bombers' 395 tons), then withdrew again for rest. Thereafter Navy land-based bombing effort continued at

(Cont. on page 52)

TABLE 17. MONTHLY OPERATIONS AND RESULTS, FOR LAND-BASED AIRCRAFT,
By Type of Aircraft and by Service (Navy-Marine), Pacific only

A. MARINE FIGHTERS

MONTH	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES					ENEMY AIRCRAFT DESTROYED IN COMBAT		TONS OF BOMBS ON TARGETS
			ON ACTION SORTIES			ON OTHER FL'TS	ON GR ND			
			To Enemy A/A	To Enemy A/C	Operational			Bombers	Fighters	
1941-December	*	49	0	0	2	0	18	10	0	0
1942 -February	*	#	0	1	0	0	0	#	#	#
March	*	4	0	0	0	0	0	1	0	0
June	*	27	0	15	0	0	0	8	7	0
August	*	57	0	7	0	1	2	21	31	0
September	*	177	1	12	0	6	0	55	22	0
October	*	401	1	19	3	4	6	51	100	0
November	*	168	1	16	6	4	0	22	44	0
December	*	40	0	4	0	4	0	0	17	0
1943-January	*	84	0	7	0	5	0	4	48	0
February	*	10	0	5	0	8	0	5	10	0
March	*	#	0	2	0	0	0	#	#	#
April	*	197	1	11	3	6	2	13	33	0
May	*	113	0	5	1	1	0	0	15	0
June	*	156	0	17	0	20	1	24	65	0
July	*	358	0	18	2	13	0	27	90	0
August	*	414	1	10	4	9	0	15	93	0
September	*	430	3	14	8	7	0	11	59	0
October	*	282	4	3	1	9	0	0	57	0
November	*	401	4	5	3	8	1	7	12	0
December	*	462	2	10	4	14	1	0	73	0
1944-January	3,679	951	2	20	6	14	2	0	249	0
February	4,554	1,160	2	13	6	7	0	7	73	0
March	6,593	819	7	0	0	14	1	0	15	51
April	5,956	1,169	13	1	3	11	1	2	0	149
May	8,334	1,594	9	0	5	8	2	0	0	278
June	7,314	1,332	10	0	3	11	2	0	1	165
July	8,029	2,901	10	0	6	6	0	0	0	745
August	11,056	4,331	8	0	4	11	0	0	0	1,420
September	11,145	3,607	8	0	8	10	1	0	0	1,091
October	15,013	4,747	12	0	5	9	0	0	1	1,558
November	14,638	5,148	16	0	9	7	3	0	0	1,402
December	15,533	2,958	12	3	8	25	5	10	44	1,056
1945-January	11,611	2,433	11	0	8	32	5	1	4	621
February	10,036	3,324	11	0	9	16	8	0	1	1,127
March	7,914	2,945	12	0	5	18	0	0	1	953
April	12,435	3,618	9	5	12	28	13	98	47	1,173
May	15,395	2,662	15	3	9	46	5	84	133	924
June	18,837	2,980	15	5	13	42	0	41	76	976
July	15,753	2,540	14	1	13	72	0	8	10	767
August	8,590	548	2	0	2	13	0	2	1	133
1941-2 Total	*	923	3	74	11	19	26	108	221	0
1943 Total	*	2,907	15	107	26	100	5	106	555	0
1944 Total	11,844	30,717	109	37	63	133	17	19	383	7,915
1945 Total	00,571	21,050	89	14	71	267	31	234	273	6,674
GRAND TOTAL	12,415	55,597	216	232	171	519	79	527	1,432	14,589

* No data available

\# No action reported; losses reported may have been sustained in unreported actions during this month, or in previous months' action, or may be erroneous reports.

No action was reported during months not listed above.

TABLE 17. Continued

B. MARINE DIVE AND TORPEDO BOMBERS

MONTH	FLIGRTS, SQUAD-RONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Opera-tional	ON OTHER FL'TS	ON GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
1942-June	*	39	4	6	3	1	0	0	6	11
August	*	20	1	0	0	1	0	0	0	8
September	*	125	0	2	4	4	0	0	0	31
October	*	123	4	2	2	4	7	0	4	51
November	*	321	5	1	1	1	0	0	4	126
December	*	291	3	1	0	8	0	0	2	83
1943-January	*	310	2	4	1	5	0	0	2	97
February	*	374	8	9	0	9	0	0	6	167
March	*	162	0	0	1	6	0	0	1	81
April	*	122	11	1	2	10	0	0	0	61
May	*	69	1	0	2	1	0	0	0	47
June	*	102	1	1	5	5	0	0	0	57
July	*	808	4	1	1	3	0	0	2	395
August	*	655	1	0	2	1	0	0	0	373
September	*	788	7	0	1	1	2	0	2	460
October	*	774	2	0	3	6	1	0	0	435
November	*	1,331	2	1	1	6	2	0	0	874
December	*	1,527	3	0	4	7	0	0	0	1,000
1944 -January	3,495	914	10	4	6	4	2	0	14	427
February	3,421	1,421	15	1	2	10	1	0	2	707
March	5,154	2,951	7	0	0	3	1	0	0	1,658
April	5,855	2,269	8	0	4	1	1	0	0	1,205
May	4,700	2,030	13	0	1	4	0	0	0	942
June	5,156	1,574	7	0	1	2	0	0	0	659
July	4,413	2,116	3	0	1	0	1	0	0	983
August	4,761	2,352	2	0	0	4	0	0	0	1,047
September	4,360	2,018	3	0	0	2	0	0	0	915
October	6,335	1,938	2	0	1	4	0	0	0	892
November	6,019	1,026	0	0	3	6	1	0	0	455
December	5,234	466	0	0	1	6	10	0	0	214
1945-January	4,084	654	1	0	0	2	0	0	0	293
February	5,768	4,128	4	2	3	2	2	0	0	1,767
March	7,494	4,508	5	0	9	1	1	0	0	2,127
April	7,803	3,402	5	0	2	6	9	0	0	1,602
May	8,567	3,623	3	0	1	15	9	0	1	1,929
June	9,327	2,731	1	0	4	11	1	1	0	1,422
July	6,307	1,699	3	0	3	11	1	0	0	919
August	3,167	302	0	0	1	1	0	0	0	155
1942 Total	*	919	17	12	10	19	7	0	16	310
1943 Total	*	7,022	42	17	23	60	5	0	13	4,047
1944 Total	58,903	21,075	70	5	20	46	17	0	16	10,104
1945 Total	52,537	21,047	22	2	23	49	23	1	1	10,214
GRAND TOTAL	111,440	50,063	151	36	76	174	52	1	46	24,675

* No data available.

No action was reported during months not listed above.

TABLE 17. Continued

C . NAVY FIGHTERS

MONTH	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES: To Enemy A/A	To Enemy A/C	Operational	ON OTHER FL'TS	ON GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT: Bombers	Fighters	TONS OF BOMBS ON TARGETS
1942-September	*	82	0	4	1	2	0	19	15	0
October	*	77	0	15	1	2	16	6	7	0
November	*	7	0	0	0	1	3	0	4	0
1943-February	*	#	2	4	0	5	1	#	#	#
March	*	8	0	0	0	0	0	0	0	0
April	*	#	1	7	0	1	0	#	#	#
May	*	3	0	0	0	2	0	0	0	0
June	*	81	0	10	2	7	0	20	19	0
July	*	167	0	16	3	8	0	8	49	0
September	*	169	0	8	1	2	0	0	27	0
October	*	174	0	4	0	1	0	0	7	0
November	*	520	6	4	5	4	0	28	39	0
December	*	266	0	3	0	2	1	1	21	0
1944-January	1,804	412	0	15	6	5	1	2	94	0
February	1,242	629	2	3	1	0	0	0	56	1
March	2,077	494	3	0	3	4	1	0	0	19
April	1,748	367	0	0	2	5	0	0	0	85
May	1,015	358	0	0	0	2	0	0	0	101
June	900	231	0	0	2	0	0	0	0	5
July	0	23	0	0	0	0	0	0	0	0
1945-March	886	76	1	0	0	1	2	0	0	20
April	89	10	0	0	0	0	0	0	0	0
May	1	1	0	0	0	0	0	0	0	0
June	48	5	1	0	0	0	0	0	0	0
August	262	29	0	0	0	1	0	0	0	0
1942 Total	*	166	0	19	2	5	19	25	26	0
1943 Total		1,388	9	56	11	32	2	57	162	0
1944 Total	8,786	2,514	5	18	14	16	2	2	150	211
1945 Total	1,286	121	2	0	0	2	2	0	0	20
GRAND TOTAL	10,072	4,189	16	93	27	55	25	84	338	231

D. FIGHTERS, SERVICE UNKNOWN

1944-January	*	238	0	0	0	0	0	1	0	0
February	*	110	0	0	0	0	0	0	2	0
March	*	420	0	0	0	0	2	0	0	0
April	*	59	0	0	0	0	0	0	0	14
Total	*	817	0	0	0	0	2	1	2	14

* No data available.
\# No action reported; losses reported may have been sustained in unreported actions during this month, or in previous months' action, or may be erroneous reports.

No action was reported during months not listed above.

TABLE 17. Continued

B. NAVY DIVE AND TORPEDO BOMBERS

MONTH	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES ON ACTION SORTIES To Enemy A/A	To Enemy A/C	Operational	ON OTHER FL'TS	ON GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT Bombers	Fighters	TONS OF BOMBS ON TARGETS
1942-June	*	6	0	5	0	0	0	0	0	4
August	*	11	0	0	0	0	0	0	0	4
September	*	122	1	0	0	4	0	0	0	42
October	*	237	1	6	5	3	17	0	9	104
November	*	110	2	2	0	12	1	0	3	58
December	*	#	0	2	0	7	0	#	#	#
1943-February	*	12	0	1	0	1	0	0	0	6
March	*	154	0	0	1	2	0	0	0	97
April	*	118	1	0	0	2	0	0	0	91
May	*	262	2	0	3	1	0	0	0	179
June	*	386	2	1	1	10	0	0	0	248
July	*	1,747	3	2	2	4	0	0	4	1,238
August	*	34	0	0	0	0	0	0	0	25
September	*	163	0	0	1	1	0	0	0	103
October	*	225	3	0	1	5	0	0	0	160
November	*	392	0	1	1	1	0	0	0	227
December	*	456	1	0	0	2	1	0	0	262
1944-January	1,508	405	3	0	0	6	0	0	1	161
February	977	537	3	0	1	4	0	0	0	236
March	2,437	1,115	5	0	1	3	1	0	0	533
April	2,458	1,051	3	0	2	5	0	0	0	555
May	1,423	976	2	0	0	0	0	0	0	523
November	225	1	0	0	0	0	0	0	0	0
December	249	1	0	0	0	0	0	0	0	0
1945-March	219	56	0	0	0	1	8	0	0	35
April	323	28	0	0	0	0	0	0	0	2
May	364	42	2	0	0	0	0	0	0	1
June	447	104	1	0	0	1	0	0	0	42
July	394	86	0	1	1	2	0	0	0	30
August	636	68	0	0	0	0	0	0	0	24
1942 Total	*	486	4	15	5	26	18	0	12	212
1943 Total	*	3,949	12	5	10	29	1	0	4	2,636
1944 Total	9,277	4,086	16	0	4	18	1	0	1	2,008
1945 Total	2,383	384	3	1	1	4	8	0	0	134
GRAND TOTAL	11,660	8,905	35	21	20	77	28	0	17	4,990

F. DIVE AND TORPEDO BOMBERS, SERVICE UNKNOWN

1944-January	*	23	0	0	0	0	0	0	0	1
February	*	25	0	0	0	0	0	0	0	8
March	*	419	0	0	1	0	0	0	0	56
April	*	139	0	0	0	0	0	0	0	69
May	*	15	0	0	0	0	0	0	0	2
Total	*	621	0	0	1	0	0	0	0	136

* No data available.

#No action reported; losses reported may have been sustained in unreported actions during this month, or in previous months' actions, or may be erroneous reports.

No action was reported for months not listed above.

TABLE 17. Continued

G. NAVY PATROL BOMBERS

MONTH	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES IN ACTION SORTIES: To Enemy A/A	To Enemy A/C	Operational	OTHER FL'TS	ON GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT: Bombers	Fighters	TONS OF BOMBS ON TARGETS
1941-December	*	21	0	8	0	0	18	0	2	5
1942-January	*	13	0	2	0	0	4	0	1	0
February	*	6	0	5	0	0	5	0	1	0
May	*	6	0	0	2	0	0	0	0	3
June	*	28	5	13	1	6	0	0	0	5
July	*	4	0	0	0	2	0	0	0	1
August	*	10	0	1	0	1	1	0	4	6
September	*	8	0	0	0	3	1	0	0	1
October	*	10	0	1	0	0	0	0	0	2
November	*	#	0	2	0	0	4	#	#	#
December	*	3	0	0	0	0	1	0	0	0
1943-January	*	2	0	0	0	0	0	0	0	0
February	*	34	0	3	0	0	0	0	0	75
March	*	37	1	0	2	1	0	0	0	33
April	*	9	0	0	0	0	0	0	0	7
May	*	7	0	0	0	4	0	0	0	0
June	*	50	0	0	0	1	0	0	0	39
July	*	63	0	1	0	5	0	1	5	41
August	*	30	2	1	0	1	0	1	0	29
September	*	88	0	0	2	4	3	2	5	36
October	*	143	0	0	4	4	1	4	1	94
November	*	176	1	0	0	6	0	2	9	79
December	*	164	2	2	0	7	3	1	8	114
1944-January	3,541	349	5	1	1	8	3	2	6	280
February	3,560	313	2	0	0	8	5	3	1	193
March @	3,280	486	2	0	2	4	1	4	0	450
April	2,657	353	4	0	0	2	0	9	3	249
May	2,856	506	2	1	1	11	0	9	8	383
June	2,942	302	3	0	2	9	4	12	8	155
July	2,366	226	2	1	1	2	0	2	2	108
August	3,220	403	1	1	2	5	3	1	3	237
September	2,279	237	2	2	0	4	1	6	3	103
October	2,543	263	6	3	0	5	1	9	9	154
November	3,199	267	2	3	1	4	16	2	8	147
December	2,729	347	5	2	0	6	8	9	27	193
1945-January	2,900	141	1	0	2	6	0	3	7	42
February	2,726	265	9	0	3	6	2	13	13	42
March	4,921	450	10	1	1	12	10	14	11	173
April	4,395	449	6	0	0	9	15	9	2	161
May	4,027	743	20	3	3	10	9	15	28	367
June	4,390	552	10	3	3	14	11	1	19	347
July	4,433	493	7	1	2	14	13	3	7	203
August	3,523	205	4	1	1	7	5	2	6	58
1941-2 Total	*	109	5	32	3	12	34	0	8	23
1943 Total	*	803	6	7	8	33	7	11	28	547
1944 Total	35,172	4,052	36	14	10	68	42	68	78	2,652
1945 Total	31,315	3,298	67	9	15	78	65	60	93	1,393
GRAND TOTAL	66,487	8,262	114	62	36	191	148	139	207	4,615

* No data available .

\# No action reported; losses reported may have been sustained in unreported actions, or in previous months' actions, or may be erroneous reports.

@ Including 33 sorties, and 41 tons of bombs, by VPB of unknown branch of service.

No action was reported in months not listed above.

TABLE 17. Continued

H. MARINE PATROL BOMBERS

MONTH	FLIGHTS, SQUADRONS IN ACTION	ACTION SORTIES	OWN LOSSES IN ACTION SORTIES			ON OTHER FL'TS	ON GROUND	ENEMY AIRCRAFT DESTROYED IN COMBAT		TONS OF BOMBS ON TARGETS
			To Enemy A/A	A/C	Operational			Bombers	Fighters	
1943, Total	*	32	0	2	0	3	2	2	1	3
1944-January	351	11	0	0	0	0	0	1	0	0
February	421	6	1	0	0	1	0	1	4	0
March	687	132	2	0	0	5	0	1	0	70
April	285	142	0	0	2	0	0	0	0	81
May	877	158	1	0	0	2	0	0	1	60
June	436	148	1	0	1	0	0	0	0	43
July	479	188	1	0	0	0	0	0	0	119
August	846	239	0	0	0	1	0	0	0	143
September	789	333	5	0	0	1	0	0	0	173
October	885	322	1	0	1	1	0	0	0	198
November	1,314	655	0	0	1	4	0	0	0	507
December	1,274	685	0	0	0	0	0	0	0	670
1946-January	1,782	516	0	0	0	1	0	0	0	560
February	1,867	845	2	0	2	1	0	0	0	817
March	1,429	698	0	0	3	0	0	0	0	731
April	1,967	1,020	1	0	0	5	0	0	0	1,190
May	2,091	1,023	4	0	0	1	0	0	0	1,278
June	1,804	526	0	0	2	1	0	0	0	489
July	1,874	628	0	0	0	2	1	0	0	724
August	1,029	160	0	0	0	2	1	0	0	149
1943-4 Total	8,644	3,051	12	2	5	18	2	5	6	2,067
1945 Total	13,843	5,416	7	0	7	13	2	0	0	5,938
GRAND TOTAL	22,487	8,467	19	2	12	31	4	5	6	8,005

*Data not available.

(Cont. from p. 46)

a reduced scale in the Bougainville and Rabaul campaigns, and in the Marshalls, until its cessation in May 1944.

(e) The story of Navy Patrol bombers, particularly with respect to their anti-shipping campaign of 1945, is more fully told elsewhere in this report. Certain items of Table 17G require detailed comment here:

(1) Patrol bomber losses to enemy aircraft in June 1942 are believed overstated, but to what extent is not known.

(2) The high bomb tonnages reported for February and March 1943 result from initial use of the first PB4Y squadron for horizontal bombing in formations. They were later restored to their normal single-plane search function.

(3) High tonnage in January 1944 results from extensive minelaying operations in the Marshalls.

(4) High tonnages in March 1944 result from the use of VPB to meet the emergency created by the Jap counter attack on Bougainville, plus extensive use of PVs (during April and May also) for bombing strikes against the Marshalls and Nauru.

(5) The lull in activity in early 1945 represented exhaustion of targets within range of present bases, followed by redisposition of the force to Luzon, Iwo, and Okinawa, from which extensive new target areas came within range.

(6) The record of the patrol bombers against enemy aircraft in 1944 and 1945 is worthy of note. Though VPB generally operated singly, without escort, they were able to destroy 146 planes against 14 losses in combat in 1944, and 153 against 9 losses in 1945.

(f) Marine VPB activity is largely the story of the PBJ, which first appeared in combat in March 1944. These planes were used for day and night patrol, for night heckling strikes in the Solomons area, and for daylight formation attacks almost entirely in the Solomons. The PBJ constituted the bulk of the bombing force in that area during 1945, and the only significant Naval air strength remaining in the area. During late 1944 and 1945 other PBJ squadrons undertook long-range anti-shipping searches and similar specialized missions from Central Pacific bases.

TABLE 18. CONDENSED MONTHLY DATA ON OPERATIONS AND RESULTS,
NAVAL AND MARINE LAND-BASED AIRCRAFT
By Operational Theatre and by Type of Aircraft

A. SOUTH PACIFIC THEATRE

MONTH	VF			VSB-VTB			VPB		
	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT
1942-May	0	0	0	0	0	0	4	3	0
June	0	0	0	0	0	0	2	2	0
August	57	0	52	31	12	0	1	0	2
September	259	0	111	247	73	0	1	0	0
October	478	0	164	360	155	13	0	0	0
November	175	0	70	431	184	7	0	0	0
December	40	0	17	291	83	2	2	0	0
1943-January	84	0	52	310	97	2	0	0	0
February	10	0	15	386	173	6	33	75	0
March	8	0	0	316	178	1	34	33	0
April	197	0	46	240	152	0	8	7	0
May	116	0	15	331	226	0	5	0	0
June	237	0	128	488	305	0	11	10	0
July	525	0	174	2,555	1,633	6	45	31	6
August	414	0	108	689	398	0	19	22	1
September	599	0	97	951	563	2	88	36	7
October	456	0	64	999	595	0	92	86	5
November	915	0	86	1,723	1,101	0	110	46	9
December	690	0	94	1,978	1,260	0	75	18	2
1944-January	1,591	0	346	1,342	589	15	92	65	3
February	1,899	1	138	1,983	951	2	54	31	9
March	1,257	3	7	4,081	2,072	0	295	223	3
April	565	14	0	2,839	1,569	0	243	116	5
May	524	4	0	2,348	1,225	0	228	115	3
June*	538	74	1	838	393	0	184	84	1
1942 TOTAL	1,009	0	414	1,360	507	22	10	5	2
1943 TOTAL	4,251	0	879	20,966	6,681	17	520	364	30
1944 TOTAL	6,374	96	492	13,431	6,799	17	1,099	634	24
GRAND TOTAL	11,634	96	1,785	35,757	13,987	56	1,629	1,003	56

* South Pacific Theatre combat areas were placed under operational control of the Southwest Pacific area command on 16 June 1944. The figures here for June 1944 cover the entire month, and no division is practicable.

No action was reported during months not noted above.

NOTES TO TABLE 18

South Pacific combat activity has already been discussed, and will be covered in more detail in studying the Solomons-Bismarck area in later tables.

TABLE 18. Continued

B. SOUTHWEST PACIFIC THEATRE

MONTH	VF			VSB - VTB			VPB		
	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT
1941-December							19	5	2
1942-January							13	0	1
February							6	0	1
September							2	0	0
1943-October							27	5	0
November							45	32	0
December							46	67	0
1944-January							43	37	0
February							28	28	0
March							43	45	0
April							33	25	5
May							7	2	4
June							25	6	13
July	1,486	431	0	1,095	585	0	273	150	4
August	2,343	725	0	1,074	515	0	312	170	2
September	2,041	593	0	1,348	620	0	449	232	1
October	2,192	681	0	1,405	663	0	458	301	6
November	2,278	593	0	644	285	0	772	587	6
December	1,001	239	54	152	74	0	881	729	34
1945-January	1,058	292	4	280	111	0	559	566	8
February	1,644	919	0	3,989	1,719	0	1,011	850	26
March	1,348	555	1	4,350	2,032	0	953	781	24
April	1,994	698	2	3,016	1,392	0	1,265	1,270	7
May	800	303	0	2,911	1,475	0	1,438	1,512	12
June	300	146	0	1,947	982	0	700	620	5
July	515	294	0	1,012	475	0	727	744	2
August	129	53	0	181	89	0	194	148	2
1941-43 TOTAL	0	0	0	0	0	0	158	109	4
1944 TOTAL	11,341	3,262	54	5,718	2,742	0	3,324	2,312	75
1945 TOTAL	7,788	3,260		17,686	8,275	0	6,847	6,491	86
GRAND TOTAL	19,129	6,522	61	23,404	11,017	0	10,329	8,912	165

NOTE: From 1 July 1944 the data include aircraft operating in the Solomons-Bismarcks area. transferred from the South Pacific commend on 16 June 1944. 1941 and early 1942 figures cover activities by VPB of PatWing 10 before establishment of Southwest Pacific Command, in territory later assigned to that commend.

No action was reported for months not shown above.

In the Southwest Pacific VPB were the sole naval aircraft until transfer of the South Pacific air force to this command in June 1944. From November 1943 to March 1944 these VPB were the celebrated PBY Black Cats, on their nightly anti-shipping sweeps of the Bismarck Sea and New Guinea coast. Thereafter PB4Y and later PV search planes began to operate from SoWesPac bases, and by 1945 a major part of the land-based Naval air force was under SoWesPac control, and was shifted progressively westward and northward to meet the changing needs of that command's campaigns.

TABLE 18. Continued.

c. CENTRAL PACIFIC THEATRE

MONTH	VF			VSB - VTB			VPB		
	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ENEMY AIRCRAFT DESTROYED IN COMBAT
1941-December	49	0	10	0	0	0	2	0	0
1942-March	4	0	1	0	0	0	0	0	0
May	0	0	0	0	0	0	2	0	0
June	27	0	15	45	15	6	14	3	0
October	0	0	0	0	0	0	1	0	0
1943-July	0	0	0	0	0	0	2	0	0
August	0	0	0	0	0	0	3	0	0
October	0	0	0	0	0	0	24	3	0
November	6	0	0	0	0	0	30	2	3
December	38	0	1	5	2	0	57	26	9
1944-January	0	0	0	0	0	0	200	159	6
February	0	0	0	0	0	0	211	116	0
March	476	67	8	404	175	0	247	234	2
April	1,030	234	2	620	260	0	178	162	2
May	1,428	375	0	673	242	0	331	279	11
June	1,025	96	0	736	266	0	188	82	6
July	1,438	314	0	1,021	398	0	117	68	0
August	1,988	695	0	1,278	532	0	266	183	1
September	1,566	498	0	670	295	0	53	22	6
October	2,555	877	1	533	229	0	108	48	12
November	2,879	809	0	383	170	0	142	67	4
December	1,957	817	0	315	140	0	151	134	2
1945-January	1,375	329	1	374	182	0	94	36	2
February	1,680	208	1	139	48	0	79	9	0
March	1,673	418	c	214	130	0	180	123	1
April	1,634	475	143	414	212	0	186	81	4
May	1,863	621	217	754	455	1	306	132	31
June	2,685	830	117	888	482	1	350	200	15
July	2,025	473	18	773	474	0	394	183	8
August	448	80	3	189	90	0	151	56	6
1941-43 TOTAL	124	0	27	50	17	6	135	34	12
1944 TOTAL	16,333	4,782	11	6,633	2,707	0	2,192	1,554	52
1945 TOTAL	13,383	3.434	500	3,745	2,073	2	1,740	820	67
GRAND TOTAL	29,840	8,216	538	10,428	4.797	8	4,067	2,408	131

NOTE: Includes all operations by aircraft based at Hawaii, Midway, Wake, the Ellice and Gilbert Islands, the former Japanese Mandated Islands (Marshalls, Carolines, Marianas), Iwo Jima, and the Ryukyus.

No action was reported during months not listed above.

The Central Pacific data also represent a series of campaigns in successive areas (see Table 33). First came the early actions at Wake and Midway, then the attacks on the Gilberts and Marshalls from bases in the Ellices and Gilberts, successively. Then as short-range planes came into the Marshalls to maintain pressure on local targets, the VPB reached out to the Carolines. Acquisition of the Marianas and Peleliu took the VF to these islands to wipe out enemy remnants, while the VPB extended their range still farther. Finally the VF and light bombers moved from the mandated islands to Okinawa, and VPB based there covered Japan, Korea, and the entire Yellow and China Sea areas.

TABLE 180 Continued

D. NORTH PACIFIC THEATRE (All Planes are VPB)

MONTH	1942		1943		1944		1945	
	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ACTION SORTIES	TONS OF BOMBS ON TARGETS	ACTION SORTIES	TONS OF BOMBS OF TARGETS
January	0	0	2	0	25	19	4	0
February	0	0	1	0	26	18	20	0
March	0	0	3	0	30	18	15	0
April	0	0	1	0	41	27	18	0
May	0	0	2	0	98	47	22	1
June	12	0	39	29	53	26	28	16
July	4	1	17	11	24	9	0	0
August	9	6	8	7	64	27	20	3
September	5	1	0	0	68	22		
October	9	2	2	0	19	3		
November	0	0	0	0	8	0		
December	1	0	6	4	0	0		
YEAR TOTALS	40	10	81	51	456	216	127	20

GRAND TOTALS: 704 sorties, 297 tons.

Two enemy aircraft were destroyed in August 1942, one in August 1944, two in September 1944.

The North Pacific air campaign had three phases. First came the holding period, when Naval PBYs were confined largely to patrol. This culminated with the capture of Attu in May 1943. Then for three months the Naval PV force helped to hammer Kiska. Finally, beginning in the early winter of 1944 the PVs began regular night strikes (and later day searches and strikes) on Jap installations and ships in the Kuriles. These continued until the end of the war, rocket loadings being substituted for bombs during some months, and the PVs being relieved by PB4Ys at the end.

PART B. SPECIALIZED DATA, BY SUBJECT MATTER

This section of the report is composed of six sub-sections covering specific types of data, as follows:

1. Detailed Date on Aerial Combat, by both Carrier-Based and Land-Based Aircraft, including loss rates and combat ratios. Breakdowns are provided for Navy vs. Marine, and by plane model, type of carrier, year, month, area, and mission of own aircraft. Data On models of enemy aircraft destroyed are also included. (Tables 19-28).

2. Anti-Aircraft Loss and Damage, and Loss Rates, with breakdown by plane model, carrier and land-based, yearly. (Table 29).

3. Attacks on Targets, by Geographical Area. Detailed breakdowns of attacks on targets, and total bomb tonnages expended on target, monthly and yearly, by area, and broken down between land and ship targets, with special emphasis on shipping targets. (Tables 30-35).

4. Attacks on Targets, by Type of Target Attacked. Attack sorties and bomb tonnage, for carrier-based and land-based aircraft, yearly, by plane model attacking, and monthly detail on shipping attacks. (Table 36-40).

5. Details of Ordnance Expenditures. Types of bombs used, and torpedo, rocket and ammunition expenditures, broken down by plane type, by type of target, yearly and monthly and by operation. (Tables 41-54).

6. Night Air Operations. Data on night attacks and aerial combat, for carrier-based and land-based aircraft, monthly and by plane model. (Tables 55-59).

7. Long Range Search Plane Combat Operations, 1945. Detailed data on PB4Y and PBM performance. (Tables 60-61).

1. Aerial Combat Data in Detail (Own and Enemy Planes Engaged and Destroyed; Loss Rates and Combat Ratios)

NOTES TO TABLES 19, 20, 21

One of the principal achievements of Naval aviation in the war was the devastating supremacy Naval planes attained over Japanese aircraft in air combat. These tables, and others in this section, provide the evidence.

At the beginning Of the war Naval superiority in the air was rather slim. Our forces were small and scattered. When they met the enemy in air combat they were often outnumbered. Even if the opposing forces were of equal strength a clear-cut victory could not be assured, though for 1942 as a whole we claimed a 3-to-1 ratio over the enemy in air combat.

In 1943, with newer planes, more planes, better training, and some deterioration of the enemy, our air combat superiority rose to approximately 5-to-1, and the F6F, employed in strong, concentrated surprise attacks from the new, more mobile carrier forces, showed promise in the last months of the year. In early 1944 the promise was proved. In the first four months of that year Naval carrier aircraft, roaming the Central Pacific from the Marshalls to Truk, Saipan, Palau and New Guinea, shot down 419 Jap planes and lost but 19 in air combat, a ratio of 22 to 1. This ratio fell during the campaigns against the Marianas and Iwo, and in the bitter battles of Formosa and Leyte, but it was exceeded in the Visayas and Luzon operations of September, October, and December, and the roving raids of January 1945. After falling to 11-to-l in the Tokyo and Kyushu strikes of February and March, the supremacy became almost absolute in the Okinawas during April and May; the enemy might get planes through to attack our ships, but he could not compete successfully against our aircraft. During these two months the Japanese lost 1,744 planes in aerial combat, to the Navy's 34 losses, a ratio of over 51-to-l.

For these later operations, of course, the Japanese had few effective combat pilots or planes remaining, and generally attempted to avoid direct combat with our planes. Nevertheless, over half of the Jap planes shot down in these two months were of single-engine fighter types, including 461 Zekes and 197 newer VF types.

Table 19 presents the record for individual types of aircraft for the entire war. It will be clear from the foregoing data that direct comparisons cannot always be made between various types of aircraft, because of the varying tires and conditions under which they engaged in combat. Thus comparisons are valid between the carrier F6F and F4U totals because they generally operated from the same ships during the same periods. The FM, however, operating from CVEs, did not usually encounter the same heavy resistance as did the fast carriers operating in advance of the Fleet. Marine F4Us were used on CVs largely in the more difficult February and March actions, and were present only in small quantities to reap the rich April and May harvest which fell to Navy F4Us. Land-based F4Us were handicapped by the difficult conditions of the Solomons in 1943-44. Land-based Navy F6Fs operated in the Solomons; land-based Marine F6Fs operated under the comparatively lush conditions of Okinawa in 1945. The effect of these differences on the totals for the entire war may be partly judged by comparing the yearly data by plane model in Table 20.

Certain tentative conclusions may be reached from these two tables;

(a) The F6F was slightly superior to the F4U in combat, apparently chiefly because of its greater ability to survive damage.

(b) CVL F6Fs enjoyed an advantage over CV F6Fs.

(c) FMs and CVE F6Fs both turned in remarkable records. The F6F appeared to be clearly superior to the FM under CVE combat conditions. but the high combat ratio in favor of the FM, its ability to destroy over 55% Of the planes it engaged, and its low ratio of loss to damage indicate that it was an exceptionally good fighter within its speed limitations.

(d) The PB4Y, normally flying unescorted single-plane long range searches, was one of the Navy's best fighter planes.

(e) Navy single-engine bombers, far from being the highly vulnerable aircraft claimed by their detractors, gave out far more punishment than they took.

(Cont. on page 60)

TABLE 19. AERIAL COMBAT DATA, FOR ENTIRE WAR,
By Model of Aircraft, Carrier-Based and Land-Based,
and for own VF, by Type of Carrier and by Service (Navy-Marine)

BASE, PLANE MODEL, TYPE CARRIER, SERVICE	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		OWN AIRCRAFT CASUALTIES TO ENEMY A/C		ENEMY A/C DESTROYED PER OWN LOSS	PERCENT OF OWN A/C ENGAGING	
		Bombers	Fighters	Bombers	Fighters	Lost	Damaged		Lost	Damaged
CARRIER-BASED	9820	2974	9792	1997	4487	452	622	14.3	4.6	6.3
F6F	6582	1878	6888	1387	3568	245	419	20.2	3.7	6.4
F4U, FG	1042	200	1026	159	419	34	31	17.0	3.3	3.0
FM	753	305	407	194	228	13	26	32.5	1.7	3.5
F4F	422	417	375	190	112	47	23	6.4	11.1	5.5
SB2C, SW	237	37	243	13	30	18	11	2.4	7.6	4.6
SBD	301	76	357	31	75	43	66	2.5	14.3	21.9
TBF, TBM	429	60	458	22	50	27	46	2.7	6.3	10.7
TBD	54	1	38	1	5	25	0	0.2	46.3	0.0
LAND-BASED@	4488	1617	6846	759	2048	455	545	6.2	0.1	12.1
F4U, FG	2258	462	3617	319	1241	155	231	10.1	6.9	10.2
F6F	393	76	482	58	150	25	38	8.3	6.4	9.7
F4F	704	653	948	228	375	131	62	4.6	8.6	8.8
F2A	17	31	15	6	4	14	3	0.7	12.4	17.6
SBD	163	2	351	0	32	36	26	0.9	12.1	16.0
SB2U	11	0	25	0	6	1	0	6.0	9.1	0.0
TBF-TBM	94	2	142	1	25	20	34	1.3	11.3	36.2
PB4Y	595	275	979	125	181	28	99	10.9	4.7	16.6
PV	76	22	107	8	12	6	9	3.3	7.9	11.8
PBS	11	2	8	0	0	0	0	#	0.0	0.0
PBY	101	56	110	0	9	36	32	0.3	55.6	31.7
PBM	47	26	56	6	10	3	6	5.3	6.4	12.8
PB2Y	17	10	4	7	1	0	5	#	0.0	29.4
F6F, CV, Navy	4712	1295	5115	933	2641	185	*	19.3	3.9	*
F6F, CVL, Navy	1712	508	1689	406	876	58	*	22.1	3.4	*
F6F, CVE, Navy	158	62	83	48	51	2	*	49.5	1.3	*
F6F, Land, Navy	307	25	423	12	103	23	*	5.0	7.5	*
F6F, Land, USMC	86	51	59	46	47	2	*	46.5	2.3	*
F4U, CV, Navy	603	131	610	100	260	18	*	20.0	3.0	*
F4U, CV, USMC	419	63	416	53	159	16	*	13.3	3.8	*
F4U, CVE, USMC	20	6	0	6	0	0	*	#	0.0	*
F4U, Land, Navy	215	23	423	19	141	14	*	11.4	6.5	*
F4U, Land, USMC	2043	439	3194	300	1100	141	*	9.9	6.9	*
F4F, CV, Navy	409	409	370	185	109	44	*	6.7	10.8	*
F4F, CVE, Navy	13	8	.5	5	3	3	*	2.7	23.1	*
F4F, Land, Navy	245	132	316	53	94	56	*	2.6	22.9	*
F4F, Land, USMC	459	521	423	12	103	75	*	1.5	16.3	*
FM, CVE, Navy	753	305	407	194	228	13	26	32.5	1.7	3.5

No losses,
@ Includes a negligible amount of combat by planes of unidentified types, not shown separately.
* Data not available.

TABLE 20. AERIAL COMBAT DATA, BY YEARS
By Model of Aircraft, Carrier-Based and Land-Based,
(Principal plane models only)

BASE, PLANE MODEL, YEAR	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		OWN AIRCRAFT CASUALTIES TO ENEMY A/C		ENEMY A/C DESTROYED PER OWN LOSS	PERCENT OF OWN A/C ENGAGING	
		Bombers	Fighters	Bombers	Fighters	Lost	Damaged		Lost	Damaged
CARRIER-BASED:										
F4F 1942	383	387	375	173	112	43	22	6.6	11.2	5.7
1943	39	30	0	17	0	4	1	4.3	10.3	2.6
FM 1944	389	197	263	101	134	12	17	19.6	3.1	4.4
1945	362	106	144	93	94	1	9	187.0	0.3	2.5
F6F 1943	404	147	380	103	148	18	55	13.9	4.5	13.6
1944	3731	1128	4098	774	2206	149	249	20.0	4.0	6.7
1945	2447	603	2409	510	1214	78	114	22.1	3.2	4.7
F4U, FG 1945	1035	185	1024	154	419	34	31	16.9	3.3	3.0
SBD 1941-2	188	66	267	28	60	39	37	2.3	20.7	19.7
1943	64	7	43	2	11	2	21	6.5	3.1	32.8
1944	49	3	47	1	4	2	8	2.5	4.1	16.3
SB2C 1943	8	2	20	1	3	2	0	2.0	25.0	0.0
1944	195	34	202	12	26	14	11	2.7	7.2	5.6
1945	34	1	21	0	1	2	0	0.5	5.9	0.0
TBF, TBM 1942	16	1	32	1	4	7	2	0.7	43.8	12.5
1943	56	12	62	8	7	8	18	1.9	14.3	32.1
1944	284	34	266	7	31	7	21	5.4	2.5	7.4
1945	73	13	98	6	8	5	5	2.8	6.8	6.8
LAND-BASED:										
F4F 1941-2	501	579	563	187	243	79	40	5.4	15.8	8.0
1943	203	74	385	41	132	52	20	3.3	25.6	9.9
F4U, FG 1943	798	213	1664	110	526	94	117	6.8	11.8	14.7
1944	979	18	1592	14	477	49	97	10.0	5.9	9.9
1945	481	231	361	195	240	12	17	36.3	2.5	3.5
F6F 1943	174	25	231	12	59	17	20	4.2	9.8	11.5
1944	153	11	217	7	58	6	18	10.8	3.9	11.8
1945	66	40	34	39	33	2	0	36.0	3.0	0.0
PB4Y 1943	91	101	216	13	28	10	20	4.1	11.0	22.0
1944	251	93	376	59	72	11	40	11.9	4.4	15.9
1945	253	81	387	53	81	7	39	19.1	2.8	15.4

Table 21 gives evidence of:

(Cont. from page 58)

(a) The formidable enemy air opposition to Naval air operations throughout the war. Far more enemy planes were engaged (and destroyed) in combat in 1944 and 1945 than during the adverse years of 1942-43.

(b) The relative decline in enemy air opposition in proportion to the vast increase in our own offensive and defensive air effort. In 1942 a quarter of our action sorties engaged enemy aircraft; in 1945 only 4 percent engaged.

(c) The increasing effectiveness of Naval aircraft against the enemy, measured in the ratio of enemy planes destroyed to own losses, in the percentage lost of own planes engaging in combat, and in percentage of own action sorties lost in air combat. In 1942 5% of all Navy action sorties were lost in aerial combat. in 1945 less than one-eighth of one percent.

(Cent. on next page)

TABLE 21. AERIAL COMBAT RATIOS , BY YEARS
By Type of Aircraft, Carrier-Based and Land-Based

BASE , PLANE TYPE		ACTION SORTIES	SORTIES ENGAGING ENEMY AIRCRAFT		ENEMY AIRCRAFT ENGAGED			ENEMY AIRCRAFT DESTROYED IN COMBAT		OWN LOSSES TO ENEMY AIRCRAFT	ENEMY PLANES DESTROYED PER OWN LOSS	PERCENT COST OF OWN PLANES ENGAGING
			Number	% of Action Sorties	Bombers	Fighters	RATIO TO OWN A/C ENGAGING	Bombers	Fighters			
CARRIER-BASED:												
VF	1942	938	383	40.8	387	375	2.0 : 1	173	112	43	6.6	11.2
	1943	2,340	445	19.0	179	380	1.3 : 1	120	148	22	12.2	4.9
	1944	37,940	4127	10.9	1340	4363	1.4 : 1	880	2340	161	20.0	3.9
	1945	44,774	3844	8.6	894	3577	1.2 : 1	757	1727	113	22.0	2.9
VSB-VTB	1942	1,735	258	14.9	68	337	1.6 : 1	30	69	71	1.4	27.5
	1943	2,787	128	4.6	21	125	1.1 : 1	11	21	12	2.7	9.4
	1944	31,188	528	1.7	71	515	1.1 : 1	20	61	23	3.5	4.4
	1945	25,392	107	0.4	14	119	1.2 : 1	6	9	7	2.1	6.5
LAND-BASED:												
VF	1941-2	1,089	518	47.6	610	578	2.3 : 1	193	247	93	4.7	18.0
	1943	4,295	1175	27.4	312	2280	2.2 : 1	163	717	163	5.4	13.9
	1944	34,048	1132	3.3	29	1809	1.6 : 1	22	535	55	10.1	4.9
	1945	21,171	547	2.6	271	395	1.2 : 1	234	273	14	36.2	2.6
VSB-VTB	1941-2	1,405	107	7.6	1	190	1.8 : 1	0	28	27	1.0	25.2
	1943	10,971	54	0.5	1	95	1.8 : 1	0	17	22	0.8	40.7
	1944	25,782	103	0.4	1	230	2.2 : 1	0	17	5	3.4	4.9
	1945	21,431	4	0.0	1	3	1.0 : 1	1	1	3	0.7	75.0
VFB	1941-2	109	64	58.7	32	67	1.5 : 1	0	8	32	0.3	50.0
	1943	883	134	15.2	138	252	2.9 : 1	15	29	15	2.9	11.2
	1944	7,085	342	4.8	116	498	1.8 : 1	71	83	17	9.1	5.0
	1945	8,714	308	3.5	105	449	1.8 : 1	60	93	9	17.0	2.9

(Cont. from preceding page)

(d) The increasing effectiveness of Naval fighter escort of single-engine bombers. In 1942 fifteen percent of carrier VSB-VTB action sorties had to engage enemy aircraft and four percent were lost to enemy air action; in 1944 only 1.7 percent met enemy aircraft, and only one-thirteenth of one percent were lost; in 1945 less than $\frac{1}{2}$ of one percent were forced to engage enemy planes, and only 7 bombers, or 1/36 of one percent, were lost in air combat.

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TABLE 22. AERIAL COMBAT DATA, MONTHLY

A. ALL CARRIER-BASED AIRCRAFT

MONTH	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		OWN AIRCRAFT CASUALTIES TO ENEMY A/C		ENEMY A/C DESTROYED PER OWN Loss	PERCENT OF OWN A/C ENGAGING	
		Bombers	Fighters	Bombers	Fighters	Lost	Damaged		Lost	Damaged
1941-December	*	*	*	*	*	1	0	*	*	*
1942-February	52	37	15	23	10	6	9	5.5	1.5	17.3
March	3	1	0	1	0	0	0	#	0.0	0.0
May	133	37	141	24	42	21	21	3.1	5.8	15.8
June	138	68	226	33	36	41	4	1.7	9.7	2.9
August	142	207	119	65	23	23	13	3.8	6.2	9.2
October	116	90	138	48	42	20	12	4.5	7.2	10.3
November	57	15	74	9	28	2	2	18.5	3.5	3.5
1943-January	15	23	0	11	0	0	1	#	0.0	6.7
February	20	5	0	4	0	1	0	4.0	5.0	0.0
March	*	*	*	*	*	1	0	*	*	*
July	1	1	0	0	0	0	0	#	0.0	0.0
August	*	*	*	*	*	2	0	*	*	*
September	15	5	0	5	0	0	1	#	0.0	6.7
October	86	17	82	9	34	1	9	43.0	1.2	10.5
November	362	130	331	92	99	26	74	7.3	7.2	20.4
December	74	19	92	10	36	3	10	15.3	4.1	13.5
1944-January	121	11	119	10	42	5	17	10.4	4.1	14.0
February	222	42	223	31	131	6	19	27.0	2.7	8.6
March	142	24	179	21	90	3	13	37.0	2.1	9.2
April	203	38	133	33	61	5	11	18.8	2.5	5.4
May	10	2	1	2	1	0	0	#	0.0	0.0
June	992	470	11 31	254	543	48	73	16.6	4.8	7.4
July	131	12	167	10	103	14	11	8.1	10.7	8.4
August	47	15	14	10	14	3	0	8.0	6.4	0.0
September	578	88	669	46	327	13	37	28.7	2.2	6.4
October	1572	617	1645	409	780	74	105	16.1	4.7	6.7
November	483	61	483	49	223	11	18	24.7	2.3	3.7
December	154	31	114	25	86	2	3	55.5	1.3	1.9
1945-January	486	85	287	74	169	10	21	24. 3	2.1	4.3
February	950	73	1184	50	382	40	64	10.8	4.2	6.7
March	630	147	574	106	243	32	25	10.9	5.1	4.0
April	1185	474	958	431	618	18	30	58.3	1.5	2.5
May	363	77	415	59	219	5	7	55.6	1.4	1.9
June	113	2	114	1	20	4	0	5.3	3.5	0.0
July	109	17	86	15	47	7	7	8.9	6.4	6.4
August	115	33	78	27	38	4	5	16.3	3.5	4.3
1941-42 TOTAL	641	455	713	203	181	114	61	3.4	7.8	9.5
1943 TOTAL	573	200	505	131	169	34	95	8.8	5.9	16.6
1944 TOTAL	4655	1411	4878	900	2401	184	307	17.9	4.0	6.6
1945 TOTAL	3951	908	3696	763	1736	120	159	20.8	3.0	4.0
GRAND TOTAL	9820	2974	9792	1997	4487	452	622	14.3	4.6	6.3

No losses.

* No engagements reported; the losses reported may have been sustained in unreported actions during this month, or in previous months' actions, or the cause of loss may have been incorrectly ascribed to aerial combat. The latter factor may apply also to other months in 1942 and 1943.

NOTE: No engagements were reported in months not listed above.

TABLE 22. Continued.

B. ALL LAND-BASED AIRCRAFT

MONTH	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		OWN AIRCRAFT CASUALTIES TO ENEMY A/C		ENEMY A/C DESTROYED PER OWN LOSS	PERCENT OF OWN A/C ENGAGING	
		Bombers	Fighters	Bombers	Fighter	Lost	Damaged		Lost	Damaged
1941-December	34	90	22	10	2	8	5	1.5	23.5	14.7
1942-January	9	12	1	0	1	2	3	0.5	22.2	33.3
February	6	8	5	0	1	6	0	0.2	00.0	0.0
March	1	1	0	1	0	0	1	#	0.0	100.0
May	3	3	0	0	0	0	3	#	0.0	100.0
June	74	43	109	8	13	39	14	0.5	52.7	18.9
July	1	0	2	0	0	0	0	#	0.0	0.0
August	47	36	77	21	35	8	4	7.0	17.0	8.5
September	191	274	201	74	37	18	28	6.2	9.4	14.7
October	204	117	240	57	120	43	10	4.1	21.1	4.9
November	92	59	135	22	55	21	7	3.7	22.8	7.6
December	27	0	43	0	19	7	2	2.7	25.9	7.4
1943-January	54	8	109	4	50	11	1	4.9	20.4	1.9
February	26	7	47	5	16	22	8	1.0	84.6	30.8
March	4	1	17	0	1	2	2	0.5	50.0	50.0
April	53	30	76	13	33	20	11	2.3	37.7	20.8
May	21	5	25	0	15	5	5	3.0	23.8	23.8
June	116	66	184	44	84	29	18	4.4	25.0	15.5
July	260	95	577	36	150	38	34	4.9	14.6	13.1
August	167	44	368	16	93	13	25	8.4	7.8	15.0
September	224	61	402	15	93	26	26	4.2	11.6	11.6
October	106	18	209	4	65	7	16	9.9	6.6	15.1
November	143	82	195	38	60	11	20	8.9	7.7	14.0
December	189	34	418	3	103	16	35	6.6	8.5	18.5
1944-January	714	7	1308	6	364	40	104	9.3	5.6	14.6
February	445	15	651	11	138	18	42	8.3	4.0	9.4
March	31	11	39	5	15	2	4	10.0	6.5	12.9
April	32	22	30	11	3	1	0	14.0	3.1	0.0
May	36	11	87	9	9	1	5	18.0	2.8	13.9
June	40	22	49	12	9	0	7	#	0.0	17.5
July	17	4	15	2	2	1	3	4.0	5.9	17.6
August	30	4	42	1	3	1	7	4.0	3.3	23.3
September	23	9	24	6	3	2	2	4.5	8.7	8.7
October	25	10	24	9	10	3	2	6.3	12.0	8.0
November	37	2	69	2	8	3	7	3.3	8.1	18.9
December	147	29	199	19	71	5	20	18.0	3.4	13.6
1945-January	23	7	14	4	11	0	3	#	0.0	13.0
February	52	27	59	13	14	2	4	13.5	3.8	7.7
March	34	16	49	14	12	1	1	26.0	2.9	2.9
April	175	129	107	107	49	5	5	31.2	2.9	2.9
May	279	130	259	99	162	6	24	43.5	2.7	8.6
June	216	50	251	43	95	8	17	17.3	3.7	7.9
July	61	14	72	11	17	3	6	9.3	4.9	9.8
August	19	4	36	4	7	1	4	11.0	5.3	21.1
1941-42 TOTAL	689	643	835	193	283	152	77	3.1	22.1	11.2
1943 TOTAL	1363	451	2627	178	763	200	201	4.7	14.7	14.7
1944 TOTAL	1577	146	2537	93	635	77	203	9.5	4.9	12.9
1545 TOTAL	859	377	847	295	367	26	64	25.5	3.0	7.5
GRAND TOTAL	4488	1617	6846	759	2048	455	545	6.2	10.1	12.1

No losse

Note: Delayed reporting of losses, and failure to report exact date of loss, may have unduly inflated apparent loss rates for come months of light combat activity succeeding months of heavy activity, particularly February 1943. Also, there is reason to believe that some aerial combat in the Solomons in 1942 and 1943 has not been reported, and that some losses from other causes have been incorrectly ascribed to-enemy aircraft by the reporting unit.

NOTE TO TABLE 22

This table is inserted largely for historical record, and its major features have been touched on in previous discussions. The rather violent fluctuations in monthly volume of air combat activity may be noted, as well as fluctuations in the loss ratios. To some extent the latter are chance fluctuations, but largely they represent actual variations in the intensity and quality of enemy aerial resistance encountered, and in the predominant types of enemy planes engaged.

NOTES TO TABLES 23 AND 24

These tables provide a breakdown of air combat activity by type of aircraft and primary purpose of the mission during which the combat occurred.

Well over half of the total number of sorties engaging enemy aircraft in combat were on offensive missions, one-twelfth were on reconnaissance and miscellaneous missions, and less than 40 percent were on defensive missions. Of the total enemy aircraft shot down, 7 percent were encountered on reconnaissance and search missions, and the remainder were evenly divided between offensive and defensive encounters. Thus, as would be expected, more enemy planes were destroyed per own plane engaging in defensive combat than in offensive combat.

On offensive missions the enemy planes engaged were over 90% fighter types, while in defensive actions about 40% were normally bombers. For the same reason losses in air combat were normally higher on offensive missions; over 60% were sustained on such missions, and only 30% of the total in defensive engagements. Normally from 40% to 70% of the enemy planes engaged by our fighters were reported destroyed. Bombers claimed the destruction of only about 15% of the enemy fighters encountered, and 30% or more of the enemy bombers engaged.

Table 23 gives anti-aircraft and operational losses on action sorties as well as losses in air combat. Of the total losses on action sorties over 80 percent were on offensive missions, 12 percent on defensive missions, and about 7 percent on search, reconnaissance and miscellaneous missions resulting in action. Primarily the combat action of Naval aircraft was offensive, and the losses sustained in action were in large part sustained in carrying the offensive to the enemy.

Table 24 is an extension to a monthly basis of the "Enemy Aircraft Destroyed" columns of Table 23. It provides an interesting historical record of the fluctuations between offensive and defensive combat at various stages of the war. In 1942 the air combat, by carrier and land-based planes, was predominantly defensive. In addition, because of a shortage of fighters on carriers, carrier bombers had to handle a considerable share of the combat on offensive missions. In the latter part of 1943 the balance shifted in favor of the offensive, and so remained during most of 1944, with the exception of the two great air campaigns of June and October, when the carriers defended themselves and the amphibious forces against everything the Japs could get into the air to stop the carrier-paced invasions of Saipan and Leyte.

The emphasis on offensive air combat continued into early 1945, particularly in February and to a lesser extent in March. In April and May combat shifted almost wholly to the defensive as carriers and land-based aircraft combined their efforts to turn back the Japanese counter-attack on our forces at Okinawa. For 1945 as a whole the balance was clearly in favor of defensive combat, by 2-to-1, while in 1944 it favored the offensive by the same ratio.

TABLE 23. OWN SORTIES AND LOSSES, AND COMBAT WITH ENEMY AIRCRAFT, BY MISSION OF OWN AIRCRAFT
By Type of Aircraft, Carrier-Based and Land-Based, for Entire War.

BASE, PLANE TYPE, PURPOSE OF MISSION	ACTION SORTIES	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		OWN LOSSES ON ACTION SORTIES		
			Bombers	Fighters	Bombers	Fighters	To Enemy A/A	To Enemy A/C	Operational
CARRIER-BASED :									
VF Offensive	67,437	4,377	513	5,483	380	2,569	614	204	357
Defensive	14,877	4,081	2,090	2,883	1,394	1,624	53	102	124
Recce. & Misc.	3,596	342	192	324	155	134	31	10	14
Unknown	106	1	1	0	1	0	58*	23*	1*
VSB- Offensive	58,514	854	69	951	28	132	597	86	494
VTB Defensive	1,136	82	61	65	21	9	0	8	3
Recce. & Misc.	1,304	83	48	86	18	19	25	9	7
unknown	144	0	0	0	0	0	50*	10*	1*
LAND-BASED:									
VF Offensive	55,253	1,963	189	3,299	79	1,028	180	141	158
Defensive	4,193	1,378	1,034	1,725	533	726	16	120	39
Recce. & Misc.	1,099	30	1	35	0	18	7	1	1
Unknown	58	0	0	0	0	0	29*	63*	0
VSB- Offensive	57,683	237	1	457	0	55	136	28	89
VTB Defensive	47	0	0	0	0	0	0	0	0
Recce. & Misc.	1,847	32	3	62	1	8	15	5	7
Unknown	12	0	0	0	0	0	35*	24*	1*
VPB Offensive	10,690	95	13	146	1	13	33	12	21
Defensive	64	16	17	7	6	4	0	1	0
Recce. & Misc.	5,996	727	359	1,103	139	196	82	38	28
Unknown	37	10	0	12	0	0	21*	22*	0

* Losses listed under "Unknown" are not comparable with the action sorties reported under this category; they represent largely losses on offensive, defensive or reconnaissance missions which were reported through aircraft record channels rather than in action reports and are thus not classifiable by type of mission. These losses should be pro-rated among the three types of mission, in proportion to the losses where type of mission was known, if loss rates for various types of mission are computed.

NOTE: Losses to enemy A/A on "defensive" missions are largely attributable to attacks by target combat air patrols after completion of their defensive primary mission. It should be noted that action sorties whose primary purpose was search or reconnaissance normally involved attacks on targets of opportunity.

(See notes on page 64)

TABLE 24. ENEMY AIRCRAFT DESTROYED IN AERIAL COMBAT
BY ALL NAVAL AND MARINE AIRCRAFT
By Base, Mission, and Type of Own Aircraft Accomplishing their Destruction, Monthly.

MONTH	BASE, MISSION, & TYPE OF OWN AIRCRAFT															TOTAL
	CARRIER-BASED						LAND-BASED									
	OFFENSIVE		DEFENSIVE		REC. & MISC.		OFFENSIVE			DEFENSIVE		REC. & Misc.				
	VF	VSB - VTB	VF	VSB VTB	VF	VSB- VTB	VF	VSB- VTB	VPB	VF	VPB	VF	VSB- VTB	VPB		
1941-December	-	-					-	-	1	10				1		12
1942-January	-	-					-	-						1		1
February	4	7	21	1			-	-						1		34
March		1					-	-		1						2
May	18	16	16	14		2	-	-								66
June	21	4	44					6		15						90
August		10	72	2		4	1	-		51				4		144
September	-	-					34	-		77						111
October	16	23	41			10	26	8		138			5			267
November	2	4	30			1	20	5		48		2	2			114
December	-	-					17	2								19
1943-January	-	-	11				42	2		10						65
February	-	-	4				15	6								25
March	-	-					-	-					1			1
April	-	-					6	-		40						46
May	-	-					-	-		15						15
June	-	-					46	-		82						128
July	-	-					93	6		81				6		186
August	-	-					27	-		73		8		1		109
September	-	-	5				93	2		4				9		113
October	27	-	16				62	-		2				5		112
November	120	20	47	3		1	8	-		78	1			11		289
December	30	8	7		1		90	-		5	2			9		152
1944-January	34	1	17				343	15		3	1			8		422
February	139	3	17		2	1	132	2		6	4			5		311
March	87	2	19		2	1	13	-		1		1		5		131
April	70	3	21				-	-		2				12		108
May	1	1			1		-	-						18		21
June	279	6	465	3	38	6	1	-						20		818
July	96	-	15		2		-	-	1					3		117
August	16	-	1		7		-	-	3					1		28
September	349	5	16		3		-	-	1					8		382
October	499	29	581	4	68	8	-	-				1		18		1208
November	196	7	58	1	10		-	-			1			9		282
December	65	-	45		1		14	-		36		4		36		201
1945-January	88	2	148	1	4		1	-		4	1			9		258
February	378	5	28		21		-	-		1				26		459
March	184	1	136		27	1	1	-						25		375
April	131	1	823		92	2	4	-		141				11		1205
May	28	1	246		3		3	1		214				43		539
June	10	-	11				7	-	3	108		2	1	17		159
July	43	-	17		2		8	-	2	10				8		90
August	18	-	41		6		-	-	3	3				5		76
1S41-42 Total	61	65	224	17	0	17	98	21	1	340	0	2	7	7		860
1943 Total	177	28	90	3	1	1	482	16	0	390	3	8	1	41		1241
1944 Total	1831	57	1255	8	134	16	503	17	5	48	6	6	0	143		4029
1945 Total	880	10	1450	1	155	3	24	1	8	481	1	2	1	144		3161
GRAND TOTAL	2949	160	3019	29	290	37	1107	55	14	1259	10	18	9	335		9291

No enemy planes were destroyed in April or July 1942.

(See notes on page 64)

TABLE 25. OWN SORTIES AND COMBAT LOSSES. AERIAL COMBAT DATA AND ENEMY AIRCRAFT DESTROYED ON GROUND. BY AREA. FOR ENTIRE WAR

BASE, AREA OF TARGET OR ENGAGEMENT	CTION ORTIES	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		ENEMY AIRCRAFT DESTROYED ON GROUND	OWN LOSSES To Enemy A/A	OWN LOSSES To Enemy A/C
			Bombers	Fighters	Bombers	Fighters			
CARRIER-BASED									
Hokkaido, No. Honshu	2,350	4	2	0	1	0	79	32	0
Tokyo Area	7,889	1002	95	1191	68	410	965	76	40
Central Honshu	3,381	220	35	146	32	47	301	70	5
Kyushu, Kure Area	6,891	681	65	862	48	348	471	130	40
Ryukyus	7,421	1612	684	1259	581	780	491	236	25
Formosa	5,727	641	207	589	157	300	521	80	26
Central & South China	843	44	9	39	8	17	3	28	4
Indo China	910	32	5	13	4	10	97	17	0
Bonins	7,502	242	39	334	27	205	167	87	22
Marianas	8,747	988	480	1012	263	478	217	141	45
Western Carolines	0,234	157	26	184	22	92	99	64	7
Eastern Carolines	3,744	276	33	322	21	135	167	38	8
Marshalls	6,812	149	32	187	23	102	162	27	9
Gilberts, Nauru	2,140	97	42	35	23	22	25	10	3
Wake, Marcus	2,794	89	17	82	9	34	36	23	1
Midway Area	387	147	71	226	36	36	140	20	42
Philippines	2,323	2471	587	2459	387	1235	1590	278	77
New Guinea, Halmahera	3,063	84	29	15	23	9	133	11	0
Celebes, Borneo	116	0	0	0	0	0	28	1	0
Sumatra, Java	117	13	4	1	4	1	41	3	0
Bismarcks, Solomons	2,533	819	494	787	247	202	91	19	97
Aleutians	86	0	0	0	0	0	0	0	0
Europe, Africa	1,103	56	22	51	14	26	30	38	1
LAND-BASED									
Tokyo, Central Honshu	314	43	9	86	4	19	2	8	3
Kyushu, Kure Area	1,108	60	5	81	4	27	5	10	4
Ryukyus	5,435	537	297	395	248	262	18	40	14
Formosa	260	32	20	35	10	10	6	4	0
Korea, North China	347	48	5	57	3	11	0	10	0
Central & South China	511	30	15	39	10	8	3	15	1
Indo China	290	33	12	59	10	14	11	6	1
Malay Peninsula	64	19	5	46	4	7	8	0	1
Bonins	272	61	17	66	9	13	9	11	1
Marianas	2,060	32	5	88	2	8	2	4	0
Western Carolines	1,456	23	6	30	5	3	11	39	0
Eastern Carolines	1,147	80	34	99	20	20	11	6	0
Marshalls	21,552	37	6	111	3	17	6	57	3
Gilberts, Nauru	444	16	11	28	2	2	0	3	1
Wake, Marcus	320	23	90	1	11	0	5	4	0
Midway Area	101	72	50	107	9	13	0	4	33
Philippines,	26,959	167	33	180	24	75	112	66	18
New Guinea, Halmahera	233	20	14	17	8	8	0	3	3
Celebes, Borneo	728	47	30	71	5	10	18	5	6
Bismarcks, Solomons	52,628	3014	861	5129	364	1513	101	241	343
Aleutians	114	23	3	26	0	2	0	5	11
Kuriles	583	37	1	75	1	2	1	7	5
Atlantic	58	28	86	5	2	0	0	3	9

(See notes on pp 69-70)

TABLE 26. OWN SORTIES AND LOSSES, AERIAL COMBAT DATA, AND ENEMY AIRCRAFT DESTROYED ON GROUND, MONTHLY, IN MAJOR AREA CAMPAIGNS

A. SOLOMONS - BISMARCKS AREA

BASE, MONTH	ACTION SORTIES	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		ENEMY AIRCRAFT DESTROYED ON GROUND	OWN LOSSES ON ACTION SORTIES		
			Bombers	Fighters	Bombers	Fighters		To Enemy A/A	To Enemy A/C	Operational
LAND-BASED	62,622	3,813	860	5,129	364	1,513	101	241	348	179
1942-August	89	42	35	72	21	33	0	1	8	0
September	506	186	271	198	74	37	1	2	18	5
October	838	204	117	240	57	120	7	6	41	11
November	606	92	59	135	22	55	0	8	21	7
December	334	27	0	41	0	19	0	3	8	0
1943-January	394	54	8	109	4	50	4	4	15	1
February	429	25	7	45	5	16	2	10	21	0
March	358	4	1	17	0	1	0	0	2	4
April	445	53	30	76	13	33	0	14	21	5
May	451	20	4	25	0	15	0	3	5	6
June	729	115	66	183	44	84	0	3	30	8
July	3,119	260	95	577	36	150	3	7	38	8
August	1,116	157	31	353	16	91	21	2	10	6
September	1,609	213	35	380	13	91	9	10	22	12
October	1,565	101	5	208	4	65	23	9	7	8
November	2,772	125	63	158	36	52	1	13	11	10
December	2,781	153	8	341	2	94	0	6	14	10
1944-January	3,048	704	7	1,273	4	360	17	16	39	18
February	3,942	444	12	651	10	138	5	24	17	10
March	5,630	18	2	20	2	6	3	19	0	3
April	3,645	5	2	3	0	0	0	21	0	10
May	3,087	4	0	5	0	1	2	20	0	3
June	1,558	4	1	4	1	1	0	5	0	4
July	2,763	0	0	0	0	0	0	6	0	4
August	3,673	2	1	1	0	1	1	9	0	2
September	3,738	0	0	0	0	0	1	10	0	8
October	4,019	0	0	0	0	0	1	6	0	5
November	3,593	0	0	0	0	0	0	4	0	4
December	1,173	1	0	13	0	0	0	0	0	2
1945-Jan.-Aug.	4,612	0	0	0	0	0	0	0	0	5
CARRIER-BASED	2,545	819	494	790	247	204	91	17	96	46
1942-February	27	19	30	0	17	0	0	0	2	0
May	332	133	37	141	24	42	21	1	21	11
August	681	142	207	119	65	23	30	5	23	6
October	287	116	90	138	48	42	21	1	20	19
November	96	20	2	26	2	5	0	1	1	0
1943-January	78	15	23	0	11	0	0	0	0	0
February	20	20	5	0	4	0	0	0	1	0
July	7	1	1	0	0	0	0	0	2	0
November	707	266	93	278	71	67	19	8	22	10
December	103	12	4	0	3	0	0	1	0	0
1944-January	178	69	1	86	1	24	0	0	4	0
March	25	4	0	2	0	1	0	0	0	0
April	4	2	1	0	1	0	0	0	0	0
GRAND TOTAL	65,167	3,832	1,354	5,919	611	1,717	192	258	444	225

Note: Minor discrepancies between this and the preceding table result from ineradicable differences between machine tabulations and are too small to affect the usefulness of the data.

(See notes on pp 69-70)

TABLE 26. Continued

B. PHILIPPINES AREA

BASE, MONTH	ACTION SORTIES	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		ENEMY AIRCRAFT DESTROYED ON GROUND	OWN LOSSES IN ACTION SORTIES		
			Bombers	Fighters	Bombers	Fighters		To Enemy A/A	A/C	Operational
CARRIER-BASED	22,328	2,471	592	2,499	385	1,234	1,590	279	77	242
1944-September	6,025	567	85	667	44	326	463	39	12	28
October	6,584	1,012	382	1,076	237	513	296	112	49	112
November	4,299	483	61	483	49	223	498	81	11	36
December	2,062	154	31	114	25	86	230	28	2	27
1945-January	3,358	255	33	159	30	86	103	19	3	39
LAND-BASED	26,937	155	32	167	24	73	112	69	11	58
1944-July	3	1	1	0	1	0	0	0	0	0
August	4	1	1	0	1	0	0	0	0	0
September	37	5	5	0	4	0	7	0	0	0
October	59	8	4	3	4	2	21	4	1	0
November	58	11	0	21	0	4	10	1	2	0
December	763	108	20	134	14	59	16	12	5	1
1945-January	1,347	10	1	7	0	7	20	9	0	9
February	5,661	0	0	0	0	0	18	13	2	12
March	5,734	2	0	1	0	1	13	10	0	13
April	5,196	1	0	1	0	0	6	13	0	6
May	3,909	1	0	0	0	0	1	7	0	2
June	2,289	0	0	0	0	0	0	4	1	8
July	1,567	7	0	0	0	0	0	0	0	7
August	310	0	0	0	0	0	0	1	0	0
GRAND TOTAL	49,265	2,626	624	2,666	409	1,307	1,702	348	88	300

See note to Part A of this table

NOTES TO TABLES 25 AND 26

Table 25 shows the distribution among areas of aerial combat by Navy and Marine aircraft, for the entire war. Table 26 gives the monthly record for the four major areas where the greatest destruction of enemy planes took place.

The area in which Naval aircraft destroyed the largest number of enemy aircraft was the Philippines - 1,721 in air combat, 1,702 on the ground. Nearly all of this was accomplished the last four months of 1944 and January 1945, 1,073 in October alone, 833 in September, 770 in November.

Second in importance were the Japanese home islands taken as a whole. In Japan the destruction was primarily of grounded aircraft, the bulk of which (1,102, plus 120 in air combat) were destroyed in the concluding carrier campaign of July and August 1945. The greatest enemy losses in aerial combat (420) were sustained in the February carrier raids on the Tokyo area; during the same month 228 grounded planes were also destroyed, for a total of 648. The remainder of the total of 2,831 planes was accounted for in the four intervening months, March-June 1945.

The area of third importance was the Ryukyus, where destruction was accomplished largely in air combat. Here too the results (1,871 in air combat, 509 on the ground) were largely accomplished in a very few months, the bulk in the one month of April 1945, when 1,337 planes were destroyed in this area alone, and May 1945, when 466 were accounted for.

In all the above areas carrier aircraft were the primary agent of destruction, of grounded

(Cont. on next page)

TABLE 26. Continued

c. RYUKYUS AREA

BASE, MONTH	ACTION SORTIES	SORTIES ENGAGING ENEMY AIRCRAFT	ENEMY AIRCRAFT ENGAGED		ENEMY AIRCRAFT DESTROYED IN COMBAT		ENEMY AIRCRAFT DESTROYED ON GROUND	OWN LOSSES IN ACTION SORTIES		
			Bombers	Fighters	Bombers	Fighters		To Enemy A/A	To Enemy A/C	Operational
CARRIER-BASED	37,421	1,612	684	1,259	581	780	491	242	25	163
1944-October	1,543	87	72	58	52	25	88	10	2	6
1945-January	676	0	0	0	0	0	28	8	0	2
March	7,866	136	84	56	58	38	106	61	2	50
April	15,423	1,100	456	846	415	547	227	102	18	59
May	7,081	257	68	278	52	160	29	44	3	34
June	4,816	28	1	21	1	10	13	17	0	12
July	16	4	3	0	3	0	0	0	0	0
LAND-BASED	5,435	537	297	395	248	262	18	46	14	26
1945-January	11	2	2	0	2	0	0	0	0	0
February	31	5	5	1	4	1	0	1	0	1
March	61	5	4	2	3	1	0	0	0	0
April	846	151	117	82	100	46	2	8	5	7
May	1,371	212	112	167	87	137	1	13	3	5
June	2,021	149	46	140	42	74	2	15	5	11
July	957	10	9	2	8	2	13	7	1	2
August	137	3	2	1	2	1	0	2	0	0
GRAND TOTAL	42,856	2,149	981	1,654	829	1,042	509	288	39	189

See note to Part A of this table.

(Cont. from preceding page)

aircraft bulked high in the total, and the campaigns were short. In the fourth-ranking area, the Solomons and Bismarcks, land-based aircraft accounted for 1,988 of the 2,520 planes destroyed, all but 192 were destroyed in air combat, and the active air campaign lasted 20 months. It was also the most expensive campaign for the Navy, in terms of air combat losses.

The Japs had a number of bad months in the Solomons and Bismarcks, but their worst three, from the standpoint of planes lost, were January 1944 (406 lost to the Navy, largely in raids on Rabaul), November 1943 (246 lost between Rabaul and Bougainvillea), and October 1942 (295 losses near Guadalcanal and Santa Cruz). Other particularly bad months for the Japs were June and July 1943 (the New Georgia campaign), and August 1942 (the initial invasion of Guadalcanal, and the Battle of the Eastern Solomons). In all of these peak months except June-July 1943 our carrier forces helped increase the total destruction.

In three other areas was the destruction of Japanese aircraft sufficiently high to warrant special notice. These were: (1) Formosa, where 477 were downed in air combat and 527 destroyed on the ground, almost entirely by carrier planes in October 1944 and January 1945; (2) the Marianas, where 751 were destroyed in air and 219 on ground, also almost entirely by carrier planes and largely in the one month of June 1944; and (3) the Bonins, where 430 Jap planes were accounted for, principally in three brief carrier raids in June-July 1944.

Over three hundred planes were destroyed in each of two other areas, the Marshalls and the Eastern Carolines, over two hundred in the Midway area and the Western Carolines, over a hundred in New Guinea and Indo China.

TABLE 26. Continued.

D. JAPANESE ROME ISLANDS

BASE , AREA, MONTH (1945)	ACTION SORTIES	SORT NGAGING NEMY IRCRAFT	ENEMY PLANES ENGAGED		ENEMY PLANES DES IN COMBAT		TROYED ON GROUND	OWN LOSSES ON ACTION SORTIES		
			Bomb- ers	Fight- ers	Bomb- ers	Fight- ers		To Enemy A/A	A/C	Opera- tional
CARRIER-BASED	0,499	1,907	197	2199	149	805	1816	309	85	151
HOKKAIDO, NO. HONSHU	2,345	4	2	0	1	0	79	32	0	16
July	1,461	4	2	0	1	0	26	21	0	12
August	884	0	0	0	0	0	53	11	0	4
TOKYO AREA	7,889	1,002	95	1191	68	410	965	76	43	47
February	2,226	886	61	1118	42	371	203	22	36	19
March	7	7	4	0	2	0	0	0	0	0
July	2,675	15	2	15	1	8	210	27	3	15
August	2,981	94	28	58	23	31	552	27	4	13
CENTRAL HONSHU	3,381	220	35	146	32	47	301	71	5	24
February	265	44	4	58	2	5	25	3	2	8
March	428	111	21	21	20	4	43	2	0	3
May	23	2	0	2	0	2	0	0	0	0
July	2,550	59	10	45	10	19	228	66	3	13
August	115	4	0	20	0	7	5	0	0	0
KYUSHU, KURE AREA	6,884	681	65	862	48	348	471	130	37	64
February	2	0	0	0	0	0	0	0	0	0
March	2,615	373	36	497	24	191	220	46	30	35
April	611	85	18	112	16	71	77	25	0	3
May	1,754	104	9	135	7	57	93	18	2	1
June	431	85	1	93	0	10	53	7	4	10
July	1,463	26	0	25	0	19	28	34	1	15
August	8	8	1	0	1	0	0	0	0	0
LAND-BASED	1,434	103	14	167	8	46	7	18	6	12
TOKYO, CENTRAL HONSHU	326	43	9	86	4	19	2	8	3	0
March	22	0	0	0	0	0	0	2	0	0
April	27	0	0	0	0	0	0	0	0	0
May	76	17	7	24	4	5	1	5	1	0
June	73	13	2	32	0	8	0	1	0	0
July	90	5	0	6	0	0	0	0	1	0
August	38	8	0	24	0	6	1	0	1	0
KYUSHU, KURE AREA	1,108	60	5	81	4	27	5	10	3	12
March	4	0	0	0	0	0	0	0	0	0
April	59	3	0	2	0	1	5	0	0	0
May	50	16	1	32	1	11	0	1	2	0
June	199	23	2	14	1	5	0	2	0	2
July	577	18	2	33	2	10	0	6	1	8
August	219	0	0	0	0	0	0	1	0	2
GRAND TOTAL	21,933	2,010	211	2366	157	851	1823	327	91	163

See note to Part A of this s table.

(See notes on pp. 69-70)

TABLE 27. JAPANESE AIRCRAFT DESTROYED IN AERIAL COMBAT
BY ALL NAVAL AND MARINE AIRCRAFT
By Type and Allied Code Name, Monthly

MONTH	EKE, HAMP	SIN OS- AR	LE- ONY	GIN OJO	FIGHTER O ATE	RANK	REC(ACK	NAISSANCE EORGE	TYRT	THER U/I	'AL	UDY	NGL ATE	ENG JILL	NE BOMBER THER
1941-December	0									1			0		
1942-January	1									0			0		
February	1									10			1		
March	0									0			0		
April	0									0			0		
May	24									14	8		10		
June	26									23	20		19		
July	0									0	0		0		
August	41									13	45		7		
September	25									3	3		0		
October	121									18	38		11		
November	50									0	4		0		
December	15									0	0		0		
1943-January	47									0	4		0		
February	16									0	5		0		
March	1									0	0		0		
April	33									0	13		0		
May	15									0	0		0		
June	69									0	17		0		
July	148									0	4		0		
August	84		3							1	15		0		
September	89		4							0	10		0		
October	96		2							0	0		0		
November	127	6	16							1	60		37		
December	117	1	13							0	0		1		
1944-January	386	1	9	2						6	2	0	3	0	0
February	200	3	5	4						26	15	0	6	0	0
March	88	3	4	1						8	1	9	0	0	0
April	52	3	2	1						2	0	4	5	2	1
May	6	0	0	2						0	0	0	0	0	0
June	461	0	44	5	1					8	28	82	45	32	0
July	89	0	1	1	0					2	0	0	2	0	0
August	10	1	0	0	0					1	0	0	2	0	0
September	97	56	83	15	25					19	18	3	2	2	0
October	351	124	76	106	9		6			55	54	64	10	50	1
November	70	60	26	46	0		1		3	8	4	6	2	7	0
December	66	42	4	6	1		3		0	1	9	5	1	3	1
1945-January	73	34	21	25	0	0	1	3	1	4	19	4	1	5	0
February	151	76	40	55	17	13	1	2	5	5	14	6	3	7	0
March	122	19	10	17	1	24	9	7	14	5	6	15	3	19	1
April	361	61	43	47	46	35	16	14	15	5	304	50	27	26	29
May	100	22	42	38	37	37	6	4	6	6	61	10	3	12	5
June	42	13	20	10	8	4	3	1	0	2	18	3	0	1	5
July	6	3	8	4	0	26	0	4	5	0	2	2	0	5	1
August	19	1	1	0	0	5	3	0	6	0	0	8	2	3	7
TOTALS	3896	529	477	385	145	144	49	35	55	247	801	271	203	174	51

(See notes on p.75)

TABLE 27. Continued

MONTH	FLO	AI P	LANES			TWIN	ENGINE	BOMB	ER, DI-	FIGHT IR-	ER, RE FRAN-	CONN	AISSANCE		
	RUFE	JAKE	PETE	OTHER & U/I	NELL	SALLY	BETTY	NICK	NAH	VING	CES	LILY	HELEN	PEGGY	OTHER & U/I
1941-December				1											9
1942-January				0											0
February				0											18
March				0											1
April				0											0
May				7											0
June				2											0
July				0											0
August				4		2									27
September	9			0		16									55
October	7			16		0	3								50
November	1			9		0	16								2
December	4			0		0	0								0
1943-January	0			3		0	11								0
February	0			0		0	4								0
March	0			0		0	0								0
April	0			0		0	0								0
May	0			0		0	0								0
June	0			15		0	27								0
July	0			2	3	0	23								6
August	1	2	2	0	0	0	0								0
September	0	0	0	0	1	0	4								0
October	0	0	0	1	2	0	9								0
November	5	0	2	2	0	2	27						1		1
December	4	0	2	2	0	0	10						0		0
1944-January	0	2	0	1	1	0	8	0	0			0	0		0
February	11	7	7	5	0	0	15	1	0			2	0		4
March	1	0	0	1	0	0	14	0	0			0	0		1
April	0	0	0	0	0	7	18	3	1			0	1		6
May	0	1	0	0	0	1	9	0	0			0	0		0
June	1	15	0	0	1	3	45	2	0	9	2	2	2		15
July	9	1	0	0	0	0	0	2	0	0	3	0	0		5
August	0	1	0	0	0	0	1	0	1	0	0	0	0		0
September	0	1	3	0	1	2	16	8	10	2	3	0	1		3
October	0	25	2	2	12	29	57	17	6	7	74	35	7		14
November	1	2	1	0	1	2	8	1	3	2	10	3	0		5
December	0	12	1	1	0	4	8	2	3	6	4	5	0		1
1945-January	0	11	1	1	3	6	4	5	8	2	6	3	7	0	0
February	6	15	4	1	3	2	9	4	8	1	0	1	3	0	0
March	6	9	0	2	3	1	44	6	2	4	8	0	2	2	1
April	0	3	0	8	0	3	48	9	4	4	24	5	0	7	3
May	4	16	14	7	1	3	20	12	23	2	9	1	1	1	0
June	1	4	2	1	1	3	11	3	1	1	1	0	0	0	0
July	0	1	4	2	0	2	6	0	6	0	0	0	0	0	0
August	0	0	2	0	1	0	2	7	1	1	5	0	0	0	0
TOTALS	71	128	47	96	34	88	477	82	77	41	149	57	25	10	227

(See notes on p. 75)

TABLE 27. Continued

MONTH	TOTALS, BY MAJOR TYPES							TOTAL, ALL TYPES
	SINGLE-ENGINE FIGHTER	SINGLE-ENGINE BOMBER	FLOAT PLANE	TWIN-ENGINE COMBAT	FLYING BOAT	TRANSPORT	TRAINER	
1941-December	1	0	1	9	1			12
1942-January	1	0	0	0	0			1
February	11	1	0	18	4			34
March	0	0	0	1	1			2
April	0	0	0	0	0			0
May	38	18	7	0	3			66
June	49	39	2	0	0			90
July	0	0	0	0	0			0
August	54	52	4	29	5			144
September	28	3	9	71	0			111
October	139	49	23	53	3			267
November	50	4	10	18	2			74
December	15	0	4	0	0			19
1943-January	47	4	3	11	0			65
February	16	5	0	4	0			25
March	1	0	0	0	0			1
April	33	13	0	0	0			46
May	15	0	0	0	0			15
June	69	17	15	27	0			128
July	148	4	2	32	0			186
August	88	15	5	0	1			109
September	93	10	0	5	3			111
October	98	0	1	11	0			110
November	150	97	9	31	2			289
December	131	1	8	10	2			152
1944-January	404	5	3	9	0	1		422
February	238	21	30	22	0	0		311
March	104	10	2	15	0	0		131
April	60	12	0	36	0	0		108
May	8	0	1	10	1	1		21
June	519	187	16	81	9	6		818
July	93	2	10	10	2	0		117
August	12	2	1	2	3	0		20
September	295	25	4	46	1	11		382
October	727	179	29	258	9	6		1208
November	214	19	4	35	3	7		282
December	123	19	14	33	3	9		201
1945-January	162	29	13	44	1	9		258
February	365	30	26	31	1	6		459
March	228	44	17	73	5	8		375
April	643	436	11	107	1	7		1205
May	298	91	41	73	3	5	28	539
June	103	27	8	21	0	0	0	159
July	56	10	7	14	0	2	1	90
August		20	2	17	0	2	0	76
TOTALS	5962	1500	342	1267	69	80	29	9249

NOTES TO TABLE 27

Table 27 shows the monthly breakdown by model and type of Japanese aircraft destroyed in combat by carrier-based and land-based aircraft combined.

If the reported identifications by Naval pilots can be accepted as generally correct, 65 percent of the Japanese aircraft destroyed in air combat were single-engine fighters, 16 percent were single-engine bombers, 14 percent were twin-engine fighters or bombers, and only 5 percent were float planes or of miscellaneous types.

The 65% of single-engine fighters may be further broken down: nearly two-thirds were Zekes, less than one-fifth were Tonys, Oscars and Nates, one-tenth were Tojos and newer types, and the small remainder were of other or unidentified types.

Over half of the single engine-bombers were the vulnerable Vals, the remainder Judys, Kates and Jills in decreasing magnitude. Nearly 40 percent of the twin-engine planes were identified as Bettys, 12 percent as Frances; eight other principal types were identified in small numbers, and over 15 percent could not be identified.

The worst month for Zekes was June 1944, when 461 were shot down by Naval planes, but all types of Jap fighters had bad months in October 1944 (727 shot down) and April 1945 (698 lost). By far the worst losses of single-engine bombers were in April 1945, when 304 Vals and 132 others went down. Twin-engine planes had their worst month in October 1944, when 258 of assorted types were destroyed in combat off Formosa and the Philippines.

TABLE 28. AERIAL COMBAT RESULTS , INDIVIDUAL MODELS OF OWN VS. JAPANESE AIRCRAFT, 1 SEPTEMBER 1944 . 15 AUGUST 1945

(Figures in left-hand column for-each plane type are enemy planes destroyed in combat by own planes of type listed; figures in right hend column are own planes lost in combat with enemy planes of the types listed.)

ENEMY AIRCRAFT MODEL	OWN AIRCRAFT MODEL																					
	F6F		4U, FG		FM		SB2C, TBM		PB4Y		OTHER VPB		TOTAL FIGHTERS		TOTAL BOMBERS		GRAND TOTALS	
Zeke, Hamp	1000	75	327	27	87	2	17	8	25	4	2	2	1414	104	39	14	1453	118
Oscar	396	26	46	1	38	3	14	1	15	2	2		480	30	31	3	511	33
Tony	275	11	60	2	29		4	2	5	2	1		364	13	10	4	374	17
Tojo	283	9	53	4	17	2	6		8		2		353	15	16		369	15
Frank	114	12	28	4	0		1		1		0		142	16	2		144	16
Jack	33	9	9	3	1		0		6		0	1	43	12	6	1	49	13
George	28	0	7		0		0		0		0		35		0		35	
Myrt	36	0	19		0		0		0		0		55		0		55	
Nate	59	1	82	1	1		0		0		2		142	2	0		142	2
U/I S/E VF*	90	6	3		10		2	5	4	3	1	3	103	6	7	11	110	17
TOTAL S/E VF	2314	149	634	42	183	7	44	16	64	11	10	6	3131	198	118	33	3249	231
Val	215		187	2	88		5		12		2		490	2	19		509	2
Judy	134	1	36	1	5		0		1		0		175	2	1		176	2
Kate	26		13		4		1		7		3		43		11		54	
Jill	105		23		7		0		3		2		135		5		140	
Sonia	21		7		1		0		2		0		29		2		31	
Other VB-VT	14	1	5		0		0		0		0		19	1	0		19	1
TOTAL VB-VT	515	2	271	3	105		6		25		7		891	5	38		929	5
Jake	50		6		7		3		31		2		63		36		99	
Pete	18		8		0		0		8		0		26		8		34	
Rufe	15		0		0		1		2		0		15		3		18	
Rex	0		6		0		0		3		0		6		3		9	
Paul	6		1		0		1		2		0		7		3		10	
Dave	0		3		0		0		2		1		3		3		6	
TOTAL F/P	89		24		7		5		48		3		120		56		176	
Betty	185	6	29	1	2		3		14		0		216	7	17		233	7
Dinah	48		23		1		0		3		0		72		3		75	
Frances	118		7		18		0		1		0		143		1		144	
Irving	20		2		9		1		0		0		31		1		32	
Nick	46	1	16		4		5		3		0		66	1	8		74	1
Sally	33		5		16		1		2		0		54		3		57	
Helen	12		9	1	0		0		0		0		21	1	0		21	1
Lily	27		3		21	1	2		0		0		51	1	2		53	1
Nell	18		0		1		0		7		0		19		7		26	
Peggy	6		4		0		0		0		0		10		0		10	
U/I T/E Combat	17	1	0		9		0		1		0		26	1	1		27	1
TOTAL T/E COMBAT	530	8	98	2	81	1	12		31		0		709	11	43		752	11
FLYING BOATS	17		0		0		1		8		1		17		10		27	
TRANSPORTS	36		3		1		3		28		1		40		32		72	
TRAINERS	17		12	1	0		0		0		0		29	1	0		29	1
UNIDENTIFIED*	0	1	0	1	0	1	0	4	0	3	0		0	7	0	6	0	9
GRAND TOTAL	3518	160	1042	49	377	9	71	20	204	13	22	6	4937	218	297	39	5234	257

* 27 F6Fs shot down by unidentified VF, 14 F6F s lost to unknown types of aircraft, and 1 F4Us shot down by unidentified VF, have been arbitrarily prorated among the various single engine enemy fighter types in accordance with the number of each reported to have been shot down by F6Fs and F4Us, and the number of F6Fs and F4Us reported shot down by each. Similar proration is not possible for other plane types.

NOTES TO TABLE 28

Table 28 is a combination of two tabulations. It covers only the period from 1 September 1944 to 15 August 1945, during which period were destroyed 5,234 airborne planes, or 57%, of the total Jap planes credited to Naval aircraft during the war. The first line of figures in each column is the number of Jap planes, of the model and type listed at the left, destroyed in combat during this 12-month period by Navy and Marine carrier and land-based planes of the model or type listed at the top. The second line of figures is the number of Navy and Marine planes lost during the same period in encounters between the same types or models of aircraft, based on a special study of our own aircraft losses.

In the case of F6F and F4U losses the bulk of those reported as destroyed by unidentified types, amounting to one-fourth of the total, have been prorated as noted in the footnote to the table . This, plus the errors in identification which may normally be expected in the action reports, results in a decrease of accuracy which leaves something to be desired, but permits comparisons which are believed sufficiently near the truth to be of considerable value and interest, and are in any event the best available.

The result of comparing each pair of figures is to produce a combat ratio for air combat between each two models or types of planes involved - subject to the limitation on accuracy noted above.

The F6F appears to have shot down 15½ single-engine Jap fighters for each F6F destroyed in combat with them. Against the Zeke the F6F ratio was over 13-to-1; against Oscar over 15-to-1; against Tojo (probably including a large proportion of misidentifications) over 31-to-1. Against the most advanced types the F6F did less well: 8½-to-1 against the Frank, Jack and George combined.

Unusual is the loss of 6 F6Fs in combat with Betty; however, with respect to enemy twin-engine planes as a whole the ratio was 66-to-1, and against all other bomber types combined was 225-to-1.

The F4U nearly matched the F6F performance during this period, with a 15-to-1 ratio against single-engine fighters, and 12-to-1 against Zeke. The F4U, however, included a relatively large number of obsolete Nates among its kills, and while its record against Oscar and Tony was superior to the F6Fs', the F4U scored only 13-to-1 against Tojo, and only 6-to-1 against Frank, Jack and George combined.

The phenomenal FM leads all fighters during this period, with a 26-to-1 ratio over Jap single-engine fighters, only 2 losses sustained in destroying 87 Zekes, and only two losses in downing 194 bombers and miscellaneous types.

Bomber losses, as might be expected, were higher against enemy fighters, though the PB4Y reported destroying over 5 fighters for every PB4Y combat loss. No Navy bombers were lost, however, in the combats which resulted in destruction of 179 enemy bombers, float planes. and miscellaneous types during this period.

The catholic taste of the PB4Ys during the 12 months may be noted. They accounted, in all, for planes of 24 different identified combat types, plus transports and unidentified types, and they destroyed over 15 Jap planes for each of their own losses.

From the Japanese angle, the ineffectiveness of their air forces against the Navy during this period is clearly shown. They lost 3,131 fighters in destroying 198 of ours, and expended 118 of their fighters in destroying only 33 of our bombers. Even their best fighter, Jack, sustained 49 losses in destroying 13 Navy planes.

The Japanese single-engine bombers knocked down only one of our planes for every 186 of their losses (our VSB and VTB enjoyed a 3½-to-1 advantage over the Japs). Their twin-engine bombers and fighters did little better, losing 68 planes for every kill they made. Their flying boats and float planes made no kills at all to offset their 203 losses. Nor did their 72 transports lost - 40% of which were destroyed by our roving search planes. In all, the Japs lost over 20 planes for each of ours destroyed in air combat during this period.

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TABLE 29. ANTIAIRCRAFT LOSS AND DAMAGE,
By Plane Model, Carrier-Based and Land-Based, by Years.

BASE, PLANE MODEL	1941-42 SORTIES ATTACKING TARGETS Total	With AA Present	LOSS AND DAMAGE TO ENEMY AA Lost	Damaged	PERCENT OF SORTIES MEETING AA Lost	Damaged	% LOST OF A/C HIT	1943 SORTIES ATTACKING TARGETS Total	With AA Present	LOSS AND DAMAGE TO ENEMY AA Lost	Damaged	PERCENT OF SORTIES MEETING AA Lost	Damaged	% LOST OF A/C HIT
CARRIER	1,976	1,238	47	66	3.8	5.3	42	4,217	3,632	44	485	1.2	13.4	8
F4F	456	169	15	14	8.9	8.3	52	107	86	2	6	2.3	7.0	25
F6F	0	0	0	0	0	0	0	1,481	1,293	24	187	1.9	14.5	11
SBD	1,209	817	18	37	2.2	4.5	33	1,147	973	6	89	0.6	9.1	6
SB2C	0	0	0	0	0	0	0	237	213	2	31	0.9	14.6	6
TBF	142	83	3	4	3.6	4.8	43	1,245	1,067	10	172	0.9	16.1	5
TBD	169	169	11	11	6.5	6.5	50	0	0	0	0	0	0	0
LAND-BASED	1,564	804	30	51	3.7	6.3	37	11,944	9,090	86	433	0.9	4.8	17
F4F	224	113	3	13	2.7	11.5	19	56	24	4	3	16.7	12.5	57
F4U	0	0	0	0	0	0	0	1,053	427	18	23	4.2	5.4	44
F6F	0	0	0	0	0	0	0	131	66	2	6	3.0	9.1	25
SBD	1,149	550	18	15	3.3	2.7	55	6,022	4,941	23	215	0.5	4.4	10
SB2U	17	17	1	3	5.9	17.6	25	0	0	0	0	0	0	0
TBF	135	101	2	16	2.0	15.8	11	4,077	3,249	31	116	1.0	3.6	21
PBY	39	23	6	4	26.1	17.4	60	184	131	2	33	1.5	25.2	6
PB4Y	0	0	0	0	0	0	0	217	156	2	31	1.3	19.9	6
PV	0	0	0	0	0	0	0	204	96	4	6	4.2	6.3	40
			944							945				
CARRIER	69,752	44,684	657	2060	1.5	4.6	24	61,951	41,943	680	1808	1.6	4.3	27
F6F	33,592	21,019	283	817	1.3	3.9	26	21,965	16,338	233	678	1.4	4.1	26
F4U, FG	0	0	0	0	0	0	0	7,993	5,982	137	201	2.3	3.4	41
FM	4,274	2,137	22	42	1.0	2.0	34	7,651	3,396	40	130	1.2	3.8	24
SBD	3,539	2,526	16	131	0.6	5.2	11	0	0	0	0	0	0	0
SB2C, SBW	12,341	9,328	162	424	1.7	4.5	28	6,555	4,870	104	215	2.1	4.4	33
TBF, TBM	16,006	9,674	174	646	1.8	6.7	21	17,787	11,357	166	584	1.5	5.1	22
LAND-BASED	59,716	31,614	248	1646	0.8	5.2	13	48,068	16,578	190	808	1.1	4.9	19
F4U, FG	27,498	10,868	110	422	1.0	3.9	21	18,047	7,208	84	211	1.2	2.9	28
F6F	1,587	774	4	31	0.5	4.0	11	1,191	269	7	6	2.6	2.2	54
U/i VF	51	27	0	0	0.0	0.0	0	27	24	0	0	0.0	0.0	0
SBD	19,713	13,667	59	591	0.4	4.3	9	17,013	4,602	13	97	0.3	2.1	12
SB2C, SBW	0	0	0	0	0	0	0	2,195	949	3	53	0.3	5.6	5
TBF, TBM	4,109	2,765	27	251	1.0	9.1	10	1,530	848	9	44	1.1	5.2	17
PBY	993	308	6	59	1.9	19.2	9	55	29	1	9	3.4	31.0	10
PBM	37	18	2	14	11.1	77.8	13	387	169	11	48	6.5	28.4	19
PB2Y	76	46	0	14	0.0	30.4	0	36	24	1	5	4.2	20.8	17
PB4Y	1,068	512	15	101	2.9	19.7	13	1,769	953	43	269	4.5	28.2	14
PV	1,660	1,112	14	94	1.3	8.5	13	569	304	11	41	3.6	13.5	21
PBJ	2,884	1,512	11	69	0.7	4.6	14	5,249	1,199	7	25	0.6	2.1	22
U/i VPB	40	5	0	0	0.0	0.0	0	0	0	0	0	0.0	0.0	0

2. ANTIAIRCRAFT LOSS AND DAMAGE

Data on number of planes lost to enemy A/A fire, from which can be calculated loss rates in terms of action sorties flown, will be found in many of the preceding tables of this report. In Table 29, are additional data on number of planes damaged by enemy A/A, and loss and damage rates in terms of (a) Number of sorties attacking targets, and (b) Number of sorties attacking targets in the face of enemy A/A fire.

On first glance at Table 29 the predominant impression will be the diversity of the figures. It may be granted that some of the smaller figures involved are affected by chance (and possibly poor reporting). Yet upon closer inspection a number of fairly consistent relationships become visible.

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(a) Loss rates to enemy A/A were highest in 1942. and generally lowest in 1943. increasing slightly from then until the end of the war. The 1942 rates reflect the predominance of large enemy warships among the targets for that year, figures for 1943 and subsequent years the relatively lower but increasing effectiveness of Japanese land A/A. Actually enemy A/A material improved and increased in volume at a far greater rate, but this trend was offset by the improved performance characteristics of Naval aircraft, and improved tactics against A/A.

(b) Loss rates for carrier-based aircraft were consistently higher than for land-based aircraft, despite inclusion in the latter of the relatively vulnerable VPB. The reason is that land-based aircraft generally were assigned to attack the less well-defended rear area targets, already well beaten down by the carrier forces, such as those in the Marshalls and Philippines. Also their campaigns against such heavily defended targets as the Rabaul area were of long duration, and by the later stages enemy A/A guns had been greatly reduced in number and ammunition supplies depleted. Carrier aircraft, on the other hand, were constantly reaching out toward the most heavily defended targets, pressing their attacks close to wipe out such small and vital targets as grounded aircraft, warships and merchant vessels, and seldom staying long enough to enjoy the benefits of the reduced A/A defenses resulting from their attacks.

(c) The lesser effectiveness of enemy A/A against our land-based planes did not result from an appreciably lower rate of hits per sortie attacking defended targets, but from a generally lower lethal effect of hits. A smaller percentage of the land-based planes hit by A/A was lost. In part, also the lower rate of losses for land-based planes reflected the extensive use of the less vulnerable SBD, while the carriers were shifting to the highly vulnerable SB2C.

(d) The SBD, carrier-based or land-based, had consistently the best record of any plane model. It generally received slightly less hits per sortie than other planes, and in addition had the lowest ratio of losses to hits of any single-engine plane.

(e) The F6F appears to have had considerable advantage over the F4U when flown under the same conditions. Receiving about the same number of hits per sortie in comparable operations, the F6F had a far lower rate of loss per plane hit.

(f) The TBM 1oss rate appears to have been lower than that of the SB2C. It received more hits per sortie, but showed greater ability to survive hits. Both SB2C and TBM were somewhat more subject to A/A loss than fighters.

(Note that in the above statements allowance has been made for non-comparable employment of the various plane models, not shown in the table, and particularly for the heavy use of the TBM in CVE support operations against targets whose A/A defenses had already been well reduced. The TBM A/A 1oss rate "on fast carriers was 50% greater than on CVEs, but was still less than the fast carrier rate for SB2Cs. The following table shows loss rates per 100 action sorties for the entire war:

	CV-CVL	CVE
F6F	.87	.83
F4U	1.46	.90
FM		.48
SBD	.68	
SB2C	1.43	
TBM	1.10	.72

(g) The loss rates for VPB were generally higher than for single-engine planes, but not excessive considering the effectiveness of the minimum altitude attack tactics customarily used. The PBJ is an exception; the bulk of its attacks were made from higher altitudes against rather poorly defended targets, and its loss rate is correspondingly low.

The following table combines and summarizes the data for the principal models of both carrier-based and land-based planes for the entire war. In utilizing it, it should be noted

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that the use of F6Fs, SB2Cs and TBMs predominantly in carrier operations, and of F4Us and SBDs mainly in land-based operations tends to distort the relationships between these planes, and produces rates differing from those which would be expected from figures based on performance in comparable operations.

Plane Model	A/A Losses per 100 Action Sorties	Planes Hit Per 100 Attacks, A/A Present	A/A Losses per 100 Attacks, A/A Present	% Lost of Planes Hit
F6F	.83	5.73	1.39	24
F4U, FG	.55	4.92	1.42	29
FM	.48	4.23	1.12	27
SBD	.29	4.73	.54	12
SB2C	1.28	6.47	1.76	27
TBF, TBM	.91	7.74	1.45	19
PB4Y	1.65	28.4	3.70	13
PV	1.08	11.2	1.92	17
PBY	1.09	24.5	3.06	13
PBJ	.21	4.1	.66	16

3. ATTACK DATA . BY GEOGRAPHICAL AREA

(It should be noted that, because of mechanical difficulties arising from the use of several different machine tabulations made at different times, there are slight discrepancies between the tables covering attacks on targets, broken down by area and by target type. None of these are sufficient to affect the validity or essential accuracy of the data.)

This section of the report breaks down the offensive effort of Navy and Marine carrier and land-based aircraft by the geographical areas in which the targets were located, with further detail in some cases on the types of targets attacked in each area. Offensive effort is expressed only in terms of (a) sorties attacking targets (see definition of this term, and note difference between definitions for 1944 and for other years), and (b) tons of bombs expended on targets. Data on rockets and ammunition expended will be found in subsequent sections, but not broken down by area.

Table 30 is the comprehensive picture of the effort placed upon each major type of target in each major area, for the entire war, by all of Naval aviation.

Table 31 breaks down the area totals of sorties attacking targets between land targets and ship targets, and by years.

Table 32 breaks down on a monthly basis the attack sorties and bomb tonnage for the four areas where the most important long campaigns were carried on: the Solomons-Bismarcks area, the Philippines, the Ryukyus, and Japan. Data are given separately for carrier-based and land-based attacks, for land targets and ship targets, on a monthly basis.

Table 33 gives data on a monthly basis, for attacks on land targets in the principal Central Pacific island groups. Tables 34 and 35 show monthly shipping attack sorties. for 1944 and 1945, for all major areas.

TABLE 30. SORTIES ATTACKING TARGETS, AND BOMB TONNAGE EXPENDED ON TARGETS (CARRIER-BASED AND LAND-BASED COMBINED)
By Type of Target, and by Target Area, for Entire War

TARGET AREA	Air-fields	Other Military Targets	Land Transportation	Harbor Areas	Other & Unknown Land *	WARSHIPS Armored	WARSHIPS Unarmored	MERCHANTMEN Over 500 Tons	MERCHANTMEN Under 500 Tons	Unknown Shipping#	TOTAL
					SORTIES ATTACKING TARGETS						
Hokkaido, No. Honshu	566	334	232	90	223	10	76	493	106	62	2192
Tokyo Area	4259	382	144	255	761	259	166	291	291	3	6811
Central Honshu	1556	126	64	120	68	533	134	172	151	28	2952
Kyushu, Kure Area	4250	318	44	144	232	919	182	496	253	51	6889
Ryukyus	14554	17665	810	1253	1241	5	273	1325	1188	8	38322
Formosa	1842	1176	102	126	464	4	222	1163	420	8	5527
Philippines	8792	26578	2323	655	1022	1526	1123	4175	1591	91	47876
Bonins	1304	4388	107	74	232	55	302	699	405	34	7600
Marianas	3630	13822	432	4	773	152	82	541	494	1	19931
Western Carolines	2798	12649	991	1153	1961	73	332	1129	1534	95	22715
Eastern Carolines	1613	1687	1	61	18	178	319	754	237	60	4928
Marshalls	3519	20156	85	416	163	119	49	716	1095	155	26473
Gilberts, Nauru	771	1238	1	133	16	0	0	19	30	0	2208
Midway, Wake, Marcus	737	1907	12	5	144	308	54	26	30	0	3223
Solomons, Bismarcks	10777	33009	1928	968	1052	766	926	1069	2029	441	52965
New Guinea, Halmahera	1394	1259	15	49	13	29	9	270	314	4	3356
Other NEI, Malaya	161	332	28	73	11	2	6	128	291	1	1033
China, Korea	188	104	65	184	13	5	53	474	344	50	1480
Indo China	114	56	102	45	1	24	239	400	92	2	1075
Aleutians, Kuriles	196	279	0	7	5	0	11	9	60	7	574
Atlantic	97	312	390	0	101	33	28	45	35	33	1074
TOTAL	63118	137777	7876	5815	8514	5000	4586	14394	10990	1134	259204
					TONS OF BOMBS EXPENDED						
Hokkaido, No. Honshu	288	127	85	29	98	5	44	206	70	30	982
Tokyo Area	1222	162	32	146	339	125	51	63	71	0	2211
Central Honshu	427	43	21	37	11	333	44	68	30	24	1038
Kyushu, Kure Area	1239	110	4	49	80	604	76	243	53	21	2479
Ryukyus	4575	7528	343	384	408	5	79	461	166	2	13951
Formosa	348	541	24	55	221	0	75	543	58	0	1865
Philippines	2318	12153	720	306	362	722	307	1716	238	3	18845
Bonins	329	1284	14	26	16	21	110	221	81	7	2109
Marianas	1215	4294	162	0	191	99	7	151	20	0	6139
Western Carolines	743	3833	221	381	443	24	78	342	54	114	6233
Eastern Carolines	557	665	0	46	9	89	74	262	20	14	1736
Marshalls	1473	8640	30	204	79	77	0	115	157	128	10903
Gilberts, Nauru	400	497	1	54	5	0	0	6	4	0	967
Midway, Wake, Marcus	403	828	8	6	35	100	7	10	5	0	1402
Solomons, Bismarcks	6996	17980	806	531	493	472	465	605	335	300	28983
New Guinea, Halmahera	419	476	6	19	0	11	6	105	34	0	1076
Other NEI, Malaya	45	237	2	8	4	2	3	49	41	0	391
China, Korea	43	48	29	84	6	4	29	226	108	87	664
Indo China	20	30	65	6	0	15	99	196	30	0	461
Aleutians, Kuriles	143	116	0	2	2	0	6	6	8	3	286
Atlantic	7	65	56	0	2	14	3	16	6	8	177
TOTAL	23210	59657	2629	2373	2804	2722	1563	5610	1589	741	102898

* Including industrial targets (2414 sorties, 947 tons).
\# Including minelaying.

NOTES 'TO TABLE 30

This table makes it clear that the three areas of heaviest Naval offensive air effort were the Solomons and Bismarcks, the Philippines, and the Ryukyus, in that order, followed next by the Marshalls, the Western Carolines, the Marianas, and Japan as a whole. Other areas, though important at particular times, received a far less total weight of attack.

These seven principal areas were the targets of over 85% of the Navy's air offensive; over 20% of the total sorties and 28% of the bomb tonnage were expended against Bismarcks-Solomons targets, 18% of each were expended against Philippines targets, and 14% of each were expended against Ryukyus targets, while the Marshalls claimed 10%.

The targets attacked varied with the area and the purposes of the campaign. Overall, about a quarter of the total offensive was directed against airfields, about one-half against other military ground targets, about one-seventh against shipping, and one-tenth against miscellaneous land targets. In Japan, however. nearly 60% of the attacks were on airfields, and about 25% on shipping, with less attention to other land targets. In the Marshalls three quarters of the attacks were on military ground targets other than airfields. In Formosa and the Eastern Carolines airfields and shipping each accounted for a third of the total. For China and Indo China two-thirds of the attacks were on shipping along the coast and in the harbors.

The principal areas of airfield attack were the Ryukyus, the Solomons and Bismarcks, Japan, and the Philippines. In the Solomons airfields were principally bombed; in the other areas fighter strafing and rocket attacks were more important.

Heavy attacks on military land targets, predominant in the Solomons end Bismarcks, the Marshalls and the Western Carolines, were largely the result of the long campaigns for complete neutralization and reduction of enemy installations in the parts of these areas that were by-passed, though a large volume of pre-invasion and direct support attacks was made. The heavy attacks on military land targets in the Philippines, the Ryukyus, the Marianas, and the Bonins, reflect almost entirely pre-invasion air bombardment and direct air support of ground forces, by carrier and land-based planes.

The heaviest volume of shipping attack, 25% of all Navy shipping attacks, was flown, largely from carriers, in the Philippines campaign. Japan itself was the second most important area for shipping attack, particularly attacks on heavy warships in harbor. Enemy warships were also heavily attacked in the Solomons area, and merchant shipping was heavily attacked in half a dozen other areas.

TABLE 31. SORTIES ATTACKING LAND TARGETS AND SHIP TARGETS
(CARRIER-BASED AND LAND-BASED COMBINED)
By Target Area and by Years

TARGET AREA	SORTIES ATTACKING LAND TARGETS					SORTIES ATTACKING SHIP TARGETS				
	1942	1943	1944	1945	TOTAL	1942	1943	1944	1945	TOTAL
Solomons, Bismarcks	1,090	10,639	31,589	4,487	47,805	1,239	1,668	2,266	1	5,174
New Guinea, Halmahera	18	10	2,691	2	2,721	85	8	525	8	626
Celebes, Borneo		9	115	372	496	1	0	169	192	362
Midway Area	0	0	0	0	0	320	0	0	0	320
Wake, Marcus	69	1,038	857	826	2,790	42	5	36	0	83
Gilberts, Nauru	0	1,830	297	32	2,159	0	47	2	0	49
Marshalls	77	544	21,268	2,457	24,346	63	180	1,717	172	2,132
Eastern Carolines		8	3,127	245	3,380		5	1,517	26	1,548
Western Carolines			11,986	7,568	19,554			2,766	397	3,163
Marianas			18,567	96	18,663			1,270	0	1,270
Bonins			1,860	4,239	6,099			1,224	270	1,494
Philippines			12,154	27,214	39,368	6	0	7,839	661	8,506
Formosa			2,273	1,430	3,703			683	1,134	1,817
Ryukyus			860	34,613	35,473			849	1,950	2,799
Kyushu, Kure Area				4,952	4,952				1,901	1,901
Central Honshu				1,934	1,934				1,018	1,018
Tokyo Area				5,794	5,794				1,012	1,012
Hokkaido, No. Honshu				1,445	1,445				747	747
Korea, No. China				32	32				282	282
Central China				35	35				119	119
South China				483	483			1	526	527
Indo China				317	317			1	756	757
Java, Sumatra, Malaya			98	19	117			31	36	67
Aleutians	2	124	0	0	126	14	2	0	0	16
Kuriles	0	5	278	78	361	0	1	41	29	71
Atlantic	430	0	483	0	913	67	55	39	0	161
TOTAL, ALL AREAS	1,686	14,207	108,503	98,670	223,066	1,837	1,971	20,976	11,237	36,021

NOTES TO TABLE 31

The predominance of the Solomons campaign in 1942-43 is clearly shown. The equal importance of land and shipping targets in 1942, and the steady decrease in the relative importance of shipping as a target is also illustrated. 1944, as the table indicates, was the year when Naval aviation was first able to come to grips with sizeable quantities of the Jap merchant marine and was the year when the 'bulk of it was eliminated.

The table also illustrates graphically the expansion of the areas of operation of the Naval air forces, and the shifts from old areas to new as enemy bases were captured or bypassed and neutralized, and enemy shipping eliminated from successive areas.

TABLE 32. SORTIES ATTACKING TARGETS , AND BOMB TONNAGE
EXPENDED ON TARGETS, IN MAJOR AREA CAMPAIGNS
Monthly, for Carrier-Based and Land-Based Attacks, on Land and Shipping Targets.

A. SOLOMONS - BISMARCKS AREA

MONTH	LAND-BASED ATTACKS				CARRIER-BASED ATTACKS			
	LAND TARGETS		SHIPPING TARGETS		LAND TARGETS		SHIPPING TARGETS	
	Sorties ttacking Targets	Tons of Bombs on Targets	Sorties ttacking Targets	Tons of Bombs on Targets	Sorties ttacking Targets	Tons of Bombs on Targets	Sorties ttacking Targets	Tons of Bombs on Targets
1942 - May	3	3	0	0	0	0	220	139
August	0	0	28	11	389	147	65	34
September	89	24	172	49	0	0	0	0
October	154	54	266	101	44	19	89	41
November	197	57	247	127	0	0	59	21
December	212	48	93	35	0	0	0	0
1943 - January	191	46	129	51	51	23	0	0
February	258	138	106	110				
March	201	116	95	95				
April	224	145	32	14				
May	229	129	127	97				
June	408	303	18	7				
July	2,127	1,482	307	176				
August	670	363	90	56				
September	983	592	89	3				
October	1,043	674	119	9				
November	1,884	1,099	183	73	240	88	217	122
De cember	2,130	1,272	87	59	0	0	69	35
1944 - January	1,046	519	263	159	0	0	91	73
February	1,554	866	316	128	0	0	1	0
March	3,938	2,153	515	143	7	0	3	0
April	3,113	1,658	172	35				
May	2,583	1,320	140	20				
June	1,409	548	55	3				
July	2,574	1,125	126	10				
August	3,485	1,386	81	11				
September	3,566	1,378	79	27				
October	3,799	1,580	236	68				
November	3,397	1,397	178	31				
December	1,118	818	10	1				
1945 - January	465	550	0	0				
February	805	815	0	0				
March	644	726	0	0				
April	765	885	0	0				
May	798	1,044	I	2				
June	426	457	o	0				
July	458	624	0	0				
August	126	143	0	0				
1942 Total	655	186	806	323	433	166	433	235
1943 Total	10,348	6,359	1,382	750	291	111	286	157
1944 Total	31,582	14,748	2,171	636	7	0	95	73
1945 Total	4,487	5,244	1	2	0	0	0	0
GRAND TOTAL	47,072	26,537	4,360	1,711	731	277	814	465

NOTES TO TABLE 32A.

The predominance of land-based operations in the Solomons-Bismarcks area may be especially noted. Carrier offensive activity against land targets was largely limited to putting the Marines ashore in August 1942, and neutralizing Buka and Bonis airfields in support of the Bougainvillea landings in November 1943. The carriers concentrated solely on enemy shipping in the

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Coral Sea, Eastern Solomons, Santa Cruz and Guadalcanal battles of 1942, and in the Rabaul and Kavieng strikes of 1943-44.

Land-based aircraft were forced to devote a major part of their offensive effort to shipping targets during the first ten critical months of the Solomons campaign, to prevent enemy reinforcement of their forces and naval bombardment of our installations. A substantial anti-shipping effort continued throughout the balance of 1943 and 1944, reaching a peak in the early 1944 strikes which made Rabaul Harbor untenable, but after May 1943 land targets received far greater attention.

Peaks of offensive activity against land targets may be noted in July 1943 (direct support of New Georgia landings), November-December 1943 (Bougainville landings), March 1944 (Japanese counter-offensive on Bougainville). The decline in volume in January-February 1944 reflects the longer missions flown against Rabaul during these months, contrasted with the previous short-range hops in the Solomons. The heavy volume of attacks in July-November 1944 reflects the withdrawal of Army planes, leaving the principal responsibility of neutralizing the Solomons to an increased force of Marine aircraft operating from Bougainvillea, Green Island and Emirau. It also reflects the withdrawal of enemy air strength, permitting use of Marine VF entirely for offensive purposes.

In December 1944 the bulk of the single-engine planes were withdrawn from this area for transfer to the Philippines, leaving PBJs as the principal Naval aircraft remaining. This accounts for the larger bomb tonnage per sortie thereafter, and the cessation of shipping attacks, which during late 1944 had been largely fighter attacks on barges.

TABLE 32. Continued

B. PHILIPPINES AREA

MONTH	CARRIER-BASED ATTACKS				LAND-BASED ATTACKS			
	LAND TARGETS		SHIPPING TARGETS		LAND TARGETS		SHIPPING TARGETS	
	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets
1944 - August	0	0	0	0	1	0	3	0
September	3,944	1,414	2,300	699	4	3	33	8
October	3,386	807	2,737	995	33	1	47	11
November	2,083	476	1,958	995	17	0	55	21
December	2,205	287	501	46	481	125	204	66
1945 - January	2,270	663	387	91	1,183	401	104	6
February	0	0	0	0	5,446	2,616	107	25
March	0	0	0	0	5,594	2,586	38	5
April	0	0	0	0	5,022	2,380	15	5
May	0	0	0	0	3,752	2,006	10	8
June	0	0	0	0	2,212	1,160	0	0
July	0	0	0	0	1,434	794	0	0
August	0	0	0	0	301	142	0	0
TOTAL	13,888	3,647	7,883	2,826	25,480	12,214	616	155

NOTES TO TABLE 32B

There were three main stages to the Naval air campaign in the Philippines (a) the destruction of enemy air strength and shipping throughout the area (plus a minor amount of pre-invasion shore bombardment and direct support) carried out by carrier forces during September, October and November, 1944; (b) protection of the amphibious forces and direct support of ground forces by both carrier and land-based planes in the Mindoro and Lingayen landings of December and January; end (c) extensive ground support end pre-invasion bombardment by Marine aircraft in the Luzon campaign and subsequent invasions of the Visayas and Mindanao.

The table shows the considerable emphasis on shipping attack in the first stage; half of the bombing offensive was against enemy naval and merchant vessels, while the remainder of the bombing effort, plus most of the fighter offensive, was sent largely against airfields. The attacks of September-November 1944 in the Philippines constituted the Navy's heaviest sustained anti-shipping offensive; they resulted (see Appendix) in 279,000 tons of combat vessels and 474,000 tons of large merchant vessels sunk (including attacks at Formosa and the Ryukyus). At the same time the air offensive resulted (see Table 26B) in the destruction of 1406 enemy aircraft in air combat and 1,295 on the ground.

By the beginning of the second stage, enemy shipping had been almost completely eliminated, and the enemy air force largely nullified. 676 more planes were destroyed, however, and substantial attacks were made on ground targets in support of ground forces.

For the third stage the carriers were no longer required, enemy aircraft were almost completely absent, and the bulk of the offensive consisted of direct air support of Army ground troops. The table shows the considerable volume of attacks flown by Marine fighters and dive bombers in the Philippines from December 1944 to the end of the war. Although the Marine offensive in this theater during these few months amounted to nearly a quarter of Marine aviations total for the war, it has been practically entirely unpublicized.

TABLE 32. Continued

c. RYUKYUS AREA

MONTH	CARRIER-BASED ATTACKS				LAND-BASED ATTACKS			
	LAND TARGETS		SHIPPING TARGETS		LAND TARGETS		SHIPPING TARGETS	
	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets
1944 - October	859	249	845	318	1	0	4	3
1945 - January	536	160	53	1	1	0	8	2
February	0	0	0	0	6	0	23	2
March	6,347	1,962	868	218	0	0	37	5
April	12,799	4,671	522	113	585	305	10	0
May	6,332	2,769	172	20	982	584	23	10
June	4,555	1,629	47	10	1,600	700	105	9
July	0	0	0	0	775	195	62	2
August	0	0	0	0	95	2	20	0
TOTAL	31,428	11,440	2,507	680	4,045	1,786	292	33

NOTES TO TABLE 32C

The pattern of the Philippines campaign was repeated in the Ryukyus, but in more condensed form. Enemy shipping was more quickly and easily eliminated in March-and April 1945 (it had already been hit in a one-day strike incidental to the Leyte campaign), but the airfields, which had been hit comparatively lightly in October and January, presented more difficulty. Those on Okinawa were quickly neutralized, but it was necessary to attack those in the Southern Ryukyus constantly through the entire 5 months of the operation. The bulk of the remaining offensive effort was concentrated on beach and inland defenses, and on guns, caves, and other defensive positions, in direct support of Marine and Army troops. In this work land-based Marine aircraft began to assist the carrier forces early in April; they assumed an increasing proportion in May and June, and on 22 June took over from the carriers the entire burden of support.

NOTES TO TABLE 32D

This table (see next page) shows the distribution of Naval attack effort between land and shipping targets in the various segments of Japan. (See Definitions for geographical limits of the various areas; note especially that the Tokyo area includes all of northern Honshu except the tip*.

Tokyo area land targets, particularly airfields, received the heaviest fraction of the carrier offensive, over 40% of the total attacks on land targets. These attacks were delivered in three periods: (a) the first strikes of 16, 17 and 25 February, were concentrated on airfields and aircraft factories, and resulted in the destruction of 203 grounded aircraft as well as 413 in air combat; (b) the strikes of 10-18 and 30 July, and (c) the final operations of 9-15 August. In the latter two periods 762 grounded enemy aircraft were destroyed in this area alone . Over half the enemy aircraft destroyed by the Navy in or over Japan, were in the Tokyo area. (See Table 26D).

In the Kyushu-Kure area, the next most heavily attacked, the offensive effort was spread over five months, though the heaviest concentrations were in March and May, in strikes aimed at breaking up enemy air concentrations capable of being employed against Okinawa. The April offensive involved also the strikes against the YAMATO and her escorts, which resulted in destroying the bulk of that suicide naval force.

Central Honshu, including the Kobe-Osaka (Inland Sea) area, and the Nagoya area, was attacked heavily only during the short period of 24-30 July. Half of the bombing effort was directed against shipping.

Hokkaido, and the adjacent tip of Honshu, were attacked only on 14-15 July and 9-10 August .

(Cont. on next page)

TABLE 32. Continued

D. JAPANESE HOME ISLANDS

MONTH	CARRIER-BASED ATTACKS				LAND-BASED ATTACKS			
	LAND TARGETS		SHIPPING TARGETS		LAND TARGETS		SHIPPING TARGETS	
	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets	Sorties Attacking Targets	Tons of Bombs on Targets
KYUSHU, KURE AREA	4,329	1,357	1,688	914	630	126	211	83
1945 - March	1,761	527	407	182	0	0	4	1
April	233	22	313	216	21	11	28	11
May	1,570	651	30	0	13	7	24	13
June	341	54	0	0	123	17	34	17
July	424	103	938	516	336	82	80	29
August	0	0	0	0	137	9	41	12
CENTRAL HONSHU	1,911	539	920	481	23	0	100	18
1945 - February	205	81	36	0	0	0	0	0
March	87	1	97	34	0	0	10	1
April	0	0	0	0	1	0	15	0
May	8	0	8	5	11	0	29	8
June	0	0	0	0	0	0	23	7
July	1,508	409	779	442	0	0	21	2
August	103	48	0	0	11	0	2	0
TOKYO AREA	5,782	1,894	865	283	12	7	147	27
1945 - February	1,339	285	244	10	0	0	0	0
March	0	0	0	0	0	0	12	0
April	0	0	0	0	0	0	11	3
May	0	0	0	0	3	1	26	4
June	0	0	0	0	5	3	34	7
July	2,100	736	366	156	0	0	56	11
August	2,343	873	255	117	4	3	8	2
HOKKAIDO, No. HONSHU	1,445	627	747	355	0	0	0	0
1945 - July	830	299	521	245	0	0	0	0
August	615	328	226	110	0	0	0	0
GRAND TOTAL	13,467	4,417	4,220	2,033	665	133	458	128

(Cont. from preceding page)

The heaviest carrier attacks on shipping in Jap home waters were on 21-28 July in the Inland Sea; in this series of strikes the bulk of the remaining Jap Navy was crippled.

Land-based Naval air attacks on Japan were carried out largely by Naval search planes, though Marine fighters from Okinawa were active against Kyushu from June on. Search plane targets were normally shipping, usually of the smaller types, along the coasts. It should be noted that the bomb tonnages expended in these attacks by single search planes are understated in the above table. Where such a plane dropped less than half a ton in an attack, it was recorded in the machine system as zero. Frequently 2 or 3 small bombs, and heavy strafing, were sufficient to destroy the small vessels encountered, and the remaining bombs of the usual load of a ton or less were saved for other targets that might be found.

TABLE 33. NAVAL AND MARINE AIR ATTACKS ON PRINCIPAL CENTRAL PACIFIC ISLAND GROUPS (LAND-BASED AND CARRIER-BASED COMBINED)
Sorties Attacking, and Tons of Bombs Expended, on Land Targets Only, Monthly

MONTH	WAKE, MARCUS		GILBERTS NAURU#		MARSHALLS		EASTERN CAROLINES		WESTERN CAROLINES		MARIANAS		BONINS	
	S	T	S	T	S	T	S	T	S	T	S	T	S	T
1942 - February	45*	18			77	30								
March	24*	6			0	0								
1943 - June	0	0	6	5	0	0								
July	0	0	6	6	0	0								
August	261*	114	0	0	0	0								
September	0	0	165*	85	0	0								
October	775*	319	5	2	6	1								
November	0	0	1515*	551	424*	193	5	5						
December	0	0	133*	60	114*	13	3	2						
1944 - January	17	20	5	5	2218*	807	16	9						
February	21	22	4	3	2363*	924	452*	110			214*	55		
March	8	4	1	1	971*	483	63	12	809*	160	0	0		
April	1	0	1	2	1526	604	2064*	790	465*	157	10	0		
May	690*	283	9	6	2147	831	170*	49	3	0	20	0		
June	0	0	42	22	1674	401	30	9	2	0	6617*	2058	491*	129
July	0	0	12	11	2332	747	25	15	1897*	573	9722*	3305	614*	178
August	12	8	135	126	2895	1225	41	9	14	4	398*	102	304*	94
September	61*	34	13	11	1620	724	1	0	6142*	1769	285	56	426*	183
October	6	4	3	0	1468	801	60	30	859	258	392	15	4	1
November	23	22	54	19	1164	609	118	57	1228*	262	503	74	12	1
December	18	19	18	19	890	624	87	37	567	150	406	193	9	2
1945 - January	10	12	20	20	479	256	0	0	983	246	27	0	2	0
February	1	0	0	0	33	15	80	33	1536	217	8	0	3102*	849
March	46	78	0	0	241	129	89	58	1468	397	3	0	1132*	232
April	9	19	0	0	196	119	23	16	725	256	6	0	0	0
May	21	34	0	0	438*	227	9	12	896	329	5	0	3	0
June	393*	169	0	0	526	256	7	6	879	339	5	0	0	0
July	153*	31	12	3	418	331	19	10	907	415	42*	4	0	0
August	193*	59	0	0	126	76	18	8	174	89	0	0	0	0
1942-1943 Total	107	457	1830	709	621	237	8	7	0	0	0	0	0	0
1944 Total	857	416	297	225	21268	8780	3127	1127	11986	3333	18567	5858	1860	588
1945 Total	826	402	32	23	2457	1409	245	143	7568	2288	96	4	4239	1081
GRAND TOTAL	2790	1275	2159	957	24346	10426	3380	1277	19554	5621	18663	5862	6099	1669

s - Sorties attacking land targets.
T - Tons of bombs expended on land targets.

#After December 1943 all attacks were on Nauru.
* Denotes months during which carrier strikes were made.

NOTES TO TABLE 33

Shown above is the Naval and Marine offensive air effort against enemy lend targets along the Central Pacific line of advance, and against islands fringing the route.

Wake and Marcus are of the least importance. They were used mainly as targets for training raids by new carriers and air groups reporting to the Fleet, although most of these missions were also timed for diversionary effect, and in addition succeeded in making the islands militarily ineffective as air bases. All months of heavy activity against these islands involved carrier raids; Wake was otherwise attacked only by PB2Ys from Midway, and PB4Ys and PVs from Eniwetok, and Marcus by a few PB4Ys from the Marianas. Some 600 Japanese were killed by air attack on Wake during the war, and 1,300 more died of disease or starvation as a result of the enemy's unwillingness to expose ships to attack by sending in supplies to the garrison.

Against the Gilberts the bombing campaign was short and heavy, and confined largely to the

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actual invasion period in November 1943, following a sma1l but effective one-day raid on Tarawa in September. All subsequent activity in the Gilberts column represents attacks on Nauru (and Ocean Island): a carrier raid in December 1943, and strikes by PVs from Tarawa thereafter, for the purpose of neutralizing the air base to prevent its use to reconnoiter our activity in the Marshalls.

The Marshalls air campaign was an extended one. It began with carrier attacks in November 1943 to neutralize the Marshalls air bases during the Gilberts campaign; it continues with a carrier strike on Kwajalein in December; and was followed by heavy poundings from the entire carrier force supporting the landings on Kwajalein and Eniwetok in January and February 1944. Thereafter Marine and Navy fighters, dive bombers and patrol bombers took over the job of completely destroying the airfields in the four remaining Jap-held islands, and destroying all remaining enemy installations and supplies. To this task a substantial force, operating from Majuro and Kwajalein, was devoted during the remainder of the war. The offensive reached its peak during August of 1944 and declined thereafter. About 2,300 of the 13,000 Japanese personnel on these four islands were killed by air attack; another 4,500 died of disease or starvation as a result of the air blockade maintained.

Against the Eastern Carolines the bulk of the Navy's offensive consisted of two 2-day carrier strikes on Truk in February and April 1944, followed by a small carrier attack on Ponape. Marine F4Us from Eniwetok thereafter made occasional attacks on Ponapa, and Navy searchplanes from time to time bombed Kusaie, Ponape, the Nomoi Islands and Truk.

The Western Carolines were the victims of a carrier raid on Palau, Yap and Woleai during the period 30 March - 1 April 1944, a further heavy raid on Palau and Yap in July 1944, and intensive carrier operations supporting the Marine and Army landings on Peleliu and Angaur in September 1944. In the latter part of that month Marine fighters and torpedo bombers based at Peleliu took over the direct support duty from the carriers, and after Peleliu was secured they maintained a steady volume of neutralizing attacks on the extensive enemy forces on the remaining islands of the Palau and Yap groups until the end of the war. Woleai also received occasional attacks from Navy search planes based at Manus and Guam.

The Naval pre-invasion and amphibious support campaign in the Marianas was the Pacific's heaviest, except for Okinawa, in terms of close support missions flown and bomb tonnage and strafing delivered with low altitude accuracy. It extended over a period of 8 weeks, from the initial strikes preceding the landing on Saipan, to the conclusion of organized resistance on Tinian and Guam. Subsequent activity by land-based Marine fighters in the Marianas was confined to neutralization missions against the two remaining Japanese airfields on Rota and Pagan.

The carrier campaign against the Bonins was one of the longest of the Pacific war, and was unusual in that the first strikes preceded the landings on Iwo Jima by 10 months. The five strikes of June-September 1944 were primarily directed toward nullifying the value of Iwo as an air base, as well as driving major shipping from the area and destroying naval base facilities at Chichi Jima. These operations succeeded in all these purposes; 418 enemy planes were destroyed during their course, and relatively few planes or major vessels were found in the area thereafter.

In the following five months Naval aviation left the Bonins strictly alone, except for occasional search plane attacks. In February of 1945 the Marine invasion of Iwo was supported for several days by the entire fast carrier force, and for three weeks by a substantial CVE force. Its success completed the chain of bases across the Central Pacific.

TABLE 34. SORTIES ATTACKING SHIP TARGETS, MONTHLY, 1944.
By Area, Carrier-Based and Land-Based (Pacific Only)

MONTH	SOLOMONS, BISMARCKS		NEW GUINEA, HALMAHERA		BORNEO CELEBES	MARSHALLS		EASTERN CAROLINES		WESTERN CAROLINES	
	C	L	C	L	L	C	L	C	L	C	L
January	91	263		15		626	133				
February	1	316		22		89	15	1021	17		
March	3	515		26		21	80	0	12	1151	0
April		172	305	15			77	341	42	10	6
May		140		7			95	16	9	0	6
June		55		7			122		10	0	6
July		126		23	2		21		16	279	2
August		81		9	23		51		1	0	2
September		79	64	21	36		68		1	563	28
October		236		0	32		52		12	0	253
November		178		0	37		110		14	0	279
December		10		7	39		159		5	0	181
TOTAL	95	2171	369	152	169	736	981	1378	139	2003	763

MONTH	MARIANAS		BONINS		PHILIPPINES		FORMOSA, RYUKYUS	OTHER AREAS	TOTAL ALL AREAS	
	C	L	C	L	C	L	C	C, L	C	L
January								0	717	411
February	150							0	1261	370
March								0	1175	633
April								11	665	314
May								43	58	258
June	1010	5	110	1				0	1120	206
July	87	0	378	16		1		2	744	209
August		0	621	2		3		24	621	196
September		0	41	10	2300	33		24	2978	290
October		13		16	2737	47	1526	7	4263	666
November		0		15	1958	55		5	1958	693
December		3		14	501	204		4	501	626
TOTAL	1247	21	1150	74	7496	343	1526	120	16061	4872

c - Carrier-based sorties.
L - Land-based sorties.

NOTES TO TABLES 34 AND 35

The bulk of Naval air attack on shipping prior to 1944 is covered by the data for the Solomons-Bismarcks campaign, in Table 32A. Enemy shipping had also been attacked and driven from the Midway area and Eastern New Guinea in 1942, the Aleutians and the Gilberts in 1943. In 1944 the mobile carrier force, and Navy searchplanes operating from new bases won in campaigns spearheaded by the carriers, extended the area untenable for Japanese shipping to 10 additional sectors of the Pacific, including the Philippines, Formosa and the Ryukyus, and the Bonins. In 1945 Naval aviation extended the untenable area to include the entire Pacific and its connecting waters, with the sole exceptions of the Sea of Okhotsk, the Japan Sea, and the southernmost waters of the N.E.I..

Tables 34 and 35 show the progressive movement of naval air shipping attack across the Pacific. In most areas there is a standard progression (1) a heavy carrier strike wiping out most of the major vessels in the area, followed by withdrawal of the reminder by the enemy; (2) the substitution of smaller vessels to run the loose blockade established by Naval search planes from new bases bordering the area, and a period of busy attack activity by these planes; (3) a steady decrease in patrol plane attacks as all shipping disappears from the area. Variations from the pattern occur. In some cases the searchplanes preceded the carriers, or carrier strikes were not needed (Korea, China, Borneo); in some cases fighter bases were established in the area and used to conduct an intensive campaign against coastal barges and small craft as

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TABLE 35. SORTIES ATTACKING SHIP TARGETS, MONTHLY, 1945
By Area, Carrier-Based and Land-Based

MONTH	JAPAN		RYUKYUS		BONINS		FORMOSA		PHILIPPINES		CAROLINES MARSHALLS
	C	L	C	L	C	L	c	L	C	L	L
January	0	0	53	8	0	32	961	17	387	104	184
February	280	0	0	23	169	9		26		107	145
March	504	26	868	37	24	15		23		38	91
April	313	54	522	10	2	5		29		15	63
May	38	79	172	23		7		25		10	67
June	0	91	47	105		3		26			5
July	2604	157	0	62		4		17			32
August	481	51	0	20		0		10			7
TOTAL	4220	458	1662	288	195	75	961	173	387	274	594

MONTH	KOREA, NO. CHINA	CENTRAL CHINA	SOUTH CHINA		INDO CHINA, MALAYA		BORNEO, CELEBES	OTHER AREAS	TOTAL, ALL AREAS	
		L	C	L	C	L	L	C,L	C	L
January	0	0	294	4	645	0	6	8	2345	358
February	0	0		22		18	10	3	449	363
March	2	16		57		11	21	2	1396	339
April	13	23		46		17	41	0	837	316
May	84	8		42		34	67	3	210	449
June	104	24		28		22	21	11	47	440
July	60	31		21		32	13	4	2608	429
August	19	4		12		13	12	19	489	159
TOTAL	282	106	294	232	645	147	191	50	8381	2853

c - Carrier-based sorties.
L - Land-based sorties.

(Cont. from preceding page)

well as ocean-going shipping, as in the Solomons, Marshalls, and Palau areas. But the eventual exhaustion of targets always came.

The Solomons-Bismarcks anti-shipping campaign ran out of ocean-going target vessels in March of 1944, and for the rest of that year was directed at barges. The New Guinea campaign was initially a Black Cat and subsequently a PB4Y enterprise, in which the carriers assisted while supporting the Hollandia and Morotai landings. In the Marshalls and Western Carolines the land-based attacks were all, after the month of the last carrier attacks, directed against barges and small boats useful for inter-island transportation of food and supplies for the enemy garrisons. The same was largely true of the land-based attacks in the Philippines. In the other areas most of these attacks were by patrol planes on ships of ocean-going types.

The geographical extent of these attacks, and their volume, can be seen from the tables. At one time or another Navy VPB were making at least 20 and up to 100 individual attacks on ships per month in each of the following areas:

New Guinea	Formosa
Borneo, Celebes	Japan
Eastern Carolines	Korea, No. China
Bonins	Central China
Philippines	Indo China, Malaya
Ryukyus	

It can be seen that the effect of these many small, accurate attacks, spread throughout each area and throughout each month, while different from the crushing blows administered by carrier forces against concentrations of ships, could meet effectively disrupt shipping movements and destroy a large number of vessels. Particular attention is invited to the VPB attacks on shipping in the waters of Japan, Korea and the entire Asiatic Coast from March 1945 to the end

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Of the war. These attacks, largely by PB4Ys and PBMs, singly and in pairs, achieved an average volume of 400 per month during this period.

Of the carrier attacks, particularly important are those in Formosa and the Philippines during September-November 1944, which completely broke up enemy reinforcement of the archipelago and accounted for a major part of the Jap Navy as well as substantial merchant tonnages (See Appendix). The progressive series of attacks through the Marshalls, Eastern and Western Carolines, Marianas and Bonins, from January to August 1944, while their combined volume was less than that of the Philippines anti-shipping campaign, were also important both in tonnage sunk and in size of ocean area cleared of the enemy.

In 1945 three carrier campaigns are outstanding: the January sweep of the entire South China Sea from Formosa to Indo China, the March strikes on Kyushu and the Ryukyus, and the heavy July offensive against the last Japanese shipping refuge - the Inland Sea - which crippled the remnants of the enemy's combat and merchant fleets.

4. Attack Data, by Type of Target Attacked

TABLE 36. PERCENTAGE OF CARRIER-BASED AND LAND-EASED OFFENSIVE AIR EFFORT DIRECTED AGAINST EACH MAJOR TYPE OF TARGET, BY YEARS

TYPE OF TARGET	SORTIES ATTACKING TARGETS					TONS OF BOMBS ON TARGETS				
	1942	1943	1944	1945	TOTAL	1942	1943	1944	1945	TOTAL
CARRIER-BASED ATTACKS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LAND TARGETS	52.3	87.3	76.9	86.5	81.2	38.5	83.1	76.8	84.4	80.0
Airfields	14.0	42.4	23.5	42.5	32.5	9.8	39.3	19.0	37.3	28.3
Other Military Targets	29,6	41.8	48.2	33.4	41.1	25.5	41.2	53.3	36.4	44.4
Land Transportation	0.4	0.0	2.0	2.8	2.3	0.6	0.0	1.4	2.7	1.9
Harbor Areas	1.3	2.4	0.7	3.1	1.8	1.1	1.8	0.8	3.3	2.0
Other and Unknown Land	7.0	0.7	2.5	4.7	3.5	1.5	.8	2.3	4.7	3.4
SHIPPING TARGETS	47.7	12.7	23.1	13.5	18.8	61.5	16.9	23.2	15.6	20.0
Armored Warships	33.3	6.0	2.9	2.8	3.4	47.7	9.1	4.5	5.0	5.6
Unarmored Warships	3.3	1.4	3.0	2.1	2.5	2.1	2.2	2.6	2.2	2.4
Merchant, Over 500 Tons	8.1	4.4	12.1	5.6	8.9	9.9	5.3	13.9	6.5	10.0
Merchant, Under 500 Tons	1.3	0.9	4.7	2.8	3.6	0.7	0.3	1.6	1.5	1.5
Unknown Shipping*	1.7	0.0	0.4	0.2	0.4	1.1	0.0	0.6	0.4	0.5
LAND-BASED ATTACKS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
LAND TARGETS	42.2	88.0	91.8	94.1	91.6	34.7	89.3	94.9	97.1	94.6
Airfields	6.7	36.4	13.2	12.5	15.1	4.0	38.7	15.5	14.8	18.0
Other Military Targets	29.5	46.1	71.8	67.1	66.9	28.3	45.9	74.1	70.9	68.8
Land Transportation	0.6	0.6	3.3	5.6	3.9	0.0	0.4	2.5	4.5	3.1
Harbor Areas	4.5	3.7	0.8	4.9	2.7	2.2	2.9	0.9	4.2	2.5
Other and Unknown Lend	0.9	1.2	2.7	4.0	3.0	0.2	1.4	1.9	2.7	2.2
SHIPPING TARGETS	57.8	12.0	8.2	5.9	8.4	65.3	10.7	5.1	2.9	5.4
Armored Warships	16.2	0.2	0.0	0.0	0.3	24.6	0.4	0.1	0.0	0.3
Unarmored Warships	17.6	3.7	0.4	0.3	0.9	14.9	3.5	0.4	0.2	0.8
Merchant, Over 500 Tons	14.6	2.2	1.9	1.1	1.8	20.2	3.4	1.8	0.9	1.8
Merchant, Under 500 Tons	9.1	3.8	5.4	4.4	4.9	5.0	0.5	1.9	1.4	1.6
Unknown Shipping*	0.3	2.1	0.5	0.1	0.5	0.6	2.9	0.9	0.4	0.9

* Including minelaying.

NOTES TO TABLE 36

This is the first of a series of tables breaking down the Naval air offensive by types of target attacked, regardless of geographical location of the target. For the most part this series contains data only on number of sorties attacking targets, and bomb tonnage expended. Data on types of bombs, and on rockets, ammunition and torpedoes expended on various types of targets, will be found in the next section of the report.

Table 36 shows where carrier-based and land-based offensive effort was directed in each year of the war. Noteworthy is the concentration of both carrier and land-based offensives on enemy shipping, particularly heavy warships, during the first year of the war, and the increased emphasis on land targets thereafter. Enemy airfields came in for heavy attention in 1943, received less attention in 1944, but in 1945, to counter the kamikaze menace, became the principal carrier target again. In 1943 military installations became the primary target of land-based planes; and except for the attacks by VPB, shipping targets became of continuously less importance for land-based planes.

For the carriers, shipping remained an important target until the end of the war, though most important in 1944 because of dwindling opportunities for major attacks thereafter. For land-based planes most shipping attacks after 1944 were on small vessels, the only types ordinarily within range.

The table makes clear that Naval aviation's most important offensive function in terms of volume was reduction of enemy ground defenses, in direct support of our own ground forces or before their arrival in the landing area. Second in importance was destruction or neutralization

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of enemy air force installations, and planes on the ground. Third was destruction of enemy warships and merchant vessels, particularly of the larger types. Miscellaneous land targets, including transportation, harbor and industrial areas, were attacked in the least volume.

It maybe noted that airfields (in attacks by carrier planes) and small merchant vessels generally receive a lower share of the total bomb tonnage than of the attack sorties, while military targets and heavy warships received more tonnage. This results from extensive use of VF rockets and strafing against the first and lighter classes of targets, and maximum bomber forces and heavy bomb loads against the heavier targets.

NOTES TO TABLE 3?

This table illustrates the offensive uses made of the various models of aircraft. Attention is invited to:

(a) The extensive use of the carrier F6F and F4U against airfields, and of the F6F against merchant shipping. The FM, based on CVEs, was used primarily against military targets in air-ground support operations.

(b) The heavy use of carrier VSB (25% of total attack sorties) against shipping, and especially against heavy warships. The use of carrier VTB against shipping, and against airfields, is reduced by inclusion in the figures of CVE VTB which engaged primarily in air-ground support operations.

(c) The predominant use of land-based VF and VSB against military targets. The land-based VTB data indicate a heavy use against airfields largely because their offensive use was principally in the Solomons campaign of 1943 and early 1944, when airfields were the principal target. Note also the extensive use of land-based VF against small vessels, largely barges in the Solomons and Marshalls areas.

(d) The heavy use of the PBJ and PV against land targets, contrasted with the primary employment of other VPB against merchant shipping.

See also Table 38, for more detailed data for 1944 only.

TABLE 37. SORTIES ATTACKING TARGETS, BY PLANE MODEL AND TYPE OF TARGET ATTACKED, FOR ENTIRE WAR
With Percentages for Each Type of Aircraft, Carrier and Land-Based

BASE, PLANE MODEL	AIR-FIELDS	OTHER MILI-TARY TARGETS	LAND TRANS-PORTA-TION	HARBOR AREAS	OTHER & UN-KNOWN LAND	WARSHIPS Ar-mored	WARSHIPS Unar-mored	MERCHANTMEN Over 500 Tons	MERCHANTMEN Under 500 Tons	SHIPS, TYPE UN-KNOWN*	TOTAL
CARRIER-BASED											
F6F	22,716	19,111	1,258	958	1,594	1,013	1,779	5,473	2,965	185	57,052
F4U, FG	4,115	1,869	171	275	489	263	140	472	195	4	7,993
FM	2,334	7,281	559	180	536	203	122	170	523	5	11,913
F4F	129	211	0	24	97	20	32	26	12	12	563
SB2C, SBW	3,982	9,008	267	284	769	924	638	2,729	490	42	19,133
SBD	1,765	2,338	20	37	86	639	157	726	77	57	5,902
TBF, TBM	9,750	16,842	859	725	1,272	1,511	638	,626	773	183	35,179
TBD	27	0	0	0	0	107	0	35	0	0	169
LAND-BASED											
F4U, FG	6,095	30,901	2,647	1,820	1,688	0	105	327	2,977	19	46,579
F6F	359	1,482	22	94	690	0	0	32	245	4	2,928
F4F, FM	39	76	0	50	3	12	87	17	35	0	319
U/i VF	39	12	0	0	0	0	0	0	0	0	51
SBD	5,368	34,075	1,365	484	689	155	471	483	759	41	43,890
SB2C, SBW	194	1,758	41	85	21	0	0	0	96	0	2,195
SB2U	0	0	0	0	0	17	0	0	0	0	17
TBF, TBM	2,695	5,570	216	385	129	88	140	290	78	250	9,841
PBJ	2,309	4,875	257	209	269	0	18	97	70	25	8,129
PV	621	1,303	17	56	63	0	28	43	249	52	2,432
PB4Y	411	482	181	102	104	5	132	492	1,055	91	3,055
PBY	131	484	7	46	22	16	60	214	202	89	1,271
PBM	15	76	1	1	2	6	34	115	169	5	424
PB2Y	50	15	0	0	1	0	1	18	14	13	112
U/i VPB	8	11	0	0	7	0	0	3	3	8	40
PERCENTAGES, BY PLANE TYPE,											
Carrier	37.8	36.7	2.6	1.8	3.5	1.9	2.7	7.9	4.8	0.3	100.0
Carrier VSB	22.9	45.3	1.1	1.3	3.4	6.3	3.2	13.8	2.3	0.4	100.0
Carrier VTB	27.6	47.7	2.4	2.1	3.6	4.6	1.8	7.5	2.2	0.5	100.0
Land-Based VF	13.1	65.1	5.4	3.9	4.8	0.0	0.4	0.8	6.5	0.0	100.0
Land-Based VSB	12.1	77.7	3.0	1.2	1.5	0.4	1.0	1.1	1.9	0.1	100.0
Land-Based VTB	27.4	56.6	2.2	3.9	1.3	0.9	1.4	3.0	0.8	2.5	100.0
VPB, 2/E Land	27.8	58.5	2.6	2.5	3.2	0.0	0.4	1.3	3.0	0.7	100.0
VPB, 2/E Sea	8.9	32.9	0.5	2.7	1.8	1.3	5.4	19.1	21.5	5.9	100.0
VPB, 4/E	14.5	15.7	5.7	3.2	3.3	0.2	4.2	16.1	33.8	3.3	100.0

* Including minelaying.

TABLE 38. SORTIES ATTACKING TARGETS, BY DETAILED TARGET TYPE AND BY PLANE MODEL, CARRIER-EASED AND LAND-BASED, 1944 ONLY

TYPE OF TARGET	CARRIER-BASED					LAND-BASED					TOTAL
	CV-CVL			CVE							
	F6F	SBD SB2C	TBF TBM	FM F6F	SBD TBF	F4U F6F	SBD	TBF TBM	PBJ	Other VPB	
Grounded Aircraft	5285	1029	800	518	87	219	9	7	42	65	8,061
Airfield Runways	3906	2116	2101	392	194	2826	2169	944	817	803	16,268
Defense Installations, Guns	6777	3622	2459	1967	1252	9403	9405	1703	221	790	37,599
Personnel and Bivouac Areas	900	490	692	1193	664	4823	2066	442	664	315	12,249
Buildings, Storage Areas*	5080	3620	3083	1158	628	6675	4446	559	851	531	26,631
Docks and Waterfront	228	81	110	23	17	227	120	18	26	85	935
Roads, Bridges, Vehicles	398	151	116	641	101	1268	523	115	36	20	3,369
Other and Unknown Land	675	349	303	214	225	1209	140	25	150	89	3,379
Armored Warships	572	534	422	233	250	0	0	2	0	11	2,024
Unarmored Warships	1153	530	290	105	26	78	47	22	3	82	2,336
Merchant, Over 500 Tons	3797	2714	1654	191	69	330	176	171	20	418	9,540
Merchant, Under 500 Tone	1899	450	377	432	114	2078	567	59	33	481	6,490
Ships, Type Unknown#	126	54	117	5	1	12	38	32	17	184	586
Total Land Targets	23249	11458	9664	6106	3168	26650	18878	3813	2807	2698	108,491
Total Ship Targets	7547	4282	2860	966	460	2498	828	286	73	1176	20,976
TOTAL ALL TARGETS	30796	15740	12524	7072	3628	29148	19706	4099	2880	3874	129,467

* Including airfield buildings and buildings of unidentified types, but excluding barracks.
\# Including minelaying.

NOTES TO TABLE 38

This table presents the additional target detail available for 1944 only, plus a division of the carrier-based offensive between fast carriers and CVEs, and thus illustrates in more detail the employment of various models of carrier aircraft. Among items worthy of nore are:

(a) The concentration of fast carrier F6Fs on parked aircraft, while the bombers concentrated on runways and other airfield installations.

(b) The fast carrier emphasis on the larger land targets, as contrasted with the CVE emphasis on personnel, guns and vehicles.

(c) The CVEs' concentration Of 75% of their offensive effort on land targets other than airfields, against the fast carriers' 50%.

(d) The fast carriers' 25% on shipping targets, against the CVEs' 13%, much of the latter representing the Leyte Gulf battle.

(e) The fast carriers' 25% on airfields, against the CVE's 11%.

(f) The dearth of grounded aircraft, warships, and large merchant vessels available for attack by land-based planes other than VPB.

(g) The predominant neutralization mature of the employment of land-based VF, VSB, VTB, and PBJs (PVs and PBYs to a lesser extent); in 1944 these plane types were used primarily against by-passed enemy bases in the Solomons, Bismarcks, Marshalls and Western Carolines. Typical is the concentration on airfield runways, defenses, guns, personnel, transportation, and small craft.

TABLE 39. ATTACKS , AND ORDNANCE EXPENDITURES ON TARGETS,
BY ALL CARRIER-BASED AND LAND-BASED AIRCRAFT. 1944 ONLY.
By Detailed Type of Target

TYPE OF TARGET	CARRIER-BASED ATTACKS				LAND-BASED ATTACKS			
	SORTIES ATTACKING TARGETS	EXPENDITURES TONS OF BOMBS	ROCKETS	M.G. AMMO.*	SORTIES ATTACKING TARGETS	EXPENDITURES TONS OF BOMBS	ROCKETS	M.G. AMMO.*
Grounded Aircraft	7,719	1,084	3,699	2,243	342	87	0	122
Airfield Runways	8,709	3,024	1,002	3,135	7,559	3,809	136	1,282
Defense Install at ions, Guns	16,077	5,014	6,413	6,095	21,522	9,704	240	4,274
Personnel and Bivouac Areas	3,939	1,262	2,987	1,523	8,310	3,320	72	2,841
Buildings, Storage Areas #	13,569	5,250	5,380	4,263	13,062	5,590	376	3,832
Docks and Waterfront	459	168	309	136	476	217	6	94
Roads, Bridges, Vehicles	1,407	299	1,119	593	1,962	619	0	652
Industrial Facilities	681	249	452	209	77	19	0	27
Urban Areas	544	166	112	152	1,107	394	0	303
Other and Unknown Land	541	86	246	57	429	69	24	27
Armored Warships	2,011	973	780	454	13	14	0	2
Unarmored Warships	2,104	573	617	642	232	94	8	74
Merchant, Over 500 Tons	8,425	3,011	2,805	1,805	1,115	463	102	452
Merchant, Under 500 Tons	3,272	347	897	840	3,218	475	127	786
Ships, Type Unknown @	303	125	12	69	283	232	58	23
Total Land Targets	53,645	16,602	21,719	18,406	54,846	23,828	854	13,454
Total Ship Targets	16,115	5,029	5,111	3,810	4,861	1,278	295	1,337
TOTAL ALL TARGETS	69,760	21,631	26,830	22,216	59,707	25,106	1,149	14,791

* In thousands of rounds expended on targets.
#Including airfield buildings and buildings of unidentified types, but excluding barracks.
@ Including minelaying.

NOTES TO TABLE 39

This table sums up the data for 1944 given in Table 38, and provides additional figures on ordnance expenditures on targets.

The carrier emphasis on strafing and rocket attacks on grounded aircraft may be noted, together with the heavy volume of bombing attack on other airfield targets (Note that sorties classified as attacking primarily aircraft runways may have expended some of their bombs, and the bulk of their rockets and strafing fire, on grounded aircraft and airfield buildings and installations).

It may also be noted that carrier planes expended over 50% of their rockets and strafing fire, and land-based planes 75%, on military land targets.

The table illustrates the intensity of attack on large merchant vessels during 1944, the considerable volume of strafing attacks on small vessels, and the heavy tonnage per sortie against armored warships. Also of interest are the attacks on land transportation targets. The urban areas attacked included principally towns on Guam and Palau, and the cities of Davao and Naha. Industrial facilities included oil storage and manufacturing facilities in the Philippines and Formosa.

From the table may be calculated average ordnance expenditures per sortie against each type of target. Note, however, that rockets were not fully utilized during 1944.

TABLE 40. ATTACKS ON SHIPPING, BY ALL NAVAL AND MARINE CARRIER-BASED AND LAND-BASED AIRCRAFT
By Type of Ship Attacked, Monthly

MONTH	ARMORED WARSHIPS		UNARMORED WARSHIPS		MERCHANT SHIPS OVER 500 TONS		MERCHANT SHIPS UNDER 500 TONS		TOTAL, ALL TYPES*	
	Sorties Attacking	Tons of Bombs	Sorties Attacking	Tons of Bombs	Sorties Attacking	Tons of Bombs	Sorties Attacking	Tons of Bombs	Sorties Attacking	Tons of Bombs
1941 - December	4		23		5	5	2		34	5
1942 - January					3				3	
February	35	18	1		37	11			73	29
March	29	11			56	29			85	40
April			4	1			2		6	1
May	166	114	18	7	36	18			220	139
June	289	109	26	6	3	3	1		319	118
July			1						1	
August	50	28	13	4	22	12	11	5	99	52
September	46	23	23	8	4	9	101	17	174	57
October	150	76	146	50	43	16	21	2	360	144
November	123	77	51	7	164	70	2	1	373	163
December	13	10	35	12	16	6	27	7	93	35
1943 - January			54	20	48	26	24	5	127	51
February			72	40	33	69	1	1	106	110
March									95	95
April	1	1			14	12	17	1	32	14
May			22	10	8	6			127	97
June			15	4			3	3	18	7
July	18	18	222	134	40	23	30	3	310	178
August			19	26	42	30	35	3	96	59
September			2	1	4	3	87	1	93	5
October			8	1	47	18	110	8	166	27
November	179	105	45	28	64	39	123	7	455	207
December	86	63	42	26	150	110	63	13	345	217
1944 - January	36	27	123	67	670	141	167	19	1128	352
February	176	86	350	86	805	368	241	47	1631	607
March	64	24	146	41	918	313	547	80	1810	612
April	2	3	56	6	436	42	409	48	979	125
May			7	4	89	28	177	12	316	93
June	152	99	63	5	500	132	611	33	1326	269
July			76	25	402	146	471	82	952	255
August	68	21	230	96	276	95	272	55	867	270
September	34	6	419	78	1756	654	1035	102	3268	842
October	1405	653	404	111	1895	709	1215	136	4931	1609
November	90	65	341	127	1391	761	751	147	2651	1103
December	10	3	120	20	402	85	593	61	1127	169
1945 - January	29	15	530	201	1524	677	617	74	2700	967
February	11	3	97	3	264	59	441	17	813	82
March	159	93	375	114	570	176	631	107	1735	490
April	253	189	118	58	202	66	580	99	1153	412
May	2	4	20	15	155	76	470	84	661	181
June	2		14	9	116	35	302	55	487	186
July	1275	773	125	52	891	406	608	189	3040	1495
August	28	14	125	59	293	126	196	65	648	264
1941-42 Total	905	466	341	95	389	179	167	32	1840	783
1943 Total	284	187	501	290	450	336	493	45	1970	1067
1944 Total	2037	987	2335	666	9540	3474	6489	822	20986	6306
1945 Total	1759	1091	1404	511	4015	1621	3845	690	11237	4077
GRAND TOTAL	4985	2731	4581	1562	14394	5610	10994	1589	36033	12233

* Including chips of unknown types, and minelaying, not shown separately (total 1079 sorties, 741 tons).

NOTES TO TABLE 40

This table is the monthly summary of all Naval air attack on enemy shipping. Comparison is invited between the attack effort expended, as shown above, and the monthly results accomplished, as shown in the Appendix.

It may be noted that merchant shipping received its first heavy weight of attack in February-March 1944, and was next attacked in the greatest force in the Philippines-China Sea campaigns of September 1944 - January 1945. Thereafter, only in July 1945 was enough shipping found to permit repetition of this scale of attack. It is also interesting to note that about half of the total Naval air offensive against armored warships was expended in three brief campaigns: the Leyte Gulf Battle of 24-26 October 1944, the Yamato attack on 7 April 1945, and the Inland Sea strikes of 18 July and 24-28 July 1945.

5. Ordnance Data

This section of the report consists of three separate groups of tables:

Tables 41-42, providing summary data on ordnance expenditures of all types, and average ordnance expended per attack.

Tables 43 to 49, giving data on bomb expenditures by type of bomb, with detail by plane type, target type, and operation.

Tables 50 to 54, giving data on rocket and ammunition expenditures, with detail by plane type, target type, and month.

a. Ordnance Expenditures, in General

NOTES TO TABLE 41

Naval and Marine aircraft during the war expended against the enemy nearly 103,000 tons of bombs, over 210,000 aircraft rockets, and about 85 million rounds of ammunition.

45$ of the bomb tonnage, 87% of the rockets, and 60% of the ammunition were expended by carrier aircraft. Approximately 95% of the totals for carrier and land-based aircraft combined were expended in dive, glide or masthead bombing, rocket or strafing attack from altitudes of 50 to 5000 feet, usually 3500 feet or less. Thus the amounts expended are hardly comparable in tonnage terms with ordnance expenditures for air forces employing less accurate methods of attack. They may, however, generally be compared between types of Naval aircraft, since normally only the PBJ, of all Naval aircraft, employed horizontal bombing from altitudes of over 5000 feet as more than an occasional method of attack.

(Cont. on next page)

TABLE 41. ATTACK SORTIES, AND ORDNANCE EXPENDED,
ON LAND AND SHIPPING TARGETS, FOR ENTIRE WAR
By Plane Model, Carrier-Based and Land-Based

BASE, PLANE MODEL	LAND TARGETS				SHIPPING TARGETS			
	Sorties Attacking Targets	Expenditures on Targets: Tons of Bombs	Rockets	Ammunition (1000)	Sorties Attacking Targets	Expenditures on Targets: Tons of Bombs	Rockets	Ammunition (1000)
CARRIER-BASED	111,938	36,542	165,532	42,529	25,966	9,117	17,037	7,665
F6F	45,637	5,093	59,420	25,895	11,415	901	10,997	5,257
F4U, FG	6,919	1,112	21,272	4,075	1,074	200	2,397	571
FM	10,890	143	27,287	6,376	1,023	5	1,050	611
F4F	461	6	0	*	102	0	0	*
SB2C, SBW	14,310	8,269	4,383	1,722	4,823	2,725	195	514
SBD	4,246	1,888	0	410*	1,656	636	0	93*
TBF, TBM	29,448	20,011	53,170	4,051	5,731	4,536	2,398	619
TBD	27	20	0	*	142	114	0	*
LAND-BASED	111,228	54,130	25,477	27,512	10,055	3,114	2,010	4,791
F4U, FG	43,151	14,107	14,809	14,600	3,428	204	390	944
F6F	2,647	504	892	638	281	11	28	85
F4F, FM	168	0	144	31*	151	0	0	*
U/i VF	51	14	0	0	0	0	0	0
SBD	41,981	19,733	144	6,581*	1,909	685	88	123*
SB2C, SBW	2,099	1,178	917	332	96	12	47	22
SB2U	0	0	0	*	17	4	0	*
TBF, TBM	8,995	7,454	4,486	1,087*	846	726	122	43*
PB4Y	1,280	689	0	898	1,775	714	0	2,910
PV	2,060	1,802	2,219	733	372	112	250	178
PBJ	7,919	7,966	1,866	2,471	210	35	1,085	28
PBY	690	544	0	75*	581	406	0	175*
PBM	95	57	0	54	329	147	0	268
PB2Y	66	56	0	12	46	41	0	15
U/i VPB	26	26	0	0	14	17	0	0
TOTAL	223,166	90,672	191,009	70,041	36,021	12,231	19,047	12,456

NOTE: Ammunition expenditure data do not cover the period prior to August 1943 in the case of carrier-based planes, or prior to October 1943 in the case of land-based planes. Expenditures were not generally given in action reports prior to these dates (nor were they completely reported thereafter particularly by land-based VSB and VTB in the Solomons). It is estimated that between 2 and 3 million additional rounds were expended in strafing but not reported, of which approximately 80% was by land-based planes, and 80% against land targets. The lack of data for the early part of the war affects materially (5% or more) only the figures indicated by an asterisk (*). For other plane models the ammunition expenditure data are believed to be 95% or more complete.

The table above indicates that the TBF-TBM torpedo bomber, accounting for a total of over 32% of total bomb expenditures, and 29% of all rocket expenditures, was the Navy's principal carrier of heavy ordnance. All types of fighters combined carried less than 22% of the total bomb tonnage to target, though they flew half the attack sorties; however, they expended nearly 2/3 of all rockets, and 70% of all ammunition.

Dive bombers of all types combined carried a total of 34‰ of all Navy bomb tonnage, but were relatively negligible factors as rocket carriers. Patrol bombers (aside from the Marine PBJs, which carried 8% of total bomb tonnage) accounted for less than 5% of total bomb tonnage, and about 7% of the ammunition expenditures.

Most ammunition was expended against non-airborne targets. Data distinguishing such target expenditures from those in air combat are not available, but only 14,308 Naval planes engaged in air combat, some but briefly, or only 5% of a total of 284,073 action sorties involving 259,187 attacks on targets. It is estimated that not over 20% of all ammunition expenditures were in air combat, leaving a minimum of perhaps 70 million rounds expended on other targets.

TABLE 42. SUMMARY OF BOMB, ROCKET, AND AMMUNITION EXPENDITURES,
By Model of Aircraft, Land-Based, and Carrier-Based by Type of Carrier,
1945 ONLY

BASE, PLANE MODEL	ACTION SORTIES	SORTIES ATTACKING TARGETS	TONS OF BOMBS ON TARGETS	ROCKETS ON TARGETS	ROUNDS OF AMMUNITION EXPENDED		AVERAGE EXPENDITURES PER ATTACK SORTIE		1000 Rounds Per Action Sortie#
					.30-.50 (1000)	20 MM. (1000)	Bomb Tons	Rockets	
CV-BASED									
F6F	17,383	13,830	2,069	29,136	8,891	7	.15	2.1	.51
F4U	9,130	7,591	1,231	22,107	4,688	135	.16	2.9	1 53
SB2C	6,874	6,555	4,036	4,535	326	474	.62	0.7	.12
TBM	7,620	7,243	5,736	3,395	820	-	.79	0.5	.11
CVL-BASED									
F6F	6,513	5,414	1,013	15,582	3,905	-	.19	2.9	.60
TBM	3,069	2,970	2,399	1,869	385	-	. 81	0.6	.13
CVE-BASED									
FM	8,479	7,651	89	28,277	4,616	-	,01	3.7	.54
F6F	2,826	2,721	612	10,402	1,654		.22	3.8	.59
F4u	443	402	81	1,562	275	6	.20	3.9	.63
TBM	7,829	7,574	4,332	38,878	1,284	-	.57	5.1	.16
LAND-BASED									
F4U	19,833	18,047	6,391	15,199	6,653	297	.35	0.8	1 35
F6F	1,310	1,191	303	920	192	-	.25	0.8	.15
FM	28	27	0	144	31	-	*	*	*
SBD	17,471	17,013	8,125	0	2,940	-	.48	0.0	.17
SB2C	2,355	2,195	1,190	964	164	225	.54	0.4	.17
TBM	1,605	1,530	1,033	4,332	299	-	.68	2.8	.19
PB4Y	2,106	1,769	852	0	3,299	7	.48	0.0	1.57
PBJ	5,415	5,249	5,938	2, 539	1,672	-	1.13	0.5	.31
PV	622	569	304	2,240	409	-	.53	3.9	.66
PBM	462	387	191	0	332	-	.49	0.0	.72
PB2Y	51	36	18	0	19	-	*	*	*
PBY	58	55	28	0	9	-	*	*	*
CARRIER TOTAL	70,166	61,951	21,598	155,743	26,844	622	.34	2.5	.39
LAND-BASED TOTAL	51,316	48.068	24,373	26,338	16,019	529	.51	.5	.32
GRAND TOTAL	21,482	110,019	45,971	182,081	42,863	1,151	.42	1.7	.36

All calibers combined.
* Not computed; less than 100 sorties.

NOTES TO TABIE 42

Because of the varying periods, conditions, and plane types involved, and the incompleteness of ammunition expenditure data for 1942-43, it has not been thought desirable to prepare data on average ordnance expenditures per attack covering the entire war as a whole. The above table provides such data for 1945 only. For the most part the 1945 performance in respect to ordnance expenditure per plane is believed superior to that for previous years.

Most significant item in the above table is the relatively low average bomb and rocket load expended by carrier VF per sortie attacking targets. It is also interesting to note that both the average bomb load and the average rocket load were greatest for CVE-based VF, least for CV-based VF. It would not appear from these data that maximum advantage wee taken of the offensive ordnance-carrying capabilities of carrier VF, or that the fighter-bomber successfully competed with the dive and torpedo bombers it displaced, so far as offensive use of heavy ordnance was concerned.

The table indicates that credit must be awarded to the CVE forces, for placing 750 lbs. of

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bombs and rockets on target per F6F attack, against less than 600 lbs. per CV F6F; for putting an average of 3 3/4 rockets on target per attacking fighter (against a per-plane capacity of 6, and a fast carrier average of 2½); for placing over 5 rockets on target per TBM attacking, and a total bomb-and-rocket load per TBM nearly equal to the CV-CVL average; and for out-strafing CV and CVL planes of the same types.

The table indicates that land-based fighters, though free from the take-off limitations of the carrier VF, and less burdened by air combat, also did not average in practice the rocket and bomb carrying capabilities urged in behalf of VBF by advocates of the fighter-bomber; they carried more bombs but far fewer rockets than carrier fighters.

Carrier VSB and VTB in general averaged 80% or better of their standard maximum loadings of 1,500 lbs. and 2,000 lbs, respectively. CVE VTB carried less weight of bombs but made up for it with the largest average rocket loadings of any plane.

Land-based SBDs reported excellent loadings relative to their normal loadings; land-based SB2Cs and TBMs carried less ordnance than the same types on carriers.

PBJs, performing largely short-range bombing missions, generally carried their maximum loads of 1-1½ tons, depending on type of bomb carried. Other types of VPB, usually flying long-range search, rarely tried to carry or expend full bomb loads on the targets of opportunity encountered, and often destroyed them with only a part of the load carried.

In ammunition expenditure the carrier fighter excelled, averaging 500 to over 600 rounds per action sortie, exceeded among major types only by the PB4Ys' 1,570 rounds - PB4Y strafing has set afire and destroyed many a small vessel and silenced many an A/A gun. The PV and PBM averaged less than half as many rounds per sortie, and single-engine bomber expenditures were consistently under 200 rounds. Land-based VF averaged only 60% as high a rate of expenditure as carrier VF, largely because the types of targets generally encountered were less vulnerable to strafing.

An interesting inquiry in the field of ordnance expenditures is the total weight of ordnance of all types expended on target per plane lost to anti-aircraft. This provides a rough measure of attack effectiveness against targets, although the limitations are obvious. The differing nature of the targets, and of the defenses of these targets, attacked by fast carrier, CVE, and land-based planes affect the figures. Also, tonnage measurements, while they may reflect with fair accuracy the effectiveness of rockets, probably do not do justice to the value of strafing fire. Subject to these limitations, the following figures are presented:

TONS OF ORDNANCE EXPENDED ON TARGET, PER
AIRCRAFT LOST TO ENEMY ANTI-AIRCRAFT FIRE, 1945 ONLY

Carrier Type, Plane Model		Tons of Ordnance Per A/A Loss	Land-Based Plane Model	Tons of Ordnance Per A/A Loss
CV	F6F	32.4	F4U	99.6
	F4U	25.6	F6F	56.0
	SB2C	43.1	SBD	647.6
	TBM	72.1	SB2C	440.3
			TBM	151.9
CVL	F6F	46.3	PB4Y	29.4
	TBM	71.4	PV	46.6
			PBJ	903.6
CVE	FM	44.9	PBM	21.2
	F6F	77.2		
	TBM	130.6		

NOTE: Rockets and ammunition added to bomb tonnage on basis of approximate weight of complete round (1000 .50 cal. rounds equal 250 lbs., etc.) Plane models expending less than 200 tons of ordnance in 1945 are excluded from the table.

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The relatively higher efficiency of the TBM over the SB2C is apparent above; the extent to which a lesser bombing accuracy may reduce its superiority is not known. The apparent relative ineffectiveness of VF is conditioned by the consideration that 50% or more of the total weight of ordnance carried by carrier VF was rockets or ammunition (20% to 30% was ammunition) which may have been more effective, ton for ton, than bombs.

The apparent CVE superiority over fast carriers of course reflects the use of their planes against targets previously partially neutralized by fast carrier planes and surface gunfire. The apparent superiority of land-based VF, VSB and VTB and PBJs reflects their use against thoroughly neutralized by-passed bases, and targets with light defenses, and in the case of PBJs reflects the effect of medium altitude bombing in addition. Yet the superior performance of the SBDs, operating largely in the Philippines, may well be noted.

The PB4Y and PBM averages reflect use of only partial bomb loads, coupled with heavy strafing, in masthead attack.

b. Bomb and Torpedo Expenditures

TABLE 43. ANNUAL ORDNANCE EXPENDITURES BY ALL CARRIER-BASED AND LAND-BASED AIRCRAFT
By Type of Ordnance

TYPE OF ORDNANCE	CARRIER-BASED							LAND-BASED				
	TONNAGES				PERCENT OF TOTAL*			TONNAGES			% OF TOTAL*	
	1942	1943	1944	1945	1942-3	1944	1945	1942	1943	1945	1942-3	1945
100-lb. GP	40	115	2,036	3,598	6.5	9.7	16.7	31	475	815	6.9	3.4
250-lb. GP	0	0	1,281	927	0.0	6.1	4.3	0	83	2,982	1.1	12.3
500-lb. GP	192	639	7,914	12,878	34.9	37.6	59.6	101	1,347	7,482	19.6	30.9
1000-lb. GP	279	426	3,944	1,336	29.6	18.8	6.2	182	2,555	7,652	37.1	31.6
2000-lb. GP	0	223	1,119	558	9.4	5.3	2.6	0	2,192	815	29.7	3.4
500-lb. SAP	0	0	624	160	0.0	3.0	0.7	0	0	93	0.0	0.4
1000-lb. SAP	0	113	1,401	209	4.8	6.6	1.0	0	0	294	0.0	1.2
Armor-Piercing	0	10	264	29	0.4	1.3	0.1	0	0	7	0.0	0.0
Napalim (Tank)	0	0	118	560	0.0	0.6	2.6	0	0	2,062	0.0	8.5
Other Incendiary	2	26	480	68	1.2	2.3	0.3	0	11	264	0.2	1.1
Fragmentation	8	2	335	957	0.4	1.6	4.4	0	48	1,257	0.7	5.2
Depth Bombs	8	50	668	36	2.4	3.2	0.2	6	19	368	0.3	1.5
Torpedoes	131	116	772	292	10.4	3.7	1.3	83	27	30	1.5	0.1
Mines	0	0	50	0	0.0	0.2	0.0	0	212	87	2.9	0.4
Type Unknown	52	0	46	0	*	*	*	156	320	0	*	*
TOTAL	712	1,720	1,052	21,608	100.0	100.0	100.0	565	7,289	4,208	100.0	100.0

*Percentages are based on totals of ordnance of known types only.

NOTE: 1944 ordnance expenditures, by type of ordnance, are not available from Op-23-V machine cards because of deficiencies in the coding system. The carrier-based expenditures for 1944 given herewith are from data compiled by ComAirPac OpIntel, and are believed reasonably complete and comparable. Similar land-based figures for 1944 are not available.

NOTES TO TABLE 43

This table, the first of seven on the subject of bomb expenditures by type and size of bombs, shows trends from year to year during the war.

Outstanding in the carrier data are the following trends from 1942 to 1945:

(a) Substantial increase in use of 100-lb. GP bombs, used largely in TBMs to secure maximum area coverage against targets susceptible mainly to fragmentation damage and small demolition charges.

(b) Increasing use of 250-lb. GP bombs, largely on SB2C wing racks, particularly in 1944.

(c) A trend toward concentration on use of the 500-lb. GP bomb as an all-purpose weapon, resulting partly from its heavy use by the increased VF complement.

(d) Substantial decrease in the use of heavy GP, SAP and AP bombs, from 44% of the total in 1942-43 to 11% in 1945.

(e) Increasing use of Napalm fire bombs and fragmentation bombs (particularly after introduction of the 260-lb. frag. bomb in 1945), and decreasing use of other special ordnance, such as torpedoes, incendiary clusters, and depth bombs.

In the data for land-based planes, though 1944 figures are not available, the same trends can be seen. The heavy 1945 use of depth bombs, SAP bombs, and incendiary clusters, represents largely a cleaning out of surplus stocks in the Solomons area.

TABLE 44. TOYS OF BOMBS, CLUSTERS, TORPEDOES AND MINES
EXPENDED BY VARIOUS MODELS OF NAVAL AND MARINE AIRCRAFT, 1945 ONLY
By Type of Ordnance

TYPE OF ORDNANCE	CARRIER BASED#				LAND-BASED							
	F6F	FG, F4U	SB2C, SBW	TBM	F4U, F6F	SBD	SB2C, SBW	TBM	PB4Y	PV	PBJ	OTHER VPB *
TONS EXPENDED												
100-lb. GP	33	3	6	3548	69	86	23	218	179	12	179	49
250-lb. GP @	97	12	747	63	24	1345	92	0	236	66	1179	40
500-lb. GP	2402	893	2344	7235	2008	2347	563	584	375	63	1450	92
1000-lb. GP	455	226	573	82	2368	3667	60	48	32	11	1466	0
2000-lb. GP	0	0	0	558	22	0	0	66	10	0	717	0
500-lb. SAP	12	0	25	123	22	0	58	6	0	0	7	0
1000-lb. SAP	7	0	202	0	119	0	37	0	0	0	138	0
Armor-Piercing	1	0	28	0	2	0	0	0	0	0	5	0
Napalm (Tank)	373	119	0	0	1794	10	147	0	0	111	0	0
Other Incendiary	2	3	0	63	34	0	18	3	37	16	140	16
Fragmentation	300	55	102	500	44	610	87	77	4	0	429	6
Depth Bombs	7	1	0	28	25	0	96	39	3	6	183	16
Torpedoes	0	0	0	292	0	0	0	0	5	0	0	25
Mines	0	0	0	0	0	0	0	0	87	0	0	0
TOTAL TONNAGE	3689	1312	4027	12492	6531	8065	1181	1041	968	285	5893	244
PERCENT OF TOTAL TONNAGE												
100-lb. GP	0.9	0.2	0.1	28.4	1.0	1.1	1.9	20.9	18.5	4.2	3.0	20.1
250-lb. GP	2.6	0.9	18.6	0.5	0.4	16.7	7.8	0.0	24.4	3.2	20.0	16.4
500-lb. GP	65.1	68.1	58.2	57.9	30.7	29.1	47.7	56.1	38.8	2.1	24.6	37.7
1000-lb. GP	12.3	17.2	14.3	0.7	36.3	45.5	5.1	4.6	3.3	3.9	24.9	0.0
2000-lb. GP	0.0	0.0	0.0	4.5	0.3	0.0	0.0	6.3	1.0	0.0	12.2	0.0
SAP-AP	0.5	0.0	6.3	1.0	2.2	0.0	8.0	0.6	0.0	0.0	2.5	0.0
Napalm (Tank)	10.2	9.1	0.0	0.0	27.5	0.1	12.5	0.0	0.0	38.9	0.0	0.0
Other Incendiary	0.1	0.2	0.0	0.5	0.5	0.0	1.5	0.3	3.8	5.6	2.4	6.6
Fragmentation	8.1	4.2	2.5	4.0	0.7	7.5	7.4	7.4	0.4	0.0	7.3	2.5
Depth Bombs	0.2	0.1	0.0	0.2	0.4	0.0	8.1	3.8	0.3	2.1	3.1	6.5
Torpedoes, Mines	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	9.5	0.0	0.0	10.2

#Carrier FMs, not shown here, expended 88 tons, as follows: 68 tons of Napalm, 8 tons of 100-lb. GP, 8 tons of 250-lb. GP, 4 tons of 500-lb. GP.

* Largely PBM

@ Including a small quantity of 300-lb. Army GP bombs.

NOTES TO TABLE 44

This table illustrates the ordnance-carrying advantages and limitations of individual models of aircraft, and shows how each model was used as an ordnance carrier during the last 7½ months of the war.

The principal fighter bomb loadings, accounting for 87 to 94 percent of their total bomb loads, were bombs of three types: the 500-lb. and 1000-lb. GP, and the fire bomb. The 500-pounder predominated among carrier VF, because of range and weight considerations, while the three types were nearly evenly matched among land-based VF. Only one other type of bomb, the 260-lb. fragmentation (usually with VT fuzing) enjoyed substantial use on fighters: this was largely in the fast carrier attacks on Japanese airfields in the last few months of the war.

VSB, in turn, were largely limited to bombs of 250 to 1000 pounds size, carrying no 2000-

pounders and few small bombs or clusters. Land-based SB2Cs were used to carry fire bombs, however, and both types of VSB carried 260-pound frag bombs on wing racks at the end of the war.

The TBM carried most of the Navy's 100-pounders, though that type constituted only 28% of its total load. Unable to carry effective loads of bombs of the 250 and 1000-lb. sizes, the TBM could carry any items of 100, 500 or 2000-lb. size, yet it was rarely used for such special items as 100-lb. or 500-lb. incendiary, fragmentation or butterfly clusters, and was insufficiently used to carry 100-pounders.

The versatility of the PB4Y and PBJ is well illustrated by the table. The PB4Y loadings of small bombs reflect the predominance of small vessels among its targets. The heavy fire-bomb loadings on PVs should be noted. These were largely used in strikes on isolated enemy positions in the Borneo area.

NOTES TO TABLE 45

This table analyzes bomb expenditures by type of target, for 1945 only. Inspection of this table permits the general statement that while bomb selection did vary somewhat with the varying requirements of different targets, the outstanding characteristic of the table is the sameness of the bulk of the loadings from column to column.

The latter characteristic results in large part from the relative inflexibility of loading arrangements on fighter and dive bomber aircraft. The former were limited to one or two bombs per plane, and clusters were generally excluded by safety considerations; the VSB were limited to 3 or 4 bombs per plane and here again clusters were excluded and other types of bombs limited. Only the TBM, PB4Y and PBJ were widely flexible as to variety of ordnance which could be carried with minimum sacrifice of their total load. Under these circumstances, the fact that bomb expenditures varied between types of targets as much as they did, is evidence that selection of attacking aircraft and type of bomb was to some extant consciously directed toward the requirements of the targets. That selection was not perfectly adapted to target requirement goes without saying; specific cases have been covered at length in analytical reports by Op-23-v and ComAirPac. It is important to note, however, that even the closest attention paid to scientific selection of ordnance will be of little value if plane design seriously limits the variety of useful ordnance that can be carried.

Attacks on airfield targets show evidence of conscious planning in the high use of 100-lb. GP bombs and fragmentation bombs reported, and the comparatively small use of bombs larger than 500 pounds. The first two types are recommended for attacks on parked aircraft, and GP bombs of 100 or 500 pound size are recommended for runway cratering and destruction of buildings. The heavy reported use of 1000-lb., 2000-lb., and SAP bombs probably largely reflects deficiencies in operational planning and in bomb supply; the use of over 50% 500-pounders may reflect in addition the plane loading problem referred to above.

The category of other military land targets is so large and internally diverse that little comment can be made, other than to point out the extensive use of fire bombs, and the relatively light use of small bombs against targets which are frequently small and difficult to hit, yet vulnerable to fragmentation effect.

Likewise little comment can be made with respect to the miscellaneous categories of land targets, other than to point out the small variation between the three columns, and to suggest that industrial targets (included in “other land”) frequently require a large proportion of heavy bombs.

The record with respect to armored warships shows a commendable restraint with respect to the use of ineffective small bombs, but a rather inadequate use of the 2000-lb. GP bombs, which have been adjudged superior to SAP and AP bombs for glide and dive attack on most types of armored vessels. The 500-pounders, which made up over one-third of the tonnage, were probably largely ineffective. The heavy use of fragmentation bombs to neutralize A/A may be noted. The light use of torpedoes results from the fact that most attacks in 1945 were made on ships in harbor.

Attacks on unarmored warships were distinguished by a commendable concentration on 500-lb. GP bombs. The use of heavier GPs was permissible, but SAP and AP bombs are wasteful against these targets, and torpedoes have a rather small chance of hitting fast maneuvering small vessels of these types.

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TABLE 45. NUMBER OF BOMBS, CLUSTERS, TORPEDOES AND MINES, AND THEIR PROPORTION TO TOTAL TONNAGE, EXPENDED ON TARGET BY ALL NAVAL AND MARINE CARRIER AND LAND-BASED AIRCRAFT, 1945 ONLY
By Type of Ordnance and Type of Target

TYPE OF ORDNANCE	AIR FIELDS	LAND OTHER MILITARY TARGETS	TARGETS LAND TRANSPORTATION	HARBOR AREAS	OTHER OR UNKNOWN LAND	SHIPPING TARGETS: WARSHIPS BB, CA, CVE, DD CL, CV, DE, PC, CVL ETC.		SHIPPING TARGETS: MERCHANT SHIPS Over 500 Tons	MERCHANT SHIPS 500 Tons or Under	UNKNOWN SHIPS	TOTAL
NUMBER OF BOMBS											
100-lb. GP	37,483	38,439	2,261	2,388	2,870	157	298	1,240	3,123	0	88,259
250-lb. GP*	4,291	20,927	1,424	737	1,136	60	314	1,046	1,173	0	31,108
500-lb. GP	24,205	38,618	3,126	3,405	3,538	1,575	1,281	3,959	1,463	260	81,430
1000-lb. GP	2,915	11,953	788	493	587	704	67	432	28	6	17,973
2000-lb. GP	379	620	89	78	79	39	39	16	34	0	1,373
500-lb. SAP	69	619	43	72	8	26	108	61	0	0	1,006
1000-lb. SAP	205	395	4	66	0	143	51	108	0	11	1,003
Armor-Piercing #	6	0	9	10	0	21	15	9	0	0	70
Napalm Bombs	356	5,051	71	267	146	0	0	0	31	0	5,922
Other Incendiary	1,066	2,222	81	222	414	0	2	152	698	1	4,858
Fragmentation	7,090	10,617	264	589	489	623	10	114	111	13	19,920
Depth Bombs	452	1,127	53	252	88	0	0	14	120	0	2,106
Torpedoes	0	0	0	0	2	110	59	138	10	3	322
Mines	0	0	0	0	0	0	0	0	0	96	96
TOTAL BOMBS @	78,517	130,588	8,213	8,599	9,357	3,458	2,244	7,289	6,791	390	255,446
TOTAL TONNAGE	11,577	24,912	1,657	1,702	1,707	1,070	566	1,650	810	165	45,816
PERCENT OF TOTAL TONNAGE											
100-lb. GP	16.2%	7.7%	6.9%	7.0%	8.5%	0.8%	2.6%	3.8%	19.3%	0.0%	9.7%
250-lb. GP*	4.7	10.5	10.7	5.5	8.4	0.7	6.9	7.9	18.1	0.0	8.5
500-lb. GP	52.3	38.8	47.2	50.0	51.8	36.8	56.6	60.0	45.2	39.4	44.4
1000-lb. GP	12.6	24.0	23.8	14.5	17.2	32.9	6.0	13.0	1.7	1.8	19.6
2000-lb. GP	3.4	2.5	5.4	4.6	4.6	3.6	6.9	1.0	4.2	0.0	3.0
500-lb. SAP	0.1	0.6	0.7	1.1	0.1	0.7	4.8	0.9	0.0	0.0	0.6
1000-lb. SAP	0.9	0.8	0.1	2.5	0.0	6.7	4.4	3.3	0.0	3.6	1.1
Armor-Piercing #	0.0	0.0	0.3	0.3	0.0	1.0	1.2	0.3	0.0	0.0	0.1
Napalm Bombs	1.3	9.0	2.1	7.4	3.4	0.0	0.0	0.0	1.9	0.0	5.7
Other Incendiary	0.7	0.6	0.6	0.8	1.8	0.0	0.0	0.4	4.3	0.0	0.7
Fragmentation	6.8	4.7	1.7	3.8	3.2	6.5	0.2	0.8	1.5	0.6	4.8
Depth Bombs	1.0	0.8	0.5	2.5	0.9	0.0	0.0	0.2	2.6	0.0	0.9
Torpedoes	0.0	0.0	0.0	0.0	0.1	10.3	10.4	8.4	1.2	1.8	0.7
Mines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.8	0.2
TOTALS	00.0%	100.0%	00.0%	00.0%	00.0%	00.0%	100.0%	00.0%	100.0%	00.0%	100.0%

* Includes a small number (about 1100 bombs) of Army 300-pound GP bombs.

\# Largely 1000-lb.

@ Counting clusters as one bomb each. It is estimated that the 4,858 "other incendiary" units were almost entirely clusters, averaging 25 individual incendiary bombs apiece, or a total of about 120,000 bombs. possibly 1/3 of the fragmentation units were 6 - bomb clusters, raising the total of frag bombs to over 50,000.

NOTE: Total tonnages in this table differ somewhat from those in other sections of this report, in which tonnages were based on total bomb-tonnage of all types, rounded to a whole number of tons for each separate mission.

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The selection of bombs against merchant vessels appears to have been excellent. However, more 1000-lb. GP bombs and torpedoes could well have been used against large vessels, and SAP bombs eliminated. The excellent selection of small GP bombs, incendiary and fragmentation clusters (largely by VPB) against small vessels, should be especially noted.

TABLE 46. REPORTED ORDNANCE EXPENDITURES OF NAVAL AND MARINE SBDs AND TBFs, 1942-1943 *

TYPE OF ORDNANCE	CARRIER-BASED				LAND-BASED			
	SBD		TBF				TBF	
	Tons	% of Total	Tons	% of Total	Tons	% of Total	Tons	% of Total
100-lb. GP	38	4.0%	105	9.0%	177	5.9%	300	8.0%
250-lb. GP	0	0.0	0	0.0	38	1.3	32	0.9
500-lb. GP	167	17.5	622	53.4	216	7.1	920	24.4
1000-lb, GP	640	67.0	18	1.5	2,588	85.6	18	0.5
2000-lb. GP	0	0.0	223	19.2	0	0.0	2,184	58.1
SAP and AP	91	9.5	0	0.0	0	0.0	0	0.0
Fragmentation	3	0.3	2	0.2	0	0.0	0	0.0
Incendiary	0	0.0	19	1.6	0	0.0	4	0.1
Depth Bombs	16	1.7	32	2.7	3	0.1	0	0.0
Torpedoes	0	0.0	144	12.4	0	0.0	102	2.7
Mines	0	0.0	0	0.0	0	0.0	200	5.3
TOTALS	955	100.0%	1,165	100.0%	3,022	100.0%	3,760	100.0%

* Figures for these two planes given in this table account for 87% of all tonnage expended by Naval and Marine aircraft during these two years.

NOTES TO TABLE 46

The above figures for the Navy's two principal bomb carrying planes of 1942-43 present an interesting contrast with the data for 1945. The overwhelming concentration on the heaviest types of bombs in 1942-43 is not believed to have had any especial justification in the nature of the targets attacked, which were principally airfields and lightly constructed military land targets. This concentration may have resulted in part from the difficulties of bomb supply to forward areas, or from operating conditions which favored the loading of the smallest possible number of bombs. It is believed, however, that the primary factor was the absence of any science of ordnance selection, or of any standard doctrine in the field; the first steps by the Navy to organize the study of bomb damage and to produce a doctrine for ordnance selection were taken in late 1943 and were not effective until 1944. Thus field commanders in the South Pacific and elsewhere were free to follow the path of least resistance - loading the fewest bombs - and the then current "blast" theory of bomb damage (which favored the largest bomb available, and ignored the desirability of using a larger number of smaller bombs to increase the probability of getting hits, on such targets as were susceptible to damage by smaller bombs).

It will be noted that the carrier forces, although they had among their targets a larger percentage of armored warships and others requiring larger bombs, were less inclined to emphasize large bombs than the land-based airforces. Neither made much use of fragmentation or incendiary ordnance. By contrast with 1942-43 the ordnance selection in 1945 exhibited exceptional improvement, for which credit may be assigned to an increasing awareness of the importance of correct ordnance, and an increasing volume of information concerning the science of ordnance selection.

TABLE 47. ORDNANCE EXPENDITURES OF ALL CARRIER-BASED AIRCRAFT, BY TYPE OF ORDNANCE AND BY OPERATION, 1944

(Figures are in tons)

TYPE OF ORDNANCE	MAR-SHALLS	TRUK, MARI-NAS	PALAU, YAP, WOLEAI	HOL-LAN-DIA	SECOND TRUK, PONAPE	MARI-ANAS, BONINS, PALAU	PALAU, YAP	PHIL-IP-PINES, BONINS	RYUKYUS FORMOSA, PHILIP-PINES		PHIL-IP-PINES	TOTAL MINOR OPERA-TIONS
	Jan.-Feb.	Feb.	March-April	April	April-May	June - August	Sept	Sept.	Oct.		Nov.-Dec.	1944
100-lb. GP	243	15	49	123	57	664	238	192	288		144	23
250-lb. GP	85	14	27	51	26	337	152	140	260		185	4
500-lb. GP	741	97	203	352	185	2607	698	878	1070		762	221
1000-lb. GP	218	17	133	154	161	1479	281	565	462		281	93
2000-lb. GP	144	13	18	25	92	367	55	170	100		115	20
500-lb. SAP	*	*	*	23	53	193	50	36	179		51	39
1000-lb. SAP	*	24	79	2	158	524	119	74	223		86	12
Armor-Piercing	0	31	51	0	5	51	0	0	106		13	7
Napalm (Tank)	0	0	0	0	0	0	70	0	0		2	46
Other Incendiary	0	16	14	34	34	247	c	46	58		17	14
Fragmentation	39	17	10	33	10	153	24	21	13		15	0
Depth Bombs	106	0	0	22	24	347	77	18	22		16	36
Torpedoes	0	66	35	0	0	61	c	72	354		136	48
Mines	0	0	50	0	0	0	c	0	0		0	0
TOTAL	1576	510	669	819	805	7030	1764	2212	3135		1823	609#

* Included with 500-lb. GP. or 1000-lb. GP. respectively: amounts are believed to be small.
#Total includes 46 tons of unknown types.

NOTE: These data are from compilations prepared by ComAirPac OpIntel, with miner adjustments, and are believed reasonably complete and accurate.

NOTES TO TABLE 47

The above table, taken from AirPac sources, shows the carrier ordnance expenditures for individual operations and groups of operations during 1944.

The most significant characteristic of the ordnance data, when so arranged, is the relatively high expenditure of small bombs during short operation, and the greater expenditure of heavy bombs during extended operations or the later phases thereof (including (a) the Truk and Marianas strikes which were the second phase of the Marshalls operation, (b) the Second Truk strikes which were the second phase of the Hollandia operation, (c) the Marianas operation as a whole, and (d) the Philippines strikes of September which succeeded the Palau operations). The reason for this was principally early exhaustion by some carriers of the limited allowances of small bombs; this required substitution, in the latter phases of the operation, of the large bombs which were carried in excess of reasonable needs, and these were then used regardless of the requirements of the targets. This situation was corrected in 1945 by altering the carrier allowances in favor of small bombs, and by replenishing bombs at sea during extended operations.

TABLE 48. ORDNANCE EXPENDITURES OF ALL CARRIER-BASED AIRCRAFT, BY TYPE OF ORDNANCE, MONTHLY, 1945

TYPE OF ORDNANCE	January		February		March		April		May		June		July-August	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
100-lb. GP	331	14	252	20	856	27	887	18	665	19	523	28	85	2
250-lb. GP	101	4	106	8	236	7	244	5	132	4	16	1	90	2
500-lb. GP	1318	57	696	55	1692	53	3066	61	2401	68	1058	57	2649	60
1000-lb. GP	249	11	57	5	62	2	209	4	85	2	39	2	636	14
2000-lb. GP	35	2	16	1	12	*	211	4	18	1	8	*	260	6
500-lb. SAP	72	3	0	0	23	1	13	*	30	1	23	1	0	0
1000-lb. SAP	42	2	0	0	80	3	56	1	0	0	0	0	32	1
Armor-Piercing	17	1	0	0	2	*	10	*	0	0	0	0	0	0
Napalm (Tank)	0	0	109	9	85	3	193	4	87	2	97	5	2	*
Other Incendiary	2	*	0	0	16	1	4	*	44	1	1	*	1	*
Fragmentation	28	1	19	2	42	1	42	1	53	2	104	6	689	15
Depth Bombs	8	*	0	0	1	*	12	*	5	*	7	1	4	*
Torpedoes	109	5	0	0	72	2	111	2	0	0	0	0	0	0
TOTAL	2312	100	1255	100	3179	100	5058	100	3520	100	1876	100	4448	100

* Less than $\frac{1}{2}$ of one percent,

NOTES TO TABLE 48

The principal trend to be noted in the 1945 carrier ordnance expenditures is the shift from 100-lb. and 250-lb. GP bombs to the 260-lb. fragmentation bomb in the last three months of the war. These bombs, with the new VT fuzing, were used by all types of planes against such primary targets as grounded aircraft and A/A guns. Heavy bombs received scant use in 1945, except in the heavy anti-shipping strikes of January and July. In the latter month armored warships were the principal targets, and 21% of total tonnage consisted of 1000 or 2000-lb. bombs.

NOTES TO TABLE 49: (see next page).

Torpedoes accounted for 12% of the total weight of bombs, torpedoes and mines expended by Naval and Marine aircraft against enemy shipping during the war. In carrier-based attacks they accounted for 14%, in land-based attacks only 5%.

In shipping attacks by carrier VTB torpedoes represented 29% of the total weight of heavy ordnance carried, and in shipping attacks by land-based VTB only 15%. The proportion of torpedos to total weight of ordnance carried by VTB against shipping declined throughout the war, as indicated by the following figures.

Year	% of Torpedoes to Total Ordnance Expended on Shipping, by Weight	
	Carrier VTB	Land-Based VTB
1942	73%	94%
1943	68	5
1944	32	3
1945	16	0

Torpedoes constituted over one quarter of the total weight of ordnance expended against armored warships, slightly over 10 percent of expenditures against unarmored warships, and slightly less than 10 percent of expenditures against large merchant vessels. Nearly half of the total torpedo expenditures were directed against armored warships.

The table shows, monthly, the targets against which torpedoes were expended, and the types of planes carrying them. All but 3% of total aircraft torpedo expenditures were by VTB, largely TBFs or TBMs.

TABLE 49. AERIAL TORPEDOES EXPENDED ON TARGETS, MONTHLY

MONTH	TOTAL No. OF TORPEDOES EXPENDED	NUMBER DROPPED BY			NUMBER DROPPED, BY TARGET TYPE			
		Carrier VTB	Land-Based VTB	VPB	WARSHIPS Armored	WARSHIPS Unarmored	MERCHANT VESSELS	DATA NOT AVAILABLE
1942 - February	9	9	0		9	0	0	
March	13	13	0		0	0	13	
May	64	64	0		64	0	0	
June	24	17	4	3	21	0	3	
August	12	12	0		11	0	1	
September	5	0	5		5	0	0	
October	32	8	24		23	5	4	
November	48	8	40		39	0	9	
December	7	0	7		7	0	0	
1943 - January	15	0	15		0	6	9	
February	3	0	3		0	3	0	
July	4	0	4		0	0	4	
November	77	73	0	4	59	14	4	
December	44	43	0	1	35	0	9	
1944 - January	56	48	6	2	16	16	6	18
February	67	66		1	14	16	36	1
March	35	35			0	16	16	3
June	22	22			20	1	1	0
August	39	39			4	11	19	5
September	72	72			0	0	70	2
October	354	354			239	13	74	28
November	136	136			34	13	89	0
1945 - January	109	109		0	3	28	78	0
March	73	72		1	0	10	60	3
April	114	111		3	103	9	2	0
May	12	0		12	4	4	2	2
June	8	0		8	0	8	0	0
July	6	0		6	0	0	6	0
TOTALS	1,460	[illegible]ach	108	[illegible].	710	173	515	62

NOTE: 1944 totals are from AirPac data, and 1944 breakdowns by type of target are approximate only. No torpedo expenditures were reported for months not listed above.

c. Rocket and Ammunition Expenditures

TABLE 50. NUMBER OF ROCKETS EXPENDED ON TARGETS, MONTHLY.
By Model of Aircraft, For Land-Based and Carrier-Based Aircraft,
and by Type of Carrier

A. CARRIER-BASED

MONTH	CV-BASED				CVL-BASED		FAST CARRIER TOTAL	CVE-BASED				
	F6F	F4U,FG	SB2C	TBM	F6F	TBM		FM	F6F	F4U, FG	TBM	TOTAL
1944-January				0			0				228	228
February				0			0				142	142
March				144			144				14	14
April				491			491				0	0
May				134			134				0	0
June				525			525				642	642
July	1,331			1176	0		2,507	56			1,373	1,429
August	156			169	0		325	0	713			713
September	1,927			607	1,238		3,772	4	0		3,906	3,910
October	3,586			417	781		4,784	0	0		1,304	1,304
November	2,137			0	354		2,491	0	0		0	0
December	2,739		43	150	335		3,267	0	0		4	4
1945-January	5,587	0	0	233	1,601	0	7,421	2,475	0	0	2,319	4,794
February	3,574	1,542	384	624	693	330	7,147	2,871	0	0	2,327	5,198
March	3,887	7,210	492	826	2,955	693	16,063	5,965	92	0	4,737	10,794
April	3,461	3,147	2058	982	4,018	502	14,168	9,038	4,828	0	12,836	26,702
May	2,991	1,860	850	341	1,936	190	8,168	1,603	3,331	268	8,827	14,029
June	505	252	170	343	538	41	1,849	6,230	2,097	1121	7,736	17,184
July	6,043	4,737	315	46	2,210	113	13,464	0	48	130	96	274
August	3,088	3,359	266	0	1,631	0	8,344	95	6	43	0	144
TOTALS	41,012	22,107	4578	7208	18,290	1869	95,064	28,337	11,115	1562	46,491	87,505

B. LAND-BASED

MONTH	F4U,FG	F6F	FM	SBD	SB2C	TBM	PBJ	PV	TOTAL
1944-February						154	0	0	154
March						94	0	0	94
April						28	0	0	28
May				232		0	0	6	238
November						0	283	59	342
December						0	129	164	293
1945-January	0	0			0	295	194	39	528
February	25	0			0	261	40	175	501
March	0	122			12	195	0	261	590
April	3,277	0			89	346	382	219	4,313
May	3,334	227			92	2,127	716	1,022	7,518
June	4,523	518			234	924	425	477	7,101
July	3,099	53			473	120	537	47	4,329
August	941	0	144		64	64	245	0	1,458
TOTALS	15,199	920	144	232	964	4,608	2,951	2,469	27,487

No rockets were expended during months not listed above.

'TABLE 51. ROCKET EXPENDITURES ON TARGETS, 1945
By Plane Model, Carrier-Eased and Land-Based, and by Target Type

TARGET TYPE	CARRIER-BASED					LAND-BASED				TOTAL
	F6F	F4U	FM	SB2C	TBM	F4U, F6F*	TBM, SB2C	PBJ	PV	
Airfields	29550	11944	7594	1210	14914	3539	123	141	4	69,019
Other Military Targets	13462	6472	16871	2743	24525	10803	3973	1128	1788	81,765
Harbor and Waterfront	1746	738	688	217	827	1004	768	154	77	6,219
Land Transportation	1128	595	1186	96	1678	410	265	66	48	5,472
Industrial	1167	1227	108	74	227	0	24	88	78	2,993
Other and unknown land	698	296	780	0	1056	89	24	21	8	2,972
Armored Warships	295	154	0	32	0	0	0	0	0	481
Unarmored Warships	1340	368	114	100	83	0	0	114	92	2,211
Merchant, over 500 tons	3759	1178	195	31	217	96	0	563	30	6,069
Merchant, under 500 tons	1818	681	741	32	591	322	119	204	115	4,623
Ships, Type unknown	157	16	0	0	24	0	0	60	0	257
TOTAL	55120	23669	28277	4535	44142	16263	5296	2539	2240	182,081

* Includes 144 by FM

NOTES TO TABLE 50

The gradual increase in the use of rockets. as their combat use spread to more squadrons and more types of planes, is clearly indicated above. The first substantial use of rockets by fast carriers, CVEs, and land-based aircraft, came in each case with the appearance of rocket-equipped fighter squadrons, an CVs and CVLs during the Guam and Palau campaigns of July and September 1944, on CVEs during the Lingayen operation. Rocket-equipped land-based Marine fighters did not appear until the beginning of the Okinawa campaign. Fighters accounted for 65% of the aircraft rockets fired at the enemy; CVE TBMs fired 60% of those expended by bombers.

Noteworthy are the expenditures for April 1945, when carriers alone fired nearly 41,000 HE rockets at enemy targets, largely on Okinawa. 116,000, or 55% of all rocket expenditures for the war, were against targets in the Ryukyus area; all but 5,600 of these were fired at land targets. Other areas heavily attacked with rockets were Japan (31,000), the Philippines (19,000), and the Bonins, principally Iwo Jima (15,000).

NOTES TO TABLE 51

1945 aircraft racket expenditures accounted for over 85% of the Naval total for the war. Thus the above table, for 1945 only, gives a nearly complete picture of the use of rockets by Naval planes. 45% of all rocket expenditures were against military land targets, such as guns, defenses, personnel, stores, etc. Another 38% were expended against parked aircraft, hangars, and other airfield targets. About 7% were expended against shipping, 10% against miscellaneous land targets.

Fast carrier fighters made the bulk of the rocket attacks on airfields and shipping; CVE FMs and TBMs made most of the attacks an other military land targets, though CVE planes also heavily attacked airfields (particularly in June 1945) and fast carrier F6Fs were quite active against military targets. SB2Cs made few rocket attacks, in comparison with other plane models. Bombers in general made relatively few rocket attacks on shipping, reserving their primary effort for bomb-carrying.

Land-based planes used rockets primarily against military installations in the Okinawa area, though fighters in the later stages of that campaign made rocket attacks on airfields in Kyushu and the Southern Ryukyus.

TABLE 52. MONTHLY EXPENDITURE OF ROCKETS, BY ALL NAVAL AND MARINE CARRIER AND LAND-BASED AIRCRAFT, BY TYPE OF TARGET, 1945

BASE , MONTH	AIR-FIELDS	OTHER MILI-TARY TARGETS	HARBOR AREAS	LAND TRANS-PORTA-TION	OTHER & UN-KNOWN LAND	WARSHIPS		MERCHANTMEN		SHIPS, UN-KNOWN TYPE	TOTAL
						Ar-mored	Unar - mored	Over 500 Tons	Under 500 Tons		
CARRIER-BASED	65,224	64,077	4,223	4,684	5,608	481	2,005	5,382	3,864	197	155,745
January	4,388	2,716	489	1,115	443	0	704	1,587	775	0	12,217
February	3,236	7,957	180	208	265	8	102	239	150	0	12,345
March	9,066	11,473	1,473	522	1319	4	727	1,265	1,008	0	26,857
April	12,296	24,331	937	1,229	642	112	53	438	832	0	40,870
May	9,941	10,509	375	360	552	0	0	100	339	21	22,197
June	13,560	4,572	12	184	455	0	0	160	90	0	19,033
July	7,147	1,983	430	726	1,128	297	159	1,158	534	176	13,738
August	5,590	536	327	340	804	60	260	435	136	0	8,488
LAND-BASED	3,823	17,683	2,000	788	327	0	206	691	804	16	26,338
January	0	100	250	0	8	0	46	124	0	0	528
February	25	153	243	0	24	0	16	24	16	0	501
March	18	112	297	0	0	0	92	22	49	0	590
April	206	3,747	0	321	0	0	6	10	23	0	4,313
May	557	5,966	127	401	183	0	0	96	188	0	7,518
June	1,032	4,841	649	54	80	0	14	138	293	0	7,101
July	1,651	1,934	358	12	24	0	32	166	136	16	4,329
August	334	830	76	0	8	0	0	111	99	0	1,458
TOTAL	69,047	81,760	6,223	5,472	5,935	481	2,211	6,073	4,668	213	182,083

NOTES TO TABLE 52

This table traces the pattern of rocket attacks in 1945. Primary carrier rocket targets in January were the airfields of the Philippines, Formosa, China and Indo China, though land targets in the Lingayen area ware also heavily hit by the CVEs and shipping in the China Sea by the fast carriers. In February the emphasis in rocket attacks shifted to land targets at Iwo, with the Tokyo airfields a good second. In March a considerably stepped up attack was directed at airfields in Kyushu and the Ryukyus, at Okinawa defenses before the invasion, and at shipping in Kyushu ports.

April witnessed the greatest rocket offensive, mostly in support of ground forces on Okinawa, but with heavy attacks on Kyushu and Ryukyus airfields also. In May the close support requirements relaxed, and land-based planes took over the major share of this duty, but air-field attacks continued. In late May and June, after withdrawal of the British Task Force covering the Southern Ryukyus, and of the U.S. fast carrier force, the CVE force diverted its major attention to airfields, while the Marine planes ashore provided the bulk of the air support.

July and August were devoted almost entirely to attacks on Japan, in which airfields and shipping were the primary rocket targets.

TABLE 53. AIRCRAFT AMMUNITION EXPENDITURES ON TARGETS (IN THOUSANDS OF ROUNDS) 1945
Carrier-Based and Land-Based, by Target Type, Monthly

BASE, MONTH	AIR-FIELDS	OTHER MILI-TARY TARGETS	HARBOR AREAS	LAND TRANS-PORTA-TION	OTHER & UN-KNOWN LAND	WARSHIPS Ar-mored	WARSHIPS Unar-mored	MERCHANTMEN Over 500 Tons	MERCHANTMEN Under 500 Tons	SHIPS TYPE UN-KNOWN	TOTAL
CARRIER-BASED	12,471	7,378	842	826	868	376	656	1708	992	8	26,125
January	1,580	342	110	176	58	11	251	688	205	0	3,421
February	1,077	992	25	72	117	5	90	131	102	0	2,611
March	2,374	2,008	294	108	251	85	169	414	292	0	5,995
April	2,349	2,606	191	164	126	27	33	110	186	0	5,792
May	1,242	676	35	24	53	0	2	27	48	1	2,108
June	1,500	338	12	27	25	0	0	16	18	0	1,936
July	1,108	367	123	192	162	234	53	227	122	7	2,595
August	1,241	49	52	63	76	14	58	95	19	0	1,667
LAND-BASED	1,438	9,155	844	1,149	259	1	105	707	2,377	124	16,159
January	174	240	105	205	30	0	6	14	139	0	913
February	294	1,480	162	136	148	0	7	56	163	0	2,446
March	135	1,596	114	139	13	0	35	90	227	0	2,349
April	182	2,090	91	261	2	0	19	61	287	0	2,993
May	111	1,845	70	158	23	0	3	217	397	0	2,824
June	236	1,018	97	87	21	1	4	124	402	124	2,114
July	240	643	179	158	22	0	29	113	560	0	1,944
August	66	243	26	5	0	0	2	32	202	0	576
TOTALS	13,909	16,533	1,686	1,975	1,127	377	761	2415	3,369	132	42,284
COMPARATIVE TOTALS, 1944	6,782	22,824	230	1,241	863	456	715	2253	1,627	0	36,991

NOTES TO TABLE 53

The pattern of ammunition expenditure differed from that for rocket expenditure, as a comparison of the above table with Table 52 will illustrate. Airfield targets consumed a higher proportion of the strafing efforts of carrier aircraft than of their rocket expenditures. The reverse appeared to be true in the case of land-based aircraft. In the case of shipping targets also, carrier aircraft appeared to rely more on strafing than rocket fire, while for military land targets rockets were used more heavily. These tendencies probably reflect the larger rocket loadings generally carried by CVE planes against military targets, plus extensive strafing of parked aircraft, airfield A/A and ship A/A by fast carrier VP. The heavy use of rockets against harbor areas, versus strafing against transportation targets, by land-based planes, may also be noted.

Carrier planes devoted their principal strafing to airfield targets, with other military targets second. Land-based planes put military targets first, merchant shipping second, and airfields a poor third. The remarkable strafing record of land-based planes against small merchant vessels reflects principally the work of PB4Ys, which during 1945 expended 1,679,000 rounds in missions against merchant vessels of under 500 tons, including 436,000 rounds in July 1945 alone.

The comparative data in the bottom lines of the table show trends in strafing between 1944 and 1945. Major increases from 1944 to 1945 may be noted with respect to airfields, harbor areas, and small vessels, and a decrease with respect to military targets. Part of this decrease, and part of the airfields increase, may have resulted from differences in classification, since in 1944 airfield buildings and guns were sometimes classified under military targets. The growing importance of harbor areas reflects the movement of the war to sectors where substantial ports and facilities were found.

TABLE 54. AIRCRAFT AMMUNITION EXPENDITURES ON TARGETS
(IN THOUSANDS OF ROUNDS), DURING 1944
Carrier-Based and Land-Based, by Type of Carrier, and by Type of Target

TYPE OF TARGET	CARRIER-BASED						LAND-BASED				TOTAL
	F6F	CV-CVL SBD, SB2C	TBF, TBM	FM	CVE F6F	TBF, TBM	F4U, F6F	SBD, TBF	PB4Y	Other VPB	
Grounded Aircraft	1786	104	79	119	144	11	81	2	41	2	2,369
Airfield Runways	2463	258	230	98	66	16	679	432	40	131	4,413
Defense Installations, Guns	3897	422	304	848	420	203	2950	1071	55	198	10,368
Personnel, Bivouac Areas	464	64	118	619	158	100	2016	407	8	410	4,364
Buildings, Storage Areas*	2707	403	376	386	273	115	2368	993	32	439	8,092
Docks and Waterfront	95	8	19	3	11	0	62	17	0	15	230
Roads, Bridges, Vehicles	138	33	19	55	323	25	410	216	4	18	1,241
Industrial Facilities	132	53	19	5	0	0	19	4	2	2	236
Urban Areas	94	10	21	8	6	13	199	12	3	85	451
Other and Unknown Land	79	2	12	27	3	3	4	13	21	12	176
Armored Warships	251	36	29	96	20	22	0	0	2	0	456
Unarmored Warships	507	54	45	24	7	5	23	1	42	7	715
Merchant, over 500 tone	1330	234	159	44	32	6	98	50	213	87	2,253
Merchant, under 500 tons	660	44	58	83	83	11	404	69	149	146	1,627
TOTAL LAND TARGETS	11855	1357	1197	2168	1404	486	8788	3167	206	1312	31,940
TOTAL SHIP TARGETS	2648	368	291	247	142	44	525	140	406	240	5,051
TOTAL, ALL TARGETS	14503	1725	1488	2415	1546	530	9313	3,307	612	1552	36,991

* Including airfield buildings and buildings of unidentified types, but excluding barracks.

NOTES TO TABLE 54

Herein is shown, for 1944 only, a more detailed breakdown of the types of targets strafed, plus data on the amount of strafing by each type of plane.

TABLE 55. SORTIES, BOMB TONNAGE. AND LOSSES IN NIGHT ATTACKS
BY NAVAL AND MARINE AIRCRAFT, FOR ENTIRE WAR
By Plane Model, Land-Based and Carrier-Based

BASE, PLANE MODEL	PLANES TAKING OFF	PLANES ATTACK-ING TARGETS	TONS OF BOMBS ON TARGETS	OWN LOSSES ON ACTION SORTIES			PLANES LOST PER 100 SORTIES		PERCENT OF NIGHT SORTIES TO TOTAL SORTIES
				To Enemy A/A	To Enemy A/C	Opera-tional	Enemy	Oper.	
LAND-BASED	5164	4973	2796	37	3	32	0.8	0.6	3.8
PB4Y	102	92	78	1	0	4	1.0	3.9	2.8
PBJ	1306	1278	747	4	0	3	0.3	0.2	15.6
PV	449	377	310	2	0	6	0.4	1.3	16.7
PBY	997	1058	870	6	1	5	0.7	0.5	72.2
PBM	165	142	58	9	0	1	5.5	0.6	32.6
PB2Y	64	56	74	0	0	0	*	*	45.1
F6F	1327	1300	268	3	0	2	0.2	0.2	32.0
F4U	74	70	9	1	1	1	*	*	0.1
SBD	121	110	31	2	0	1	1.7	0.8	0.3
TBF, TBM	559	490	351	9	1	9	1.8	1.6	5.3
CARRIER-BASED	636	582	204	12	0	12	1.9	1.9	0.4
F6F	301	267	19	4	0	8	1.3	2.7	0.5
F4U	17	16	0	0	0	0	*	*	0.2
FM	4	4	0	0	0	0	*	*	#
SBD	23	23	12	1	0	0	*	*	0.4
TBF, TBM	291	272	173	7	0	4	2.4	1.4	0.8
GRAND TOTAL	5800	5555	3000	49	3	44	0.9	0.8	2.0

* Not computed; less than 100 sorties.
# Less than 0.05.

(a) Night Attack

Tables 55 and 56 give brief statistical data on Navy and Marine night attacks on targets. While the number of sorties attacking targets at night was only 2 percent of total attack-sorties by Naval aircraft, the total volume is more impressive than might ordinarily be thought, amounting to 5,800 sorties and 3,000 tons of bombs, largely by land-based planes. For some types of aircraft, mainly the flying boats, land-based F6F night fighters, and to a lesser extant PVs and PBJs, night attacks constituted a major portion of their offensive activity.

For the PBY, too slow and vulnerable for day attack on defended targets, night work constituted a profitable and principal employment. The 1,058 attacks made by PBYs on 997 sorties were divided between ship and shore targets. Black Cats from New Guinea flew low level night bombing missions against Jap ships in the Bismarck Sea area in the winter of 194344, and Black Cats in the Solomons cooperated with PT-boats in spotting and attacking Jap barges and shore installations. PEWS were also used for night heckling raids on Jap bases throughout the South and Southwest Pacific, and for minelaying, and were still pursuing Jap shipping as far west as Celebes in late 1944.

PBMs and PB2Ys made a number of night attacks, largely on shipping (plus two PB2Y long-range night raids on Wake), but these two plane types ware largely used for anti-sub patrol and sector search in quiet areas, and thus flew far fewer night attack missions.

PBJ night missions fell into two principal classes: night heckling missions over Rabaul and Kavieng, constituting the bulk of the sorties, and night rocket attacks on shipping, principally in the Bonins area. PV night missions were principally attacks on the Northern Kuriles, flown over the 600 miles from Attu under difficult weather conditions. PB4Ys flew few night missions: a few heckling sorties over Rabaul, and some minelaying flights.

The number of night missions by single-engine land-based planes is surprisingly large. Those by TBFs were predominantly for minelaying in the Solomons area, but included also night heckling attacks and shipping attacks there, and in 1945 some heckling missions at Okinawa.

The F6F night missions were flown almost entirely by Marine night fighter squadrons. Those from November 1944 to March 1945 were flown against Palau and Yap, in preparation for those in subsequent months in the Okinawa area, where substantial support was given our ground forces by regular heckling missions over enemy lines.

(Cont. on next page)

TABLE 56. NUMBER OF NAVAL AND MARINE AIRCRAFT ATTACKING TARGETS AT NIGHT

By Plane Model, Carrier-Based and Land-Based, Monthly

MONTH	CARRIER-BASED								LAND-BASED					
	F6F	TBF TBM	Other	Total	F6F	F4U	SBD	TBF TBM	PBY	PBJ	PV	Other PB*	TOTAL	GRAND TOTAL
1942 - May							0	0	3				3	3
June							0	0	5				5	5
August							3	0	0				3	3
September							17	1	0				18	18
October							30	3	0				33	33
November							7	0	0				7	7
December							7	0	0				7	7
1943 - January							0	0	2			0	2	2
February							4	1	9			0	14	14
March								129	7			11	147	147
April								48	0			2	50	50
May								105	0			0	105	105
June								2	6			3	11	11
July								9	16			7	32	32
August	9	18	11	38				25	5		1	0	31	69
September	31	30	12	73				0	10		3	2	15	88
October	0	6	0	6				0	28		9	0	37	43
November	0	24	0	24				37	43		14	2	96	120
December	0	0	0	0				0	53		18	4	75	75
1944 - January	0	0	0	0		2		6	135	0	25	19	187	187
February	1	13	0	14		0		29	60	0	22	16	127	141
March	0	0	0	0		0		27	83	56	43	3	212	212
April	20	0	1	21		4		10	17	80	35	6	152	173
May	0	0	0	0		0	36	0	74	92	90	15	307	307
June	27	0	3	30	6	4	6	0	55	105	50	9	235	265
July	12	0	0	12	0	37		0	63	117	10	8	235	247
August	1	0	0	1	2	9		0	83	108	17	21	240	241
September	1	0	0	1	8	0		0	93	68	0	0	169	170
October	12	4	4	20	13	0		0	69	26	23	0	131	151
November	4	0	0	4	259	12		0	51	70	16	3	411	415
December	31	17	0	48	7	0		0	36	36	0	18	97	145
1945 - January	5	15	0	20	24	0		0	31	47	0	2	104	124
February	4	8	0	12	202	2		0	17	102	0	1	324	336
March	24	33	0	57	147	0		0	2	32	0	29	210	267
April	61	38	12	111	115	0		17	1	81	0	47	261	372
May	18	47	0	65	181	0		41	0	77	0	37	336	401
June	4	4	0	8	241	0		0	1	86	0	17	345	353
July	2	15	0	17	95	0		0	0	74	0	5	174	191
August	0	0	0	0	0	0		0	0	21	1	3	25	25
1942 Total	0	0	0	0	0	0	64	4	8	0	0	0	76	76
1943 Total	40	78	23	131	0	0	4	356	179	0	45	31	615	746
1944 Total	109	34	8	151	295	68	42	72	819	758	31	118	2503	2654
1945 Total	118	160	12	290	005	2	0	58	52	520	1	141	1779	2069
GRAND TOTAL	267	272	43	582	1300	70	110	490	1058	1278	377	290	4973	5555

* Including 92 by PB4Y, 142 by PBM, 56 by PB2Y.

Carrier night offensive missions were flown largely by VF(N) and VTB(N), which came aboard in early 1944 and in September 1944 respectively. although pre-dawn attacks accounted for a number of sorties flown earlier. The number of night attacks flown increased greatly in the Okinawa operation, as a night CV and a night CVE made available full night air groups for regular neutralization attacks on enemy airfields and attacks on shipping.

Surprisingly low 1oss rates were reported for night Operations by lend-based F6Fs end PBJs. PBYs, considering their vulnerability in minimum altitude attacks, and PVs, considering the difficult conditions of the North Pacific, also reported remarkably low losses. Carrier loss rates, though higher than the day rates, were not excessive considering the hazards involved and the value of the work done.

TABLE 57. NIGHT AERIAL COMBAT RECORD FOR LAND-BASED AND CARRIER-BASED NAVAL AND MARINE AIRCRAFT, MONTHLY

MONTH	LAND-BASED				CARRIER-BASED			
	Own Aircraft On Mission	Own Aircraft Engaging In Combat	Enemy Aircraft		Own Aircraft On Mission	Own Aircraft Engaging In Combat	Enemy Aircraft	
			Engaged	Destroyed In Combat			Engaged	Destroyed In Combat
1943 - July	18	8	15	2	0	0	0	0
November	6	6	8	8	3	3	4	2
December	7	7	10	7	0	0	0	0
1944 - January	12	7	6	3	0	0	0	0
February	7	7	7	5	1	1	1	0
March	1	1	1	1	0	0	0	0
April	16	7	6	2	2	1	3	1
May	17	3	3	1	0	0	0	0
June	2	2	3	0	7	5	7	7
July	0	0	0	0	9	5	4	4
August	3	3	4	1	2	1	1	0
September	0	0	0	0	2	1	1	1
October	2	1	1	1	17	12	10	10
November	0	0	0	0	2	1	1	1
December	3	3	4	3	18	5	6	5
1945 - January	0	0	0	0	4	3	4	4
February	0	0	0	0	3	2	2	2
March	0	0	0	0	9	7	12	11
April	21	7	7	5	55	33	36	33
May	31	20	26	25	20	12	17	16
June	23	20	23	23	0	0	0	0
July	9	9	10	9	0	0	0	0
August	3	3	3	3	10	3	8	6
TOTAL	181	114	137	99	164	95	117	103

(b) Night Air Combat

U.S. Naval and Marine aircraft during World War II shot down a total of 202 enemy aircraft at night and lost only 7 planes in night aerial combat, or 1/29 of the enemy losses in the same actions. If operational losses on missions involving night combat are included, 15 enemy planes were destroyed per own plane lost. It should be noted that the chance of over-optimistic claims of enemy aircraft destroyed in night combat is negligible, since most enemy planes crash in flames visible for miles, and usually only one or two aircraft are engaged at a time.

103 of the enemy planes were shot down by carrier night fighters, or planes acting as night fighters, 90 by land-based night fighters, and 9 by patrol bombers.

Of the 7 losses to enemy aircraft, only one involved a carrier-based F6F(N), and only 2 involved land-based F6F(N)s, which became the standard night fighters for land and carrier use, and accounted for three-fourths of the enemy planes destroyed in night combat.

The first night fighters consisted of a small Marine squadron of PVs converted to night fighters, sent to the Solomons in late 1943 to discourage the nightly "Washing Machine Charlie" raids. This squadron accounted for 11 enemy planes between November 1943 and May 1944, including 7 float planes and 4 bombers, and lost one plane in air combat. It was supplemented by a Navy squadron of F4Us equipped with intercept radar gear. This squadron accounted for 4 floatplanes and 4 bombers, with no air combat losses. Another F4U (N) squadron (Marine) brought down two Bettys in the Marshalls, with one loss.

After these three squadrons all land-based night fighters were the new F6Fs with AI intercept gear, and all were in Marine squadrons. Their first night air combat was in October 1944, when they knocked down a float plane in the Palau area, and in December, when they destroyed 3 Jap fighters in the Philippines. They had no further night combat until April 1945, when the three Marine VP(N) squadrons sent to Okinawa began their campaign which resulted in the destruction, in a 4-month period, of 64 enemy aircraft, against 2 air combat losses and 1 operational loss sus-

(Cont. on next page)

TABLE 58. NIGHT AERIAL COMBAT RECORD. BY PLANE MODEL, FOR ENTIRE WAR

BASE, PLANE MODEL	OWN AIRCRAFT ON MISSION	OWN AIRCRAFT ENGAGING IN COMBAT	ENEMY PLANES ENGAGED		ENEMY PLANES DESTROYED		OWN LOSSES ON MISSION	
			Bombers	Fighters and F/P	Bombers	Fighters and F/P	Enemy A/C	Operational
CARRIER-BASED	164	95	79	38	69	34	2	4
F6F	149	85	70	36	62	33	2	4
F4U	5	4	7	0	5	0	0	0
FM	4	4	0	1	0	1	0	0
TBF, TBM	6	2	2	1	2	0	0	0
LAND-BASED	181	114	63	74	51	48	5	2
F6F	87	61	39	32	38	30	2	1
F4U	17	13	7	5	6	5	1	1
TBF	9	3	1	2	0	0	0	0
PV(N)	15	13	10	7	5	6	1	0
PB4Y	14	10	4	16	2	6	1	0
PBJ	30	8	1	8	0	0	0	0
PBY	8	5	0	4	0	1	0	0
PBM	1	1	1	0	0	0	0	0
TOTAL	345	209	142	112	120	82	7	6

tained in these engagements.

The first carrier night fighters to engage in combat were a pair of standard F6Fs, guided by a radar-equipped TBM, which intercepted a Jap bomber attack in the Gilberts area in November 1943. One of the F6Fs (piloted by Cdr. O'Hare) was shot down by the Japs, and the TBM reversed the concept of the team by shooting down two of the Japs.

In early 1944 these makeshift teams were replaced by 4-plane teams of AI-equipped F6Fs (and for a few months some AI-equipped F4Us) assigned to each CV. These planes accomplished little in night combat until the Marianas campaign, when they shot down 11 Jap planes. In September a night air group equipped with F6F(N)s was placed aboard the CVL INDEPENDENCE, and during the five months of its service its planes shot down 15 Jap planes at night, while the CV teems accounted for 5 more. This group was succeeded by a CV night group aboard ENTERPRISE, which in its 5 months of intermittent service made 18 night kills, and was in turn succeeded by a third group which in August brought down 6 Jap planes.

During the Okinawa campaign the brunt of the night-fighting was borne by the CV night fighter teams, which brought down 11 Japs in March, 27 in April, and 6 in May. In all, carrier-based single-engine VF(N) destroyed 60 Jap planes in night combat during the Okinawa campaign, and land-based night fighters an additional 64. These 124 planes were brought down at a cost of four losses, combat and operational.

Attention is invited to the large proportion of enemy planes destroyed to enemy planes engaged, especially in actions involving the F6F and F4U. Once our night fighters came within shooting range of the enemy planes, few escaped.

As would be expected, over half of the total enemy planes destroyed were twin-engine fighters or bombers, or flying boats. Of the single-engine types destroyed at night, half were float planes (See Table 59).

TABLE 59. TYPES OF ENEMY AIRCRAFT DESTROYED BY NAVAL AND MARINE AIRCRAFT IN NIGHT AERIAL COMBAT, FOR ENTIRE WAR

PLANE MODEL, BASE	SINGLE-ENGINE FIGHTERS	SINGLE-ENGINE BOMBERS	FLOAT PLANES	TWIN-ENGINE BOMBERS OR FIGHTERS	FLYING BOATS	OTHER OR U/i	TOTAL
F6F, Carrier	12	7	11	48	13	4	95
F6F, Land-Based	12	5	12	37	0	2	68
F4U, Carrier	0	0	0	5	0	0	5
F4U, Land-Based	0	2	4	5	0	0	11
FM, Carrier	0	0	0	1	0	0	1
TBF, Carrier	0	0	0	2	0	0	2
PV(N)	0	1	7	3	0	0	11
PB4Y	1	0	4	1	1	1	8
PBY	0	0	1	0	0	0	1
TOTAL	25	15	39	102	14	7	202

7. LONG RANGE SEARCH PLANE OPERATIONS

TABLE 60. MONTHLY RECORD OF PB4Y AND PBM PATROL AIRCRAFT, 1945

MONTH	SQUADRONS IN ACTION		TOTAL ACTION SORTIES	SORTIES ATTACKING SHIPS			ENEMY AIRCRAFT		OWN LOSSES#		
	No. of Sq'dns	Planes on Hand	TOTAL FL'TS	War-ships	Merchant Ships over 500 Tons	Merchant Ships Under 500 Tons	Engaged	Dest. in Combat	To Enemy A/A	To Enemy A/C	Total, All Causes
January	9	130	1,491	56	4	5	20	16	10	1	0	8
February	9	124	1,167	175	4	25	59	84	26	6	0	13
March	18	260	2,976	334	17	65	93	63	25	7	1	27
April	20	281	3,471	359	16	39	144	46	10	4	0	25
May	21	296	3,323	541	9	82	217	124	41	15	3	35
June	22	302	3,491	443	14	62	175	112	20	10	3	38
July	22	284	3,733	472	16	48	202	59	10	7	1	36
August	17	236	2,593	188	4	14	92	37	8	4	1	16
TOTAL			22,245	2,568	84	340	1,002	541	150	54	9	198
Monthly Average*	17	239	2,781	342	11	45	134	72	20	7.2	1.2	25

* On 8 months basis for non-action items, 7⅓ months for action items.
\# Total losses include 56 on ground, 11 operational on action sorties, and 68 operational on non-action flights, in addition to the losses to enemy action listed.

Attention has been paid, in previous sections of this report, to the air combat record of PB4Y patrol planes, and to the substantial proportion of their attack effort which was directed against shipping. Unfortunately, in those analyses the PB4Y record was somewhat smothered under the much larger figures covering action by carrier planes and by the large number of land-based single-engine planes. Thus this brief additional section is provided to give full credit to the long range search planes for their combat achievements.

Emphasis herein is placed on 1945, and on PB4Ys. PBMs, included in one of the tables, turned in many noteworthy performances during 1945, and in 1944 PB4Ys performed, on a smaller scale, with even greater individual brilliance then in 1945. The 1945 figures, however, present a more impressive set of data, and fuller detail can be provided.

Table 60 above gives 1945 monthly data for all PB4Y and PBM squadrons which reported action during the respective months. Not all squadrons in the Pacific are included, since during each month there were some which flew only negative patrols. The squadrons included were based in the Philippines, the Marianas, and ultimately at Iwo and Okinawa.

Average squadron strength was 14 aircraft, and each plane on the average made 11 or 12 flights, largely sector searches of 600 to 1000 miles, per month. A squadron normally flew 2 to 5 sectors daily, each covered usually by single planes, sometimes by 2-plane teams. Occasionally additional anti-shipping search and attack teams were sent out; rarely were larger strike missions flown.

As the table indicates, 7 out of 8 flights were negative with respect to action with the enemy, but the average plane attacked targets or engaged enemy aircraft once or twice a month. The majority of their attacks were on enemy shipping - large merchant vessels and warships when they were sighted, small vessels when nothing larger was available - and land targets were normally attacked only in sectors where shipping had entirely disappeared.

Starting with attacks in the Philippines and the Bonins area in January, the planes worked up to the Ryukyus, the Formosan coast, the North China Coast, the Yellow Sea and the Coasts of Korea, and the shores of Kyushu, Shikoku and Southern Honshu, as new forward bases became available. From the Philippines they also worked down the South China coast, to Indo China, Malaya, and Borneo. Initially in each area a substantial residue of large vessels remained, but as attacks mounted those which were not sunk were withdrawn, or kept in harbor by day, so that the bulk of the vessels remaining at sea were the small coastal types of 50 to 300 tons on which the Japs had in the end to rely for supplying their distant forces and returning vital materials to Japan.

These were the vessels the search planes attacked, usually in single plane bombing and strafing attacks at 50 to 200 feet altitude. When such tactics are used, accuracy is such that bomb tonnages dropped are no measure of the results obtained. In a study of reports on 870 PB4Y mast-

head attacks on ships of all sizes, it was found that 370 attacks, or over 40%, resulted in hits, and that over 18% of all bombs dropped were hits. These figures do not include any measure of the hits by small incendiary bombs normally dropped in clusters on the smaller vessels, or of the effect of strafing. Dozens of small vessels were destroyed by fires caused by incendiary hits or strafing alone, and most of the smaller vessels attacked could be sunk by a direct or underwater hit by one 100-lb. or 250-lb. bomb.

During 1945 PB4Ys alone dropped over 4,000 bombs, plus over 500 incendiary clusters, in attacks on probably 600-800 different vessels, and expended over 2,000,000 rounds of ammunition in strafing these vessels. It is probable that as a result of the 1945 PB4Y and PBM attacks some 300-500 of these vessels were sunk. (No final evaluation or assessment of the claims regarding small vessels has yet been made). The effect was to cripple the remaining Japanese sea transport in most areas, and to cause withdrawal of many vessels not yet sunk, because of the danger of attack, and because of fuel shortage resulting from the sinking of tankers.

Table 60 shows the steady building up of anti-shipping attacks in 1945, to the peak operations of May, June and July, largely in the Yellow Sea and off Korea and Japan itself. In June and. July an average of 8 or 9 attacks on ships were made daily.

PB4Y ATTACK RECORD, 1945, BY TARGET TYPE

TARGETS	Sorties Attacking Targets	Number of Bombs Expended						
		General Purpose				Incendiary Clusters	Other Types	Rounds of Ammo. Expended
		100#	250#	500#	1000# 2000#			
Warships	53	129	52	15	7	0	0	85,000
Merchant Ships, over 500 Tons	238	296	302	402	13	45	6	566,000
Merchant Ships, Under 500 Tons	840	1,953	813	160	7	503	25	1,676,000
Minelaying	49	0	0	0	0	0	96	124,000
TOTAL SHIPPING	1,180	2,378	1,167	577	27	548	127	2,451,000
Land Transportation	170	92	448	93	16	42	3	322,000
Airfields	125	273	36	421	19	25	13	85,000
Other Military Targets	161	363	155	278	4	67	3	214,000
Other Land Targets	133	477	79	131	8	65	5	126,000
TOTALS	1,769	3,583	1,885	1,500	74	747	151	3,198,000

The above table shows the ordnance expended in the attacks by PB4Ys alone, and illustrates the predominance of small bombs, incendiary clusters and strafing which were all that were required against the smaller targets, though, as will be noted, heavier bombs were used against the larger vessels. Normally, mixed bomb loads were carried, to permit a choice of bombs depending on the type of target met. Despite the 3 to 4 ton bomb capacity of the PB4Y, rarely were loads of more than 2 tons carried, and the normal load was usually about 2,500 pounds, because of the extra fuel required for long-range searches.

In the minority of attacks which were directed against land targets (in the absence of ships), land transportation (including railroads, bridges, trains, and trucks) was the favorite type of target. Airfield installations, miscellaneous military buildings, and harbor areas of small coastal villages, were the other principal targets attacked.

Table 60 also shows the monthly air combat record of PB4Ys and PBMs. The 292 patrol planes which engaged in combat met 541 enemy aircraft, and shot down 150, or nearly 30% of them. Losses in air combat were 9 planes, only 6% of the number of enemy planes destroyed, and only 3% of the number of our VPB engaging in combat. The best records were in February and March, when 51 enemy planes were shot down with only 1 combat loss.

Losses to antiaircraft fire in these low level attacks were slightly over 2% of the planes attacking. Operational losses were 1/3 of one percent of the total number of flights.

APPENDIX

JAPANESE SHIPPING SUNK BY NAVAL AIRCRAFT

TABLE A. TOTALS FOR WAR, BY TYPE OF SHIP

TYPE OF VESSEL	SHIPS SUNK BY U.S. NAVAL CARRIER-BASED AIRCRAFT ALONE		SHIPS SUNK BY U.S. NAVAL LAND-BASED AIRCRAFT ALONE		SHIPS SUNK BY NAVAL AIRCRAFT IN COMBINATION WITH OTHER FORCES		TOTAL SHIPS SUNK BY, OR WITH AID OF, U. S. NAVAL AIRCRAFT	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons
Battleships	5	184,000			1	30,000	6	214,000
Carriers, Large	5	136,600					5	136,600
Carriers, Medium	5	59,150			2	22,050	7	81,200
Carriers, Escort	1	17,000					1	17,000
Cruisers, Heavy	6	72,000	1	14,000	3	41,000	10	127,000
Cruisers, Light	6	33,535			2	10,340	7	43,875
TOTAL ARMORED WARSHIPS	28	502,285	1	14,000	8	103,390	37	619,675
Destroyers	28	45,415	5	8,115	8	10,450	41	63,980
Small Warships*	103	125,928	2	2,300	14	17,862	119	146,090
TOTAL WARSHIPS	159	673,628	8	24,415	30	131,702	197	829,745
TOTAL MERCHANT SHIPS, 1000 Gross Tons or Over	275	1,293,875	50	182,583	41	229,061	366	1,705,519
TOTALS	434	1,967,503	58	206,998	71	360,763	563	2,535,264

* Including a few large auxiliaries.

These data, though not compiled by Op-23-V, are inserted because of their interest in connection with the tables covering carrier attacks on shipping.

The data on ships sunk have been compiled by the Statistical Section of the Foreign Branch of ONI (Op-23-F44). They are based on a careful study of shipping reported sunk by Japanese sources, correlated with action reports from all Allied forces as evidence of the cause of sinking. Most of the figures included represent final assessments by a joint Army-Navy board; assessments have not been completed, however, and the data must thus be regarded as preliminary and subject to change: For this reason release of the detailed figures in a classification lower than CONFIDENTIAL is not authorized, though the totals may be quoted in round numbers as approximations, if an indication of their preliminary nature is given and they are not attributed to ONI or the joint assessment board.

Ships credited sunk by Naval aircraft alone represent largely instances where no other agent could have been responsible for the sinking. Ships credited sunk in attacks involving any combination of Naval aircraft with Army aircraft, Naval surface ships, or submarines, have generally been credited as effected by combined efforts, unless unequivocal evidence exists (as in the case of the Midway Battle) that Naval aircraft were the only agents inflicting damaging hits on the ships sunk. The data, in view of their compilation for intelligence purposes by a non-aviation office, and with Army representation in the assessment of the bulk of them, can be considered completely conservative with reference to sinkings by Naval aircraft.

It should be noted that merchant vessels of under 1000 gross tons are not included in these tabulations; assessments of such sinkings are not known to have been made on any comprehensive basis by any agency.

Rough but interesting measures of the effectiveness of Naval aircraft in sinking ships, in terms of tons sunk per sortie attacking, and per ton of bombs expended, can be obtained by comparing these data with attack data in the body of this report. A few of the overall figures

TABLE B. MONTHLY TOTALS OF JAPANESE SHIPS SUNK BY U.S. NAVAL AIRCRAFT

MONTH	ARMORED WARSHIPS		UNARMORED WARSHIPS		MERCHANT SHIPS, 1000 GROSS TOYS OR OVER		TOTALS	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons
1941-December			2	1,892			2	1,892
1942 -March					4	28,780	4	28,780
May	1	15,000	3	1,915			4	16,915
June	5	87,900					5	87,900
August	1	7,100	1	1,800	1	9,310	3	18,210
October	1	5,170	1	1,800	3	25,547	5	32,517
November	2	39,000			11	77,608	13	116,608
1943-January					1	6,732	1	6,732
February					2	10,386	2	10,386
May			2	3,300	1	1,917	3	5,217
July			4	14,200			4	14,200
October			1	1,315			1	1,315
November			1	2,000	1	5,824	2	7,824
December			1	492	10	42,300	11	42,792
1944-January			7	730	16	60,552	23	61,282
February	1	5,195	6	11,720	33	203,291	40	220,206
March			7	11,210	20	97,815	27	109,025
April			1	100	1	2,724	2	2,824
May					1	6,500	1	6,500
June	1	28,000	5	2,395	15	66,235	21	96,630
July			9	6,263	6	20,617	15	26,880
August			4	5,000	6	29,576	10	34,576
September			11	17,660	44	204,918	55	222,578
October	12	185,140	14	20,010	32	129,961	58	335,111
November	3	30,670	19	25,975	30	138,754	52	195,399
December			5	5,300	10	42,289	15	47,589
1945-January			21	21,840	52	293,609	73	315,449
February			1	440	2	11,105	3	11,545
March			5	3,104	19	38,843	24	41,947
Apri1	2	51,000	7	10,250			9	61,250
May			2	880	11	42,059	13	42,939
June			1	100	3	6,400	4	6,500
July	8	165,500	15	36,334	29	91,937	52	293,771
August			5	3,445	2	9,930	7	13,375
1941-42 Total	10	154,170	7	7,407	19	141,245	36	302,822
1943 Total			9	21,307	15	67,159	24	88,466
1944 Total	17	249,005	88	106,363	214	1,003,232	319	1,358,600
1945 Total	10	216,500	57	76,393	118	493,883	185	786,776
GRAND TOTAL	37	619,675	161	211,470	366	1,705,519	564	2,536,664

NOTE: Above data include full tonnage of ships sunk by Naval aircraft in combination with other agents. No sinkings were reported in months not listed.

are given herewith

Type of Enemy Vessel	Tons Sunk Per Sortie Attacking#	Tons Sunk Per Ton of Bombs#
Armored Warships	114	208
Unarmored Warships	43	125
Merchant Vessels*	111	284
TOTAL, all three types	98	238

#Tons sunk includes half the tonnage of ships credited to Naval aircraft in combination with other agents.

* Sorties and Tons of Bombs are for attacks on vessels of 500 tons or over. Tons Sunk are vessels of 1000 gross tons or over.

Monthly comparisons maybe made with Table 40, but in making comparisons note that Appendix Table B includes at their full tonnage ships sunk by Naval aircraft in combination with other agents.

SUBJECT INDEX TO TABLES

(All tables cover entire war period unless otherwise noted)

A . GENERAL DATA ON FLIGHTS, ACTION SORTIES, OWN AIRCRAFT LOSSES, BOMB TONNAGE EXPENDED, ENEMY PLANES DESTROYED

B. SPECIALIZED DATA, BY SUBJECT MATTER

NOTE: For enemy aircraft destroyed in air combat, see Aerial Combat Data section of index, and note thereto.
For enemy aircraft destroyed on ground, see Tables 3,4,14,25,26.

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