



**NONRESIDENT  
TRAINING  
COURSE**



September 1995

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# **Aerographer's Mate 1 & C**

**NAVEDTRA 14010**

Although the words “he,” “him,” and “his” are used sparingly in this course to enhance communication, they are not intended to be gender driven or to affront or discriminate against anyone.

## PREFACE

By enrolling in this self-study course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program.

**THE COURSE:** This self-study course is organized into subject matter areas, each containing learning objectives to help you determine what you should learn along with text and illustrations to help you understand the information. The subject matter reflects day-to-day requirements and experiences of personnel in the rating or skill area. It also reflects guidance provided by Enlisted Community Managers (ECMs) and other senior personnel, technical references, instructions, etc., and either the occupational or naval standards, which are listed in the *Manual of Navy Enlisted Manpower Personnel Classifications and Occupational Standards*, NAVPERS 18068.

**THE QUESTIONS:** The questions that appear in this course are designed to help you understand the material in the text.

**VALUE:** In completing this course, you will improve your military and professional knowledge. Importantly, it can also help you study for the Navy-wide advancement in rate examination. If you are studying and discover a reference in the text to another publication for further information, look it up.

*1995 Edition Prepared by  
AGCM B. J. Bauer and  
AGC(AW) T. Howlett*

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## **Sailor's Creed**

“I am a United States Sailor.

I will support and defend the Constitution of the United States of America and I will obey the orders of those appointed over me.

I represent the fighting spirit of the Navy and those who have gone before me to defend freedom and democracy around the world.

I proudly serve my country's Navy combat team with honor, courage and commitment.

I am committed to excellence and the fair treatment of all.”

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# INSTRUCTIONS FOR TAKING THE COURSE

## ASSIGNMENTS

The text pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions. Pay close attention to tables and illustrations and read the learning objectives. The learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

## SELECTING YOUR ANSWERS

Read each question carefully, then select the BEST answer. You may refer freely to the text. The answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the course.

## SUBMITTING YOUR ASSIGNMENTS

To have your assignments graded, you must be enrolled in the course with the Nonresident Training Course Administration Branch at the Naval Education and Training Professional Development and Technology Center (NETPDTC). Following enrollment, there are two ways of having your assignments graded: (1) use the Internet to submit your assignments as you complete them, or (2) send all the assignments at one time by mail to NETPDTC.

**Grading on the Internet:** Advantages to Internet grading are:

- you may submit your answers as soon as you complete an assignment, and
- you get your results faster; usually by the next working day (approximately 24 hours).

In addition to receiving grade results for each assignment, you will receive course completion confirmation once you have completed all the

assignments. To submit your assignment answers via the Internet, go to:

<http://courses.cnet.navy.mil>

**Grading by Mail:** When you submit answer sheets by mail, send all of your assignments at one time. Do NOT submit individual answer sheets for grading. Mail all of your assignments in an envelope, which you either provide yourself or obtain from your nearest Educational Services Officer (ESO). Submit answer sheets to:

COMMANDING OFFICER  
NETPDTC N331  
6490 SAUFLEY FIELD ROAD  
PENSACOLA FL 32559-5000

**Answer Sheets:** All courses include one “scannable” answer sheet for each assignment. These answer sheets are preprinted with your SSN, name, assignment number, and course number. Explanations for completing the answer sheets are on the answer sheet.

**Do not use answer sheet reproductions:** Use only the original answer sheets that we provide—reproductions will not work with our scanning equipment and cannot be processed.

Follow the instructions for marking your answers on the answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

## COMPLETION TIME

Courses must be completed within 12 months from the date of enrollment. This includes time required to resubmit failed assignments.

## **PASS/FAIL ASSIGNMENT PROCEDURES**

If your overall course score is 3.2 or higher, you will pass the course and will not be required to resubmit assignments. Once your assignments have been graded you will receive course completion confirmation.

If you receive less than a 3.2 on any assignment and your overall course score is below 3.2, you will be given the opportunity to resubmit failed assignments. **You may resubmit failed assignments only once.** Internet students will receive notification when they have failed an assignment--they may then resubmit failed assignments on the web site. Internet students may view and print results for failed assignments from the web site. Students who submit by mail will receive a failing result letter and a new answer sheet for resubmission of each failed assignment.

## **COMPLETION CONFIRMATION**

After successfully completing this course, you will receive a letter of completion.

## **ERRATA**

Errata are used to correct minor errors or delete obsolete information in a course. Errata may also be used to provide instructions to the student. If a course has an errata, it will be included as the first page(s) after the front cover. Errata for all courses can be accessed and viewed/downloaded at:

<http://www.advancement.cnet.navy.mil>

## **STUDENT FEEDBACK QUESTIONS**

We value your suggestions, questions, and criticisms on our courses. If you would like to communicate with us regarding this course, we encourage you, if possible, to use e-mail. If you write or fax, please use a copy of the Student Comment form that follows this page.

## **For subject matter questions:**

E-mail: n315.products@cnet.navy.mil  
Phone: Comm: (850) 452-1001, Ext. 1713  
DSN: 922-1001, Ext. 1713  
FAX: (850) 452-1370  
(Do not fax answer sheets.)  
Address: COMMANDING OFFICER  
NETPDTC (CODE 315)  
6490 SAUFLEY FIELD ROAD  
PENSACOLA FL 32509-5237

## **For enrollment, shipping, grading, or completion letter questions**

E-mail: fleetservices@cnet.navy.mil  
Phone: Toll Free: 877-264-8583  
Comm: (850) 452-1511/1181/1859  
DSN: 922-1511/1181/1859  
FAX: (850) 452-1370  
(Do not fax answer sheets.)  
Address: COMMANDING OFFICER  
NETPDTC (CODE N331)  
6490 SAUFLEY FIELD ROAD  
PENSACOLA FL 32559-5000

## **NAVAL RESERVE RETIREMENT CREDIT**

If you are a member of the Naval Reserve, you will receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For Naval Reserve retirement, this course is evaluated at 8 points. (Refer to *Administrative Procedures for Naval Reservists on Inactive Duty*, BUPERSINST 1001.39, for more information about retirement points.)

## **COURSE OBJECTIVES**

The objective of this course is to provide Aerographer's Mates with occupational information on the following areas: convergence, divergence, and vorticity; the forecasting of upper air systems; the forecasting of surface systems; the forecasting of weather elements; the forecasting of severe weather features; sea surface forecasting; meteorological products and tactical decision aids; oceanographic products and tactical decision aids; operational oceanographic products and tactical decision aids.

graphy; tropical forecasting; weather radar; meteorological and oceanographic briefs; and administration and training.

## Student Comments

**Course Title:** Aerographer's Mate 1 & C

**NAVEDTRA:** 14010 **Date:** \_\_\_\_\_

**We need some information about you:**

Rate/Rank and Name: \_\_\_\_\_ SSN: \_\_\_\_\_ Command/Unit \_\_\_\_\_

Street Address: \_\_\_\_\_ City: \_\_\_\_\_ State/FPO: \_\_\_\_\_ Zip \_\_\_\_\_

**Your comments, suggestions, etc.:**

<p><b>Privacy Act Statement:</b> Under authority of Title 5, USC 301, information regarding your military status is requested in processing your comments and in preparing a reply. This information will not be divulged without written authorization to anyone other than those within DOD for official use in determining performance.</p>
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NETPDTC 1550/41 (Rev 4-00)

# CHAPTER 1

## CONVERGENCE, DIVERGENCE, AND VORTICITY

In your reading of the *AG2* manual, volume 1, you became familiar with the terms *convergence*, *divergence*, and *vorticity* when used in relation to surface lows and highs. You were also presented with a basic understanding of the principles involved. In this section, we will cover the terms, the motions involved in upper air features and surface features, and the relationship of these processes to other meteorological applications.

We will first discuss convergence and divergence, followed by a discussion of vorticity.

### NOTE

The World Meteorological Organization adopted "hectopascals" (hPa) as its standard unit of measurement for pressure. Because the units of hectopascals and millibars are interchangeable (1 hPa = 1 mb), hectopascals have been substituted for millibars in this TRAMAN.

### CONVERGENCE AND DIVERGENCE

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**LEARNING OBJECTIVES:** Define the terms *convergence* and *divergence*. Recognize directional and velocity wind shear rules. Recognize areas of mass divergence and mass convergence on surface pressure charts. Identify the isopycnic level. Retail the effects that convergence and divergence have on surface pressure systems and features aloft. Identify rules associated with divergence and convergence.

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As mentioned in the *AG2* manual, volume 1, unit 8, convergence is the accumulation of air in a region or layer of the atmosphere, while divergence is the depletion of air in a region or layer. The layer of maximum convergence and divergence occurs between

the 300- and 200-hPa levels. Coincidentally, this is also the layer of maximum winds in the atmosphere; where jet stream cores are usually found. These high-speed winds are directly related to convergence and divergence. The combined effects of wind direction and wind speed (velocity) is what produces convergent and divergent airflow.

### CONVERGENCE AND DIVERGENCE (SIMPLE MOTIONS)

Simply stated, convergence is defined as the increase of mass within a given layer of the atmosphere, while divergence is the decrease of mass within a given layer of the atmosphere.

#### Convergence

For convergence to take place, the winds must result in a net inflow of air into that layer. We generally associate this type of convergence with low-pressure areas, where convergence of winds toward the center of the low results in an increase of mass into the low and an upward motion. In meteorology, we distinguish between two types of convergence as either horizontal or vertical convergence, depending upon the axis of the flow.

#### Divergence

Winds in this situation produce a net flow of air outward from the layer. We associate this type of divergence with high-pressure cells, where the flow of air is directed outward from the center, causing a downward motion. Divergence, too, is classified as either horizontal or vertical.

### DIRECTIONAL WIND SHEAR

The simplest forms of convergence and divergence are the types that result from wind direction alone. Two flows of air need not be moving in opposite directions to induce divergence, nor moving toward the same point to induce convergence, but maybe at any angle to each other to create a net inflow of air for convergence or a net outflow for divergence.