

## Aviation Selection Test Battery (ASTB)

The Aviation Selection Test Battery (ASTB) is used by the U.S. Navy, Marine Corps, and Coast Guard as one criterion used in making selection determinations for officer aviation program applicants. The most recent complete revision of the ASTB was completed by the Naval Operational Medicine Institute (NOMI) in cooperation with the Educational Testing Services (ETS) in Princeton, New Jersey in 1992. In 2004, three new parallel forms of this ASTB version were released by NOMI, and Forms 1 and 2, which had been in circulation from 1992 to 2004, were suspended.

The ASTB is used by the Navy Personnel Command (NPC) and Commandant Marine Corps to select candidates for the Navy and Marine Corps pilot and flight officer programs. Portions of the test are also used by the Navy for selection into Officer Candidate School (OCS). The Coast Guard currently uses the ASTB to select pilot candidates for training, and uses a subcomponent score from the ASTB for its non-aviation officer commissioning program.

### ASTB Administration Procedures and Policies

The ASTB is administered at Navy Recruiting Districts (NRDs), NROTC units, Marine Corps Officer Selection Offices (OSOs), and at numerous other permanent custody sites. The test is administered in a paper format, but at many sites it can be administered on a computer through a web-based system called APEX.NET. There are three versions of the test—Form 3, Form 4, and Form 5. Each version of the test contains different questions, but all three versions have the same format, subtests, and number of questions. The complete test battery contains 6 subtests and requires approximately 2 ½ hours to administer.

**Retest Policy:** Examinees that would like to improve their scores on the ASTB must wait until the 31st day following their initial attempts before taking different versions of the test. For example, an individual that takes Form 3 during their first administration must take Form 4 or Form 5 during their second testing session. A third and final attempt at Form 3, 4, or 5 is authorized on the 91st day following the first retest. *These test interval requirements cannot be waived, so it is important that examinees are aware of the forms taken during previous administrations and the amount of time that has passed between administrations. Please talk to your recruiter or call 850-452-2257, and choose Option 3 followed by Option 5 if you are unsure of your test date or form number.*

**3 Test Lifetime Limit:** A major change regarding the administration of the ASTB was the establishment of a 3 test lifetime limit in July 2004. An examinee may only take each version of the test (Form 3, Form 4, and Form 5) once, which means that an individual will only be allowed to take the ASTB 3 times during his or her lifetime. Examinees must take a different form during each retest, but the forms can be taken in any order. This limit only applies to Forms 3, 4, and 5. Therefore, if individuals took a previous version of the test (Forms 1 and 2, which are longer in use), it is not counted in this limit.

**Illegal Testing:** An examinee that retests too early or retests using a form that he or she has already taken will generate an *illegal test*. An illegal test means that the individual will not receive valid scores for the testing administration. On the other hand, the illegal test will still be counted against the individual's lifetime limit.

## ASTB Scoring and Examinee Distributions

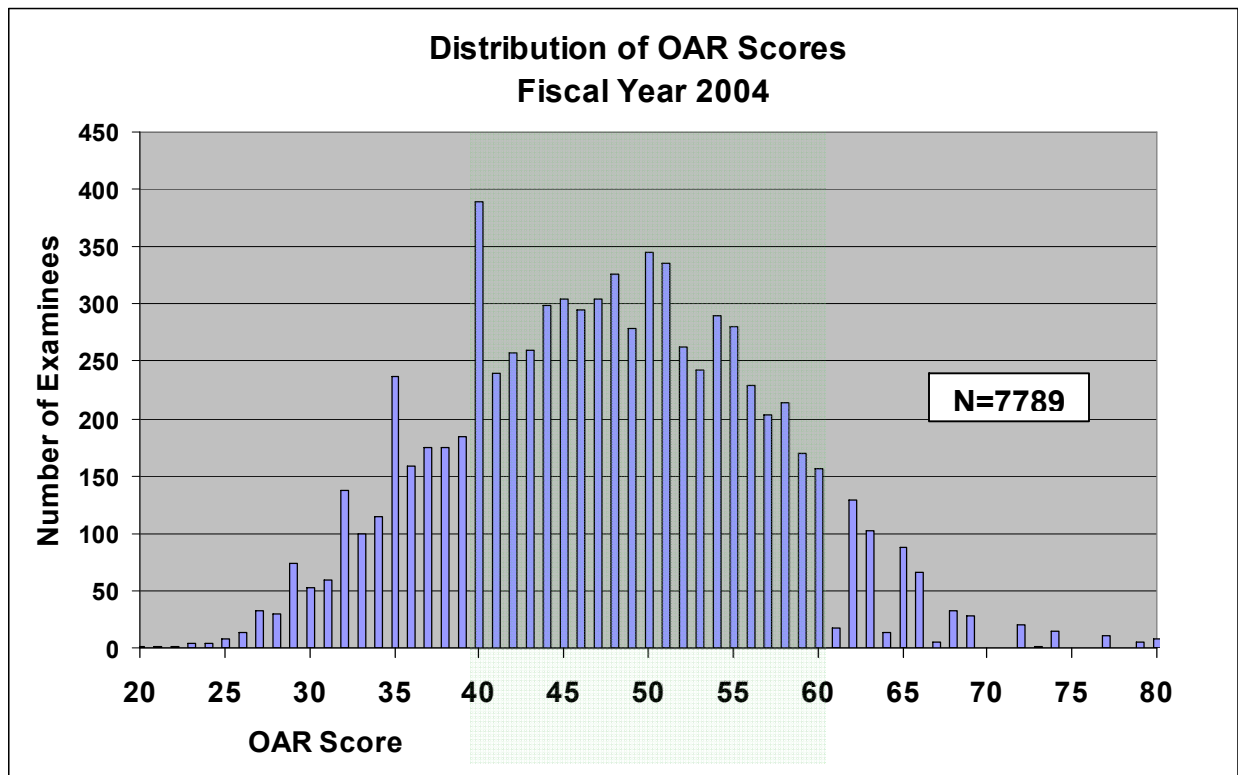
The current version of the ASTB was constructed and validated to predict both performance and attrition through the primary phases of aviation training for Student Naval Aviators (SNAs) and Student Naval Flight Officers (SNFOs).

The entire test battery consists of 6 subtests:

ASTB Subtest	Length	Time Limit
Math Skills Test (MST)	30 items	25 min
Reading Skills Test (RST)	27 items	25 min
Mechanical Comprehension Test (MCT)	30 items	15 min
Spatial Apperception Test (SAT)	25 items	10 min
Aviation and Nautical Information Test (ANIT)	30 items	15 min
Aviation Supplemental Test (AST)	34 items	25 min

} **OAR**

During the test administration, examinees have the option of taking the entire test battery or the OAR portion of the test, which consists of the Math Skills Test, Reading Comprehension Test, and Mechanical Comprehension Test. Examinees that take only the OAR portion will receive only one score, the Officer Aptitude Rating (OAR), which is used to predict academic performance in Navy Officer Candidate School (OCS). OAR scores range from 20 to 80, and are scaled as t-scores.



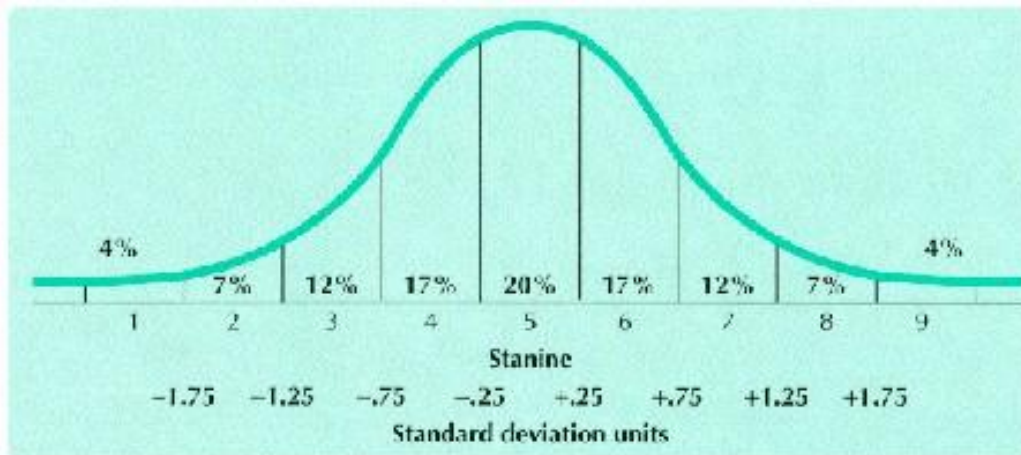
The chart shows the distribution of OAR scores for all examinees taking the ASTB in one year. The green band shows that most examinees obtain scores between 40 and 60, while very few individuals obtain scores at the upper and lower extremes of the score range.

**Test Merges:** Applicants who have taken only the OAR portion of the ASTB (MST, RCT, & MCT) may take the remaining portions (SAT, ANIT, & AST) to obtain a complete set of scores. Examinees must take the remaining portions within 90 days of the initial test, and the test date of the SAT, ANIT, & AST become the official test date for the complete exam. The test merge will count as only one attempt against the examinee's 3 test lifetime limit.

Examinees that take the entire test battery receive 4 scores that are derived from combinations of the subtests. The following three scores are relevant to the selection of aviation candidates:

- The Academic Qualifications Rating (AQR) is predictive of academic performance in aviation preflight instruction (API) and primary phase ground school.
- The Pilot Flight Aptitude Rating (PFAR) is predictive of primary flight performance for Student Naval Aviators (SNAs).
- The Flight Officer Flight Aptitude Rating (FOFAR) is predictive of primary flight performance for Student Naval Flight Officers (SNFOs).

Along with these three scores, individuals that take the entire test battery also receive an Officer Aptitude Rating. The AQR, PFAR, and FOFAR are standardized and reported as stanines. AQR, PFAR and FOFAR scores range from 1 to 9. The graphic below indicates what percentage of a normal population will fall into each category.



Note that the above figure depicts the normal distribution of a single score only. Aviation accessions are made based on two scores (AQR & PFAR or AQR & FOFAR). The joint distributions of scores on these two combinations are as follows:

**Examinee Distributions for AQR and PFAR Score Combinations (FY 04)**

		PFAR								
		1	2	3	4	5	6	7	8	9
AQR	1		95.8%	87.3%						
	2	95.5%	94.3%	87.0%	72.8%	55.4%				
	3	85.0%	85.0%	82.8%	72.2%	55.3%	37.7%			
	4	70.0%	70.0%	69.7%	65.9%	53.9%	37.6%	19.1%	7.7%	
	5		51.4%	51.4%	50.7%	46.7%	35.6%	18.9%	7.7%	
	6			31.1%	31.0%	30.4%	26.9%	17.4%	7.6%	3.1%
	7				15.3%	15.3%	14.8%	12.2%	6.6%	2.9%
	8					5.9%	5.9%	5.6%	4.2%	2.3%
	9						1.8%	1.8%	1.7%	1.2%

**Examinee Distributions for AQR and FOFAR Score Combinations (FY 04)**

		FOFAR								
		1	2	3	4	5	6	7	8	9
AQR	1		95.6%							
	2	95.5%	94.7%	85.8%	70.9%					
	3	85.0%	85.0%	83.2%	70.8%	53.3%				
	4			70.0%	66.9%	53.1%	31.2%			
	5				51.3%	47.8%	31.0%	15.3%	5.6%	
	6					30.9%	26.4%	14.9%	5.6%	1.8%
	7						15.0%	11.8%	5.4%	1.8%
	8							5.8%	4.3%	1.7%
	9								1.8%	1.3%

Each cell of the chart shows the percentage of examinees that obtained a particular score or higher for each score combination on the AQR and PFAR or AQR and FOFAR. Therefore individuals that scored a 6 on the AQR and an 8 on the PFAR would be included in the percentage for an AQR of 5 and a PFAR of 7. For example, if an individual wanted to know how many people scored a 4 on the AQR and a 6 on the PFAR, he or she would look down the left side of the table and find the row that contains AQR scores of 4 and then go across the table to the PFAR score of 6. In this case, the table shows that 37.6% of examinees obtained an AQR of 4 or higher and a PFAR of 6 or higher.

**ASTB Study Guide and Sample Questions**

The most frequently requested information about the ASTB is what types of questions are on the test and whether study materials are available. The following section is designed to provide information to answer these questions and prepare individuals for the types of information that they will see on the exam, but in no way is it meant to be an exhaustive study guide. The section includes an overview of the questions

found in each subtest, links to documents that will help prepare examinees, and sample questions for each subtest.

The ASTB subtests contain the following types of items:

**Mathematics:** The math skills assessed by the ASTB subtests include arithmetic and algebra, with some geometry. The assessments include both equations and word problems. Some items require solving for variables, others are time and distance problems, and some require the estimation of simple probabilities. Skills assessed include basic arithmetic operations, solving for variables, fractions, roots, exponents, and the calculation of angles, area, and perimeter of geometric shapes.

**Reading Comprehension:** Reading comprehension items require ASTB examinees to extract meaning from text passages. Each item requires the examinee to determine which of the response options can be inferred from the passage itself. This is pretty straightforward, although it is very important that examinees remember that incorrect response options may still appear to be 'true' – only one answer to each item can be derived solely from the information in the passage.

**Mechanical Comprehension:** Items contained within the mechanical comprehension portion of the ASTB include topics that would typically be found in an introductory high school physics course and the application of these topics within a variety of situations. The questions in this portion of the test gauge examinees' knowledge of principles related to gases and liquids, and their understanding of the ways in which these properties affect pressure, volume, and velocity. The subtest also includes questions that relate to the components and performance of engines, principles of electricity, gears, weight distribution, and the operation of simple machines, such as pulleys and fulcrums.

**Aviation & Nautical Information:** ASTB subtests also assess an examinee's familiarity with aviation history, nautical terminology and procedures, and aviation-related concepts such as aircraft components, aerodynamic principles, and flight rules and regulations. Of all the ASTB subtests, ANI scores are the most easily improved by study because it is largely a test of knowledge, rather than aptitude. Examinees can prepare for this subtest by reviewing general reference materials, such as encyclopedias, FAA and civilian aviation books, and handbooks and manuals that provide an overview of basic piloting, navigation, and seamanship. In addition to these sources, some examinees have used commercially available study guides. Even though NOMI does not endorse a particular study guide, books that are designed to prepare individuals for military aptitude flight tests and officer candidate tests often provide a good introduction to aviation and nautical-related subjects.

**Spatial Apperception:** These items evaluate an examinee's ability to match external and internal views of an aircraft based on visual cues regarding its direction and orientation relative to the ground. Each item consists of a view from inside the cockpit, which the examinee must match to one of five external views. These items capture the ability to visualize the orientation of objects in three-dimensional space.

**Aviation Supplemental Material:** The final subtest of the ASTB will typically contain a variety of items that are similar in format and content to the items in the preceding subtests.

- There will be a link to a page that contains sample questions for each subtest on the ASTB.
- There will be a link to the Program Authorizations and instructions related to the test.

All items on the test underwent sensitivity reviews and differential item analysis to prevent cultural and gender bias in the new ASTB.

The scores submitted for pilot programs are the AQR & PFAR. The AQR & FOFAR are used for flight officer program selection. The minimum scores for entry into the flight programs are determined by NPC and Commandant, Marine Corps.

## **Frequently Asked Questions about the ASTB**

- **What does the ASTB measure?**

The ASTB is primarily an aptitude test - it assesses math skills and aptitude, the ability to extract meaning from written material, familiarity with mechanical concepts and simple machines, and the ability to perform mental rotations to determine the orientation of aircraft in 3-dimensional space.

The ASTB also measures a test taker's knowledge of aviation and nautical terminology, familiarity with aircraft components and function, knowledge of basic aerodynamic principles, and grasp of some flight rules and regulations. Performance on this part of the battery can be improved by study, and examinees with aviation and to a lesser extent, shipboard experience will typically do well. Both these concepts have proven to be excellent predictors of both training performance and success in training. Examinees that walk in with some level of basic knowledge in these areas are more likely to succeed as aviators.

- **How do I know if I should take the entire ASTB or only the OAR portion?**

A general guideline is that individuals who are applying for aviation programs should take the entire ASTB battery (Navy and Marine Corps pilot and flight officer programs and Coast Guard pilot programs). Individuals that are applying for other programs (Ex: Navy OCS) may only be required to take the OAR portion, but individuals should talk to their recruiters or program administrators for more information.

- **How well does the ASTB predict training performance and attrition?**

ASTB scores are highly predictive of aviation training outcomes, such as grades that are obtained from tests during training in classroom settings (academic grades) and ratings that are derived from performance in aircraft (flight grades). The measure that is used to describe the test's ability to predict flight grades and academic grades is called validity. The predictive validity of the AQR for the prediction of SNA (pilot) academic grades is  $r = .45$  ( $p < .001$ ), while the validity of the PFAR to predict SNA flight grades is  $r = .35$  ( $p < .001$ ). Validity coefficients range from 0 to 1 and the validity for both academic and flight grades compare favorably with selection testing standards.

Even though the prediction of these criteria is a valuable resource, one of the most important utilizations of the ASTB is its ability to predict attrition, which refers to a student's probability of completing aviation training. Approximately 22% of pilots and 25% of flight officers attrite from aviation training each year, which have proven to be costly figures for the Navy and Marines because of the high costs associated with training each student. Therefore, it is estimated that the reduction in training attrition costs produced by ASTB screening saves the Navy and Marine Corps over 30 million dollars each year.

- **Can I take the ASTB on a computer? Will I have an advantage if I take the paper version of the test?**

At some test sites, the ASTB is available in a web-based format called APEX.NET. The content on the computer-administered version of the test is identical to the paper-and-pencil version of the test. The

web-based version of the ASTB allows for the administration of the exam anywhere in the world, but the system is operated on a secure server that is monitored and controlled by NOMI.

Even though some individuals feel more comfortable taking the paper version of the test, studies have found that there is virtually no difference in pass rates between the paper and computer versions of the test.

- **How can I find out my ASTB scores? Is there any way to find out my scores immediately?**

The paper-and-pencil version of the ASTB must be sent to NOMI to be scored. Unlike previous forms of the test, scoring manuals were not issued to the fleet for ASTB Forms 3, 4, and 5 in order to protect test security. Therefore, recruiters and other test administrators are no longer able to provide unofficial scores for the test. In order to obtain scores for the test examinees or recruiters may call 850-452-2257. After hearing the message, press Option 3, then Option 5 to obtain scores. An official score letter will be generated that can be sent be faxed mailed, or e-mailed to a military or education address.

Immediate scores on these ASTB forms can be generated using the APEX.NET web-based platform for ASTB administration. Ask your recruiter for more information, or have him or her contact NOMI at 850-452-2257x1060.

- **What is the Biographical Inventory (BI) and why isn't it used any longer?**

The BI considers background experiences, such as extracurricular involvement in high school and college, relevant to success in the fast-paced and demanding aviation program. Although the BI was initially a powerful predictor of attrition, its ability to predict which students will complete aviation training has essentially declined to zero over a period of years.

- **What are the current ASTB minimum score requirements?**

The minimum score requirements differ by program and service. Please refer to Program Authorizations 106 and 107, and MCO 1542.1I, or talk to your recruiter for specific information regarding the program to which you are applying.

- **How well do most examinees do on this test?**

Please refer to the tables above which show score distributions for the OAR portion of the test as well as score combinations for the AQR and PFAR (pilots), and the AQR and FOFAR (flight officers).

- **Why were the old forms of the ASTB replaced? Are pass rates equivalent between the old (Forms 1 & 2) and new (Forms 3, 4, & 5) ASTB forms?**

There are several reasons for the introduction of new forms of the ASTB. The first reason is that the last time that the last revision of the test occurred more than 10 years ago. Therefore, some of the questions had become outdated and needed to be updated. Also, widespread exposure of test questions on the Internet and in study guides made it necessary to update the ASTB to ensure its accuracy in predicting individuals that would be successful in aviation training.

Nationwide pass rates on the ASTB at both USN and USMC SNA & SNFO standards are virtually identical (+/- 3%) to pass rates on Forms 1 and 2.

- **Which tests make the greatest contribution to each score I received?**

The formulas that are utilized to compute ASTB score components are proprietary information and will not be released by NOMI. The following general guidance is offered to assist examinees in preparing for an ASTB test or retest.

- Academic Qualifications Rating (AQR): This score is affected by performance on all subtests, but the strongest influence is made by the Math Skills Test.
- Pilot Flight Aptitude Rating (PFAR): This score is affected by performance on all subtests, but the greatest contribution is made by the Aviation & Nautical Info and Spatial Apperception Tests.
- Flight Officer Flight Aptitude Rating (FOFAR): This score is affected by performance on all subtests, but the strongest influence is made by the Math Skills Test.
- Officer Aptitude Rating (OAR): This score is affected by performance on the first three subtests, Math Skills, Reading Comprehension, and Mechanical Comprehension.

- **I heard there were some questions with no right answers on the ASTB. Is this just a rumor?**

There were a few flawed items in one of the subtests released with the new ASTB forms in 2004. NOMI caught these before any of the tests had been given, but several of the test booklets had already been mailed out to recruiters. Therefore, the flawed items were eliminated from the scoring key until updated forms were sent out. During the time period that the flawed items were in the field, examinee scores were calculated using fewer items so that examinee scores were not affected by the flawed items.

- **I have seen study guides for military aviation tests in bookstores. Would these guides help me study for the ASTB?**

NOMI does not endorse any commercial study guides, but the guides might be helpful for examinees who want to acquire testing strategies, review and practice math principles and problems, familiarize themselves with military history and aviation terminology, and practice pacing on timed tests.