PEAK OF FLIGHT NEWSLETTER

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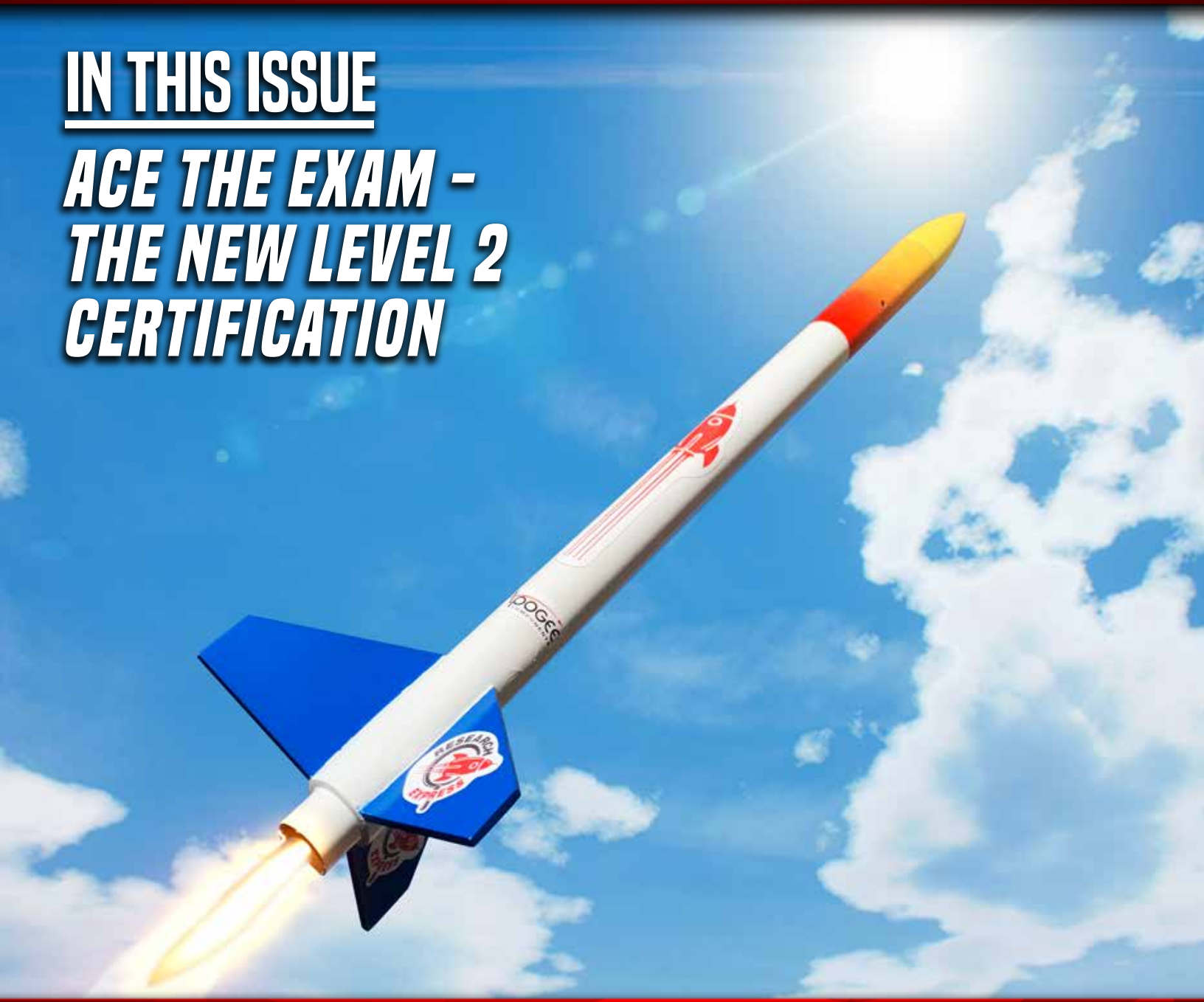

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PEAK OF FLIGHT

Ace the Exam - The New Level 2 Certification

By Bobby Potter

Ace the Exam - The New Level 2 Certification

Anyone attempting a level 2 certification will understand the written exam is no joke. It not only requires you to understand the NAR safety code and the basic knowledge that our community regularly enforces, but many of the underlying regulatory codes and obscure guidelines are also covered.

To pass this exam, you are required to receive a score of 87%. With there being a total of 40 questions, this means you have to get at least 35 correct.

This was always the case, but with the recent changes to this exam, I thought it would be a good time to go over everything that is covered, what you might see on the exam, and the best resources for you to study and prepare.

The New Level 2 Exam - What Changed?

On a recent podcast of The Rocketry Show, Jesse, Corneilus, Jim and Daniel were joined by John Thompson of the NAR. John went over many of the changes to the process regarding the new exam, and he makes for a great source as he is a principal author of the changes.

The first update that came across as a really great improvement was the downtime between a failed test and when you would be able to retake it. Previously, if you failed the exam, you were required to wait 30 days before you were eligible for a retake. Now, upon failing, you can try it again immediately. Should you fail that as well, you would be eligible to try a 3rd time after 7 days. This could be a great resolution for those who are nervous or generally poor test takers, as they know they get another shot immediately if it doesn't go their way.

There were also changes to the individuals who can certify your test results. The rationale here is that it is just a test, and you don't need to be certified at level 2 to grade a test from an answer key. So now it can be administered by any 2 individuals with an L1 certification or a single individual already certified at L2 or L3. You can see the full detailed certification procedure here: https://www.nar.org/high-power-rocketry-info/level-2-hpr-certification/.

These changes are formalities though, whereas the test itself had some fairly significant content changes as well. For instance, many of the questions regarding low-level explosive user permits were removed, favoring a test that focused on the safety and legal regulations around building and safely flying rockets. Similar adjustments were made in each category of the test.

After comparing the full question pools from the 2012 version of the exam (http://www.nar.org/pdf/HP-question-pool.pdf) and the new one (https://www.nar.org/wp-content/uploads/2020/10/HPRL2-2020-V2_STUDY_GUIDE.pdf) it would appear that the test focuses more on a deeper understanding of the concepts as opposed to just focusing on the FAA and NFPA regulations. In my opinion, the test has gotten harder. It focuses more on real-life scenarios, with word problems where you need to make decisions based on the regulations, safety code and best practices. Let's go over what you might see in the level 2 written exam going forward.

What is in the test now? What should I study?

The L2 written exam is there to verify your understanding of the basic principles of rocketry and the underlying regulations that dictate the hobby's activities. The test follows the same format which it did previously, just with some changes to the questions. It is broken into 4 sections.

A - Applicable regulations

There are a few regulating bodies that model rocketry falls under. Primarily, high power rocketry is concerned with the Federal Aviation Administration (Part 101) and the National Fire Protection Association (Code 1127).

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About this Newsletter
You can subscribe to receive this e-zine FREE at the Apogee Components website www.ApogeeComponents.com, or by clicking the link here Newsletter Sign-Up

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NATIONAL FIRE CODES®

FIGURE 1: THE NATIONAL FIRE PROTECTION ADMINISTRATION IS ONE OF THE TWO MAIN REGULATORY BODIES WHICH COVERS THE ACTIVITIES OF HIGH-POWER ROCKETRY.

This section consists of 10 questions randomly pulled from a pool of 22 questions. Unfortunately many of these questions just require memorization, as you need to know specifics, like which NFPA regulation covers high power rocketry (NFPA 1127).

There are a lot of good resources for this section, but primarily you should be familiar with source documentation for the NFPA code 1127 (http://blogs.nwic.edu/rocketteam/files/2011/10/NFPA-1127.pdf) and the FAA Code 101 (https://www.ecfr.gov/cgi-bin/text-idx?rgn=div5&node=14:2.0.1.3.15). These are the primary legal codes that guide the conduct of our hobby, and are key components of the test. A full memorization of these codes is not necessary, but I do recommend going over them in-depth, and taking note of any pertinent information.

The NAR uses an abbreviated version of these

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A21) According to NFPA 1127, when is it acceptable to alter a High Power Rocket motor?

A) When the results of a simulation show that a different delay time is needed for optimal deployment
B) When the motor manufacturer allows it
C) It is never acceptable to modify a High Power Rocket motor
D) Both "A" and "B"

FIGURE 2: THE CORRECT ANSWER IS B. MOST MOTOR MODIFICATIONS ARE NOT CONSIDERED ACCEPTABLE BY NAR, HOWEVER THE DELAY CHARGE CAN BE ALTERED ON MOTORS WHERE THE MANUFACTURER HAS DEEMED IT ACCEPTABLE.

documents, which you should already be familiar with, called the Model Rocket Safety Code (https://www.nar.org/safety-information/model-rocket-safety-code/). For this section of the test, you should know the Model Rocket Safety Code by heart.

In this section you will see questions regarding:
- -What codes regulate rocketry activities
- -Demonstrate understanding of total impulse
- -Minimum age for certification
- -Propellant and rocket weight limitations
- -Limitations of materials used in construction
- -Rules regarding visibility and waivers

B - Rocket Motor Designations

The primary purpose of this section is to test your understanding of model rocket motors. More specifically, it verifies you can read the engine codes, and know what they mean. There are a lot of great resources to further your understanding here, but we recommend our Advanced Construction Video on Model Rocket Engine Codes (https://www.apogeerockets.com/Advanced_Construction_Videos/Rocketry_Video_279). This will give you a pretty well-rounded understanding of the engine codes, and this video covers much of what will be in this section of the test.

In this section, you'll see questions regarding:

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-What each section of the code means
-The unit used for impulse (Newton-seconds)
-Ejection Delay Information
-Potential & probable causes of CATO's
-How impulse scales with the letter on the engine code (and be able to calculate maximize total impulse through "J")
-Calculate burn time from total impulse and average thrust

C - Range and Safety Practices

B7) You have an H64-8 rocket motor which has been certified to have a total impulse of 320.00 Newton-seconds. What is the approximate burn time for this motor?

A) 3 seconds
B) 5 seconds
C) 8 seconds
D) 10 seconds

FIGURE 3: THE CORRECT ANSWER IS B. TO CALCULATE BURN TIME, TAKE THE TOTAL IMPULSE (320 NEWTON-SECONDS) DIVIDED BY THE AVERAGE THRUST (64 NEWTONS).

Much of this section should come from your understanding of rocketry. If you are going for your level 2 certification, you should have a decent bit of rocketry experience that you can rely on. You've likely launched often with a NAR section, but are at a minimum somewhat informed at the best practices adhered to by the NAR for sanctioned launches. This is a larger section, being 24 questions randomly pulled from a pool of 60. This section of the test is critical to the safety of our hobby, and the knowledge only comes from an in-depth understanding of the NAR Safety Code, best practices, and experience. For many, this will be the hardest section of the exam.

Obviously, the Model Rocket Safety Code is essential reading here. Flight experience also really becomes of value, as preparing and launching model rockets, experiencing failures, and understanding what went wrong is a critical skill. In this section you will see questions from the NFPA 1127, the Model Rocket Safety Code, as well as general rocketry knowledge. The first two can be studied, the latter really comes from experience.

In this section, you'll see questions regarding:
-NFPA1127 & The Model Rocket Safety Code

C6) The FAA has granted a Certificate of Waiver or Authorization for High Power Rocket flights up to 2,500 feet AGL for your 2x "N" cluster-powered rocket. What is the minimum launch site dimension?

A) 500 feet
B) 1,250 feet
C) 1,500 feet
D) 4,000 feet

FIGURE 4: QUESTIONS REGARDING FIELD SIZE WILL DEFINITELY BE ON THE TEST. THE CORRECT ANSWER HERE IS "D". CAN YOU FIGURE OUT WHY?

-Motor Retention
-Adhesive Choices and Principles of Construction
-Launch Pad & Rocket Flight Preparation
-RSO Guidelines
-Potential Causes of Damage During Flight
-Motor Cluster
-Black Powder & Composite Motors
-Model Rocket Recovery Systems and Practices
-Wind Speed and Launch Angle Limitations
-FAA Waivers

D - Rocket Stability

This section is short and sweet, and is there just to confirm your understanding of rocket stability. It verifies you know what stability is, and how you can measure it. If you are familiar with the general rules of stability, and where they come from, you are going to be fine here.

Anyone building and flying model rockets needs to understand stability. An unstable rocket is dangerous, and

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puts everyone on the field at risk. Fortunately, our hobby drills the principles of stability into everyone. If you are taking the L2 exam, you almost certainly have a full understanding of stability, making this one of the easiest sections of the exam.

In this section you may see questions on:
- -The Center-of-Gravity and Center-of-Pressure
- -The Barrowman Equations (Surface-level under standing)
- -Causes of Instability
- -The Cause of a Changing Center-of-Gravity during ascent
- -Definition of Stability

Check your Knowledge

Think you are ready for the written exam? Well, the NAR provides a study guide and a large amount of resources for members to use when preparing for this test. These resources were all updated with the new release, and can be requested through your NAR section or found online here: https://www.nar.org/wp-content/uploads/2020/10/HPRL2-2020-V2_STUDY_GUIDE.pdf

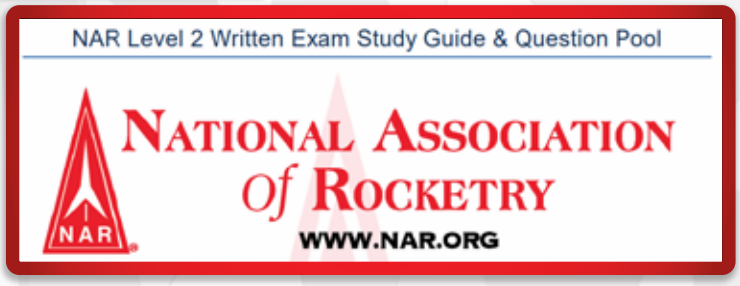

FIGURE 5: NAR STUDY GUIDE

This study guide goes over the entire pool of questions that are pulled from to create each exam. It gives you the answer to each question, and points you to the regulatory documentation which it originates from.

It's basically the dream study guide.

Are you ready to check your knowledge? The NAR has prepared a practice test (http://www.nar.org/pdf/sec-A.htm) that has the exact questions on it that will be on the final exam. If you ace that, you will ace your written test. This practice exam covers every question that could possibly be on the test, so if you know the answers, you are good to go.