LockwoodSTEM

Introduction to Engineering Design

Unit 0: Engineering Foundations & Rocket Launch Pad Challenge

Student learning deck • LockwoodSTEM aerospace-aligned IED curriculum

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Mindset

Think like an engineer: define, test, revise, communicate.

Systems

Notebook routines, safety, course resources, and FabLab expectations.

Challenge

Team launch pad prototype supported by evidence and reflection.

Unit 0 Learning Arc

From engineering mindset to tested launch pad prototype and portfolio evidence.

0.1 Mindset

0.2 Notebook

0.3 Safety

0.4 Design Process

0.5 Documentation

0.6 Problem Definition

0.7 Launch Pad Brief

0.8 Build Plan

0.9 Prototype

0.10 Test + Improve

0.11 Design Review

0.12 Portfolio

Unit throughline: You will learn engineering habits first, then use those habits to solve a small but complete aerospace design challenge.

Unit 0 Deliverables Map

Use this map to track the evidence you will build throughout Unit 0.

Lesson(s)	Evidence / Deliverable	Purpose
0.2	Notebook setup + course resource access	Establish organization and digital access.
0.4–0.5	Paper airplane design process worksheet	First numbered notebook artifact; revise for quality.
0.6	Problem / criteria / constraints worksheet	Clarifies how to define design problems.
0.7–0.8	Launch pad concept + build plan	Moves from ideas to build-ready documentation.
0.9–0.10	Prototype build notes + testing/improvement evidence	Shows iteration through testing.
0.11–0.12	Final design review + Unit 0 portfolio reflection	Communicates final design and individual learning.

How Unit 0 Works

Use a consistent engineering rhythm: define, document, build, test, improve, and communicate.

UNIT 0 HABITS

- Tie every activity back to evidence: sketches, notes, photos, measurements, test results, and reflections.
- Avoid rewarding only the best-looking prototype; reward clear problem definition, documentation, testing, and improvement.
- Use aerospace examples frequently: rockets, aircraft, drones, satellites, launch systems, and ground support equipment.
- Explain what changed, why it changed, and what evidence supports the decision.

Lesson 0.1

Course Launch & Engineering Mindset

FOCUS QUESTION

How do engineers think, document, and make evidence-based decisions?

Today you will learn to:

- Course purpose and aerospace engineering mindset
- Engineering problems vs. school assignments
- Evidence as the foundation of design decisions

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

What does it mean to think and work like an engineer?

By the end, you should be able to...

- Describe what IED is and how it connects to aerospace engineering.
- Explain why engineers use evidence, constraints, testing, and communication.
- Compare finishing an assignment with solving an engineering problem.

Lesson 0.1

Unit 0 Lesson Focus

Course Launch & Engineering Mindset

Connect today’s activity to the larger engineering process.

School Assignment vs. Engineering Problem

Set the mindset for the year.

A typical assignment

- Often has one expected answer
- Can be finished and forgotten
- Usually judged by completion
- Mistakes are avoided

An engineering problem

- Has multiple possible solutions
- Requires criteria and constraints
- Uses testing to improve ideas
- Mistakes become evidence

IED Course Focus

You will build engineering habits through an aerospace lens.

Core engineering skills

- Sketching and visual communication
- CAD modeling and technical drawings
- Fabrication and prototyping
- Testing and data analysis
- Design reviews and documentation

Aerospace connections

- Rocket launch pad challenge
- Rocket models and assemblies
- Aircraft, drone, satellite, and rover examples
- FabLab tools and manufacturing routines
- Human-centered aerospace capstone

Evidence-Based Engineering

The key idea for day one.

KEY IDEA

- Engineers do not just say “I think this works.”
- Engineers use evidence: sketches, measurements, test data, observations, photos, prototypes, and user feedback.
- Every design claim should connect to proof.
- The first version is not the finish line; it is the first source of evidence.

Lesson 0.2

Engineering Notebook Setup & Course Resources

FOCUS QUESTION

How will you organize evidence so your engineering work can be understood later?

Today you will learn to:

- Engineering notebook expectations
- Course resources and file organization
- Digital naming habits that support documentation

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How will you organize engineering work and access course resources?

By the end, you should be able to…

- Set up the binder-based engineering notebook system.
- Explain chronological organization and table of contents routines.
- Locate key course resources, templates, downloads, and submissions.

Lesson 0.2

Unit 0 Lesson Focus

Engineering Notebook Setup & Course Resources

Connect today’s activity to the larger engineering process.

Engineering Notebook System

The notebook is a chronological evidence record.

Notebook rules

- Use a 1.5 inch binder as the engineering notebook.
- The first page is the printed Table of Contents.
- Do not number the Table of Contents.
- Page numbering starts with the first actual document.
- Add work in the order it is completed.

Why it matters

- Makes design thinking visible.
- Helps teams trace decisions.
- Creates evidence for design reviews.
- Supports revision and inspection.
- Builds professional documentation habits.

Course Resource Access Check

Confirm you can find everything you need before projects begin.

ACTIVITY

Digital access routine

1. Log in to Google Classroom.
2. Open and bookmark the LockwoodSTEM IED Course Hub.
3. Find lesson pages, downloads, templates, and certifications.
4. Confirm shared Drive or submission access.
5. Review file naming expectations.

Evidence you create

No formal notebook submission. Complete the access checks live in class.

Digital File Naming

Make digital work findable and professional.

REQUIRED FORMAT

- LastName_FirstName_Unit_AssignmentName
- Use clear names for CAD files, screenshots, PDFs, and submitted documents.
- Save and back up work in the correct location.
- A file name should make sense even before the file is opened.

Lesson 0.3

Safety Acknowledgment, PPE & FabLab Orientation

FOCUS QUESTION

How do safe habits make engineering work possible?

Today you will learn to:

- FabLab safety as an engineering requirement
- PPE, behavior, and tool-space expectations
- Signed safety acknowledgment and readiness

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How do safety expectations protect people, tools, materials, and project quality?

By the end, you should be able to...

- Identify major safety expectations for the engineering classroom and FabLab.
- Explain PPE expectations and safe behavior around tools and materials.
- Understand the signed acknowledgment requirement before tool use.

Lesson 0.3

Unit 0 Lesson Focus

Safety Acknowledgment, PPE & FabLab Orientation

Connect today’s activity to the larger engineering process.

Safety Is an Engineering Requirement

Safety protects people, tools, materials, and project quality.

NON-NEGOTIABLES

- Wear safety glasses when directed or required by fabrication activity.
- Wear closed-toe shoes during fabrication activities.
- Tie back long hair and secure loose clothing or jewelry.
- Use tools, machines, and materials only with permission and supervision.
- Report damaged tools, unsafe conditions, and injuries immediately.

PPE + Behavior

The FabLab is a shared engineering workspace.

PPE expectations

- Safety glasses when required
- Closed-toe shoes for fabrication
- Hair tied back around tools
- No loose clothing or dangling jewelry
- Use gloves only when appropriate and directed

Behavior expectations

- No horseplay or rushing
- Ask before using tools or materials
- Keep work areas clear
- Respect active build zones
- Stop immediately if something seems unsafe

Signed Acknowledgment Requirement

You may not use FabLab tools or machines until the acknowledgment is returned.

Requirement	What it means for you
Your signature + parent/guardian signature	Confirms safety and FabLab expectations were reviewed.
Paper copy collected	This is a graded completion item.
Required before tool use	You can participate without it, but you cannot use tools or machines until it is returned.
Certifications handled separately	Lesson 0.3 is orientation, not full tool certification.

Lesson 0.3

Safety & PPE Video Connection

Use this optional resource if you want a quick visual explanation of the lesson ideas.

What to watch for

STEMonstrations: Lab Safety

the role of PPE in preventing injuries
safe behavior expectations in a lab space
why safety is part of quality engineering work

Scan or open

Open Video

If the QR code does not scan, use the link below:
https://www.youtube.com/watch?v=NA4aPX5SuME

This resource is optional and is provided to help reinforce the lesson with a visual example.

Lesson 0.4

Engineering Design Process

FOCUS QUESTION

How do engineers use testing and revision to improve a design?

Today you will learn to:

- The design process as a cycle
- Paper airplane distance challenge
- Testing, evaluating, and revising with evidence

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How do engineers improve an idea through testing and redesign?

By the end, you should be able to...

- Describe the design process as a flexible cycle.
- Apply the cycle to a paper airplane distance challenge.
- Use test evidence to revise a design.

Lesson 0.4

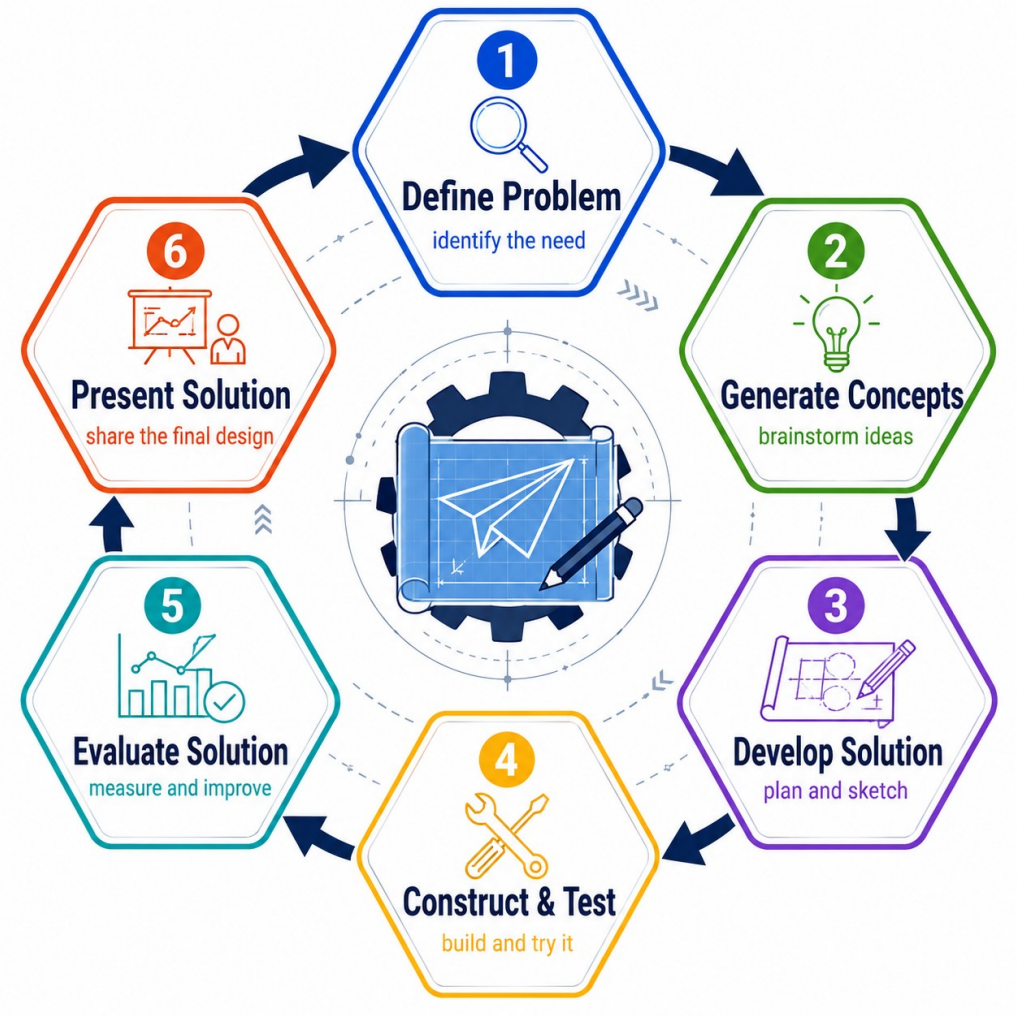
Unit 0 Lesson Focus

Engineering Design Process

Connect today's activity to the larger engineering process.

Engineering Design Process

The process is a flexible cycle, not a strict checklist.



Design process stages

- Define the problem: goal, constraints, success criteria
- Generate concepts: multiple possible solutions
- Develop solution: choose and plan a design
- Construct & test: build prototype and collect evidence
- Evaluate solution: compare results to criteria
- Present solution: communicate the design and next steps

Paper Airplane Distance Challenge

A fast design-process cycle with measurable evidence.

ACTIVITY

Challenge rules

1. Each student sketches one concept individually.
2. The team chooses one Version 1 concept to build.
3. Version 1 uses one sheet of paper only.
4. Complete one official test flight and record distance.
5. Revise the design and build Version 2 with one new sheet of paper.
6. Complete one official test flight and compare evidence.

Evidence you create

Individual design process worksheet becomes the first numbered notebook document.

Test → Evaluate → Revise

Make the design cycle visible during the airplane challenge.

1 Test

Measure distance from the launch line to the first ground contact. Record results in feet and inches.

2 Evaluate

Compare Version 1 and Version 2. Did performance improve, worsen, or stay similar?

3 Revise

Explain what changed and what evidence supports the design decision.

Paper Airplane Evidence Checklist

You should leave with a completed design-process artifact.

- ☐ Individual concept sketch is complete.
- ☐ Team Version 1 and Version 2 data are recorded.
- ☐ Revision is explained with evidence.
- ☐ Worksheet is numbered as the first notebook document.
- ☐ Table of Contents is updated.

Lesson 0.4

Engineering Design Process Video Connection

Use this optional resource if you want a quick visual explanation of the lesson ideas.

What to watch for

STEMonstrations: Engineering Design Process

where defining the problem happens
how testing leads to improvement
why engineers rarely get the best solution on the first try

Scan or open

Open Video

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https://www.youtube.com/watch?v=IbbxjA5e2hw

This resource is optional and is provided to help reinforce the lesson with a visual example.

Lesson 0.5

Engineering Notebook & Documentation Basics

FOCUS QUESTION

What makes engineering documentation useful?

Today you will learn to:

- Strong vs. weak documentation
- Sketches, decisions, test data, and revision notes
- Notebook evidence that supports design thinking

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How does documentation make engineering thinking visible?

By the end, you should be able to...

- Explain what strong engineering documentation looks like.
- Improve the Lesson 0.4 paper airplane worksheet.
- Connect documentation quality to engineering decisions and communication.

Lesson 0.5

Unit 0 Lesson Focus

Engineering Notebook & Documentation Basics

Connect today’s activity to the larger engineering process.

Weak vs. Strong Documentation

You should learn to improve evidence quality, not just add more words.

Weak documentation

- Undated or unlabeled notes
- Missing sketches or measurements
- Vague statements like “it worked”
- No explanation of changes
- Hard for another person to follow

Strong documentation

- Dated, labeled, and organized
- Sketches show key features
- Data and observations are clear
- Decisions are explained with evidence
- Another person can understand the work

Why Documentation Matters

Use aerospace and manufacturing examples to make documentation feel real.

Engineering purpose

- Trace decisions over time
- Repeat tests consistently
- Inspect parts and assemblies
- Communicate changes clearly
- Prevent avoidable mistakes

Student action today

- Review the 0.4 worksheet
- Improve unclear responses
- Check that data are recorded
- Add labels where needed
- Place the improved worksheet in the notebook

Documentation Standard

Use this standard repeatedly throughout the course.

STRONG DOCUMENTATION IS...

- Clear: another person can understand what happened.
- Dated: work is traceable over time.
- Labeled: sketches, tables, and photos have meaning.
- Evidence-based: claims connect to data, observations, or testing.
- Detailed enough to support a design review.

Lesson 0.6

Problem Definition, Criteria & Constraints

FOCUS QUESTION

How do engineers define the problem before designing a solution?

Today you will learn to:

- Problem statements vs. solution ideas
- Criteria as goals and constraints as limits
- Using clear definitions to guide design work

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How do engineers define a problem clearly before designing a solution?

By the end, you should be able to...

- Separate the problem from the solution.
- Write a clear problem statement.
- Identify criteria and constraints for a design challenge.

Lesson 0.6

Unit 0 Lesson Focus

Problem Definition, Criteria & Constraints

Connect today's activity to the larger engineering process.

Problem vs. Solution

Before you design, they must know what problem they are solving.

Solution too early

- “We are going to build a rocket stand.”
- Names the product before the need is defined
- Can lock the team into one idea too soon
- Makes it harder to compare alternatives

Problem definition

- “You need a way to support the rocket safely during setup.”
- Explains the user, need, and reason
- Leaves room for multiple possible solutions
- Guides criteria and constraints

Criteria vs. Constraints

You will use these words all year.

Term	Meaning	Launch pad example
Criteria	Goals the design should meet	Supports the rocket securely; stands on its own; includes realistic launch pad features.
Constraints	Limits the design must follow	Approved classroom materials only; must fit the provided rocket; no custom 3D printed parts.
Success criteria	How the team knows the design worked	Rocket fit is secure; prototype does not tip; support does not collapse.
Evidence	Proof used to justify decisions	Sketches, test results, photos, observations, and final explanation.

Define Before Designing

This lesson prepares you for the launch pad challenge.

ACTIVITY

Problem definition practice

1. Read the scenario carefully.
2. Identify the user or need.
3. Write the problem in one or two clear sentences.
4. List criteria the design should meet.
5. List constraints that limit the design.
6. Check that no final solution is chosen too early.

Evidence you create

Problem Definition, Criteria, and Constraints worksheet.

Lesson 0.7

Rocket Launch Pad Design Challenge Launch

FOCUS QUESTION

How can a launch pad design support a rocket safely and effectively?

Today you will learn to:

- Challenge brief and project expectations
- Individual ideas before team concept development
- Criteria, constraints, and research-informed features

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

Rocket Launch Pad Design Challenge Launch

How can a team turn research and individual ideas into one launch pad concept?

How can a team turn research and individual ideas into one launch pad concept?

By the end, you should be able to...

- Understand the full Rocket Launch Pad Design Challenge brief.
- Identify the problem, criteria, and constraints before brainstorming.
- Brainstorm individually before combining ideas into one team concept.

Lesson 0.7

Unit 0 Lesson Focus

Rocket Launch Pad Design Challenge Launch

Connect today's activity to the larger engineering process.

Rocket Launch Pad Design Challenge

You begin the first complete design challenge.

CHALLENGE BRIEF

- Design and build a launch pad that fits and supports the provided 3D printed rocket.
- The launch pad must stand on its own.
- The design should include research-informed launch pad features.
- Use only approved classroom materials.
- Justify the design through sketches, documentation, testing, and presentation.

From Individual Ideas to Team Concept

Do not let teams simply choose one student's idea.

1 Define

Start by identifying the problem, criteria, and constraints for the challenge.

2 Brainstorm

Each student creates one individual launch pad idea or concept sketch first.

3 Combine

Teams share ideas and combine useful features into one team concept.

Launch Pad Criteria and Constraints

Keep these visible as you design.

Category	Requirement
Fit and support	Must fit/support the provided 3D printed rocket.
Stability	Must stand on its own without tipping or collapsing.
Research-informed features	Should include realistic launch pad features from research or examples.
Materials	Must use approved classroom materials. No custom 3D printed parts for this challenge.
Documentation	Must be justified through sketches, notes, testing, and presentation.

Launch Pad Team Concept

You move from individual sketches to one shared concept.

ACTIVITY

Team concept workflow

1. Review problem, criteria, and constraints.
2. Create one individual concept sketch.
3. Share sketches within the team.
4. Identify useful features from multiple ideas.
5. Combine features into one labeled team concept sketch.
6. Explain how the concept meets criteria and constraints.

Evidence you create

Notebook entry: Rocket Launch Pad Team Concept.

Lesson 0.7

Launch Pad Inspiration Video Connection

Use this optional resource if you want a quick visual explanation of the lesson ideas.

What to watch for

An Exclusive Look at Pad 39B: Tour of Artemis Launch Site

features real launch pads need

how a launch pad supports, protects, and organizes a rocket

ideas you can adapt for your launch pad concept

Scan or open

Open Video

If the QR code does not scan, use the link below:
https://www.youtube.com/watch?v=fqKbSEO_Axg

This resource is optional and is provided to help reinforce the lesson with a visual example.

Lesson 0.8

Launch Pad Build Plan

FOCUS QUESTION

How does planning make a prototype easier to build and test?

Today you will learn to:

- Materials and construction planning
- Build sequence and team responsibilities
- Sketches and notes that make the plan build-ready

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How can a team turn a concept sketch into a build-ready plan?

By the end, you should be able to...

- Refine the team launch pad concept into a build plan.
- Add labels, approximate dimensions, materials, and construction steps.
- Prepare for a build-readiness check before building.

Lesson 0.8

Unit 0 Lesson Focus

Launch Pad Build Plan

Connect today’s activity to the larger engineering process.

Build Plan Requirements

A good plan reduces improvisation during construction.

Plan must include

- Refined team sketch
- Labeled major parts
- Approximate dimensions
- Materials list
- Step-by-step construction plan

Readiness check

- Build is realistic
- Materials are approved
- Rocket fit is considered
- Base and support are clear
- Potential weakness is identified

Approved Materials Planning

You should design with classroom materials in mind.

Material family	Possible use
Cardboard / paperboard	Base, walls, guides, bracing, support surfaces.
Popsicle sticks / craft sticks	Frames, reinforcement, angled supports.
Straws / tubes	Guides, lightweight supports, alignment features.
String / rubber bands	Tension, temporary holding, simple support features when approved.
Tape / glue / hot glue	Connections only when approved and used safely.
Provided 3D printed rocket	Used for fit and support checks, not modified.

Build-Ready Plan

The plan should let another person understand how to build the prototype.

ACTIVITY

Plan refinement steps

1. Review the team concept from Lesson 0.7.
2. Improve weak or unclear areas.
3. Add labels and approximate dimensions.
4. Create a materials list.
5. Write construction steps in order.
6. Complete a design check before construction begins.

Evidence you create

Notebook entry: Launch Pad Build Plan.

Lesson 0.9

Launch Pad Prototype Build Day

FOCUS QUESTION

How do teams turn a design plan into a physical prototype?

Today you will learn to:

- Safe, organized prototype construction
- Fit, stability, and build quality checks
- Progress documentation and evidence collection

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How can a team safely build a first prototype from an approved build plan?

By the end, you should be able to...

- Build a first prototype from the approved plan.
- Check rocket fit and stability during construction.
- Document changes, problems, and solutions as they happen.

Lesson 0.9

Unit 0 Lesson Focus

Launch Pad Prototype Build Day

Connect today’s activity to the larger engineering process.

Prototype Build Priorities

Build function before decoration.

1 Base first

The launch pad must stand on its own before extra features are added.

2 Support next

The provided rocket must sit securely without collapsing, sliding, or tipping.

3 Features last

Add research-informed details after the main structure is stable.

Build Day Expectations

Build carefully and document changes.

DURING CONSTRUCTION

- Gather only approved materials needed for the plan.
- Compare the physical prototype to the build plan.
- Pause for mid-build fit and stability checks.
- Do not force parts or ignore unsafe conditions.
- Document any change from the original plan and explain why it happened.

Prototype Build Progress

The first prototype does not need to be perfect; it needs to be documented.

ACTIVITY

Build evidence

1. Photo or sketch of prototype in progress.
2. Materials used.
3. Changes made during construction.
4. One problem encountered.
5. How the team solved or plans to solve that problem.

Evidence you create

Notebook entry: Prototype Build Progress.

Lesson 0.10

Launch Pad Testing and Improvement

FOCUS QUESTION

How does testing show what a prototype needs next?

Today you will learn to:

- Test criteria and repeated trials
- Recording observations, data, and failure points
- Evidence-based improvements and revision notes

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How can testing evidence help a team improve a prototype?

By the end, you should be able to...

- Test the prototype against challenge criteria.
- Record observations and identify strengths and weaknesses.
- Make at least one evidence-based improvement.

Lesson 0.10

Unit 0 Lesson Focus

Launch Pad Testing and Improvement

Connect today's activity to the larger engineering process.

Launch Pad Test Criteria

The test should match the design requirements.

Test	Question to answer	Evidence to record
Stability test	Does the launch pad stand without tipping?	Pass/fail, photo, notes about wobble or tipping.
Rocket fit test	Does the provided rocket sit securely?	Fit observations, support contact, slipping or movement.
Support test	Does the pad hold the rocket without bending/collapsing?	Observations of weak joints, bending, sliding.
Design feature check	Can the team identify realistic launch pad features?	Labeled features and explanation.

Test, Record, Revise

A launch pad improves when the team uses evidence.

1 Test

Run the criteria checks and record what actually happens.

2 Record

Identify strengths, weaknesses, and specific failure points.

3 Revise

Improve the prototype using approved materials and explain what changed.

Common Evidence-Based Improvements

You should connect changes to test results.

IMPROVEMENT OPTIONS

- Widen the base to improve stability.
- Reinforce weak joints or support columns.
- Adjust rocket support spacing or angle.
- Add bracing to reduce bending or twisting.
- Improve alignment so the rocket sits more securely.
- Remove unnecessary parts that add weight or instability.

Prototype Testing and Improvement

Finish with a tested and improved prototype.

ACTIVITY

Documentation steps

1. Record test results.
2. Note what worked well.
3. Note what did not work well.
4. Make at least one design improvement.
5. Add a sketch or photo of the improved prototype.
6. Explain how the improvement made the launch pad better.

Evidence you create

Notebook entry: Prototype Testing and Improvement.

Lesson 0.11

Final Documentation & Design Review

FOCUS QUESTION

How do engineers communicate and defend a final design?

Today you will learn to:

- Final design evidence and prototype documentation
- Design review explanation and sentence frames
- Using data and documentation to justify decisions

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

How can a team clearly explain and justify a finished prototype?

By the end, you should be able to...

- Prepare final documentation for the launch pad prototype.
- Explain how the design changed from concept to final version.
- Justify how the final prototype meets criteria and constraints.

Lesson 0.11

Unit 0 Lesson Focus

Launch Pad Final Documentation and Design Review

Connect today’s activity to the larger engineering process.

Design Review Evidence

A finished prototype must be supported by clear evidence.

Show the process

- Problem definition
- Initial concept
- Build plan
- Prototype construction
- Testing and improvement
- Final design

Use evidence

- Sketches
- Materials list
- Approximate dimensions
- Photos
- Test results
- Design explanation

Final Launch Pad Design Review

Organize and communicate your evidence.

ACTIVITY

Review preparation

1. Check that the prototype is finished and stable.
2. Organize evidence from Lessons 0.7–0.10.
3. Create or update a final labeled sketch.
4. Summarize test results.
5. Explain one major improvement.
6. Explain how the final design meets criteria and constraints.

Evidence you create

Notebook entry: Final Launch Pad Design Review.

Design Review Sentence Frames

Use these sentence frames to justify design decisions.

EVIDENCE LANGUAGE

- Our launch pad meets the stability criterion because…
- The provided rocket is supported by…
- Our most important test result was…
- After testing, we changed… because…
- With more time, the next improvement would be…

Lesson 0.12

Unit 0 Portfolio Check and Design Reflection

FOCUS QUESTION

How does reflection help engineers prepare for the next design challenge?

Today you will learn to:

- Portfolio completeness and evidence check
- Final reflection on the design process
- Connecting Unit 0 habits to future IED work

Build evidence.

Test ideas.

Improve designs.

Aerospace Design Cycle

Problem → Prototype → Test → Revise

Unit 0 starts the habits you will use all year in IED.

Unit 0 Portfolio Check and Design Reflection

How can a complete notebook portfolio show your growth through the design process?

How can a complete notebook portfolio show your growth through the design process?

By the end, you should be able to...

- Organize the complete Unit 0 notebook portfolio.
- Verify that launch pad challenge documentation is complete.
- Reflect on teamwork, testing, improvement, and design process growth.

Lesson 0.12

Unit 0 Lesson Focus

Unit 0 Portfolio Check and Design Reflection

Connect today’s activity to the larger engineering process.

Unit 0 Portfolio Checklist

The notebook should show the full path from idea to improved prototype.

- ☐ Course resource and notebook routines are understood.
- ☐ Paper airplane design process worksheet is complete and numbered.
- ☐ Problem definition / criteria / constraints work is complete.
- ☐ Launch pad individual concept and team concept are complete.
- ☐ Launch pad build plan is complete.
- ☐ Prototype build notes and testing/improvement notes are complete.
- ☐ Final design review is complete.
- ☐ Individual Unit 0 reflection is complete.

Final Reflection Prompts

Reflection should be specific and evidence-based.

You explain

- How the team used the design process
- Their strongest contribution
- The biggest challenge
- Which improvement had the biggest impact
- What they would change with more time

Strong reflections include

- Specific examples
- Clear connection to evidence
- Honest discussion of problems
- Recognition of teamwork
- Understanding of iteration

End of Unit 0 Message

This is the transition into technical sketching and documentation.

WHAT TO CARRY FORWARD

- Engineering work starts with a clearly defined problem.
- Design ideas must be judged against criteria and constraints.
- Testing is a source of evidence, not a pass/fail moment.
- Documentation makes design thinking visible.
- A prototype improves when teams revise based on evidence.

Unit 0 Close

The launch pad challenge is the first complete design-process cycle of the course.

Mindset

Shift from assignment completion to engineering evidence.

Process

Define, brainstorm, build, test, improve, and present.

Bridge

Unit 1 begins technical sketching and engineering documentation.