FLITE TEST STEM

EDUCATE
EMPOWER
ELEVATE

MIDDLE SCHOOL YEAR 2021-22

Flite Test STEM Curriculum Overview
Science, Technology, Engineering and Mathematics

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FT STEM ORIGINS

Entertaining, Educating and Elevating The World of Flight!

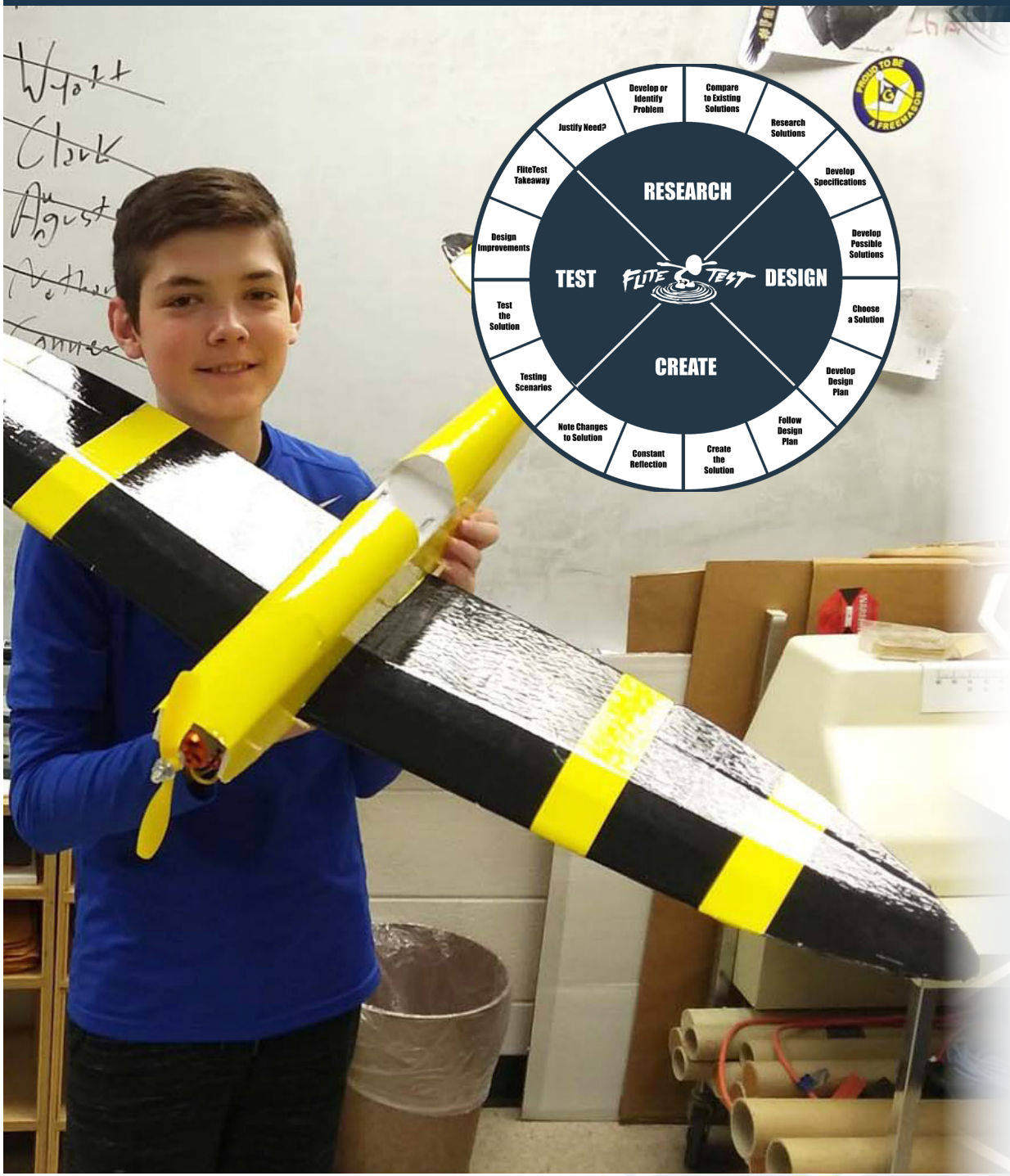
Flite Test was created for people passionate about flight. Our community organization is for the people that build and fly planes and multirotors as a hobby. They are the dreamers and engineers that are thrilled by the first launch of a maiden flight. What we do personifies the veteran and the beginner alike, giving them a chance to share common experiences with others and in turn, enhancing the R/C community. The goal was to develop a creative outlet that allows us to work in our passion daily. Flite Test was designed to empower our audience. Our YouTube connection shows just enough humor, technology and information to appeal to the R/C flight crowd as a whole. Our hope is to entertain, educate and elevate our viewers as we move forward with quality content.

2015 saw Flite Test become a leader in educating the hobby in remote control scratch build aviation. Our mission since then has been to take the Flite Test educational concept and fuse it with today's leading STEM learning platform being used in schools.

Flite Test + STEM = FT STEM

Constructing STEM literacy through the lens of scratch build aviation for 21st-century learners is the foundation of Flite Test's K–12 curriculum solution. Using a modified engineering design model process, the innovative, STEM-driven hands-on aircraft activities engage learners at every level and provide real-world learning opportunities that expose students to careers in science and technology. The program also stresses critical 21st-century skills, such as communication and teamwork. Students of all learning styles (interventions, talented and gifted programs, and extended learning instruction) have success in our Flite Test Clubs all across the world, and our hands-on approach provides a variety of flexible implementation models. Our curriculum involves both student-directed and teacher-led curricula to create a powerful and effective STEM experience.

OUR CURRICULUM



Making and Impact

As of 2021 FT STEM has over 5,000 enrolled students and teachers and is currently being adopted across the country and the World in STEM programs, summer camps, EAA Young Eagle Programs, after school enrichment programs, home and public schools. Through the growth and success of the curriculum, Flite Test has been able to deliver scratch build flight to a growing community of first time hobbyists and future aviation engineers and pilots. This growth, along with our major influence on the hobby in general, has propelled us to create the *Flite Test Community Association.* A program designed to "Bring Hope to the Hobby" organizing our community to promote model aviation.

How it Works

FT STEM is a curriculum designed to supplement or create a program in an educational setting from kindergarten to high school promoting a broad array of engineering and future aviation careers. As a supplemental option, educators can pull specific elements from the curriculum to meet the needs of their classroom. The following overview is a suggested and recommended approach based on the input from teachers developing and currently using the curriculum. The overview is the big picture of the curriculum and for its implementation as a school course option. Educators and students are encouraged to use the following amenities from the FT STEM interactive site;

- Online Teacher and Student Hangars
- Over 100 foundational lessons, lesson creator for teachers, and ability to assign lessons to students.
- Teacher grading portal of student submitted design projects.
- Teacher and student resource bank of Flite Test articles, How to videos, drawing files, and more.
- Student Online design project creator.

Over 1500 Teachers

Meets National Standards

Over 3,000 Students

STANDARDS ALIGNMENT

FT STEM aligns its curriculum with standards that are nationally known and that can be easily adopted or modified by educational programs. Having a heavy emphasis on engineering and critical thinking, a majority of the curriculum is aligned with ISTE *(International Society for Technology in Education)*.

Others include Next Generation Science Standards, Science and Engineering Standards of NSTA, National Council of Teacher Mathematics Standards, and National Career and Technical Education Standards.

International Society For Technology in Education

1. Empowered Learner - Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences. (1B, 1C, 1D) *See ISTE Video Playlist Connection*
2. Digital Citizenship - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical. (2B, 2C) *See ISTE Video Playlist Connection*
3. Knowledge Constructor - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others. (3A, 3B, 3C, 3D) *See ISTE Video Playlist Connection*
4. Innovate Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. (4A, 4B, 4C, 4D) *See ISTE Video Playlist Connection*
5. Global Collaborator - Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. (7B, 7C, 7D) *See ISTE Video Playlist Connection*

(2021) ISTE - https://www.iste.org/standards/for-students

Next Generation Science Standards

1. Engineering and Design - Systematic approach to solving problems. (MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, MS-ETS1-4, MS-PS2-2, MS-PS4-3)
2. Energy - Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. (MSPS3-3)
3. Motion and Stability- Forces and Interactions. (MS-PS2-2)

(2021) NGSS https://www.nextgenscience.org

STANDARDS ALIGNMENT CONTINUED

National Council of Teacher Mathematics Standards

1. Measurement - Understand both metric and customary systems of measurement. Understand, select and use units of appropriate size and type to measure angles, perimeter, area, surface area and volume. Select and apply techniques and tools to accurately find length, area, volume, and angle measurements to appropriate levels of precision. Develop strategies to determine the surface area and volume of selected prisms, pyramids and cylinders. Carry out simple unit conversions within a system of measurement, such as from centimeters to meters.
2. Numbers and Operations - Work flexibility with fractions, decimals and percents to solve problems.
3. Geometry - Use two-dimensional representations of three- dimensional objects to visualize and solve problems such as those involving surface area and volume.
4. Data Analysis and Probability - Formulate questions, design studies and collect data about a characteristic shared by two populations or different characteristics within one population.
5. Algebra - Develop an initial conceptual understanding of different uses of variables

(2021) www.nctm.org

STEMPATHY

Flite Test Takeaways

Soft skills include clear communication, teamwork, problem solving, flexibility and creative thinking, among others. Colleges of Engineering seek students who possess strong soft skills and who are willing to practice and grow in their personal development. Below are the major themes mentioned:

- Effective communication with colleagues and presenting ideas to foster product development.
- Ability to give and take constructive suggestions/criticisms.
- Willingness to learn and evolve as an individual and with the team.
- Ability to visualize a project's completion prior to its creation.
- Competitive approach and the confidence to solve any problem.
- Tech savvy with willingness to adapt to the change of technology.

The progress of product development requires students to be imaginative and creative to solve problems. Colleges and the engineering industry need students who have prior experience in Design Thinking to reduce "on the job training." Below is the desired basic Design Thinking process:

- Use information literacy to generate solutions for an identified problem.
- Work as a team with different viewpoints to develop multiple ideas.
- Use available technology to create a solution.
- Perform appropriate tests needed to finalize a product.

Colleges of Engineering seek students who have made an attempt to apply their learning in technology to support their engineering pathway. Below are tech skills praised by college reps during FT STEM prerequisite research:

- Design software such as Solidworks, Inventor and AutoCAD
- Programming and entry-level usage with embedded electronics
- Basic hand tool usage
- Fabrication Lab equipment usage i.e. laser cutters, 3D printers, CNC routers, soldering, etc.

OUR LEARNING STRANDS

Strand #1 - FT Workbench

The FT-Workbench is the foundational skill sets students need to acquire in order to successfully design, build, engineer, and fly content related projects. Curriculum lessons that teach these fundamentals should be chosen and assigned to students, see curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Flight Safety and Maintenance
- Fundamental Concepts of Flight
- Flite Test Build Techniques
- Power Plant and On-board Components
- Fundamental Concepts of Design
- Engineering Design Model Implementation

STEMPATHY

FT Workbench will see students learning to work in teams, putting into practice Design Thinking, and learning to build aircraft within Flite Test techniques.

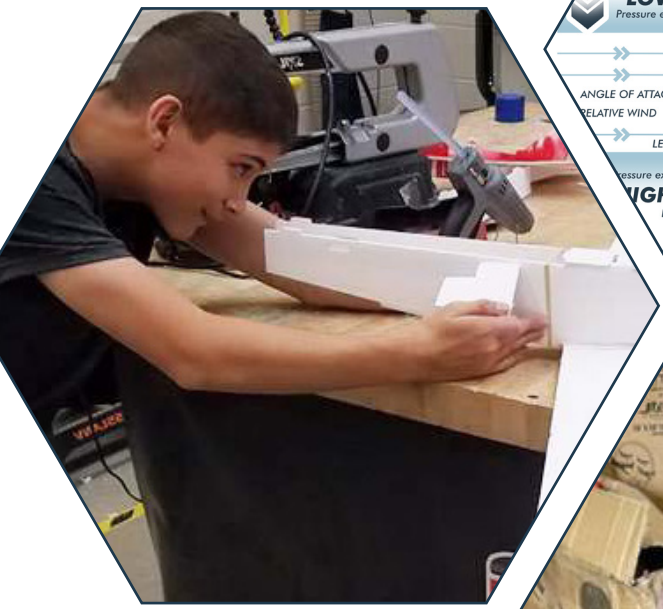
- Soft, Design, and Tech

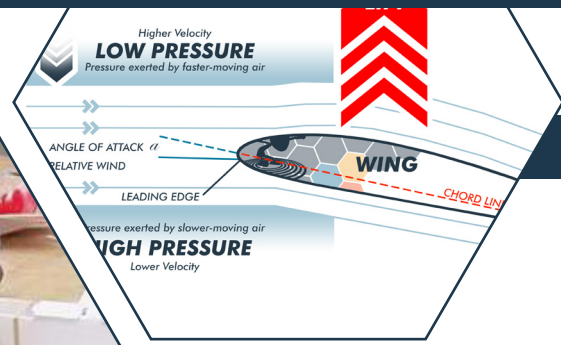
Unit Alignment

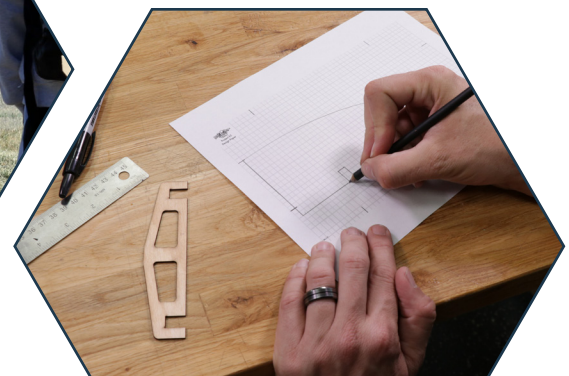
The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- Principles of Flight
- UAV Power Plant and Components
- Aircraft Design
- Design Communication
- Design Thinking

OUR LEARNING STRANDS







Strand #2 - Build to Fly

The Build to Fly strand exposes students to the construction and flight of Flite Test designed aircraft including free flight, power flight, and multirotors. See curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Multi-platform understanding
- Scratch Build Construction
- Power Systems
- Propulsion and Control Systems
- Radio Systems
- Flight Safety and Maintenance

STEMPATHY

Build to Fly will see students learning to work in teams, and learning to build multiple aircraft platforms within Flite Test techniques.

- Soft and Tech

Unit Alignment

The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- UAS Power Plant and Components
- Battery Safety
- Build to Fly Units

OUR LEARNING STRANDS

Strand #3 Inquiry and Design

Inquiry and Design challenges students to modify or change an existing Flite Test designed aircraft. Allowing for student practice within the engineering design model and integrating new aircraft design opportunities. See curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Scratch Build Safety
- Engineering Design Model Implementation
- Cont. Scratch Build Construction
- Aerodynamics and Design
- 2D and 3D CAD Integration
- Lab Fabrication and Manufacturing
- Flight Safety and Maintenance

STEMPATHY

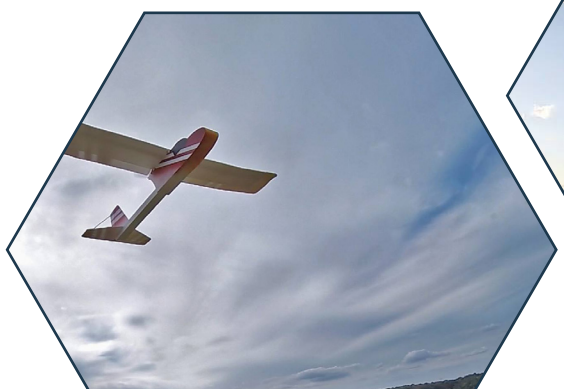
Build to Fly will see students learning to work in teams, and learning to build multiple aircraft platforms within Flite Test techniques.

- Soft, Design, and Tech

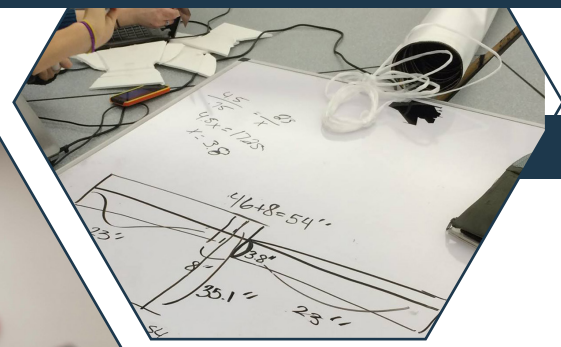
Unit Alignment

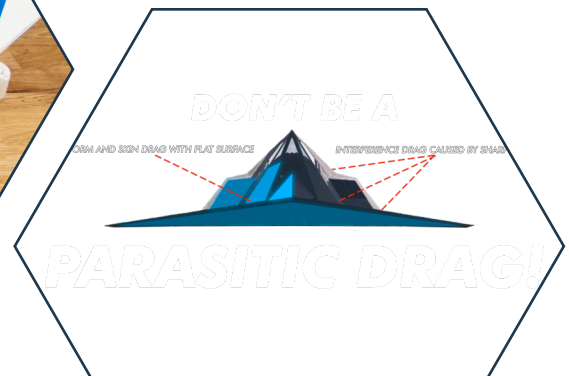
The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- UAS Power Plant and Components
- Battery Safety
- Aircraft Design
- Design Communication
- Design Thinking
- Inquiry and Design Units



OUR LEARNING STRANDS





Strand #4 - Engineering and Design

Engineering and Design challenges students to research, design, create, and test a solution to a problem ranging for a simple aircraft design to solving a real world problem in the world of UAV. See curriculum map for alignment and the following skill sets covered;

Curriculum Skill Sets:

- Lab and Classroom Safety
- Scratch Build Safety
- Engineering Design Model Implementation
- Product development through marketing and manufacturing
- Cont. build construction, aerodynamic design, and flight safety maintenance.
- 2D and 3D CAD Integration
- Lab Fabrication and Manufacturing
- Flight Safety and Maintenance

STEMPATHY

Build to Fly will see students learning to work in teams, and learning to build multiple aircraft platforms within Flite Test techniques.

- Soft, Design, and Tech

Unit Alignment

The following units are designed to meet the needs of the FT Workbench learning strand, students and teachers may approach as many and/or order of units to which they see fit;

- FT Safety 5
- UAS Power Plant and Components
- Battery Safety
- Aircraft Design
- Design Communication
- Design Thinking
- Engineering and Design Units

A CURRICULUM DESIGN EXAMPLE

Unit Planning

As an instructor, you know what is best for your classroom, and FT STEM is designed as your supplemental curriculum tool. Prior to purchasing, use the following Curriculum Overview to plan your FT STEM experience.

Example:

- **Grade**: Middle School
- **Subject**: Industrial Tech
- **Unit**: Transportation
- **Timeline**: 2 Weeks
- **Objective**: Ultimate Egg Drop Challenge - 2 week duration
- **Teams**: Groups of 2

Unit Outline:

- **Design Thinking** - Using the FT STEM Engineering Design Model, solve the problem of transporting an egg without breaking using an FT Sparrow to also clear a distance of more then 30' thrown.
- **Flight Fundamentals** - Plane Physics - Student led research
- **Build 2 Fly** - Model chosen FT Sparrow
    - Design Challenge Integration, students create housing mechanism to keep egg safe. Possible launching system, no motors allowed, could use power with servos to control plane in flight after thrown.
    - **Final Testing and Design Notebook Submission**

Support:

Need help planning or you have completed your FT STEM experience and need guidance in purchasing the right equipment? Contact our awesome teacher support staff at support@ftstem.com and we can help.

If you are a seasoned pro and know exactly what you want, then please visit our store and find the latest Flite Test STEM products and prices by going to www.store.ftstem.com

SAMPLE MIDDLE SCHOOL SCHEDULES

Develop Based on Unit Plan

Your unit plan will determine the length of your ideal middle school schedule. Depending on how many units you want to attempt will determine if your FT STEM experience is just that, a unit, a quarter, semester, or a year long class. Some institutions will build multiple year schedule progressions. Below is some basic schedule templates with topics taken from our curriculum overview.

4-6 Week Module:

- **Educational Platform**: Home School or integrated unit within an industrial technology or science course.
- **Time/Day**: 1 hr session
- **Days/week**: 2-3 days
- **Topics**: Safety, Aircraft Design (Subject/Standard Connection), Build 2 Fly Flite Test Model, and Flight.

Quarterly:

- **Educational Platform**: Home School or integrated unit within an industrial technology or science course.
- **Time/Day**: 1 hr session
- **Days/week**: 2-3 days
- **Topics**: Safety, Basic Design, Aircraft Design, Build 2 Fly Flite Test Model, Flight, Inquiry and Design, and Flight to test assigned design problem.

Semester:

- **Educational Platform**: Home School or Elective Course.
- **Time/Day**: 1 hr session
- **Days/week**: 2-3 days
- **Topics**: Safety, Design, Aircraft Design, Build 2 Fly Flite Test Model, Flight, Engineering and Design, Flight to test assigned design problem.

Support:

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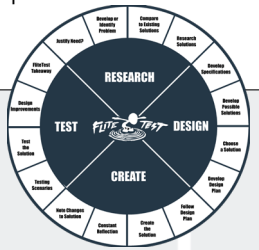
CURRICULUM MAP

Unit	Learning Strand	Significant Concept(s)	National Standards	Time	Lesson/Product Application	Evidence of Outcomes
Safety	FT Workbench	Improvement in safety leads to improvement in productivity and a safer airspace. Longevity of a scratch build aircraft is dependent upon the understanding and safety of LiPo batteries.	ISTE Standards • Innovate Designer • Knowledge Constructor • Empowered Learner NGSS Standards • Energy NCMT Standards • Algebra	1-2 weeks	Lesson 1: What is FT STEM? Lesson 2: FT-Safety 5 Lesson 3: Power Pack Safety Lesson 4: Power Pack Components Lesson 5: Power Pack Installment Lesson 6: Lipo 101 Safety Lesson 7: LiPo Charging Lesson 8: LiPo Containment	Students will understand and execute the appropriate use of safety in construction and flying of aircraft. Students will understand the LiPo battery and its usage and safety when dealing with scratch build aircraft.
Power Systems	FT Workbench Build to Fly	Mechanical power acting as a component of propulsion.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner	1-2 Weeks	Lesson 1: Power Pack Safety Lesson 2: Power Pack Components Lesson 3: Power Pack Installment	Students will understand the usage and how the electronic components work with the construction of the FT-Power Pod and multirotor.
Design Thinking	FT Workbench Inquiry and Design Engineering and Design	Using a process of design makes for an improved product and function.	ISTE Standards • Knowledge Constructor • Innovate Designer NGSS Standards • Engineering and Design	1-2 Weeks	Lesson 1: Transport the Weight Lesson 2: Covering the EDM Lesson 3: Project Based on FT-EDM usage	Students will be able to achieve processes of engineering design, defining a problem, developing solutions and comparing solutions by testing them to see which best solves the problem.



Unit	Learning Strand	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Design	FT Workbench Inquiry and Design Engineering and Design	Computer Aided Design (CAD) or drafting ideas graphically results in solutions for problems.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner NCMT Standards • Measurement • Geometry • Numbers and Operations	2-4 Weeks	Lesson 1: Pick a Unit of Measure Lesson 2: Thumbnail Design Lesson 3: Create the Puzzle Lesson 4: Using CAD Software Lesson 5: Printing Layouts Lesson 6: Project Based Design Practice	Students will be able to CAD/draw an idea graphically on paper to communicate their understanding of measurement and basic aircraft design.
Aircraft Design	FT Workbench Inquiry and Design Engineering and Design	Understanding the different design elements that make up an aircraft supports future aircraft solutions.	ISTE Standards • Knowledge Constructor • Empowered Designer	2-4 Weeks	Lesson 1: Aircraft Types Lesson 2: Empennage Design Lesson 3: Wing Loading Lesson 4: Thrust to Weight Ratio	Students will through a series of lessons learn about the different aircraft design choices associated with creating an aircraft to serving a specific function.
Flight Fundamentals	FT Workbench	Given specific forces on an aerodynamically correct object can result in flight.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner NGSS Standards • Motion and Stability • Energy • Engineering and Design NCMT Standards • Measurement • Geometry • Data Analysis and Probability	2-4 Weeks	Lesson 1: Basics of Flight Lesson 2: Testing the Basics Lesson 3: Control Surface Effect Lesson 4: Control Surfaces in Action Lesson 5: Center of Gravity Lesson 6: Airfoils Lesson 7: wing Configuration Lesson 8: Aerobatics	Students will understand how basic flight aerodynamics work within their aircraft designs and builds.

Unit	Learning Strands	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes

Build to Fly	FT Workbench
	Build to Fly
		Precision in measurement and build techniques increases successful function of a product.	ISTE Standards
			• Knowledge Constructor
			• Innovate Designer
			• Empowered Learner
				Ongoing	Lesson: Build 2 Fly
					Flite Test Aligned Build Kits
					
					Options;
					• Multiwing Configuration
					  • (EZ) Project BasiX
					  • (EZ) Project Starship
					  • (EZ) Project Jets
					  (1 Week)
					
					• High-wing Concept
					  • (1) FT Trainer
					  • (2) FT Simple Cub
					  (1-3 weeks)
						Students will understand the basic scratch build approach to creating an FT-Aircraft and learning the different aircraft configurations to support future student designs in the later learning strands.
						
						LEVELS:
						FT Aircraft assessed based on build and flight characteristics.
						
						EZ
						Basic (1)
						Intermediate (2)
						Experience (3)

BASIC BUILD TO FLY ALIGNED DIY AIRCRAFT

Project EZ

FT Might Trainer

FT Simple Cub

Unit	Learning Strands	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Inquiry and Design	FT Workbench Inquiry and Design	Altering a product can lead to new developments in its design and performance.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner • Digital Citizenship NGSS Standards • Motion and Stability • Energy • Engineering and Design NCMT Standards • Measurement • Algebra • Geometry • Data Analysis and Probability	Ongoing	Lesson: Inquiry and Design • Students see CAD Vault within Online Hangar for drawing download. Flite Test Aligned Build Kits Options; • (2) FT Alpha, Bravo, Charlie interchangeable wing concept (2-4 weeks)	Through discovery, students will be able to apply the Flite Test Fundamentals (Design, EDM and Build 2 Fly) to alter the designs of current aircraft build kits. LEVELS: FT Aircraft assessed based on build and flight characteristics. Beginner (1) Intermediate (2) Advanced (3)

INQUIRY AND DESIGN ALIGNED DIY AIRCRAFT

FT Alpha FT Bravo FT Charlie

Unit	Learning Strands	Significant Concept	National Standards	Length	Lesson/Product Application	Evidence of Outcomes
Engineering and Design	FT Workbench Inquiry and Design Engineering and Design	Engineering new designs can lead to the development of new technologies.	ISTE Standards • Knowledge Constructor • Innovate Designer • Empowered Learner • Digital Citizenship NGSS Standards • Motion and Stability • Energy • Engineering and Design NCMT Standards • Measurement • Algebra • Geometry • Data Analysis and Probability	Ongoing	Lesson 1: Engineering and Design Lesson 2: Simulated Problems Flite Test Aligned Product Application: • FT STEM Online • FT EDM Student Design Brief Creator • FT-Foam Board • FT-Design Templates • FT-Crafty Kit • FT-Power Pack • FT-Electronics Kit • CAD Software • Fab Lab or Innovation Center	Students will be able to apply the Flite Test High School Fundamentals (Design, EDM, Build 2 Fly, Inquiry and Design) to the creation of new aircraft design to perform flight.

DIY SIMULATED PROBLEM IDEAS

Payload Carrying Challenge

Glider Drop Challenge

A Famous Aircraft Remake

New Aircraft Design Concept

A New FT DIY Build Kit

*This unit breakdown can be designed to start at the Middle School level and progress to the High School level. This potiential pathway progression only works if the school has aligned its STEM implementation by grade level. In an isolated case, a teacher can start the curriculum at any grade level with success. A school could also choose to use the Build to Fly Strand only and conduct build activities for the students. If your school has a specific engineering model that you need to follow, you can easily replace the FT-EDM implementation with your own to meet building or district standards.

MS Design Cycle

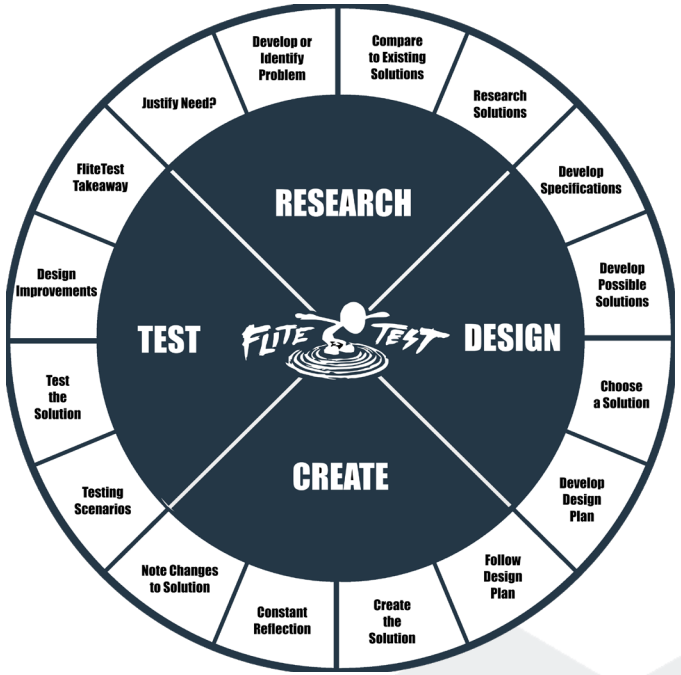
DIRECTION: The FT-EDM is designed to guide the students though the process of creating a solution. The student have free movement within the FT-EDM in order to achieve the best results. Students will not only use this method for solving Flite Test STEM Curriculum problems but should also be able to transfer this knowledge across subject areas and to real-life applications.

RESEARCH: In this stage, the student in most cases is assigned a problem to identify. The student should justify the need and compare to existing solutions while conducting research. In special circumstances, a student can develop his/her own problem. The research can be student-led or guided to help this initial stage.

DESIGN: After the students research possible solutions for the problem, they need to identify or develop design specifications to follow. They need to communicate their understanding of the problem by creating a series of sketches, drawings or physical models. After analyzing all possible solutions, the student must choose one to justify, develop a Design Plan and continue on in the process.

CREATE: The student creates the solution using appropriate technology and strategies whilefollowing the developed design. It is important for the student to constantly reflect on the progress of their solution and to follow their Design Plan while noting any changes made to their overall solution.

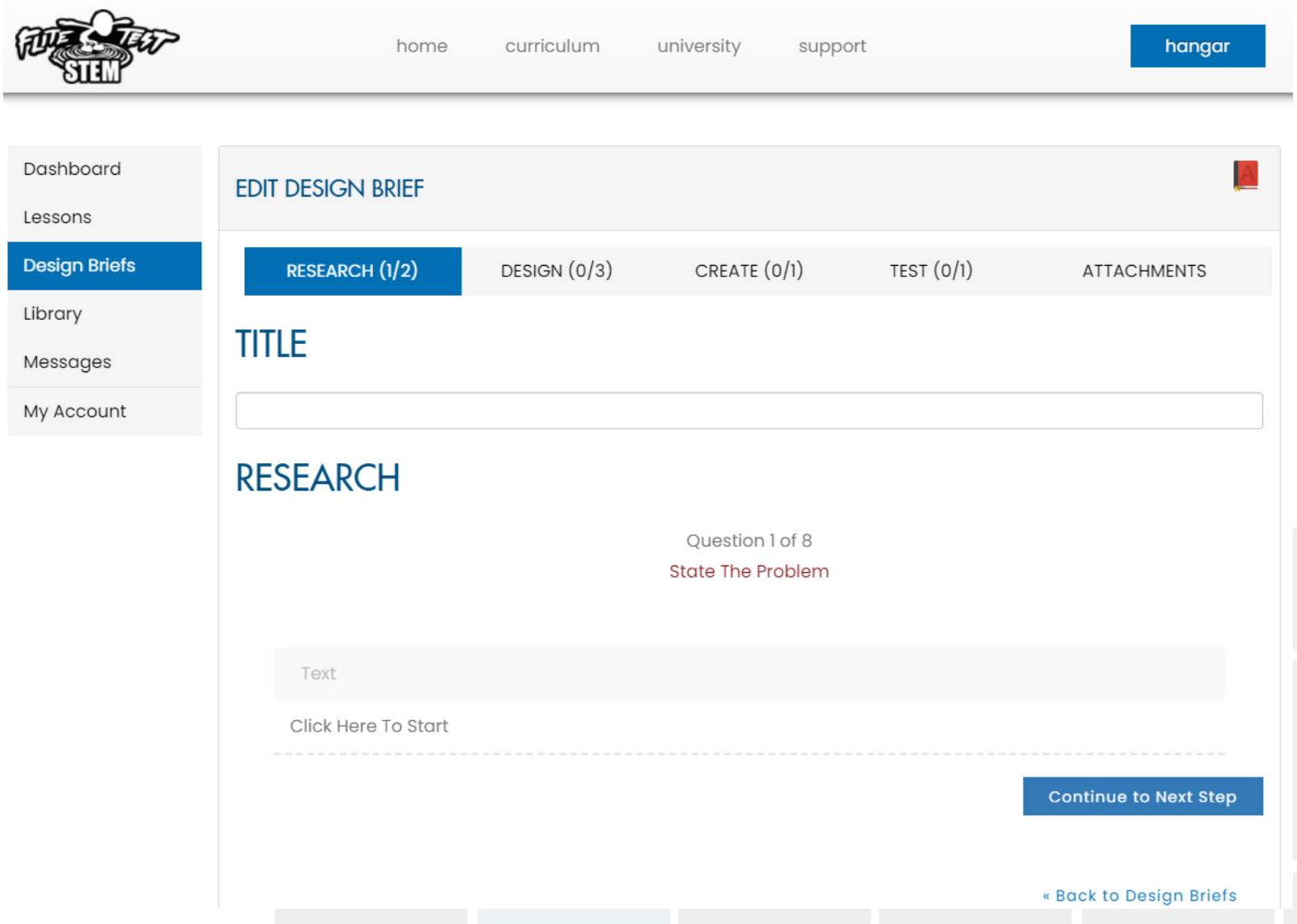
TEST: The final stage of producing a solution: putting the solution through a series of designed or assigned tests. The students will compare their solutions to others and suggest ways of improving their solutions while discussing the impact or takeaway from the project



Middle School Flite Test Engineering Design Model (FT-EDM)

STUDENT DESIGN BRIEF "ENGINEERING NOTEBOOK"

In the engineering field, a design brief "Engineering Notebook" is a written work for a design project developed by a single designer or design agency for a client. Design briefs organize the process that is followed to complete a product. Below is the online FT-Design Brief that middle school students can use to solve a problem during the Inquiry/Engineering and Design Learning Strands. The FT-EDM Engineering Notebook can be used as a grading tool for conceptual understanding. Please see the rubric after the diagram below. This brief was also designed to take into account other STEM-related problem-solving applications. The Middle School EDM brief can be done electronically using the FT-STEM Online Student Hangar Option or printed and used as hard-copy.



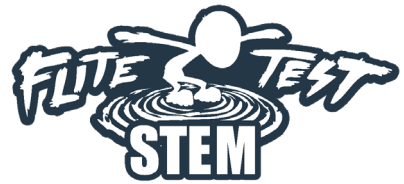
ASSESSING THE ENGINEERING NOTEBOOK

Below is a simple approach for assessing your students using the FT-EDM. This rubric can and should be adjusted to accommodate your school/district grading systems. No single grade level has to be assessed using the FT-EDM Engineering Notebook Rubric. However, by the end of each quarter or semester, a modified assessment or the one below should be used to show data of student achievement or growth. The FT-EDM can be used for every build the students complete. The instructor can decide how they would like to orchestrate this requirement.

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
RESEARCH	In this stage, the student identifies a design need, compares existing solutions while conducting research on alternative solutions, generates design and market specifications, and develops a plan based on market research. The research can be student-led or guided to help this initial stage.	**Advanced 5**	□ The student states the problem □ The student justifies the need □ The student investigates the problem □ Research shows evidence of comparison to existing solutions. □ Student responses have appropriate handwriting and spelling	
		Proficient 3–4	□ The student states the problem □ The student justifies the need □ The student investigates the problem □ Student responses have appropriate handwriting and spelling	
		Partially Proficient 1–2	□ The student somewhat states the a need. □ The student attempts some research on possible solutions.	
		Non-Proficient 0	The student does not reach a level described above but has attempted to research a solution.	

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
DESIGN	After researching the necessary information to find a possible solution, students need to develop the design and marketing specifications to follow. They need to communicate their understanding of the problem by creating a series of sketches, drawings or physical models. After analyzing all possible solutions, the student must choose one to justify and proceed to development.	**Advanced 5**	□ The student identifies and/ or develops the design specifications □ The student generates the assigned amount of ideas___ □ The student picks one design to justify □ The student develops a design plan based on project specs □ The student states their next steps	
		Proficient 3–4	□ The student identifies and/ or develops the design specifications □ The student created a design □ The student picks one design to justify □ The student has attempted a design plan	
		Partially Proficient 1–2	□ The student attempts to identify the Design Specs. □ The student has attempted a design.	
		Non-Proficient 0	The student does not reach a level described above.	
CREATE	The student creates the solution using appropriate technology and strategies while following the developed design. It is important for the student to constantly reflect on the progress of their solution and to follow their Design Plan while noting any changes made to their overall solution.	**Advanced 5**	□ The student expertly uses techniques and equipment □ The student completes a goodquality product □ The student followed their design plan □ Students noted any changes to their overall solution □ Student reflects on progress of product	

EDM Stage	Evidence of Outcomes	Achievement	Qualifiers	Instructor Comments
CREATE (continued)		**Proficient 3–4**	□ The student uses appropriate techniques and equipment. □ The student completes product with appropriate quality. □ The student somewhat follows their design and market specifications. □ The student attempts to reflect on progress of product.	
		Partially Proficient 1–2	□ The student attempts to appropriately use techniques and equipment. □ The student attempts product.	
		Non-Proficient 0	The student does not reach a level described above.	
TEST	The final stage of producing a solution: putting the solution through a series of designed or assigned tests. The students will compare their solutions to others and suggest ways of improving their solutions while discussing the impact or takeaway from the project.	**Advanced 5**	□ The student appropriately tests their product conducting two or more testing scenarios. □ The student evaluates their product performance. □ The student identifies methods for making improvements. □ Student discusses impact or takeaway from the project.	
		Proficient 3–4	□ The student tests their product. □ The student evaluates their product performance. □ The student somewhat discusses the impact or takeaway from the project.	
		Partially Proficient 1–2	□ The student tests their product. □ The student attempts a final testing response.	
		Non-Proficient 0	The student does not reach a level described above.	



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