Grade	Strand	Substrand	Standard "Understand that ...	Code	Benchmark	When Taught	Project/Problem Ideas	Project/Problem Ideas
9th-12th	1. The Nature of Science and Engineering	1. The Practice of Science	2. Scientific inquiry uses multiple interrelated processes to pose and investigate questions about the natural world.	9.1.1.2.1	Formulate a testable hypothesis, design and conduct an experiment to test the hypothesis, analyze the data, consider alternative explanations, and draw conclusions supported by evidence from the investigation.	Entire Year	All Problems	paper airplane competition or flight without wings. look at red bull airplane competition
9th-12th	1. The Nature of Science and Engineering	1. The Practice of Science	2. Scientific inquiry uses multiple interrelated processes to pose and investigate questions about the natural world.	9.1.1.2.2	Evaluate the explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the scientifically acceptable evidence, and suggesting alternative scientific explanations.	Entire Year	All Problems	Real World Design Problem
9th-12th	1. The Nature of Science and Engineering	1. The Practice of Science	2. Scientific inquiry uses multiple interrelated processes to pose and investigate questions about the natural world.	9.1.1.2.3	Identify the critical assumptions and logic used in a line of reasoning to judge the validity of a claim.	Entire Year	All Problems	possible book: Flying Without Wings
9th-12th	1. The Nature of Science and Engineering	1. The Practice of Science	2. Scientific inquiry uses multiple interrelated processes to pose and investigate questions about the natural world.	9.1.1.2.4	Use primary sources or scientific writings to identify and explain how different types of questions and their associated methodologies are used by scientists for investigations in different disciplines.	Entire Year	All Problems	
9th-12th	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	3. Science and engineering operate in the context of society and both influence and are influenced by this context.	9.1.3.3.2	Communicate, justify, and defend the procedures and results of a scientific inquiry or engineering design project using verbal, graphic, quantitative, virtual, or written means.	Entire Year	All Problems	Presentation of plane after build
9th-12th	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	4. Science, technology, engineering, and mathematics rely on each other to enhance knowledge and understanding.	9.1.3.4.5	Demonstrate how unit consistency and dimensional analysis can guide the calculation of quantitative solutions and verification of results.	Entire Year	All Problems	
9th-12th	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	4. Science, technology, engineering, and mathematics rely on each other to enhance knowledge and understanding.	9.1.3.4.6	Analyze the strengths and limitations of physical, conceptual, mathematical and computer models used by scientists and engineers.	Entire Year	All Problems	
9th-12th	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	3. Developments in physics affect society and societal concerns affect the field of physics.	9P.1.3.3.1	Describe changes in society that have resulted from significant discoveries and advances in technology in physics. For example: Transistors, generators, radio/television, or microwave ovens.	Entire Year	All Problems	

9th-12th	1. The Nature of Science and Engineering	3. Interactions Among Science, Technology, Engineering, Mathematics, and Society	4. Physical and mathematical models are used to describe physical systems.	9P.1.3.4.1	Use significant figures and an understanding of accuracy and precision in scientific measurements to determine and express the uncertainty of a result.	Entire Year	All Problems	
9th-12th	2. Physical Science	2. Motion	1. Forces and inertia determine the motion of objects.	9P.2.2.1.1	Use vectors and free-body diagrams to describe force, position, velocity and acceleration of objects in two-dimensional space.	Quarter 1: Theory	Develop a pair of wings to get a fighter plane off an aircraft carrier	Real World Design Problem
9th-12th	2. Physical Science	2. Motion	1. Forces and inertia determine the motion of objects.	9P.2.2.1.2	Apply Newton's three laws of motion to calculate and analyze the effect of forces and momentum on motion.	Quarter 1: Theory	Parachute, take off and landing of plane	
9th-12th	2. Physical Science	2. Motion	1. Forces and inertia determine the motion of objects.	9P.2.2.1.3	Use gravitational force to explain the motion of objects near Earth and in the universe.	Quarter 1: Theory	Satellite, Mars lander	
9th-12th	2. Physical Science	2. Motion	2. When objects change their motion or interact with other objects in the absence of frictional forces, the total amount of mechanical energy remains constant.	9P.2.2.2.1	Explain and calculate the work, power, potential energy and kinetic energy involved in objects moving under the influence of gravity and other mechanical forces.	Quarter 1: Theory	Satellite, Mars lander	
9th-12th	2. Physical Science	2. Motion	2. When objects change their motion or interact with other objects in the absence of frictional forces, the total amount of mechanical energy remains constant.	9P.2.2.2.2	Describe and calculate the change in velocity for objects when forces are applied perpendicular to the direction of motion. For example: Objects in orbit.	Quarter 1: Theory	Satellite Mars lander	
9th-12th	2. Physical Science	2. Motion	2. When objects change their motion or interact with other objects in the absence of frictional forces, the total amount of mechanical energy remains constant.	9P.2.2.2.3	Use conservation of momentum and conservation of energy to analyze an elastic collision of two solid objects in one-dimensional motion.	Quarter 2: Theory	Egg drop in a fuselage	
9th-12th	2. Physical Science	3. Energy	1. Sound waves are generated from mechanical oscillations of objects and travel through a medium.	9P.2.3.1.1	Analyze the frequency, period and amplitude of an oscillatory system. For example: An ideal pendulum, a vibrating string, or a vibrating spring-and-mass system.	Quarter 2: Theory	flutter, weights on aileron to reduce flutter, gound resonance for helicopters, the helicopters skids work like tuning forks if landing is wrong,	

9th-12th	2. Physical Science	3. Energy	1. Sound waves are generated from mechanical oscillations of objects and travel through a medium.	9P.2.3.1.2	Describe how vibration of physical objects sets up transverse and/or longitudinal waves in gases, liquids and solid materials.	Quarter 2: Theory	flutter, weights on aileron to reduce flutter, gound resonance for helicopters, the helicopters skids work like tuning forks if landing is wrong,	
9th-12th	2. Physical Science	3. Energy	1. Sound waves are generated from mechanical oscillations of objects and travel through a medium.	9P.2.3.1.3	Explain how interference, resonance, refraction and reflection affect sound waves.	Quarter 3: Design/Build	radar, sonar, take off, speed of sound, sonic boom	
9th-12th	2. Physical Science	3. Energy	1. Sound waves are generated from mechanical oscillations of objects and travel through a medium.	9P.2.3.1.4	Describe the Doppler effect changes that occur in an observed sound as a result of the motion of a source of the sound relative to a receiver.	Quarter 4: Flight	use built plane to demonstrate doppler effect	
9th-12th	2. Physical Science	3. Energy	2. Electrons respond to electric fields and voltages by moving through electrical circuits and this motion generates magnetic fields.	9P.2.3.2.1	Explain why currents flow when free charges are placed in an electric field, and how that forms the basis for electric circuits.	Quarter 2: Theory	Circuit board for cockpit	
9th-12th	2. Physical Science	3. Energy	2. Electrons respond to electric fields and voltages by moving through electrical circuits and this motion generates magnetic fields.	9P.2.3.2.2	Explain and calculate the relationship of current, voltage, resistance and power in series and parallel circuits. For example: Determine the voltage between two points in a series circuit with two resistors.	Quarter 2: Theory	Circuit board for cockpit	
9th-12th	2. Physical Science	3. Energy	2. Electrons respond to electric fields and voltages by moving through electrical circuits and this motion generates magnetic fields.	9P.2.3.2.3	Describe how moving electric charges produce magnetic forces and moving magnets produce electric forces.	Quarter 2: Theory	Circuit board for cockpit, static	
9th-12th	2. Physical Science	3. Energy	2. Electrons respond to electric fields and voltages by moving through electrical circuits and this motion generates magnetic fields.	9P.2.3.2.4	Use the interplay of electric and magnetic forces to explain how motors, generators, and transformers work.	Quarter 4: Build/flight	create schematic of electric motor, alternator	
9th-12th	2. Physical Science	3. Energy	3. Magnetic and electric fields interact to produce electromagnetic waves.	9P.2.3.3.1	Describe the nature of the magnetic and electric fields in a propagating electromagnetic wave.	Quarter 3: Design/Build	alternators, bbq lighter/magneto	

9th-12th	2. Physical Science	3. Energy	3. Magnetic and electric fields interact to produce electromagnetic waves.	9P.2.3.3.2	Explain and calculate how the speed of light and its wavelength change when the medium changes.	Quarter 3: Design/build	develop aviator glasses	
9th-12th	2. Physical Science	3. Energy	3. Magnetic and electric fields interact to produce electromagnetic waves.	9P.2.3.3.3	Explain the refraction and/or total internal reflection of light in transparent media, such as lenses and optical fibers.	Quarter 3: Design/Build	develop aviator glasses	
9th-12th	2. Physical Science	3. Energy	3. Magnetic and electric fields interact to produce electromagnetic waves.	9P.2.3.3.4	Use properties of light, including reflection, refraction, interference, Doppler effect and the photoelectric effect, to explain phenomena and describe applications.	Quarter 3: Design/Build	develop aviator glasses	design the instrumentation on a satellite or drone to collect data. Ex: ocean currents and temperatures, farming data
9th-12th	2. Physical Science	3. Energy	3. Magnetic and electric fields interact to produce electromagnetic waves.	9P.2.3.3.5	Compare the wave model and particle model in explaining properties of light.	Quarter 3: Design/Build	develop aviator glasses	design the instrumentation on a satellite or drone to collect data. Ex: ocean currents and temperatures, farming data
9th-12th	2. Physical Science	3. Energy	3. Magnetic and electric fields interact to produce electromagnetic waves.	9P.2.3.3.6	Compare the wavelength, frequency and energy of waves in different regions of the electromagnetic spectrum and describe their applications.	Quarter 3: Design/Build	model of plane and its uses of the EMS	design the instrumentation on a satellite or drone to collect data. Ex: ocean currents and temperatures, farming data
9th-12th	2. Physical Science	3. Energy	4. Heat energy is transferred between objects or regions that are at different temperatures by the processes of convection, conduction and radiation.	9P.2.3.4.1	Describe and calculate the quantity of heat transferred between solids and/or liquids, using specific heat, mass and change in temperature.	Quarter 3: Design/Build	heat sheilds for reentry, cooling of the plane engine (cools by air, oil, and fuel), turbines, will use the air from compressor to cool cabin	
9th-12th	2. Physical Science	3. Energy	4. Heat energy is transferred between objects or regions that are at different temperatures by the processes of convection, conduction and radiation.	9P.2.3.4.2	Explain the role of gravity, pressure and density in the convection of heat by a fluid.	Quarter 2: Theory	heat sheilds for reentry	
9th-12th	2. Physical Science	3. Energy	4. Heat energy is transferred between objects or regions that are at different temperatures by the processes of convection, conduction and radiation.	9P.2.3.4.3	Compare the rate at which objects at different temperatures will transfer thermal energy by electromagnetic radiation.	Quarter 2: Theory	thunderstorms/ weather	

11-12	Reading	13. Reading in Science and Technical Subjects	3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text.	11.13.3.3	Follow precisely a complex multistep procedure when carrying out experiments, designing solutions, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	Entire Year	Most Problems	
11-12	Reading	13. Reading in Science and Technical Subjects	6. Assess how point of view or purpose shapes the content and style of a text.	11.13.6.6	Analyze the author's purpose in describing phenomena, providing an explanation, describing a procedure, or discussing/reporting an experiment in a text, identifying important issues and questions that remain unresolved.	Entire Year	All Problems	
11-12	Writing	14. Writing in History/Social Studies, Science, and Technical Subjects		11.14.2.2	Write informative/explanatory texts, as they apply to each discipline and reporting format, including the narration of historical events, of scientific procedures/ experiments, or description of technical processes: (a) Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. (b) Develop the topic thoroughly by selecting the most significant, credible, sufficient, and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. (c) Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. (d) Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. (e) Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. (f) Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).	Quarter 4: Build/flight		
11-12	Writing	14. Writing in History/Social Studies, Science, and Technical Subjects		11.14.8.8	Gather relevant information from multiple authoritative data, print, physical (e.g., artifacts, objects, images), and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.	Quarter 4: Build/flight		