

MORENO VALLEY HIGH SCHOOL AVIATION II CURRICULUM

Course Title: Aviation II Course Number: 0954

Department: Science ADS Number: 0954

Prerequisites: Aviation I

Length of Course: Year long Credit/PRI Area: .5 credit per semester Grade Level(s): 9-12

COURSE DESCRIPTION

Aviation II is a continuation of Aviation I. This class will be a primary support to Project Nostradamus which supported by the AF STARBASE LaLuz, Space (Students Participating In and Coordinating Engineering) program at Kirtland Air Force Base. The Project continues to develop and maintain a UAV (unmanned aerial vehicle) in the form of a radio controlled Lancair aircraft which will be used to over-fly and report positions of hot spots for the U.S. Forest Service. The students in this class will work with the National Forest Service, the U.S. Air Force in the Starbase La Luz program and Los Alamos National Laboratories in developing and continuing a successful progression in this science, engineering and vocational education project. The students will also continue on with advanced areas of instruction introduced in Aviation I. Those will include:

- Basic mechanics and instrumentation concerning an aircraft engine, airframe and GPS (Global Sattelite Systems)
- Ground School: interested students will be able to pass the Private Pilot written exam by the end of the school year
- Airport Management Skills [including the possibility of an internship position in either Taos or Angel Fire]

SYLLABUS

Units of Study:

1. Principles of Flight
 - a. Advanced Aircraft Structures
 - b. Advanced Control Functions
 - c. Advanced Weight and Balance Procedures
 - d. Simulated and Real-time flight of a radio controlled aircraft
2. Weather
 - a. Thermodynamics in Conjunction with Forest Fires
 - b. Advanced Weather Briefings
 - c. Computerized Weather Analysis and Reporting
3. Navigation and Communication
 - a. Advanced GPS navigation
 - b. Advanced Thermal Imagining and Data Anaylsis
 - c. Joint Communication Strategies for Emergency Serivces
 - d. Joint Communication Strategies with the U.S. Forest Service
4. Project Nostradamus
 - a. Simulated and Real Radio Controlled Flight Situations
 - b. Business and Reporting Procedures for the U.S. Forest Service and AF Starbase LaLuz

c. Business , Marketing, and Economic Strategies for Project Nostradamus

Skills Emphasized:

- Team Building
- Leadership Development
- Flight Skills (Simulated and Actual)
- Lab Credit will be given for hands-on activities (flight, information integration, and engineering outcomes) during the simulated and actual flight activities with the U.S. Forest Service.
- Business Practices
 - Writing business letters
 - Marketing skills in “selling” the project to outside entities
 - Presentations to community and outside business entities
 - Portfolio development to make Project Nostradamus an integral and ongoing project for Moreno Valley High School

STRATEGIES

This class will utilize activities which will integrate the subject of aviation into all core subjects with the expansion of work on the Nostradamus Project. Advanced instruction will continue on two flight simulations: one for regular aircraft and the other for radio-controlled aircraft. Advanced work will continue with sensors and data instruction gathered from flights and work with the U.S. Forest Service, Los Alamos National Labs and the AF STARBASE LaLuz program.

ASSESSMENTS:

Unit tests

Workbook exercises

Lab work:

- hands-on flight activities utilizing two aircraft:
 - (Kadet) for training purposes
 - (Lancair) for actual practice flight activities with the U.S. Forest Service.

Team projects

- Lab exercises
- Self Assessment
- Project Leader and the Project Manager assessment of each team member

AF STARBASE LaLuz evaluations

- Initial Review
- Critical Review There is also a finalization of the project at the
- STARBASE Symposium

SUGGESTED TEXTBOOKS AND INSTRUCTIONAL MATERIALS

Aviation Career Awareness Program - - Cessna/Air Age Education

Rod Machado’s Private Pilot Handbook/Rod Machado’s Private Pilot Workbook

From the Group Up: MacDonald/Peppler

Ready For Take-Off - - Robin Lawrie

KING Schools Computerized Materials (Textbook and Testing Materials)

Aviation Supplies and Academics Computerized Materials (Textbooks and Testing Materials)

COURSE TITLE: AVIATION II

Teacher: J. Boyd

Draft: January 2006

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G3 Flight Simulator
 Aviation Flight Simulator 2005
 New Mexico Space Journal
 RC Flyer Magazine
 Flight Journal Magazine
 Aircraft Owners and Pilots Association Magazine
 Experimental Aircraft Association Magazine
 Women In Aviation Magazine
 Flying Magazine
 Private Pilot Magazine
 Backyard Flyer Magazine

Specific Readings from various flight magazines and by authors such as Richard Bach, Anne Morrow Lindbergh, Albert Einstein, Robert Oppenheimer.

SUGGESTED TITLES/AUTHORS WEB SITES

- www.AVWEB.com
- www.Ninety-Nines.org
- www.kingschools.com
- www.nasa.gov
- www.rcflight.com
- www.aviationhighschool.com
- www.nifa.com
- www.universityaviationassociation.org
- www.faa.gov
- www.googleearth.com
- www.nasaworldwind.com

SEMINAR PIECES OR USE

Selections from works by Richard Bach, Anne Morrow Lindbergh, Albert Einstein, Robert Oppenheimer plus selections on current issues topics.

STRAND I: LANGUAGE ARTS: READING AND LISTENTING FOR COMPREHENSION
CONTENT STANDARD: STUDENTS WILL APPLY STRATEGIES AND SKILLS TO COMPREHEND INFORMATION THAT IS READ, HEARD, AND VIEWED.

A. **BENCHMARK:** *Listen to, read, react to, and analyze information*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
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GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Grade 10: #2. Respond reflectively (through small group discussion, class discussion, journal entry, essay, letter, dialogue) to written and visual texts.</p> <p>Grade 10: #4. Evaluate the information, explanations, or ideas of others by:</p> <ul style="list-style-type: none"> • identifying clear, reasonable criteria for evaluation • applying those criteria using reasoning and substantiation <p>Grade 11: #1. Demonstrate increasing insight and reflection to print and non-print text through personal expression.</p> <p>Grade 12: # 1. Express reflections and reactions to print and non-print texts as well as to personal experience by:</p> <ul style="list-style-type: none"> • composing and presenting reflective texts that give an audience an understanding of complex thoughts and feelings, a sense of significance, and a sense of encouragement to reflect on own ideas • responding to texts make connections, reflecting on cultural and historical perspectives, examining own response, and recognizing features of the author's • use of language and how the writer relates to the subject so that the audience will empathize <p>Grade 12: #2. Analyze and critique texts from various perspectives and approaches by:</p> <ul style="list-style-type: none"> • developing critiques based on establishing and applying clear, credible criteria for evaluation • substantiating assessments with reasons and evidence 	<p>Analyze newspaper articles and media materials on the subject of aviation as it relates to their day-to-day lives. Analyze and critique information which may have an impact on the Nostradamus Project including information of an economic nature for the State of New Mexico.</p>

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B. BENCHMARK: *Listen to, read, react to, and analyze information*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
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GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Grade 9: #1. Use a variety of techniques for researching topics including: cross-referencing while gathering information summarizing dialogue</p> <ul style="list-style-type: none"> • using news sources (e.g., newspapers, magazines, TV, radio, videotapes, Internet, email, government publications, microfiche, other library resources) <p>Grade 9: #2. Synthesize a variety of types of visual information including pictures and symbols.</p> <p>Grade 10: #1. Use a variety of information resources to critically interpret and evaluate experiences, language, and ideas.</p> <p>Grade 10: #3. Use multiple resources to gather information to evaluate problems, examine cause and effect relationships, and answer research questions to inform an audience.</p> <p>Grade 11: #4. Demonstrate proficiency in accessing and sending information electronically.</p> <p>Grade 12: #2. Use a variety of resources to gather information to critically analyze texts to gain meaning, develop thematic connections, and synthesize ideas.</p>	<p>Each week students will turn in a newspaper article, internet article or synopsis of a news related event which has some sort of connection to the Nostradamus Project.</p> <ul style="list-style-type: none"> • Discussion and/or seminar about articles • Written and oral summaries of articles

STRAND I: LANGUAGE ARTS: READING AND LISTENING FOR COMPREHENSION
CONTENT STANDARD: STUDENTS WILL APPLY STRATEGIES AND SKILLS TO COMPREHEND INFORMATION THAT IS READ, HEARD, AND VIEWED.

C. BENCHMARK: *Demonstrate critical thinking skills to evaluate information and solve problems*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Grade 9: #1. Examine texts for arguments and develop informed opinions by: examining relevant reason and evidence</p> <ul style="list-style-type: none"> • noting the progression of ideas that substantiate the proposal • identifying and analyzing personal, social, historical, or cultural influences, contexts, or biases <p>Grade 9: #2. Support informed opinions by providing relevant and convincing reasons, using various types of evidence, language, and organizational structure, and demonstrating an awareness of possible questions, concerns, or counter-arguments.</p> <p>Grade 10: #1. Examine controversial issues by:</p> <ul style="list-style-type: none"> • sharing and evaluating personal response • researching and summarizing data 	<p>Students will discuss the various aspects of the Nostradamus Project in conjunction with aviation developments, the U.S. Forest Service, the State of New Mexico and the economic impact of the project .</p> <p>Students will also continue analysis of aviation in conjunction with the State of New Mexico's development of the Spaceport at Las Cruces.</p> <p>Each Team of the Nostradamus Project will report to the entire group concerning decisions made for that particular teams workings. Support will include:</p> <ul style="list-style-type: none"> • Rationale for decisions • Cost analysis of the component

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ul style="list-style-type: none"> • developing a framework in which to discuss the issue (creating the context) • compiling personal responses and researched data to organize the argument • presenting data in various forms (e.g., graph, essay, speech, video) <p>Grade 10: #2. Critically interpret and evaluate experiences, literature, language, and ideas by:</p> <ul style="list-style-type: none"> • making generalizations supported by specific references • reflecting on observations and their relationship to a current viewpoint • distinguishing fact from fiction and recognizing personal bias <p>Grade 10: #5. Read critically and independently to draw conclusions from research.</p> <p>Grade 11: #1. Use language persuasively in addressing a particular issue by: finding and interpreting information effectively</p> <ul style="list-style-type: none"> • recognizing propaganda as a purposeful technique • establishing and defending a particular perspective • responding respectfully to viewpoints and biases <p>Grade 11: #2. Use critical analysis to gain meaning, develop thematic connections, and synthesize ideas by:</p> <ul style="list-style-type: none"> • examining the functions and effects of narrative strategies (e.g., plot, conflict, suspense, point of view, characterization, dialogue) • interpreting effects of figures of speech and the effects of sounds • analyzing stylistic features such as word choice and links between sense and sound • identifying ambiguity, contradiction, irony, parody, and satire • demonstrating how selections reflect the cultures that shaped them. <p>Grade 11: #2. Analyze overall effectiveness of one's own writing.</p> <p>Grade 12: #1. Research, define, and present issues of public concern by:</p> <ul style="list-style-type: none"> • using a variety of resources such as media centers, on-line resources, interviews, and personal reflection • specifying the nature of an issue, including claims made and the reasoning that supports those claims • organizing and delivering a presentation that specifies reasons for the claim and makes a clear stance on the issue. <p>Grade 12: #3. Analyze the effects on a text of the attitudes and values of a period in which the text was written.</p>	<ul style="list-style-type: none"> • Detailed analysis of “fit” into project

STRAND II: LANGUAGE ARTS: WRITING AND SPEAKING FOR EXPRESSION
CONTENT STANDARD: STUDENTS WILL COMMUNICATE EFFECTIVELY THROUGH SPEAKING AND WRITING.

A. **BENCHMARK:** *Communicate information in a coherent and persuasive manner using verbal and non-verbal language.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Grade 9: #1. Evaluate personal effectiveness in group discussions and make corrections as necessary.</p> <p>Grade 9: #2. Ask questions to broaden and enrich discussions.</p> <p>Grade 9: #3. Express an informed opinion that clearly states a personal view, is logical and coherent, and engages the reader's interest.</p> <p>Grade 9: #4. Support an informed opinion by using appropriate language, reason, and organizational structure for the audience and purpose.</p> <p>Grade 10: #1. Produce responses to editorials/literature for a neutral audience by providing:</p> <ul style="list-style-type: none"> • a clearly stated position or proposed solution • relevant, reliable support <p>Grade 10: #2. Make well-informed and well-organized formal presentations with a clear main point, adjusting the message, wording, and delivery to the particular audience and context.</p> <p>Grade 10: #3. Defend argumentative positions on literary and non-literary issues by:</p> <ul style="list-style-type: none"> • sharing and evaluating initial personal response • presenting researched and summarized information • creating a context to discuss the issue • researching and compiling data to organize the argument • presenting data <p>Grade 11: #1. Use language persuasively in addressing a particular issue by:</p> <ul style="list-style-type: none"> • finding and interpreting information effectively • recognizing propaganda as a purposeful technique • establishing and defending a point of view • responding respectfully to viewpoints and biases <p>Grade 11: #2. Identify, analyze, and evaluate criteria used for formal and informal discussions to determine how well others engage in discussion.</p> <p>Grade 11: #3. Analyze differences in responses to focused group discussion in an organized and systematic way.</p> <p>Grade 12: #1. Develop oral formal presentations using clear enunciation, gestures, tone, vocabulary, and organization appropriate for a particular audience.</p>	<p>Students will develop an oral presentation for the Initial Review and the Critical Review evaluations with Air Force Starbase LaLuz.</p> <p>Minutes will be kept for each Team designated for the Nostradamus Project. Each team is responsible for weekly evaluations of their work.</p> <p>Weekly Advisory Council meetings will be held. Each team will be responsible for a group report and analysis of the work completed that particular week. The group will analyze and discuss each Team's efforts.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	Grade 12: #2. Make explicit use of various techniques for effective presentations (e.g., voice, inflection, tempo, gestures). Grade 12: #3. Organize and deliver an argument so that an intended audience will respond by: <ul style="list-style-type: none"> • wording the claim clearly • specifying convincing reasons to support the claim • adopting a stance and appropriate tone toward the issue Grade 12: #4. Design and apply criteria for evaluating oral presentations and arguments before delivering them	

STRAND III: LANGUAGE ARTS: LITERATURE AND MEDIA
CONTENT STANDARD: STUDENTS WILL USE LITERATURE AND MEDIA TO DEVELOP AN UNDERSTANDING OF PEOPLE, SOCIETIES, AND THE SELF.

A. **BENCHMARK:** *Use language, literature, and media to understand the role of the individual as a member of many cultures.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	Grade 9: #3. Respond to a variety of literary works and media (e.g., memoirs, vignettes, narratives, diaries, newspaper, movies) that offer an audience: <ul style="list-style-type: none"> • an understanding of a student's personal reactions • a sense of how the reaction results from careful consideration of the text • an awareness of how personal and cultural influences affect the response 	Students will read several pieces on leadership and management to analyze and discuss in light of the Nostradamus Project.

STRAND II: MATHEMATICS: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

A. **BENCHMARK:** *Represent and analyze mathematical situations and structures using algebraic symbols.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>6. Represent and analyze relationships using written and verbal expressions, tables, equations, and graphs, and describe the connections among those representations:</p> <ul style="list-style-type: none"> • translate from verbal expression to algebraic formulae (e.g., 'Set up the equations that represent the data in the following equation: John's father is 23 years older than John. John is 4 years older than his sister Jane. John's mother is 3 years younger than John's father. John's mother is 9 times as old as Jane. How old are John, Jane, John's mother, and John's father?') • given data in a table, construct a function that represents these data (linear only) • given a graph, construct a function that represents the graph (linear only) <p>7. Know, explain, and use equivalent representations for the same real number including:</p> <p>13. Solve:</p> <ul style="list-style-type: none"> • formulas for specified variables • radical equations involving one radical <p>14. Factor polynomials, difference of squares and perfect square trinomials, and the sum and difference of cubes.</p> <p>15. Simplify fractions with polynomials in the numerator and denominator by factoring both and reducing them to the lowest terms.</p> <p>16. Manipulate simple expressions with + and - exponents.</p> <p>17. Use the four basic operations (+, -, x, ÷):</p> <ul style="list-style-type: none"> • linear expressions • polynomial expressions • rational expressions 	<p>Students will create a gridded mapping of a UAV flight. The students will calculate the weight and balance of the UAV in light of the specific instrumentation necessary for that particular mission.</p> <p>The class will analyze the flight plan utilizing an advance computerized flight calculator.</p>

STRAND II: MATHEMATICS: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

B. BENCHMARK: *Understand patterns, relations, functions, and graphs.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
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GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Distinguish between the concept of a relation and a function. 2. Determine whether a relation defined by a graph, a set of ordered pairs, a table of values, an equation, or a rule is a function. 3. Describe the concept of a graph of a function. 4. Translate among tabular, symbolic, and graphical representations of functions. 5. Explain and use function notation. 6. Determine the domain of independent variables and the range of dependent variables defined by a graph, a set of ordered pairs, or a symbolic expression. 7. Identify the independent and dependent variables from an application problem (e.g., height of a child). 8. Describe the concept of a graph of an equation. 9. Understand symmetry of graphs. 10. Analyze and describe middle and end (asymptotic) behavior of linear, quadratic, and exponential functions, and sketch the graphs of functions. 11. Work with composition of functions (e.g., find f of g when $f(x) = 2x - 3$ and $g(x) = 3x - 2$), and find the domain, range, intercepts, zeros, and local maxima or minima of the final function. 12. Use the quadratic formula and factoring techniques to determine whether the graph of a quadratic function will intersect the x-axis in zero, one, or two points. 13. Apply quadratic equations to physical phenomena (e.g., the motion of an object under the force of gravity). 	<p>The students will develop tailored performance charts for the UAV based on each specific mission type. Various camera and data “packages” will be developed an integrated into the specific space parameters for each mission flown.</p> <p>Flight characteristic charts will be developed for each specific mission based on the payload weight and the atmospheric conditions at the given time.</p>

STRAND II: MATHEMATICS: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

C. BENCHMARK: *Use mathematical models to represent and understand quantitative relationships.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Model real-world phenomena using linear and quadratic equations and linear inequalities (e.g., apply algebraic techniques to solve rate problems, work problems, and percent mixture problems; solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest; apply quadratic equations to model throwing a baseball in the air). 2. Use a variety of computational methods (e.g., mental arithmetic, paper and pencil, technological tools). 3. Express the relationship between two variables using a table with a finite set of values and graph the relationship. 	<p>Students will continue with advanced flight planning situations to figure wind drift and performance conditions for the UAV and the radio controlled practice aircraft.</p> <p>The students will plot a graphed mapping selection for use in finding and reporting the plot points for hot spots.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>4. Express the relationship between two variables using an equation and a graph:</p> <ul style="list-style-type: none"> • graph a linear equation and linear inequality in two variables • solve linear inequalities and equations in one variable • solve systems of linear equations in two variables and graph the solutions • use the graph of a system of equations in two variables to help determine the solution <p>5. Solve applications involving systems of equations.</p> <p>6. Evaluate numerical and algebraic absolute value expressions.</p> <p>7. Create a linear equation from a table of values containing co-linear data.</p> <p>8. Determine the solution to a system of equations in two variables from a given graph.</p> <p>9. Generate an algebraic sentence to model real-life situations.</p> <p>10. Write an equation of the line that passes through two given points.</p> <p>11. Understand and use:</p> <ul style="list-style-type: none"> • such operations as taking the inverse, finding the reciprocal, taking a root, and raising to a fractional power • the rules of exponents <p>12. Verify that a point lies on a line, given an equation of the line, and be able to derive linear equations by using the point-slope formula.</p>	

STRAND II: MATHEMATICS: ALGEBRA, FUNCTIONS, AND GRAPHS
CONTENT STANDARD: STUDENTS WILL UNDERSTAND ALGEBRAIC CONCEPTS AND APPLICATIONS.

D. BENCHMARK: *Analyze changes in various contexts.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>1. Analyze the effects of parameter changes on these functions:</p> <ul style="list-style-type: none"> • linear (e.g., changes in slope or coefficients) • quadratic (e.g., $f[x-a]$ changes coefficients and constants) • exponential (e.g., changes caused by increasing $x[x + c]$ or $[ax]$) • polynomial (e.g., changes caused by positive or negative values of a, or in a constant c) <p>2. Solve routine two- and three-step problems relating to change using concepts such as:</p> <ul style="list-style-type: none"> • exponents • factoring 	<p>Students will calculate the payload specifics for a given UAV mission.</p> <p>The students will calculate a wind triangulation problem for a UAV mission.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<ul style="list-style-type: none"> • ratio • proportion • average • percent <p>3. Calculate the percentage of increase and decrease of a quantity.</p> <p>4. Analyze the general shape of polynomial expressions and equations for different degree polynomials (e.g., positive and negative general shapes for third-, fourth-, and fifth-degree polynomials).</p> <p>5. Estimate the rate of change of a function or equation by finding the slope between two points on the graph.</p> <p>6. Evaluate the estimated rate of change in the context of the problem.</p> <p>7. Know Pascal's triangle and use it to expand binomial expressions that are raised to positive integer powers.</p>	

STRAND III: MATHEMATICS: GEOMETRY AND TRIGONOMETRY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.

A. **BENCHMARK:** *Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>1. Interpret and draw two-dimensional objects and find the area and perimeter of basic figures (e.g., rectangles, circles, triangles, other polygons [e.g., rhombi, parallelograms, trapezoids]).</p> <p>2. Find the area and perimeter of a geometric figure composed of a combination of two or more rectangles, triangles, and/or semicircles with just edges in common.</p> <p>3. Find and use measures of sides and interior and exterior angles of triangles and polygons to classify figures (e.g., scalene, isosceles, and equilateral triangles; rectangles [square and non-square]; other convex polygons).</p> <p>4. Interpret and draw three-dimensional objects and find the surface area and volume of basic figures (e.g., spheres, rectangular solids, prisms, polygonal cones), and calculate the surface areas and volumes of these figures as well as figures constructed from unions of rectangular solids and prisms with faces in common, given the formulas for these figures.</p> <p>5. Demonstrate an understanding of simple aspects of a logical argument: identify the hypothesis and conclusion in logical deduction</p>	<p>The students will build and maintain the two radio controlled aircraft.</p> <p>The Data and Sensors Team will develop a “package” for the cameras and receivers which will fit into the belly of the UAV and not adversely affect the flight characteristics of the vehicle.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>use counterexamples to show that an assertion is false and recognize that a single counterexample is sufficient to refute an assertion</p> <p>6. Demonstrate an understanding of inductive and deductive reasoning, explain the difference between inductive and deductive reasoning, and identify and provide examples of each:</p> <ul style="list-style-type: none"> • for inductive reasoning, demonstrate understanding that showing a statement is true for a finite number of examples does not show it is true for all cases • unless the cases verified are all cases • for deductive reasoning, prove simple theorems 	

STRAND III: MATHEMATICS: GEOMETRY AND TRIGONOMETRY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.

B. BENCHMARK: *Specify locations and describe spatial relationships using coordinate geometry and other representational systems.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Demonstrate understanding of the construction of the coordinate plane, know the names of the origin, coordinate axes and four quadrants, draw and label them correctly, find the coordinates of an indicated point, and plot a point with given coordinates. 2. Determine the midpoint and distance between two points within a coordinate system and relate these ideas to geometric figures in the plane (e.g., find the center of a circle given two endpoints of a diameter of the circle). 3. Given two linear equations, determine whether the lines are parallel, perpendicular, or coincide. 4. Use basic geometric ideas (e.g., the Pythagorean theorem, area, and perimeter of objects) in the context of the Euclidean Plane, calculate the perimeter of a rectangle with integer coordinates and sides parallel to the coordinate axes and with sides not parallel. 	<p>Students will continue with advanced flight planning utilizing weight and balance problems for the UAV and specific payloads.</p> <p>Students will modify the UAV and training aircraft for specific purposes of the Nostradamus Project.</p>

STRAND III: MATHEMATICS: GEOMETRY AND TRIGONOMETRY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.

C. BENCHMARK: *Apply transformations and use symmetry to analyze mathematical situations.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	1. Describe the effect of rigid motions on figures in the coordinate plane and space that include rotations, translations, and reflections: determine whether a given pair of figures on a coordinate plane represents the effect of a translation, reflection, rotation, and/or dilation sketch the planar figure that is the result of a given transformation of this type 2. Deduce properties of figures using transformations that include translations, rotations, reflections, and dilations in a coordinate system: <ul style="list-style-type: none"> • identify congruency and similarity in terms of transformations • determine the effects of the above transformations on linear and area measurements of the original planar figure 	Students will modify the UAV according to the various payload specifications necessary to complete each distinct mission.

STRAND III: MATHEMATICS: GEOMETRY AND TRIGONOMETRY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND GEOMETRIC CONCEPTS AND APPLICATIONS.

D. BENCHMARK: *Use visualization, spatial reasoning, and geometric modeling to solve problems.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	1. Solve real-world problems using congruence and similarity relationships of triangles (e.g., find the height of a pole given the length of its shadow). 2. Solve problems involving complementary, supplementary, and congruent angles. 3. Solve problems involving the perimeter, circumference, area, volume, and surface area of common geometric figures (e.g., 'Determine the surface area of a can of height h and radius r . How does the surface area change when the height is changed to $3h$? How does the surface area change when the radius is changed to $3r$? How does the surface area change when both h and r are doubled?'). 4. Solve problems using the Pythagorean theorem (e.g., 'Given the length of a ladder and the distance of the base of the ladder from a wall, determine the distance up the wall to the top of the ladder'). 5. Understand and use elementary relationships of basic trigonometric functions defined by the angles of a right triangle (e.g., 'What is the radius of a circle with an inscribed regular octagon with the length of each side being exactly 2 feet?'). 6. Use trigonometric functions to solve for the length of the second leg of a right triangle given the angles and the length of the first leg. (e.g., 'A surveyor determines that the angle subtended by a two-foot stick at right angles to his	Students will be given specific parameters to plan a successful UAV missions. <ul style="list-style-type: none"> • Weather restrictions for flight conditions. • Radio and Navigation equipment for specific flights. • Fuel requirements for specific missions and flight conditions.

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	transit is exactly one degree. What is the distance from the transit to the base of the measuring stick?'). 7. Know and use angle and side relationships in problems with special right triangles (e.g., 30-, 45-, 60-, and 90-degree triangles).	

STRAND V: MATHEMATICS: DATA ANALYSIS AND PROBABILITY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND HOW TO FORMULATE QUESTIONS, ANALYZE DATA, AND DETERMINE PROBABILITIES.

A. **BENCHMARK:** *Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	1. Understand the differences between the various methods of data collection. 3. Know the characteristics of a well-designed and well-conducted experiment: <ul style="list-style-type: none"> • differentiate between an experiment and an observational study 	The Data and Sensors Team will collect and analyze the data sent from the UAV to determine the specific origin of the hotspots for reporting to the U.S. Forest Service.

STRAND V: MATHEMATICS: DATA ANALYSIS AND PROBABILITY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND HOW TO FORMULATE QUESTIONS, ANALYZE DATA, AND DETERMINE PROBABILITIES.

B. **BENCHMARK:** *Select and use appropriate statistical methods to analyze data.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Understand the meaning of measurement data and categorical data, and of the term 'variable.' 2. Understand the meaning of 'univariate' (i.e., one variable) and 'bivariate' (i.e., two variable) data. 3. For univariate data, be able to display the distribution and describe its shape using appropriate summary statistics, and understand the distinction between a statistic and a parameter: <ul style="list-style-type: none"> • construct and interpret frequency tables, histograms, stem and leaf plots, and box and whisker plots • calculate and apply measures of central tendency (mean, median, and mode) and measures of variability (range, quartiles, standard deviation) • compare distributions of univariate data using back-to-back stem and leaf plots and parallel box and whisker plots 4. For bivariate data, be able to display a scatter plot and describe its shape: <ul style="list-style-type: none"> • fit a linear model to a set of data using technological tools • describe and interpret the relationship/correlation between two variables using technological tools 	<p>The students will interpret and write a summary of the data collection on each flight mission, whether real or simulated.</p> <p>The students will analyze and report the data collected from the mission on a form for Starbase Laluz which will be used for the Initial Review, the Critical Review and the end-of-year Symposium.</p>

STRAND V: MATHEMATICS: DATA ANALYSIS AND PROBABILITY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND HOW TO FORMULATE QUESTIONS, ANALYZE DATA, AND DETERMINE PROBABILITIES.

C. BENCHMARK: *Develop and evaluate inferences and predictions that are based on data.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<ol style="list-style-type: none"> 1. Compare and draw conclusions between two or more sets of univariate data using basic data analysis techniques and summary statistics. 2. Draw conclusions concerning the relationships among bivariate data: <ul style="list-style-type: none"> • make predictions from a linear pattern in data • determine the strength of the relationship between two sets of data by examining the correlation • understand that correlation does not imply a cause-and-effect relationship 3. Use simulations to explore the variability of sample statistics from a known population and construct sampling distributions. 4. Understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inference. 5. Evaluate published reports that are based on data by examining the design of 	<p>Students will analyze data and mission reports from the U.S. Forest Service and the Civil Air Patrol Search and Research patrols.</p> <p>Students will maintain flight logs of their flight experience, both simulated and real-time for analysis after each mission.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	the study, the appropriateness of the data analysis, and the validity of conclusions.	

STRAND V: MATHEMATICS: DATA ANALYSIS AND PROBABILITY
CONTENT STANDARD: STUDENTS WILL UNDERSTAND HOW TO FORMULATE QUESTIONS, ANALYZE DATA, AND DETERMINE PROBABILITIES.

D. BENCHMARK: *Understand and apply basic concepts of probability.*

STRAND II: CONTENT OF SCIENCE: PHYSICAL SCIENCE
CONTENT STANDARD I: UNDERSTAND THE STRUCTURE AND PROPERTIES OF MATTER, THE CHARACTERISTICS OF ENERGY, AND THE INTERACTIONS BETWEEN MATTER AND ENERGY.

A. BENCHMARK: *Understand the properties, underlying structure, and reactions of matter.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Interactions of Energy and Matter</p> <p>7. Understand that electromagnetic waves carry energy that can be transferred when they interact with matter.</p> <ul style="list-style-type: none"> • 8. Describe the characteristics of electromagnetic waves (e.g., visible light, radio, microwave, X-ray, ultraviolet, gamma) and other waves (e.g., sound, seismic waves, water waves) <p>C. Understand the motion of objects and waves, and the forces that cause them.</p> <p>Forces</p> <p>1. Know that there are four fundamental forces in nature: gravitation, electromagnetism, weak nuclear force, and strong nuclear force.</p> <p>2. Know that every object exerts gravitational force on every other object, and how this force depends on the masses of the objects and the distance between them.</p> <p>6. Represent the magnitude and direction of forces by vector diagrams.</p>	<p>Students will use the UAV and training aircraft in “real world” situations which will illustrate the forces of flight.</p> <p>Students will maintain and/or modify the UAV and training aircraft structures to better adapt to specific flight situations.</p> <p>Students will maintain “flight logs” of their flight experiences, both with the computer simulator and the radio controlled training aircraft.</p>

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
	<p>7. Know that when one object exerts a force on a second object, the second object exerts a force of equal magnitude and in the opposite direction on the first object (i.e., Newton 's Third Law).</p> <p>Motion</p> <p>8. Apply Newton 's Laws to describe and analyze the behavior of moving objects, including:</p> <ul style="list-style-type: none"> • displacement, velocity, and acceleration of a moving object • Newton 's Second Law, $F = ma$ (e.g., momentum and its conservation, the motion of an object falling under gravity, the independence of a falling object's motion on mass) • circular motion and centripetal force. <p>9. Describe relative motion using frames of reference.</p> <p>10. Describe wave propagation using amplitude, wavelength, frequency, and speed.</p> <p>12. Describe how waves are used for practical purposes (e.g., seismic data, acoustic effects, Doppler effect).</p>	

STRAND II: CONTENT OF SCIENCE: LIFE SCIENCE
CONTENT STANDARD 2: UNDERSTAND THE PROPERTIES, STRUCTURES, AND PROCESSES OF LIVING THINGS AND THE INTERDEPENDENCE OF LIVING THINGS AND THEIR ENVIRONMENTS.

C. BENCHMARK: *Understand the characteristics, structures, and functions of cells.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Biochemical Mechanisms</p> <p>7. Describe how most cell functions involve chemical reactions, including:</p> <ul style="list-style-type: none"> • promotion or inhibition of biochemical reactions by enzymes • processes of respiration (e.g., energy production, ATP) • communication from cell to cell by secretion of a variety of chemicals (e.g., hormones). 	<p>Students will examine the various chemical retardants used in fighting forest fires. The effect of these chemicals on the aircraft structure and flight characteristics of the UAV will be examined.</p>

STRAND II: CONTENT OF SCIENCE: EARTH AND SPACE SCIENCE
CONTENT STANDARD 3: UNDERSTAND THE STRUCTURE OF EARTH, THE SOLAR SYSTEM, AND THE UNIVERSE, THE INTERCONNECTIONS AMONG THEM, AND THE PROCESSES AND INTERACTIONS OF EARTH'S SYSTEMS.

B. BENCHMARK: *Examine the scientific theories of the origin, structure, energy, and evolution of Earth and its atmosphere, and their interconnections.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Energy and the Earth's System 8. Describe the patterns and relationships in the circulation of air and water driven by the sun's radiant energy, including:</p> <ul style="list-style-type: none"> • patterns in weather systems related to the transfer of energy • differences between climate and weather • global climate, global warming, and the greenhouse effect • El Niño, La Niña, and other climatic trends. 	<p>The students will examine the effect of heat and wind currents on the UAV in relation to the environments of a forest fire.</p> <p>The students will examine the various aspects of weather conditions on the variability of forest fires and conditions in fighting forest fires.</p>

STRAND III: SCIENCE AND SOCIETY

CONTENT STANDARD: UNDERSTAND HOW SCIENTIFIC DISCOVERIES, INVENTIONS, PRACTICES, AND KNOWLEDGE INFLUENCE, AND ARE INFLUENCED BY, INDIVIDUALS AND SOCIETIES

A. BENCHMARK: *Examine and analyze how scientific discoveries and their applications affect the world, and explain how societies influence scientific investigations and applications.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	<p>Science and Technology 3. Evaluate the influences of technology on society (e.g., communications, petroleum, transportation, nuclear energy, computers, medicine, genetic engineering) including both desired and undesired effects, and including some historical examples (e.g., the wheel, the plow, the printing press, the lightning rod).</p>	<p>The students will examine the development of various fire fighting techniques related to aviation.</p>

STRAND I: HISTORY

CONTENT STANDARD 1: STUDENTS ARE ABLE TO IDENTIFY IMPORTANT PEOPLE AND EVENTS IN ORDER TO ANALYZE SIGNIFICANT PATTERNS, RELATIONSHIPS, THEMES, IDEAS, BELIEFS, AND TURNING POINTS IN NEW MEXICO, UNITED STATES, AND WORLD HISTORY IN ORDER TO UNDERSTAND THE COMPLEXITY OF THE HUMAN EXPERIENCE.

D. BENCHMARK: *Skills: Use critical thinking skills to understand and communicate perspectives of individuals, groups, and societies from multiple contexts.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	1. Understand how to use the skills of historical analysis to apply to current social, political, geographic, and economic issues. 2. Apply chronological and spatial thinking to understand the importance of events. 3. Describe primary and secondary sources and their uses in research. 6. Interpret events and issues based upon the historical, economic, political, social, and geographic context of the participants. 7. Analyze the evolution of particular historical and contemporary perspectives. 8. Explain how to use technological tools to research data, verify facts and information, and communicate findings.	The students will develop an economic plan for continuation of the Nostradamus project in relation to the specific conditions present in New Mexico.

STRAND II: GEOGRAPHY
CONTENT STANDARD 2: STUDENTS UNDERSTAND HOW PHYSICAL, NATURAL, AND CULTURAL PROCESSES INFLUENCE WHERE PEOPLE LIVE, THE WAYS IN WHICH PEOPLE LIVE, AND HOW SOCIETIES INTERACT WITH ONE ANOTHER AND THEIR ENVIRONMENTS.

A. BENCHMARK: *Analyze and evaluate the characteristics and purposes of geographic tools, knowledge, skills, and perspectives, and apply them to explain the past, present, and future in terms of patterns, events, and issues.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	1. Evaluate and select appropriate geographic representations to analyze and explain natural and man-made issues and problems. 2. Understand the vocabulary and concepts of spatial interaction, including an analysis of population distributions and settlements patterns.	The students will analyze the Nostradamus Project in relation to forest fighting in the State of New Mexico.

STRAND II: GEOGRAPHY
CONTENT STANDARD 2: STUDENTS UNDERSTAND HOW PHYSICAL, NATURAL, AND CULTURAL PROCESSES INFLUENCE WHERE PEOPLE LIVE, THE WAYS IN WHICH PEOPLE LIVE, AND HOW SOCIETIES INTERACT WITH ONE ANOTHER AND THEIR ENVIRONMENTS.

D. BENCHMARK: *Analyze and evaluate how economic, political, cultural, and social processes interact to shape patterns of human populations, and their interdependence, cooperation, and conflict.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	7. Evaluate the effects of technology on the developments, changes to, and interactions of cultures.	Students will study the historical aspects of fighting forest fires in remote regions and the economics involved in past fire outbreaks. The findings will be applied to an analysis of hot spotting with a UAV.

STRAND III: CAREER READINESS
CONTENT STANDARD 3: STUDENTS WILL DEMONSTRATE THE TECHNOLOGICAL KNOWLEDGE AND SKILLS REQUIRED FOR FUTURE CAREERS.

A. **BENCHMARK:** *Explain how technology is used in communications and the arts; engineering, industry, and science; health and human services; and business and marketing.*

GRADE	PERFORMANCE STANDARDS	ILLUSTRATIONS
9-12	No performance standards listed.	A specific marketing plan will be developed by the Nostradamus Project finance committee to make the project self-sustaining.