# Aerospace Engineering
# At-A-Glance - Lamar CISD

| Ongoing Skills Imbedded All Year | Professional Standards/Employability Skills/Technical Skills | | |
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| Grading Period | Unit Name | Estimated Time Frame | TEKS |
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| **Grading Period 1**<br>**28 Days** | **Evolution of Flight** | **5 Days** | 1.1A, 1.1B, 1.1C, 1.1D, 1.1E, 1.1F |
| | AE 1.1 (A) Identify major Aerospace Engineering accomplishments.<br>AE 1.1 (B) Describe trends in Aerospace Engineering.<br>AE 1.1 (C) Analyze how Aerospace Engineering achievements were made.<br>AE 1.1 (D) Predict how Aerospace Engineering achievements will impact future accomplishments.<br>AE 1.1 (E) Synthesize discrete facts into a coherent sequence of events.<br>AE 1.1 (F) Deliver organized oral presentations of work tailored to the audience. | | |
| | **Physics of Flight** | **23 Days** | 1.2A, 1.2B, 1.2C, 1.2D, 1.2E, 1.2F, 1.2G, 1.2H, 1.2I, 1.2J, 1.2K, 1.2L, 1.2M, 1.2N, 1.2O, 1.2P, 1.2Q, 1.2R, 1.2S, 1.2T, 1.2U, 1.2V, 1.2W, 1.2X, 1.2Y, 1.2Z, 1.2AA |
| | AE 1.2 (A) Identify major components of an aircraft.<br>AE 1.2 (B) Approximate the center of gravity of geometric shapes.<br>AE 1.2 (C) Identify the three axis of an aircraft.<br>AE 1.2 (D) Label the motions about the three axis of an aircraft.<br>AE 1.2 (E) Describe the four major forces which act on an aircraft.<br>AE 1.2 (F) Describe the four ways that lift is generated by an airfoil.<br>AE 1.2 (G) Label the components of an airfoil.<br>AE 1.2 (H) Describe the Earth's atmosphere composition and layers.<br>AE 1.2 (I) Describe the relationship of altitude, temperature and pressure within the Earth's atmosphere.<br>AE 1.2 (J) Describe the factors that impact lift and drag.<br>AE 1.2 (K) Explain factors which improve aircraft stability.<br>AE 1.2 (L) Describe how the motions about the three axis of an aircraft are stabilized and controlled by aircraft components.<br>AE 1.2 (M) Calculate the center of gravity of an aircraft.<br>AE 1.2 (N) Revise the weight and location of masses onboard an aircraft for safe flight balance.<br>AE 1.2 (O) Demonstrate how lift may be created with an airfoil.<br>AE 1.2 (P) Calculate the values of Earth's atmosphere altitude, temperature and pressure relative to each other.<br>AE 1.2 (Q) Calculate the values of lift, drag and Reynolds Number.<br>AE 1.2 (R) Predict how aircraft characteristics affect lift, drag, and Reynolds Number.<br>AE 1.2 (S) Design an airfoil to meet or exceed desired performance.<br>AE 1.2 (T) Design a glider to meet or exceed desired performance.<br>AE 1.2 (U) Summarize test data to evaluate glider performance against design criteria.<br>AE 1.2 (V) Revise a glider to meet or exceed desired performance.<br>AE 1.2 (W) Analyze the factors that contribute to a successful glider design.<br>AE 1.2 (X) Accurately construct a glider that represents a design.<br>AE 1.2 (Y) Predict glider performance.<br>AE 1.2 (Z) Compare glider performance to predicted performance.<br>AE 1.2 (AA) Optimize glider performance to improve performance. | | |
| | **Physics of Flight** continue | **13 Days** | 1.2A, 1.2B, 1.2C, 1.2D, 1.2E, 1.2F, 1.2G, 1.2H, 1.2I, 1.2J, 1.2K, 1.2L, 1.2M, 1.2N, 1.2O, 1.2P, 1.2Q, 1.2R, 1.2S, 1.2T, 1.2U, 1.2V, 1.2W, 1.2X, 1.2Y, 1.2Z, 1.2AA |

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| **Grading Period 2**<br>**25 Days** | AE 1.2 (A) Identify major components of an aircraft.<br>AE 1.2 (B) Approximate the center of gravity of geometric shapes.<br>AE 1.2 (C) Identify the three axis of an aircraft.<br>AE 1.2 (D) Label the motions about the three axis of an aircraft.<br>AE 1.2 (E) Describe the four major forces which act on an aircraft.<br>AE 1.2 (F) Describe the four ways that lift is generated by an airfoil.<br>AE 1.2 (G) Label the components of an airfoil.<br>AE 1.2 (H) Describe the Earth's atmosphere composition and layers.<br>AE 1.2 (I) Describe the relationship of altitude, temperature and pressure within the Earth's atmosphere.<br>AE 1.2 (J) Describe the factors that impact lift and drag.<br>AE 1.2 (K) Explain factors which improve aircraft stability.<br>AE 1.2 (L) Describe how the motions about the three axis of an aircraft are stabilized and controlled by aircraft components.<br>AE 1.2 (M) Calculate the center of gravity of an aircraft.<br>AE 1.2 (N) Revise the weight and location of masses onboard an aircraft for safe flight balance.<br>AE 1.2 (O) Demonstrate how lift may be created with an airfoil.<br>AE 1.2 (P) Calculate the values of Earth's atmosphere altitude, temperature and pressure relative to each other.<br>AE 1.2 (Q) Calculate the values of lift, drag and Reynolds Number.<br>AE 1.2 (R) Predict how aircraft characteristics affect lift, drag, and Reynolds Number.<br>AE 1.2 (S) Design an airfoil to meet or exceed desired performance.<br>AE 1.2 (T) Design a glider to meet or exceed desired performance.<br>AE 1.2 (U) Summarize test data to evaluate glider performance against design criteria.<br>AE 1.2 (V) Revise a glider to meet or exceed desired performance.<br>AE 1.2 (W) Analyze the factors that contribute to a successful glider design.<br>AE 1.2 (X) Accurately construct a glider that represents a design.<br>AE 1.2 (Y) Predict glider performance.<br>AE 1.2 (Z) Compare glider performance to predicted performance.<br>AE 1.2 (AA) Optimize glider performance to improve performance. | | |
| | **Flight Planning and Navigation** | **12 Days** | 1.3A, 1.3B, 1.3C, 1.3D, 1.3E, 1.3F, 1.3G, 1.3H, 1.3I, 1.3J, 1.3K, 1.3L, 1.3M, 1.3N, 1.3O, 1.3P, 1.3Q |
| | AE 1.3 (A) Describe major advances in navigation technology.<br>AE 1.3 (B) Identify components of common aviation navigation aids.<br>AE 1.3 (C) Describe how an aircraft reacts to flight control inputs.<br>AE 1.3 (D) Describe purpose of air traffic control system how it functions.<br>AE 1.3 (E) Explain how Global Positioning System, GPS, functions.<br>AE 1.3 (F) Identify the functions of a typical Global Positioning System, GPS, unit functions.<br>AE 1.3 (G) Describe the relationship of Tsiolkovsky rocket equation variables. Identify characteristics which contribute to a successful team.<br>AE 1.3 (H) Interpret an indication shown on a navigation aid. Illustrate navigation aid indication on a map.<br>AE 1.3 (I) Operate an aircraft in a simulated environment.<br>AE 1.3 (J) Plan a flight route.<br>AE 1.3 (K) Use a navigation aid to fly an aircraft to a destination in a simulated environment.<br>AE 1.3 (L) Predict an aircraft collision based on aircraft vectors.<br>AE 1.3 (M) Calculate an alternate aircraft vector for safe separation.<br>AE 1.3 (N) Create route consisting of latitude and longitude waypoints using a Global Positioning System, GPS, unit.<br>AE 1.3 (O) Interpret a route from latitude and longitude waypoints.<br>AE 1.3 (P) Select team members for a project based on characteristics.<br>AE 1.3 (Q) Select propulsion system based on characteristics of each. | | |
| **Grading Period 3**<br>**25 Days** | **Aerospace Materials and Structures** | **15 Days** | 2.1A, 2.1B, 2.1C, 2.1D, 2.1E, 2.1F, 2.1G, 2.1H, 2.1I, 2.1J, 2.1K |
| | AE 2.1 (A) Describe common aerospace materials and their properties.<br>AE 2.1 (B) Identify moment of inertia and Young's Modulus equations.<br>AE 2.1 (C) Recognize the impact of loading conditions on a structure.<br>AE 2.1 (D) Classify materials for aerospace applications.<br>AE 2.1 (E) Model a structure using a 3D modeling software.<br>AE 2.1 (F) Analyze deformation of a structure as a result of force application.<br>AE 2.1 (G) Design a structure that meets a given criteria.<br>AE 2.1 (H) Construct a composite structure.<br>AE 2.1 (I) Measure mechanical properties of material.<br>AE 2.1 (J) Interpret measurements of a tensile tester.<br>AE 2.1 (K) Calculate moment of inertia and Young's Modulus equations. | | |

*Lab Safety and Scientific Processes*
**Readiness Standards**
Supporting Standards

| | Propulsion | 10 Days | 2.2A, 2.2B, 2.2C, 2.2D, 2.2E, 2.2F, 2.2G, 2.2H, 2.2I, 2.2J, 2.2K, 2.2L, 2.2M, 2.2N, 2.2O, 2.2P, 2.2Q, 2.2R, 2.2S, 2.2T, 2.2U, 2.2V, 2.2W, 2.2X |
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| | AE 2.2 (A) Describe the four primary forces acting on an aircraft.<br>AE 2.2 (B) Explain how Newton's Third Law applies to aerodynamic forces.<br>AE 2.2 (C) Describe the characteristics of the four types of propulsion systems.<br>AE 2.2 (D) Classify rocket engine systems. Identify the thrust and impulse equations.<br>AE 2.2 (E) Describe parts and functions of a typical model rocket engine.<br>AE 2.2 (F) Outline model rocket safety suggestions.<br>AE 2.2 (G) Label model rocket components and functions.<br>AE 2.2 (H) Recognize the equation of center of gravity and center of pressure.<br>AE 2.2 (I) Identify common space propulsion systems.<br>AE 2.2 (J) Identify basic criteria to consider when designing a spacecraft.<br>AE 2.2 (K) Construct a physical model of a system.<br>AE 2.2 (L) Measure mechanical properties of material.<br>AE 2.2 (M) Interpret measurements of a test system.<br>AE 2.2 (N) Simulate performance of propulsion systems.<br>AE 2.2 (O) Design an aircraft propulsion system to meet a given objective such as maximum efficiency, maximum thrust to weight ratio.<br>AE 2.2 (P) Infer how changes in propulsion system parameters affect performance. Interpret measurements of a model rocket engine thrust.<br>AE 2.2 (Q) Design a stable model rocket.<br>AE 2.2 (R) Construct a stable model rocket.<br>AE 2.2 (S) Gather performance data associated model rocket launch such as maximum height of flight.<br>AE 2.2 (T) Construct a stable model rocket.<br>AE 2.2 (U) Calculate maximum height using rocket engine test data and indirect height measurements.<br>AE 2.2 (V) Organize and express thoughts and information in a clear and concise manner.<br>AE 2.2 (W) Select spacecraft components based on characteristics of each component.<br>AE 2.2 (X) Select spacecraft landing system based on characteristics of each component. | | |
| **Grading Period 4**<br>**33 Days** | **Propulsion** continue | **20 Days** | 2.2A, 2.2B, 2.2C, 2.2D, 2.2E, 2.2F, 2.2G, 2.2H, 2.2I, 2.2J, 2.2K, 2.2L, 2.2M, 2.2N, 2.2O, 2.2P, 2.2Q, 2.2R, 2.2S, 2.2T, 2.2U, 2.2V, 2.2W, 2.2X |
| | AE 2.2 (A) Describe the four primary forces acting on an aircraft.<br>AE 2.2 (B) Explain how Newton's Third Law applies to aerodynamic forces.<br>AE 2.2 (C) Describe the characteristics of the four types of propulsion systems.<br>AE 2.2 (D) Classify rocket engine systems. Identify the thrust and impulse equations.<br>AE 2.2 (E) Describe parts and functions of a typical model rocket engine.<br>AE 2.2 (F) Outline model rocket safety suggestions.<br>AE 2.2 (G) Label model rocket components and functions.<br>AE 2.2 (H) Recognize the equation of center of gravity and center of pressure.<br>AE 2.2 (I) Identify common space propulsion systems.<br>AE 2.2 (J) Identify basic criteria to consider when designing a spacecraft.<br>AE 2.2 (K) Construct a physical model of a system.<br>AE 2.2 (L) Measure mechanical properties of material.<br>AE 2.2 (M) Interpret measurements of a test system.<br>AE 2.2 (N) Simulate performance of propulsion systems.<br>AE 2.2 (O) Design an aircraft propulsion system to meet a given objective such as maximum efficiency, maximum thrust to weight ratio.<br>AE 2.2 (P) Infer how changes in propulsion system parameters affect performance. Interpret measurements of a model rocket engine thrust.<br>AE 2.2 (Q) Design a stable model rocket.<br>AE 2.2 (R) Construct a stable model rocket.<br>AE 2.2 (S) Gather performance data associated model rocket launch such as maximum height of flight.<br>AE 2.2 (T) Construct a stable model rocket.<br>AE 2.2 (U) Calculate maximum height using rocket engine test data and indirect height measurements.<br>AE 2.2 (V) Organize and express thoughts and information in a clear and concise manner.<br>AE 2.2 (W) Select spacecraft components based on characteristics of each component.<br>AE 2.2 (X) Select spacecraft landing system based on characteristics of each component. | | |

*Lab Safety and Scientific Processes*
**Readiness Standards**
Supporting Standards

| | Aero Careers Exploration | 5 Days | 4.3A, 4.3B, 4.3C, 4.3D, 4.3E, 4.3F, 4.3G |
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| | AE 4.3 (A) Describe factors that a student should consider when planning a career<br>AE 4.3 (B) Outline questions as preparation to interview a professional.<br>AE 4.3 (C) Collect information related to a future career.<br>AE 4.3 (D) Interview a professional.<br>AE 4.3 (E) Assemble career information into a coherent plan.<br>AE 4.3 (F) Deliver organized presentations of work tailored to the audience.<br>AE 4.3 (G) Criticize the work of a peer. | | |
| | Space Travel | 8 Days | 3.1A, 3.1B, 3.1C, 3.1D, 3.1E, 3.1F, 3.1G, 3.1H, 3.1I, 3.1J |
| | AE 3.1 (A) Recognize common celestial groups such as galaxy, star and planet.<br>AE 3.1 (B) Describe the relative sizes of celestial bodies.<br>AE 3.1 (C) Explain how global governance applies to space issues.<br>AE 3.1 (D) Outline how past space faring achievements contributed to subsequent achievements.<br>AE 3.1 (E) Describe how commercial organizations contribute to space related activities.<br>AE 3.1 (F) Identify the impact that space junk has on space-based activities.<br>AE 3.1 (G) Analyze an issue to which space applies.<br>AE 3.1 (H) Organize and express thoughts and information in a clear and concise manner.<br>AE 3.1 (I) Design a system to mitigate space junk.<br>AE 3.1 (J) Construct a prototype to demonstrate a design solution. | | |
| **Grading Period 5**<br>**34 Days** | Flight Physiology | 5 Days | 2.3A, 2.3B, 2.3C, 2.3D, 2.3E, 2.3F |
| | AE 2.3 (A) Describe common human body systems and their functions.<br>AE 2.3 (B) Recognize the formula for distance with respect to time and acceleration.<br>AE 2.3 (C) List common factors contribute to an aircraft accident.<br>AE 2.3 (D) Measure human vision quality such as acuity, astigmatism, color vision perception, depth perception and peripheral vision field.<br>AE 2.3 (E) Analyze how human factors affect aerospace system design. Infer reaction time through indirect measurements.<br>AE 2.3 (F) Analyze an aircraft accident to determine likely causes. | | |
| | Space Travel | 5 Days | 3.1A, 3.1B, 3.1C, 3.1D, 3.1E, 3.1F, 3.1G, 3.1H, 3.1I, 3.1J |
| | AE 3.1 (A) Recognize common celestial groups such as galaxy, star and planet.<br>AE 3.1 (B) Describe the relative sizes of celestial bodies.<br>AE 3.1 (C) Explain how global governance applies to space issues.<br>AE 3.1 (D) Outline how past space faring achievements contributed to subsequent achievements.<br>AE 3.1 (E) Describe how commercial organizations contribute to space related activities.<br>AE 3.1 (F) Identify the impact that space junk has on space-based activities.<br>AE 3.1 (G) Analyze an issue to which space applies.<br>AE 3.1 (H) Organize and express thoughts and information in a clear and concise manner.<br>AE 3.1 (I) Design a system to mitigate space junk.<br>AE 3.1 (J) Construct a prototype to demonstrate a design solution. | | |
| | Orbital Mechanics | 10 Days | 3.2A, 3.2B, 3.2C, 3.2D, 3.2E, 3.2F, 3.2G, 3.2H, 3.2I, 3.2J, 3.2K, 3.2L |
| | AE 3.2 (A) List major contributions made by people studying orbital mechanics.<br>AE 3.2 (B) Describe common satellite orbital pattern shapes and applications.<br>AE 3.2 (C) Name and describe the six Keplerian elements.<br>AE 3.2 (D) Explain Kepler's Laws. Recognize the equations for orbital period, orbital gravitational potential energy, orbital kinetic energy, and total orbital energy.<br>AE 3.2 (E) Describe how an orbital mechanics modeling software can be applied design a satellite system.<br>AE 3.2 (F) Explain how financial factors impact a project.<br>AE 3.2 (G) Analyze how an orbital mechanics theory can describe satellite motion.<br>AE 3.2 (H) Organize and express thoughts and information in a clear and concise manner.<br>AE 3.2 (I) Identify the most appropriate orbital pattern for an application.<br>AE 3.2 (J) Calculate an orbiting body's orbital period, orbital gravitational potential energy, orbital kinetic energy, and total orbital energy.<br>AE 3.2 (K) Model a satellite system using a modeling software.<br>AE 3.2 (L) Formulate a financial proposal for a project. | | |

| | **Alternative Applications** | **7 Days** | 4.1A, 4.1B, 4.1C, 4.1D, 4.1E, 4.1F, 4.1G, 4.1H, 4.1I, 4.1J |
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| | AE 4.1 (A) List alternative applications than aircraft for aerospace engineering concepts. <br> AE 4.1 (B) Describe the parts and functions of a wind turbine. <br> AE 4.1 (C) Identify factors that impact aircraft efficiency. <br> AE 4.1 (D) Recognize the drag equation. <br> AE 4.1 (E) Design aerospace system as an alternate to an aircraft which use aerospace engineering concepts. <br> AE 4.1 (F) Examples include a wind turbine and a parachute. <br> AE 4.1 (G) Construct an alternate aerospace system. <br> AE 4.1 (H) Measure output of an alternate aerospace system. <br> AE 4.1 (I) Optimize an alternate aerospace system. <br> AE 4.1 (J) Explain aircraft efficiency affects aircraft design. | | |
| | **Aerospace Careers** | **7 Days** | 4.3A, 4.3B, 4.3C, 4.3D, 4.3E, 4.3F, 4.3G |
| | AE 4.3 (A) Describe factors that a student should consider when planning a career <br> AE 4.3 (B) Outline questions as preparation to interview a professional. <br> AE 4.3 (C) Collect information related to a future career. <br> AE 4.3 (D) Interview a professional. <br> AE 4.3 (E) Assemble career information into a coherent plan. <br> AE 4.3 (F) Deliver organized presentations of work tailored to the audience. <br> AE 4.3 (G) Criticize the work of a peer. | | |
| **Grading Period 6** <br> **28 Days** | **Remote Systems** | **28 Days** | 4.2A, 4.2B, 4.2C, 4.2D, 4.2E, 4.2F, 4.2G, 4.2H, 4.2I, 4.2J, 4.2K, 4.2L, 4.2M, 4.2N, 4.2O, 4.2P, 4.2Q, 4.2R, 4.2S, 4.2T |
| | AE 4.2 (A) Explain how unmanned systems can be integrated into aerospace systems. <br> AE 4.2 (B) Recognize factors that affect communication with equipment in space. <br> AE 4.2 (C) Describe how input and output devices function. <br> AE 4.2 (D) Explain the purpose of a flowchart or pseudocode. <br> AE 4.2 (E) Describe functions of a computer program. <br> AE 4.2 (F) Identify how functions of a computer program can be applied to perform a task. <br> AE 4.2 (G) Outline how a satellite data is gathered and used to create a map. <br> AE 4.2 (H) Describe how human factors impact space travel. <br> AE 4.2 (I) Describe how spacecraft systems function. <br> AE 4.2 (J) Analyze how aerospace unmanned systems function. <br> AE 4.2 (K) Synthesize a discrete knowledge into a coherent sequent of events. <br> AE 4.2 (L) Deliver organized oral presentations of work tailored to the audience. <br> AE 4.2 (M) Describe the impact of a communication delay on the success of a mission. <br> AE 4.2 (N) Operate output devices to perform a function. <br> AE 4.2 (O) Relate sensor input to the environment being measured. <br> AE 4.2 (P) Create a flowchart or pseudocode to perform a task. <br> AE 4.2 (Q) Construct a control program to accomplish a specified goal. <br> AE 4.2 (R) Operate a remote system through a series of performance tasks including autonomous navigation Gather data using robot control software. <br> AE 4.2 (S) Arrange data using spreadsheet software. <br> AE 4.2 (T) Operate a simulated spaceflight. | | |