PRODUCT FACT SHEET

Aerodynamics Technology (40-assignment)

This is an integrated instructional module designed specifically to operate within the LJ ScanTEK Modular Technology Program environment. It includes a 10-assignment exploratory curriculum and a further 30-assignment in-depth curriculum. The exploratory curriculum and the in-depth curriculum are each split into two parts. Each part includes a pre-test and post test. The module includes hardware, software and curriculum materials sufficient to provide a complete learning experience.

The curriculum incorporates continuous assessment through questions. When used in conjunction with a ClassAct networked management system, this provides instant feedback of student performance. The assessments begin with a comprehensive pre-test. This quiz includes questions for each subsequent assignment, together with questions that will specifically test math and reading ability.

Every assignment starts with a series of questions designed to track inventory. These ensure that any missing items are located before they are needed.

Each assignment is divided into a series of tasks. Hands-on tasks form the core of the student work. Where appropriate, these are accompanied by research tasks based upon illustrated textbooks and on-screen applications. Assessment questions are incorporated into each task.

Typical 10-assignment topic areas include:

- Aerodynamics
- Control of a wind tunnel
- Measuring wind resistance in a wind tunnel
- Wind resistance of different vehicle shapes
- Vehicle designs
- Car designing
- Lift, down-force and drag aerodynamic forces
- Wing design for optimum lift
- Measuring lift force
- Comparing different types of wing
- Designing a glider

Typical 10-assignment activities include:

- Perform experiments to demonstrate the two basic aerodynamic forces.
- Explore the functions and controls of a real wind tunnel.
- Discover how to measure wind resistance using the wind tunnel.
- Measure the wind resistance of different vehicle shapes.
- Observe the effect of adding a spoiler to an automobile.
- Use a computer program to design an automobile.
- Use the computer program to simulate wind tunnel and road tests of a vehicle design.
- Use the wind tunnel to produce lift force from a simple wing design.
- Discover what the angle of attack is.
- Observe the airflow around wings when the angle of attack changes.
- Measure the aerodynamic force that pushes airplanes off the ground.
- Find out how this force changes when the angle of the wing is changed.
- Test different wing designs to discover which is most suitable for flying.
- Make a model glider and test its ability to maneuver in the wind tunnel.

Typical 30-assignment topic areas include:

- An introduction to the laws of pressure
- Static and dynamic pressure and the Bernoulli equation
- Wind tunnels
- Lift and drag
- Making a car 'stick' to the ground using down force
- Vehicle handling
- Mechanical design of a vehicle
- Vehicle design criteria
- Wing design
- Angle of attack, profile and chords
- Aerofoils and flaps
- Aspect ratio and span
- Turbulence
- Basic aircraft design
- Propeller power
- Helicopters and airplanes
- Supersonic aerodynamics
- Building design problems
- Bridge design to overcome unwanted aerodynamic characteristics
- Aerodynamics of ballistics
- Prototyping

Typical 30-assignment activities include:

- Identify how static and dynamic air pressure influences aerodynamics.
- Demonstrate a fundamental aerodynamic principle discovered by Bernoulli.
- Describe different types of wind tunnels and their component parts.
- Identify how to control the wind speed within the wind tunnel.
- Define how drag values can be measured in the wind tunnel.
- Demonstrate drag acting on a parachute.
- Describe the relationship between facing area and drag.
- Show how to use the computer to measure aerodynamic forces acting on objects in the wind tunnel.
- Differentiate the drag caused by various vehicle shapes.
- Identify reasons for selecting a particular type of vehicle.
- Identify the effect of downforce.
- Show how automobile design is influenced by downforce.
- Complete a virtual wind tunnel and road test on a computer designed car.
- Design the mechanical and aerodynamic components of a car using a computer.
- Examine the design criteria of a car from a set of customer requirements.
- Produce a vehicle design on a computer to fulfill a set of design criteria.
- Evaluate the effectiveness of adding a spoiler to a car design.
- Compare results of downforce for vehicles with and without spoilers.
- Identify the pioneers of aerodynamics technology.
- Indicate the airflow around a flat wing.
- Recognize the need for various wing designs.
- Show how the lift of a wing changes with the angle of attack.
- Describe the differences between a flat, cambered and symmetrical wing.

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Typical 30-assignment activities include (continued):

- Describe the technical terms relating to an aerofoil.
- Calculate the size of an aerofoil to NACA standards.
- Describe how changing the wing span can alter the lift generated by a wing.
- Demonstrate how the chord length will affect the lift generated by a wing.
- Show how turbulence can affect the performance and handling of a sports car.
- Assess the stall point of a wing by increasing the angle of attack.
- Identify warning systems used in aircraft to avoid stalling.
- Construct a paper airplane following written instructions.
- Relate the control surfaces on a paper airplane to those of a real aircraft.
- Devise a paper airplane design to meet specified requirements.
- Evaluate the torque produced by 2 and 4 blade propellers.
- Identify the coding system used for propellers.
- Compare the flight of helicopters to that of airplanes.
- Calculate the speed of sound at various altitudes.
- Describe how aircraft technology has changed over the past 100 years, including advances in aerodynamic design.
- Complete a word grid of technical aerodynamic terms.
- Describe wind characteristics around an international airport.
- Classify wind speed by the Beaufort range.
- Describe the effect the wind will have on a skyscraper.
- Identify how the shape of a building can help with minimizing forces created by the wind.
- Identify the effect of wind on a model chimney.
- Solve the problem caused by wind against a chimney.
- Calculate the force of wind on a building.
- Describe problems caused by wind flow around bridges.
- Evaluate a solution to an unstable bridge problem.
- Recognize how real bridges can become unstable due to the effects of the wind.
- Design an addition to a bridge to overcome unwanted aerodynamic characteristics.
- Identify how aerodynamics is involved in the topic of ballistics.
- Show how the shape of the bullet can affect its range.
- Design a powered aircraft to fly a specified distance.
- Build and test a prototype of the aircraft.
- Evaluate the design of the prototype aircraft.
- Create a report on an aerodynamic topic.

Each assignment is designed around a list of performance objectives. These lists include academic, technical and occupational objectives. The assignments are written in such a way as to enable a student to attain the performance objectives, with the assessment questions linked to these in order to provide a measure of true competency.

The performance objectives are used by the ClassAct management system to generate a comprehensive portfolio of student competency reports. Default reports supplied with this module include:

- Entry report
- Technical/Occupational Exit report
- Basic Skills report based upon the federal SCAN's report.

The items supplied with this instructional module include:

- 10-assignment On-Screen Student Assignment Guide CD
- 10-assignment Student Assignment Guide
- 10-assignment Student Workbook
- 10-assignment Instructor's Guide
- 30-assignment Student Assignment Guide
- 30-assignment Student Workbook
- 30-assignment Instructor's Guide
- Computer Aided Instruction Software
- Video: 'Aerospace Processes'
- Car Builder Software
- Wind Tunnel
- Pre-cut balsa shapes
- Modeling clay
- Aerostream Monitor Interface Unit
- Safety glasses
- Oscillating bridge module
- Propeller support module
- Elastic band powered model airplane

Additional items required:

- Computer

Module Facts

For Technology Program, order as:
ST180/40 Aerodynamics Technology

	No.	Average time
Assignments	40	45 minutes
Extension Activities	5	45 minutes
	Total	33 ¾ hours

LJ Technical Systems
Web site: www.ljgroup.com

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