Physics, Technology and Engineering in Automobile Racing
Unit Plan Overview

Overarching Question

What physics concepts can be learned by analyzing automobile racing?

Key Concepts

- Acceleration
- Air resistance
- Force
- Friction
- Inertia
- Mass
- Momentum
- Safety features
- Speed
- Velocity
- Centripetal force
- Downforce
- Gravity
- Trade-off
- Acceleration due to gravity
- Conversion
- Displacement
- Distance
- Power
- Revolution
- Rotational motion
- Work

Key Concepts Continued

- Airfoil
- Bernoulli's principle
- Ground effect
- Pressure

Lessons and Main Ideas

Lesson 1
Analysis of Newton's Laws in Automobile Racing

- What are Newton's laws of motion, and how are they applied in automobile racing?

Lesson 2
Forces in Automobile Racing

- What forces are involved in automobile racing?
- How do air resistance and downforces from air movement create forces that affect race cars?
- What accounts for centripetal forces in automobile racing?

Lesson 3
The Study of Motion Using Artifacts from the Collections of **The Henry Ford**

- How are the basic concepts of distance, velocity, acceleration and inertia applied in the study of automobile racing?

Lesson 4
Ground Effects Innovations in Automobile Racing

- What are ground effects? How do they use physics principles? Why are they important for race cars?

Lesson 5
Work, Energy and Power in Automobile Racing

- How is energy transformed from one type to another in automobile racing?

Duration

5-10 class periods
(45-60 minutes each)

Continued…

Digitized Artifacts
from the Collections of **The Henry Ford**

Lesson 1
Analysis of Newton's Laws in Automobile Racing

- Willys Gasser, 1958 (side view ID# THF69391)
- Three Men Pushing a Barber-Warnock Special Race Car Off the Track at Indianapolis Motor Speedway, probably 1924 ID# THF68328
- Official Start of First NHRA Drag Racing Meet, Great Bend, Kansas, 1955 ID# THF34472
- Damaged Race Car After a Racing Accident, 1905-1915 ID# THF12446
- Lyn St. James Suited Up in Racecar, Giving a Thumbs-Up, 2008 ID# THF58671
- Ford Thunderbird NASCAR Winston Cup Race Car Driven by Bill Elliott, 1987 (engine view ID# THF69265)
- Buck & Thompson Class D Slingshot Dragster, 1960 ID# THF36041
- Henry Ford Driving the 999 Race Car Against Harkness at Grosse Pointe Racetrack, 1903 ID# THF23024

Lesson 2
Forces in Automobile Racing

- Soap Box Derby Car, 1939 ID# THF69252
- Official Start of First NHRA Drag Racing Meet, Great Bend, Kansas, 1955 ID# THF34472
- Three Men Pushing a Barber-Warnock Special Race Car Off the Track at Indianapolis Motor Speedway, probably 1924 ID# THF68328
- Ford Race Car "666," 1906-1907, Driven by Frank Kulick ID# THF69468
- Buck & Thompson Class D Slingshot Dragster, 1960 ID# THF36041
- Damaged Race Car After a Racing Accident, 1905-1915 ID# THF12446
- Henry Ford Driving the 999 Race Car Against Harkness at Grosse Pointe Racetrack, 1903 ID# THF23024
- Dave Lewis's Race Car Stopped on the Board Track at Altoona Speedway, Tipton, Pennsylvania, 1925 ID# THF73131
- March 84C Race Car, 1984 (cockpit view ID# THF69363)
- Leon Duray Being Timed at Culver City Speedway, California, 1927 ID# THF73132
- Willys Gasser, 1958 (front view ID# THF69394)
- Ford Thunderbird, NASCAR Winston Cup Race Car Driven by Bill Elliott, 1987 (overhead view ID# THF69264)
- Race Car "999" Built by Henry Ford, 1902 ID# THF70568

Lesson 3
The Study of Motion Using Artifacts from the Collections of **The Henry Ford**

- Barber-Warnock Special Race Car in Pit at Indianapolis Motor Speedway, 1924 ID# THF68329
- Henry Ford Driving the 999 Race Car Against Harkness at Grosse Pointe Racetrack, 1903 ID# THF23024
- Ford Thunderbird NASCAR Winston Cup Race Car Driven by Bill Elliott, 1987 (engine view ID# THF69265) (side view ID# THF69258)

Continued...

Unit Plan Overview Continued

Lesson 3 Continued

- Timing Slip From Oswego Dragway, Used with Buck & Thompson Slingshot Dragster, 1963 ID# THF45621
- Race Car "999" Built by Henry Ford, 1902 ID# THF70568
- Official Start of First NHRA Drag Racing Meet, Great Bend, Kansas, 1955 ID# THF34472

Lesson 4
Ground Effects Innovations in Automobile Racing

- Willys Gasser, 1958
  (front view ID# THF69394)
- Ford Thunderbird, NASCAR Winston Cup Race Car Driven by Bill Elliott, 1987
  (aerial view ID# THF69264)
- March 84C Race Car, 1984
  (aerial view ID# THF69371)
  (side view ID# THF69368)

Lesson 5
Work, Energy and Power in Automobile Racing

- Three Men Pushing a Barber-Warnock Special Race Car Off the Track at Indianapolis Motor Speedway, probably 1924
  ID# THF68328
- Ford Thunderbird NASCAR Winston Cup Race Car Driven by Bill Elliott, 1987
  (engine view ID# THF69265)

Materials

- Computer with access to the Internet; digital projector and screen (preferred) OR printed handouts of the digitized artifacts and descriptions
- Background Information Sheet for Students 1A:Analysis of Newton's Laws and Racing
- Student Activity Sheet 1B: Newton's Laws
- Answer Key 1B: Newton's Laws
- Background Information Sheet for Students 2A: Forces in Automobile Racing
- Student Activity Sheet 2B: Forces
- Answer Key 2B: Forces
- Background Information Sheet for Students 3A: Study of Motion Using Artifacts from the Collections of **The Henry Ford**
- Student Activity Sheet 3B: Motion and Energy
- Answer Key 3B: Motion and Energy
- Background Information Sheet for Students 4A: Ground Effects Innovations in Automobile Racing
- Student Activity Sheet 4B: Ground Effects Innovations
- Answer Key 4B: Ground Effects Innovations
- Background Information Sheet for Students 5A: Work, Energy and Power in Automobile Racing
- Student Activity Sheet 5B: Work, Energy and Power
- Answer Key 5B: Work, Energy and Power
- Culminating Projects
- Extension Activities
- Student Activity Sheet 6: Review/Assessment Questions
- Answer Key 6: Review/Assessment Questions