New Fellow Education Transfer Plan
Cover Sheet

Title of ETP	Sputnik I: How It Changed Our World Today
Name of IISME Fellow	Virgel Paule
Fellow's year-round email	vpaule@hotmail.com
Sponsor Company	Lockheed Martin Space Systems Company
Name of Mentor	Rob Granier
National Board Certificate Area	Adolescence and Young Adulthood/Social Studies-History

I, the IISME **Fellow** named above, affirm that the ETP I am submitting is my own work, that I acknowledged sources where appropriate, and that I avoided including any proprietary information of the Sponsor Company. By my submission I am assigning to IISME my entire copyright in the ETP. I understand IISME is simultaneously granting me a license to use the ETP for pedagogical purposes.

_____ _____

Signature Date

Category	*Curriculum* Subject: Math Science Technology [Social Studies] Level: Elem Middle [High] Other *Staff Development* *Describe*_____ *Other* *Describe*
Objectives	Students will be able to understand the events surrounding Sputnik and its launch. They will understand and explain the social, political and economical effects in America; obtain a general overview (history) of Lockheed Martin Co. and their aeronautical contributions; learn how certain satellite systems affect our daily lives. In the process, students will learn how to research topics utilizing various forms of resources. National Board Standards: *Standard I: Knowledge of Students* *Standard III: Knowledge of Subject Matter* *Standard V: Promoting Social Understanding*

Abstract (50 words or less)	This will be a four lesson unit on the following: 1) A History of Lockheed Martin, 2) The Significance of Sputnik I, 3) Technology and How it Relates to Us, 4) Career: Where Do We Go From Here? - (Guest Speaker from Lockheed Martin). Lessons will consist of mainly lecture with assignments at the end of lectures for lessons one and two. Lesson four will require a guest speaker. Assignments include a mini-research paper, reader's theater and worksheet for the guest speaker. Student's will compare, contrast and share their views on the political, economical and social effects of Sputnik and technology in America.
Describe how your ETP aligns with the National Board Standard stated in your proposal.	Through this four lesson unit curriculum, students will understand the histories of Lockheed Martin, Sputnik I and compare the pros and cons of the past to their present situation. Students will be more equipped with a knowledge base that allows them to analyze how global and local conditions have changed over time in relation to military, national security, technology and education. In addition, students will examine information that will enhance their research skills and further their awareness of the education and work experience needed for becoming an engineer, scientist or a financial analyst.
Describe the connection between your ETP and the Summer Fellowship.	During my fellowship, I had the opportunity to work with projects that included researching the process of the Independent Cost Evaluation (ICE) and the history of the product. This includes, but is not limited to satellites, payloads, buses, rocket boosters, and satellite propulsion. From my research here at Lockheed Martin, I have learned that the company has contributed to our society in the most serviceable, yet controversial ways. I believe this information (historical perspective) will be helpful in assisting my students to think more critically about how their values and belief systems are affected by this business and how technology directly affects them.
Resources Needed	Transparencies, markers, stationery, hand-outs, overhead projector, VCR, TV, paper model airplanes, tape recorders.
Evaluation/Assessment Measures Used	Rubric: http://rubistar.4teachers.org/indez.php
Formatting specifications	PC _X__ or Mac____ **(Must be in Word or Text Format)** Software used ___Microsoft Word_____

Submitted Copy	Soft and hard copy due to peer coach by the end of the summer fellowship. Also, a copy of the cover sheet signed by a school site administrator submitted to IISME Oct.3, 2004 to receive $300 grant.

I, the **Mentor** named above [please select one of the following],

- ❑ have read the attached ETP, and my comments, if any, appear below.
- ❑ have read the attached ETP, and, as outlined in the IISME-Company Fellowship Agreement, have reviewed it on behalf of the Sponsor Company, and have determined that the ETP does not contain any Sponsor-proprietary information. My additional comments, if any, appear below.

Comments:

Signature Date

Administrator's comments:

Signature Date

Unit: Sputnik; How It Changed Our World Today
Subject: Social Studies
Lesson I
Grade Level: 9-12
NBS: I, III, V
Unit Objective: Students will be able to:

- Obtain a general overview of Lockheed Martin Co. and other companies that share similar responsibilities
- Get a better understanding of Sputnik I.
- Understand Sputnik I military, social, political, scientific and educational effects in America.
- Gain more insight on different types of satellites (commercial, government) and their functions.
- Learn how satellites affect our daily lives today.

LESSON 1

Objective: Students will learn the history of Lockheed Martin: its founders, their early accomplishments, and what the company is doing today. Students will understand that the inventions of the founders of Lockheed Martin has impacts on military, expansion of US Defense, transportation, communication and social interaction around the world.

What is Lockheed Martin?

- Glenn L. Martin
- Loughead Brothers (Allan and Malcolm)
- Lockheed Martin Corporation

Activities

Time in Flight

1. Get into groups of three-five
2. Pick and research an early invention from Glenn Martin, Allan/Malcolm Loughead or Lockheed Martin
3. Research and explain the following: (if applicable)
    a. What is the invention?
    b. What are its achievements or accomplishments? How was it utilized?
    c. How was this invention different from others?
    d. What are the social, political and economical implications of this invention?
4. Present findings in oral presentation and written report – see rubric

Resources for Research Questions

http://news.ssc.lmco.com/ (Lockheed Martin website: current and historical data)
http://www.allstar.fiu.edu/aero/martin.htm (Glenn L. Martin's Inventions)
http://www.shanaberger.com/martin.htm (Lockheed Martin Inventions)

Inventions by Glenn Martin, Loughead Brothers & Lockheed Martin

- Model TT Trainer Plane
- F-1 Flying Boat
- MB-2
- Lockheed Vega
- SC-1
- XT5M-1 Bomber
- China Clipper M-130
- B-26 Marauder
- P-38 Lightning
- XP-900
- Lockheed Polaris Fleet Ballistic Missile
- Lockheed Poseidon Fleet Ballistic Missile
- Lockheed Trident Missile
- Lockheed F-104 Star Fighter
- Explorer I
- Martin Bold Orion
- Lockheed “Black Box”
- Martin Titan I
- Lockheed A-12
- Lockheed SR-71 Blackbird
- Titan II Rocket
- Lockheed Deep Quest
- Lockheed F-117A Stealth Fighter
- Hubble Space Telescope
- Magellan Spacecraft
- Lockheed F/A-22 Fighter Plane
- Lockheed Milstar Satellite
- U-2S Reconnaissance Aircraft
- C-130J Transport Plane
- Joint Strike Fighter
- Gemini VIII
- DL-1
- YB-10
- Lockheed Model 10 Electra
- Lockheed Model 14 Super Electra
- Lockheed XP-80 Shooting Star
- Martin B-29 Bomber
- Lockheed Navy P2V Neptune
- Martin Matador TM-61 (Missile)
- Lockheed C-130 Hercules
- Lockheed U-2

Research Report : Mini-Research Paper Rubric

Teacher Name: _____ _____

Student Name: _____

CATEGORY	4	3	2	1
Organization	Information is very organized with well-constructed paragraphs and subheadings.	Information is organized with well-constructed paragraphs.	Information is organized, but paragraphs are not well-constructed.	The information appears to be disorganized. 8)
Quality of Information	Information clearly relates to the main topic. It includes several supporting details and/or examples.	Information clearly relates to the main topic. It provides 1-2 supporting details and/or examples.	Information clearly relates to the main topic. No details and/or examples are given.	Information has little or nothing to do with the main topic.
Diagrams & Illustrations	Diagrams and illustrations are neat, accurate and add to the reader's understanding of the topic.	Diagrams and illustrations are accurate and add to the reader's understanding of the topic.	Diagrams and illustrations are neat and accurate and sometimes add to the reader's understanding of the topic.	Diagrams and illustrations are not accurate OR do not add to the reader's understanding of the topic.
Mechanics	No grammatical, spelling or punctuation errors.	Almost no grammatical, spelling or punctuation errors	A few grammatical spelling, or punctuation errors.	Many grammatical, spelling, or punctuation errors.
Sources	All sources (information and graphics) are accurately documented in the desired format.	All sources (information and graphics) are accurately documented, but a few are not in the desired format.	All sources (information and graphics) are accurately documented, but many are not in the desired format.	Some sources are not accurately documented.

A = 18-20 B = 16-17 C = 14-15 D = 12-13 F = 11 and below

Lesson I: Teacher Notes/Transparencies - Timeline

Glenn L. Martin

- 1886, Born in Macksburg, Iowa. Parents: Armita and Clarence
- 1892, Six years old, entered and won a kite contest. Popular kite with the boys, they contracted to pay him $0.25 for each kite. Delivered three kites/day until he ran out of customers. First business venture at age of six
- 1894, Made larger box kite and realized it could carry him into the air. He destroyed them because his father thought it was too dangerous
- 1904, Eighteen years old moved to Santa Ana, California. Helped father in automobile business
- 1907, First attempt to fly his self-designed and built flying machine. Made of silk and bamboo (failed). He called it a "monoplane"
- 1909, Second attempt flew for eight seconds in the air for a distance of 100 feet
- 1911, Factory to make planes, set up in old cannery in Santa Ana
- 1911-1913, Barnstormed (toured as a stunt flyer) as a source of income to keep factory operating
- 1912, Glenn L. Martin Company is officially incorporated in Los Angeles. Becomes president of company. At age 26, flew from Newport to Catalina: longest over-water flight up to that time. First passenger flight with mother Minta Martin
- 1914, designed and made Model TT, world's first designed trainer plane for U.S Army Signal Corps
- 1915, co-stars in the movie, "A Girl of Yesterday" to drum up interest in his Model T
- 1916, Wright Company and Martin Aircraft Company formed in New York. The merging companies split after 10 months
- 1917, Martin pulled out of the Wright-Martin Company and reestablishes the Glenn L. Martin Company in Ohio
- 1924, produced the Martin SC-1, torpedo-scout bomber for Navy (300 total)
- 1929, Company opened an aircraft manufacturing factory in Middle River (near Baltimore). The XT5M-1 bomber was first airplane to built there
- 1933, received Collier Trophy for greatest achievement in aviation by FDR at 47y/o
- 1935, father died in Santa Ana
- 1937, Built and delivered China Clippers to Pan America. M-130 makes first-ever scheduled Trans-Pacific flight
- 1938, Contract from France for French Maryland Bombers
- 1940, Martin introduces the B-26 Marauder bomber, which achieves the best survivability rate of any WWII bomber

- 1941, WWII, government contract for B-26 (5,200 are produced)
- 1945, Two B-29 bombers, built by Martin and named Enola Gay and Bock's Car
- 1949, The Martin Matador TM-61 US Air Force tactical missile flies for the first time
- 1950, Korean War, Defense contracts
- 1952, age 66; voluntarily steps down and is replaced by a younger man as president of Martin Company
- 1953, mother died
- 1953, Martin Company began designs for spacecraft Viking, Vanguard Rocket
- 1955, age 69, died on his farm from cerebral hemorrhage

Guiding Teacher Questions

1. Does anyone know a person/family member who's in aviation industry?
2. Is anyone interested in aviation aeronautics?
3. Is anyone interested in becoming a pilot? Commercial or military?
4. How important was the Wright Brothers flight in 1903?
5. What has inspired you to take initiative and create or try something new?
6. What interests/disinterests you about our armed services?

Malcolm and Allan
F-1 flying boat

Allan and Malcolm Loughead

- 1887, Malcolm born, San Francisco, CA
- 1889, Allan born, San Francisco, CA
- 1910, Allan began work as an airplane mechanic and shortly learned how to fly
- 1912, Brothers believed they could make money flying people in planes
- 1913, Borrowed $4,000 from cab company, built a two-seat flying boat "Model G"
- 1913, Charged $10 fee, but more than people willing to pay. Unable to make payments creditors seized their plan.
- 1915, Eventually bought back plane and showcased it at the Panama-Pacific International Exposition in San Francisco
- 1916, Started the Loughead Aircraft Manufacturing Company in Santa Barbara, CA
- 1918, Developed the world's largest seaplane, "F-1". Received a contract with Navy
- 1921, Loughead Aircraft closed after $2,500 asking price was too expensive for buyers
- 1921, Malcolm moved to Detroit, became successful with hydraulic brake system
  Changes name to "Lockheed" because of its mispronunciation "Log-head"
  Established new company, "Lockheed Hydraulic Brake Company"

- 1926, Allan established, “Lockheed Aircraft Corporation” with Jack Northrop.
  Built the Vega (high-speed monoplane) with room for six people and a top speed of 185 mph
- 1928, Lockheed Aircraft went bankrupt during Depression
- 1932, Robert Gross (finance investor) purchased company and salvaged name
  Amelia Earhart becomes first woman to fly solo across the Atlantic
- 1934, Allan legally changes name to Lockheed
- 1945, Allan continued his career as a real estate salesman while serving as an
  aviation consultant
- 1958, Malcolm dies at age 69
- 1969, Allan kept an informal relationship with Lockheed Air Corporation until his death

Guiding Teacher Questions continued

1. Who and what types, if any, of entrepreneurships have you thought about?
2. Most of these avionic inventions have gone towards U.S. Defense. Is it good/bad? Why?
3. What are the benefits and drawbacks of the accomplishments of Martin and the Lougheads?
4. Who has attempted a task and failed the first, second and third times? What eventually happened?
   (Martin and Loughead finally were successful at it after countless attempts.)
5. How would our life be different today if the Wright Brothers never achieved flight?

Spaceship One

Lockheed Martin (merger)

- 1995, the two companies, Lockheed Corporation and Martin Marietta Corporation merged to form Lockheed Martin
- Headquarters in Bethesda, Maryland
- Employs 130,000 people worldwide
- Engaged in research, design, development manufacture, integration of advanced technology systems, products and services

Customer Base

- 80% of Lockheed Martin's business is with the U.S. Department of Defense and U.S. Federal Government agencies

Largest provider of:

- IT services
- Systems integration
- Training to the U.S Government

Remainder of business comprises of:

- International government
- Commercial sales of products, services and platforms

Financial Performance

2003 reported sales: $31.8 billion

Organization
(Five Operating Units)

Aeronautics

2003 sales - $10.2 billion includes

- tactical aircraft
- airlift
- aeronautical research and development lines of business

Electronic Systems

2003 reported sales: $ 8.9 billion

- missiles
- fire control
- naval systems,
- platform integration
- C4I (missile) lines of business

Integrated Systems

2003 reported sales: $3.4 billion

- addresses growing need for highly integrated systems and solutions
- “network centric” vs. “platform centric”

Space Systems

2003 reported sales: $6 billion

- space launch
- commercial satellites
- government satellites
- strategic missiles

Technology Services

2003 reported sales: $3.1 billion

- federal services
- energy programs
- government and commercial IT
- aeronautical/aerospace services lines of business

Unit: Sputnik: How It Changed Our World Today

Lesson II

Title: The Significance of Sputnik

Objective: Students will gain a better understanding of Sputnik I and its effects on the United States. Students will understand the importance of the launching and the events that followed.

Vocabulary:

- Cold War
- Space Age

- Sputnik I
- Vanguard
- Laika
- Malcolm Lockheed
- Allan Lockheed
- Space Race
- NASA 1958
- International Geophysical Year (IGY)
- Glenn Martin

Activity: Readers Theater

Instructions:

1. Get into groups of five to six.
2. Create a script and present it to the class.
3. Each participant will have a character and MUST have at least seven lines to read.
4. Include a setting to describe the background of your play.
5. The topic should be based on any of the lectures we have discussed so far
    a. topics may include: Glenn L. Martin, Lockheed Brothers, Sputnik I, Space Race, Cold War, forming of NASA, or IGY.
6. Language should be appropriate (see me if you have any questions)
7. May use slang to make it fit to your liking.
8. Have fun! This is fictional to a degree, but certain facts should be stated with accuracy.

Example of a Readers Theater

Setting: The Year is 1909. Allan, Malcolm are laughing and jumping up for joy as they watch their long time friend, Kaya, land their F-1 Flying Boat that they built. The successful flight lasted roughly 30 minutes. This is the first flight that has lasted more than five minutes. As Kaya pulls the airplane to a halt, he jumps out and jumps into the waiting arms of Allan and Malcolm who are waiting for their pilot to touch ground so they can all celebrate. As they all embrace and give each other high fives, all three tow the plane back to their barn and begin to talk about their budding careers and future.

Malcolm – WE DID IT! We finally did it!

Allan – You better believe it! Finally. We are going to be rich and famous someday. You guys will see, we are all going to be on the cover of TIME and the Rolling Stones Magazines. I can see it now, “the Loughead brothers and Kaya up the Wright Brothers one in their flight.”

Kaya – Oh yeah, I think I’ll have to buy a nice Armani Suit for that photo-shoot.

Allan – Kaya, What the heck is an Armani Suit?

Kaya – I don’t know, but doesn’t it sound nice and expensive

Allan – I suppose so; just make sure you shave WHEN they do take our picture for TIME.

Malcolm – Boys relax! We have to focus and figure out how we can make a business out of this. We have lots of work to do. Just because we fly a plane for 30 minutes doesn’t mean we are going to be rich

and famous. Let's not get ahead of ourselves. BUT, do you two have any ideas how we can profit from this?

Allan – I think we should charge people to watch us fly around. The Wright Brothers are the only other show on earth, and including us, that will be two shows on earth.

Kaya – You're such an Einstein, Allan. "We'll be two shows on earth." You're so full of it. Everyone has seen what an airplane can do. It goes up, flies around, take a turn here, takes a turn there and then lands back down. Seen it done that. Big deal. We need to do something more for them… Like fly people around as passengers.

Malcolm's eyes light up as soon as he hears Kaya say fly people around. His right leg is shaking as it always does when he gets excited. He puts his Diet Coke down, puts his hand on Kaya's shoulder with a look of surprise.

Malcolm – Not a bad idea Kaya. That could actually work. Of course, we have to build a larger airplane that will seat more than one and possibly up to four. Flying people around for $200 a ride.

Allan – TWO HUNDRED DOLLARS! Are you out of your mind? Who in their right mind will and can pay two hundred dollars for a plane ride? We're in San Francisco of all places. Who has that kind of money lying around when fathers and mothers need to feed their family. Now, I know we're a bunch of smart guys here, but math guys we are NOT!

Kaya – How about one hundred and ninety-nine dollars.

Malcolm – Or one hundred ninety-nine dollars and ninety-nine cents. Still less than 200.

Allan – Goodness! I'm going to sleep. Maybe you two should rest on it too.

Allan gets up, walks over to a pile of hay, and flops down for a nice long nap. Malcolm and Kaya sit at the table pensively looking outside of the barn thinking of ways to get on the cover of the Rolling Stone.

Reader's Theater Rubric

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Organization	The story is very well organized. One idea or scene follows another in a logical sequence with clear transitions.	The story is pretty well organized. One idea or scene may seem out of place. Clear transitions are used.	The story is a little hard to follow. The transitions are sometimes not clear.	Ideas and scenes seem to be randomly arranged.

Dialogue	There is an appropriate amount of dialogue to bring the characters to life and it is always clear which character is speaking.	There is too much dialogue in this story, but it is always clear which character is speaking.	There is not quite enough dialogue in this story, but it is always clear which character is speaking.	It is not clear which character is speaking.
Writing Process	Student devotes a lot of time and effort to the writing process (prewriting, drafting, reviewing, and editing). Works hard to make the story wonderful.	Student devotes sufficient time and effort to the writing process (prewriting, drafting, reviewing, and editing). Works and gets the job done.	Student devotes some time and effort to the writing process but was not very thorough. Does enough to get by.	Student devotes little time and effort to the writing process. Doesn't seem to care.
Creativity	The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.	The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.	The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.	There is little evidence of creativity in the story. The author does not seem to have used much imagination.
Focus on Assigned Topic	The entire story is related to the assigned topic and allows the reader to understand much more about the topic.	Most of the story is related to the assigned topic. The story wanders off at one point, but the reader can still learn something about the topic.	Some of the story is related to the assigned topic, but a reader does not learn much about the topic.	No attempt has been made to relate the story to the assigned topic.

A = 18-20 B = 16-17 C = 14-15 D = 12-13 F = 11 and below

Teacher Notes/ Transparencies/Key Concepts/Vocabulary

Cold War- major competition between the super-powers; United States and USSR (today's Russia). There was no physical fighting, but a struggle of which country was technologically, politically and militarily superior.

For example, Democracy vs. Communism. Which governmental system is superior to the other?

International Geophysical Year (1957-58) –

- 1952, the International Council of Scientific Unions decided to establish July 1, 1957 to December 31, 1958, as the IGY because the scientists knew that the cycles of the solar activity would be at a high point then.

- 1954, the council adopted a resolution calling for artificial satellites to be launched during the IGY to map the Earth's surface.

- July, 1955 the White House announced plans to launch an Earth-orbiting satellite for the IGY and solicited proposals from various government research agencies to undertake development.
- September, 1955 the Naval Research Laboratory's Vanguard proposal was chosen to represent the U.S. during the IGY
- Space race - competition between the U.S and the Soviet Union to determine who would become the first country to occupy their place in space

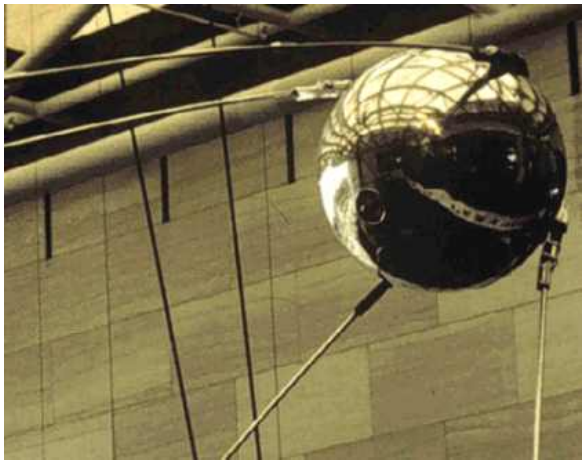
Preparation for IGY

U.S.- space program was conducted in full view of the world with cameras covering their every move, but they struggled (too much hype).

USSR – space program was centered in a remote region of Kazakhstan and conducted with the utmost secrecy.

National Perception – U.S. at this time was clearly the world leader in technology. Credited for WWII, Korean War and its powerful military

- October 4, 1957; Soviet Union successfully launched Sputnik I.
- What is Sputnik I? An artificial satellite, the size of a basketball.
    - Sputnik – meaning, "fellow traveler of earth"
    - aluminum 22-inch sphere *(bring basketball to illustrate approximate size)*
    - four antennae
    - 183 pounds
    - small radio beacon (beep in intervals)
    - telemetrically verified exact locations on the earth's surface
    - 98 minutes to orbit the Earth on its elliptical path
    - three months after launch, Sputnik fell from orbit



Sputnik I

Sputnik I Launch Pad

Significance of Sputnik I/ U.S. Public Outlook

- Soviet Union had a greater amount of technological knowledge than the U.S.
- Caught the world's attention and the American public off-guard
- Established their presence in space
- Communism was mastering the universe
- American dismayed by the beeping sound coming from their radios and TV's
- Launch translated into Soviet's capability to launch ballistic missiles that could carry nuclear weapons from Europe to the U.S.
- President Eisenhower downplayed the evening saying, Sputnik was "one small ball in the air." ……"and it's something which does not raise my apprehensions, not one iota."
- U.S. stock market dropped from 461.70 to 419.79 (9.9%) in three weeks (economics) (drop gave the idea that the nation was technologically inferior)
- Eisenhower administration blamed for letting the Soviet Union *best* the United States November 3, 1957 – Soviet Union launched Sputnik 2 carrying a dog.
- Spacecraft weighed 1,120 pounds
- stayed in orbit for 200 days
- Laika- name of dog

United States Response to Sputnik I and II

- 1957, test launched Project Vanguard, but failed. The rocket rose about three feet above the platform, shook briefly and disintegrated in flames
- 1958, (February) launched Vanguard vehicle that reached an altitude of four miles and then exploded
  (January), successfully launched Explorer I from Cape Canaveral, Florida
  - satellite carried a Geiger counter to measure radiation encircling the earth
  - instrument verified the existence of the Earth's magnetic field
  - discovered what came to be called, the "Van Allen Radiation Belts"
  - (March), Project Vanguard received additional funding and was successfully launched. Vanguard I confirmed the existence of the Van Allen belts and their severity

Space Act – July 29, 1961 Congress passed a bill and that signed into law
Within the executive office, NACA advise the President in matters relating to the establishment of space policy and to the administration of the nations space program Headed by the Vice-President (1961), includes Secretary of State, and Secretary of Defense
Functions:

1. Plan, direct aeronautical and space activities
2. Arrange for participation of scientific community
3. Dissemination of information concerning results and activities

(October), birth of National Aeronautics and Space Administration (NASA) formerly known as, National Advisory Committee for Aeronautics (NACA)

The Years that Followed Sputnik

- 1963, President John F. Kennedy announces plans to land a man on the moon and returning him safely to the earth
- 1960-1968, both the U.S. and Soviet Union landed spacecrafts on the moon
  Soviets landed a series of rovers that they used to explore the lunar surface
- 1969, July 20, U.S. successfully lands Neil Armstrong on the moon

10:56pm – Armstrong takes first steps on the lunar moon
11:15pm – Edwin Aldrin joins Armstrong on the moon's surface
The astronauts unveiled a plaque mounted on a strut of the spacecraft and read to a worldwide TV audience, "Here men from the planet Earth first set foot on the moon July 1969, A.D. We came in peace for all mankind."
- After raising the American flag and talking to President Nixon by radiotelephone, the two astronauts deployed the lunar surface experiments assigned to the mission and gathered 22 kilograms of samples of lunar soil and rocks.
- 1:11 a.m. July 21, reentered spacecraft and closed hatch in preparation for return to earth
- total time on the moon: 21 hours 36 minutes on the lunar surface

Quotes:

"Houston, Tranquility Base here - the Eagle has landed." – Neil Armstrong
“One small step for man, one giant leap for mankind” - Neil Armstrong

Launching of Sputnik led to the following:

- 1970s, Martin, Heritage, Good year Aerospace, Lockheed Company’s continue to develop new technology at a rapid pace.
  - SR-71 Blackbird aircraft –retains world record for speed
  - Heritage develops first digital sonar capability for Navy
  - Martin produces a multiple docking adapter for Skylab- America’s first space station
  - all make Mars exploration possible contributing to (Viking I & II spacecraft)
  - Development of the Global Position System (GPS)
  - First launch of the Trident I fleet ballistic missile from the USS Francis Scott Key

Man made Maneuvering Unit (MMU)

- 1980s,
  - Launching of the Space Shuttle
  - Development of heat-resistant tiles on Shuttle
  - Man made Maneuvering Unit (allows astronauts to free float outside the Space Shuttle Challenger)
  - Release of the F-117a Stealth Fighter
  - Introduction of NEXRAD Doppler weather radar, the world’s first advanced weather tracking radar system

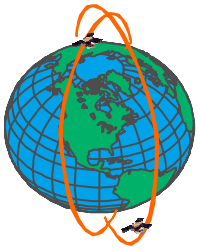
Lesson III

Title: Technology and how it relates to us.

Objective: Students will obtain a general view of a prototypical satellite and their different functions. Students will learn how different types of technology apply to their everyday lives.

- **What are satellites?**
- **What are the key types of satellites?**
- **What are the significant parts of a satellite?**
- **What does it take to put a satellite in orbit?**
- **Who builds satellites?**

What are satellites?



100's of man-made satellites orbit the earth

Satellites orbit a planet, like our Earth

- A planet's gravitational force keeps them orbiting the planet

Moons also orbit Jupiter

<u>Natural</u> satellites are not made by people

- The Moon is a natural satellite orbiting earth

Hubble Space Telescope Observes the origin of the universe

<u>Artificial</u> satellites are made by people

- These satellites take years to build and launch

Source: Lockheed Martin: Satellites. January 2002 (#P547022)

What are the types of satellites?

Space Sciences

- **Observe stars, planets and origin of universe**

Earth Observation

- **Image the earth and used to map the world**

Meteorological

- **Monitor weather and climate change**

Telecommunications

- **Provide telephone, internet, T.V. and data services**

Global Positioning Systems (GPS)

- **Provide worldwide navigation for airplanes, ships and cars**

While far up in Space, Satellites are used in our everyday lives

Source: Lockheed Martin: Satellites. January 2002 (#P547022)

****Teacher: Use page 29 to help illustrate**

What are the key parts of a satellite?

- **Satellites are made up of major "subsystems"**
  - **Examples:**
    - **Power and propulsion subsystem**
    - **Attitude Control subsystem**
    - **Command and data handling subsystem**

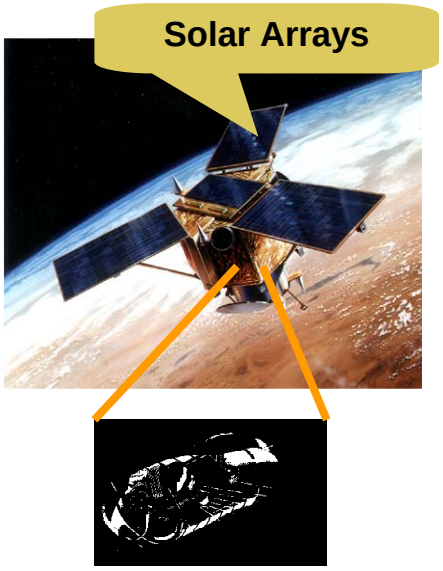
- **These subsystems are integrated together with the satellite structure to create a "satellite bus"**

- **A "Payload" is then integrated with the satellite bus**
  - **a Payload is the primary mission of the satellite**
  - **Examples:**
    - **Communications**
    - **Imaging cameras**
    - **Telescopes**
    - **Direct broadcast TV**

**** Teacher: See Page 28 for A2100 basic model (use in addition to this page)**

Source: Lockheed Martin: Satellites. January 2002 (#P547022)

Power and Propulsion subsystem



Battery must last 5-7 years

- Satellite is powered by Solar energy from the sun
  - Solar arrays point to sun to gather energy from sunlight
  - Battery inside satellite is charged by solar power for use when on dark side of earth
  - All satellite functions are powered by solar arrays/batteries, except for orbit adjustment
- Satellite use propulsion thrusters (small jets) to make orbit adjustments

Source: Lockheed Martin: Satellites. January 2002 (#P547022)

The Satellite launch is a dangerous and exciting time

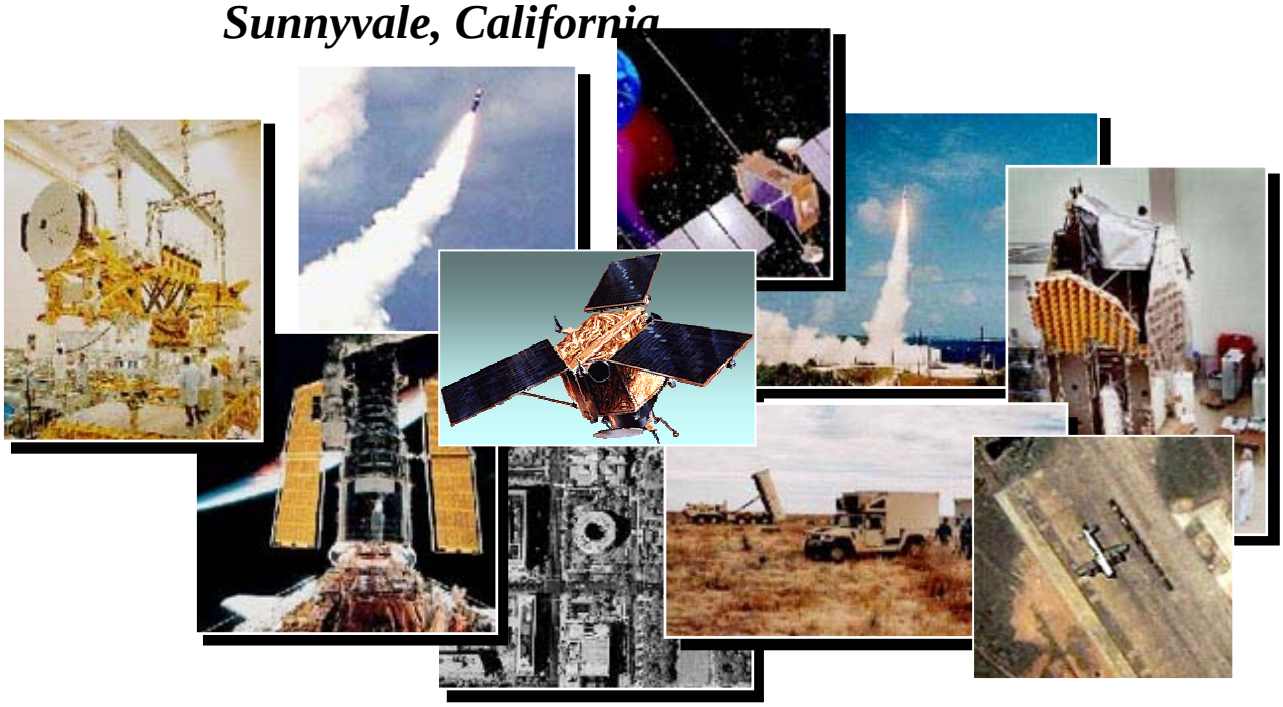
IKONOS 2/Athena II liftoff from Space Launch Complex 6, Vandenberg Air Force Base, California
24 September 1999, 11:21 a.m. Pacific Time

- **Satellites range in size from 100 pounds to 47,000 pounds**
- **It takes a large rocket (10-20 stories high) to launch many satellites**
- **Many satellites are larger than a school bus!**

Source: Lockheed Martin: Satellites. January 2002 (#P547022)

Who Builds Satellites?

Lockheed Martin Space Systems Company
Sunnyvale, California

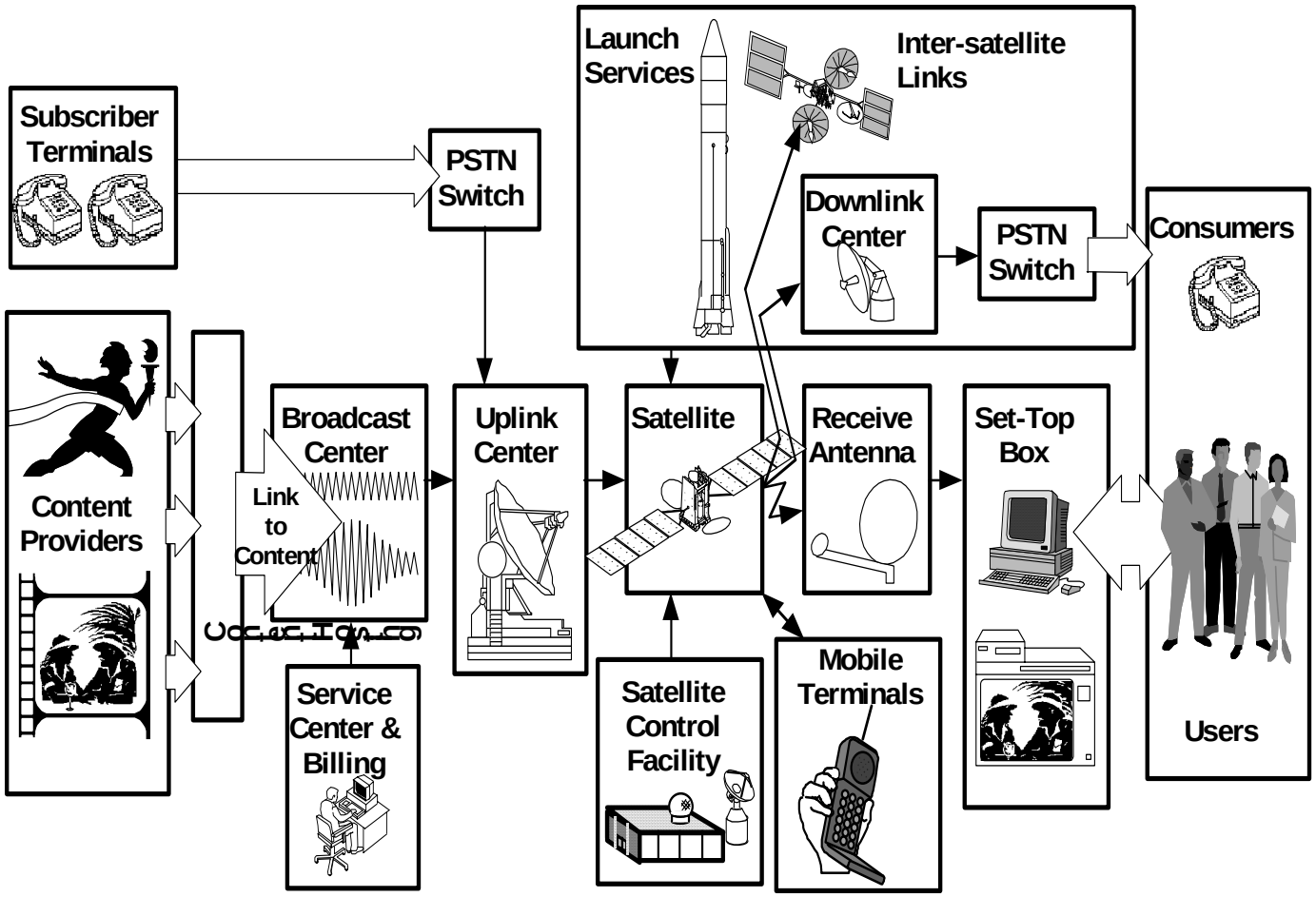


Lockheed Martin has built and launched over 750 satellites.
More than all other companies in the world combined!

Source: Lockheed Martin: Satellites. January 2002 (#P547022)

Communications Satellite System

(Flow of intelligence)



Source: P/O A2100 Satellite Communications Class
Charts on server:\\Csc2\Common\Comm Class Library\Chart Set
File name: Comm_Class_dcb.

Why Communicate by Satellite?

1. Cost effective in the short term.
2. World-wide coverage

Services

Commercial (service providers) allows us immediacy to multiple services

1. Voom – HDTV
2. Echostar – transmits over 150+channels
   EchoStar Communications' DISH Network – first DBS satellite launched in 1995. Provides local channel coverage to residential television viewers.
3. Telecast Canada – 150+ channels
4. Global Star – satellite phones (little use because of fiber-optics & cable)
5. Iridium – satellite phones (little use, time to get satellite into space is longer)
6. Asia Cellular Satellite (ACeS) – wireless service provider in Asia

Technology in our lives today!

Technology is more accessible to the public more than ever.

Who uses or knows of someone who uses the following items/services?

Cellular phones – Sprint, AT&T, Cingular, Nextel

(email, send photographs, text mail, play games, beam information, calendar, music, Internet)

Pagers – Motorola, Metrocall

LCD – in cars as an option (moving towards standard)

Radio Satellite – in cars (receive over 500 stations without commercials)

GPS – (camping, cars, hiking, directions)

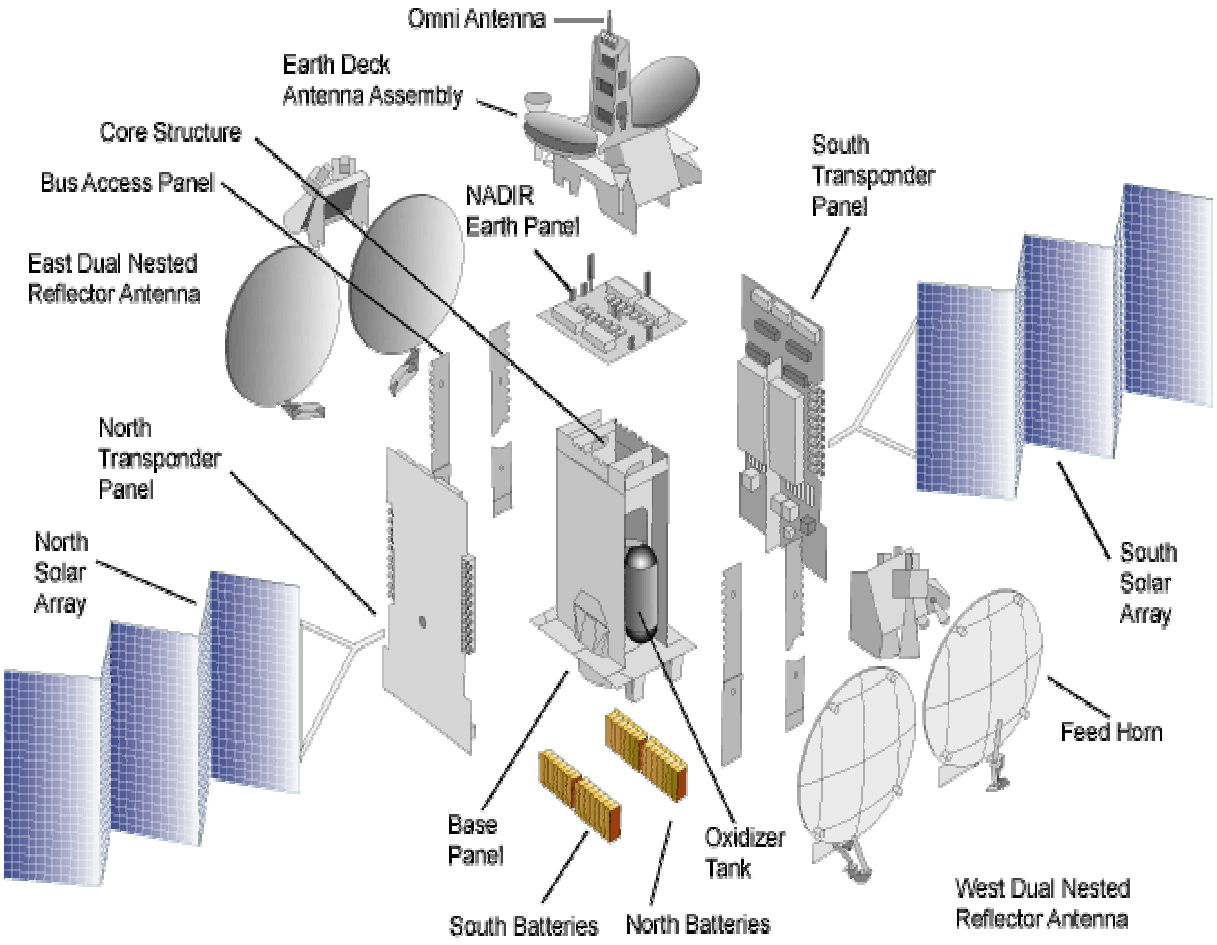
Palm Pilot – planner, to do list, phone book, phone, computer, and email built into one

MP3 – I-Pod, Rio, Sony (digital files from the Internet)

Laptops – companies target children as young as eight and customize computers for their age bracket

Teacher Transparency (basic model satellite)

Anatomy Of An A2100: The Industry's Most Flexible And Modular Platform

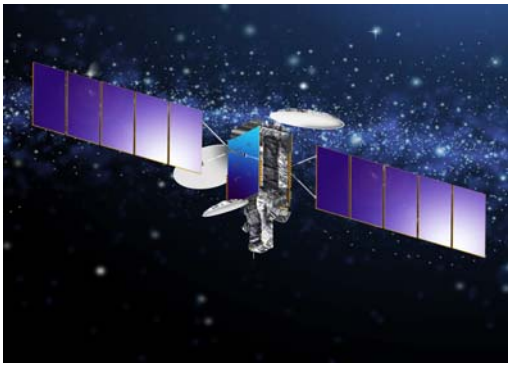


Source: http://www.lmcommercialspace.com/pay/capabilities.htm

Teacher Transparency

Satellites

NSAT 110
(Commercial Broadcast)

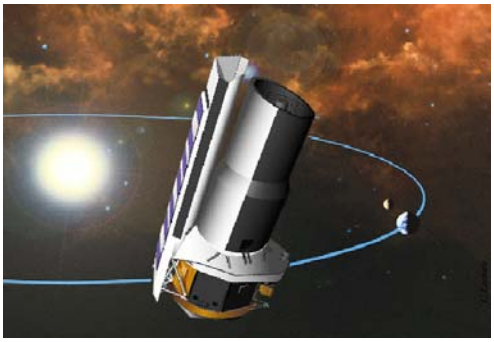


NEWSKY7
(Commercial Broadcast)

NEWSKY6
(Commercial Broadcast)

ACeS
Asia Cellular Satellite System
(Commercial Broadcast)

IKONOS (Imaging)



Space Infrared Telescope Facility (SIRTF)

Source: http://www.spaceimaging.com/

Unit: Sputnik: How It Changed Our World Today

Lesson IV

Title: Where Do We Go From Here? (Guest Speaker)

Objective:

- Students will gain direct insight and information from a guest speaker from Lockheed Martin.
- Students will have the opportunity to ask questions based on our class lecture and the speaker's presentation.
- Students will actively take notes while listening to the speaker.
- Students will write a Thank You letter to our guest speaker.

Guest Speaker Worksheet

Name of Speaker	
Company	
Occupation	
What I know	
What I want to know	
What I learned	
Educational/Job Skills required/related Engineering, Science, or Technical Career	

Rubric for Student Worksheet (Guest Speaker)

	Exemplary (4)	Accomplished (3)	Proficient (2)	Emerging (1)	Did not address
Student stated name, company occupation	Lists all criteria	Lists three of the criteria	Lists two of the criteria	Lists one Criteria	
Student listed 4 existing facts/concepts about subject	Lists all criteria	Lists three of the criteria	Lists two of the criteria	Lists one criteria	
Student listed 4 particulars students wants to know	Lists all criteria	Lists three of the criteria	Lists two of the criteria	Lists one criteria	
Student listed 4 pieces of information that they wanted to know	Lists all criteria	Lists three of the criteria	Lists two of the criteria	Lists one criteria	
Student listed 4 educational/ Skills requirements	Lists all criteria	Lists three of the criteria	Lists two of the criteria	Lists one criteria	