Have you Ever Thought About Being An Engineer?

Alf Carroll, Sr. Principal Systems Engineer*
Kim Francis, Director of Engineering**
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Alf Carroll - Raytheon

Ever thought about being an Engineer ?

- **Curious how things work?**
- **Take things apart to see?**
- **Modify things to make them work better for you?**
- **Enjoy working with a team?**
- **Do you like math?**

  (or at least understand it)

Ever thought about being an Engineer ?

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- **Take things apart to see?**
- **Modify things to make them work better for you?**
- **Enjoy working with a team?**
- **Do you like math?**
- **If you say yes to most of the above, you should consider becoming an Engineer**

What do you want from a career?

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- **Well-paid?**
- **Job Security?**
- **Challenging & Fun?**
- **Flexible Schedule?**
- **Ability to change careers?**
- **Travel?**

Why Engineering?

- **Engineers are in Great Demand**
- **Many important problems that need to be solved**
- **YOU could be part of the solution!**
- **It can actually be fun, rewarding work, and provide good $$$.**

Avg. Starting Salaries For College Grads

Engineers have the best starting pay out of college !

Average Starting Salary Offers to Class of 2007 College

Major	Average salary offer ($)
Chemical engineering	59,218
Computer engineering	55,920
Electrical engineering	55,333
Mechanical engineering	54,057
Computer science	53,051
Information sciences & systems	49,966
Civil engineering	48,998
Economics (business/managerial)	47,782
Management information systems	47,407
Finance	46,442
Accounting	46,292
Business administration/management	43,256
Marketing	39,269
Political science/government	35,261
History	35,092
Sociology	32,161
English	31,924

Challenges in Today's World

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Challenges in Today's World

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- **Here's just a few examples :**
  - **Global Warming**
  - **Future Sources of Energy**
  - **Countering Terrorism**
  - **World Hunger and Disease**
  - **Global Economy**
  - **Pollution**

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Future Engineers and Scientists are going to be a Key Part of the SOLUTION

Global Warming

KNOWN:

- The earth is getting warmer
- CO_2 is a greenhouse gas

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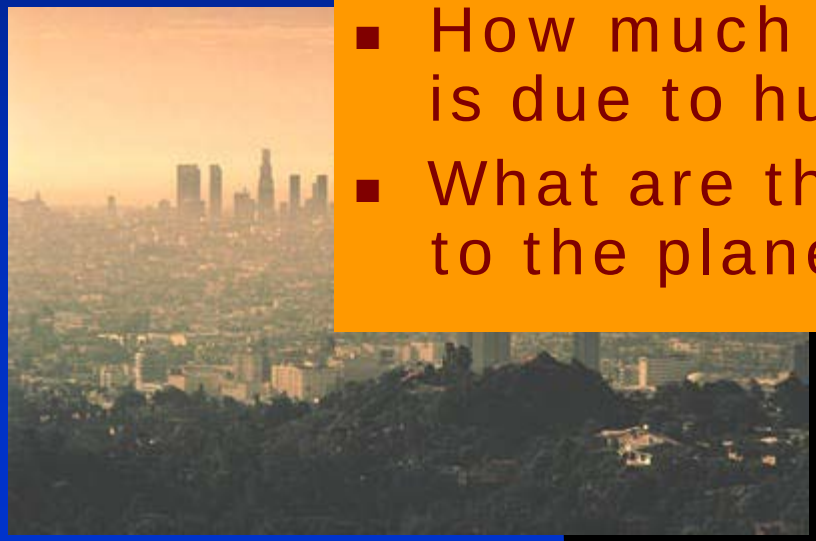
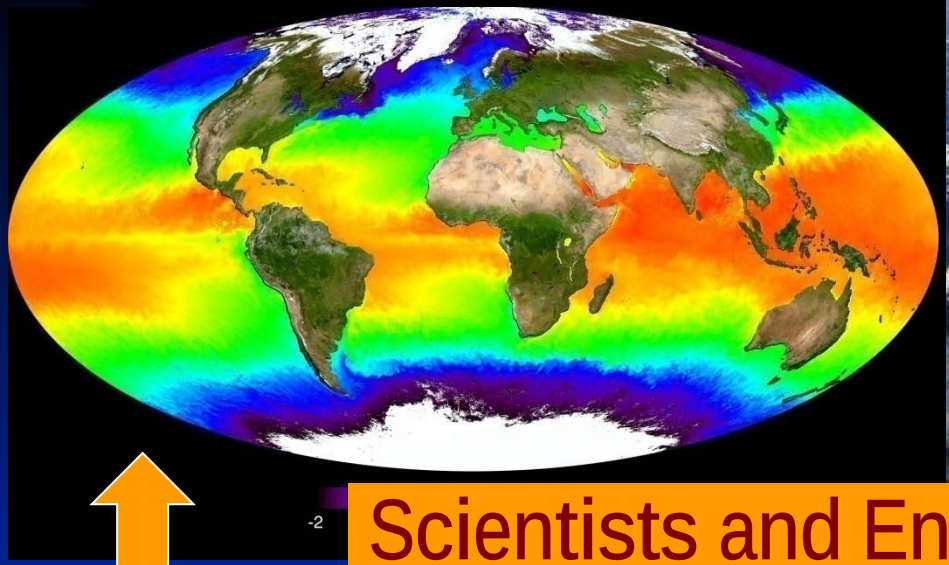
QUESTIONS:

- How much of the warming is due to human activity?
- What are the consequences to the planet?



Global Warming



Scientists and Engineers team up to solve these questions:
Climate Monitoring & Modeling

Environmental Scientists

Global Warming
Meteorology

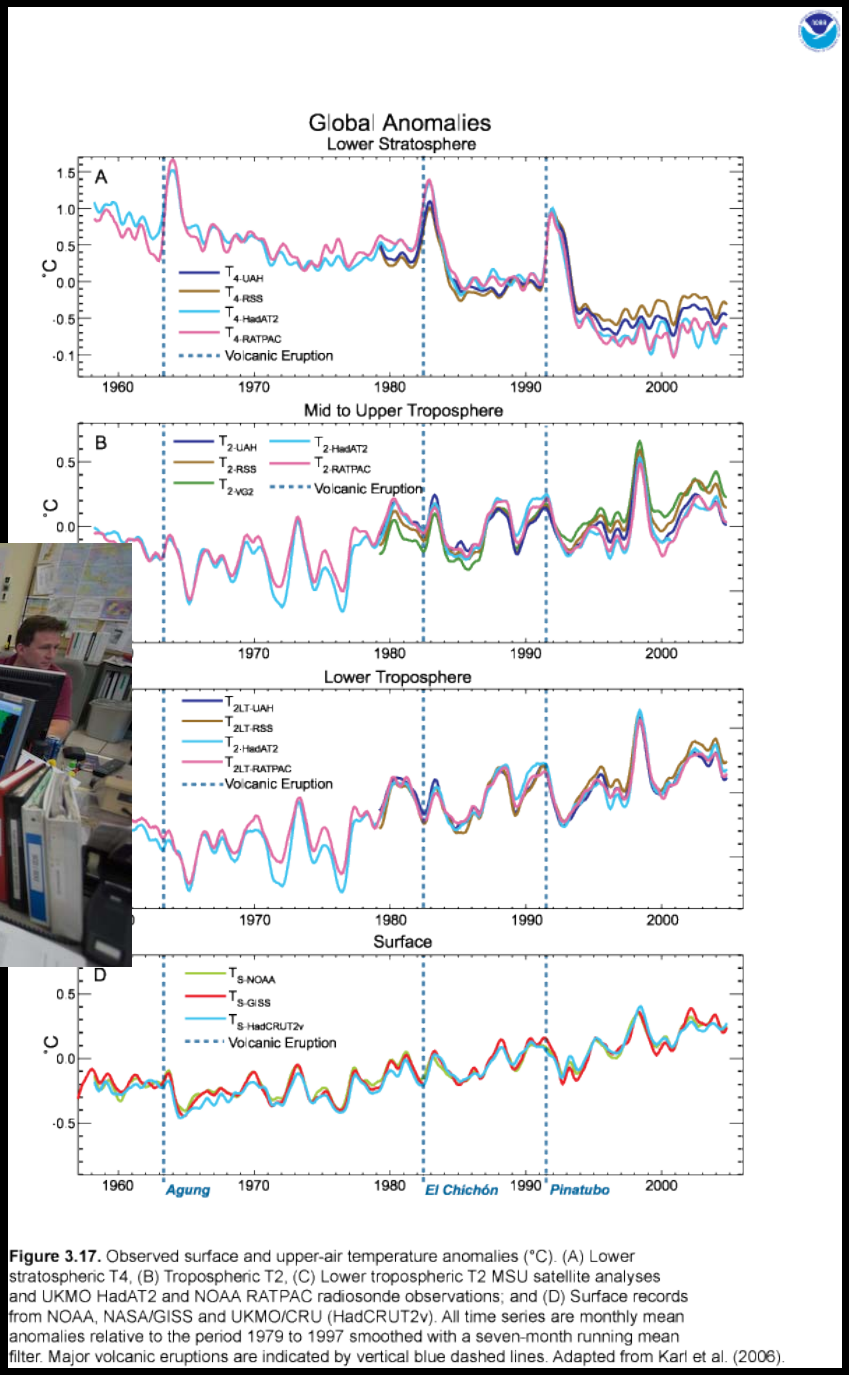


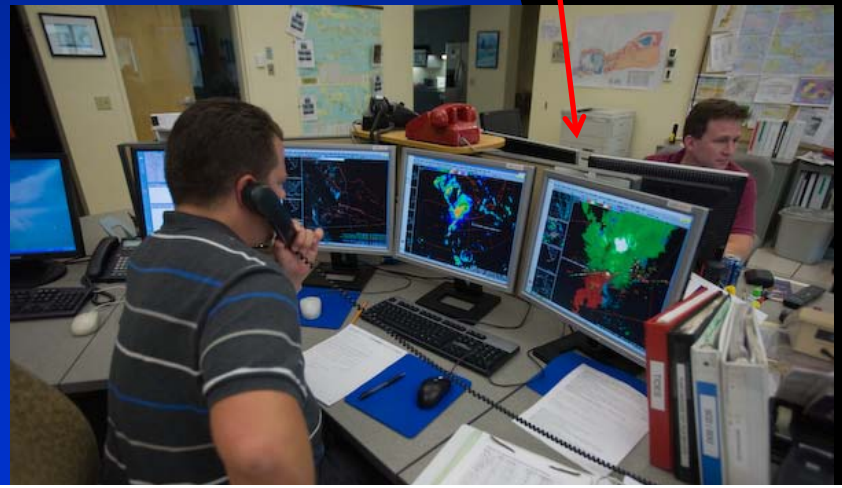
Figure 3.17. Observed surface and upper-air temperature anomalies (°C). (A) Lower stratospheric T4, (B) Tropospheric T2, (C) Lower tropospheric T2 MSU satellite analyses and UKMO HadAT2 and NOAA RATPAC radiosonde observations; and (D) Surface records from NOAA, NASA/GISS and UKMO/CRU (HadCRUT2v). All time series are monthly mean anomalies relative to the period 1979 to 1997 smoothed with a seven-month running mean filter. Major volcanic eruptions are indicated by vertical blue dashed lines. Adapted from Karl et al. (2006).

Global Warming
Weather Balloon

MECHANICAL ENGINEERING:
Low cost rugged, reliable

ELECTRICAL ENGINEERING:
Accurate sensors, radio transmitter, low power

COMPUTER ENGINEERING:
Data processing, user interface, graphics display



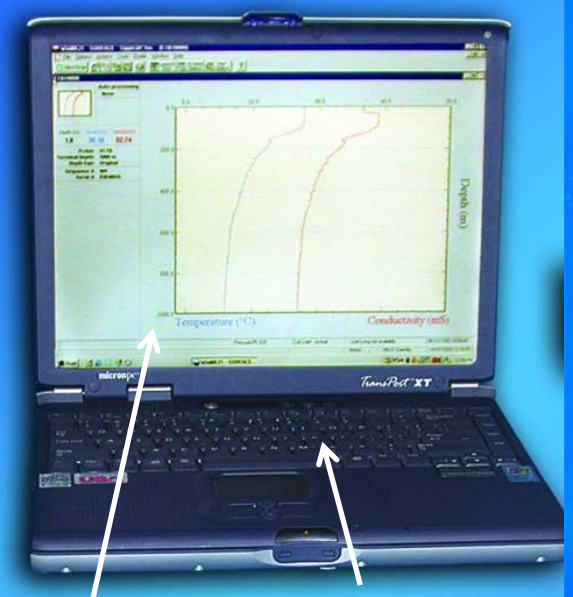
SAFETY/ ENVIRONMENTAL ENGINEERING:
Safe for people and surrounding environment

Technical Solutions Require Knowledge and Teamwork!

Mark Whalen – Lockeed-Martin

Global Warming

Oceanographic Instruments



Programming

User Interface

Computer Engineering

Electrical Engineering

Digital Signal Processing

Accurate Sensors

Low Power

Waterproof Wire

Hydrodynamic Shape

High Pressure Housing

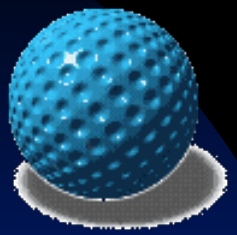
Low Cost

Mechanical Engineering

Technical Solutions Require Knowledge and Teamwork!

Hands-on examples

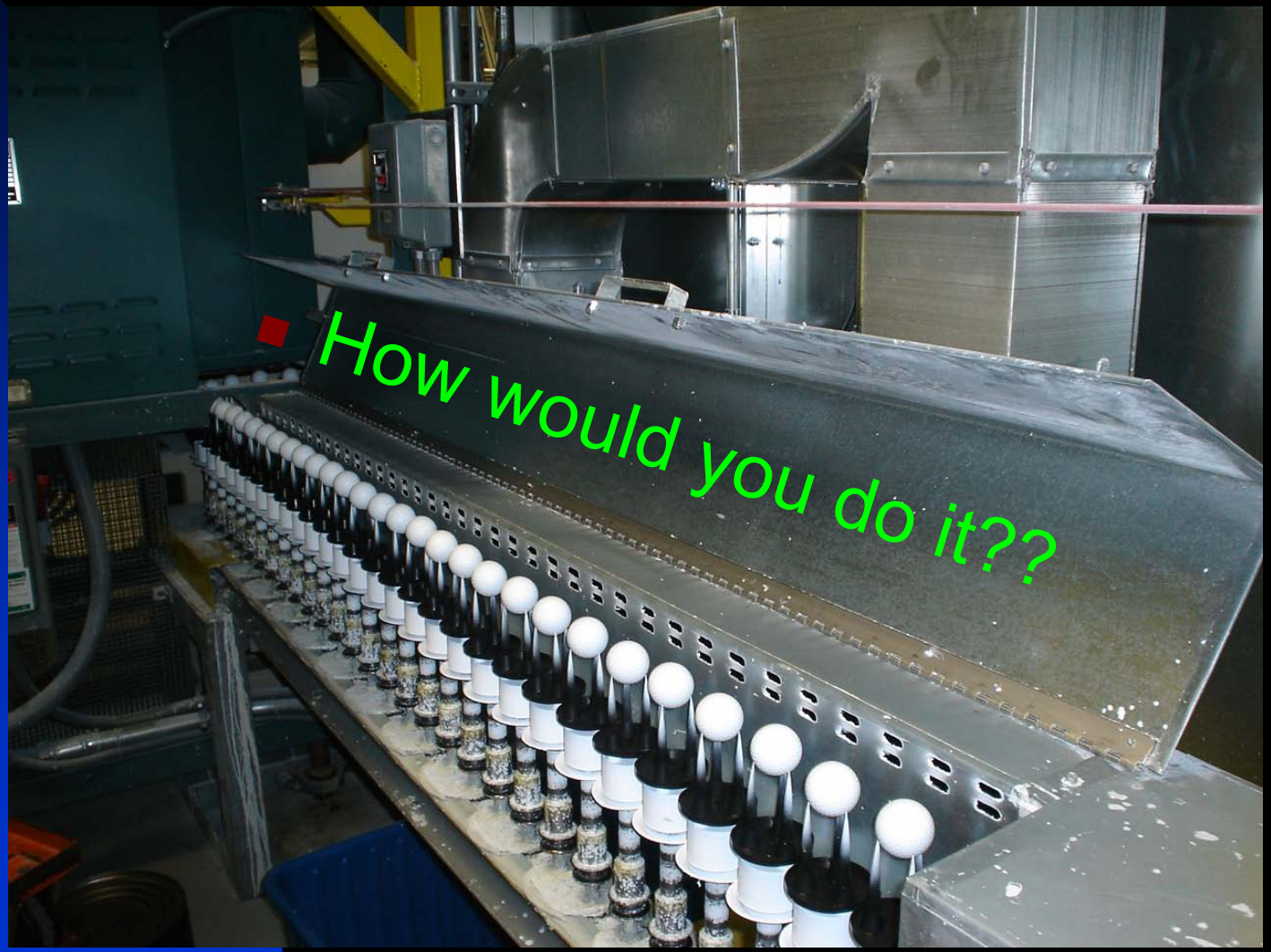
Manufacturing Engineering



- What does it take to make a product?
  - An idea, concept, invention
  - A design, then drawings to specify materials, sizes, product performance characteristics
  - A process to get raw materials, make parts and put them together
  - Assembly equipment and testing procedures to ensure safe, efficient operation
  - A warehousing plan to distribute it
  - A marketing plan to sell it

Kim Francis – Titleist Golf

Example: painting a golf ball



Example: painting a golf ball

- Must have even, smooth application
- Must allow product to dry
- Cannot let excess paint go into the atmosphere
- Must process enough product to be economical

Kim Francis – Titleist Golf

Terrorism Defense

- **EXAMPLE: USS Cole was attacked in 2000, by Terrorists (17 Sailors died)**
- **VERY Challenging Technology, esp. "Determining Hostile Intent"**
- **Need to defend against terrorists without hurting innocent people!!!**

How would you do it ??

Alf Carroll - Raytheon

One solution that does "Warning & Hailing" is LRAD "Long Range Acoustic Device"

LRAD is designed so Sailors can Hail, Notify (many languages), Warn &"Determine Intent"

***Before* Taking Severe Protective Action**

Great Engineering Helps Protect People and Improve Safety!

MECHANICAL ENGINEERING:
Compact, rugged, corrosion resistant

ELECTRICAL ENGINEERING:
High power level

ACOUSTICAL ENGINEERING:
Sound level very high in front, low in back

SAFETY/ ENVIRONMENTAL ENGINEERING:
Safe for sailors and surrounding environment

COMPUTER ENGINEERING:
Language translator

Engineering An LRAD

YOU Can Help Solve Some of the Worlds Challenges!

- **YOUR daily choices, plus:**
- **Engineers and Scientists Will Have Important Roles in the Solution**
- **Is anyone here already planning on it?**
- **Anyone thinking about it?**
- **Not sure yet, but curious?**

SO…. Think about this…

- **Consider pursuing Engineering or Science in College**
  - **Take lots of Math and Science**
  - **Talk to your Guidance Counselor, NHS Advisor, Math, Science Teachers**
  - **Check out nearby colleges: Northeastern, UMASS, WPI, UNH,URI,MIT**

Working with Schools

- Talk first to folks who speak our language
  - Science/Math teachers (MS and HS)
  - District Science/Math Coordinators
  - State Science/Math Coordinators & Associations
- Try to complement teachers' efforts
  - Class visits on engineering applications of basic science/math ideas
  - Mentor students & support student projects/competitions
  - Support/ Expand Tech Ed across curriculum

A Survey

Survey - Engineering Careers Presentation
ORR – 3/11/10

Please circle the appropriate response to each of the following:

1. The presenters effectively dealt with the topic "Considering a Career in Engineering."

Strongly Agree				Strongly Disagree
1 (20)	2 (18)	3 (5)	4 (1)	5 (2)

2. I am interested in a career in Engineering or the Sciences.

Strongly Agree				Strongly Disagree
1 (6)	2 (12)	3 (15)	4 (8)	5 (4)

3. Today's presentation was interesting and informative.

Strongly Agree				Strongly Disagree
1 (16)	2 (17)	3 (11)	4 (0)	5 (2)

4. Today's presentation was dull and uninteresting.

Strongly Agree				Strongly Disagree
1 (0)	2 (1)	3 (7)	4 (24)	5 (14)

5. The presentation was nicely organized.

Strongly Agree				Strongly Disagree
1 (14)	2 (27)	3 (4)	4 (0)	5 (1)

6. Visual aids were well designed and nicely organized.

Strongly Agree				Strongly Disagree
1 (20)	2 (19)	3 (5)	4 (2)	5 (0)

7. The speaker(s) appropriately involved the audience.

Strongly Agree				Strongly Disagree
1 (22)	2 (18)	3 (3)	4 (2)	5 (1)

8. Participants questions were answered satisfactorily.

Strongly Agree				Strongly Disagree
1 (22)	2 (16)	3 (6)	4 (1)	5 (2)

9. The presentation met my expectations.

Strongly Agree				Strongly Disagree
1 (16)	2 (22)	3 (6)	4 (1)	5 (1)

Continue on the back

Survey data

Which of the following types of engineering would you like to know more about? (Please circle one or more of the following)

- **Aerospace/aeronautical (7)**
- **Computer (11)**
- **Agricultural (3)**
- **Electrical/electronics and Communications (12)**
- **Architectural (8)**
- **Environmental (14)**
- **Environmental health (9)**
- **Bioengineering & biomedical (7)**
- **Industrial/manufacturing (4)**
- **Chemical (5)**
- **Materials (1)**
- **Civil (8)**
- **Mechanical (20)**
- **Mining and mineral (2)**
- **Nuclear (8)**
- **Petroleum (0)**

Optional:

What did you like best?

Alternate energy materials (6)
Handed around materials; visuals (4)
Relation to their personal lives/stories (3)
I started thinking about becoming an engineer. Liked the statistics favoring engineers.
Open atmosphere for questions. Guys really knew their stuff.
Whole presentation was good, so I liked it all.