

# Slides to use with “The Challenger Disaster and Correlations”

Correlations are discussed in Chapter 1 starting on page 30

# The Challenger explosion and Correlational Research

- For most students in the 1990s, the explosion of the space shuttle Challenger, on Jan. 28, 1986, was a distinct moment from their childhood (*a flashbulb memory*).

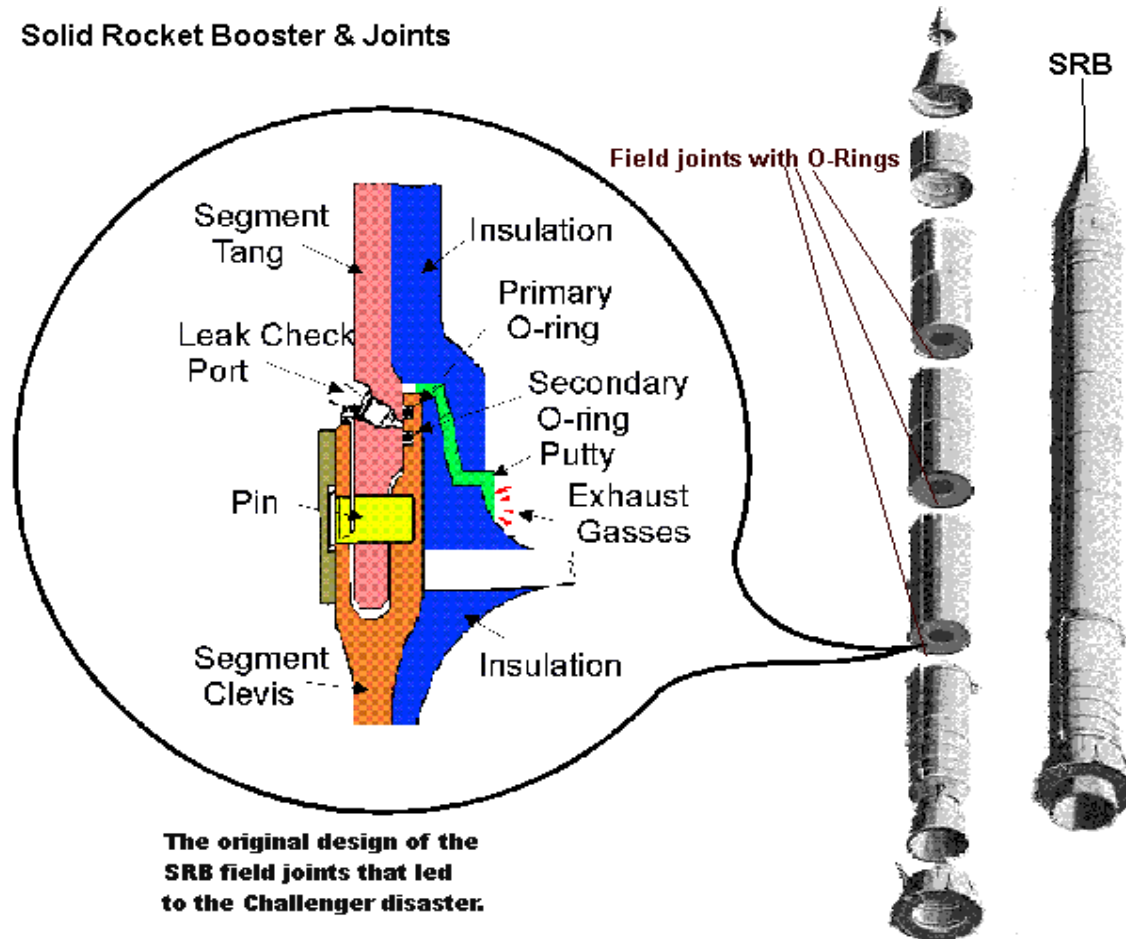


# The Challenger

- The decision to launch Challenger was in part based on a correlational analysis of failure rates and temperature.
- The shuttle exploded just after launch because of the failure of a part called an *o-ring* due to low atmospheric temperatures at the time of launch.
- This activity demonstrates the importance of accurately interpreting correlational data.

# Location of o-rings

Solid Rocket Booster & Joints



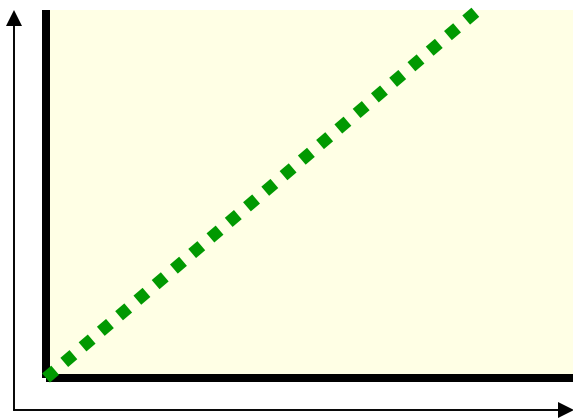
# 1. Correlational research Table A

NASA used data from previous launches to determine if there was a correlation between temperature and failure.

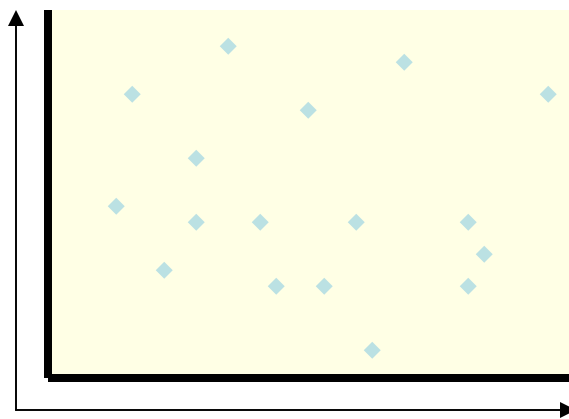
- Data table A (used to determine launch)

• Temperature	# of o-ring failures
• 53	2
• 57	1
• 58	1
• 63	1
• 70	2
• 75	2

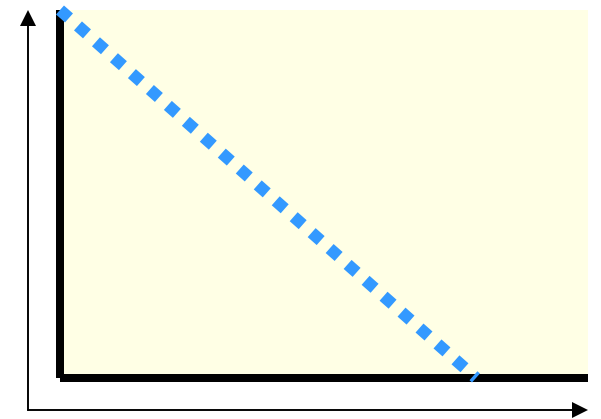
# Types of relationships, p. 31



**Perfect positive  
correlation (+1.00)**



**No relationship (0.00)**



**Perfect negative  
correlation (-1.00)**

## 2. Drawing a line of best fit

- This line roughly summarizes the direction of the points you have plotted.
- Do they appear to be going downward? Upward? Have no discernable direction?
- You draw a straight line through the entire graph---not necessarily through any point--  
- merely summarizing the direction, if any.

# 3. Correlation definitions

- *Positive*: both variables move in the same direction
- Example: the more hours you study for Wednesday's test in this class, the higher will be your grade

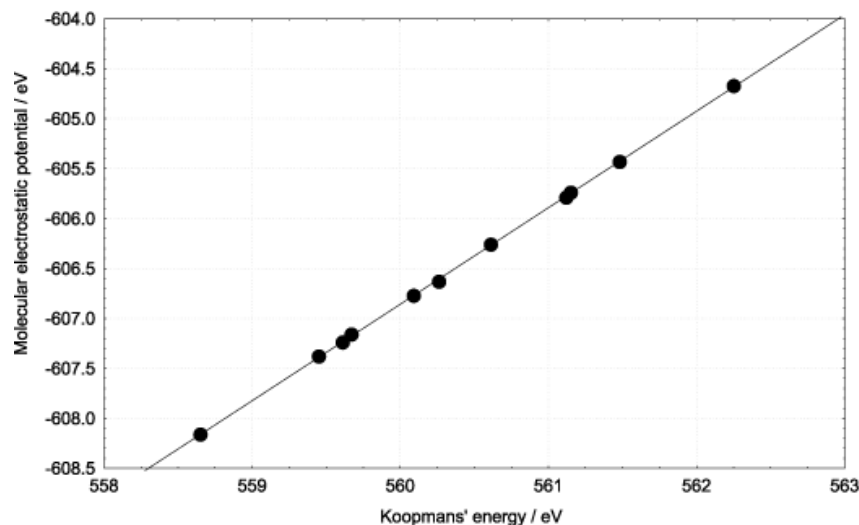
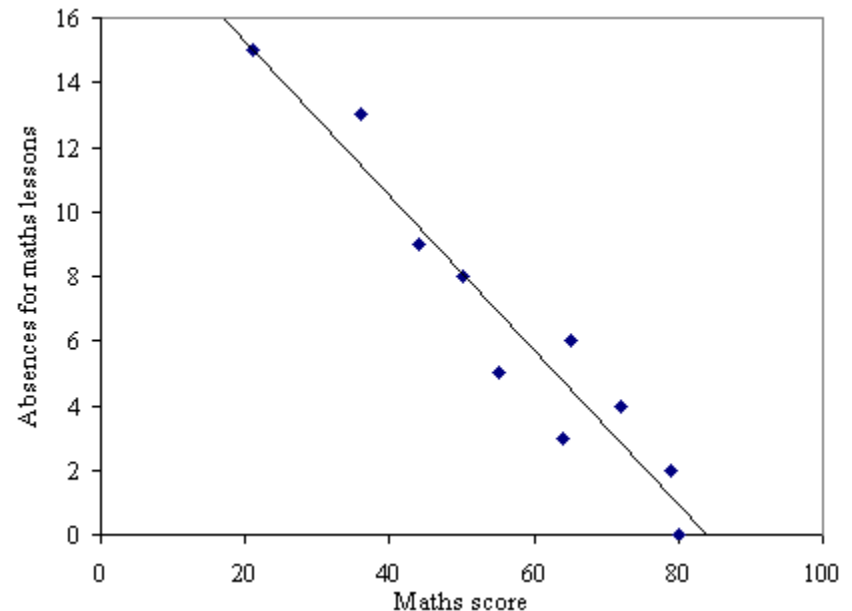


Figure 2. Graph of HF/6-31G(d,p) calculated molecular electrostatic potentials and  $1s$  electron Koopmans' energies of the carbonyl oxygen in the isolated acceptor molecules.



# Negative correlation

- the variables move in opposite directions
- Example: as hours of television watching increase, your grade on Friday's quiz will decrease



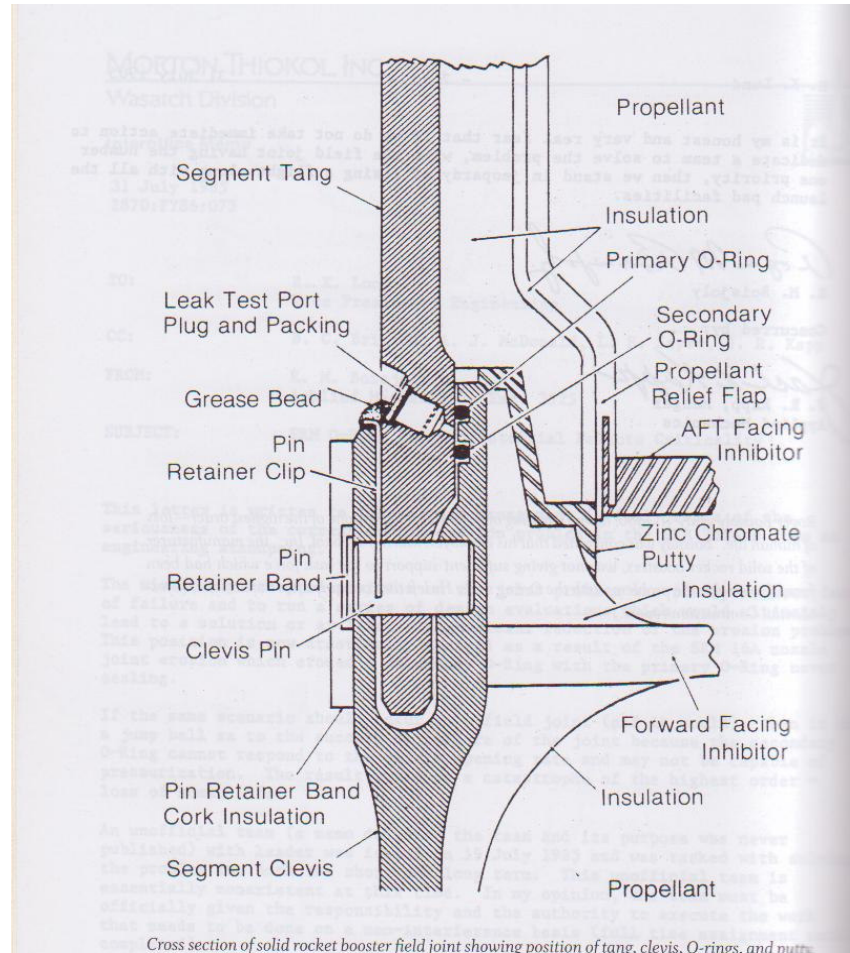
## 4. What type of correlation?

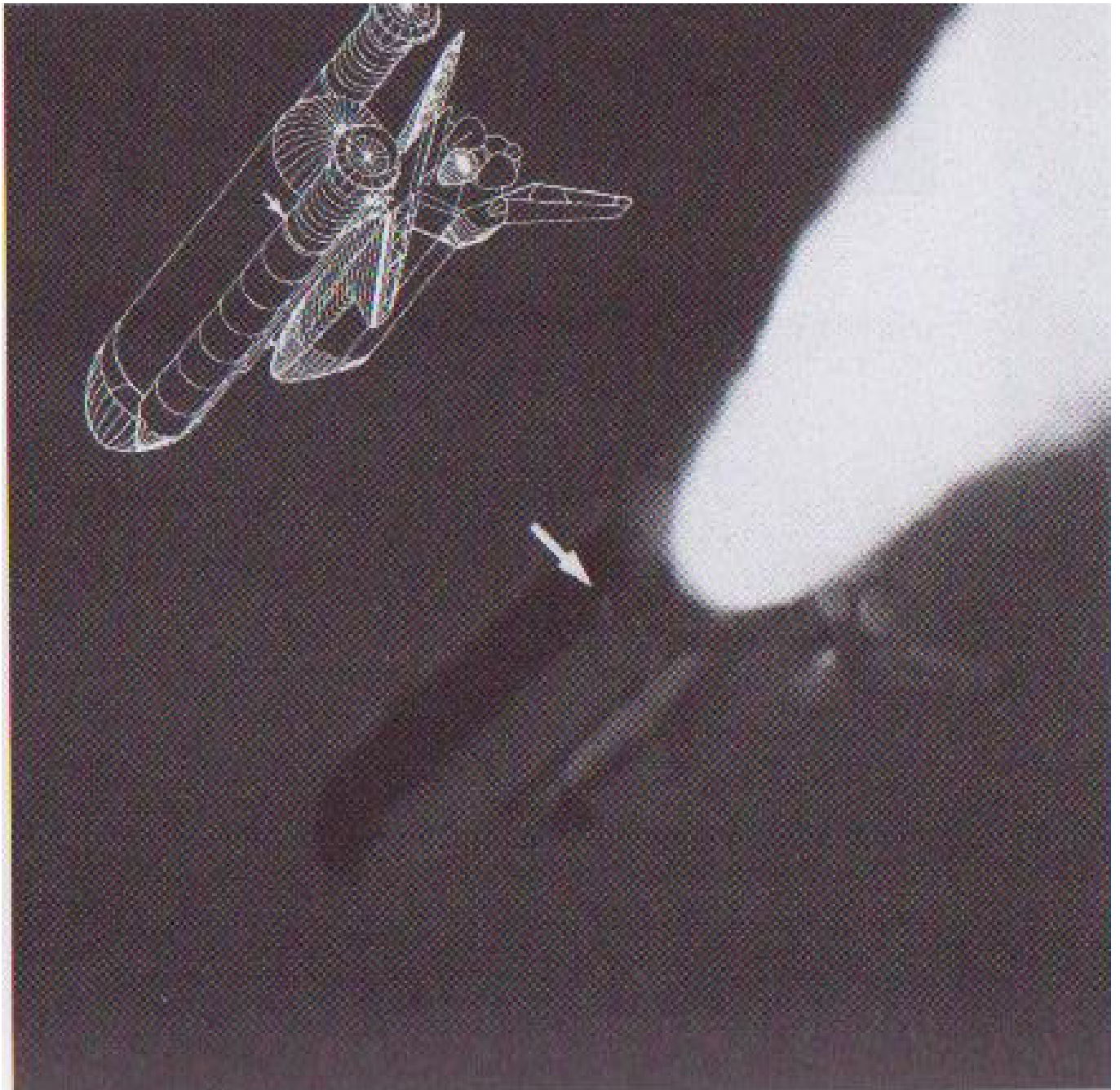
- A. positive
- B. negative
- C. none

## 5. Why was the Shuttle launched?

- Data Table A revealed no correlation between O ring failure and atmospheric temperature

# The O rings





## 6. Data Table B

•	Temp	Failure
•	53	2
•	57	1
•	58	1
•	63	1
•	66	0
•	67	0
•	68	0
•	69	0

# Data Table B, continued...

- 70 0
- 70 2
- 72 0
- 73 0
- 75 0
- 75 2
- 76 0
- 79 0
- 81 0

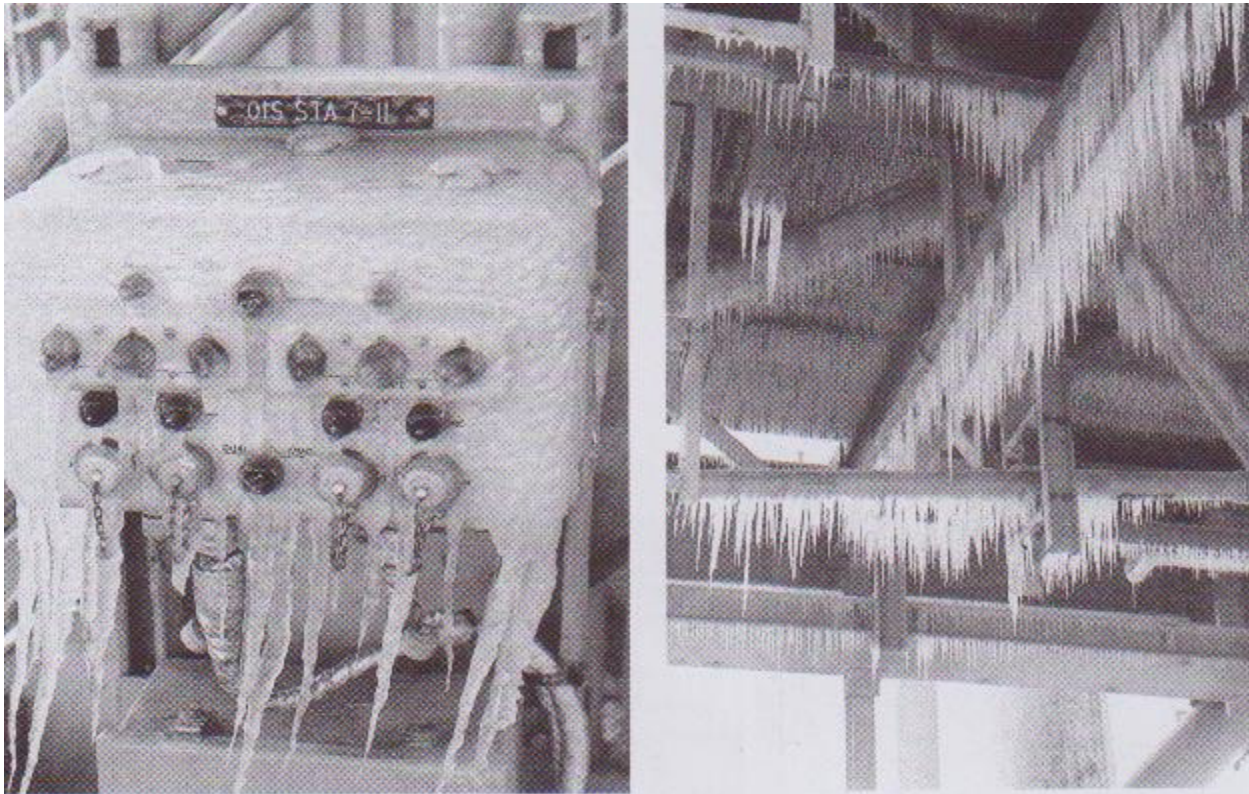
# The temperature at launch

- 36 degrees



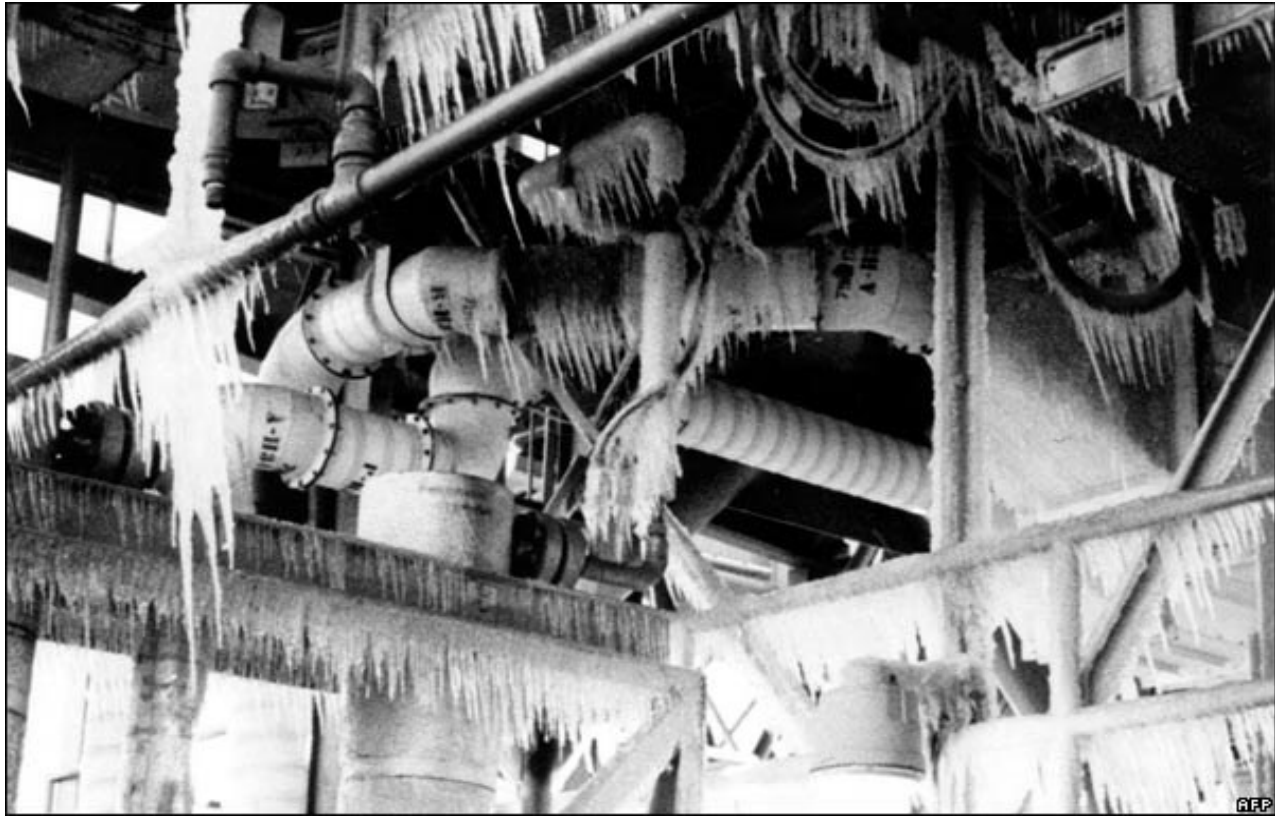


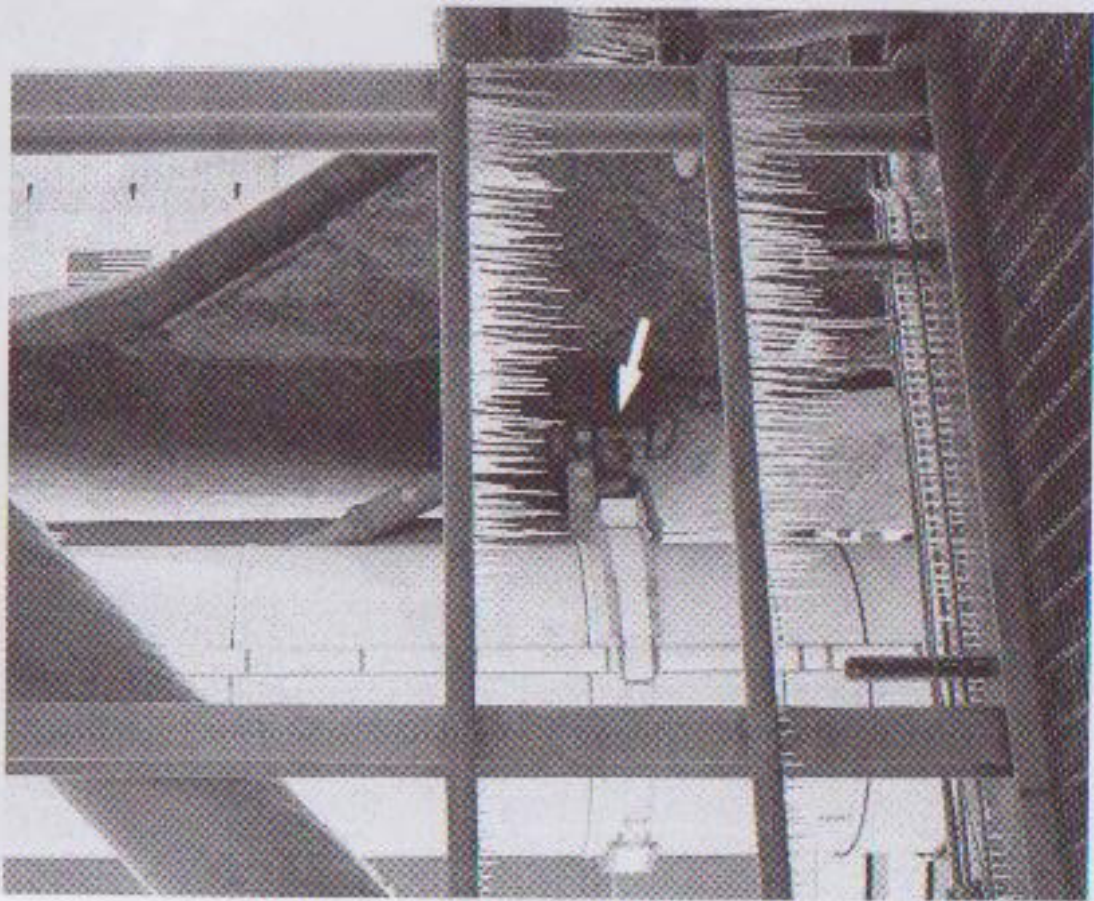
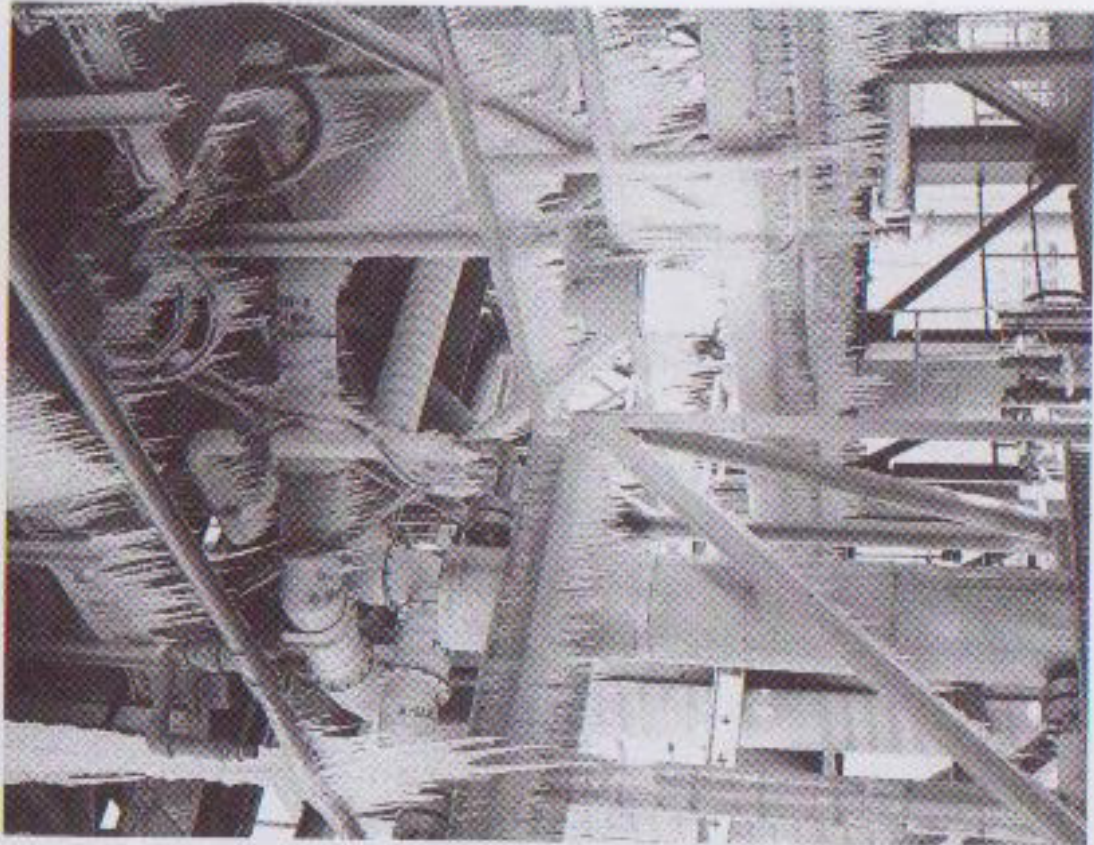
# Foot long icicles



*Heavy ice on the launch tower the morning of January 28, 1986, with foot-long icicles. One of*

# Challenger before launch





## 7. Draw a line of best fit

- This one should show a slight correlation (unlike the first table).

8. What type of correlation is shown for Data Table B?

- A. positive
- B. negative
- C. none

# 9. Final discussion points

- a. All available data should be used in experimentation and analysis
- b. Social and political pressures can often affect the gathering and use of experimental data. In this case:
  - i. NASA's budget was under scrutiny (pressure to have a public success)
  - ii. President Reagan had discussed the planned launch in his State of the Union address, mentioning First Teacher in Space, Christa McAuliffe (pressure to support Reagan)

# Christa McAuliffe, 1<sup>st</sup> teacher in space, with the Challenger crew



<http://science.ksc.nasa.gov/shuttle/missions/51-l/51-l-crew.gif>

# Final point:

- *C. Groupthink*: those making the launch decision sought unanimity and no one was forceful enough in dissenting from the group. (Some engineers knew the shuttle should not be launched but their views were not part of the decision making at NASA.)



# History Repeats Itself?

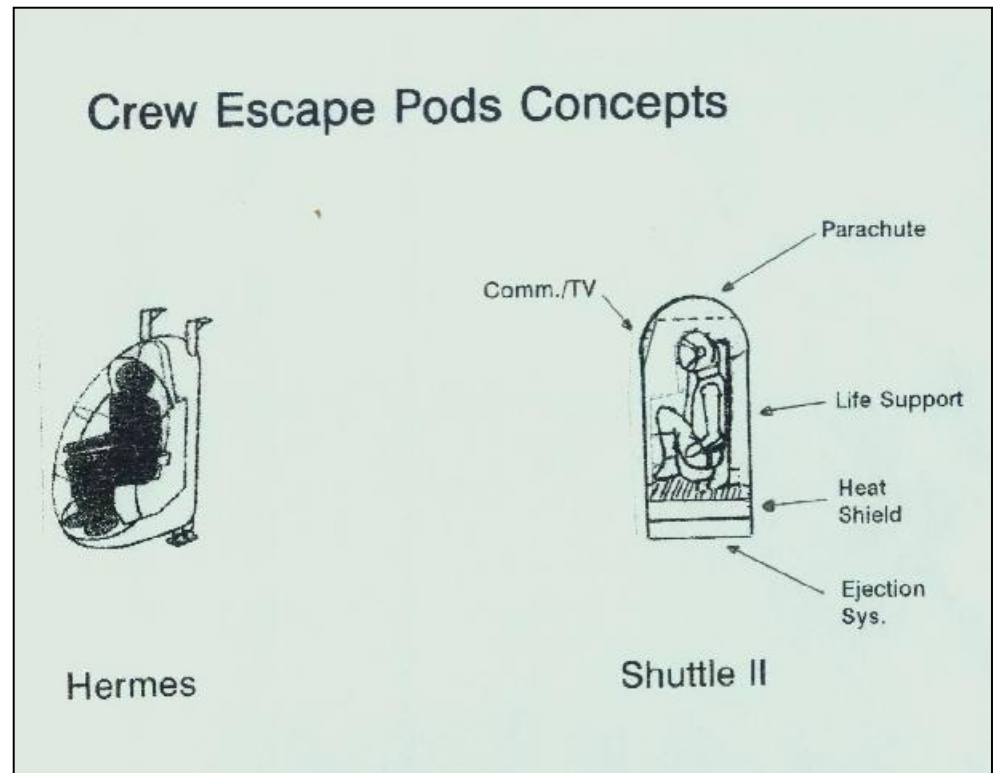
- Streaking through the atmosphere at 18 times the speed of sound, the Space Shuttle Columbia disintegrated Feb. 1, 2003, about 15 minutes before its scheduled landing at the Kennedy Space Center in Florida.



# President warned on Columbia?

NASA aerospace engineer Don A. Nelson, writes the President in July, 2002 warning that the shuttle is not safe and needs escape modules for the crew.

However, the presidential science adviser never gives the letter to the President.





(NASA)

# Name that method

- Determine whether the research is experimental or correlational
- Do not do no. 3
- If it's experimental: identify the independent and dependent variables
- If it's correlations: identify the variables
- SEE PAGES 38-39 FOR BACKGROUND, PARTICULARLY TABLE 1.3