# What We'll Discuss

## TOPIC OUTLINE

Comparison with standard experiments

Learning form past

Contrasts with Standard Experiments

# CASE STUDY

- An air bag in the laboratory works differently than in real life. Laboratory testing of air bags cannot possibly include all types of collision conditions, nor does most testing involve real vehicle occupants. Testing air bags in controlled conditions leads to uncertainties about how air bags will behave in unpredictable future circumstances.
- Engineers faced questions like: Would drivers use seat belts in addition to air bags? If so, what kind of seat belt? How close would the driver or passenger be to the air bag when it inflated? What would happen if more than two people were in a front passenger seat?

# Standard Experiments

- Any project is carried out in partial ignorance due to

1. The uncertainties in the abstract model used for the design calculations,
2. The uncertainties in the precise characteristics of the materials purchased,
3. The uncertainties caused by variations in processing and fabrication of materials and
4. The uncertainties about the nature of stresses the finished product will encounter.

# Standard Experiments

- The final outcomes of engineering projects are generally uncertain like that of experiments what we do in laboratories.
- The following uncertainties occur in the model designs:

1. Model used for the design calculations
2. Exact characteristics of the material purchased.
3. Constancies of materials used for processing and fabrication.
4. About the nature of the pressure the finished product will encounter.

# Standard Experiments

- **Third, effective engineering relies on knowledge gained about products both before and after they leave the factory**
- Monitoring is thus as essential to engineering as it is to experimentation in general.
- Just as in experimentation, both the intermediate and final results of an engineering project deserve analysis if the correct lessons are to be learned from it.

# Learning from past

- Usually engineers learn from their own earlier design and operating results, as well as from those of other engineers, but unfortunately that is not always the case.
- Lack of established channels of communication, misplaced pride in not asking for information, embarrassment at failure or fear of litigation, and plain neglect often impede the flow of such information and lead to many repetitions of past mistakes

# Informed Consent

- **Informed consent is understood as including two main elements: knowledge and voluntariness.**
- **The public and clients must be given information about the practical risks and benefits of the process or product in terms they can understand.**
- **Engineers cannot succeed in providing essential information about a project or product unless there is cooperation by superiors.**

# Contrasts with Standard Experiments

- **To be sure, engineering differs in some respects from standard experimentation..**
  - **Experimental Control**
  - **Informed consent**
  - **Knowledge gained**

# THANK YOU