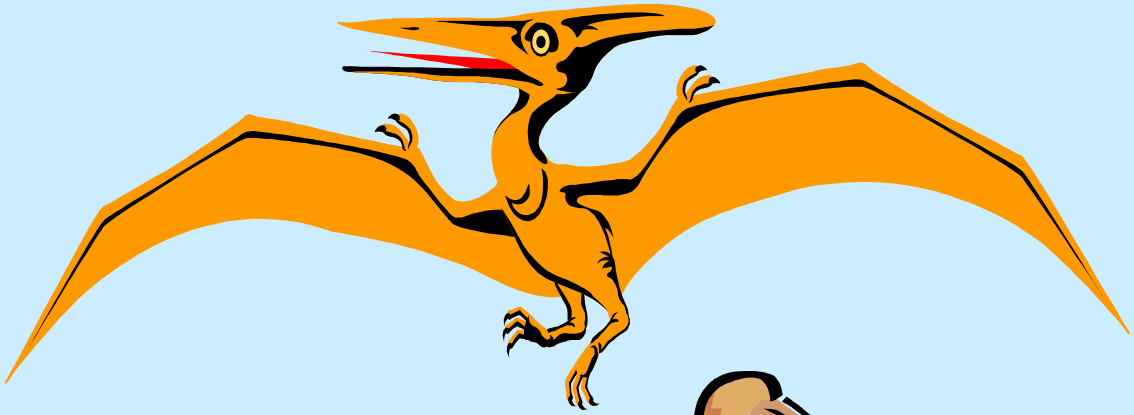
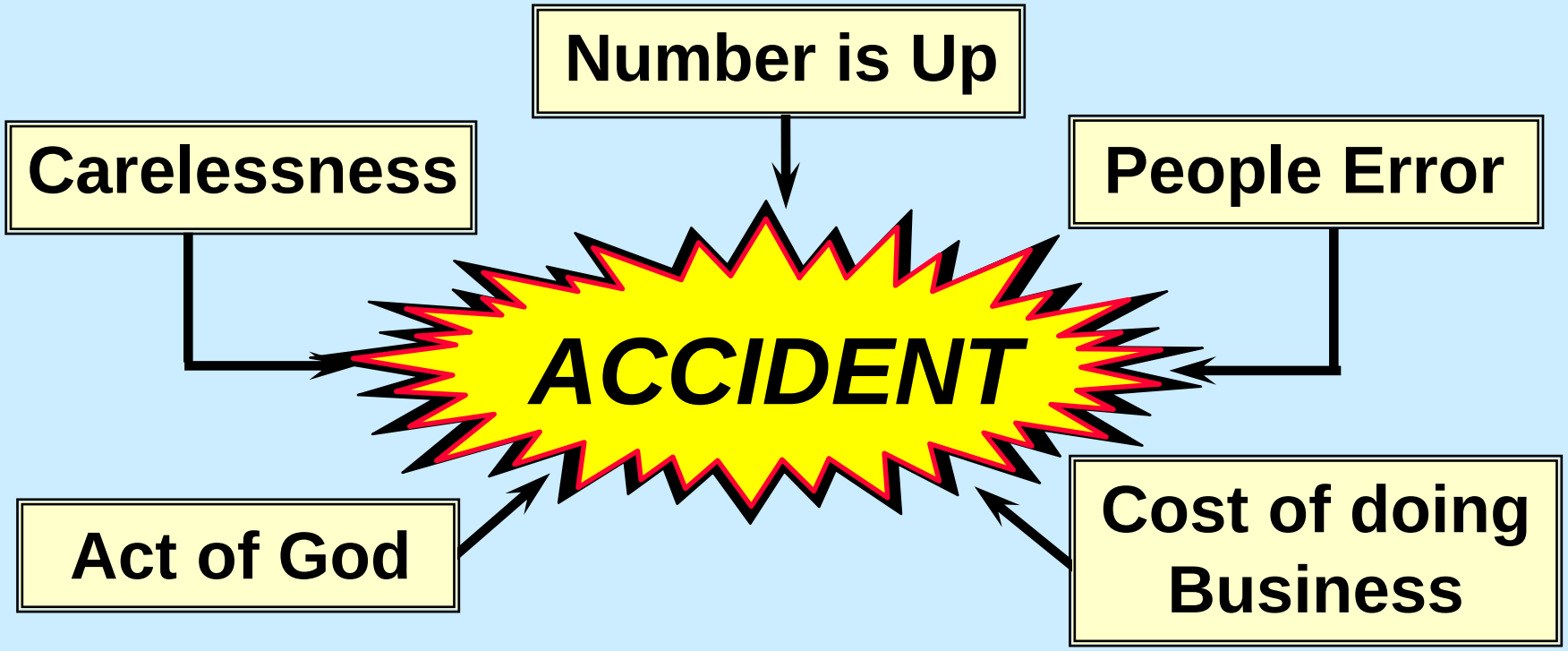
ACCIDENT CAUSATION



Early Man

Industrial Revolution

Factory managers reasoned that workers were hurt because —

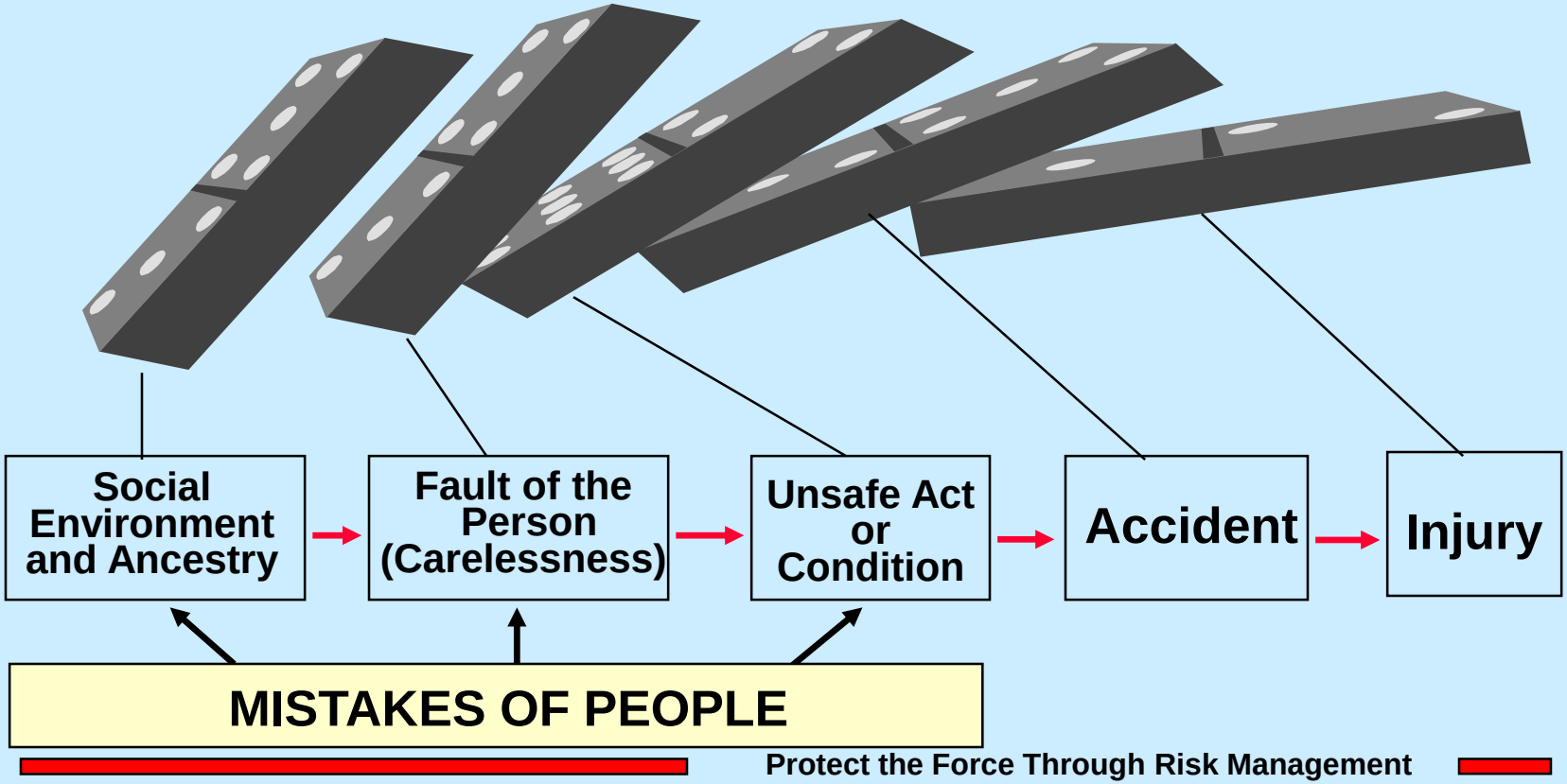


PEOPLE PROBLEM

Domino Theory

1932 First Scientific Approach to Accident/Prevention - H.W. Heinrich.

"Industrial Accident Prevention"



Protect the Force Through Risk Management

Heinrich's Theorems

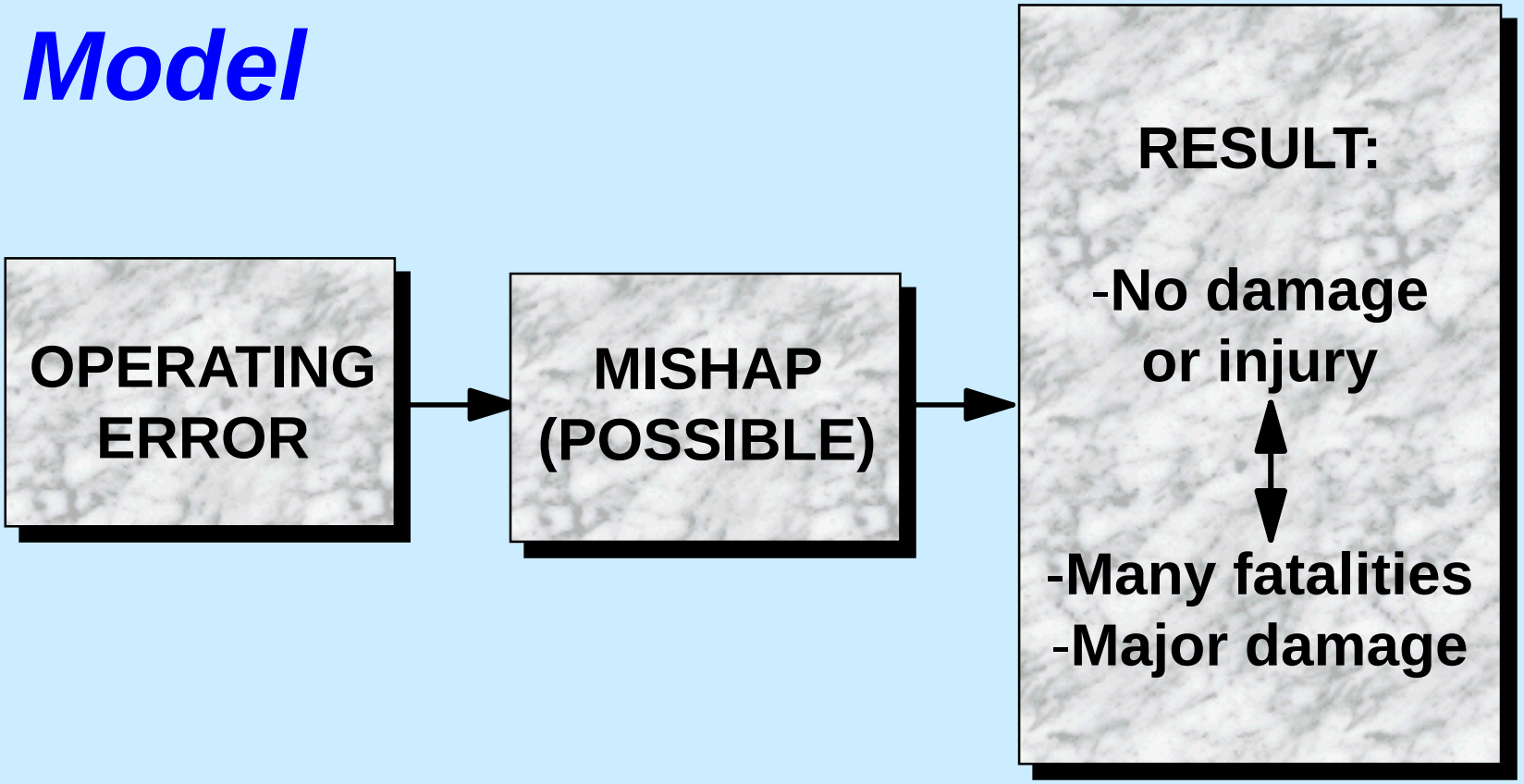
- ***INJURY*** **- caused by accidents.**
- ***ACCIDENTS*** **- caused by an unsafe act – injured person or an unsafe condition – work place.**
- ***UNSAFE ACTS/CONDITIONS*** **- caused by careless persons or poorly designed or improperly maintained equipment.**
- ***FAULT OF PERSONS*** **- created by social environment or acquired by ancestry.**
- ***SOCIAL ENVIRONMENT/ANCESTRY*** **- where and how a person was raised and educated.**

Heinrich's Theory

Corrective Action Sequence (The three "E"s)

- Engineering
- Education
- Enforcement

Modern Causation Model



Modern Causation

- ***How* accidents are caused & *how* to correct those causes.**
- **Parallels Heinrich's to a point.**
  - **Injury is called RESULT, indicating it could involve damage as well as personal injury and the result can range from no damage to the very severe.**
  - **The word MISHAP is used rather than Accident to avoid the popular misunderstanding that an accident necessarily involves injury or damage.**
  - **Finally, the term OPERATING ERROR is used instead of Unsafe Act & Unsafe condition.**

Examples

Operating Errors:

- **Being in an unsafe position**
- **Stacking supplies in unstable stacks**
- **Poor housekeeping**
- **Removing a guard**

Systems Defect

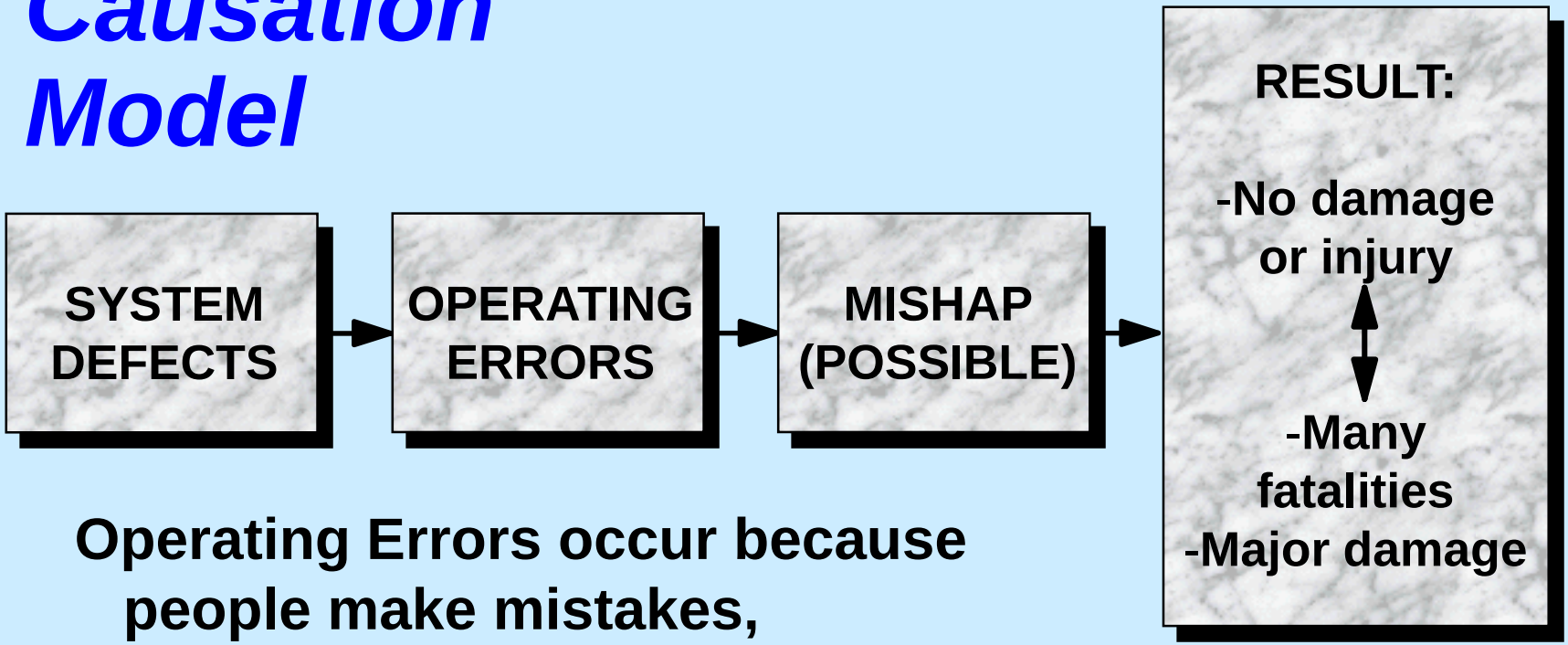
- **Revolutionized accident prevention**
- **A weakness in the design or operation of a system or program**

Examples

Systems defects include:

- **Improper assignment of responsibility**
- **Improper climate of motivation**
- **Inadequate training and education**
- **Inadequate equipment and supplies**
- **Improper procedures for the selection & assignment of personnel**
- **Improper allocation of funds**

Modern Causation Model

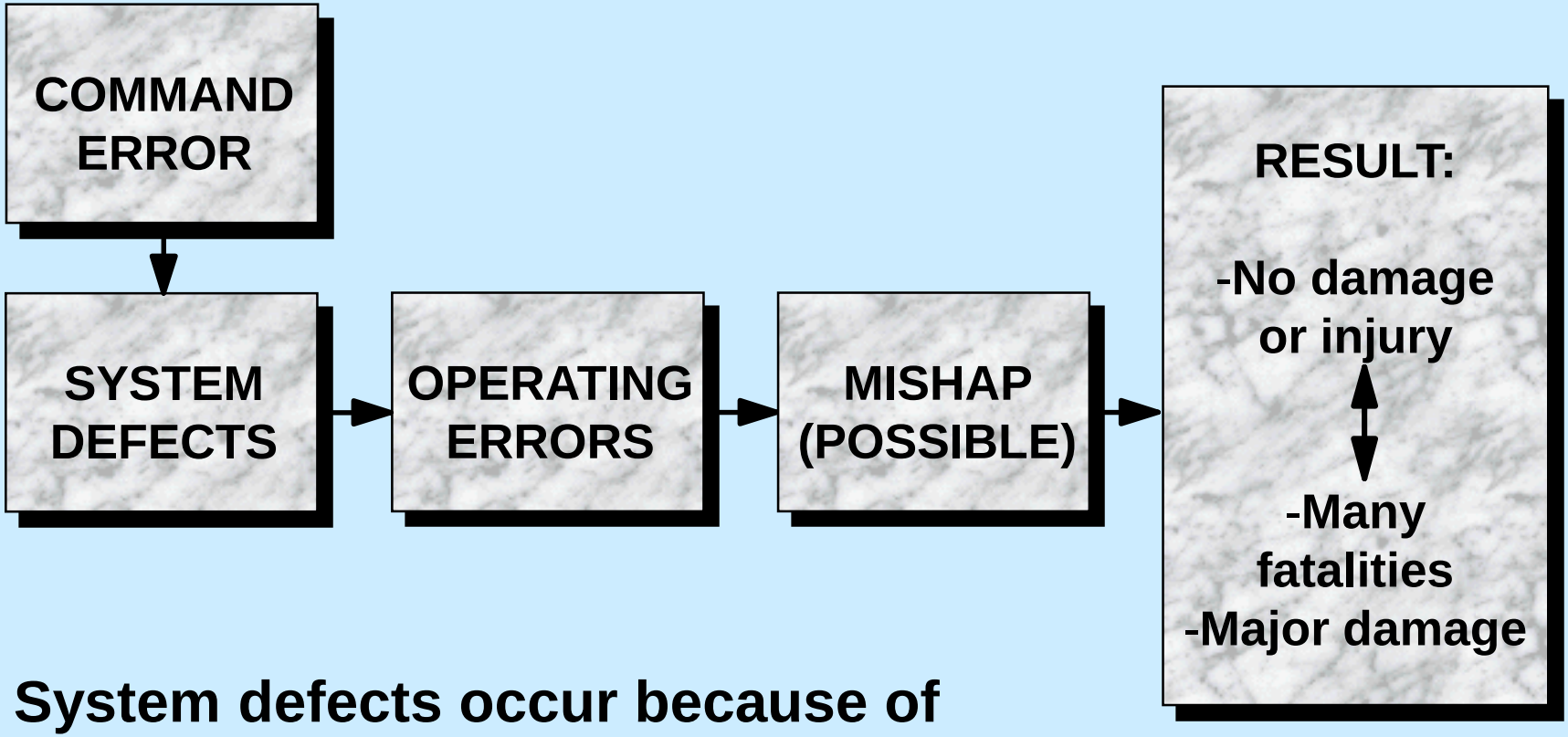


Operating Errors occur because people make mistakes, but more importantly, they occur because of

SYSTEM DEFECTS

Modern Causation Model

Managers design the Systems



System defects occur because of

MANAGEMENT / COMMAND ERROR

Safety Program Defect

A defect in some aspect of the safety program that allows an avoidable error to exist.

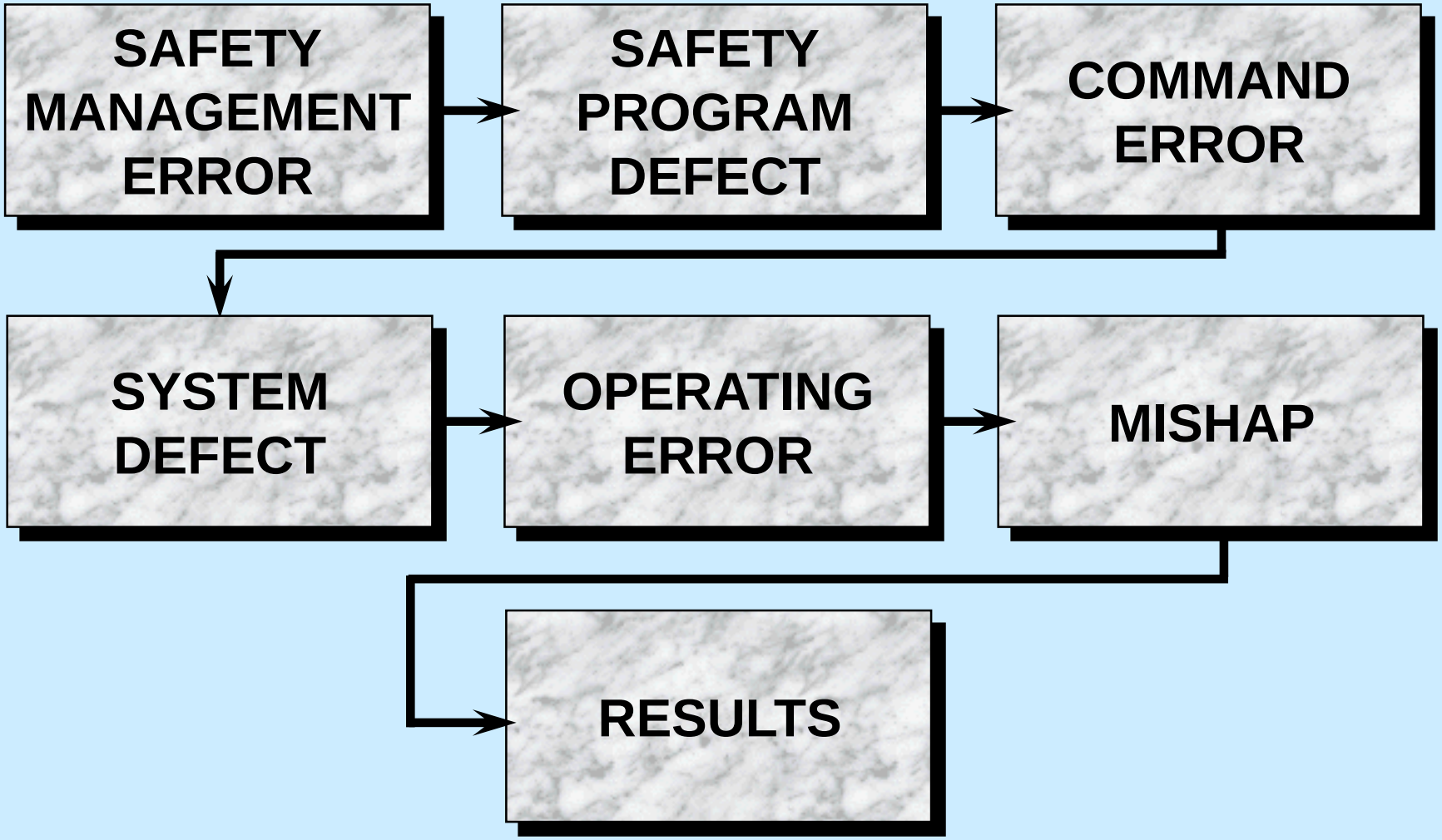
- **Ineffective Information Collection**
- **Weak Causation Analysis**
- **Poor Countermeasures**
- **Inadequate Implementation Procedures**
- **Inadequate Control**

Safety Management Error

A weakness in the knowledge or motivation of the safety manager that permits a preventable defect in the safety program to exist.

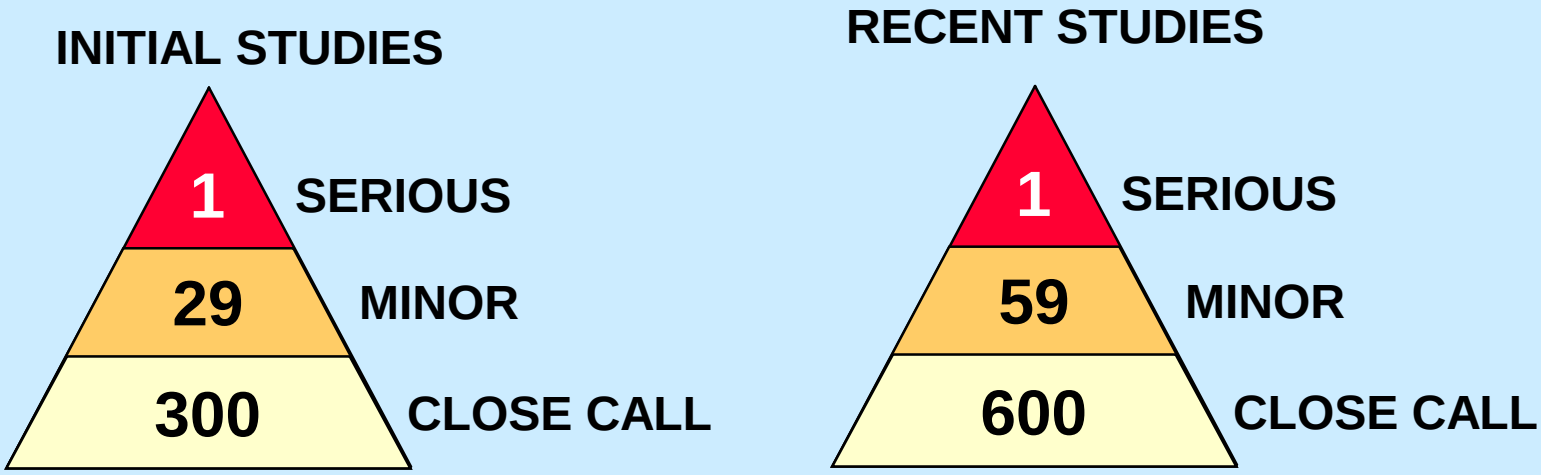
SAFETY MANAGEMENT ERROR

Modern Causation Model



Near-Miss Relationship

- **Initial studies show for each disabling injury, there were 29 minor injuries and 300 close calls/no injury.**
- **Recent studies indicate for each serious result there are 59 minor and 600 near-misses.**



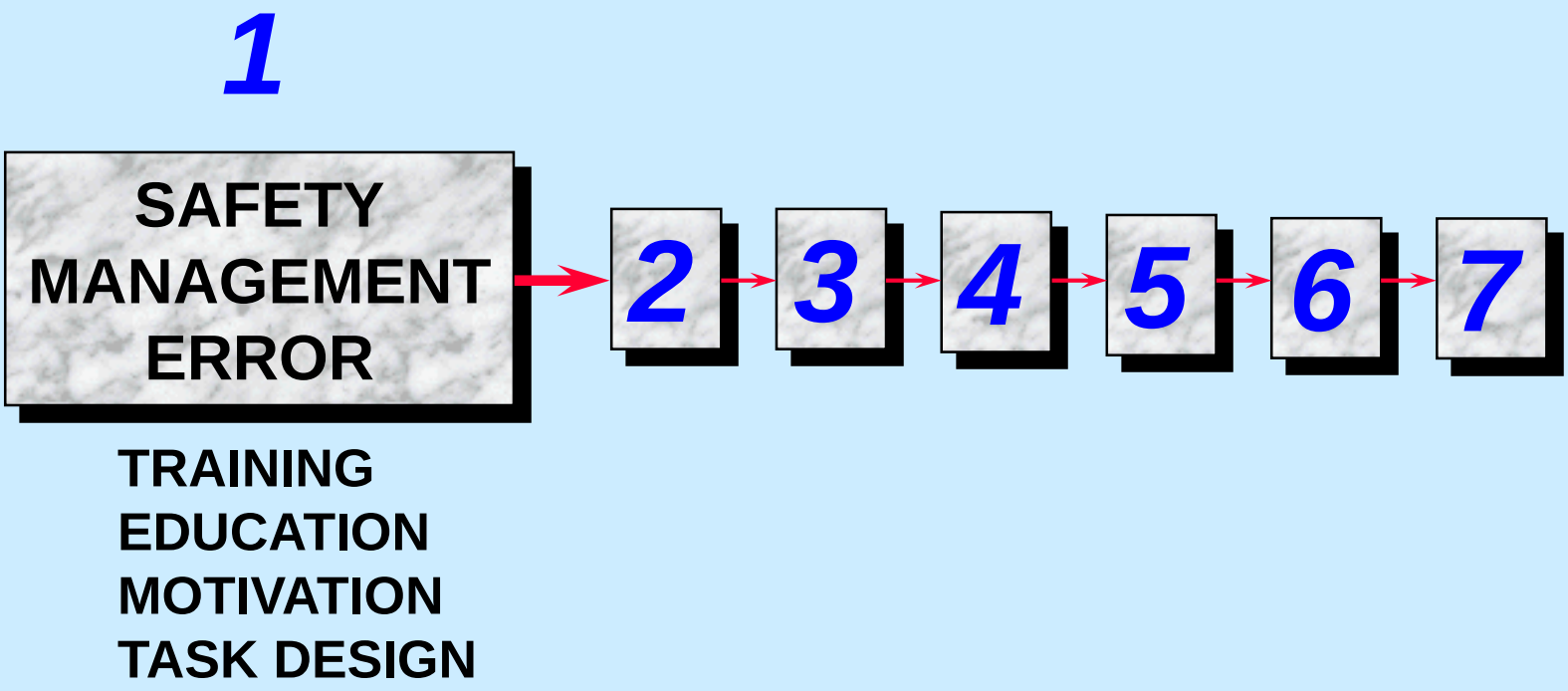
Seven Avenues

There are seven avenues through which we can initiate countermeasures. None of these areas overlap. They are:

- **Safety management error**
- **Safety program defect**
- **Management / Command error**
- **System defect**
- **Operating error**
- **Mishap**
- **Result**

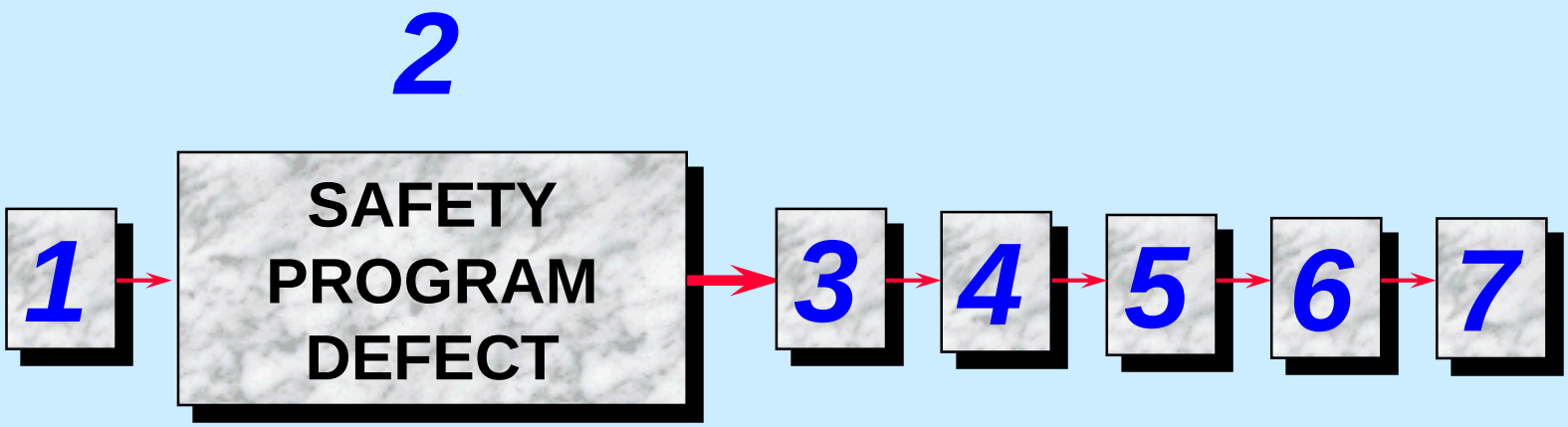
Seven Avenues

Potential countermeasures for each modern causation approach include:



Seven Avenues

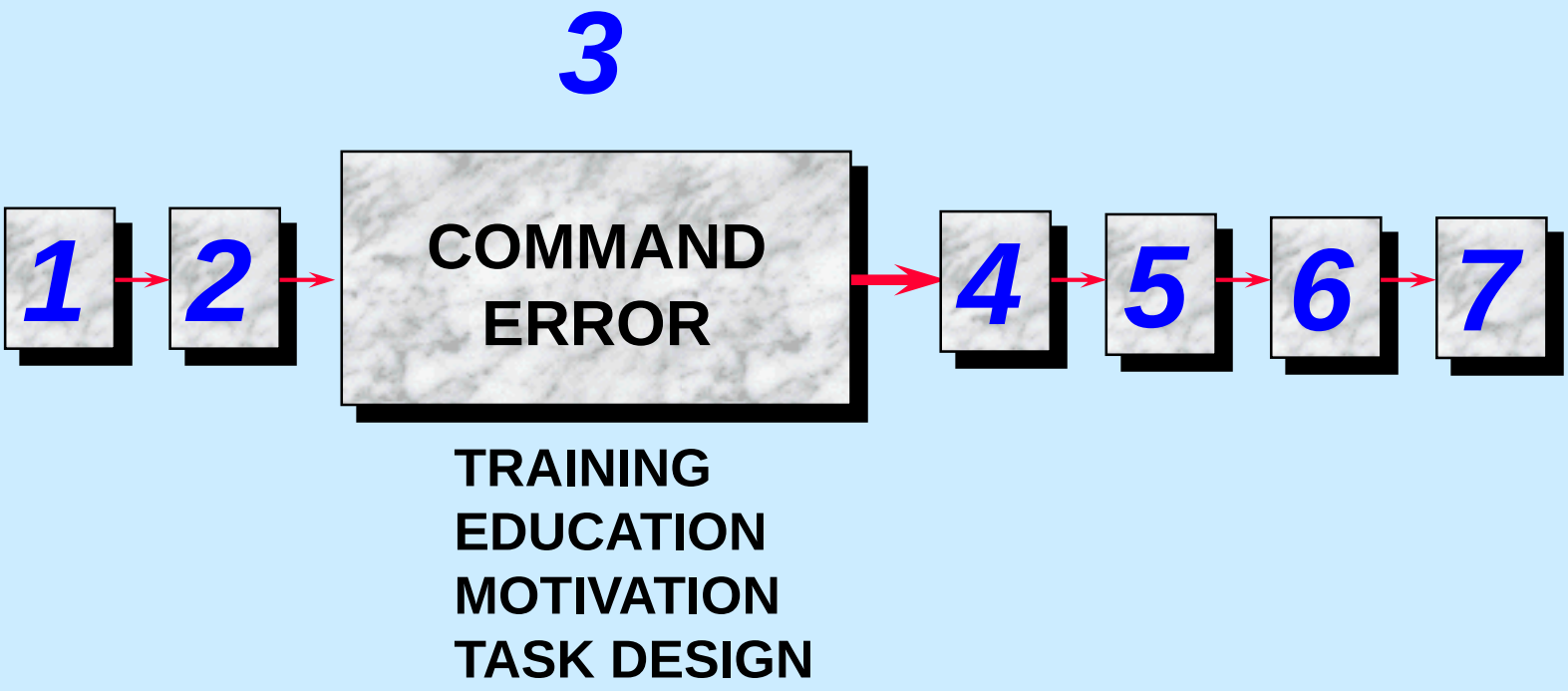
Potential countermeasures for each modern causation approach include:



REVISE INFORMATION
COLLECTION
ANALYSIS
IMPLEMENTATION

Seven Avenues

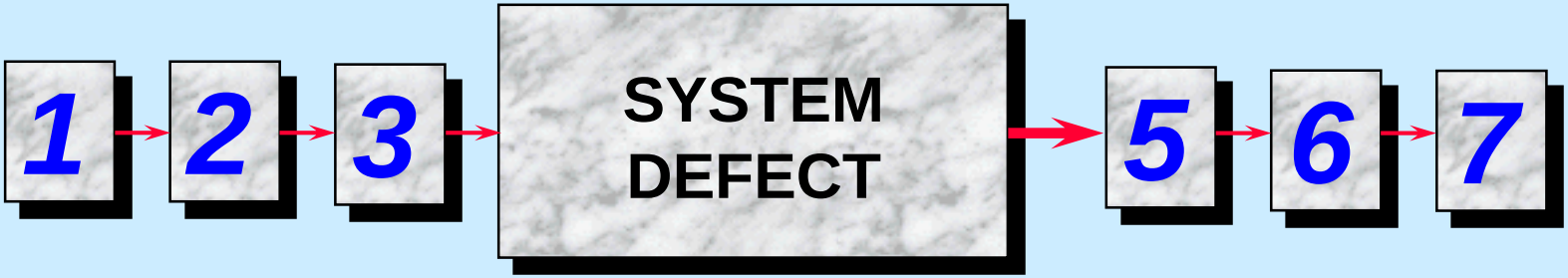
Potential countermeasures for each modern causation approach include:



Seven Avenues

Potential countermeasures for each modern causation approach include:

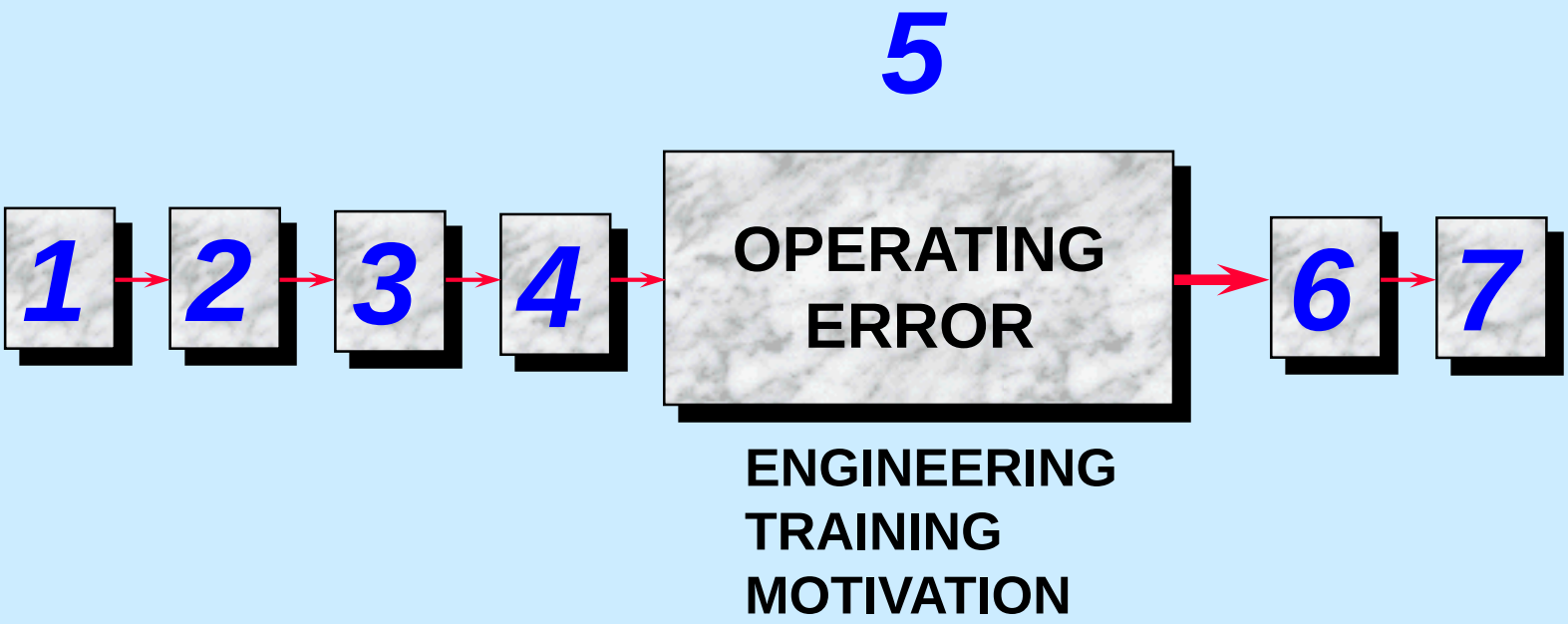
4



DESIGN REVISION VIA--
- **SOP**
- **REGULATIONS**
- **POLICY LETTERS**
- **STATEMENTS**

Seven Avenues

Potential countermeasures for each modern causation approach include:



Seven Avenues

Potential countermeasures for each modern causation approach include:

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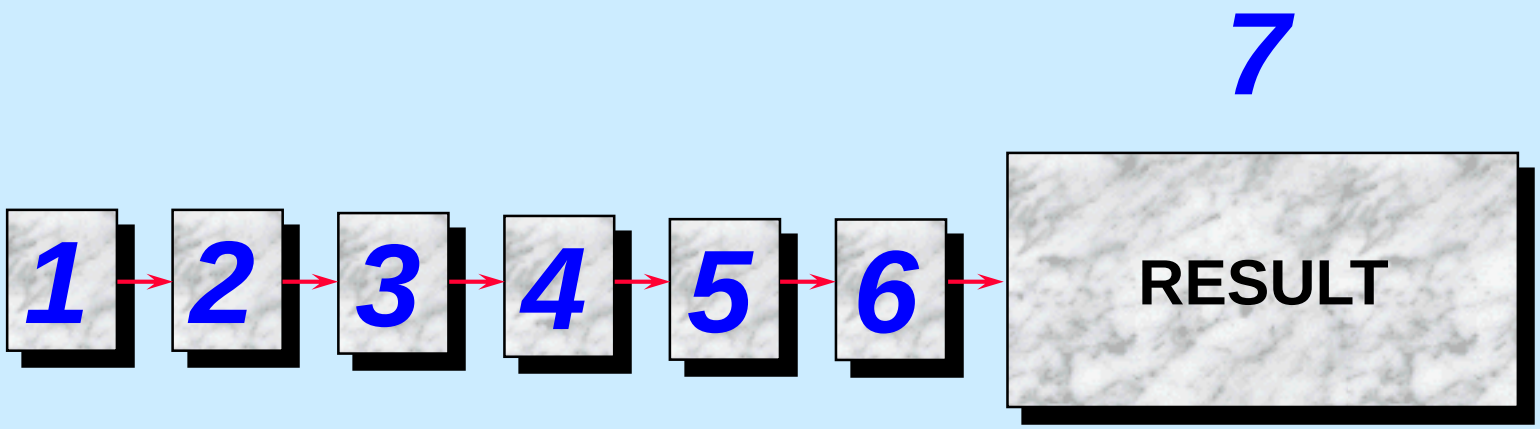


CONTAINMENT
FIREFIGHTING
RESCUE
EVACUATION
FIRST AID

Army Systems Model

A system is simply a group of interrelated parts which, when working together as they were designed to do, accomplish a goal. Using this analogy, an installation or organization can be viewed as a system.

The elements of the Army Systems Model are:

- **Task**
- **Person**
- **Training**
- **Environment**
- **Material**

Army Systems Model

TASK

- **Communication Control**
- **Arrangement**
- **Demands on soldiers**
- **Time aspects**

Army Systems Model

PERSON

Selection

- **Mentally**
- **Physically**
- **Emotionally**
- **Qualified**

Motivation

- **Positive**
- **Negative**
- **Retention**

Army Systems Model

TRAINING

Types	Targets	Considerations
• Initial	• Operator	• Quality/Quantity
• Update	• Supervisor	
• Remedial	• Management	

Army Systems Model

ENVIRONMENT

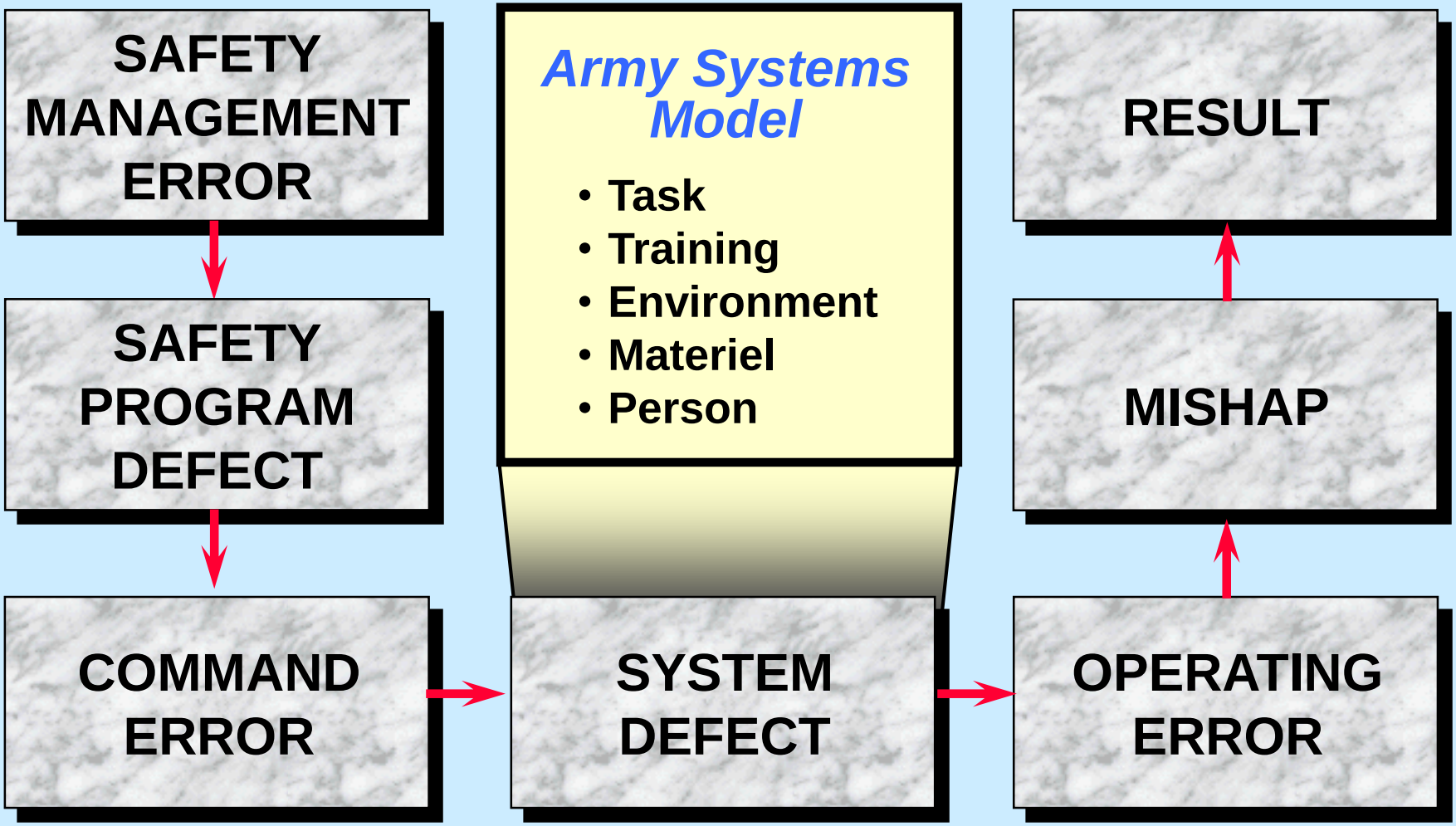
- **Noise**
- **Weather**
- **Facilities**
- **Lighting**
- **Ventilation**

Army Systems Model

MATERIEL

- **Supplies**
- **Equipment**
- **Machine Design**
- **Maintenance**

Army Systems Model



Human Error Model (Ferrell's Model)

- ***Overload:*** *The mismatch between the load and the capacity of a person at the time of action*
- ***Incorrect response by a person to the situation.***
- ***Improper activity.***

LOAD	CAPACITY	STATE
Task Physical Information Processing	Natural Physical condition State of mind Training Drugs Pressure Fatigue Stressors that impair the ability to respond	Motivational Level
Environment Light Noise Distraction Stressor that require active coping		
Internal Worry Emotional Stress		
Situational Goals or Criteria Danger		

INCOMPATIBILITY

Stimulus Response

- Control display

Response-Response

- Inconsistent Control Type locations

Work Station

- Size
- Force
- Reach
- Feel

IMPROPER ACTIVITY

Didn’t Know

Deliberately Took Risk

Low perceived probability of accident

Low perceived cost of accident