American Airlines

Applying Systems Thinking to Safety

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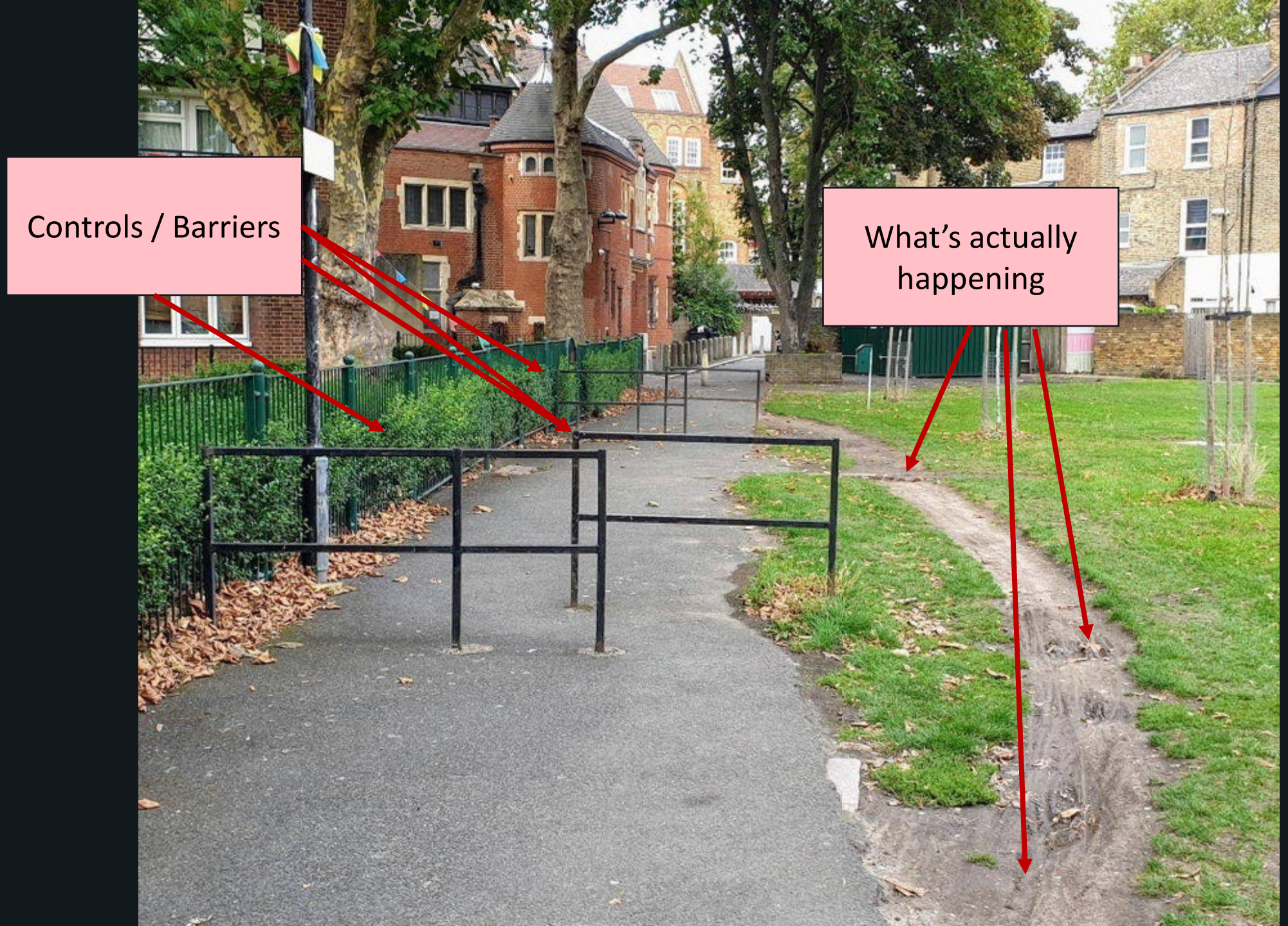
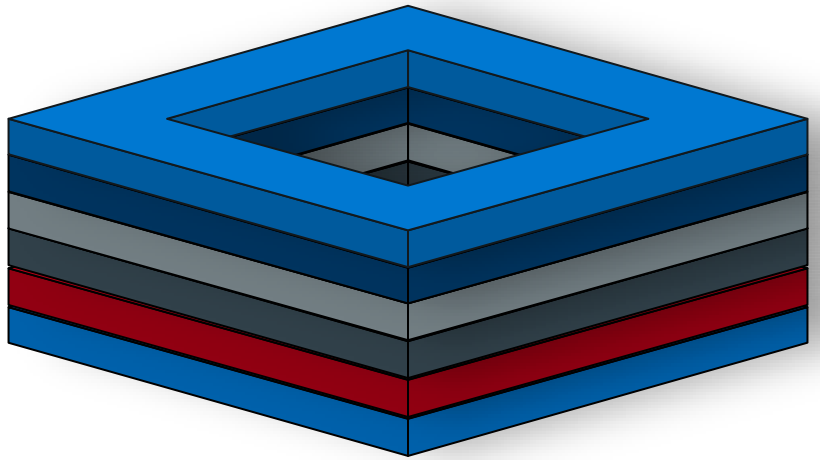

Controls / Barriers
What's actually happening

American Airlines Safety System & Programs

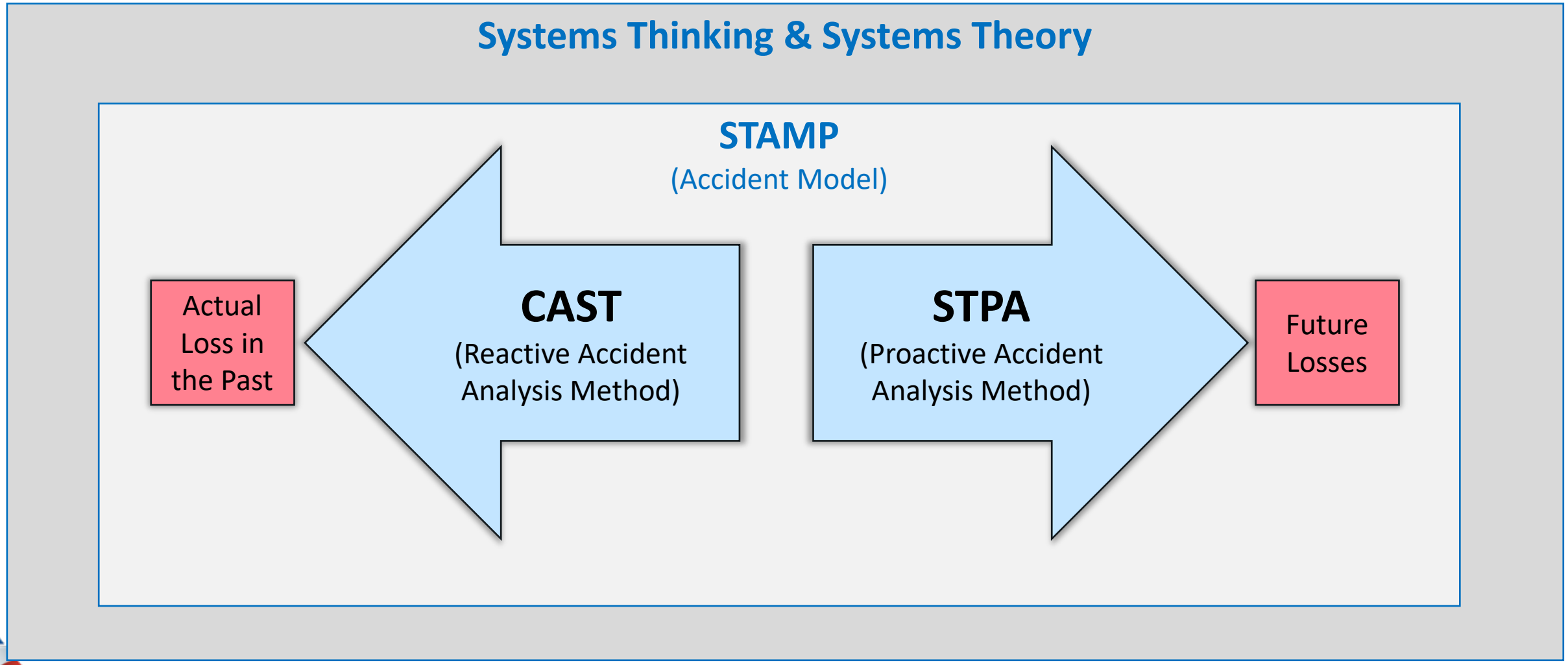
- LOSA / LIT
- Fatigue Risk Management
- Systems Engineering
- Human Performance



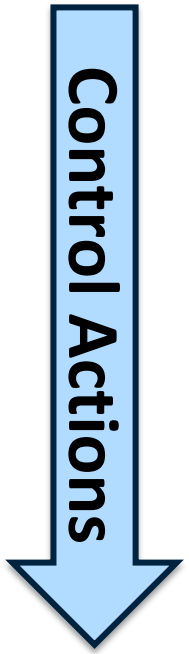
- ASAP
- Safety Data Science
- Efficiency & Continuous Improvement
- Safety Assurance Monitoring

STAMP

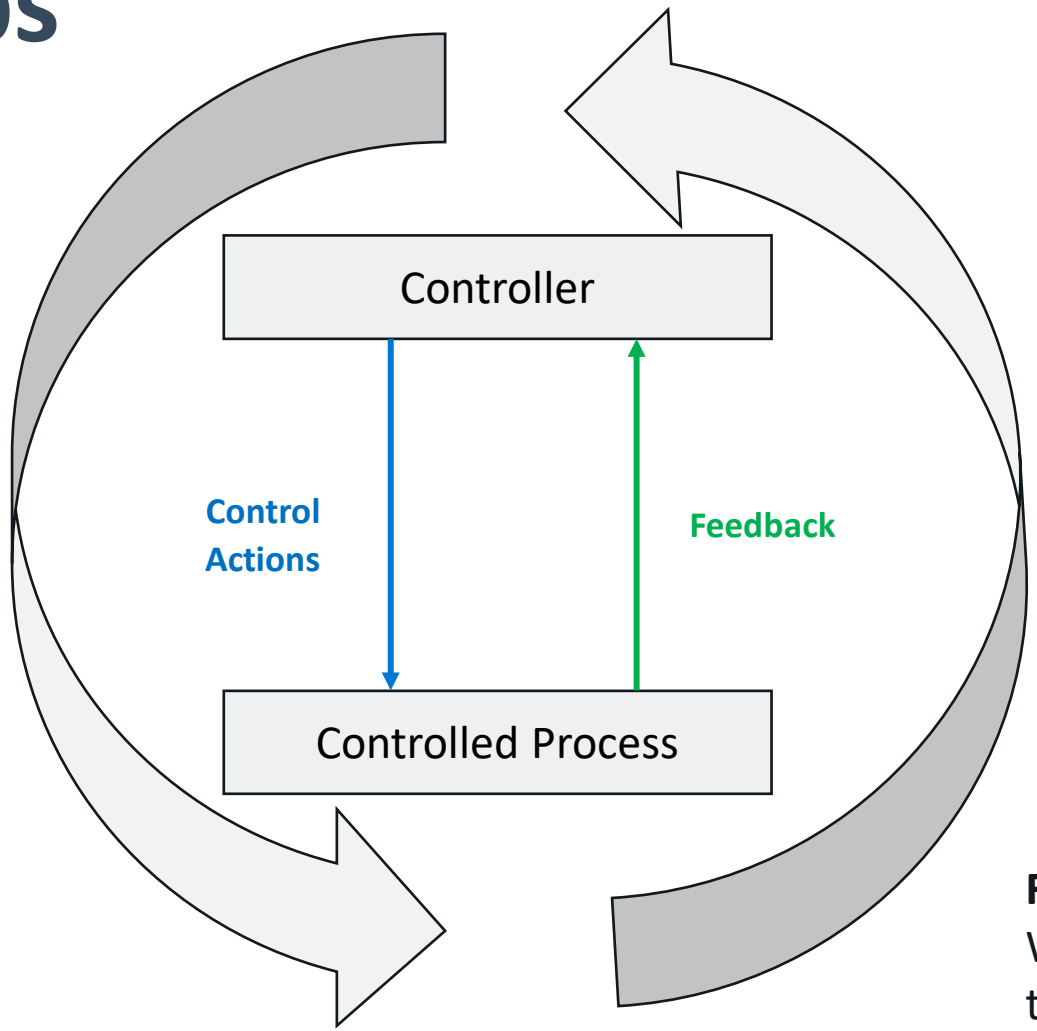
Systems Theoretic Accident Model and Processes

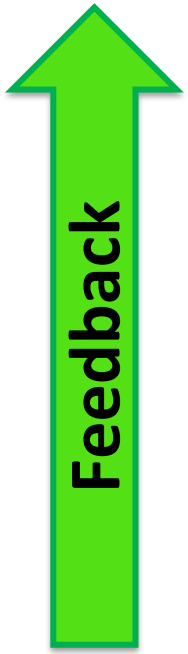


Control Loops

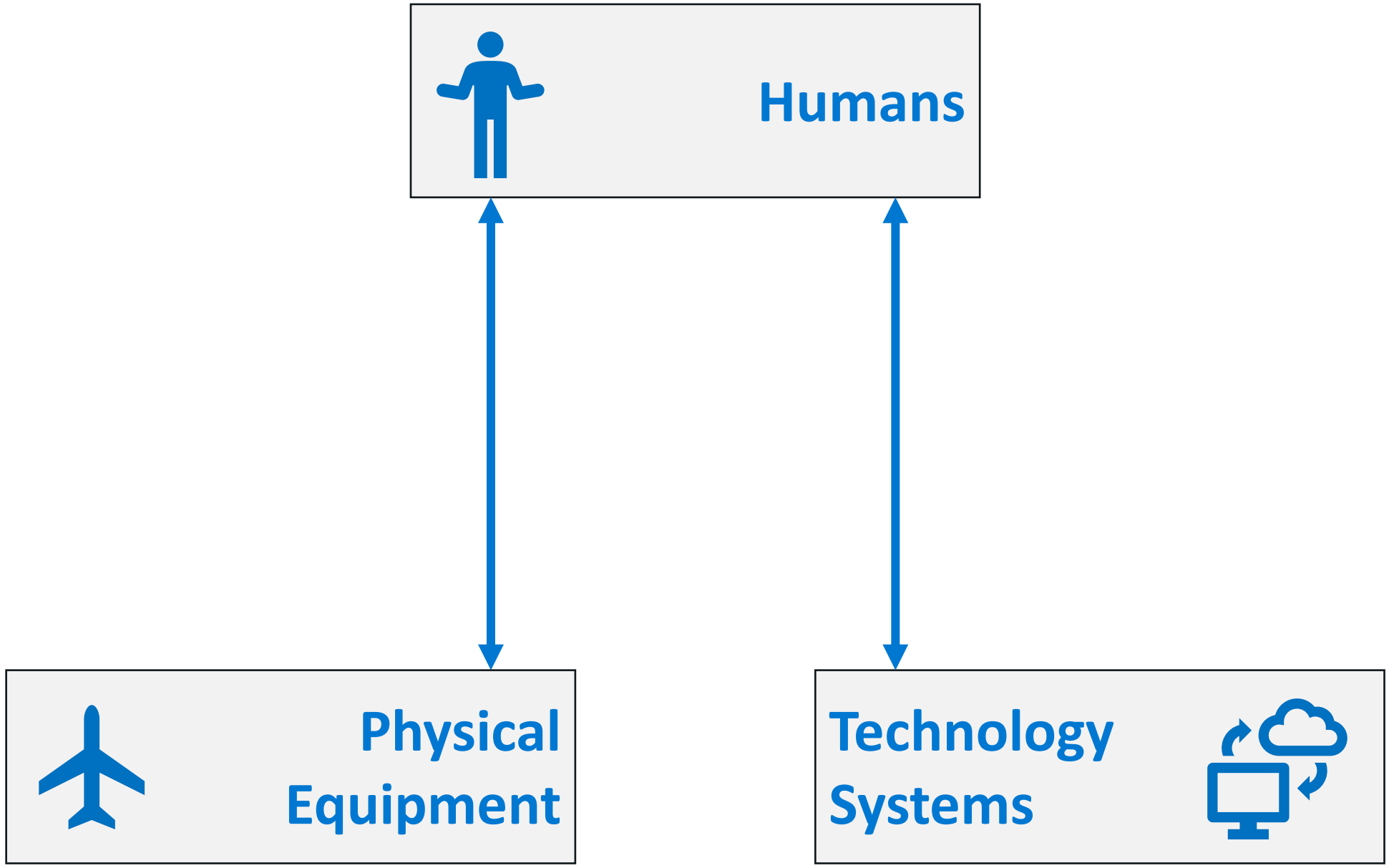


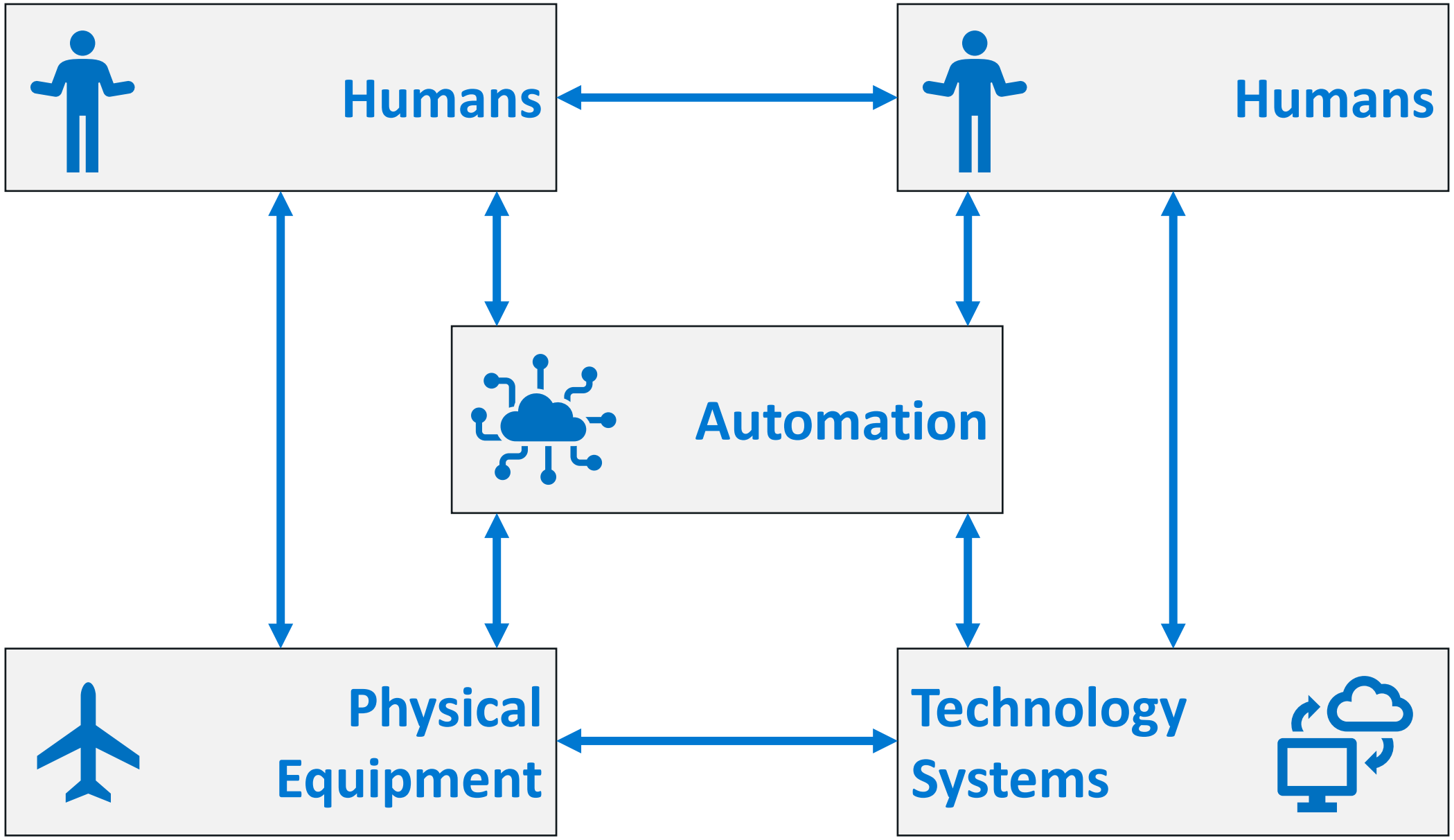
Control Action Definition:
An action available to the controller.

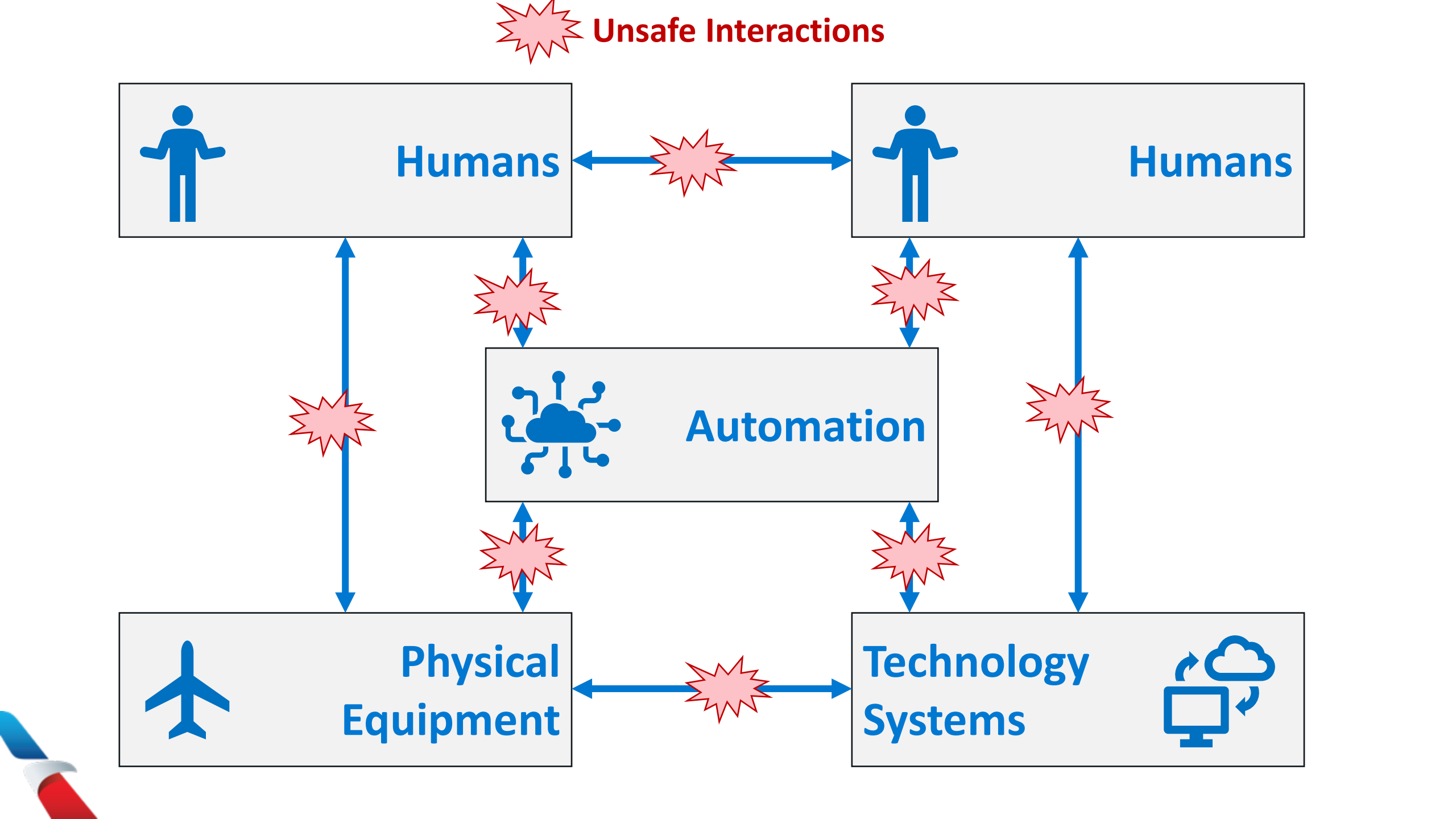


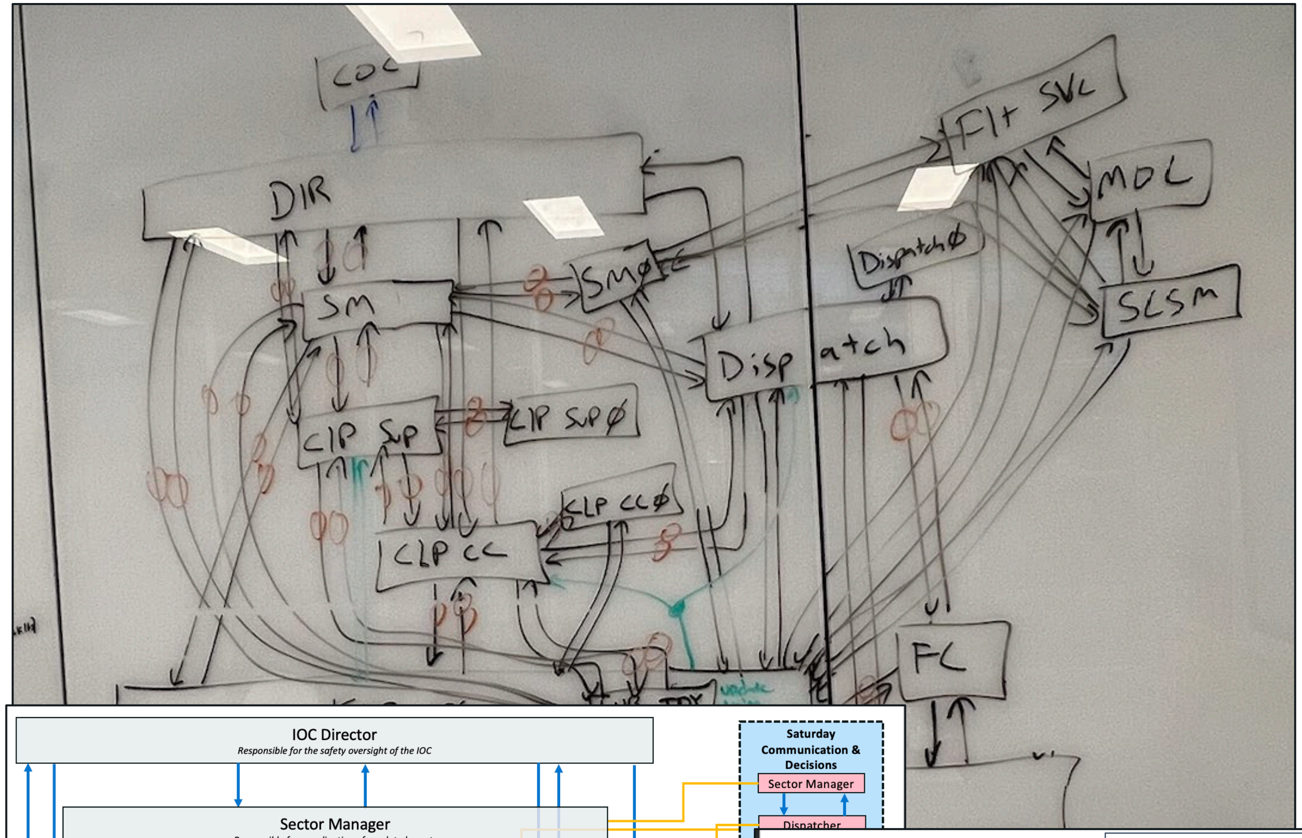


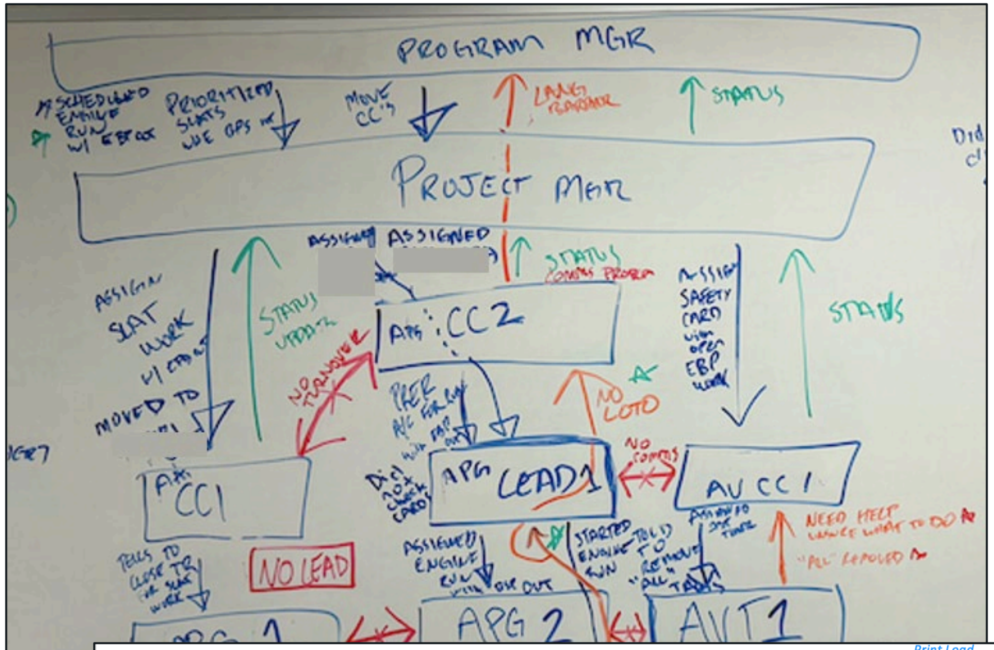
Feedback Definition:
What the controller receives to determine the impact of the control action

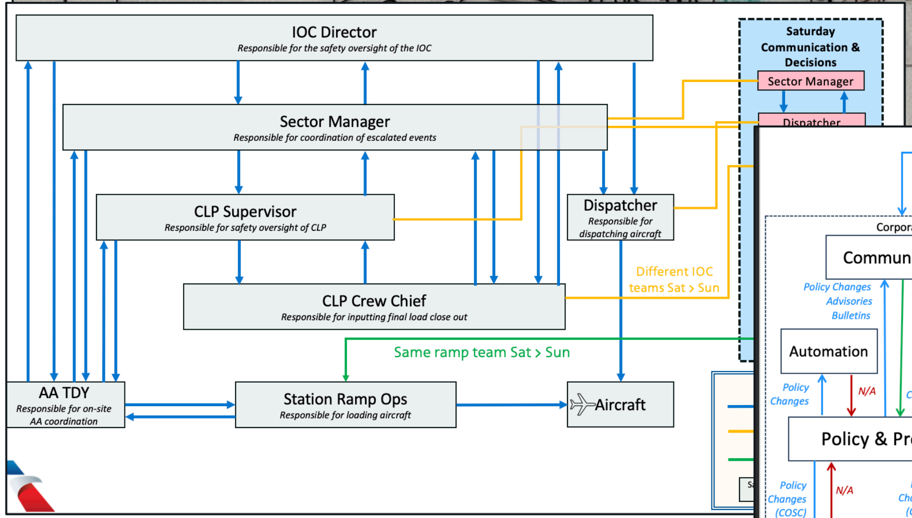

Humans
Physical Equipment
Technology Systems

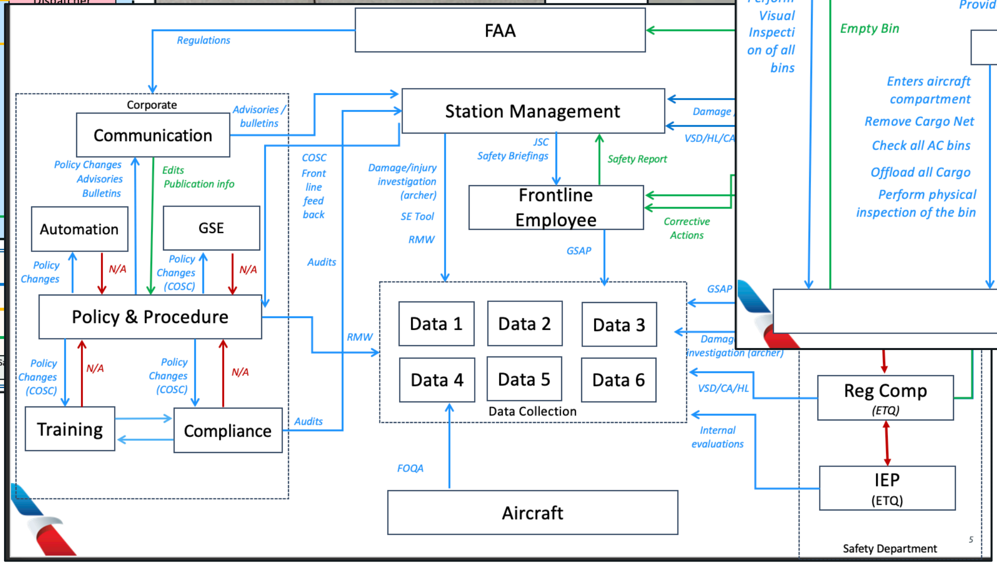

Humans
Humans
Automation
Physical
Equipment
Technology
Systems

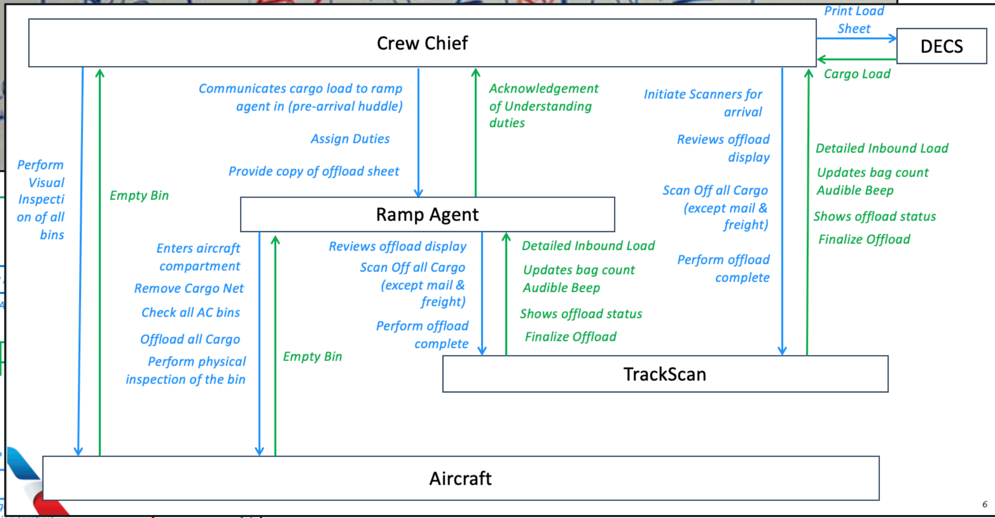

Unsafe Interactions
Humans
Humans
Automation
Physical
Equipment
Technology
Systems


COC
DIR
Flt SVC
MOC
SMO
SM
Dispatch
SLSM
Disp atch
CLP Sup
CLP SUPO
CLP CCO
CLP CC
FC


PROGRAM MGR
PROJECT MGR
STATUS
APG CC2
APG LEAD1
AV CC1
CC1
NO LEAD
NO LOTO
APG 2
AVT1


IOC Director
Responsible for the safety oversight of the IOC
Saturday Communication & Decisions
Sector Manager
Dispatcher
Sector Manager
Responsible for coordination of escalated events
CLP Supervisor
Responsible for safety oversight of CLP
Dispatcher
Responsible for dispatching aircraft
Different IOC teams Sat > Sun
CLP Crew Chief
Responsible for inputting final load close out
Same ramp team Sat > Sun
AA TDY
Responsible for on-site AA coordination
Station Ramp Ops
Responsible for loading aircraft
Aircraft


FAA
Regulations
Corporate
Communication
Advisories / bulletins
Station Management
Damage
VSD/HL/CA
COSC
Front line feed back
Damage/injury investigation (archer)
SE Tool
RMW
JSC
Safety Briefings
Safety Report
Frontline Employee
Corrective Actions
Policy Changes
Advisories
Bulletins
Edits
Publication info
Automation
GSE
Policy Changes
N/A
Policy Changes (COSC)
N/A
Audits
GSAP
Policy & Procedure
RMW
Data 1
Data 2
Data 3
Data 4
Data 5
Data 6
Data Collection
GSAP
Damage investigation (archer)
VSD/CA/HL
Internal evaluations
Policy Changes (COSC)
N/A
Policy Changes (COSC)
N/A
Training
Compliance
Audits
FOQA
Aircraft
Reg Comp
(ETQ)
IEP
(ETQ)
Safety Department
5


Crew Chief
Print Load Sheet
DECS
Cargo Load
Communicates cargo load to ramp agent in (pre-arrival huddle)
Acknowledgement of Understanding duties
Initiate Scanners for arrival
Assign Duties
Reviews offload display
Detailed Inbound Load
Provide copy of offload sheet
Perform Visual Inspection of all bins
Empty Bin
Scan Off all Cargo (except mail & freight)
Updates bag count
Audible Beep
Shows offload status
Finalize Offload
Ramp Agent
Enters aircraft compartment
Reviews offload display
Detailed Inbound Load
Remove Cargo Net
Scan Off all Cargo (except mail & freight)
Updates bag count
Audible Beep
Perform offload complete
Check all AC bins
Shows offload status
Offload all Cargo
Perform offload complete
Finalize Offload
Perform physical inspection of the bin
Empty Bin
TrackScan
Aircraft
6

“Every system is perfectly designed to get the result that it does”

- W. Edwards Deming

Build your processes to be resilient

Every *action* available to a team member – when can it be unsafe?

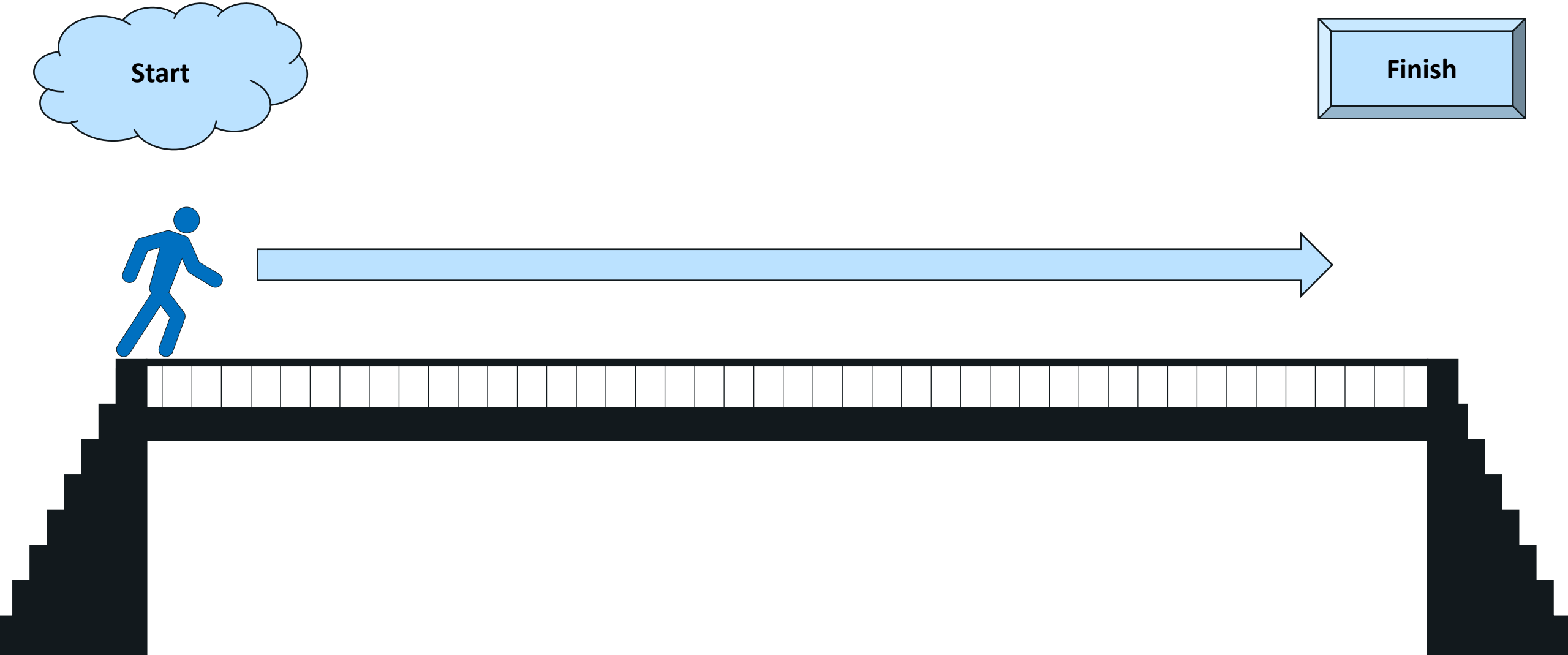
Not providing action causes hazard	Providing action causes hazard	Providing action too early	Providing action too late
Operator does not provide action when *context*	Operator provides action when *context*	Operator provides action too early before *context*	Operator provides action too late after *context*

Use these to build (or reinforce) your processes, procedures, training, etc..

Operator must provide action when *context*	Operator must not provide action when *context*	Operator must provide action after *context*	Operator must provide action before *context*

Bridge Experiment

Work that needs to be accomplished



Create procedures and training

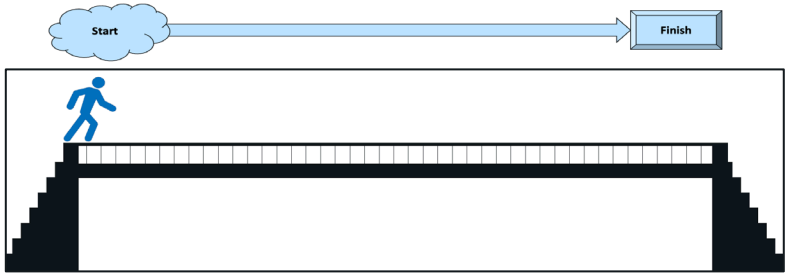
Policy & Procedure Manual

- Walk up the steps on the left
- Walk across the bridge from left to right
- Exit down the steps to the right

Note: Running on the bridge is <u>strictly prohibited.</u>

Training

- Walk up the steps on the left
- Walk across the bridge
- Exit down the steps to the right



Walk = good

Run = bad

Do not run or jump on bridge!

Event #1

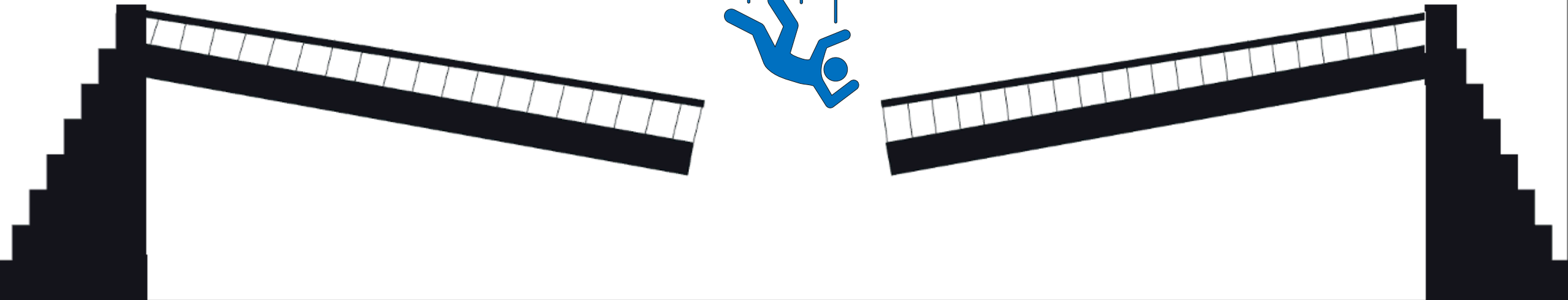
Event #1 Investigation

Findings & Conclusions

- Worker failed to follow procedure
- Worker ran across bridge

Corrective Actions

- Issue corrective action to the worker
- Mandatory re-training for the worker



Event #2

Event #2 Investigation

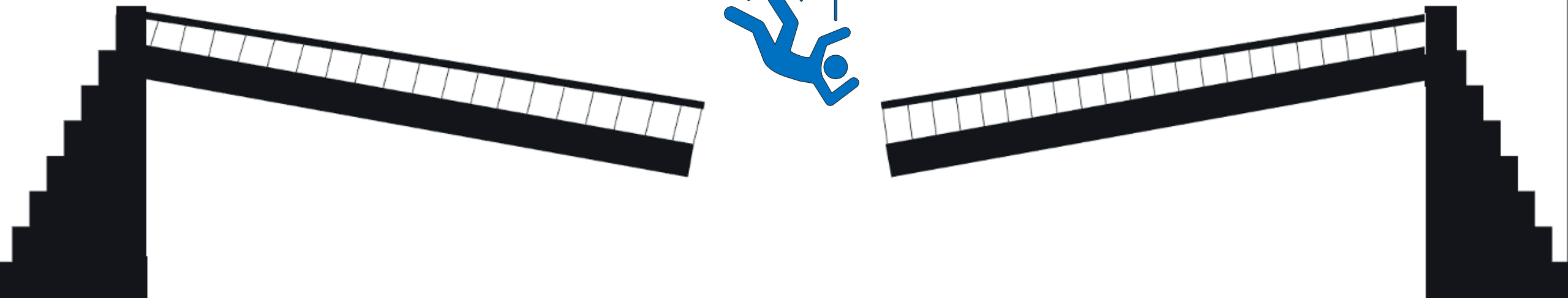
Findings & Conclusions

- Same worker failed to follow-procedure
- Worker willfully decided to break procedure

Corrective Actions

- Terminate worker
- Add sign to bridge

Same worker as yesterday



Event #3

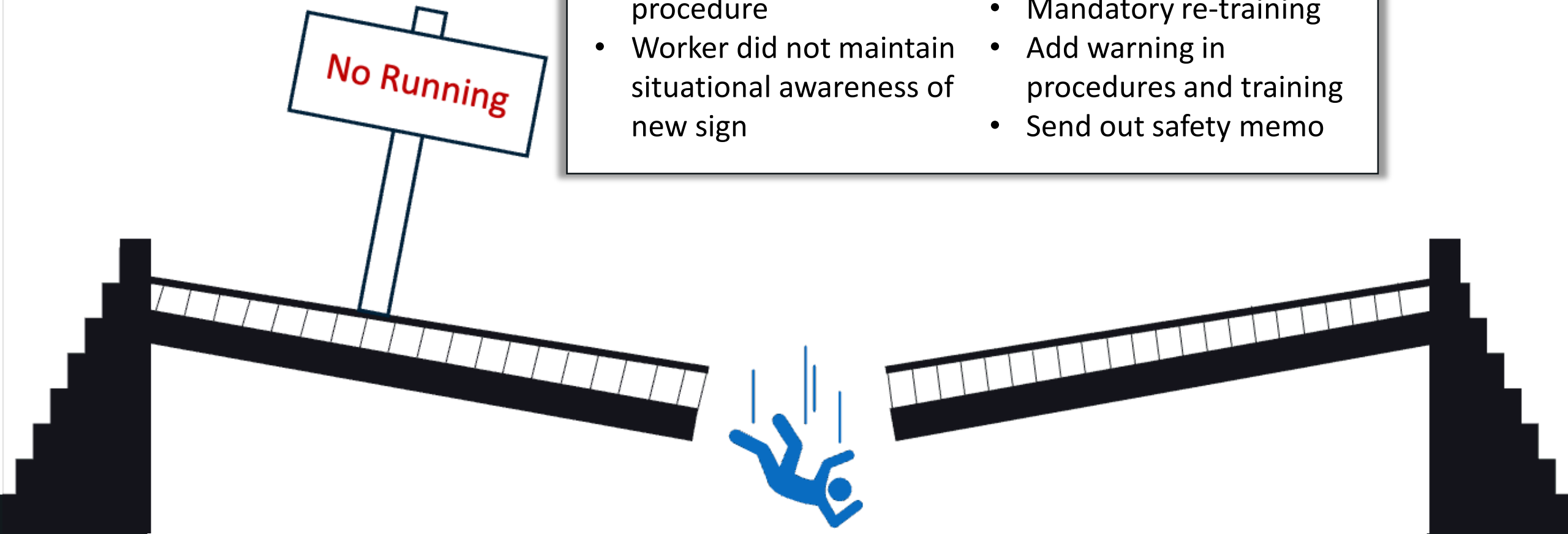
Event #3 Investigation

Findings & Conclusions

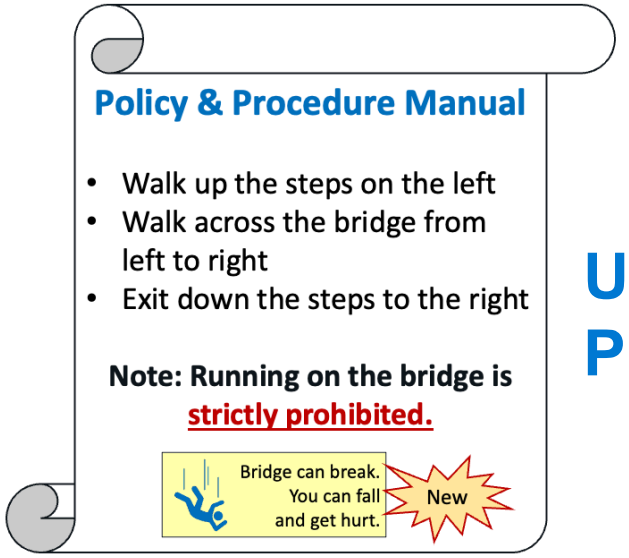
- Worker failed to follow-procedure
- Worker did not maintain situational awareness of new sign

Corrective Actions

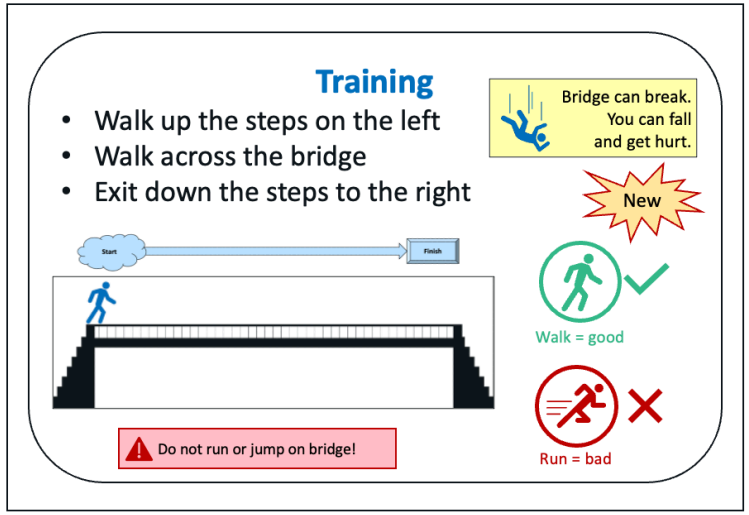
- Issue corrective action
- Mandatory re-training
- Add warning in procedures and training
- Send out safety memo



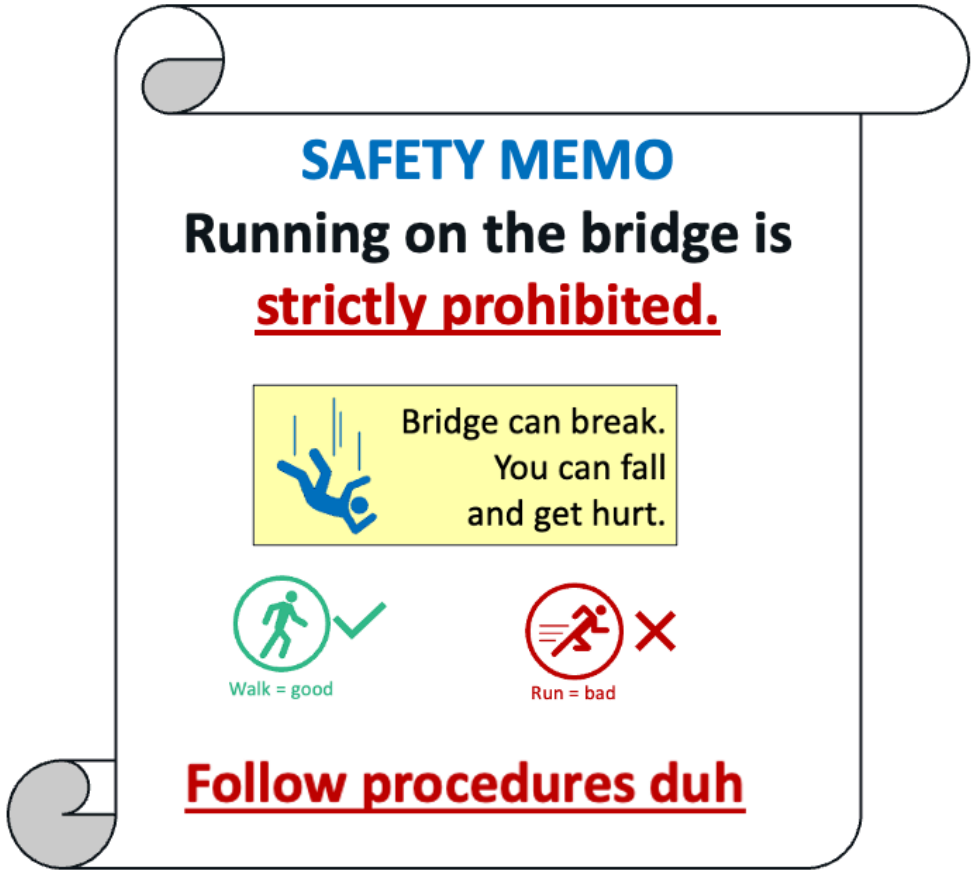
Event #3 Corrective Actions



Update Policies, Procedures, Manuals



Update Training



Send out Safety Memo

New

Event #4

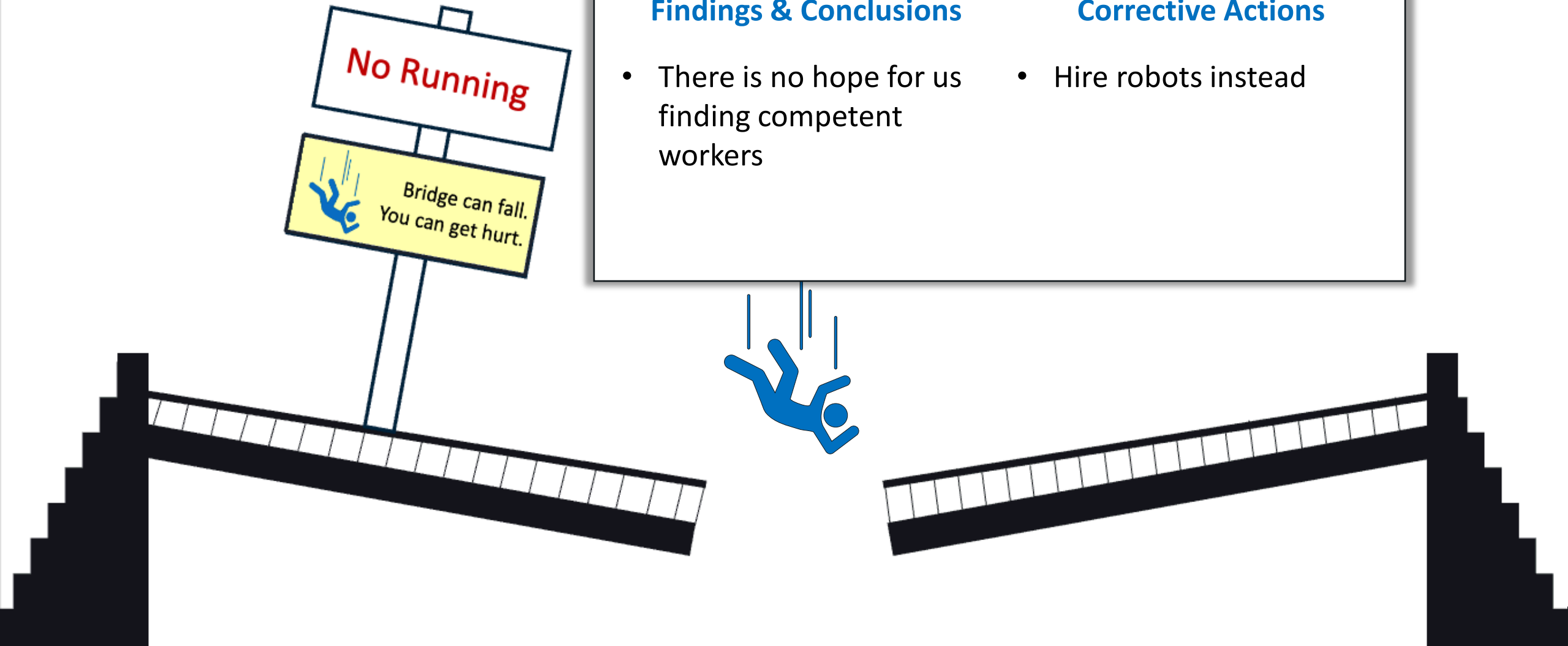
Event #4 Investigation

Findings & Conclusions

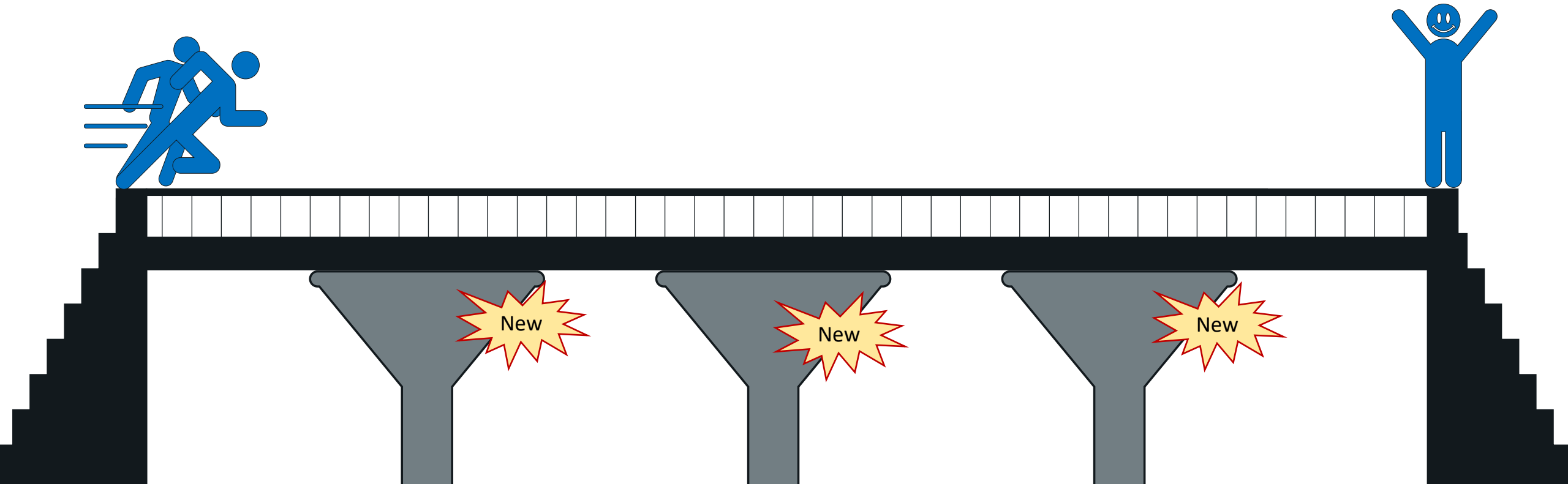
- There is no hope for us finding competent workers

Corrective Actions

- Hire robots instead



Event #4



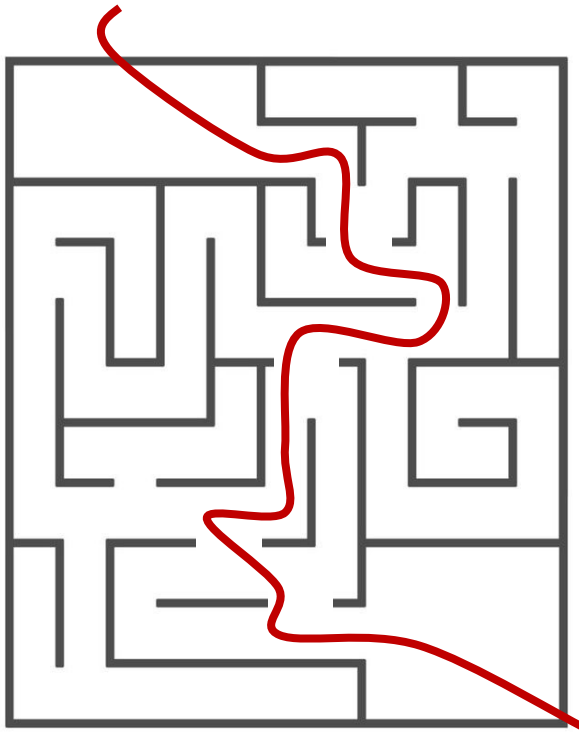
When Ohio State University designed their campus, they waited to see where the students walked before paving the walkways.

“Blame is the enemy of safety”

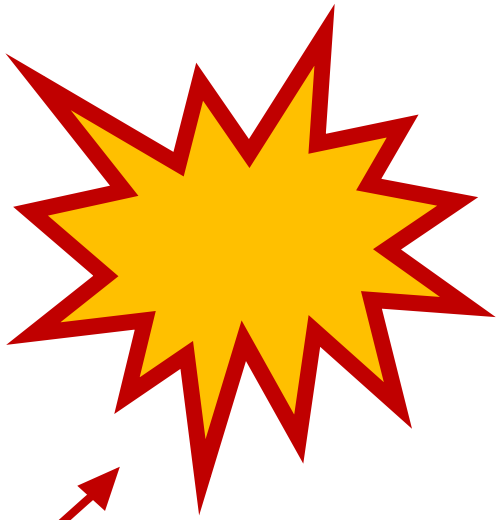
- Nancy Leveson, MIT

Three Parts of Every Event

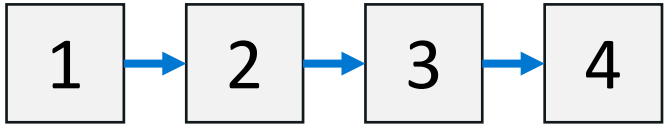
Context



Consequence



The Retrospective Understanding



What is the most important part of the event?

Pre-Accident Investigations, Conklin 2013

CAST Structure 30,000ft Overview

Loss

System Hazardous State in which event occurred

System Safety Constraints (barriers)

Physical Equipment

What physical safety controls are in place?

What Failed?
What was inadequate

Human Controller

What actions lead to the loss?

What belief supports the action?

Context

Context

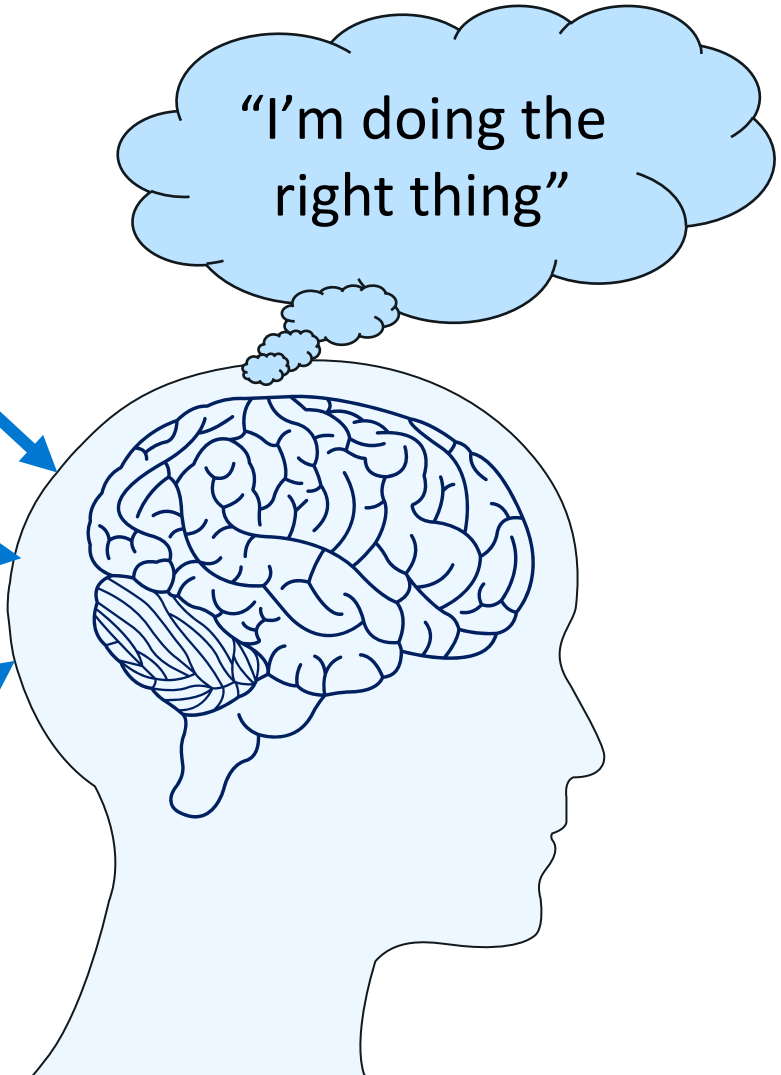
Beliefs
(process model)

Contributing Action

Past Experiences

Organizational Pressure

Influence from peers

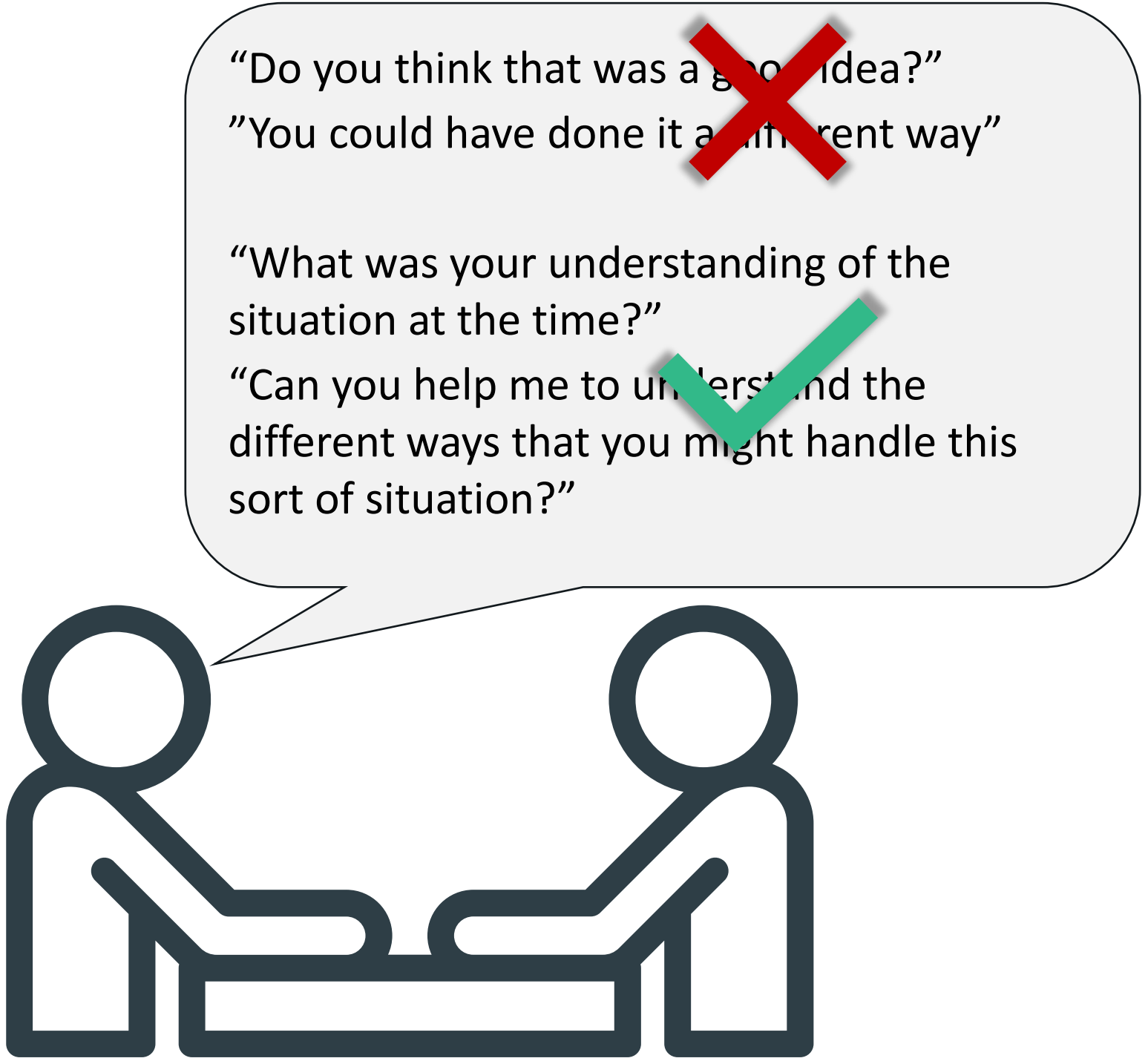


Unsafe Action by human

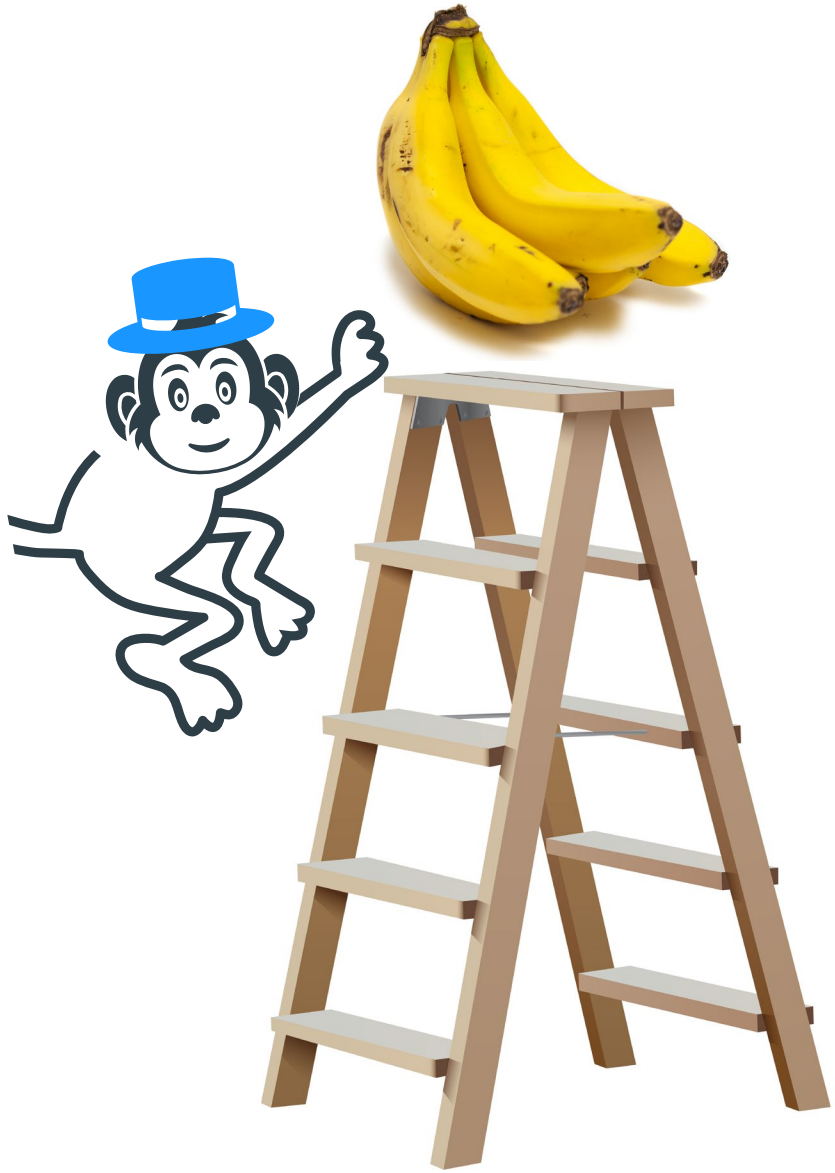
Interviews

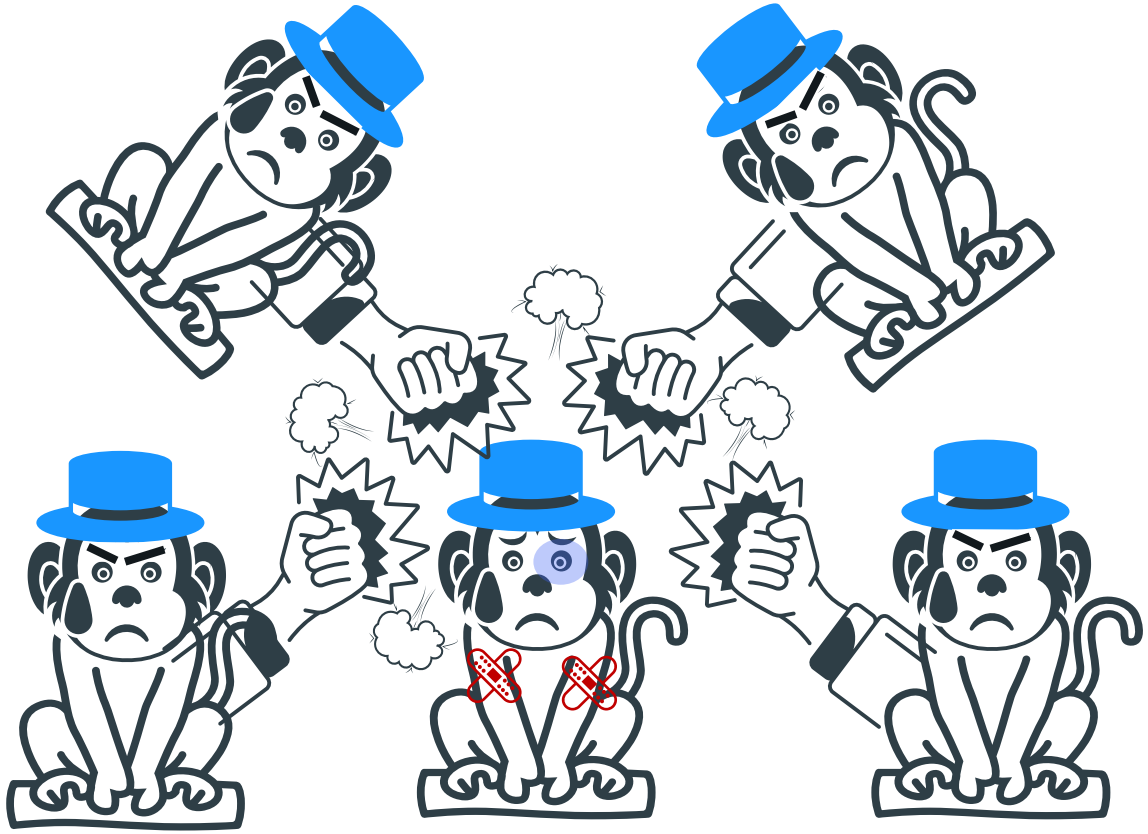
Stay away from judgmental or blaming language

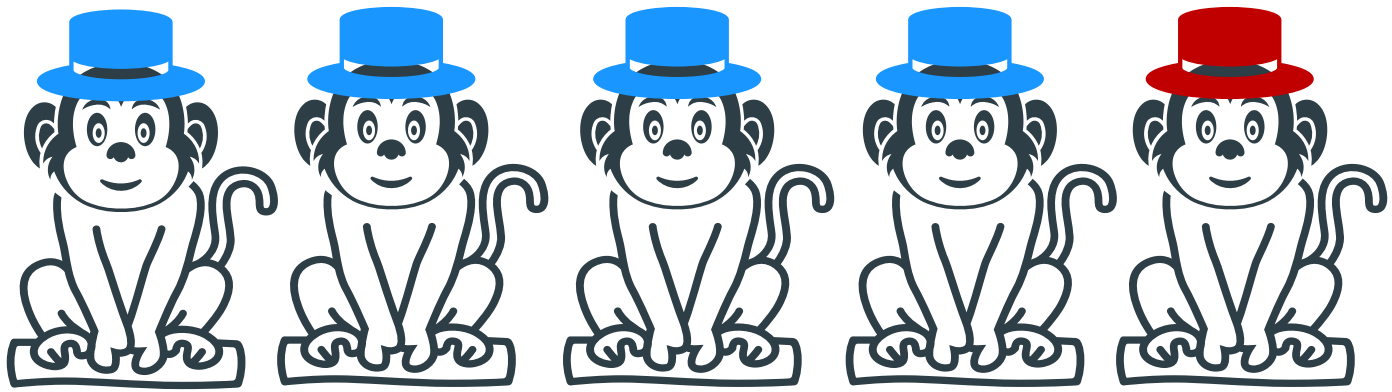
Identify context which made actions seem reasonable

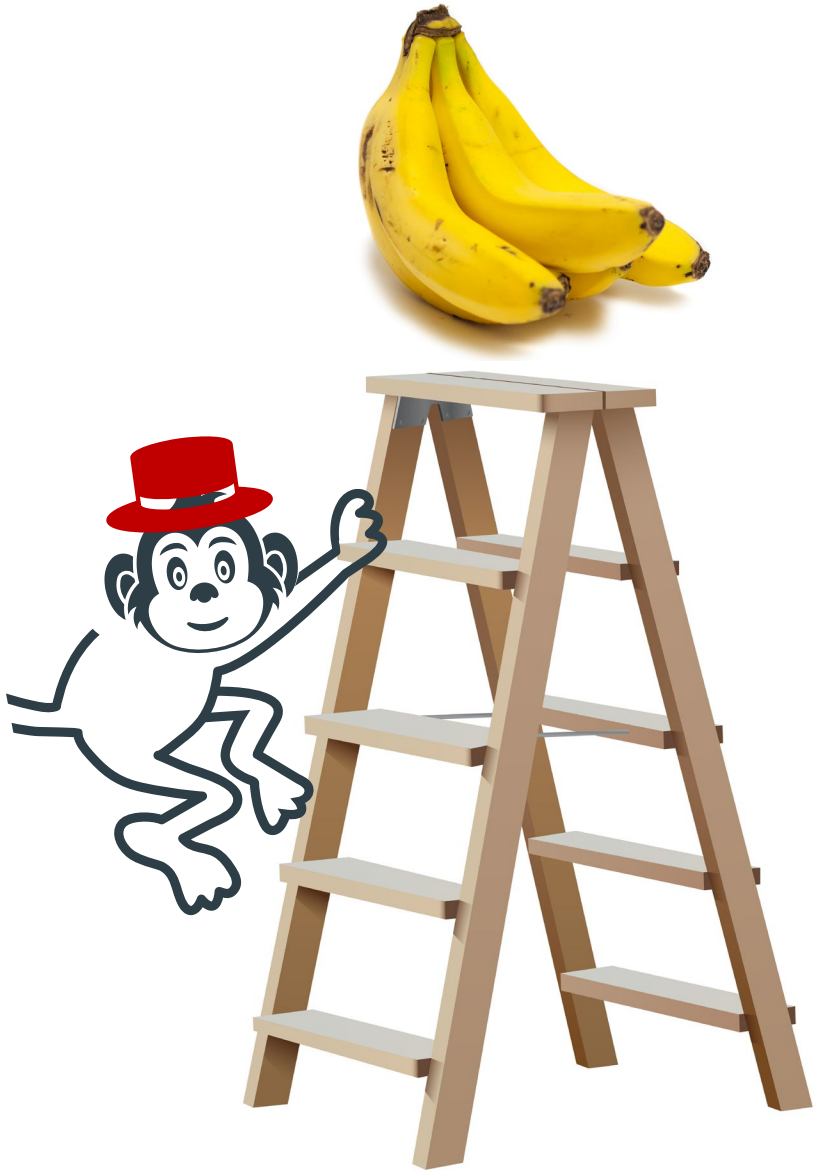


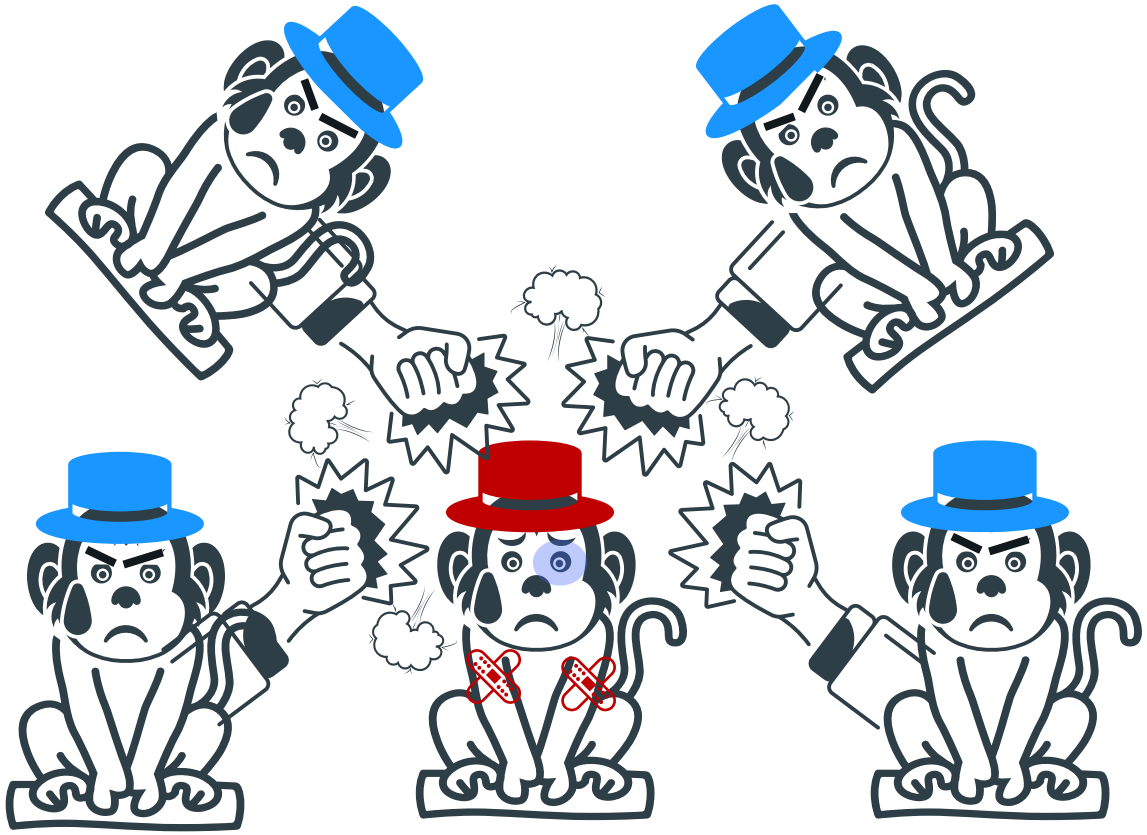
Monkey Experiment

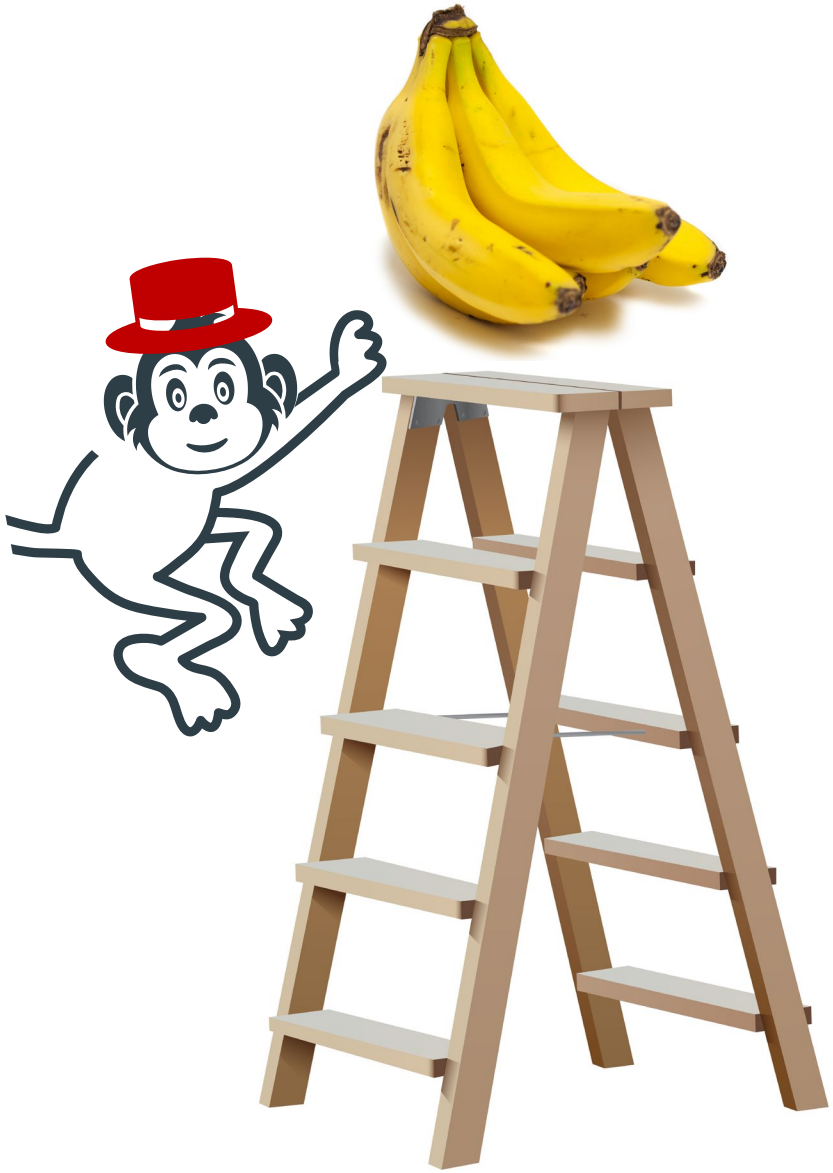


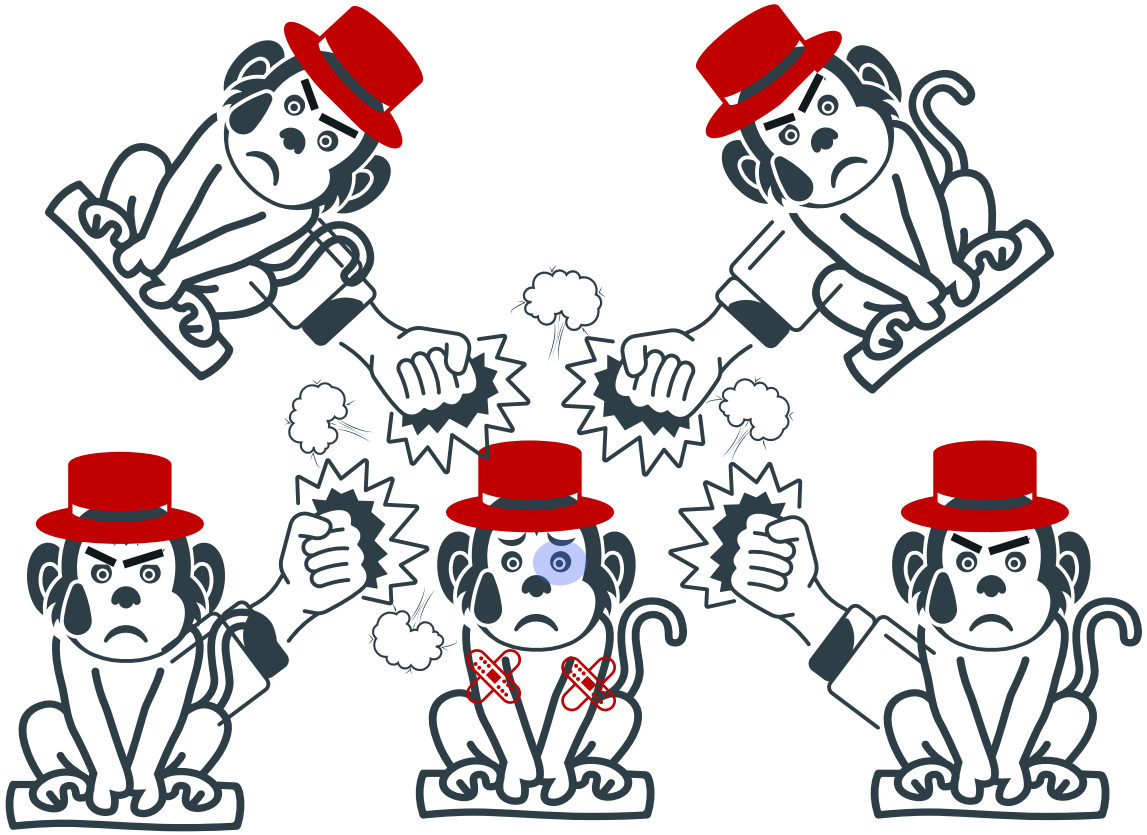








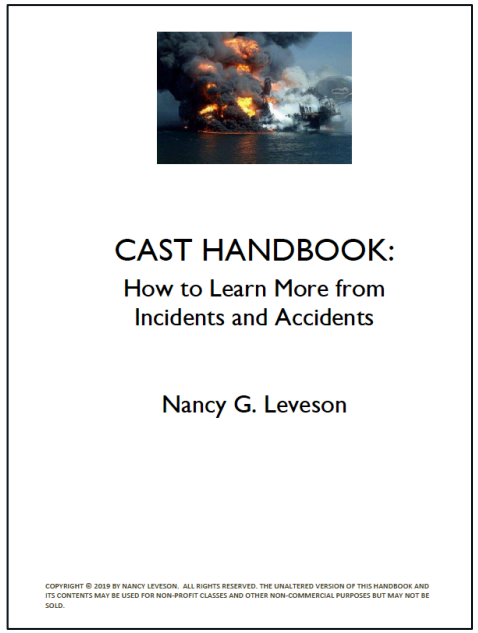




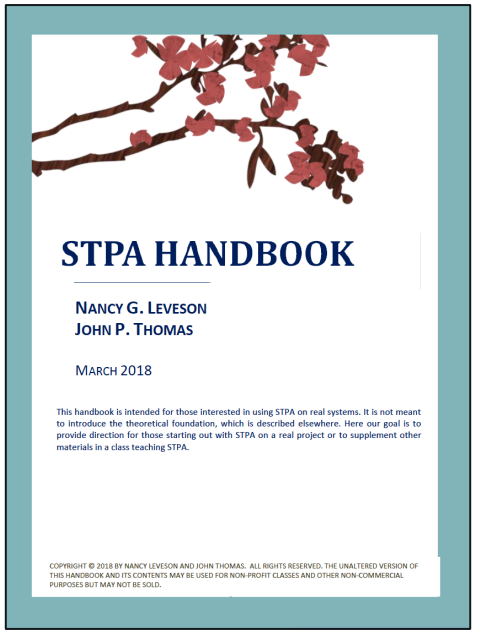
Monkey Experiment Conclusions

"I don't know – that's how things are done around here"

Resources

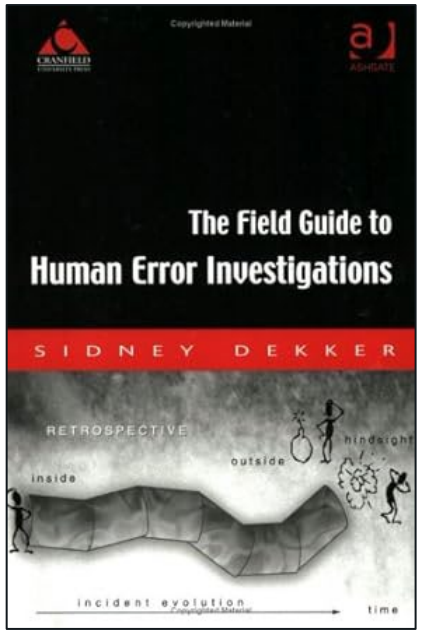


CAST Handbook
Nancy Leveson

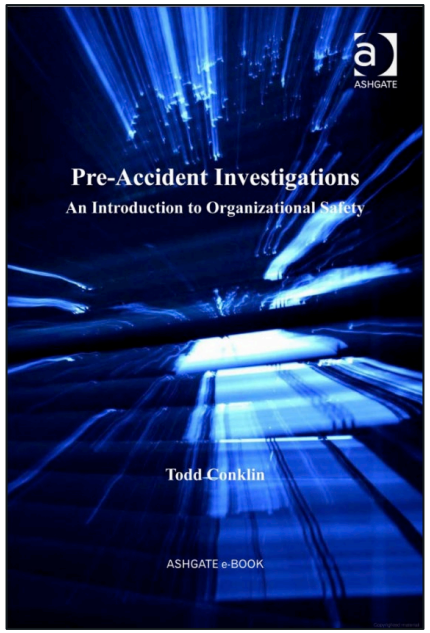


STPA Handbook
Nancy Leveson, John Thomas

Free to download on MIT's website
http://psas.scripts.mit.edu/home/materials/



The Field Guide to Human Error Investigations
Sidney Dekker



Pre-Accident Investigations
Todd Conklin

StaySafe.

Questions