Aviation and its Contributions to Healthcare

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paediatric cardiothoracic surgeon at GOSH
professor of physic at Gresham College

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health care is dangerous

200,000 preventable deaths per year in USA

≈20 large jet airliner crashes per week, with no survivors

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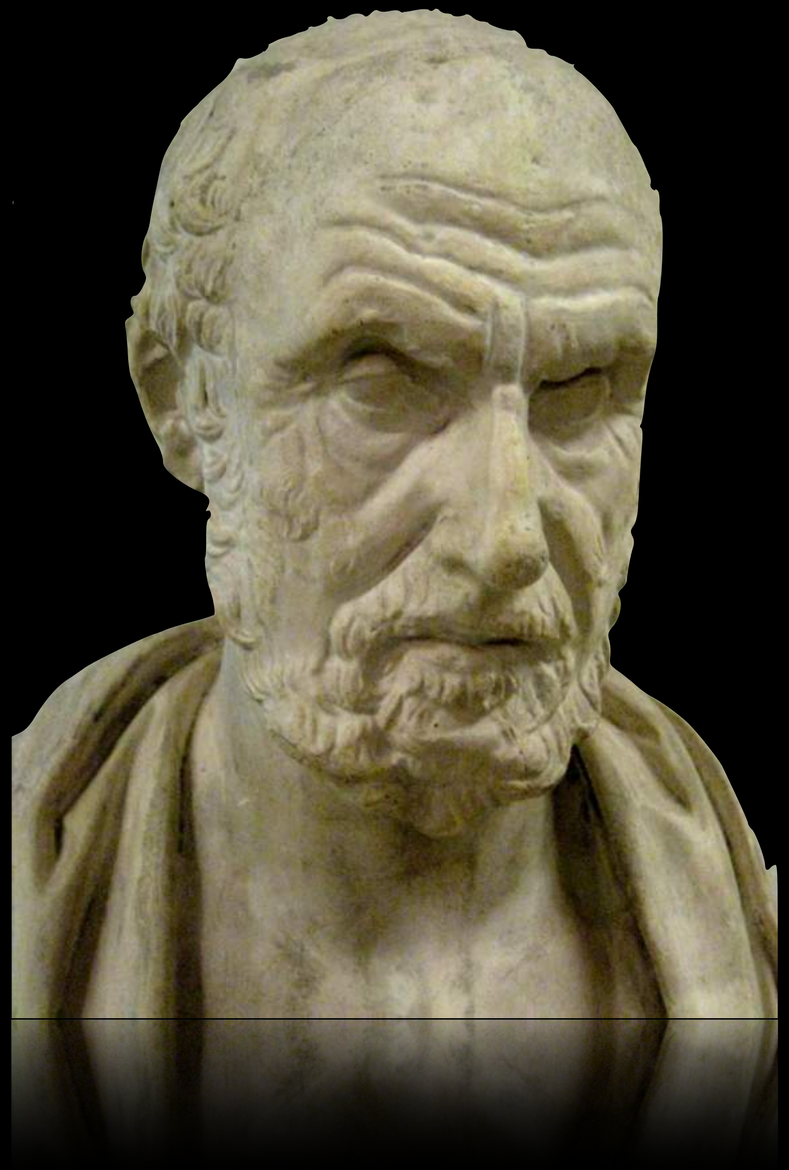

FIRST, DO NO HARM

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preoccupied with failure
reluctant to simplify interpretations
sensitive to operations

committed to resilience
defer to expertise

human factors account for 30-90% of accidents in hazardous environments

high-reliability organisations

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HUMAN ERROR
IS
INEVITABLE

60-70% of an NHS Hospital Turnover is spent on staff

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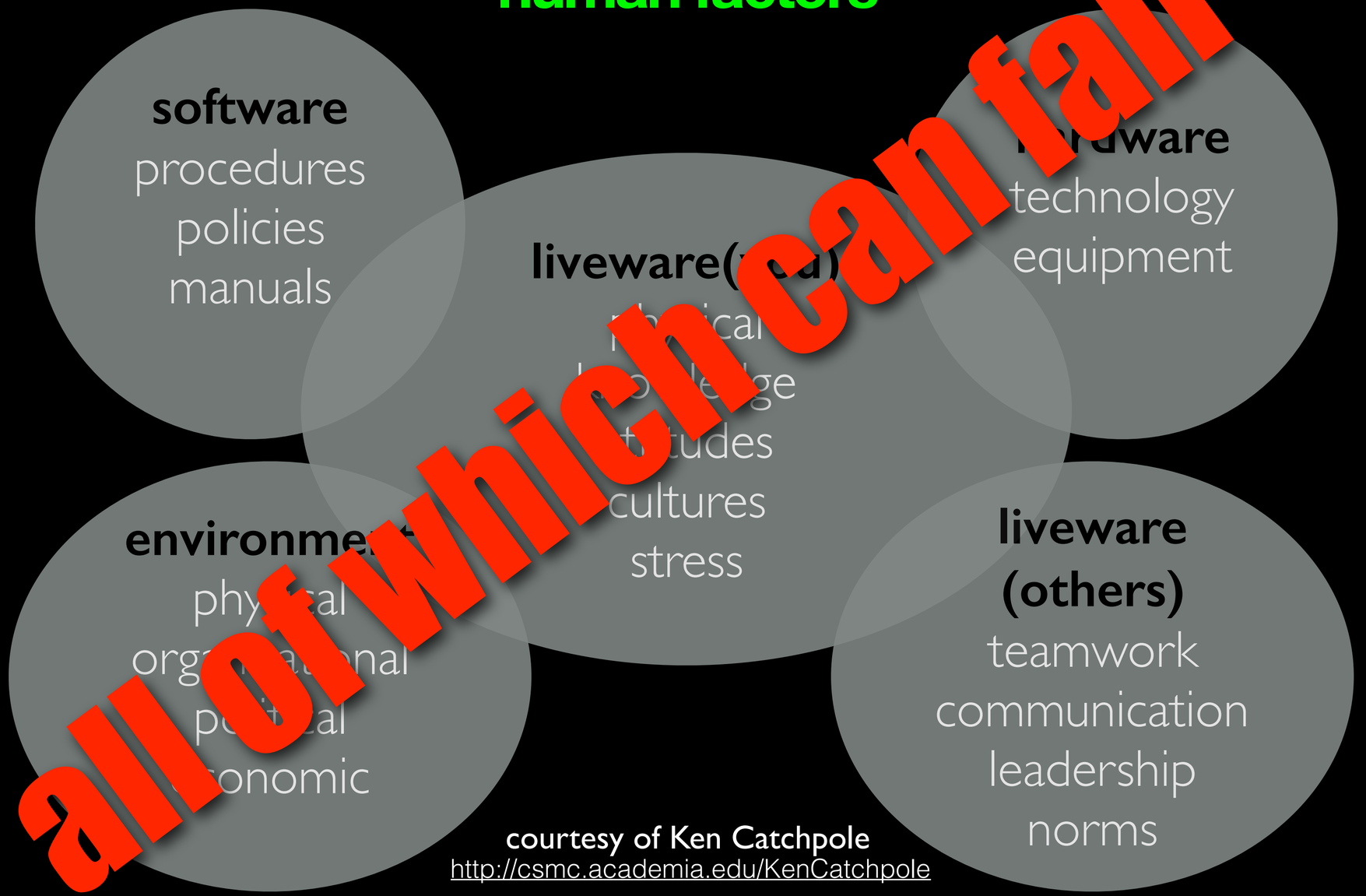
the complex inter-relationships of cardiac care;
human factors



courtesy of Ken Catchpole
http://csmc.academia.edu/KenCatchpole

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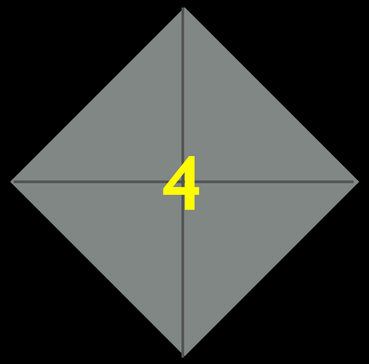
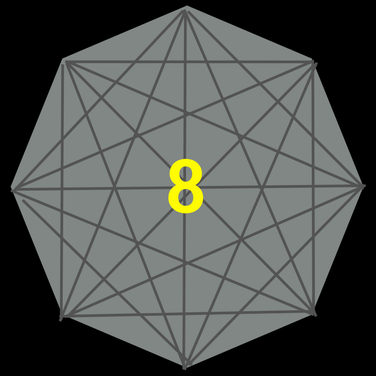
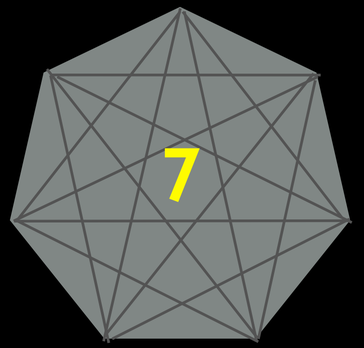
How many interactions to be **effective**?







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how **safe** is healthcare?

Courtesy of Prof James Reason

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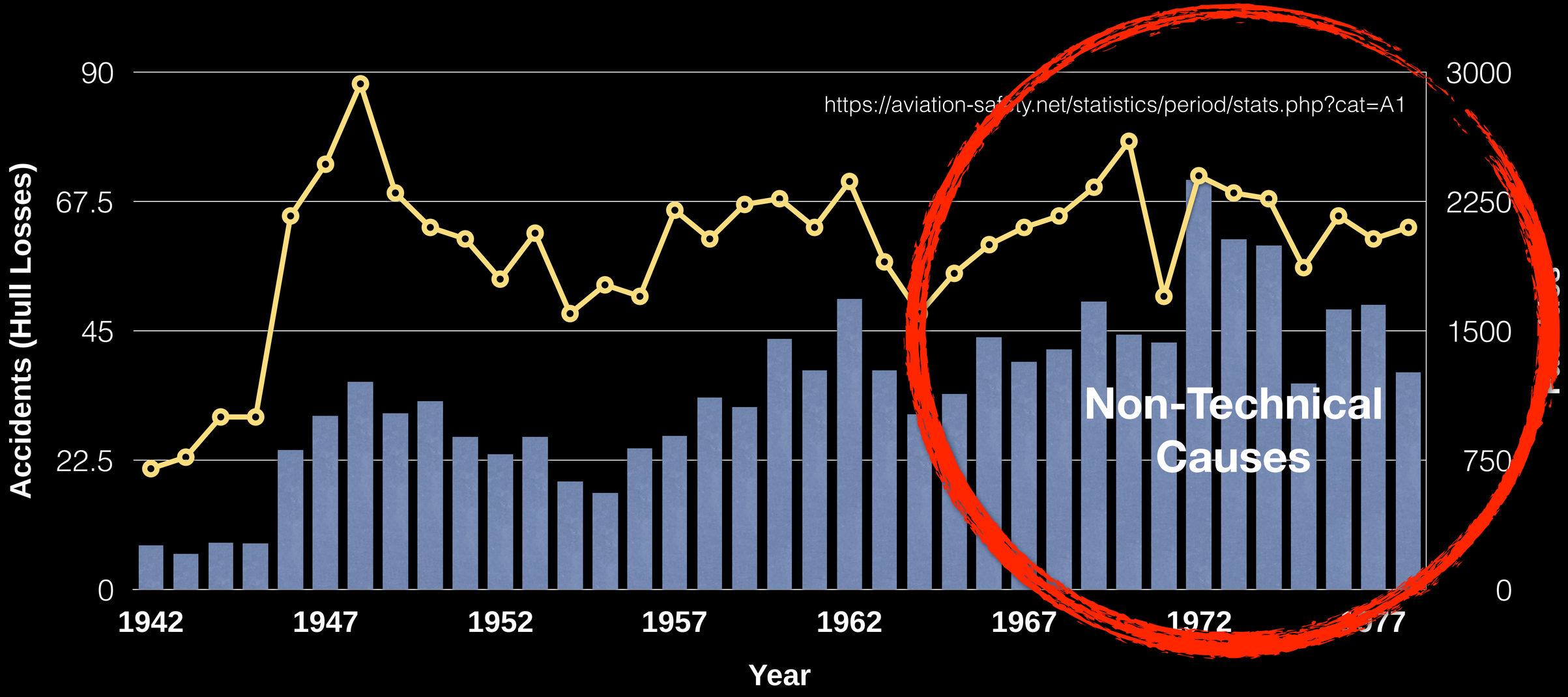
Fatal Airliner (>14 passengers) hull-loss accidents



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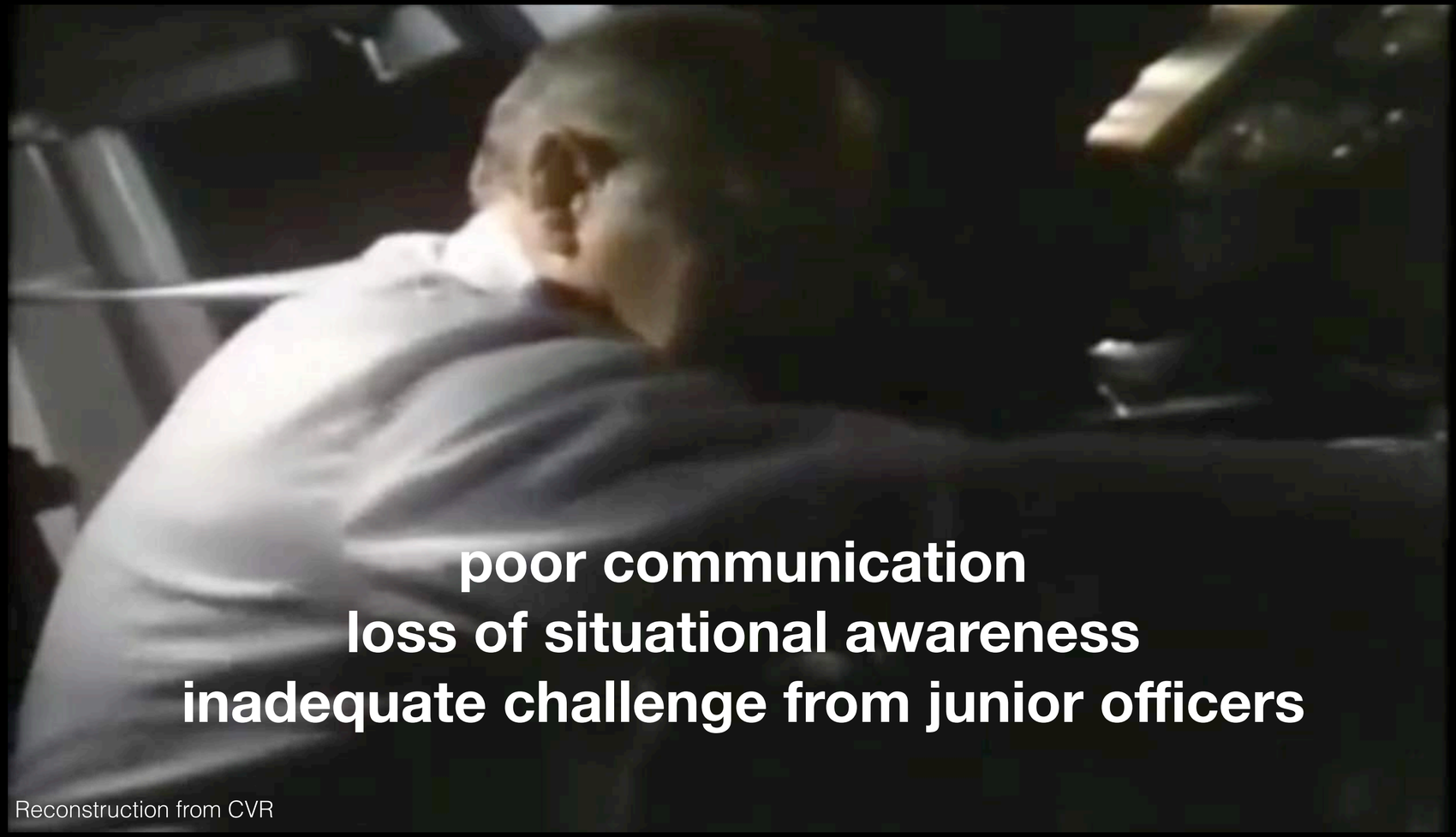
Eastern Flight 401 29 Dec 1972



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edited from https://www.youtube.com/watch?v=gyOTeaz5aTE

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poor communication
non-standard terminology
co-pilot’s lack of assertiveness
captain unwilling to accept input
KLM captains ‘legendary status’

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Captain Jacob van Zanten

https://en.wikipedia.org/wiki/Jacob_Veldhuyzen_van_Zanten

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United 173, December 28, 1978

As a result of a relatively minor landing gear problem, a United Airlines DC-8 was in a holding pattern while awaiting landing at Portland, Oregon.

Although the first officer knew the aircraft was low on fuel, he failed to express his concerns convincingly to the captain.

The plane ran out of fuel and crashed

http://www.airdisaster.com/investigations/ua173.shtml

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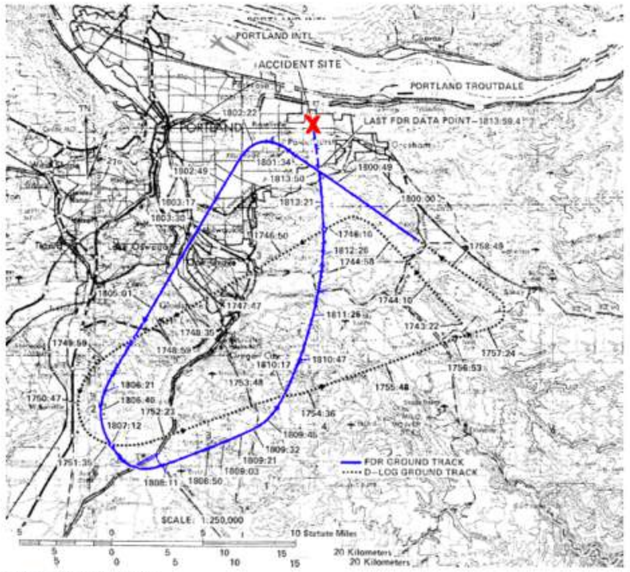
Time	Crew Member	Words



Source: NTSB-AAR-79-9, p. 5

“The National Transportation Safety Board determined that the probable cause of the accident was **the failure of the captain to monitor properly the aircraft’s fuel state and to properly respond to the low fuel state and the crew-member’s advisories regarding fuel state.** This resulted in fuel exhaustion to all engine‘s. His **inattention resulted from preoccupation with a landing gear malfunction and preparations for a possible landing emergency**.

Contributing to the accident was the **failure of the other two flight crew members either to fully comprehend the criticality of the fuel state or to successfully communicate their concern to the captain.**”

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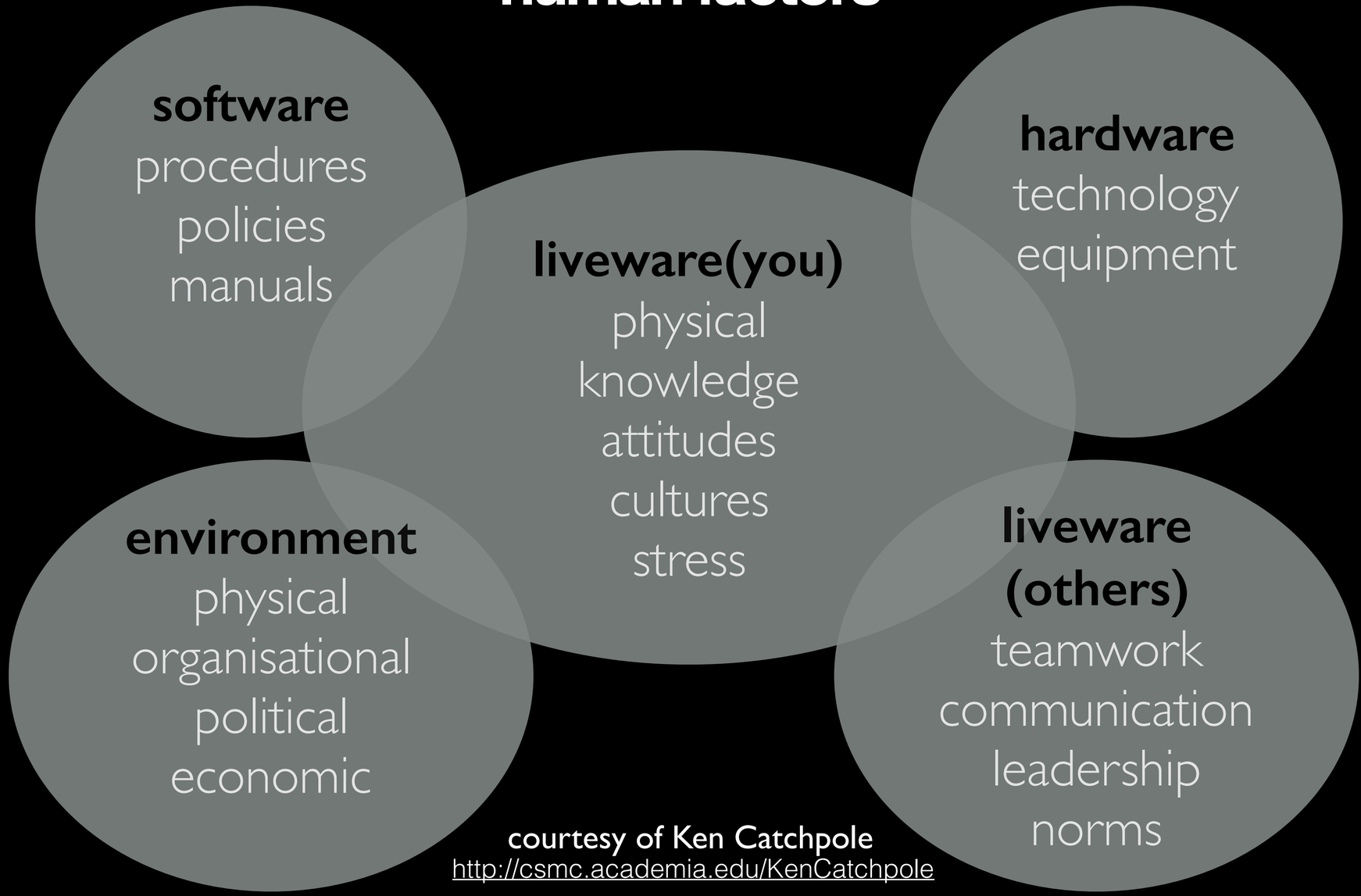
complex inter-relationships; human factors



courtesy of Ken Catchpole
http://csmc.academia.edu/KenCatchpole

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1970's culture

centred around the pilot

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Capt. Chesley “Sully” Sullenberger

“In the bad old days , when the captain was a god with a small ‘g’ and a Cowboy with a capital ’C’,
first officers carried little notebooks that listed the idiosyncrasies and personal preferences of different captains.”

nurses do the same for surgeons

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Prof. Robert Helmreich
former Prof of Psychology at University of Texas

"There was no concept of a team. None whatsoever. Captains looked at first officers and engineers not as resources but as kind of like fire extinguishers:
"**Break the glass if they're needed**""

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By Joel Taylor - 19th April, 2012

+1 0 Like 24 Share Tweet 0 Comments 0

Flybe pilots sacked after 'my bitch' jibe led to mid-air row

Two Flybe pilots were sacked for turning the air blue after the captain called the first officer 'his bitch' and was told to 'f* off' in reply, a tribunal has heard.**

Two Flybe pilots have been dismissed following a mid-air row (Picture: PA)

Two Flybe pilots have been dismissed following a mid-air row (Picture: PA)

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NTSB Recommendation after United 173

"Issue an operations bulletin to all air carrier operations inspectors directing them to urge their assigned operators to **ensure that their flightcrews are indoctrinated in principles of flightdeck resource management, with particular emphasis on the merits of participative management for captains and assertiveness training for other cockpit crewmembers.**"

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flight-deck resource management

cockpit resource management

crew resource management

CRM

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CRM Components

- Communication
- Leadership Skills
- Decision-making
- Situation Awareness
- Teamworking
- Managing stress and fatigue
- Understanding one’s limitation

Non-Technical Skills

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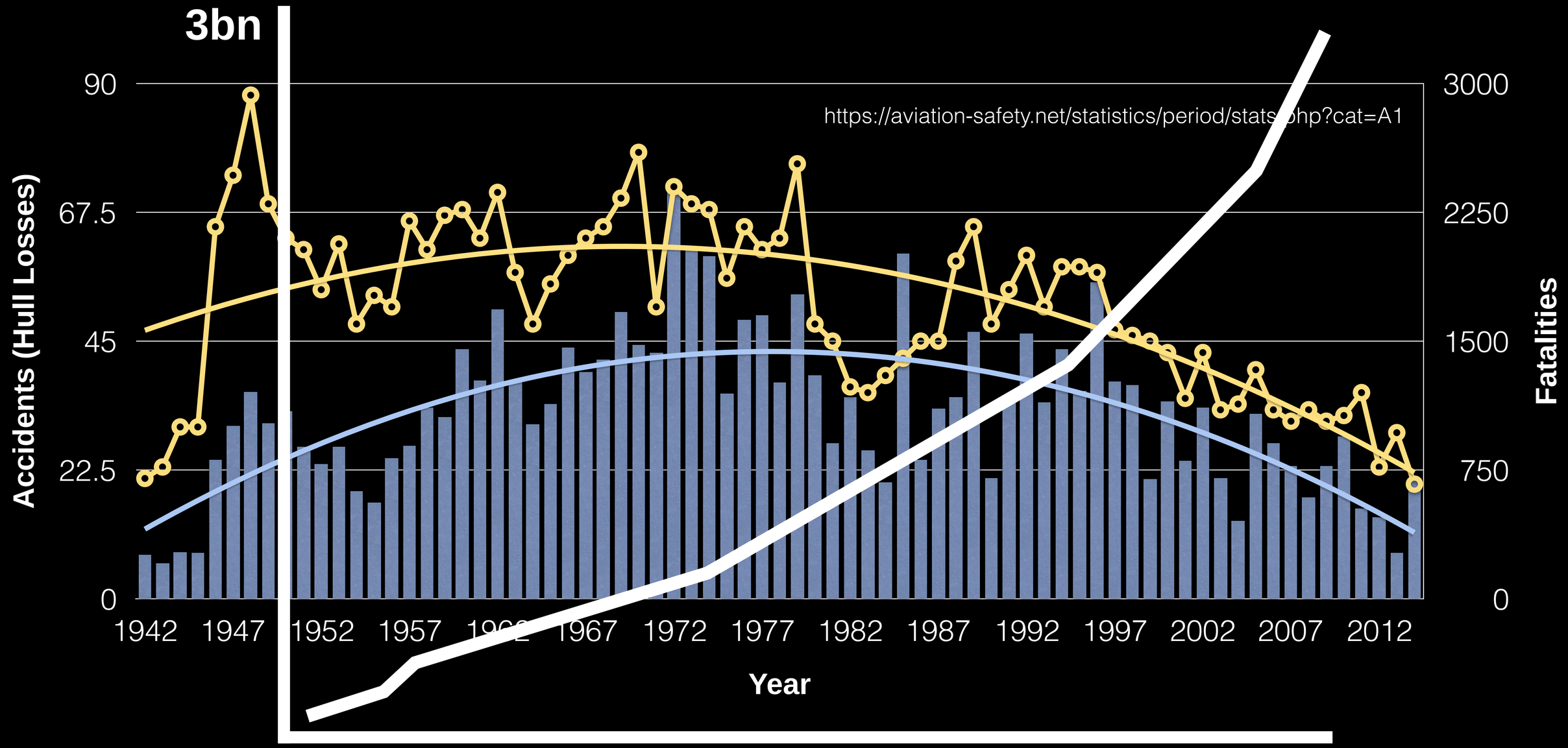
effect of CRM

- 98% of flights face threat
- Errors occur on 82% of flights
- 70% decrease in crashes since the inception of CRM

Fatal Airliner (>14 passengers) hull-loss accidents



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Accident Rates and Onboard Fatalities by Year

Worldwide Commercial Jet Fleet | 1959 through 2014

All accident rate
Fatal accident rate
Hull loss accident rate
Onboard fatalities

Annual accident rate (per million departures)

50
40
30
20
10
0

1400
1200
1000
800
600
400
200
0

Annual onboard fatalities

60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14

Year

TOP 10 MOST DANGEROUS US-JOBS IN 2010

(with fatal work injury rate)

1.	Fishermen	116,0
2.	Logging workers	91,9
3.	Airplane pilots	70,6
4.	Farmers and ranchers	41,4
5.	Mining machine operators	38,7
6.	Roofers	32,4
7.	Sanitation workers	29,8
8.	Truck drivers and delivery workers	21,8
9.	Industrial machine workers	20,3
10.	Police officers	18,0

Slide Courtesy of Manfred Mueller, Lufthansa

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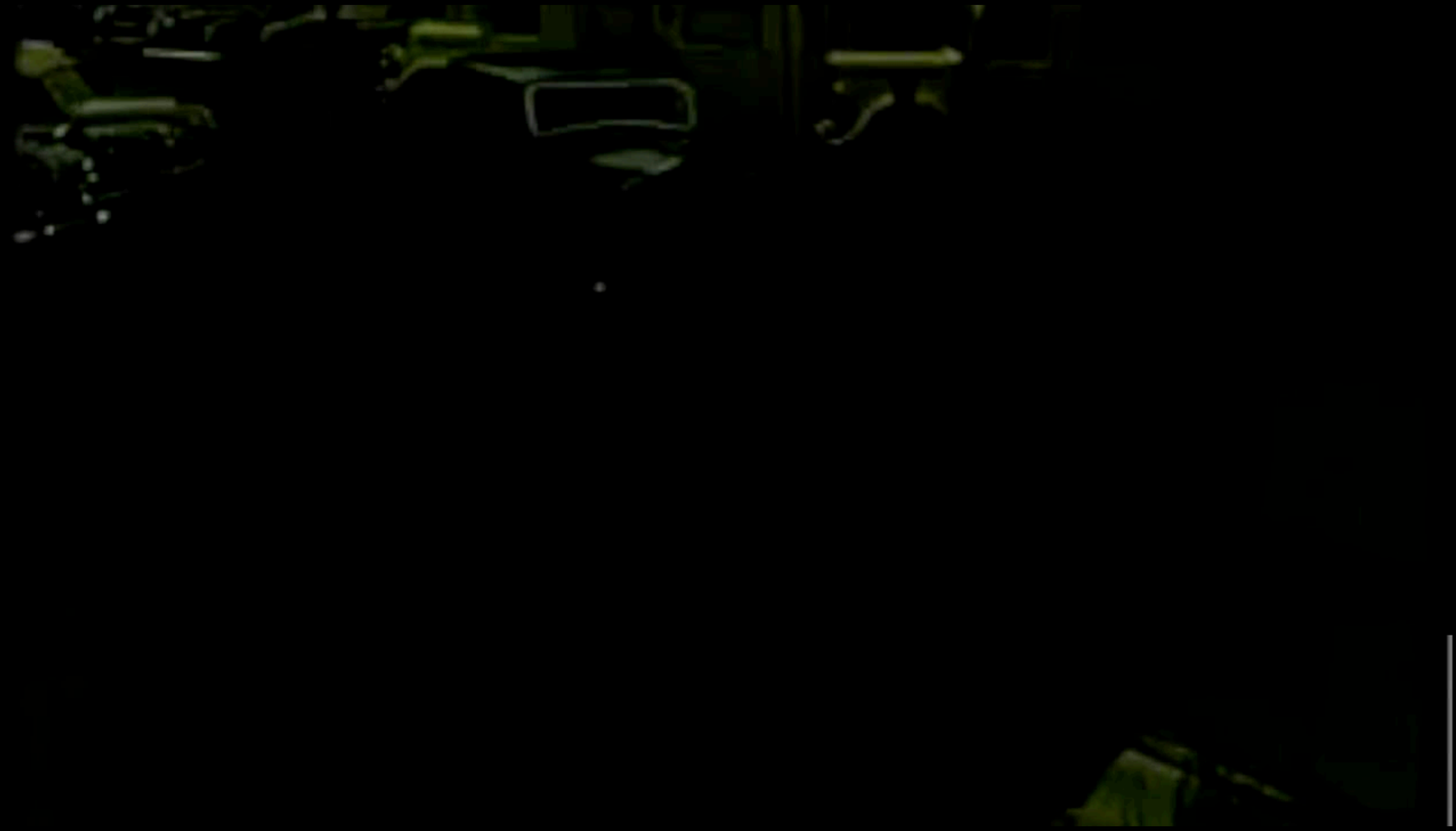
Surgical Culture



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the eye of hawk, the heart of a lion and the hands of a lady

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teaching by humiliation

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cardiac surgeons

must be situationally aware, able to marshal available resources, initiate rapid changes in management and do so in a way that uses adaptive command and control skills

“goal-orientated with a strong sense of their own ability to control their actions and environment”

“sacrifice their personal needs on the altar of their career”

“may enjoy the positional power that comes with the role”

Winlaw DS, Large MM, Jacobs JP, et al. Leadership, surgeon well-being, and other non-technical aspects of pediatric cardiac surgery. In: Barach PR, Jacobs JP, Lipschultz SE, et al., eds. Pediatric and Congenital Cardiac Care: volume 2: Quality improvement and patient safety. London: Springer-Verlag, 2015:293-306.

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Strength	Derailer
Diligent	Perfectionist
Charming	Manipulative
Confident	Arrogant
Shrewd	Mistrustful
Focused	Passive aggressive
Careful	Cautious
Independent	Detached
Imaginative	Eccentric
Vivacious	Dramatic
Enthusiastic	Volatile
Dutiful	Dependent

http://www.rcseng.ac.uk/publications/docs/leadership_management.html/?searchterm=giddings

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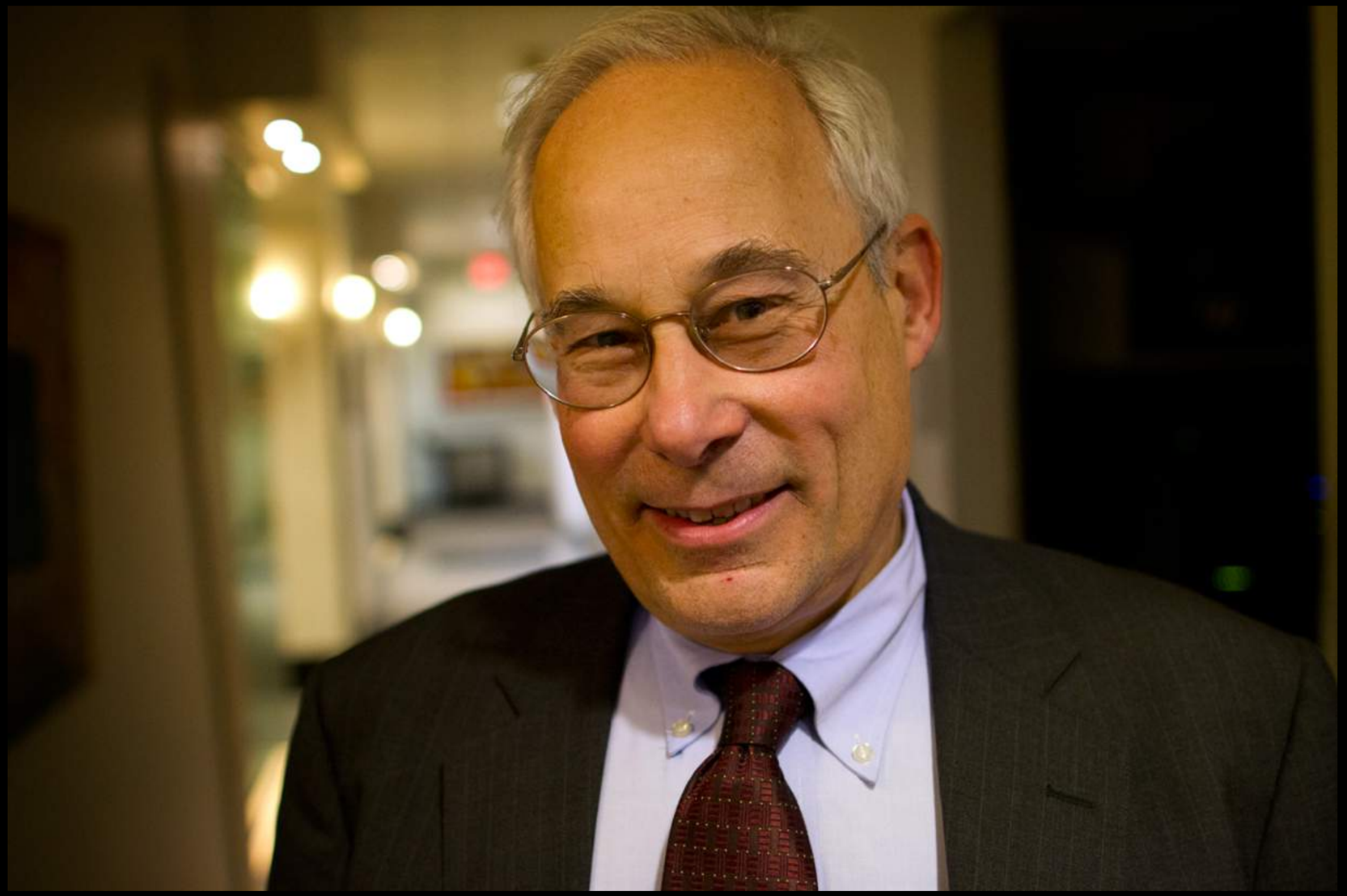
Don Berwick



Institute *for* Healthcare Improvement

QI

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Lucian Leape

THE NATIONAL PATIENT SAFETY FOUNDATION'S LUCIAN LEAPE INSTITUTE

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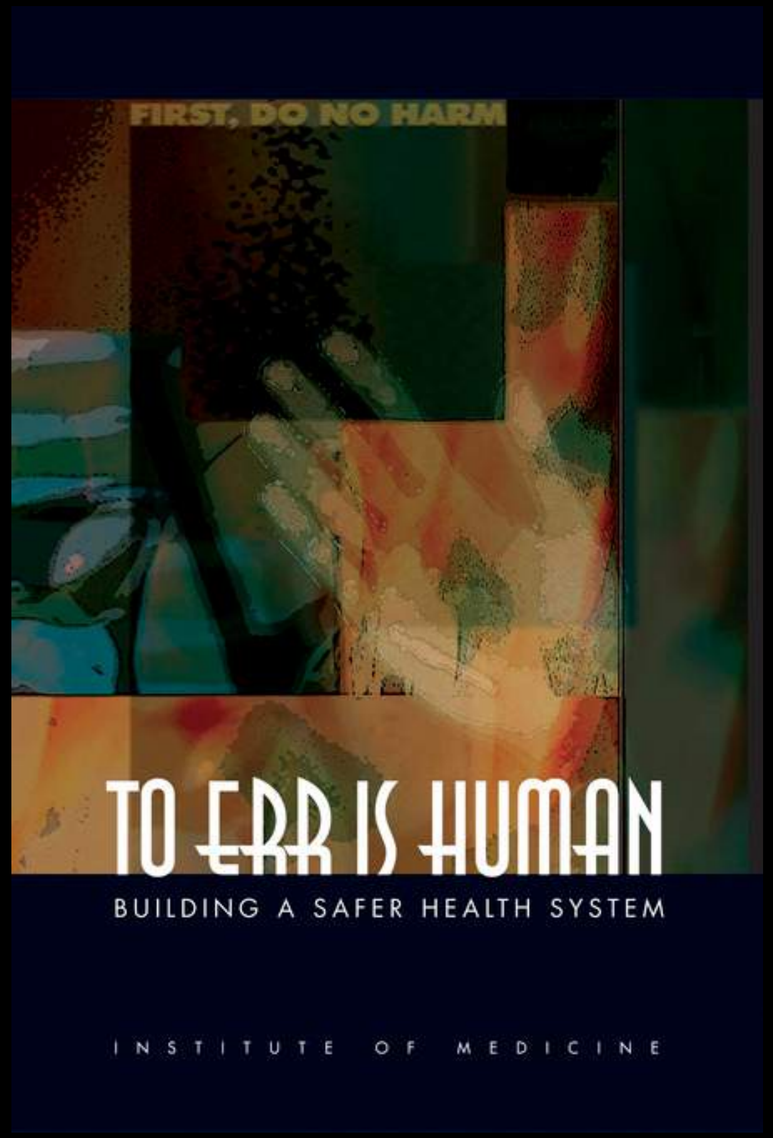

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Marc de Leval

Analysis of a cluster of surgical failures: Application to a series of neonatal arterial switch operations

Marc R. de Leval, MD, FRCS, Katrien François, MD (by invitation), Catherine Bull, MRCP (by invitation), William Brawn, FRCS (by invitation), David Spiegelhalter, PhD (by invitation)

The Journal of Thoracic and Cardiovascular Surgery
Volume 107, Issue 3, Pages 914-924 (March 1994)
DOI: 10.5555/uri:pii:S0022522394703507

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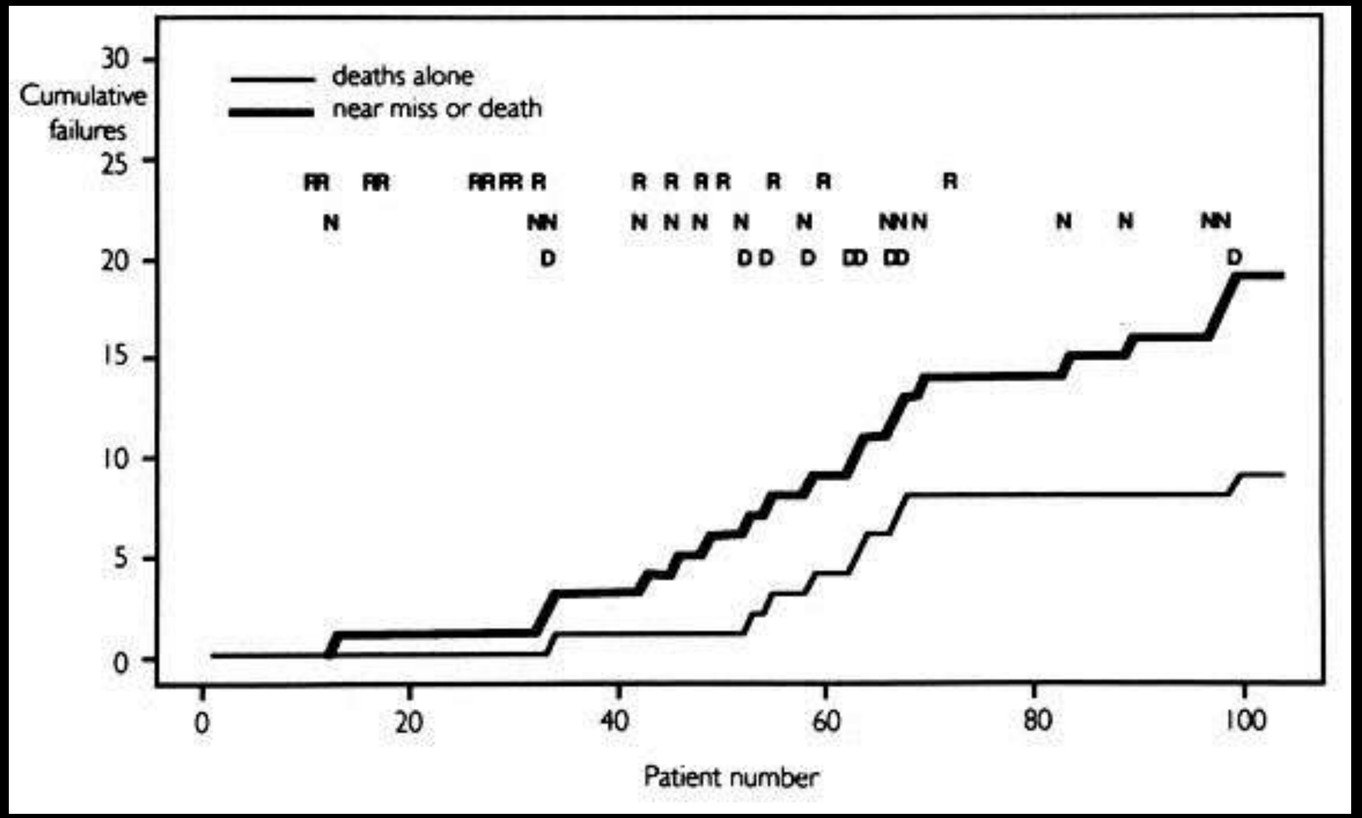
CUSUM



The Journal of Thoracic and Cardiovascular Surgery 1994 107, 914-924DOI: (10.5555/uri:pii:S0022522394703507)

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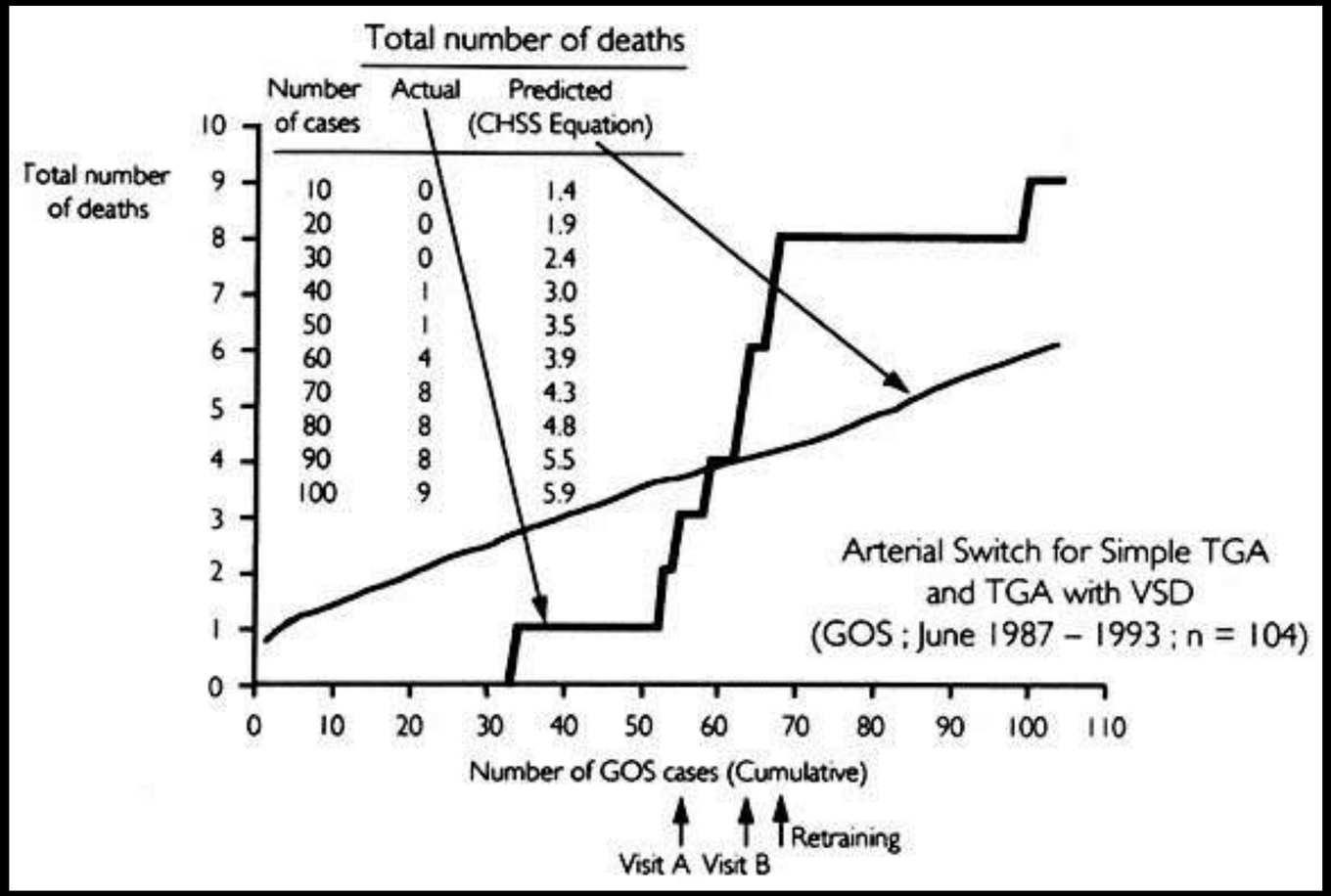

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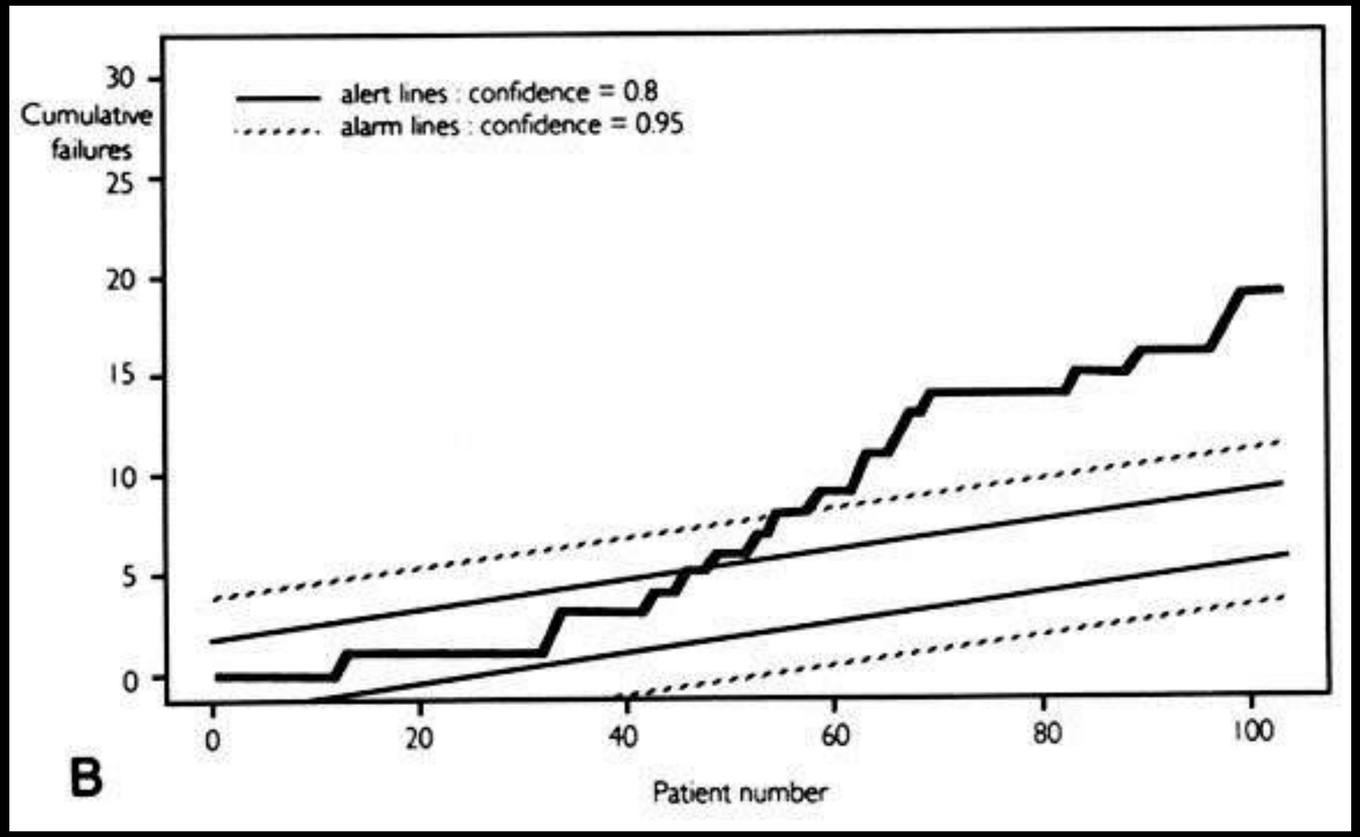

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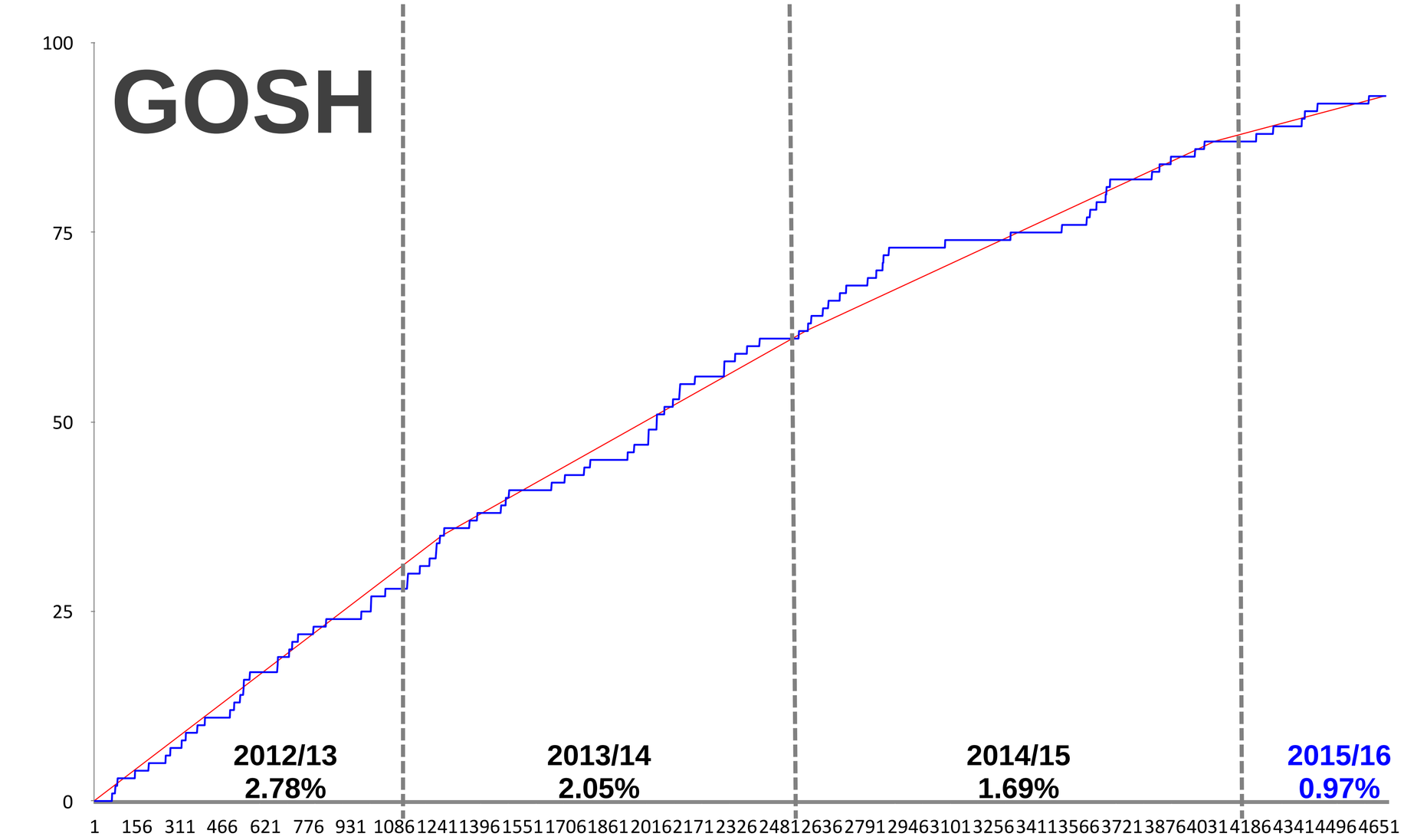
In-Hospital Cardiac Surgery Mortality



James Reason

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Reason's Swiss Cheese Theory

25/7/2000

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de Leval MR.
Human factors and surgical outcomes: a Cartesian dream.
Lancet 1997;**349**(9053):723-5.

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The Clinical Human Factors Group

Martin Bromiley, talking about his wife Elaine

www.risky-business.com

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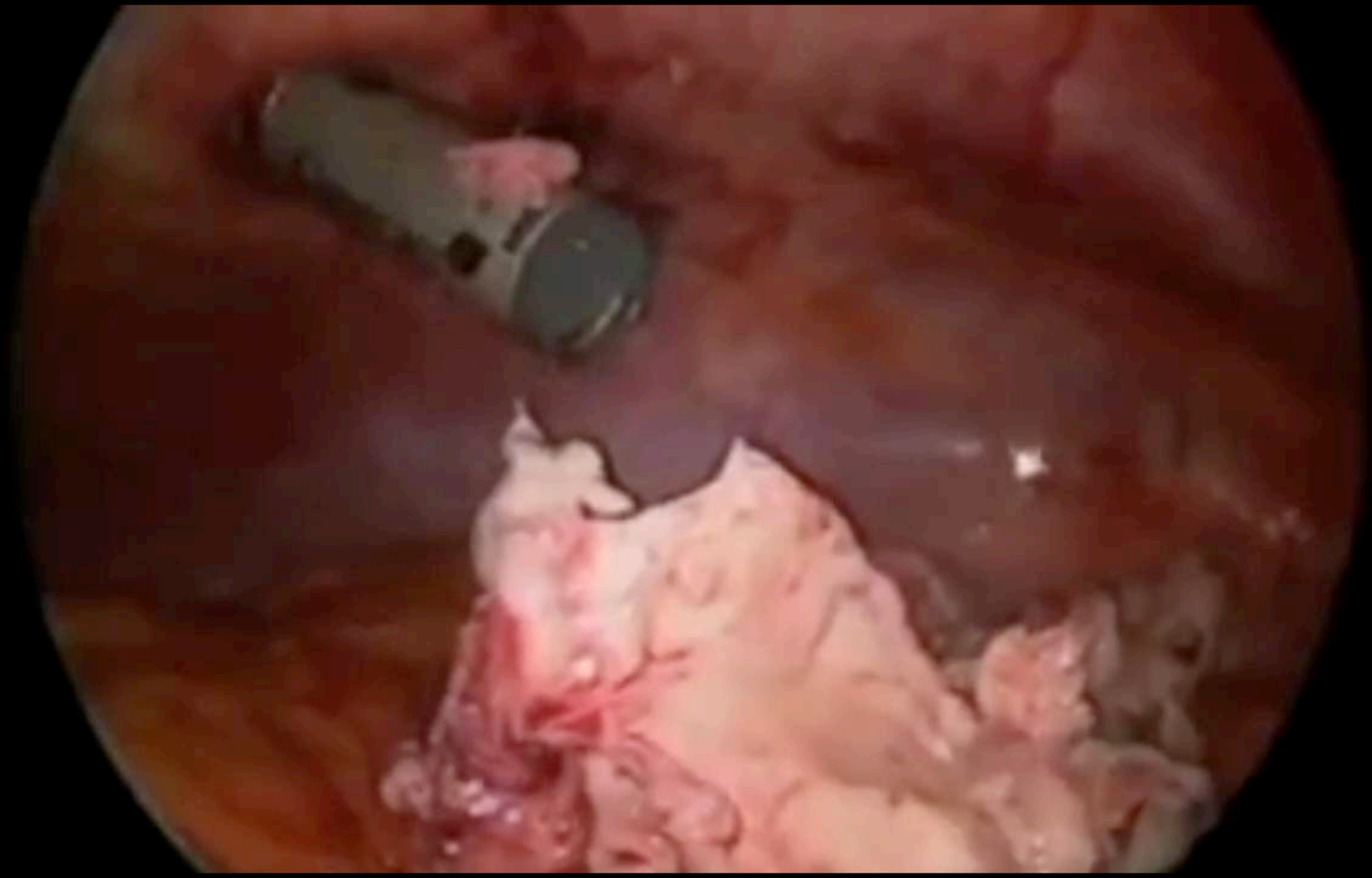
Bethany and the morcellator



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Bethany Bowen

congenital spherocytosis
2 siblings

elective laparoscopic splenectomy
major teaching hospital

this is her mother, Clare

Bethany died,
and, within a year, so did her father

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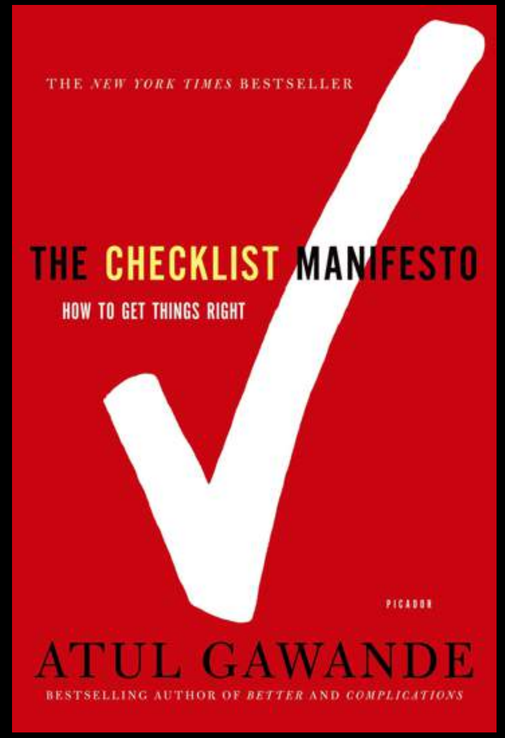
Atul Guwande



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“The volume and sophistication of what we know has exceeded our ability to deliver its benefits correctly, safely or reliably. We need a different strategy”

“There is a different strategy. It is **THE CHECKLIST**”

Atul Gawande. The Checklist Manifesto; how to get things right
Metropolitan Books , New York, 2009

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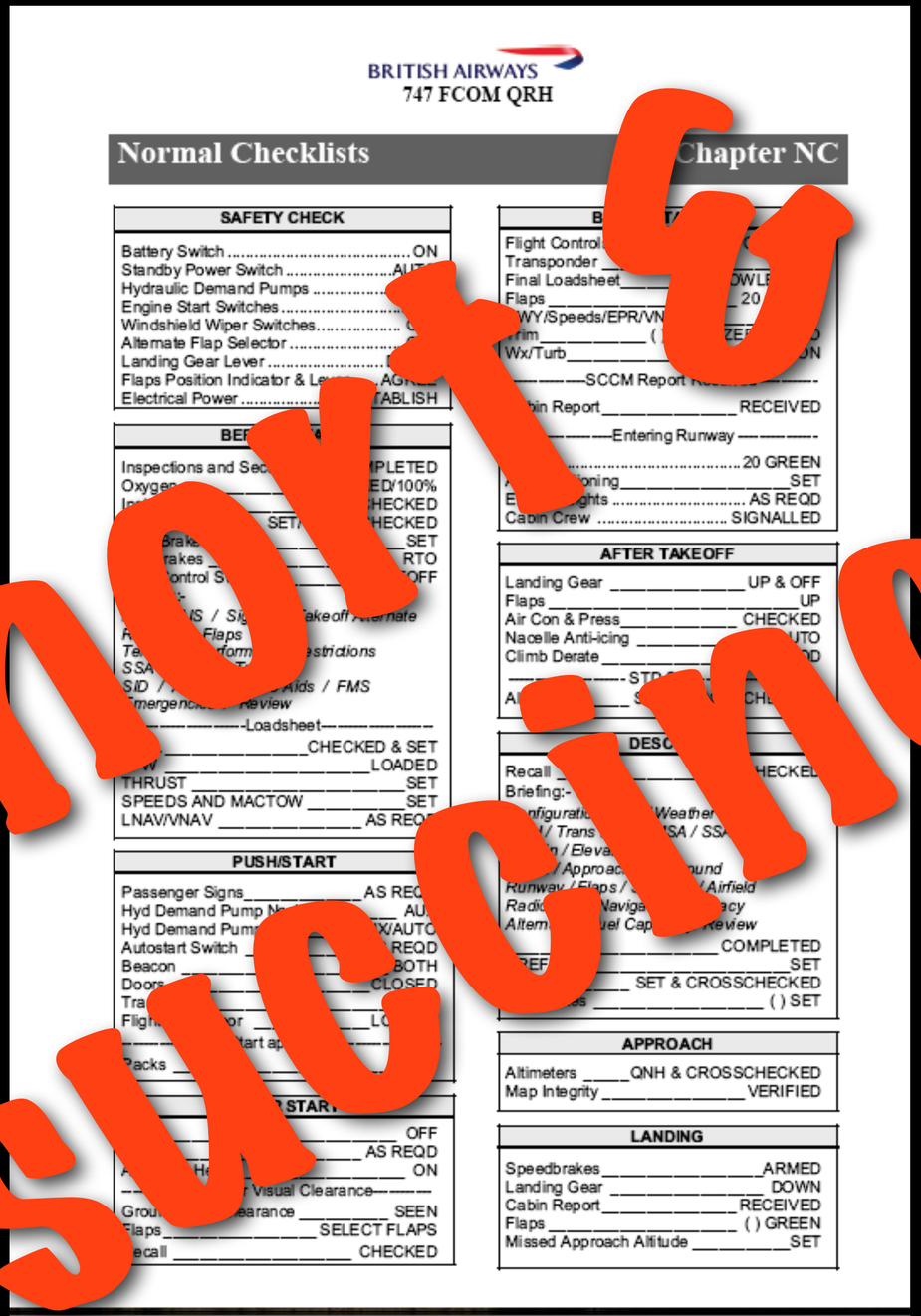

short & succinct

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WHO checklist?

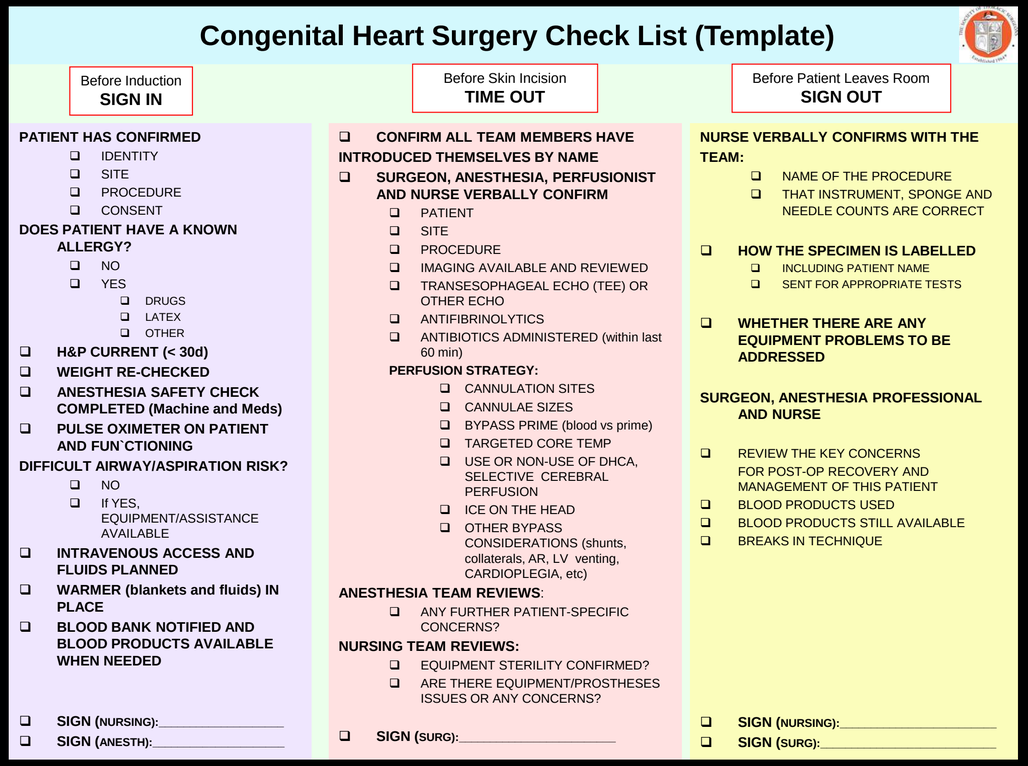
A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population

Alex B. Haynes, M.D., M.P.H., Thomas G. Weiser, M.D., M.P.H., William R. Berry, M.D., M.P.H., Stuart R. Lipsitz, Sc.D., Abdel-Hadi S. Breizat, M.D., Ph.D., E. Patchen Dellinger, M.D., Teodoro Herbosa, M.D., Sudhir Joseph, M.S., Pascience L. Kibatala, M.D., Marie Carmela M. Lapitan, M.D., Alan F. Merry, M.B., Ch.B., F.A.N.Z.C.A., F.R.C.A., Krishna Moorthy, M.D., F.R.C.S., Richard K. Reznick, M.D., M.Ed., Bryce Taylor, M.D., and Atul A. Gawande, M.D., M.P.H., for the Safe Surgery Saves Lives Study Group*

N ENGL J MED 360;5 NEJM.ORG JANUARY 29, 2009

Table 5. Outcomes before and after Checklist Implementation, According to Site.*

Site No.	No. of Patients Enrolled		Surgical-Site Infection		Unplanned Return to the Operating Room		Pneumonia		Death		Any Complication	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
							percent					
1	524	598	**4.0**	**2.0**	**4.6**	**1.8**	0.8	1.2	**1.0**	**0.0**	**11.6**	**7.0**
2	357	351	2.0	1.7	0.6	1.1	3.6	3.7	1.1	0.3	7.8	6.3
3	497	486	5.8	4.3	4.6	2.7	1.6	1.7	0.8	1.4	13.5	9.7
4	520	545	3.1	2.6	2.5	2.2	0.6	0.9	1.0	0.6	7.5	5.5
5	370	330	**20.5**	**3.6**	1.4	1.8	0.3	0.0	**1.4**	**0.0**	**21.4**	**5.5**
6	496	476	4.0	4.0	3.0	3.2	2.0	1.9	3.6	1.7	10.1	9.7
7	525	585	**9.5**	**5.8**	**1.3**	**0.2**	1.0	1.7	2.1	1.7	**12.4**	**8.0**
8	444	584	4.1	2.4	0.5	1.2	0.0	0.0	1.4	0.3	6.1	3.6
Total	3733	3955	**6.2**	**3.4**	**2.4**	**1.8**	1.1	1.3	**1.5**	**0.8**	**11.0**	**7.0**
P value			<0.001		0.047		0.46		0.003		<0.001	



Congenital Heart Surgery Check List (Template)

Before Induction **SIGN IN**	Before Skin Incision **TIME OUT**	Before Patient Leaves Room **SIGN OUT**
PATIENT HAS CONFIRMED ❑ IDENTITY ❑ SITE ❑ PROCEDURE ❑ CONSENT **DOES PATIENT HAVE A KNOWN ALLERGY?** ❑ NO ❑ YES ❑ DRUGS ❑ LATEX ❑ OTHER ❑ **H&P CURRENT (< 30d)** ❑ **WEIGHT RE-CHECKED** ❑ **ANESTHESIA SAFETY CHECK COMPLETED (Machine and Meds)** ❑ **PULSE OXIMETER ON PATIENT AND FUN`CTIONING** **DIFFICULT AIRWAY/ASPIRATION RISK?** ❑ NO ❑ If YES, EQUIPMENT/ASSISTANCE AVAILABLE ❑ **INTRAVENOUS ACCESS AND FLUIDS PLANNED** ❑ **WARMER (blankets and fluids) IN PLACE** ❑ **BLOOD BANK NOTIFIED AND BLOOD PRODUCTS AVAILABLE WHEN NEEDED** ❑ **SIGN (NURSING):**_____ ❑ **SIGN (ANESTH):**_____	❑ **CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME** ❑ **SURGEON, ANESTHESIA, PERFUSIONIST AND NURSE VERBALLY CONFIRM** ❑ PATIENT ❑ SITE ❑ PROCEDURE ❑ IMAGING AVAILABLE AND REVIEWED ❑ TRANSESOPHAGEAL ECHO (TEE) OR OTHER ECHO ❑ ANTIFIBRINOLYTICS ❑ ANTIBIOTICS ADMINISTERED (within last 60 min) **PERFUSION STRATEGY:** ❑ CANNULATION SITES ❑ CANNULAE SIZES ❑ BYPASS PRIME (blood vs prime) ❑ TARGETED CORE TEMP ❑ USE OR NON-USE OF DHCA, SELECTIVE CEREBRAL PERFUSION ❑ ICE ON THE HEAD ❑ OTHER BYPASS CONSIDERATIONS (shunts, collaterals, AR, LV venting, CARDIOPLEGIA, etc) **ANESTHESIA TEAM REVIEWS**: ❑ ANY FURTHER PATIENT-SPECIFIC CONCERNS? **NURSING TEAM REVIEWS:** ❑ EQUIPMENT STERILITY CONFIRMED? ❑ ARE THERE EQUIPMENT/PROSTHESES ISSUES OR ANY CONCERNS? ❑ **SIGN (SURG):**_____	**NURSE VERBALLY CONFIRMS WITH THE TEAM:** ❑ NAME OF THE PROCEDURE ❑ THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT ❑ **HOW THE SPECIMEN IS LABELLED** ❑ INCLUDING PATIENT NAME ❑ SENT FOR APPROPRIATE TESTS ❑ **WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED** **SURGEON, ANESTHESIA PROFESSIONAL AND NURSE** ❑ REVIEW THE KEY CONCERNS FOR POST-OP RECOVERY AND MANAGEMENT OF THIS PATIENT ❑ BLOOD PRODUCTS USED ❑ BLOOD PRODUCTS STILL AVAILABLE ❑ BREAKS IN TECHNIQUE ❑ **SIGN (NURSING):**_____ ❑ **SIGN (SURG):**_____

checklists in cardiac surgery

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standardise

until you absolutely have to improvise

Dr Kevin Fong

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Prof Charles Vincent

Prof Rhona Flin

Mr Peter McCulloch

If CRM, checklist, assessment and training are so effective, why are they not everywhere in the NHS?

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inconsistent leadership

complexity of organisation

voluntary not compulsory

local preference and investment

hard to sustain

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Guy Hirst

"We had some great successes when proper initiatives were put in place and the outcomes were most impressive. That however was usually the exception rather than the rule.

I was incredulous at the way the surgical checklist was introduced. Like many initiatives in healthcare, it was poorly thought out."

No nuance, no explanation and poor training. No wonder it has become a crude auditing tool.

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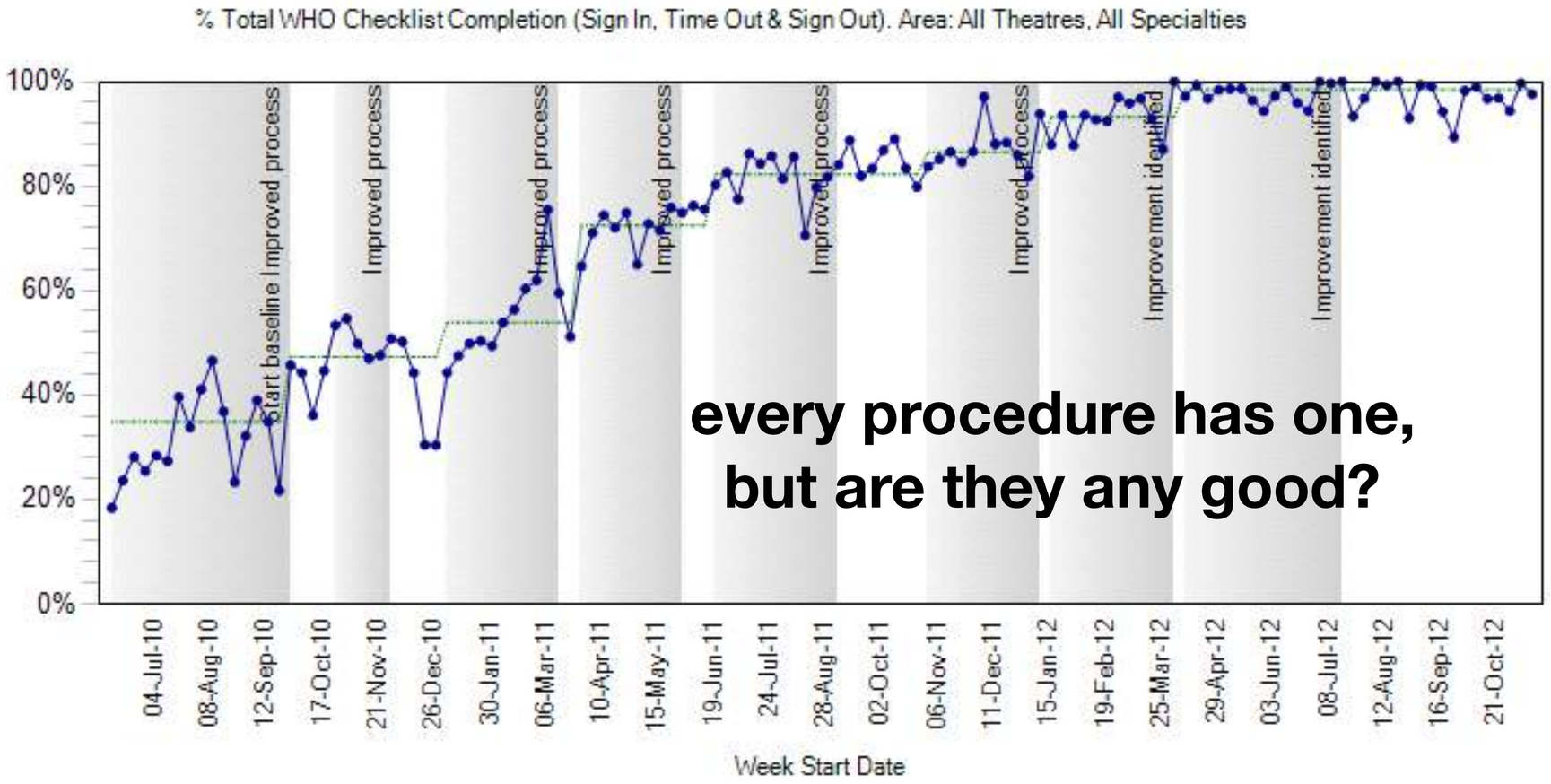
every procedure should have a checklist



every procedure has one,
but are they any good?

the black box

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the simulator

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LOSA Observation Form

MX LOSA Observation Forms: Install (B4)

Observation Number:_____ ☐ Did not observe this section

		Safety Risk N/A, Safe (S), At Risk (AR), Didn't Observe (UNO)	Threat Code (See Threat Codes List)	Threat Effectively Managed Y/N	Error Outcome 1.Inconsequential 2.Undesired state 3.Additional error 4.Do not know	Threat Remarks	General Remarks
Safety							
1	Notes, cautions, and warnings reviewed						
2	Notes, cautions, and warnings followed						
Personnel							
3	Required personnel available						
Procedures							
4	Current documentation (e.g., task cards, AMM, service bulletins) available and reviewed						
5	Effectivity/configuration verified						
6	Materials utilized						
7	Servicing procedures followed						
8	Installation procedures followed						
Communication & Coordination							
9	Communication among technicians accomplished						
10	Communication to other departments accomplished						
Threat Management							
11	Strategies developed for identified threats						
12	Generated non-routines for work-not-specified in the tech publications						
Turnover or Completion							
13	Task/shift turnover completed						
14	Individual work step signoff completed						
15	QC inspection signoff completed						
16	Access panels installed						

Describe the threat(s). How did the crew manage or mismanage the threat(s)?

Describe any associated undesired aircraft states.

Comments - Good or bad. (Please provide examples.)

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no compulsory training,
no regular technical assessment,
no regular observation of my performance

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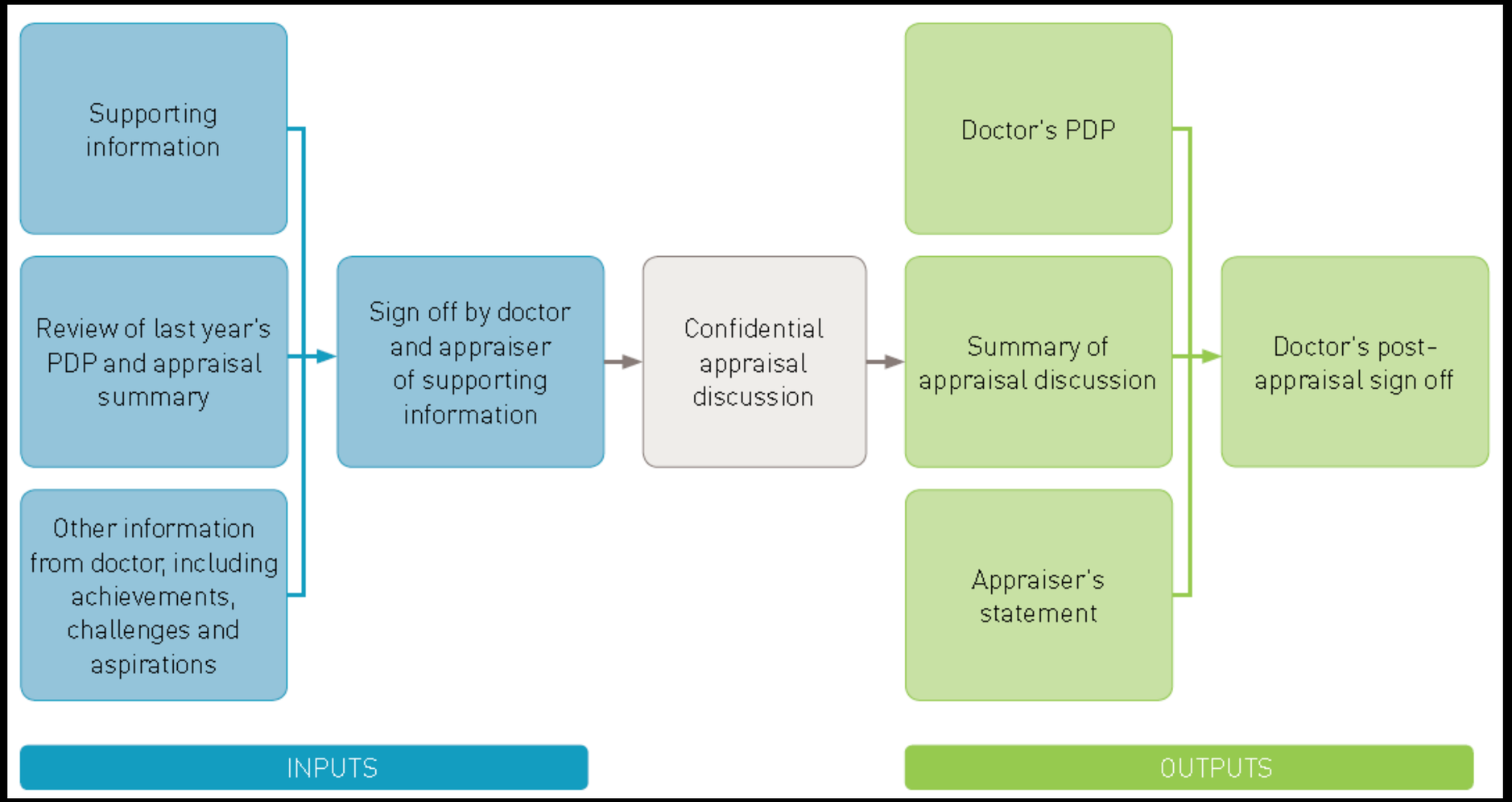
Appraisal



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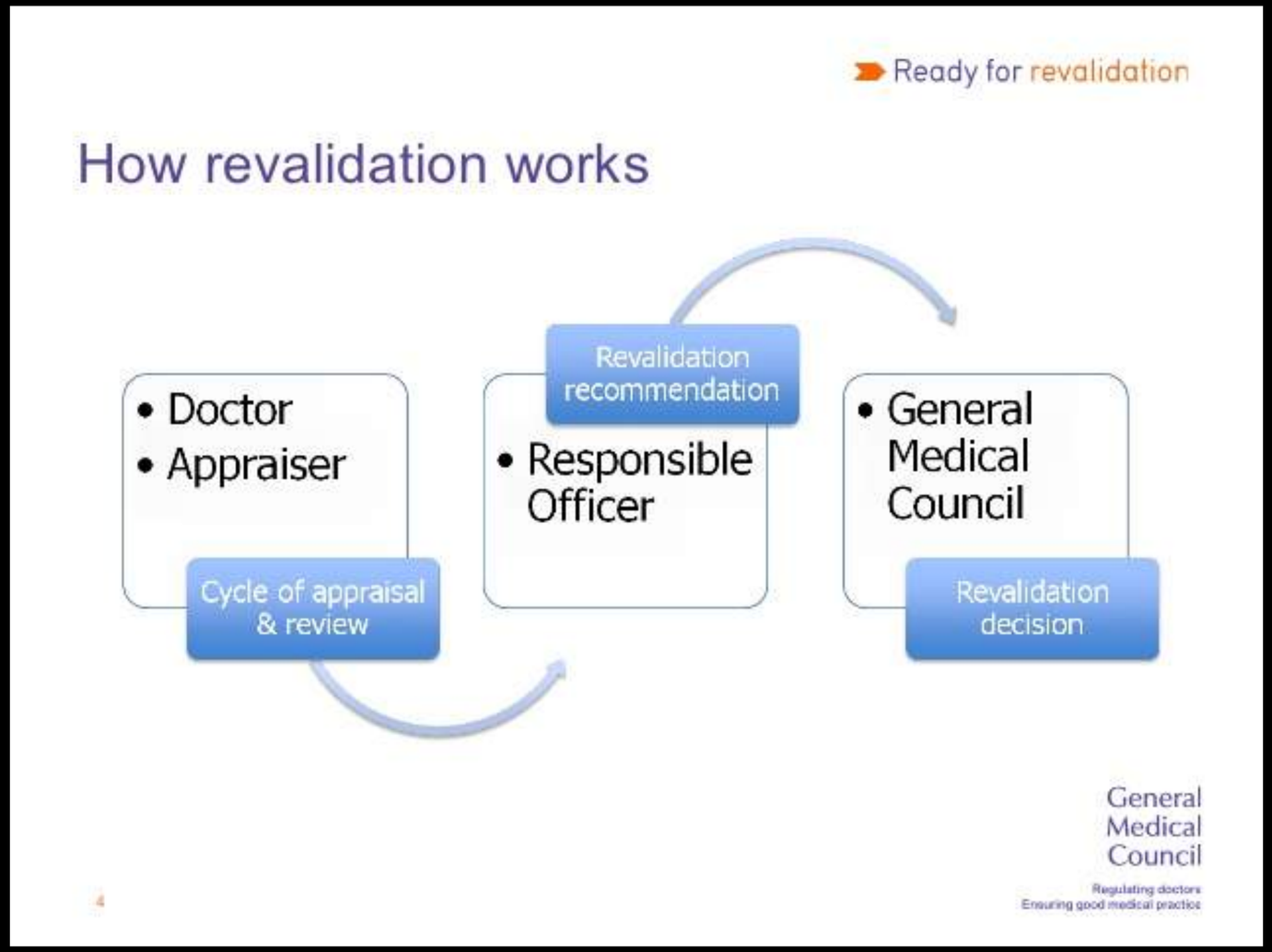
Revalidation



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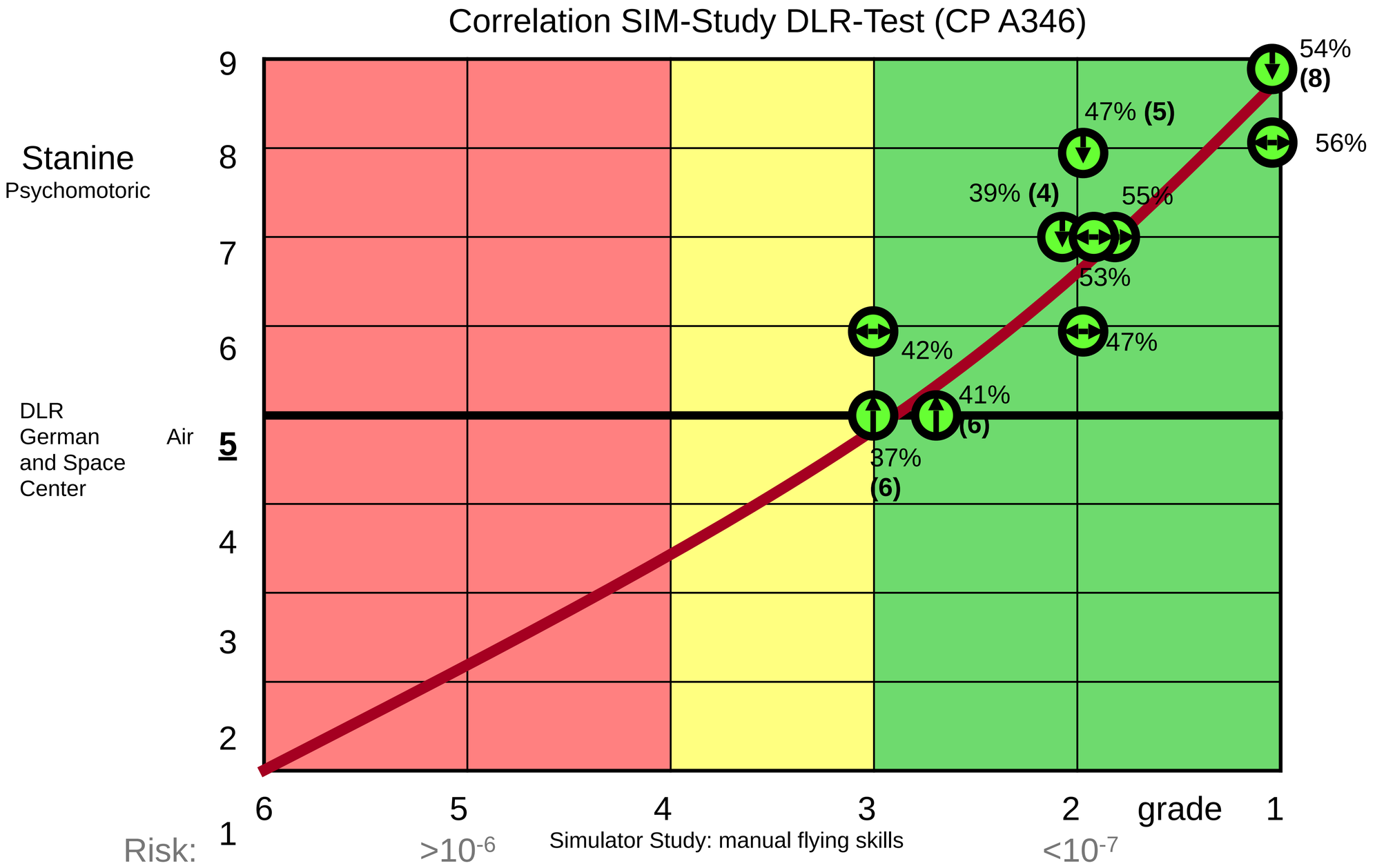
Correlation SIM-Study DLR-Test (CP A346)
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Risk:
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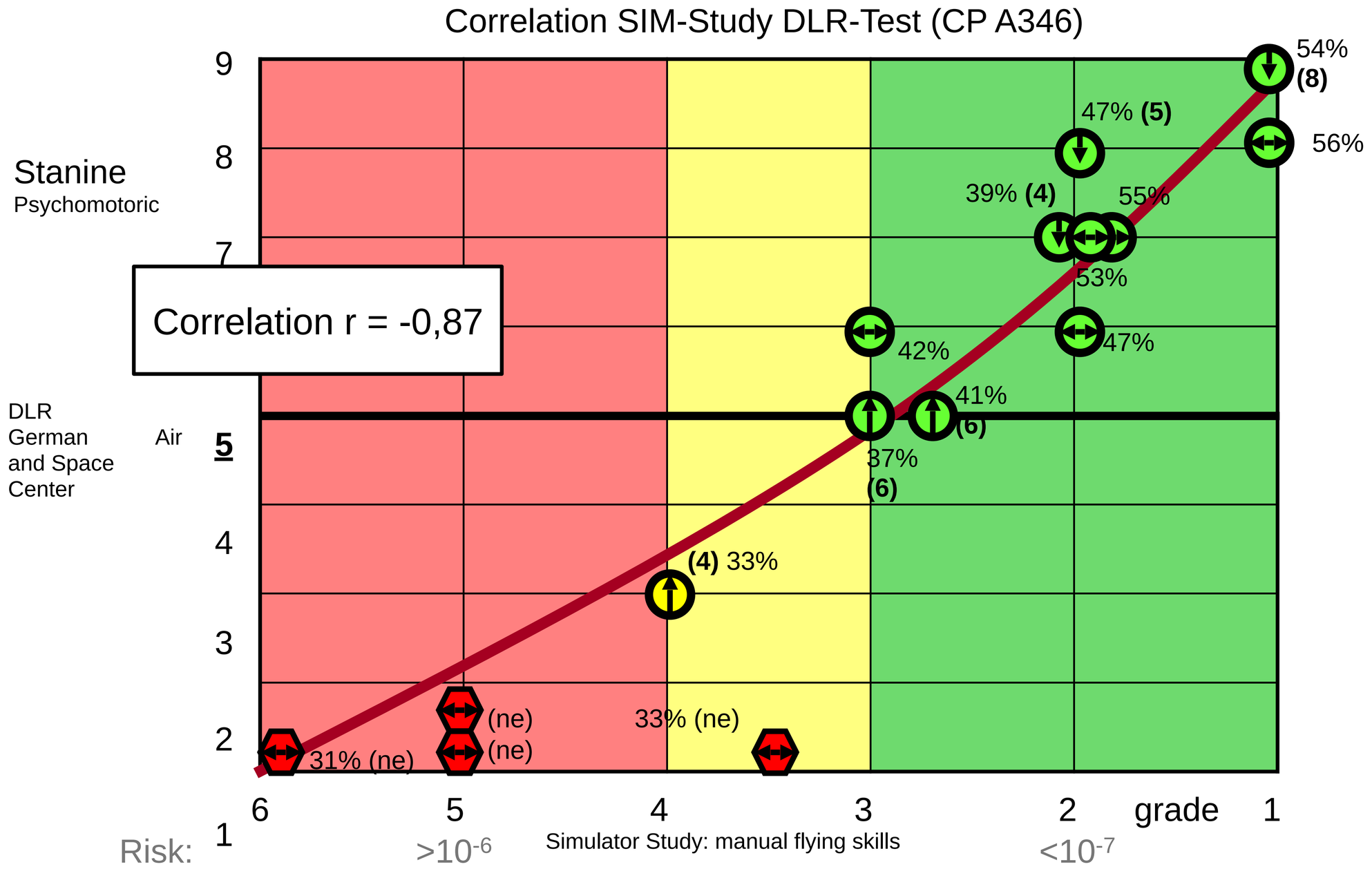
Simulator Study: manual flying skills
<10-7


Correlation SIM-Study DLR-Test (CP A346)
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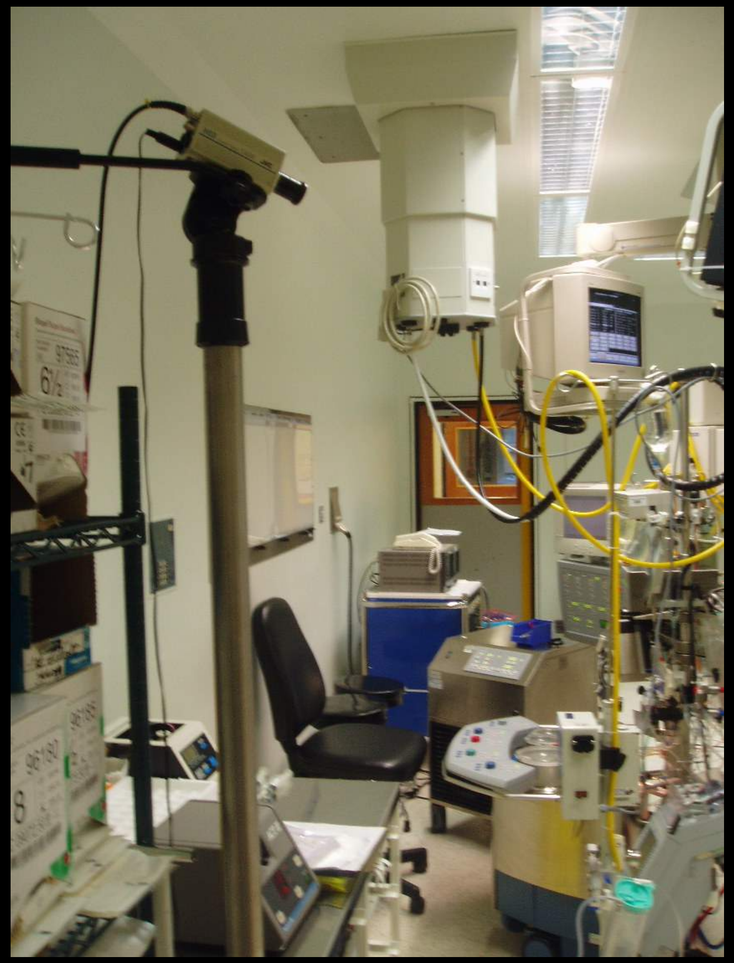
Simulator Study: manual flying skills
Risk:
>10-6
<10-7

Altitude for flight 4U 9525

"Altitude Chart for Flight 4U9525 register D-AIPX" by Giovanni Rafael Di Rosario Garcia, bearbeitet von Lämpel - Own work. Licensed under CC BY-SA 4.0 via Commons - https://commons.wikimedia.org/wiki/File:Altitude_Chart_for_Flight_4U9525_register_D-AIPX.png#/media/File:Altitude_Chart_for_Flight_4U9525_register_D-AIPX.png



ken catchpole

ari darzi, peter mcculloch

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Dr. Teodor Grantcharov and his team during a minimally invasive surgery being recorded by the “black box.”

records everything, (including conversations) but only for endoscopic surgery

Dr Teodor Grantcharov

St Michael’s Hospital Toronto

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The Law of False Equivalence

just because it worked in aviation doesn’t mean it will work elsewhere

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Ed Hickey

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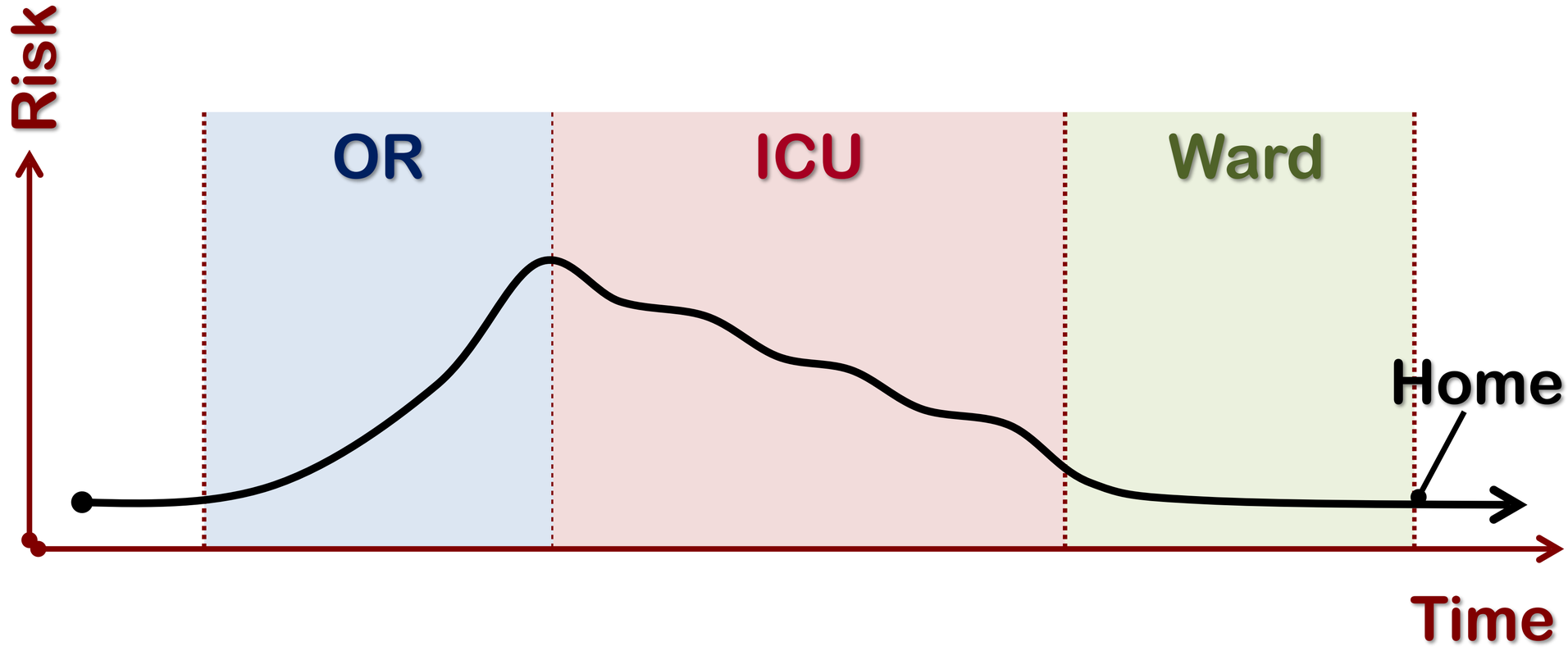
martin.elliott@gosh.nhs.uk



Washington

London

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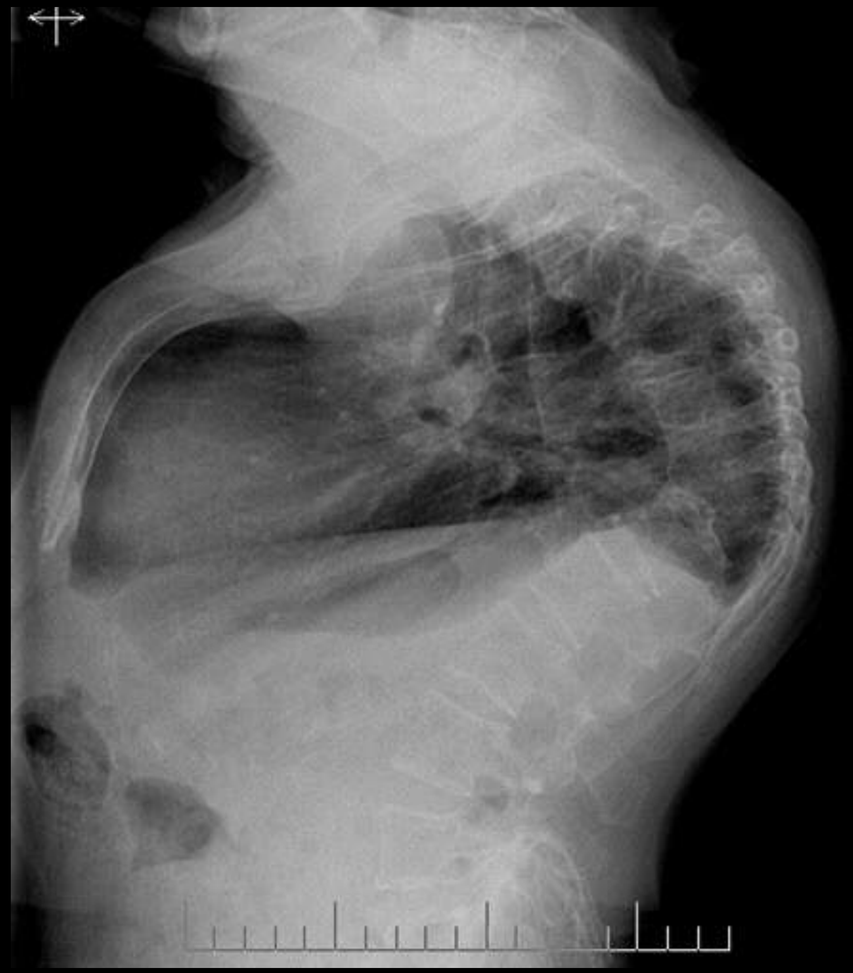

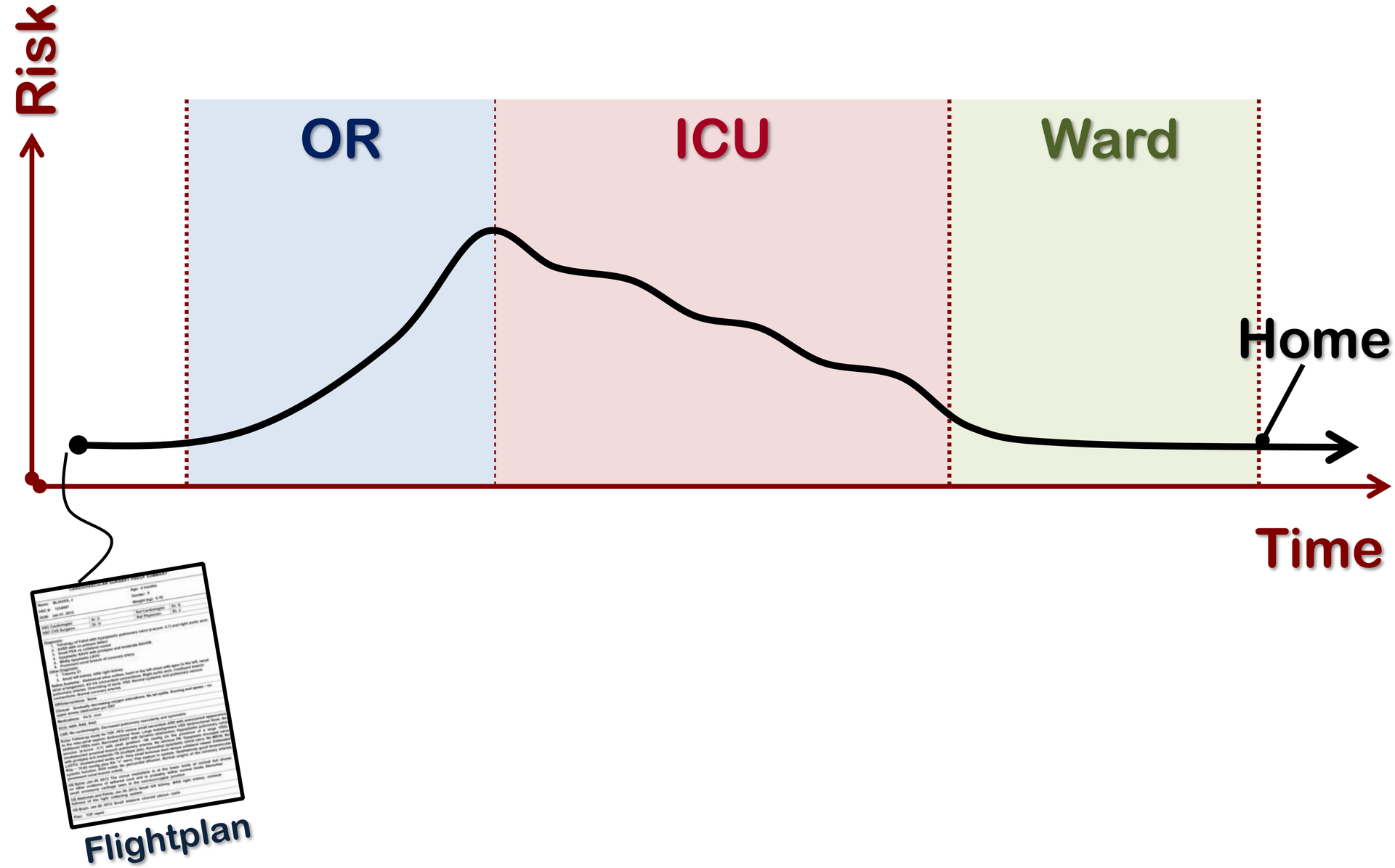

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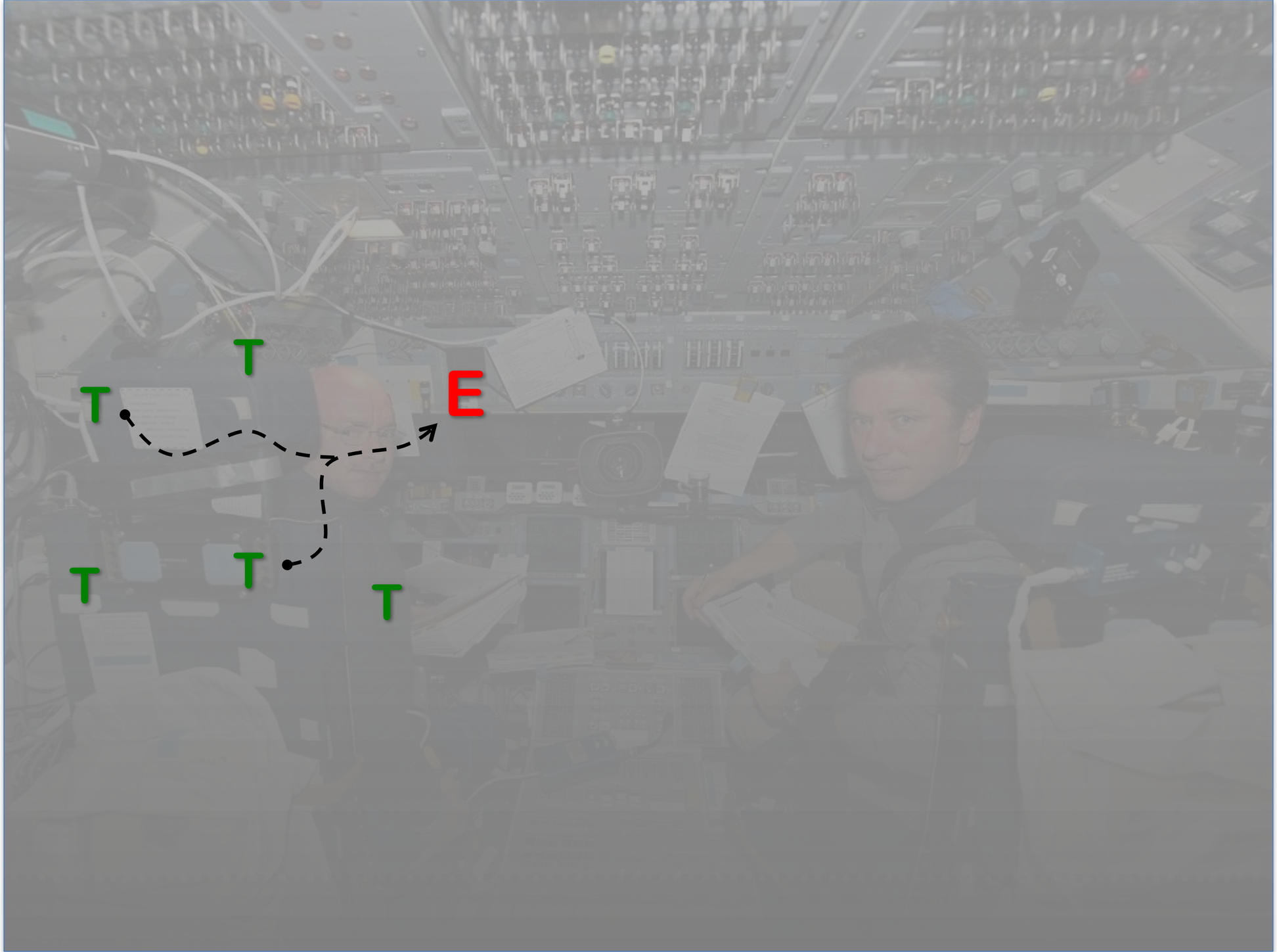
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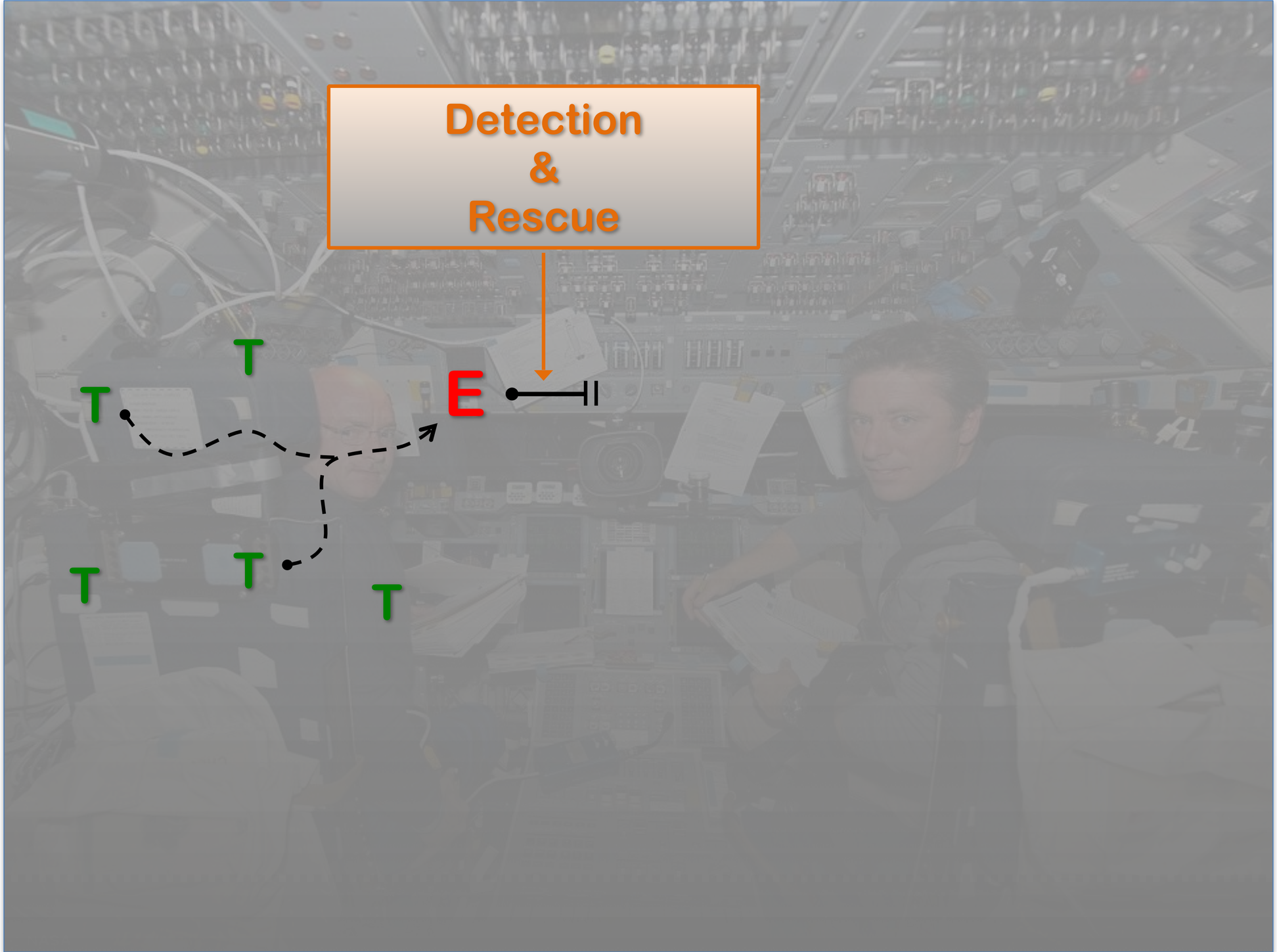
Detection
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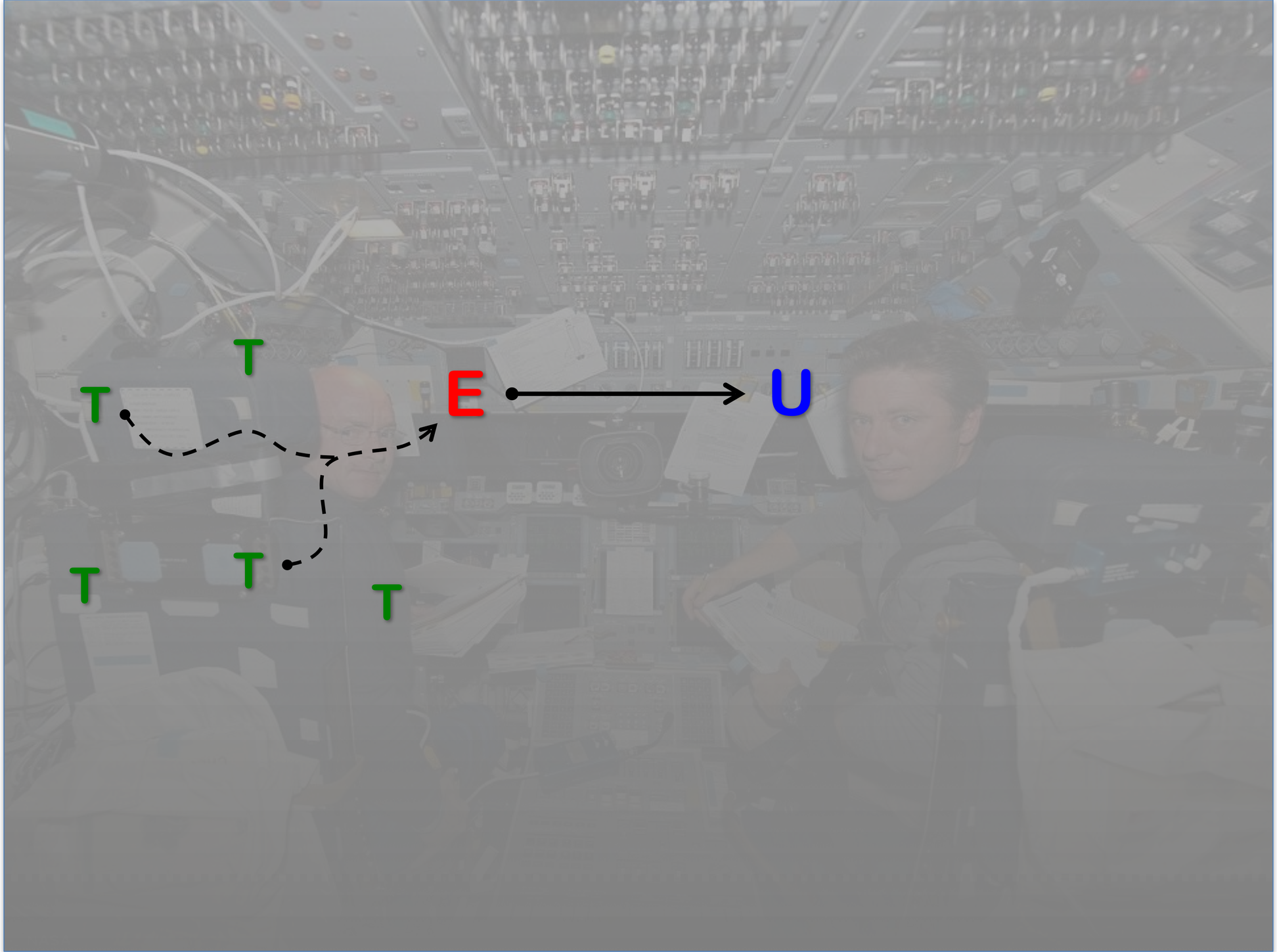
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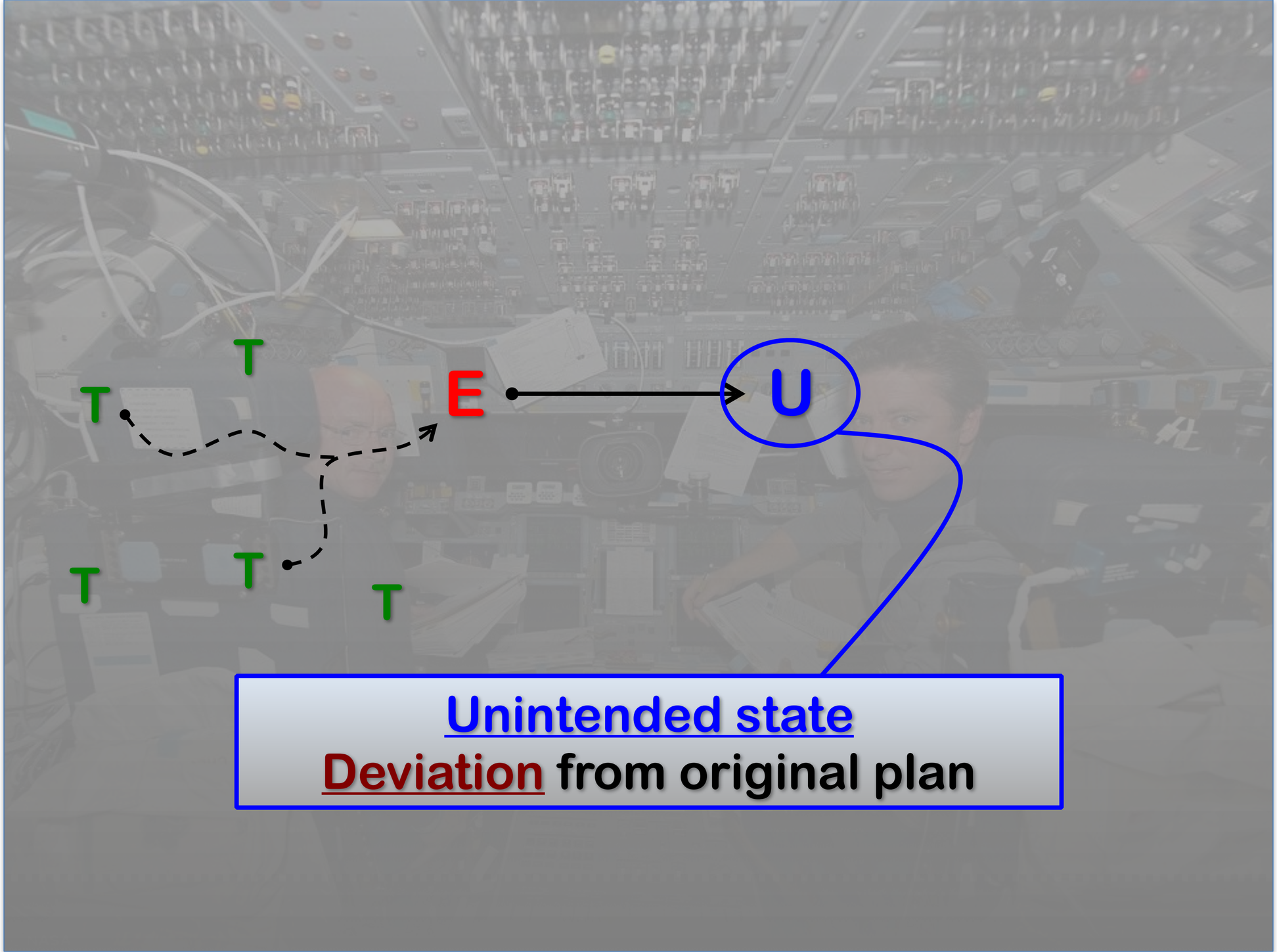
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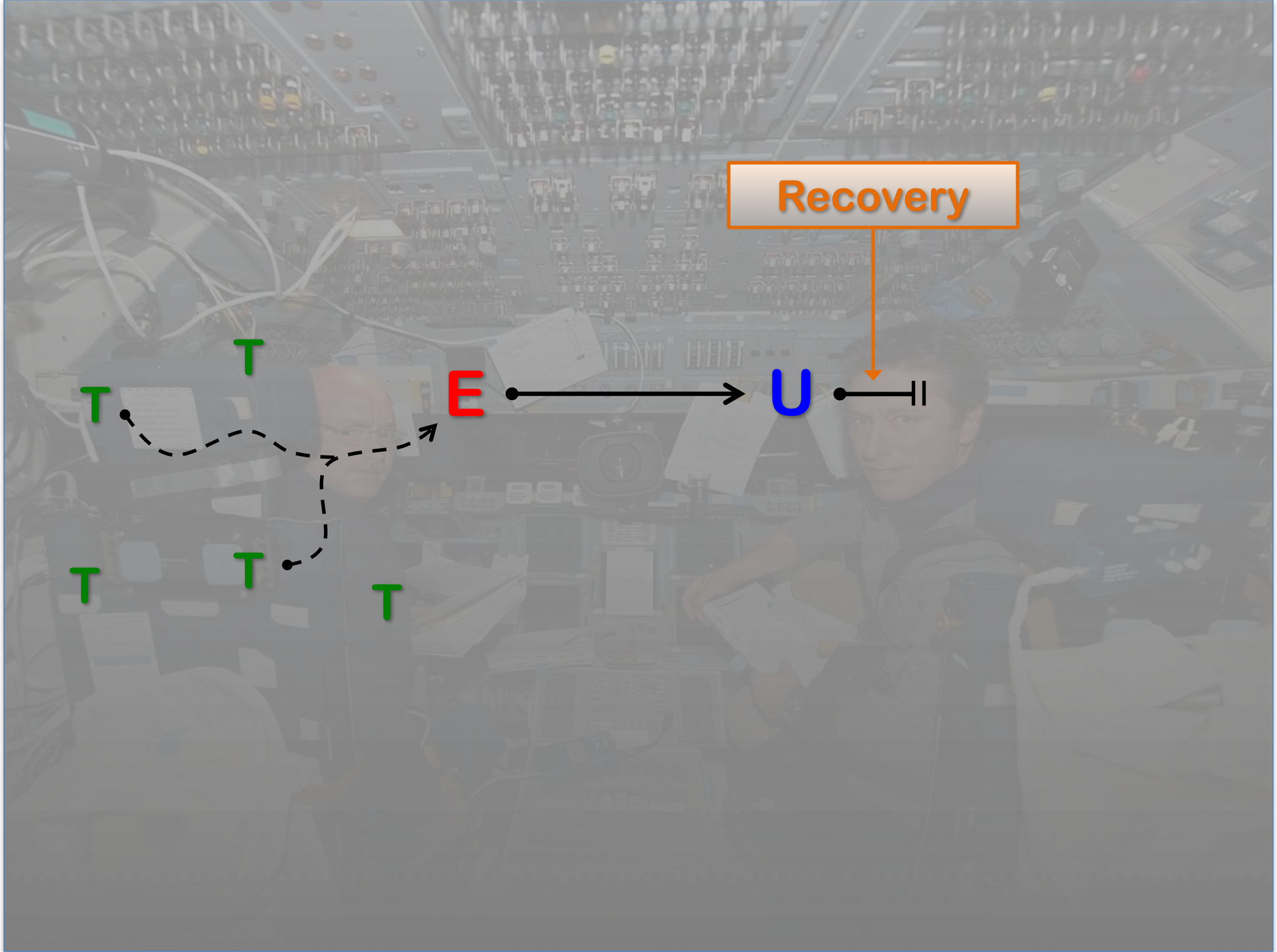
Unintended state
Deviation from original plan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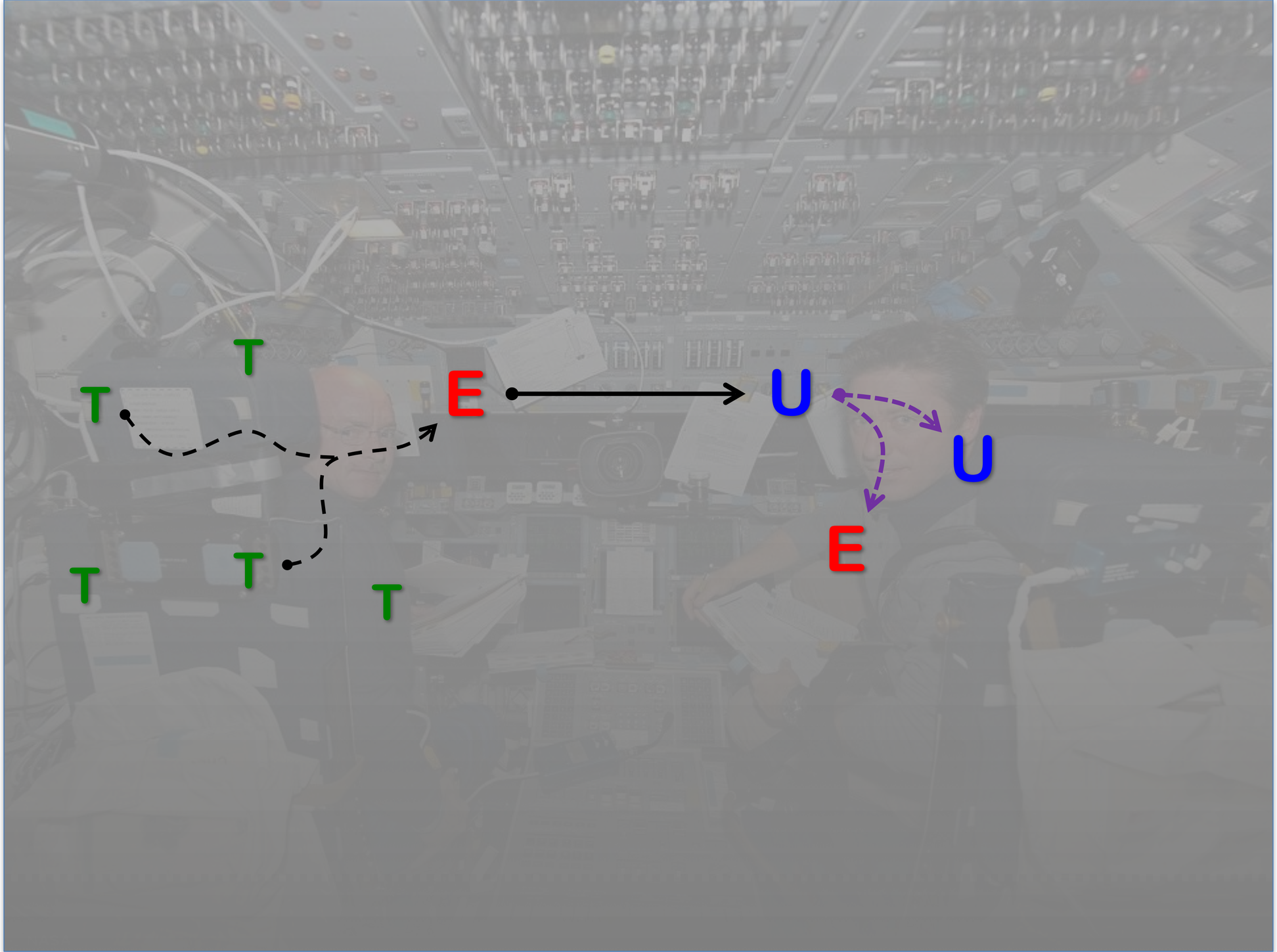
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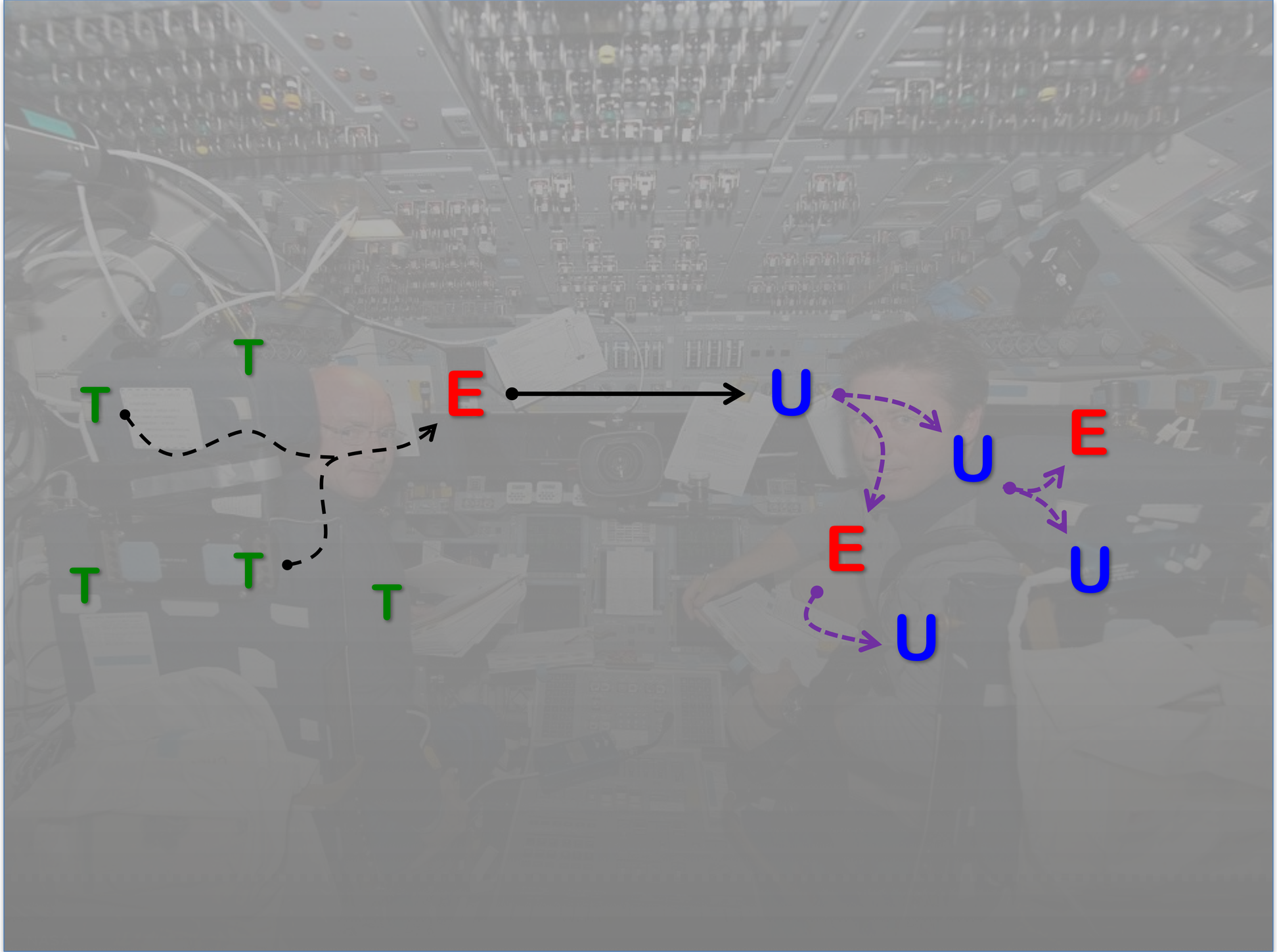
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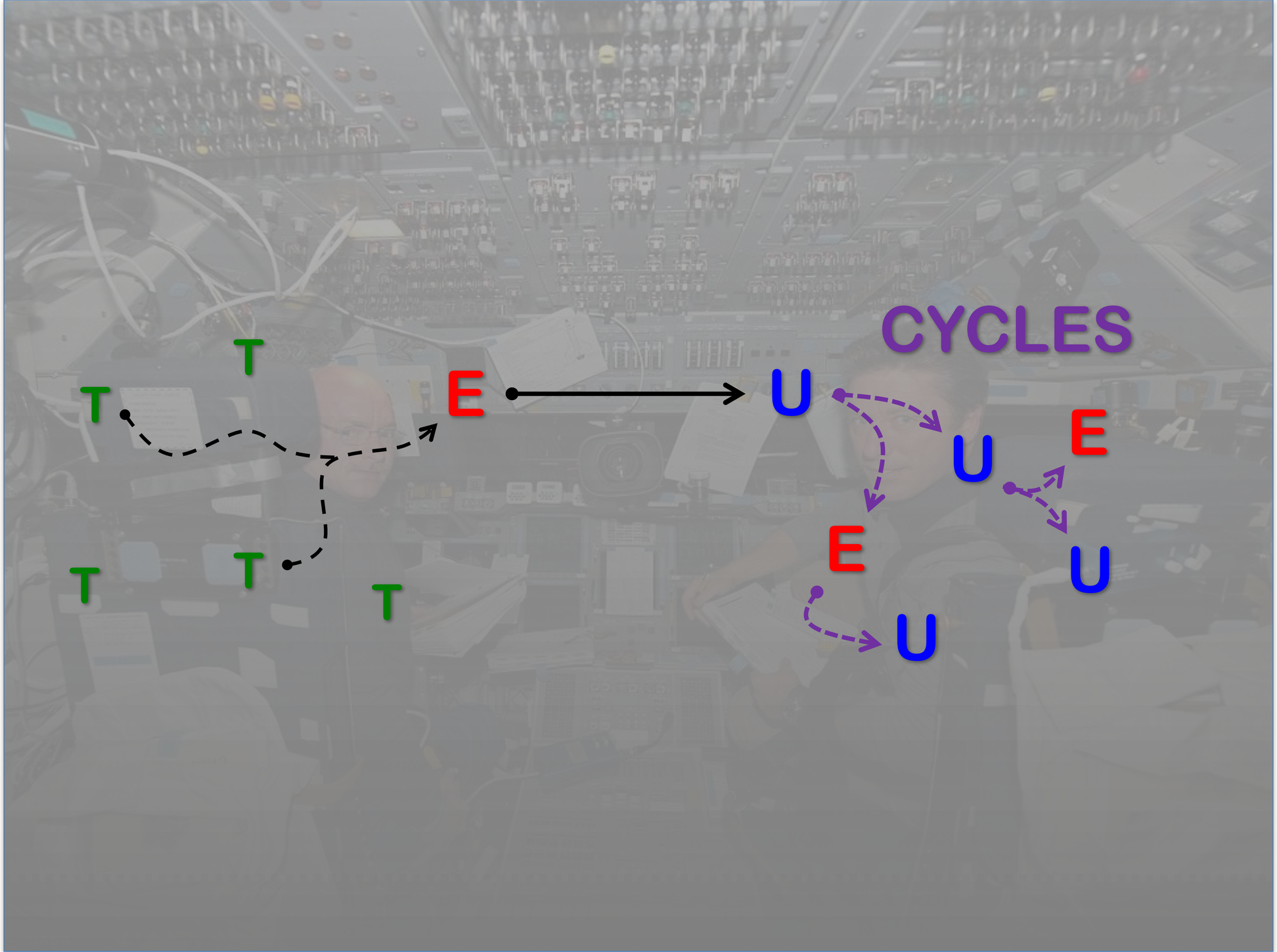
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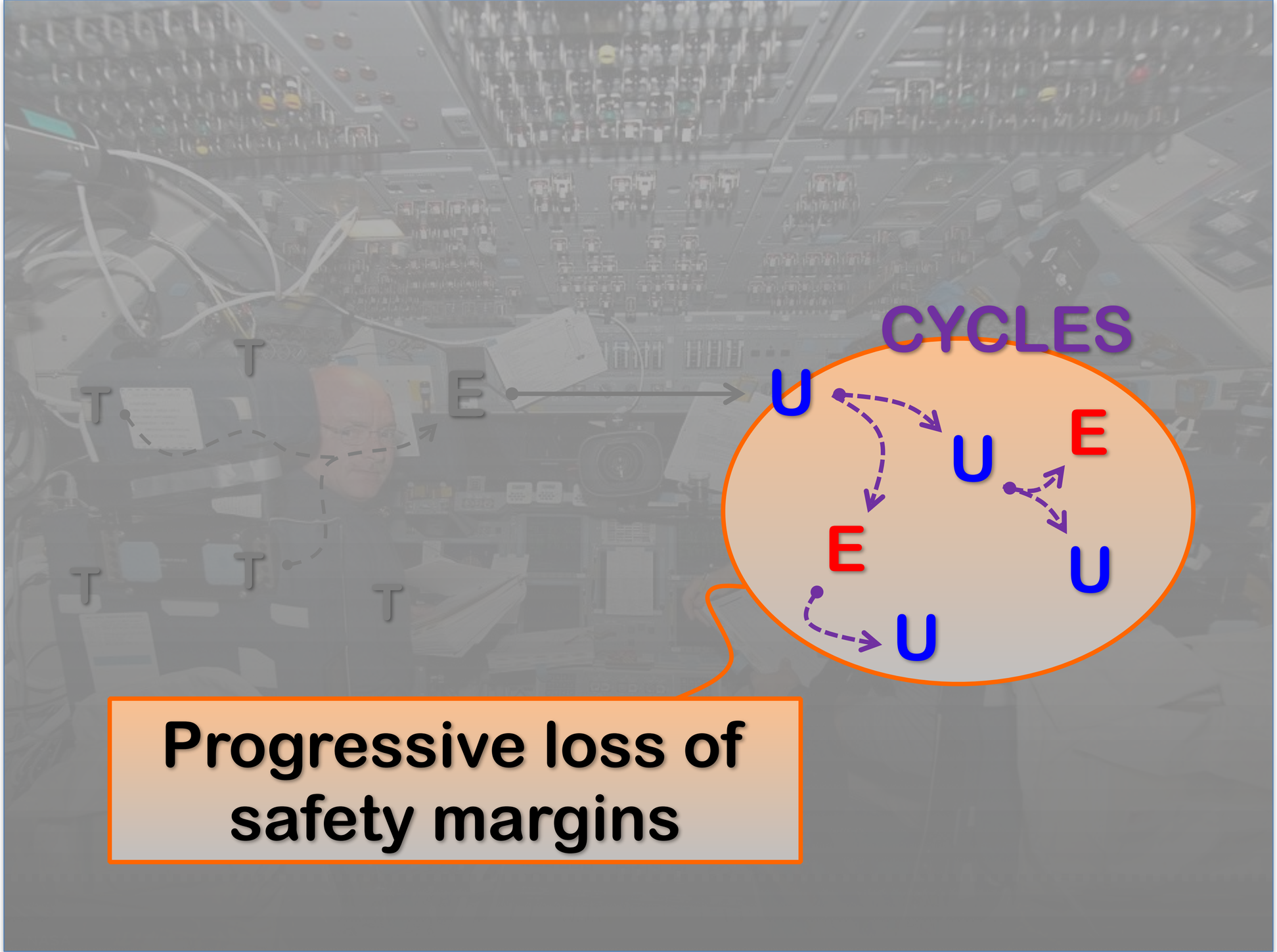
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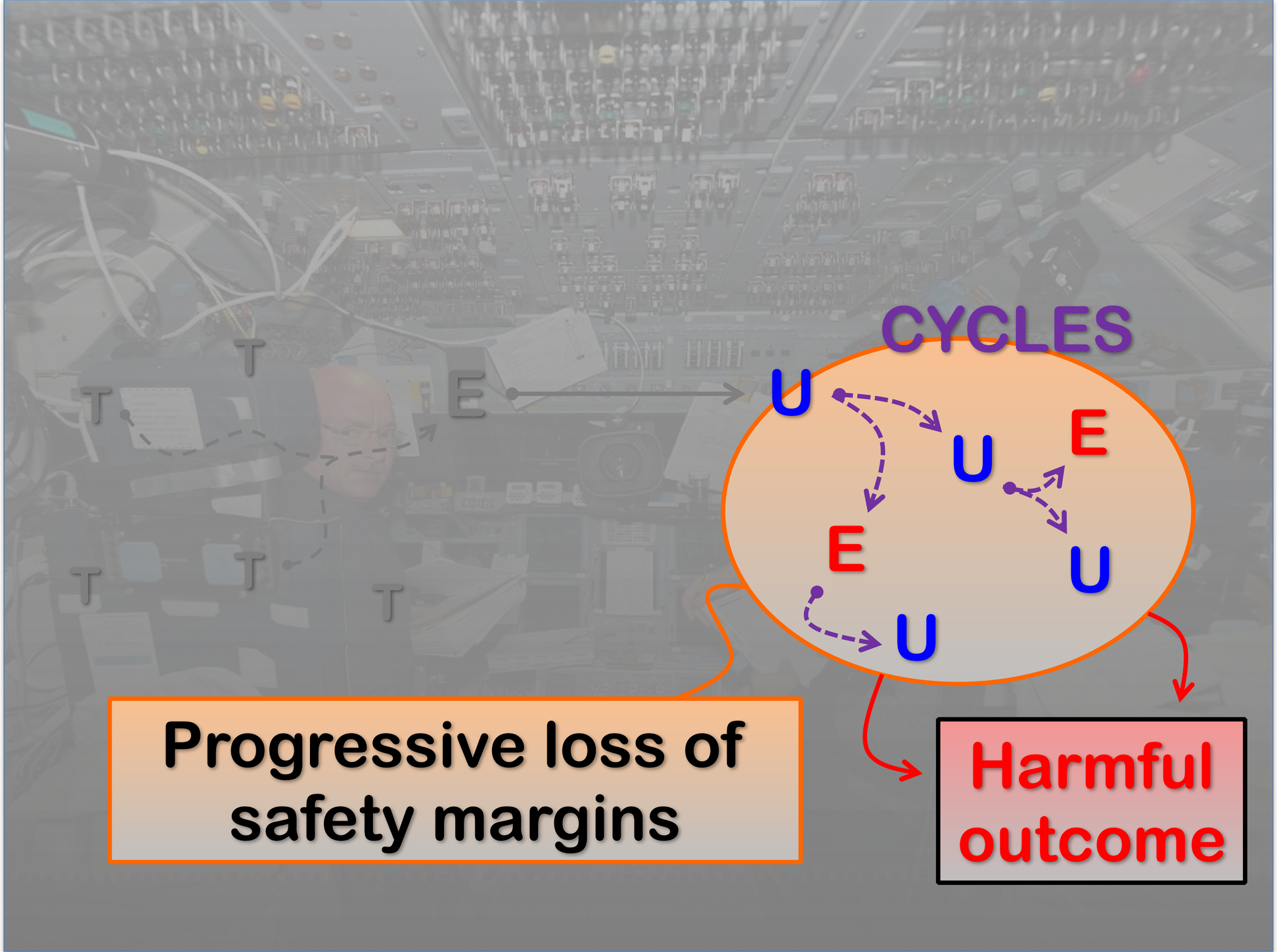
Progressive loss of safety margins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Progressive loss of safety margins
Harmful outcome

Threats

Terrain

Weather

Malfunctions

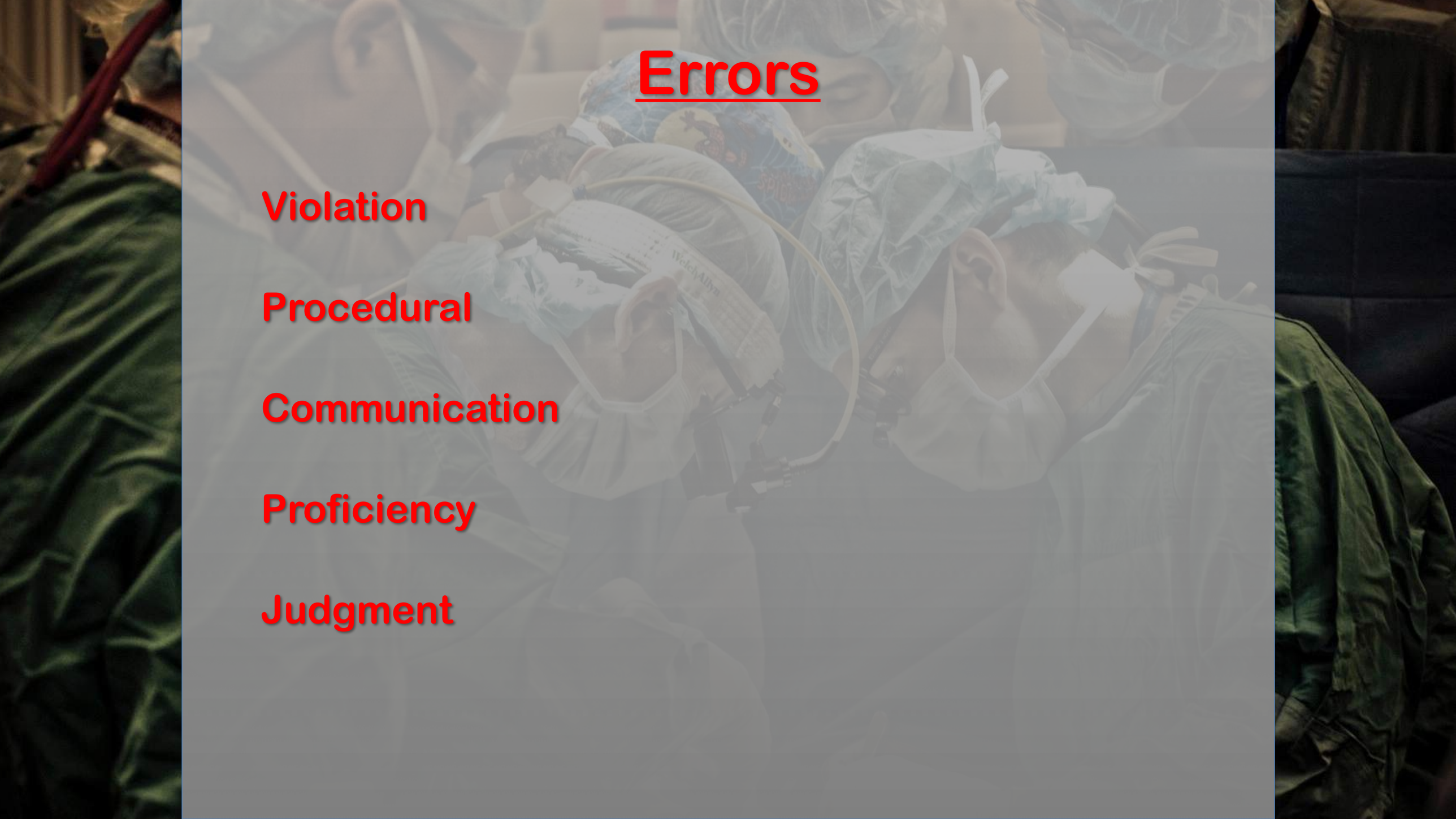
External errors

Operational stressors

Latent culture

Corollaries in Surgery

Terrain	Disease
Weather	Co-existing conditions
Malfunctions	Equipment
External errors	External factors
Operational stressors	Stressors/distractions
Latent culture	Latent culture



Errors

Violation

Procedural

Communication

Proficiency

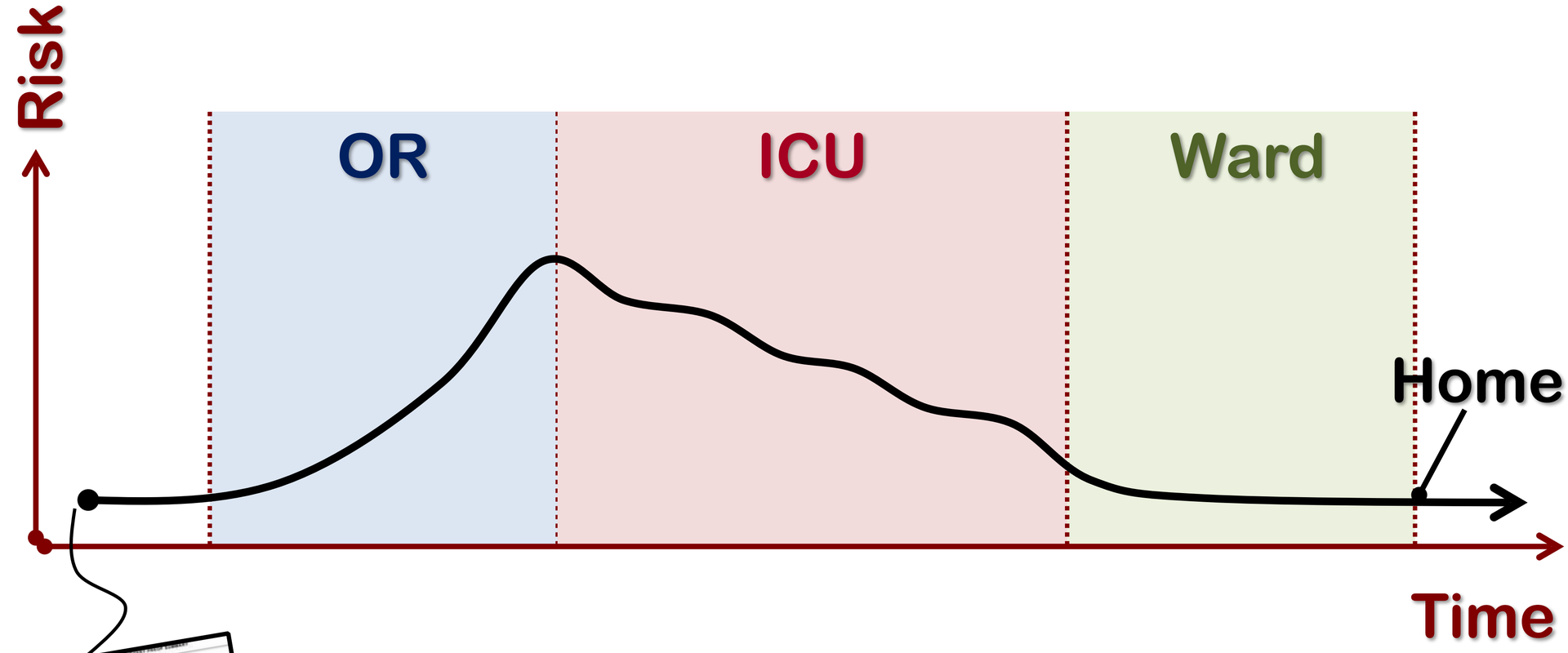
Judgment

Errors

Violation	Deviation from standard care path
Procedural	“Mistake”; dose error, counts
Communication	
Proficiency	Sub-optimal execution of task
Judgment	Decision error

Errors

Violation	Deviation from standard care path
Procedural	“Mistake”; dose error, counts
Communication	
Proficiency	Sub-optimal execution of task
Judgment	Decision error



Flightplan

Open forum flightplan review

Dedicated 1.0 FTE tracking of journey

- All clinical charts tracked
- Interviews with all staff
- Echos and imaging all reviewed
- Lab results scoured

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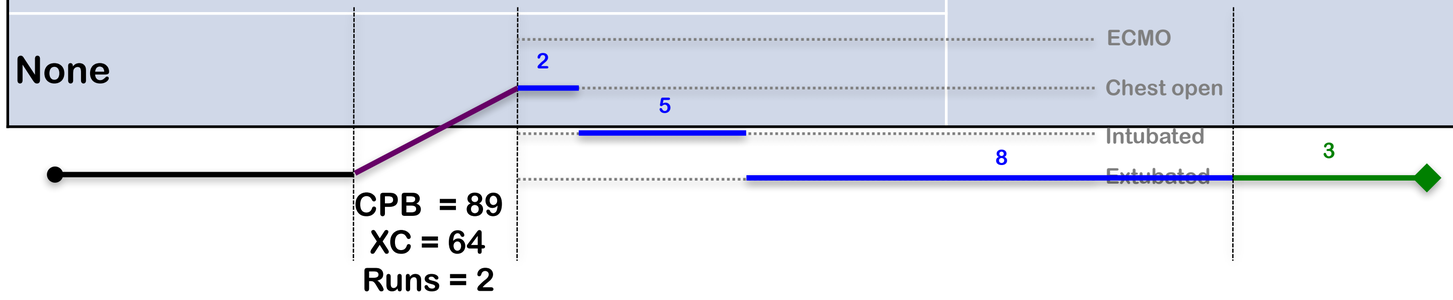
Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
Joe Bloggs	46 days	EH	YX	-	-

Admission diagnosis	INTERVENTION
VSD	Feb 15th 2012
Other diagnoses	VSD repair
Syndromic, ex-prem, severe failure, 3.6kg	
Previous interventions	
None	



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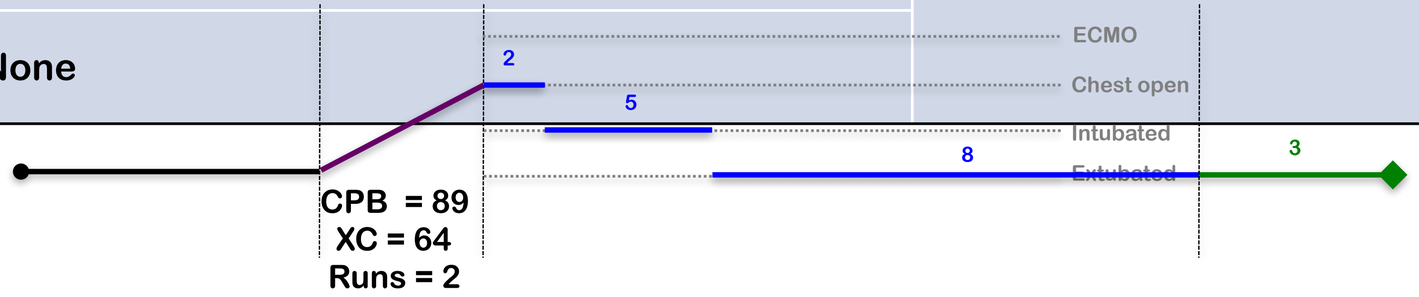
Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
Joe Bloggs	46 days	EH	YX	-	-

Admission diagnosis	INTERVENTION
VSD	Feb 15th 2012
Other diagnoses	VSD repair
Syndromic, ex-prem, severe failure, 3.6kg	TEE: RVSP 55 mmHg
Previous interventions	
None	



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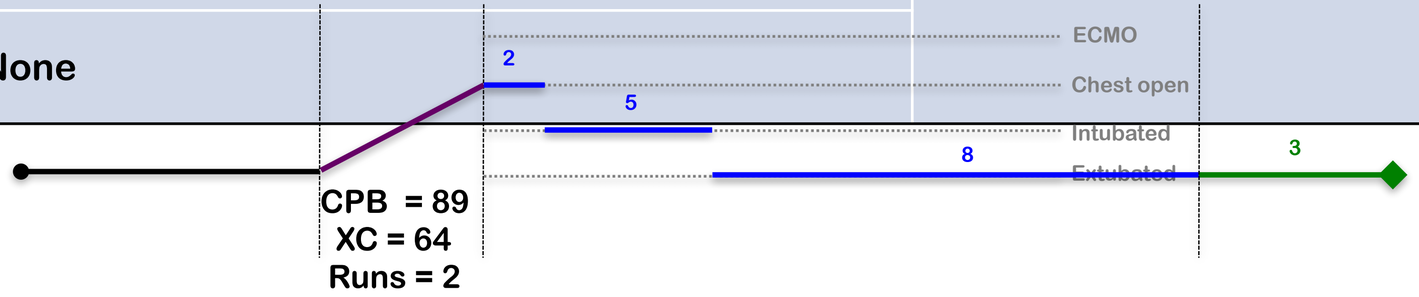

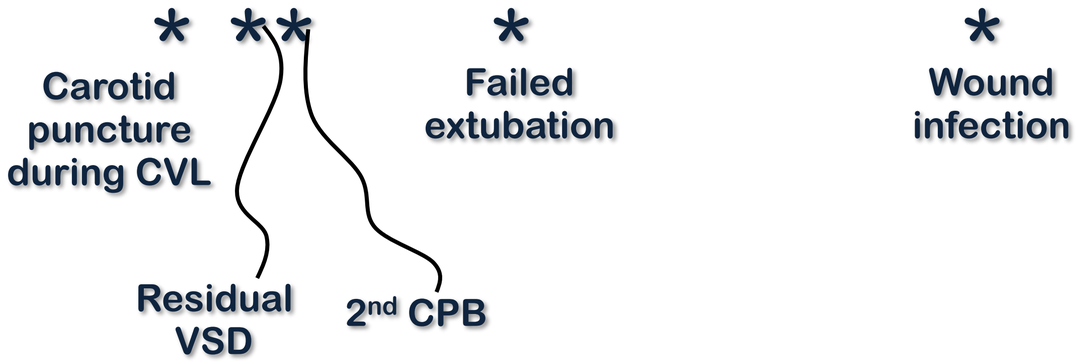

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Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
Joe Bloggs	46 days	EH	YX	-	-

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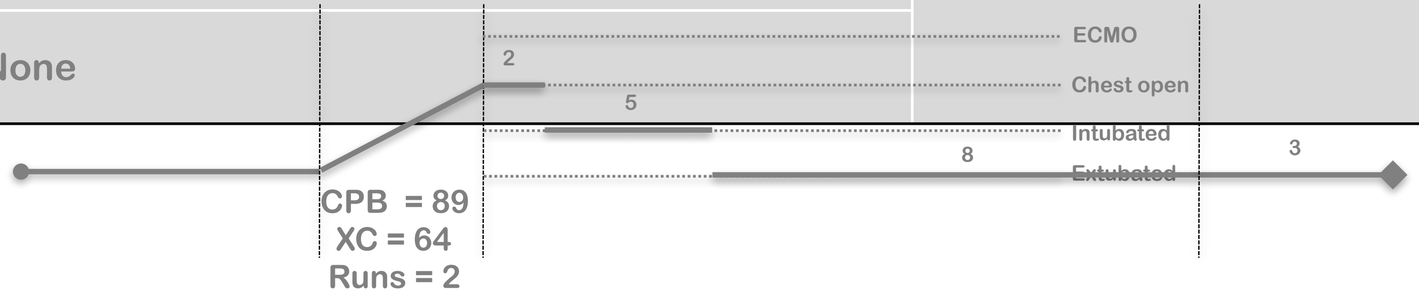

* Carotid puncture during CVL

* Residual VSD

* 2nd CPB

* Failed extubation

* Wound infection

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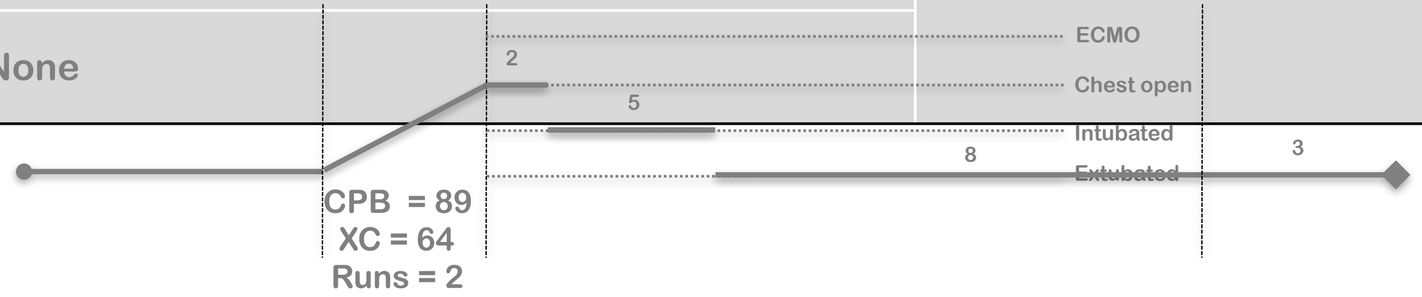
SickKids | Labatt Family Heart Centre

Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
Joe Bloggs	T 46 days	EH	YX	-	-

Admission diagnosis	INTERVENTION
VSD T T T T Other diagnoses Syndromic, ex-prem, severe failure, 3.6kg TEE: RVSP 55 mmHg Previous interventions None	Feb 15th 2012 VSD repair



* Carotid puncture during CVL

** Residual VSD, 2nd CPB

* Failed extubation

* Wound infection

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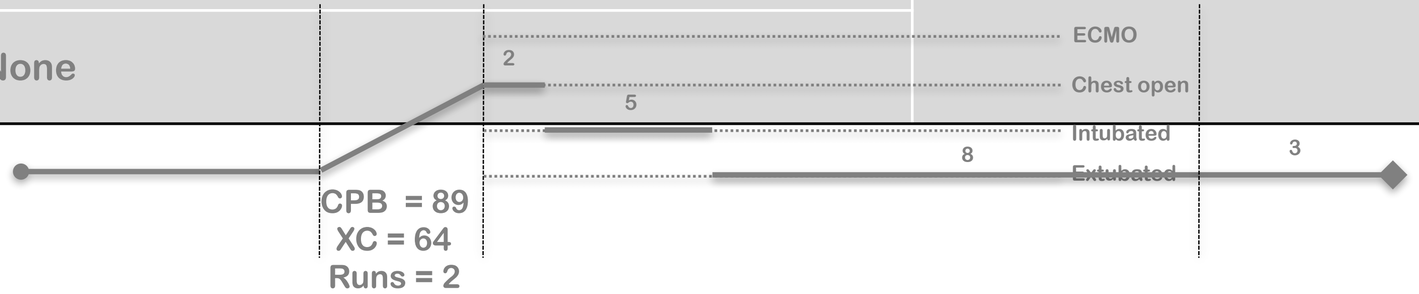
SickKids | Labatt Family Heart Centre

Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
Joe Bloggs	T 46 days	EH	YX	-	-

Admission diagnosis	INTERVENTION
VSD T T T T Other diagnoses Syndromic, ex-prem, severe failure, 3.6kg TEE: RVSP 55 mmHg Previous interventions None	Feb 15th 2012 VSD repair



* Carotid puncture during CVL

E

* Residual VSD

E

* 2nd CPB

* Failed extubation

* Wound infection

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SickKids | Labatt Family Heart Centre

Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
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Admission diagnosis	INTERVENTION
VSD T T T T Other diagnoses Syndromic, ex-prem, severe failure, 3.6kg TEE: RVSP 55 mmHg Previous interventions None	Feb 15th 2012 VSD repair

* Carotid puncture during CVL
E

* Residual VSD
E

* 2nd CPB
U

* Failed extubation
U

* Wound infection
U

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Risk

OR		ICU		Ward	
Total patient flights	Any error	Apical OR error	Cycles of error	Amplifying errors	Failed de-escalation
N=524	N=257	N=94	N=110	N=51	N=64

50% of all patients experience error

Most errors (33% of all patients) are clinically consequential

Most clinically consequential errors lead to further cycles of error or unintended state

>30,000 airline crews observed during LOSAs

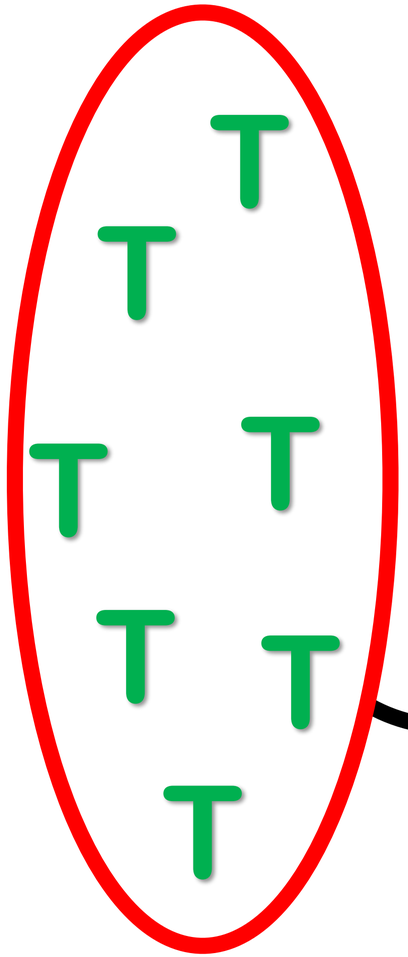
Highest-performers:

Hypervigilant

Continuously problem-solving

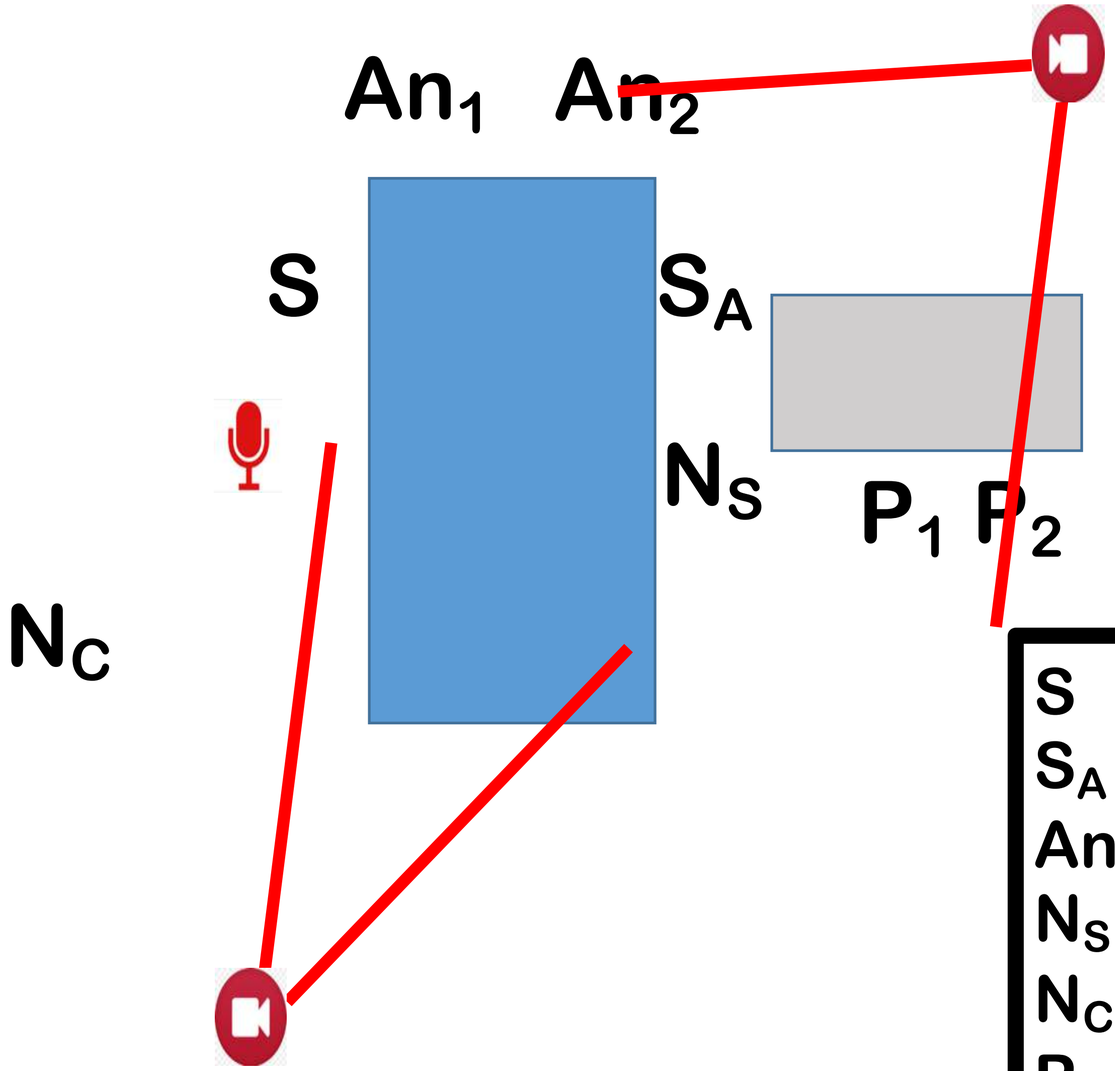
Anticipate failure

LOSAs in operating room



- To implement an aviation style of evaluation in the cardiac operating room.
- To identify all potential operative threats.

Operating Room Setup



S	Leading Surgeon
S_A	Assistant Surgeon
An	Anaesthetist
N_S	Scrub Nurse
N_C	Circulating Nurse
P	Perfusionist

Threat Classification

- Absence
- Coordination/Communication
- Decision Error
- Distraction
- Workspace Management
- External Pressures
- External Resource Failure
- Fatigue
- Patient/Morphological Procedural
- Psychomotor Error
- Sterility
- Team Conflict
- Technical Difficulties
- Temperature Control of Patient

Catchpole KR et.al. (2006)

Total count of threats in 21 operations:

N=880

Performance tracking initiative

1. Data Collection

2. Discussion with Surgeon

3. Database Entry

Surgery

1. Morning Rounds

2. Data Collection

3. Discussion with Staff

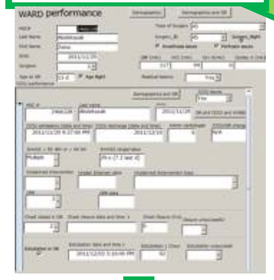
4. Database Entry

Critical Care Unit

1. Data Collection

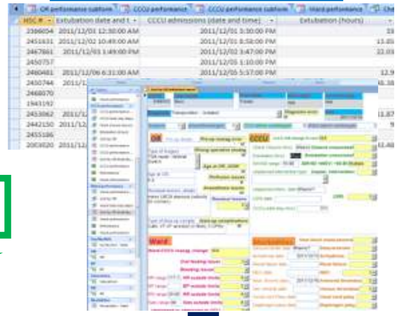
2. Discussion with Staff

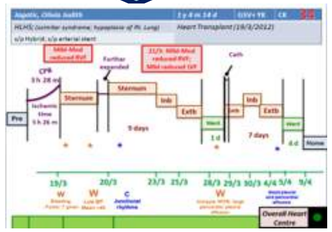
3. Data Collection



Ward

Data Analysis





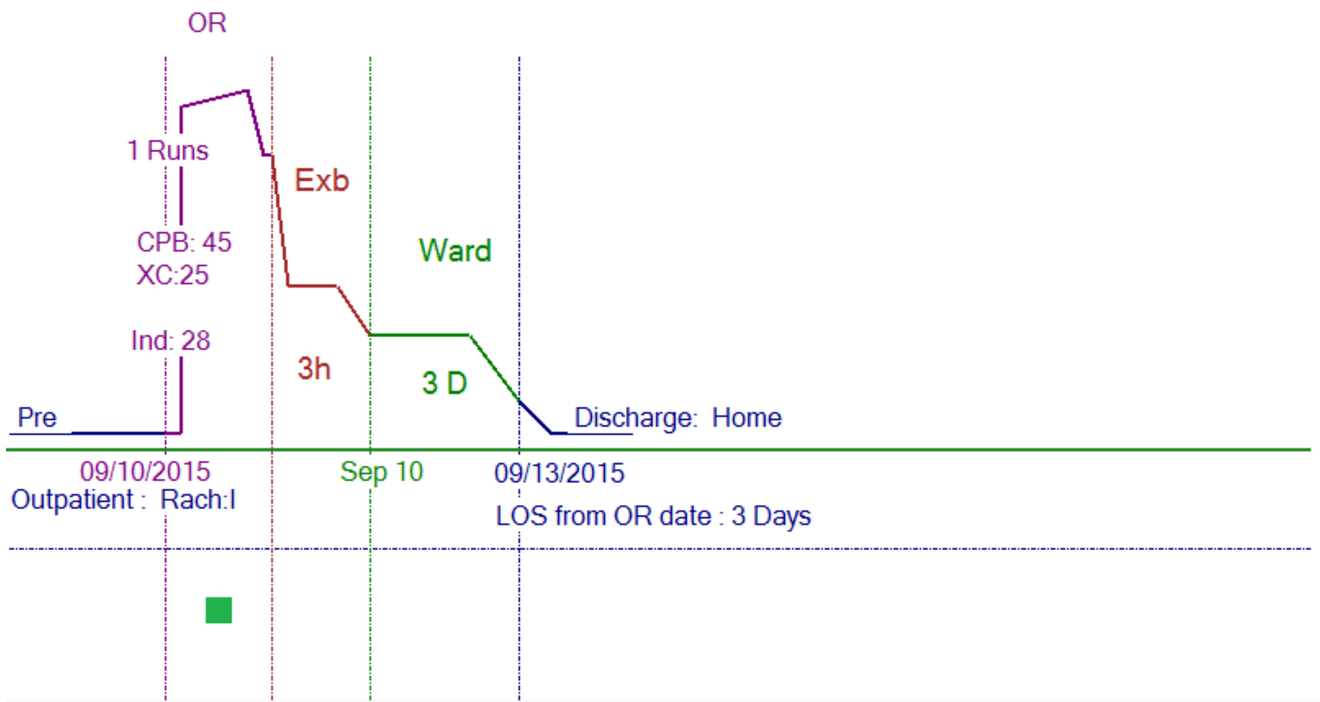
Performance Rounds

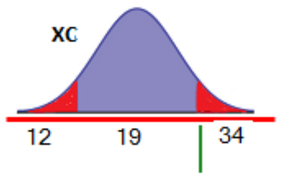
Name	Age	Weight	Surgeaon+Fellow	Anesth	ICU	Cardio
Name 110110- F	**2y 8m 14d**	**11.50 Kg**	**JC+ DT**	**KC**	**AK**	**GG**

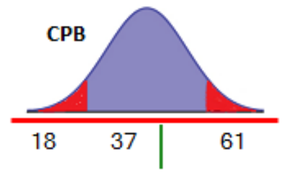
Diagnosis	Intervention
Secundum ASD, RV dilation	***Sep 10,Secundum ASD closure***

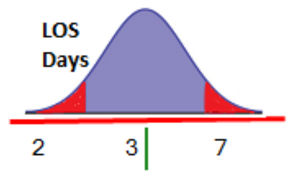
Other Diagnosis	Previous Intervention

Good biv sys fnx
No Res ASD









Excellent for team

Educational

Improves accountability

Awareness and follow-up

Problems solved fast

20 years of training

No guidance on performing in or managing degraded situations

Yet, crew resource management has been mandatory in pilot training for >20 years!

AHA Scientific Statement

Patient Safety in the Cardiac Operating Room: Human Factors and Teamwork

A Scientific Statement From the American Heart Association

Joyce A. Wahr, MD, FAHA, Co-Chair; Richard L. Prager, MD, FAHA; J.H. Abernathy III, MD; Elizabeth A. Martinez, MD; Eduardo Salas, PhD; Patricia C. Seifert, MSN; Robert C. Groom, CCP; Bruce D. Spiess, MD, FAHA; Bruce E. Searles, MS, CCP; Thoralf M. Sundt III, MD; Juan A. Sanchez, MD; Scott A. Shappell, PhD; Michael H. Culig, MD; Elizabeth H. Lazzara, PhD; David C. Fitzgerald, CCP, FAHA; Vinod H. Thourani, MD; Pirooz Eghtesady, MD, PhD, FAHA; John S. Ikonomidis, MD, PhD, FAHA; Michael R. England, MD; Frank W. Sellke, MD, FAHA; Nancy A. Nussmeier, MD, FAHA, Co-Chair; on behalf of the American Heart Association Council on Cardiovascular Surgery and Anesthesia, Council on Cardiovascular and Stroke Nursing, and Council on Quality of Care and Outcomes Research

(*Circulation*. 2013;128:1139-1169.)

Why have we not done as well as airlines?

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Prioritisation and Leadership

safety must be the top priority

leadership (and messaging) must be consistent

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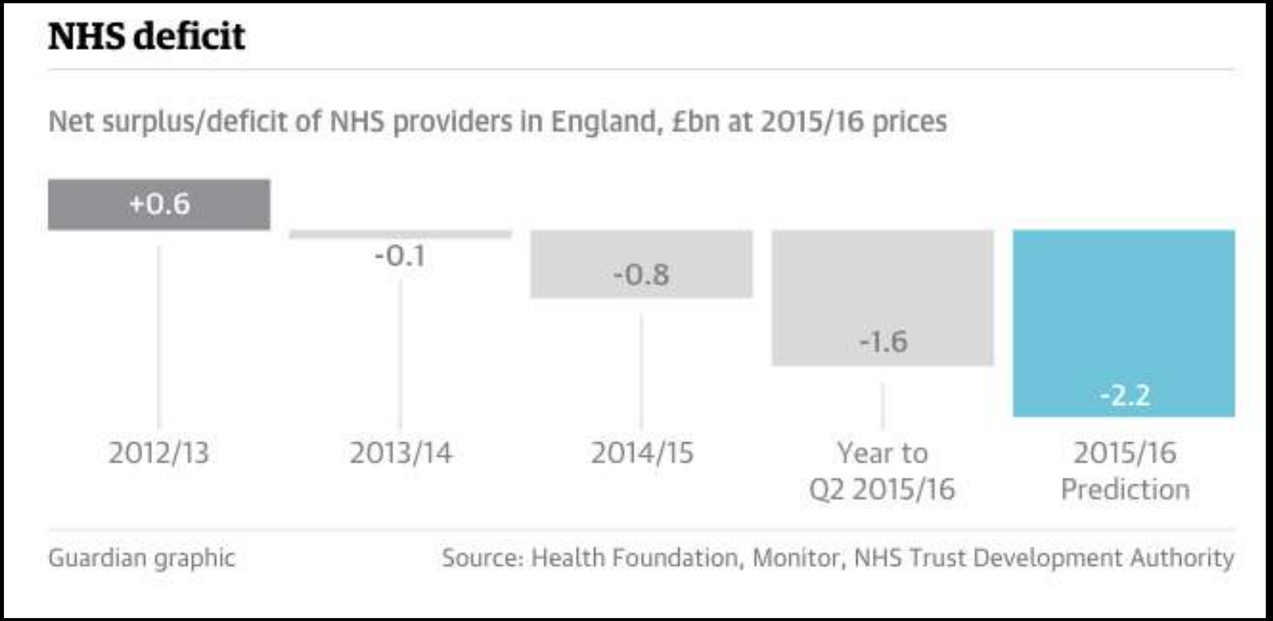
Financial Pressures

safety must NOT be compromised



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2010 „Manager of the year“

2004 bis 2009
„Most Admired Global Airline“

„Highest Ranked Network Airline“

Continental CEO Jeff Smisek

(committed to cost saving:
worked one year without getting salary)

Continental Airlines

Safety is our top priority: Flights can stop for extra fuel en route if necessary!

Continental Airlines fuel emergencies

(less than 30 minutes of fuel!) at Newark Airport

2005: 19
2006: 42
2007: 96

Optional and Local

Variably Implemented in Core Training

In-service performance assessment unsophisticated

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aircraft tend to be more predictable than patients

Helmreich RL.

On error management: lessons from aviation.

BMJ 2000;**320**:781–5

it’s harder for us, but we can do much better

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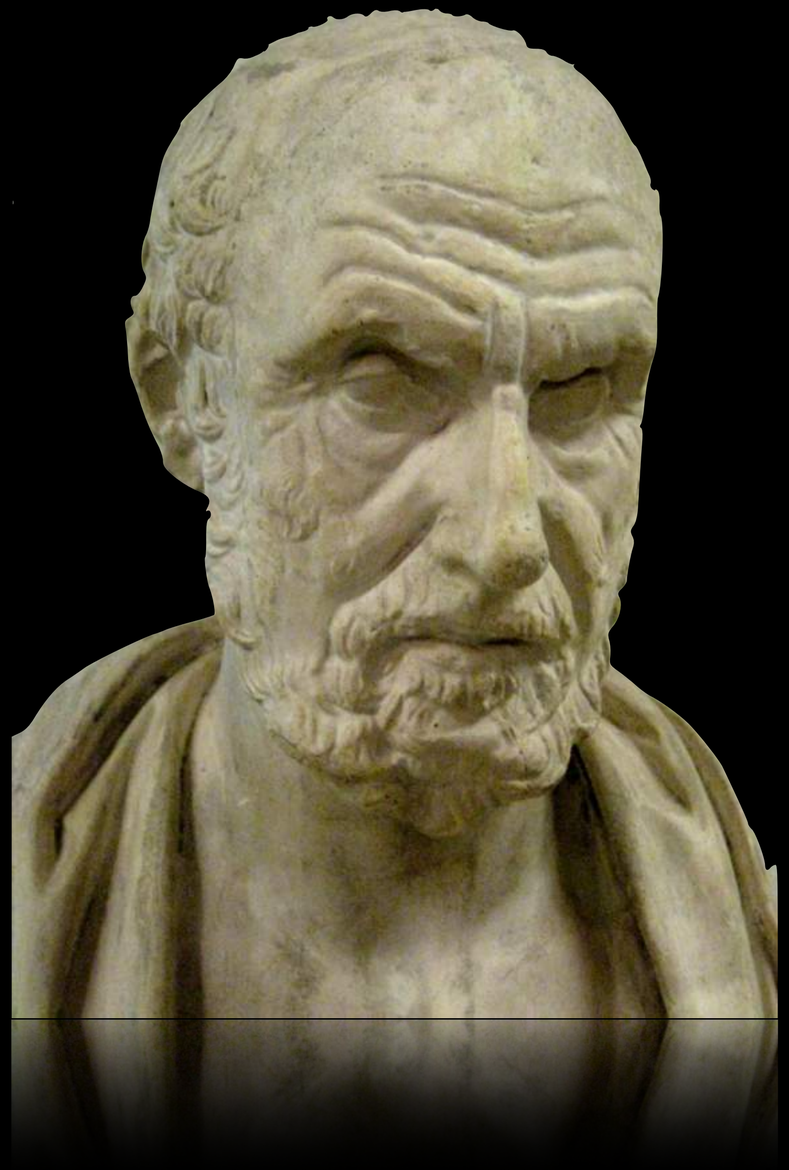

FIRST, DO NO HARM

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With Thanks to

Captain Guy Adams, CTC Aviation

Name	Age	Surgeon	Anaesthetist	ICU	Cardiology
Joe Bloggs	46 days	EH	YX	-	-

Admission diagnosis	INTERVENTION
VSD	Feb 15th 2012
Other diagnoses	
Syndromic, ex-prem, severe failure, 3.6kg	VSD repair
Previous interventions	
None	

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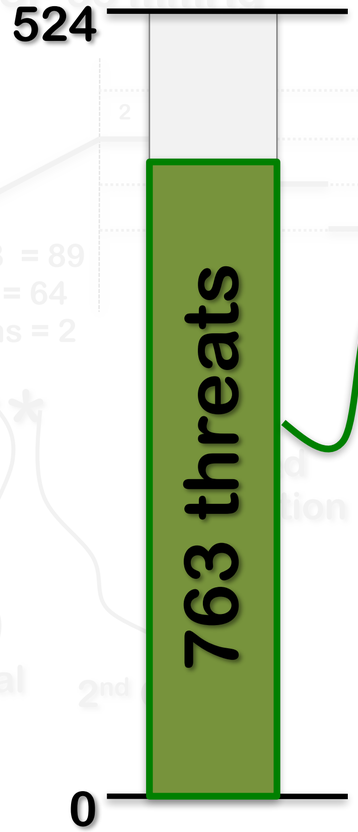
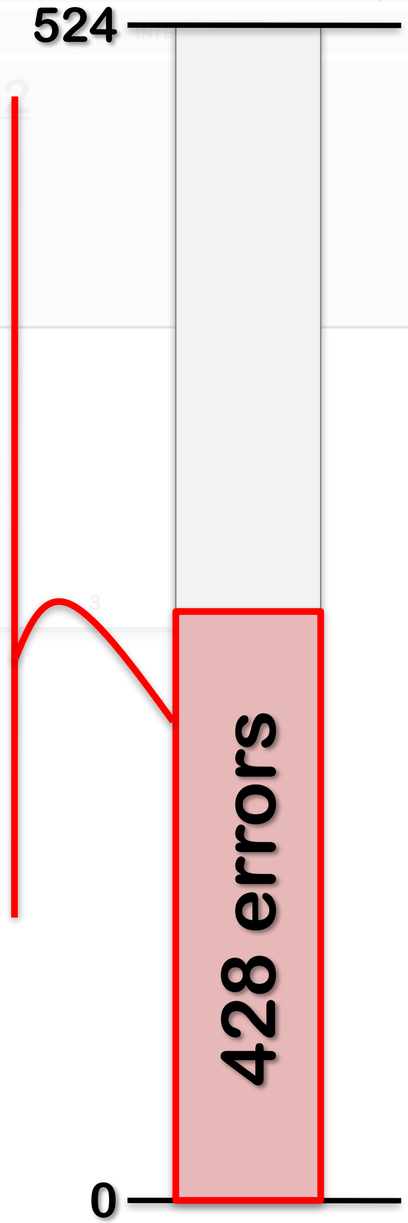


	N	%
Morphology	230	30
Co-morbidities	424	56
Equipment	26	3
External threats	79	10
Operation stressors	1	<1

UNIVERSITY OF TORONTO

SickKids® | Labatt Family Heart Centre

	N	%
Violation	10	2
Procedural	14	3
Communication	18	4
Proficiency	280	65
Inferred	32	7
Judgment	69	16



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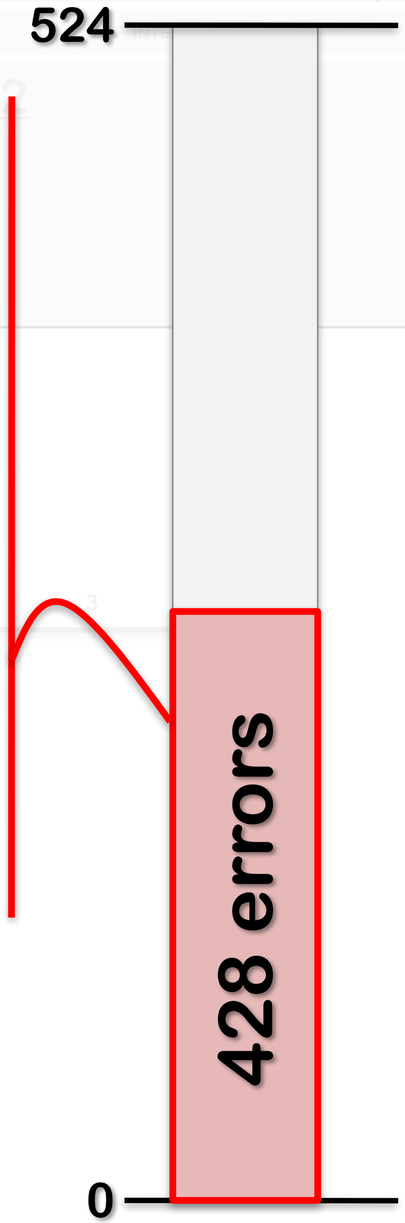

UNIVERSITY OF TORONTO

SickKids® | Labatt Family Heart Centre

“The single greatest impediment to error prevention in the medical industry is that we punish people for making mistakes”

Professor Lucian Leape 2009

- George Webb | 16-Feb-2015 3:52 pm

  Why do we continue to compare health to the motor and air industries. Some of the technology is transferable and some of the systems but not all. Why not compare health to nuclear systems protection? They use triple monitoring to guard against technology or system errors and fail safe where possible. As an ex electrical engineer with some knowledge of automation I have experienced system failures even in the best of
  equipment. It is time that experts stuck to what they know and stop acting as poly maths.