



# The Road to High Reliability: Using Crew Resource Management to Reduce Harm in Healthcare

North Carolina Association for Healthcare Quality

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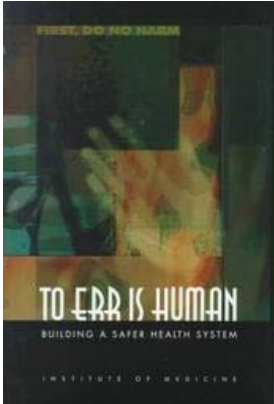


# CRM Goal

“To use all available sources – information, equipment, and people – to achieve safe and efficient operations”

## Our Objectives

- Describe the concept of High Reliability and how it relates to CRM
- Identify how humans perform and how errors occur
- Learn how CRM principles can be used by healthcare professionals to
  - Avoid errors
  - Trap errors when they occur – before reaching the patient
  - Establish more Collaborative Interactive Teams (CIT)



# Death By Numbers

44,000 to 98,000 patient deaths per year from medical errors

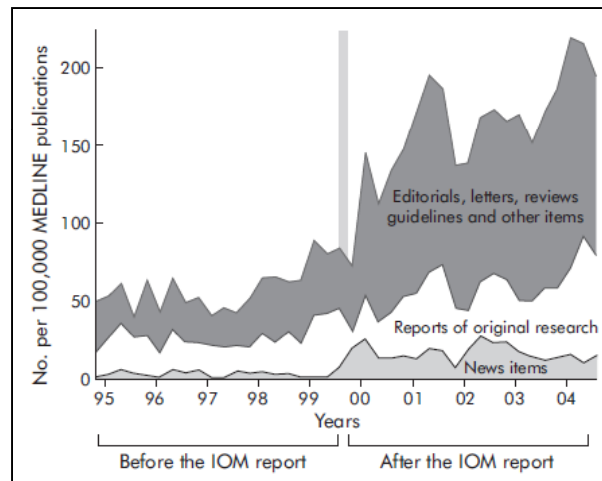
*To Err is Human*, Institute of Medicine (1999)

268 people per day...“a 747 a day”

1 death every 383 admissions (based on *AHA Fast Facts on US Hospitals*, 2010)

## A Lot of Talk

Patient safety publications before and after the IOM report, *To Err is Human*  
Quality & Safety in Health Care (2006)



**TO ERR IS HUMAN – TO DELAY IS DEADLY**

Ten years later, a million lives lost, billions of dollars wasted

“Based on our review of the scant evidence, we believe that preventable medical harm still accounts for more than 100,000 deaths a year... the Centers for Disease Control and Prevention (CDC) estimates that hospital-acquired conditions alone kill 99,000 each year...”

**In this report, we give the country a failing grade on progress...”**

Consumers Union (2009)

# Recently in the News...

## Hospitals hurt 18 percent of patients, study says

**The New York Times**

November 25, 2010

- **Published in the NEJM**
- **2,341 patients admitted to 10 hospitals**
- **63.1 % of the injuries were preventable**
- **2.4 % caused or contributed to a patient's death**

**“Process changes, like a new computer system or the use of a checklist, may help a bit,” he said, “but if they are not embedded in a system in which the providers are engaged in safety efforts, educated about how to identify safety hazards and fix them, and have a culture of strong communication and teamwork, progress may be painfully slow.”**



## Medical mistakes plague Medicare patients

November 16, 2010

- **780 randomly selected Medicare patients**
- **1 in 7 (13.5%) experienced at least one serious instance of harm that prolonged hospital stay**
- **Less serious harm in additional 13.5% of patients**

**“Although hospitals have broadly embraced safety initiatives, the still-high rate of adverse events indicates that far more needs to be done. Hospitals must work faster to adopt evidence-based practices that reduce medical errors. “**

# A Teamwork Failure

## THE PLAIN DEALER

Ohio's Largest Newspaper • Cleveland, Ohio

Sunday, May 23, 2010

Lauren Wargo, a 19-year-old from Shaker Heights, Ohio, went to an outpatient surgical center where a plastic surgeon was going to remove a mole from her eyebrow. The oxygen used during her surgery and an electrical device used to seal blood vessels combined to create a flash flame that left her face, neck and ear badly burned. Four years later, the 23-year-old still has to wear make-up to cover the scars on her face and is unable to completely close one eyelid.

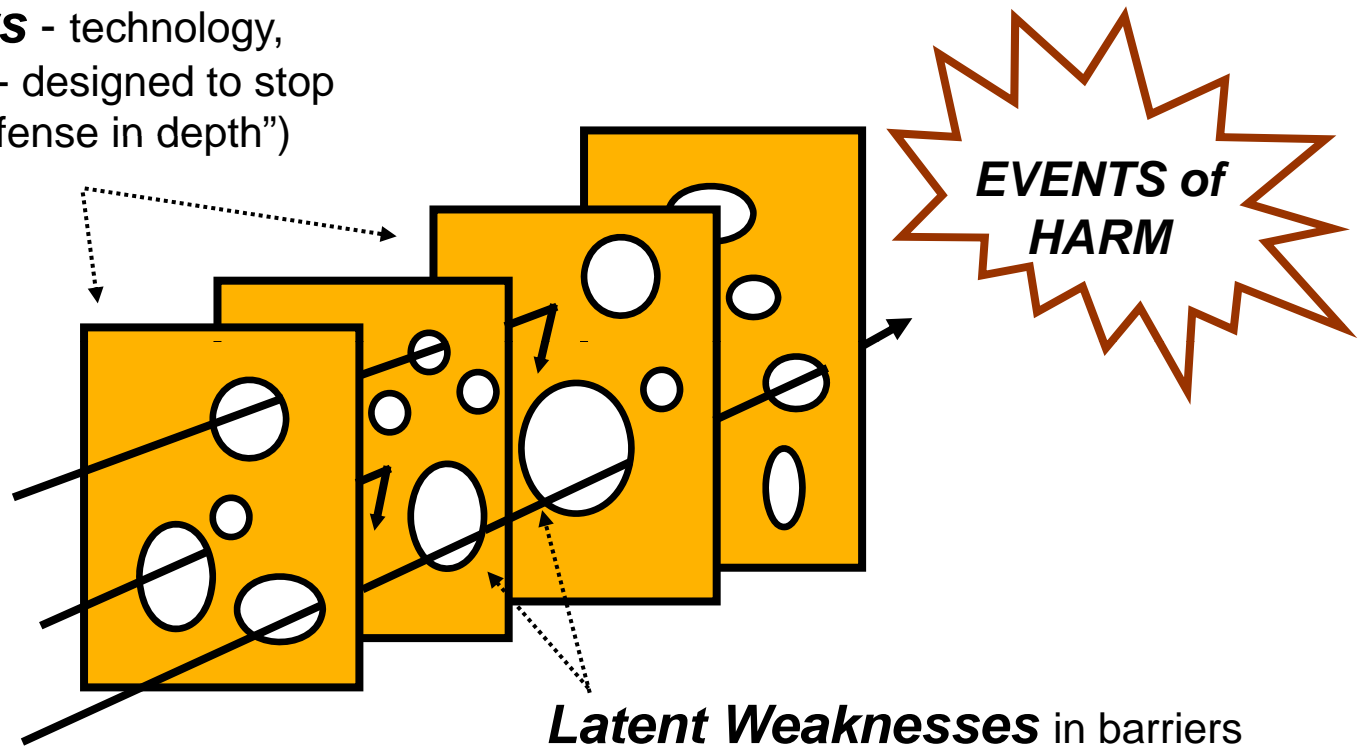


How could this have happened? As is too often the case when hospital errors occur, health care professionals weren't communicating with each other

# The Swiss-Cheese Effect

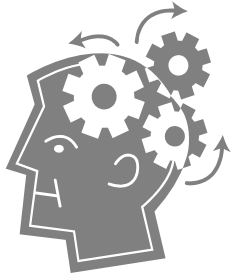
**Multiple Barriers** - technology, processes, and people - designed to stop active errors (our “defense in depth”)

**Active Errors**  
by individuals result  
in initiating action(s)



**PREVENT**  
The Errors

**DETECT & CORRECT**  
The System Weaknesses



# Human Error Classification

*Based on the Skill/Rule/Knowledge classification of Jens Rasmussen and the Generic Error Modeling System of James Reason*

	<b>Skill Based</b>	<b>Rule Based</b>	<b>Knowledge Based</b>
<b>Activity Type</b>	Familiar, routine acts that can be carried out smoothly in an automatic fashion	Problem solving in a known situation according to set of stored “rules,” or learned principles	Problem solving in new, unfamiliar situation for which the individual knows no rules – requires a plan of action to be formulated
<b>Error Types</b>	<ul style="list-style-type: none"> <li>▪ Slips</li> <li>▪ Lapses</li> <li>▪ Fumbles</li> </ul>	<ul style="list-style-type: none"> <li>▪ Wrong rule</li> <li>▪ Misapplication of a rule</li> <li>▪ Non-compliance with rule</li> </ul>	Formulation of incorrect response
<b>Error Prevention Themes</b>	Self checking – stop and think before acting	<ul style="list-style-type: none"> <li>▪ Educate if wrong rule</li> <li>▪ Think a second time if misapplication</li> <li>▪ Non-compliance – reduce burden, increase risk awareness, improve coaching culture</li> </ul>	Stop and find an expert
<b>Error Probability</b>	1:1000	1:100	3:10 to 6:10

# Reliability

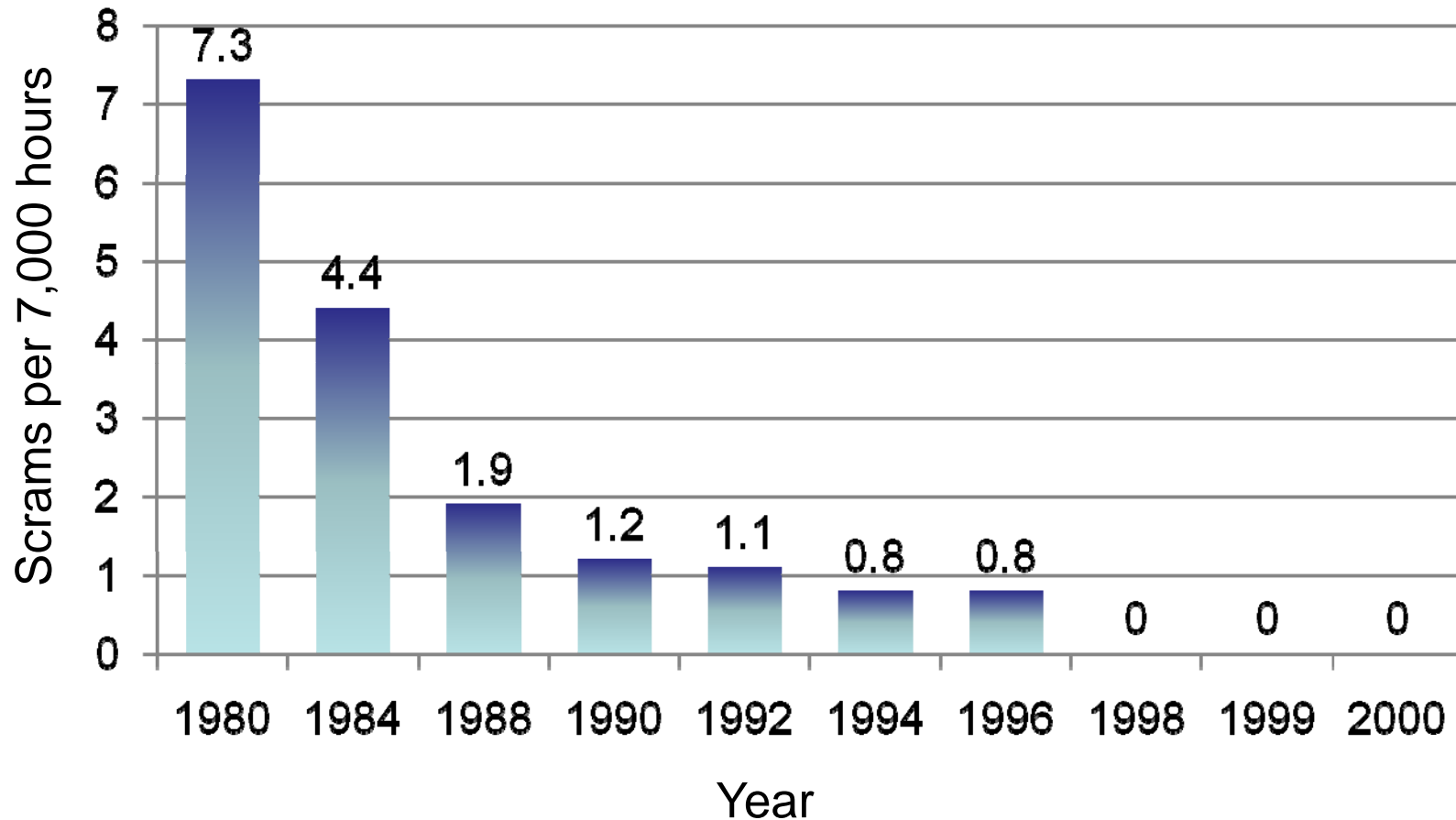
*Reliability: The **probability** that a system, structure, component, process, person will successfully provide the intended function(s).*

Often a ratio such as 0.96 or 96%

Sometimes a frequency such  $10^{-3}$  per year



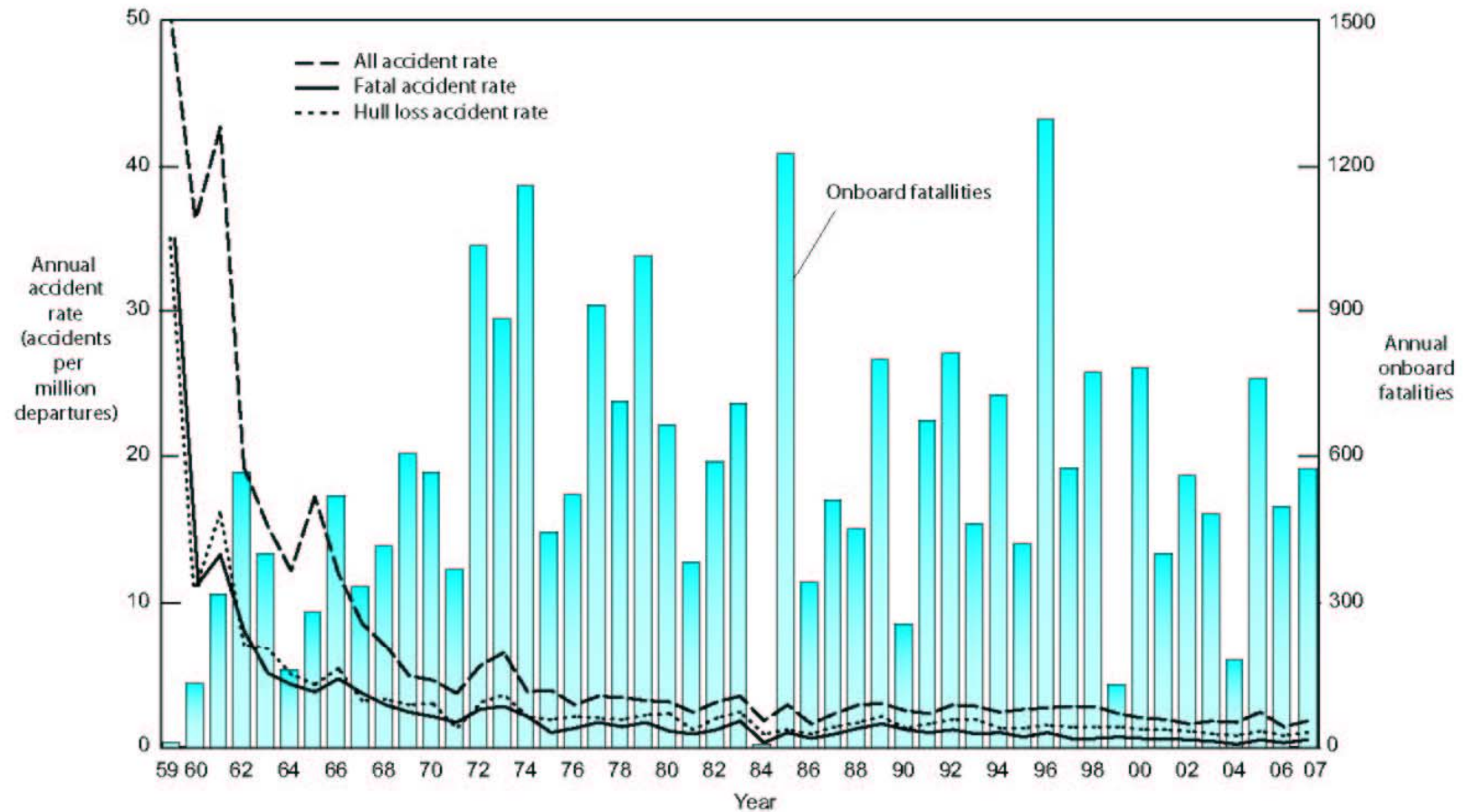
# Reliability – U.S. Nuclear Power



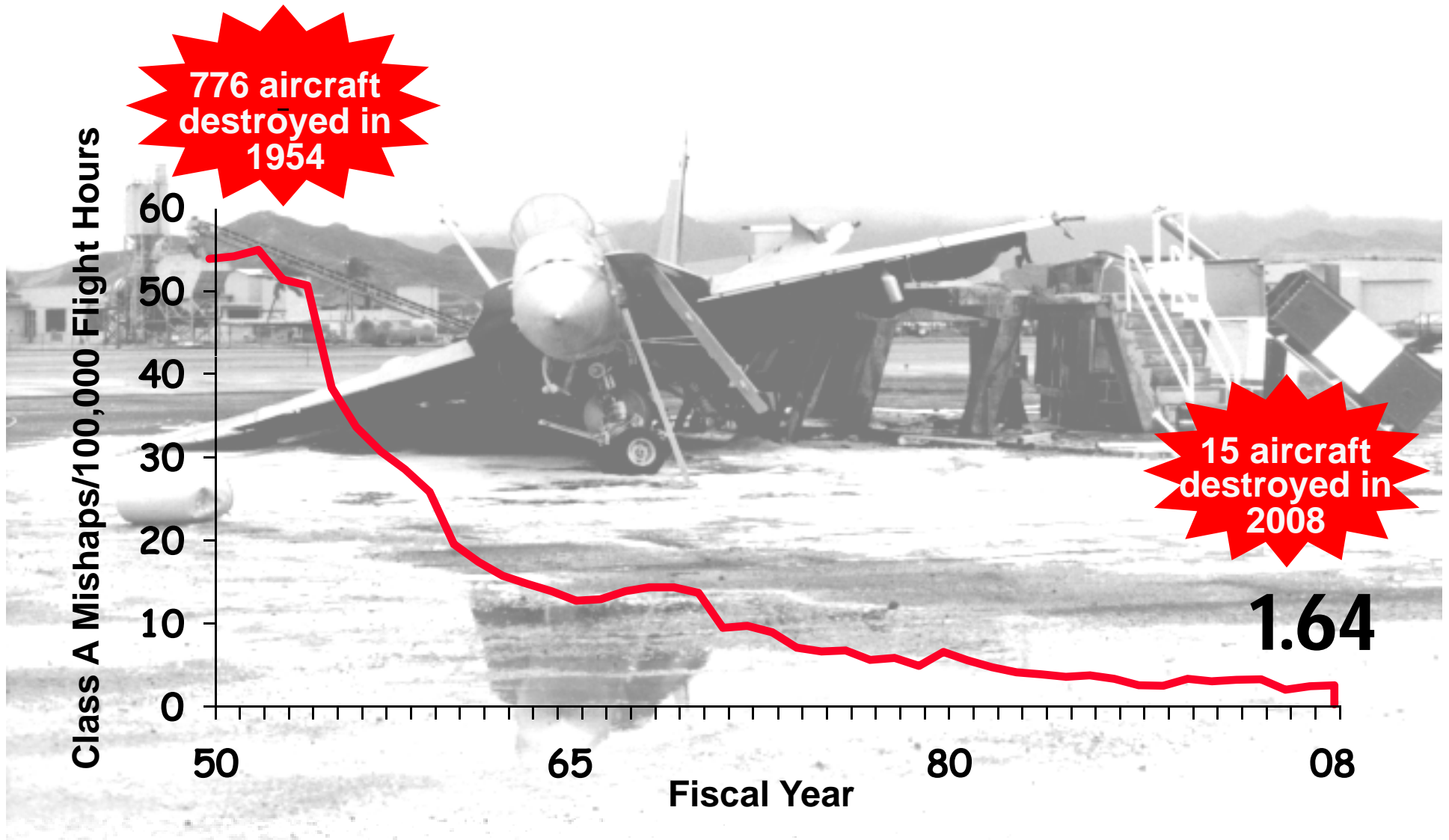
The unplanned automatic scrams per 7,000 hrs critical indicator tracks the median scram (automatic shutdown) rate for approximately one year (7,000 hrs) of operation. Unplanned automatic scrams result in thermal and hydraulic transients that affect plant systems. The scram rate has been significantly reduced since 1980. In 2000, 59% of operating plants had zero automatic scrams.

# Reliability – Commercial Aviation

## Accident Rates and Onboard Fatalities by Year Worldwide Commercial Jet Fleet – 1959 Through 2007

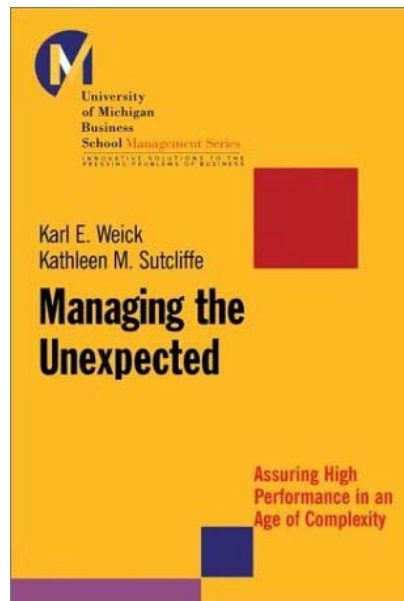


# Reliability – Naval Aviation



Source: [www.safetycenter.navy.mil](http://www.safetycenter.navy.mil) ORM Flight Mishap Rate

High Reliability Organizations (HROs)  
“operate under very trying conditions all  
the time *and yet manage* to have fewer  
than their fair share of accidents.”



Managing the Unexpected  
By Karl E Weick & Kathleen M Sutcliffe

# Five Principles of HROs

## ***Three Principles of Anticipation***

### **Preoccupation with Failure**

Regarding small, inconsequential errors as a symptom that something's wrong

### **Sensitivity to Operations**

Paying attention to what's happening on the front-line

### **Reluctance to Simplify *interpretations***

- *We discuss alternatives on how to go about our normal work activities*
- *We're not afraid to ask questions and voice safety concerns*

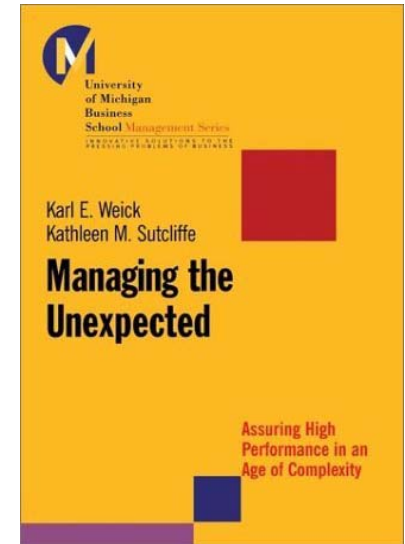
## ***Two Principles of Containment***

### **Commitment to Resilience**

Developing capabilities to detect, contain, and bounce-back from events that do occur

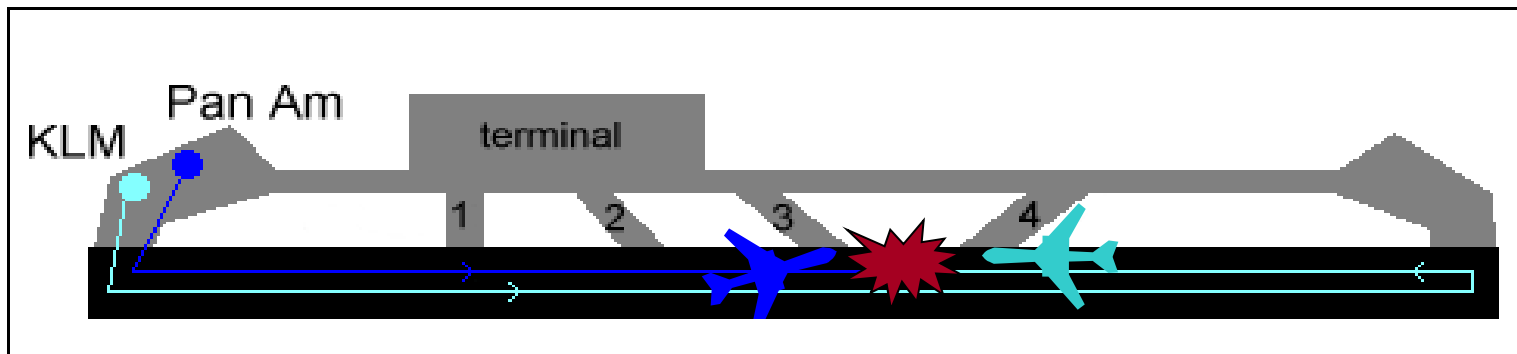
### **Deference to Expertise**

- *We take advantage of the unique skills of our colleagues*
- *When a patient crisis occurs, we rapidly pool our collective expertise to resolve it*



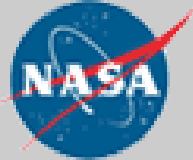
# Tenerife Disaster

## How Could this have Happened?



# CRM Development

- NASA workshop, *Resource Management on the Flightdeck*, convened in 1979 to address air safety
  - Human error identified as the cause for > 70% of crashes
  - Majority of crew errors consisted of failures in leadership, team coordination, and decision-making
  - Crew Resource Management (CRM) label first applied
    - Intended to reduce pilot error



National Aeronautics  
and Space Administration

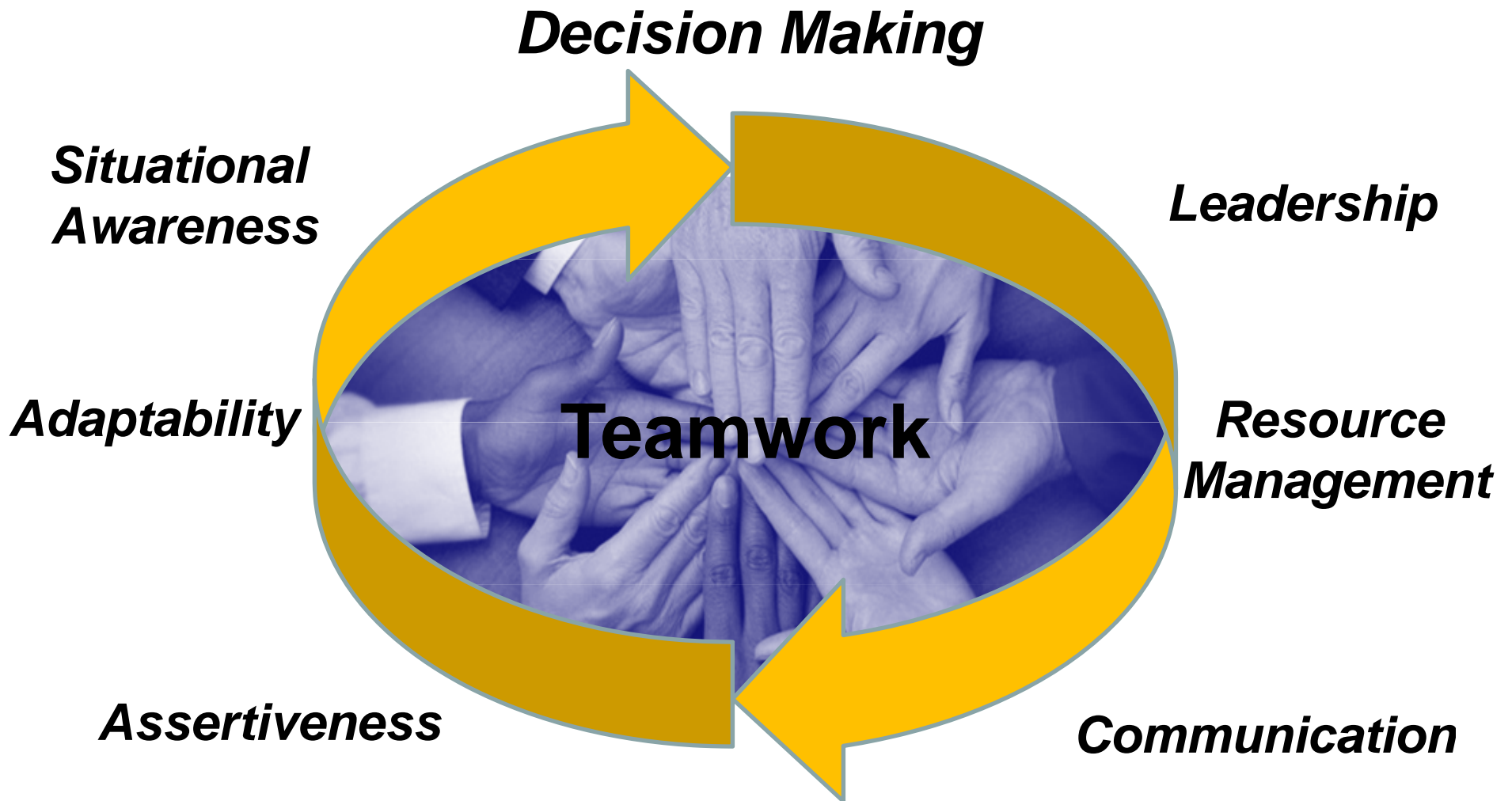
## Goal of CRM

“To use all available sources – information, equipment, and people – to achieve safe and efficient flight operations”

- Dr. John Lauber, NTSB member

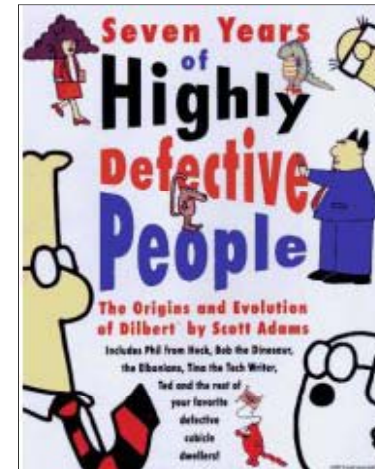
# Seven Elements of CRM

*Use all available sources – information, equipment, and people – to achieve safe and efficient operations*



# Cross-Checking in Health Care

Individual reliability is limited:  
**1 defect per 1,000 opportunities**



Cross-checking multiplies the error probability:  
 **$0.001 \times 0.001 = 1$  defect per million**

**High Reliability Organization (HRO)  
Lesson:  
We are Better Together**

# Intimidation in Healthcare



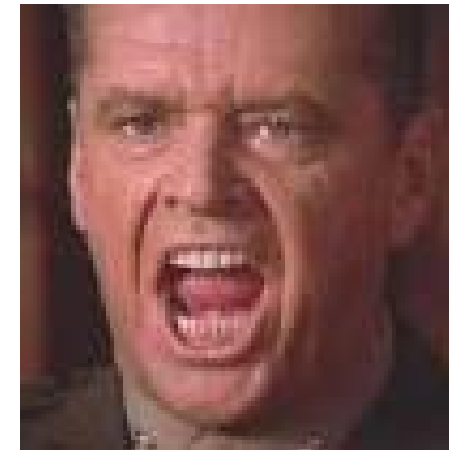
- Institute for Safe Medication Practices 2003 Survey
  - 2095 healthcare providers (1565 nurses, 354 pharmacists)
  - 88% condescending language or tone
  - 87% impatience with questions
  - 79% reluctance or refusal to answer questions or phone calls
  - 48% strong verbal abuse
  - 43% threatening body language

Denigrates Subordinates

Intimidating

Poor for morale

Atmosphere inhibits the flow of information



# Why does it matter?

34% felt the highly respected reputation of the prescriber was intimidating and avoided clarification

31% allowed physician to give medication despite reservations

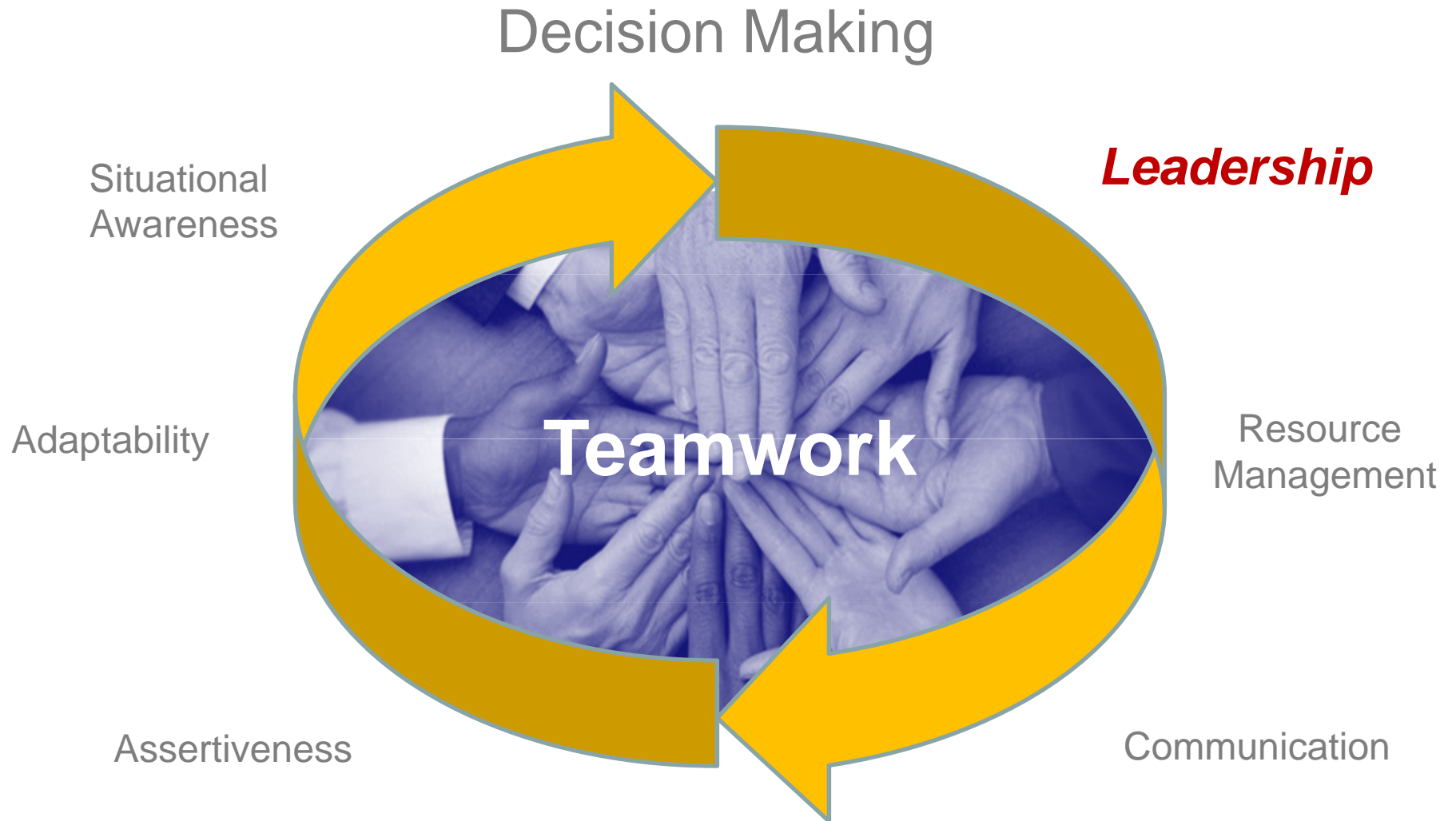


49% altered their handling of order clarifications or questions

49% felt pressure to accept, dispense or administer a medication despite concerns

75% used avoidance techniques to clarify orders

# Seven Elements of CRM



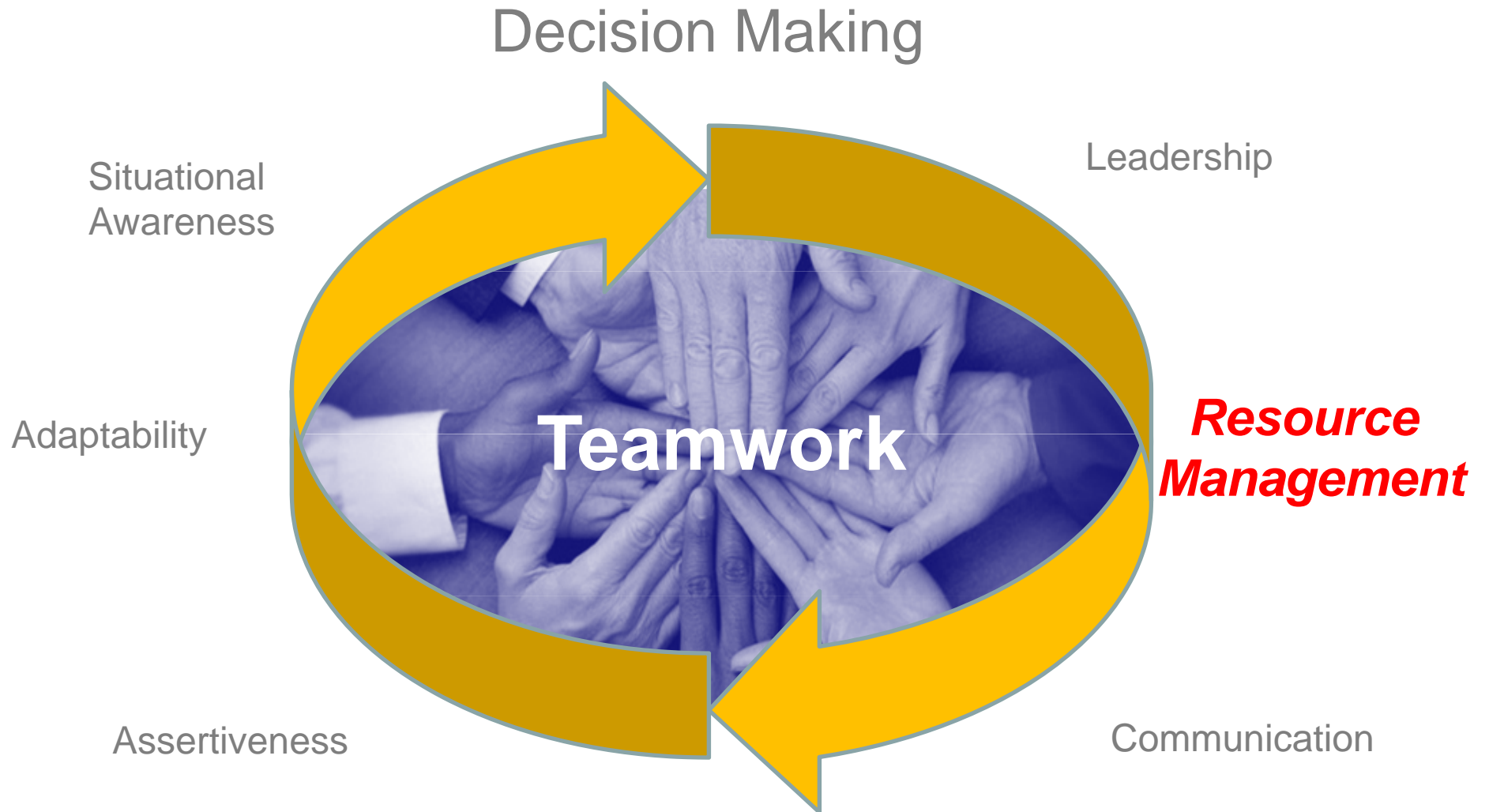
# Professional Atmosphere



- Leaders set the tone for the flow of information
  - Begins in the Brief
  - Greetings
  - Politeness
  - Tone
  - Eye contact / body language
- Team Goals
  - “We” and “Us” vice “I” and “You”
  - What’s best for the patient
- Invite questioning attitudes
  - “If any member of the team sees anything that is unsafe, I expect you to speak up.”



# Seven Elements of CRM



# Briefs Improve Communications and Teamwork

- 2006-2008 research study at William Beaumont Hospital
  - 1061 bed teaching and research hospital
  - 58 OR suites
  - 37,133 briefings and debriefings conducted
  - Average 2.9 minute briefing time
  - 90% agreed briefs effective in improving communication
  - 90% agreed briefs improved teamwork

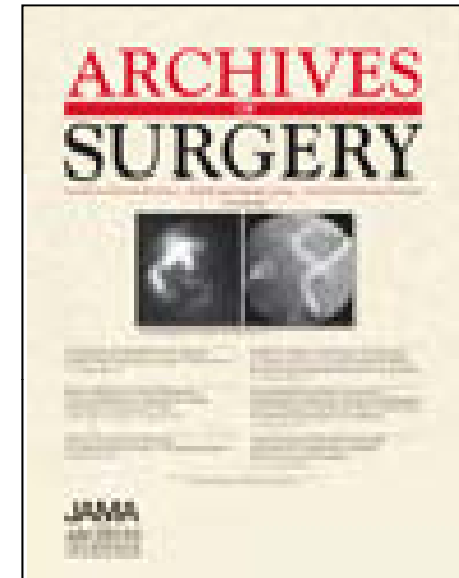


Royal Oak, MI campus

**Beaumont**<sup>®</sup>  
William Beaumont Hospital

# Preoperative Briefs Save Time

- Nov 2008 Archives of Surgery
  - 422 respondents
  - Preoperative briefs reduced unexpected delays in the OR by **31%**
  - Decreased the frequency of communications breakdowns



- What are the names and the roles of the team members?
- Is the correct patient/procedure confirmed (Timeout)?
- Have antibiotics been given?
- What are the critical steps of the procedure?
- What are the potential problems for the case?

# Pre-Operative Briefs Save Lives

## Association Between Implementation of a Medical Team Training Program and Surgical Mortality

JAMA®

- 108 VHA facilities studied
- 74 facilities received team training / 34 did not
- **18% reduction** in annual mortality in those receiving training
- 7% reduction in those who had not

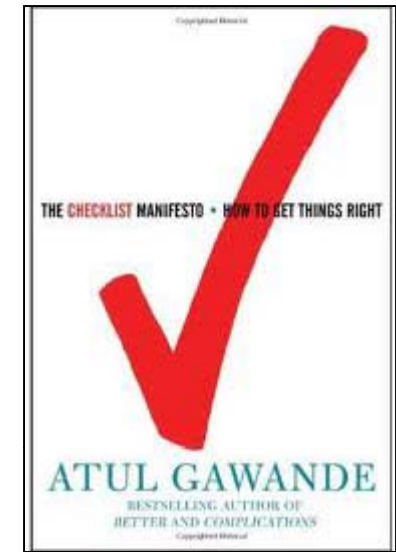


VHA's training program required briefings and debriefings in the OR, including checklists as an integral part of the process. The training included 2 months of preparation, a 1-day conference, and 1 year of quarterly coaching interviews



Neily, J., Mills, P.D., Young-Xu, Y. et al. Association Between Implementation of a Medical Team Training Program and Surgical Mortality, JAMA, 2010, 304(15), 1693-1700.

# Checklist Manifesto



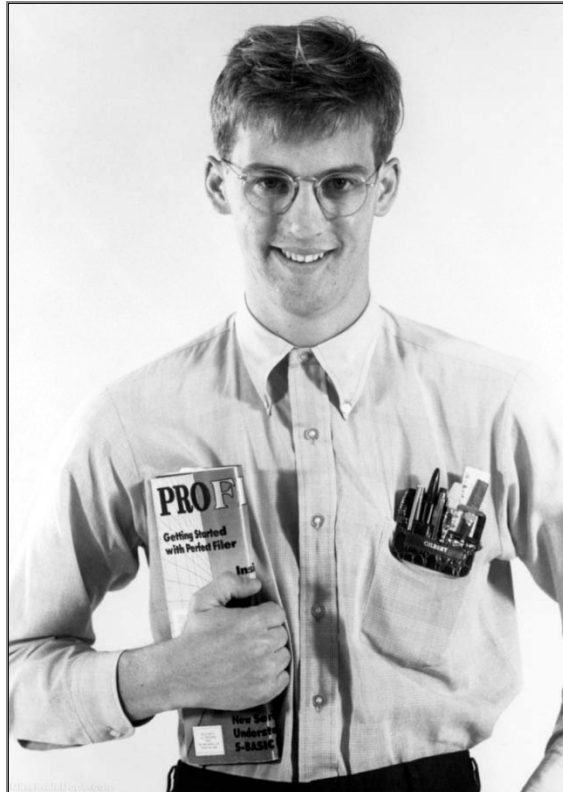
Pre & Landing Checks		Shut Down Checks	
<b>Pre-Landing Checks</b>		<b>After Landing</b> <i>Clear of runway and stop!</i>	
<b>B</b> Brakes	Check OFF	Carburettor heat	OFF (COLD)
<b>U</b> Undercarriage	Fixed down	Flaps	Full up
<b>M</b> Mixture	RICH	Trim	Neutral
<b>F</b> Fuel	ON and sufficient including go-around and diversion	Throttle friction nut	Loose
<b>F</b> Flaps	Use as required	Electrics	Non-essentials OFF
<b>L</b> Landing light	Use as required	Radios	Non-essentials OFF
<b>I</b> Instruments	Engine temp and pressures checked, altimeter set	<b>Shut Down</b>	
<b>C</b> Carburettor heat	Check conditions and set as required	Position	Into wind with the nosewheel straight
<b>H</b> Harnesses	Fastened and secure	Parking brake	ON
<b>H</b> Hatches	Secure	Throttle	1,800 RPM for 20 seconds 1,200 RPM for 10 seconds



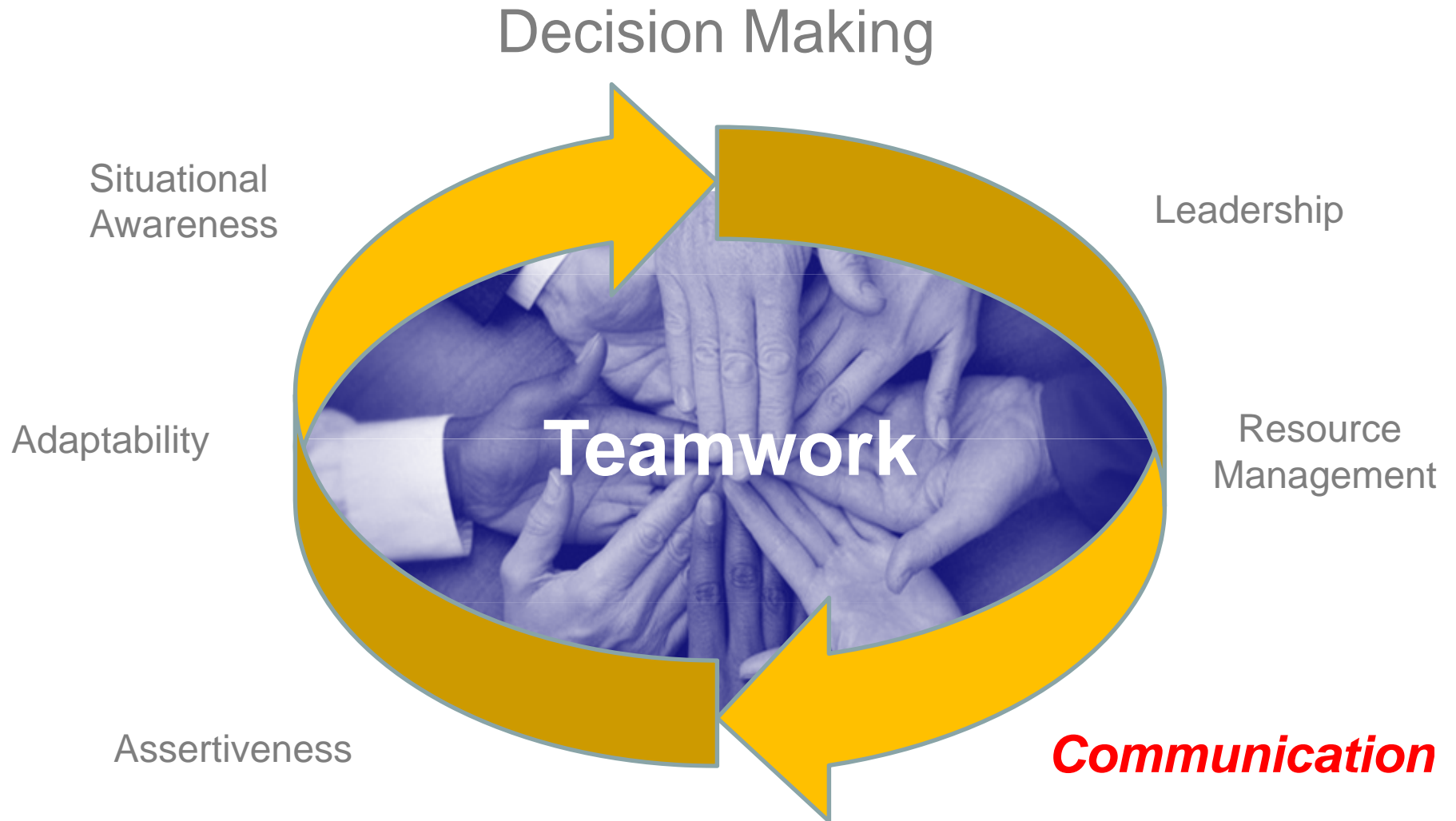
B-17 Flying Fortress



# High Reliability – 1 out of a Million



# Seven Elements of CRM



# Barriers to Effective Communication



Preconceptions / Assumptions  
Rank / Experience (authority gradient)  
Task / Information Overload  
Task Underload  
Noise / Distractions / Jargon  
Social / Cultural  
Interpersonal



# Tools to Overcome Communications Barriers

- *Inform others of progress*
- *Feedback results to others*

**Call-out** to maintain SA

**Phonetic & Numeric Clarifications**

**SBAR** quick & to the point:

Situation  
Background  
Assessment  
Request



**Speak up for Safety with ARCC:**

Ask  
Request  
Concerned  
Chain of Command

**3-Way Repeat Back:**

- Sender initiates communication
- Receiver repeats back
- Sender acknowledges accuracy by saying, *“That’s correct”*

**Clarifying Questions:**

- Ask 1 or 2 questions to ensure understanding in *high risk* situations or when information is *incomplete or ambiguous*

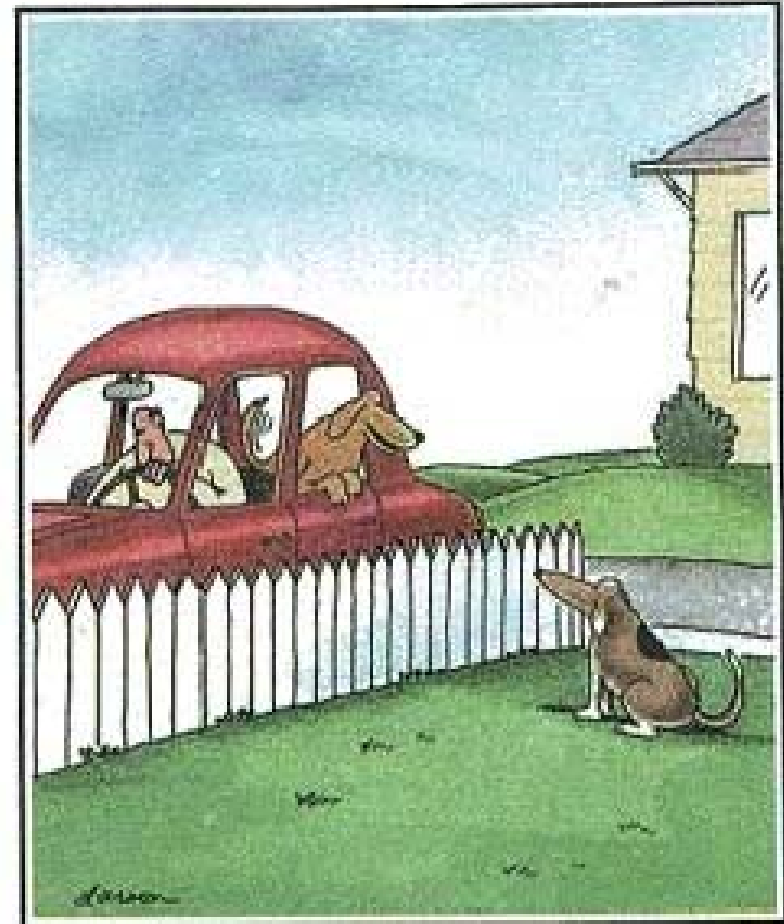
# 3-Way Repeat-Back

**Clear**

**Complete**

**Accurate**

Sent and Received



“Ha ha ha, Biff. Guess what? After we go to the drugstore and the post office, I’m going to the vet’s to get tutored.”

# Repeat Back



When information is transferred...



Sender initiates communication using Receiver's Name. Sender provides an order, request or information to Receiver in a clear and concise format.



Receiver acknowledges receipt by a repeat-back of the order, request or information.



Sender acknowledges the accuracy of the repeat-back by saying, "That's correct!" If not correct, Sender repeats the communication.

Invite yourself in:  
"Let me repeat that back..."

Train our ears to listen for  
"That's Correct!" – it's a code word  
for "we understand each other"

# 3-Way *Read* Back

The same thing as a 3-Way Repeat Back, BUT...

Receiver *writes* the  
information, request or order  
and *reads it back*.



*Don't rely on your memory...*

write it whenever you receive critical information that might be difficult to remember.

**This is so critical that The Joint Commission  
requires this for communication of critical test  
results, verbal orders and telephone orders**

# Use Numeric Clarifications

For sound alike numbers,  
say the number and then the digits

15...**that's** one-five

50...**that's** five-zero

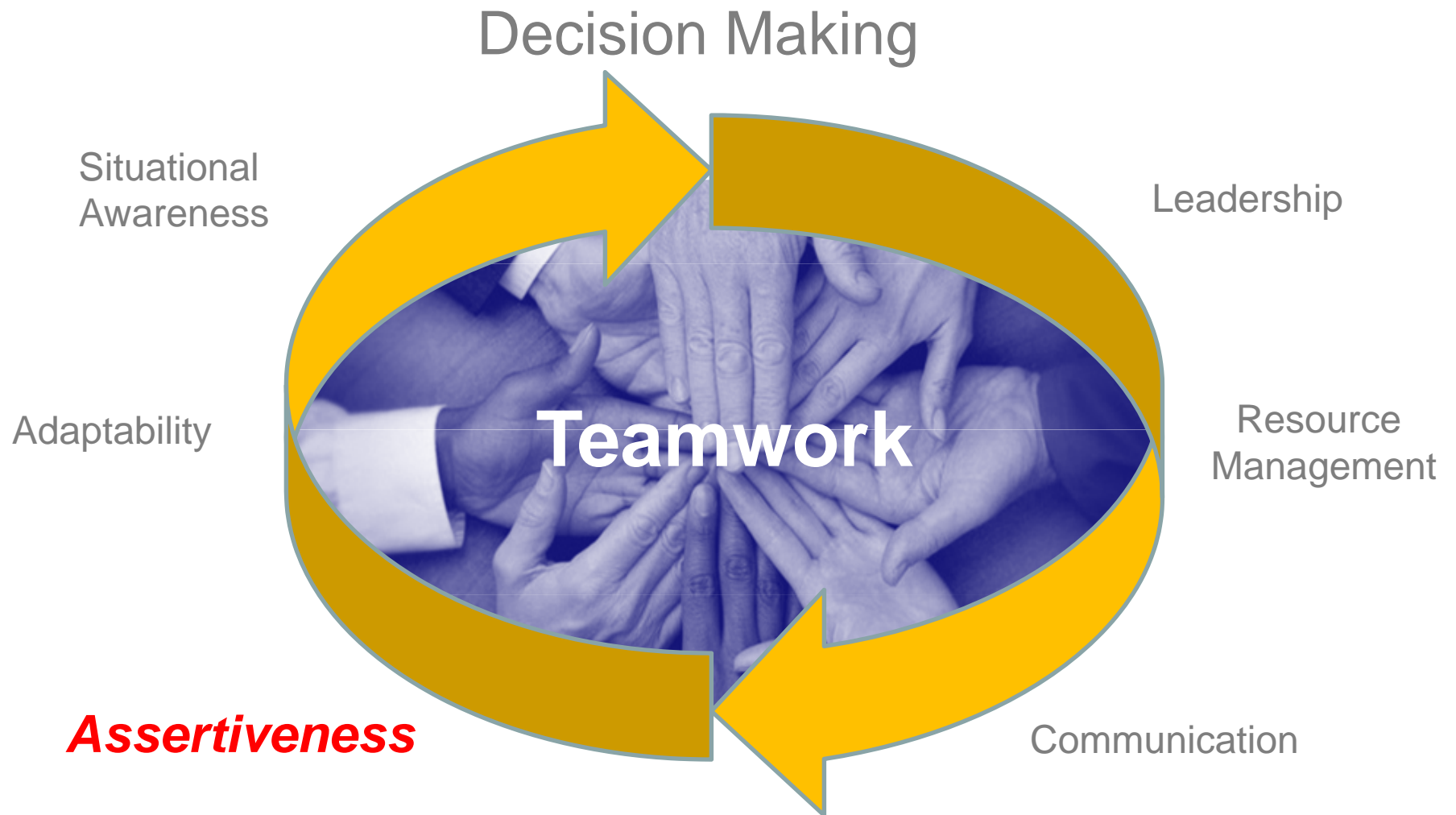
45...**that's** four-five

425...**that's** four-two-five

4 to 5...**that's** the range four dash five

...and **always** use leading zeros – as in 0.9

# Seven Elements of CRM



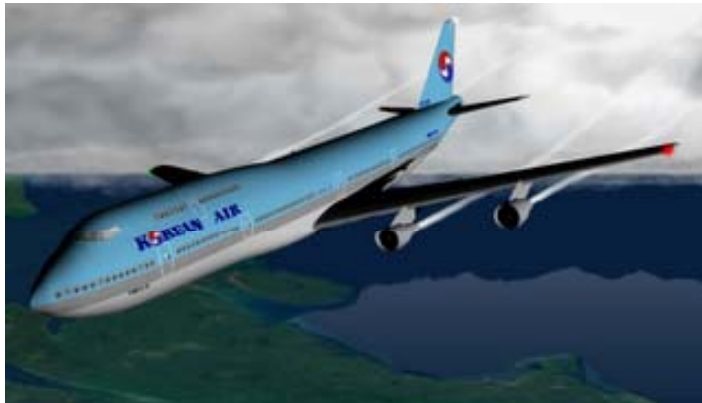
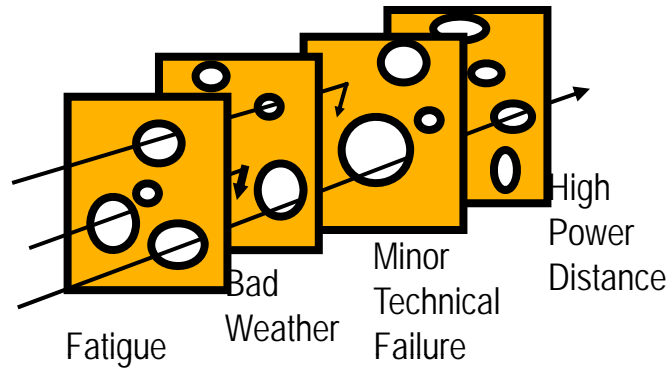
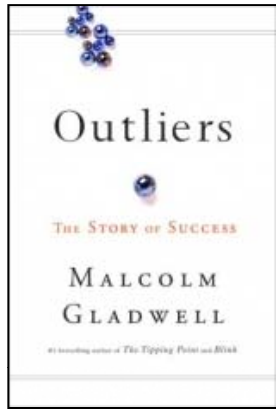
*We discuss alternatives on how to go about our normal work activities...*

*We're not afraid to ask questions and voice safety concerns...*



**Reluctance to Simplify**

# Korean Airlines Flight 801



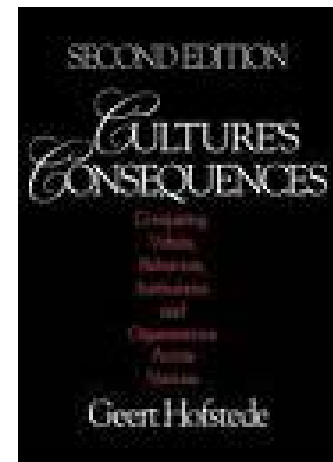
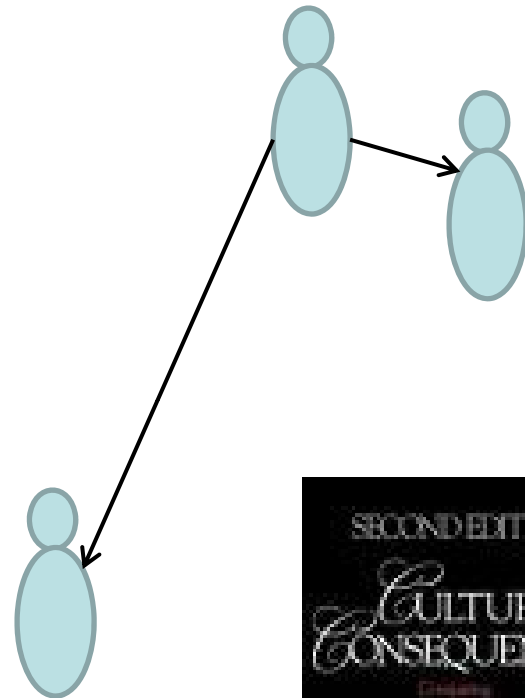
# Power Distance

## Geert Hofstede's Power Distance

- Extent to which the less powerful expect and accept that power is distributed unequally
- Measure of interpersonal power or influence superior-to-subordinate as perceived by the subordinate
- Leads to strong Authority Gradients, which is the perception of authority as perceived by the subordinate

### USA

- Moderate to low PD (38<sup>th</sup> of 50 countries)
- Surgeons & anesthesiologists view low
- Nurses view as significantly higher



# Can We Function as a Team?

- 75% of surgeons rated teamwork “High”
- Others on the team “not-so-much”
  - 39% of anesthesiologists
  - 28% of surgical nurses
  - 25% of anesthesia nurses
  - 10% of residents



50% of surgeons felt junior team members should not question the decisions of senior physicians

# Practice Peer Checking and Coaching using ARC

A responsibility to protect in a manner of mutual respect –  
an assertion and escalation technique

Use the lightest touch possible...

**A**sk a question

Make a **R**equest

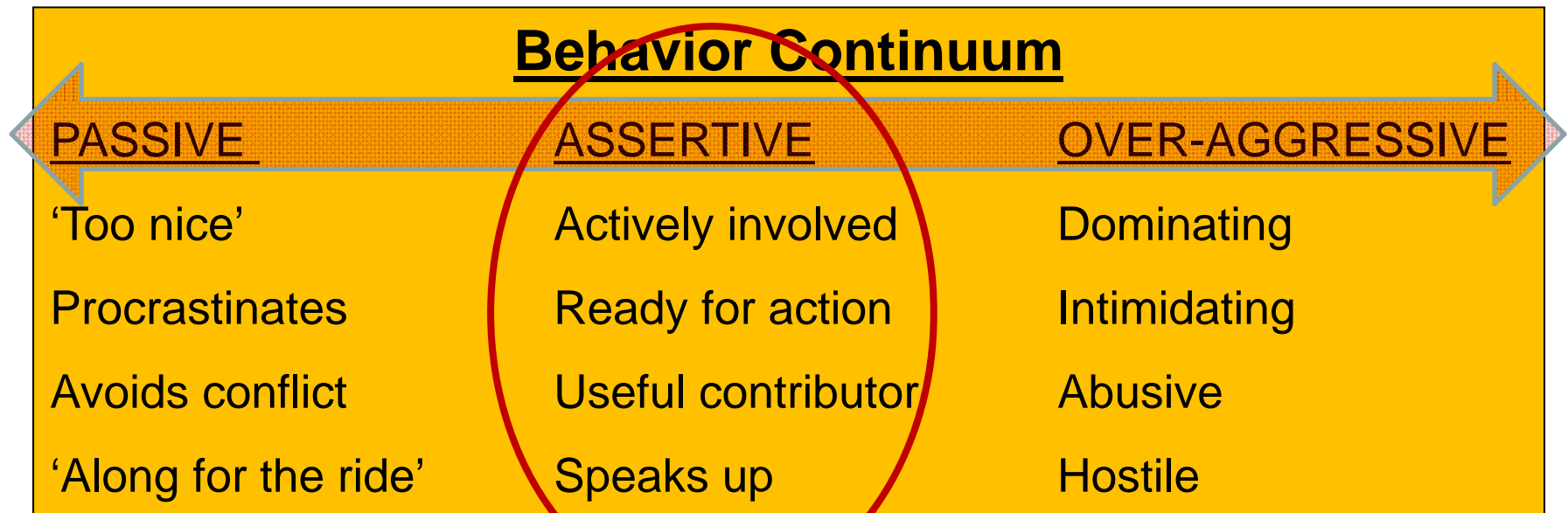
Voice a **C**oncern



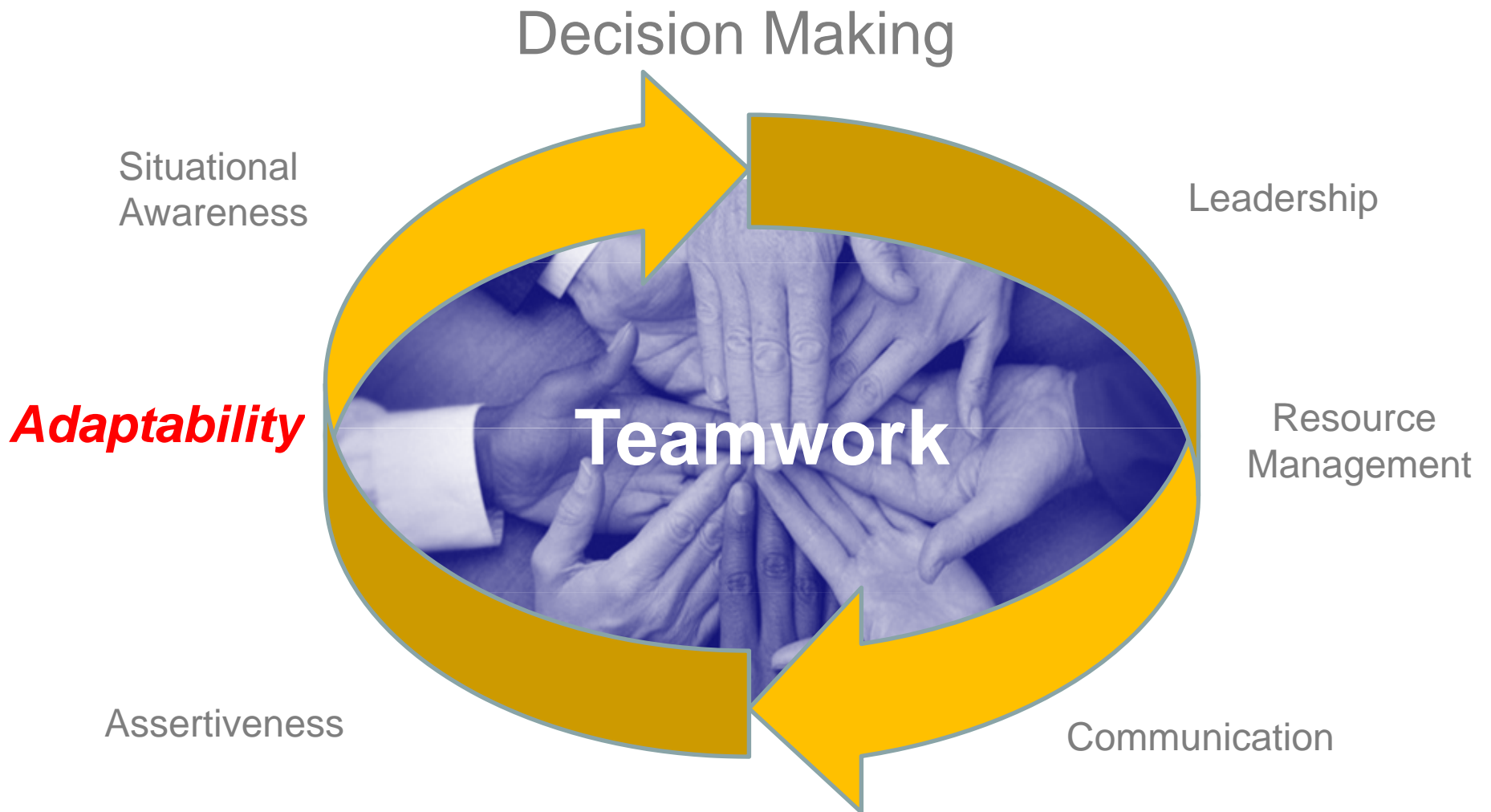
A Safety Phrase – “I have a Concern...”

# Assertiveness

- The willingness to state and maintain a position until convinced otherwise by facts
  - Requires initiative and courage to act



# Seven Elements of CRM

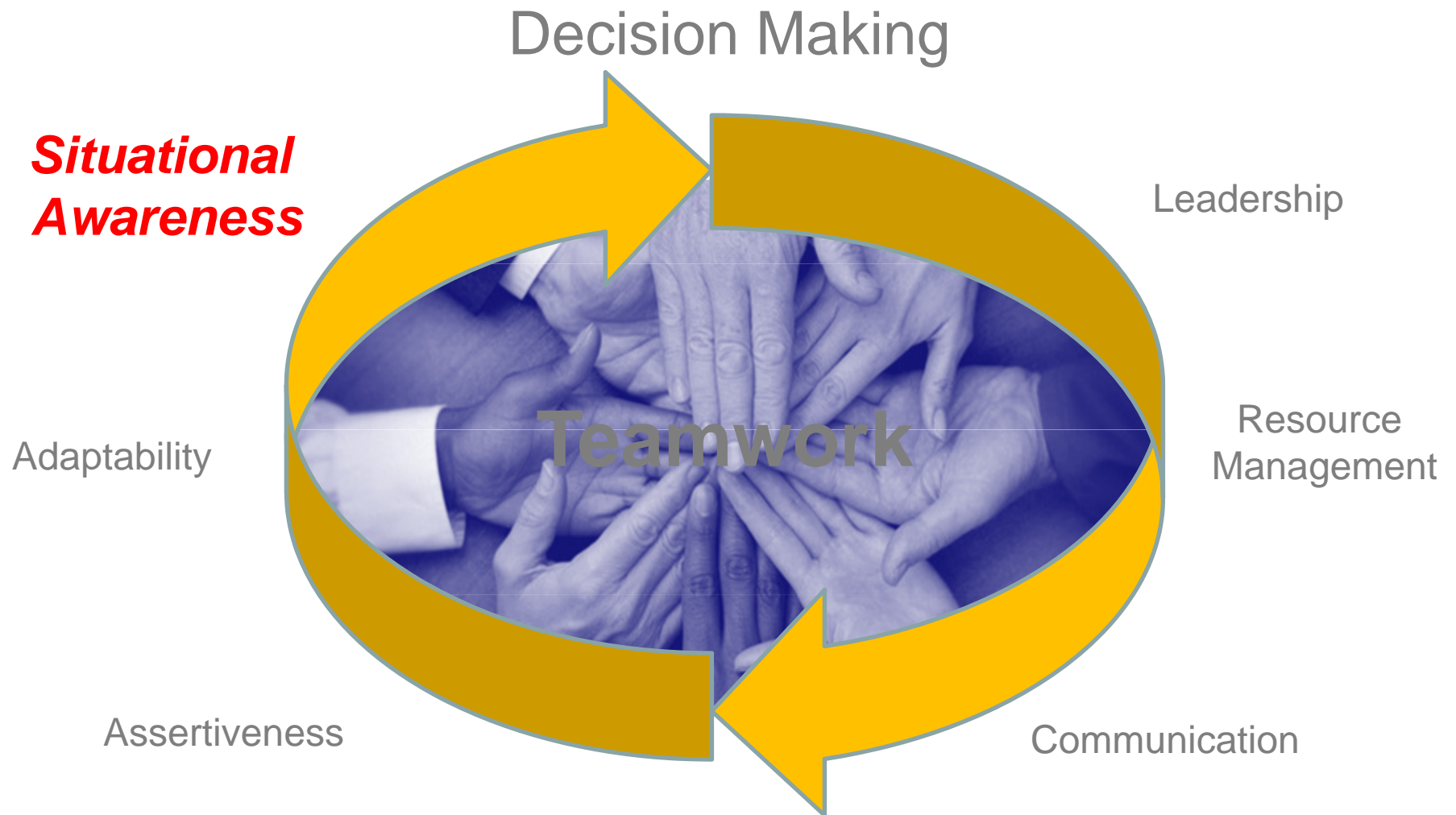


# Adaptability

- The ability to work well with others
  - During unexpected changes in personnel
  - Even despite strained interpersonal relationships
  - Even when you don't think performance is up to par
- Remaining flexible when new information becomes available
  - During unplanned situations and emergencies



# Seven Elements of CRM



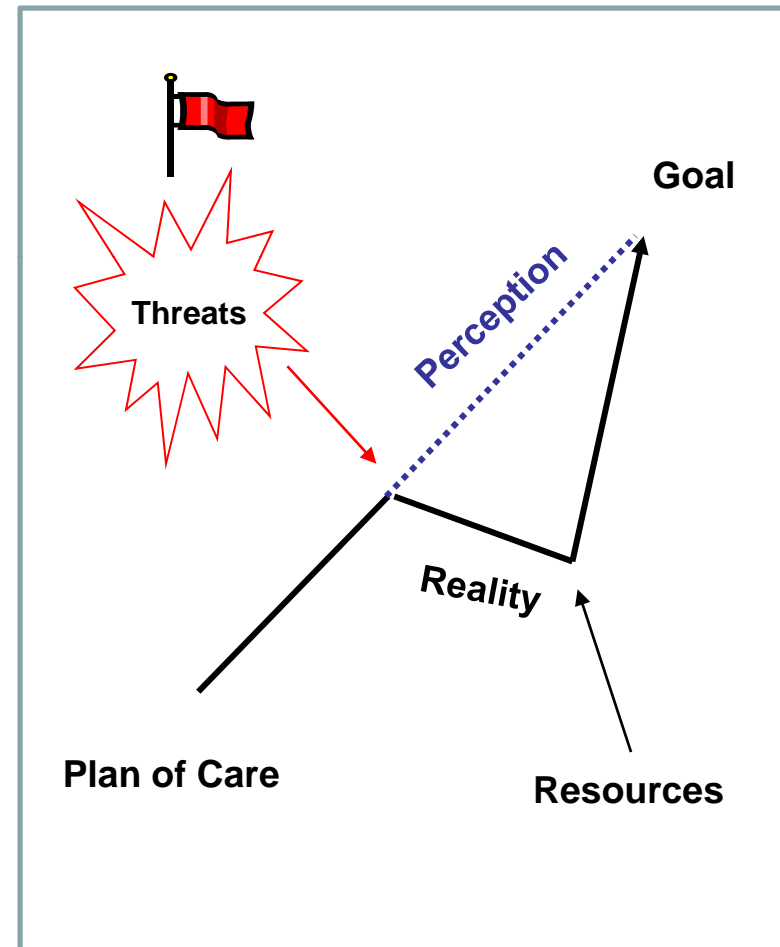
# Situational Awareness

Degree to which knowledge and perception of a given situation mirrors reality



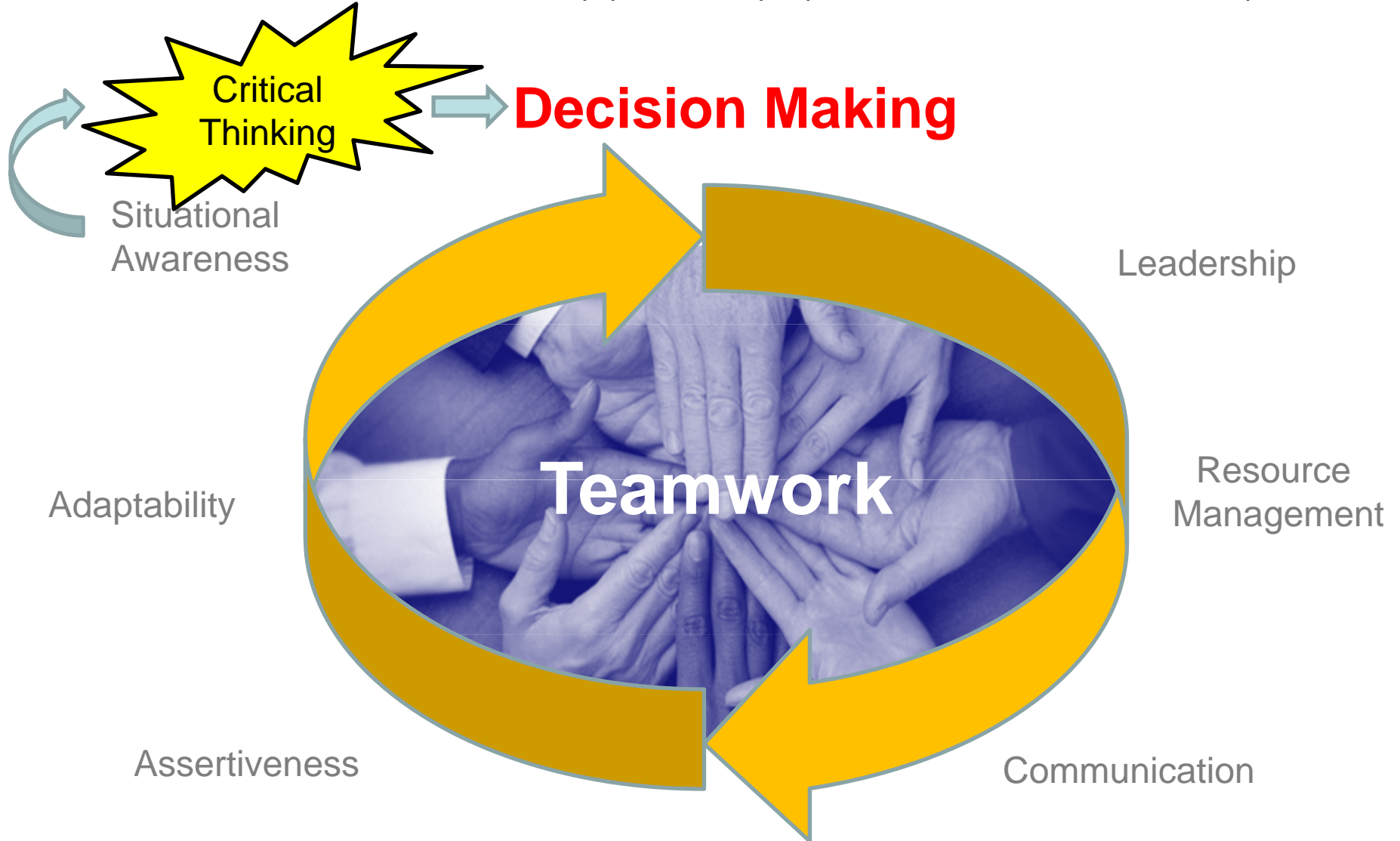
- Know the Red Flags
- Look for the Red Flags
- Communicate the Red Flags

**Reflect &  
Verify**



# Seven Elements of CRM

*Use all available sources – information, equipment, and people – to achieve safe and efficient operations*



# Miracle on the Hudson



# What does “Crew” mean?



**I am very happy to know that, unlike at other appearances we've made, I don't have to explain here what 'crew' means."**

*– Captain Chesley “Sully” Sullenberger, in remarks after an emotional, 2-minute standing ovation at the ALPA 55<sup>th</sup> Air Safety Forum Awards Banquet in Washington, DC*



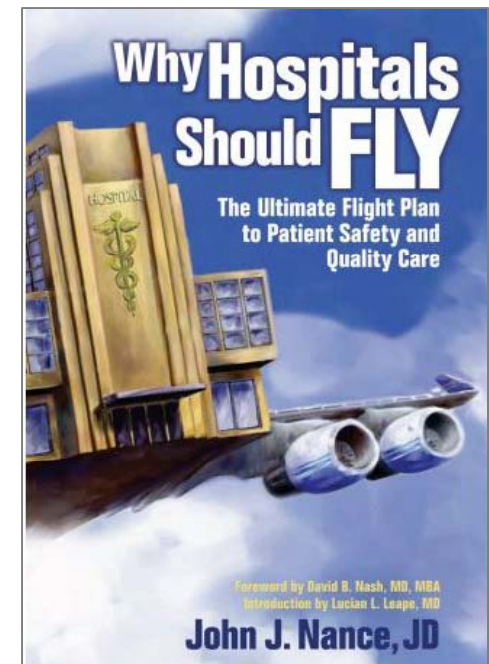
**The crew of US Airways Flight 1549 receiving ALPA's first-ever Distinguished Safety Award in August of 2009**

# Lessons from Aviation

*“Since humans are fallible, the only chance to keep human error from hurting patients is to crosscheck each other by creating Collegial Interactive Teams (CIT’s).”*

- John Nance

1. Team leaders are required to lead with the full participation of their crews – while crews need to be assertive with respect.
2. CIT’s can’t be effective without mutual caring, respect and support.
3. CIT’s can’t be effective without barrierless communication.
4. There can be no barrierless communication if the culture discourages people from speaking up.
5. Culture change is exponentially faster when the culture itself decides to make the change.



# Contact Information

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