

Stress, Fear, and Panic:

Decision-Making in High-Risk Environments



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**Amarillo, TX
Fire Department**

Photo courtesy of the Amarillo Globe-News

The Objective:

“a better understanding of how
stress [and] fear...

combine to *erode rational thinking*”

- Putnam

Topics:

1. Assessment vs. *Situation Awareness*
2. The *Physiological* Reaction
3. Five *Factors* Affecting Decisions
4. Four *Biases* Affecting Decisions
5. Impact of *Training* and *Experience*

Professional Decision-Making:



1. *Life* or *Death*
2. Dynamic situations
3. High workload
4. Time constraints
5. Uncertainty

Public's Decision-Making:



O'Fallon, Illinois

1. *Life* or *Death*
2. Physical Threat
3. Dynamic situations
4. Time constraints
5. Uncertainty

The Initial Research:

“I knew I was in trouble.

I thought about
using my radio,
but I thought,

I found my way in;
I can find my way out.”

- Hospitalized Seattle Firefighter

“The reality of our
[fire service]
culture is very
simple...

*we hire aggressive
firefighters...”*

- Kreis

AFD Injuries/Near Misses:



Leading Causes:

1. Human Error
2. Situation Awareness
3. Decision-making
4. Individual Action

Civilian Assessment:

Station Nightclub Fire



:54 seconds -

Cameraman leaves Lobby

The Facts:

Rock & Roll Show

Nightclub

Crowded

Fire on the Stage

Civilian Reactions:

Station Nightclub Fire



“...numerous people
who were not moving
and were still
watching the stage”

- Interviewed Survivor

:54 seconds -

Cameraman leaves Lobby

Firefighter Assessment:

Storm King Mountain



Blow-up

The Facts:

Heavy Brush

Rough Terrain

Carrying Equipment

Large *Fire*

Firefighter Reactions:



“...the twelve firefighters
did not at first hike
at maximum speed....
everyone failed to recognize
early enough
the danger of the situation.”

- Maclean

The Connection

They did not have *situational awareness*.



Situational Awareness

The goal is *not* just *assessment*,

it is to develop

situational awareness to

make the *correct* decisions.

An Assessment:

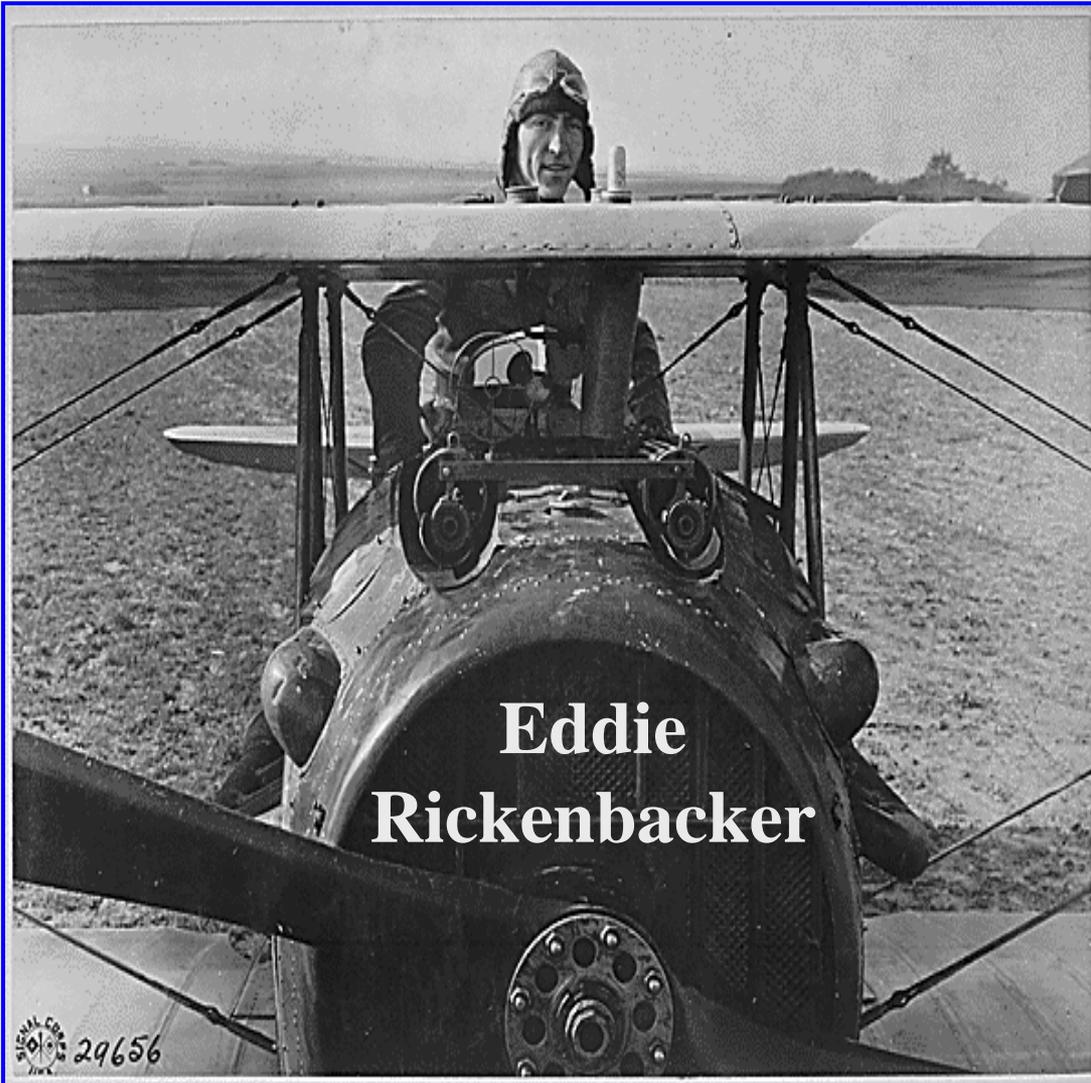


Rain

And

Possible Wind

Situational Awareness (SA)



**Eddie
Rickenbacker**

The
processes involved
in perceiving and
comprehending
a situation.

Level I - Perception



Sensing

The

Cues

Level II - Comprehension



Understanding

the

Input

Level II - Comprehension



<http://www.photolib.noaa.gov/nws/index.html>

Severe Weather
Probability

Timeframes

Objectives

Level III - Projection



Anticipating

and

Reacting

Level III - Projection



Resource Needs

Issue Warnings

Impact Predictions

Recognition-Primed Decision-Making:



Analytical

versus

Naturalistic

Recognition-Primed Decision-Making

1. Trigger Points
2. *Efficiency* vs. thoroughness
3. > 90% of Fire Commander's decisions

The Problem Is “Recognition-Primed”



Psychology of Preparedness:



“When a threat is perceived ...

It activates a flood of chemical response.”

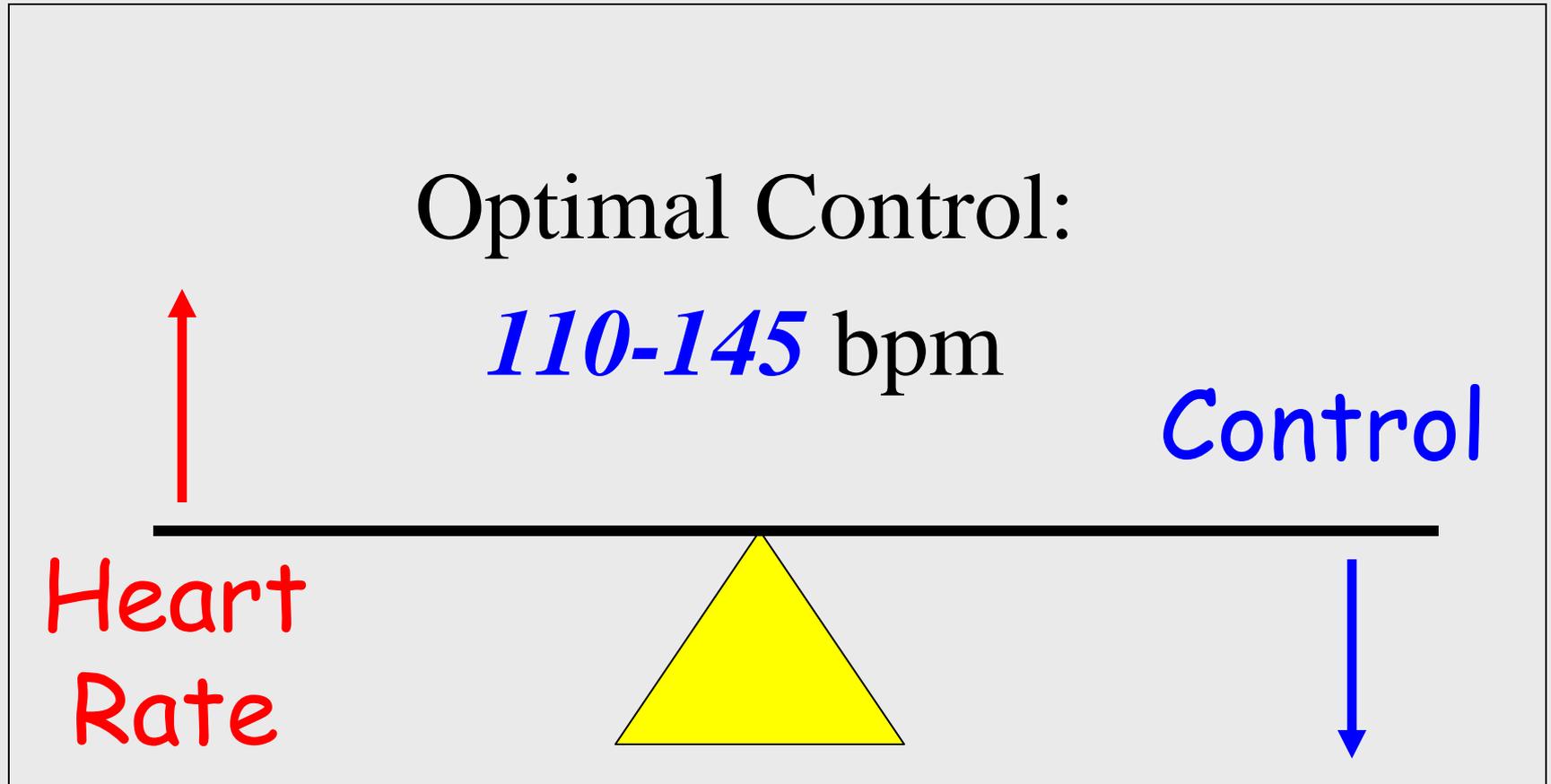
- Tim Birmingham

Physiological Reactions:



1. Pupils dilate
2. Muscles tighten
3. Heart-rate/Breathing increases
4. Blood is shunted
 - Oxygen/Nutrients
 - Heat (Perspiration)

Physiological Reactions:



Impairments by Heat Rate (bpm):



115: Fine Motor Skills

150: Irrational Behavior

170: Tunnel Vision

175: Memory Disruption

Impairments by Heat Rate (bpm):

185 - 220

- Hyper-vigilance
- Irrational behavior
- Repetition of ineffective behavior
- *Catatonic reaction*
- Increased reaction time

Leach's “Theory of 10-80-10”

10% will react *Rationally*:

- Relatively Calm
- Decision-making is sharp and focused
- Able to prioritize, plan, and take action

Leach's "Theory of 10-80-10"

80% will be “*Stunned and Bewildered:*”

- Behavior is mechanical, reflexive
- Reasoning is significantly impaired
- Perceptual narrowing (*tunnel vision*)

Leach's "Theory of 10-80-10"

10% will react *Inappropriately*:

- Loss of behavioral control
- Decision-making is *counterproductive*

Physiological Reactions:



MS Estonia

“People lose their ability to make decisions. They turn into *statues*.”

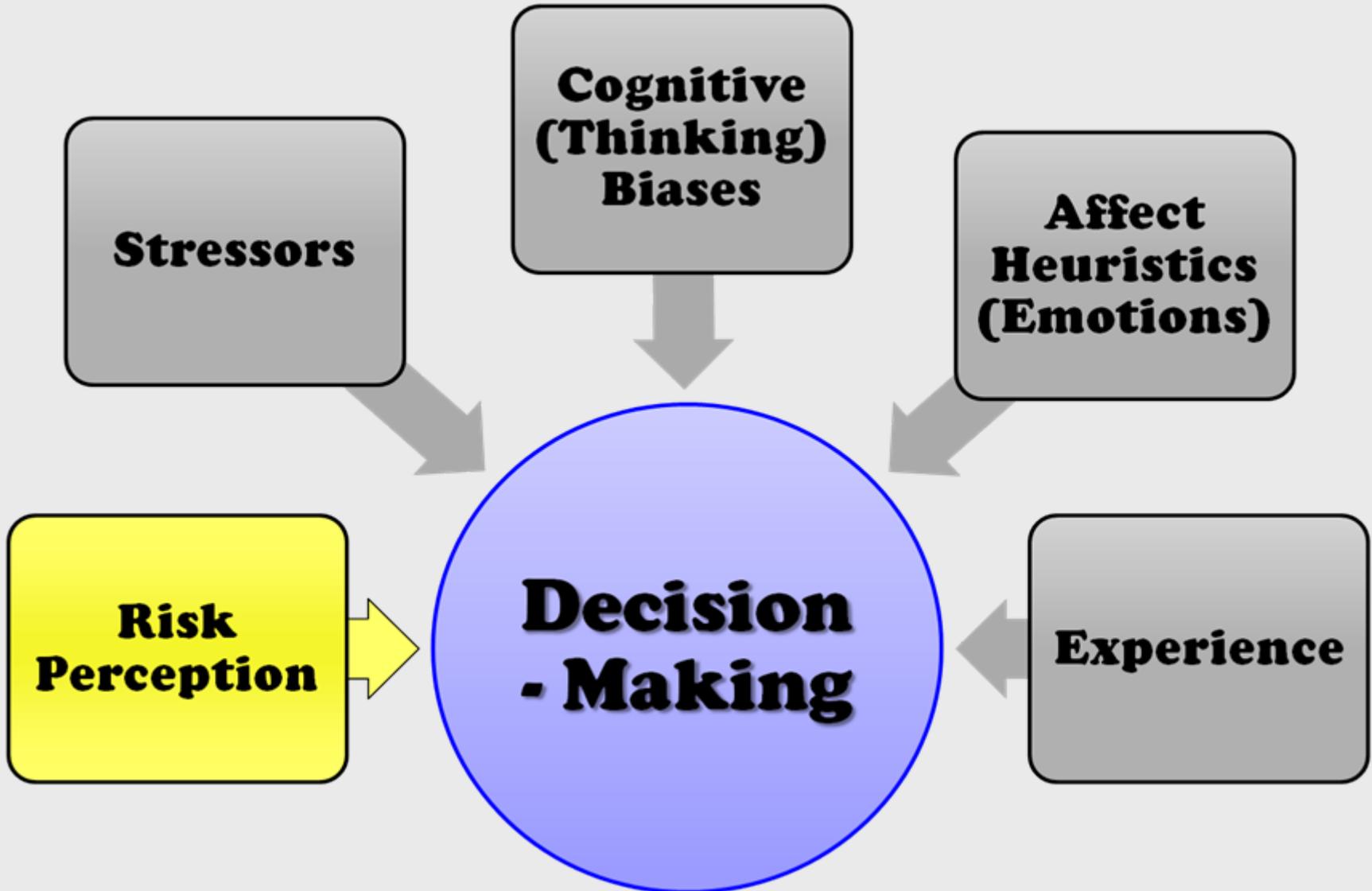
- Sherwood

Decision-Making:

“signals are received and interpreted
by a *unique individual*,
and the resultant behaviors
are a product of that individual’s
decision-making processes”

- Pan et al.

Five Decision Factors:



Risk Propensity:

Risk-Taking Orientation



Photo by Hans van de Vorst

- Self-control
- Danger-seeking
- Energy
- Impulsiveness
- Invincibility

Risk Perception:



“Each decision-
maker has...
a unique set
of resulting
behaviors”

- Williams

Risk Perception:



“...a reasonably careful jumper
primary risks
some bruises or
maybe a broken
arm or leg, *not a
plunge into the
depths* of the
Grand Canyon

Risk Perception vs. Procedures:

Despite policies, violations will occur:

1. Commercial Pilots:

➤ Study: 27% of accidents

2. Ambulance Drivers:

➤ “Black Box” Study

Risk Perception :

ADVANCED SPOTTERS' FIELD GUIDE
ADVANCED SPOTTERS' FIELD GUIDE
ADVANCED SPOTTERS' FIELD GUIDE
ADVANCED SPOTTERS' FIELD GUIDE



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service



“... keep a *2-mile*
"buffer zone"
between you and
the storm.”

- NWS

Risk Perception :



Storm chasers and a South Dakota tornado
Photograph by Carsten Peter



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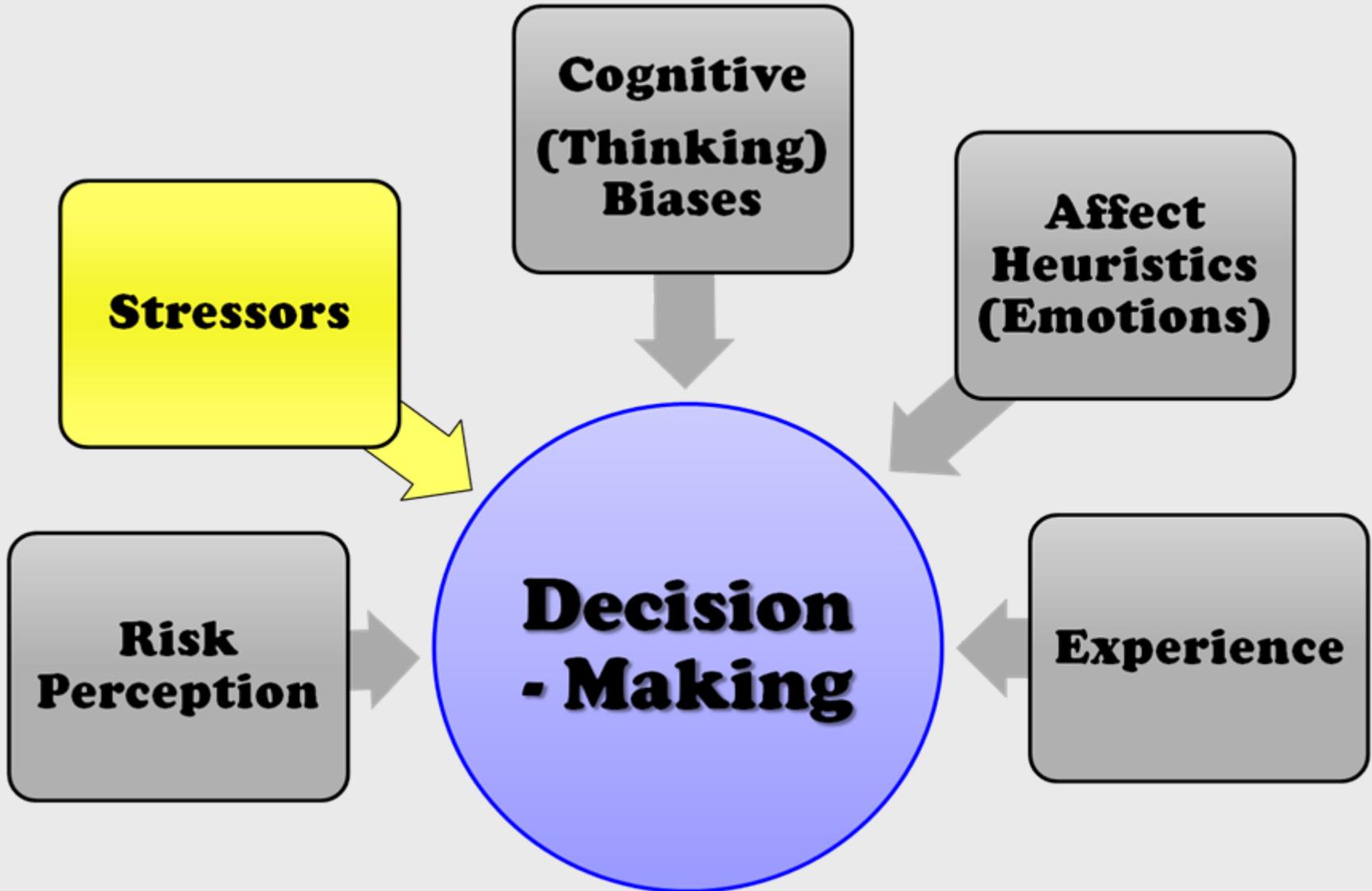
How many
telephone posts
are there in two
miles?

Risk Perception vs. Procedures:

“firefighters who tend to ignore
safety rules and regulations
not only had accidents
more frequently
but also
suffered *more severe* injuries”

- Liao et al.

Five Decision Factors:



USS Vincennes:

Captain's Stressors:



1. Multiple Info Sources
2. Conflicting Info
3. Rapidly evolving
4. Time Pressure
5. Threat

Stressors Impact on Decisions:

1. Reduce opportunity to gather information

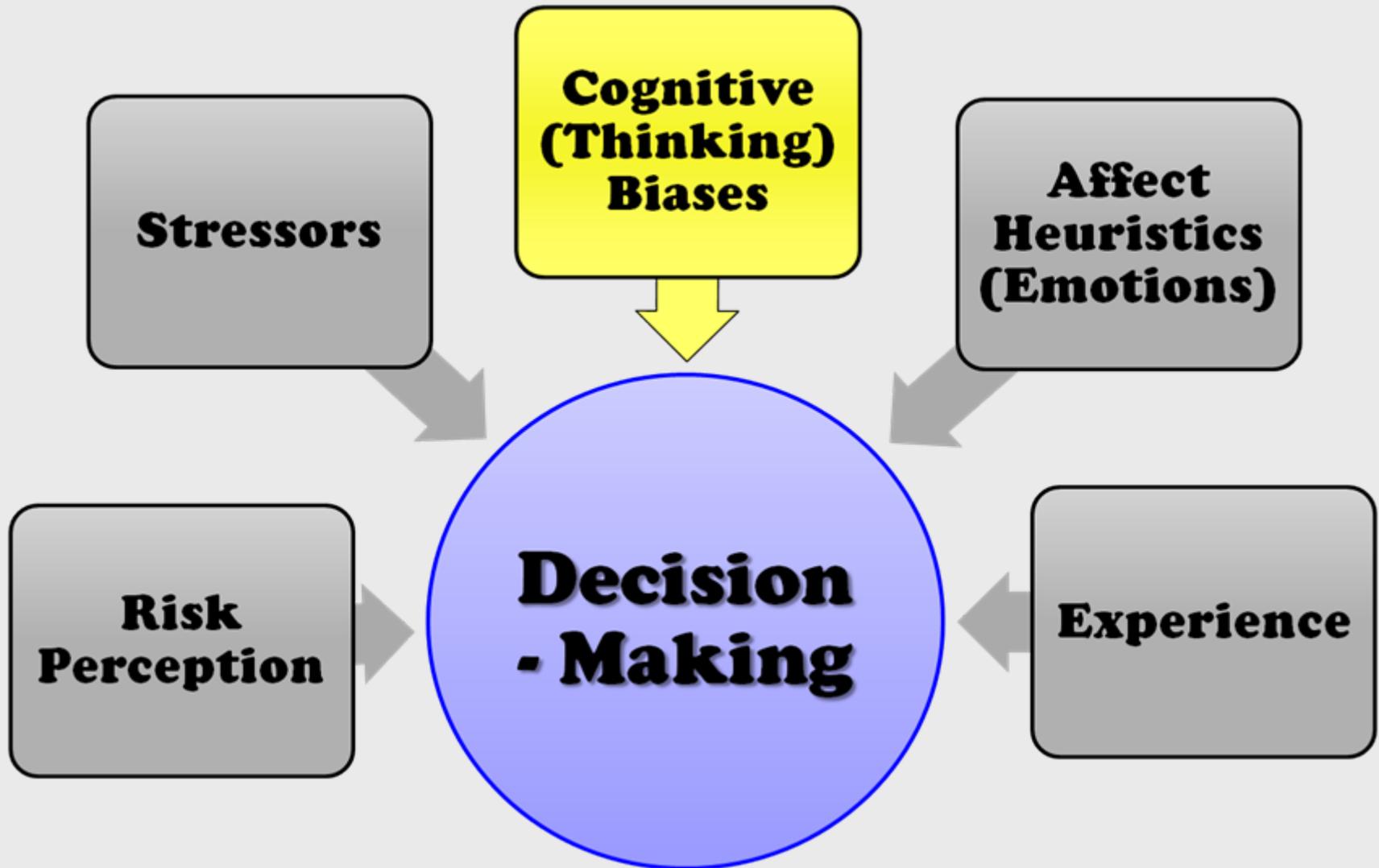
➤ *Police Officer: Shoot/No Shoot Situation*

2. Disrupt working memory

➤ *My Mother-in-Law*

7 Short-term Memory Registers

Five Decision Factors:



Representativeness Bias:

Categorizing:



“...miners did not select the most efficient strategy – they chose further *information over action*”

Representativeness Bias:



Does a *Near-miss*

make a person

more cautious

or

less cautious

the next time?

Representativeness Bias:



Near-Misses:

Mars Rover Operators

“... categorized the [similar] circumstances as being *survivable*”

Anchor and Adjustment Bias:

Making an Initial Decision and *Sticking To It:*



Air Florida

Flight 90

(78 fatalities)

Overconfidence Bias:

1. Illusory Optimism

- *Person feels they have control over the situation*

2. Invulnerability Illusion

- *Person feels the situation will not harm them*

Overconfidence Bias:



“inappropriate
feelings of
invulnerability
and control”

- Dillon and Tinsley

Framing Bias:

1. Complacency

- *7 of 9 mishaps involving C-130 aircraft*

2. Expectations

- *USS Vincennes – gunboat skirmishes*

3. Firefighter Duty-to-Die Syndrome (Crawford)

- *Failure conflicts with hero image*

Framing Bias in Driving

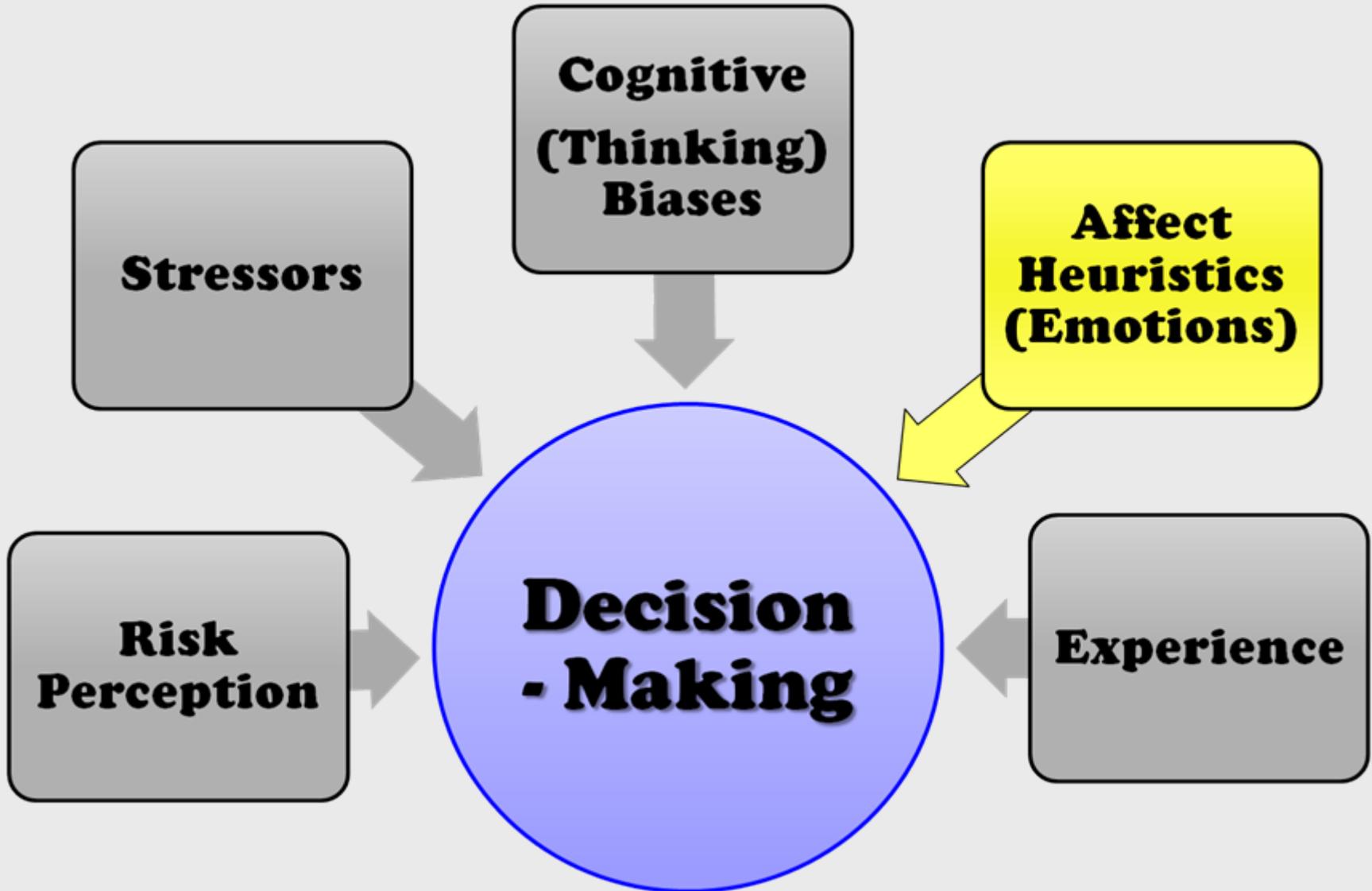


*Milford,
Connecticut
PD*

June 13, 2009

<http://www.youtube.com/watch?v=PFdDW9aE6-A&feature=related>

Five Decision Factors:



Emotions:

"I must not fear.

Fear is

the *mind-killer*."

--- *Frank Herbert, Dune*

Emotional Reactions:

1. Anxiety

- A generalized condition w/o direct trigger

2. Panic:

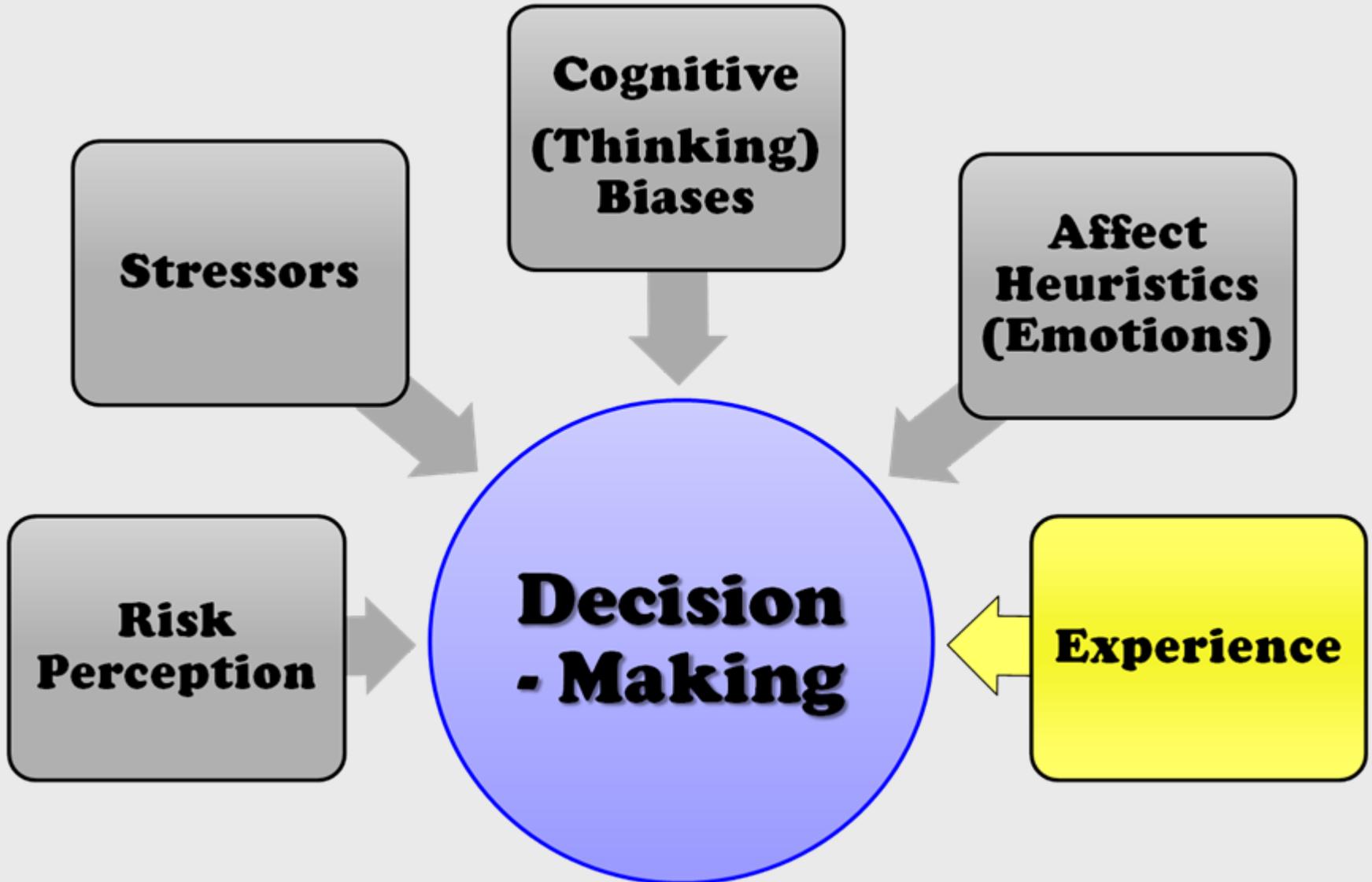
- Sudden fear that dominates thinking
- Loss of behavioral control

Emotional Reactions

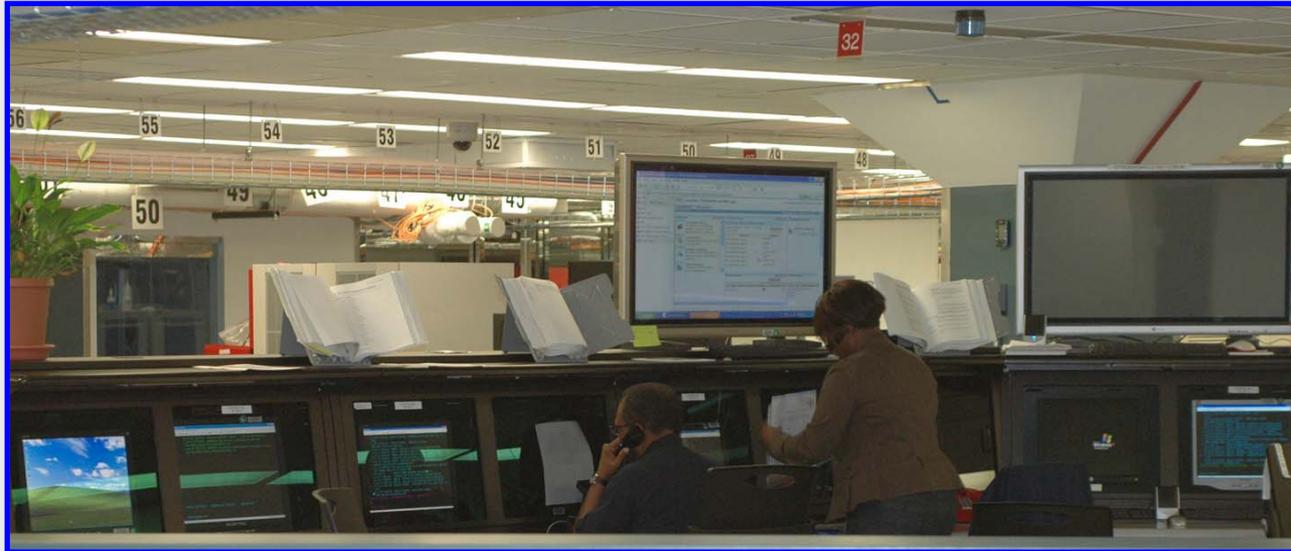
Emotions and Feelings affect decisions:

1. Environmental clues are “good or bad”
 - *Denial is often the first reaction*
2. Individual may shift from experience...
to following instincts
 - *Will personalize responses (Charleston Fire)*

Five Decision Factors:



Training:



“familiarity with the criterion environment...
effective task performance
under stress conditions”

- Driskell and Johnston

Training and Experience:

“You rarely get someone
to jump a skill level
by teaching more facts and rules....

we cannot expect
to *grow instant experts* ”

- Williams

Experience:

“Experts see the world differently.

*They see the things
the rest of us cannot”*

- Klein

Experience Benefits:

1. Knowledge of performance needed
2. How *stressors, biases, and emotions* interrelate
3. Novices vs. Situational Awareness:
 - *Perception*
 - *Integration*
 - *Comprehension*

Experience:

Variety of experience

is more important
than simple years of service.

Adaptive Experts:



United Flight 232:

In simulator tests

no other

DC-10 crews

*were able to
repeat the effort*

Mentoring:

Train Your Mentors:

“to describe perceptual skills
or to enhance the
development of *perceptual expertise*
in the trainees”

- Klein

The Precipitation:

“I knew I was in trouble.
I thought about using my radio, but I thought, I found my way in; I can find my way out.”

Human Bias?

- Representativeness
- Anchor and Adjustment
- Illusory Optimism
- Framing Bias

Training and Experience:



Risk perception
can be modified,

Stressors can be
mitigated,

Biases can be
minimized,

Emotions can be
mastered.

Summary:

We are trained
to work in unique circumstances;

but in high-risk, dynamic
environments,
we are *humans first*.

Your Turn:

Comments
and
Constructive Criticism

In Honor of Brian Hunton

Amarillo Fire Department

2003-2005