

Presentation to The Royal Aeronautical Society - May 2001

Training for Situation Awareness

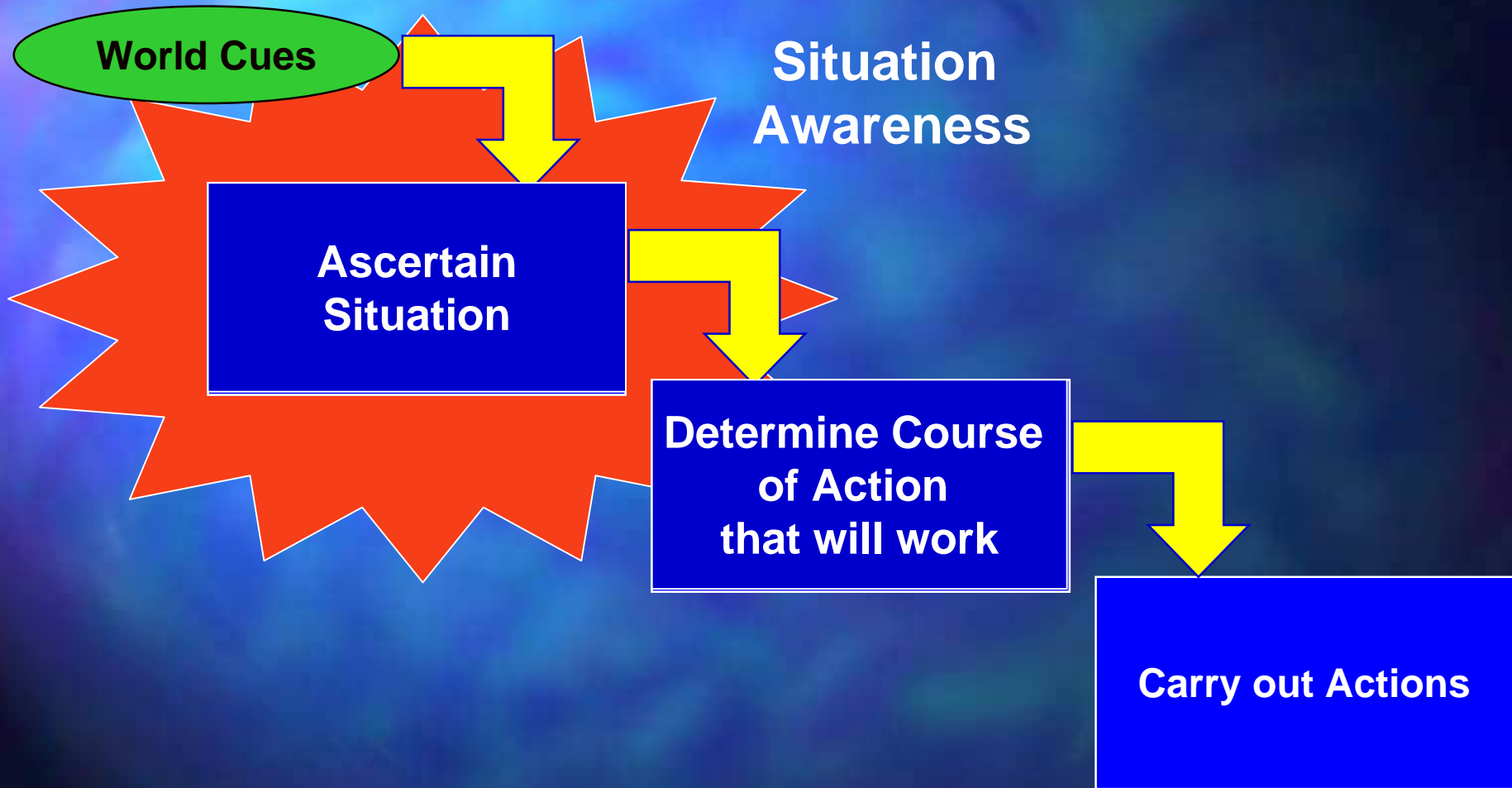


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How Do People Make Decisions?

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Naturalistic Models of Decision Making



Situation Awareness is Key

- **Leading Causal Factor in Review of 175 Military Aviation Mishaps**
(Hartel, Smith & Prince , 1991)
- **Major Causal Factor in 88% of Accidents Associated with Human Error in Review of Major Aircarrier Accidents (1989-1992)**
(Endsley, 1994)
- **Portion of the task that takes up the majority of the pilot's time and effort**



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Situation Awareness: Drives the Decision Process



SITUATION
AWARENESS

DECISION
MAKING

PERFORMANCE

*The Key Factor Determining
Decision Quality is SA*



Situation Awareness

Situation Awareness is the Perception of the Elements in the Environment within a Volume of Time and Space, the Comprehension of their Meaning, and the Projection of their Status in the Near Future.

Geographic

- own aircraft
- other aircraft
- terrain features
- airports
- cities
- waypoints
- navigation fix
- position relative to designated
- path to desired
- runway & taxi
- path to desired
- climb/descend

Spatial/Terrain

- attitude
- altitude
- heading
- velocity
- vertical velocity
- G's
- flight path
- actual values to assigned
- projected flight
- projected land

System SA

- system status
- functioning aircraft
 - radio
 - altimeter
 - transponder
 - flight modes
- deviations from
- ATC communication
- fuel
- impact of degradation
 - on performance
- time and distance

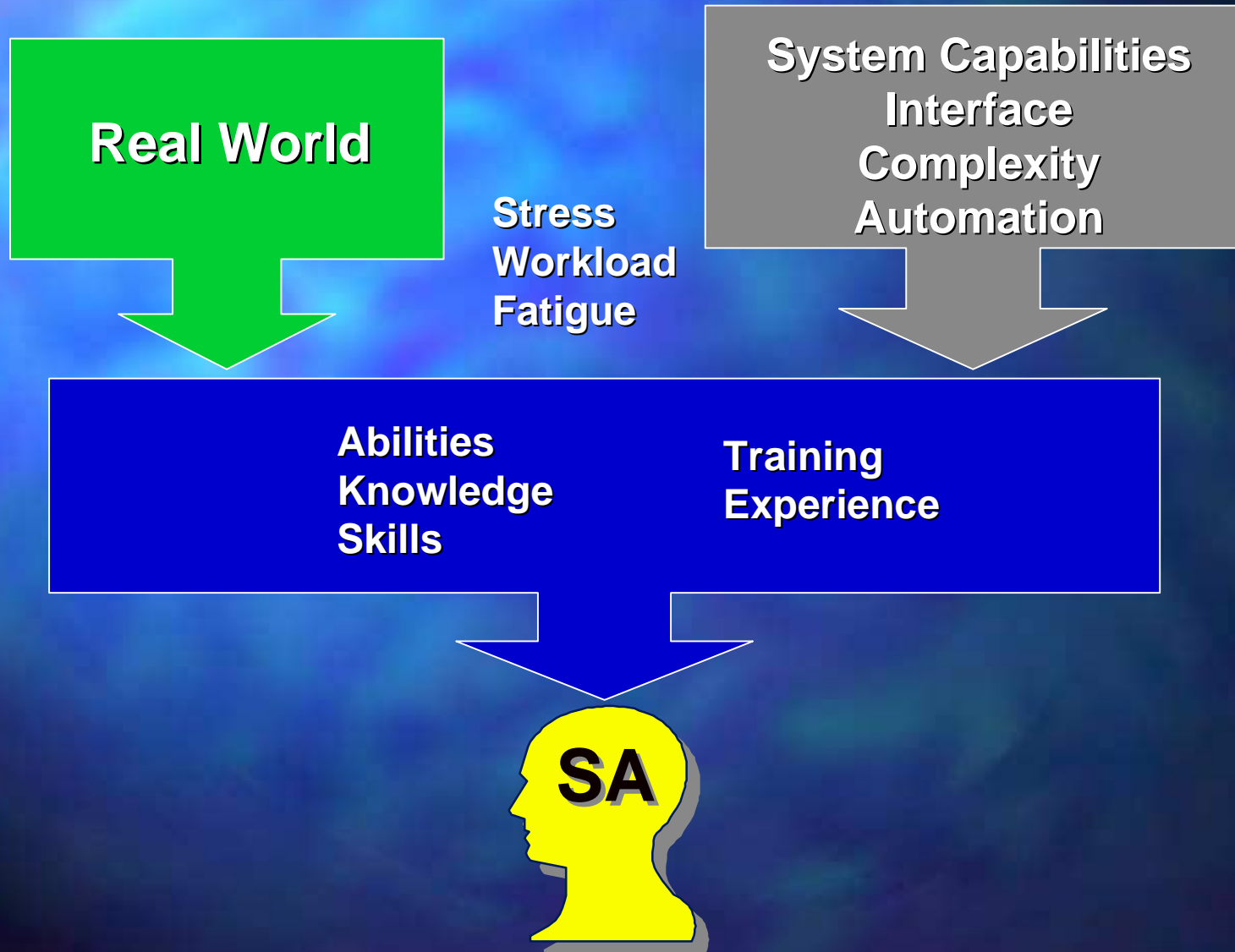
Environmental SA

- weather formations & movement
- temperature
- icing
- ceilings
- fog
- turbulence, winds
- sun
- visibility
- IFR/VFR conditions
- areas to avoid
- flight safety
- projected weather conditions



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Factors Affecting SA



Increased
vigilance &
Monitoring

Out-of-the-loop
performance
problems

More cognitive
load

Loss of manual
Skills

Mode errors



The Next Generation Cockpit



What About the Next Generation Pilot?

Can We Better Train for Enhanced SA?

Situation Awareness

Decision Making

- **Basic Procedures**

Systems

CRM

Emergency Procedures

Handling Skills

Are Some Pilots Better at SA than Others?

Ten Fold Difference in SA
Among Trained Pilots

**Individual
Abilities**

Attention Sharing
Psychomotor Skills

Spatial Ability

Pattern Matching

Perceptual Speed

Working Memory

What Do Good Pilots Do Different?

Bas

Meta-Cognitive Skills

Con

Pre-flight Planning

Contingency Planning

Self-Checking

Task Management & Prioritization

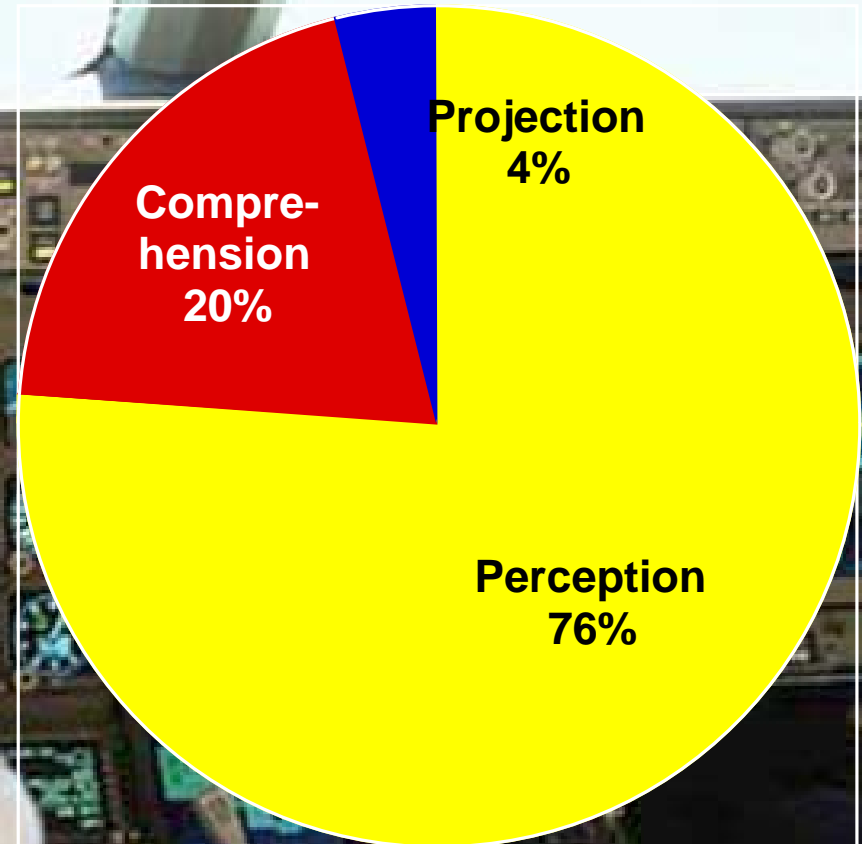


Where do Pilots Have Problems with SA?

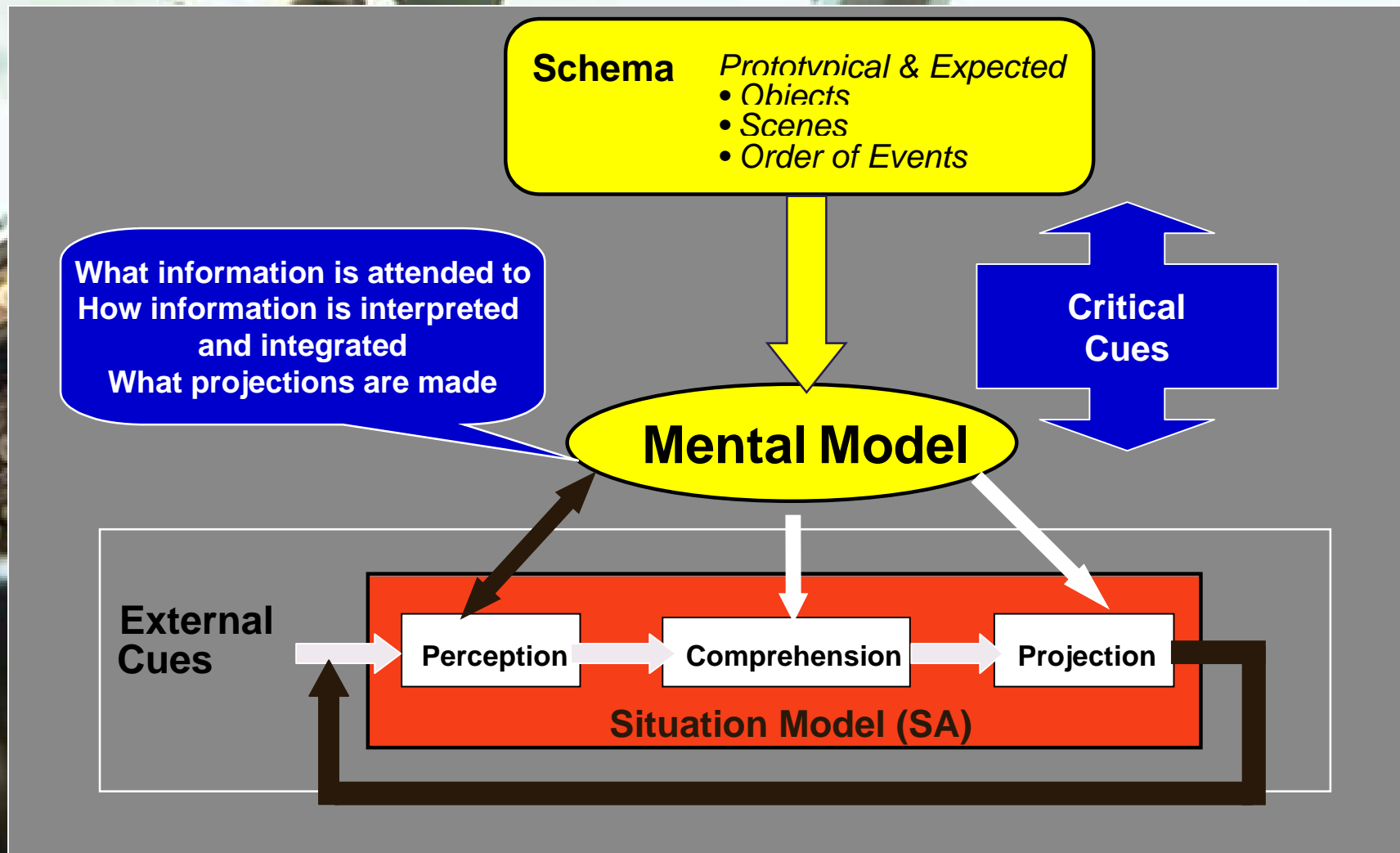
Failure to Monitor or Observe
Task Distraction
Misperception

No Mental Model
Wrong Mental Model

Over-projection of Current Trends



What Allows Pilots to Achieve High Levels of SA?





Training Recommendations

- **Training support for low time pilots**
 - **Psychomotor skills**
 - **Communicating with ATC**
 - **Judging relative speed and heading of other traffic in pattern (merging)**

- **Higher order cognitive skills training**
 - **Attention sharing**
 - **Task management and prioritization**
 - **Contingency planning**
 - **Checklist completion**
 - **Self-checking**



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Training Recommendations

- **Intensive pre-flight briefings**
 - **New airports, airspace procedures,...**
 - **Weather changes**
- **SA-oriented training**
 - **Building mental models and shema**
 - Recognizing weather patterns and trends
 - Problem diagnosis
 - Projection of events
- **Structured feedback**



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What is the Future of Aviation Training?

Current Generation Training?



Next Generation Training?