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In this month's issue of Flightfax, we are focusing on individual and aircrew situational awareness and how our ability to process information influences our performance and risk management decision making abilities.

From a senior leader's perspective, both Pilot In Command and Air Mission Commander are the leaders within the flight that are responsible for establishing and maintaining the positive working environment that encourages open and free exchange of information. You are responsible for setting the tone within the cockpit. Once you have established this open exchange of information, where even the newest PI or most junior CE feels comfortable participating in the crew, then you, as a PC, will be provided the right information necessary for you to build the right mental models for a successful mission. The excellent article "Situational Awareness and Decision Making" by Craig Geis details how our past experiences shape our situational awareness and why complacency is more of a danger to experienced aviators.

Situational awareness is expanded into a crew attribute in CW4 Fenner's article "Don't Be Afraid to Speak Up." The entire aircrew, not just the PC or AMC, is responsible for successful mission execution and each crew member has a role to play. When each crew member is afforded the right voice within the cockpit, the PC will be provided the right information at the right time to make the best decisions. Clear information flow directly influences situational awareness and good situational awareness enhances information flow. It is up to the leaders within the aircraft, supported by a good cockpit team, to achieve this state.

On behalf of the Combat Readiness Center Aviation Team, thank you for your dedication to this Nation and your Selfless Service during this time of conflict. My additional appreciation and well wishes to the Soldiers deployed and their Families. May all be blessed and have a Merry Christmas / Happy Holidays!!

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Situational Awareness and Decision Making by Craig Geis

This is the fourth in a series of articles presented by Mr. Geis designed to help you better understand the science of human factors, which simply stated, is the study of the human capabilities and limitations that give rise to human performance errors. The three previous articles are found in the Sept 12, Jan 13, and Mar 13 issues of Flightfax.

In order to better understand situational awareness, we need to further explore the interaction of the previously discussed human factor concepts in the previous three articles.

Situational awareness involves being aware of what is happening around you in order to understand how information, events, and your own actions will impact your decisions, both immediately, and in the near future.

A common view of situational awareness involves ***perceiving, understanding, and thinking ahead*** to come up with an anticipated result.

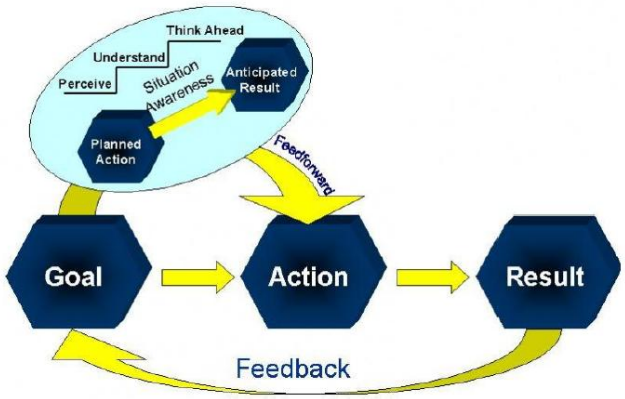

Figure 1: Situational Awareness Model
Reference: Sky Library - European Organization for the Safety of Air Navigation

The model in Figure 1 is simple, but the concept of situational awareness is not. In reality, our ability to perceive, understand, and think ahead requires us to examine a multitude of human factor issues.

Perception & Information Processing

Our level of situational awareness is ultimately determined by our ability to effectively process information. In order to be processed, the incoming information must first be perceived. To prevent overload, the brain selects only a small portion of the information detected by the peripheral nervous system to process consciously. Figure 2 illustrates that effective information processing is a function of our current physiological state which ultimately determines what information is available to process.

Individual stress levels determine the nervous systems level of arousal, which determines what we are able to attend to. We may be scanning our environment for threats, but if we do not attend to a stimulus, we do not perceive it at the conscious level. In this instance, our level of situational awareness is zero. A lack of situational awareness is often seen as complacency. Physiologically we perceive the information but are not consciously aware of it, so there is no understanding.

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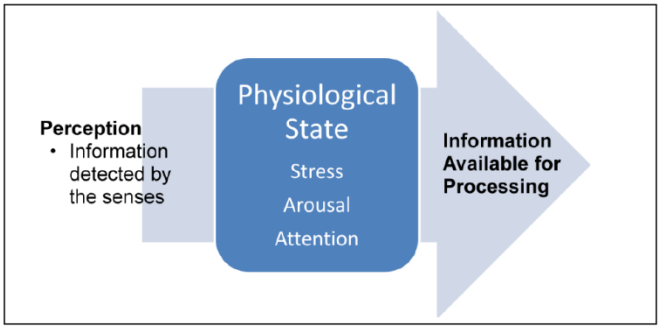

Figure 2

Complacency

We have all seen complacency in ourselves. Complacency, in simple language, is ***a lack of situational awareness or concern for a problem, accompanied by a feeling of pleasure and security in the task we are doing.***

While complacency may be about a feeling of self-satisfaction, contentment, and sometimes smugness about what we are doing, we need to be aware that complacency starts unconsciously - *by not effectively processing the information detected by the peripheral nervous system.*

The root cause factors listed below are most often seen in accident reports as complacency error. The seven factors are:

1. Habit Patterns - Automatic actions requiring little or no conscious thought, and no conscious monitoring.

2. Normalcy - Things appear normal because of the highly repetitive nature of the task, and the high probability of success.

3. Simplicity - The result of learning a task so well that no thought or concern is put forward to complete it.

4. Familiarity - The result of continued exposure to the same task. Familiarity is also the result of experience.

5. Assumption - If something has always worked in the past, we believe it will work again.

6. Expectations - Low expectation of encountering a problem often comes from success in prior experiences.

7. Constant Success/Lack of Negative Consequences – A lack of negative consequences leads to learning that has a high probability of repeating itself.

Constant exposure to any or all of these seven principles wires the nervous system to unconsciously choose courses of action. Choosing a course of action without thoroughly understanding the potential implications means we have a reduced level of situational awareness.

Understanding this helps explain why it is often the ***more experienced*** pilots that are ***more susceptible to complacency;*** they just don't perceive the threat. Less experienced individuals are more susceptible to skill-based error. I have developed a simple assessment tool that can assist you in determining the level of risk/probability of complacency vs. skill-based error. It will allow you to assess the type of error an individual may make by looking at the basic components that lead to complacency and skill-based error. This tool is available for download at

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www.cti-home.com under the Articles tab in the Heliprops folder.

Understanding: Comprehending the Situation

The initial development of situation awareness comes from our understanding the meaning of the perceived information. This is accomplished by comparing incoming stimulus with information stored in our memory. We also make our initial risk assessment at this stage.

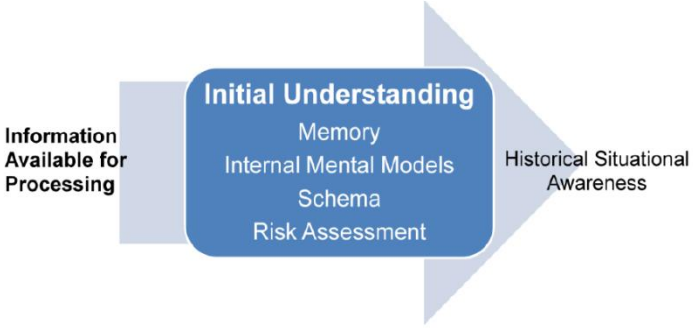

Figure 3: Understanding & Internal Models

The information stored in our memory is called a ***mental model*** or ***schema***. Think of them as a mental structure or composite of memories that we use to organize and simplify our knowledge of the world around us. We have schemas about ourselves, other people, our company, our equipment, the weather and, in fact, almost everything. They are so basic to our understanding of behavior that we are rarely aware of their impact on our decisions***. Most of our daily decisions are performed unconsciously based on mental models.***

Schemas (mental models) also affect what we notice, how we interpret things, how we make decisions, and how we act. Remember, the seven root causes of complacency, each one acts as a filter, accentuating and downplaying various elements. We use them to classify things, such as when we 'pigeon-hole' people. Schemas also help us forecast or predict what will happen. Schemas help us 'fill in the gaps.' When we classify something we have observed, the mental model will tell us much about its meaning, hence enabling a threat assessment and other predictions.

These permanently stored models are developed throughout life, and are acquired through experience and training. They are composed from bits and pieces (thin slices) of information gathered and stored in our memory. We sometimes call them experiences, biases, prejudices, attitudes, etc. If a schema is incomplete or wrong for the current situation, it can act as an information filter, and we will perceive only selected parts of the information. When schemas are complete, we can use them to make general predictions about a particular situation. Think of it as *a static assessment in historical time.*

While helpful, static mental models may replace carefully considered analysis as a means of conserving time and energy, and play a major role in applying knowledge, and in making decisions. Mental models become deeply ingrained blueprints of thought and action. This knowledge is fundamental to understanding how we view situations through our own filters, and how we ultimately make decisions. Our mental models help shape our behavior and define our approach to solving problems. Internal models are good for general predictions, but what about operating in a real-time environment? Remember that '*lazy piece of meat'* between our ears,

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mentioned in the first article? Many accidents occur when a crewmember distorts current information to fit their own internal model. The brain likes this simple way of conserving energy for 'more important tasks.'

Understanding: Comprehending the Situation

At any given time, our personal level of situational awareness is the degree of accuracy by which our perception of our current environment mirrors reality. In most accident investigations, we find that reality should have reflected more than the individual's internal model. Situational models help us to create a clearer perception of the situation, and a more accurate assessment of risk.

Figure 4: Understanding & Situational Models

We develop a situational model by gathering real-time, current information, (which may or may not agree with our internal mental model), and creating a new situational model. This new situational model is seen as our level of situational awareness.

Thinking Ahead

Conscious behavior comes from our ability to use the information available to think ahead. Our new situation model may or may not change our behavior. If the new cues we receive are strong enough, and we are willing to modify our solid internal models, it probably will change our behavior.

Individual vs. Crew Situational Awareness

Every individual will perceive a situation differently, based upon their internal mental models and their interpretation of new information. If we are alone, our decisions are based on our own perceptions. When we operate in a multi-crew/team environment, effective crew situational awareness depends on crewmembers developing accurate expectations for team performance by drawing on a common knowledge base. Even as a single pilot we need to gather information for outside sources to make decisions.

Each crew member will have their own mental model *but* ***to act as a crew, we need to develop a Shared Mental Model.***

A *shared mental model* allows team members to effectively:

- Anticipate the needs of the crew
- Adapt to the changing demands of the task

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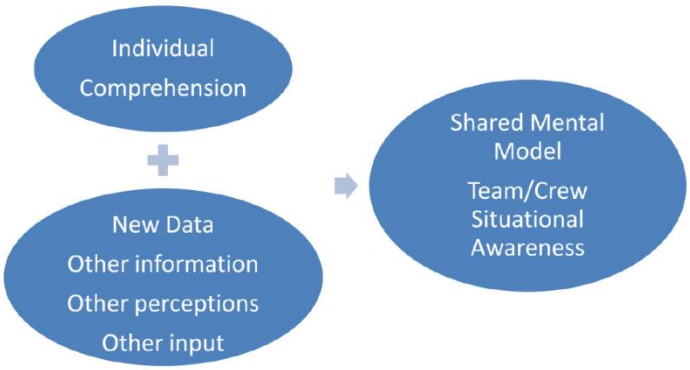

Figure 5: Crew/Team situational Awareness

To ensure a Shared Mental Model of the situation**, crew members must share their knowledge relative to**:

- The task
- Team goals and objectives
- Team member roles and responsibilities
- Information regarding threats/hazards that each person perceives

To provide a solid base for building crew situational awareness, crew members need to have information that will help them develop relevant expectations about the entire crew task.

Key Points to Remember:

1. Situational awareness is the process of keeping track of what's going on around you in a complex, dynamic environment.
2. We develop situational awareness from experience, training, practicing our job skills, and the use of good crew resource management skills.
3. We must first perceive a stimulus before we can understand its meaning.
4. Complacency generally occurs from a faulty perception of the situation.
5. You can assess the risk of skill error and complacency error by using the Complacency Error vs. Skill-Based Error Risk Assessment Tool.
6. An accurate comprehension of the meaning of a situation comes from both internal and situational mental models.
7. Internal mental models are developed throughout our lives, and are used to filter information quickly and make decisions.
8. Situational mental models represent a real-time assessment of a current situation. The brain compares them to permanently stored internal models and they are adjusted accordingly.
9. Team situational awareness depends on the sharing of information among team members and developing a shared mental model.
10. To develop a shared mental model, teams need to share information on the task, goals & objectives, roles & responsibilities, and information regarding threats.
11. Complacency affects the most experienced person the most.
12. Less experienced people are less complacent, but more prone to skill errors.