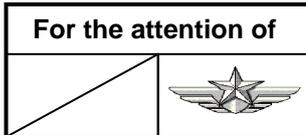


SAFETY PROMOTION NOTICE

SUBJECT: GENERAL

Lessons learned on Situational Awareness



AIRCRAFT CONCERNED	Version(s)	
	Civil	Military
EC120	B	
AS350	B, BA, BB, B1, B2, B3, D	L1
AS550		A2, C2, C3, U2
AS355	E, F, F1, F2, N, NP	
AS555		AF, AN, SN, UF, UN, AP
EC130	B4, T2	
SA365 / AS365	C1, C2, C3, N, N1, N2, N3	F, Fs, Fi, K, K2
AS565		MA, MB, SA, SB, UB, MBe
SA366		GA
EC155	B, B1	
SA330	J	Ba, L, Jm, S1, Sm
SA341	G	B, C, D, E, F, H
SA342	J	L, L1, M, M1, Ma
ALOUETTE II	313B, 3130, 318B, 318C, 3180	
ALOUETTE III	316B, 316C, 3160, 319B	
LAMA	315B	
EC225	LP	
EC725		AP
AS332	C, C1, L, L1, L2	B, B1, F1, M, M1
AS532		A2, U2, AC, AL, SC, UE, UL
EC175	B	
H160	B	
EC339		KUH/Surion
BO105	C (C23, CB, CB-4, CB-5), D (DB, DBS, DB-4, DBS-4, DBS-5), S (CS, CBS, CBS-4, CBS-5), LS A-3	CBS-5 KLH, E-4
MBB-BK117	A-1, A-3, A-4, B-1, B-2, C-1, C-2, C-2e, D-2, D-2m, D-3, D-3m	D-2m, D-3m
EC135	T1, T2, T2+, T3, P1, P2, P2+, P3, EC635 T1, EC635 T2+, EC635 T3, EC635 P2+, EC635 P3, T3H, P3H, EC635 T3H, EC635 P3H	

No. 3862-P-00

Example: Fatal accident - CFIT - in a night flight with a BK117-C1

During a night-time offshore helicopter hoist training, an Airbus Helicopters BK117 C-1 impacted the sea in a Controlled Flight Into Terrain / Water (CFIT). Three of the four crew members died.

The crew had been approaching a small vessel for night winch training. The first direct approach had to be terminated due to the low visibility and the late identification of the sea rescue vessel. Another attempt, with the co-pilot flying a left-hand circuit was successful. The PIC in the right-hand seat took over controls after the subsequent departure from the ship.

During the next approach, the crew discussed the previous hoisting and the problems with the Hi-line. Radio calls were also made to the vessel and ATC. These communications increased the PIC's workload and it is highly likely that they distracted him from focusing on the manual control of the helicopter purely according to the instruments. The descent commenced in the downwind leg and a sort of base leg was flown and the descent continued.

Approximately 12 seconds prior to the accident, the PIC stated the course with "170" and the co-pilot said "*now turn*". At that time, the helicopter had a speed of approximately 35 KIAS and was in approximately 150 ft AMSL. The PIC said "150" and at the same time the radio altimeter sounded "Decision Height". The co-pilot acknowledged four seconds prior to the accident "150" and the PIC reported three seconds prior to the accident "100". This was followed by the HHO-CM's "*Ey, ey, ey*", which was also the last voice recording. The helicopter impacted the surface of the water.

As part of the root cause analysis, the accident investigators came to the result that the PIC did not continuously scan the instruments and that he was overwhelmed with the manual control of the helicopter without external visual references. The warning of the radio altimeter when passing 100 ft GND did not result in verbal reaction or the termination of the approach. It is highly likely that the Pilot Non Flying (PNF) had not recognized the fluctuations in speed and altitude during the approaches. The benefit of a multi-pilot crew was not utilized because of the high total flying experience that each of them had, the confidence in their own skills and in the experience of the other.

One of the identified root causes (extract):

Loss of situational awareness in combination with loss of control.

Loss of Situational Awareness

Situational awareness (SA) is very often the critical prerequisite for successful decision making, particularly in complex, dynamically changing situations.

In the flight environment, the safe operation of the aircraft consistent with the pilot's goals is highly dependent on the current assessment of the rapidly changing situation, including details of the aircraft operational parameters, external conditions, etc. Without this situational awareness and assessment, which needs to be both **accurate and complete**, the pilot will be unable to effectively perform his function. Even small lapses in the situational awareness can have catastrophic results.

No. 3862-P-00

Def. Situational Awareness (SA):

Situational 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 (Endsley, 1995/2000).

The situational awareness process is a separated prerequisite for the following decision-making process.

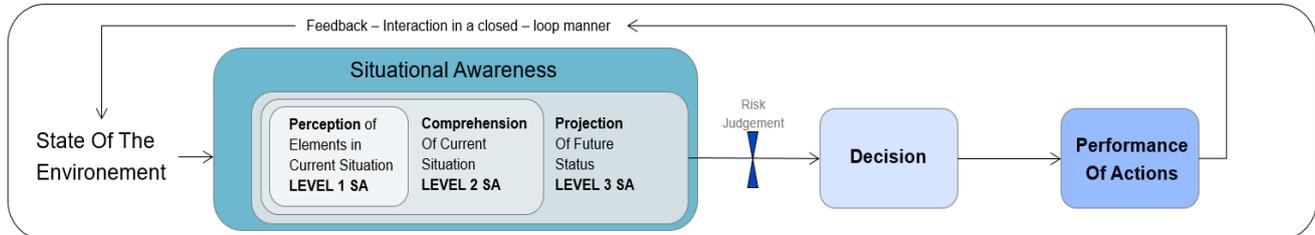


Fig. Mica R. Endsley, PHD, 1995, Model of Situational Awareness in Dynamic Decision Making

The SA contains three levels:

Level 1 SA:

The first step in achieving SA is to perceive (being aware of) the status, attributes, and dynamics of relevant elements in the environment, like location, altitude, heading, threats, obstacles, speed, etc.

Level 2 SA:

The second step is the comprehension of the current situation, based on a synthesis of the Level 1 SA. This includes an understanding of the significance of these elements in the light of the operator's goal. Based on this knowledge, the decision maker - the pilot - forms a holistic picture of the environment, comprehending the significance of objects and events.

Level 3 SA:

The third step is the projection of the future status, which means the ability to project the future actions of the elements in the environment - at least in the very near term. This is achieved through knowledge of the status and dynamics of the elements and comprehension of the situation (Level 1 SA and Level 2 SA). These immediately consecutive levels are leading to the selection of problem-solving strategies, risk judgement, and to the decision making process, which finally trigger the related action, and respectively the performance of this action.

In general, poor performance will occur when SA is incomplete or inaccurate, when the correct action for the identified situation is not known or miscalculated, or when time, workload, stress or other factors limit a person's ability to carry out the correct action.

In other words:

Good SA can therefore be viewed as a factor that will increase the probability of good performance (but cannot necessarily guarantee it). Limited SA has a negative impact on the decision and on the performance of action (see next chapter).

No. 3862-P-00

Individual factors that influence SA

A key idea is that SA is an individual and mental construct of the actual situation. The more the mental construct departs from the actual situation, the more likely it is that incorrect or inappropriate decisions will be made. A major limit to SA is the person's ability to accurately perceive multiple items in parallel. Complex decision making and multiple tasks can quickly exceed a person's limited attention. In addition, time is important in situational awareness because in a dynamic situation, such as flying an aircraft, things are constantly and rapidly changing.

Working memory and long-term memories play an important role to circumvent this limit and to allow a person to modify attention-deployment on the basis of other information perceived or in coordination with his/her active goals. This means that people are active participants in the determination of the elements of the environment that will become a part of their SA (Level 1 SA). They are focused on their attention, based on goals and objectives and on long-term memories, like experiences and training.

However, this means that there is a probability of filtered perception (Level 1 SA - "Which information do I need?"), and therefore a loss of SA of other and critical elements that can occur in a complex environment, with the risk of less performance (of action).

M. Endsley: *"Of the errors identified, **76.3% were Level 1 SA errors**, 20.3% were Level 2, and 3.4% were Level 3. Level 1 SA errors occurred when relevant data were not available, when data were hard to discriminate or detect, when a failure to monitor or observe data occurred, when presented information was misperceived, or when memory loss occurred... These results give an indication of the types and frequency of SA errors that occur in aviation, with failure to monitor or observe available information forming the largest single category"*.

Training and experience are mandatory for good working memory and long-term memories. With training and experience, people are able to create schemata and mental models as a mechanism for a well-known situation, and to create (so called) scripts, which provide sequences of appropriate and predefined actions. These mental models and scripts can easily facilitate the cognitive process because the individual does not actively decide on appropriate actions at every turn, but will automatically know the action to take in this well-known situation.

It becomes a prototypical situation for the decision-maker, corresponding with a supposed "correct" action or decision. It means that learned schemata and scripts dictate decision-making and the performance of action.

Lessons to be learned to improve Situational Awareness

No one has perfect situational awareness - there are always some aspects of a complicated task or operation we forget. Remember: We filter incoming information and we only use the information that we consider correct for our next goal.

No. 3862-P-00

SA can be negatively influenced by a lot of factors and circumstances, such as:

- Attentional tunneling, fixation, or misplaced salience,
- Workload, anxiety, fatigue, distraction or other stressors,
- Data overload, complexity,
- Requisite memory trap, erroneous mental models, training deficiencies, and many other influencing factors.

A good SA starts with important questions, such as:

- Have I filled all elements in my flight planning?
- How much fuel do I need? What about the weather on route, at destination?
- What is the ETA?
- If plan A does not work, what are plan B, plan C?
- Where is my last point of return?

To keep or to regain your situational awareness and before taking action, ask yourself:

“What can go wrong? Is there anything that I am missing?”

Predict the future! Think ahead of the aircraft! Where will I be in the next minute? In the next 5 minutes? 15 minutes?

If a complex situation or a problem occurs, do not be 100-percent focused on this current condition. Do not dive into a “tunnel-vision”. You are still flying an aircraft in space and time.

During an approach, be conscious of your descent and your decision height. “What will I do? What are my next actions? What about the traffic around me?”

Reduce your task overload! “What information do I really need for my next decision and action?”

If everything works well and your autopilot is flying the aircraft, avoid complacency! Do not be too passive! Stay attentive and vigilant, otherwise you will lose time in an unforeseen situation. If something tells you that things are not right, maybe things are really not right. You are the master of the flight, not the aircraft and its systems.

Have an efficient crew resource management (CRM). Give clear and unambiguous information to your crew member. Ask your PF, if he or she is aware of a problem. If the PF does not acknowledge correctly, ask again and help. Foster a common and full understanding of the situation.

Remember:

Situational awareness means that the needed information will be received, understood, and projected into the nearest future. It must be accurate and complete. Only with good SA, you will have a good risk assessment, a good decision making and you will have a high performance of action.

Fly safe!