



# Situation Awareness and Decision Making in a Warning Environment

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Advanced Warning Operations Course

IC Core 2

Lesson 3: Team SA



Warning Decision Training Branch

Lesson 3 will focus on the Situation Awareness (SA) of teams. The “teams” in this lesson are not limited to the forecast office staff. For example, another team would be the entire group comprised by the forecast office, the media, and emergency managers, who are all part of the warning process.

## Lesson 3: Team SA

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Learning Objective:

- Identify factors that can impact getting and maintaining team SA.

“When in danger, when in doubt, run in circles,  
scream and shout”

John Helping

The Learning Objective for Lesson 3 applies to factors that affect getting and maintaining team SA. The Learning Objectives will be tested when you take the on-line exam for IC Core 2.

## Lesson 3: Team SA

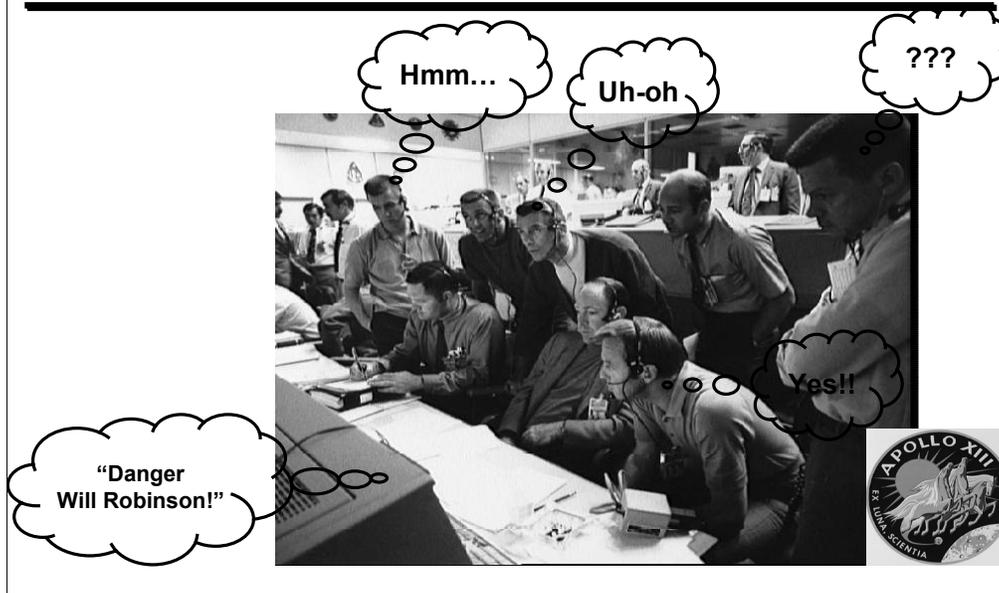
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### Performance Objectives

1. Using specific data examples, identify the three levels of SA and how they are contributing to your warning decisions, while working:
  - a) WES simulations, and
  - b) Warning events.
2. As part of post-event analysis, determine the role that SA (good or bad) at the three levels played in the warning decisions that were made.

The Performance Objectives for Lesson 3 apply during this course as well as after completion. Though they are not tested formally, questions related to these Performance Objectives will be posed during the course simulations. Developing SA in the “domain” of the warning environment is a skill that evolves over time and is an important asset in making sound warning decisions.

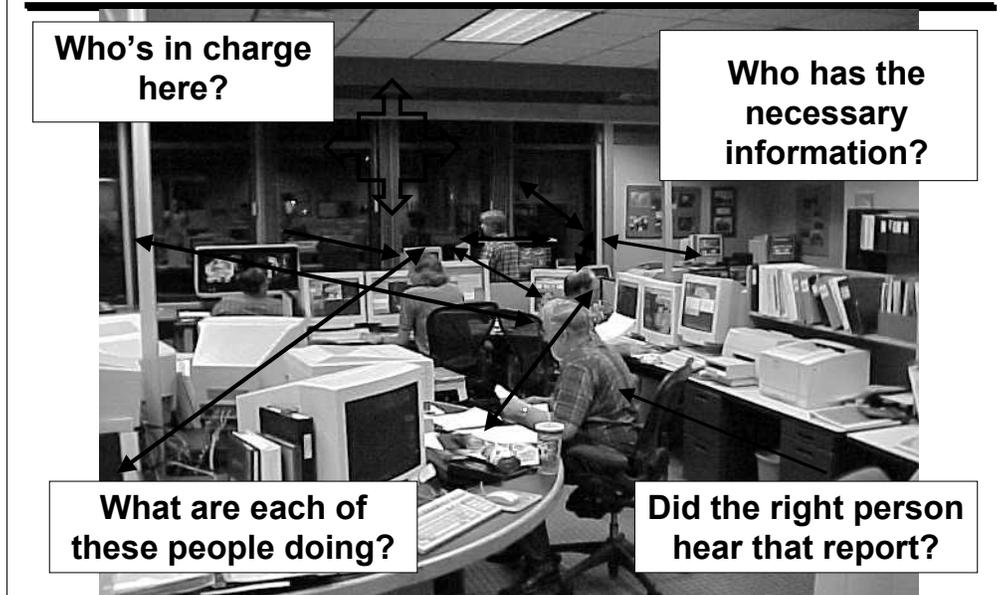
# Apollo 13 and Team SA



The Apollo 13 mission is an interesting example of a shift in team SA. This large team of controllers had to build their SA sufficiently to shift the goal from mission completion to getting the astronauts back alive. Imagine the reluctance to abandon the mission, but lengthy resistance would have caused delays that might have prevented the return of the astronauts.

# Team SA

## A Shared Understanding



This photo was taken at a forecast office during a significant warning event. The arrows depict all the potential interactions among team members. There are five people working in this one area and others working elsewhere. The potential for communications chaos is very high in this environment.

## Are Team Decisions Inherently Better?

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- **Nope**
- Differing views can paralyze a team
- Teams may suffer from a collective error
- Communication of information among team members may be faulty
- Status differences may have an impact
- Cultural differences may play a role

Team SA has its own challenges. Team decisions are not necessarily better. There are a number of things that can derail team SA, such as inability to resolve conflicts, poor communication, status and cultural differences.

## Team SA Definition

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“The active construction of a situation partly shared and partly distributed between two or more agents, from which one can anticipate important states in the near future.” Salas et al 1995

- Team SA is the result of each individual’s SA
- If one individual loses SA, it can affect that of the group

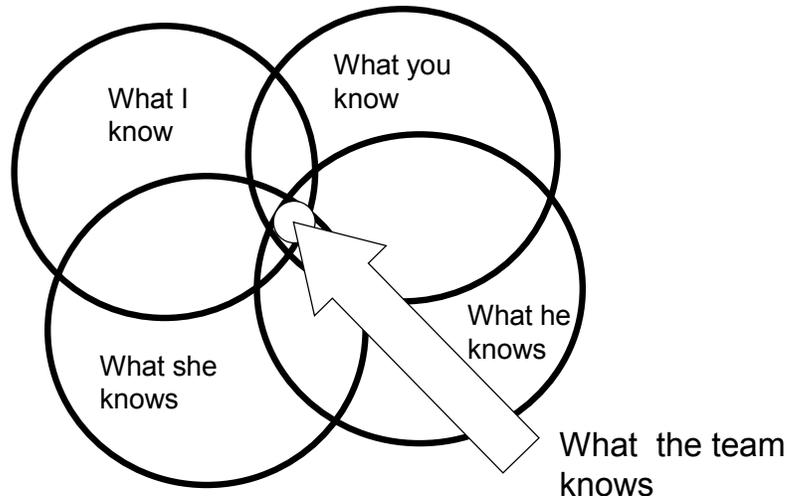
“40% of reported incidents in the ASRS data base occurred when **only one** crew member had a problem with SA.”

<http://asrs.arc.nasa.gov>

The definition of team SA addresses the construction of SA for each individual, with information shared among team members, building team SA. The quote from ASRS shows that the impact is significant when only one member of a team loses their SA. ASRS is the Aviation Safety Reporting System, a web site provided by NASA where pilots and crew members can report incidents anonymously. This database is also used by human factors researchers.

# Team SA

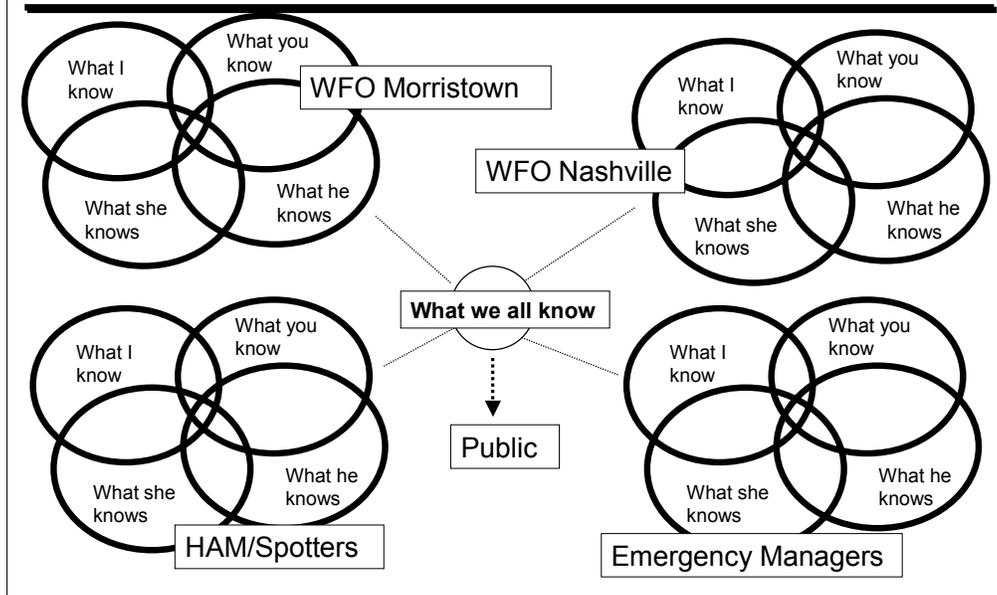
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The subset of information that all team members know can be quite small. This is appropriate provided it is the right subset of information. Each team member will likely have a vast amount of individual knowledge, but only a portion of it needs to be shared.

# Team SA

## Distributed Teams



The warning process involves many teams, both internal and external to the NWS office. In addition to the NWS offices, HAMs/spotters, Emergency Managers, and the media are all members of the distributed team involved in the warning process. The better the communications among these groups, as well as a clear understanding of roles and responsibilities, the better the chance for good decision making and public service during severe weather events.

## Distributed Teams – SA Shift NWS Example

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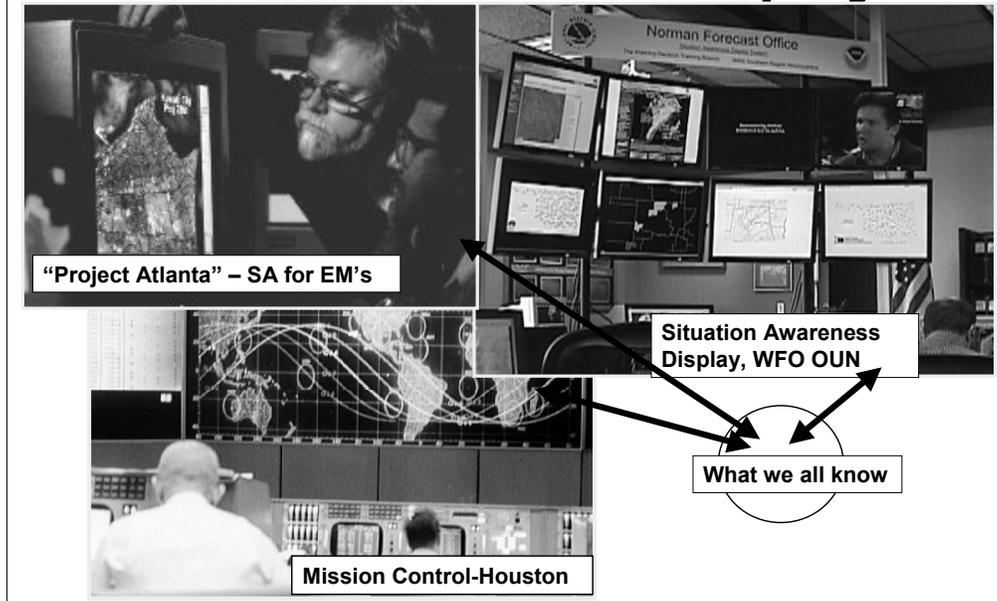
- PDS Tornado watch; spotters focused on looking for rotation/tornadoes
- Radar shows intense supercells, though not tornadic; SVR warnings, no TORs
- One spotter reports “debris” at distance (large area of hail)
- NWS through amateur radio; not seeing tornado potential on radar
- Spotter shift SA and hail reports increase



In this example, the fact that a PDS Tornado Watch had been issued had shifted the SA of the spotters toward rotation and tornadoes. Radar was indicating intense supercells, but rotation features were minimal. No tornado warnings were issued, only severe thunderstorm. The forecast office was expecting hail reports and not getting them until a spotter reported “debris” at a distance. The NWS used amateur radio to communicate to the spotters that the tornado potential was low at that time and that hail seemed to be the threat. Not long after, hail reports began coming in as the spotters shifted their SA.

# “What We All Know”

## The Use of Situation Displays



SA displays have been used in other domains for many years and new technologies support more robust designs. Mission Control in Houston may be the best known example of a large SA display. Emergency Managers in Atlanta have an experimental SA display. Some forecast offices, including Fort Worth and Norman, have been developing SA displays to support warning operations.

# Attaining and Maintaining Team SA

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- Leadership
  - *Roles and responsibilities are well defined and understood*
  - Promote familiarity among staff, supporting verbal and nonverbal communication
  - Minimize “face threat”
    - The penalty for calling attention to a person’s error
    - ***The higher the face threat, the less likely an error or an omission will be communicated***



Leadership can strongly affect team SA and performance...favorably or unfavorably! Leadership is most important in creating an environment where roles and responsibilities are well defined and understood. Leadership sets the tone for communications among staff members. Good leadership can also minimize “face threat”, which is a sometimes dangerous hindrance to communication. At all times, the most junior member of the staff should feel comfortable pointing out potential errors to the most senior member of the staff. If not, there’s a chance that critical information may not be communicated.

# Attaining and Maintaining Team SA

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- Leadership and Face Threat
  - In aviation, face threat often cited in failures of first officers in monitoring/challenging the captain's decisions



“Face Threat” inhibits communication, sometimes tragically. Self-awareness on the part of senior person is just as important as assertiveness on the part of the journeyman. Good leadership provides an environment where communication between superiors and subordinates flows freely.

## Face Threat: Potential Impact on Warning Operations

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- New intern (Bob) answering phones; most senior forecaster (Jim) issuing warnings
- Jim's tone of voice and body language conveys "do not interrupt"; Bob overhears Jim minimizing tornado potential in a strengthening storm
- Bob gets a funnel report from that same storm; assumes the report is bad and doesn't share it
- ***Funnel report turns out to be crucial unshared information that would likely have tipped the scales in favor of a warning***

This example involves an unfortunate lack of communication between a new intern "Bob" and a senior forecaster "Jim". Bob overhears Jim discussing a storm with colleagues and minimizing that storm's tornado potential. Bob is also getting the message that Jim is very busy and does not want to be interrupted. When Bob gets a call with a funnel report on the same storm, he assumes Jim knows all and that the report is bad. Bob does not relay the report, which turns out to be a crucial cue.

# Attaining and Maintaining Team SA

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- Communications
  - *Roles and responsibilities are well defined and understood*
  - Seek clarity in order to avoid assumptions
  - Focus on **relevant** content, minimize “distractor” information
    - A coop observer is reporting steady but light rain outside of the threat area. Though duly noted, does this need to be passed to the warning forecaster?

Even in the absence of face threat, communications can suffer. Once again, roles and responsibilities need to be well defined and understood by all. Assumptions need to be avoided, so ask questions as needed for clarity. Do not share irrelevant information, which will vary from event to event. In this case, the warning forecaster doesn't need to know about reports of light rain outside the threat area.

## **Lesson in Communications**

### ***From an Experienced Pilot...***

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- Family vacation...I turn my attention to my wife and the map in her lap...My youngest son makes the call: "Daddy, the trees!" We're off the road, trees at our 12 o'clock...I spin the wheel to the left...we're back on the road. I'm a very humble man.
- Lesson 1: Each of us, regardless of time, experience, qualification, rank or position, can ***still do stupid things***. Be humble.
- Lesson 2: A "fledgling" member of my crew makes the call. Listen to ***everyone***. Look beyond age, experience, rank and qualifications.

J.S.T. Ragman

This example is a personal story from an experienced commercial pilot, Air Force Reserve Guard unit commander, and trainer. His message is to always be on guard for error and to always listen to everyone on your crew.

# Forecast Office Internal Communications

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- Gaps
  - Report of previous tornado with storm sent to WFO, but not passed to warning forecaster
  - Call from EM...told storm was expected to weaken; call was not logged or discussed with others...storm intensified
- Connections
  - Warning coordinator, teams of warning forecasters, roles and responsibilities for each individual well defined and understood



Here are examples of internal communications within a forecast office, both good and bad. The gaps are examples of crucial pieces of information that were not passed to the right person...the warning forecaster needs to know in real time if a particular storm has previously produced a tornado. Another gap is one staff member telling an EM that a storm is expected to weaken and not sharing this conversation with the warning forecaster who was working that storm. An example of good connections is the presence of a warning coordinator and all staff members having clearly defined roles and responsibilities.

# Forecast Office External Communications

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- Gaps
  - Not enough staff to handle workload...SVSs and LSRs not issued, which support media and EMs
  - EM told storm expected to weaken, though it intensified; EM not contacted before warning issued for his county
- Connections
  - Radio system that supports direct communications between WFO and EMs.
  - Instant messaging to media for warnings soon to be issued; use of strong language in warnings for large tornadoes



Here are examples of external communications, both good and bad, between the forecast office and the media and emergency managers (EMs). One of the gaps results from not having adequate staff for the event, resulting in no SVSs or LSRs being issued. These products provide a valuable service to the media and EMs, and hampered the performance of these external partners. In another case, an EM talked to a staff member and was told that a storm is expected to weaken. When the storm intensified and a warning was issued for that county, the EM was not notified in advance. The two examples of good external communications involve some type of system, radio or instant messaging, that allows for a direct connection between the NWS and the external partners. Also noted is the use of strong language in warnings to convey a particularly high threat.

# Attaining and Maintaining Team SA

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- Preparation, Planning

- *Roles and responsibilities are well defined, understood and practiced*



- “predefined severe weather shift duties...allowed the staff to focus on specific duties with knowledge that all necessary tasks were being completed...minimized duplication of effort and maximized warning and communications performance.”

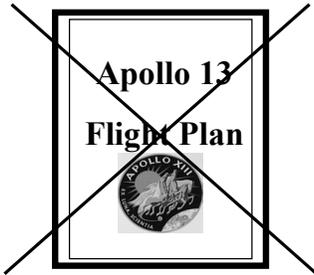
- Prepare yourself, be aware of yourself and others, have a plan

Pre-planning can make a significant difference during warning operations. Successful office performance often results from well defined responsibilities for each individual, as well as a coordinator to oversee workload and to deal with the inevitable surprises. The quote is from a service assessment of a widespread but successful event. Each staff member was better able to focus on their particular duties because they knew that all necessary operations were accounted for.

# Attaining and Maintaining Team SA

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- Adaptability
  - If the plan isn't working, change the plan!
  - Strive for a pro-active mode, instead of reactive
  - Avoid "flying behind the plane"



"In preparing for battle I have always found that plans are useless, but planning is indispensable."

Dwight Eisenhower

There is no single "plan" for severe weather operations. Since the warning environment is so dynamic, adaptability is essential. It may be necessary to call in more staff, adjust warning sectors, and adjust roles and responsibilities, as needed. Adaptability allows for a more proactive approach to warning operations, instead of reactive. In aviation, working in a reactive mode is called "flying behind the plane".

## **SA and “Warning Coordinator” Maintain the Overall Big Picture**

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- Maintains “event level” SA (internal and external to office)
  - Oversees end-to-end office operations
  - Not a “catch all” person for unassigned tasks
- Monitors staffing and workload
- Doesn’t know details such as storm scale structures
- Gages the office’s message to the customer
  - Flow of products
  - Wording of products
- Ensure actions are documented



As presented in Lesson 2, Individual SA, the warning coordinator has to maintain his or her own SA, which is “event level”. The warning coordinator does not know details such as storm scale structures, which is the focus of the warning forecaster’s individual SA. The warning coordinator manages team SA by monitoring staffing and workload, as well as monitoring the office’s overall message to the customer.

## SA Summary

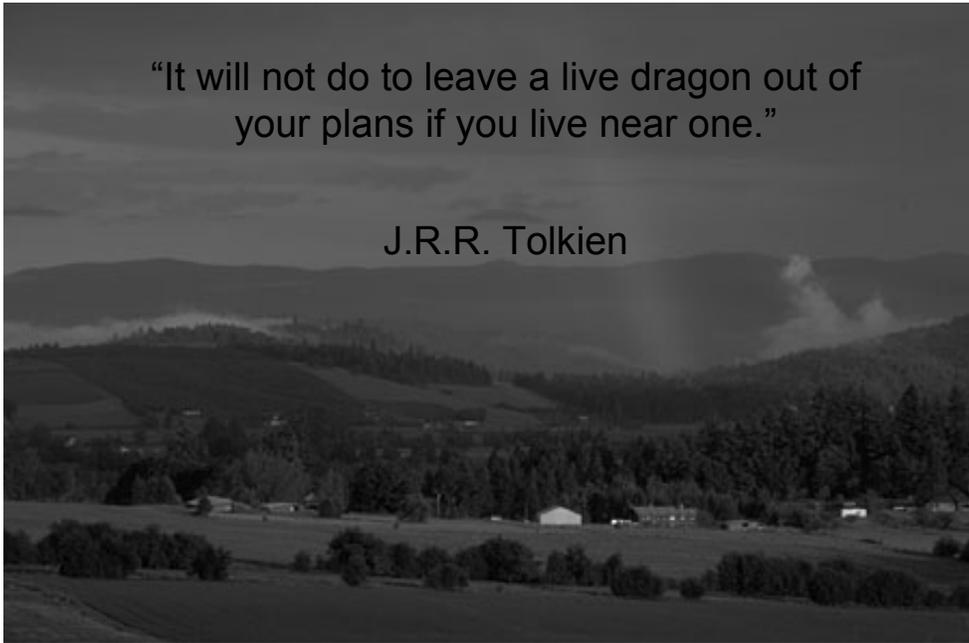
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- Team SA requires all to maintain individual SA and contribute to group SA
- Several *controllable* factors can impact the team's ability to have it and keep it
  - Workload
  - Clearly defined roles and responsibilities
- Understanding how these factors will come together (or came together) can affect your team's ability to manage SA better in the future

In summary, team SA requires team members to maintain their individual SA and contribute to the group SA. There are several controllable factors, such as workload and clearly defined roles and responsibilities, which can support good team SA. Understanding how these factors contribute to team SA will support the development of better team SA in the future.

“It will not do to leave a live dragon out of  
your plans if you live near one.”

J.R.R. Tolkien



A final word from J.R.R. Tolkien. Since we have a live dragon living nearby,  
it's best to plan for it!



# **Situation Awareness and Decision Making in a Warning Environment**

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Advanced Warning Operations Course

IC Core 2

Lesson 3: Team SA



Warning Decision Training Branch

This concludes Lesson 3: Individual SA. There is one remaining lesson for IC Core 2.

## Questions?

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1. Check with your AWOC facilitator (most often the SOO)
2. Send your question to [iccore2@wdtb.noaa.gov](mailto:iccore2@wdtb.noaa.gov)

If you have questions about the material from IC Core 2, first check with your AWOC facilitator (most likely your SOO). If your AWOC facilitator cannot answer your question, please send an email to [iccore2@wdtb.noaa.gov](mailto:iccore2@wdtb.noaa.gov).

