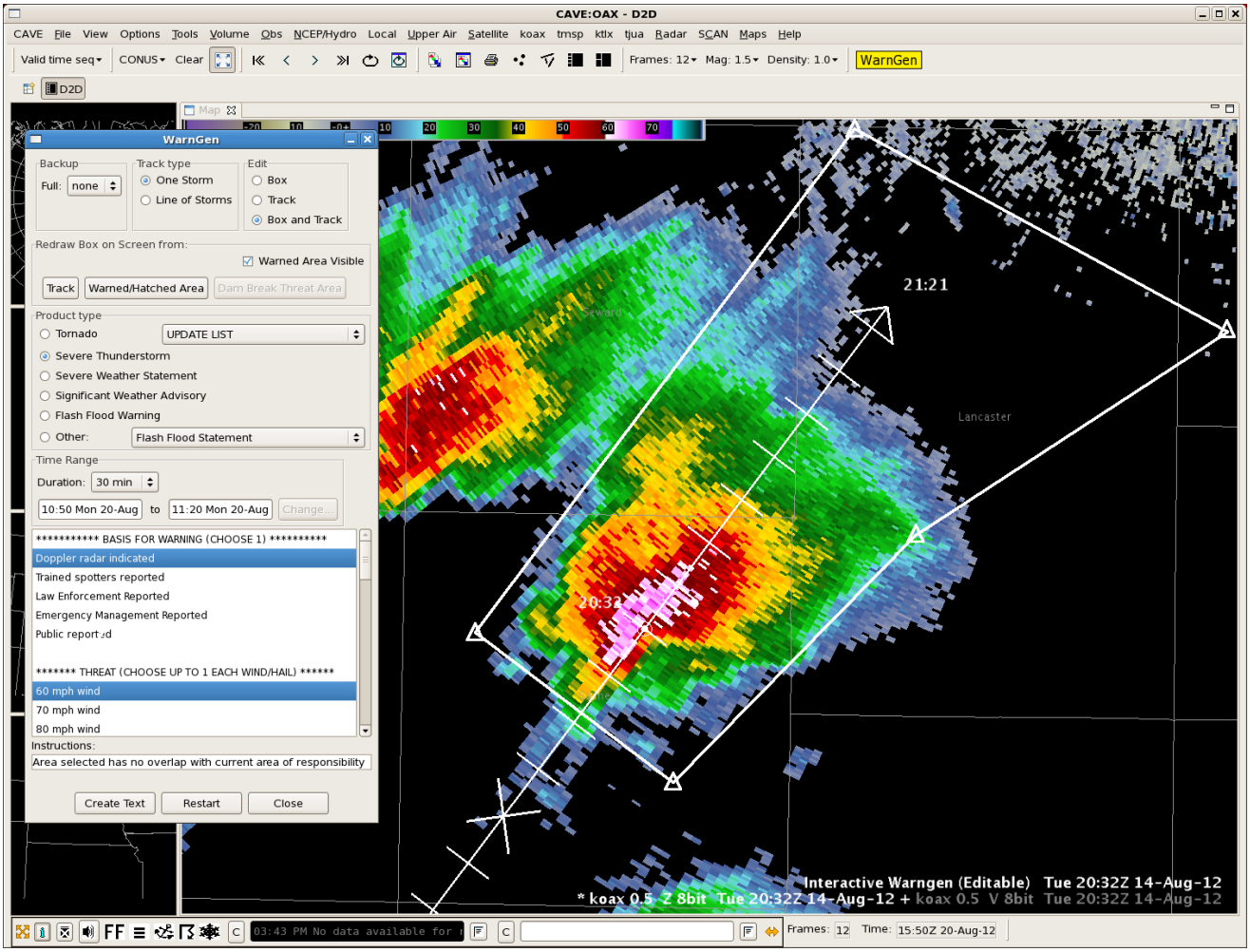
Distance Learning Operations Course



Topic 8: Storm-Based Warning Fundamentals

Presented by the Warning Decision Training Branch

Version: 1210

Introduction

Topic 8 is a new topic in DLOC that provides the basic fundamentals of issuing Storm-Based Warnings (SBWs). The training is composed of several small lessons, or modules, based on key knowledge and skills required to effectively create SBWs. The modules in Topic 8 include some primers on applications and tools used to interrogate storms for their potential severity to help create an initial warning polygon. In addition, there are several lessons which are examples of how to issue SBWs that are categorized by various situations and storm types. We include methods for developing both Tornado Warnings (TORs) and Severe Thunderstorm Warnings (SVRs). Lastly, some of the lessons fall into the category of how to deal with special circumstances that arise in issuing SBWs such as merging storms, storms in close proximity, fast-moving storms, and storms that cross CWA boundaries.

The following is a summary of the individual lessons in Topic 8:

Lesson Descriptions

Lesson 1: Storm-Interrogation Primers

Description: These lesson primers use the WES to show basic procedures of the following AWIPS D2D applications: SCAN/DMD, FFMP, FSI, All-Tilts, Panel Combo Rotate, and WarnGen. The videos illustrate procedures of each application and basic storm-interrogation methodologies to help support SBW creation.

Duration: 1-2 hours

Lesson 2: TOR for Isolated Tornado Threat

Description: This lesson provides several examples of how to issue tornado warning polygons for individual tornadic supercells. The lesson discusses how to separate tornado and severe thunderstorms warnings for a single (large) storm.

Key Learning Points:

- In most potentially tornadic situations, it is preferable to use a **single TOR with a buffer around current and projected positions of the low-level circulation.**
- In some rare, high-end situations, you can split SVR and TOR out for the same storm.
- If time allows, in addition to the tornado threat language, try to include wind and hail threat information in the text product of a TOR.
- Draw TOR polygons based on temporal and spatial analysis of storm structure via all-tilts SRM product. Include your level of certainty due to location of storm.

Duration: 10 minutes

Lesson 3: TOR for QLCS Tornado Threat

Description: This lesson provides instruction on how to issue SBWs for a line of storms, in particular, a tornado-producing mesovortex embedded in a line with adjacent damaging wind threats.

Key Learning Points:

- To help recognize tornado threat for squall line tornado SBWs, you must first evaluate ambient low-level shear, and then look for inflow

notches, line intersections, and velocity couplets forming at reflectivity kinks in the line.

- When appropriate, lay out separate SVRs (or TORs) for adjacent severe line segments developing along and ahead of the squall line.

Duration: 3 minutes

Lesson 4: TOR/SVR for Backbuilding (Training Storms) Situations

Description: The lesson describes strategies for issuing warnings for backbuilding situations that minimize overlap and contain no gaps.

Key Learning Points:

- In merging situations, where appropriate, combine warnings to simplify the message and minimize confusion to our customers.
- Minimize overlap by checking projected storm motions and make sure there are no gaps when storms are merging.
- Intra-office communication is vital when there are overlapping polygons in time and space.

Duration: 4 minutes

Lesson 5: SVR for Pulse Storms (Low Shear)

Description: This lesson illustrates considerations for issuing a SBW for a slow moving pulse storm. Strategies for reshaping the polygon based on future initiation along outflow boundaries are shown.

Key Learning Points:

- When issuing a SBW for a downburst situation, it is advisable to expand the width of the polygon in the direction of potential microburst motion.
- Use velocity interrogation of storms to detect low-level convergence associated with a MARC.

Duration: 4 minutes

Lesson 6: SVR for Squall Line System

Description: This lesson illustrates how to handle a common SBW situation with damaging winds along and to the rear of a squall line system.

Key Learning Points:

- Warn for the potential wind threat out in front and behind strong reflectivity gradient encompassing the line.
- Be mindful of SVR duration to cover duration of wind threat (along and behind line).

Duration: 4 minutes

Lesson 7: Storm-Based Warning Special Considerations

Description: Originally titled “Advanced Storm-Based Warnings”, this lesson describes important SBW issues, such as limiting SBW size, avoiding excessive text, how to issue warnings for storms that cross CWA borders, how to handle storms in

close proximity of each other, and anticipating movement of fast-moving storms.

Key Learning Points:

- Minimize extremely large polygons in most situations to avoid excessive text.
- Anticipate movement of threats by fanning out polygons in direction of storm propagation (for splitting storms, for example).
- To improve warning lead time, do not wait until the severe storm is close to exiting an existing warning before re-issuing.
- Capture multiple threats in single polygon.
- To improve warning coordination, always contact adjacent WFOs before dissemination and during warnings.
- WFOs should coordinate polygon placement of storms with adjacent WFOs that cross over into other CWAs.
- Reduce amount of Call-To-Action (CTA) text in warnings.

Duration: 18 minutes

Lesson 8: Two TORs in Close Proximity

Description: This short lesson illustrates a methodology for issuing two SBWs for tornadic storms in close proximity.

Key Learning Point:

- Coordinate and create **two polygons** with a slight overlap (no gap) to account for two separate tornado threats in the same county.

Duration: 5 minutes

Lesson 9: Non-Linear Motion

Description: This lesson provides guidance on how to incorporate environmental data to address non-linear motion issues with creating SBWs.

Key Learning Points:

- In creating SBW polygons for all situations, incorporate environmental factors that influence storm motion, including updraft forcing, shear, boundary location, and orientation.
- When storms are crossing CWA borders, include polygons from local and adjacent CWAs on your warning monitors to help coordinate placement.

Duration: 21 minutes

Lesson 10: Merging Storms

Description: This lesson provides SBW merger guidance, including how to anticipate storm collisions, how to draw the first polygon, and how to draw the merged storm polygon.

Key Learning Points:

- Minimize areas of overlap in SBWs on merging storms.
- In areas of significant storm overlap, the warning polygon for more significant threat should cover the overlapped area.
- Increase downstream polygon size, as needed, to handle potential uncertainty due to storm interactions and evolutions.

Duration: 4 minutes

Lesson 11: Limiting Number of Counties in Warnings

Description: The lesson presents recommended strategies for limiting the number of counties to 12 or less when issuing SBWs for a large complex of storms.

Key Learning Points:

- Limit warnings to 12 counties (or parishes) or less to avoid problems with text overload on digital devices.
- Divide large threats (such as squall line winds) into multiple, smaller polygons.
- Divide SBW phenomenon (e.g., line threats) into multiple polygons by using the following:
  - Logical breaks of storm structure,
  - Differences in storm motion, or
  - Varying geopolitical features.
- Apply spatial and temporal thinking (covered distance of threat) when considering a large polygon situation.

Duration: 20 minutes

Lesson 12: Pathcasts in SBWs

Description: This lesson discusses the types of pathcasts in WarnGen and the sources of errors. These errors include AWIPS WarnGen map location uncertainties, differences between radar signatures and associated damage paths, and uncertainties in storm evolution.

Key Learning Points:

- There are three main error sources inherent in pathcasts: AWIPS mapping, radar sampling errors, and storm location errors.
- Except in exceedingly rare situations, it is NOT advisable to use specific “time of arrival” pathcasts.

Duration: 18 minutes

Rationale

Although this new instruction adds to the size of training in previous DLOCs, it is crucial to know the fundamentals of how to create Storm-Based Warnings before attending the Workshop. The integrated warning process is complex, but it must include a working knowledge of SBWs. The knowledge and skill in how to use radar products will help you understand complex convective storm processes. Gaining expertise in using tools such as WarnGen to issue SBWs directly relates to your ability to be successful in the warning process. The goal of this instruction is to improve your ability to become proficient in basic knowledge and skills in creating and issuing SBWs.

Completion Requirements

Prerequisites:

- DLOC Topic 1 WES Exercises (especially Exercise 6 on issuing follow-up statements)
- DLOC Topic 7

Exam

There will be one test after the last lesson in Topic 8. The test questions are based on the learning objectives described in each lesson. These learning objectives are the key for demonstrating mastery of the knowledge in Topic 8.

Learning Objectives

Learning Objectives for Topic 8:

1. **Students must demonstrate basic proficiency in using FFMP, FSI, All-tilts, PCR, and WarnGen for storm interrogation practices to help evaluate threats for the creation of Storm-Based Warnings.**

2. **Students must be able to demonstrate recommended strategies for proper polygon placement for these basic convective warning situations:**
   - Tornado Warning for isolated (single cell) tornado threat (high shear situation)
   - Tornado Warning for Quasi-Linear Convective System (QLCS) tornado threat
   - Tornado and/or Severe Thunderstorm Warning for a backbuilding (training storm) situation
   - Severe Thunderstorm Warning for a Pulse Storm (low shear situation)
   - Severe Thunderstorm Warning for a Linear system (emphasis on size and number of warnings to be used)
   - Storms in close proximity with minimal overlap
   - Storms with non-linear motion
   - Merging storms

3. **Students must be able to identify and mitigate common issues associated with SBWs such as:**
   - Limiting polygon size to 12 counties or less
   - Avoiding excessive text
   - Using Pathcasts

4. **Students must be able to anticipate movement of storms to effectively configure SBWs.**

5. **Students must be able to demonstrate recommended strategies for issuing warning follow-up statements (cancelling, continuing, and correcting) in various situations.**

6. **Using guidelines based on NWSI-10-511 and 10-922, students must demonstrate proper text usage in severe weather warnings.**

   (Note: Instruction will be provided at the DLOC Workshop on SBW text formatting for TORs, SVRs, and FFWs).