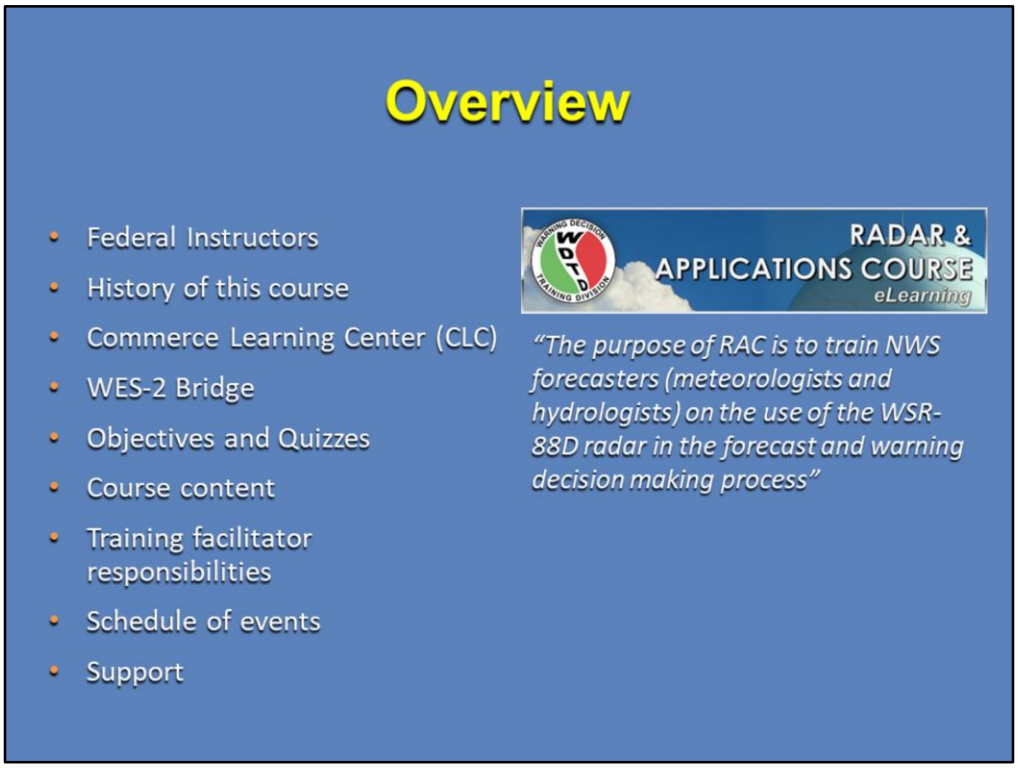
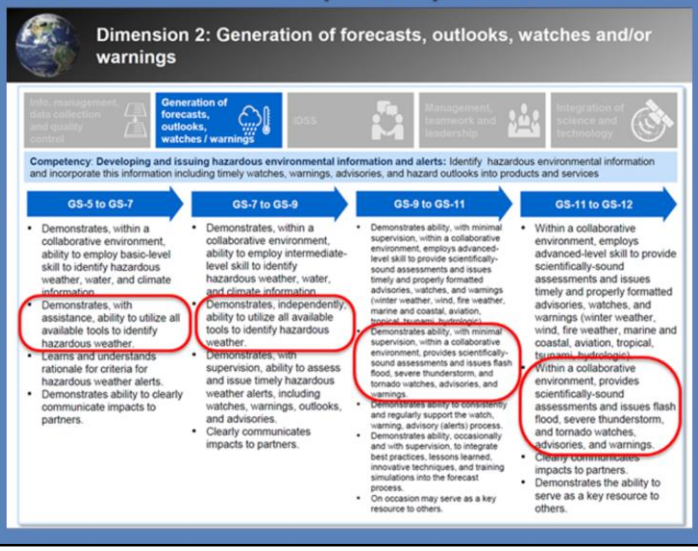

Radar & Applications Course (RAC)
Orientation
Warning Decision Training Division (WDTD)



Welcome to the Radar & Applications Course (RAC) conducted by the NWS Warning Decision Training Division (WDTD). The primary purpose of the RAC is to train NWS forecasters (meteorologists and hydrologists) on the use of the radar in the forecast and warning decision making process.

Why You Must Complete RAC

- Completion is necessary for career advancement in the NWS GS 5-12 1340 Competency-Based Model

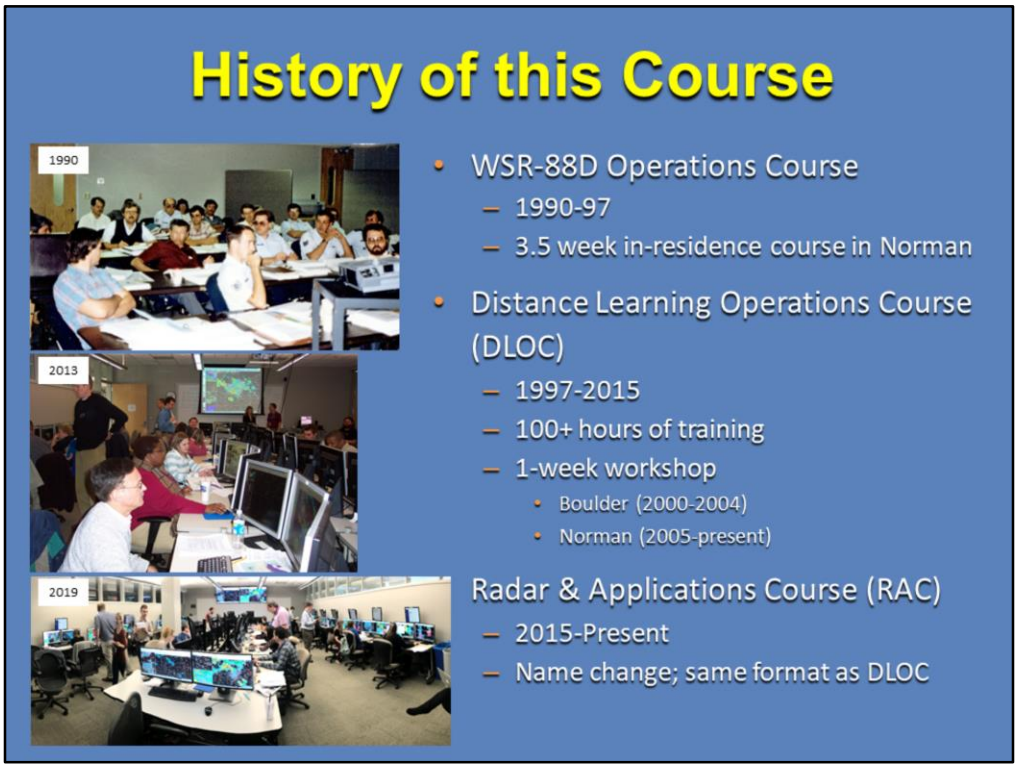


Dimension 2: Generation of forecasts, outlooks, watches and/or warnings

Info. management, data collection and quality control | **Generation of forecasts, outlooks, watches / warnings** | IDSS | Management, teamwork and leadership | Integration of science and technology

Competency: Developing and issuing hazardous environmental information and alerts: Identify hazardous environmental information and incorporate this information including timely watches, warnings, advisories, and hazard outlooks into products and services

GS-5 to GS-7	GS-7 to GS-9	GS-9 to GS-11	GS-11 to GS-12
• Demonstrates, within a collaborative environment, ability to employ basic-level skill to identify hazardous weather, water, and climate information. • Demonstrates, with assistance, ability to utilize all available tools to identify hazardous weather. • Learns and understands rationale for criteria for hazardous weather alerts. • Demonstrates ability to clearly communicate impacts to partners.	• Demonstrates, within a collaborative environment, ability to employ intermediate-level skill to identify hazardous weather, water, and climate information. • Demonstrates, independently, ability to utilize all available tools to identify hazardous weather. • Demonstrates, with supervision, ability to assess and issue timely hazardous weather alerts, including watches, warnings, outlooks, and advisories. • Clearly communicates impacts to partners.	• Demonstrates ability, with minimal supervision, within a collaborative environment, employs advanced-level skill to provide scientifically-sound assessments and issues timely and properly formatted advisories, watches, and warnings (winter weather, wind, fire weather, marine and coastal, aviation, tropical, tsunami, hydrologic). • Demonstrates ability, with minimal supervision, within a collaborative environment, provides scientifically-sound assessments and issues flash flood, severe thunderstorm, and tornado watches, advisories, and warnings. • Demonstrates ability to consistently and regularly support the watch, warning, advisory (alerts) process. • Demonstrates ability, occasionally and with supervision, to integrate best practices, lessons learned, innovative techniques, and training simulations into the forecast process. • On occasion may serve as a key resource to others.	• Within a collaborative environment, employs advanced-level skill to provide scientifically-sound assessments and issues timely and properly formatted advisories, watches, and warnings (winter weather, wind, fire weather, marine and coastal, aviation, tropical, tsunami, hydrologic). • Within a collaborative environment, provides scientifically-sound assessments and issues flash flood, severe thunderstorm, and tornado watches, advisories, and warnings. • Clearly communicates impacts to partners. • Demonstrates the ability to serve as a key resource to others.



This course has steadily evolved over the years, but the focus has always been on the use of the WSR-88D in operations, particularly warning operations. It began in 1990 as the WSR-88D Operations Course which was taught as a 3 & 1/2 week in-residence course in Norman, Oklahoma. In 1997, it transitioned into the Distance Learning Operations Course (DLOC) and provided a blended learning approach which included web-based training, on-line modules, teletraining, and a 1-week workshop delivered at its conclusion. The name was changed to the Radar & Applications Course (RAC) in 2015 to provide a more accurate and meaningful description of the course, but it maintains the same format as DLOC.

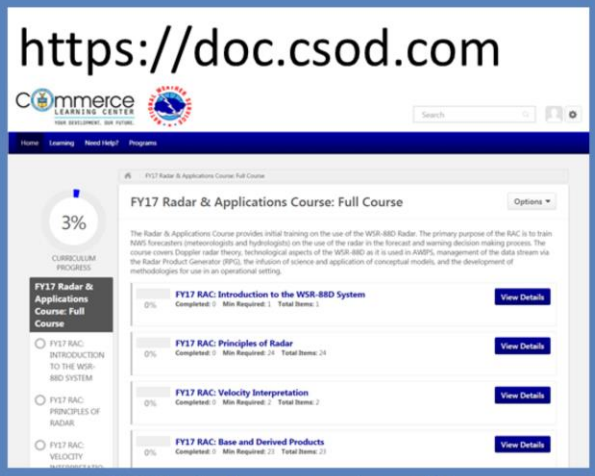
Commerce Learning Center (CLC)

- Completion status tracked via the CLC
  - Lesson quizzes
  - WES activities
  - Instructor-led training (ILT)

We use the Commerce Learning Center (CLC) to track your completion of each part of the RAC: Lesson quizzes, WES activities, and ILTs. We recommend you bookmark the web address https://doc.csod.com. Most of the lessons are on-line training that you will launch directly from the CLC. Other training (such as AWIPS Convective Warning Fundamentals) will be taken on your local WES machine, but you will need to come back to the CLC and take some action in order to show up as complete.

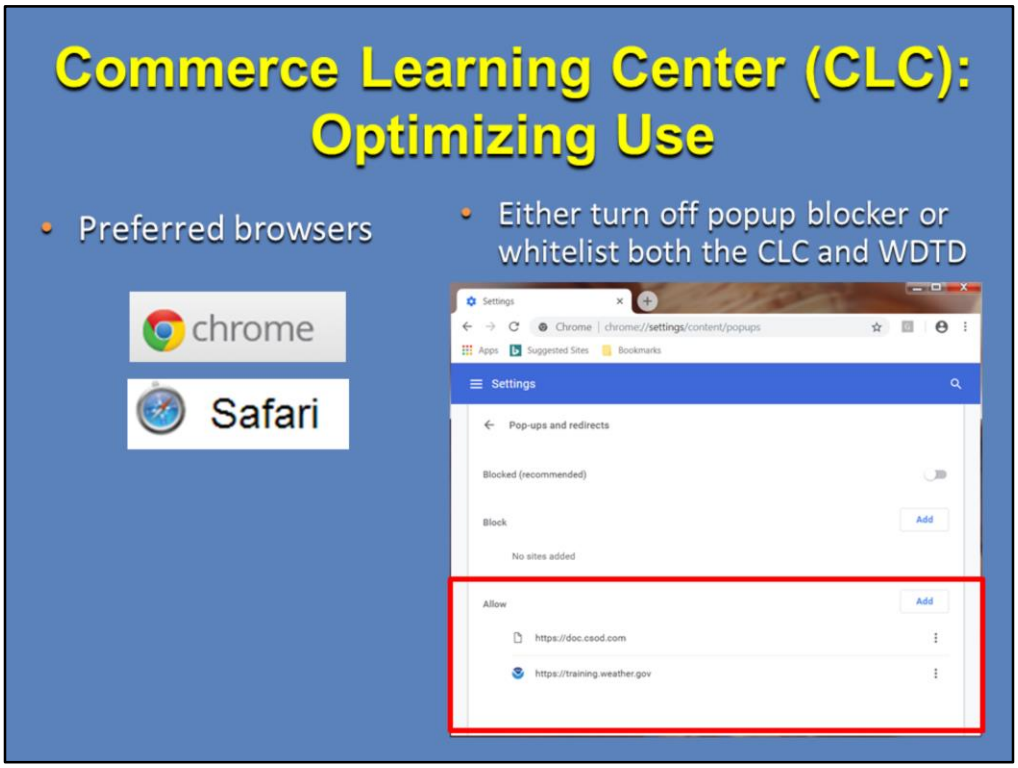
Commerce Learning Center (CLC): RAC Curricula

- Take RAC topic lessons in order
- Register for teletraining
- Register for workshops
- Track your progress



RAC Curriculum on your transcript

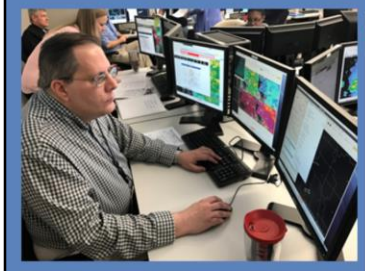
Your RAC Curriculum is your path to course completion.



Google Chrome is the preferred browser for the CLC. Safari also works for mobile users. Other browsers may have issues.

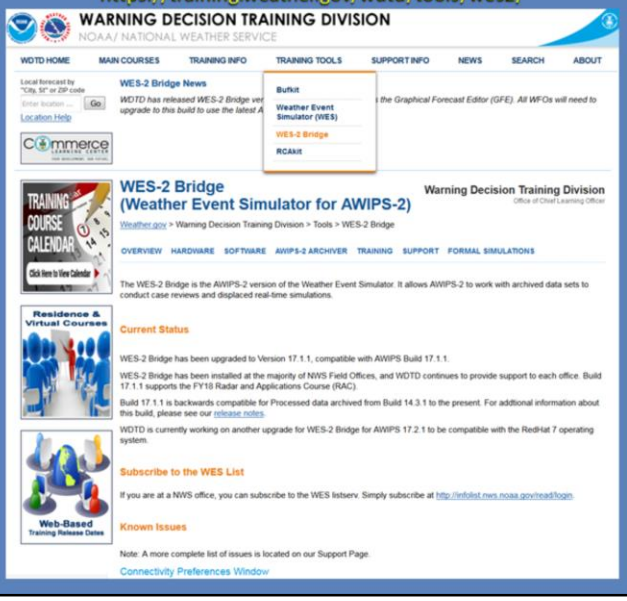
If you have popup blockers on, you will not see the presentations appear when you select them unless you create an exception for the CLC and WDTD web sites.

WES-2 Bridge
(Weather Event Simulator for AWIPS-2)



Point of Contact:
Dale.Morris@noaa.gov

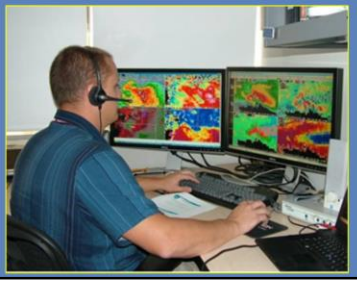
https://training.weather.gov/wdtd/tools/wes2/



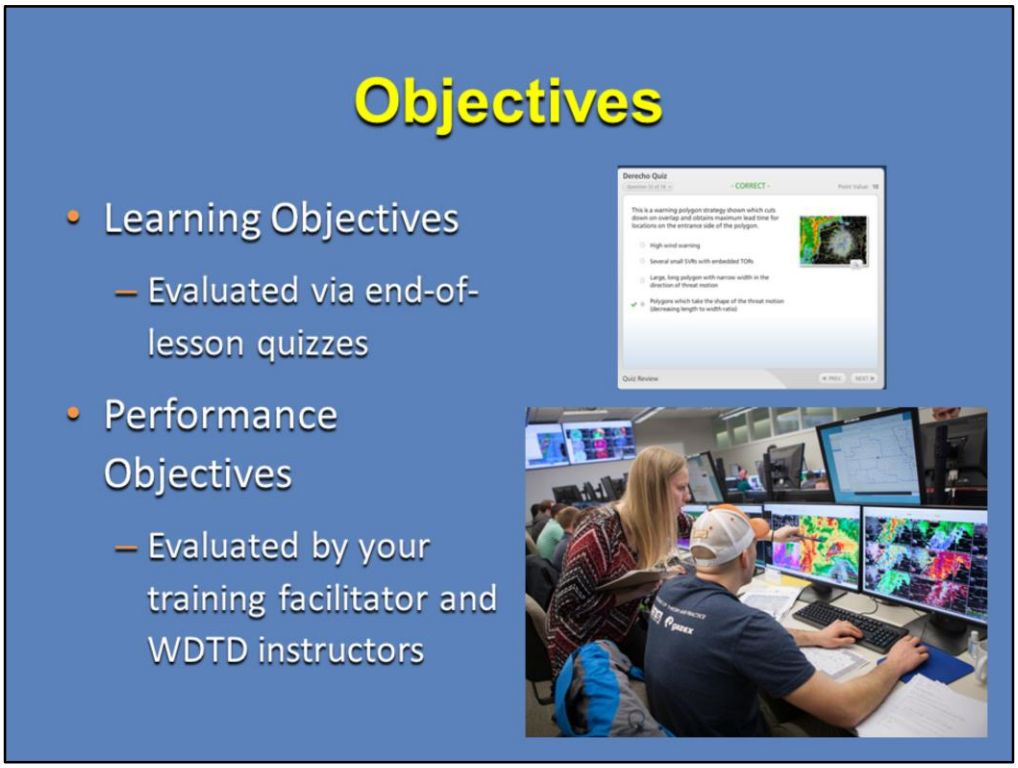
WES-2 Bridge is a weather event simulator for AWIPS-2. You will use it during both the distance learning and in-residence Workshop lab portions of RAC. Your point of contact for WES-2 Bridge support is Dale Morris.

Types of Training Modes

- Web modules
  - Completed asynchronously
- Live, instructor-led teletraining (ILT) sessions
- AWIPS/WES exercises



RAC presents training material in various ways. Some are self-paced modules on the Internet. Others are recorded “Articulate” modules where the instructor’s voice is paired with the relevant images. Another method is via live teletraining session where you and your classmates go through material together with a WDTD instructor. You must pre-register for each teletraining session via the RAC curriculum in the CLC and take it at the scheduled time.

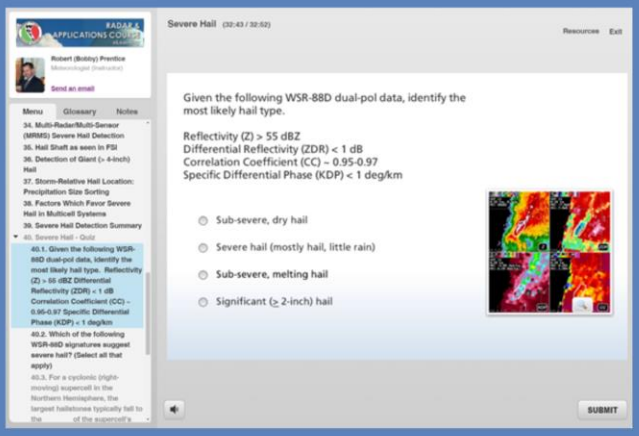


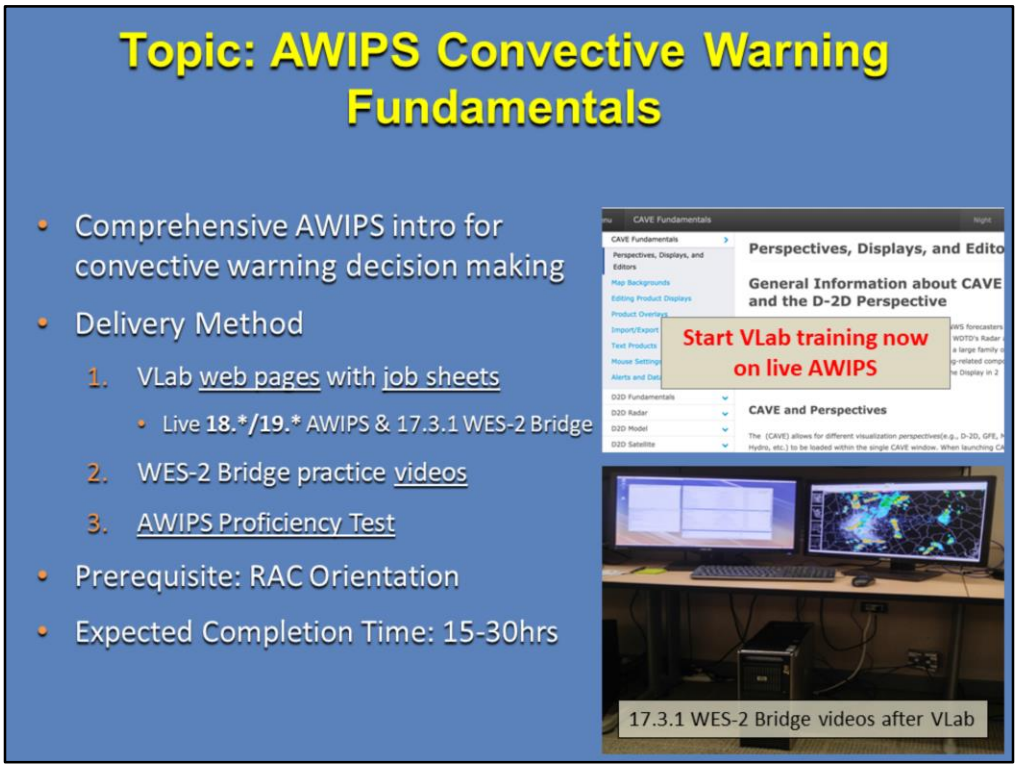
Each lesson contains learning and/or performance objectives. A learning objective is an outcome statement that captures specifically what knowledge, skills, and attitudes learners should be able to exhibit following instruction. We assess it in RAC via an end-of-lesson quiz.

A performance objective is a statement that clearly describes the behavior or performance the learner is expected to exhibit as a result of training. We assess it in RAC via AWIPS WES exercises by your training facilitator, the AWIPS Proficiency Test by your training facilitator, and at the RAC Workshop Lab by WDTD instructors.

End-of-Lesson Quizzes

- Must be completed on the Commerce Learning Center (CLC)
- Taken at your office
- Passing score is 70-80%

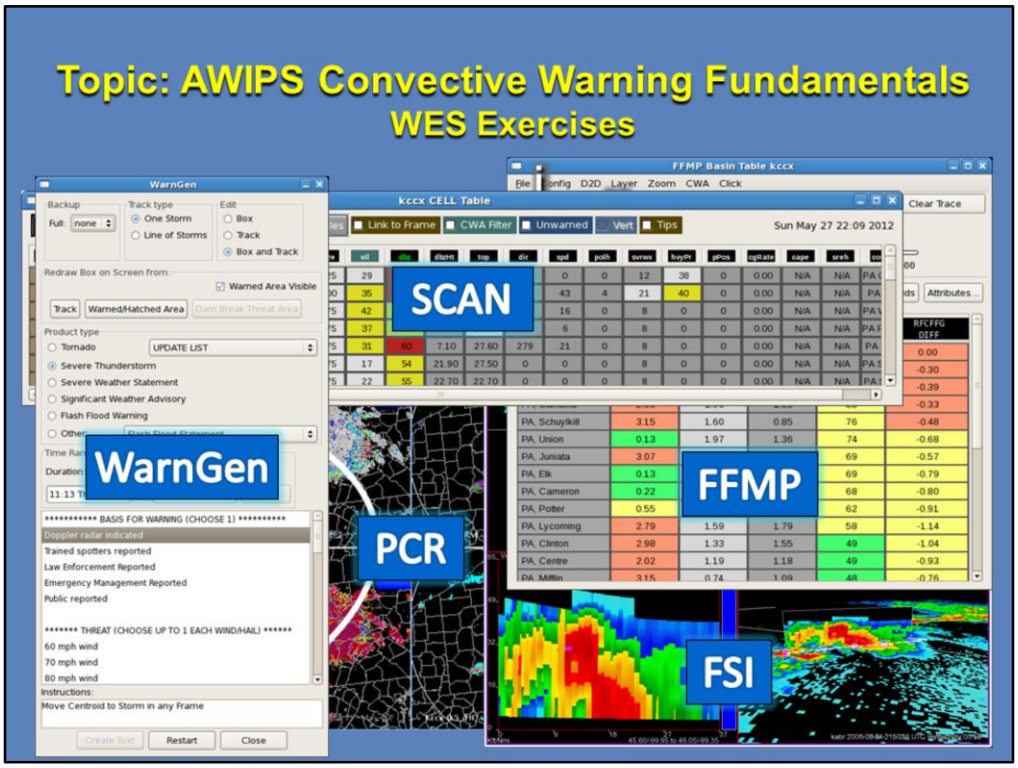




The AWIPS Convective Warning Fundamentals, is a comprehensive introduction to all the AWIPS convective warning-related tools. You will need this when you start implementing RAC training into the RAC warning decision making exercises and simulations in the workshop primer and at the workshops All RAC students must take it, including "experienced" forecasters, because it's important that everyone have the same WDTD approved skill set and be on the same page when they work together as a warning team in our Workshop simulation/scenarios.

The delivery method is a blend of VLab and WES-2 Bridge. Most of the VLab web pages and job sheets are taken on the live AWIPS which will be some version of build 18 or build 19. The practice videos must be taken on the WES-2 Bridge and will require the 17.3.1 WES-2 Bridge. Most of the content is independent of AWIPS builds, but there will be notes about any different AWIPS behaviors between builds in the VLab materials. The VLab job sheets and WES videos will prepare you to take a proficiency test that is proctored by your local facilitator.

You can start the AWIPS Convective Warning Fundamentals immediately after the orientation. Expect both VLab and WES-2 Bridge exercises to take 15-30 hours. In the future you will likely not have much time for AWIPS training, so this is a unique opportunity to develop a deep and solid foundation of AWIPS needed for warning decision making.

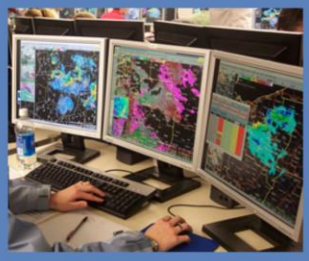


The WES Exercises cover AWIPS applications that you will use in warning decision making in your job.

It is important for you to develop a basic proficiency with these different AWIPS tools even if your current office doesn't use all of them because you will likely use some of these at different offices in your career and you need the latest exposure to all these tools to make an informed decision about what tools ultimately work best for you.

Topic: AWIPS Convective Warning Fundamentals
Proficiency Test

- Demonstrate AWIPS radar and warning proficiency
  - Student will see assignment in CLC
  - Administered by training facilitator
- Score of at least 70% required
  - Retake at discretion of training facilitator
  - Training facilitator: Scan and email Michael.A.Magsig@noaa.gov
  - WDTD marks test "complete" in CLC
- ***Must complete before the Convective Storm Structure and Evolution topic's Applied Performance Drills***



You will see the AWIPS Proficiency Test listed as an assignment in the CLC. It is a timed, paper exam administered by your training facilitator. The facilitator will observe your performance of specific AWIPS tasks. You will need to achieve a passing score of at least 70% on the exam to receive credit. You may retake the exam at the discretion of your training facilitator. Once complete, your training facilitator must send the graded exam back to WDTD; scan and Email as attachment is preferred, but USPS "snail mail" is fine. We will then mark the test "complete" in the CLC.

You must complete the AWIPS Proficiency Test before the Convective Storm Structure and Evolution topic's Applied Performance Drills.

RAC Tracks

Meteorologist vs Hydrologist

Orientation	MET, HYDRO
Introduction to the WSR-88D	MET, HYDRO
Principles of Doppler Radar	MET, HYDRO
Velocity Interpretation	MET, HYDRO
Base and Derived Products	MET, HYDRO
Winter Weather	MET
Convective Storm Structure and Evolution	MET
Flash Floods	MET
Storm-Based Warning Fundamentals	MET
Workshop (Norman, OK)	MET

Let's discuss the RAC topics.

Most RAC students are Meteorologists who have been assigned to the Meteorologist Track, but a few are Hydrologists who have been assigned to the Hydrologist Track.

Topic: AWIPS Convective Warning Fundamentals
WES Exercises Release + More

1. Two disks containing Weather Event Simulator (WES) 2 Bridge cases with videos
   - "AWIPS Convective Warning Fundamentals" videos
   - "Convective Storms" Applied Performance Drills videos
   - "Workshop Primer" videos
2. AWIPS Proficiency Test emailed to training facilitators
   - 17.3.1 WES-2 Bridge **required** for RAC

Should arrive by Oct 15, 2019

The AWIPS Convective Warning Fundamentals and WES exercises are being sent at the start of the course and should arrive the week of orientation. The shipment contains the 17.3.1 WES-2 Bridge cases and other WES training videos for AWIPS Convective Warning Fundamentals, the RAC Convective Storms topic Applied Performance Drills exercises, and the Workshop Primer videos we will talk more about later in this presentation.

Because 17.3.1 is the baseline for this year's RAC workshops, the 17.3.1 WES-2 Bridge is a requirement for RAC.

Topic: Introduction to the WSR-88D System

- Overall system description covering equipment groups
- Delivery Method
  - Self guided web module
- Completion Time
  - 1 hour

Instructor: Andy Wood

Topic: Principles of Meteorological Doppler Radar

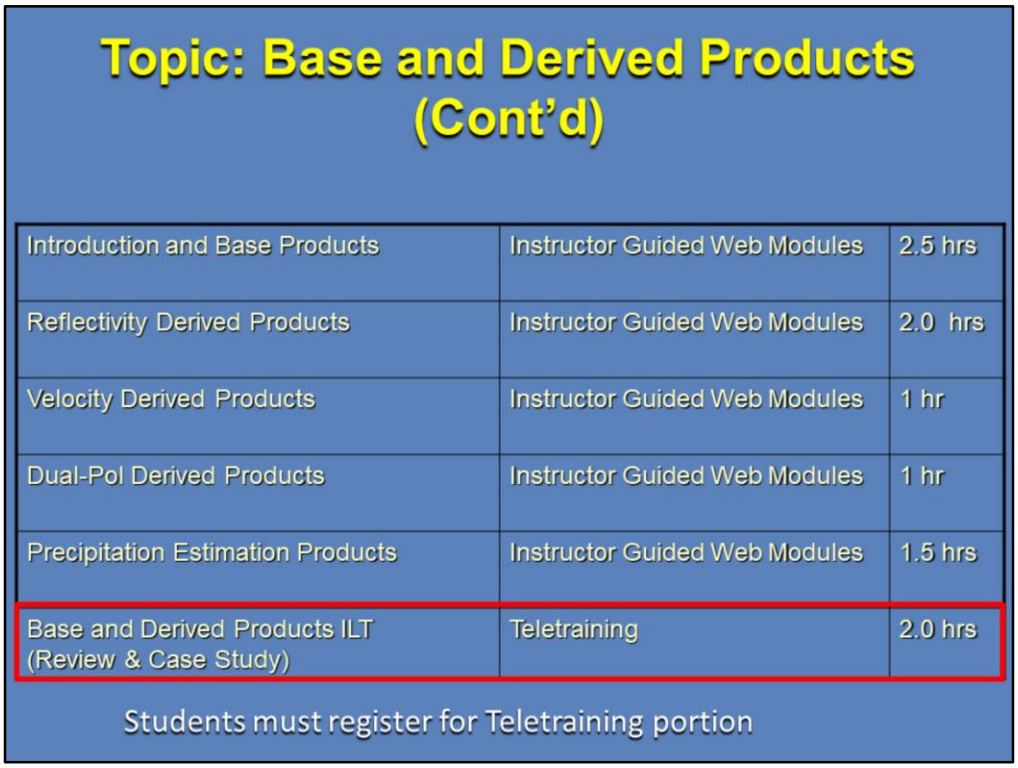
- How the WSR-88D collects, quality controls, and processes data into products
- Delivery Method
  - Instructor guided web modules
- Completion Time
  - 7 hours

Topic: Velocity Interpretation

- How to interpret both large and small scale velocity patterns
- Delivery method
  - Instructor guided web modules
- Completion Time
  - 1 hour

Topic: Base and Derived Products

- Covers products and the algorithms that generate them
- Delivery method
  - Instructor guided web modules
  - Instructor Led Training (ILT) session
- Completion time
  - 10 hours



The lessons in this topic are organized into sections.

The final lesson "Products Review & Case Study" is an Instructor-Led Teletraining session. You must pre-register in the CLC for one of the sessions.

Topic: Winter Weather

- Precipitation type analysis
- Accounting for errors in Snow Accumulation Algorithm (SAA)
- Delivery method
  - Instructor guided web modules
- Completion Time
  - 1 hour

Topic: Convective Storm Structure and Evolution

- Thunderstorms and all things severe
- Delivery method
  - Instructor guided web modules
  - Applied Performance Drills on WES
- Completion time
  - 12 hours

Topic: Flash Floods

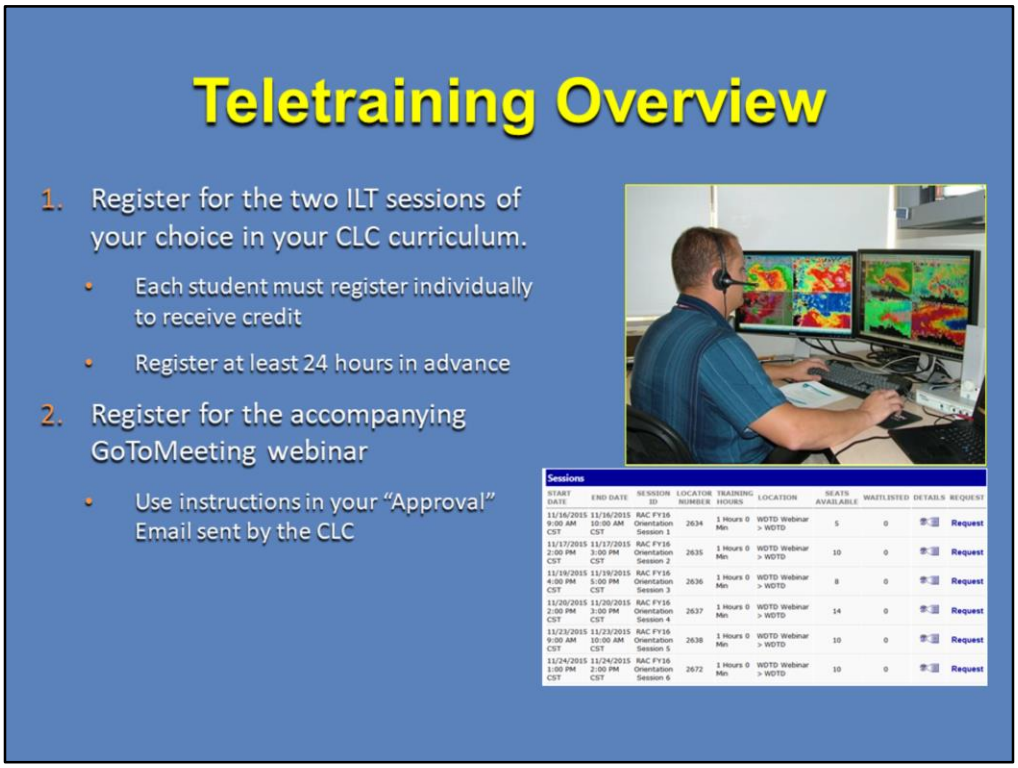
- Covers concepts, products and tools useful for flash flood forecasting and decision-making
- Delivery method
  - Instructor guided web modules
- Completion time
  - 2-2.5 hours

Topic: Warning Fundamentals

- "Polygonology" and wording of warnings
- Delivery Method
  - Instructor guided web modules
  - Instructor-led training
- Completion time
  - 4 hours

Topic: Warning Fundamentals (Cont'd)

Lesson Title	Time
Drawing the Warning, Part 1: Fundamentals	10 min
Drawing the Warning, Part 2: Additional Considerations	6 min
Drawing the Warning, Part 3: Complex Scenarios	10 min
Warning Content: Impact-Based Warnings	10min
After the Warning Is Issued: Continuation, Cancellation, and Expiration	7 min
Impact-Based Warnings (2 modules plus 5 exercises)	2 hours
Convective Storms & Warning Fundamentals ILT	2 hours



Teletraining means we train live over the internet, like what you're doing now.

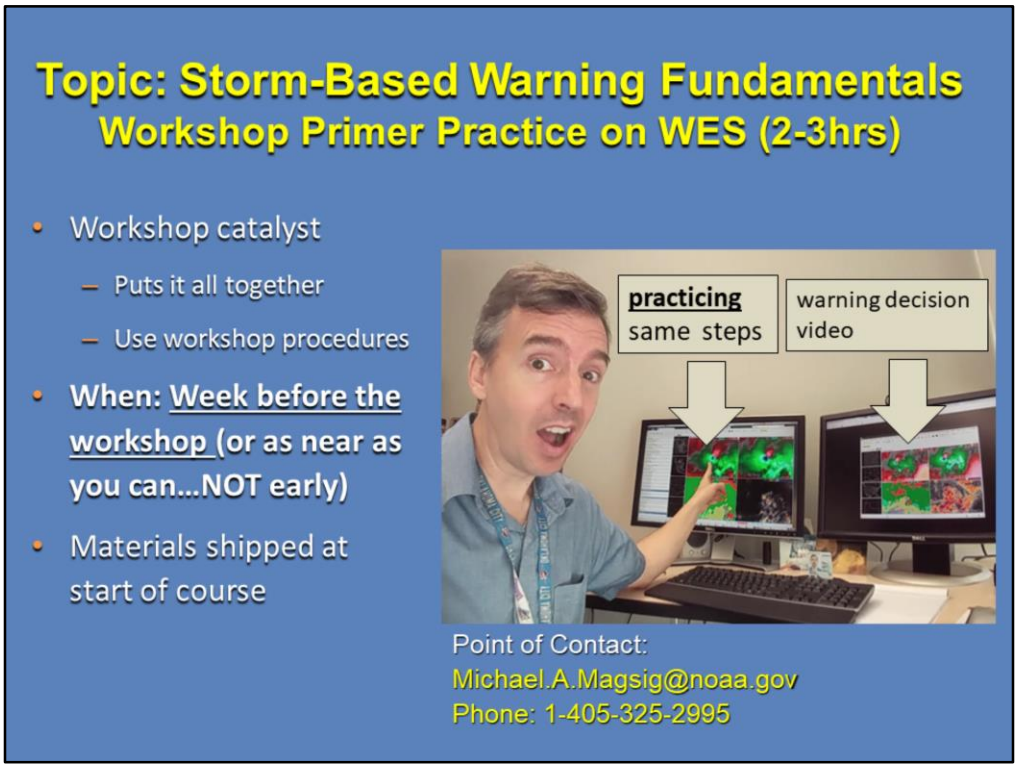
After this Orientation teletraining session is over, you will have two more: One at the end of the Based and Derived Products topic and another at the end of the Warning Fundamentals topic. The registration steps are:

1. Register for the instructor-led training (ILT) session of your choice in your Commerce Learning Center (CLC) curriculum. Each student must register individually to receive credit in the CLC, even if multiple students from the same office attend the same session. Register at least 24 hours in advance.
2. Register for the accompanying GoToMeeting webinar using instructions in your "Approval" Email sent by the CLC. Contact WDTD (nws.wdtd.rachelp@noaa.gov) if the Email hasn't arrived within 24 hours (should come in just a few minutes)

Note…The audio for each session is via WDTD's RAC Line, 1-866-564-5812. Student passcode is 2094167#

Teletraining Protocol

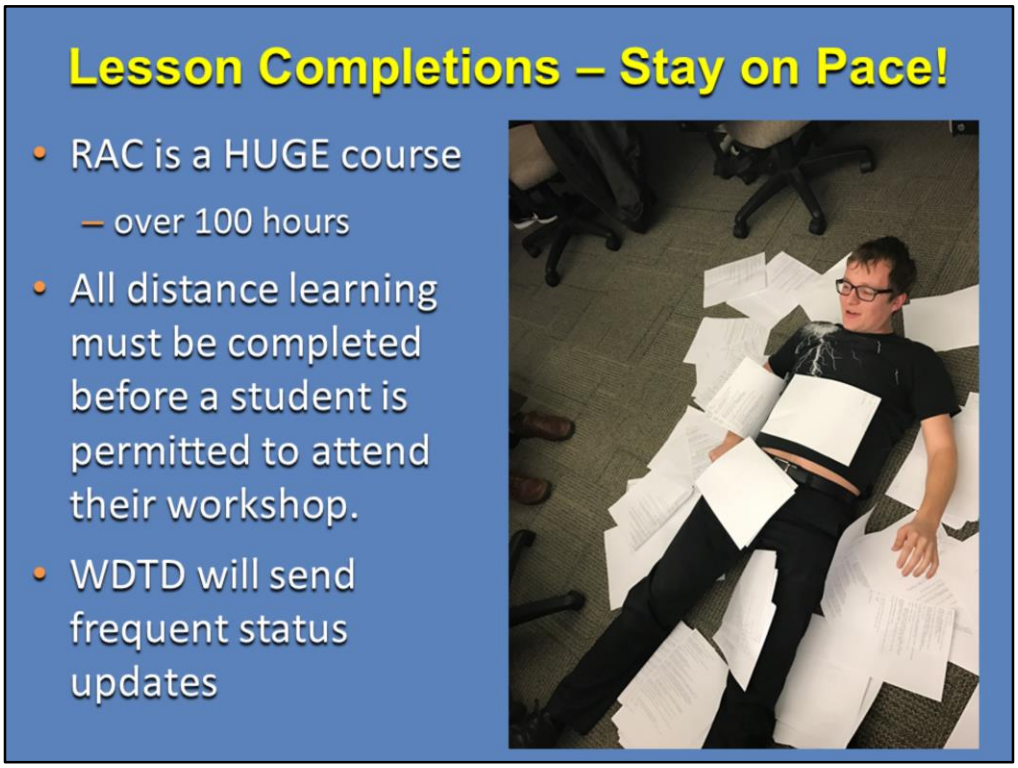
- Dedicate time for your session
  - *"Do not disturb!"*
- Keep phones muted, not on hold
- Expect interaction
  - *Direct questions*
  - *Quiz questions*
  - *Annotate features*



One very important exercise that will prepare you for the week of simulation nirvana at the workshop is the Workshop Primer. In this catalyst for the workshop, you will start to put everything together to issue warnings on WES, and you will get a head start on using workshop AWIPS procedures.

The videos will play on one monitor and you will practice the same steps on the other monitor.

The workshop primer should be completed the week before the workshop (or as near as you can and NOT early), so you are refreshing your skills right before you come to the workshop to maximize your growth in the workshop.



Please be aware that RAC is a **HUGE** course (over 100 hours) and all distance learning must be completed before a student is permitted to attend their RAC workshop. Thus, it's important to stay on pace. It takes a big time commitment from the student and support for that time commitment from co-workers and the management team.

The RAC Project Manager (Bobby Prentice) will send frequent status updates which include the latest "RAC Training Completion Report" and a course completion timeline in order to keep you up with the pace.

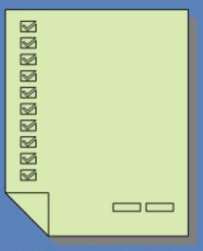
RAC Workshop

- Sessions include:
  - Warning Decision and You
  - Warning Methodology
  - Mini-Scenarios
  - Flash Flood Forecasting
  - Flash Flood Lab (pt 1 & 2)
  - Warning Issuance
  - Simulation Scenarios
  - Communication and Team Dynamics
  - Hazardous Weather Testbed (HWT) Visit
  - Storm Prediction Center (SPC) Visit

The Workshop is the culmination of RAC. It brings together everything you've learned, and more, into a laboratory and simulation environment. Most of your time at the workshop will be in the lab. Typically, you'll work with two (2) other forecasters and go through events in displaced real-time together.

RAC Workshop
Prerequisites

- **All** distance learning must be completed before the workshop, including:
  - All end-of-lesson quizzes
  - AWIPS Proficiency Test
  - WES Exercises
  - Workshop Primer
- Arrive at workshop "warning ready" including:
  - AWIPS "knobology"
  - WarnGen fundamentals



Put me in Coach. I'm ready to play!

You must complete all distance learning components before you may attend the workshop including: Lessons quizzes, AWIPS Proficiency Test, WES exercises, and the Workshop Primer. Students must arrive at the workshop "warning ready" including AWIPS "knob-ology" and WarnGen fundamentals. We want you to get the basics out of the way so we can work on your higher order warning forecaster skills at the workshop.

RAC Workshop
Delivery Method

- In-residence at the National Weather Center (NWC)
- Workshop:
  - Nov 18-22, 2019
- You will be automatically registered in the CLC

- Completion time
  - 40 hours (8 am Monday - 5 pm Friday)
  - Many students will not be able to fly home until Saturday!

Workshop lodging will be at the National Center for Employee Development (NCED) Conference Center and Hotel located three miles east of the National Weather Center (NWC) in Norman. Most of the hotel's guests are postal service employees in-training as students in the NCED Training Facility on the same grounds across the street. You will be asked to provide WDTD with your travel information in the RAC curriculum section of your NWS CLC account.

WDTD will provide post-workshop observations and feedback to both students and their training facilitators based on instructor observations during the RAC lab simulations. The goal is to improve warning performance at their home office after completing RAC. WDTD will accomplish this by providing actionable opportunities to further improve warning performance.

Training facilitators should contact the RAC Project leader (Robert.A.Prentice@noaa.gov) if they **do not** want their office to receive this information.

Facilitator Responsibilities

Ensure Students Follow the Course Completion Timeline!

RAC FY20, Class 2 - Completion Timeline (Begins Oct 16, 2019; Workshop Feb 3-7, 2020)

Orientation Instructor-Led-Training (ILT) session (1 hour)	Class Begins	Intro to the WSR-88D System (1 hour)	Principles of Radar (6 hours)	Velocity Interpretation (45 minutes)	Base and Derived Products (7 hours)	Base and Derived Products ILT session* (2 hours)	Winter Weather Applications (1 hour)	AWIPS Convective Warning Fundamentals** (18 hours)	Convective Storm Structure and Evolution (16 hours)	Flash Floods (4 hours)	Storm-Based Warning Fundamentals (5.5 hours)	Convective Storms & Storm-Based Warning Fundamentals Instructor-Led-Training session* (2 hours)	Workshop Primer*** (4 hours)	Workshop**** (40 hours)
		Recommended completion by	Recommended completion by	Recommended completion by	Deadline	Deadline	Recommended completion by	Recommended completion by	Recommended completion by	Recommended completion by	Deadline	Deadline	Deadline (due 1BZ)	
10/15/2019	10/16/2019	10/17/2019	10/27/2019	10/29/2019	11/11/2019	11/12/2019	11/12/2019	12/11/2019	1/7/2020	1/14/2020	1/23/2020	1/24/2020	1/31/2020	Feb 3-7, 2020

*Students must attend one of the Instructor Led Training (ILT) sessions by the listed deadline.

**Meteorologist Track students must complete AWIPS Convective Warning Fundamentals (which is also a separate stand-alone course) before they begin the Convective Storm Structure and Evolution topic's Applied Performance Drills section.

***Meteorologist Track students should take the Workshop Primer the week before their workshop so they arrive at the workshop "warning ready" including AWIPS "knob-ology" and WarnGen fundamentals. We want them to get the basics out of the way so we can work on their higher order "warning forecaster" skills at the workshop.

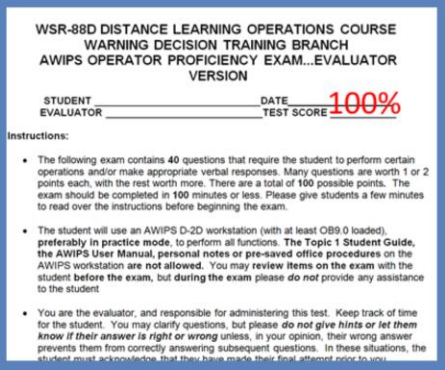
****Be aware that RAC is a HUGE course (64 hours of distance learning, plus a 40 hour workshop, 104 total hours) and all distance learning lessons must be completed before a student is permitted to attend the RAC workshop. If a student hasn't completed all of the lessons, he/she must wait until the next workshop opening to complete the course.

- Coordinate scheduling of training events
  - Ensure no office conflicts
- Monitor progress
- Provide time/support
  - Reach out to WDTD if necessary

Your training facilitator plays a critical role. He/she must: coordinate the scheduling of training events, monitor your progress and provide time and support and reach out to WDTD if necessary. Your training facilitator is our partner in this. We all want you to have a great training experience.

Facilitator Responsibilities
AWIPS Proficiency Test

- Install & test WES exercise materials
  - Testing instructions provided with AWIPS Convective Warning Fundamentals
- Proctor AWIPS Proficiency Test before the workshop



WSR-88D DISTANCE LEARNING OPERATIONS COURSE
WARNING DECISION TRAINING BRANCH
AWIPS OPERATOR PROFICIENCY EXAM...EVALUATOR VERSION

STUDENT _____ DATE_____
EVALUATOR _____ TEST SCORE 100%

Instructions:

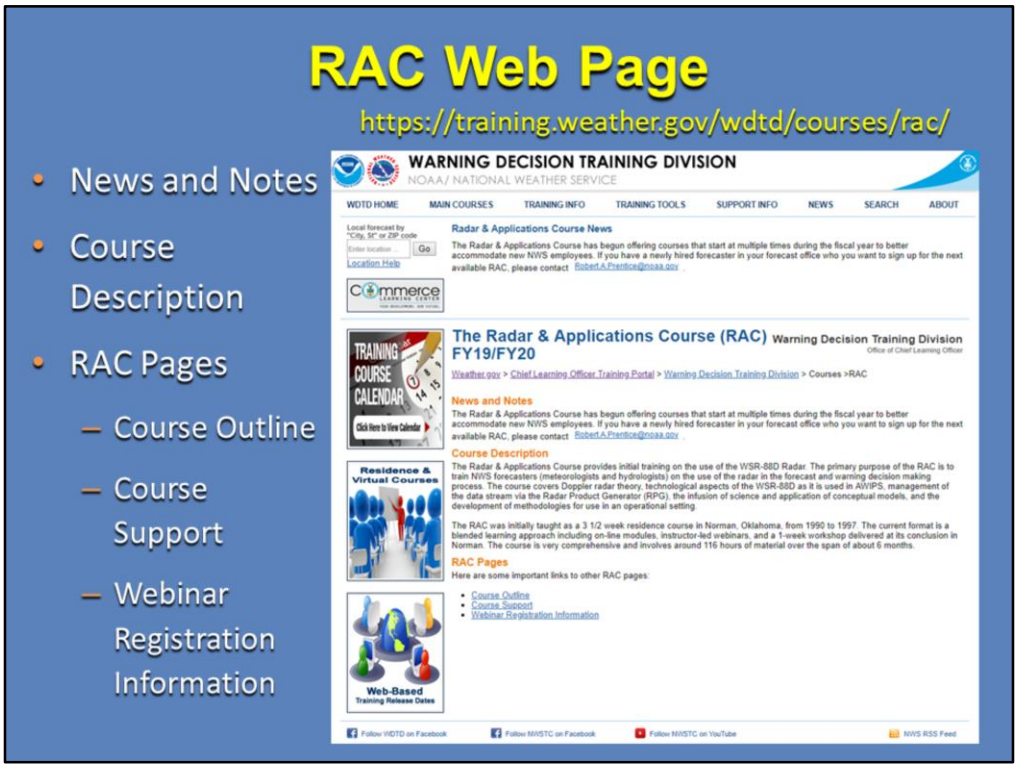
- The following exam contains **40** questions that require the student to perform certain operations and/or make appropriate verbal responses. Many questions are worth 1 or 2 points each, with the rest worth more. There are a total of **100** possible points. The exam should be completed in **100** minutes or less. Please give students a few minutes to read over the instructions before beginning the exam.
- The student will use an AWIPS D-2D workstation (with at least OB9.0 loaded), **preferably in practice mode**, to perform all functions. **The Topic 1 Student Guide, the AWIPS User Manual, personal notes or pre-saved office procedures** on the AWIPS workstation **are not allowed.** You may **review items on the exam** with the student **before the exam,** but **during the exam** please ***do not*** provide any assistance to the student
- You are the evaluator, and responsible for administering this test. Keep track of time for the student. You may clarify questions, but please ***do not give hints or let them know if their answer is right or wrong*** unless, in your opinion, their wrong answer prevents them from correctly answering subsequent questions. In these situations, the student must acknowledge that they have made their final attempt prior to you

Facilitators must also install and test the WES exercise materials and proctor the AWIPS Proficiency Test in advance of the Workshop. Testing instructions will be provided with AWIPS Convective Warning Fundamentals.

It is important for the facilitator to verify the WES is set up and works. We will have guidance provided with the AWIPS Convective Warning Fundamentals release.

Schedule of Events

RAC FY20-2 Schedule (begins Oct 16, 2019; Workshop Feb 3-7, 2020)		
Event	**Date**	**Time (Z)**
AWIPS Fundamentals videos, Applied Performance Drills videos, AWIPS Proficiency Test, Workshop Primer arrive	10/15/2019	
Orientation Instructor-Led-Training (ILT) session	10/15/2019	18-19Z
RAC FY20, Class 2 Begins	**10/16/2019**	
Base & Derived Products ILT, session 1	10/31/2019	18-20Z
Base & Derived Products ILT, session 2	11/12/2019	18-20Z
Convective Storms & Warning Funds ILT, session 1	1/14/2020	18-20Z
Convective Storms & Warning Funds ILT, session 2	1/24/2020	18-20Z
Workshop	**02/03/2020 to 02/07/2020**	



The RAC web page is a good source for course information and support. Note…although the course outline has links to lessons on our WDTD web site and the CLC, you must access the lessons from your RAC curriculum on the CLC to receive credit.

There are four sources of RAC support:

1. Your office's training facilitator (usually your SOO or DOH).
2. RAC Web page
3. The RAC Help Email list which contacts the entire WDTD RAC Team. This is better for general inquiries and quick responses (for example, instructor is out of the office).
4. Contact instructors directly

The RAC Project Manager (Bobby Prentice) will also send RAC status updates via e-mail.

If you have questions, be sure to ask them at the Orientation instructor-led-teletraining session or contact nws.wdtd.rachelp@noaa.gov