COLORADO™

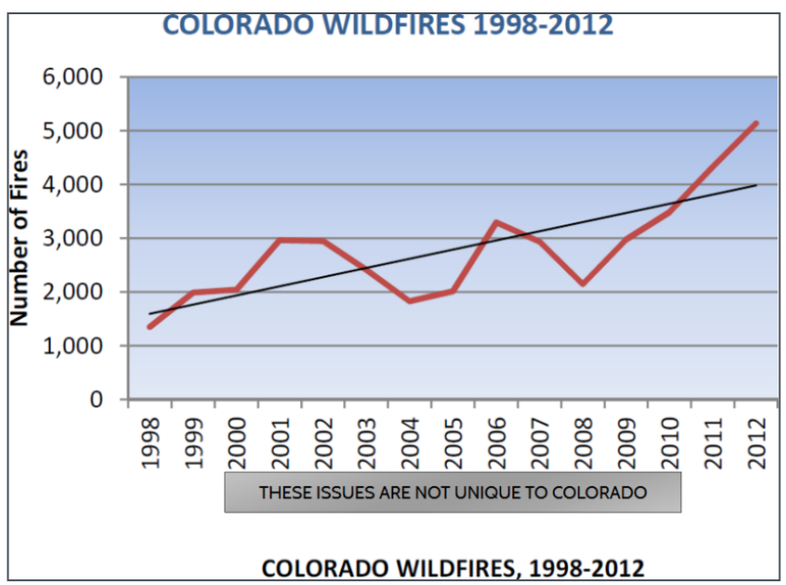
DFPC's Toolbox

Colorado Fire Prediction System (CO-FPS)

COLORADO
Department of Public Safety

Wildfire in Colorado

- 68% of Colorado's forested lands are under federal jurisdiction
- The Wildland-Urban Interface in Colorado is currently 1.1 million acres, and is projected to increase to 2.2 million acres by 2030
- Fire seasons are increasing in activity and length, leading to increased suppression costs



DFPC's Wildfire Management Goal

. . . keep all wildfires with values at risk smaller than 100 acres and to suppress all fires in Wildland Urban Interface (WUI) areas at less than ten acres, 98% of the time.

Colorado's New Tools

- Multi-Mission Aircraft
  - Early detection, persistent surveillance, air attack, and many more missions in one package
- Colorado Wildfire Information Management System (CO-WIMS)
  - One-stop-shopping for: decision support tools, collaborative mapping, remote sensing data, and risk assessment
- Quick-Reaction Suppression Tools
  - Single Engine Air Tankers (SEATs)
  - Type II and Type III helicopters with helitack crews
  - DFPC & State/Local Interagency Engines
- Colorado Center of Excellence for Advanced Technology Aerial Firefighting (Center of Excellence)
  - Technology and Policy Improvement

Multi Mission Aircraft (MMA)

- Once airborne, the aircraft can be on-scene of an incident anywhere in Colorado within one hour

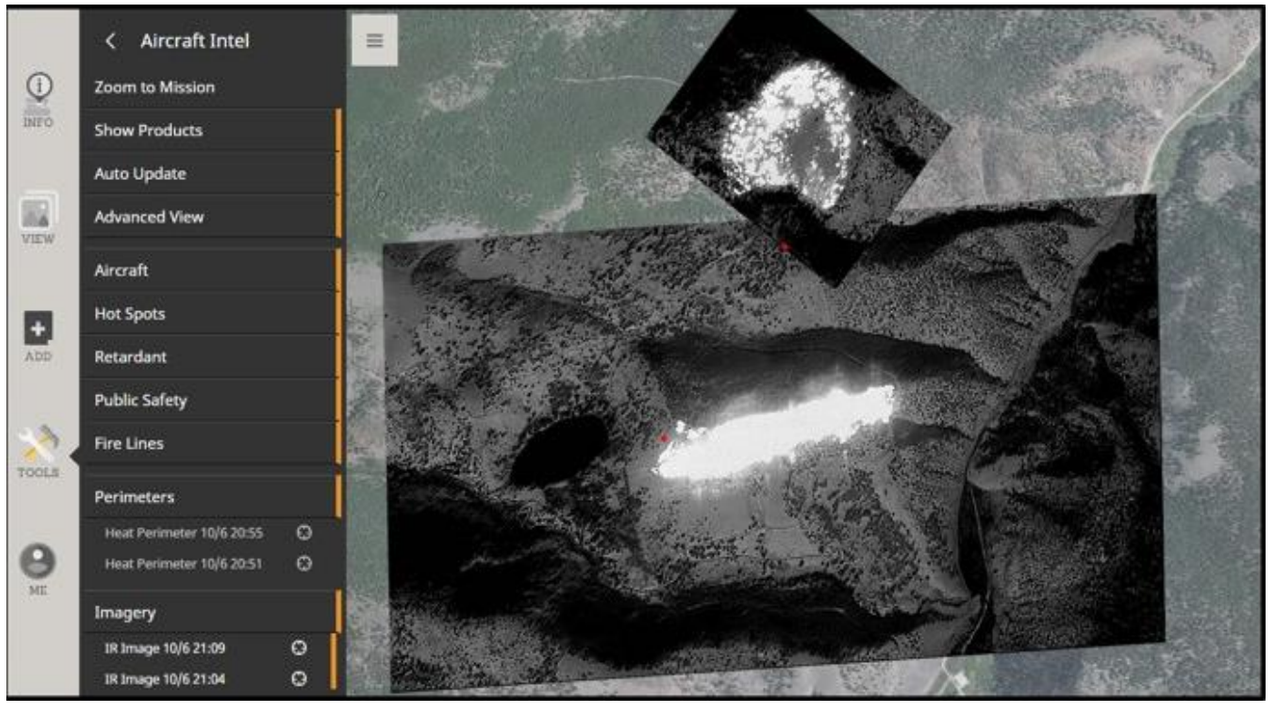
- 2015 Wildfire Season Statistics:
  - 437 hours flight time
  - 25 detection missions resulting in 40 new fires detected and reported to the appropriate dispatch center
  - 32 large fire surveillance/imagery missions
  - 5 Search & Rescue Missions

MMA & CO-FPS

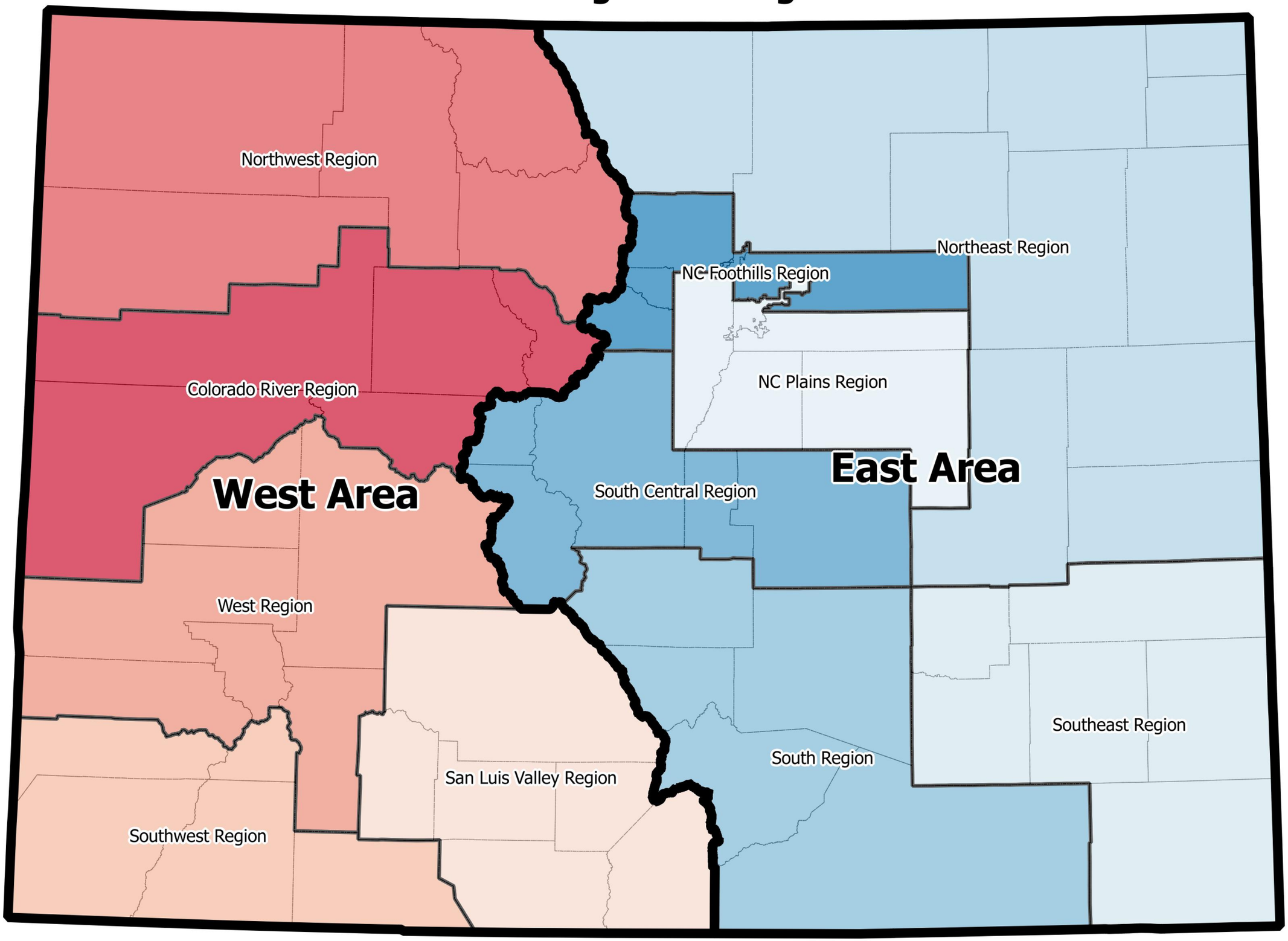
MMA maps the fire perimeter

Perimeter data loaded into CO-WIMS

CO-FPS model is initiated from CO-WIMS



Colorado Division of Fire Prevention and Control
Fire Management Regions



State Fire Management Officers and CO-FPS

- As CO-FPS becomes operational, DFPC FMOs will receive training in its use and will be able to serve as points of contact regarding the system for cooperators in their region

- DFPC FMOs will continue to be responsible for supervising state suppression assets and coordinating state fire support in their regions

Aerial Wildland Fire Suppression

- DFPC contracted for two single engine air tankers (SEATS) during the 2015 fire season
- SEATS flew 104 hours on 24 fires during 2015
- DFPC contracted for two type III helicopters and one type II helicopter during the 2015 fire season
- Combined, DFPC helicopters flew 267 hours on 60 initial attack fires and 48 large fires during 2015, delivering 198,000 gallons of water

Ground Wildland Fire Response

- DFPC operates four wildland fire engines staffed with exclusively state personnel
- DFPC operates four engines staffed jointly by state and local personnel
- DFPC fire engines made 221 responses in 2015 in support of local and federal agencies

Firefighters and CO-FPS

- DFPC resources will continue to operate under the Incident Command System, and will still rely on National Weather Service fire forecasting

- The ability to visualize CO-FPS products in CO-WIMS will supplement existing weather and predictive services information available to firefighters

- Fire aviators will be able to access predictions from CO-FPS regarding aviation hazards such as turbulence and wind shear

Incident Management Teams

- DFPC personnel hold a wide array of fire qualifications and serve on local and national incident management teams

- CO-FPS will initially be available to teams on a limited basis, with new features becoming available to teams as they are developed and validated

Local & Federal Cooperators

- DFPC supports our wildland cooperators through training, fire funding, FEPP engines, and grant making
- CO-WIMS access is available free of charge to cooperators
- As CO-FPS becomes operational it will also be available for cooperators to use through their CO-WIMS login

Center of Excellence for Advanced Technology Aerial Firefighting

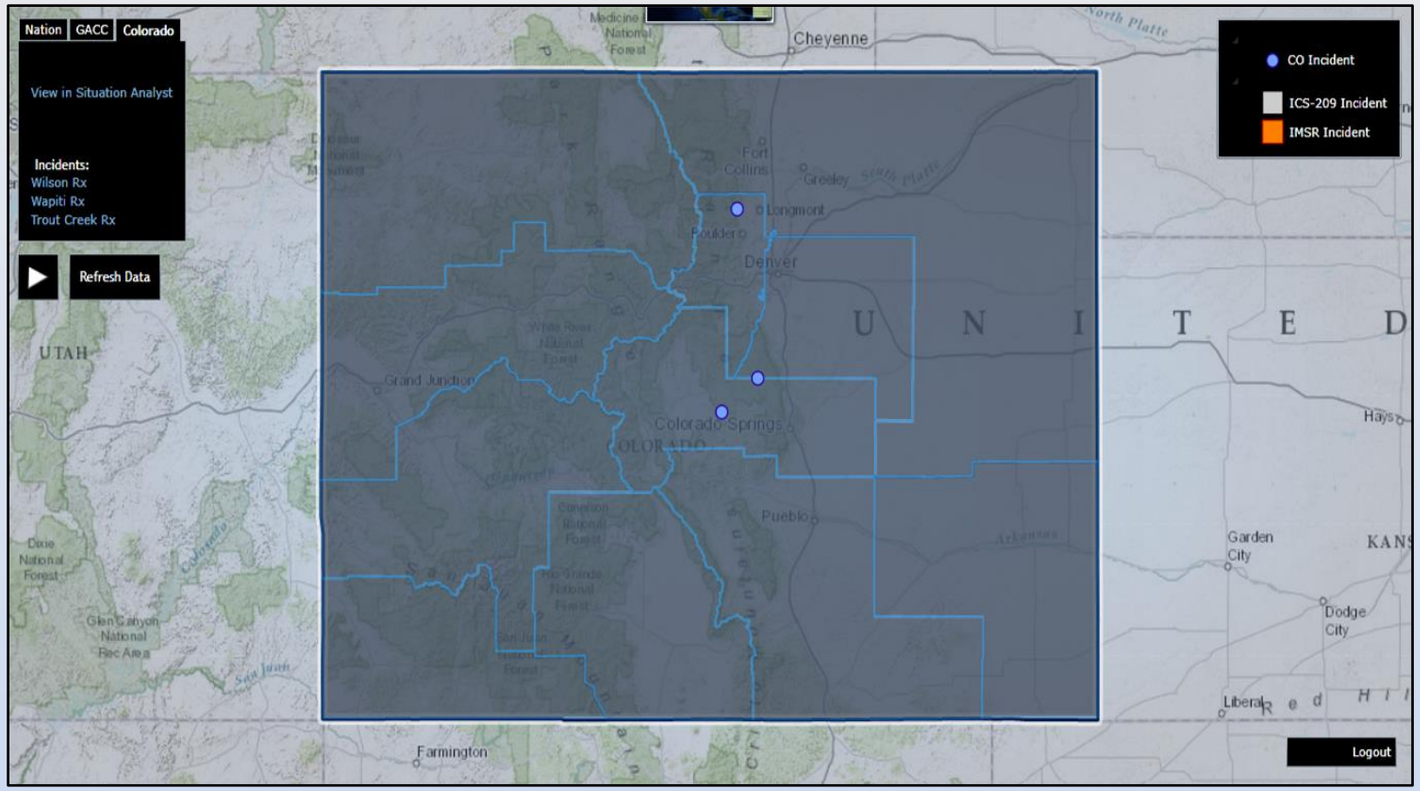
- Responsible for the development of CO-FPS as directed in House Bill 15-1129

- Mission of the Center is to "…research, test, and evaluate existing and new technologies that support sustainable, effective, and efficient aerial firefighting techniques."

- The Center of Excellence is also researching the use of unmanned aerial systems on wildland fires, and night aerial firefighting operations

CO-WIMS

Colorado Wildfire Information Management System



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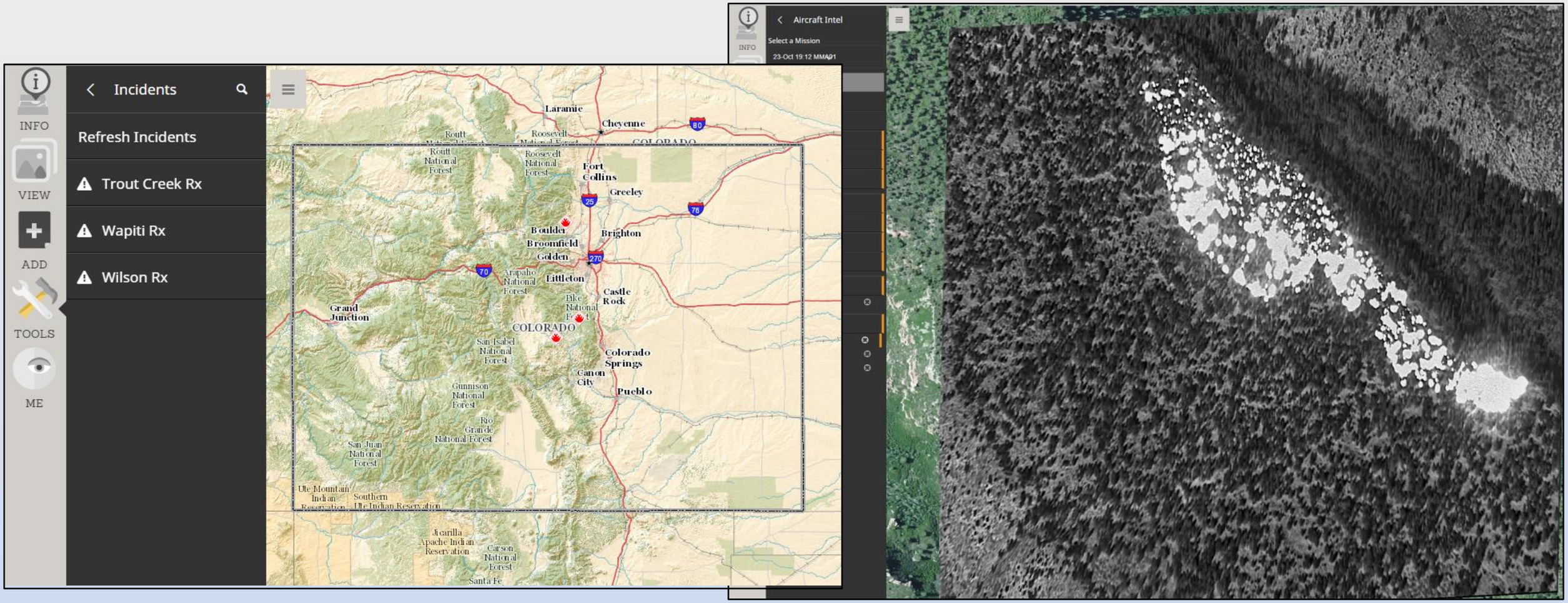
2015

Why Should I Care About CO-WIMS?

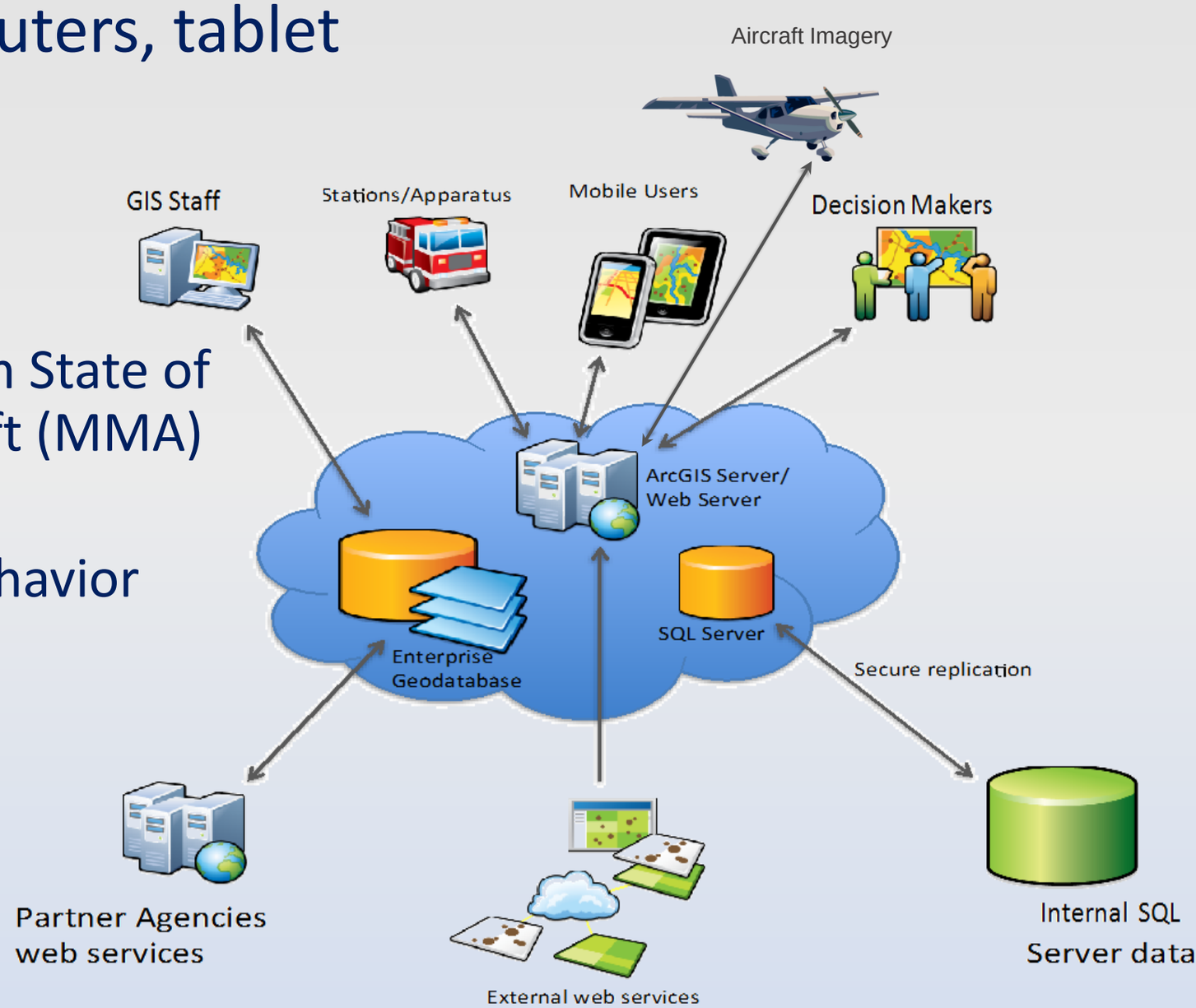
- CO-WIMS brings you
  - An up-to-date picture of the wildfire situation across the state (and beyond, actually – across the US)
  - <u>Maps, and imagery from MMA aircraft of wildfire incidents in Colorado</u>



What is CO-WIMS?

A multi-device decision-support system

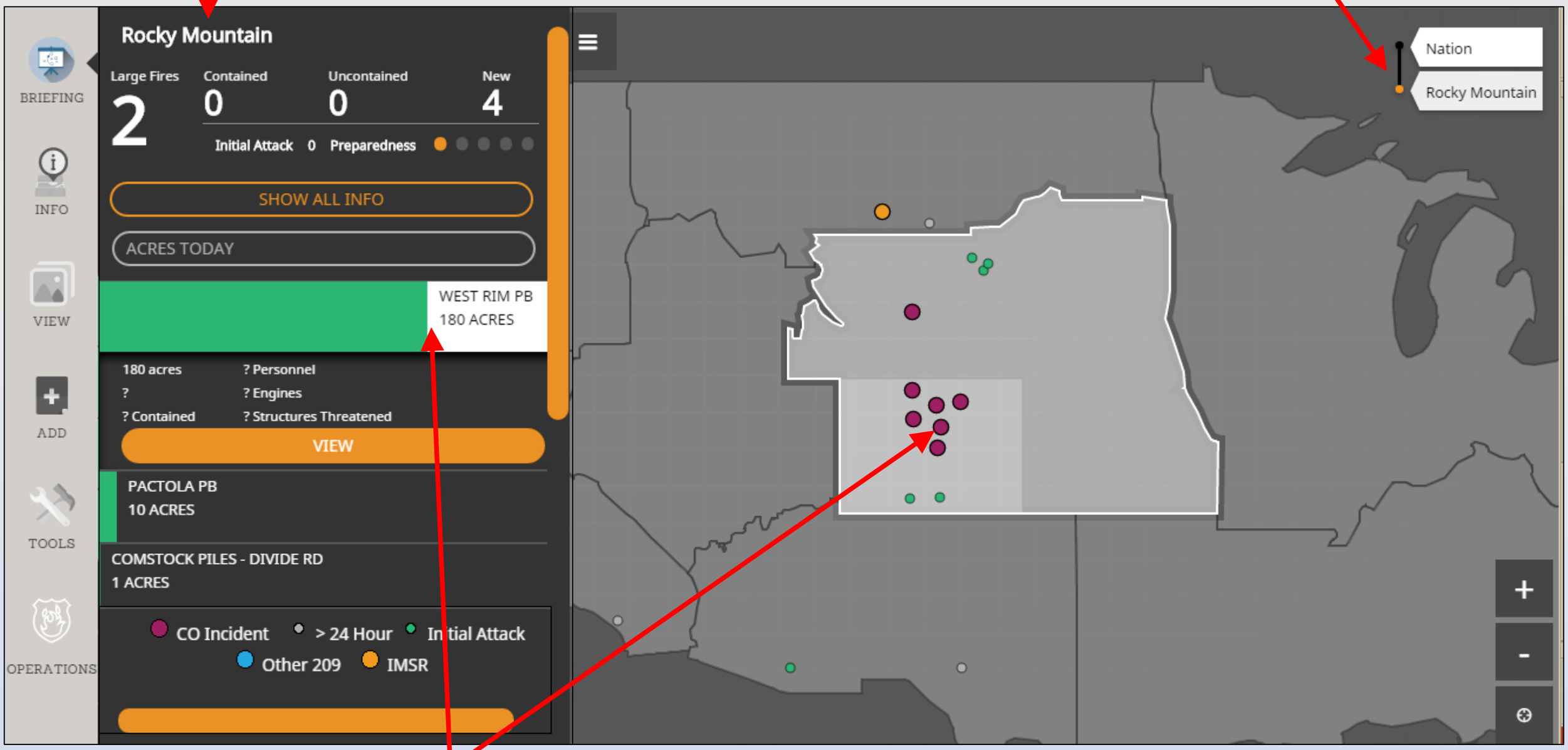
- On desktop and laptop computers, tablet devices, and smart phones
  - Web-based, iOS, and Android
- Access to:
  - Near real-time aircraft intel from State of Colorado's Multi-Mission Aircraft (MMA)
  - National fire and resource info
  - Weather, fuels, potential fire behavior
  - Colorado Data and Resources
- Mapping & Reporting
  - Create and track incidents
  - Map incidents
  - Map special risks



Briefing Mode: Regional and State

Summary of information
(Nation, Region, and Incident)

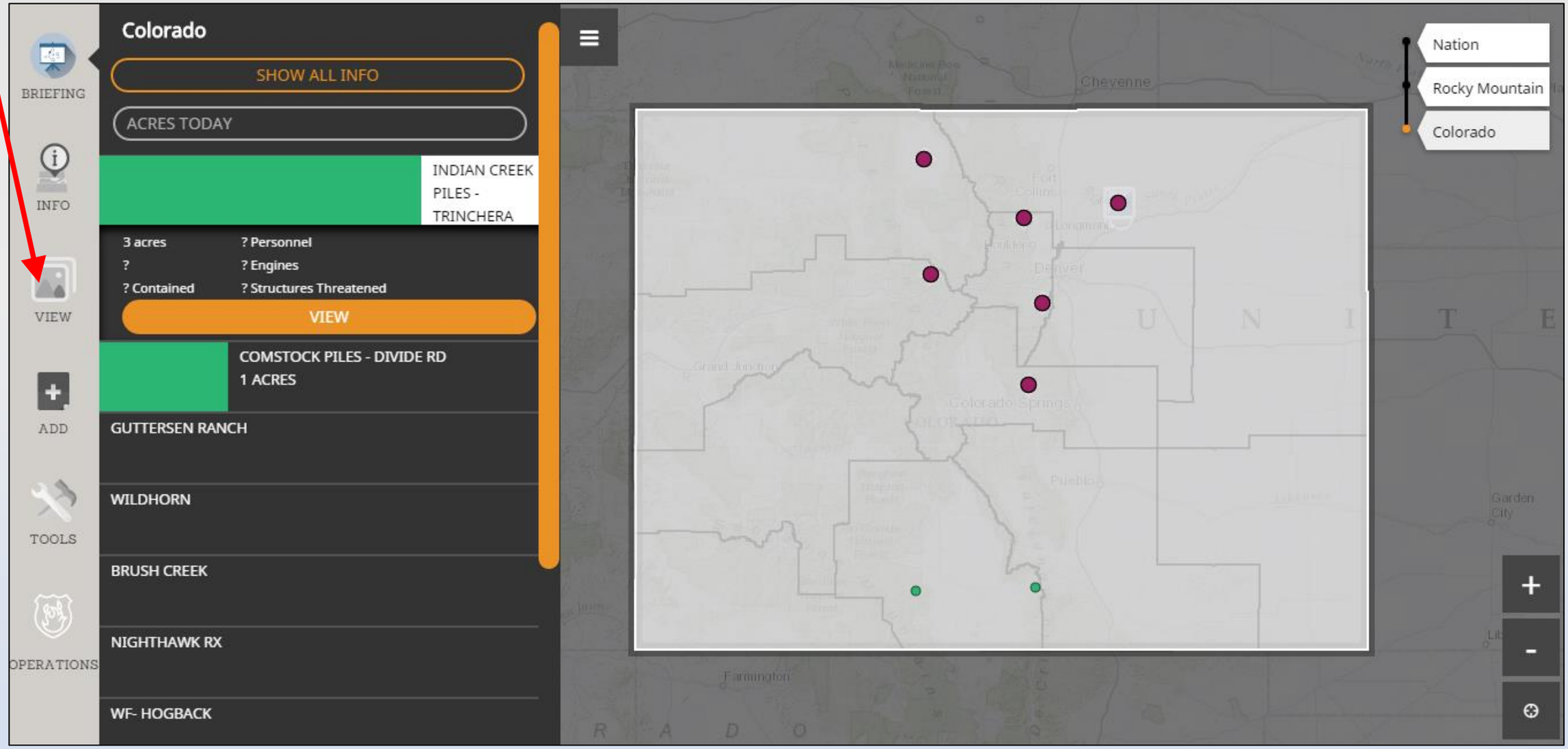
Zoom to Nation, GACC or State



Click on a fire name or map location
to get summary information

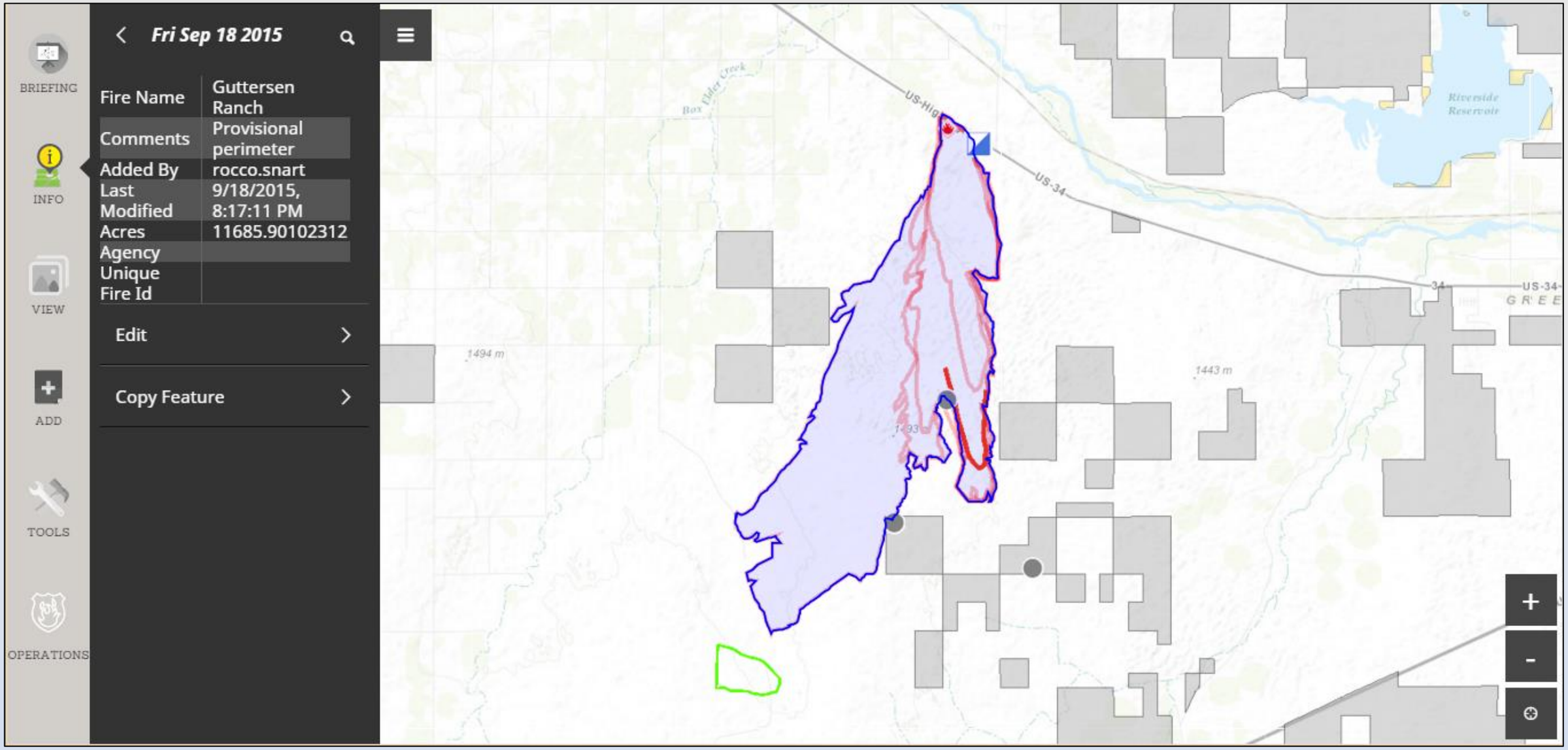
Briefing Mode: Regional and State

Switch to tactical views for detailed incident information



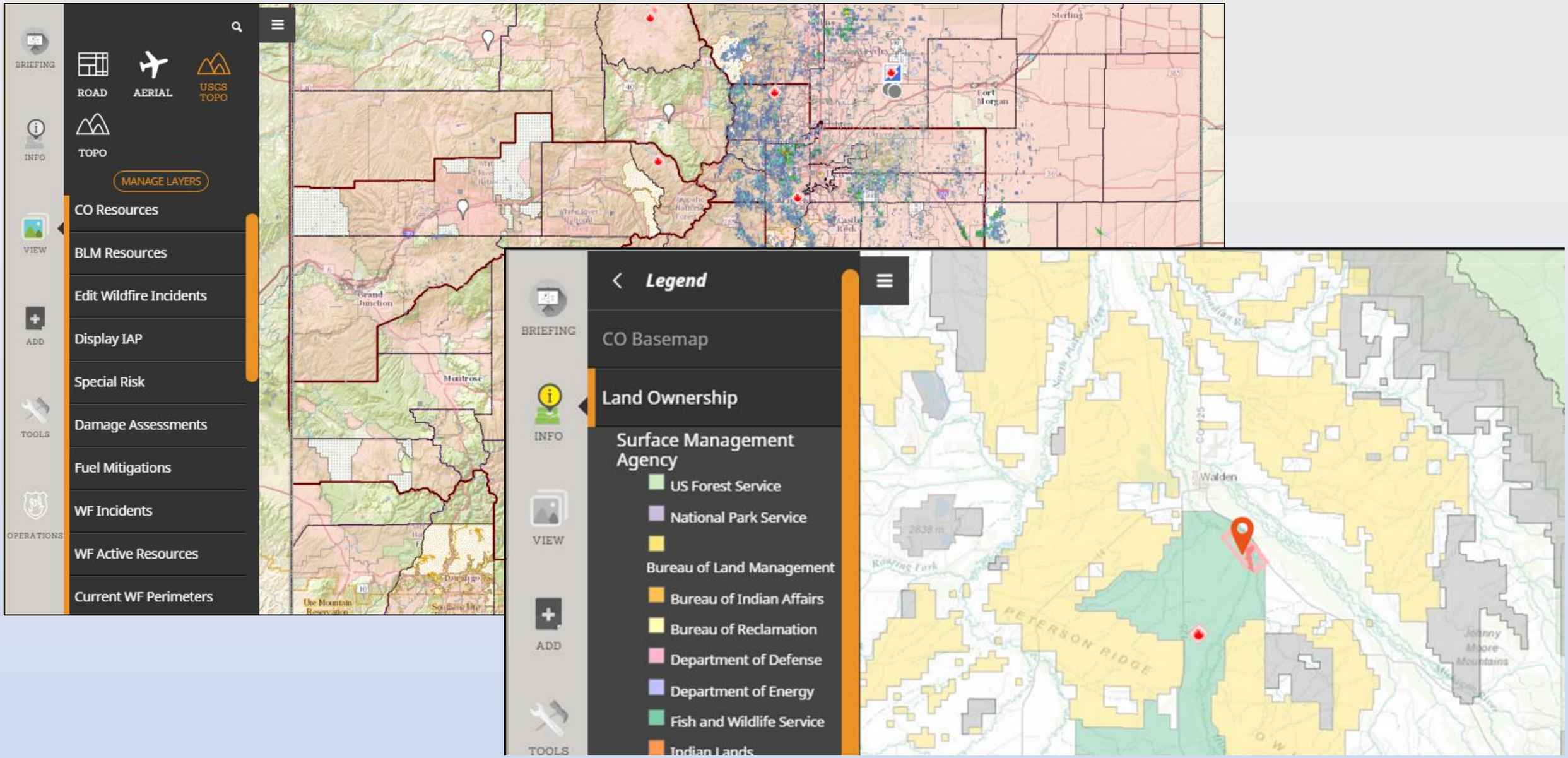
Tactical Mode: Collaborative Mapping

- Map fire perimeter, structures, critical infrastructure, sensitive areas, and damage assessments



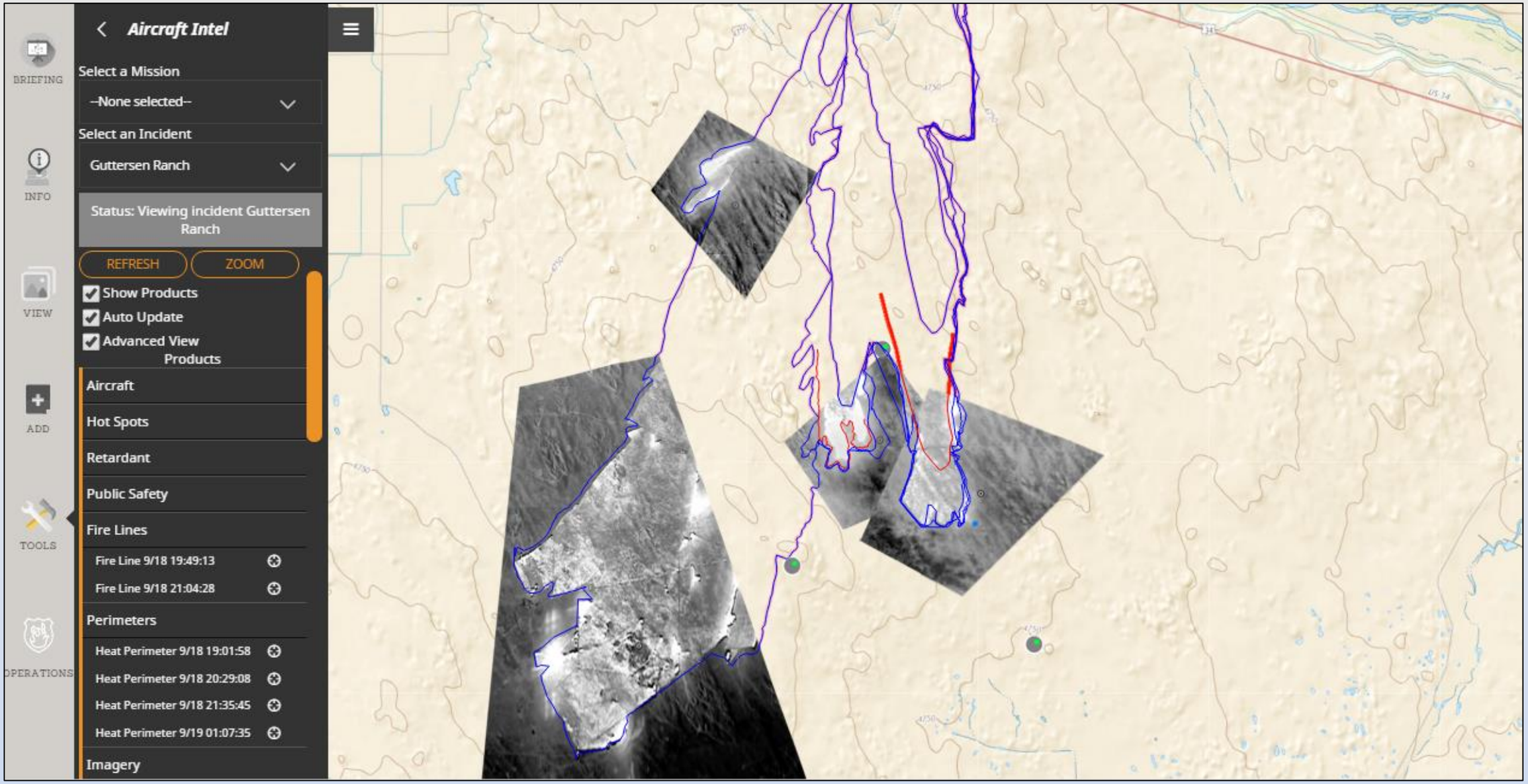
Data Sources

- Property ownership, values, watersheds, structures, MODIS hot spots, weather, precipitation, CO-WRAP, and many other data layers are available



Aircraft Intel

- Imagery, video, and key points of intelligence delivered to CO-WIMS (Situation Analyst) in near real-time from the aircraft



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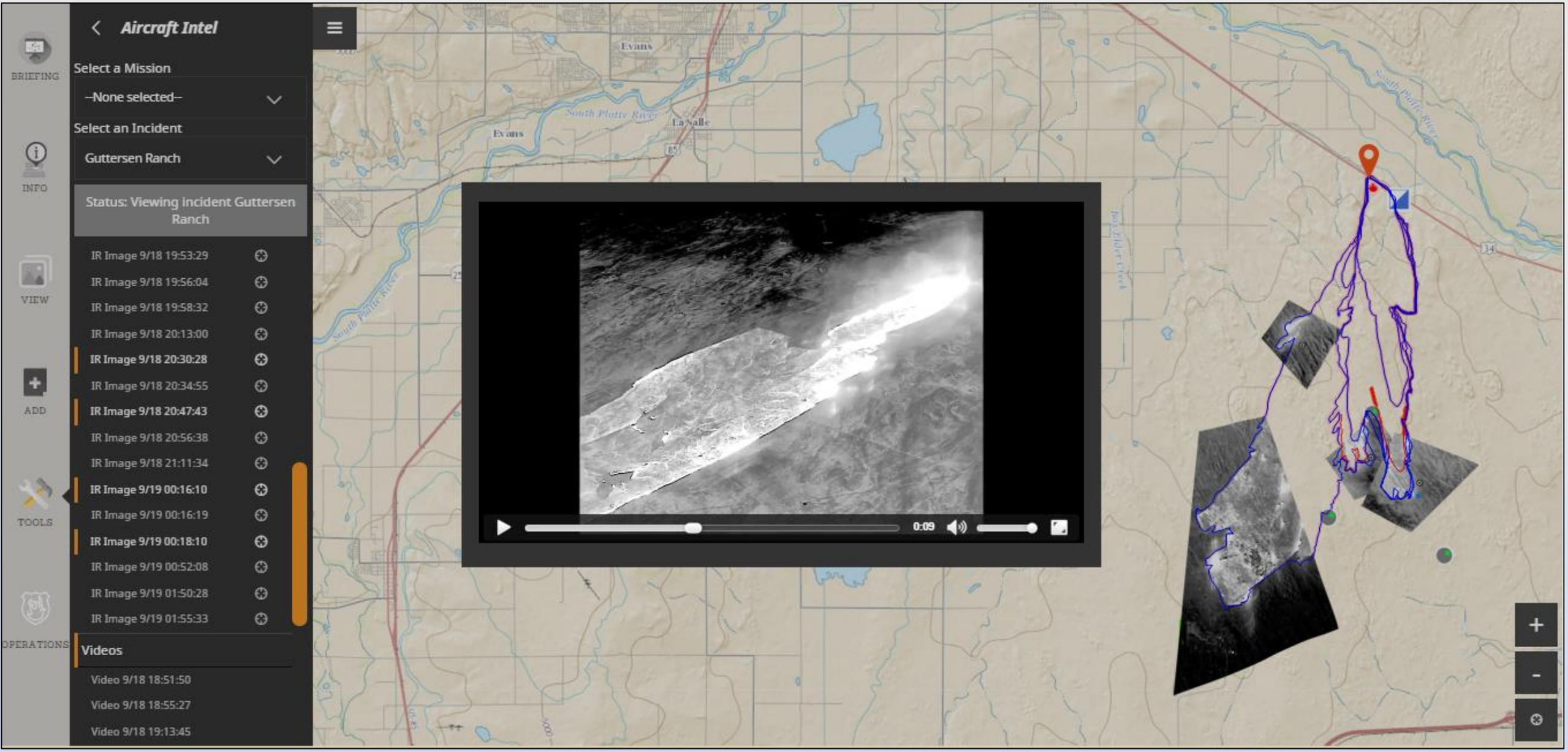
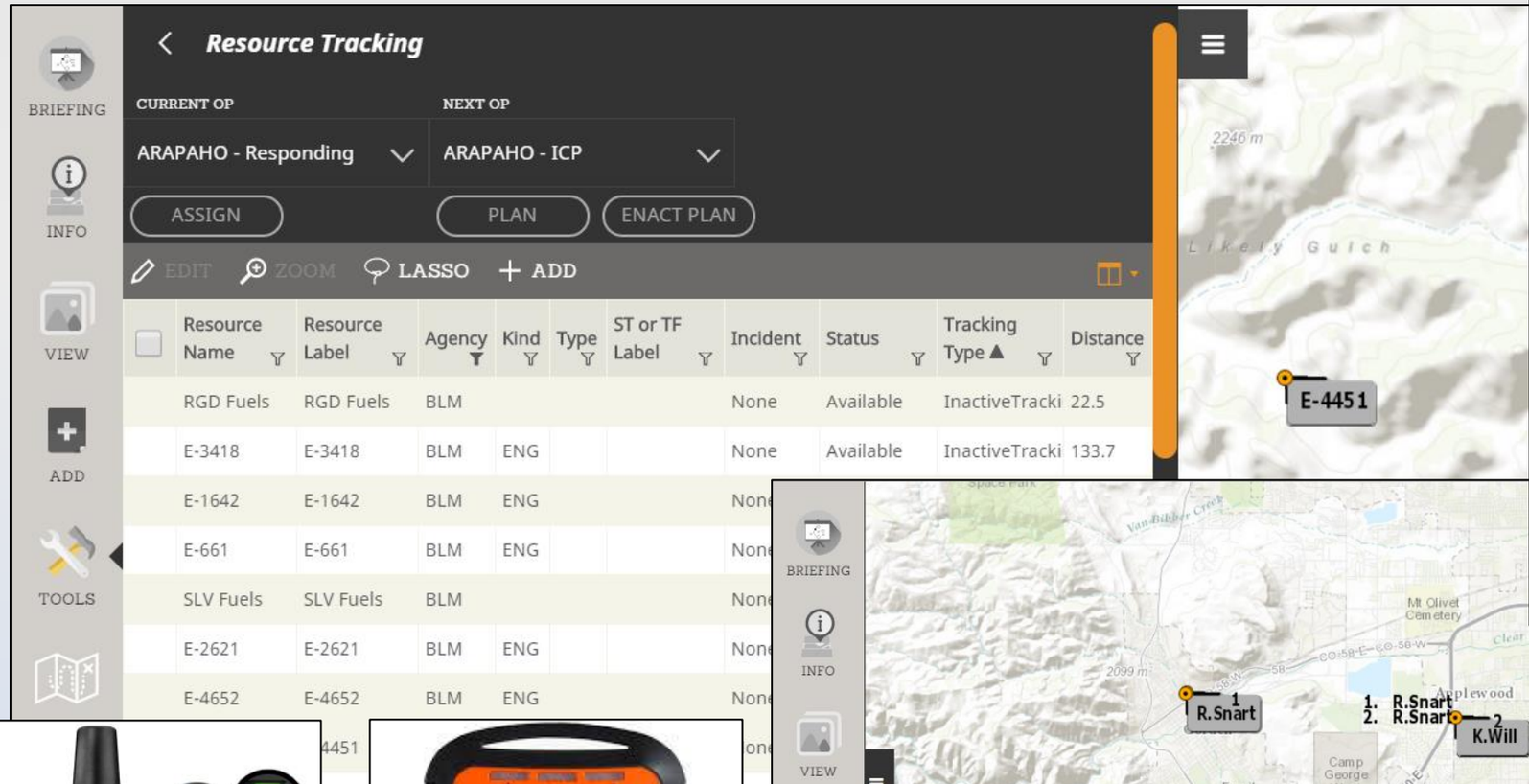
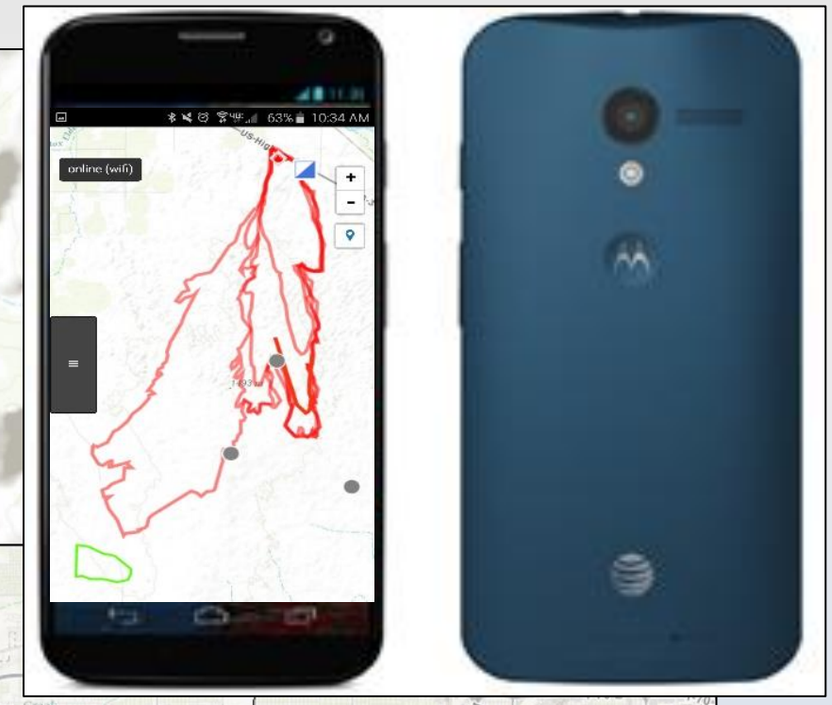
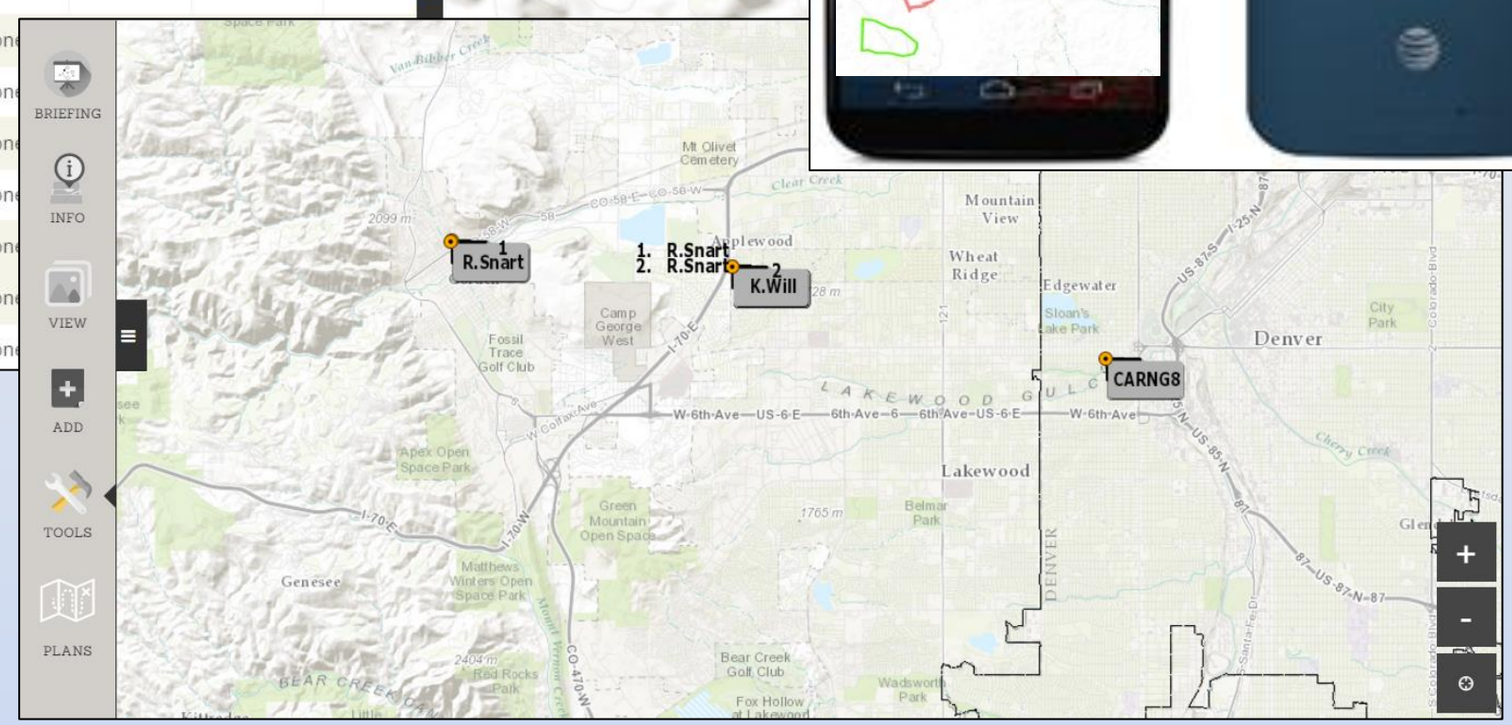


Resource Tracking and Management

- Tracking of Mobile Resources (SPOT, Delorme, Intterra Mobile App)
- Ability to send resource picture to MMA



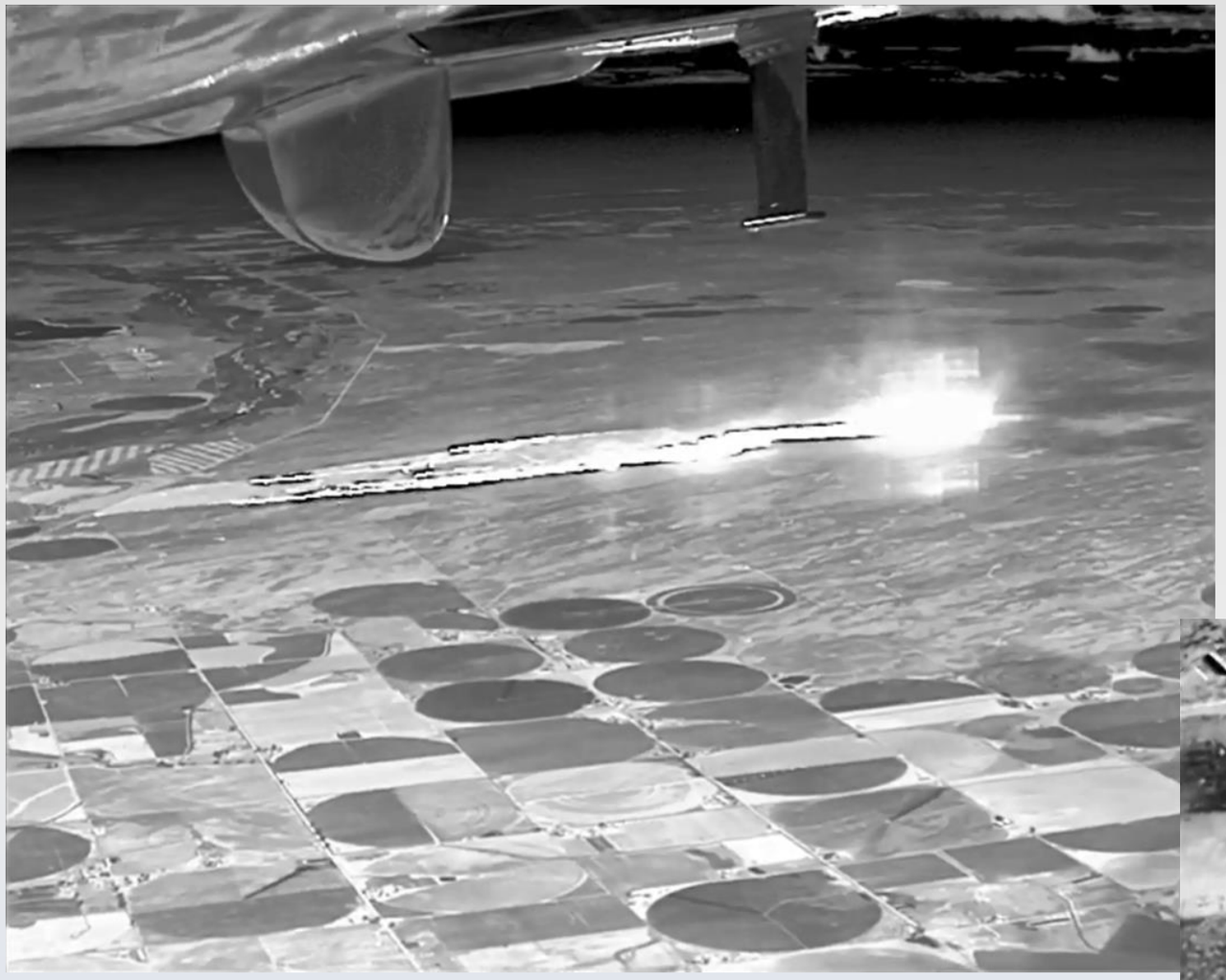




Everyone sees this *Common Picture* immediately

intterra
making better happen faster.

Questions?



Colorado

Multi Mission Aircraft

& CO-WIMS

Rapid Attack Capabilities

- Heli-Tankers
  - Type II and Type III helicopters with helitack crews
  - Provide quick reaction suppression to small fires in remote areas of Colorado wilderness
- Single-Engine Air Tankers
  - Pre-positioned throughout the state based on risk assessment
- All aircraft can be launched within 20 minutes of notification

The Multi-Mission Aircraft

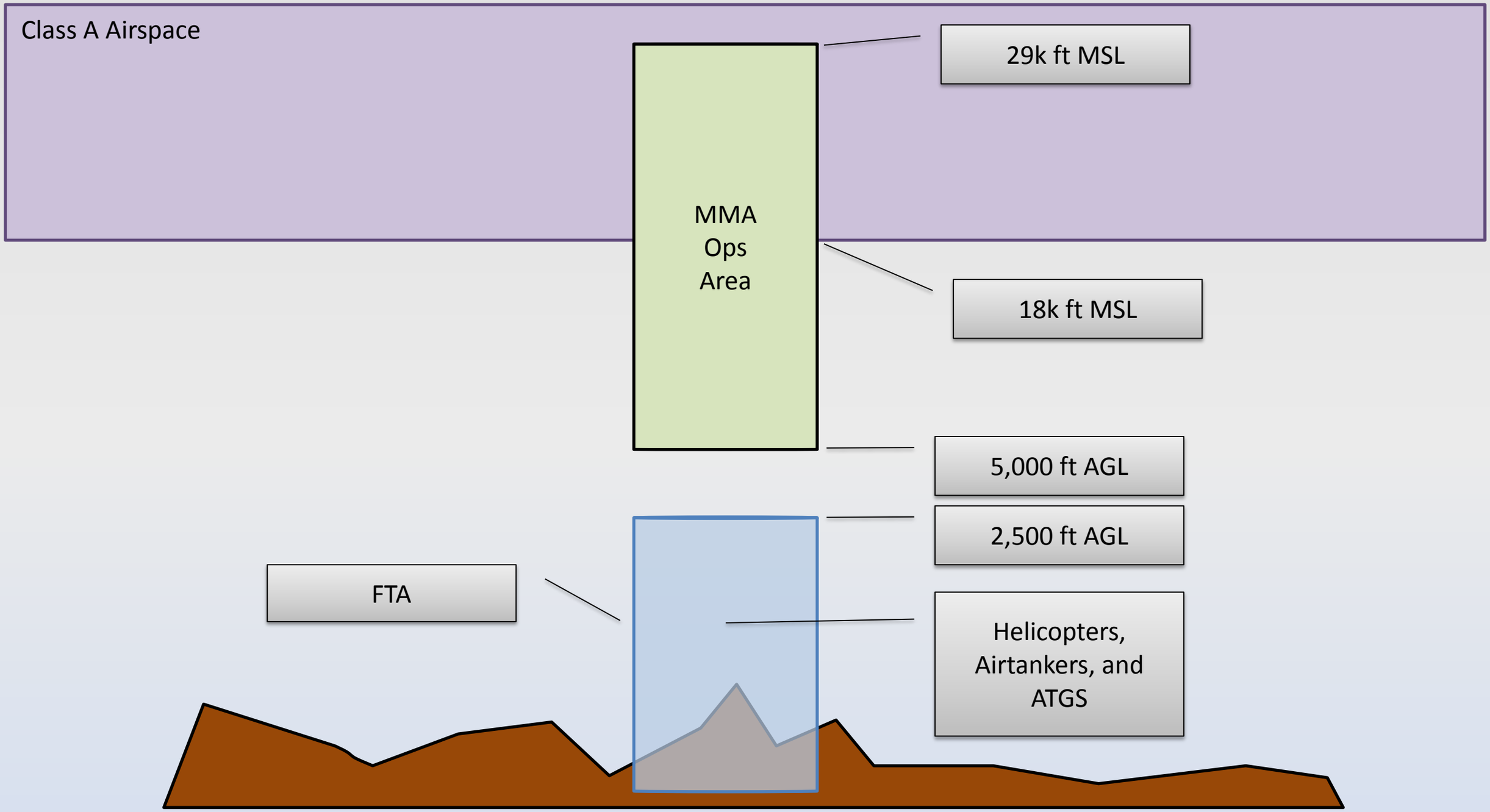
- Pilatus PC-12 aircraft
  - FAA certified airframe and operations
  - Pressurized, high-altitude, affordable, and long endurance
  - Night operations
- Systems installed:
  - Color and thermal cameras
    - Fire detection
    - Fire mapping
    - Firefighter safety overwatch
    - Evacuation monitoring
  - Broadband internet
    - CO-WIMS access
    - Direct delivery of imagery and surveillance information
    - Internet chat, real-time video, and email
  - Data and image processing
  - Interoperable voice radios
- Minimum crew of two
  - Pilot and Mission System Operator (MSO)
- Based in Centennial, CO
  - Deployable to many forward operating locatio

MX-15HDi Sensor

On-Aircraft View

- Small fire detection – Video – YouTube
- Fire Behavior – Video – YouTube
- Personnel Overwatch – Video – YouTube
- Fire Mapping – Video – YouTube
- Aviation Monitoring – Video – YouTube
- Prescribed Fire Monitoring – Video - YouTube

Where the MMA Operates



The MMA Does Not Need to Enter the FTA!

How Will the MMA Help Me?

- Where is the fire?
  - Smoke reports
  - Fire maps
  - Control line monitoring
- Where are my people
  - Safety overwatch and evacuation vectoring directly to ground crews
- Fire behavior description
  - Spread rates and fire progression
  - Spot distances
- Mop-up surveys

Limitations and Caveats

- The MMA can not see through clouds
- Availability is subject to:
  - Other requests and priorities as determined by the DFPC (not the USFS!)
  - Aircraft maintenance issues (typically 90+% available)
  - Weather
    - Low clouds over the target area
    - Severe weather conditions at the aircraft takeoff location or landing zone
- The MMA does not produce survey quality imagery
  - Images loaded in CO-WIMS are typically correctly registered within 3%-8%
    - Dynamic, mountainous terrain affects accuracy (flatter is better)
    - Distance from the aircraft affects accuracy (closer is better)
- Response time
  - "Red" status – airborne 20 minutes after notification
  - "Yellow" status – airborne 60 minutes after notification
  - "Green" status – airborne 4 hours after notification
  - Transit time <45 minutes to anywhere in Colorado
  - Total response time is <u>Status Time</u> + <u>Transit Time</u>
- Loiter time as much as 5+ hours

Communications

- VHF Radios
  - The MMA follows the interagency frequency guides
- UHF Radios
  - 8CALL90, 8TAC91, 8TAC92, and 8TAC93
- Google Chat & Email

Other Missions

- CO-WIMS and the MMA are built with wildfire in mind, but are useful for many missions
  - Natural disaster response – floods, earthquakes, search and rescue efforts
  - Man-made events – chemical spills, border patrol, terrorist attacks, riots, and other public safety incidents
  - Research and development – agricultural tasks, environmental monitoring, and wildlife and habitat survey

Cost and Getting Access

- MMA detection missions are free to local Colorado jurisdictions
- To order the MMA call the State Emergency Operations Line:

303-279-8855

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Division of Homeland Security & Emergency Management

Department of Public Safety

Discussion & Break

Colorado Fire Prediction System

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Department of Public Safety

Stakeholder Committee & Next Steps

Colorado Fire Prediction System

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CO-FPS Work Plan

- 5 major milestones in the initial development of the system

1. Establish and support stakeholder committee
2. Develop prototype code for CO-FPS model
3. Conduct limited demonstration of CO-FPS system starting in September 2016
4. Establish training plan on system capabilities
5. Develop project management plan for future work

Stakeholder Committee Mission

- The committee will assist the Center of Excellence with its legislative directive to establish and support CO-FPS
- The committee will help develop detailed user requirements for the system's capabilities and features
- The committee will help develop user-centric verification metrics to assess the success of the model

Committee Meeting Plan

- Monthly meetings approximately 3-4 hours in length will be held over the next year
- Eleven total meetings will be held, 6 in the Denver area and 5 in Rifle at the Center of Excellence or other agreed upon location
- Last meeting tentatively scheduled for November 2016

Stakeholder Committee Composition

- Join the stakeholder committee by indicating interest on the sign-in sheet or by contacting me at brad.schmidt@state.co.us or (720) 425-8729
- Even if wildland firefighting is not your area of expertise, you have valuable insight to share with fellow committee members and project managers

Desired Outcome

- NCAR personnel will keep minutes from stakeholder committee meetings
- As a result of the committee process, CoE and NCAR will
    - recommend changes to CO-FPS
    - update computational requirements
    - document lessons learned
    - create a review of the project

CO-FPS 12 Months From Now

- The computational abilities of the model will be tested by modeling 3 simultaneous real and simulated fires up to 25,000 acres each in size
- A System Acceptance Test using criteria developed with the stakeholder committee will be conducted to assess the system's quality
- The system will be able to operate on a limited semi-autonomous basis to support actual and simulated wildland fires in Colorado, and will have operational interfaces with COWIMS and the multi-mission aircraft

CO-FPS Long Term Vision

- The State of Colorado will own the computer hardware and software required to run CO-FPS
- Approximately 5 years of continuous development by NCAR and DFPC is anticipated to create a fully functioning system
- While the stakeholder committee represents a one year commitment, feedback from system users and stakeholders in the years to come will be crucial to the success of the system