



# STEReO

combining NASA technologies and partnerships to transform  
current-day emergency response operations

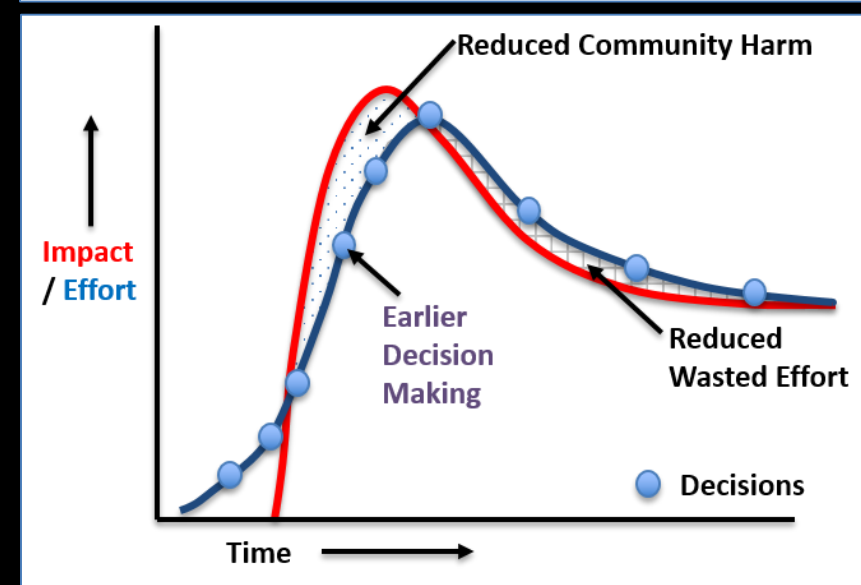
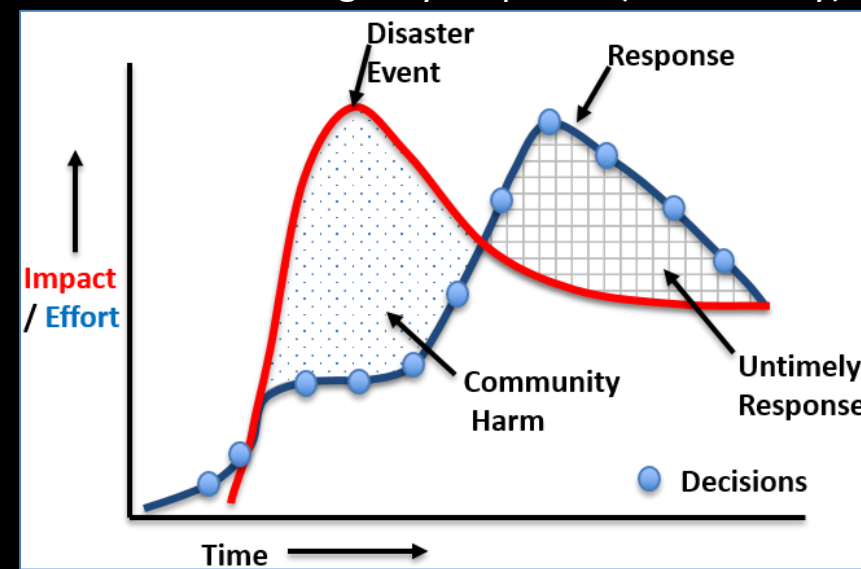
joey mercer

# STEReO concept



- apply NASA expertise in UTM services, autonomy, communications, and human factors to develop a system that provides emergency responders with opportunity and situation awareness for the safe, expeditious, efficient, and scalable use of airspace
- to be evaluated in a flight demonstration during a wildfire training exercise, and within a simulation of post-hurricane emergency response operations

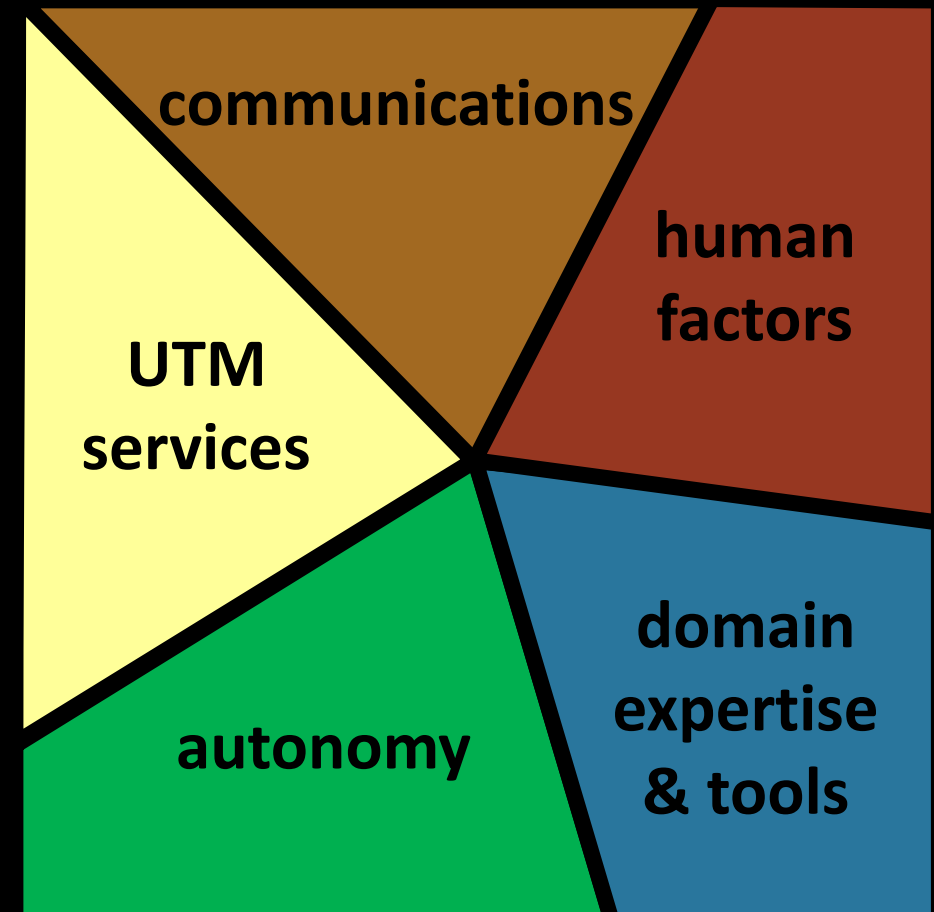
theoretical emergency response (current-day)



theoretical emergency response (STEReO)

## methodology

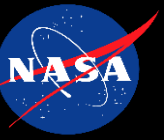
- use innovative communication approaches to enable new traffic management services and autonomous vehicle capabilities, providing a data-rich common operating picture





## background

- UTM = UAS Traffic Management
  - a 6-year NASA research project that ended in FY20
  - a prototype system for automated management of large quantities of sUAS traffic in low-altitude airspace
  - designed and tested with input from the FAA and commercial users
- USS = UAS Service Supplier
  - a provider of services within a UTM ecosystem
  - functions within a distributed architecture, allowing for multiple USSs to coexist
  - requires adherence to a USS-to-USS API for interoperability



## conceptual objective

- enable data exchanges that facilitate coordination and situation awareness

## first-year progress

- integration of data feeds from FAA, digital VHF, ADS-B
- development of 'USS-in-a-box'

## next steps

- field tests of network design



## conceptual objective

- increase system resiliency and robustness

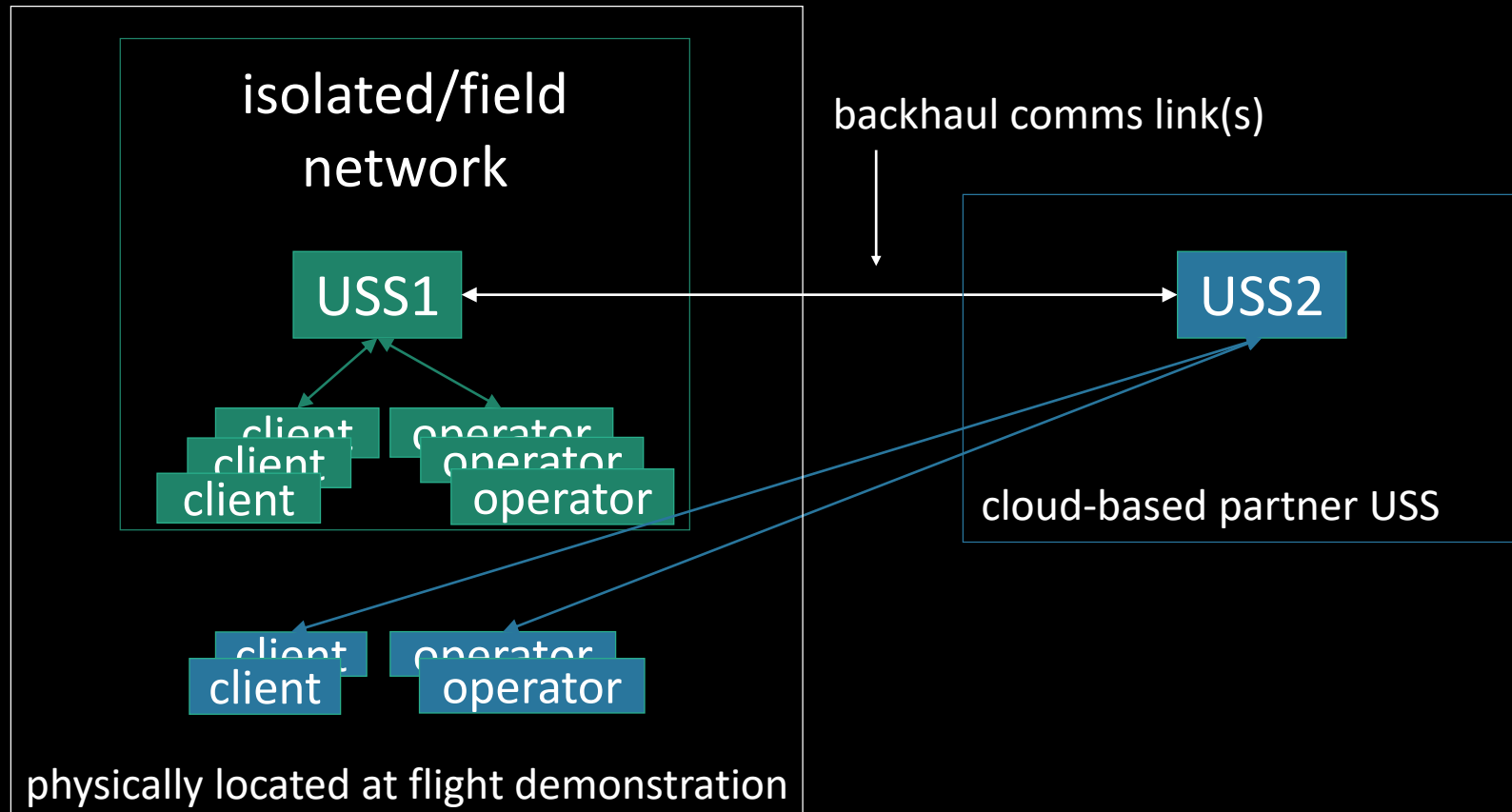
## first-year progress

- installation of candidate connectivity solutions for testing/evaluation
  - local wi-fi, mesh wi-fi, LTE backhaul (firstnet, AT&T, verizon, t-mobile)

## next steps

- satellite backhaul
- joint effort with UTM services to identify switch-over techniques
- develop prototype radio for V2V communications @ 80ghz

## notional network architecture





## conceptual objective

- build operator trust, transfer risk away from human capital

## first-year progress

- integration of crash-management software with flight control system
- integration of 'perception' sensor payload with flight control system
- integration of vehicle GCS with USS

## next steps

- incremental flight tests





## conceptual objective

- support effective teamwork

## first-year progress

- attended aerial supervision training event
- held stakeholder workshop and virtual tabletop exercise
- began work on A/R applications for wearable and hand-held devices

## next steps

- draft CONOPS document



## conceptual objective

- leverage existing products/work-flows, to increase value for end-users

## first-year progress

- exploring digital-VHF options for APRS messaging
  - ground-asset tracking
- field observation of comms van (ground support for aerial vehicle)
- possibility of capturing 'door event' messages from retardant drops

## next steps

- EGP
- foreflight



## flight test/demonstration of wildland fire use-case

- spring of 2021 (linked to annual training events)
  - USFS – National Aerial Supervision Training Academy (NASTA)
  - CAL FIRE – CAL FIRE Aerial Supervision Academy (CASA)
- manned-unmanned interactions
  - adds UAS operations in immediate proximity to current-day manned operations for air attack



## flight test/demonstration of wildland fire use-case

- implement new data exchanges to deliver enhanced situation awareness
  - integration of ground-asset tracking
  - digital means for target description tasks
  - clear communication of intent of autonomous vehicles
- hardware testing of several communication systems and connectivity solutions



## simulation of post-hurricane response use-case

- will take place in the Airspace Operations Laboratory at NASA Ames Research Center
- leverages findings from the wildland fire flight demonstration
- moves focus to suburban/urban environments
- broadens stakeholder and user community
- will help identify additional challenges and opportunities

questions?

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**Fire Traffic Area (FTA) Dec 2020**

**National Interagency Airspace: <http://airspacecoordination.org>**

**\*\*\*Clearance is required to enter the FTA\*\*\***

**Initial Radio Contact:** 12 nm on assigned air tactical frequency.  
**No Radio Contact:** Hold a minimum of 7 nm from the incident.

**Note:** Airtanker maneuvering altitude determines minimum airtanker and ATGS orbit altitudes. Assigned altitudes may be higher and will be stated as MSL.

<b>Note 1</b>	<b>ATGS Orbit</b> 2500' AGL Minimum	
		<b>Media</b> *
		<b>VFR</b>

<b>Note 2</b>	<b>Airtanker Maneuvering</b> Maximum 1000' AGL	
		<b>Note 2</b>
		1500' AGL <b>Airtanker Orbit</b> Minimum
		Max 500' AGL <b>HELOS</b> *

<b>Note 1</b>	1000' min. separation between ATGS orbit and airtanker orbit altitude.
<b>Note 2</b>	500' min. separation between airtanker orbit and maneuvering altitude.
<b>Note 3</b>	On arrival reduce speed to cross 7 nm at assigned altitude and <b>150 KIAS</b> or less.

**\* Helicopters:** Fly assigned altitudes and routes.

**\* Media:** Maintain VFR separation above highest incident aircraft or position and altitude as assigned by controlling aircraft.

Airtanker Base As Assigned	Air Guard 168.625 Tx Tone 110.9	Air to Air As Assigned	National Flight Following 168.650 Tone 110.9 TX and RX
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**National Interagency Airspace: <http://airspacecoordination.org>**

# simplified NASA org chart

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NASA's research mission directorates:

- aeronautics (ARMD)
- human explorations and operations (HEOMD)
- science (SMD)
- space technology (STMD)

ARMD:

- air traffic management technologies
- vehicle design
- integrated aviation systems

=> airspace operations laboratory (AOL @ NASA Ames)