



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

Identifying Collaboration Challenges in Crisis Management

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Long-Term Goal

- **Help crisis managers collaborate more successfully across organizations and locations**



Massachusetts State Police review building diagrams during an active-shooter drill.

Photo by MSgt Scott Crossman, 6 SWS First Sergeant.

While our research focus is on aviation security, we use photographs from many C² and emergency operations centers to emphasize our work's broader relevance



Near-Term Goal

- **Make specific recommendations to help aviation security community members collaborate more effectively**
- **Motivation for this project:**
 - **Inter-organizational coordination is currently via a conference call only**
 - **Digital data sharing is not implemented among all participants**
 - **No set of common tools**
 - **Little inter-organizational training in techniques, procedures, and practices**



Washington Air Route Traffic Control Center (ARTCC)



Contributions of This Paper

- **Focuses on the process used to understand collaboration among US National Airspace Security partners**
 - Provides our interview questions
 - Summarizes the collaboration problems that we have found
 - Presents an example of the potential solutions

Applicable to other time-sensitive, synchronous, non-located, cross-organizational situations

...as a resource for others

Results can inform other crisis response managers regarding the challenges they may encounter



Process Steps

- **Compose/refine interview questions**
- **Conduct interviews**
- **Consolidate data and enter into spreadsheet**
- **Analyze data to identify challenges**



*Air Traffic Control
System Command
Center (ATCSCC),
<http://www.fly.faa.gov>*



Compose/Refine Interview Questions

- **Interview questions evolved**
 - Started out in 8 categories
 - Simplified to 4 categories
 - Structure was then re-organized around decisions
 - Final: 6 top-level, 54 sub-questions

■ **Categories:**

- Decisions**
- People**
- Processes**
- Resources**

■ **Example questions**

- “Are there standards, routines or plans in place that you follow regarding this decision?”
- “What are the major pieces of information needed to make this decision?”



Conduct Interviews

Occurred in interviewees' workplaces

90-minute sessions were targeted

Visited 19 different organizations

Interviewed 1 – 12 people at each organization

Type of Organization	Number visited once	Number visited twice	Totals
FAA	6	2	8
DoD	4	1	5
DHS	2	0	2
Airlines	2	0	2
Other	2	0	2

Consolidate Data and Enter Into Spreadsheet

The screenshot shows a web-based form titled "Model Row" with a close button in the top right corner. The form is divided into several sections:

- Statement**: A large text input field.
- Initials**: A small text input field.
- Model Category**: A dropdown menu with options like "Problem", "Requirement", and "Solution".
- Phase**: A group of checkboxes for "Plan", "Monitor", "Evaluate", "Act", and "Recover".
- Aviation Security Collaboration Model Entry Form**: The main title and the CAASI logo.
- People**: A group of checkboxes for "P0: People", "P1: Culture", "P2: Trust", "P3: Motivation and Incentives", and "P4: Command Structure and Roles".
- Processes**: A group of checkboxes for "PR0: Processes", "PR1: Workflow", "PR2: Collaboration", "PR3: Communication", and "PR4: Training".
- Resources**: A group of checkboxes for "R0: Resources", "R1: Tools", and "R2: Information".
- Endnote 1 #:** A small text input field.
- Endnote 1 Text:** A large text input field.
- Additional Details Endnote 1:** A large text input field.
- Create Row Now**: A green button at the bottom left.
- Close Form**: A button at the bottom right.

- All team members combined notes
- “Statements” extracted
- Each statement resides on one row
- Check boxes indicate the statement’s nature
- “Endnotes” provide supporting information for the statement

Analyze Data

Sorted on different characteristics to determine issues that occur frequently across organizations

Extracted issues that appear to be serious based on:

- Frequency of occurrence
- Our subjective judgment
- The collaboration literature
- A governance review

E.g., serious issues had caused (or could cause):

- Delayed action
- Misunderstandings
- Duplicated work
- A lack of needed response



Emergency response discussion in Antarctica

<http://photolibrary.usap.gov/>

Challenge 1

Inability to cue
partners' attention to
relevant information
because of its lack of
persistence

Example quote (all quotes in this section are from our raw data or data analysis notes and are anonymized):

“...they don't monitor the DEN [the conference call]. They get on when they have something to say and then get off.”



Challenge 2

Insufficient team awareness

- Team awareness is the moment-by-moment understanding of who collaborators are and what they are doing, necessary for task coordination

Example quote:

“He knew exactly what the embedded [role X] person was doing; knew he was making all the right calls to people without being asked, but now he doesn’t know what the person is doing because [role X] is no longer collocated with him.”



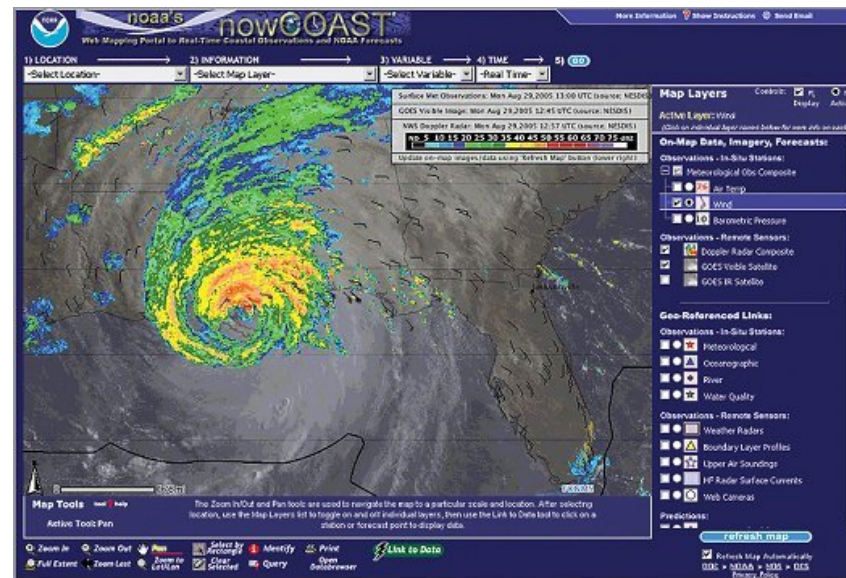
Challenge 3

Limited joint situation awareness

- Common perception, comprehension, and projection of the facts describing the environment

Example quote:

During a “recent pandemic scare... they stood up the Emergency Management Center and got a more complete picture...the EMC made a big difference” in providing joint situation awareness.



nowCOAST map viewer displaying NWS radar reflectivity, GOES cloud imagery, and surface wind barbs (speed and direction) for Hurricane Katrina on August 29, 2005.

<http://www.nauticalcharts.noaa.gov>

Challenge 4

Lack of coordinated Concept of Operations (CONOPs)

- A set of high-level directives for what should be done by whom in what situation

Example quote:

“We do not have a set of articulated or documented CONOPs”



*Southern Command Center for
Oregon State.*

<http://www.oregon.gov>

Challenge 5

Lack of a clear set of standardized protocols and procedures



Example quote:
‘Agencies have not agreed on policies and procedures to specify who has access to the Domestic Events Network, and under what circumstances.’

US Dept. of Transportation Federal Highway Administration Command Center for Oakland Bay Bridge Seismic Safety Project

<http://ops.fhwa.dot.gov>

Challenge 6

Information is not shared in an agile manner with the right people

Example quote:
“Other agencies do not have access to FAA information yet they could benefit from seeing this ‘bigger picture’”



*In the Oregon State Police
Command Center*

<http://www.oregon.gov>

Challenge 7

Inadequate capabilities
for sharing classified
and sensitive
information

Example quote:

“Coordinating between classified and unclassified networks is a complicating factor. Some classified DoD information is shared with the FAA but the FAA doesn’t have permission to share it with others.”



Louisiana Dept. of Agriculture and Forestry's Mobile Command Center

<http://www.ldaf.state.la.us/portal/>

Challenge 8

Information (and the tools used to convey it) is not always trusted

Example quote:

“He doesn’t know if he would trust a computer....He would want to talk to a person”

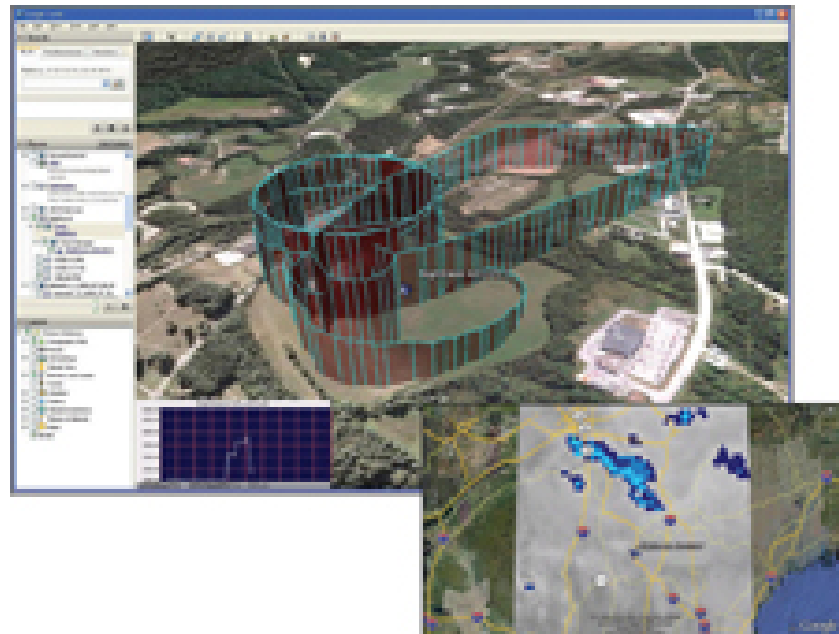


Nevada Joint Information Center

www.nvstatejic.nv.gov/

Challenge 9

No effective mechanisms to fuse related information



Examples of situation awareness displays that show flight track and local storm data.

<http://www.nasa.gov>

Example quote:
“The Situation Awareness Status Table...is separate from the other applications that pertain to the status of the various targets.”

Challenge 10

Inadequate joint training programs and training standards

Example quote:

“She doesn’t understand the constraints of all the aviation security players.”

Photos from The MITRE Corporation laboratory, training, and evaluation facilities



Challenge 11

Inadequate procedural support for joint crisis operations

Example quote:

“In [Facility X], there is no agreed-upon procedure for de-escalating a situation.”



A National Guard Bureau Joint Coordination Center, meeting on 1/18/2009 to support the presidential inauguration. USAF photo by Master Sgt. Mike R. Smith

www.defense.gov/news/

Challenge 12

Inadequate automation
support for joint crisis
operations

Example quote:

“Her biggest challenge is
Temporary Flight Restriction
violators....she has to do a lot
of calling to trace where that
aircraft came from...”



*A Scientific Support Coordinator
working in the National Oceanographic
and Atmospheric Administration
(NOAA) command center in response to
a 2007 oil spill (a NOAA photo)*

<http://www.noaanews.noaa.gov>

Challenge 13

Insufficient support for apprising senior management

Example quote:

“[Organization X] personnel make a special effort to ensure that all communications occur via the Red Switch to make sure that senior managers know about the developing situation, regardless of whether it is convenient to do so and despite the fact that not all relevant managers are listening.”



An emergency management operations center in Grant County, Wisconsin

www.grantcountyem.com



Example Suggested Solutions

- **Use “speech to text” applications to transcribe the conference call information for later reference**
- **Employ “presence indicators” to show who is on the conference call at any given moment**
- **Develop coordinated, cross-organizational CONOPs and procedures**
- **Expand joint training efforts**



Conclusions and Future Work

- **Identified collaboration challenges that occurred widely among the organizations studied**
- **Proposed candidate high-level solutions**
- **Combined the challenge categories with the candidate solutions into a framework**
- **Currently working on validating solutions via experimentation**