Chapter 42
Incident Command Situation Assessment Utilizing Video Feeds from UAVs:
New Risks for Decision Making Breakdowns

John McGuirl
The Ohio State University, USA

Nadine Sarter
University of Michigan, USA

David Woods
The Ohio State University, USA

ABSTRACT

Past experience has shown that introducing new Information Technologies can have unintended and undesirable consequences, such as new forms of errors and a narrowing of data search activities. Eight Incident Commanders (ICs) took part in a simulated disaster response exercise to determine how the availability of real-time image feeds from a UAV impact on situation assessment and decision-making. The exercise simulated the video feed from an unmanned aerial vehicle (UAV) that allows incident command centers to monitor developments at a crisis site. The results showed that information from the video image channel dominated information available from other channels or in other forms. Nearly all of the ICs failed to detect important changes in the situation that were not captured in the imaging channel but that were available via other, more traditional data sources. The dominance of the image feed resulted in ICs narrowing their data search activities and reducing cross-checking across diverse data sources. This study confirms anecdotal reports that users can over-rely on video feeds from UAVs.

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INTRODUCTION

Decision-makers in complex, naturalistic settings are faced with numerous challenges, including time stress, solving ill-structured problems with limited sometimes unreliable or ambiguous information, and high costs for failure (Klein et al., 1986). In the case of incident command in emergency response and related fields of practice (Davis, 2002; Gilchrist, 2000; Demchak et al., 2007), new technologies are being used to support decision-making by increasing the flow of timely data through new sensors on robotic platforms that provide real-time image streams to decision-makers (e.g., feeds from one or more unmanned aerial vehicles). It is assumed that the video feed from this channel will help incident commanders develop timely situation assessments and allow incident commanders to closely track the activities of responders on the scene as they develop response strategies as they confront various challenges on the ground (Demchak et al., 2006; Rodriguez et al., 2006; MacKenzie et al., 2007; Bergstrand and Landgren, 2009).

However, previous research has shown that introducing new technology into complex fields of practice changes what is expertise, how practitioners coordinate activities, and how systems are able to adapt to surprise and change (Woods and Hollnagel, 2006). This chapter describes a study that examines the consequences of one point of technology change - the introduction of real-time video feeds into emergency management through the use of unmanned aerial vehicles (UAVs). The availability of sensors on UAVs allows incident command centers to monitor developments at the crisis site remotely (McCurdy et al., 2005).

The goal of the study was to assess how this new data channel changes data gathering, integration, and sense making of emergency management decision-makers. Command centers find access to real time images from the scene of interest to be very compelling, but anecdotal reports and observations from exercises and deployments suggest the new image data channel may be too compelling and lead command decision makers to focus only on information from this one data channel.

In the study the data gathering and sensemaking activities of eight actual incident commanders were tracked as they manage a simulated crisis (petro-chemical plant fire) with access to a real-time video feed of the crisis site. The crisis management exercise evolved in ways designed to challenge incident command decision-making and, in particular, to reveal if the incident commanders over-relied on information coming in through the image data stream and under-utilized information available from other data channels.

The results showed that information from the video channel dominated information available from other channels or in other forms. Nearly all of the ICs failed to detect important changes in the situation that were not captured in the imaging channel but that were available via other data sources. The dominance of the image feed evidenced in how ICs narrowed their data search activities and reduced cross-checking activities across the diverse data sources available to them. This study confirms anecdotal reports that users can over-rely on video feeds from UAVs, and it demonstrates how this over-reliance can distort decision-making. The results suggest new forms of representation are needed to balance information integration across diverse, valuable data sources.

Challenges in Incident Command

Emergency operations management is a classic case of "multi-threaded work" (Woods and Hollnagel, 2006) in which the practitioner must assess the situation by gathering and integrating multiple data sources, detect anomalies in the evolution of events, and exercise authority over a distributed, multi-level organization. In particular, the Incident Commander (IC) must maintain an up-to-date working model of the situation by monitoring incoming data about the evolving threats/distur-