

Coordination through Focused Media Spaces

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1. INTRODUCTION

Since distributed work settings are becoming more and more common, research has been made on finding suitable ways for supporting awareness among distributed participants. One part of this is the media space research, which is aiming at supporting informal awareness through opening up a common space through video and/or audio transmissions.

Air traffic control (ATC) work is a complex work setting, the airspace continuously changing with or without the controllers. Since different controllers handle different sectors (parts of the airspace) on the way, there is an extensive need for coordination of the current state of the aircraft soon to be in the next sector. One way to coordinate the latest information is through a video or audio link, which is used in Copenhagen ATC (DK) and Shannon ATC (IE). These two case studies show the usefulness of media spaces for focused purposes in supporting coordination, one show the use of a video link and one show an audio link.

2. MEDIA SPACE USE

Media Spaces are used for supporting informal overview and contact among colleagues that are geographically distributed. This is done through a constantly open video and/or audio link. Earlier research, e.g. Mantei et al. 1991; Gaver 1992; Dourish et al. 1996 have presented different angles on the impacts a media space have in cooperative work. Some of the earlier work has reported on the problems occurring when using media spaces:

- Constraints that the cameras and monitor displays offer, Gaver 1992.
- Not having eye contact, Mantei et al. 1991.
- Not seeing what the other participants see – having different views, Gaver et al. 1993; Dourish et al. 1996.

Several metaphorical ideas have been used to describe how the media space may be perceived. One of them is the notion of tele-presence, taken a step further by Hollan and Stornetta 1992. They claim that we need to go beyond (to make it better than) being there:

"...the people at a distance will never stop being at a disadvantage until we use the same mechanisms to interact

with each other when we are physically close as when we are physically distant."

In two ethnographically inspired studies of air traffic control, I have studied media space use that is working successfully because they are focusing on a central delimited piece of information that is enough for giving a common understanding of the situation.

3. CLOSED-CIRCUIT TV SYSTEM AT COPENHAGEN ATC

The closed-circuit TV system was introduced to reduce time consuming and obtrusive phone calls between the different sectors. The purpose of the system is to distribute the view of the flight strip rack containing the important annotated flight strips, see Berndtsson and Normark 1999, between adjacent sectors. This is especially useful in the sectors closest to the airports that keep the responsibility for the aircraft for a short time.

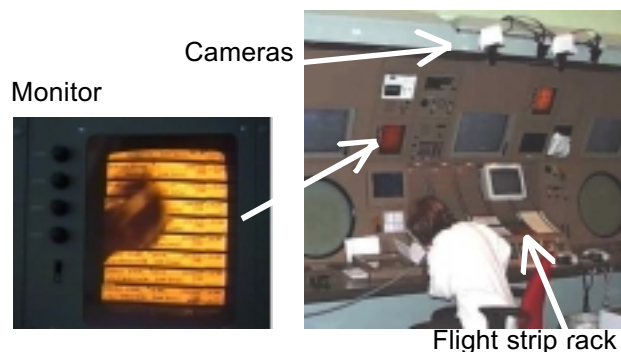


Figure 1: CCTV-monitor and an *en route* sector in Copenhagen.

The sector above has a closed-circuit television monitor where the controller can see strip racks from other sectors. The movement of a controller's hand over his/her strip rack alerts the controller that something is happening, suggesting to check the monitor since changes are likely to have taken place. Through distributing the 'at a glance' view of the flight strips the closed-circuit television system makes it possible for the controllers to coordinate e.g. flight levels and the order of the incoming aircraft without phone calls. Perhaps most important, they look for all handwritten signs, marks,

messages etc that are written on the strip. Between the approach control sector and the tower control sector the closed-circuit television system enables the tower controllers to see the actual landing sequence of the approaching aircraft. Another example is when the approach controller instructs the pilot of an aircraft to contact the tower, the approach controller also makes a stroke with her or his pen on the strip, just to remember that the aircraft has been handed over to the tower. This stroke also allows controllers in the tower to know that the aircraft very soon will be his/hers responsibility.

4. OVERHEARING AT SHANNON ATC

Because of the lesser amount of traffic at Shannon airport in Limerick, the controllers are able to use their radio system and loudspeakers to listen in on the adjacent sector's radio frequency to get an understanding of what is going on. They are thus listening to both their own and the next sectors radio traffic.

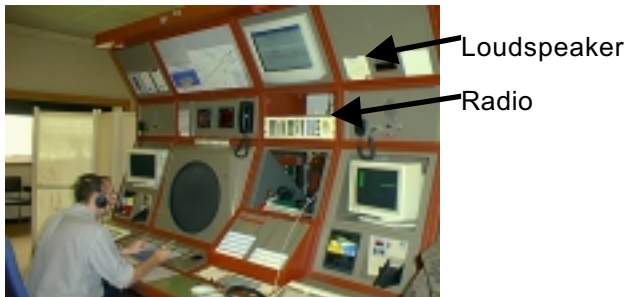


Figure 2, The approach sector at Shannon

As you can see in Figure 2, the controller in the approach sector is using a headset. When asked if it was possible to hear something from the outside, the controllers explained that the headset is supposed to direct the sound on their own radio frequency, but still take in the ambient sound from 'the outside world'. They would not want radio traffic from two frequencies in the headset. One controller explained that after a while, it is possible to listen even if you are talking on the radio at the same time.

The sound heard from the loudspeaker is both an indication that something is happening and an indication, more specific, of what is happening. In the tower, the controller is listening for the approaching order of the aircraft, in order to be prepared for what needs to be done. The controller listens to the aircraft's distance from the airport. By knowing this, it is possible to calculate when the aircraft is coming in to land. When s/he hears an aircraft approaching, s/he knows that the approach soon will call up for a hand over and they start the preparations by lighting up the runway. In the approach sector, the controller listens for information about where the traffic is in the departure process. That is interesting to the controller in relation to the own traffic in the approach sector.

5. TOWARDS GETTING "BEYOND BEING THERE"

The methods of listening in on the adjacent sector's frequency and seeing other sectors flight strips are only there for support, they cannot be relied on for official coordination. They are there to support distribution of the current state, basically reducing the amount of information that has to be distributed between the adjacent sectors. The successful use of media spaces in these settings is dependent on the suitable information they broadcast. The controllers get the right amount of information. By choosing an area rich of information, it is possible to get an overview of the situation in other parts of the sky. By using the tools that are already there (the flight strips and the radio communication), there is no extra work to be done for the controllers. It is interesting to notice that by transmitting a delimited piece of information, the controllers get a more effective overview of the situation than they would have had if they were sitting in the same room because the exact information needed is shown to them at their own positions.

6. ACKNOWLEDGEMENTS

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