

Andrew J. Ryan

October 12, 2000

PaperTitle: *The Effect of Shared Information
on Pilot/Controller and
Controller/Controller*

Author(s): R. John Hansman and Hayley J.
Davison

Air Transportation -- Dr. Donohue

While much attention has been paid to increasing the flow of information between pilots and controllers, these two entities are not the only agents involved in the ATM. Creating a symbiotic relationship between pilots, and controllers and between interacting controllers and traffic flow managers is important to enhance/improve the flow of information among decision-making parties. Many of the decisions which need to be made are structured, decisions. That is, they are routine and can be represented (handled) by well-defined rules or procedures. Conversely, unstructured decisions occur when disrupted conditions are present (inclement weather would create a disruptive condition). In these cases, discrete rules are not applicable and shared information becomes of utmost importance. This paper explores the effect of current and proposed information sharing to deal with such scenarios.

When making a decision, it is important to establish a set of goals or a desired best outcome. A shortcoming of the current ATM decision making model is that the actors involved in making the decision do not have the same common goal. For instance, while controllers and pilots are both concerned with the safety of a flight, in terms of the optimizing the performance of the system; controllers tend to have the goal of maintaining the flow within the sector whereas pilots are only concerned with optimizing the performance of their specific flight. This is exemplified by situations where a pilot tries to depart ahead of their departure time and arrive at an airport ahead of schedule. In the eyes of a controller, this decision is not optimal, however the pilot has met *his* goal. The remainder of the paper describes areas where increases information sharing can increase ATM performance. These will be discussed individually.

1. **Shared Information in Controller/Pilot Interactions:** This interaction is focused on the management of the specific flight for which they have common responsibility. The need for shared information is needed in the following areas:
 - *Shared weather information* -> Pilots and controllers do not have the same information in terms of weather conditions

- *Shared traffic information* -> pilots observe traffic from an aircraft-centric view and are primarily concerned with traffic which will impact their current or planned trajectories. Controllers (again) are concerned with the “big picture.” Tools such as TCAS are providing shared traffic information for both parties and increase situational awareness.
 - *Shared Intent Information* -> While there is communication between pilots and controllers, intent is rarely included in these messages. The flight plan serves as the basic mode of information but there are cases (such as separation issues) where a known intent can optimize flight and system performance.
 - *Shared Affective Information* -> Affective information such as emotional state, workload, or capability can aid in assessing situational urgency.
2. **Shared Information in Pilot/Airline Interactions:** pilot and airlines communicate via the dispatcher who provides flight planning services and supports the pilots in the event of any disruptions. Since 1980s, messages sent between pilots and dispatchers have increased from 1,700 to 2,700 per month.
 3. **Shared Information in Intra-facility Controller/Controller Interactions:** Interaction between controllers within a single facility tends to focus on coordinating the control of individual flights and regulating flow. Most facilities are arranged so that primary traffic flow is between adjacent controllers. Shared information is important here so controllers are aware of what is going on in adjacent sectors. Currently, physical gestures (tone, posture, and gesture) are used to communicate affective state. Systems are now being used to allow shared information to be available as opposed to physical interaction.
 4. **Shared Information in Cross Facility Controller/Controller Interactions:** Controllers can only interact and share information across facility boundaries which limits the flexibility and efficiency of ATM operations.

There is a need for future systems which support shared information and multi-lateral controller interactions.

5. **Shared Information in Airline/ATM Interactions:** The Official Airline Guide (OAG) and filed flight plans are the principle basis for shared information between airlines and ATM. Collaborative Decision Making augments the amount of information hat can be exchanged, in real time, between these parties.

Personal Comments:

Behind the Ball et al. paper, this ranks second best among the (year) 2000 entries. While its list-based format does not add to its readability, the information the authors relate is accurate and noteworthy.