2007

An Overview of the Tanker Airlift Control Center

Laura G. Militello

Patrick J. Vincent

Jesse A. Gaydon

Stephanie D. Swindler

AN OVERVIEW OF THE TANKER AIRLIFT CONTROL CENTER

Laura G. Militello
University of Dayton Research Institute
Dayton, OH

Patrick Vincent, J.
Northrop Grumman
Fairborn, OH

Jesse A. Gaydon
Air Mobility Command/Tanker Airlift Control Center (TACC/XONI)
Scott AFB, IL

Stephanie D. Swindler
Air Force Research Laboratory/Logistics Readiness Branch (AFRL/HEAL)
Wright Patterson AFB, OH

The Tanker Airlift Control Center (TACC) plans, schedules, and tracks tanker, airlift, and aeromedical evacuation aircraft worldwide. This paper presents an overview of the TACC, presenting a snapshot of a constantly evolving, dynamic organization. Based on information gathered via interviews and observations conducted intermittently over a 12-month period, we present key characteristics of the TACC, TACC personnel, the organizational structure, and primary external collaborators.

Introduction

The Tanker Airlift Control Center (TACC) serves as the information hub for all Air Mobility Flights throughout the world. TACC personnel are engaged in planning, scheduling, tasking, and executing air mobility forces 24 hours per day, 7 days per week. Effective and efficient operations rely on complex collaboration as TACC members receive information from a range of disparate sources, identify important implications of that information, and then disseminate it to key players both within and outside the TACC. Although this collaboration is supported by databases, shared planning tools, and organization design, the highly dynamic and unpredictable nature of the work makes it difficult for technologies and organizational structures to keep pace. Technologies and organizational structures must constantly evolve to accommodate variation in the type and quantity of requirements, changing missions, and changes in the nature of warfare (Herbert, 2006).

This paper presents an overview of the TACC based on interviews and observations conducted intermittently over a 12-month period. The first section describes some of the key characteristics of the work setting within the TACC. The second section discusses personnel who work in the TACC. The third section presents an overview of the TACC organizational structure. The fourth section highlights key organizations the TACC must collaborate with in order to fulfill missions. The final section provides summary and conclusions.

Key Characteristics

One key characteristic of the TACC is that it provides an excellent example of distributed cognition. The organization is so complex that no one person holds a complete mental model of the logistics process. Instead leaders rely on individual specialists and specialist cells to manage, coordinate, and run individual portions of the process. For example, within the TACC, a cell populated with medical service corps and aeromedical evacuation personnel develops concepts of operations for a range of contingencies, organizes the personnel and equipment needed to set up and maintain staging facilities, and arranges patient evacuation worldwide in the world. Another cell plans for channel missions that run on a regular basis, transporting cargo and personnel around the world. Planners in this cell must project transportation needs for a 12-month period and then continue to refine the plan on a monthly and then weekly and daily basis until channel missions are executed. While these are seemingly disparate tasks with different types of expertise, each must have some awareness of the other, as sometimes a channel mission will be used to transport patients (an aeromedical evacuation mission) after dropping cargo at its destination. The TACC is populated with personnel possessing deep knowledge of a specific function within the logistics

process, and more general knowledge of the larger logistics process.

A second key characteristic of the TACC is that it is organically adapting. The organization constantly evolves and re-organizes depending on resources available and mission requirements. The number of personnel available to work in the TACC, as well as the types of expertise available, varies over time. The TACC re-organizes, expands, and collapses cells as needed and re-defines functions based on current mission requirements. For example, when a contingency such as a natural disaster occurs, representatives from all relevant directorates and specialized cells assemble in the "glass room" to form a command and control cell for managing the first days or week so of the contingency, and creating a plan for sustainment, if necessary.

A third key characteristic of the TACC is that it is responsive to world needs. The US military has a presence around the world and plays a whole host of roles, depending upon the needs of the situation. The TACC is poised to react to any type of contingency, including support for natural disasters in the US such as hurricane Katrina in August 2005, or internationally such as the tsunami in Southeast Asia in December 2004. The TACC also provides air transportation of cargo and personnel in support of the Global War on Terror. This is all in addition to providing air transportation for routine military operations worldwide including moving troops and equipment for exercises and training purposes.

TACC Personnel

The TACC employs both military and civilian personnel who serve complimentary roles. Military personnel generally come to the TACC with relatively recent operational experience. Therefore, they are able to bring current knowledge of Air Force operations and theater conditions. Civilian personnel, who are often retired military, provide continuity and corporate memory within the TACC. Military and civilian personnel work side-by-side, providing the organization the benefits of both backgrounds.

TACC Organizational Structure

The constantly changing nature of the TACC makes a description of the organizational structure difficult. We will, however, do our best to capture the high-level organizational structure at the time of our study.

The TACC can be divided into two primary functions: planning and execution. These two functions reside in the same building but are physically separated. Most planning functions are staffed for a five-day work week. Most execution functions are staffed 24 hours, 7 days per week.

Planning Functions

Planning functions are divided into four directorates, three of which correlate with mission type, and one that is dedicated to allocating specific aircraft to specific missions (Figure 1). *The Channel Operations* Directorate plan all regularly scheduled channel missions up to 12-months in advance and refines the plan as the mission nears, eventually matching specific cargo with specific flights. Channel missions fly the same routes on a regular basis, similar to a commercial freight company. The *Current Operations* Directorate plans all "special assignment airlift missions" or those for which advance planning does not occur, including special operations and movement of political and military leaders. The *Global Readiness* Directorate plans for contingencies around the world including natural disasters, peace-keeping missions, and wartime efforts. In addition, the Global Readiness Directorate plans all air movement related to exercises and training. Finally, the *Mobility Management* Directorate serves as the liaison between the TACC and units that fly the missions. The three planning directorates all rely on the Mobility Management Directorate to allocate assets to fulfill the planned missions. Figure 1 provides an illustration of the planning directorates.

Execution Functions

Any mission to be flown within the current 24-hour period moves from planning to the Command and Control Directorate on the execution floor, which directs the execution of airlift and air refueling missions. On the execution floor there are flight managers, mission controllers, and weather forecasters that work together with aircrews to adapt mission plans as needed due to weather or other perturbations. In situations in which a mission must be re-planned (due to maintenance problems, weather, or even political issues), the Operations Directorate re-plans the mission, often diverting an aircraft from an existing mission to a higher-priority mission. In addition, representatives from the Surgeon General Global Patient Movement Global Patient Movement Requirements Center (GPMRC) and the aeromedical evacuation cell work together on the execution floor to ensure that all urgent and

priority patients are moved quickly and safely. Other specialists on the execution floor include Maintenance, who are available to coordinate solutions to maintenance problems that occur mid-mission, and the Mission Flow Director who monitors runways and parking space availability worldwide, deconflicting as necessary. Figure 2 illustrates the execution directorates.

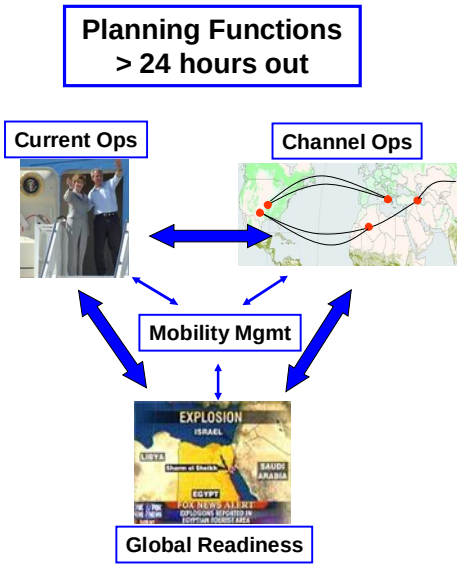

Figure 1. TACC planning directorates

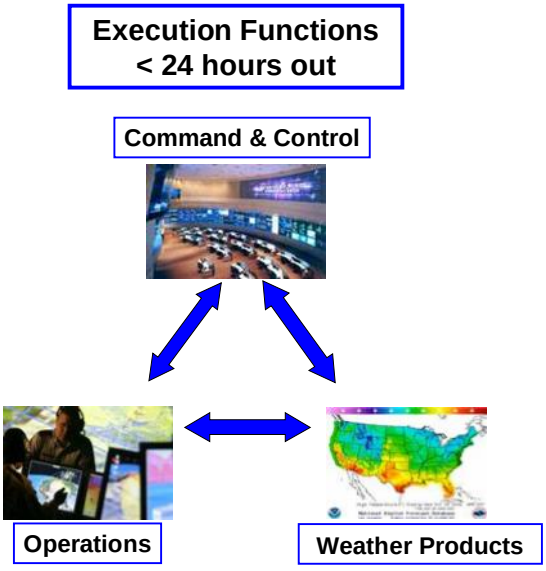

Figure 2. TACC execution directorates

External Collaboration

In addition to the complex coordination that takes place within and across the cells within the TACC, the TACC collaborates with a large number of external organizations.

The TACC is a hub for air transport worldwide. This requires extensive collaboration at all levels from airfield managers to component commanders. In service of our goal of providing an overview, here we present a high-level view of external collaborators, focusing primarily on the most routine collaborations. Clearly, many other agencies and companies collaborate with the TACC that are not mentioned here.

Requests for airlift are termed "requirements" in this domain. The TACC receives air transport requirements directly from the U.S. Transportation Command. The U.S. Transportation Command serves as a sustainment and distribution integrator (Schwartz, 2006). A key part of their role is to receive transportation requirements from the individual services, and determine which requests are valid air requirements before passing them along to the TACC. Although US Transportation Command generally serves as a mediator between the services and the TACC, it is not unusual for a planner in the TACC to contact a customer directly to clarify and coordinate specific requirements.

After requirements arrive in the TACC, planners work with active duty air wings, the National Guard/Reserves, commercial carriers, and the White House Movement Office to determine available airlift and begin scheduling actual missions. TACC planners also work with airfield managers and governments around the world to obtain permission for use of airfields and diplomatic clearances.

Finally, when the requirement, now in the form of a mission, reaches the execution floor, TACC personnel may coordinate with nearly anyone involved in making a mission happen. This might include the aircrew, the aeromedical evacuation crew, maintenance personnel, airfields, staging facilities, and the Air Terminal Operations Center.

It is also worth noting, that leadership in the TACC communicates data about airlift accomplished as well as predicted in the future, on a daily basis. This data allows war planners to assess current effort levels and make realistic plans for future operations.

Summary and Conclusions

While it is difficult to describe a complex and constantly evolving organization such as the TACC, this paper attempts to provide a snapshot overview. The TACC is an organization characterized by distributed cognition, organic adaptation, and extreme responsiveness to world needs. It is made up of highly experienced personnel, both military and civilian, each with areas of deep expertise and general knowledge of the larger logistics process.

Although the organizational structure of the TACC appears to be in nearly constant flux, expanding and collapsing cells as needed to meet the needs of the military, all functions are in pursuit of planning and executing airlift missions. In order for these missions to occur as safely and reliably as they do, extensive collaboration is required both within the TACC and across a broad range of external organizations.

In this dynamic context, forward-looking TACC leaders have leveraged expertise from within the Air Force Research Laboratory in recent years to examine issues of organizational design and technological support. These efforts have been mutually beneficial, providing a rich domain of study for human factors, cognitive engineering, organizational design, and system design specialists from the Air Force Research Laboratory, as well as leading edge technology concepts and services for the TACC. For example, the Human Interactions with System Agents (HISA) research project resulted in the novel application of intelligent agents to the design of a work-support system used for channel plans (Mulvehill & Whitaker, 2000; Eggleston, Young, & Whitaker, 2000; Young, Eggleston , & Whitaker, 2000). The Global Air Mobility Advanced Technology (GAMAT) research program produced software tools to support preflight and enroute flight management on the execution floor of the TACC (Scott et al, 2005). These projects followed soon after the Mobility 2000/Mobility 21 large-scale transformation effort in the TACC (Padula, 2007). Ongoing efforts include the development of an instrument for assessing collaboration readiness in C2 organizations (Lyons, Swindler, Wolf, & Vincent, 2007), and the design and development of a prototype software tool to aid TACC personnel in re-planning when missions are disrupted due to weather, maintenance, or any unpredictable real-time event (Whitaker et al, in press). We anticipate that this mutually beneficial relationship between the TACC and the Air Force Research Lab will continue as the TACC continues to evolve to meet worldwide air transportation needs and Air Force researchers continue to seek meaningful applications for leading-edge research.

Acknowledgements.

This work was funded by the Air Force Research Laboratory – Logistics Readiness Branch (AFRL/HEAL) under contracts FA8650-04-D-6546 and FA8650-06-C-6726.

References

Eggleston, R.G., Young, M.J., & Whitaker, R.D. (2000). Work-centered support system technology: A new interface client technology for the battlespace infosphere. Proceedings of the NAECON, 2000, Dayton, OH, 10-12 October, 2000, 499-506.

Herbert, A.J. (2006, September). Air Mobility's Never-Ending Surge. *Air Force Magazine, 89(9)*, 47-52.

Lyons, J.B, Swindler, S.D., Wolf, J.J., & Vincent, P.J. (2007). Assessing Readiness for Collaboration in Military C2 Centers. *Proceedings of the 14th International Symposium on Aviation Psychology*.

Mulvehill, A., & Whitaker, R. (2000). *Human interaction with software agents (HISA).* (AFRL-HE-WP-TR-2002-0007). Wright-Patterson AFB, OH: Human Effectiveness Directorate.

Padula, G. (2007). Transformation – Practical Lessons. *Proceedings of the 14th International Symposium on Aviation Psychology*.

Scott, R., Roth, E., Deutsch, S., Machiodi, E., Kazmierczak, T, Eggleston, R., Kuper, S., & Whitaker, R. (2005). Work-centered support systems: A human-centered approach to intelligent system design. *IEEE Intelligent Systems*, *20(2*), 73-81.

Schwartz, N.A. (2006, July-August). Orchestrate, Integrate, Coordinate. *Defense Acquisition, Technology, and Logistics XXXV(4), DAV 191*, 2-10.

Whitaker, Roth, Stilson, Scott, Thomas-Meyers, Wampler, Forsythe. (2007). Designing Decision Support for Mission Resource Retasking. *Proceedings of the 14th International Symposium on Aviation Psychology*.

Young, M.J., Eggleston, R.G., and Whitaker, RD. (2000). Direct manipulation interface techniques for interaction with software agents. Paper presented at the NATO/RTO symposium on Usability of Information in Battle Management Operations, Oslo, Norway.