Evaluating Aircraft Maintenance Production Meeting Effectiveness

GRADUATE RESEARCH PAPER

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Abstract

Meetings fulfill many important functions within an organization, while also representing a significant cost. This is particularly true in United States Air Force (USAF) Maintenance Groups, where preparing for and attending aircraft maintenance production meetings represent a significant portion of key maintenance leaders' duty day. Due to their prevalence and cost, research into meetings, and specifically how to design them to be as effective as possible, has become an important field of study, termed "meeting science". The design characteristics identified in "meeting science" research have been employed at organizations across the private sector to improve their meeting culture and increase effectiveness. While meetings and meeting design characteristics have been widely studied and applied in the private sector, little to no research or application has been done in the USAF maintenance community. This paper will evaluate the daily aircraft maintenance production meetings held at the Maintenance Group level to assess whether it is an effective use of time that produces value-added outcomes commensurate to its costs to the organization or, if not, how it can be changed to do so through an application of science-based meeting design principles.

To my wife, thank you for your support and patience throughout this past year. I could not have completed this adventure without you.

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Ian F. Mazerski

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EVALUATING AIRCRAFT MAINTENANCE PRODUCTION MEETING EFFECTIVENESS

I. **Introduction**

If you had to identify, in one word, the reason why the human race has not achieved, and never will achieve, its full potential, that word would be 'meetings.

Dave Barry
Author

As a leader, you must consistently drive effective communication. Meetings must be deliberate and intentional - your organizational rhythm should value purpose over habit and effectiveness over efficiency.

Chris Fussell
Author

Meetings are a ubiquitous fact of life in any large organization. Meetings offer leaders and managers a valuable tool to communicate their vision and direction for the organization, address problems and challenges, and coordinate amongst employees. Meetings also play a significant role in shaping an organization's culture and employee relationship building. As valuable as meetings can be, meetings also present a challenge to organizations. Too many meetings can be viewed as a waste of time and resources, leading to increased employee frustration and dissatisfaction (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 3).

Research has shown that since the 1950s, the number of hours an employee spends in meetings has rapidly increased. A 1973 study by Mintzberg found that an employee in a managerial position spent most of their typical workday, about 69%, in meetings (Mintzberg, 1973). Building on this research, a 1987 study by Mosvick and

Nelson found that relative to the 1960s, the average executive participated in twice as many meetings in the 1980s (Mosvick and Nelson, 1987). A 1990 survey of 1,900 business leaders reported that almost 72% of those surveyed spent more time in meetings than they had five years previously (Tobia and Becker, 1990: 34 - 38). Additionally, almost half (49%) of the respondents reported that they expected their meeting load to increase over the next four years (Tobia and Becker, 1990: 34 - 38). A 2006 study found that the average employee in a large organization spends six hours per week in meetings. A 2007 study of employees in managerial roles found that they were spending twenty-three hours per week in meetings (Rogelberg, Scott, & Kello, 2007: 18). More recently, a 2019 study commissioned by Verizon found that employees' time in meetings has risen eight to ten percent annually since the year 2000. Employees now attend, on average, more than sixty meetings per month (Verizon White Paper, Meetings in America, 2020).

As the number of meetings and amount of time employees, especially managers, spend in meetings has risen, so too has the cost of meetings to an organization. A 2001 study by Romano and Nunamaker found that U.S. business organizations spend between seven and fifteen percent of their personnel budgets on meetings (Romano and Nunamaker, 2001: 4). More recently, in 2019, Rogelberg stated that the cost of meetings to U.S. companies was over $1.4 trillion per year (Rogelberg, 2019: 9). The cost of unproductive or ineffective meetings has also been the topic of numerous research efforts. A 1989 study by Sheridan reported that U.S companies waste over $37 billion annually on unproductive meetings (Sheridan, 1989: 11). Similarly, in 2019, online meeting software provider Doodle reviewed data from over 19 million meetings and surveys of over six thousand business professionals. Doodle's analysis of the results

found that unproductive meetings cost companies over $399 billion (Doodle, State of Meetings Reports, 2019).

Just as research has shown that the number of meetings, time spent in meetings, and costs associated with meetings has all increased, it has also shown that most meetings are either ineffective or perceived to be ineffective by attendees. A 2005 survey conduct by Microsoft, which included over forty-thousand responses, found that seventy-one percent of workers in the United States considered the meetings they attended to be unproductive (Rogelberg, 2019:10). A 2014 Harris Poll conducted for the project management company Clarizen found that thirty-five percent of respondents indicated that meetings are a "waste of time" (Rogelberg, 2019: 10). More recently, a 2017 survey of senior managers across a range of industries conducted by the Harvard Business Review found that seventy-one percent identified their organization's meeting as inefficient or ineffective (Perlow, Hadley & Eun, 2017). Additionally, sixty-five percent of respondents also stated that meeting requirements kept them from completing their work tasks (Perlow, Hadley & Eun, 2017).

The research is clear, the number of meetings and amount of time employees are spending in meetings has significantly increased over the last several decades, and this trend appears likely to continue. Organizations are incurring ever-increasing costs due to their meeting requirements but are not necessarily receiving their expected return on investment. In response to the growing meeting demands placed on their employees, companies have begun to invest significant resources into ensuring their meetings are purposeful, efficient, and effective at producing desired results.

While all the research and statistics cited above were conducted in the private sector, it has important implications for leaders and managers in the U.S. Air Force (USAF). Just as in the private sector, meetings have become a ubiquitous part of USAF leaders' and managers' daily schedules. USAF leaders and managers must balance the demands of their jobs with the meeting requirements levied upon them. This is especially true within the USAF maintenance community. USAF maintenance leaders and managers typically begin their duty day by attending and briefing at a series of inter-related maintenance production meetings.

Maintenance Groups (MXGs) across the USAF follow a similar morning production meeting regimen, or "battle rhythm." The Maintenance Group Commander will chair a daily update brief, typically between 0800 and 0900, in which representatives brief them from across the MXG on the previous day's flying, current aircraft status, the progress of maintenance actions and expected fix times, the day's flying schedule, quality assurance findings, mishaps and incidents, and airfield and facility status. Additional topics may also be included depending on the MXG's mission and Maintenance Group Commander's preferences. To prepare for this meeting, Operations Officers, in both the Aircraft Maintenance Squadron (AMXS) and Maintenance Squadron (MXS), chair a squadron-level production meeting. These squadron-level meetings typically occur around an hour before the MXG meeting. They are designed to prepare the squadron's representatives, usually the Operations Officer, Aircraft Maintenance Unit Officer-in-Charge (AMU OIC), or Flight Commander, to brief the Maintenance Group Commander. Before the squadron-level meeting, there are AMU or Flight level meetings to prepare for the Squadron-level meeting. Every day, this sequence is repeated, Monday through

Friday, at MXG's across the USAF. An additional group-level production meeting, this one chaired by the MXG Deputy Commander, is held in the afternoon, typically between 1400-1500, depending on location. This meeting covers similar topics as the morning group-level meeting. Figure 1, Standard Maintenance Group Daily Production Meeting Sequence, illustrates the standard aircraft maintenance production meeting flow, with information flowing from one meeting to the next.

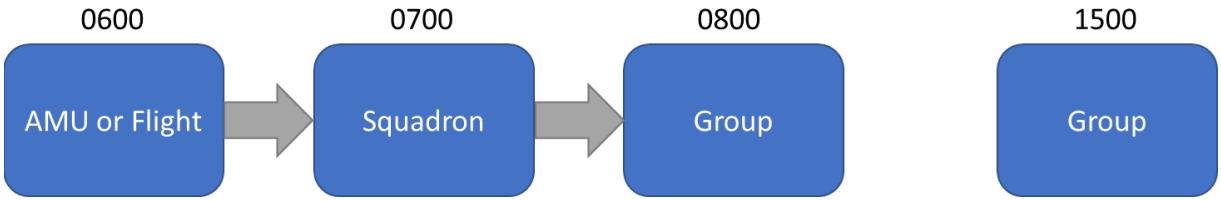

Figure 1. Standard Maintenance Group Daily Production Meeting Sequence

This standard morning production meeting sequence represents a significant time investment for key maintenance leaders at all levels across an MXG. As such, these meetings must be conducted as efficiently as possible and produce tangible, value-added outputs that increase MXG effectiveness and mission accomplishment. As the daily production meetings at the AMU/flight and squadron levels are constructed to prepare squadron representatives to brief the Maintenance Group Commander at the group-level meeting, their design and content are shaped by the group level meeting.

Problem Statement

Just as in the private sector, USAF maintenance leaders and managers find an ever-increasing portion of their duty day monopolized by preparing for and attending meetings. The standard production meeting regimen in maintenance groups requires key

maintenance leaders and managers to spend the first two to three hours, if not more, of their duty day attending maintenance production meetings. Time spent preparing for and attending these meetings removes critical leaders and managers from the flight line and back shops and prevents the completion of other work-related tasks. However, it is unknown if the standard aircraft maintenance production meeting in its current form is an effective use of time that produces value-added outcomes commensurate to its costs to the organization or, if not, how it can be changed to do so.

Research Questions

1) What is the purpose of the group-level daily maintenance production meeting?
2) Is the daily group-level maintenance production meeting, as currently constructed, achieving its purpose?
3) What information does the Maintenance Group Commander require daily?
4) Do alternate means exist, such as an executive dashboard that can communicate required information to the appropriate audiences in place of an in-person maintenance production meeting?
5) What risks are associated with not conducting in-person maintenance production meetings?
6) Can meeting design be applied to group-level production meetings to improve their effectiveness?

Research Objectives

The objective of this research is to evaluate the daily production meetings held by USAF maintenance leaders at the group level through subject matter expert interviews, a

comparative analysis of the design and content of the Maintenance Group Commander-chaired daily maintenance production meeting, and descriptive statistical analysis of production meeting duration and attendees. Specifically, this research will focus on the purpose and design of the daily group-level meeting. This data will be analyzed to evaluate whether or not these meetings effectively produce value-added outcomes for the organization, and if not, to identify potential areas for improvement based on meeting science research.

Research Focus

The research presented in this paper will focus on the daily maintenance production meetings held in Air Mobility Command maintenance groups. Specifically, semi-structured qualitative interviews were conducted with maintenance leaders currently assigned to, or with recent experience in, the 305th Maintenance Group at Joint Base McGuire-Dix-Lakehurst, New Jersey, the 60th Maintenance Group at Travis Air Force Base, California, and the 436th Maintenance Group, Dover Air Force Base, Delaware. Due to their similarities, these maintenance groups were selected, as all are assigned to Air Mobility Command, have multiple assigned aircraft, and contain an Aerial Port Squadron (APS).

Methodology

This research utilized a mixed-methodology approach. First, a series of semi-structured qualitative interviews with subject matter experts, consisting of key leaders across the maintenance group involved with daily production management, was conducted. The interviews focused on defining the purpose of daily maintenance

production meetings and explored their design and intended outputs. Second, a comparative analysis of the slides and content of the Maintenance Group Commander chaired daily maintenance production meetings provided by three Air Mobility Command maintenance groups was conducted. This data focused on identifying common trends and topics covered in the respective meetings and applications of meeting design characteristics. Finally, descriptive statistical analysis was utilized to assess the average duration and number of attendees at maintenance production meetings.

Implications

While the focus of this paper is limited to a specific set of meetings, maintenance production meetings, at a particular set of locations, the implications of its analysis and findings have broader applicability across the USAF maintenance community. Increasing the effectiveness of meetings through meeting design offers a means to give precious time back to USAF maintenance leaders and managers. The process utilized in this research could be applied to staff meetings or any of the multitudes of meetings USAF leaders find themselves regularly attending. The potential for time savings, organizational alignment, and increased job satisfaction and performance is significant.

II. Literature Review

Chapter Overview

The chapter will review relevant background information on maintenance production meetings in Air Mobility Command maintenance organizations and research relating to meeting science, or the structure, conduct, and impact of meetings in organizations. This chapter is comprised of three sections. The first section will provide a brief overview of the Air Force Instructions (AFIs) governing the structure, functions, and responsibilities of USAF MXGs. This will aid in understanding the existing sequence of daily maintenance production meetings in MXGs. The second section will review the AFIs directing maintenance production meetings and their mandatory content. Finally, the third section will provide an overview of relevant research into "meeting science" and the importance of evaluating an organization's meetings.

Maintenance Group Structure, Functions, and Responsibilities

A contributing factor to the development of meetings and the meeting culture within any organization is its structure, functions, and responsibilities (Allen, Rogelberg & Scott, 2008). To understand what a maintenance production meeting is and why the current regimen of meetings evolved, it is helpful to understand the underlying structure and responsibilities of an MXG. U.S. Air Force instructions (AFIs) 38-101 *Manpower and Organization* and AFI 21-101 *Aircraft and Equipment Maintenance Management* outline the structure, functions, and responsibilities of an MXG. AFI 21-101 *Aircraft and Equipment Maintenance Management* "prescribes basic aircraft and equipment maintenance management policy implementation and procedures used throughout the

United States Air Force to perform Mission Generation (MG) functions" (AFI 21-101, 2020, 14).

AFI 38-101 *Manpower and Organization* outlines the approved, standard structure of all MXGs. An MXG is comprised of the Maintenance Group Staff, which includes the Maintenance Group Deputy and Superintendent, Maintenance Operations (MXO), and Quality Assurance (QA), a Maintenance Squadron (MXS), and an Aircraft Maintenance Squadron (AMXS). If the MXG is responsible for multiple MDS's, it may have multiple AMXS, one per weapon system assigned, or the AMXS may have multiple AMUs, one per weapon system. For example, the 305 MXG at Joint Base McGuire-Dix-Lakehurst has two assigned airframes, the C-17 and the KC-10. The 305 AMXS is responsible for the MXG's assigned C-17's, while the 605 AMXS is responsible for the MXG's assigned KC-10's. Additionally, an MXG may also include, where authorized, a Munitions Squadron and/or an Aerial Port Squadron (APS). Figure 2 below illustrates a standard MXG organizational structure.

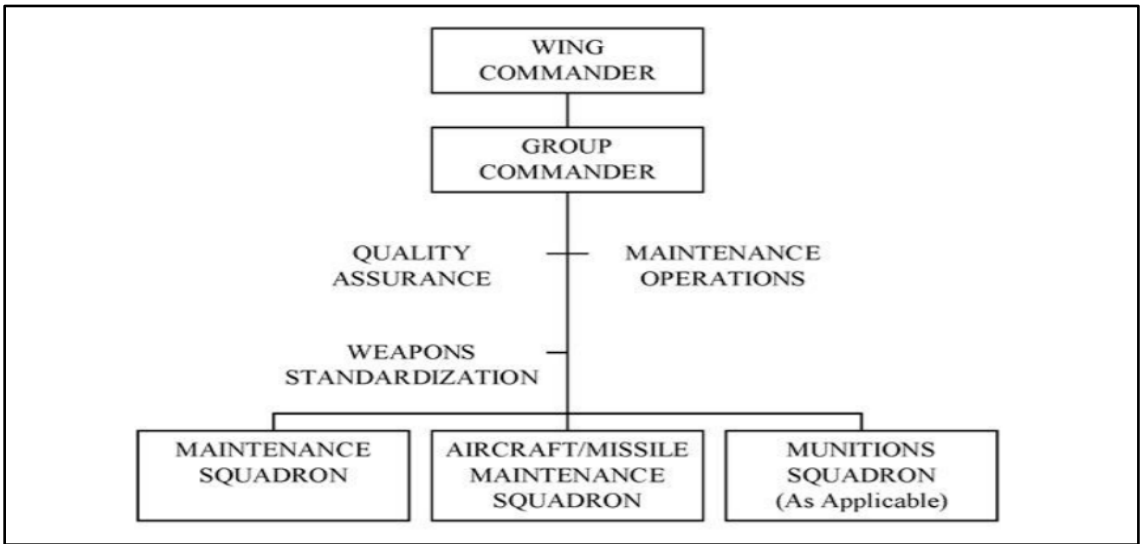

Figure 2. Standard Maintenance Group Organization Chart (Source AFI 38-101)

As outlined in AFI 38-101, an MXG is responsible for supporting "the primary mission with weapon system maintenance. This includes maintenance training, on-equipment, and off-equipment maintenance". (AFI 38-101, 2019, 97). On-equipment maintenance is defined as "maintenance tasks that are or can be effectively performed on or at the weapon system or end-item of equipment" (AFI 21-101, 2020, 415). Off-equipment maintenance is defined as "maintenance tasks that are not or cannot be effectively accomplished on or at the weapon system or end-item of equipment but require the removal of the component to a shop or facility for repair" (AFI 21-101, 2020, 415). An MXG accomplishes this responsibility by overseeing and managing its subordinate squadrons. Key MXG level participants in daily production meetings include the Maintenance Group Commander, Maintenance Group Deputy, and Maintenance Group Superintendent.

An AMXS is responsible for "direct mission generation support by consolidating and executing on-equipment activities necessary to produce properly configured, mission-ready weapon systems to meet operational, contingency, or training mission requirements" (AFI 38-101, 2019: 99). Maintenance personnel assigned to an AMXS "service, inspect, maintain, launch, and recover aircraft" (AFI 38-101, 2019: 99). A typical AMXS comprises a Maintenance Supervision section, one or more AMUs, a Support Flight, and a debrief section. Maintenance Supervision, which consists of the squadron's operations officer and superintendent, is responsible for the "overall management and supervision of daily maintenance activities" (AFI 38-101, 2019: 99). An AMXS' AMUs, led by their AMU OIC and AMU Superintendent, are responsible "for servicing, inspecting, maintaining, launching, and recovering assigned aircraft and

ensuring all mobility requirements are met" (AFI 38-101, 2019: 100). Key AMXS participants in daily maintenance production meetings include the Operations Officer, superintendent, AMU OIC(s), AMU Superintendent, Lead Production Superintendent, and Production Superintendent. Figure 3 illustrates the standard organizational structure of an AMXS.

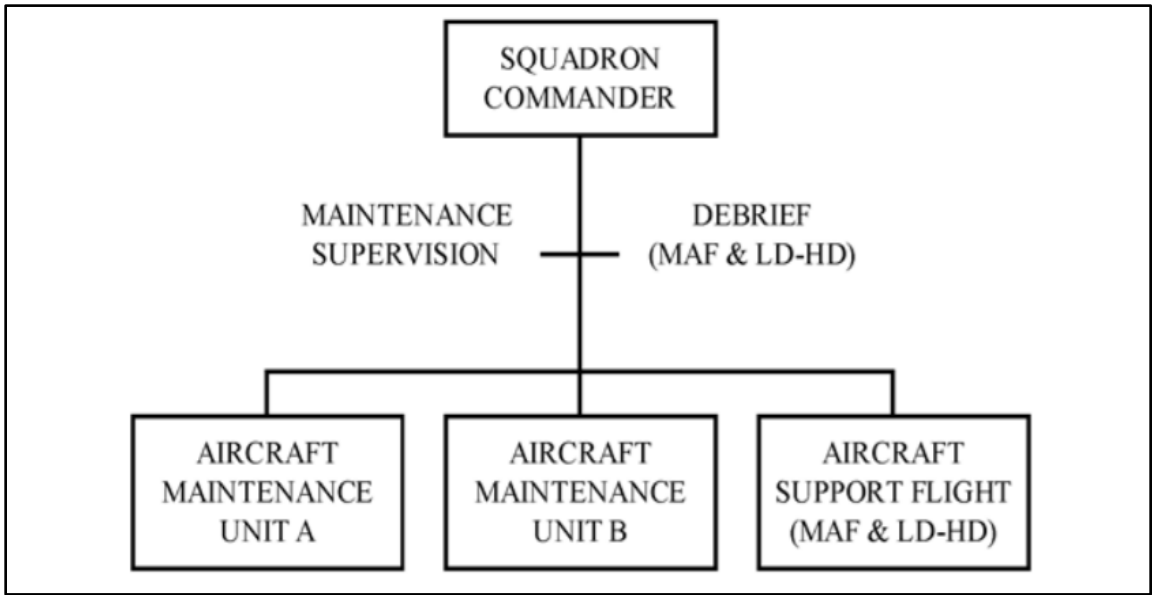

Figure 3. Standard Aircraft Maintenance Squadron Structure (Source: AFI 38-101)

An MXS is responsible for providing "back shop support to perform on and off-equipment maintenance tasks that are assigned to a specific back shop function" and "provides both organizational and intermediate level maintenance and supports repair network integration operations when assigned by the Major Command" (AFI 38-101, 2019: 100). An MXS comprises a Maintenance Supervision section and several flights, each with a specific maintenance function. Typical MXS representatives attending and briefing at the MXG daily maintenance production meeting are the Operations Officer,

Maintenance Superintendent, Lead Production Superintendent, and sometimes Flight Commanders. Figure 4 represents a standard MXS organizational structure.

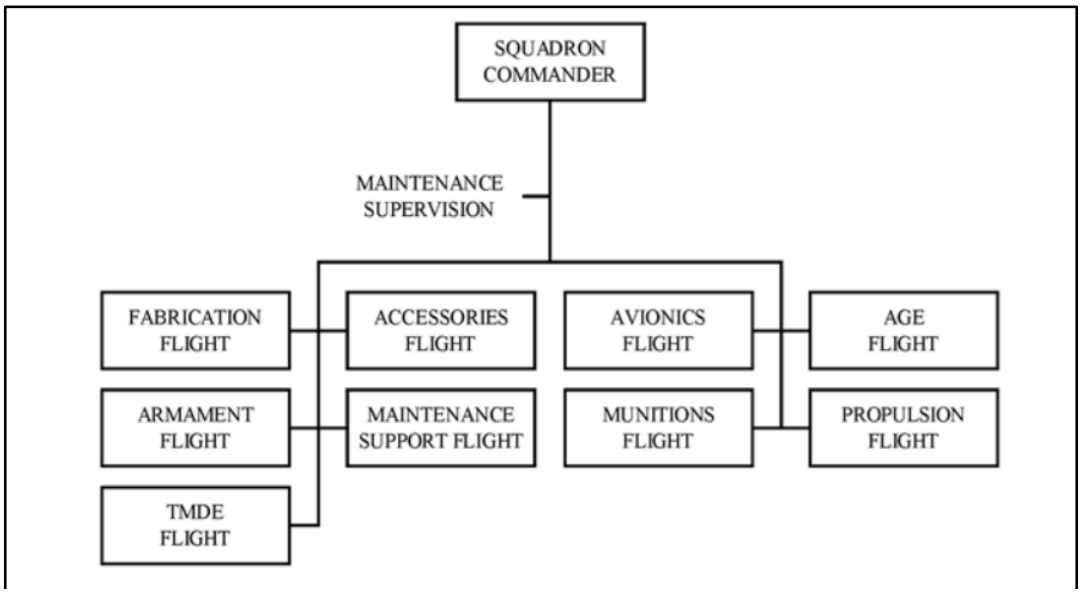

Figure 4. Standard Maintenance Squadron Structure (Source: AFI 38-101)

AFI Requirements

AFI 21-101 *Aircraft and Equipment Maintenance Management* is the "basic instruction for all weapon system and support equipment maintenance management guidance" (AFI 21-101, 2020: 1). It provides aircraft maintenance leaders with "the minimum essential guidance and procedures to safely and effectively maintain, service, and repair weapon systems and support equipment" (AFI 21-101, 2020: 1). Chapter Two of the instruction outlines the roles and responsibilities for "key leaders involved in maintenance activities" (AFI 21-101, 2020: 25). A review of this instruction found that it contains the word "meeting" eighty-nine times; however, it refers to a maintenance production meeting in only two instances.

Chapter 2, Paragraph 2.2 outlines Wing Commander's responsibilities. Paragraph 2.2.2 directs that Wing Commanders will "Conduct a daily "Wing Standup" meeting" (AFI 21-101 Air Mobility Command Sup, 2020: 29). This meeting will cover, at a minimum, "a review of previous, current, and future activities, focused on identifying and resolving issues with executing the established flying and maintenance schedule" (AFI 21-01 Air Mobility Command Sup, 2020, 29). The Air Mobility Command supplement allows this requirement to be accomplished via electronic means (AFI 21-101 Air Mobility Command Sup, 2020, 29).

The Maintenance Group Deputy Commander chairs the second daily maintenance production-related meeting directed by AFI 21-101. Paragraph 2.5.1 requires the Maintenance Group Deputy to "Chair and designate mandatory attendees for the daily maintenance production/scheduling meeting" and that "the purpose of this meeting is to verify aircraft and equipment utilization, scheduled maintenance requirements, establish work priorities, and coordinate schedule changes for the next day" (AFI 21-101 Air Mobility Command Sup, 2020, 39). This is the only location in AFI 21-101 that the term "daily maintenance production/schedule meeting" is used. Minimum mandatory topics that must be covered in this meeting are:

2.5.1.1. Aircraft and aircraft system status.

2.5.1.2. MICAP and repair cycle status.

2.5.1.3. AF Form 2407s, Weekly/Daily Flying Schedule Coordination.

2.5.1.4. Current-day flying and maintenance schedule execution.

2.5.1.5. Remaining portion of the current day's schedule.

2.5.1.6. Previous week/day's flying and maintenance schedule deviations to the published schedule.

2.5.1.7. Prioritizing aircraft requiring/competing for shared resources.

2.5.1.8. Special inspections (SIs).

2.5.1.9. Time Change Items (TCIs).

2.5.1.10. Time Change Technical Orders (TCTOs).

2.5.1.11. Depot Field Team (DFT)/Contract Field Team (CFT) schedules.

2.5.1.12. Due In From Maintenance (DIFMs) to ensure no overdue DIFM assets exist.

2.5.1.13. Condition Based Maintenance (CBM+) component status to ensure proactive aircraft maintenance practices.

(AFI 21-101, 2020, 39)

Neither AFI 21-101 nor any other AFI reviewed contained any requirement for the Maintenance Group Commander to chair a daily maintenance production meeting.

Meeting Science

During this research project, the researcher could find no specific research focused on meetings in the USAF or related to aircraft maintenance production meetings. However, a significant and growing body of research exists examining meetings and their impact on organizations.

The idea of a meeting or meetings being the focal point of a research endeavor is relatively new. H.B. Schwartzman is credited with putting forward the first formally recognized definition of a meeting in "The Meeting as a Neglected Social Form of in Organizational Studies" (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 4). Schwartzman defined a meeting as a "prearranged gathering of two or more individuals for the purpose of work-related interaction (Schwartzman, 1986, 8). Schwartzman was also the first researcher to take a scientific approach to studying meetings in and of

themselves as a focal target of inquiry (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 5). In 1989, H.B. Schwartzman continued exploring meetings in *The Meeting; Gatherings in Organizations and Communities.* Following the publishing of *The Meeting; Gatherings in Organizations and Communities*, little additional research into meetings themselves was accomplished until the early 2000s (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 5). In 2006, Rogelberg, Leach, Warr, and Burnfield refined Schwartzman's definition of a meeting, defining a meeting as:

> Purposeful work-related interactions that occur between two or more individuals and have the following three characteristics:
>
> 1) These interactions have more structure than a simple chat but less structure than a lecture
> 2) Meetings are scheduled in advance and last, on average, from 30 to 60 minutes
> 3) Meetings can occur in different formats. For example, meetings can take place face to face, in a distributed setting, or as a combination of the two (Rogelberg, Leach, Warr, and Burnfield, 2006: 84)

Since then, a growing body of research has been conducted on meetings, their effectiveness, and their impact on organizations and employees. Research focused on meetings as the primary topic of inquiry is now being worked across multiple disciplines, including psychology, communication, management, organizational behavior, marketing, anthropology, and sociology (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 4). This growing body of research, along with Schwartzman's *The Meeting; Gatherings in Organizations and Communities,* has provided the foundation for what is now recognized as "meeting science."

The *Cambridge Handbook of Meeting Science*, a comprehensive overview of relevant research into the field of meetings, defines "Meeting Science" as the "study of

what happens before, during, and after meetings in the workplace" (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 4). Researchers in the field of meeting science attempt to utilize the scientific method to understand "how and why meetings function the way that they do" and determine the "impact of those meeting factors on individuals, groups, teams, organizations, and society" (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 4). Meeting science examines meetings not only as a mechanism or tool for communication but also as an "activity that defines the employee's experience of work, of people, and of time" (Allen, Lehmann-Willenbrock & Rogelberg, 2015: 4). The authors argue that continuing research into meeting science is necessary and essential, as meetings "can raise individuals, teams, and organizations to tremendous levels of achievement" or "undermine effectiveness and well-being" of those same individuals, teams, and organizations (Allen, Lehmann-Willenbrock & Rogelberg, 2015).

As detailed in this paper's introduction, the number of meetings employees are required to attend increased consistently since the 1950s. Employees, especially those in managerial roles or positions, are finding an ever-increasing portion of their workday consumed by either meeting preparation or attendance. Several researchers have explored the connection between employee well-being and job satisfaction and their increasing meeting requirements. Luong and Rogelberg (2005) examined the relationship between an employee's meeting load and daily well-being. Utilizing existing stress research, these authors described meetings as daily hassles and interruptions that prevent or delay employees from attaining core work goals. Using fatigue, subjective workload, and feelings of productivity as measures of well-being, Luong and Rogelberg found that the number of meetings an employee attended daily was related to more significant fatigue

and increased subjective workload (Luong and Rogelberg, 2005: 64). Luong and Rogelberg concluded that "even when meeting quality and other potential moderators are not controlled for, the results suggest that meeting load in and of itself is an important variable to consider when studying employee well-being" (Luong and Rogelberg, 2005: 66). Based on this conclusion, Luong and Rogelberg argue that "organizations may want to be sensitive to the number of meetings employees are required to attend" as too many meetings could lead to increased employee fatigue, dissatisfaction, absenteeism, and potential turnover (Luong and Rogelberg, 2005: 66).

Similarly, Rogelberg, Leach, Warr, and Burnfield (2006) examined the relationship between an employee's meeting time demands and job attitude and well-being (JAWB). Their research found that perceived meeting effectiveness had a "strong, direct relationship with JAWB" (Rogelberg et al., 2006: 86). Perceived meeting effectiveness was positively related to employees' job-related comfort, job-related enthusiasm, and intention to quit (Rogelberg et al. 2006: 88). Perceptions of meeting effectiveness were found to be promoted by the extent that people come prepared to meetings, an agenda is used, meetings are punctual (start and end on time), purposes are explicit, and there is widespread attendee participation (Rogelberg et al., 2006: 94).

Research by Rogelberg, Allen, Shanock, Scott, and Shuffler (2010), further supported the relationship between perceived meeting satisfaction and an employee's overall job satisfaction. Their research determined meeting satisfaction to be a distinct factor contributing to an employee's overall job satisfaction separate from traditional measures such as work requirements, pay, promotion, supervisor, coworkers,

communication, horizontal comm, organizational integration, role ambiguity, team satisfaction, organizational commitment, and negative affectivity (Rogelberg et al., 2010: 155). The authors' findings "suggest that organizations that see the value in maintaining and promoting employee morale and job satisfaction should not take meeting experiences for granted" (Rogelberg et al., 2010: 167). They recommend that organizations regularly assess meeting satisfaction and hold managers accountable for managing and working to improve meeting effectiveness by making it part of the organization's performance-appraisal process (Rogelberg et al., 2010: 167).

Mroz and Allen (2015) contributed to the study of meeting science by exploring how the relationship a manager fosters with subordinates in meetings affects those employees' intentions to quit (ITQ). Mroz and Allen explored the positive aspects of meetings, hypothesizing that an organization in which employees perceived a high level of organizational support (POS) and leader-member exchange (LMX) quality in meetings would positively impact their ITQ. The authors' research established that there are "far-reaching ramifications of workplace meetings on employee job attitudes."

In addition to the connection between employee well-being and increasing meeting load, several researchers have examined what factors contribute to an employee's perception that a meeting was effective. Nixon and Littlepage (1992) examined the relationship between an organization's meeting procedures and perceived meeting effectiveness. Twenty procedures for effective meetings were identified in contemporary meeting literature and tested for their relationships with perceptions of meeting effectiveness. Sixteen of the twenty specified procedures were observed to

significantly correlate with perceptions of meeting effectiveness (Nixon and Littlepage, 1992: 365). Based on the results, meeting effectiveness was determined to be most closely related to; open communication, generation of a variety of options, full exploration of decision consequences, a task-oriented focus, action planning, temporal integrity, agenda integrity, and leader impartiality (Nixon and Littlepage, 1992: 367).

Leach, Rogelberg, Warr, and Burnfield (2009) examined the relationship between meeting design characteristics and employees' perceptions of meeting effectiveness. Five meeting design characteristics, Using an Agenda, Keeping Minutes, Punctuality, Having Appropriate Meeting Facilities, and Having a Chairperson/Leader, were examined to determine their impact on employees' perceptions of meeting effectiveness (Leach et al., 2009: 65). All five design characteristics were determined to positively correlate with perceived meeting effectiveness (Leach et al., 2009: 68). Agenda use, punctuality, and facilities, specifically, were found to be essential factors to increased perceptions of meeting effectiveness and deemed to warrant specific attention from organizations seeking to improve the effectiveness of their meetings (Leach et al., 2009: 74).

Kauffeld and Lehmann-Willenbrock (2012) contributed to the study of meeting science through an examination of meeting participants' microlevel interaction processes and meeting effectiveness. Act4teams, a validated instrument for group interaction analysis, was utilized to analyze the interactions of meeting participants in ninety-two meetings. Act4teams coded the observed meeting interactions according to a four-category coding scheme. The four categories included Problem-focused Statements, Procedural Statements, Socioemotional Statements, and Action-Oriented Statements

(Kauffeld and Lehmann-Willenbrock, 2012: 140). Meeting satisfaction, meeting effectiveness, and team performance were then assessed via a post-meeting questionnaire (Kauffeld and Lehmann-Willenbrock, 2012: 142). Problem-focused Statements, Positive Procedural Statements, and Proactive Action-Oriented Statements were associated with increased meeting satisfaction, team productivity, and organizational success (Kauffeld and Lehmann-Willenbrock, 2012: 146).

Collectively, the growing body of research into meeting science provides strong inducements for an organization to examine the meetings it holds. Employees' meeting load and perception of meeting effectiveness have been clearly shown to have a solid link to their job satisfaction and well-being (Luong and Rogelberg, 2005, Rogelberg et al., 2006, Rogelberg et al., 2010). Research has also demonstrated a link between meeting satisfaction and an employee's intention to quit or remain with an organization (Mroz and Allen, 2015). Perceived meeting effectiveness is linked to an organization's meeting design principles and procedures (Nixon and Littlepage, 1992, Leach et al., 2009, Allen et al., 2015). Any organization interested in its employees' well-being, job satisfaction, and performance should be evaluating how it designs and conducts meetings to ensure they are efficient and effective.

III. Methodology

Chapter Overview

This chapter details the process utilized to collect, analyze, and interpret data to evaluate the daily maintenance production meetings held by USAF maintenance leaders at the group level. Qualitative interviews with maintenance leaders at the squadron and group level were conducted to assess current perceptions of maintenance production meeting purpose and effectiveness, evaluate the present application of meeting design principles, and identify potential areas for improvement. Additionally, meeting data, including meeting content, average meeting duration, and the average number of meeting attendees, was requested from units for comparative content analysis and descriptive statistical analysis.

Research Design

Semi-structured interviews of subject matter experts were selected as the primary means of research for this paper. Interviews are utilized in qualitative research for a variety of purposes. Interviews can be used "as a primary data gathering method to collect information from individuals about their own practices, beliefs, or opinions" (Harrell, 2009: 24). They can also be used "to gather information on past or present behaviors or experiences" or to "tap into the expert knowledge of an individual (Harrell, 2009: 24). There are three types of research interviews: structured, unstructured, and semi-structured (Harrell, 2009). In structured interviews, the interview questions are "fixed and asked in a specific order to all interview participants" (Harrell, 2009: 28). The major drawback of structured interviews, and why they were not utilized in this research,

is that “the interviewer is generally limited to providing only previously scripted explanations or repeating scripted questions” (Harrell, 2009: 28). This limits the interviewer’s ability to pose follow-up questions or gain a thorough understanding of the answers provided. In an unstructured interview, the researcher has a plan for the interview but “minimum control over how the respondent answers,” which can allow the interview to go in multiple directions (Harrell, 2009: 26). While they can produce “very rich and nuanced data,” unstructured interviews are time-consuming to conduct and analyze and best suited to when the researcher has a great deal of time to spend with the community they are interviewing (Harrell, 2009: 26). In a semi-structured interview, the researcher utilizes prepared questions and follow-up questions but has discretion over the order in which questions are asked and how the interview flows (Harrell, 2009: 27). Semi-structured interviews are often used when the researcher wants to delve deeply into a topic and thoroughly understand the answers provided (Harrell, 2009: 26). The use of semi-structured interviews was selected due to their advantages over structured and unstructured interviews.

The researcher utilized a standard qualitative data analysis method, content analysis, to analyze the interview responses. Content analysis is a method commonly used to analyze qualitative data. It allows the researcher to interpret qualitative data by looking for similar words, phrases, or themes between the different data entries and the interview responses (Krippendorff, 2004). This allowed the researcher to draw conclusions from the whole set of interview responses.

In addition to conducting semi-structured qualitative interviews, the researcher requested targeted units provide information on their meeting content, meeting duration,

and meeting attendees for a comparative content and descriptive statistical analysis. Units were queried for group and squadron level data on maintenance production meeting content, average meeting duration, and the average number of meeting attendees. A comparative content analysis of the provided meeting content, in the form of slide decks or other utilized visual artifacts, was conducted to identify common content trends and requirements and any application of meeting design characteristics. The provided meeting duration and attendance data were reviewed and analyzed to provide a representative sample on the meeting load daily maintenance production meetings levy on maintenance groups.

Interview – Structure and Population

The semi-structured interviews utilized for this research were divided into two parts. The interviews began with a set of seven questions using a five-point Agree-Disagree Likert scale. These questions were followed with an additional five open-ended questions, with the order determined by the interview participant's answers, questions, and comments from the first seven questions. The interviews were primarily conducted via virtual methods, utilizing either Microsoft Teams (three), Zoom.gov (three), or over the phone (one). One interview was conducted in person. One interview was conducted via a combination of email correspondence (the interview participant provided written answers to interview questions) with a follow-up phone call.

A total of nine semi-structured interviews were conducted as part of this research. Interviews were solicited through email. The interview population consisted of USAF Field Grade Officers, or those in the rank of Major, Lieutenant Colonel, and Colonel, and

civilian government employee equivalents, currently serving in aircraft maintenance leadership billets at Air Mobility Command maintenance organizations. All interview participants were serving in Squadron Maintenance Operations Officer, Squadron Commander, Deputy Group Commander, or Group Commander duty positions at the time of their interviews.

Interview Questions

The following twelve questions were asked in each of the nine semi-structured interviews conducted for this research. The first seven questions were asked in order, with the interview respondent's answers and questions or comments guiding the order of the follow-on open-ended questions. The overall objective of the questions was to gain subjective opinions from the subject matter experts on the purpose of Maintenance Group Commander chaired daily maintenance production meetings, their effectiveness, the use of meeting design characteristics, and areas for improvement.

1. The Maintenance Group Commander chaired daily maintenance production meeting(s) have been deliberately designed to meet organizational goals
   1 – Strongly Disagree
   2 – Disagree
   3 – Neither Agree nor Disagree
   4 – Agree
   5 – Strongly Agree

2. The content of and topics covered in the Maintenance Group Commander chaired daily maintenance production meeting(s) impacts the content and topics covered in maintenance production meetings at lower organizational levels across the MXG (AMU/Flight, Squadron)
   1 – Strongly Disagree

   2 – Disagree

   3 – Neither Agree nor Disagree

   4 – Agree

   5 – Strongly Agree

3. The Maintenance Group Commander chaired daily maintenance production meeting(s) in my organization are an effective management tool
   1 – Strongly Disagree

   2 – Disagree

   3 – Neither Agree nor Disagree

   4 – Agree

   5 – Strongly Agree

4. The Maintenance Group Commander chaired daily maintenance production meeting(s) in my organization have a clear agenda
   1 – Strongly Disagree

   2 – Disagree

   3 – Neither Agree nor Disagree

   4 – Agree

   5 – Strongly Agree

5. The Maintenance Group Commander chaired daily maintenance production meeting(s) in my organization begin and end as scheduled (on time)
   1 – Strongly Disagree

   2 – Disagree

   3 – Neither Agree nor Disagree

   4 – Agree

   5 – Strongly Agree

6. All attendees at the Maintenance Group Commander chaired daily maintenance production meeting(s) in my organization are necessary and have clear roles.
   1 – Strongly Disagree

   2 – Disagree

   3 – Neither Agree nor Disagree

   4 – Agree

   5 – Strongly Agree

7. Maintenance leaders in my organization spend too much time preparing for and attending daily maintenance production meetings (all levels)
   1 – Strongly Disagree

   2 – Disagree

   3 – Neither Agree nor Disagree

   4 – Agree

   5 – Strongly Agree

8. Why do MXG's have a Maintenance Group Commander chaired daily production meeting/update?

9. What maintenance production information/topics do Maintenance Group Commanders require daily?

10. Is the information you identified in your response to the previous question available via means or methods other than being briefed in a meeting?

11. What are some innovative things you have seen an organization do to make their meetings more effective and better use of members' time?

12. What would your ideal group-level daily production meeting look like? In other words, what changes would you like to see?

IV. Analysis and Results

Chapter Overview

The following chapter will describe the results and analyze the semi-structured interviews conducted during this research project. Additionally, the comparative analysis of Maintenance Group Commander chaired daily production meeting content will be detailed. Finally, the descriptive statistical analysis of meeting duration and meeting attendees will be discussed.

Interview Results and Analysis

As described in this paper's Methodology chapter, nine semi-structured interviews were conducted with maintenance leaders currently serving in Maintenance Operations Officer, Squadron Commander, Deputy Group Commander, and Group Commander positions. The first part of the interviews began with seven questions scored on a one to five "Disagree to Agree" Likert scale. This portion of the interview results is captured below in Table I.

Table 1. Interview Part I Results

	Question #1	Question #2	Question #3	Question #4	Question #5	Question #6	Question #7
Interview #1	4	5	3	4	4	1	5
Interview #2	2	4	3	5	4	2	5
Interview #3	1	5	2	4	1	1	5
Interview #4	4	3	4	4	1	1	5
Interview #5	1	5	4	4	2	2	4
Interview #6	4	5	2	4	2	2	5
Interview #7	4	4	3	5	2	1	5
Interview #8	5	5	5	5	5	5	3
Interview #9	2	5	3	4	2	1	5
Avg Score	3	4.556	3.222	4.333	2.556	1.778	4.667
Std Dev	1.5	0.726	0.972	0.500	1.424	1.302	0.707

Question #1 - Group Commander chaired daily maintenance production meeting(s) have been deliberately designed to meet organizational goals

This question was designed to assess maintenance leaders' perceptions that their organization's Maintenance Group Commander chaired daily maintenance production meeting was deliberately designed to meet their organizational goals. As illustrated by Cohen et al. (2011), the design of meetings is an essential factor in meeting participants' perceptions of meeting effectiveness (Cohen et al., 2011). Meetings that are perceived to be aligned with organizational goals and drive progress towards achieving those goals have a much higher chance of being perceived as effective and good use of time by attendees (Lehmann-Willenbrock et al., 2018).

The average score received for this question was a 3, correlating to a "Neither Agree nor Disagree" response on the provided Likert scale. The mode of the response scores was a 4, or "Agree," with four of nine interviewees providing it as their response. The standard deviation for answers was 1.5, indicating a significant variation between individual responses and the largest standard deviation recorded for any interview question.

The lack of explicit agreement or disagreement in responses and the high standard deviation indicates that maintenance leaders are unclear about whether the design of their organization's Maintenance Group Commander-chaired daily maintenance production meeting supports the achievement of organizational goals. This could be due to a lack of understanding about meeting design characteristics. Alternatively, as every interviewee mentioned during the open-ended question portion of their interview, the entire sequence

of maintenance production meetings is just "how it has always been done." The mindset of "how it has always been done" can lead leaders and managers to accept ineffective or unproductive meetings without questioning whether the meetings produce progress towards organizational goals (Lehmann-Willenbrock, 2019).

Question #2 - The content covered in the Group Commander chaired daily maintenance production meeting(s) impacts maintenance production meetings at lower organizational levels (Flight/AMU/Squadron)

This question was designed to assess the researcher's hypothesis that the Maintenance Group Commander chaired daily maintenance production meeting should be the focus of any meeting improvement initiatives. As the content included in and discussed during this meeting directly impacts all maintenance production meetings at lower organizational levels (Flight, AMU, Squadron), any changes or improvements would significantly impact the organization. As there are no AFI requirements governing the content of this meeting, Maintenance Group Commanders have wide latitude on the content of these meetings, their frequency, and required attendees.

The average response score for this question was 4.556, falling between an "Agree" and "Strongly Agree" rating. With a standard deviation of .726, there was a strong consensus among the interview participants that the content covered in Maintenance Group Commander chaired daily maintenance production meeting(s) impacts the maintenance production meeting held at lower levels throughout maintenance organizations. This consensus indicates strong support for the researcher's hypothesis

that, at least initially, the Maintenance Group Commander chaired daily maintenance production meeting should be the focus of meeting improvement initiatives, as any changes or improvements to this meeting would have the most significant impact across the organization.

Question #3 - Group Commander chaired daily maintenance production meetings in my organization are an effective maintenance management tool

This question was designed to directly assess interview participants' perceptions of the effectiveness of Maintenance Group Commander chaired daily maintenance production meetings. A consensus of "Agree" or "Strongly Agree" responses would indicate that aircraft maintenance production meetings are perceived to be effective. Such a response would also suggest that crucial meeting design principles were being utilized, as found in Cohen et al. (2011). An "Agree" or "Strongly Agree" consensus would further indicate that the meeting was aligned with organizational goals and was viewed to produce value-added outcomes, as found in Lehmann-Willenbrock et al. (2018). A consensus of "Disagree" or "Strongly Disagree" responses to this question would suggest opportunities for improvement exist. Additionally, as outlined earlier in this paper, multiple studies have demonstrated that meeting participants' perceptions of meeting effectiveness connect to a range of positive and negative outcomes (Allen, Lehmann-Willenbrock & Rogelberg, 2015, Rogelberg et al., 2010, Leach et al., 2009).

The average response score for this question was 3.22, indicating a "Neither Agree nor Disagree" response from the interview respondents, with a standard deviation

of .972. Six of the nine interview participants provided a 3 or lower score for their response. This response score indicates a level of ambivalence about the effectiveness of Maintenance Group Commander chaired daily production meetings. When combined with interview participants' responses to the open-ended questions, this can be attributed to the fact that most participants viewed portions of the meetings as necessary and effective but considered other portions as ineffective, non-value added, or a waste of time.

As noted previously, Cohen et al. (2011) and Lehmann-Willenbrock et al. (2018) found that the design of meetings in an organization and their alignment to the organization's goals can be strong indicators of perceptions of meeting effectiveness. The average response score corresponding to a "Neither Agree nor Disagree" response, and the fact that six of the nine interview participants proved a 3 or lower score, suggests that Maintenance Group Commander daily aircraft maintenance production meetings, or portions of the meetings, are lacking in their application of critical meeting design elements. Additionally, these meetings may not be aligned with organizational goals or producing outcomes recognized by attendees as value-added. This suggests that the effectiveness of Maintenance Group Commander chaired daily aircraft maintenance production meetings could be increased through a formal evaluation of the meeting's design and content, focusing on applying critical meeting design characteristics and aligning meeting outcomes to organizational goals.

Question #4 - Group Commander chaired daily maintenance production meeting(s) in my organization have a clear agenda

While the first three questions were designed to assess interview participants' perceptions of meeting design, impact, and effectiveness, this was the first question to evaluate specific meeting design characteristics. This question was asked to assess whether an agenda was utilized as a part of Maintenance Group Commander chaired daily maintenance production meetings. The use of an agenda is one of the three key meeting design characteristics identified by Leach et al. as a strong indicator of meeting effectiveness (Leach et al., 2009: 74). A meeting agenda serves three purposes; to relay information about the meetings such as location, date, and time, pre-notify attendees of the meeting's content, and state the order in which topics will be discussed (Leach et al., 2009: 66). Cohen et al. (2011) also found that agenda use, especially if available to meeting participants ahead of time, has a high correlation with positive perceptions of meeting effectiveness.

The average response score for this question was 4.333, representing an "Agree" response. The lowest provided score was a 4, with six of nine interview participants scoring their response as such. The standard deviation of .5, the smallest of any response score, indicates strong agreement amongst all interview participants. These results indicate that agenda use is one critical meeting design characteristic currently utilized by USAF maintenance organizations, and their use should be continued in the future.

Question #5 - Group Commander chaired daily production meeting(s) in my organization begin and end as scheduled

This question was designed to assess the use of another meeting design characteristic, meeting punctuality, identified by Leach et al. (2009) and Cohen et al. (2011) as a critical driver of meeting effectiveness. Meeting punctuality is the idea that meetings in an organization begin and end, as scheduled (Leach et al., 2009: 68). Meeting punctuality "enables attendees to reliably schedule meetings around their personal work tasks, thereby reducing the disruptive effects of meetings" (Leach et al., 2009: 66). Meeting punctuality is also an essential factor for meeting participants' perceptions of their value to an organization, as meetings that begin and end on schedule demonstrate that the organization values their time (Leah et al., 2009: 66).

The average response score for this question was 2.556, corresponding to a "Disagree" rating. The standard deviation of response scores was 1.424, the second-highest of any set of responses. Three of nine interview participants responded with either "Agree" or "Strongly Agree" with the other six providing a "Disagree" or "Strong Disagree" response. Six of the nine respondents commented that while their Maintenance Group Commander chaired daily maintenance production meeting generally starts on time, they have no set end time and vary significantly in length. As found by Leach et al. (2009) and Cohen et al. (2011), meetings that run past their scheduled end time are strongly perceived by participants to be ineffective, disruptive to completing other tasks, and a waste of time. Tropman (1996) recommends that if a meeting arrives at its scheduled conclusion time with unfinished business, arrangements should be made for another meeting or that the issues be dealt with separately. The interview participants'

responses to this question provide another avenue for maintenance leaders to improve their meetings' effectiveness.

Question #6 - All attendees at the Group Commander chaired daily maintenance production meeting(s) in my organization are necessary and have clear roles

This question was designed to assess another meeting design characteristic, the selection of attendees, identified by Cohen et al. (2011) as a critical indicator of meeting effectiveness. Additionally, Cohen et al. (2011) found that the number of attendees at a meeting directly negatively correlated with perceived meeting effectiveness. Further research by Rogelberg (2019) found that "bloated meetings," or those with two or more unnecessary attendees, given the stated meeting goals, occurred in 59% of meetings at the organizations he studied. These "bloated meetings" were found to be "suboptimal from a process and effectiveness perception" and represent a significant source of frustration for attendees and cost to the organization (Rogelberg, 2019: 70).

The average score of interview participant responses for this question was 1.778, indicating a "Strongly Disagree." The standard deviation of response scores was 1.302. This high a standard deviation due to one interview participant scoring their response a 5, or "Strongly Agree," with no other interview participant providing a score higher than a 2, or "Disagree." Overall, eight of nine interview participants provided a "Disagree" or "Strongly Disagree" response. Removing the outlier score shows a strong consensus that attendees at Maintenance Group Commander chaired daily maintenance production meetings are not all necessary or have clearly defined roles. This suggests that the

meetings are attended by too many participants, offering an opportunity for meeting improvement. Maintenance leaders should review the meeting's purpose and goals and identify the critical participants required to achieve that stated purpose and goal. Once those key participants have been identified, meeting attendance should be limited to those identified required participants.

Question #7 - Maintenance leaders in my organization spend too much time preparing for and attending daily maintenance production meetings (at all levels)

This question was designed to provide insight into maintenance leaders' perceptions of meeting load and time demands on themselves and other maintenance leaders within their organizations. Multiple studies have shown that a high meeting load has a range of adverse effects on employees (Luong and Rogelberg, 2005, Rogelberg et al. 2006, Rogelberg et al., 2010, Mroz and Allen, 2015), including a detrimental effect on other meetings that would otherwise be perceived as effective (Leach et al., 2009).

The average score of interview participant responses for this question was 4.667, corresponding with an "Agree" or "Strongly Agree" response. The standard deviation for these responses was .707, and the lowest score provided was a 3, with eight of the nine interview participants providing a 4 or higher score. These scores indicate consensus that maintenance leaders spend too much time in maintenance production meetings, offering another opportunity for maintenance organizations to improve their meeting effectiveness. Reducing the amount of time maintenance leaders spend preparing for and attending maintenance production meetings gives time back on their schedules to perform

other work-related tasks. It also offers time back for engagement with subordinates and customers on the flight line or in work centers.

Question #8 - Why do MXGs have a Maintenance Group Commander chaired daily production meeting/update?

Rogelberg states that having a clear purpose and goal for a meeting is the first step in ensuring that an organization's meetings are designed to be effective (Rogelberg, 2019: 72). This question was asked to determine if the purpose and goal of the Maintenance Group Commander chaired daily maintenance production meeting was clearly understood by the maintenance leaders participating. As mid and senior-level maintenance leaders with extensive experience attending and participating in Maintenance Group Commander chaired maintenance production meetings, it was assumed that they would provide similar responses. However, counter to this assumption, the interview participants responded with a wide variety of answers, demonstrating a lack of clear purpose and goals. Three of nine interview participants cited fulfilling AFI requirements, even though no AFI requirements for a Maintenance Group Commander chaired meeting exist. One common theme, identified by five of nine interview participants, was the idea that the meeting served multiple purposes. However, there was no consensus on what those multiple purposes were. Providing MXG leadership an update on aircraft status, flying schedule execution and maintenance progress, communicating organization-wide priorities, and professional development were the commonly identified purposes. Two interview participants suggested that Maintenance Group Commander chaired daily maintenance production meetings resulted from

tradition and organizational inertia, or a continuation of "how we have always done it." Overall, the responses to this question suggest little consensus among maintenance leaders on the purpose and goals of having a daily Maintenance Group Commander chaired maintenance production meeting, offering another potential opportunity for improvement.

Question #9 - What maintenance production information/topics do Maintenance Group Commanders require daily?

This question was designed to identify essential information and topics required by Maintenance Group Commanders daily, to identify a starting point for streamlining the maintenance production meeting they chair daily. If required maintenance production information and topics could be identified, they could be used as a starting point for applying meeting design characteristics to ensure they are presented to the Maintenance Group Commander as effectively and efficiently as possible.

There was consensus amongst the nine interview participants' responses on what information Maintenance Group Commanders required daily. The following items were identified in all nine responses: current aircraft status, previous day's flying schedule execution, present day's flying schedule, the next day's flying schedule, maintenance repair priorities, and any limitations or constraints on meeting mission requirements. Additionally, if the MXG includes an APS, cargo throughput and aerial port status are required. Additional items mentioned in multiple responses, including Quality Assurance findings, mishap or incident information, and health of fleet metrics. Five of nine responses indicated that current meetings focus too much on "reporting the news" or

"answering the mail" on the previous day's flying and maintenance actions, with these topics dominating discussions and meeting time.

Question #10 - Is the information you identified in your response to the previous question available via means or methods other than being briefed in a meeting?

All nine interview participants agreed that the required information they had identified in Question #9 was available to maintenance leaders through means other than a meeting. Although all the necessary information is readily available, the interview participants identified two challenges associated with utilizing it. First, the required information is spread out over multiple data systems. There is no "one-stop-shop" data system where the Maintenance Group Commander or other maintenance leaders could log on and get a snapshot of the information required. Instead, the required information is located on multiple data management systems. Interview participants identified seven data management systems that capture portions of the necessary information: GO81, Global Reach, Logistics, Installations, and Mission Support – Enterprise View (LIMS-EV), Enhanced Maintenance Operations Center (EMOC), Global Decision Support System (GDSS), Logistics Evaluation Assurance Program (LEAP) and Standard Base Supply System (SBBS). The second issue identified was how the various systems present data. Data is not shown in an easy-to-view and digest manner. All interview participants identified these two issues as driving factors behind holding daily Maintenance Group Commander chaired maintenance production meetings and for the need for slide decks to

be built. Six of nine interview participants suggested that a modern data visualization program, such as Power BI or Tableau, if capable of directly interfacing with the various data management systems, could produce an executive-level dashboard view of maintenance organizations could increase meeting effectiveness and reduce person-hour costs.

Question #11 - What are some innovative things you have seen an organization do to make their meetings more effective and better use of members' time?

Interview participants' answers commonly identified three innovative initiatives in their responses to this question. The first, mentioned in all nine responses, were multiple efforts to reduce or streamline the number of slides presented in Maintenance Group Commander chaired maintenance production meetings. A common trend to these responses was that these efforts were often personality-driven and occurred after the arrival of a new Maintenance Group Commander. None of the responses included any experience with conducting a formal process of meeting evaluation, which is consistent with research conducted by Volkema and Niederman (1996), which found that while organizations often seek to shorten meetings, they do so without applying a formalized meeting evaluation process beforehand. Volkema and Niederman (1996) suggest that organizations would benefit from applying a standardized evaluation process, like those used in traditional continuous process improvement (CPI) events (Volkema and Niederman, 1996: 287).

The second, again mentioned in all nine responses, was the utilization of telecommunications programs, such as Microsoft Teams or Zoom.gov, to host remote

meetings due to COVID-19 restrictions on large in-person gatherings. The interview participants' consensus was that the shift to remote Maintenance Group Commander daily maintenance production meetings had had a net positive impact on their organizations. Several responses indicated that the transition to remote meetings allowed them to accomplish other tasks, such as respond to emails or prepare for other meetings, during the portions of the meeting that did not directly apply to them. Three interview participants, while agreeing that the transition to remote meetings was a largely positive development, suggested that their organizations had missed an opportunity for more significant change, as they had changed the means through which the meeting was conducted (remote versus in-person) and had made no changes to content, discussions, or attendees.

The third initiative mentioned in seven of nine responses was using locally generated programs or databases to compile data and produce meeting slides. The databases mentioned were built utilizing either Microsoft Access or Microsoft SharePoint. All interview participants cautioned that these locally generated databases were only valuable when they worked and often experienced technical issues. Additionally, the use of most of these programs and databases had been discontinued after the few technicians that had either created them or understood how to operate them had departed the unit. A program/database called "Waddle Vision," utilized at the 60th Maintenance Group at Travis Air Force Base, was explicitly identified in three of nine responses, with all three interview participants highlighting it as the "best" or "most complete" use of programming to automate the process of compiling data and producing meeting visual aids which they had seen. "Waddle Vision" offers a potential avenue for

further research on building and implementing a consolidated information database from which an executive-level dashboard could be developed.

Question #12 - What would your ideal group-level daily production meeting look like? In other words, what changes would you like to see?

The unanimity of interview participants' responses to this question focused on five items: reducing meeting frequency, the continuation of remote meetings, better information visualization, giving time back, and continuation of professional development. Reducing meeting frequency was the most common response. All interview participants stressed the importance of conducting Maintenance Group Commander level maintenance production meetings. Still, seven of nine recommended reducing the frequency from daily to a Monday and Friday schedule. This would provide an opportunity to brief the Maintenance Group Commander on a forecast of the week's maintenance and flying activities and give an end-of-week recap with a look ahead at the upcoming week. This meeting regimen would provide an opportunity for professional development and mentorship, something all interview participants identified as essential while giving maintenance leaders time back three days a week. On the days without a Maintenance Group Commander chaired maintenance production meeting, a dashboard that provides an organization-level snapshot of required information would be crucial to ensuring the Maintenance Group Commander and other essential maintenance leaders are kept up to date.

All interview responses indicated strong support for continuing virtual meetings, or at a minimum, allowing the option for remote attendance. A hybrid meeting model, where some participants could attend in person with others attending virtually by utilizing Microsoft Teams or Zoom.gov, was the preferred method for maintenance production meetings going forward. Multiple responses highlighted that virtual meetings offered considerable time savings for personnel, eliminating the need to travel to and from the meeting location.

Meeting Strengths

The interview results highlight several significant strengths of current Maintenance Group Commander chaired aircraft maintenance production meetings. First and foremost, all interview participants agreed that Maintenance Group Commander maintenance production meetings are a necessary and essential management tool. While there was disagreement over the purpose and goals of the Maintenance Group Commander chaired maintenance production meeting, the interview participants all recognized the importance of the meeting and the additional meetings required to prepare for it. The recognition of the importance of the meeting indicates that maintenance leaders have "bought-in" to their organization's meeting culture.

The interview results also revealed the widespread use of one critical meeting design characteristic identified in meeting science research as a strong indicator of meeting effectiveness. Interview participants unanimously agreed that their organization's Maintenance Group Commander chaired aircraft maintenance production meeting utilized an agenda. The use of agenda was one of three meeting design

characteristics identified by Leach et al. (2009) as having a significant positive relationship with perceptions of meeting effectiveness. Maintenance organizations should continue their use of meeting agendas.

Areas for Improvement

The interview results indicate that maintenance organizations are not adequately applying several critical meeting design characteristics identified in meeting science research as having a significant positive relationship with meeting effectiveness. First, the interview response results suggest maintenance organizations could improve their aircraft maintenance production meeting effectiveness by advertising meeting start and stop times and adhering to them. Advertising and adhering to meeting start and stop times enables attendees to reliably schedule meetings around their other work-related tasks, thereby reducing the disruptive effects of meetings (Leach et al. 2009: 66). Adhering to start and stop times also signals to attendees that their leadership values their time (Leach et al. 2009: 66). Second, the interview response results indicate that maintenance organizations could improve their meeting effectiveness by inviting only necessary participants who have a clear purpose and relevant expertise for the meeting. Interview participants were unanimous in their responses that not all meeting attendees were necessary or had clear roles. Research by Cohen et al. (2011), Rogelberg (2019), and Lehmann-Willenbrock et al. (2018), all found that attendee characteristics play a critical role in meeting effectiveness. Cohen et al. (2011) found that meeting size was negatively correlated with meeting effectiveness and recommended that "meeting organizers should carefully consider the list of meeting attendees, and only attendees central to the meeting's purpose

should be invited." Similarly, both Rogelberg (2019) and Lehmann-Willenbrock found that matching meeting attendees with meeting content and reducing or eliminating attendees for whom the meeting had no relevance positively correlated with meeting effectiveness.

Another area for improvement identified in the interview responses is the need to clarify the purpose of the organization's Maintenance Group Commander chaired maintenance production meeting and the desired outcomes. While all interview participants stressed the *importance* of the meeting to their organizations, as highlighted in the previous section discussing strengths, there was no consensus on the meeting's *purpose.* Clearly defining a meeting's purpose and desired outcomes is an essential prerequisite for appropriately designing the meeting (Rogelberg, 2019).

The final area for improvement identified in the interview responses was the frequency and duration of Maintenance Group Commander chaired maintenance production meetings. There was widespread agreement that maintenance leaders currently spend too much time preparing for and attending multiple daily maintenance production meetings. Multiple research efforts, such as Luong and Rogelberg (2005) and Rogelberg et al. (2006), have demonstrated that heavy meeting loads have adverse effects on employees' well-being, work quality, and intent to quit. Additionally, as noted by Perlow, Hadley, and Eun (2017), "time is zero-sum" and every minute an employee spends in a meeting has an opportunity cost. Recognized as such, reducing the frequency and duration of maintenance production would give maintenance leaders and managers time back to perform other critical work-related tasks.

Meeting Content Comparative Analysis

As outlined in this paper's Methodology chapter, a comparative content analysis of the meeting content of Maintenance Group Commander chaired daily maintenance production meetings was conducted to identify content trends to identify potential required meeting topics. As noted in this paper's Literature Review chapter, there is currently no AFI requirement for a Maintenance Group Commander to hold a daily maintenance production meeting.

The first element compared was the length of the respective maintenance groups' slide decks. Two maintenance groups provided their standard Maintenance Group Commander daily maintenance production meeting Microsoft PowerPoint slide deck. These slide decks contained thirty-two and thirty-seven slides, including introduction and closing slides, respectively. The third maintenance group provided their Maintenance Group Commander daily maintenance production meeting "package." This meeting package was twenty-five pages in length.

The Maintenance Group Commander chaired maintenance production meeting slides and package were then evaluated for shared content. The titles and content of slides were compared to identify those topics present in all three meetings. All three meetings contained the following content:

1) Previous day's flying execution, to include deviation reporting
2) Aircraft maintenance status
3) Current day's fly schedule
4) Next day's fly schedule
5) Status of scheduled or "heavy" maintenance inspections

6) Long-range aircraft schedule or “checkerboards”
7) Requirement Driven Allocation Process (RDAP) information
8) Supply status
9) Off-station aircraft status
10) Inbound aircraft forecast
11) Maintenance Recovery Team location and status
12) Hangar and critical facility status
13) Aerial Port cargo throughput/status

The following content was common to two of the three meetings:

1) Weather update
2) Airfield parking status
3) Transient Alert activity/status
4) Vehicle / Aerospace Ground Equipment / Deicer status
5) PPR Log

Overall, the content of the three meetings overlapped considerably. All content was found to be present in at least two of the three meetings. This level of standardization across maintenance groups, in the absence of an AFI requirement or standard, suggests some consensus amongst Maintenance Group Commanders and senior maintenance leaders regarding what information they require to make informed decisions. Every content topic found in common amongst all three meetings was identified in responses to interview question number nine, which asked interview participants to determine what information Maintenance Group Commanders required daily. However, all three

meetings included a far more significant amount of content than that identified in the interview responses.

While there was extraordinarily little difference in content between the three meetings evaluated, there were differences in the order topics presented and how the content was presented. Two of the three meetings began by providing a weather update before moving onto the previous day's flying schedule execution, current aircraft status, and current day's flying schedule before diverging to cover other topics. The third meeting began with an overview of the day's events, highlighting any unusual or unique occurrences and providing a snapshot of each subordinate unit's activity level. No other trends related to the order of content were noted. As noted, two of the three maintenance groups utilized Microsoft PowerPoint slides to present content and information. These two meeting slide decks were visually similar, using multiple graphs, charts, and other visual aids to display content. The third maintenance group, which utilized a "meeting package," presented its content in a much more text-heavy format.

Meeting Load Data Statistical Analysis

As described in this paper's Methodology chapter, squadrons at three Air Mobility Command maintenance groups were asked if they tracked either the duration or number of attendees at their daily maintenance production meetings. Several units provided estimates of both requested pieces of data, but all reported that they did not track this data. Units were then asked to track meeting start times, meeting end times, the number of attendees, and meeting method (in-person, virtual, hybrid) for thirty days. This data aimed to gauge the amount of time and number of personnel involved in preparing

for the organization's Maintenance Group Commander chaired daily production meeting. Three squadrons provided complete data, with the other squadrons providing partial or incomplete data. The three comprehensive data sets were utilized to establish an average time and attendee number for daily squadron-level maintenance production meetings.

The data collected showed that the average duration of a squadron level daily maintenance production meeting was 41.7 minutes and averaged 13 attendees (12.9 rounded up to the nearest whole person). The shortest production meeting tracked was concluded in 19 minutes, with the longest lasting 78 minutes. The standard deviation in meeting duration time was 8.56 minutes. For attendees, the average number ranged from a low of 10 to a high of 19. On the enlisted side, attendees ranged in rank from Senior Airmen to Chief Master Sergeant, with the majority being Senior Non-Commissioned Officers in the rank of Master Sergeant or higher. For officers, attendees ranged in rank from Lieutenant to Major. All three units which provided complete data sets reported using a hybrid method for conducting their meeting, with both in-person and virtual attendance.

At the maintenance group level, the average duration of a daily maintenance production meeting was 45.23 minutes and included an average of 35 attendees. Group-level maintenance meetings ranged in time from 33 minutes to 56 minutes. The standard deviation in meeting duration was 6.25 minutes. For attendees, the average number ranged from a low of 31 to a high of 40. The standard deviation for the number of attendees was 2.18. Attendees' ranks ranged from Senior Airmen to Chief Master Sergeant on the enlisted side and from Lieutenant to Colonel on the officer side. The meetings were conducted via virtual (Microsoft Teams) means.

Due to its limited size and scope, the collected meeting load data does not provide a representative sample of the meeting load placed upon maintenance leaders in Air Mobility Command maintenance groups. However, when analyzed through the prism of meeting science, it does provide a couple of critical insights. First, there is a lack of understanding in maintenance organizations on the cost of their daily maintenance production meeting regimens. Without an accounting of the number of maintenance leaders required and the amount of time they spend preparing for and attending maintenance production meetings, it is impossible to objectively quantify the meeting load and cost on an individual or organization. Without quantifying the cost, it is difficult, if not impossible, to conduct a cost-benefit analysis and determine if the current maintenance production meeting process is effectively producing outcomes commensurate with costs or requires evaluation and change. Additional research and data collection at maintenance groups across Air Mobility Command is needed to truly determine the costs of the current system of daily maintenance production meetings. Second, although the data collected is limited in scope, it does highlight the large size of group-level daily maintenance production meetings. Multiple researchers have found that meeting size negatively correlates with meeting effectiveness, attendee perceptions of meeting effectiveness, and attendee meeting satisfaction (Cohen et al., 2011; Geimer et al., 2015). This data, especially when combined with the consensus of responses to interview question #6, indicate that maintenance groups could improve their meeting effectiveness and free up maintenance leaders to perform other tasks by clearly articulating required attendees and limiting attendance to those identified personnel or necessary positions to ensure the meeting accomplishes its intended objectives.

Chapter Summary

This chapter provided the results and comparative content analysis of the semi-structured interviews conducted as part of this research project and data collected. The analysis results indicate that the Maintenance Group Commander chaired maintenance production meeting is a critical and necessary maintenance management tool. However, there has not been much deliberate research or thought to develop the meeting's goals, objectives, content, frequency, and attendees, and all offer areas for improvement. Maintenance Groups across Air Mobility Command and the Air Force could benefit from evaluating how they are currently conducting maintenance production meetings and applying science-based meeting design principles to improve their effectiveness while giving time back to maintenance leaders at all levels.

V. Conclusions and Recommendations

As Rogelberg argues, the collective body of research into meetings demonstrates that "meetings are in many ways the building blocks and core elements of the organization" (Rogelberg 2019; 17). Recognized as such, the goal of an organization looking to improve its meeting culture should not be the elimination of all meetings but rather to ensure that all meetings conducted by an organization are necessary, purposeful, productive, and effective (Rogelberg, 2019). An organization can accomplish this goal by evaluating its meeting culture and a concerted application of science-based meeting design principles.

The aircraft maintenance production meetings, which occur daily at the flight, squadron, and group level in maintenance groups on installations across Air Mobility Command, are an essential management tool. These maintenance production meetings provide a means to exchange information for planning, coordinating, monitoring progress, priority setting, and decision making. They also offer an opportunity for feedback, training, and professional development. While these meetings serve many vital functions, they also represent a significant organizational and individual time investment. As Perlow, Hadley, & Eun (20170 write, "time is zero-sum. Every minute spent in a wasteful meeting eats into time for solo work that is equally essential for creativity and efficiency" and "schedules riddled with meetings interrupt deep work." As such, organizational leaders owe it to their subordinates to ensure that the meetings they are asked to attend are purposeful, effective, and efficient. Current maintenance production meetings, especially the daily one chaired by the Maintenance Group Commander, offer a

significant opportunity for evaluation and improvement by applying the critical meeting design characteristics identified in recent meeting science research.

The USAF's aircraft maintenance community is currently undergoing a period of significant transition. Multiple initiatives are underway across the service to significantly alter how aircraft maintenance organizations accomplish their respective missions. One such initiative is Air Combat Commands' reorganization of AMUs into Fighter Generation Squadrons (FGS) as part of its Combat Oriented Maintenance Organization (COMO) reorganization. The objective of transitioning to the COMO organizational model is to "flatten the maintenance organizational structure" and "enhance the fighter force's agility, and better prepare them for a future dynamic force employment in a high-end fight" (*ACC to Align Fighter Squadron Operations, Maintenance*, 2021). Another initiative gaining traction is applying Theory of Constraints (ToC) principles to enhance aircraft maintenance processes. Maintenance groups at Fairchild Air Force Base, Ellsworth Air Force Base, and Kadena Air Force Base, among others, have seen significant increases in aircraft availability and readiness through their utilization of ToC principles (*Aircraft Availability, Readiness Increase*, 2020). These initiatives aim to improve aircraft maintenance organizations' effectiveness and represent seismic shifts in these organizations' daily operations. Now is an opportune moment for maintenance leaders to evaluate the aircraft maintenance production meetings in their organization and apply meeting science principles to maximize their effectiveness.

Recommendations

This research indicates that the study of the maintenance production meetings held in maintenance groups across the USAF, despite their high frequency and large audiences, is lacking or non-existent. Maintenance leaders do not have an accurate sight picture of the actual meeting load and its associated costs placed upon themselves and other leaders and managers in their organizations. Maintenance production meetings are viewed as a necessary evil, or "just how it has always been done," as multiple interview participants stated. Maintenance groups would benefit from evaluating the cost, both in hours and money, of their current maintenance production meeting process. This could be accomplished by using readily available online meeting cost calculators, such as the one available on the Harvard Business Review website, available at https://hbr.org/2016/01/estimate-the-cost-of-a-meeting-with-this-calculator. Establishing a cost associated with their maintenance production meetings would enable maintenance leaders to conduct an appropriate cost/benefit analysis to determine if the cost is reasonable for the benefits produced or if further evaluation and change are warranted.

The deliberate application of meeting design principles to maintenance production meetings can yield significant person-hour savings and improve meeting effectiveness, both real and perceived. As such, maintenance organizations could benefit from a formal review of their current maintenance production meeting processes. Maintenance production meetings should be considered for a formal CPI event, like those commonly conducted within maintenance groups to improve or lean out production processes such as C-17 Home Station Check inspections. For years, maintenance groups have funded attendance at certification courses that train personnel in LEAN, Sigma-Six,

and CPI skills and often utilize these personnel to conduct internal CPI events. Similar courses exist to train personnel on meeting design, development, and facilitation and could be considered to ensure that the meeting process improvement event has an appropriately trained and prepared facilitator. The CPI event should focus on applying the critical meeting design characteristics identified by Leach et al. (2009) and Rogelberg, Shanock & Scott (2012) to the organization's maintenance production meeting. The Maintenance Group Commander chaired daily maintenance production meeting drives the content and discussions in flight/AMU and squadron-level maintenance production meetings. It is the ideal candidate as a starting point for review and evaluation.

Another area identified that could yield immediate and noticeable improvement is the development of an enterprise-wide data analysis and visualization tool that can replace the need to have personnel spend significant time producing and updating slide decks. As outlined throughout the interviews, many maintenance groups have attempted to build local programs to alleviate the person-hour cost of building meeting slide decks while still providing maintenance leaders with the required information in an easily digestible format. None of the programs discussed, apart from "Waddle Vision" at Travis Air Force Base, have survived long-term. Commercially available data analysis and visualization software options, such as Microsoft Power BI and Tableau, are widely used across the private sector to collate large amounts of data and present it to decision-makers in an easy to view and digest format. The use of these or similar programs, or the development of a command or enterprise one, could be an effective tool to provide maintenance leaders, at all levels, with a single source, easily digestible, a dashboard-

style snapshot of all critical information required to make informed maintenance production decisions. This could alleviate the need for daily Maintenance Group Commander chaired maintenance production meetings, allowing for the adoption of an alternate schedule, such as Monday and Friday only, as proposed in multiple interview responses. At the very least, such a dashboard, if it contained all the required data and presented it appropriately, would drastically reduce the person-hour cost spent building slides.

Limitations and Future Research

The primary limitation of this research was the small interview population and the limited number of maintenance groups from which data was collected. A larger interview population, with participants selected from all of Air Mobility Command's maintenance group, would provide a more holistic view of the current state of maintenance production meetings, perceptions of their effectiveness, and opportunities for improvement. Additionally, the interview population comprised Operations Officers, Squadron Commanders, Group Deputies, and Group Commanders, or the more senior base-level maintenance leaders. As Cohen et al.'s (2011) research has shown, senior leaders and managers in an organization tend to have more favorable views and opinions of the effectiveness and necessity of their organization's meetings. Interviewing only more senior maintenance leaders could potentially skew results towards more positive results.

A further significant limitation was the lack of meeting data, such as average meeting duration or the number of attendees, available from queried units. Maintenance units, at least those focused on for this study, do not track any meeting data or metrics.

Lack of data on meeting costs prevents maintenance leaders from conducting appropriate cost/benefit analysis of their maintenance production meetings to make informed decisions on whether improvements are necessary.

The research presented in this paper offers a jumping-off point for future research into maintenance production meetings. It has established that, despite their importance as a maintenance management tool and the amount of time and resources they require, maintenance production meetings are seldom studied. Maintenance production meetings are ripe for improvement by applying meeting design characteristics and new technology. As such, the following five areas are suggestions for future research: 1) determining the actual costs of the current maintenance production meeting regimes and conduct a cost/benefit analysis of alternatives; 2) as there is no AFI requirement for a Maintenance Group Commander chaired daily maintenance production meeting, determining what topics and content are required to allow Maintenance Group Commanders and other maintenance leaders to make informed decisions; 3) determining the appropriate software or technology solutions to interface with the myriad of data systems utilized by the aircraft maintenance community and collate data from those systems into an executive dashboard that presents required information in an easily digestible format; 4) perform a comparative analysis of maintenance production meeting design and processes between the USAF and private industry, such as Delta Airlines; and 5) apply meeting design principles to other frequent meetings, such as staff meetings, to see if effectiveness or efficiency can be gained.

Summary

Meetings have gone from a little-studied part of the daily work requirements of leaders and managers to an area of intense focus and research. In recent years, the explosion in meeting science research is because organizations have recognized that meetings, though a vital management tool, represent a significant time commitment for leaders, managers, and employees. As such, organizations and businesses have concluded that their meetings, the process employed to determine when a meeting is necessary, and their design must be as effective and efficient as possible. While organizations across the private sector have invested time, money, and training into improving their meeting effectiveness, little deliberate thought or design has been applied to the maintenance production meetings that occur daily at the flight and AMU, squadron, and group levels at maintenance groups across Air Mobility Command and the United States Air Force. Evaluating their meetings and applying the science-based design characteristics identified as drivers of meeting effectiveness by meeting science research offers USAF maintenance organizations an opportunity to improve their effectiveness as an organization. As Allen, Lehmann-Willenbrock, and Rogelberg (2015) write, meetings "can raise individuals, teams, and organizations to tremendous levels of achievement" or "undermine effectiveness and well-being" of those same individuals, teams, and organizations. Air Force leaders, at all levels, owe it to their Airmen to ensure they are doing their part to make the former, rather than the later, happen.

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14. ABSTRACT
Meetings fulfill many important functions within an organization, while also representing a significant cost. This is particularly true in United States Air Force (USAF) Maintenance Groups, where preparing for and attending aircraft maintenance production meetings represent a significant portion of key maintenance leaders' duty day. Due to their prevalence and cost, research into meetings, and specifically how to design them to be as effective as possible, has become an important field of study, termed "meeting science". The design characteristics identified in "meeting science" research have been employed at organizations across the private sector to improve their meeting culture and increase effectiveness. While meetings and meeting design characteristics have been widely studied and applied in the private sector, little to no research or application has been done in the USAF maintenance community. This paper will evaluate the daily aircraft maintenance production meetings held at the Maintenance Group level to assess whether it is an effective use of time that produces value-added outcomes commensurate to its costs to the organization or, if not, how it can be changed to do so through an application of science-based meeting design principles.

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