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Richard G. Moffett III

Michael B. Hein

Glenn L. Littlepage

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Richard G. Moffett III
Michael B. Hein
Glenn L. Littlepage
Middle Tennessee State University
Murfreesboro, TN, USA

Safe and efficient flight operations require the effective intergroup coordination across multiple aerospace specializations. Various factors can impact this coordination including attitudes such as occupational stereotypes. This study reports on the development of a measure to assess ingroup-outgroup bias among aerospace specializations. Students from six aerospace specializations (Administration, Aircraft Maintenance, Air Traffic Control, Flight Dispatch and Scheduling, Professional Pilot, and Technology) at a southern university completed a questionnaire designed to assess stereotypes using adjectives to describe the members of ingroups and outgroups. Results indicate that students who had identified themselves as pilots or dispatchers exhibited ingroup-outgroup bias but in different ways. Implications of the findings for educating and training students in aerospace specializations are provided.

Safe and efficient flight operations require the effective coordination across multiple aerospace specializations such as Pilot, Flight Dispatch, Air Traffic Control, and Aircraft Maintenance. Various factors can impact this coordination including attitudes. According to Gregorich, Helmreich, and Wilhelm (1990) "considerable evidence exists which suggests that attitudes about the management of flight deck resources do influence the quality of crew coordination" (p. 682). Such findings have been applied to situations found in flight operations centers as noted in the evolutionary shift from cockpit to crew resource management (CRM) perspective (Helmreich, Merritt, & Wilhelm, 1999).

O'Conner, Campbell, Newton, Melton, Salas, and Wilson (2008) state that the primary measure used to assess attitudes that might impact crew coordination, especially in CRM training programs, is the cockpit management attitude questionnaire (CMAQ) developed by Helmreich (1984). According to Helmreich the CMAQ is a self-report survey that measures attitudes related to communication, coordination, command responsibility, and recognition of stressor effects. However, one attitude that has not been investigated as a possible impact on CRM is occupational stereotypes represented by aerospace specializations such as Pilots, Flight Dispatchers, and Maintenance Technicians.

Stereotypes can be defined as a "socially shared set of cognitions (e.g., beliefs, expectations) about the qualities and characteristics of the members of a particular group or social category" (Forsyth, 2010, p. 426). Stereotypes about occupations have been studied for sometime (e.g., Walker, 1958) but typically in the context of gender (e.g., White & White, 2006). This contextual limitation holds true for aerospace specializations (e.g., Davey & Davidson, 2000). However, some researchers have focused on stereotypes between occupations such as medical researchers and biomedical scientists (Lewitt, Ehrenborg, Scheja, & Brauner, 2010), and between engineers and managers (Jemielniak, 2007). Occupational stereotypes about aerospace specializations might impact the performance of individuals in a flight operations center through the process of ingroup-outgroup bias.

Ingroup-outgroup bias is the "tendency to view (one's own group) and its members more favorably than other groups" (Forsyth, 2010, p. 82). Forsyth noted that ingroup-outgroup bias can increase conflict and result in a breakdown in the ability of groups to work effectively towards a common goal. Furthermore, he states that when intergroup conflict occurs, typically the "ingroup favoritism is stronger than outgroup rejection" (p. 423).

One way to assess ingroup-outgroup bias among occupations is to identify the likeableness of the words used to describe the members of one's ingroup and to describe the members of the outgroups. If the words chosen for one's ingroup are significantly more favorable than those chosen for the outgroups, evidence for possible ingroup-outgroup bias could be said to exist. By having members of aerospace specializations (Dispatch, Maintenance, and Pilots) choose words that they think generally describes the members of their own specialization and other specializations, we can begin to assess if ingroup-outgroup bias exists.

The Present Research

Development of a Measure of Stereotypes about Aerospace Specialization

Dumas, Johnson, and Lynch (2002) developed a list of 844 person-descriptive words (adjectives) and established ratings of likeableness and familiarity of those words. The authors reported that their list expands on earlier word lists that researchers frequently use to "describe of qualify an individual's personality, dispositions, or behavior" (p. 523). Mean values and standard deviations for both likeableness and familiarity are available for each word. The results from Dumas et al. indicate that the ratings are reliable and correlate well with ratings found by previous researchers.

For the present research, we selected words from the list of 844 adjectives established by Dumas et al. in which both likeableness and familiarity were rated on 6-point scales. We initially selected items that met two criteria: high familiarity (mean rating of 5 or above) and consistency of rated likableness ($SD < 1$). Each of the authors examined the resulting list of 314 adjectives and independently selected items that represented personal characteristics relevant to work teams. For example, the word "competent" was used but not "amorous." From these items, 139 adjectives were selected by all three authors. These items were then alphabetized.

Hypotheses and Analyses

H1: Pilots will select adjectives with a higher mean likeableness rating to describe pilots than they will to describe maintenance personnel.

H2: Pilots will select adjectives with a higher mean likeableness rating to describe pilots than they will to describe dispatch personnel.

H3: Dispatchers will select adjectives with a higher mean likeableness rating to describe dispatchers than they will to describe maintenance personnel.

H4: Dispatchers will select adjectives with a higher mean likeableness rating to describe dispatchers than they will to describe pilots.

Each of the four hypotheses will be tested with a series of dependent sample t-tests. These analyses will be conducted separately for ratings by students in the Professional Pilot, Flight Dispatch and Scheduling, and Aircraft Maintenance programs and will contrast the mean rating of the adjectives selected to describe each specialty area.

Method

Participants and Procedure

Researchers at Middle Tennessee State University, working through a NASA-funded project titled MTSU Center for Research on Aviation Training, built a lab which is a replica of an airline's flight operations center. The simulation lab is referred to as NASA FOCUS, (flight operations center-unified simulation). Senior-level MTSU students from six aerospace specializations participate in high-fidelity simulations of a regional airline. Students interactively participate in a simulated work shift playing roles of aircraft dispatchers, pilots, ramp controllers, maintenance technicians, crew schedulers, and weather briefers. Combining the efforts of aerospace and psychology professors and graduate assistants, there are a number of research efforts currently underway including concepts of teamwork, shared task mental models, interpositional knowledge, attitudes, and future curriculum revisions.

As part of this larger research project, 60 students from six aerospace specializations (Administration, Aircraft Maintenance, Air Traffic Control, Flight Dispatch and Scheduling, Professional Pilot, and Technology) completed the "Perceptions of Aerospace Professionals" questionnaire. For the purposes of the present research only 39 subjects were used: 11 subjects identified themselves as Dispatch and 28 subjects identified themselves as Pilot. The remaining aerospace specializations had too few subjects to be included in the analyses.

The “Perceptions of Aerospace Professionals” questionnaire consisted of three copies of the list of adjectives described above; one for each of the target specializations to be described (i.e., one for pilots, one for flight dispatchers, and one for aircraft maintenance personnel). Each participant was asked to circle the specialization that best reflected his/her specialization. The specializations included Air Traffic Control, Flight Dispatch & Scheduling, Aircraft Maintenance (training or management), Professional Pilot, Administration, and Technology. Next, participants were asked to circle the adjectives that are generally descriptive of members of each of the specified aerospace specializations (Dispatch, Maintenance, and Pilot).

For each participant, a likeableness score for each adjective chosen was determined by using the mean established for that word by Dumas et al. These scores were then averaged within a specialization to yield a mean likeableness score for that specialization.

Results and Discussion

Overall, partial support was provided for the hypotheses.

Figure 1 presents the mean likeableness ratings of those who identified themselves as Pilots. As is shown in this figure, these subjects viewed themselves and the members of the other groups in a generally favorable light.

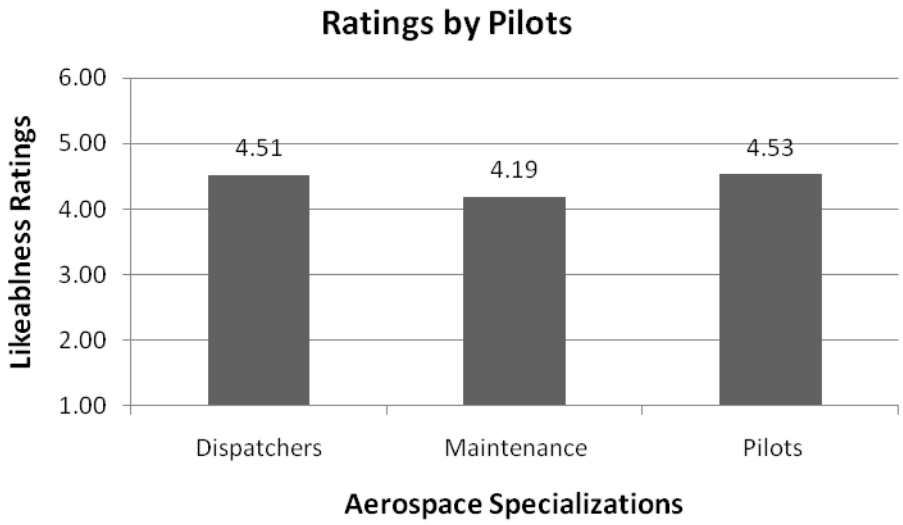

Figure 1. Mean likebleness ratings by pilots.

The results of a dependent sample t-test, comparing the mean rating of the adjectives selected to describe each specialty area by Pilots supported Hypothesis 1. There was a significant effect for specialty area, $t(27) = 2.31$, $p < .05$, with pilots (M=4.53, SD=.60) receiving higher scores than maintenance personnel (M=4.19, SD=.91) from pilots. However, Hypothesis 2 was not supported. There was a not a significant effect for group, $t(27) = .11$, $p > .05$, with pilots (M=4.53, SD=.60) receiving scores almost identical to dispatchers (M=4.51, SD=.69) from pilots.

Figure 2 presents the mean likeableness ratings of those who identified themselves as Dispatchers. As is shown in this figure, these subjects viewed themselves and the members of the other groups in a generally favorable light.

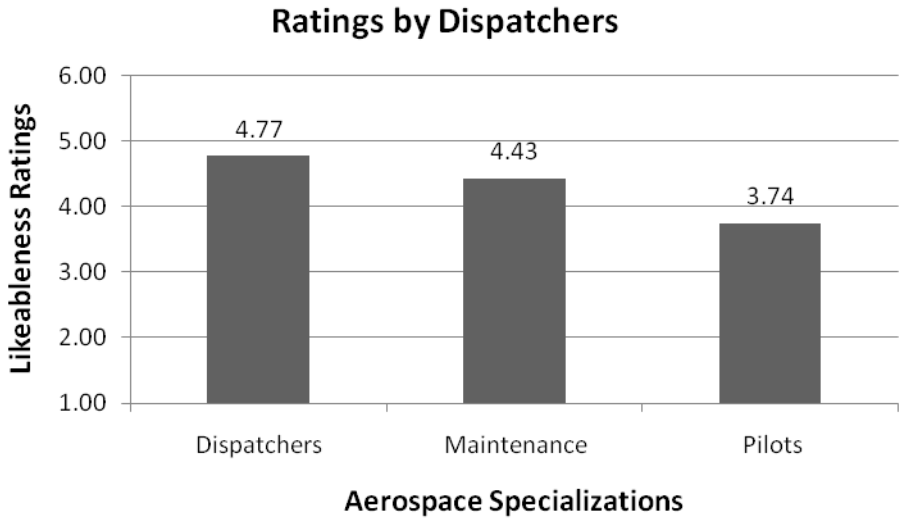

Figure 2. Mean likeableness ratings by dispatchers.

The results of a dependent sample t-test, comparing the mean rating of the adjectives selected to describe each specialty area by Dispatchers did not support Hypothesis 3. There was a not a significant effect for group, $t(10) = .12$, $p > .05$, with dispatchers (M=4.77, SD=.50) receiving scores not significantly different than maintenance personnel (M=4.43, SD=.63) from dispatchers. However, Hypothesis 4 was supported. There was a significant effect for specialty area, $t(10) = 2.77$, $p < .05$, with dispatchers (M=4.77, SD=.50) receiving higher scores than pilots (M=3.74, SD=1.12) from dispatchers.

The above results indicate that both Pilots and Dispatchers may have ingroup-outgroup bias towards other aerospace specializations, but this effect is manifested toward different groups. Pilots exhibit ingroup-outgroup bias towards Maintenance personnel but not Dispatchers who they view very similarly to themselves. On the other hand, Dispatchers exhibit ingroup-outgroup bias towards Pilots but not Maintenance personnel.

It is beyond the scope of this study to speculate as to the reasons for this difference in ingroup-outgroup bias between Pilots and Dispatchers. However, looking at the trends of the differences it appears that the size of the ingroup-outgroup bias held by Dispatchers towards Pilots indicates that the stereotypes held by Dispatchers could be more problematic and might impact effective coordination between these groups.

Some limitations of this study involve the sample used. The overall sample size was small which reduces the generalizability of the findings. Additionally, if data from other aerospace specializations could have been collected the nature of the observed trends might be better understood.

As mentioned earlier, the present study is part of a larger research effort. The focus of this research effort is to understand the effects of training aerospace specializations in an intensively interdependent simulated environment called the NASA Flight Operations Center – Unified Simulation (FOCUS). This simulation replicates a flight operations center of regional airlines. This simulation requires students from six aerospace specializations to perform their jobs and coordinate their efforts to deal with normal and unplanned situations. The simulation requires face-to-face contact in the pursuit of a superordinate goal of safely and efficiently operating the flight operations center. These intergroup opportunities provide the foundation for reducing possible aerospace specialization stereotypes and thus reducing ingroup-outgroup bias (Pettigrew & Troop, 2006).

To test the effectiveness of the simulation to reduce this bias, the measure used in the present research will be re-administered as a post-test once students have received training in the simulation. If the experience of working with other aerospace specializations in the intensively interdependent simulated environment can be shown to

reduce stereotypes about aerospace specializations, then suggestions about education and training can be developed to increase coordination and reduce conflict, which may facilitate increasing airline safety and efficiency.

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