Factors that Affect Retention and Satisfaction Among Newly Hired Aerospace Engineers

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1 Abstract

Turnover plays a significant role in the productivity of any organization and is especially vital within the initial adjustment period of new hires. Organizations seek to develop strategies to reduce turnover to help solve this issue, but these strategies require knowledge of what influences the retention and satisfaction of the employees. The objective of this research is to identify the factors that managers perceive to affect the retention and the satisfaction of newly hired aerospace engineers so that managers or employers can create strategies to reduce turnover within this group.

While research has been conducted on general retention and satisfaction, no research has been specific to the aerospace engineering field and its newly hired employees. These aspects are important because unique factors can arise within specific fields.

The current study used qualitative research methods to analyze seven semi-structured interviews with experienced managers of newly hired aerospace engineers. These interviews were analyzed to find key factors that managers consider to affect retention and satisfaction.

This research identified six themes for retention factors: local and national economic trends, personal factors unique to each newcomer, the quality of work assigned to the newcomer, the social environment of the workgroup, benefits offered to employees, and the newcomer's role and how it fits in with the workgroup. This study also identified six themes for satisfaction factors: the quality of work assigned to the newcomer, management styles and actions, general work environment, benefits, fit with a mentor, and expectations for the aerospace industry.

2 Introduction

Retention can be defined as the percentage of a workforce that stays in their workgroup over a period of time. In many organizations, retention is considered an important measure of the productivity of a workgroup because a low retention rate can lead to increased costs for resources and recruiting as well as taking time to find and train new employees. These costs can be up to 200% of the previous employee's salary [1]. Because retaining employees is important, organizations should seek to identify and address factors that affect retention.

Employee satisfaction is also a particularly important factor and is unique, in that it can be used as an independent measure of job quality and productivity. Finding both retention and satisfaction factors, and how they overlap, is important for company productivity.

While retention and satisfaction have been researched in general contexts, as well as in some specific industries, no recent research has been done on these topics in the aerospace engineering industry. Although many factors are present across many industries, specific organizations and jobs are likely to have unique factors that must also be considered as well as the varying scope and severity of the impact of each factor. Therefore, this study aims to identify retention and satisfaction factors for newly hired aerospace engineers so that turnover prevention strategies can be developed within the field of aerospace engineering.

Prior research has found many retention factors that apply broadly across many industries. These studies, and the factors already known, are summarized in the literature review below. While few factors are unique to the aerospace industry, some factors might be more relevant or impactful within aerospace than in other fields because of unique aspects or situations that arise within aerospace. These unique aspects include that the aerospace industry typically requires a skilled and educated workforce. Additionally, aerospace engineering includes a wide variety of jobs and is often associated with the defense industry, which means aerospace engineers are often in stressful positions that can have wide-ranging and significant impacts and may require the engineers involved to have security clearance or to be secretive about their work. These unique qualities make it likely that retention and satisfaction factors within aerospace engineering are different, or have different effects, than other industries. Using a qualitative method and semi-structured interviews, this study identifies these factors from the perspectives of aerospace

engineering managers. The factors are organized by whether they affect retention and/or satisfaction and are further categorized by themes that connect them. Finally, these factors are compared to what has been seen in previous research on general turnover factors. The study findings can be used in turnover prevention strategies to improve the retention and satisfaction of aerospace engineers and consequently the productivity of aerospace engineering organizations.

3 Literature Review
3.1 Retention
Previous studies provide several elements that affect employee retention: factors internal to the organization, factors external to the organization, and employee conditions [2]. Internal factors include salary and benefits, company culture, and the social environment. External factors are related to the general economy, laws, or regulations that affect the organization, and management directly. Finally, employee conditions involve demographic information, such as age, gender, or education, but can also include individual traits, such as personality or values [3]. Some studies include job satisfaction as an employee condition [2], [3], while others evaluate it as a separate factor [4]. Susomrith and Coetzer [5] found that internal factors serve as larger barriers than external factors in small engineering firms, implying that internal factors might be more significant for retention than external factors. Zimmerman [6] found that personality traits such as emotional stability or conscientiousness have direct and indirect effects on both job satisfaction and retention.

Recent research has focused on a new concept that affects retention, called job embeddedness. Job embeddedness is considered "the level of links a person has to other people or activities, the extent that the person's job and community are congruent with the other aspects of their life, and the sacrifices a person would make in the process of leaving their employment" [7]. This concept includes internal, external, and employee conditions factors and is a broader model to analyze the interaction between factors and retention. According to the study conducted by Tanova and Holtom [7], job embeddedness accounts for significant variance beyond demographic or traditional factors. Job embeddedness and other similar models provide convenient frameworks to analyze retention factors and how they impact retention, but identifying these factors is still required to use these models.

3.2 Satisfaction
Employee satisfaction is a complex topic and has many factors. Demographics play a significant role in determining satisfaction. Sabharwal [8] found that foreign-born science and engineering faculty at research institutions have lower satisfaction in all aspects of their jobs than native-born faculty. Sabharwal [8] also found that women are less likely to express satisfaction with advancement opportunities, location, salary, and job security, all of which can be considered satisfaction factors. Additionally, the same factors might affect different employees distinctly. An analysis through the career orientation of employees found that independent workers, who focus more on their employability, experienced lower satisfaction when career support or skill development promises were unfulfilled, while these factors were less important to employees focused on loyalty and advancement within their current organization [4]. This individual approach is supported by Colakoglu [9], who found that pursuing careers that align with an individual's self-concepts can promote subjective career success, which is closely linked with job satisfaction.

Other research has found that situational factors, specifically job characteristics, are the most important for satisfaction, rather than individual factors [6]. Robinson [10] analyzed how design engineers spend their time and how different tasks and activities affect their satisfaction. Robinson's results indicate that both the quality of activities and the variety between activities are important for satisfaction. Another consideration is how the organization and management interact with the employees. High-performance work systems are defined as human resource practices to find and retain the best human capital. These practices have an important effect on job satisfaction through the mediating factor known as perceived organizational support [11]. Finally, the relationships built between the newcomer and their coworkers and managers during their

socialization and adjustment period have a significant effect on their satisfaction both during the socialization process and in their future career [12].

3.3 Gaps
While employee retention and satisfaction factors have been identified and analyzed in general, it is important to note that they can vary between sectors and businesses. Aerospace engineering is a unique sector because of its significance to national defense and its large impact on the national economy. Additionally, the aerospace industry is a rapidly changing area that has undergone recent developments. The emphasis of aerospace is no longer on concepts of "farther, faster, higher," driven by a priority on national security prevalent during the Cold War but rather on "quicker, better, cheaper," driven by market competition and the economy [13]. This is one example of the constant and relatively rapid changes that are unique to aerospace. These qualities are likely to create, strengthen, and weaken specific retention and satisfaction factors, as seen by how these qualities relate to factors seen in the aforementioned research. Therefore, this research will identify retention factors specific to aerospace engineering, which have not been sufficiently investigated. Additionally, because many current research studies examine retention with no focus on how long the employee has been at the company, this research will focus on newly hired aerospace engineers with little previous experience. Finally, this research will focus on finding satisfaction factors and examining how distinct or connected they are with retention. The research questions are:
1. What are the factors that affect retention among newly hired aerospace engineers?
2. What are the factors that affect satisfaction among newly hired aerospace engineers?

4 Method
4.1 Selection of Interview Participants
The participants were selected through researchers' connections from various companies around the country. The selection criteria for participants were: participants have an engineering degree, have worked with newcomers in an aerospace company, and have held a managerial position.

A total of seven (one female and six male) participants from four different aerospace companies participated in this study. All companies represented are aerospace-focused organizations whose headquarters are in the United States. All companies to which the managers belong have some military and space divisions in their portfolio. Three companies have developed parts and/or aircraft for commercial use. All the participants in this study have had at least five years of experience managing newcomers, and many of them have had five years or more working experience as an engineer.

4.2 Data collection
A qualitative research method has been applied as it enables researchers to explore data in-depth from a sample of participants. This study was a part of a larger study that has the following goals: exploring newcomer's retention and satisfaction, the actions of managers and newcomers in socialization, and the onboarding process in the aerospace industry and the culture or working environment. This paper is focused on the first goal: exploring newcomer's retention and satisfaction.

Interviews were chosen as the data collection method because they help researchers collect data through interaction between interviewers and participants. Each interview was semi-structured and followed the same interview protocol. Semi-structured interviews provide researchers flexibility in wording the questions and allow asking follow-up questions for more information and details.

All seven participants were individually interviewed by one interviewer. All participants were compensated with a gift card worth $99.99. As designed, each interview lasted from one to one and a half hours. Two of the seven interviews were in-person interviews, and the remainder of the interviews were virtual, conducted through online meetings or phone calls.

Interviews were audio-recorded, and the recordings were transcribed by an external transcriptionist. The interviewer checked each transcript after an interview to ensure the audio file had been clearly and

correctly translated into text. Some phrases or sentences were not clear in the text because of cross-talking or unrecognized words in the audio files. The unclear transcriptions were correctly transcribed by the interviewer when the research team was reviewing the transcripts. These transcripts were treated as the raw data in our research.

4.3 Data Analysis

An initial codebook was designed to guide and organize the creation of codes, which were meant to identify the key ideas of each interview to compare and analyze. The initial codebook was organized at the highest level by the interview questions, followed by themes, parent codes, and child codes. The themes were very general ideas or categories to which many codes belonged, while the codes inside them were completely independent of one another and could be applied directly to quotes from the interviews. Parent codes were specific key ideas from the interviews and child codes were examples of the parent codes. The following coding procedure was followed:

1. Three transcripts were selected based on which interviews offered the most detailed responses. This decision was made after reading every transcript and listening to every interview.
2. Three or four coders individually coded the transcript, creating new codes when necessary. For the first transcript coded, all codes were new, although some were based on concepts discussed in previous literature.
3. The coders met as a group to discuss their codes. All differences and new codes were discussed by at least three coders, with each coder defending the codes they thought best applied. Most codes were discussed until there was a unanimous agreement, but for the sake of time, some codes were decided by majority vote.

The codebook was then used to code the remaining four transcripts. At least three researchers coded each transcript and discussed every code from each transcript as a group. The group discussed and resolved coding issues, including modification of definitions to better fit the data. Once the coding of all transcripts was complete, the data were analyzed in three main steps. First, the coded data were used to identify all factors that contribute to either retention or satisfaction. These factors were then categorized into themes based on concepts that the codes shared. These steps were used to answer the research questions by identifying and comparing the impacts of factors that contribute to retention and satisfaction.

5 Findings

5.1 Retention Factors

Six themes were found and each contains multiple retention factors. These themes are economy, employee conditions, work quality, social environment, benefits, and employee role and fit. A graphical representation of each theme and factors can be seen in Figure 1.
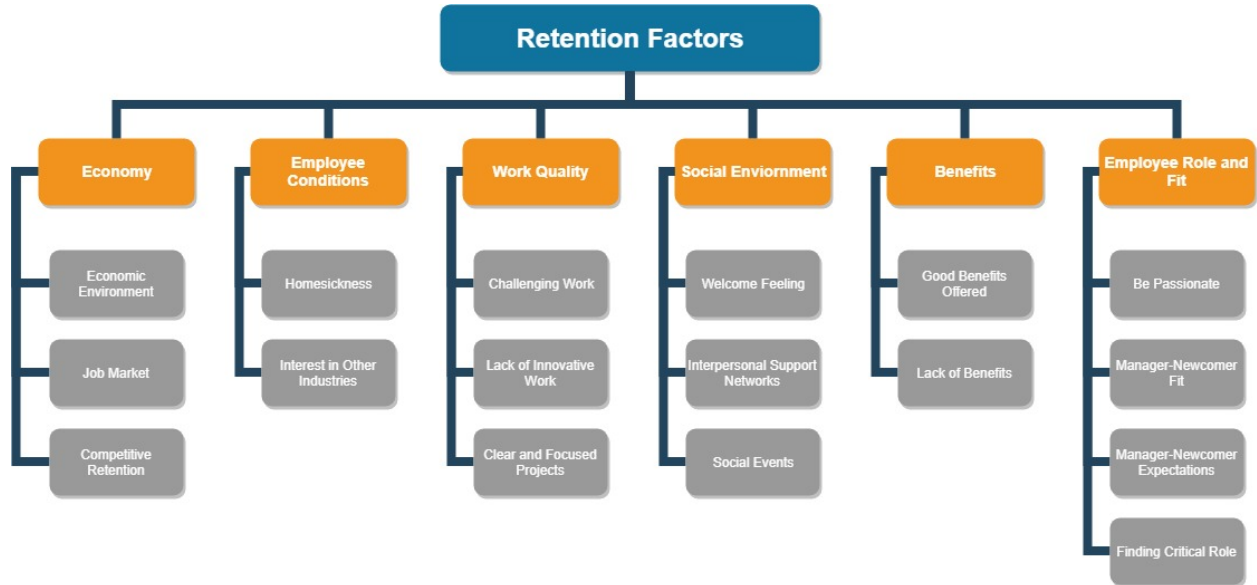

Figure 1. Organization of identified retention factors

5.1.1 Economy

Three factors were found that relate to the economy theme. These were the economic environment, the job market, and competitive retention. Economic environment refers to trends in the national or global economy that affect the newcomer's retention and alternative options. The job market is more local, meaning that the amount and type of other jobs in the area influence the newcomer's retention. Competitive retention focuses on the benefits or compensation that alternative jobs offer and how they compare to the newcomer's current position. These factors are represented in the quote below from one of the participants.

- *"That's a function of the economy today, the job market in [State]. So, now the new college grads can go company-hopping from one company to the next, and there's a lot of companies that are offering bonuses to bring people onboard because they're so desperate for some of the engineering discipline."*

5.1.2 Employee Conditions

Employee conditions emphasize personal factors that can affect a newcomer's retention. Factors included homesickness or other personal issues. The participant also mentioned that the newcomer could lose interest in aerospace engineering or grow interest in another career that would cause them to leave their current position in that organization.

- *"It could mean that maybe they've grown a passion in a totally different industry."*

5.1.3 Work Quality

Work quality refers to how the type of work or features of the work being done by the newcomer affects their retention. First, one manager discussed assigning newcomers challenging work, meaning that the

manager tailors work assignments for the newcomer so that their technical skills are developed. Further, managers challenge newcomers' technical skills but do not make the assignment too difficult to complete.

- *"If we just give them very simple work continuously, don't really challenge them, they're probably going to be looking for new opportunities, if we do what we should do, which is get them onboard and give them a challenging work statement, and make sure they're engaged, our retention's going to be higher."*

A similar idea, expressed by the same manager, was that there is a lack of innovative work to distribute to employees, meaning that the manager does not have sufficient work that employees, including the newcomer, would find interesting or exciting; thus, the manager must balance the interesting work between newcomers and more experienced engineers, which could lower the retention of newcomers.

- *"You have to balance it because there's always work statement that you've got to do to turn the crank in the system, make sure the system keeps going, but you can't just assign the monotonous work to the new engineers, and give all the interesting assignments to the seasoned engineers, because you're not going to be training your talent appropriately."*

Finally, we found that clear and focused projects influence retention. A project or team with a clear focus and goals helps increase retention, whereas unclear goals and deadlines or a weak or obscure focus can lower retention.

- *"If people get put into more of a long-term research and development environment with no clear focus, folks can get disillusioned with it if they're new and young pretty quick."*

5.1.4 Social Environment

The social environment refers mainly to how the newcomer and their coworkers interact. First, we found that many aspects of the social environment that contribute to making the newcomer feel welcome increase retention. One participant mentioned giving the newcomer a "nice welcome package" to assist with their socialization. This welcome package is given within the first few days of the newcomer's new position and could include workspace decorations, office supplies, or other small items that help the newcomer feel welcome. This idea was also seen when coworkers are willing to help the newcomers complete assignments or develop skills.

Beyond simply making the newcomer feel welcome, the way coworkers interacted with newcomers was discussed in more detail. One such method was through interpersonal support networks, which are formal or informal groups of coworkers that assist the newcomer with social, personal, or work tasks.

- *"Making sure people that are new to the area, especially if they're coming from different states or countries, that they know where to go to do certain things like, you know, grocery shopping, car shopping ... We even have teammates that will help people pick apartments and things like that. I know many teams that help the new hires in terms of getting established, also, with network and contacts that are important to them."*

One manager noted that social events, started by the newcomer, other coworkers, or even the interpersonal support networks, can help the newcomer feel more comfortable or improve their sense of belonging. These social events range from as simple as going out to lunch together to more planned events, such as road trips to different cities.

5.1.5 Benefits

Benefits were defined as any incentive or reward offered to employees beyond regular compensation. From the participants' interviews, benefits ranged from pension plans to educational plans for employees. While one manager noted that, in general, benefits have been improving recently, another participant noted that the removal of a pension plan had lowered the retention rate at their organization. It is clear that benefits

are unique to each company and the way they affect newcomers is influenced by both internal and external factors, as seen in the idea of competitive retention mentioned in the economy theme.

- *"A lot of people would say it's a function of, you know, [Company Name] doesn't offer a pension anymore, so some people think there's not a reason for people to stick around."*
- *"I think that in general benefits and even starting pay for a lot of the younger engineers has improved over the years."*

5.1.6 Employee role and fit

This theme includes any ideas relating to the role that newcomers had in the workgroup as well as how they interacted with their manager. The main difference between this theme and the social environment theme is that the employee role and fit puts more emphasis on employee traits and individual relationships rather than the group setting. For example, we found that being passionate and other passionate employees existing in the workgroup can increase retention because it can help newcomers get through challenges that would otherwise cause them to leave the organization.

- *"When you're working in your passion area, sometimes it will override other challenges you may come up within a month."*

A participant also discussed how managers and newcomers fit with each other and, independently, how the alignment or misalignment between each of their expectations for the role can affect retention. The first idea relates to more personal relationships between the manager and the newcomer. The latter idea focuses more on the expectations that the newcomer has for the role and how the manager can adjust the role to meet those expectations.

- *"Managers typically will interview or have one-on-one's weekly, if not even sometimes every other day with new hires to understand where they want to go with their career, what drives them, so they can tailor the tasks and assignments to them."*
- *"Managers and companies are pretty supportive of trying to fit the person to the skills and the analysis."*
- *"It could be that the role didn't meet expectations that they had coming in to it."*

Similarly, finding a critical role for the newcomer was important for retention. This was used to describe managers finding roles in which the newcomers feel satisfied and feel like they contribute meaningfully to the workgroup. This concept is unique from others in this theme, in that, it does not necessarily involve the newcomer's expectations or changing the role they are currently in to meet those expectations.

5.2 Satisfaction Factors

Six themes were identified that connected job satisfaction factors: work quality, management, work environment, benefits, employee-mentor fit, and industry expectations. The complete list of all factors that contribute to satisfaction can be found in Figure 2.
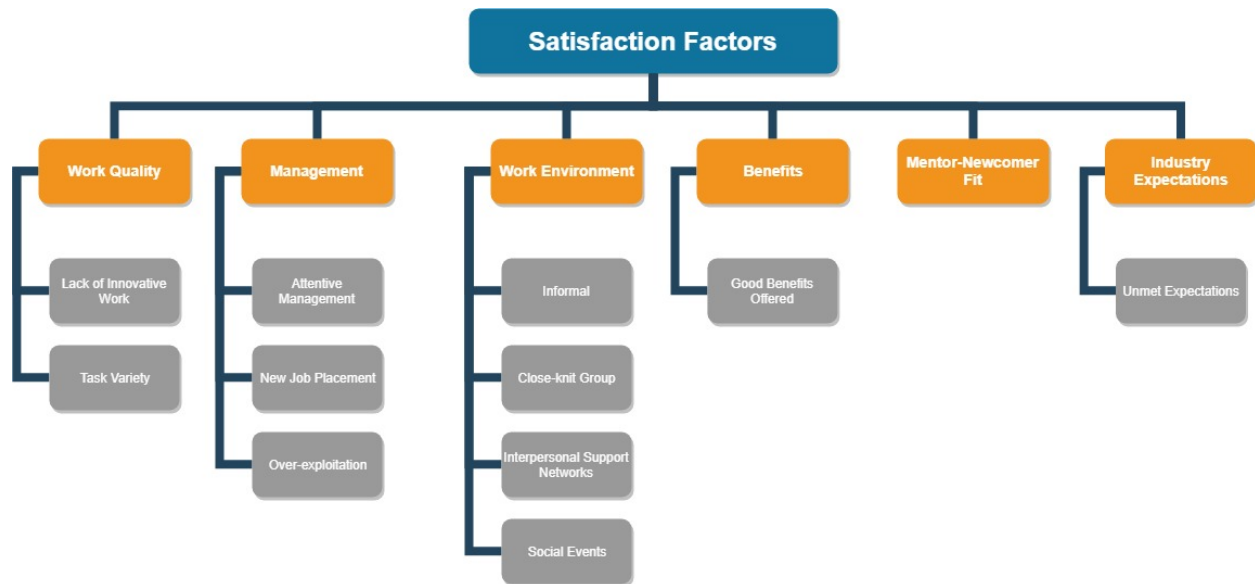
Figure 2. Organization of Satisfaction Factors

5.2.1 Work Quality

This theme was noted in the discussion concerning retention but includes some different concepts here. One overlapping concept was the lack of innovative work, which was described in the retention factor above.

- *"So, I think it's a really difficult balance, because we want to retain them and we want to make the work exciting, but all the development that we do have, we can't give it all to the new college grads because the more senior developers want to do it too."*

One manager also mentioned that task variety was important for satisfaction, which was not found in the retention question. The primary difference between task variety and other concepts under the theme of work quality is that task variety does not mean that the work is interesting or challenging, only that the employees' work assignments are unique and change regularly.

- *"I think our set up is pretty unique in the industry and that we have the wind tunnel lab right next to the office. And so you could have an engineer analyzing flight test data, doing analysis and then helping to run a wind tunnel test almost on the same day. So, there's a huge variety of things to do even within aerospace."*

5.2.2 Management

This theme was distinguished by the actions or behaviors of managers that directly affect employee satisfaction. Three managers mentioned that attentive management is important for newcomer satisfaction. This refers to managers listening to the newcomer and paying attention to their needs and concerns.

- *"We encourage them to stay around. We try to listen to them. If they're really totally miserable, I think [Company Name] does a really good job of trying to find other assignments for those people if it's not working out."*
- *"Our new hire satisfaction is pretty good. And we've been paying attention to it is partly why."*

While simply listening to newcomers is important, the actual action that managers take to address those concerns also affects retention. One action named by our participants was a new job placement. Specifically, this means the manager helps the newcomer find a role in which they are more satisfied than their current role. Finally, one manager noted that an important action is to not take advantage of employees or overexploit them. This means that ensuring that employees are fairly compensated increases satisfaction, while unfairly compensating employees or practices that take advantage of employees lowers satisfaction.

- *"I always told everybody the best thing I could do as a manager is fight to get you paid for every hour you work. Because there's a lot of companies out there that are trying to do comp time and trying to ... You know, the financial side. They try and get work accomplished for free. The best you can do is get people compensated and paid for all the hours they're there onsite on the clock"*

5.2.3 Work Environment

The work environment is close to the social environment theme related to retention but also includes the idea that the work environment does not have strict corporate policies that must be followed. One participant specifically talked about having a flexible work schedule or employees working from home. Additionally, one manager discussed the influence of a close-knit group on satisfaction, meaning that the workgroup members have strong personal ties to each other and are comfortable working together. Interpersonal support networks and social events, the same factors as defined in the retention section, were also found to increase satisfaction.

5.2.4 Benefits

Offering good benefits was discussed to increase satisfaction. Specifically, the benefit discussed was supporting education for hired engineers.

- *"One of which is our education plan. As long as you're trying to get a degree that's deemed as useful in your field of work, we'll pay for your degree 100%. That's a perk that's not for new hires, but it's for everyone, but it's been seen as a very good recruiting tool for us."*

5.2.5 Fit with Mentor

One participant noted how a poor fit between mentors and newcomers can lower satisfaction. This is similar to the manager-newcomer fit but focuses on the personal relationship between the newcomer and a senior engineer within the same workgroup. The more senior employee acts as a mentor to the newcomer, rather than a manager who directly supervises and has authority over the newcomer.

- *"I think the second piece is the mentor that the new engineer is partnered with, it's a responsibility of a manager at [Company Name] to ensure that you have the right person to partner a new engineer with, sometimes we don't choose right, unfortunately. And so if you have a mentor that's not necessarily engaged and not necessarily wanting to be part of that process, it can obviously impact the new engineer's abilities to quickly step in and come up the learning curve like we'd want them to."*

5.2.6 Industry Expectations

The final unique factor that affects satisfaction was the unmet industry expectations. This referred to the newcomer having preconceived expectations for the aerospace engineering industry that were not accurate or were never fulfilled. An important aspect here is that it was not the specific role the newcomers had or the unique workgroup they were in that did not meet their expectations but rather the industry itself.

- *"It's been difficult I think for the new college grads who are software developers who went to school and learned C++ or Java or whatever languages they learned to come onboard, even though we told them this was going to happen, they're frustrating that they're not developing, that they're testing instead."*

6 Discussion

The results of this study identified which factors affect retention and satisfaction among newly hired aerospace engineers and the themes that connect these factors. The themes identified were not particularly

unexpected or new in the context of factors identified in the turnover/retention literature. However, knowing which themes apply to aerospace engineers specifically provides important information.

6.1 Retention

The economic theme is supported by the factors that Wang [2] identified in the "enterprise outside" conditions: employee supply and demand conditions, industry conditions, and enterprise location conditions. The current research found homesickness and losing industry interest as employee conditions, which Wang [2] supported by describing the employee's family situation and evaluation of enterprise as employee conditions affecting retention. Surprisingly, while personality traits have been shown to have a direct effect on turnover and satisfaction [6], participants in our study did not mention the personalities of newcomers having any effect beyond their fit with the workgroup. However, some participants did mention that engineers are commonly introverted, which can slow their socialization process and, if combined with a poor leader-newcomer relationship, can lead to turnover.

Considering the factors internal to the organization, work quality is not a surprising theme. Cloutier et al. [1] noted the impact that innovative work has on newcomers, while Susomrith and Coetzer [5] found that employees often consider a high workload a barrier to training and development. While it is clear from both the results of this study and previous research that the clarity, difficulty, and amount of work play an important role in satisfaction and retention, the variety of tasks was previously only emphasized in small businesses [14]. In our research finding, task variety plays an important role in retention.

The manager's management style and the social and work environment are also expected factors and were seen in prior turnover studies as well. Especially important were the interpersonal support networks, as networks lead to increased productivity, inclusion, and efficiency [15]. Holtom et al. [7] also found that network groups can improve social embeddedness and lower turnover intentions. This social embeddedness was defined as access to mentoring and social inclusion, which is further reflected in the welcoming environment, close-knit groups, and social events that managers identified in this research. Additionally, social embeddedness involves how the newcomer fits with the team in social aspects, which is supported by Cloutier et al. [1] and could be considered part of the close-knit groups and social events found in this research. However, the diversity of the workgroup was previously identified as a retention factor in [1] and [7], but was not emphasized or specifically mentioned by the research participants.

The benefits factor was not unexpected and has been identified in previous research. This research found educational programs, bonuses, and pension plans to be significant benefits. Other research also considered educational opportunities to be important [1], while Wang [2] simply found that incentives affect retention. While benefits are a predictable factor, that does not mean they should be ignored or assumed to exist in any position, as participants in this research stated that a lack of benefits can have significant negative consequences.

As mentioned above, beyond the social aspects, there is another aspect of the role the newcomer has and how they fit with their workgroup. This includes factors that are personal to the newcomer, such as being passionate or how they view their career [4] but also includes the expectations that the newcomer and manager have for the newcomer's role, which can contribute to the newcomer's fit [16]. The final factor identified in this research was whether a newcomer finds a critical role, indicating one of meaningful contribution to the group. Clearly, this is largely dependent on how the newcomer perceives the role and what they would like from the role, which involves consideration of career orientation [4] and is also part of the person-job-organization fit identified by [1].

6.2 Satisfaction

The management and work environment themes have unique effects on satisfaction. Attention and communication from the manager have been seen as important in satisfaction [1], [17]; however, the manager taking specific action in the form of a new job placement was not seen in other retention research. Similar to task variety, this could be because new job placement occurs more often within aerospace engineering than in other researched professions. Beyond this unique contribution, the effect of

management styles and practices found in this research reflects the same conclusions as prior studies [1], [17].

The social environment and work environment themes found in this paper are very closely connected, with the only difference observed in this study being work group and corporate policies. This overlap between social and work-oriented aspects can be seen in the factors identified in previous research. Tanova and Holtom [7] used the concept of social embeddedness to primarily mean the social inclusion and fit an employee has with their workgroup. Similarly, Harman [16] used job embeddedness as the extent to which the newcomer is linked with others or to activities and how the job fits with other aspects of their lives. While these terms are not identical to the social and work environment of this study, the similarities in their definitions show the connection between social and job-related factors. Additionally, the aspect of job embeddedness describing how the newcomer fits with the organization or workgroup [16] reaffirms the idea that the relationship between the newcomer and the mentor impacts satisfaction described by one of our participants. Finally, the negative effect of unmet industry expectations on satisfaction reaffirms conclusions of research over the last two decades [14], [18].

6.3 Implications for Education

This study focuses mostly on what organizations can do to affect turnover and retention, but some factors identified in this paper can be addressed before new engineers start working in full-time jobs. During their time at a university, engineering students can be prepared for factors identified in this study, either by the engineering students themselves or the educators responsible for preparing them for full-time positions. While factors outside the engineering organizations, such as economic conditions or employee supply and demand, may lie beyond the control of engineers, students can be better prepared for personal factors that might affect their retention and satisfaction as well as factors that are internal to the organization.

Based on the data from the seven participants in this paper, educators need to place a larger emphasis on the social aspects of the work environment, including informing students how introversion and social embeddedness can impact retention and satisfaction. Additionally, the importance of being passionate about work combined with having accurate expectations about the type and quality of work of new engineers suggests that educators should better inform students of how the content they learn will be applied in an industry setting, specifically, that new engineers are not necessarily given the challenging and innovative work. Educators should pay attention to the factors that affect retention and satisfaction mentioned by the seven participants in this paper and advise their students to expect these factors.

7 Conclusion

Retention factors for aerospace engineering newcomers were identified in this research within six categories, involving the economy, personal factors, work quality, the social environment, benefits and incentives, and the newcomer's role and fit. Satisfaction factors were found in six categories, involving the work quality, management, the work environment, benefits, the newcomer's relationship with his or her mentor, and the expectations they had for aerospace engineering before their current position. The overlapping factors are clear and contribute to an explanation for the correlation between job satisfaction and increased retention. While most factors found in this study were reflected in prior research, task variety, finding a critical role, and new job placement were not found in other research. This suggests that these factors are unique to the aerospace engineering industry or in some measure emphasized more within aerospace engineering. Further, concepts of personality traits and workgroup diversity were not found in this study, despite their strong presence in other retention and satisfaction research.

While this study has shown that unique factors do exist within aerospace that are not found in general turnover research, the full extent of their impact, as well as the breadth of these factors, requires further research to be valuable to aerospace organizations. It is important to note that this study does not qualify the relative importance of these factors, as the sample size of seven participants only serves to identify possible factors. Future research on this topic should focus on clarifying why these factors have a larger role in aerospace and exactly how much they affect retention and satisfaction. In addition, future studies

should examine the newcomers' experiences to supplement the managerial perspectives and to better understand which factors are most important or most common. Additionally, once these unique factors are known more comprehensively, the best method to address these factors through turnover reduction strategies should be examined and developed. Based on the variation in factors given by participants in this research, it is likely that these strategies must be customized according to individual companies and organizations. However, a broad strategy focusing on common factors, including those found in this study, would undoubtedly be useful in improving retention and satisfaction and increasing aerospace engineering companies' productivity.

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