Female Wings in the Uruguayan Air Force

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Introduction

2020 marked the 20th anniversary of the first graduation of female officers from the Military School of Aeronautics (EMA), the Uruguayan Air Force (FAU) academy. This represents a paradigm shift in the military, a more than a century old profession where women's presence was mainly absent. This article's serves as a reference document to the null bibliography of the subject at a national level.

Documents and official acts were analyzed, in an exploratory and descriptive manner, for this research. The sample consisted of 48 women of which, at the time of this study, 81.3 percent graduated as navigators, since they did not obtain their pilot wings, and will therefore not be able to command an aircraft. This article demonstrates a prevalence of the female gender in the Navigator field, and possible correlating factors.

Theoretical Framework

Women in the Uruguayan Air Force (FAU)

Over the years, as with other countries with deeper histories, our country evolved from varying different norms. Females in the Armed Forces were not exempt from these norms—worldwide, they were relegated to auxiliary duties for years after the end of the Second World War. The idea of women as flight personnel first started taking traction globally with first world countries. In 1974, the United States Navy allowed half a dozen women to obtain their wings and become the first naval aviators. That same year, the Army allowed women to command helicopters. Two years later, the US Air Force (USAF) enrolled women in flight training. The introduction of women in piloting duties was gradual, since at first they were first not be allowed to fulfill roles in combat duties, which limited their careers. In the FAU, as per Gómez, “… 1921 incorporated the first women in the Armed Forces, the year in which the course for military nurses was established at the Military Hospital. Around 1970, they were admitted to the ranks of junior personnel.” Their tasks were diverse, of an administrative nature, including services as well as professions such medicine or law—the first women to join the FAU were in Aerospace Health. De León, David, Lambruschini wrote:
Since 1965, women had been integrated into the Armed Forces in increasing numbers, although at first, they were only Officers of the Armed Forces Health Service commissioned in the Air Force. On December 1983 the first two females graduated as Officers of the Technical Corps, specialty Rank “H”–Aerospace Health, from the Military School of Aeronautics (EMA). In 1993, The Technical School of Aeronautics (ETA) offered a course in aeronautical specialties specifically designed for females—eighteen aeronautical technicians graduated from said course.\(^2\)

Since 1941, women in the civilian work force have been conducting aeronautical tasks commanding civilian aircraft. Mirta Vianni, a pioneer civilian pilot, was the first. She then trained Irene Samko and many others who then obtained their pilot licenses. Some were only seventeen years old, like Susana Garcia Duarte (mother of the author of this article). All of them also had something in common—that their entry into the military ranks was forbidden due to the regulations in force at that time. It was not until 1997 that the FAU finally allowed women to enter the EMA, the first military school that allowed women not only in Uruguay, but in Latin America as well—finally allowing women to become part of the Air Corps and thus have the possibility of obtaining their military wings. That year, EMA opened its doors to its first five women (of which one of them left the school during the recruitment period), and they continued their career with the goal of belonging to the Air Corps just like the men. It is important to note that today, the EMA only trains Air Corps military personnel (i.e., students graduate as either Navigators or Aviators—no other options). Prior to the nineties, there were other specialties taught, such as Technical and Territory Security Corps, among others, which are no longer taught at EMA.

In the Air Corps, students start their first year via their corresponding Flight Selection Course (theoretical–practical), and where on their second year, as First Cadets, they will branch into either the Navigator or Aviator specialties. Aviators must then meet theoretical and practical phases of their specialty to continue their career progression—this allows them to obtain their wings after four years of joining the EMA, as a FAU officer in the rank of ensign. On the other hand, navigator career paths vary according to their assigned tasks but, unlike aviators, will not have the possibility to become aircraft commanders.

**Variable 1 - Psychophysical**

Arrúa explains aeronautical medicine as a branch of medical science where the physiological and pathophysiological interactions of man and flight, and their resistance and ability to prevent injuries by performing in an environment not created for them, are studied.\(^3\)
The FAU has a Directorate of Health Care, which had its beginnings in 1917 in the Military Aviation School, and today is a part of the general staff, independent from the Army. The institution’s Cabinet of Aerospace Medicine, among its various tasks, conducts psychophysical aptitude of members who primarily perform, but are not limited to, air activities; to include prevention, detection, and even the treatment of pathologies that can affect personnel. These evaluations are performed by doctors and nurses of varying specialties, who ensure that flight crews attain and maintain minimum requirements to enter a cockpit throughout their careers, to guarantee not only their safety, but that of all personnel as well.

EMA cadets must obtain medical clearance to complete their practical flight phase. This stage begins even long before studying the theory of flight, and include dental, otorhinolaryngological, ophthalmological, psychological, reaction times and laboratory tests, to name a few. Obtaining a non-aptitude rating during a cadet’s stay at EMA is cause for discharge from the institute since, as indicated above, they would not be able to enroll in the Navigator or Aviator specialty.

This article focuses on the following areas: size (height), aviation psychology, and reaction times. This is necessary since, as Arrua explains, “the high and low levels of situational awareness are a detriment to the performance of the individual.”

Reactions times are measurable thanks to several psychological tools available to measure human responses to stimuli. In this case, subjects will enter a room where different experiments, with stimuli, will be conducted—with reaction times measured between the time elapsed between the beginning of the stimulus and the individual’s response.

**Variable 2 - Motivational**

Given the existence of several theories on the subject, this article selected the one most studied at EMA headquarters during a cadet’s career, which proposes that human motivation is based on the cadet’s willingness to meet their needs—Abraham Maslow’s theory of human motivation. Maslow identified the main needs of the human being by identifying five categories of needs that are adapted to this research work, since the fulfillment of each need is reflected in the integrity of the person. This is how Quintero summarizes them:

**Physiological needs:** They are of biological origin and are oriented towards the survival of man; basic needs are considered and include things like the need to breathe, to drink water, to sleep, to eat, to have sex, to shelter.

The person who is on the street, and who does not have a plate of food, is considered not to have their basic needs covered. Consequently, the next step in the pyramid cannot be reached since most of the previous needs are not fulfilled.
Security needs: When physiological needs are satisfied, a second level of needs arises oriented towards personal security, order, stability, and protection. Within these needs are things such as: physical security, employment, income and resources, family, health and against the crime of private property.

So that individual who has a roof over his head and is in good health has this need covered.

Need for love, affection and belonging: When the needs for security and physiological well-being are moderately satisfied, the next class of needs contains love, affection and belonging or affiliation to a certain social group, and are aimed at overcoming feelings of loneliness and alienation. This allows a person to join a social group, to be and feel part of something else.

Esteem needs: When the first three types of needs are moderately satisfied, the esteem needs arises, oriented towards self-esteem, recognition of the person, particular achievement, and respect for others. By satisfying these needs, people feel self-confident and valuable within a society; when these needs are not met, people feel inferior and worthless. In this category, Maslow pointed out two esteem needs: a lower one that includes the respect of others, the need for status, fame, glory, recognition, attention, reputation, and dignity; and a higher one, which determines the need for self-respect, including feelings such as confidence, competence, achievement, proficiency, independence, and freedom. Self-actualization needs are the highest and are at the top of the hierarchy; Maslow describes them as the need for a person to be and do what the person was “born to do,” that is, it is the fulfillment of personal potential through a specific activity.5

Thus, a person who is inspired to be a pilot must do everything possible to become one. Undoubtedly, reaching this goal, which is already very demanding, must have solid a foundation based on all needs being met. The objective at EMA is for cadets to find themselves 100 percent body and mind dedicated to the task needing to be performed, without having to worry about extraneous factors. For this to occur, cadets must ideally have satisfied the five needs, to be at the top of the pyramid only thinking about the Flight Course, without any interference in their normal performance.

Variable 3 - Academic Performance

The EMA has an Education Headquarters in charge of courses, students, teachers, and exams in general. Its function is to formalize the academic training process so that cadets become part of the senior leadership of the FAU. This takes place over four school years, culminating in graduation with a bachelor’s degree in Aerospace Military Defense, with an aviator, logistics, or communications and electronics specialty, corresponding to Aviators (for the first specialty) or Naviga-
tors (for the latter two). Although during their education cadets have a cultural and military preparation with a large number of non-military civilian professors, the academic performance used for this article’s research concerns only with academic performance related to flight and military theory.

**Problem Statement**

This research sought to investigate the observable phenomenon surrounding the considerable number of female officers who end up in the Navigator specialty of the FAU.

**Methodology**

This research was conducted in the FAU during 2020, using data from 1998 (the year that female cadets first started in the flight course) through the writing of this article. At first, it was exploratory in nature since it was a problem that had not been addressed at the FAU, as a review of literature revealed that similar studies were only performed in other countries very different from ours. At the same time, it was also descriptive in nature, as it was based on societal values.

This research bases its methodology on two approaches, which then determine a third: A quantitative approach that uses the collection of important data to support the hypothesis, and a qualitative approach that served to refine the research; obtaining, for example, through in-depth questions, valuable information that was then analyzed and triangulated, regarding the way in which individuals perceive and interpret a situation. Finally, the third approach combined the previous two after collecting data and observations, contrasting quantitative information with qualitative information, thus providing a concrete and real diagnosis to understand why most women graduated from EMA as navigators versus pilots. The convenience of using a varying set of research approaches and methods opened the greatest opportunity to understand this phenomenon.

**Research Design**

The design of this research was non-experimental, as facts and variables were observable in the period studied, with no opportunity for the author to deliberately manipulate the variables. It was also cross-sectional since they were a snapshot of the period encompassing Flight Course studies.

The first variable studied encompassed psychophysical, psychological, and motor skills—all within the psychophysical aspects of flying. The second variable studied encompassed motivation, and the third variable studied was academic performance.
Hypothesis

There is a correlation between the Navigator specialty and the psychophysical, motivational, and academic conditions in the female gender of the EMA. To support/refute this hypothesis, surveys and interviews were fundamental to understand opinions and experiences, as well as FAU official Basic Flight Squadron, EMA, and psychophysical test records.

Results

Psychophysical Variable (Height)

![Figure 1. Height](image)

Source: Authors, based on FAU Psychophysical Office data

Specific Objective: Identify psychophysical aspects of females that affect the Navigator specialty.

Interesting and revealing data were obtained from the sample of forty-four women (out of a total of forty-eight women—specific data for four subjects could not be found): 34 percent (15 women) did not exceed the 1.60m requirement of the FAU T-260 training aircraft (Leonardo SF-260 of Italian origin), which has a small cabin with side-by-side shoulder-to-shoulder rubbing seats. The T-260’s pilot seat has a 10.5° backward tilt (to slightly increase the pilot’s tolerance to “G” forces and to comfortably allow the use of the back parachute, as the aircraft is designed for acrobatic maneuvers), thus requiring long legs to access the entire travel of the rudder pedals due to that slight backward inclination. If a short height pilot manages to extend their feet to reach the pedals to have total control of the flight commands, they will most likely sacrifice forward vision, necessary for basic aircraft control in initial flight conditions and navigation under visual flight rules.
Other countries have already gone through similar situations, such as the USAF, which has eliminated the minimum height requirements for aviators. This is due to the USAF’s ability to perform anthropometric evaluations to assign aircraft that suit an aviator’s physical conditions (i.e., this is possible by having a varied inventory of training platforms—this is not possible in FAU since the EMA only has one basic training platform).

There are concerns within EMA that a small stature affects the normal course of a flight for a student pilot, specifically, in the spin and in the landing phases. In both cases, among others with lesser degrees of risk, EMA’s T-260 training aircraft, made in Italy and undoubtedly designed for an average man’s height (which in Italy is 1.77m and close to Uruguay’s 1.73m average height), does not perform well for smaller stature aviators. Of note, this aircraft was also used as the basic trainer for the Italian Air Force, which did not allow women to join its ranks until well into the 21st century (after this aircraft had already been manufactured).

As stated in EMA’s official records, the short stature of women has had a significant impact on their practical phase progression as a flight safety concern.

Figure 2 shows the maturity level of female students, according to studies conducted by EMA’s Psychology Department—they reflect the results of either Machover, personality inventory, or projective (characterized by open ended questions) tests that may indicate depression or anguish. The figure reflects the results of forty-two women (out of a total of forty-eight women, as the results of the remaining six are not found in the records).

![Figure 2. Maturity](Source: Documents of the FAU’s Psychophysical Files, author’s creation)

Of special importance is the percentage of “little maturity” women, represented by four of the forty-two women—equivalent to 9.5 percent. Cross verifying data
with Basic Flight Squadron records shows that of these four women, one of them failed a theory test twice and was unable to progress to the practical aviator phase. Meanwhile, records show that the other three women were not able to achieve basic control of an aircraft, and two of them demonstrated disorientation to the point the Instructor Pilot had to assume control of the aircraft.

Figure 3 shows the average reaction times performed by first-year Cadets. It reflects the results of thirty-nine women (out of a total of forty-eight women, since the results of the remaining nine were not found in the records).

In the case of subject thirty-seven, she was at the ceiling of what is allowed (40 hundredths of a second), so other factors had to be evaluated for her competency rating. Additionally, according to cross-data, this female cadet not only had “slowness” in reaction times, but she was also within the group with “little motivation”.

![Figure 3. Reaction times](Source: Documents of the FAU’s Psychophysical Files, author’s creation)

Of note, of the thirty-nine women, sixteen of them had an undesirable high average reaction time of between 39 and 40 hundredths of a second. According to the records, 68.75 percent of these sixteen women experienced slow cockpit response times, fear, insecurity, lack of perception or poor distributive attention, and slow reaction times. The remaining 31.15 percent failed the Theoretical Course and did not continue to the practical phase.

Undoubtedly, there is significant importance in reacting quickly in an aircraft, since it is an agile and unstable machine, even more so in phases such as takeoff.
and landing. Hence, the need for the average reaction times to be low. Cross-information showed that of 15 of them, five women have reaction time values above the average value of 39, while another five women were above the average value of 38 (still high), and finally another five women’s remaining values are between 35.6 and 37.7, an average value that, although lower in comparison, is not exactly a low value. For this reason, there could be a close relationship, to be considered in future research, that the values recorded from the Department of Psychology end up being reaffirmed in the cockpit during the practical phase.

**Motivational Variable**

Specific objective: Identify the motivation of females that graduated as Navigators.

![Figure 4. Motivation](image)

*Source: Documents of the FAU's Psychophysical Files, author's creation*

Figure 4 shows motivation according to studies conducted by the Department of Psychology. This information was collected through interviews since other collection techniques were not available. Of forty-two women (out of a total of forty-eight women, since the results of the remaining six were not in the minutes), 50 percent showed “little motivation” a few weeks after the start of the Flight Course year.

Typically, the Flight Course is highly anticipated by all cadets, as this is when the most desired goal of a military aeronautical career, flying, is achieved. Having twenty-one female cadets starting the Flight Course with little motivation is
something that should be studied further. This is also the year when, in addition

to the Flight Course, cadets move on to the Academy’s Professional Course, be-
come junior cadets, and receive the Command insignia on their uniform.

Of note, the 50 percent who were “little motivated” also had a substantial num-
ber of high reaction time averages between 39 and 40 hundredths of a second.
Thus, there’s a significant relationship between low motivation and high reaction
time averages.

**Academic Performance Variable**

Specific objective: Identify the academic performance of females that graduated
as Navigators.

For this analysis, the author compared those who passed from the theoretical to
the practical phase with those who did not. Academic performance only concerns
subjects regarding aircraft procedures, theory of flight, mechanics and systems,
emergencies, and navigation, among others, strictly related to the Flight Course.

Of the 48 female cadets in this study, 18.75 percent did not pass the theoretical
phase of the Flight Course, as recorded in the official records. Delving further into
these results, in a survey conducted by the author with all of them (many of whom
had already left the Institution), 80 percent expressed that the result of their grades
was what they expected, with the remaining 20 percent replying they did not.

Performance is the final sum of several factors ranging from motivation, atti-
tude, maturity, the social environment inside and outside the EMA, and even
family relationships. However, the academic performance variable studied only
involved skills directly tied to flight, proving it is undoubtedly necessary to be
motivated to understand such disparate subjects as the operation of an engine,
electrical systems, flight and emergency procedures (from memory), and ability to
control cockpit switches and indicators, to name a few, blindfolded. These skills
require great mental discipline, and a level of understanding and reasoning that
does not spare easily distracted individuals lacking concentration, or with lack of
attention and interest.

**Findings**

**Hypothesis**

Regarding the hypothesis proposed at the beginning of this article, it cannot be
affirmed that it is completely valid. While there are psychophysical and motiva-
tional conditions prevalent with females in the navigator specialty of the EMA,
further specific investigation is required to determine their degree of influence.
Regarding academic performance, it is not possible to identify any type of relationship that justifies that the variable is gender related, as the standards are the same for the male gender. That is, failure to meet the standard results in failing the theoretical phase, regardless of gender. The following provides further specific details, as follows:

**Psychophysical**

**Height**

There were fifteen women out of a total of forty-eight women who had a height below 1.60m, which ended affecting their induction into the practical phase, due to the operational limitations of FAU’s T-260 trainer. Thus, without a change in the training platform, the 1.60m height requirement will continue to be a critical limit.

However, although it was not part of this research, the FAU currently has a female aviator who, even though less than 1.60 m in height, achieved the expertise needed to be an aviator. This undoubtedly means that it would not be correct to emphatically affirm that height is a limiting factor. Nonetheless, there has only been one such case in these two decades.

**Maturity**

Out of forty-two, only four women presented a low level of maturity (with the understanding that maturity is measured against maturity expected for their age). Of these female cadets, one failed a theoretical test for the second time, and did not move to the practical phase. Meanwhile, the other three female cadets demonstrated inability to master basic flight control, disorientation, and loss of aircraft control to the point that the Instructor Pilot had to take over the controls.

It is particularly important to correlate the relationship between maturity and mastery of basic flight control, especially when it comes to flight safety, and this study proves there is a meaningful relationship between maturity and performance in the Flight Course, albeit a moderate relationship, which should be studied more carefully.

At present, due to this research, the EMA is conducting a special psychologist led project, in conjunction with the INMAE (National Institute of Aeronautical and Space Medicine) of Argentina, on the cadets’ level of maturity during the initial 18-month training phases (for both sexes), before they start the Practical Flight Course.
**Reaction Times**

Analysis of thirty-nine women (out of a total of 48) shows that the average reaction time in 16 (41 percent) of them is between the values of 39 and 40. This average is considered high, with the upper limit being forty. Also, of these thirty-nine women with slow reaction times, three averaged 39.9, of which two demonstrated having “little maturity,” thus suggesting a causal relationship, albeit not conclusive. More time needs to elapse to increase the sample size and have more precise data.

It is also important to mention that reflexes are a trained skill, so high values may also be related to the first time the reaction test was performed. Therefore, high values do not always have to be linked to any pathology; thus it is not feasible to emphasize that there is a cause-and-effect relationship between high reaction times and what is reflected in performance later in the cockpit. A more advanced investigation that establishes to what extent this specific variable can influence performance is recommended.

**Motivational**

A meaningful relationship was identified regarding the low motivation observed in 50 percent of the women sample size studied after the first few weeks of the Flight Course. It was also observed that low motivation correlated with slow reaction times, averaging 38.9 of all those identified as “little motivated.” After this research was conducted, EMA significantly increased the coordination already being carried out with other units of the FAU, to carry out joint activities to complement not only the training of the cadets in general (boarding and disembarking of aircraft, rappelling from helicopter, etc.), but also to increase cadet motivation, a work that continues to be carried out. Likewise, the number of female officers in EMA was increased to create better mentoring, leadership, and empathy, from a female perspective.

**Academic Performance**

In this area, there were no significant statistical or observable academic performance variables that influenced the navigator specialty.

**Final Considerations**

This study shows that there is a prevalence of the female gender in the Navigator specialty in the FAU, with possible correlating factors.
Finally, this research was a highly honorable endeavor for the FAU, as well as its personnel, with its main objective being to establish knowledge of, and solution to, practical problems through a process that is as important as the results obtained.

Notes


4. Ibid. P. 51.


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Has a bachelor’s degree in Military Aerospace Defense and is the Deputy Director of the Military School of Aeronautics of the Uruguayan Air Force (FAU). He is currently a command pilot assigned to the 5th Air Squadron (Helicopters), with 2,300 flight hours on fixed and rotary wings. He is currently a UH-1H instructor pilot trained at the Argentine Army Aviation, Bell 212 commander pilot and AS-365 Dauphin platform co-pilot. He has served in Africa in four deployments under the United Nations flag, accumulating more than 1,000 hours in UNMEE operations in Ethiopia and MONUSCO in the Democratic Republic of Congo, completing a total of 44 months in those missions. Lt. Col. Tajes is a graduate of the Military School of Aeronautics, a graduate of the High Command Course and a graduate of the FAU’s Air Command and Staff College.