CONSIDERATIONS REGARDING THE DEVELOPMENT OF A HIERARCHY OF SPECIAL OPERATIONS FORCES WITHIN AIR FORCES USING MULTICRITERIA ANALYSIS

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Abstract: *Special operations forces represent an elite element within each military, playing a crucial role in contemporary military operations. Their significance stems not only from the exceptional level of personnel training but also from the quality of equipment and logistic support provided, as these aspects are determinant for the effectiveness and success of the missions they are involved in. In this regard, aircraft and equipment associated with these forces must meet high standards and fulfill stringent requirements, given the complex nature of special operations.*

The article aims to provide readers with an insight into the hierarchy of special operations forces, adopting an analytical approach based on multicriteria methodologies. This methodology allows for the evaluation and comparison of various aspects of special forces, including personnel training, technological capabilities, operational flexibility, and logistical efficiency, to identify and highlight the key elements contributing to the success of these units.

Keywords: *multicriteria analysis, special operations forces, hierarchy*

1. INTRODUCTION

Special Operations Forces (SOF) represent a pinnacle element of modern military capabilities, designed to address and resolve complex and diverse challenges in a dynamic and often hostile operational environment. They constitute a vital component of a nation's arsenal, providing the capacity to act swiftly and effectively across a diverse range of scenarios and environments, often surpassing the capabilities of conventional forces.[1]

These units are trained and equipped to operate in a variety of environments, including urbanized theaters of operations, mountainous, desert, and maritime terrains. Their operational flexibility is a crucial aspect, allowing them to rapidly adapt to the changing requirements and conditions of the terrain and efficiently fulfill their missions.

In this article, we aim to conduct a hierarchy of Special Operations Forces (SOF) through the means of multicriteria analysis. This method enables us to consider essential criteria such as personnel training, available equipment and technology, operational flexibility, logistical efficiency, and previous operational experience.

By combining and carefully evaluating these factors, we can achieve a comprehensive and objective hierarchy of Special Operations Forces. This endeavor not only highlights the strengths and priorities of these units but also provides valuable guidance for their future planning and development, contributing to the strengthening of the capabilities and effectiveness of these elite forces in the face of current and future threats.

Multicriteria analysis represents a strategic methodological approach aimed at conducting hierarchies and prioritizations within the decision-making context. Essentially, this process involves evaluating and comparing multiple alternatives against various relevant criteria, with the objective of identifying and highlighting the most suitable or effective options.

Through multicriteria analysis, the goal is not only to determine which alternatives are superior but also to establish the order of importance based on the defined criteria. This hierarchy is crucial in the decision-making process as it enables the identification and selection of options that best align with the specific objectives and needs of the situation at hand.

To achieve this hierarchy, multicriteria analysis utilizes various techniques and methods, such as the scoring method, which we employed in this study, multicriteria decision analysis, the so-called "consultation group" method, etc. These tools provide a structured and objective framework for evaluating and comparing options based on their diverse characteristics and potential impacts, thereby contributing to more informed and efficient decision-making. [2]

In conducting this hierarchy, the criteria considered are meticulously selected by the study's authors and are primarily based on the characteristics of aircraft used for transporting troops for infiltration. These criteria may include, among others, the aircraft's ability to operate in various weather and terrain conditions, its operational autonomy, as well as the level of safety and security provided to the transported troops. Additionally, another crucial aspect contributing to the hierarchy's development is the infiltration procedure itself, where the type of parachute used to reach the objective can significantly influence the mission's effectiveness and success.

However, within the criteria selection process, special attention is given to a more subjective aspect, namely the combat experience of the special operations forces. The inclusion of this criterion in the analysis is motivated by the recognition of the importance of direct experience in real operations in the effectiveness and adaptability of these forces in conflict situations. However, it is important to emphasize that addressing this criterion is accompanied by increased attention to its subjectivity, given the sensitive nature of the subject and the limitations of information available in the media regarding this specific dimension.

2.MULTICRITERIA ANALYSIS OF FIXED-WING TRANSPORT AIRCRAFT WITHIN THE SPECIAL OPERATIONS FORCES OF THE AIR FORCES

To begin with, we will establish the fixed-wing aircraft in the inventory of special operations forces:

Table 1. Fixed-wing aircraft

Fixed-wing aircraft	**Country**
C-295	Spain
C160 Transall	France
C-130J	United Kingdom
MC-130P	USA
Il-76 Candid	Russia

Once we have established the fixed-wing transport aircraft in the inventory of special operations forces within the air forces of each state, we will initiate the process of multicriteria analysis. Initially, we will define the criteria we consider viable for determining the final ranking. From our perspective, the most important characteristics to be considered, given the purpose of these aircraft, are: maximum takeoff weight, maximum speed, range, engine performance, and finally, maximum altitude.

For this step, we will input the criteria into the table below, along with the indicators and numerical ranges corresponding to each criterion:

Table2. Criteria and numerical range

Criteria		Indicator	Numerical Range
C1	Maximum Takeoff Weight	Kilograme	21.000-195.000
C2	Maximum Speed	Kilometers/hour	480-900
C3	Range	kilometers	1.555-5.000
C4	Engine Performance	kW	2.177*2-7.375*4
C5	Maximum Altitude	Metres	9.145-13.000

Once the criteria, their indicators, and respective value ranges are established, we will create the performance matrix. The rows will represent the criteria, while the columns will represent the fixed-wing transport aircraft alternatives.

Table 3. Performance matrix

Criteria	Maximum Takeoff Weight	Maximum Speed	Range	Engine Performance	Maximum Altitude
C-295[3]	21.000	482	1555	2177*2	9145
C160 Transall[4]	51.000	513	1853	4500*4	8.230
C-130J [5]	70.307	670	3300	3458*4	12.300
MC-130P [6]	70.307	480	5000	3660*4	10.000
Il-76 Candid [7]	195.000	900	4000	7375*4	13.000

The next step involves assigning a scoring range to each criterion considered in the performance matrix, for the purpose of normalizing the matrix and facilitating calculations. The score is in the range of values [1, 3], where 1 represents the least preferred option, 2 represents the average option, while 3 is associated with the most preferred option.

Table 4. The score of each aircraft

Criteria	Maximum Takeoff Weight	Maximum Speed	Range	Engine Performance	Maximum Altitude
C-295	1	1	1	1	1
C160 Transall	2	2	2	2	1
C-130J	2	2	2	2	3
MC-130P	2	1	2	2	2
Il-76 Candid	3	3	3	3	3

Once the scores are established, we need to assign weights to each criterion mentioned up to this point in the development of the multicriteria analysis. In explaining this analysis method, weights are assigned between the values [1, 5], where the values represent: 1 - least important, 2 - somewhat important, 3 - moderate, 4 - important, and finally, 5 - most important. Thus, the weight matrix is created as follows:

Table 5. Directly estimated weights

Maximum Takeoff Weight	Maximum Speed	Range	Engine Performance	Maximum Altitude
5	2	4	3	1

The final step of the fixed-wing transport aircraft analysis consists of solving the calculations and subsequently establishing the final ranking. Following the mathematical calculations, the following values have emerged:

Table 6. The scores of the aircraft

Alternative	Score
C-295	15
C160 Transall	29
C-130J	31
MC-130P	28
Il-76 Candid	45

Once we have obtained the numerical values, we compile the final ranking as follows:

Table 7. The final ranking

Place	The final ranking
1	Il-76 Candid
2	C-130J
3	C 160 Transall
4	MC-130P
5	C-295

3. MULTICRITERIA ANALYSIS OF ROTARY-WING TRANSPORT AIRCRAFT WITHIN THE SPECIAL OPERATIONS FORCES OF THE AIR FORCES

To begin with, we will establish the rotary-wing aircraft in the inventory of special operations forces:

Once the rotary-wing transport aircraft in the inventory of special operations forces within the air forces of each state are established, we initiate the process of multicriteria analysis. The first step is to define the items we consider representative in determining the final ranking. In our opinion, the most important characteristics to be considered, given the purpose of these aircraft, are: troop transport capacity, maximum takeoff weight, maximum speed, range, and finally, maximum altitude.

Table 8. Rotary-wing aircraft

Rotary-wing aircraft	Country
AS 332	Spain
H 225 M	France
Chinook	United Kingdom
Super Stallion	USA
MI-26	Russia

For this step, we will input the items into the table below, along with the indicators and numerical ranges corresponding to each criterion.

Table 9. Criteria and numerical range

Criteria		Indicator	Numerical Range
C_1	Troop Transport Capacity	Number	16-93
C_2	Maximum Takeoff Weight	Kilograme	7.000-56.000
C_3	Maximum Speed	Kilometers/hour	257-327
C_4	Range	kilometers	500-1000
C_5	Maximum Altitude	Metres	4.600-6.100

Once the criteria, their indicators, and respective value ranges are established, we will create the performance matrix. The rows will represent the criteria, while the columns will represent the alternatives of rotary-wing transport aircraft.

Tabelul 10. Performance matrix

Criteria	Troop Transport Capacity	Maximum Takeoff Weight	Maximum Speed	Range	Maximum Altitude
AS 332[8]	24	9150	327	851	5180
H 225 M[9]	16	7000	257	580	4800
Chinook[10]	55	22680	310	740	6100
Super Stallion[11]	93	33339	280	1000	5600
MI-26[12]	90	56000	295	500	4600

The next step involves assigning a scoring range to each criterion considered in the performance matrix, for the purpose of normalizing the matrix and facilitating calculations. The score is in the range of values [1, 3], where 1 represents the least preferred option, 2 represents the average option, while 3 is associated with the most preferred option.

Table 11. The score of each aircraft

Criteria	Troop Transport Capacity	Maximum Takeoff Weight	Maximum Speed	Range	Maximum Altitude
AS 332	1	1	3	2	1
H 225 M	1	1	1	1	1
Chinook	2	2	3	2	3
Super Stallion	3	3	1	3	2
MI-26	3	3	2	1	1

Once the score is determined, we need to assign a weight to each criterion mentioned so far in the development of the multicriteria analysis. Weights are assigned between the values [1, 5], where the values represent: 1 - least important, 2 - somewhat important, 3 - moderate, 4 - important, and finally, 5 - most important. Thus, the weight matrix is created as follows.

Table 12. Directly estimated weights

Troop Transport Capacity	Maximum Takeoff Weight	Maximum Speed	Range	Maximum Altitude
5	3	2	4	1

The final step of the rotary-wing transport aircraft analysis consists of solving the mathematical calculations and subsequently establishing the final ranking. Following the mathematical calculations, the following values have emerged:

Table 13. The scores of the aircraft

Alternative	Score
AS 332	23
H 225 M	15
Chinook	33
Super Stallion	40
MI-26	33

After obtaining the numerical values, we compile the final ranking as follows:

Table 14. The final ranking

Place	The final ranking
1	Super Stallion
2	Chinook
2	MI-26
3	H 225 M
4	AS 332

4. THE ANALYSIS OF COMBAT EXPERIENCE STARTING FROM 1970

The final criterion integrated into the analysis is that of combat experience, as in moments of crisis and tension, the individual capabilities of combatants become evident, reflecting the level of training and preparedness. As emphasized throughout the analysis, special operations forces are often deployed in areas of intense conflict, where they undertake a wide range of missions in the crucial and direct stages of confrontation. However, these units can also conduct operations in the pre-conflict and post-conflict stages of a confrontation, highlighting the necessity of superior training and adaptability in the face of various challenges and operational contexts.

For the sake of relevance and consistency, I have chosen to limit the mention of combat experience to operations and conflicts conducted by special operations forces starting from 1970. This decision stems from significant technological advancements in the military domain and the evolving nature of the battlefield, which grants this period particular significance in the development of doctrines and tactics for these units. Furthermore, this period has undergone extensive scrutiny to evaluate and validate how real-world aspects of conflict influence the training and preparedness of special operations forces.

Moreover, to ensure a deeper understanding of this subchapter, it is important to emphasize that I will not delve into details about individual confrontations, but rather highlight the operations or conflicts in which special operations forces have been involved, as well as their duration and period.

France:

- Capture of the Grand Mosque in Mecca, November 20th – December 4th, 1979, 15 days;
- Ouvea cave hostage taking, April 22nd – May 5th, 1988, 24 days;
- Gulf War, January 17th - February 28th, 1991;

- Air France Flight 8969 hijacking, December 24th – 26th, 1994, 3 days;
- Operation Azalea, September 28th – October 3rd, 1995, 6 days;
- Kosovo War, February 1998 – June 11th, 1999;
- Bosnian War, July 16th, 1994 – December 2nd, 2004;
- Iraq War, March 19th, 2003 – April 30th, 2009;
- War in Afghanistan, 2000-2010;
- 2009 raid on Somalia, 2009, 1 day;
- Trebes and Carcassonne attacks, March 23rd, 2018, 1 day;
- Battle for Talahandak, June 3rd, 2020, 1 day.[13],[14],[15],[16]

United Kingdom:

- The ethno-nationalist conflict in Northern Ireland, 1976 – 1997;
- Lufthansa Flight 181 hijacking, October 13th - 18th, 1977, 5 days;
- Capture of the Iranian Embassy in London, April 30th - May 5th, 1980, 6 days;
- Falklands War, April 2nd - June 14th, 1982;
- Gulf War, January - February 1991;
- Bosnian War, July 16th, 1994 – December 2nd, 2004;
- Kosovo War, February 1998 – June 11th, 1999;
- Sierra Leone Civil War, Operation Barras, September 10th, 2000, 1 day;
- War in Afghanistan, 2000-2010;
- Iraq War, March 19th, 2003 – April 30th, 2009.[17],[18],[19],[20]

USA:

- Salvadoran Civil War, October 15, 1979 – January 16, 1992;
- Operation Urgent Fury, Invasion of Grenada, October 25 – 29, 1983, 4 days;
- Operation Just Cause, Invasion of Panama, December 20, 1989 – January 31, 1990;
- Gulf War, January 17 – February 28, 1991;
- Operation Restore Hope, Somali Civil War, December 5, 1992 – May 4, 1993;
- Operation Uphold Democracy, Haitian Civil War, September 19, 1994 – March 31, 1995;
- Bosnian War, July 16, 1994 – December 2, 2004;
- Kosovo War, February 1998 – June 11, 1999;
- Afghanistan War, 2000-2010;
- Iraq War, March 19, 2003 – April 30, 2009.[21],[22],[23],[24]

Russia:

- Crimea Crisis (Annexation of Crimea), February 20 – 26, 2014;
- Recovery of the SU-24M plane shot down by the Turkish Army, November 24, 2015, 1 day;
- Palmyra Offensive, March 9 – 27, 2016, 18 days;
- Miracle of Akerbat, August 16, 2017;
- Operation Dawn of Idlib, April 30 – August 31, 2019.[25],[26],[27],[28]

Spain:

- Iraq War, March 19, 2003 – April 30, 2009;
- Afghanistan War, 2000-2010;
- Kosovo War, February 1998 – June 11, 1999;
- Bosnian War, July 16, 1994 – December 2, 2004;
- Gulf War, January 17 – February 28, 1991.[29],[30],[31],[32]

Before advancing to the final classification stage, it is imperative to emphasize that the list of operations and conflicts mentioned is based solely on publicly accessible information sources.

It is important to acknowledge that there is an inherent likelihood that these sources do not fully cover all actions carried out by the special operations forces of the states under analysis. This aspect must be approached with caution, as each state has an interest in keeping certain activities of its special forces secret. Therefore, disclosing other relevant information can be a challenging task, compromising the open and accessible nature of the work to the general public.

That being said, the final ranking of special operations forces in terms of combat experience is:

Table 15. The final ranking of combat experience

Place	The final ranking
1	France
2	United Kingdom
1	USA
2	Russia
3	Spain

5. MULTICRITERIA ANALYSIS OF SPECIAL OPERATIONS FORCES

This is the final step in ranking the special operations forces, encompassing the results of the previous analyses. To complete the comparative multicriteria analysis, we decided to assign scores based on the positions occupied by the respective states in the previous rankings. Thus, positions 1 and 2 will each receive 3 points, position 3 will receive 2 points, and positions 4 and 5 will each receive 1 point.

Table 16. Scores assigned to each criterion

Criteria	Ram-air parachutes[1]	Round parachutes[2]	Fixed-wing transport aircraft	Rotary-wing transport aircraft	Combat experience
France	1	2	2	1	3
United Kingdom	3	1	2	3	2
USA	3	3	1	3	3
Russia	1	3	1	1	1
Spain	3	1	3	2	2

To conduct a multicriteria analysis as fair as possible, given the information available in the study of certain criteria, I decided to assign specific weights to these criteria. The weights were chosen as follows:

Table 17. Directly estimated weights

Ram-air parachutes	Round parachutes	Fixed-wing transport aircraft	Rotary-wing transport aircraft	Combat experience
5	4	3	2	1

At this point, with the scores and criteria weights established, we can calculate the points for each state to subsequently determine the final ranking of the special operations forces within the air forces. The table with the final scores is as follow:

Table 18. The resulting scores

Alternative	Score
France	24
United Kingdom	27
USA	39
Russia	23
Spain	35

With the scores established, the final ranking can be determined, as follows:

Table19. The final ranking

Place	The final ranking
1	USA
2	Russia
3	United Kingdom
4	France
5	Spain

6. CONCLUSIONS

The proposed study undoubtedly presents certain limitations that need to be carefully addressed. Firstly, it's important to highlight the restriction to a relatively small number of items and criteria, in this case, five. This limitation may affect the accuracy and comprehensiveness of the analysis as it does not cover all relevant aspects of evaluating special operations forces within the air forces. Although the criteria selection was done carefully, including a greater number of items could provide a more comprehensive and detailed perspective on the performance of these forces.

While it can be argued that the analysis approaches reality, we must acknowledge the sensitivity of publicly available information. Information from the public domain can often be limited or biased, and some essential aspects may be subject to censorship, thereby affecting the objectivity of the analysis. Consequently, it's important to recognize that any assessment based on this information must be treated with a certain degree of subjectivity and caution to avoid erroneous or distorted conclusions.

A distinctive aspect of this study is its evolutionary nature, which allows for continuous adjustments and improvements as new equipment and technologies emerge in the arsenal of special operations forces. This adaptability is crucial for maintaining relevance and continuously updating the criteria and evaluation methodologies, ensuring that the analysis remains in step with changes in the operational and technological dynamics of these forces.

In conclusion, while the study provides an initial attempt to evaluate special operations forces within the air forces, careful consideration and a continuous process of review and improvement are necessary to ensure the accuracy, relevance, and objectivity of the analysis in the context of the ongoing changes in the military and operational domains.

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