

COMPARATIVE ANALYSIS OF TRANSPORT AIRCRAFT, BACKGROUND FOR SHORT/ MEDIUM COURIER TRANSPORT AIRCRAFT PROCUREMENT

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Abstract

In accordance with Air Force requirements, the comparative analysis of short/medium transport aircraft comes to sustain procurement decision of short/medium transport aircraft. This paper presents, in short, the principles and the results of the comparative analysis for short/medium military transport aircraft.

1. Introduction

Before starting the short/medium transport aircraft procurement, a Concept study including a comparison algorithm regarding the performances and costs of the military transport aircraft was elaborated within the Flight Test Center (WO-word order). In this paper, the authors presents, in short, the principles and the results of the comparative analysis for short/medium military transport aircraft which substantiated the procurement decision of the Ministry of Defense. The object of this paper was confined to the comparative analysis of performances as the aircraft cost data were consistently changed between the answer to request of information and the official supply. From the complete data base of the military (WO) transport aircraft, after the first stage of analysis, only two aircraft were chosen to answer the purpose.



Fig.1 - C-295- EADS/CASA Spain



Fig.2 - C-27 J Spartan- ALENIA Italy

2. Criteria and attributes choice

According to the above introduction, the object of this analysis is a comparison between C-295 and C-27 J military(WO) transport aircraft, based on technical data provided by the CASA and ALENIA factories on their responsibility [1-4].

At the beginning, the authors tested the TASCFORM method application (designated for the combat aircraft comparison) but, the criteria and the evaluation coefficients available for the fighter were not available for the military transport aircraft. In this situation, the authors performed an original direct comparison based on technical and tactical criteria.

So, for each criteria, the authors chose the following attributes:

- Technical attributes:
 - Maximum payload (G_U);
 - Propulsion efficiency (Maximum payload /engines power - E_P);
 - Structural efficiency (Maximum payload /empty aircraft weight - E_S);
 - Fuel consumption/flight hour (C_{SP});

The increasing efficiency are in ascending order.

- Tactical attributes:
 - Maximal distance with payload 6.000 Kg (D_{GU});
 - Cruise speed (V_C);
 - Pallets maximum number (C_{pa}) ;
 - Personnel max number (ground troops/paratroops - C_P) .

Table 1

| CHARACTERISTICS | | | | | | | | | |
|---------------------------|---------------|------------------|--------------|----------------------|------------------|--------------------|---------------------------|------------------|------------|
| Criteria and attributes | TECHNICAL | | | | TACTICAL | | | | |
| | G_U (Kg) | E_P (Kg/Cp) | E_S (-) | C_{SP} (l/hour) | D_{GU} (Km) | V_C (Km/hour) | C_{pa} (no. Pallets) | C_P (no. Pers) | |
| Aircraft | | | | | | | | troops | paratroops |
| ORD ^(*) | 6.000 | 1,200 | 0,428 | 1.250 | 3.200 | 400 | 3 | 60 | 40 |
| C 295 | 9.250 | 1,876 | 0,829 | 750 | 3.700 | 400 | 4 | 71 | 49 |
| C-27J | 11.500 | 1,240 | 0,670 | 875 | 4.260 | 500 | 3 | 68 | 46 |

(*) – Operational Requirement Document

3. Characteristics normalized evaluation

Generally, the characteristics normalization consists in applying the maximum and minimum criteria for the values entered in each column. Because, the number of proposal is insufficient for good result of the applied method, for a good comparison, data normalization was make according to data imposed by **Operational Requirement Document** for short/medium military transport aircraft. Since the number of proposals, is insufficient for a good performance of the applied method, for a good comparison, the data normalization was

done according to the data required by the Operational Requirements Document for military short / medium transport aircraft Applied formula are:

$$V_n = |(V_{fav} - V_p)| / V_p \tag{1}$$

where,

V_n - normalized value:

V_{fav} - parameter physical value for compared aircraft;

V_p – imposed value by ORD.

The results after computation (WO) are presented in table 2 below:

Table 2

| NORMALIZATION | | | | | | | | | |
|-------------------------|-----------|--------|--------|---------|----------|--------|---------|--------|------------|
| Criteria and attributes | TECHNICAL | | | | TACTICAL | | | | |
| | Gu (-) | Ep (-) | Es (-) | Csp (-) | DGU (-) | Vc (-) | Cpa (-) | Cp (-) | |
| Aircraft | | | | | | | | troops | paratroops |
| C 295 | 0,542 | 0,563 | 0,937 | 0,400 | 0,156 | 0,000 | 0,333 | 0,183 | 0,225 |
| C-27J | 0,917 | 0,033 | 0,565 | 0,300 | 0,331 | 0,250 | 0,000 | 0,133 | 0,150 |

4. Criteria and attributes weight

Table 3

| WEIGHT | | | | | | | | | |
|-------------------------|-----------|------------|--------|--------------|----------|--------------|-------------------|---------------|------------|
| Criteria and attributes | TECHNICAL | | | | TACTICAL | | | | |
| | Gu (Kg) | Ep (Kg/Cp) | Es (-) | Csp (l/hour) | DGU (Km) | Vc (Km/hour) | Cpa (no. Pallets) | Cp (no. Pers) | |
| weight | | | | | | | | troops | paratroops |
| | 0,50 | 0,15 | 0,15 | 0,20 | 0,30 | 0,30 | 0,20 | 0,10 | 0,10 |

Weight values were chosen so that to describe the contribution of each attribute according to their level of importance.

5. Operational efficiency

Operational efficiency was computed in three usual variants of the criteria and attributes weight

Table 4

| VARIANTS | WEIGHT | |
|-----------|-----------|----------|
| | TECHNICAL | TACTICAL |
| Variant 1 | 0,5 | 0,5 |
| Variant 2 | 0,7 | 0,3 |
| Variant 3 | 0,3 | 0,7 |

The performance coefficients values were obtained by addition of the normalized values of the weight attributes according to data in table 3 and, for variants, according to data in table 4. The results are presented in table 5 and in fig.3 below:

Table 5

| | Variant 1 | Variant 2 | Variant 3 |
|--------------|-----------|-----------|-----------|
| C 295 | 0,365 | 0,449 | 0,281 |
| C-27J | 0,405 | 0,487 | 0,324 |

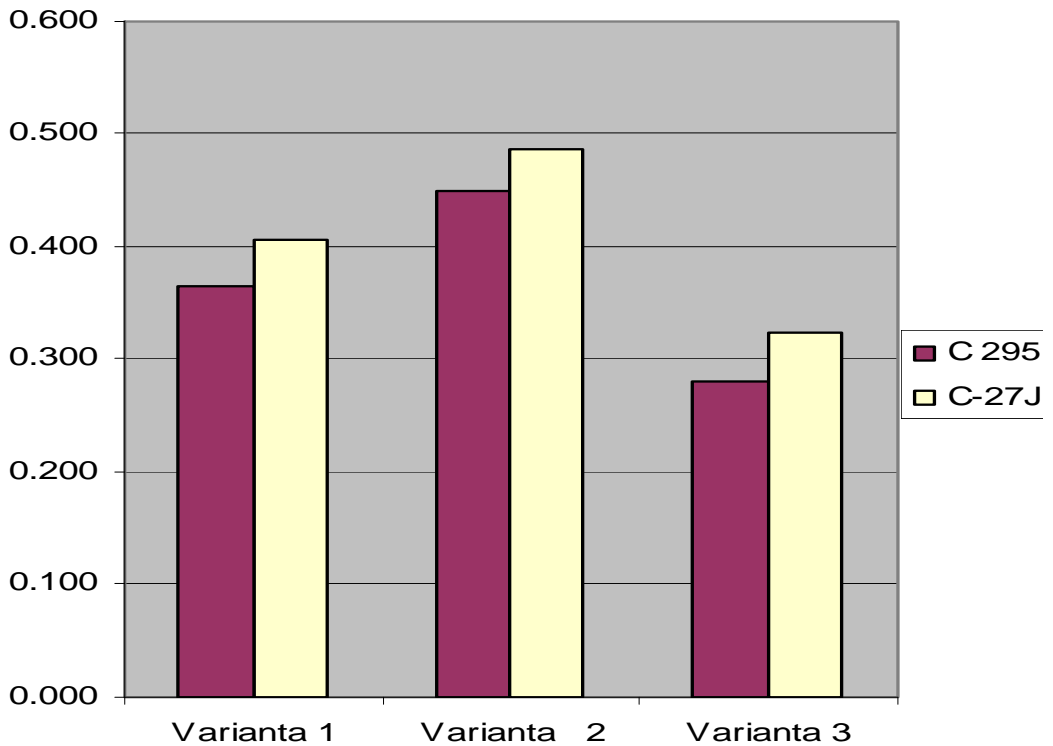


Figure 3 - Operational efficiency

6. Conclusion

The conclusion as illustrated in figure 3 is relevant:

- **The operational efficiency of C-27 J aircraft is better then that of the C-295 aircraft for all three criteria and attributes weight variants.**

according to the above conclusion, the final decision was C-27J.

DIMENSIONS

| | |
|---------------------|---------------------------------------|
| Length | 22.7 m |
| Height | 4.8 m |
| Tail Height | 9.6 m |
| Wing Span | 28.7 m |
| Tail Span | 12.4 m |
| Cabin Height | 2.6 m |
| Cabin Floor Width | 2.45 m |
| Cabin Diameter | 3.33 m |
| Cabin Cross Section | 6.96 m ² |
| Cabin Length | 11.43 m (including ramp) |
| Cabin Floor Area | 23.23 m ² (excluding ramp) |
| Cabin Volume | 69.5 m ³ (excluding ramp) |

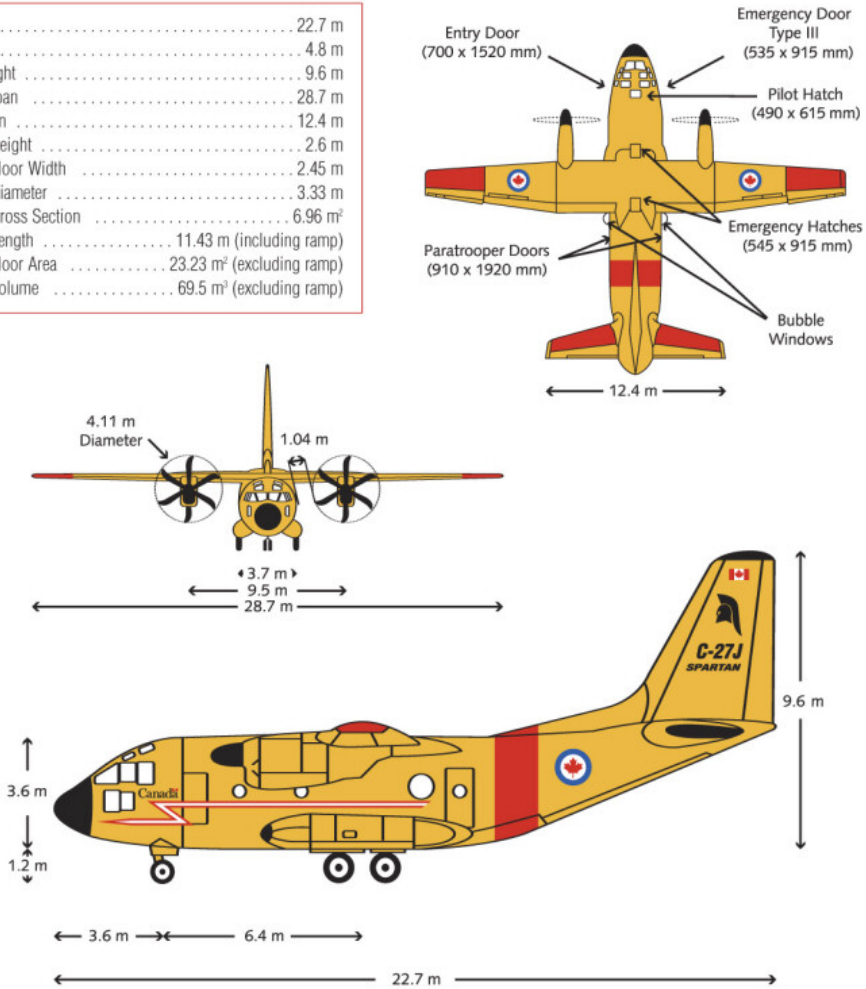


Fig.4 - C-27J SPARTAN

REFERENCES

- [1] *C-27 J vs. C-295 comparison* - Edited by Alenia/2006.
- [2] *A response to the Alenia C-27 J vs. C-295 comparison* - Edited by EADS/CASA/2006.
- [3] *Consideration on the EADS-CASA brochure with comparison between C-27 J and C-295/2006.*
- [4] *Alenia answers to RFI requirements* (section 1 and 2)/2006.