IAR-93 military aircraft monument

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Abstract: *In this presentation, we will concentrate on the vertical support, which is free from all sides. A Finite Element Model (FEM) of the IAR-93 aircraft monument has been developed in PATRAN/NASTRAN®, partly from a previous ANSYS® model FEM can be used to investigate potential structural modifications or changes in column monument with realistic component corrections. Model validation should be part of every modern engineering analysis and quality assurance procedure.*

Key Words: *IAR-93, monument, finite element analysis, loads, stresses.*

1. INTRODUCTION

The IAR-93 "Eagle" is an attack aircraft developed jointly by Romania (IAR.93) and Yugoslavia (J22) that entered service in the mid 1970s. It was heavily inspired by the Anglo-French "Jaguar" program of the same era having a high set wing.

Several variants entered service carrying out roles

- Ground attack,
- Tactical Reconnaissance
- Maritime Reconnaissance/ attack
- Target Towing
- Various test duties for INCAS
- Point Air Defense

Fig. 1 IAR-93 Eagle

IAR-93 “Eagle” is a twin-engine, subsonic, close support, ground attack and tactical reconnaissance aircraft with secondary capability as low level interceptor, built as single-seat main attack version or combat capable two-seat version for advanced flying and weapon training.

Summary aircraft characteristics and performance are:

- Wing span : 30.5ft
- Lenght: 48.9ft
- Height: 14.8ft
- Max Take-off Weight: 10.180 kg
- Max Speed in level flight: M=0.9
- Service ceiling: 49.000ft
- Max range: 820 miles
- Combat radius: Up to 300 miles, depending on stores and external fuel.

2. IAR-93 MONUMENT ARHITECTURE

The corresponding details of the monument arrangement are shown in Fig. 2 through Fig. 5.

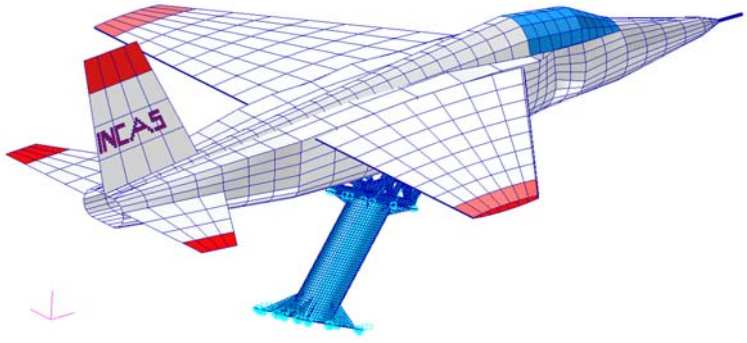

Fig. 2 IAR-93 monument assy

3. CAD-CAE REPRESENTATION

The subsequent details of CAD- CAE representation are shown in Fig. 3 through Fig. 7.

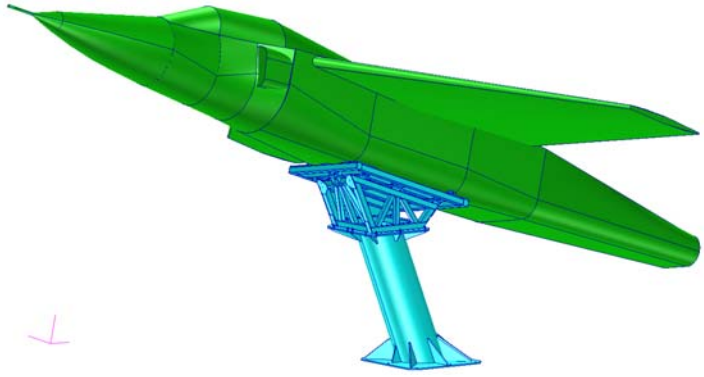

Fig 3 IAR-93 and column

The word “column” is related, in this paper, to building construction. The vertical support which is free from all sides taking the load of beam and transferring independently the load to the ground is called column.

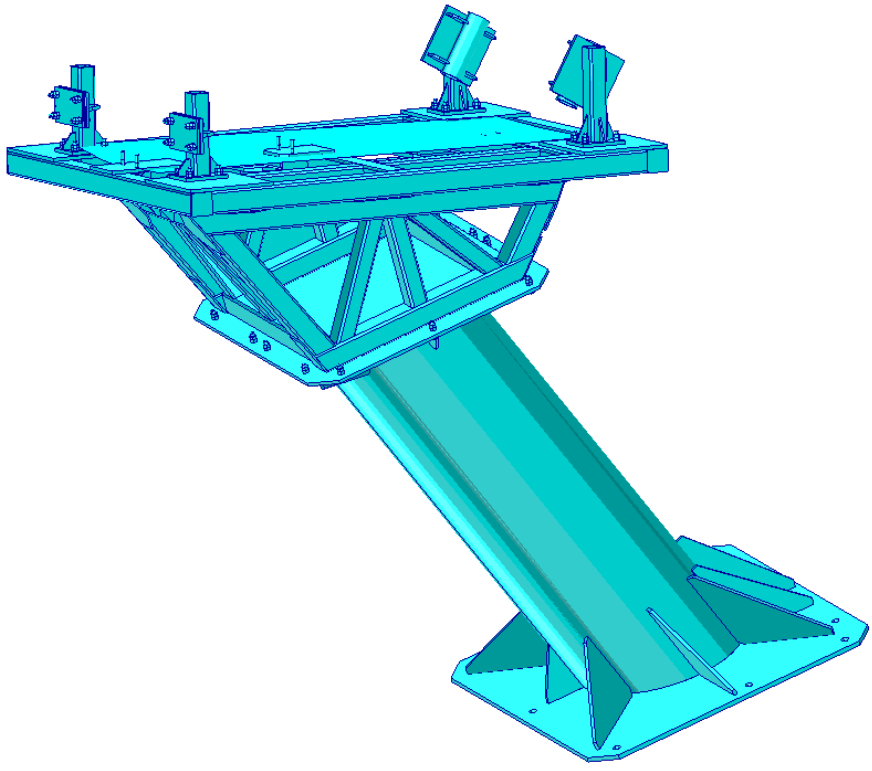

Fig 4 Column CAD assy

In case of frame structure building constructions, the entire load is born by columns and the floor area, the internal space of building being is freely adjusted according to the requirement.

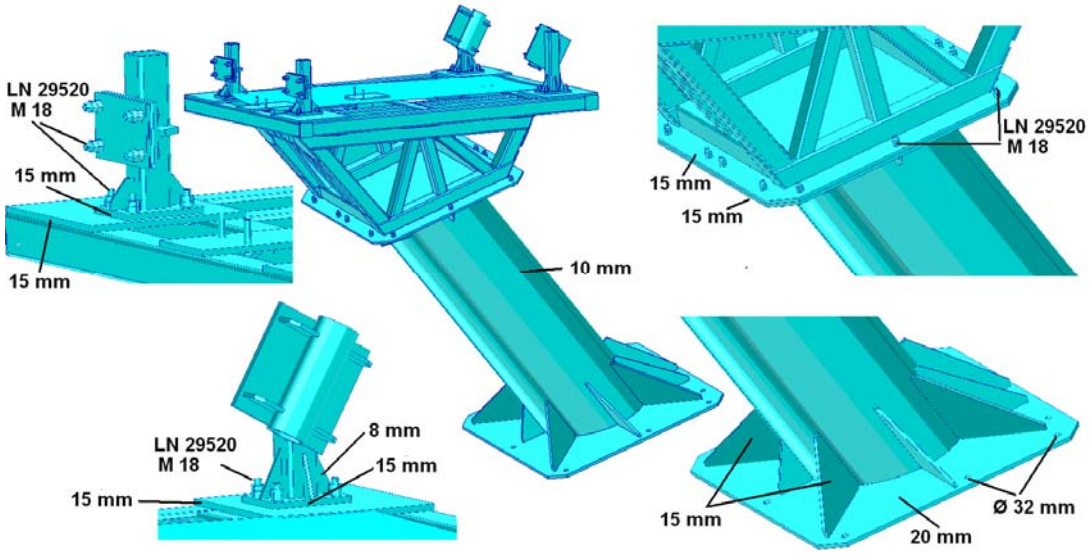

Fig 5 Column CAD details

The size, cement concrete ratio and numbers of steel bars with their diameter are available in structural drawings which are designed according to the load born by the column and factor of safety.

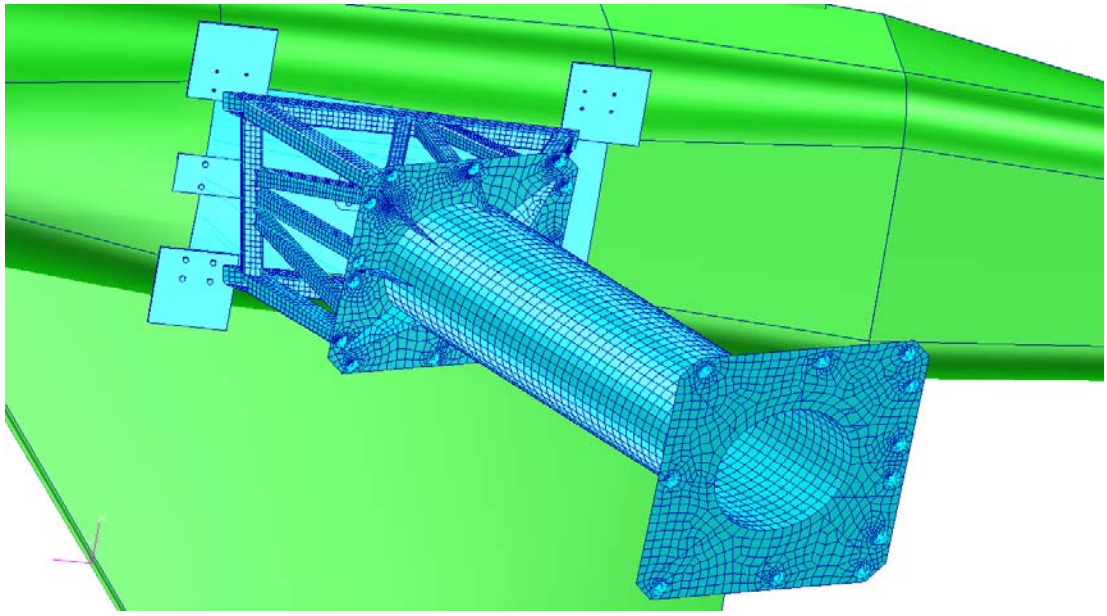

Fig 6 Column FEM model

4. COLUMN STRESS ANALYSIS

The gusseted plates, cleat angles and fastenings (bolts, rivets) in combination with bearing area of shaft shall be sufficient to take all loads

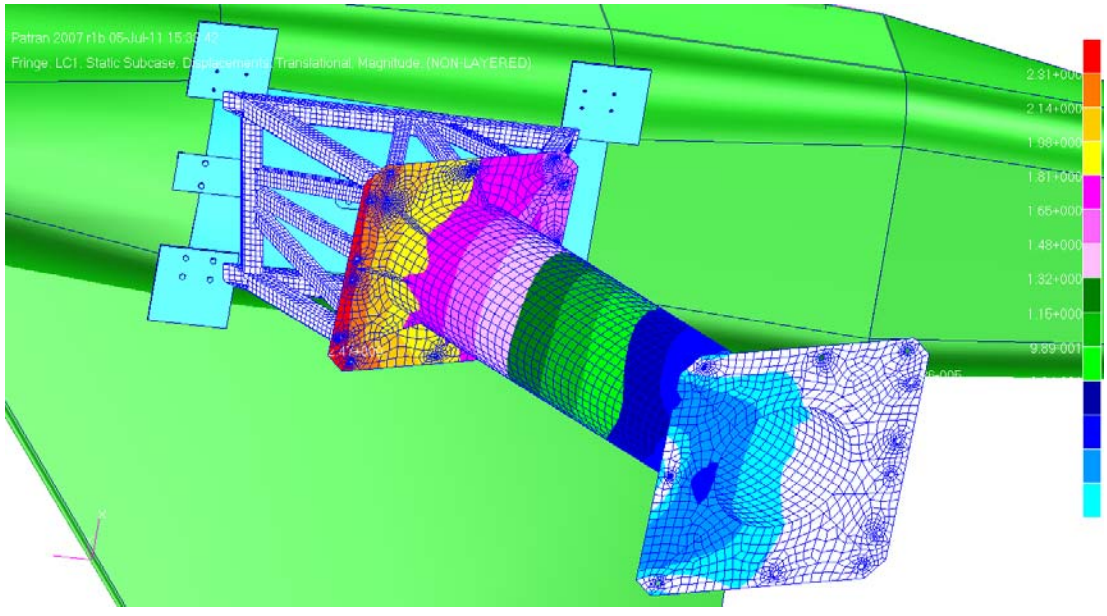

Fig. 7 Column FEM displacements

Tab. 1 Reaction forces in base plate

Load case	Frez [N]	Fx [N]	Fy [N]	Fz [N]
Weight	3.000E+04	6.712E+02	1.097E+02	-2.999E+04
Front wind	5.207E+04	-4.770E+04	-2.867E+03	-2.068E+04
Rear wind	3.000E+04	6.712E+02	1.097E+02	-2.999E+04
Right wind	3.956E+04	4.900E+02	2.641E+04	-2.945E+04
Left wind	4.024E+04	8.523E+02	-2.619E+04	-3.054E+04

Tab. 2 Reaction moments in base plate

Load case	Mrez [N mm]	Mx [N mm]	My [N mm]	Mz [N mm]
Weight	6.277E+07	3.785E+06	6.266E+07	3.138E+05
Front wind	1.457E+08	1.002E+07	-1.453E+08	-1.592E+06
Rear wind	6.277E+07	3.785E+06	6.266E+07	3.138E+05
Right wind	1.362E+08	-1.167E+08	6.358E+07	2.992E+07
Left wind	1.418E+08	1.242E+08	6.174E+07	-2.930E+07

5. PROJECT OVERVIEW

The following is an updated overview of the major components of the IAR-93 monument:

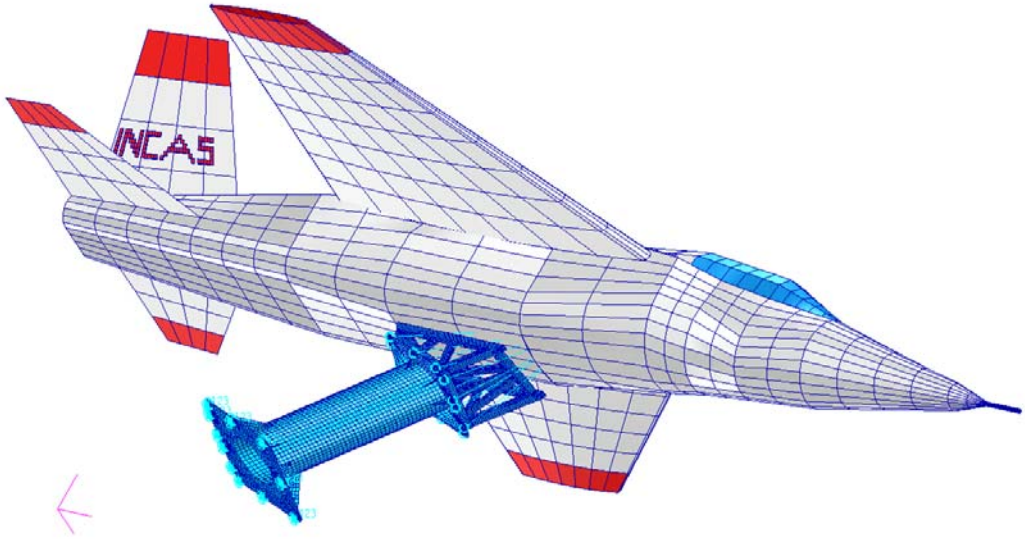

Fig. 8 IAR-93 INCAS monument

- The IAR 93 will be mounted at the southwest corner of Iuliu Maniu Avenue and Valea Cascadelor Street, facing the INCAS building.
- The site is approximately 100 square meters
- The aircraft will sit roughly 15 m off the ground, for security and safety reasons
- The aircraft will have a distinct appearance of flying above INCAS edifice.
- The IAR-93 will be subtly lit at night, both inside and outside.

- Informational display panels detailing the history of the IAR-93 and the INCAS Company will be located around the perimeter of the monument.
- A PATRAN/NASTRAN, [3] finite element model of the IAR-93 monument, originally created for static stress analysis purposes, could be used also for dynamic analysis.
- Furthermore, although the invention has been described with reference to an aircraft structure, it is understood that the device may also be used in other fields of application.

REFERENCES

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