SERVICE BULLETIN

ANALYSIS OF THE SAFETY BELT TIE MAGIC GS-700

March 31st, 2010.

SB-Ibis-011

OBLIGATORY

AFFECTED AIRCRAFT:

All Aircraft type IBIS Model (Magic), made earlier to the month of April 2010. That has the tie-belt plate lateral to the compression channel of the airplane.

REASON:

Was detected that in extreme situations plate belt of his point is lost because of the effort to crush the rivets on your plate then followed rupture, letting loose and the plate of the belt is loose.

SUBJECT:

It was made by the owners in the study of the standard FAR 23 and thereby ensures that the belt plate is maintained even in extreme situations such as accidents and damage to the aircraft.

COMPLIANCE:

From date.
DANGER: Failure to follow these instructions can cause personal injury or death in case of an accident or a dangerous situation that may lead to a forced landing.

ANALYSIS AND RESULTS BY AIRCRAFT SA IBIS
PERFORMANCE AND INSTRUCTION FOR CHANGE PLATE

ABSTRACT

The primary objective of this paper presents a structural static analysis of the different cases of tie belt MAGIC GS-700 under the normative FAR-23 of emergency landing conditions.

1. INTRODUCTION

A safety belt is a harness designed to restrain an occupant of a vehicle under emergency conditions and keep his seat. First used in aircraft in the 1930s, the seat belt system is considered the most effective passive safety ever invented. The objective of safety belts to minimize injuries to occupants, preventing the passenger is struck by the harsh elements of the interior or is thrown from the vehicle.

Currently, safety belts have tensors to ensure the body in the moment of impact by a spring or a gunshot (fireworks tensor). The belt should be possible to place more glued to the body, flat and free of knots or kinks. The hip belt should be located in front of the iliac crests, bones protruding hips. This is to hold the body against a tough and not the soft abdomen.

2. THEORETICAL FRAMEWORK

2.1 Terms of emergency landing

General

1. The aircraft, although it may be damaged in emergency landing conditions, must be designed to protect each occupant under those conditions.

2. The structure must be designed to give each occupant a reasonable opportunity to escape serious injury in a crash landing by making proper use of seat belts:

a. The occupant experiences the last inertia forces listed below:

- *Ascent 4.5 g*
- *Front 9.0 g*
- *Lateral 3.0 g*
- *Descent 4.5 g*

3. METHODOLOGY

For a proper study of the different cases of tie belt MAGIC GS-700, were analyzed under the same load of 4.5 g of occupying the items were subject to greater efforts during the emergency landing conditions established by the normative FAR-23.

The cases studied for this structural analysis are:

Case 1. Fasten seat belt reinforced with rivets external.
Case 2. Fasten seat belt through AN3-5A bolts.

4. DEVELOPMENT AND RESULTS

4.1 Major Structural Elements

The belt tie determined from the role in the structure and level of effort that are subject (Figure1). According to the type of fastener and fixing areas of seat belts in an emergency landing condition, the lateral tie will be subject to greater efforts than the central and superior points. (Figure2). For this reason the study focuses on the analysis of the lateral anchor.

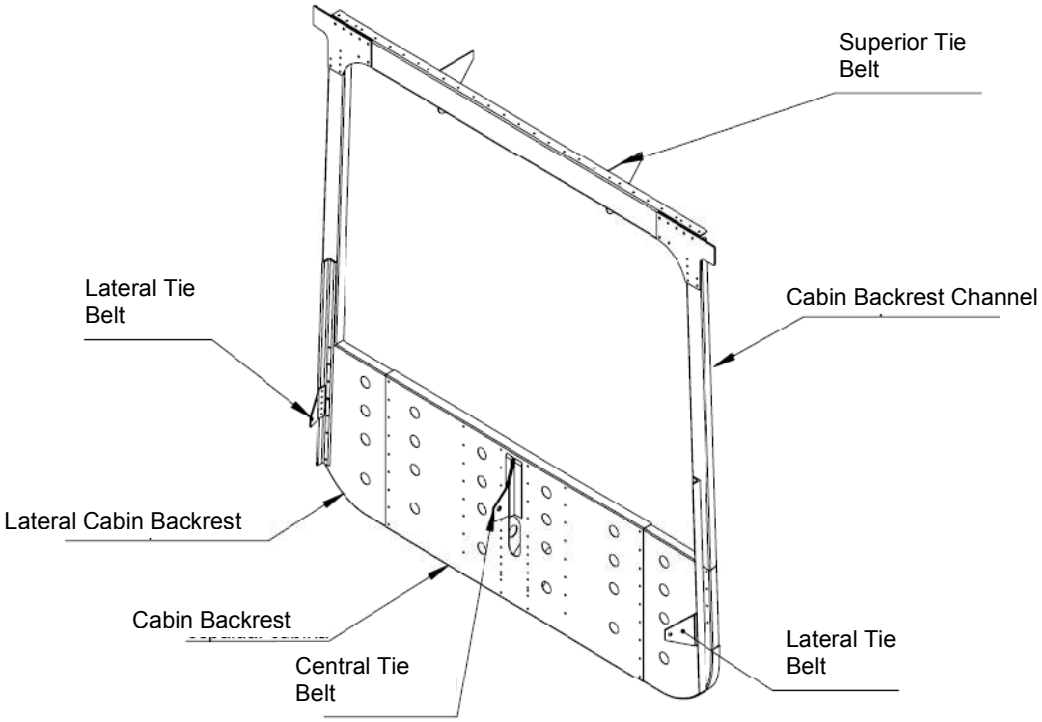


Figure1. Major Structural Elements

Figure2. Tie Side Seat belt

4.2 Analysis with Finite Element Structural Static

We performed a static analysis of lateral tie belt Magic GS-700 under tensile loads to determine their structural strength. For the analysis takes into account considerations such as: boundary conditions, material constraints and mesh type.

4.2.1 Material

The structure of the channel compression is an aluminum alloy 6061-T6 which behaves like an isotropic material, with the following characteristics:

Elasticity Module E		**Rigidity Module G**		**Reason POISSON V**	**Mass Density ρ**	**Elastic Limit to Tension**		**Maximum Resistance to Tension**		**Elongation in 2" inch**
Mpsi	GPa	Mpsi	GPa		Mg/m^3	Kpsi	MPa	Kpsi	MPa	%
10	68,9	3,77	26	0,33	2,7	40	276	45	310	12

* The rivets used are of a low carbon steel.
* The bolts used are steel alloy 4037 0 8740.

4.3 Results

CASE 1

- Tie belt side of the external reinforced by rivets (Figure3)

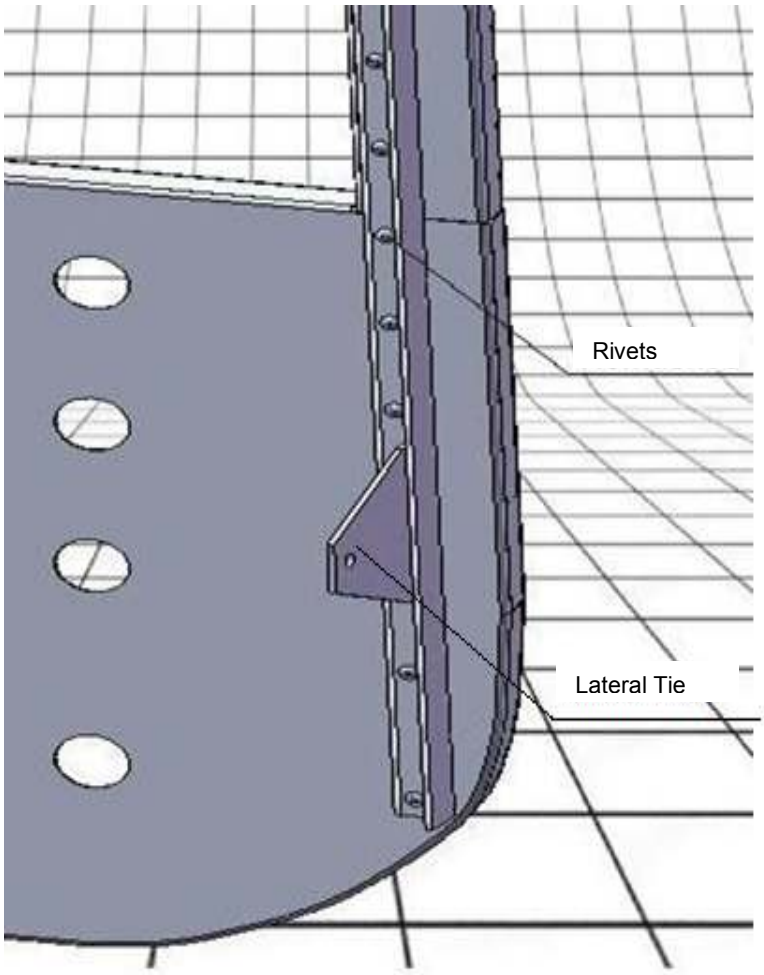


Figure3. Lateral Safety Belt Tie by Rivets

For an inertial force last 4.5 g and a weight of 80kg occupant gives a 264lb load in the tie side seat belt. The images shown below correspond to the results of areas where further efforts are generated, travel and safety factors of the structure of tie belt.

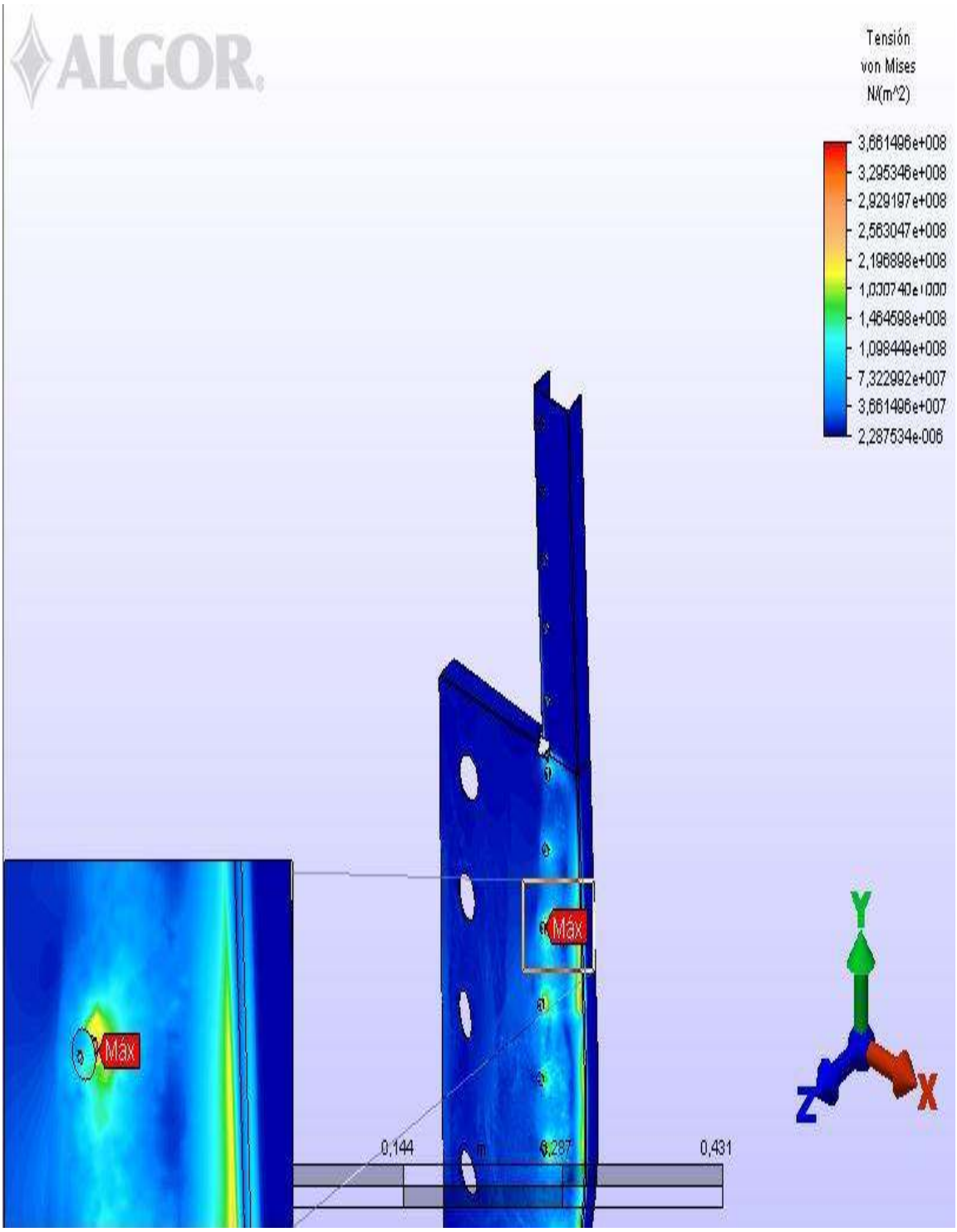


Figure4. Maximum effort in Lower Side Cabin Backrest

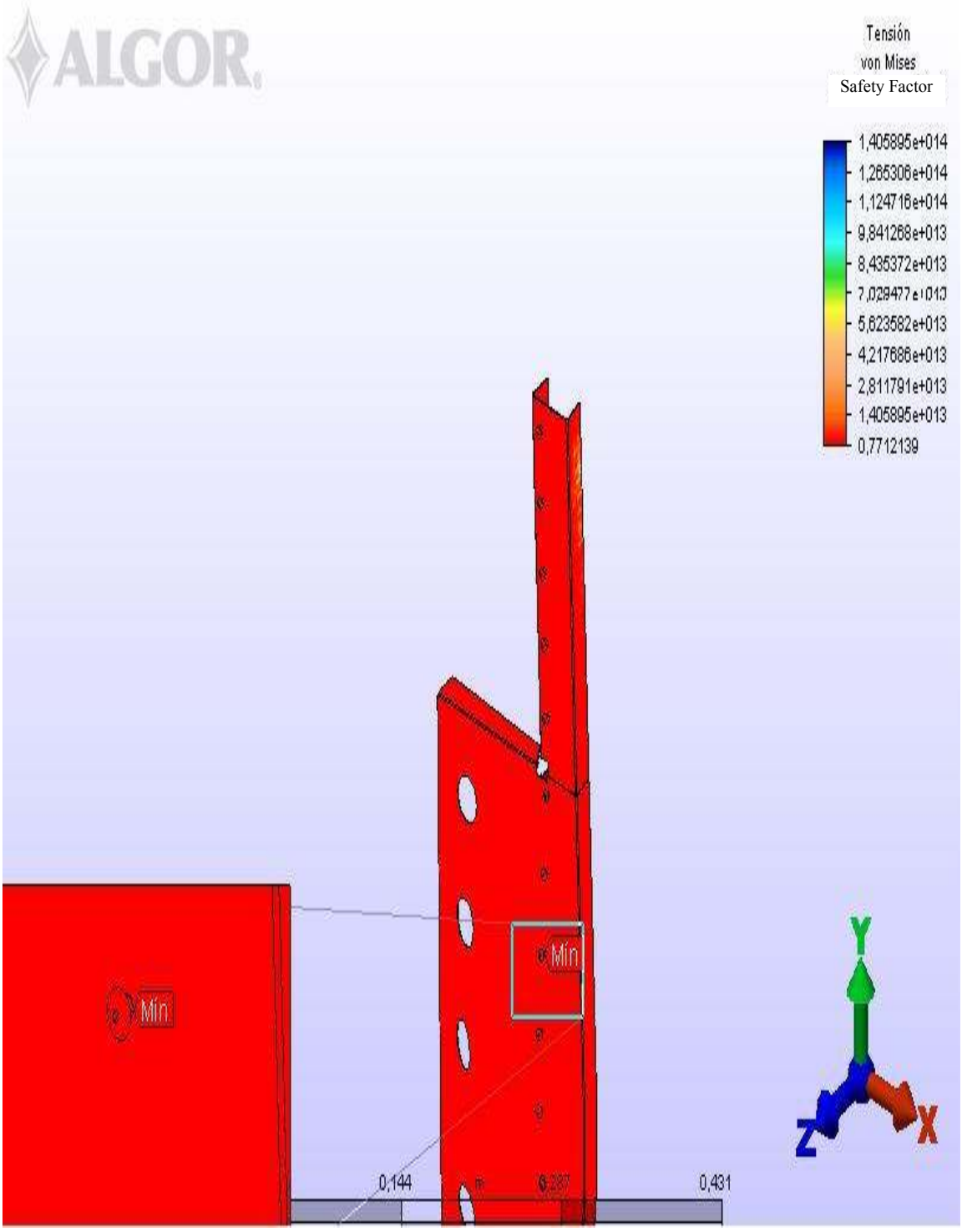


Figure5. Security Factor in Lower Side Cabin Backrest

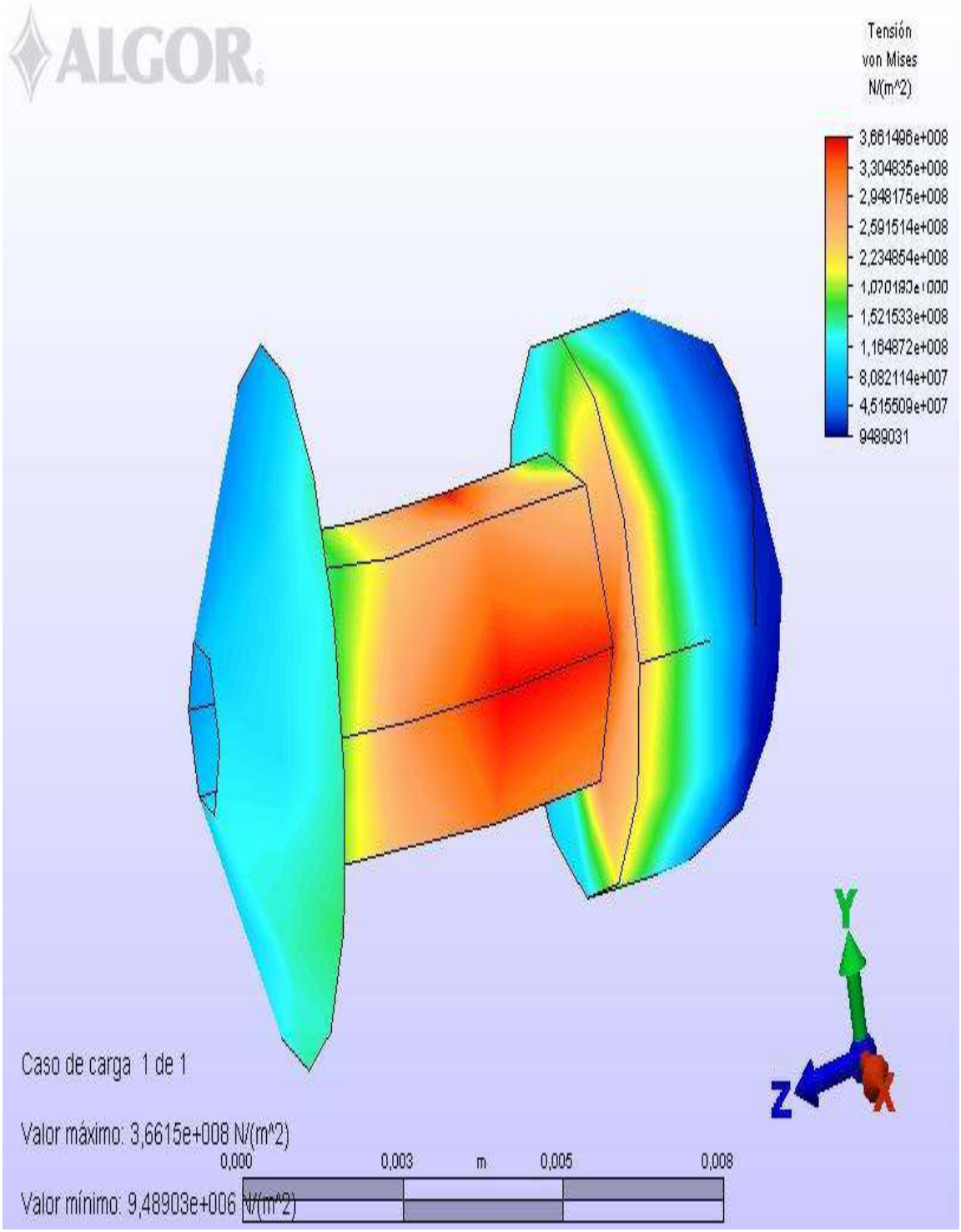


Figure6. Maximum effort in the Rivet Lower Cabin Backrest Lateral

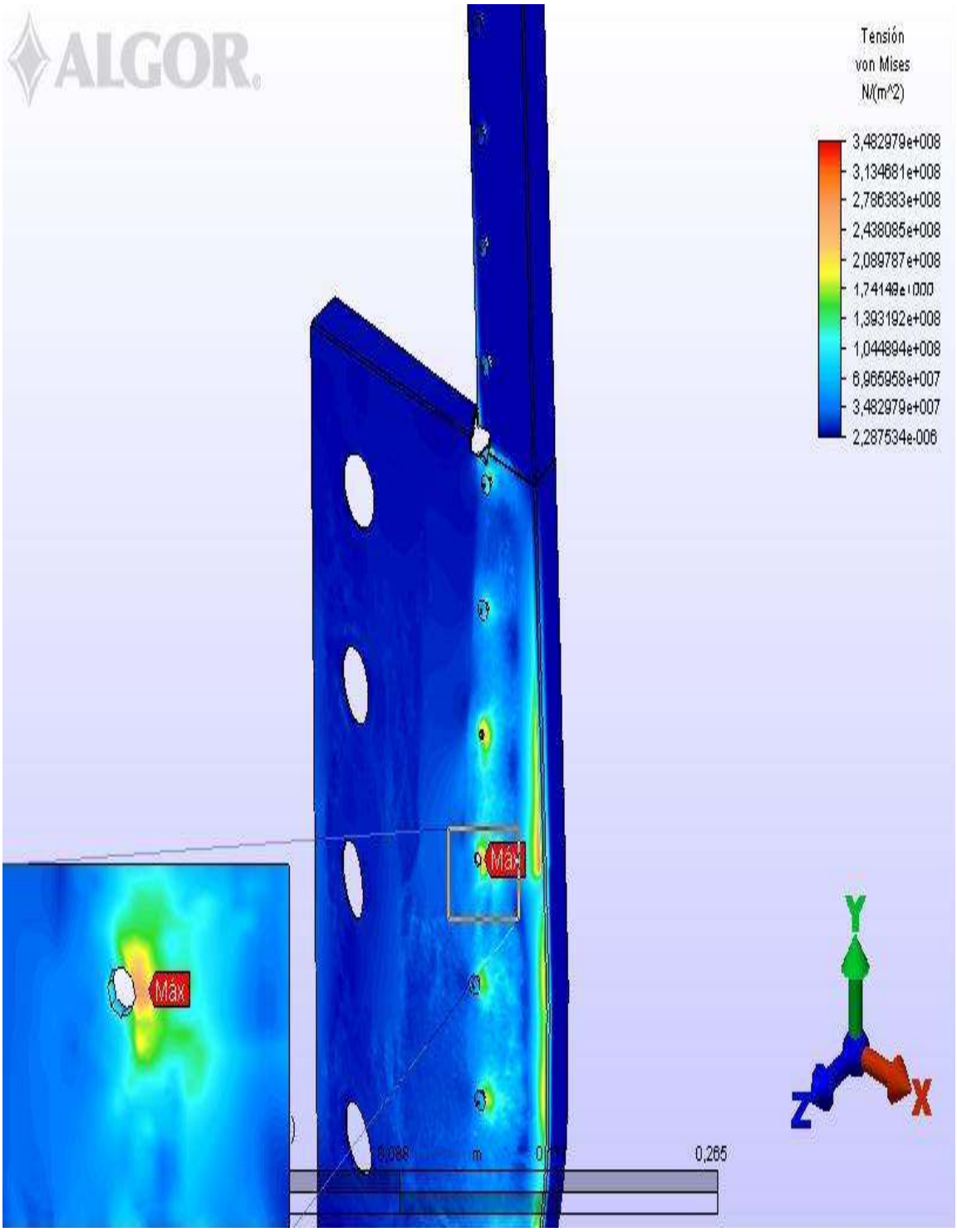


Figure7. Maximum effort in the Central Party Cabin Backrest Lateral

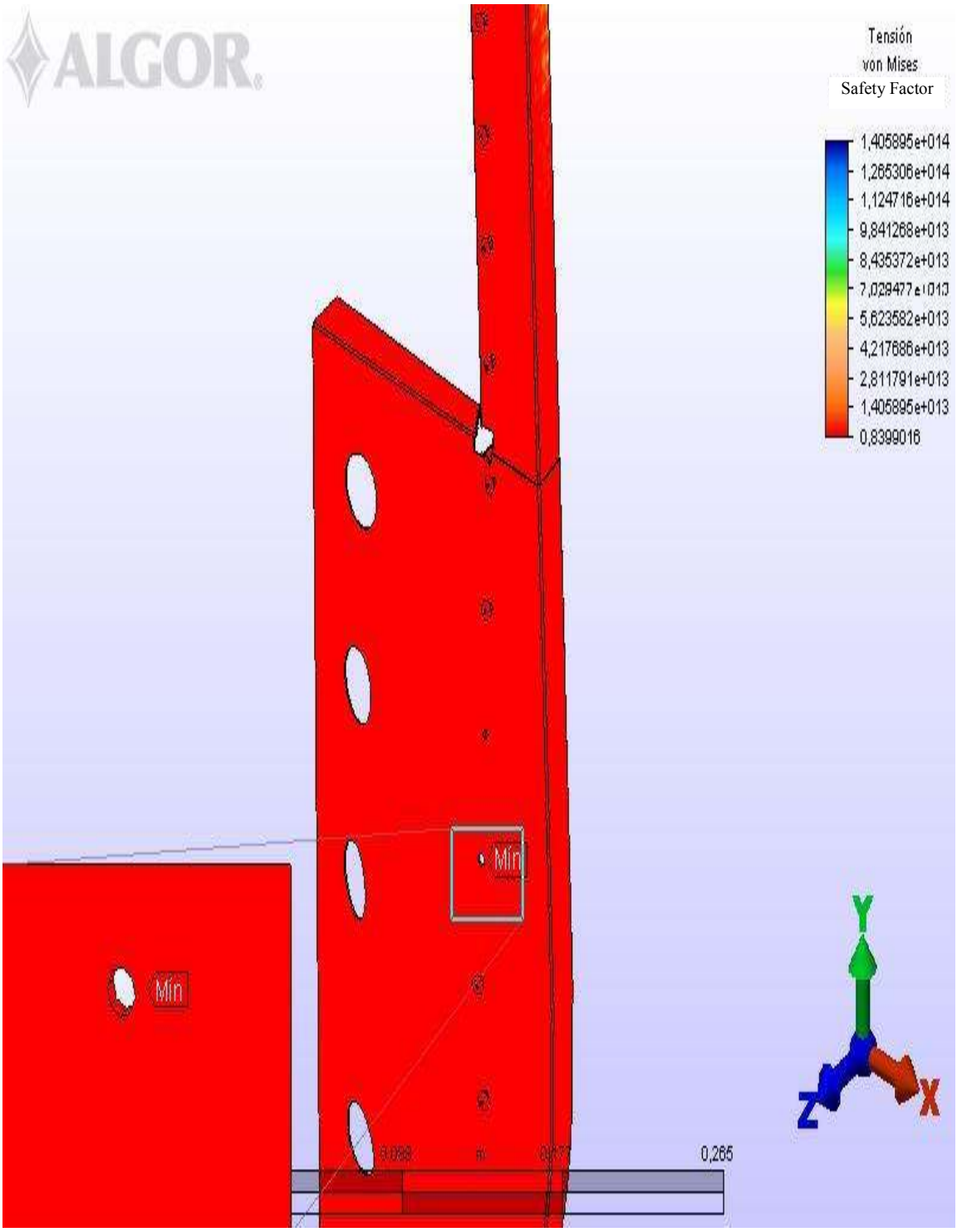


Figure8. Security Factor in the Central Part Cabin Backrest Lateral

For this specific case and the previous analysis made in the structure that holds the side plate of the seat belt during an emergency landing subjected to 4.5 g of the occupant and a 264lb load application of the structure that holds the lateral tie could not bear the necessary because the maximum stress exceeds the yield strength of the material.

The structure that holds the lateral tie failed primarily because of the crushing effort of rivet on it to 3.6 g (figure9), obtaining a safety factor Fs = 0.93 (Figure10)

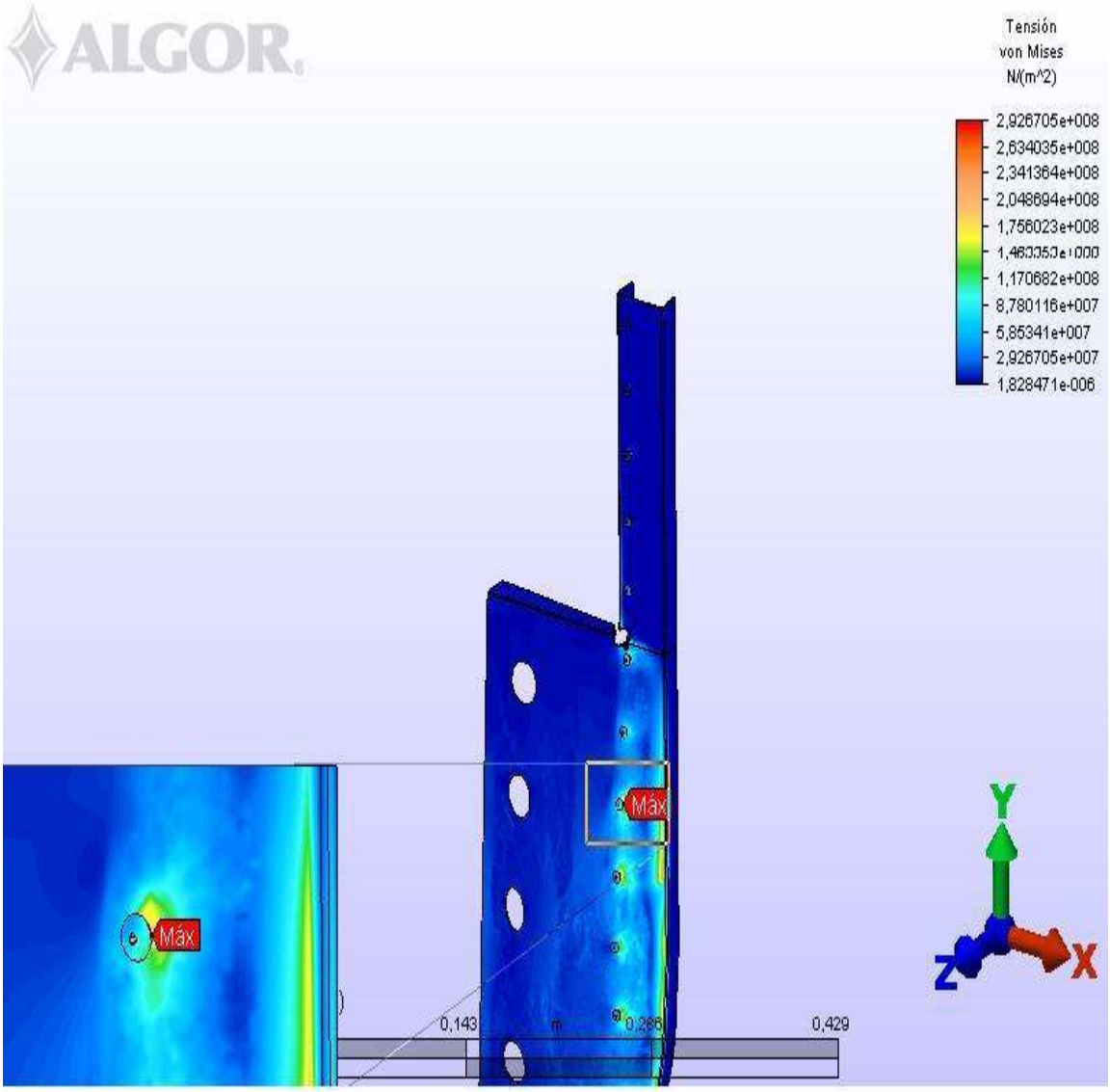


Figure9. Maximum Effort

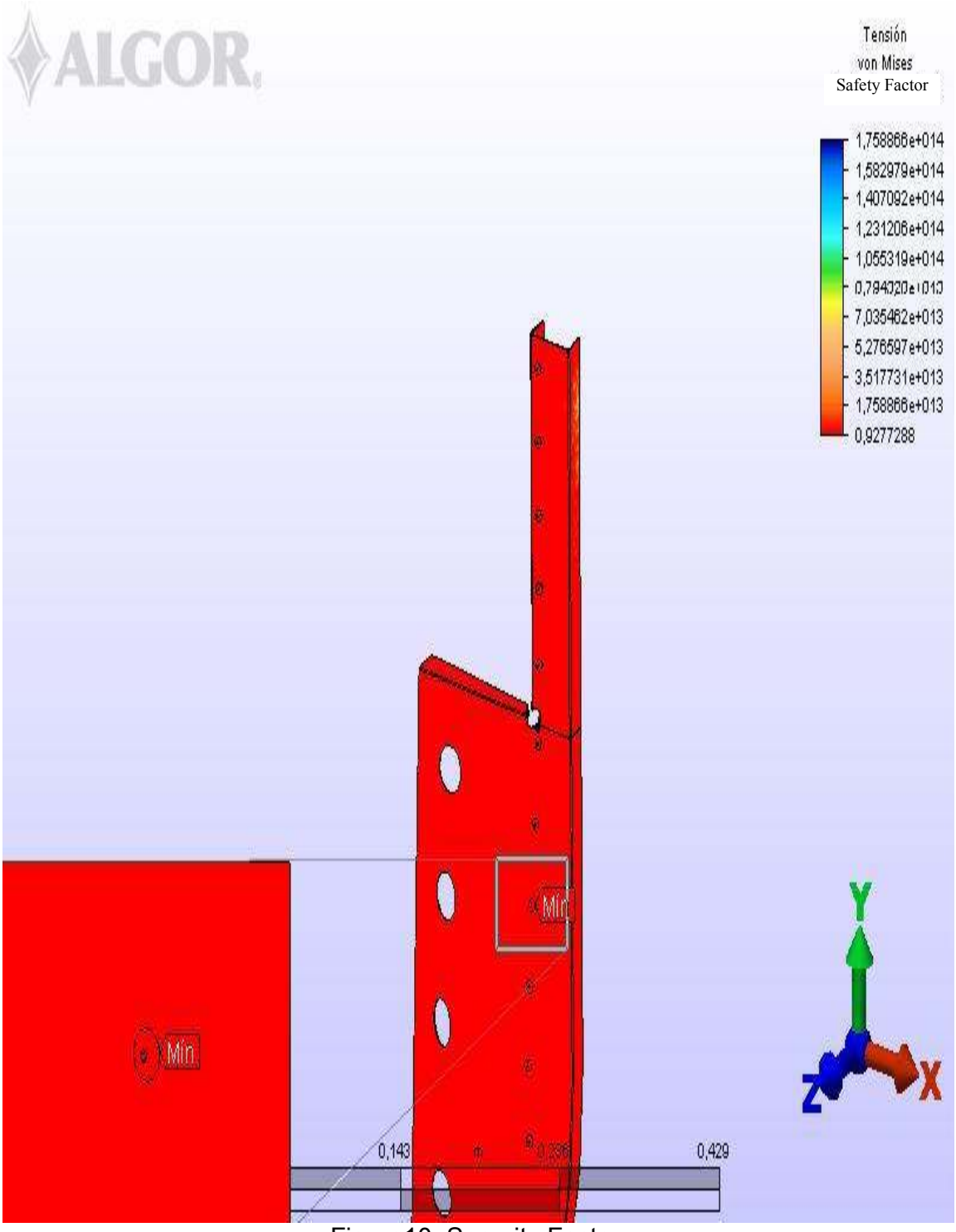


Figura10. Security Factor

When this structure is subjected to these charges of 4,5g we obtain a safety factor Fs = 0, 77, which determines that the structure should be modified to comply fully with the regulations FAR-23. For this reason we performed the analysis of Case 2, which shows the change in the mooring side seat belt of the airplane IBIS Magic GS-700.

CASE 2

- Tie belt Side by AN3-5A bolts. (Figure11).

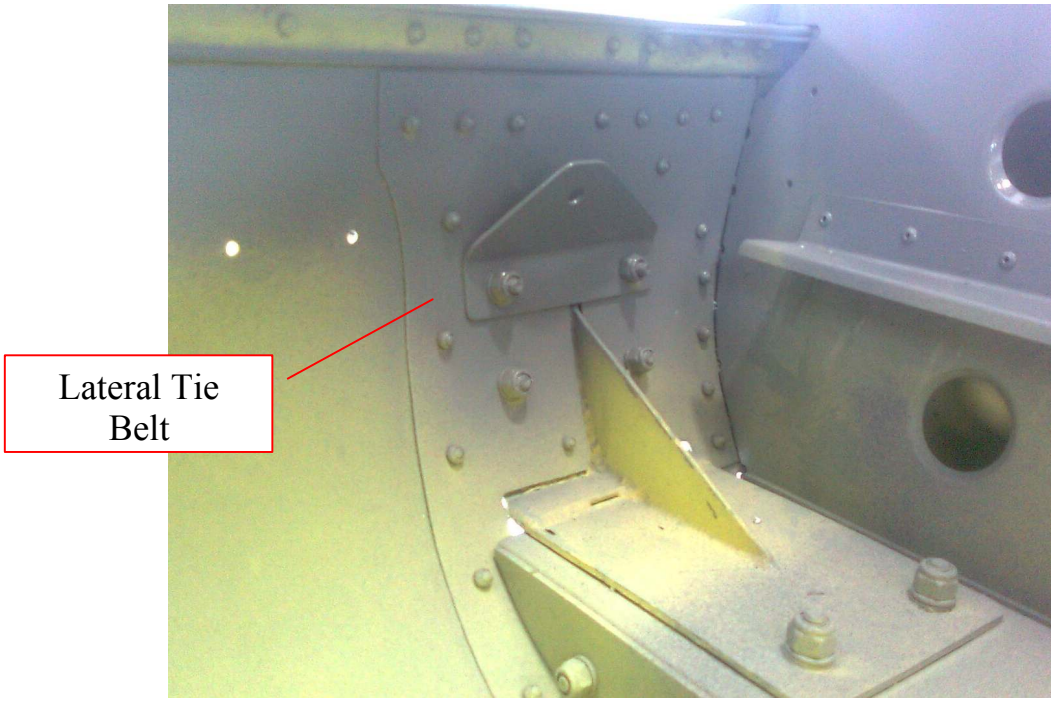


Figure11. Lateral Tie Seatbelt

For an inertial force last 4.5 g and a weight of 80kg occupant gives a 264lb load in the tie-side seat belt. The images shown below correspond to the results of areas where further efforts are generated, travel and safety factors of the structure of tie belt.

- Lateral tie plate seat belt a thickness of 0.090 inch (Figure12)

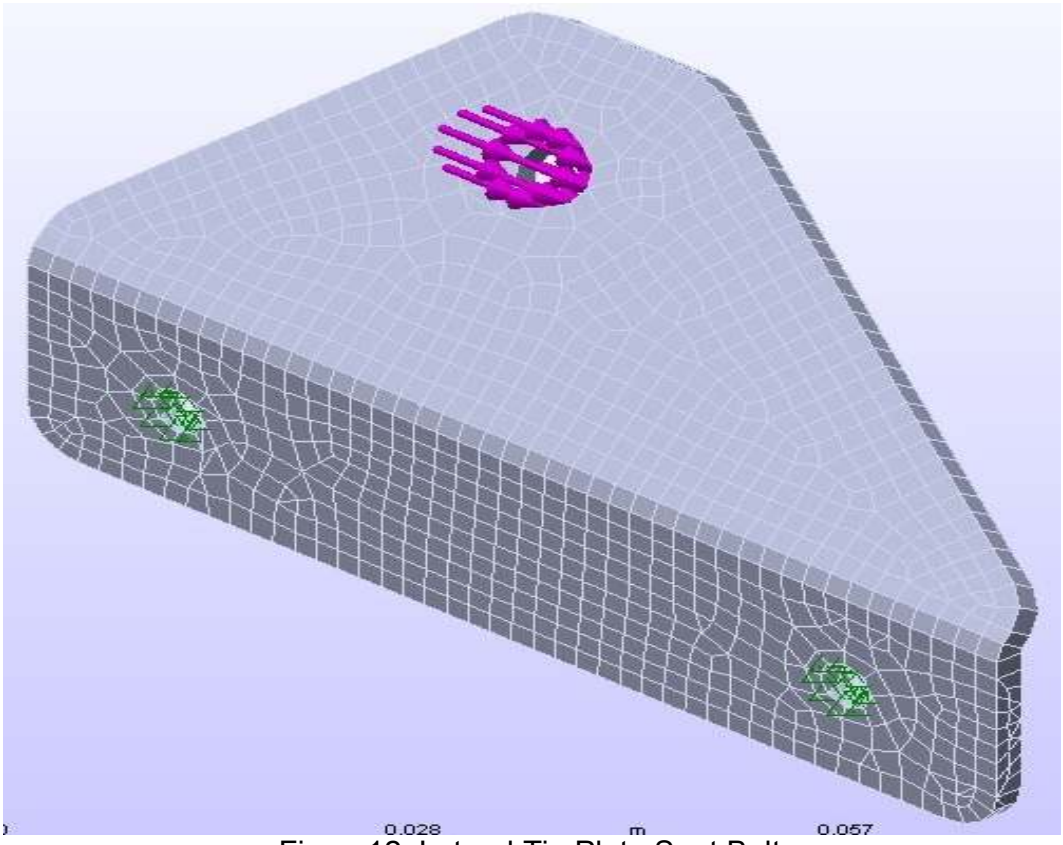


Figure12. Lateral Tie Plate Seat Belt

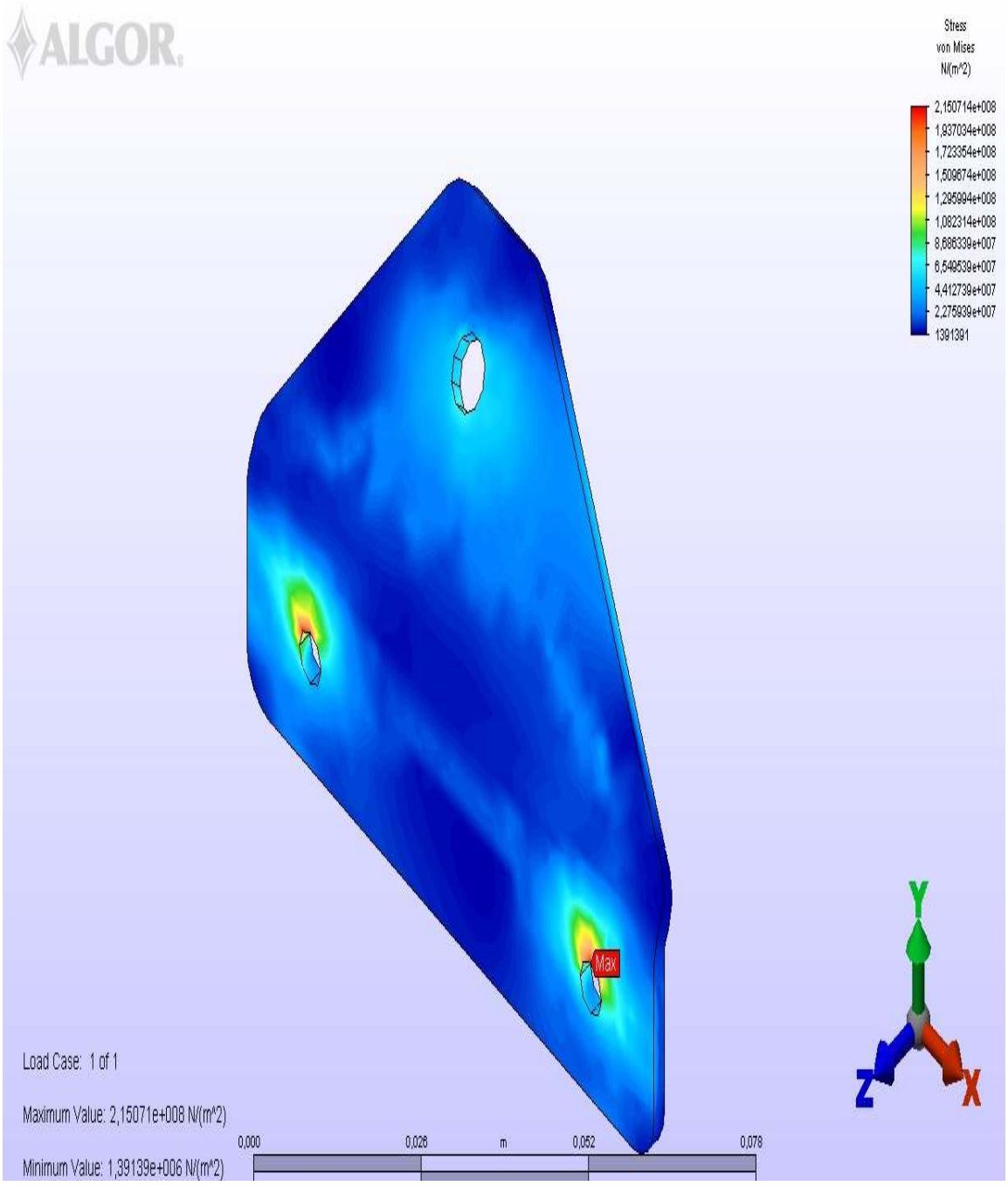


Figure13. Maximum Efforts in Tie Plate

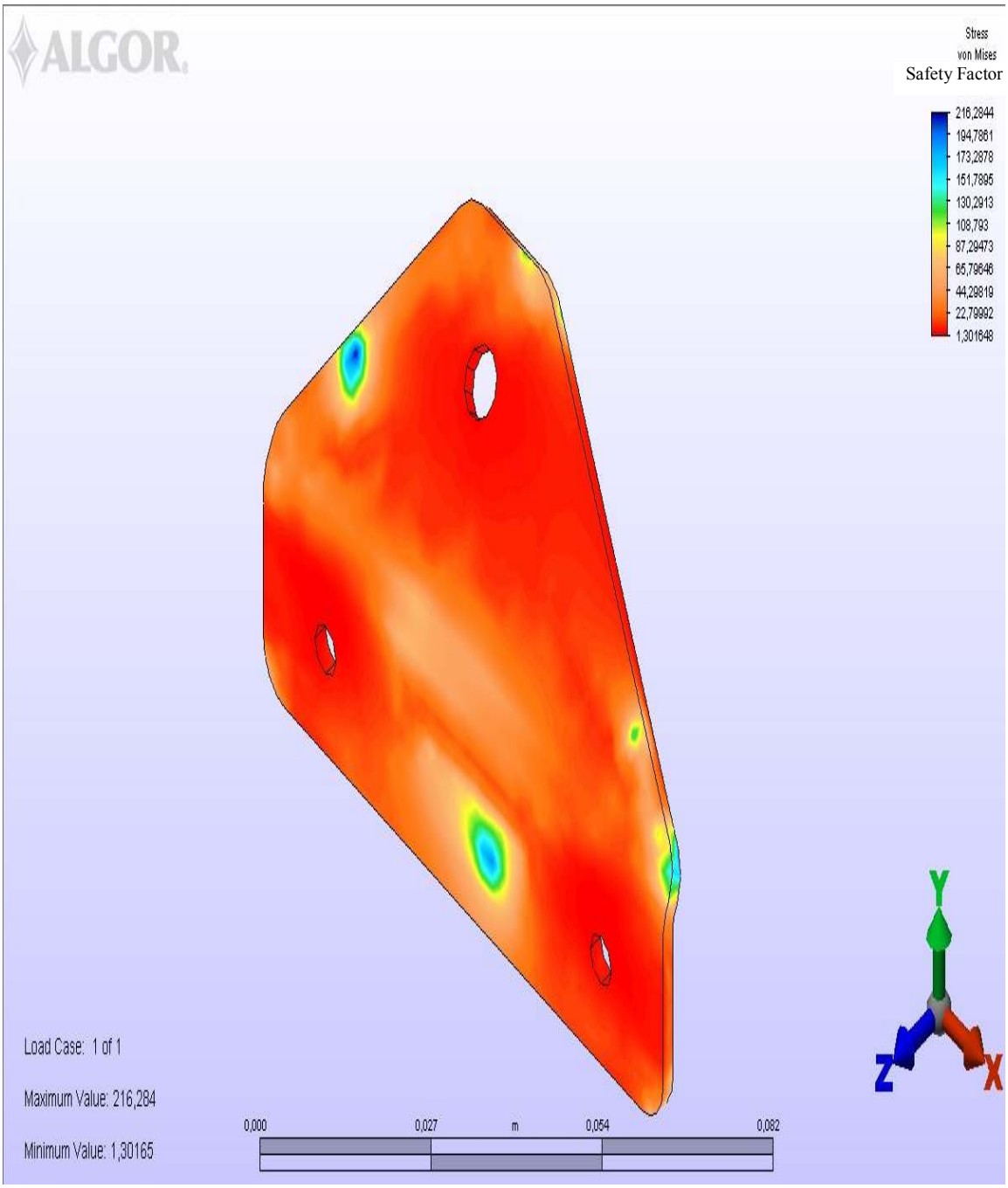
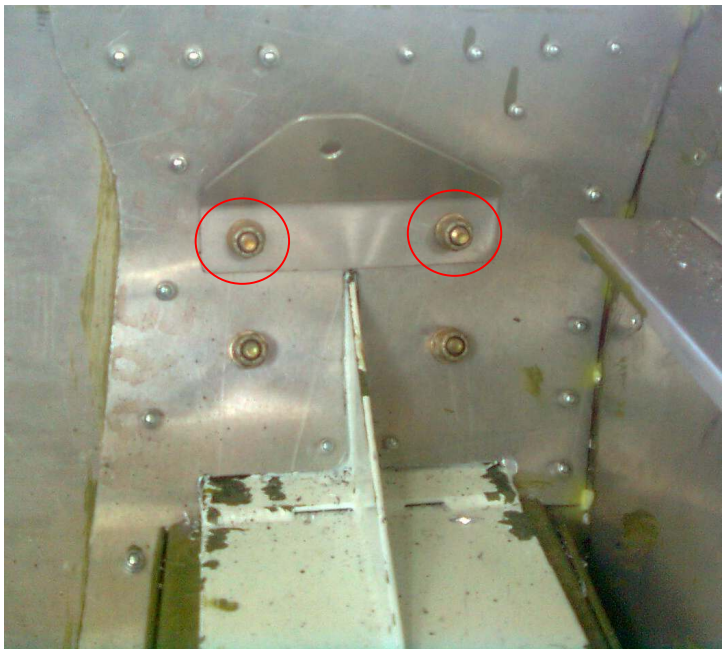


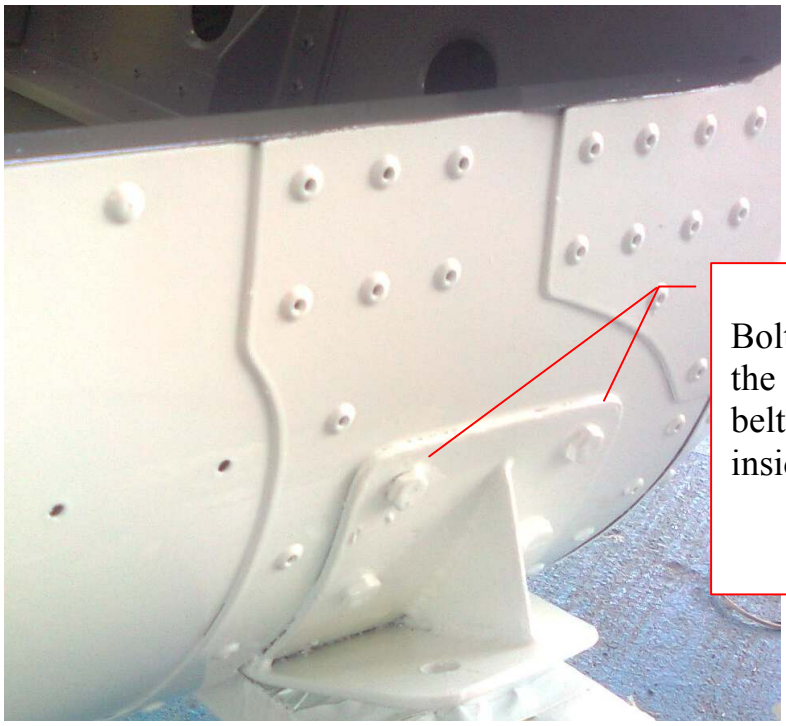
Figure14. Safety Factor in Tie Plate

For this specific case and the previous analysis made in the structure that holds the side plate of the safety belt, tie plate 0.090 inch, tie increases the resistance of lateral loads experienced during an emergency landing at a maximum stress σ_{max} = 215MPa which does not exceed the yield strength of the material and a safety factor Fs = 1.3. In this way we guarantee that the lateral tie in each of the variables analyzed may have a greater resistance in non-normal operations, thus having a much greater margin of slack for situations that require more effort from the structure.

With the above analysis is recommended by the owners of the part to fix the seat belt in the lateral with the work described in Case 2, to carry out this operation is done regarding the piece in Annex 1 to proceed make the new point of attachment.

Once the piece ready 0.090 inch proceed to install, this board is fixed on the steel tie down the strut at the bottom of the main channel of the landing gear with two bolts AN3-5A, as shown by the figures. This is done for both sides of the lateral attachment seat belt





Bolts that secure the side plate tie belt from the inside

ANNEX 1
LATERAL TIE PLATE