

# ***XII SAE BRAZIL AeroDesign***

## ***Regular classes, Open and Micro***

### ***Operational Procedures***

#### ***SAE AeroDesign 2010***

Prepared by the Technical Committee of Competition

Revision\_00

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## I. Introduction

The SAE AeroDesign come over the years gaining a degree of complexity such that it becomes important not only to define and draw up a regulation course and at the same time complete, but also 'consider' all procedures related to the Rules of Competition.

It can be seen clearly throughout at ten editions, that the SAE AeroDesign in Brazil is bringing an increasing number of technical challenges to the teams participating. Some of these challenges are closely related to certain *operating procedures* and to these challenges are properly assessed quantitatively by the technical committee of the competition (judges and inspectors) to properly define these procedures becomes a crucial issue.

Due to this need, the Technical Committee looks with this document to record and clarify for all involved, as will the progress of XII SAE AeroDesign (2010) with regard to these technical operating procedures.

## II. Objectives

This document: "*Operational Procedure - SAE AeroDesign 2010*," has as main objective to explain in detail all the processes (or procedures) to be used during the competition so that not only teams but also the entire technical committee of the Competition, have a source of information about the procedures to be adopted during the competition AeroDesign SAE 2010.

Ensure the highest degree of transparency in decision-making process of the competition is always one of the most important points considered by the Technical Committee and organizer of the XII SAE AeroDesign Competition. For this reason this document was intended.

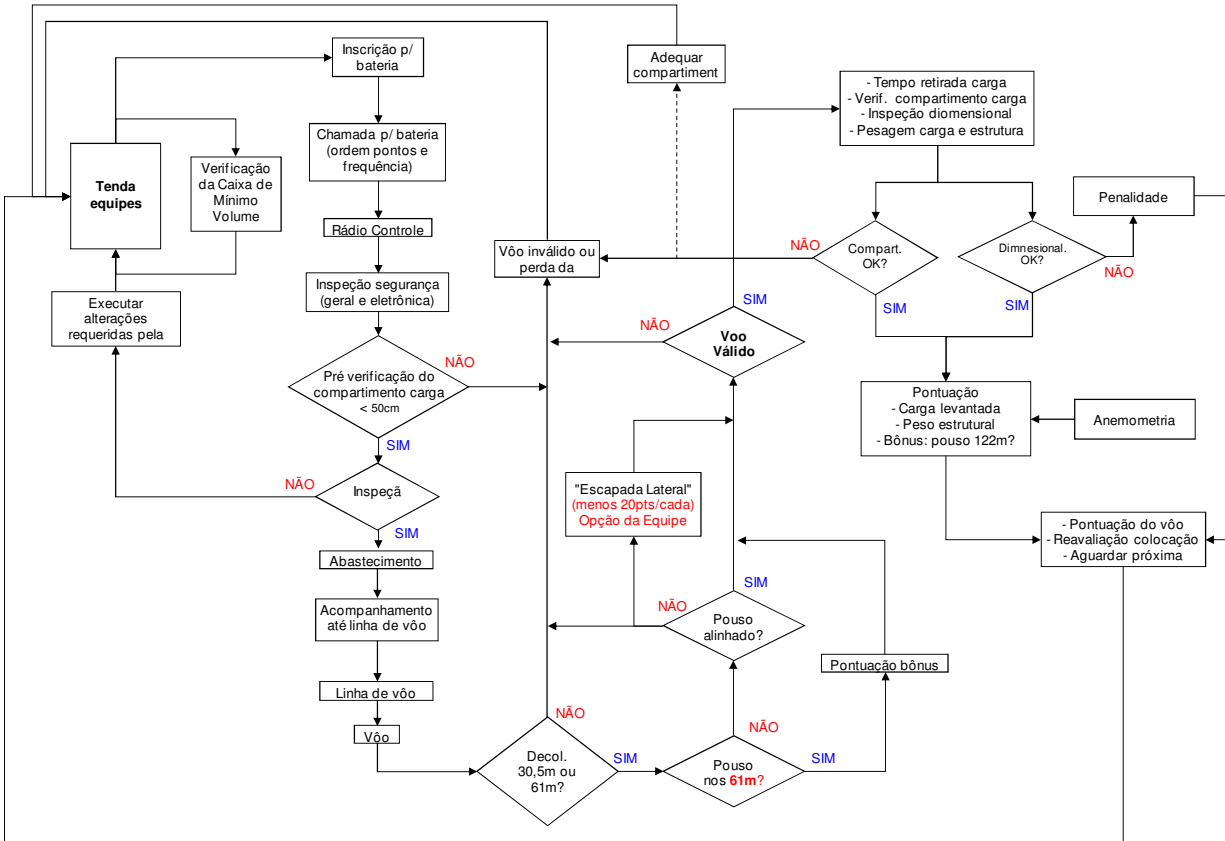
All procedures described in this document are mandatory. Some changes may be made necessary and in such cases the Technical Committee will look after to provide the teams review of this document contemplating such changes.

## III. Competition Sequence - Flowchart

The flowchart below has the objective of detailing by graphical form all the procedures by which each aircraft must pass in each of the flight sets in the days of Competition Flight.

Some changes may be made necessary and these adjustments eventually may not be represented here, though such changes if they do occur, will not affect the sequence in a general way, staying valid the diagram below.

Ver validade deste fluxograma



## IV. Detailing Procedures

In the following sections will detail all operational procedures relevant to XII SAE AeroDesign Competition. Some of these procedures is not part of the Flight Competition therefore are not present in the figure above, although their detail is of utmost importance for proper conduct of the remaining phases of SAE AeroDesign Competition.

## 1. Reception Teams

### 1.1. Reception Teams

On October 20 after 2:00 pm (Wednesday) the representatives of SAE Brazil, will be in a room located in the building of the Aeronautical Technology Institute (ITA) or in a stand in the lobby of the building of Electronics and Computing ITA to provide for the receipt of the teams which will be delivered the kits containing shirt (4 shirts per team) and caps.

On October 21 the receipt of the teams will definitely be in the stands in the building of Electronics and Computer ITA. See item 1.2.

**From day 20 and up (maximum) at 12:00 am on October 21, deliver to the reception of the Competition an envelope containing:**

Write out the envelope:

- ✓ Name and team number
- ✓ "Ao Comitê Técnico"

Envelope should contain:

1. Statement that the plane has flown ([Appendix 11 of the Rules, p. 97.](#))
2. Term of agreement with the document "Operational Procedures SAE AeroDesign 2010" (last page of this document)
3. Form of an exchange pilot (and for SAE pilot) if applicable (Appendix 10 of the Rules, pp. 1996).
4. Copy of Disclaimer (only the teams that did not put the disclaimer in the reports)
5. [Copy of the BRA \(Brazilian Airmodel Confederation \(Cobra\) ID card\) or an equivalent ID from country of origin in the case of international teams.](#)

### 1.2. Local of Competition and Project 'Show Room' of Aircraft

The Project Competition (Oral Presentations) will take place in Building of Aerodynamics (ITA) in five (or six) rooms set out below, item 2.1.

In Computer Building (ITA) in turn will happen in the upper and lower floor of the building, the *show room* of aircraft, as well as the opening ceremonies of the XII SAE AeroDesign Competition.

The simplified map below details the locations described above and the path from the main door of the CTA.

## Map of Room of Oral Presentations Building of Aeronautics - ITA



## 2. Design Competition (Thursday (October 21))

### 2.1. Teams Arrival and Judges 'Briefing'.

On October 21 will take place in Building Aeronautics ITA called Project Competition, where teams will defend their projects to the judges.

This phase of Design Competition will occur in five rooms previously demarcated by SAE plate with names and numbers.

There are two rooms outside the building and four rooms inside (preliminary definition that may be changes).

Room 01: Balão Brasil	(Internal room/ number: <b>TBD</b> )
Room 02: Dirigível N <sup>o</sup> 6	(Internal room / number: <b>TBD</b> )
Room 03: Dirigível N <sup>o</sup> 9	(External room / number: <b>TBD</b> )
Room 04: 14 <sup>o</sup> Bis	(External room/ number: <b>TBD</b> )
Room 05: Demoiselle	(Internal room / number: <b>TBD</b> )
Room 06: Dirigível N <sup>o</sup> 5	(Interna room / number: <b>TBD</b> )

From 07:30 am the judges by competition will do a *briefing* to deal the last detail and will go to their respective rooms.

In each room there is at least one judge by each of the disciplines in which projects are evaluated and at least two itinerant judges, who are constantly changing room following a certain sequence in order to guarantee better homogenization of notes.

After 8:00 am, teams can now going to the rooms according to the chart below. This chart will also be posted on the SAE Web site at the beginning of October.

Sala								
# 1	# 2	# 3	# 4	# 5	# 6			
Balão Brasil	Dirigível N° 6	Dirigível N° 9	14°Bis	Demoiselle	Dirigível N° 5			
4	50	80	48	67	19	8:30	XX Internacional	
30	16	94	76	23	70	9:00	XX Open	
81	2	52	75	24	11	9:30	XX Micro	
18	17	45	90	82	39	10:00		
86	20	74	35	84	1	10:30		
89	88	79	68	40	15	11:00		
14	12	85	21	28	5	11:30		
58	55	43	77	25	31	12:00		
ALMOÇO							12:30	
65	66	38	34	56	22	13:30		
59	7	53	51	36	42	14:00		
72	87	29	69	13	3	14:30		
96	6	81	10	8	64	15:00		
46	62	54	78	27	37	15:30		
73	49	33	92	32	9	16:00		
80	83	95	41	57	71	16:30		
61	26	44	63	93	47	17:00		
Dentro	Dentro	Fora	Fora	Dentro	Dentro			

The presentations will begin at 8:30 am, with half an hour at most for all the activities of presentation for each team including the arrival of the aircraft positioning, preparation, presentation and questions from judges.

The aircraft should be complete and "mounted" upon oral presentation to the judge's consideration and possible clarification of doubts.

**Regular and Open Classes:** It is not necessary to mount the aircraft as would be like to fly, just that it will be similar in appearance to the takeoff configuration <sup>(1)</sup>. There is not of fundamental importance that all electrical connectors, screws and other components are fully fixed. The Commission suggests that in order to speed up the presentation of the team and facilitate the subsequent disassembly of the aircraft, but will not be accepted mounts, adjustments or disassembly of aircraft inside the oral presentation room.

For the Open Class, where the impossibility of assembling complete aircraft inside the room, it is suggested to take the main parts so that judges can eventually see some important detail or to assist in oral presentation and/or clarification questions.

**Micro Class:** According to the Rules (Section 9.5, page 52.) the aircraft must be mounted in up to three minutes, **and should be fully operational**, except for battery installation. The section 2.2.1 below provides details of the mounting procedure.



(1): Example of items that are not essential for oral presentation: electrical connection fully assembled, screw fully set and that not compromise the transport of aircraft and other items that do not affect the presentation of the aircraft configuration.

### **Important Note**

See Message 10 on the SAE website (Link of AeroDesign 2009 in Messages)

[Message 10 - Design Competition - Resources to Support the Oral Presentations](#)

Rooms intended for oral presentations by the teams, scheduled to take place on October 21, the first day of the XII SAE BRAZIL AeroDesign, are equipped with:

- 1 – projector;
- 2 – microcomputer plugged directly to projector.

Since it is permanent installations, it is recommended to teams that have the intention to make use of presentations based on the PowerPoint application and/or other audio-visual facilities to bring their electronic files previously stored on CDs or memory stick (USB flash drive).

Connections between *laptop* brought by participating teams with the projector will be allowed only as an alternative (or extreme <sup>11</sup>) for cases where the use of CD's or flash memory has not succeeded.

There will be a survey of software installed in each room. See the next section (2.2). It was recommended, however that the presentations are also made using the following pattern:

Windows 2000;  
Office 2000;

To play the videos we recommend *Windows Media Player 9* and video format '*wmv*'.

(1): If the team brings the presentation in the above settings, or those that will be published and it fails (ie does not play) in the ITA PC, only this situation is allowed to return to the team resource.

## **2.2. Oral Presentations**

In each room there will be a controller to take care the time and interruptions. The team that is presenting will be notified by the controller when miss one minute to the end of the presentation.

Before each presentation the team, the mentor and teacher in the room will be presented and identified by the person responsible for oral presentation.

After the team entry and preparation for the presentation (positioning of the aircraft, preparation the presentation) whose time is estimated at two minutes, a controller will make a pronouncement on some important aspects of the presentation:

- Maximum time of presentation (15 minutes).
- Penalties (as per item 10.5.3, Rules page 69 and Appendix 13 page 105)
- Notification when miss one minute to the end of the presentation.

It should be noted that:

- ✓ The teams and the general public will have free access to the presentations, since they do not interfere or undermine the current presentation. The entrance in room is allowed ONLY in the intervals between presentations.
- ✓ Only one (1) student team at a time can make a presentation.
- ✓ Will be allowed to interference from other members, since signaled properly and introduced by the presenter.
- ✓ Interference by team members that not signaled, will result in a penalty of two points to the team.
- ✓ Will be allowed to carry out the presentation by more than one team member, since the exchange was predefined at the beginning of the presentation.
- ✓ Interference by teachers or mentors are not allowed and will result in penalties of 5 points per interrupt.
- ✓ All teams must be with airplane mounted in the presentation to the assessment of judges as described in Section 2.1.

1 –Oral Presentation	
Description	Penalty
Not being with the airplane assembled and complete on the oral presentation (Regular Class and Micro) or not be available to judges (Open Class), as section 11.8.	20 points
Delay in oral presentation	2 points/minute
Interruption by teachers and mentors in the oral presentation	5 points
Undue interruption (without introduction) by other team members in oral presentation	2 points

**See also Section 11.6 of the Rules (p. 82-84).**

**Software installed in each room (all in English):**

Sala 01: Balão Brasil (Numeração ITA: N°1410)

Windows XP

Office XP Professional (2002)

Acrobat Reader 7.0

Sala 02: Dirigível N°6 (Numeração ITA: N°1414)

Windows XP

Office XP Professional (2002)

Acrobat Reader 7.0

Sala 03: Dirigível N°9 (Numeração ITA: N°1401A)

Windows XP

Office XP Professional (2002)

Acrobat Reader 7.0

Sala 04: Dirigível N°12 (Numeração ITA: N°1401B)

Windows XP

Office XP Professional (2002)

Acrobat Reader 7.0

Sala 05: Demoiselle (Numeração ITA: N°1404)

Windows XP

Office XP Professional (2002)

Acrobat Reader 7.0

**Softwares instalados em 2007:  
Estas informações serão verificadas posteriormente**

### 2.2.1. Micro Class - Assembly Requirement Demonstration

According to the Rules, Section 9.5, the Micro Class aircraft must be mounted on up to three minutes, for up to two team members.

The demonstration of this requirement will start at 8:30 am on a desk dedicated to this purpose in the building of Aeronautics, ITA, in place to be defined. If mounting on the table is not possible due to the size of the aircraft, or, if the team chooses, the assembly must be performed on the floor

**Note: The location for the exhibit of the assembly requirement can possibly be modified for reasons of logistics or layout. In case of change, the teams will be informed via email.**

The chart below shows the scheduled appointments for the aircraft assembly from each team. The team is responsible for being present at the location indicated on time. The tolerances are 5 minutes. After the tolerance, the team can not perform the assembly, and this requirement will be considered failed, which does not relieve the team of measurements of carrying case. Measurement and verification of the provision of aircraft and components inside the box, is mandatory.

HORÁRIO	EQUIPE
8:30	94
	81
	90
	82
9:00	86
	84
	89
	88
	85
14:00	87
	91
	92
	93
	95

The aircraft must be within the carrying case closed.

The team must inform the inspector who are the members that will assemble the aircraft, and only they can stay close to the table. The team must determine, between these two components, who will announce the end of the assembly, to the inspector stopping timer. The others must stand behind the inspector, and remain silent. The interference of a third member in the assembly of the aircraft invalidates the attempt, leaving the team is penalized under the rules.

An inspector marks the time, and your markup is **final and incontestable**.

When the members are ready to begin assembly, the inspector will signal and start the timer, which will be finished only after a notice of the members that the aircraft is completely assembled. The inspector tells the time every 30 seconds and when missing 10 seconds.

The judges of the room inspecting the aircraft, and validate or not the assembly. The validation of the assembly is referenced on the checklist shown in the figure below.

Failure to comply with the requirement of assembly results in penalty of **20 points**, as described in Rules, Section 9.5 page 52.

According to Section 9.5.1 of the Rules, the carrying case should have a maximum internal volume of 0.175 m<sup>3</sup>. The measurement is performed after assembly of the aircraft, and a team member must accompany the inspector during the measurement to be performed with a measuring tape. The tolerance of measurement is 5mm for each edge.

The box should be made by the team and its walls must be free from deformation or be more flat as possible. Internal measures will be considered of greater value, or those that determine the greater volume.

In no time the carrying case may be damaged, that is **not allowed to break or disassemble the box to access the aircraft**.

**If the carrying case internal volume exceeds 0.175 m<sup>3</sup> the assembly will not be considered valid, and proper penalty is applied. The aircraft will not be able to fly, and must make the necessary changes in the carrying case, according to the procedures for modification of design and subject to applicable penalties and other restrictions on competition.**

## Example: Micro Class Checklist Assembly

SAE BRASIL Sociedade de Engenheiros da Mobilidade		M	SAE AeroDesign 2010	
<b>FICHA DA EQUIPE - Montagem da Aeronave Micro</b>			Data	<input type="text"/>
Equipe Nº	<input type="text"/>	Nome	<input type="text"/>	
HORA PROGRAMADA:	<input type="text"/>	:	HORA CHEGADA:	<input type="text"/>
<b>Nota: Todas as conexões elétricas, incluindo as do motor, devem permanecer DESCONECTADAS durante toda montagem</b>				
<b>Check List Pré-Montagem</b>				
Apresentou-se dentro dos 05 minutos	( S / N )	6	<input type="text"/>	
Apenas 02 integrantes para montagem	( S / N )	7	<input type="text"/>	
Crachá dos 02 integrantes	( S / N )	8	<input type="text"/>	
Aeronave dentro da Caixa <b>Fechada</b>	( S / N )	9	<input type="text"/>	
Rádio dentro da Caixa	( S / N )	10	<input type="text"/>	
Combustível/Baterias dentro da Caixa	( S / N )	11	<input type="text"/>	
<b>Tempo de Montagem</b>	(Segundos)	12	<input type="text"/>	
<b>Check List Pós-Montagem</b>				
Motor Fixado	( S / N )	13	<input type="text"/>	
Hélice montada	( S / N )	14	<input type="text"/>	
Spinner ou contra-porca instalado	( S / N )	15	<input type="text"/>	
Trem de pouso fixado	( S / N )	16	<input type="text"/>	
Asa fixada	( S / N )	17	<input type="text"/>	
Servos fixados	( S / N )	18	<input type="text"/>	
Links dos comandos conectados	( S / N )	19	<input type="text"/>	
Parafusos de fixação instalados	( S / N )	20	<input type="text"/>	
Baterias colocadas, <b>porém não conectadas</b>	( S / N )	21	<input type="text"/>	
Ligações elétricas dos servos/ extensões conectadas	( S / N )	22	<input type="text"/>	
<b>Dimensional</b>				
Valores medidos (mm)	( Anotar mesmo se a aeronave não for montada no tempo limite )			
Comprimento ( ' L ' )	23	<input type="text"/>	mm	( numeros redondos )
Largura total ( ' W ' )	24	<input type="text"/>	mm	( numeros redondos )
Altura total ( ' H ' )	25	<input type="text"/>	mm	( numeros redondos )
<b>Volume da Caixa</b>	26	<input type="text"/>	m <sup>3</sup>	( mm <sup>3</sup> / 10 <sup>9</sup> )
<b>MONTAGEM VÁLIDA ?</b> ( caso negativo, justificar abaixo )	( S / N )	27	<input type="text"/>	
<b>Observações Adicionais (SE NECESSÁRIO, USE O VERSO DA FOLHA)</b>				
<input type="text"/>				
<input type="text"/>				
<input type="text"/>				

### 2.3. Preview Safety Inspection - Thursday

The first safety inspection of aircraft should be made during the "show room" in the building of Computing ITA.

The purpose of this initial safety inspection is to allow the teams, if any adjustments or modifications requested by the inspectors, they do so with more ease (from Thursday to Friday) in order to be with the aircraft ready for

inspection done before each flight. Thus the beginning of the competition will be done faster and safety.

The Safety Inspectors will make this first evaluation of the aircraft following a checklist shown in the document: "Rules and Best Practice - AeroDesign 2010. All teams should be able to receive safety inspector on Thursday, (October 21).

## **2.4. Dimensional Inspection - Regular Class**

The dimensional inspection will be made on Friday (October 22) and ONLY after the valid flights.

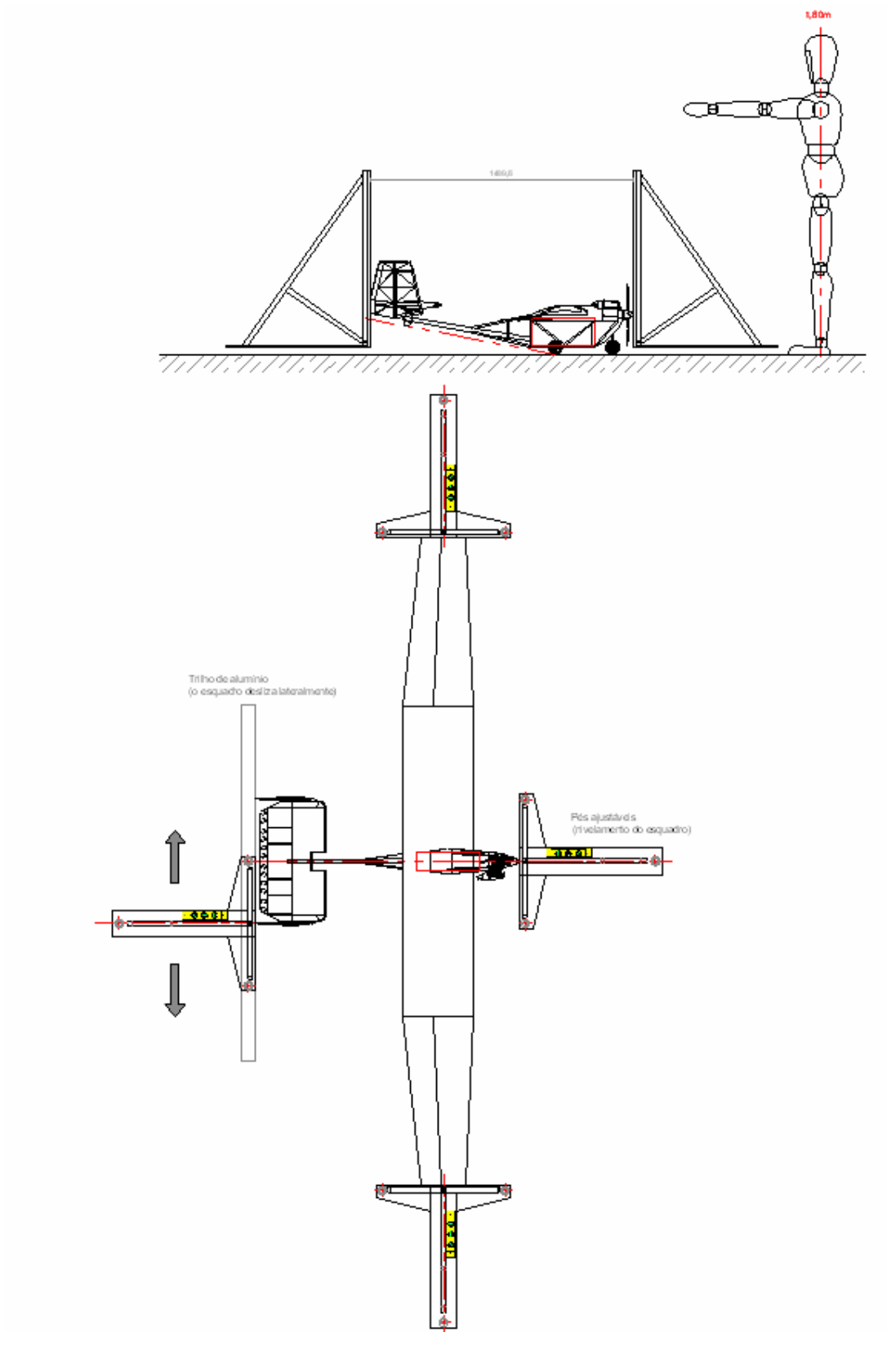
It is extremely important to note here that after the dimensional inspection, the team that has the sum of the dimensions out of described in Section 7.2.1 of the Regulation, will have a penalty imposed pursuant to Section 7.2.2 which will be posted on the battery that the discrepancy occurs .

**See also Sections 7.2.1 and 7.2.2 of the Rules (p. 28-31).**

To perform the dimensional inspection will be used four special fixtures (or *squares*), a height gauge and tape measure. Throughout the inspection process, the aircraft must be on the most flat floor as possible that will be known as the Rules: "surface of reference."

The fixtures have adjustable base for leveling and perpendicularity of the surface that represents the vertical reference planes, i.e., limiting the length and height for each *block of land*.

To check the "L" (longitudinal) size, the aircraft must be positioned so that the most front (spinner or other element) is in contact with one of the squares, then the inspector should position the second triangle in the lower back the aircraft. The measure will then be verified with a measuring tape.

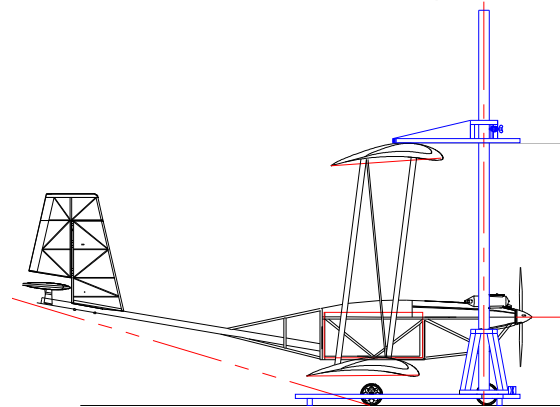


For “B<sub>1</sub>” (width of the blocks aerodynamic) measures, through plans, the blocks will be identified and when possible, the aircraft will be positioned so that one of the corners is in contact with a triangle and then the other will be positioned on the opposite corner and the measure will be taken.

All measures should be taken with the vertical faces of the brackets perpendicular to the reference plane (or floor of the tent). Each triangle has three points of support and adjustable bubble level on two axes.

For cases in which the more extreme measures are not in the same plane (picture above) one of the brackets will be positioned on a reference line where it will be moved laterally to the plane of the first square.

To check the "H" dimension (height), the inspector will seek the highest point of the aircraft through an "arm" (or gauge height) resting on the floor (or reference surface), then take the measure with a tape measure.



In the end, all measures are put in a spreadsheet and will be the sum of the measures. Measured in millimetres (mm).

The measures will be checked according to the plan submitted in the Report.

**Configuração exemplo**  
Aeronave convencional com dois blocos de superfícies de uma superfície cada.  
Somatório: L + H + B<sub>1</sub> + B<sub>2</sub> = 6350mm (ou 6,35m)

Equipe nº XX / Nome da Equipe	
Dimensões máximas	
<i>Inscrever valores em mm</i>	
L Comp. Máximo (mm)	
H Altura Máxima (mm)	
B <sub>1</sub> Maior Enverg. Bloco 1 (mm)	
B <sub>2</sub> Maior Enverg. Bloco 2 (mm)	
--	
B <sub>1</sub> Maior Enverg. Bloco "n" (mm)	
Soma Total (mm)	▶
ITEM	Área em cm <sup>2</sup>
Área Alar (cm <sup>2</sup> )	
Área Emp. Hor. (cm <sup>2</sup> )	
Área Emp. Ver. (cm <sup>2</sup> )	
PARAMETRO ADICIONAIS	
Abargamento da Asa	
Coef. Vol. de Cauda HOR.	
Coef. Vol. de Cauda VERT.	
ITEM	kg
Peso Vazio	

L (mm)      H (mm)

É Interessante Indicar os blocos

Bloco 1      Bloco 2

Superfície de Referência

LEGENDA

13



Two team members (maximum) may accompany the process of measurement to assist inspectors in making the size of aircraft. It's always interesting to assist and guide the inspectors telling the weakest parts of their aircraft.

## 2.5. Checking the 'Minimum Volume Box'

From 2007, an additional challenge for teams was proposed as a bonus. This challenge is to design the aircraft which, **when disassembled**, occupies the smallest volume possible. This volume is defined as a box (or parallelepiped) whose sides are to be mutually orthogonal and the measures of length (L), width (W) and Height (H) must match the internal dimensions of the box.

The box should be made by the team and its walls must be free from deformation or be more flat as possible. Internal measures will be considered of greater value, or those that determine the greater volume.

The aircraft must come disassembled in any number of subsets which must be packed completely inside the box.

The value of the bonus will be a maximum **20 points**.

**Note:** The concept of disassembled aircraft indicates that it can not be "finished in the competition," i.e., the assembly is totally and exclusively on the basis of fittings bolted, pinned, etc. The aircraft must be disassembled, i.e. after the flight is assumed that it can be saved back into the box and reassembled for an upcoming flight. The judges and inspectors may require a more careful check for any team to confirm the terms described above, and underscores.

Even after checking the minimum volume the aircraft must maintain its characteristics equivalent to the time of check Minimum Volume Box, or the aircraft must be disassembled to keep the same as it was during the initial check. This may not be glued or modified for the flight in any flight.

It may be required for the teams best placed (number of teams at the discretion of the Technical Committee), further examination of the aircraft inside the box. If the aircraft is not possible to be reinserted in the box the team loses the bonus about Minimum Volume Box.

### **Verification procedure of the box and contents**

During the Thursday, October 21, or at latest on Friday 22, a group of inspectors will check and measure the internal volume of the box. This procedure may be done at the team bench (in the 'show room' in the building of Computing ITA) or at Flight Competition environment, early morning.

This check will be made initially according to the schedule of oral presentations, in other words, teams that will perform in the afternoon will have their boxes checked in the morning and vice versa.

Two inspectors will go until the team **with the plan of the case that are represented not only the aircraft disassembled, but the list of subsets as defined in Rules, item 7.10.7, pg. 40. 40.**

We ask the teams that already done the oral presentation, look for an inspector after the oral presentations so that the box is checked.

Equipe nº XX / Nome da Equipe	
Dimensões Internas da caixa	cm
Comprimento (L)	00,00
Largura (W)	00,00
Altura (H)	00,00
Volume Interno (L x W x H)	cm <sup>3</sup> ou m <sup>3</sup>
	00,00
Quantidade de subconjuntos na caixa	
	XX
Lista de itens ou subconjuntos	
	Fuselagem + motor
	Asa Completa
	Trem de Pouso
	Empenagem Horizontal
	etc.
	-

In the case of the aircraft being in the box, the inspector will ask to the team to open the box and take out the subsets that compose the aircraft. After the inspector checks all subsets of the list and that all aircraft can be wrapped inside the box, the inspector will make the measurement of the box with a tape measure. If in case the aircraft is already out of the box at the arrival of the inspector on the bench team, the procedure will be by measuring the box and then packing the aircraft in the box.

The Technical Committee asks for full cooperation and understanding by the team to this procedure. It is in everyone's interests that this verification is made as quickly as possible and with maximum possible fidelity of the results. It is very important for all the teams that opted for this bonus, make this verification on Thursday, October 21.

Teams that fail to do this procedure on Thursday, will search a member of the Technical Committee (yellow shirt), so that this procedure be done as soon as possible on Friday, first day of flight competition.

For the first aircraft to fly on Friday (22/10) it is imperative that the verification of minimum volume box is made on the 21st (Thursday).

See also 7.2.1 and 7.2.2 of the Rules (p. 28-31).

If these measures are not taken, the team does not have this bonus.

### **3. Flight Competition - Beginning**

#### **3.1. Delivery of Radios**

As the 2.4 GHz system will be used for the first time XII SAE AeroDesign, the Technical Committee chose not to retain the 2.4 GHz radio initially.

However, if there is any problem that may have been generated, or are suspected to have been generated by the new radio system, the Technical Committee will request that all radios that are this frequency should be delivered in the tent radio imperatively. Upon receipt of ALL Radios 2.4 GHz, will be controlled the quantity of 2.4 GHz radios outside the tent. The maximum number of allowed radios outside the 'tent of control of the radios' will be defined and communicated in due time and will depend on the number of 2.4GHz radios present in XII SAE AeroDesign.

For safety issue, discussions will not acceptable on this decision, independents of the practices adopted in other similar events and that employ this radio system.

Will be disclosed, a specific message directed to the teams that use the 2.4GHz radio, which will be required some care and recommendations regarding the use of radios during the XII SAE AeroDesgn. It is vital that all teams to read the message and collaborate with due attention to the recommendations and requirements contained in these messages.

##### **3.1.1. Time Limit for the Delivery of the radios.**

With the significant increase in the number of teams for the SAE AeroDesign is extremely important to ensure a good number of flights per team, that the competition is initiated in the scheduled time: 7:30 am (every day).

**For this reason teams must deliver ALL radios that operate at frequencies of 72MHz (including reserves) in the tent of safety inspection (tent of radio), no later than 7:30 am, in the three days of the Flight Competition**

Teams that use 2.4 GHz radio will not have retained their radios, but they, like other teams, must be submitted no later than 7:30 am informing the inspector of the tent radio that make use of this kind of radio. The teams that had not delivered the radios (including reserves), or fail to inform the use of radio 2.4 GHz up to the specified time in three days of the Flight Competition will be penalized 20 points.

The severity of this item reflects how important is the cooperation of everyone to ensure the good running and success of the competition. For to the Competition is initiated it is essential that all radios have been delivered, so it is very important the cooperation of ALL.

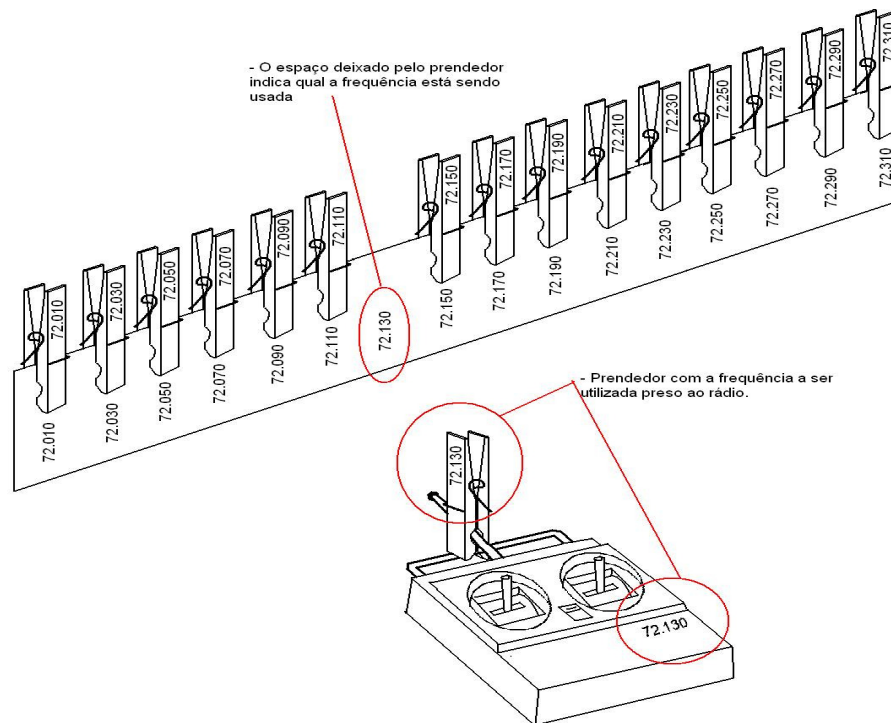
**Attention should be given to the planning of this item so that at least one member team delivered the radio(s) until the time limit.**

Events beyond the control of the Technical Committee can occur causing the procedures of collection of radios may be reassessed. We rely on understanding and cooperation in situations of this nature.

## 3.1.2. Control of Radio

One of the ways to control the frequency of the radios in operation is preparing a "scale" containing all possible frequencies to be used in the field, typically in 72 MHz band. For each frequency, there is a wooden clothespin (or plastic) with the frequency written on its surface, and note the same frequency on the "scale", in the position he should occupy, as shown below.

Under no circumstances inspectors are allowed to "borrow" the radios to test the aircraft. These tests can only be done in a controlled manner during the safety inspection and monitoring of a inspector. It is recommended that teams have a lot of attention in the assembly of the aircraft on Thursday so that the connectors are not assembled incorrectly resulting in reverse commands or any other event that results in loss of flight.



### **IMPORTANT NOTE:**

The inspector is a volunteer and are instructed not to make exceptions to guarantee safety aspects. **We ask the cooperation of all to the conscious use of radios (ALL frequencies) during the competition.**

## 3.2. 'Briefing'

On the first day of the Flight Competition (Friday) there will be a *briefing* with representatives of the Technical Committee and organizer of the Competition. This *briefing* will be on the airstrip, the pilot and captain of the team should be present. This time will be shown the Box of flight, given the lines that demarcate the boundaries for takeoff (30.5 m or 61m), width, landing procedures and other items.

**There will be over 100 people participating in this briefing, so the silence and respect are fundamental to the procedures are well understood and the competition are conducted safely.**

(Note: **Only the captain and the pilot will attend the briefing.**)

**See the part of the Flight Briefing to be given to the pilots and captains of each team on the first day of the Flight Competition at end of this document (Appendix 9.1).**

**The good development of flight competition must be everyone's responsibility! We rely on collaboration to ensure, with appropriate safety, as many flights as possible.**

### 3.3. Classification Flights - Introduction

#### 3.3.1. Flights Inscriptions.

Aiming to optimize the time during the flight competition, was established in 2006 the inscription process for the flights, ie, determine a period of time (5-10 min) for teams interested in participating in that flight to make your application.

The inscription process is quick, marking a 'X' in the list of teams for that particular flight. This is done in the Tent of Sound.

Only teams registered will have their names called to give beginning to the flights. This process applies to all flights for qualify and competition. Before each flight, the teams are directed to the Safety Inspection.

For 2010, the process is similar. There will be three sets of qualify and the maximum as possible sets of competition. From the 4th flight may only participate on aircraft classified.

Each team has up to three chances to qualify. The teams qualified in the first or second flight, only will fly back on competition flights (4th set).

Teams will be called as follows:

- For the first 3 sets, which are qualify (see section 10.2.1 ), the teams will be called in the forward to score, ie, the 1st place is called first, then the 2nd place, and so on until the last one.
- For competition set (see section 10.2.2 of the Rules, p. 66.) teams will be called in reverse order of score, ie, the team with less points (last in the partial qualify) flies first, then the penultimate, and so on until the 1st place. For the order of the teams, the scores are always considered the most current at the instant the call for the set:

1st Set (qualify): direct order of project scores;

2nd Set (qualify): direct order of project scores;

3rd Set (qualify): direct order of project scores;

4th Set (competition): reverse order of the scores updated to the 2nd set;

5th Set (competition): reverse order of the scores updated to the 3rd set;

And so on ...

Teams will be called three times to appear for the safety inspection at intervals of five minutes between each call. After five minutes of the last call (15 minutes from first call), the team is automatically out of this set, and will have to await the next.

No exceptions will be opened with respect to the order calling the teams.

NOTE: It is the responsibility of the team, pay attention to the call of preparation for flight.

**The Technical Committee, encourages, so that teams that are their aircraft ready and tested, to appear for the flight in the first set.** It is hoped with that speed up the qualify set, providing more time for competition sets. As the number of teams entered in 2010 AeroDesign is considerable, the time has become a valuable resource to obtain a greater number of sets.

From the start of inscription for the 1st Set of each category, announced in sound system, all teams are eligible to subscribe and will take for it a time to be announced in early inscriptions. As a reference this time is 45min. **The opening of inscription will be adopted in the following sequence of categories: 1st) Micro, 2nd) Regular and 3rd) Open.** This will be adopted for a first set, in the following sets some changes in this sequence may occur.

**As in the 1st Set the flight order will be started with the Micro Class aircraft, the inscription period for this category will be the first 10 minutes of the interval defined above of 45 min, ie, Micro Class aircraft must fly first.** It's recommended to Micro Class aircraft be ready to fly in early on Friday, Oct. 22.

If no team is to submit voluntarily to the flight at predetermined time for applications, the set could be considered "completed" after 45min of waiting, and thus in 2010 there will be only two chances to qualify for teams that not appeared at this 1st set.

NOTE: The consideration about which set will be accounted for defining the sequence of flight will depend on the progress of the competition and processing of the points.

**We have the collaboration of all the teams that we will get a record number of flights. Let DO TOGETHER this AeroDesign the BEST event so far ever in Brazil!**

### 3.3.2. Procedures for Qualify Sets

#### a) First Qualify Set

For the first qualify set the teams should make your application along with delivery of the radios on beginning the day(see section 3.1.1). Once the supervisor makes the gathering of radio, the team must indicate whether or not to participate in the first battery.

Teams that any delay in delivery of the radios will have until 8:00 am to inform the inspector of sound tent whether or not to participate in the first set, and will be placed at the end of the call queue for that set. After the indicated time, applications will be considered terminated and is therefore not possible to enter new teams for this first battery.

After inscription, teams must be fully prepared with their aircraft to go to the tent of Safety Inspection soon as they were called to give beginning the First Set. The call will take from 10 to 10 teams or as the flow of aircraft during the Safety Inspection.

For details about the process of Safety Inspection see Section 4.1 below.

**The teams that are qualified at this first flight, only to fly back on the first Competition Set (or 4th General Set).**

Will be given in this XII SAE AeroDesign a major priority of the flight window, ie, aircraft that are not able for the flight (all ready) or not have the cargo bay with the minimum dimensions required for the Regular and Micro Classes may not be allowed to fly until these items are corrected. For this reason, we made two standard block (wood) for each category and will be one available to the teams to test before it set (or Thursday) and the other at the end of the flight for a quick check.

**b) Second Qualify Set**

All teams will be called by the sound to begin registration for the Second Set. For the application process needs go just one team member and communicate to the inspector your wish to attend the said set. Teams will be called about five times in the time of registration to be determined during the Competition (or within 45 minutes) to make your entry into the Second Set.

The teams that qualified in this battery, only to fly back on the first Competition Set (or 4th General Set).

**c) Third (and last) Qualify Set**

For this Third Set, the procedures will be similar to those previously described.

This will be the last chance for classification. Teams that do not classify at this Third Set unfortunately are no eligible to fly in the competition sets. As mentioned above, the flight number is relatively small, in other words, for teams classified in the first set are typically only four flight opportunities.

This division between Qualify and Competition set has the objective to raise the technical level of competition making it the only aircraft capable of actually carrying the minimum weight required in Section 10.2.1 of the Regulation, pg. 66, and comply with all other requirements, can continue competing. **There will be no more than three sets due relatively low time for many flights.**

**3.4. Batteries Competition - Introduction**

For Competitive sets the procedures will be similar to those described above for the Qualify sets, but the call order of the teams will be based on project scores plus scores obtained on the flight Qualify sets.

In Competition sets may only participate aircraft classified, in the other words, those who made a complete flight (circuit 360º) with the minimum payload of 4kg, for aircraft of the Regular Class, 10kg for aircraft of the Open Class, and minimum payload equal to the empty aircraft weight (with batteries) for Class Micro.

For the XII SAE AeroDesign, the prediction (or goal) is that we will have a total of six (6) sets, or three sets of qualify and at least three more Competition sets, on only qualified teams will participate.

There is no mandatory to make three (3) Competition sets. This number is a goal, but the complying of this number is always dependent on a number of factors which unfortunately are beyond the control of the Technical Committee. In 2006, we achieved three (3) sets from competition in 2007 were four (4) in 2008 were five (5) (being the 5th between the top five) and in 2009, again four (4) Competition sets.

**We always ask to everyone pay attention to the calls made over the sound system and being with the aircraft ready to 'take action'.**



## **4. Pre-Flight Procedures**

### **4.1. General Safety Inspection**

#### **4.1.1. Introduction**

Before the flight of each set, all aircraft must undergo a rigorous safety inspection followed by a default 'checklist'.

The aircrafts of the Regular and Micro Classes, should go to one of the benches in the Safety Inspection tent and Open Class aircraft must be inspected in their own workbenches, or in a place designated by the Coordinator of Security Inspectors.

**Only experienced inspectors are allowed to do the safety inspection of Open Class aircraft**

Aircraft which are not considered able for the flight during the safety inspection lose their right to fly on that set.

The 'checklist' of safety to be used during the 2010 SAE AeroDesign will be available in the document "Rules and Best Practice - AD 2010." This checklist is similar (or possibly equivalent) to that used in the previous year.

**It is recommended to facilitate the safety inspection process, that all teams read carefully the document "Rules and Best Practice - AD 2010."**

#### **4.1.2. Basic Procedures and Safety Checklist**

During SAE AeroDesign, is made previously to each set, a safety inspection. For this safety check is used a checklist shown in the document: *Rules and Best Practice* (to be posted on the SAE website) containing items for each part of the aircraft.

Case the review of the document of 2010 is not available, see equivalent of 2008.

Link: <http://www.saebrasil.org.br/eventos/aerodesign2008/index.htm>

See document: **Rules and Best Practice (Portuguese) (REVISED 05/21/2008)**

Unfortunately the document for 2009 is no longer on the site, however this can be considered, except in some parts, relative to 2008.

If possible (for reasons of time) the final checklist will be published to the teams targeting with this, improve the inspection process and therefore speed up the competition.

**IMPORTANT: See information about the Safety Inspection contained in Regulation 10.1.2 (page 58).**

### **4.2. Electro/Electronic Safety Inspection**

#### **4.2.1. Electronic Inspection Procedure**

A specific electronics safety process will also be done on all aircraft previously to each flight. There are specific items in the 'checklist' about this inspection.



They are normally found on this inspection:

- ✓ Battery charge
- ✓ Electrical system installations
- ✓ Receptor and Antenna conditions
- ✓ etc...

For safety reasons, the electric system battery must be unplugged during the inspection. The engine can only be started up to the appropriate location for testing of the engine.

**NOTE:** Because of the high risk inherent in the use of batteries of 'Li-Po' several recommendations regarding the use of such batteries may be found in "Rules and Best Practice - AD 2010 or the previous year (AD 2008).

#### 4.2.2. Lithium Polymer batteries (Li-Po)

##### Advantages:

- Higher capacity compared to Ni-Cd and Ni-MH;
- Less weight compared to Ni-Cd and Ni-MH;

##### Disadvantages:

- Requires confined area to charge (explosion risk);
- Do not tolerate impact (explosion risk);
- Highly flammable (explosion risk);
- High cost.

##### Condition of use in the Competition:

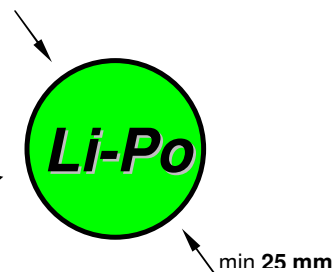
Will be permitted to use Li-Po at AeroDesign 2010, but with some restrictions:

- There will be a reserved local in the competition which will be allowed to charge the Li-Po. This local is intended solely for this purpose and will provide only the physical location for recharging. It is the responsibility of the team to have the equipment to charge to recharge. See Section 4.2.2.1 below.

**It is recommended that extreme caution and constant monitoring during the process of recharging Li-Po.**

- Aircraft using Li-Po must be identified by a specific symbol (below) prepared by the Technical Committee, which will be located on both sides of the rudder. It is the responsibility of the team display the symbol on the aircraft.

**Símbolo identificador das aeronaves que utilizam baterias de Lítio-Polímero (Obrigatório)**

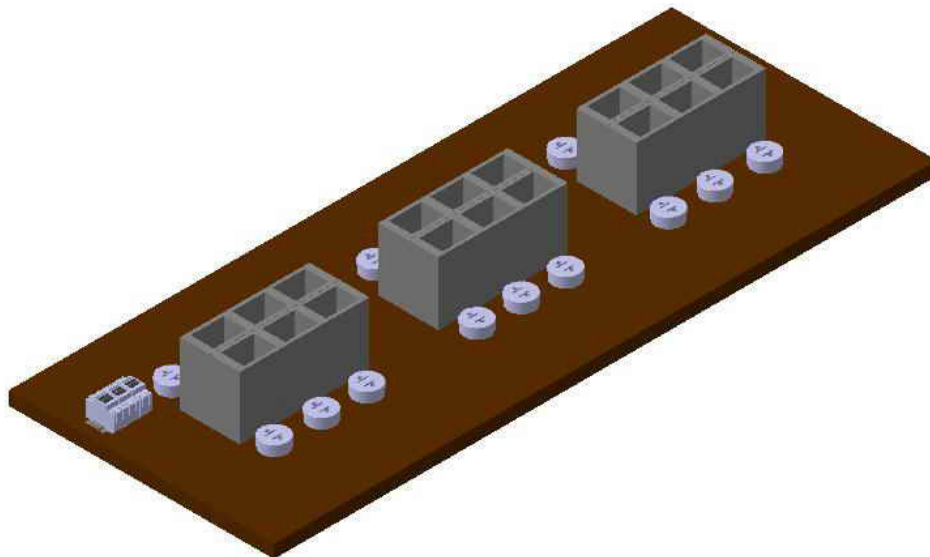


The diameter of the symbol should be at least 25 mm

- If the aircraft suffered some sort of damage (falling) the battery will be retained until the end of the day;
- In the case of batteries with more than one cell, the team must provide the charge meter (cell-to-cell).
- Checking the battery charge during the safety check: can be made with a specific checker (should be provided by the team) or multimeter (if the battery has only one cell).

#### 4.2.2.1. Li-Po Charging Procedure

As shown above, there is a local dedicated to charging Li-Po. At this local can be found on a table, concrete block with dimensions L x H x D (still undefined), equipped with **220V power** plug.



Monitoring of the charge process will be the responsibility of the team and should preferably be accompanied by a inspector.

For good organization of this space, it is recommended that only one team member circulates at this reserved local, and have full knowledge in handling the charging equipment.

In all battery charges process must be balance the charge between the cells.

**The occurrence of motor cut-off caused by no enough charge invalidate the flight and incur the loss of points from that set.**

The charging equipment shall:

- Be specific to the type of battery to be used;
- Being able to charge the battery to be used;
- Possess the function of balancing the cells individually;
- Owning handling fully understood by the team.

Batteries:

- Must have balancing connector of individual cells;
- Must be accessible, easy removal and installation easy;

- In case of electric propulsion, is required, the use of at least two segregated batteries, ie, one to system control other to propulsion.



**Examples of Individual Balancing connectors**

### 4.3. Fill up and Defuelled procedures

After the safety inspection the aircrafts are directed to the fill up tent.

In this tent are all standard fuel gallons for the Regular Class (with 10% Nitromethane) and fuel used by the teams from Open Class and Micro Class.

The fuel tank will be emptied and refilled before each flight by inspector.

The fill up is made with hand pump and shall be until as full as possible independent of the size of the tank (full tank).

**The occurrence of engine cut-off caused by empty tank invalidate the flight and incur the loss of points from that set.**

Open and Micro Classes, in addition to standard fuel, supplied by SAE BRAZIL, is allowed to use fuel with different proportions of nitromethane, since this is a commercial fuel<sup>(1)</sup> used to practice of Model Aircraft. In this case, should be provided by the team itself.

**(1): It is understood as commercial fuel that produced by a company accredited to do so. Eg Byron.**

The fuel tank must be accessible (not just visible) to determine the contents for inspection and check all your connections. It is recommended that tank allow the visualization of its interior, in other words, they do not should be totally opaque.

Tanks in which the visualization even partial, of its internal components is not possible, may not be accepted.

The removal of fuel for weighing and determining factor EE will be made by the team, but **ONLY WITH THE MONITORING OF INSPECTOR RESPONSIBLE FOR AIRCRAFT. IT IS PROHIBITED THE REMOVAL OF FUEL WITHOUT MONITORING.**

**IMPORTANT: The fuel is only provided for the official flights. It will not be provided to any kind of engine test or other flights that not official competition. For these cases, teams should bring their own fuel.**

For Open and Micro Classes, the responsibility of special fuel (as Section 8.4 and 9.6 of the Rules) is the team. The organization will only provide fuel with 10% Nitromethane.

**Not allowed to use gasoline engines.**

**Procedures for handling fuel from OPEN CLASS and MICRO CLASS during the competition:**

- Teams must supply at tent, ALL sealed gallons (or as they were bought) to be used in competition flying. These gallons will be identified with the number and name of the team, as well as the institution to which this team belongs. It is recommended not to post this identification on the label that identifies the type of fuel.
- The fill up or defuelling should be done by the team itself using its own pump and under the monitoring of a qualified inspector. IS NOT ALLOWED TO REMOVE OR FILL UP THE TEAM FUEL TANK WITHOUT THE MONITORING OF A INSPECTOR.

We recommend the use of commercially produced fuel tanks to facilitate the security check.

#### 4.4. Flight Line

After filling up the aircraft will be kept on a waiting list for flight. See pictures of the layout, [item 9.2](#). Each aircraft must be accompanied by a maximum of two team members and by a inspector with the flight sheet corresponding to that set.

**It is not allowed under any circumstances, to change the payload after the security check outside the 'review load tent'.**

In case of rain, the Technical Committee will have possibly as a courtesy, plastic bags should be used to cover the aircraft in order to protect them from any excess of water.

#### 4.5. Review load Tent (For all sets)

To 2010 will be maintained a tent called " Review Load Tent".

Historically the idea of this tent came from events in 2004, the year that reached a record in the variation of the parameters of altitude density, this variation is reconciled with a long time waiting in the queue of aircraft flight.

The objective of this new possibility is opened to allow these teams to review their strategies (or loads to be transported) and in cases of modification, can make them with the accompaniment of a inspector and not compromising the security during the change of load compartment.

The "Review Load Tent" will be available on all sets, including the qualify set. This enables teams to review their strategies since the first flight of the competition.

The review load tent will be located inside the fence of protection, next to the entry of aircraft to the airstrip. See layout, [item 9.2](#)

**The exchange of payload will apply and accept only those aircraft on which this operation can be done in less than two minutes. This is a reference time, because it is desirable to be done effectively in less time. The exchange can be done in the aircraft in the queue only if there are at least two (2) aircraft in front waiting to fly (one at airstrip (or in flight) and two waiting to fly). Will not be allowed under any hypothesis, changing the payload on the airstrip or with less than two aircraft waiting for the flight.**

Only in very special cases the inspector may decide to shorten the interval for the exchange of payloads and allow the procedure to be done with less than two aircraft forward.

It is always important that all teams have in mind that this procedure was designed with the objective of increasing competitiveness and allow teams to achieve better results.

However, in case of very complex procedure, excessive time for the exchange of payload or generation of polemics by the teams, this procedure may no longer be applied in subsequent sets.

However, once started the review process on the set, this will be done throughout the entire set of course.

## 5. Flight and Airstrip Procedures

### 5.1. Airstrip Entrance

The aircraft that are in flight line will be called according to the sequence of their own line of flight. Exceptions may occur if necessary for guidance of airstrip inspector.

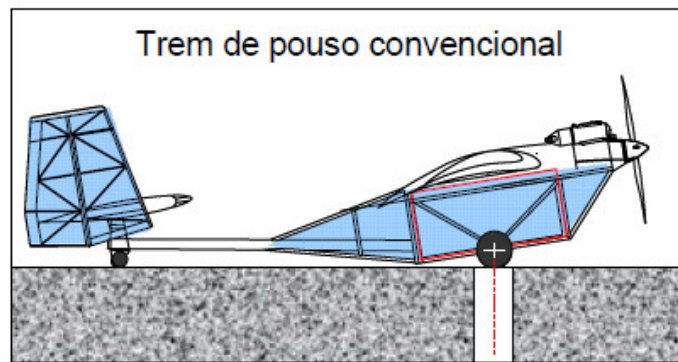
After being called the aircraft are carried by the team member along with the pilot to the area determined by the airstrip inspector or coordinator. Are allowed in the airstrip area up to two people for the Regular and Micro Classes, and three people to the Open Class. The cameraman's team is also allowed to enter, provided they stay in certain areas. See Appendix 9.1 (Briefing).

### 5.2. Positioning the Aircraft on the Airstrip and Command Test.

Aircraft with tricycle landing gear must position the wheels of main landing gear on the line for takeoff.



Aircraft that have conventional landing gear (tailwheel) can be positioned as shown below (see Regulation pp. 61).



After positioning the aircraft on the airstrip is made one last command test before takeoff to ensure that everything is correct.

The command test could also be done when the aircraft is on the side of the airstrip moments before positioning it for takeoff. The decision of the best time is left to Airstrip Judge (Yellow shirt).

In the occurrence of a situation which does not comply (eg., inversion of commands) the team will lose your time and depending on the case to be decided by judges, may lose the set.

As shown above, a component of the team ('Mechanical') can hold the aircraft during engine acceleration, but the 'Mechanical' cannot help any time at takeoff moment. If in case the judge realize that the 'mechanical' gave a "boost" the aircraft, the flight will be invalidated and the team loses the set.

### **5.3. Attempts and Time to Takeoff**

After confirming free airstrip, the judges should start counting the time of takeoff.

This time will be considered from the moment of judge call when the aircraft is ready next to the airstrip (near the launch point).

In 2010, for ALL SETS, the time that each Regular Class team will have to start up and take off the aircraft will be a maximum of three minutes (3 min).

This change will have for main objective to get as many sets as possible.

For the Open Class teams will be five minutes in all sets. See Appendix 9.1.

Teams will have three (3) attempts to takeoff since the time limit is respected.

The direction of flight will be a circuit of 360° in the direction "opposite to the wind." The aircraft will take off against the wind direction and land on the same way. The pilot will be informed of the direction of flight so that getting into the airstrip. If the no wind the direction of flight will be determined by the judge and will be the same for all teams. There will be no option of the direction of flight by the pilot.

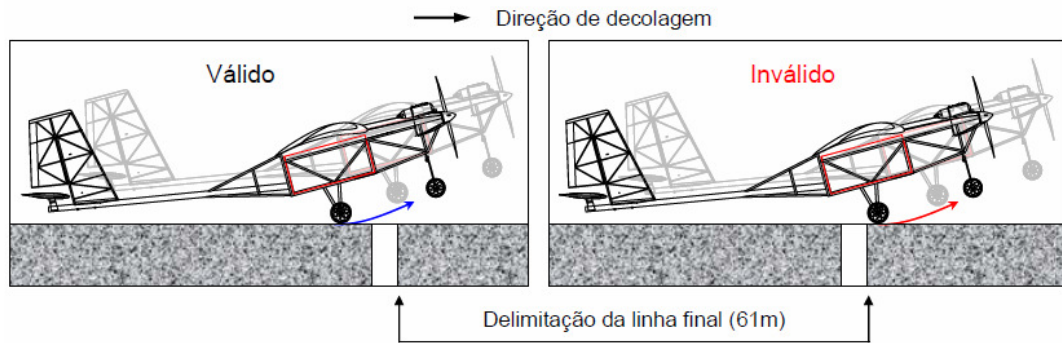
**See Appendix 9.1.**

### **5.4. Distance of Takeoff and Flight**

**Take off distance:** the aircraft must take off (being on the air) within the runway length that is stipulated for the respective categories, or the attempt is invalidated. The Regular Class is the one that has two sectors takeoff, 30.5 m and 61m. The Open Class has a single sector of 61m, while for Class Micro this limit is 30.5 m. A inspector will be responsible for checking whether or not the aircraft exceeded the limit as section 10.1.5 of the Rules of Competition.

Each team has up to three (03) attempts to take off within 61m. An accident invalidate the attempt.





In the case of the aircraft take off after the line (or cross the line still rolling), the inspector will raise a red flag indicating that it failed to take off within the maximum distance defined in regulation. The takeoff must occur before the line clearly.

In 2010 Regular Class teams have again the challenge of segmented airstrip. The positioning of the aircraft is the same as described in the preceding chapter. A inspector will be in line 30.5m and tell you if the aircraft took off before 30.5m. If the aircraft take off until 30.5M, will receive the score described in Item 7.10, page 37 of the Rules for the Sector 1. If the aircraft exceeds the first 30.5m and took off until 61m, the score will be the one given to Sector 2.

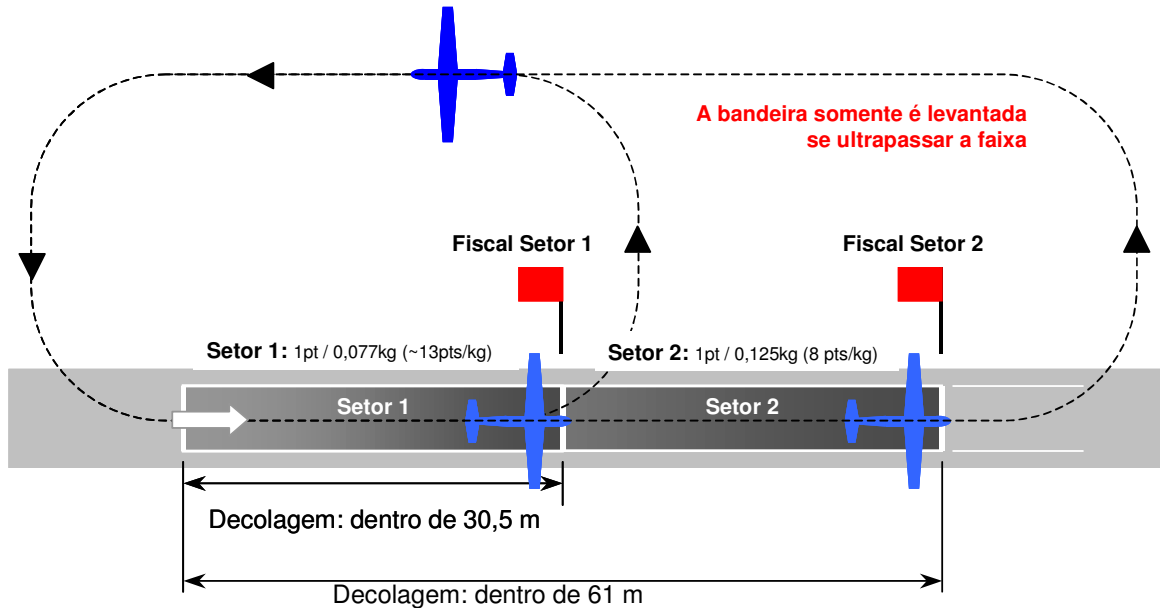
The procedure will be done to the segmented airstrip as follows:

1. Will be positioned an inspector (with the red flags) on each of the lines bounding the takeoff. Will be in all four inspectors, ie two for each direction of takeoff.
2. The aircraft always starts takeoff roll on the 1st Sector. If the case clearly the aircraft took off before the line of 30.5 m, no flag is raised. If this takes off after the line of 30.5 m flag regarding this first takeoff limit is raised indicating that the aircraft not succeed takes off in 1st sector.
3. In case the aircraft is unable clearly to take off before the 61m mark, the second red flag is raised. Thus the flight is considered invalid. If for safety reasons the pilot decided to continue the takeoff it is authorized to do so, unless the judge to guide in a manner contrary.

Probably, to improve visual communication (and minimize the shock) flags that define the final line of the first sector will be made of yellow or orange instead of red.

In the figure below can see a graphical representation of the explanation above.





**If in doubt about the correct takeoff of the aircraft before each line, the final word is always of the inspector.**

**If the team takes off before the 30.5m line (the first sector), but again touch the ground in the second sector and then take off before the 61m line limit, the launch is considered valid, however, the score that the team will receive is one related to the second sector. Any touch after the final line of the second sector (61m line) logically invalidate the attempt.**

### **Important note:**

#### **Events occurred during some takeoff in 2009.**

The aircrafts in general taking off near the maximum limit, can, after the takeoff, 'shave' the grass at climb. This event can eventually not invalidate the flight provided that during this transition does not noticeably lower the aircraft touches the ground or have changed their attitude or direction as a function of touch. When the aircraft only "licks" that makes the grass usually without the slightest change in their flight path.

**The decision on the validation of the flight or not, it will be only to Judges (yellow), or members of the Technical Committee (yellow shirt) who witnessed the fact.**

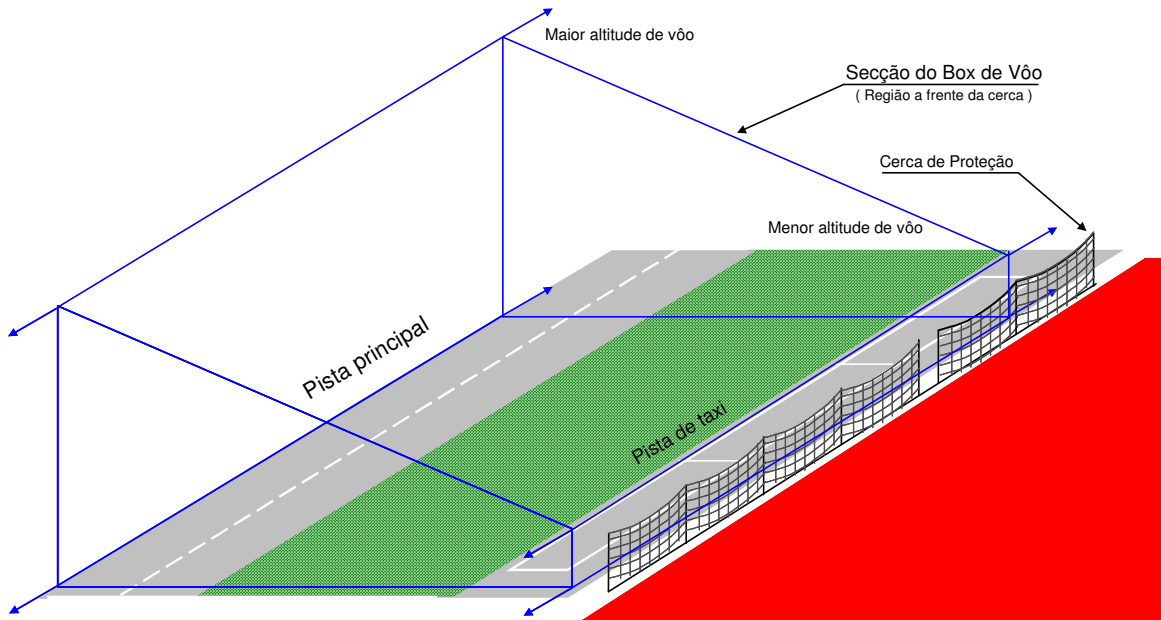
**Flight:** There is no limit on how many laps can make the aircraft before landing, provided there is no empty fuel and no disrespect the flight area. If the aircraft touch the airstrip and return to fly the flight is invalidated.

**It is vital to attend and readily accept the guidelines of the pilot's helper (Judge with yellow shirt that stays beside the pilot of the team during the flight).**

**The occurrence of "empty fuel" invalidate the flight and incur the loss of points from that set**

**Flight Box:** The Flight Box, shown in figure initial of the 'briefing' (Appendix 9.1) should be seen not only as a parallelepiped, but with the upper bounding of this Box as an inclined plane in the direction of the fence protection of the public.

Imagine a flight box whose vertical section, perpendicular to the airstrip is a trapezoid, with the smaller enclosed by the fence protection height and wider base for maximum flight altitude reached by aircraft from AeroDesign (opposite side of circuit). See figure below.



Near to this fence is forbidden for aircraft to gain altitude quickly in order to overcome this protection. The takeoff should be gradual (soft) so that the aircraft increase the altitude only when the aircraft is away from the public, or at the boundary of the circuit of flight. See sequence of photos on the next pages.

Not necessarily the aircraft must fly over the main airstrip, on the contrary, if possible prevent is better.

In 2010, mainly with the increase in power of the Open Class aircrafts, care during takeoff near the fence of protection must be redoubled. Certainly many, if not all, of the Open Class aircraft will reach the maximum total payload of 35kg.

**It is everyone's responsibility: teams, pilots, inspectors and organization, be attentive to detail to ensure a safe flight for all aircraft of AeroDesign 2010.**

**It is vital to attend and follow the guidelines of the pilot assistant (or judge with a yellow shirt that stays beside the pilot of the team during the flight).**

**The next page shows an example of gradual takeoff (safe takeoff).**

**It is interesting and HIGHLY RECOMMENDED that ALL aircraft of all categories doing a similar takeoff, especially the Open Class aircrafts.**



If there is any crash during the competition, the rescue will be authorized only by the judge of the airstrip. The judge will throw the vehicle of INFRAERO to get the aircraft along with two representatives of the team. Those INFRAERO responsible will accompany the competitors during the gathering of the aircraft so that all parts of the aircraft is obtained and the site is completely clean. This will be charged so that there are no foreign objects which, being sucked through the turbines of aircraft operating on the airport airstrip, causing the called *Foreign Object Damage*, or simply FOD, which represents a huge risk to

aircraft, crew and passengers without citing the high values and associated financial damage caused by the ingestion of foreign objects on the airstrip.

**About FOD, see section 6.7.2 of this document.**

## 5.5. Landing

### 5.5.1. General conditions for landing

The aircraft must land within the area designated as a landing zone with 122 meters long and about 10m wide (this area covers four sectors of the airstrip 30.5 m). The design of the airstrip will be released in the layout shown in Appendix 9.2.

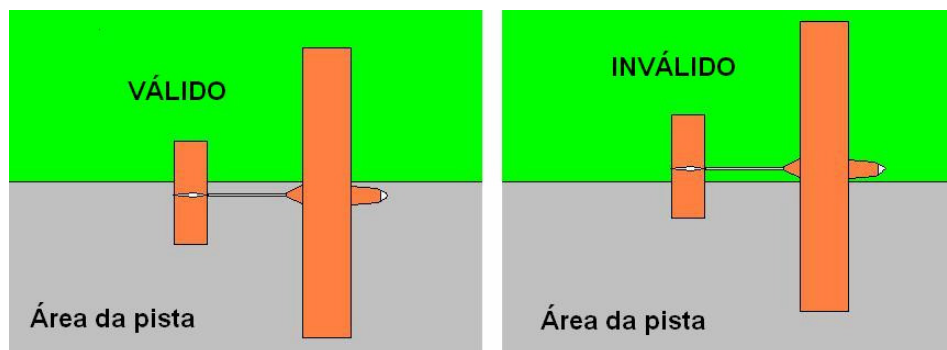
A touch and go will not be allowed. A fall invalidate the attempt. A landing is defined as valid when the aircraft touch within 122 meters demarcated, roll and stop (unlimited length).

The width allowed to touch, running and stop will be actually shown in the briefing for the pilots and captains at the time of the competition.

The initial touch of the aircraft on the ground must be within the designated area for landing, ie, the aircraft must land within the airstrip. This means flying over the first line that border the airstrip and touch the ground only after this line. The rollover to the stop may be beyond the longitudinal airstrip limits. If the aircraft exceeds the limit of longitudinal landing area, it must do it by rolling, ie with at least one of the wheels on the main landing gear touching the ground.

The criterion to judge if the landing was valid (or within the marked area), is defined as:

- If after stop, 50% of the aircraft is within the defined area, the flight is valid.
- If after stop, more than 50% of the aircraft is outside of the defined area, the flight will not be valid.



The airstrip inspectors will judge basing with above criterias. The inspectors words shall be final and irrevocable. In cases deemed most critical is advisable to consult members of the Technical Committee in order to define a final decision.

### 5.5.2. Side Escape

Considering the event of side escape (picture above) was created in the 2007, an opportunity to validate the flight of those teams that exceed the side limit (10m) within landing zone. This possibility will be maintained for 2010.

Occurring side escape, judges ask whether the team prefers to invalidate or validate the flight with a **penalty of twenty (20) points in the final score of the competition.**

#### **Important Note**

If the Judge, for some reason, forget to ask about the "side escape", the team members can (and should) remind him that this option exists. Often given the dynamism required to flights, the judge may not remember this option. **Will not accept discussions about this item after the flight.**

This procedure will be valid for all sets (qualify and competition). **The loss of points is cumulative,** in other words, in the occurrence of a lateral escape more than once, with the team decided to validate the landing, it will lose **20 points every time this happens.** For example, two "side escape" equals to loss 40 points!

For cases in which the aircraft get off completely of the airstrip and return to the airstrip, this is considered, at first moment, a invalid flight and such an occurrence will also be defined as a "side escape", including in of the explained above.

After landing, it is the responsibility of the team turn off the batteries of the aircraft.

### **5.5.3. Bonus by stopping at 61m**

The teams who make a valid flight (see section [10.1.5.5](#) ), landing and stopped completely within the 61m as defined, will receive a bonus as follows:

$$\text{Points} = 0,6 \times \text{ES} \times \text{PL} \quad \text{or} \quad \text{Points} = 0,6 \times \text{PL}^2 / \text{EW}$$

where:

ES = Efficiency Strutural Factor (see section 7.10.2)

PL = Payload (kg)

EW = Empty Weight (kg)

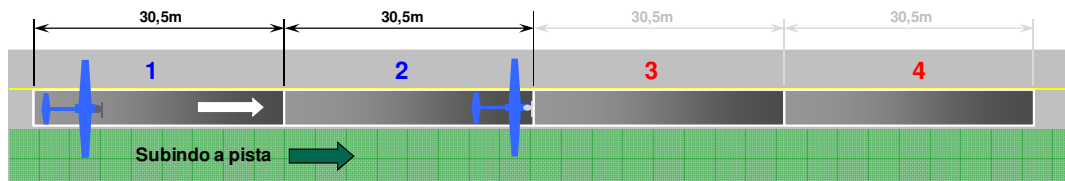
The points considered in the final score will be only those related to better flight. This bonus WILL NOT BE CUMULATIVE.

**In the case of a side escape the bonus by stopping within 61m does not apply.**

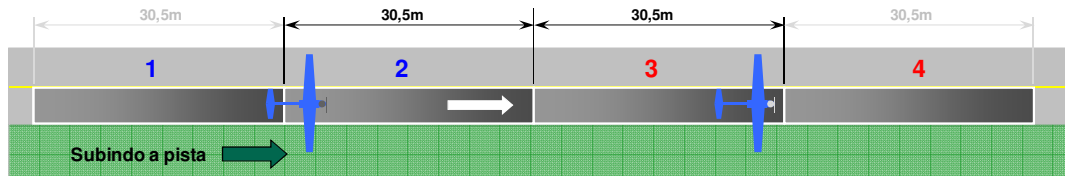
For the team to receive this bonus, the landing can only be done effectively within a maximum of two sectors of 30.5 m. The landing will not be measured and therefore must be done within at most two adjacent sectors of 30.5m. The aircraft must touch in one of these sectors of 30.5m and stop on the next sector. The following figures illustrate the scenarios where the bonus is valid (scenarios 1, 2 and 3) and some where the bonus is not valid (scenarios 3, 4 and 5).

## Cenários **válidos** para bonificação de parada em 61m

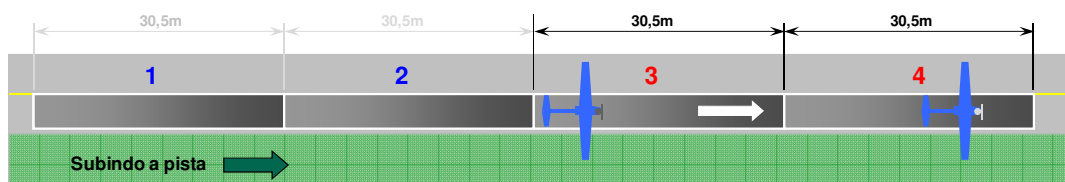
**Cenário 1:** Toque no **Setor 1** e parada no **final** do **Setor 2** (antes do **Setor 3**)



**Cenário 2:** Toque no **Setor 2** e parada no **Setor 3**

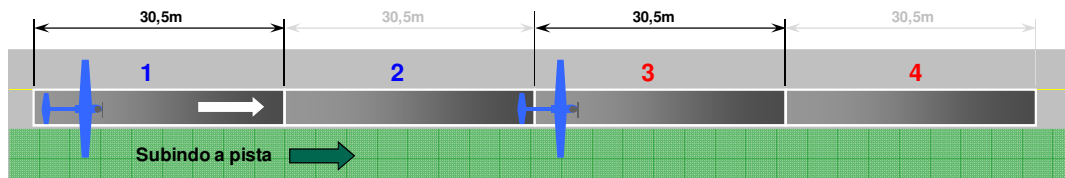


**Cenário 3:** Toque no **Setor 3** e parada no **Setor 4**

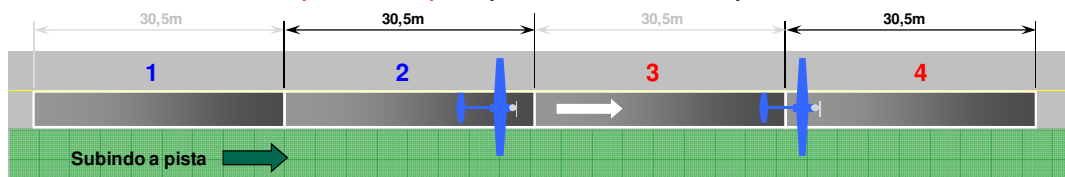


## Cenários **inválidos** para bonificação de parada em 61m

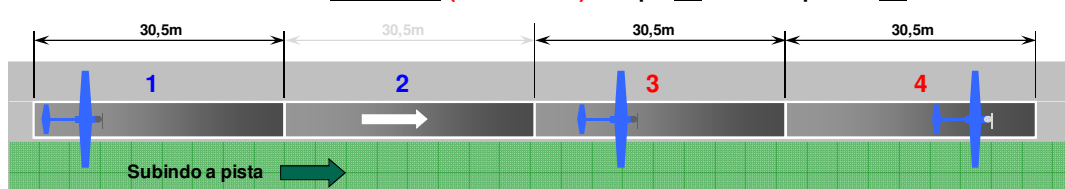
**Cenário 4 (Não válido):** Toque no **início** do **Setor 1** e parada no **início** do **Setor 3**



**Cenário 5 (Não válido):** Toque no **final** do **Setor 2** e parada no **início** do **Setor 4**



**Cenário 6 (Não válido):** Toque no **Setor 1** e parada no **Setor 3** ou **4**



**In scenario 5, even landing the aircraft in less than 61m, the bonus will not be considered valid.** The motive for this decision is to not generate reasons for discussion, since the landing distance will not be effectively measured. For purposes of counting in the spreadsheet, the aircraft must land in two consecutive sectors, as shown on valid scenarios (1, 2 and 3).

## 5.6. Flight Validation

After landing, the team captain (or representative who are in the area in preparation for flight), can not exceed the designated area for flight until the aircraft has stopped completely.

After the aircraft has stopped completely, the team captain may not be less than 2m (two meters) of the aircraft until the inspector has come to inspect the integrity of the aircraft.

**If this rule is not obeyed, the flight will be invalidated.**

### 5.6.1. Condition of the Aircraft After Landing

According to the Competition Rules, Section 10.1.5.4 page 63, we have the following considerations:

The aircraft should take off and land with all parts to get the points. All parts must remain fixed on the aircraft to the landing be valid, except that the propeller can be broken by hitting the ground. The aircraft must land with the same parts that took off, then not being allowed to put away any parts on take off or any other time of the flight. Broken parts, even if they remain attached to the aircraft, invalidate the flight, in other words, elements that break completely and that through cables remain "united" to the aircraft structure does not guarantee the VALIDATION OF FLIGHT.

An inspection of the aircraft can be since just visually until lifting the aircraft to check the occurrence of some loose part (on the floor).

The loosening or breakage of a wheel, an axis or any item that has a function and which deprived the original aircraft or not allow (or affect) a later flight without the need to repair voids that flight. Will not accept discussions about the possibility of later flight without any of the items which was cited above. For example: a "flat tire" (or loose an "o-ring") is considered "no-go" for a next takeoff, because it affects the safety during the run and must be repaired.

'Gates' of the cargo bay of the aircraft that releases, invalidate the flight.

Furthermore, wood chips (from wing tip for example), small pieces of covering (eg Monokote) or other small item that is definitely not weakened and / or compromise the structural integrity of the aircraft and does not affect the safety for the next flight might not be considered evidence which would invalidate the flight.

Rigging cables broken, since the aircraft together, can not invalidate the flight. These are considered the only structural elements that may not, even broken, invalidate the flight. For such aircraft structure MUST remain integrated even with the broke of such cables. The final word on the invalidation of the flight in a situation of this nature, will always be of the member of the Technical Committee (yellow shirts). It is an Airstrip Judge or Judge near the event occurred. This decision is final and irrevocable.

Deformation of landing gears are permitted until that immediately after the aircraft stops and without a team member touches the aircraft, it can be rolled easily by an inspector (or member of the Technical Committee) **over at least two meters**. If this rolling is possible without dragging the aircraft on the ground and without the above rules are violated, the flight may be considered valid. If the aircraft has made the wheels deformed or broken preventing rolling on the ground, the flight will be invalidated. The rolling does not necessarily need to be



made straight, but it can not drag or force applied to perform this rolling. We reiterate that the loss of “o-ring’s” invalidate the flight.

After the complete halt of the aircraft, the team captain (or representative who are in the area in preparation for flight), can not exceed the designated area for flight until the aircraft has stopped completely and does not stay less than 2 meters from the aircraft until the inspector has come to verify the aircraft and inspected the integrity of it. **If this rule is not obeyed, the flight will be invalidated.**

**The decision on a possible invalidation should be taken ONLY by Airstrip Judge (yellow t-shirt). Because it is an item that may require a judgement is preferable that this judgement be done by the same people who written the rules of competition, in other words, members of the Technical Committee (or yellow t-shirts).**

## 5.7. Last Set - Criteria for defining the number of participating teams.

Depending on several factors beyond the control of the Technical Committee, the schedule (approximate) for closure of the competition flight on Sunday is 5:30 pm (local time). As this year’s competition will take place in daylight saving, **we consider that the time of closure will be between 6:00 pm.**

Trying to follow this schedule, the following procedure will be done to determine the number of aircrafts in the last set:

$$N_{UB} = \frac{\Delta T_{UB}}{1 + \frac{\Delta T_{DOMINGO}}{N_{DOMINGO}}}$$

where:

$N_{UB}$  = number os aircrafts that will fly in the last set

$\Delta T_{UB}$  = remaining time to end the competition. It is calculated with the difference, in minutes, from the last flight of the last set to the end of the competition (5:30pm).

$N_{DOMINGO}$  = Number of the aircrafts that already flown on Sunday

$\Delta T_{DOMINGO}$  = Time elapsed since the first takeoff on Sunday until the last landing.

The smallest value possible to  $N_{UB}$  is 5 aircrafts. If calculation results in  $N_{UB} < 5$ , will not have the last set.

The selected aircrafts to the last set will be the  $N_{UB}$  firsts placed, as the last classification.

### Calculation sample:

The first aircraft took off at 7:53am. The last landing was at 3:27pm. A total of 57 aircrafts flown at this period.

So:



$$N_{DOMINGO} = 57$$

$$\Delta T_{DOMINGO} = 15:27 - 7:53 = 454 \text{ min}$$

$$\Delta T_{UB} = 17:30 - 15:27 = 123 \text{ min}$$

$$N_{UB} = \frac{123}{1 + \frac{454}{57}} = 13,72 = 13 \text{ aircrafts}$$

In other words, the aircrafts from 1<sup>o</sup> until 13<sup>o</sup> place will fly in the last set.

The Technical Committee believes that achieving the largest number of competition set as possible is always more interesting, though based on experiences that occurred in previous years, the time set for the closure of the Competition (Closing Dinner) must be adhered strictly. In this document was cited as the most competitive set possible is one of the goals of the Commission, but for this goal be possible, we need the participation and collaboration of everyone in every detail that affects the time of completion of each set, for example : delivery of radios, called for attention to the beginning of the sets, understanding of all procedures, collaboration with the inspectors work and why not, solidarity throughout the competition.

We are certain that with the participation of ALL, we can achieve our goal described above.

## **6. After Procedures to the Flight**

### **6.1. Withdrawal Payload Time**

After confirming the flight is valid for an airstrip judge (or inspector) and the record in the spreadsheet, the aircraft is taken to the fuel tent where of the fuel will be removed to after that the aircraft has the empty weight mesured.

The aircraft payload (payload plus load support) is taken during the 'early withdrawal payload' (valid only for Regular Class).

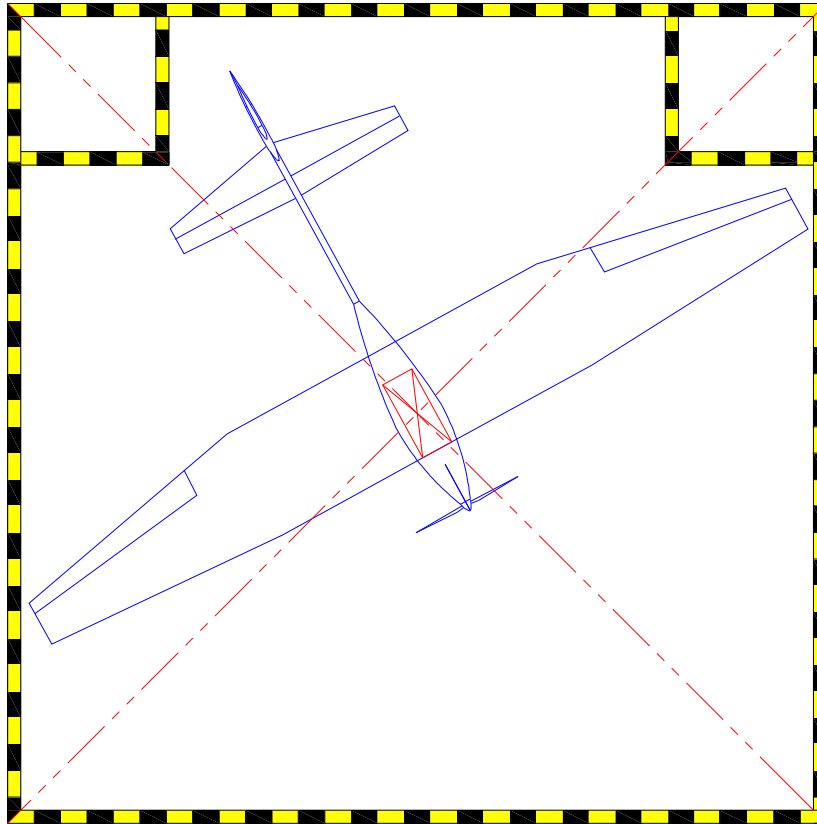
#### **Early Withdrawal process of the payload ("Pit Stop")**

The aircraft is positioned within the square outlined in the floor so that the center of its load bay coincides with the center of the square (intersection of diagonals). The square will has approximately 2.5m each side.

The team member will be positioned standing outside the square waiting the order of the inspector that will conuting the time.

After the authorization of the inspector (voiced by a "go" or "now") the component of the team exceeds the limit defined by the square on the floor of the tent, pull the payload in the shortest time as possible and positioned in a small enclosed squares on the floor. At least two inspectors marks the time of withdrawal. The valid time will be the average of the mesured time.

It banned the use of any cutting tool (scissors, knife or similar) to cut the cover or any other component in the act of opening the cargo bay. Any part or component of the payload compartment should be able to be reused, so it can not be destroyed in the opening, even if unintentionally. The closing systems of the load compartment should be such that can be reused without having modified characteristics.



## 6.2. Weighing of Payload and Aircraft

After removal of the payload (payload plus support) this set is brought to scale, so that its weight is determined and the score on the payload is subsequently counted.

The aircraft must have computed its empty weight (no load, load support and fuel\*) so that the structural efficiency factor is accounted for.

\*The withdrawal of the fuel is not mandatory.

In Open Class, the empty weight measured in each set will also be used to calculate the FPV (Section 8.12.2 of the Rules) of each set.

For Micro Class, the empty weight will be used to determine the minimum load to be lifted in qualify sets (Regulation, Section 10.2.1) and must be measured **with the batteries installed.**

The load values may only be disclosed if it be the team desire.

The inspectors weighing are aware that the value should not be disclosed without the consent of the team, however, the Technical Committee recommends whenever the team member that is next to the inspector tell whether or not the load is released.

**The values defined by the scales can not be questioned by the teams.** This value will be considered in the final score.

Photos of the values shown in the display of the scale can be taken by a team member at the time of weighing his own aircraft, provided that such photos are done in an organized manner and without affecting the weighing operations. It can be careful not to shoot spreadsheets from other teams even by mistake, it is even forbidden. The team should ask the inspector at the time of filling up the weight so that your spreadsheet is photographed. Teams that do not comply with the request or are shooting up spreadsheets from other teams without permission will be warned and penalized as appropriate until. The Committee believes that this is a desire of teams and therefore asks the same cooperation during this process.

## 6.3. Dimensional inspection of the compartment.

After each valid flight the Regular Class aircraft will go through dimensional inspection (Section 7.2 of the Rules, p. 28) and check the size of the cargo bay (Section 7.5, pp 33-35, and Appendix 2).

### 6.3.1. Dimensional Inspection

The process is described in this document in Section 2.4, page 11.

### 6.3.2. Inspection of Cargo Bay

#### **Regular Class**

According to section 7.5.1 of the Rules (pg. 33), the compartment must necessarily take the form of a parallelepiped, **can have its dimensions at the discretion of the team, but neither side of this parallelepiped may exceed 500mm.**

When the aircraft is ready to fly, the compartment must be completely closed, with the payload placed in the compartment.

The payload compartment shall be accessible and the system load fully visible to check the setting of the load during the safety inspection. See examples and explanations in Appendix 1 and Appendix 2 .

The dimensions adopted by the team, and the volume of the enclosure will be required to be reported in the project report at least one of the plans.

**The maximum size of the compartment will be checked after each valid flight, using a standard template to be provided and used by the competition organizer or a measure tape.**

This check will be done primarily to ensure that measures adopted by the team not exceeding the limit of 500mm, check the form (parallelepiped) and to verify the integrity of the setting system of the load.

If any of the dimensions of the compartment exceeds 500mm, the team will only have invalidate the flight, and may make the necessary changes in the aircraft, according to the procedures for modification of design and subject to applicable penalties and other restrictions on competition (order of flight rules for qualification, etc.).

**The limitation of the maximum of the load compartment is designed to prevent any team using all wingspan to accommodate the load. This type of solution is not allowed because it can negatively affect the rolling response of the aircraft.**

### **Micro Class**

For Micro Class, the compartment must have the form of a parallelepiped, with dimensions determined by the team in order to attend the minimum proportions between edges of 1.0 x 1.25 x 3.0. According to section 9.4.1 of the Rules (pg. 50).

**It is the responsibility of the team providing the standard block to be used to verify the dimensions of the cargo compartment.** The standard block should be rigid, made of wood or material of similar rigidity, ensuring that walls are free of distortions. In case a change of dimension along the side of the block, the measures will be considered of lesser value.

If the block does not comply with both the measured as indicated above, it's size that determines the **highest** proportions parallelepiped 1.25 x 1.0 x 3.0 contained in the parallelepiped measured.

Example: parallelepiped with dimensions: 103 x 124 x 290 mm

To maintain the aspect ratio of 1.0 x 1.25 x 3.0, the block should have **103** x 128.75 x 309 mm or 99.2 x **124** x 297.6 mm or 96.67 x 120.83 x **290** mm.

Thus, the **largest** proportions parallelepiped 1.25 x 1.0 x 3.0 measured is contained in the parallelepiped determined by the 3rd edge: 96.67 x 120.83 x 290 mm.

To check the volume of the compartment after each valid flight the payload will be removed and the block will be placed in the cargo compartment, which must be closed completely (with all fixtures) for verification. There can be no interference with the volume element bounded by the bay, ie, with the block of wood.

**Warning: There can be no interference with the aircraft element of volume bounded by the block of wood, and to insert this block in space delimited by the internal compartment shall not be required minimal application of force (the fit should be slippery).**

If the wood block does not enter the cargo compartment, the team will only have invalidate the flight, and may make the necessary changes in the aircraft, according to the procedures for modification of design and subject to applicable penalties and other restrictions on competition (order of flight rules for qualification, etc.).

The load support may be less size than the compartment so as to allow the placement of any adjustment to the center of gravity, however the load distribution on the support must follow the requirements defined in the following section 9.4.2 of the Rules, page 51.

#### **6.4. Aircraft Release**

After the aircraft go through all the procedures described above has its spreadsheet delivered to the final scoring judges and the aircraft is then released to return to the team tent.

#### **6.5. Example of “Flight Spreadsheet” (filled out by inspectors)**

In the following figure is shown to the team spreadsheet (or flight spreadsheet) to be used for the SAE AeroDesign 2010. The example shows the spreadsheet by the first qualify set used in 2008.

The spreadsheet of 2010 are very similar.

All the 'look' of the sheet is made with the intention of reducing entry errors (vertical layout of fields) and all its fields are numbered in accordance with the sequence of procedures to be followed by the aircraft.

As mentioned below, each set will have their sheet printed on paper of different colors. The sheet referring to the first qualify set is always white.

**FICHA DA EQUIPE - 1ª Bateria de Classificação**

Data  /  /

Equipe Nº  Nome

HORA CHAMADA:  :

HORA CHEGADA:  :

Nota: O rádio poderá ser ligado somente durante a inspeção de segurança e durante o voo COM PRENDEDOR

Check List

Apresentou-se dentro dos 5 minutos	(S / N)	6	<input type="text"/>
Crachá (piloto e co-piloto)	(S / N)	7	<input type="text"/>
Aprovado na Inspeção de segurança GERAL	(S / N)	8	<input type="text"/>
Rádio PCM (Verificar em cada bateria)	(S / N)	9	<input type="text"/>
Volt/Watch (Verificar em cada bateria)	(S / N)	10	<input type="text"/>
Aprovado na Inspeção de segurança ELETR.	(S / N)	11	<input type="text"/>

Abastecimento

Abastecimento completo	(S / N)	12	<input type="text"/>
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Decolagem  Setor de decolagem (escrever 1 ou 2 (use letra legível))  Obs.: 1 = 30,5m e 2 = 61m

Voo Hora do voo  :

Voo válido	(S / N)	15	<input type="text"/>
------------	---------	----	----------------------

Se não foi válido, qual o motivo? (pode ser mais de um motivo)

Decolagem (além de 61 m)	(S / N)	16	<input type="text"/>
Voo Incompleto (Queda)	(S / N)	17	<input type="text"/>
Toque (fora da pista 122m X 10m)	(S / N)	18	<input type="text"/>
Peça solta ou quebra de componentes	(S / N)	19	<input type="text"/>
Outros (especificar) >	(S / N)	20	<input type="text"/> >

Penalizações

Toque na aeronave antes do fiscal	(S / N)	21	<input type="text"/>
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POUSO DENTRO DA PISTA (S / N) 22  (bonus e contome e quação)

Desabastecimento

Aeronave sem combustível ?	(S / N)	23	<input type="text"/>
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Retirada de Carga (Class e Regular somente)

Tempo (seg)		24	<input type="text"/>
Aeronave OK ?	(S / N)	25	<input type="text"/>

Dimensional (class e regular somente)

Compartimento de carga (bloco de madeira)	(S / N)	26	<input type="text"/>
Valores medidos (mm) (Se a aeronave não for medida na bateria, insira um sinal de '=')			
Comprimento ('L')		27	<input type="text"/> mm (numeros redondos)
Altura total ('H')		28	<input type="text"/> mm (numeros redondos)
Envergadura Bloco 1 ('B1')		29	<input type="text"/> mm (numeros redondos)
Envergadura Bloco 2 ('B2')		30	<input type="text"/> mm (numeros redondos)
Envergadura Bloco 3 ('B3')		31	<input type="text"/> mm (numeros redondos)

Identificação da Aeronave

Nome da escola e número da aeronave	(S / N)	32	<input type="text"/>
-------------------------------------	---------	----	----------------------

Pesos

Carga (CP)(kg)	(S / N)	33	<input type="text"/>
Aeronave vazia (PV)(kg)	(S / N)	34	<input type="text"/>
Voo Vazio (Classe Aberta)	(S / N)	35	<input type="text"/>

Observações Adicionais (SE NECESSÁRIO, USE O VESO DA FOLHA)

Each set has a different color of sheet. The reason for the differentiation of colors on each set is to avoid disruption or errors during the transmission of data to the score spreadsheet. Through color you can better organize the work of score judges, a work considered one of the most demanding and complex of all competition.

Are asked, so that the teams need to resolve any doubts about the score, do so with due calmness and warmth as it facilitates the attendance and assists in resolving the question or issue if this is indeed detected.

Branca		1ª Bateria de Classificação
Amarela		2ª Bateria de Classificação
Magenta		3ª Bateria de Classificação
<hr/>		
Azul		4ª Bateria - Competição
Verde		5ª Bateria - Competição
Amarelo Claro ou Natural (cor do papel reciclado)		6ª Bateria - Competição
Cinza ou outra cor não usada		7ª Bateria - Competição

These colors may change depending on the availability of paper.

The completion of the sheet is done by inspectors in each area and corresponding data is transferred manually to the computers to score.

## 6.6. Score

For AeroDesign 2010, scores of flight to be included in the final grade will use the values obtained by the **best flight**, without decoupling, ie, all results obtained by the team on a given set "go together".

**Best Set corresponds to the set in which the final score is the highest among all the sets. This score corresponds to the sum of: points per payload, accuracy and bonuses linked (EE factor and time of removal of load).**

The other bonuses (valid landing within the airstrip, minimum volume (function) and video of flight (up 5pts)) are recorded at the end of the competition.

The bonus points for landing within 61m (or two consecutive sectors) will be recorded as Section 5.5.3 of this document, Reules, Section 39 page version 7.10.5 and Section 8.12.5, page 48 for the Regular and Open Classes respectively.

This bonus is no longer cumulative, ie, will only be considered as the CP and PV for that set, independent of in the other sets took off with more or less **weight**.



The score for the video of flight has no direct relation to the date of sending the video. We can not interfere, so strongly, in the timeline and schedule of the teams.

About the bonus (or the 05 points) the points are given only in terms of video quality. There have been cases in 2006 where the aircraft "disappeared from the screen" just after the takeoff and therefore is not possible to evaluate the aircraft's flight characteristics and therefore the subsidy will not be total (05 points). Only the subsidy is not accounted for the teams that did not send videos (!).

The request for sending the flight videos as a bonus was the best so far found to encourage the teams to actually fly before the Competition Flight.

Remembering: The possible penalty of 20 points by "lateral escaped" will be counted at the end of the competition and is cumulative, ie, two "escaped" is equivalent to loss of 40 points!

## 6.7. Additional Important Notes

### 6.7.1. Safety Aspects in the CTA

It is vital that all teams remember that the area where the competition is held **is a military area so fitting a lot of care about the traffic and conduct within such areas.**

All involved (teams, inspectors and judges) must comply with following items:

1. To circulate inside of the CTA (and the Competition) is required to be always identified with the badge of the competition and band in visible places.
2. Transit only in authorized areas or are way to the local of the competition. No team or participant of the AeroDesign is authorized to "walk" along the dependency of the CTA. Who is covered in unauthorized locations may be severely reprimanded thereby configuring an unpleasant occurrence for everyone: teams and organization AeroDesign.
3. Observe speed limits within the CTA is extremely important and mandatory.
4. Not authorized the consumption of alcoholic beverages during the SAE AeroDesign under any circumstances.

To unload the aircraft and equipment for the competition next to the entrance area we ask, please, to do so quickly. After this procedure, the vehicle (car, bus or truck) must be parked in appropriate places. It is important that we all work together through these small gestures, so that we can all develop a competition with a good time and consequently great success.

### 6.7.2. FOD (Foreign Object Damage) – IMPORTANT RULES - Required reading for ALL

It was noted during the flying competition and especially the end of each day, a excess of leftover parts of aircraft Competition, pieces of wood, metal and even lead used for balancing CG (which is banned in 2010 (Regulation pág.59))

among many other items within the workspace of the teams (in the tents and around the benches).

All this "junk" left on the floor during the competition of 2009 was due to the winds and the movement of people in place, led to all directions. This situation has led to the end of competition, serious recommendations from the institutions responsible for the airport and had even called the "Hazard Report" depending on the severity of damage to such items left on the ground could result in aircraft that operate there, if ingested by a jet engine.

For example, a small screw placed on the floor (and inadvertently kicked into the area of the airstrip) can cause serious damage to the shoulders of a turbine and a more serious and can even lead to a "*rotor non containment*" considered one of the most critical events in aviation and unfortunately responsible for some of the most serious accidents involving aircraft in flight. Even pieces of the balsa, carried by wind can cause serious damage to aircraft engines.

Special attention should be paid by the team in search of crashed aircraft in the area of flight. Shall be recovered every last components of the aircraft, especially if the accident was near the main airstrip or taxiway.

It is suggested (for now) that small elements and possible to drop of the aircraft are painted red or another color, high contrast with the asphalt and/or grass.

**Thus in 2010, the Technical Committee and all others responsible for the area will be very attentive to this kind of situations during all the competition and especially the end of each day.**

**There is not the desire of the Organizing Committee, however in extreme cases, a penalty may be imposed if a team does not pay attention to these important observations and do not keep your work area clean. It should be emphasized that this must be constantly observed and monitored.**

One aim of the Organising Committee is to deliver on the first day of competition, along with the kit delivered to students at the time of arrival, **a garbage bag for each day of the Flight Competition. There will be three trash bags for each team.** We also have garbage cans (the maximum as possible) placed over the competition area for disposal of materials.

Suggestion (mandatory) reading.

[http://en.wikipedia.org/wiki/Foreign\\_object\\_damage](http://en.wikipedia.org/wiki/Foreign_object_damage)

<http://www.fodnews.com/>

### **6.7.3. Aircraft Condition After Landing**

See in this document section 5.6.1 (page 37) or Rules, Section 10.1.5.4 (page 63).

### **6.7.4. Alterations and Repair of Aircraft**

The aircraft original design as shown in the Project can be repaired during the course of the competition. However, the aircraft will reach the end with their original parts (or replaced with spare parts identical to the originals), with the exception of the propeller, engine, servos, radios and components of the landing gear that can be replaced or exchanged at any time in the ground.

Replaced parts mentioned above, should be identical to original except for the

propeller. Any change in the original design must be informed of the Technical Committee as cited in Section 6.10, page 22 of the Reules.

Repairs can be made only in broken parts. Changes may be made only with the permission of the judges to comply with the changes required by them during the safety inspection.

Note: Any change (due to repair or not) in relation to the original design must be declared, authorized and may suffer as appropriate, penalties determined by the judges.

The use and addition of covering material, tape, glue, rivets or small screws and internal structural parts **to repair**, are not considered changes.

For the Open Class is **EXPRESSLY PROHIBITED THE REPAIR OF PARTS OR ASSEMBLIES OF PRIMARY STRUCTURES** such as:

- Wing Spar
- *Tail Boom* of the fuselage
- Horizontal Empennage Spar
- Among others, depending on the aircraft.

**Each team may carry no more than one spare aircraft.**

**See Section 10.3 of the Rules (pg. 67)**

### **6.7.5. Engine Checking**

The engines will be inspected one by one as the maximum rotation with a tachometer, using standard plug, propeller and fuel. This inspection will be done in random order and can be done more than once, at the criteria of the Technical Committee. An specifically designated inspector for such job will perform this inspection and can also do it before or after flights.

**The engines of the top five will be removed from the aircraft after the last set of the event to complete inspection. During this last set, the aircrafts of the top five teams will stay on airstrip and will be stopped from returning to pit. The Technical Committee will determine the engine removal area and final inspection just after the last set of the event.**

The aircraft can be repaired during the course of the competition. If the aircraft needs to be repaired, their parts could be replaced as long as they maintain the same original design of the part replaced. The aircraft can be audited at any time of the competition. It is REQUIRED that the aircraft will pass through new safety inspection before any flight, after repairs in case of replacement of any external part (eg, replacement of parts of the wing, fuselage, control surfaces, etc.).

### **6.7.6. Carrying Requirement Varification - Micro Class**

The aircraft may be inspected at any time in the competition by the Technical Committee in order to verify compliance with the carrying requirement (Section 9.5 of Rules - The carrying case should contain all the aircraft parts necessary for to realize the flight, including radio, simulated fuel and/or batteries, respecting the specifications of section 9.5.1. Rules).

The aircraft can be repaired during the course of the competition, but its parts may be replaced as long as they maintain the same original design of the part

replaced. It is REQUIRED that the plane will pass through new safety inspection before any flight, after repairs in case of replacement of any external part (eg, replacement of parts of the wing, fuselage, control surfaces, etc.).

## **7. Awards**

### **7.1. Honorable Mentions**

The Technical Committee of AeroDesign always sought since its first edition enhance the work of all teams even those who have not obtained the first place through honorable mention for defined and specific items related to various stages of the competition.

For this year, are being studied some new honorable mentions that will be released only on the Closing Dinner, October 24.

The mentions already defined as classic and will again be awarded this year for the three categories are:

- 1 - Best Project - Regular Class
- 2 - Best Project - Open Class
- 3 - Best Project - Class Micro
  
- 4 - Best Oral Presentation - Regular Class
- 5 - Best Oral Presentation - Open Class
- 6 - Best Oral Presentation - Class Micro
  
- 7 - Greatest 'Accuracy' - Regular Class
- 8 - Greatest 'Accuracy' - Open Class
- 9 - Greatest 'Accuracy' - Micro Class
  
- 10 - Greatest Payload - Regular Class
- 11 - Greatest Payload - Open Class
- 12 - Greatest Payload - Class Micro

Only for Regular Class

- 13 - Shorter Payload Withdrawal
- 14 - Major Structural Efficiency
- 15 - Best Team International
- 16 - Aircraft of 'Minor volume carrying case'

Possibly (?) There will be two or three additional honors which will be released only during the Awards Ceremony.

The honorable mentions are always awarded to the absolute maximum or minimum values (points, weights, time, etc.).

#### **Important Notices:**

**During the Awards Ceremony, to speed up a bit the process for submission of mentions, the teams that receive more than one honorable mention will be called up on stage only once and receive the information duly announced, but in sequence.**

## 7.2. Preliminary score sheet

The score sheet whose result is released in the Closing Dinner is preliminary, because some errors may occur, as has unfortunately occurred.

The Technical Committee works to that all errors will be effectively eliminated.

This work is done by improving the 'layout of spreadsheets' used by the inspectors during the "path of the aircraft," the automation of the scoring spreadsheets and release of results, the extensive training of inspectors and judges involved in competition and finally improvement in the definition of each process that involves each transaction made during all stages of the competition.

Regardless of all these precautions can always occur some difficulties or failure in the countless details that involve the entire scoring process. An extreme attention is given to the first placed teams since any failure would result in an extremely unpleasant situation for everyone.

For this reason it is always set to the worksheet released soon after the competition has preliminary character. The spreadsheet official (and final) will be posted on the website of SAE Brazil, sent by email to the teams and press, until 10 days after the end of the Competition or November 3, 2010.

We always understand and support the team throughout the process so that everything runs smoothly and any problems are corrected throughout the competition and always on time.

**During the 2009 competition, very favorable climate for mutual collaboration between teams and the Technical Committee provided a Competition extremely fast, dynamic and pleasant even with some glitches along the way which were soon remedied with the help of his teams.**

**Let us all together make this 'Aero' an event even bigger and better!**

## 8. Conclusions and Acknowledgments

The Technical Committee and the Organization of AeroDesign 2010 would like to thank all the participating teams. This **Operational Procedure** document aims to maintain the highest degree of transparency in decision-making process of the competition.

We hope to maintain the same high spirit of competition, cooperation and camaraderie between the teams, as in previous editions of AeroDesign.

We would like to emphasize that this event is organized on the basis of a great volunteer work and idealistic by the organizers, technical committee, judges, inspectors and Sponsors. These volunteers are engaged with great zeal and selflessness over the years to achieve an enriching event for the participating teams, with great personal sacrifices.

Mainly, the work of Embraer's professionals involved in the event demonstrates this mentality of detachment, dedication and cooperation we would like to see recognized and reflected in the competition. These professional, highly competent and often overworked in their daily professional practice, devote their weekends and free time to organize the event, checking reports and all other

activities on the background of AeroDesign. For the success of this competition, we need the cooperation and understanding from all participants.

We therefore hope that the participating teams demonstrate maturity and detachment to understand and recognize the great effort and dedication involved in making the event and that together we can accomplish a great event in this 2010 edition of AeroDesign!

**Let us all together make this event the best AeroDesign that ever existed!**

## 9. Appendices

### 9.1. Flight 'Briefing'

#### FLIGHT PROCEDURES - 'Briefing for Pilots'

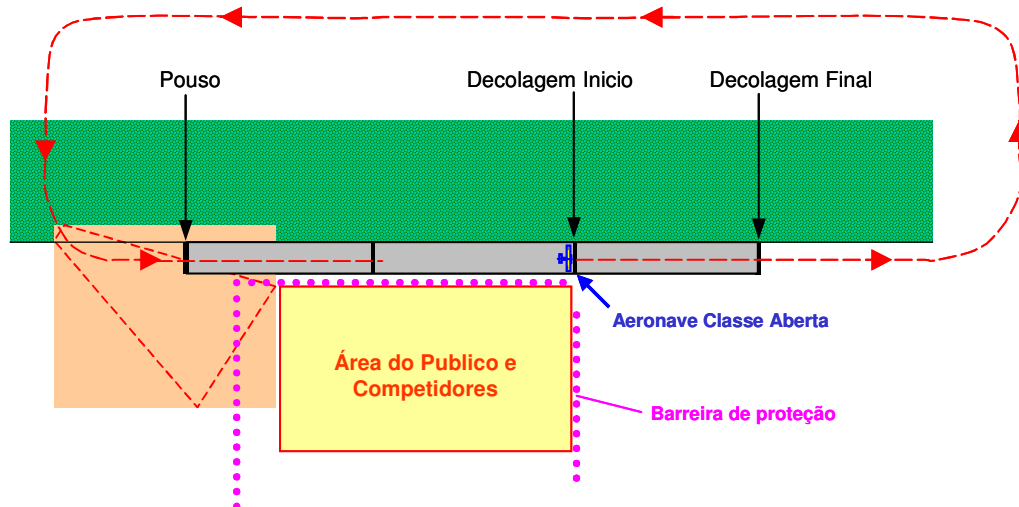


- The flight zone covers the entire front area of the airstrip to the main airstrip of the airport. Where is bounded laterally between the intersections A (alpha) and B (Bravo) of the main airstrip of the airport. Flights over the main airstrip of the airport and its intersections due to be avoided and the pilots will be informed during the flight to return to the flight area. **(Green area demarcated in the figure above). More information about the layout of 2010, see item 9.2 below.**
- The area behind the airstrip where it comprises the area of the competitors, public and "pit" is prohibited for flight. If any aircraft showing invade the forbidden area should be commanded out immediately or else fly to the ground **under penalty of disqualification of the team if the judge's order is not complied with.** **(Red area demarcated in the figure above).**
- The direction of flight will be a circuit of 360° in the opposite direction to the wind. The aircraft will take off and land into the wind direction. The pilot will inform the direction of flight so that getting into the lane. If the wind is zero the flight will be determined by the judge of the airstrip and will be the same for every team. There will be no choice of the direction of flight by the pilot. If the wind is in cross direction the direction of flight will be determined by the judge of



the airstrip. In the event that the wind change position during flight the landing can be done against the direction that taken off. But this will only be allowed with the permission of the judge of airstrip that will be with the pilot during flight. **(A suggested flight path is marked in yellow in the first picture shown at the beginning of the document).**

- Be demarcated two or three tracks on the taxiway from the airport, each with two sectors of takeoff. If the decision for the demarcation of three tracks is taken, the Open Class aircraft will use only the external ones



### Important Notices:

For Open Class is mandatory that the route of the aircraft is wider so that in almost any phase of flight, the bow of the aircraft remains pointed to the public or competitors. When flying close to the public aircraft must be at a low height and aligned with the airstrip as mentioned in item 5.4 above.

The takeoff must be done as gradual as possible so that when the aircraft is at a higher altitude above the ground, this is already far more of the 'inhabited area'.

In the case of the existence of "three tracks" (each with two sectors), not to say the picture above the landing must necessarily start from the first track, but only that the curve for approach should be broad, allowing the alignment of aircraft with the runway before it was the freight area of the public and competitors. It is recommended that this procedure is executed for all classes: Open, Regular and Micro.


- The initial position of the aircraft's main landing gear on the starting line on the track. The aircraft should take off (being in the air) within the limit for each category, or the attempt is invalidated. Each team has up to three attempts to take off. An accident invalidate the attempt.
- There is no limit on how many laps can make the aircraft before landing, provided there is no empty fuel and no disrespect the flight area. If the plane touch the airstrip and try to fly the flight is invalidated.
- The aircraft must land within the area designated as a landing zone at 122 meters in length. A valid landing is defined as touching within 122 meters demarcated, roll and stop (no length limit). The width allowed to touch, stop running and are bounded by the side lines of the innermost track. The initial



touch of the airplane on the ground must be within the designated area for landing, but rolling until stopping may be beyond the airstrip. If the aircraft exceeds the limit of longitudinal landing area, he must do it by rolling, ie, with at least one wheel touching the ground. **(The area of the track is marked in white in the first picture shown at the beginning of the document) .**

- The criterion to judge if the aircraft touched off the marked area is defined as: if at the touch 50% of airplane is within the defined area, the flight is valid. The final word on this question it is the judge of the airstrip (part of the Technical Committee).
- Zig-zags, doughnut spin and swinging landing are allowed.
- After the aircraft complete stopped, the team captain may not be less than 2 meters from the plane until the inspector has come to inspect the integrity of the aircraft. If this rule is not obeyed, the flight will be invalidated.
- Bonuses will be given as cited in Rules, Section 5.1.6 (page 57) for teams in Regular and Open Classes as they can completely stop its aircraft within the area demarcated on the track, ie, not exceeding the limits of longitudinal and lateral track at any moment of landing, until the arrest of the aircraft.
- Time to take off from the call:  
Regular and Micro classes: Each team will have five minutes (or 3 min) for takeoff from his call in the first set. From the second set each team will have three minutes to take off. If the team is not ready for flight when requested, lose his time, having to wait until the next set to fly.  
Only the mechanic (1) and pilot (1) may be at the airstrip to the start up the aircraft.  
Open Class: Each team will have five minutes to take off from its call on all sets (qualify and competition). If the team is not ready for flight when requested lose his time, having to wait until the next set flying.  
For the case of the Open Class, two mechanics are allowed (2) and a pilot (1) on the airstrip to start up the aircraft.

This time will be marked from the moment the aircraft is ready next to the airstrip (near the launch point) is called.

 Exceptionally considering the requests and aiming a better record of flights made by the teams, the Technical Committee decided to authorize the presence of another component of the team title of "Cameraman Team" just to make filming of the flight. This should always be on the side of the track during the entire starting procedure of the aircraft and may not interfere at all during this process. The Committee encourages all to send the movies made during the competition to the same address for sending reports. May be used to improve rules and procedures in the future.

- If there is any aircraft crash during flight, the rescue will be authorized only by the judge of the airstrip. The judge will throw the vehicle INFRAERO to get the aircraft along with two representatives of the team. Those responsible INFRAERO will accompany the competitors during the pick up process of the aircraft so that all parts of the airplane is obtained and the area is completely clean. This will be charged so that there are no foreign objects (FOR) on area, thus causing future damage to the aircraft operating at the airport.

- As competition flight is being realized in an airport with their normal flight activities, there is the possibility of stops. When any aircraft is near the airport, the competition will be interrupted by the judge of airstrip that will be in direct contact with flight controllers. Once the aircraft to free the main airstrip of the airport and the controllers release the resumption of activities the judge shall authorize the continuation of the competition.
- **The team is responsible to provide all the necessary tools for starting and correct operation of the aircraft. The organization does not provide tools during the proof.**

## 9.2. Layout AeroDesign SAE 2010

In all competitions SAE AeroDesign a new layout is studied in conjunction with procedures to ensure maximum flow over the three days of the Flight Competition.

The layout of 2010 showed small changes compared to 2009, to eliminate some negative points raised in 2009. Some modifications come by feedback from teams in the days of competition and via forms that were sent after competition, highlighting the importance of the conversation between the committee and teams.

Are presented below three figures for the 2010 Layout, where it can be seen the the "hangaretes" and other areas where operations are performed AeroDesign 2010.

### **1) In the first figure (page 62)**

In this figure it is possible to have a broad view of the entire area of competition with teams placed under the "hangaretes". Area in yellow. Four other pyramidal tents (area in light blue) will be mounted next to "hangaretes" to accomodate the medical group, the safety inspection, the sound system to call the team and the post to deliver the radios.

The operational tent is the one on the left of the tents mentioned above. It is in this tent which are made all the operations of payload and aircraft weighing, aircraft measurement by Regular Class, processing of notes and withdrawal load time measurement. Further details about this tent will be described below.

### **2) In the second figure (page 63)**

The second figure is a slightly enlarged view of the area of competition where the left is the grandstand (covered) for the public and staff.

At right of the bleachers is the area reserved for special guests (sponsors, officials and guests)(blue tent 10 x 10m tents near protection fence and entrance area of the aircraft to the airstrip).

The tent of the SAE (green tent), where the days of the competition is done to care the teams, will be positioned just above (or beside) the area of special guests.

The last green tent that is located more to the center at the beginning of the aircraft queue is the tent of fuel, where the operations are done for supply and withdrawal of the fuel.

The alimentation tent is planned to be mounted next to "hangaretes" (just above).

### **3) The third figure (page 64)**

The third figure is a view of the region of the tents where the main operations ill be made.

Teams registrations: after the opening of registrations a team representative must go to the area of sound, in the region with red rectangle. It is required that be formed a queue and that inscriptions are done in an organized manner.

Safety Tents: the two blue tents just below the medical tent is the safety inspection. The drawing shows the placement of 10 aircraft forming a "U". The entrance to this tent can be made by the central corridor. The output of the aircraft is always in the direction of the fuel tent and soon after they shall stand in the queue waiting for flight.

Operating tents: the tent a little more isolated on the left of the safety tent is the Operational Tent, where there are the main operations of final verification and dimensional control of the aircraft. The entry and exit of aircraft in this tent is always done by right side. See bars delimiting a corridor. Only two team members can enter in tent at the time that operations are performed on your aircraft.

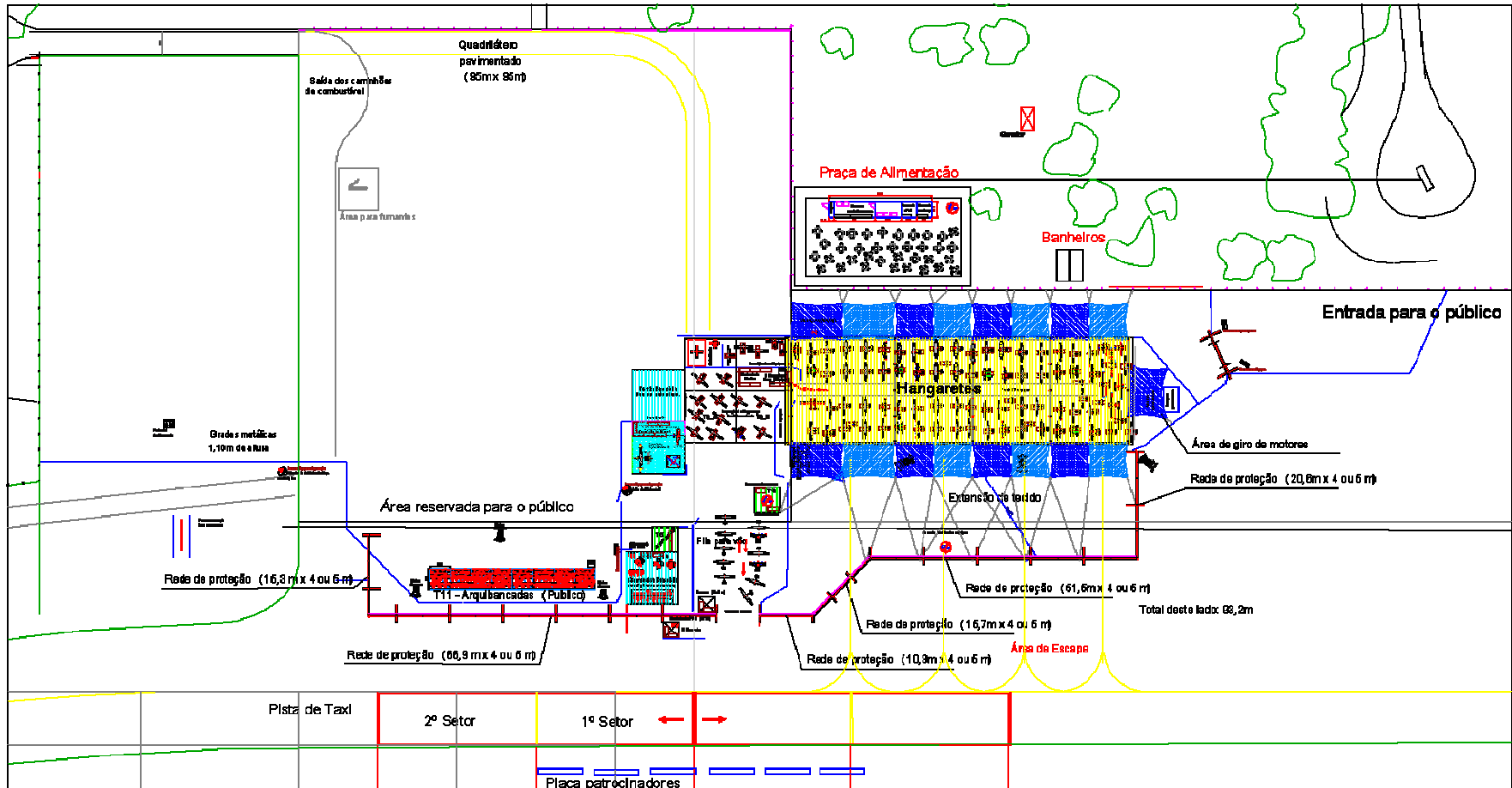
In this tent are performed:

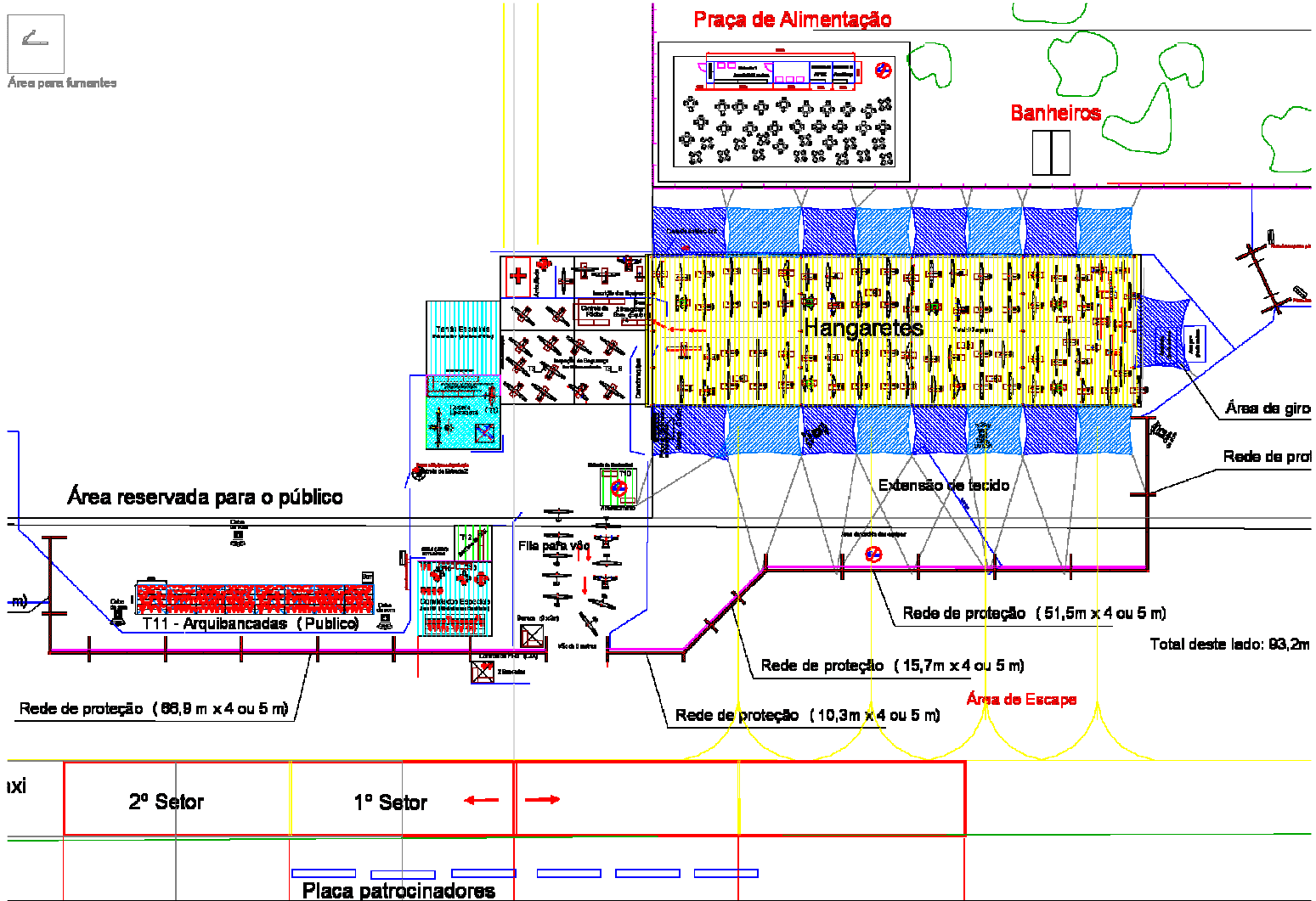
- 1) Quick Payload Removing, possibly this operation will be on the left of the tent to provide a larger area to the fans of the teams during that operation and greater proximity to the public. Note: In drawing this area is at right side.
- 2) Dimensional Inspection of aircraft of the Regular Class. The aircraft will be measured in this tent with the use of templates already described in this document. Probably the reference floor will be the concrete itself.
- 3) Weighing of aircraft and payload: aircraft will be weighed in this tent in the most protected from wind as possible. This location will be near the top right corner of the tent (see diagram) or left. It is worth remembering that the weight values are confidential, except if the team did not bother to publish them. We request that the team remember the inspector about the confidentiality of the information or not.
- 4) Anemometry: the results collected by altitude density by the electronic weather station are processed in this tent and the results are posted on the scoreboard every 30 minutes or less.
- 5) Processing results: The results of each set for the three categories are handled by judges in the same tent. The sheet from each set for each team are processed manually. If the team find any errors in punctuation, it is recommended that this be reported to any member of the Technical Committee that is available for the problem is corrected in the best way (and calmly).

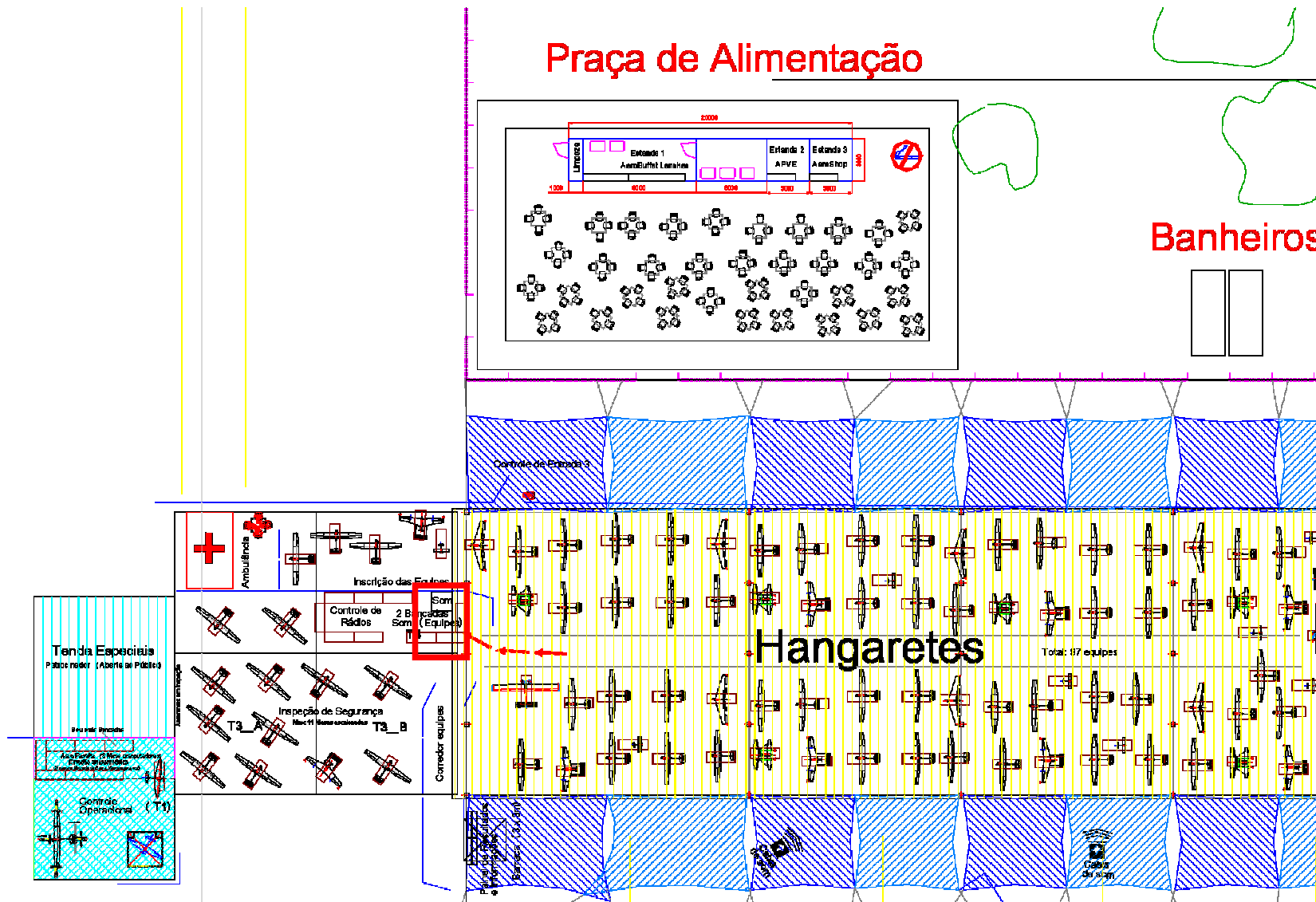
The **area for testing the engine** is preliminarily positioned in the right side of "hangaretes" in an area surrounded by fences and near the portal of entry of the Competition.

We ask everyone to respect the limited areas to ensure the best progress as possible of the competition.

**It is worth remembering that it is STRICTLY FORBIDDEN smoking and alcohol consumption in the area of competition, even within the alimentation area. We asking, understanding and cooperation regarding these restrictions.**







### 9.3. "Operating Procedures - SAE AeroDesign 2010"

#### **Agreement Terms**

The team \_\_\_\_\_  
, No \_\_\_\_\_, agrees with the goals of Aero Design competition and is aware of the procedures established in the "Operational Procedure - SAE AeroDesign 2010"

The team affirm that you have read this document thoroughly and knows all the procedures are now defined for the AeroDesign 2010.

Signature of Team Captain: \_\_\_\_\_

Name: \_\_\_\_\_