June 2008

Dragster Compétition

Concept of evolutionary Dragster

A4 TECHNOLOGIE
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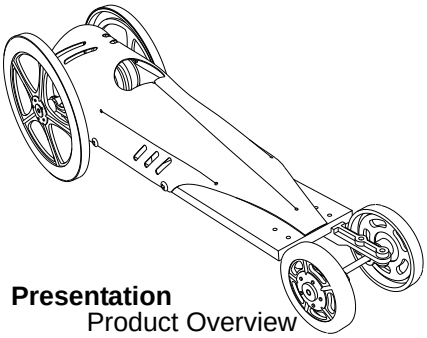
Dragster Compétition

Juin 2008
Etienne Bernot



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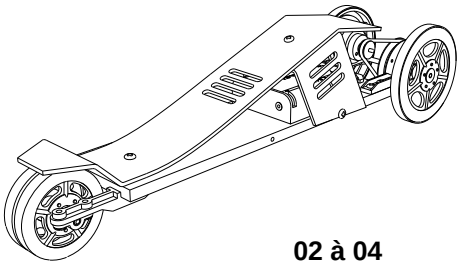

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Paper car body color models in the "DRC paper car bodies" appendix record

CDROM CONTENTS

The project' CDRom is available in the A4 Company catalogue (ref "CD-DRC).

It contains :

- The FreeHand version file (editable with this software - Evaluation version included).
- The PDF version file (readable and printable with Acrobat Reader software).
- Photos of the product, des images de synthèse, DXF format pictorial views.
- Files for machining.
- The **full product 3D modeling** in its various versions with SolidWorks, Parasolid and eDrawings format **3D files**.

Overview of dragster racing

The product

Dragster model for competing : Two dragsters racing running in parallel.

Functioning

Dragster with electric motor and belt drive on the two rear wheels.
Possibility of various mechanical configurations :

- variable transmission primary ratio by the possibility on assembling pulleys motor of 6, 10 or 15 mm diameter;
- variable transmission final ratio by the possibility of mounting wheels of 44, 60, 80 ou 100 mm diameter,
- front axle modifiable with different configurations,
- choice for rubber or hard plastic tread wheel,
- choice for réalization and mounting of various car body types.

Teaching interests

Allow students to work on various product configurations to better understand and analyze.
Getting them to make informed choices to improve performance and adapt the dragster to various racing types (track more or less long or s loping).

- change the motor pulley diameter (transmission primary ratio),
- change driving wheels diameter (transmission final ratio, adhesion),
- change the front axle configuration (steering and stability of the dragster),
- change the wheels tread (adhesion),
- change the dragster body (implementation issues, design, dragster's weight and inertia).

Competition challenge and motivation.

Group working, technical choices comparison.

"On demand" manufacturing according to workshop' means and available time : possibility having to perform a simple assembly but also possibility to shape components by cutting, drilling, thermobending. Finally, possibility to achieve advanced dragster bodies with CN small milling cutter.

Realisation

Parts and materials are available at retail.
The kit packaging provides a frame already cutted to the dimensions.

The basic kit don't include tne dragster's body that may be réalized with various materials.

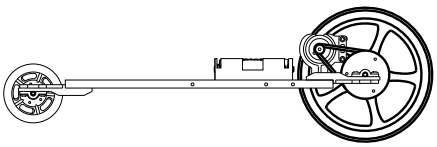
- Mechanical plastic parts (ABS) are supplied finished on a set with various wheels and pulleys diameters.
- The frame is made of a expanded PVC foam 6 x 50 x 200 mm. It comes cut to dimensions in the kit.
It must be predrilled or pointed for screws to attach mechanical parts and dragster's body.
- Dragster's bodies: various models in 3 different materials are available, from the easiest model realization to a model allowing a real shaping with workshop tools.

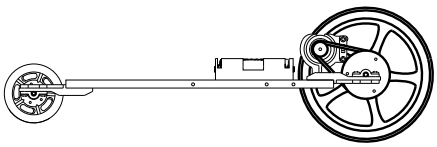
* Printed paper dragster body (various models to be printed in the record).
  Realization with printing, laminating and cutting.
  Very easy realization.
* Dragster body in polypropilene sheet 0.5 ou 0.8 m : two designs proposed for manual réalization or CN cutting.
  Template for manual cutting in this record (pointing through the template, tracing with dry point, scissors cutting).
  3D model and files on CDRom for machining.
  Work with a flexible material.
* Dragster body in 2 mm polystirene sheet : two designs proposed for manual réalization or CN cutting.
  Simple drawing for manual realization (saw or shear right cuts, drilling, thermobending)
  in this record.
  Advanced drawing for CN cutting with internal shapes to cut (page 28).
  CDRom's 3D model and files for machining.
  Shaping material; use of a wide range of tools.

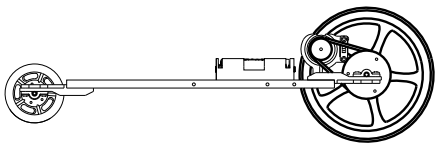
See few examples of personal realization through modifications on models proposed at the end of record.

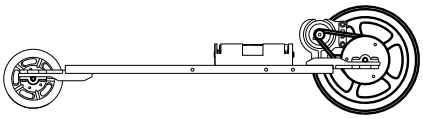
Variants

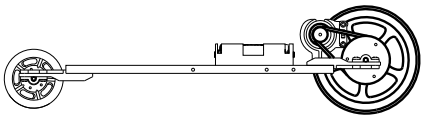
- Different possibilities to change the transmission ratio
Note : it's only planned to exchange the primary pulley (motor pulley) and wheels .
The secondary pulley on wheels axis would be difficult to interchange.

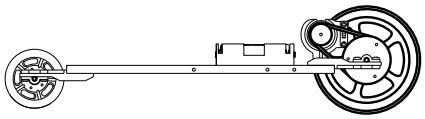

Motor pulley Ø 6 - Rear wheel Ø 100

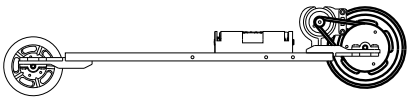

Motor pulley Ø 10 - Rear wheel Ø 100

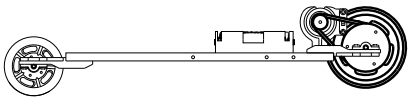

Motor pulley Ø 15 - Rear wheel Ø 100

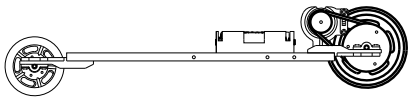

Motor pulley Ø 6 - Rear wheel Ø 80

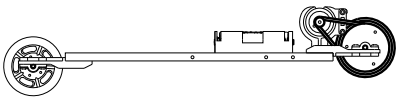

Motor pulley Ø 10 - Rear wheel Ø 80

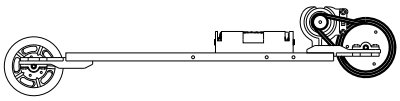

Motor pulley Ø 15 - Rear wheel Ø 80

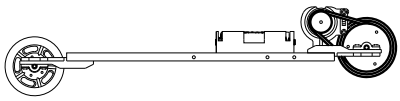

Motor pulley Ø 6 - Rear wheel Ø 60


Motor pulley Ø 10 - Rear wheel Ø 60

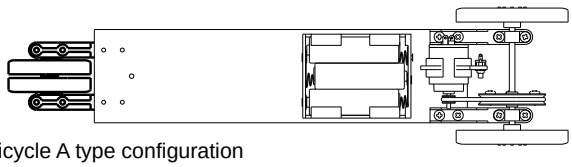

Motor pulley Ø 15 - Rear wheel Ø 60

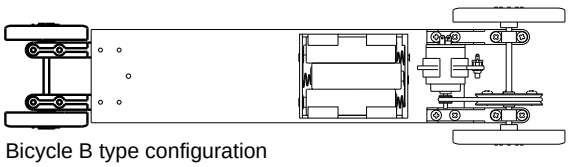

Motor pulley Ø 6 - Rear wheel Ø 44

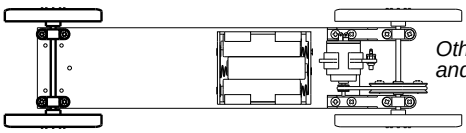

Motor pulley Ø 10 - Rear wheel Ø 44


Motor pulley Ø 15 - Rear wheel Ø 44

- The various front axle configuration options
Note : one could also mount the axle directly on the frame with two riders, without using axle holders. One could also consider mounting different diameters wheels. To simplify the technical record (frame drilling plan, dragster body adaptation) already dense for young students, we have presented only two configurations with Ø 44 wheels.

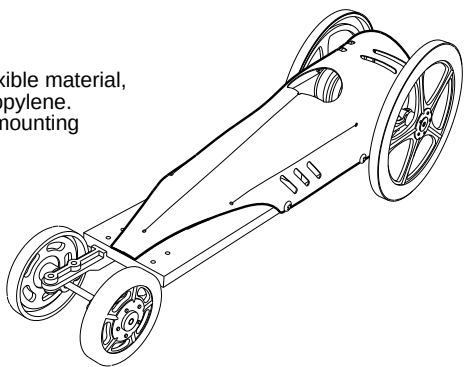

Unicycle A type configuration

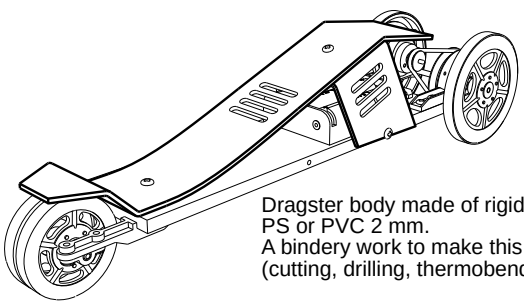

Bicycle B type configuration


Other possibilities with a different mounting axle and using different diameter wheels.

- The various camber possibilities
Depending on workshop means, the available time and student training objectives, several dragster bodies types can be achieved.

Dragster body made of flexible material,
laminated paper or polypropylene.
Cut flat and curved when mounting





Dragster body made of rigid material,
PS or PVC 2 mm.
A bindery work to make this model
(cutting, drilling, thermobending).

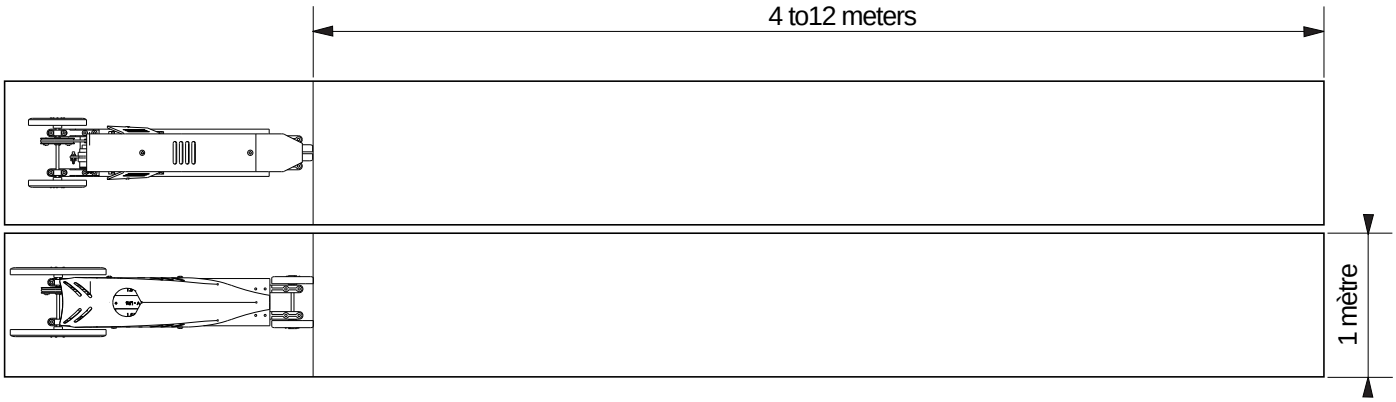
Competition

Regulations

Track
The track consists of two adjacent lanes, 1m wide and 4 to 12 m length (adaptable depending on conditions).
It's drawn on the ground using, for example,adhesive tape.
(The objective is not to define track with obstacles to guide dragsters).
The ground nature is critical for competition (adhesion, flatness).

Regulation

- Dragsters compete in pairs in duel.
- Both dragsters competing are rushing in parallel at start signal.
- The dragster rushes from standing, front wheels axle on the start line.
- It's forbidden to help manuelly at startup. One must just release the dragster.
- The first dragster crossing the finish line wins the round and the team wins one point
- If a dragster leave the track before the finish line, he loses the round and his opponent wins the point.
- If both dragsters leave the track before the finish line,
  one that left the track farthest from the starting point, wins half a point.
- The competition is organized so that all teams face in duel.
- All teams must have competed the same number of duels.
- The winning team is the one that will have accumulated more points at the end of the competition.



Nota

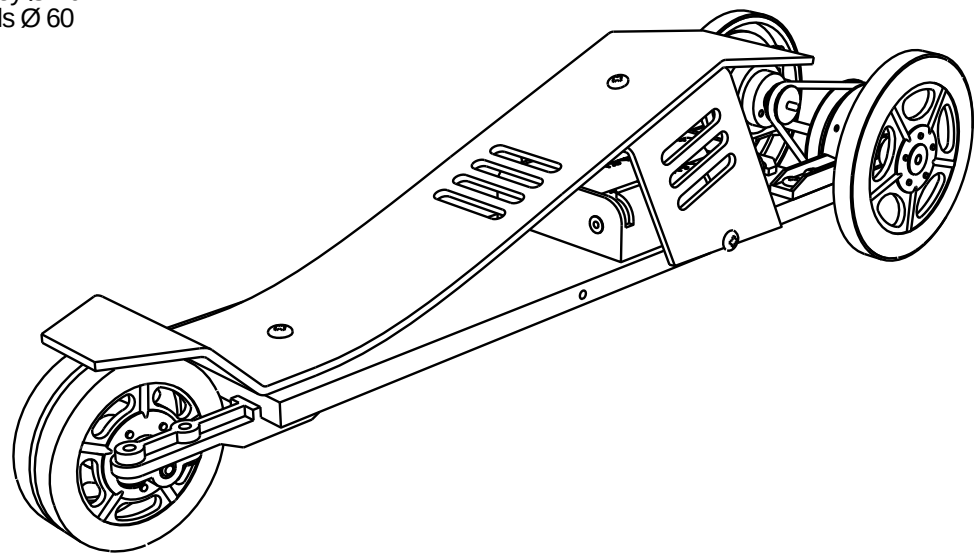
1 - The track will be adapted to local constraints. To take in account this length is crucial for the competition. Indeed, for a short track the acceleration will be preferred and for a long one the peak speed will be decisive as well as a good road holding in a straight line.

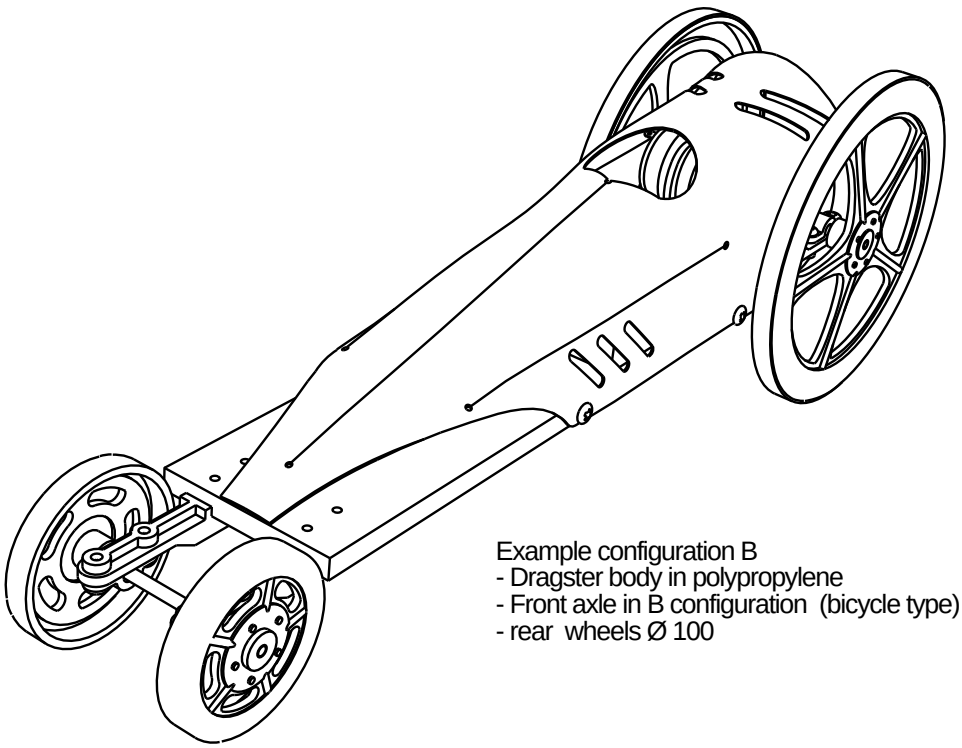
2 - It's interesting, if a sloped track is available, to do up hill and downhill races. It will be thus demonstrated that according to the ground type, the optimum gear ratio isn't the same.

Competition scoreboard

Teams	B	C	D	E	F	G	H	I	J	K	Total points	Ranking
A	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
B		Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
C			Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	VWinner ... Points ...	Winner ... Points ...		
D				Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
E					Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
F						Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
G							Winner ... Points ...	Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
H								Winner ... Points ...	Winner ... Points ...	Winner ... Points ...		
I									Winner ... Points ...	Winner ... Points ...		
J										VWinner ... Points ...		

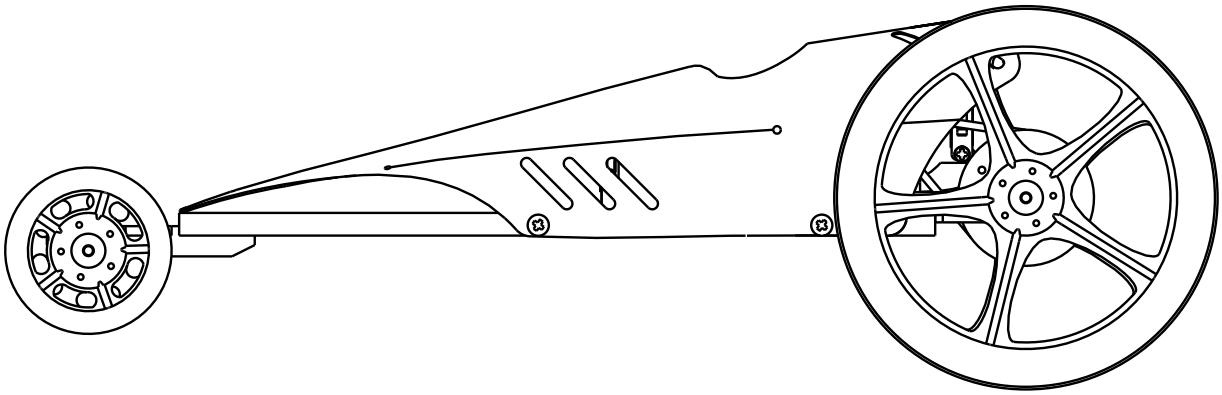
Example A configuration
- Dragster body in PS 2 mm
- Front axle in A configuration (unicycle type)
- Driving pulley Ø 10
- Rear wheels Ø 60

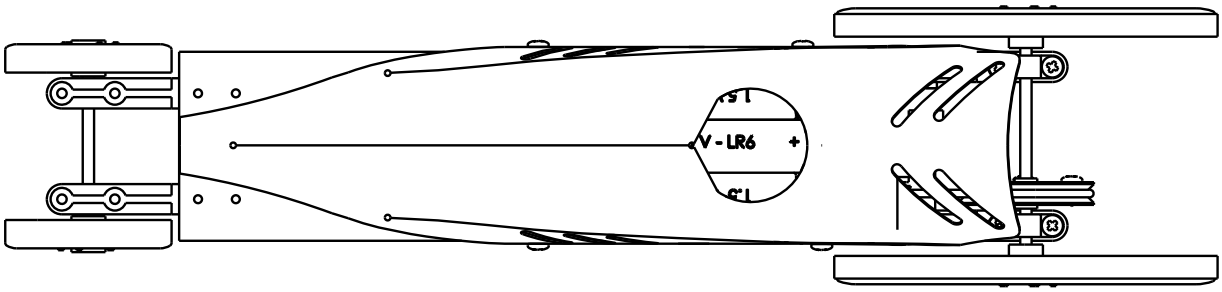




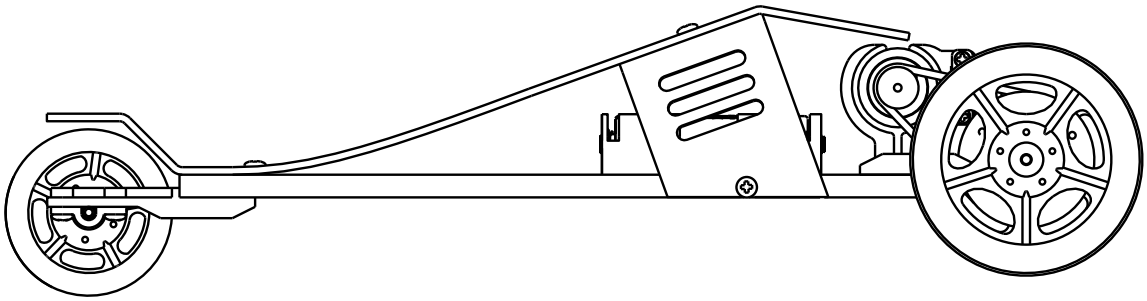
Example configuration B
- Dragster body in polypropylene
- Front axle in B configuration (bicycle type)
- rear wheels Ø 100

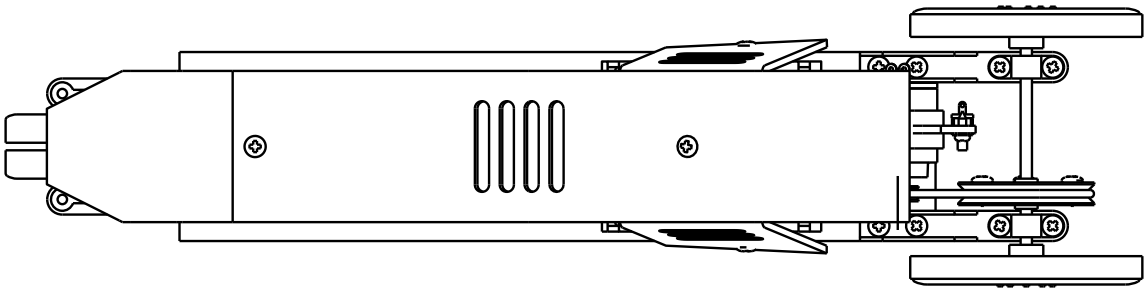
A4 TECHNOLOGIE www.a4.fr		A4	*PROJECT* **Dragster Compétition**	*PART* **Set**
	School	*Class*	*DOCUMENT TITLE* **Two examples of dragster configuration**	
Name	*Date*			



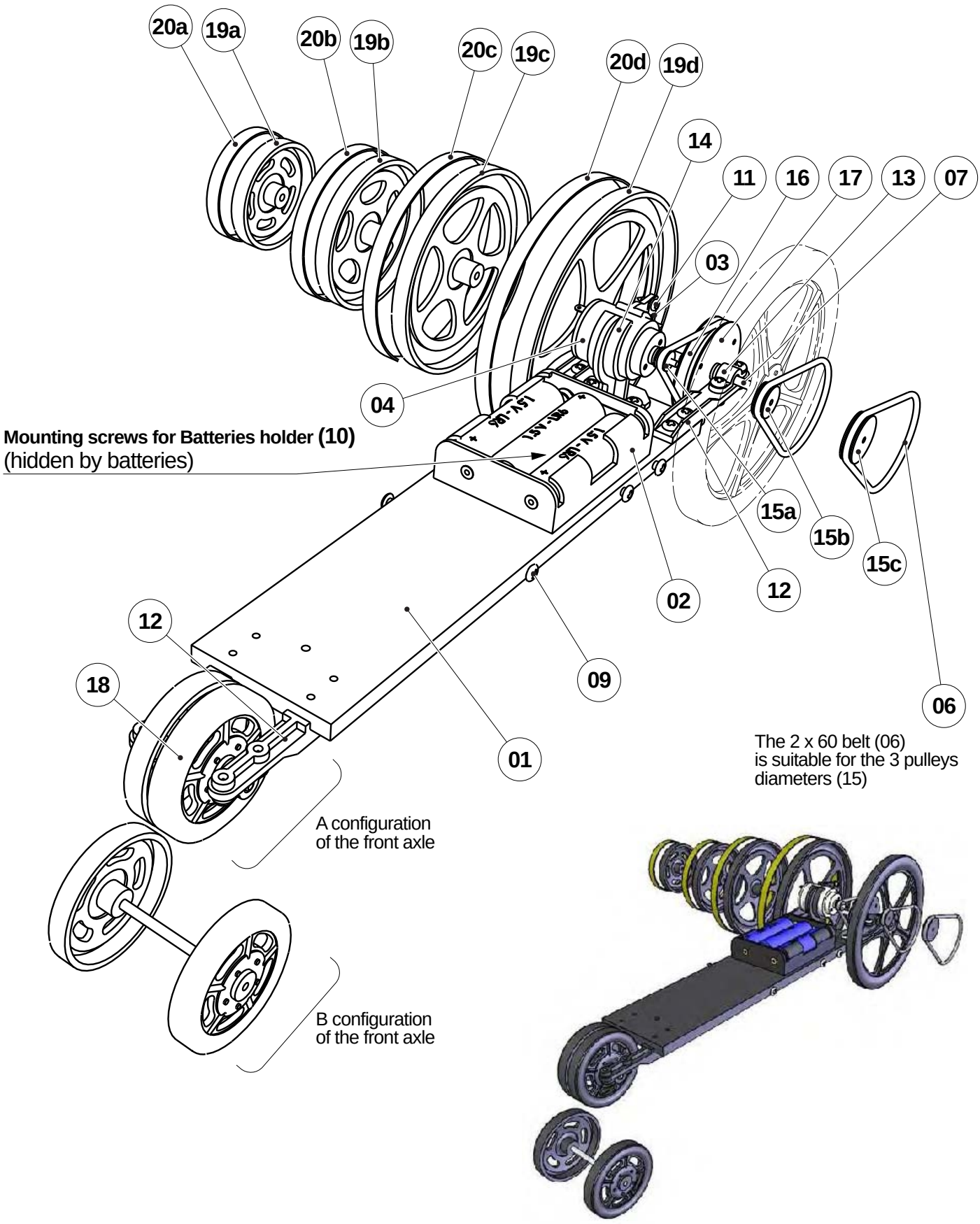


A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 2**	A4	*PROJECT* **Dragster Compétition**	*PART* **Set**
	School	*Class*	*DOCUMENT TITLE* **Example of dragster with flexible polypropylene body**	
Name		*Date*		





TECHNOLOGIE www.a4.fr	Scale 1 : 2	A4	PROJECT **Dragster Compétition**	PART **Set**
	School	Class	DOCUMENT TITLE **Example of dragster with polystyrene body**	
Name	Date			



A4 TECHNOLOGIE www.a4.fr		A4	PROJECT **Dragster Compétition**
	School	Class	
Name	Date		DOCUMENT TITLE **Perspectives with various construction options**

PART **Set without body**

22		Flexible body	Piece cut in a paper or polypropylene 190 X 235 raw format sheet then bent cold at assembly.
21		Rigid body thermobended	Pieces cut from a 2 mm PVC or PS and thermobended
21a	01	Cover	40 X 240 raw format
21b	01	Hoop	40 X 140 raw format

Body : several options available from semi-rigid or rigid thermoplatics materials
(The bodies different options aren't represented on the overall exploded view ; see pages 22 to 30)

20		Wheels tread : dimensions according to wheel Ø:	Rubber bracelet (dimensions listed : wide x length flat)
20a	04	6 x L 60 tread wide for a Ø 44 wheel	
20b	02	6 x L 80 tread wide for a Ø 60 wheel	
20c	02	6 x L 1000 tread wide for a Ø 80 wheel	
20d	02	6 x L 120 tread wide for a Ø 100 wheel	
19		Rear wheel : choice of various Ø :	Injected pieces on set "Drag" Réf DRAG -GRAP
19a	02	Ø 44 rear wheel	
19b	02	Ø 60 rear wheel	
19c	02	Ø 80 rear wheel	
19d	02	Ø 100 rear wheel	
18	02	Ø 44 front wheel	Injected pieces on set "Drag" Ref DRAG -GRAP
17	01	Pulley B flank D 3 x 34 (Ø 2 holes drilled)	Injected pieces on set "Drag" Ref DRAG -GRAP
16	01	Pulley A flank D 3 x 34 (Ø 3 holes drilled)	Injected pieces on set "Drag" Ref DRAG -GRAP
15		Driving half pulley - Choice of various Ø :	Injected pieces on set "Drag" Ref DRAG -GRAP
15a	02	Ø 6 half pulley	
15b	02	Ø 10 half pulley	
15c	02	Ø 15 half pulley	
14	01	Motor holder	Injected pieces on set "Drag" Réf DRAG -GRAP
13	04	Staple	Injected pieces on set "Drag" Réf DRAG -GRAP
12	04	Axle holder	Injected pieces on set "Drag" Réf DRAG -GRAP
11	02	Screw TC 2 x 6,5 (switch mounting)	Steel screw - Sheet metal - Cylindrical head - Ø 2 x lengh 6.5
10	02	Screw TF 3 x 6,5 (batteries holder mounting)	Vis acier - Type tôle - Milled head - Ø 3 x length 6.5
09	25	Screw TC 3 x 6,5 (all assemblies)	Steel screw - Sheet metal - Cylindrical head - Ø 3 x length 6.5
08	01	Front wheel axle	Steel Ø 3 x length according to front axle configuration: 36 or 57
07	01	Rear wheel axle	Steel axle Ø 3 x length 73
06	01	Belt	Elastic bracelet 2 x 60 - Ref BRAELA- 2X60-BD
05	01	Electrical wiring	L 50 mm - Retrieved on falls of wire from batteries holder
04	01	Motor	Ø 21 - Output axle Ø 2 - 4.5 V - Ref MOT-D21-2A
03	01	Switch	Micro unipolar switch with slider - Ref INV-GLI
02	01	Batteries holder	For 3 R6 batteries - Output wiring L 80 - Ref SUP-PIL-3R6FIL
01	01	Frame	200 x 50 x 6 mm thick Expanded PVC
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

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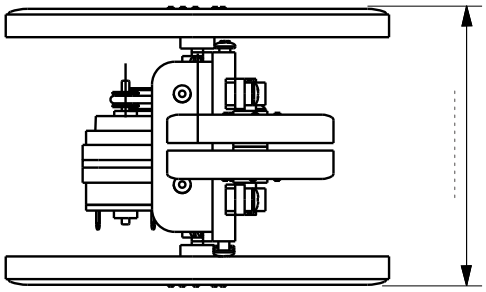
School *Class*

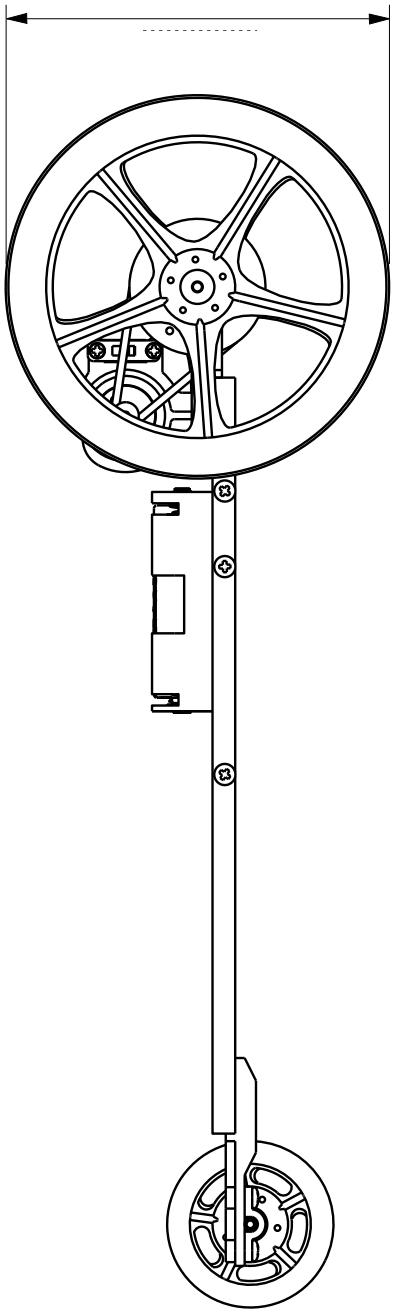
Name *Date*

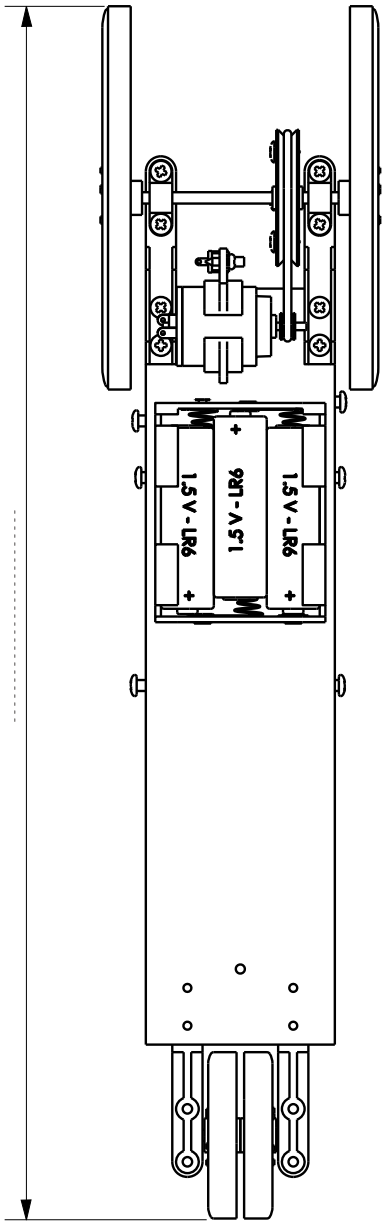
PROJECT **Dragster Compétition**

PART **Set**

DOCUMENT TITLE **General nomenclature**

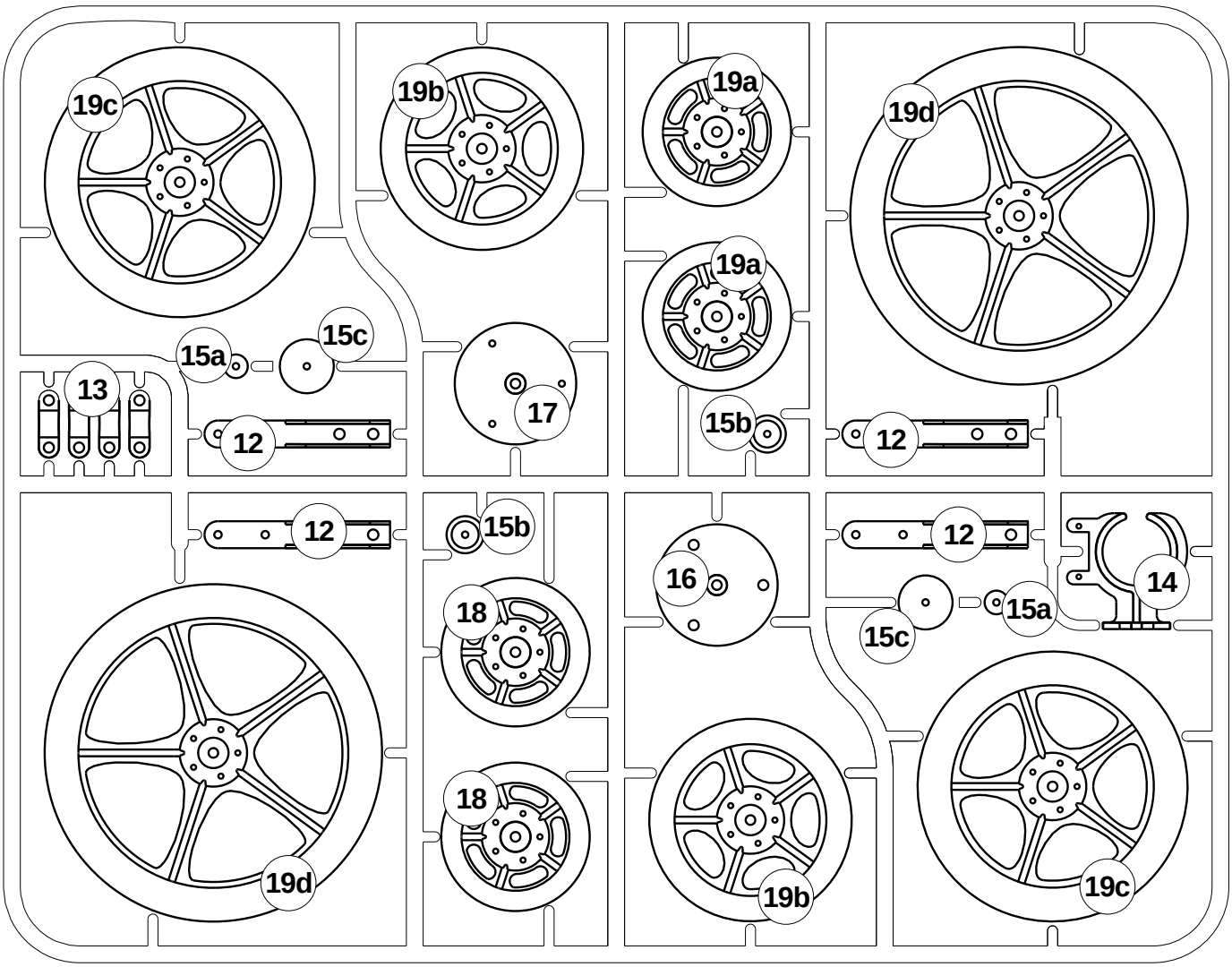






Exercise
Complete the quotation : identify the three overall dimensionsof the dragster without its body

TECHNOLOGIE www.a4.fr	**Scale 1 : 2**	A4	*PROJECT* **Dragster Compétition**	*PART* **Set without body**
	School	*Class*	*DOCUMENT TITLE* **Plan views**	
Name	*Date*			



Casting (channels cons-form through which the material was injected and that keeps parts) is shown in thin lines.

19		Rear wheel : choice of various Ø :	**Injected piece on set "Dragster" Réf DRAG -GRAP**
19a	02	Ø 44 rear wheel	
19b	02	Ø 60 rear wheel	
19c	02	Ø 80 rear wheel	
19d	02	Ø 100 rear wheel	
18	02	Ø 44 front wheel	**Injected piece on set "Dragster" Ref DRAG -GRAP**
17	01	Pulley B flank D 3 x 34	**Injected piece on set "Dragster" Ref DRAG -GRAP**
16	01	Pulley A flank D 3 x 34	**Injected piece on set "Dragster" Ref DRAG -GRAP**
15		Half pulley : choice of various Ø :	**Injected piece on set "Dragster" Ref DRAG -GRAP**
15a	02	Ø 6 half pulley	
15b	02	Ø 10 half pulley	
15c	02	Ø 15 half pulley	
14	01	Motor holder	**Injected piece on set "Dragster" Réf DRAG -GRAP**
13	04	Staple	**Injected piece on set "Dragster" Réf DRAG -GRAP**
12	04	Axle holder	**Injected piece on set "Dragster" Réf DRAG -GRAP**
MARK	**NUMBER**	**DESIGNATION**	**CHARACTERISTICS**

A4 TECHNOLOGIE www.a4.fr

Scale 1 : 2 | **A4**

School *Class*

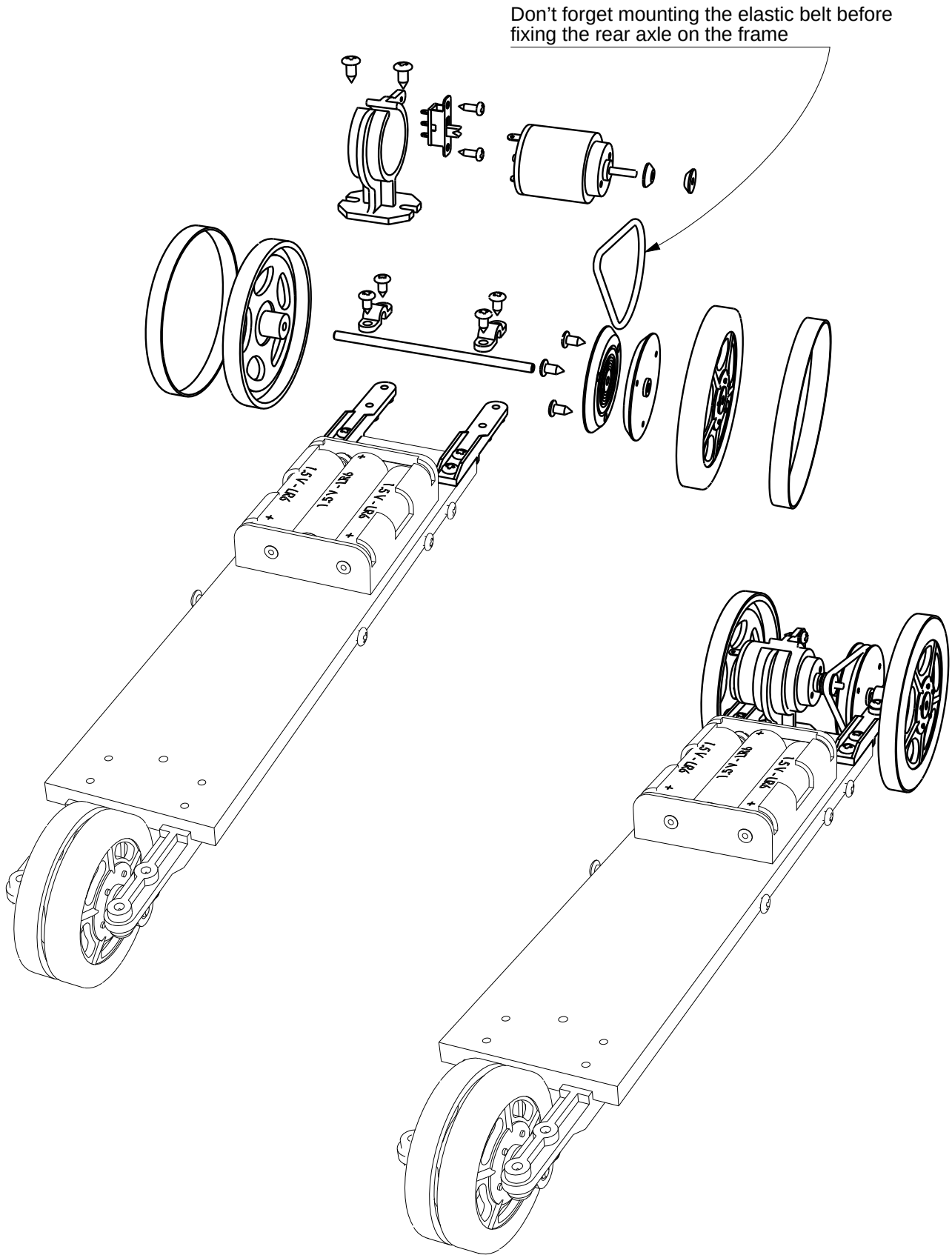
Name *Date*

PROJECT ***Dragster Compétition***

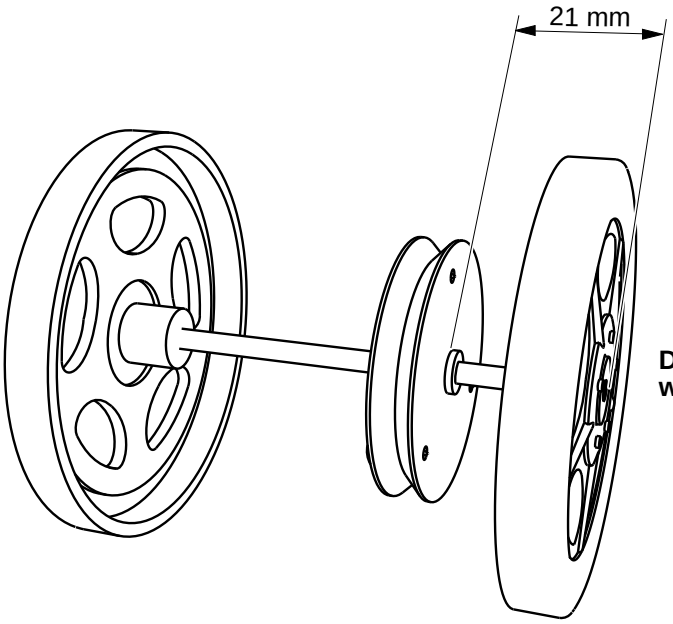
PART **Set of injected parts**

DOCUMENT TITLE

Identifying parts of the set



TECHNOLOGIE www.a4.fr	A4	PROJECT **Dragster Compétition**	PART **Rear axle (Propulsion function)**
School	Class	DOCUMENT TITLE **Exploded view and perspective**	
Name	Date		



Detailed fitting of the pulley on the rear wheel axle length 73

MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
20		Wheels tread : dimensions with wheel Ø :	Rubber bracelet (dimensions listed : wide x length flat)
20a	04	Wide tread 6 x L 60 for Ø 44 wheel	
20b	02	Wide tread 6 x L 80 for Ø 60 wheel	
20c	02	Wide tread 6 x L 1000 for Ø 80 wheel	
20d	02	Wide tread 6 x L 120 for Ø 100 wheel	
19		Rear wheels : choice of various Ø :	Injected parts on set “Drag” Ref DRAG -GRAP
19a	02	Ø 44 rear wheel	
19b	02	Ø 60 rear wheel	
19c	02	Ø 80 rear wheel	
19d	02	Ø 100 rear wheel	
17	01	Pulley B flank D 3 x 34 (Ø 2 holes drilled)	Injected parts on set “Drag” Ref DRAG -GRAP
16	01	Pulley A flank D 3 x 34 (Ø 3 holes drilled)	Injected parts on set “Drag” Ref DRAG -GRAP
15		Half pulley : choice of various Ø :	Injected parts on set “Drag” Ref DRAG -GRAP
15a	02	Ø 6 half pulley	
15b	02	Ø 10 half pulley	
15c	02	Ø 15 half pulley	
14	01	Motor holder	Injected parts on set “Drag” Ref DRAG -GRAP
13	04	Staple	Injected parts on set “Drag” Ref DRAG -GRAP
12	04	Axle holder	Injected parts on set “Drag” Ref DRAG -GRAP
11	02	Screw TC 2 x 6,5 (switch fixation)	Steel screw - sheet metal - Cylindrical head - Ø 2 x length 6.5
09	25	Screw TC 3 x 6,5 (all assemblies)	Steel screw - sheet metal - Cylindrical head - Ø 3 x length 6.5
07	01	Rear wheel axle	Steel axle - Ø 3 x length 73
06	01	Belt	Elastic bracelet 2 x 60 - Ref BRAELA- 2X60-BD
05	01	Electrical wiring	L 50 mm - Retrieved on falls of wire from the batterie holder
04	01	Motor	Ø 21 - Axle output Ø 2 - 4.5 V - Ref MOT-D21-2A
03	01	Switch	Micro unipolar switch with slider - Ref INV-GLI
01	01	Frame	200 x 50 x 6 mm thickness expanded PVC

A4 TECHNOLOGIE www.a4.fr

A4

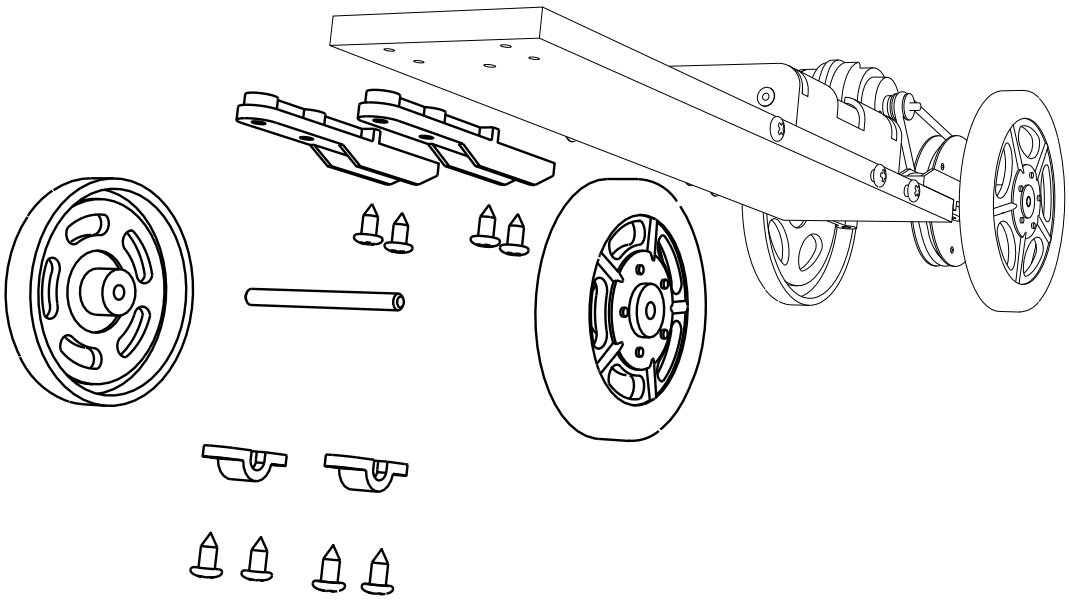
School *Class*

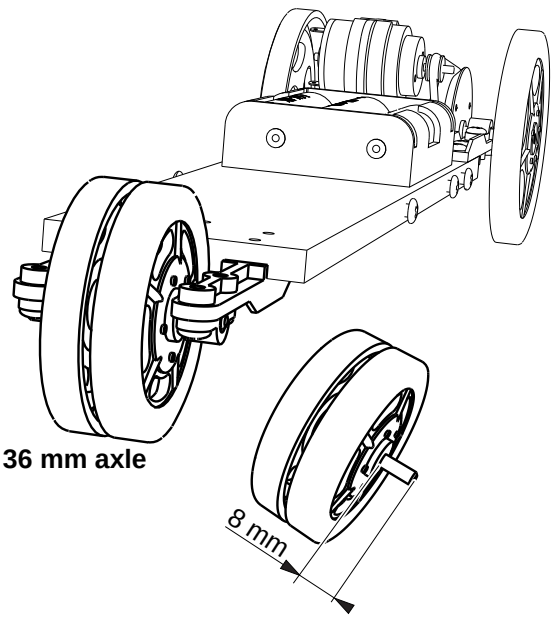
Name *Date*

PROJECT
Dragster Compétition

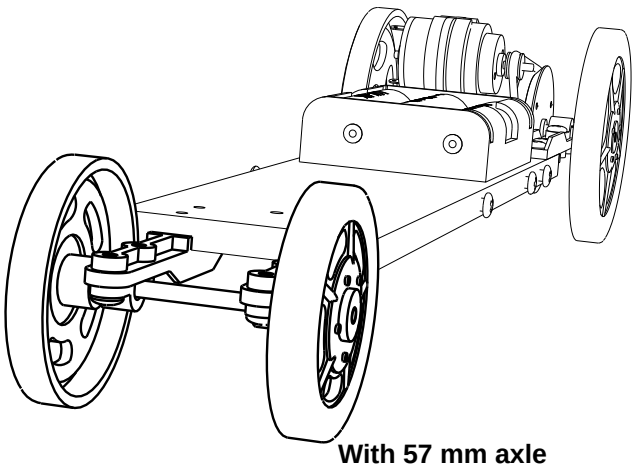
PART
Rear axle (Propulsion function)

DOCUMENT TITLE
Nomenclature





With 36 mm axle



With 57 mm axle

MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
20a	02	6 x L 60 wide tread for Ø 44 wheel	Rubber bracelet - *Not shown on drawing*
18	02	Ø 44 front wheel	Injected part on set “Drag” Ref DRAG -GRAP
13	04	Staple	Injected part on set “Drag” Ref DRAG -GRAP
12	04	axle holder	Injected part on set “Drag” Ref DRAG -GRAP
09	8	Screw TC 3 x 6,5 (all assemblies)	Steel screw - Sheet metal - Cylindrical head - Ø 3 x length 6.5
08	01	Front wheel axle	Steel Ø 3 x length according to the front axle : 36 or 57
01	01	Frame	200 x 50 x 6 mm thickness Expanded PVC

A4 TECHNOLOGIE www.a4.fr

A4

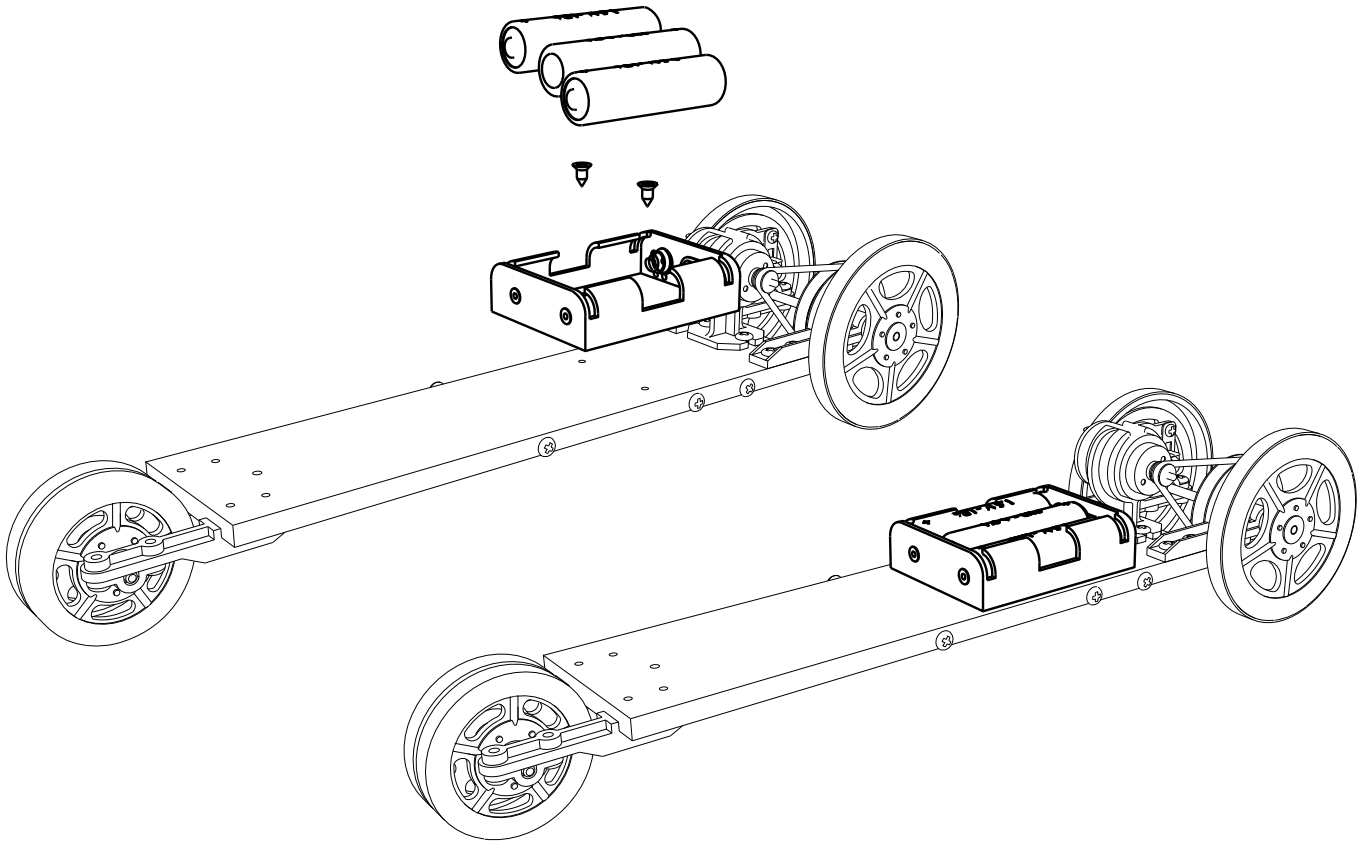
School

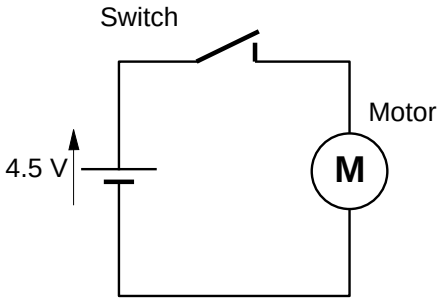
Name *Date*

PROJECT
Dragster Compétition

PART
Front axle (Guide function)

DOCUMENT TITLE
Exploded view and perspectives Nomenclature

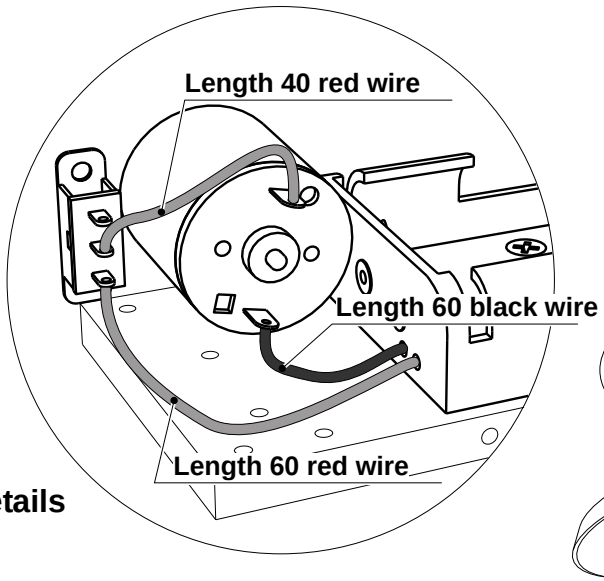




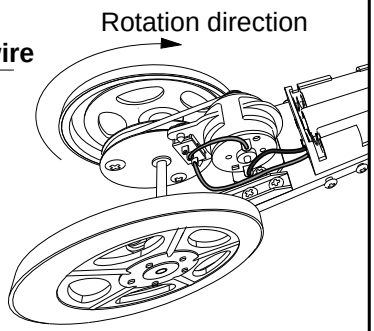
Wiring diagram

Marks on motors rear faces may be different from one serie to another. It's nécessary to check the direction of rotation before fixing the wiring rule

Electrical wiring length
wires from the battery holder must be cut to 60 mm length.
The red wire fall is used for motor / switch connection



Wiring details



MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
10	02	Screw TF 3 x 6,5 (batteries holder fixation)	Steel screw - Sheet metal - Milled head - Ø 3 x length 6.5
05	01	Electrical wiring	L 50 mm - Retrieved on wire falls from batteries holder
02	01	batteries holder	For 3 R6 batteries - Wires output L 80 - Ref SUP-PIL-3R6FIL
01	01	Frame	PVC Expansé 200 x 50 x épaisseur 6 mm

A4 TECHNOLOGIE www.a4.fr

A4

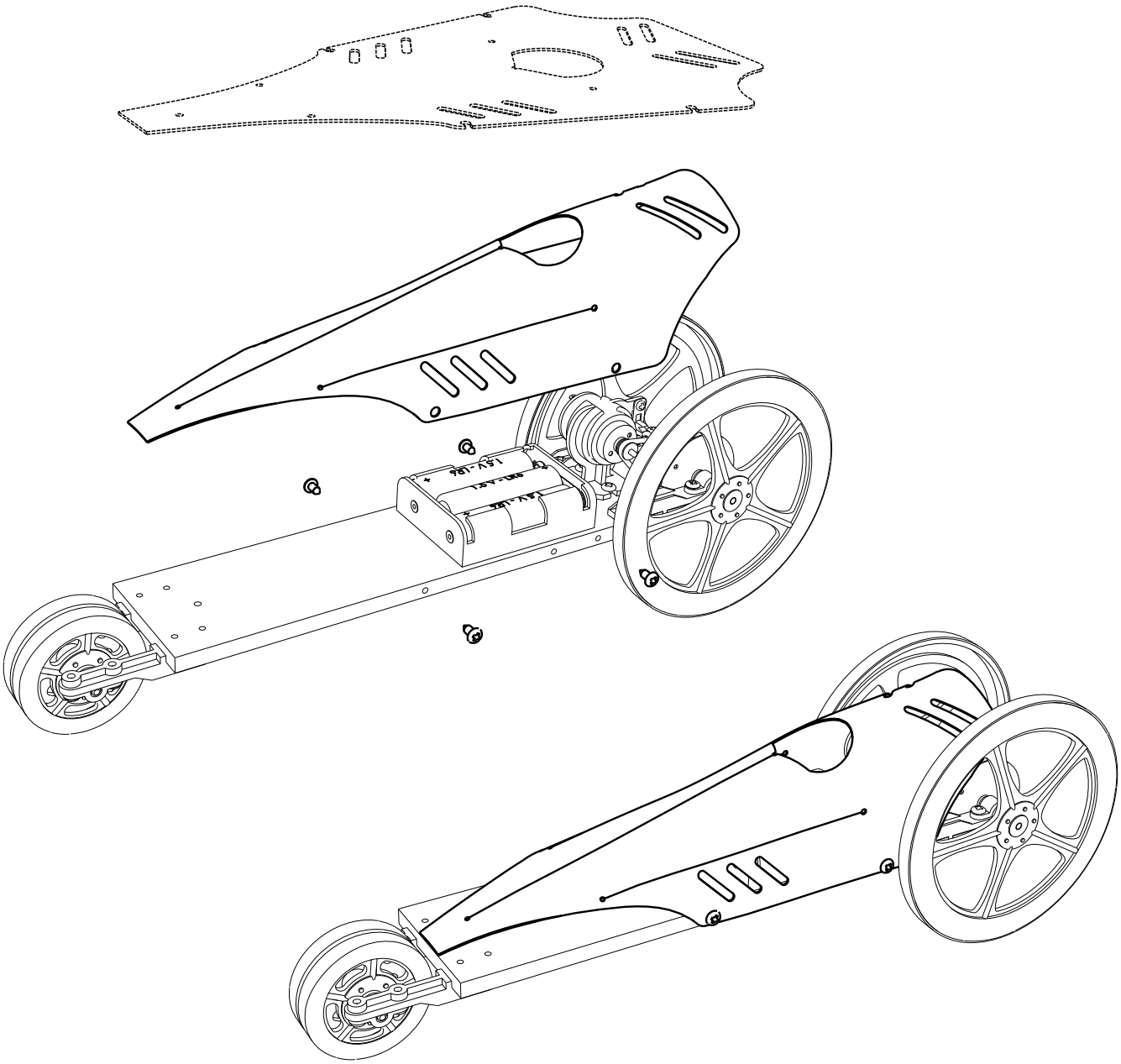
School *Class*

Name *Date*

PROJECT **Dragster Compétition**

PART Batterie holder (Power supply Function)

DOCUMENT TITLE
Exploded view and perspective - Wiring detail Nomenclature



MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
22	01	Flexible body	Part cut in a paper or polypropylene sheet 190 X 235 raw format then cold bended at mounting.
09	04	Screw TC 3 x 6,5	Steel screw - Sheet metal - Cylindrical - Ø 3 x length 6.5
01	01	Frame	200 x 50 x 6 mm thickness Expanded PVC

A4 TECHNOLOGIE www.a4.fr

A4

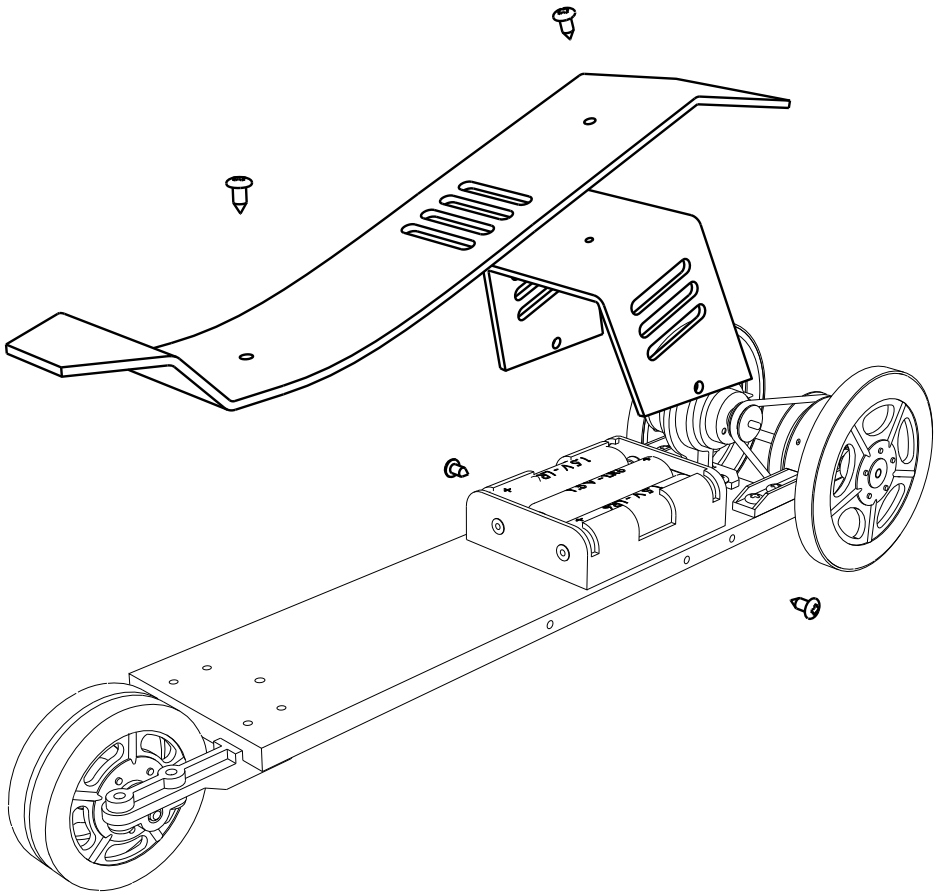
School *Class*

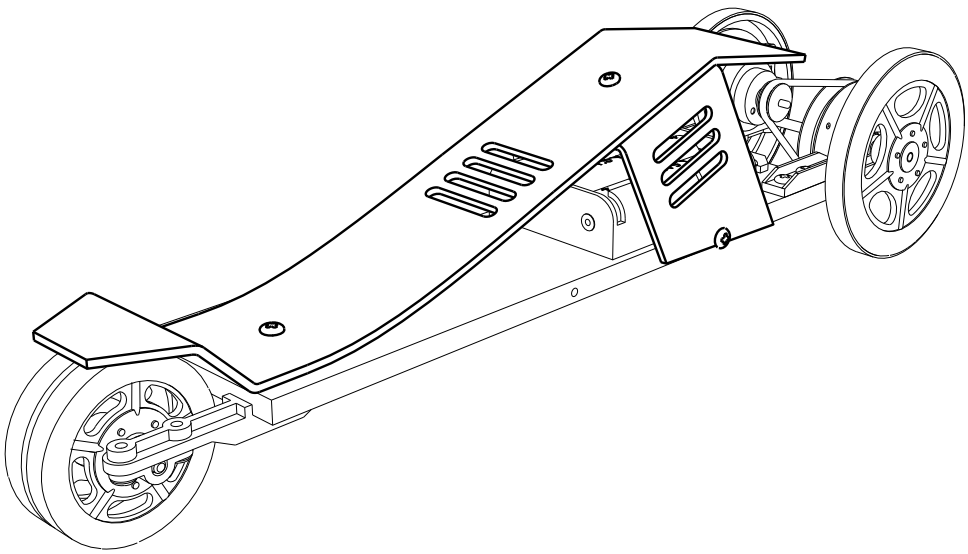
Name *Date*

PROJECT
Dragster Compétition

PART
Flexible body (Design function)

DOCUMENT TITLE
Exploded view and perspective Nomenclature of the function





MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
21		Rigid body thermobended	Parts cut in a 2 mm PVC or PS 2 thermobended
21a	01	Cowl	40 X 240 raw format
21b	01	Hoop	40 X 140 raw format
09	03	Screw TC 3 x 6.5	Steel screw - Sheet metal - Cylindrical head - Ø 3 x length 6.5
01	01	Frame	200 x 50 x 6 mm thickness Expanded PVC

A4 TECHNOLOGIE www.a4.fr

A4

School *Class*

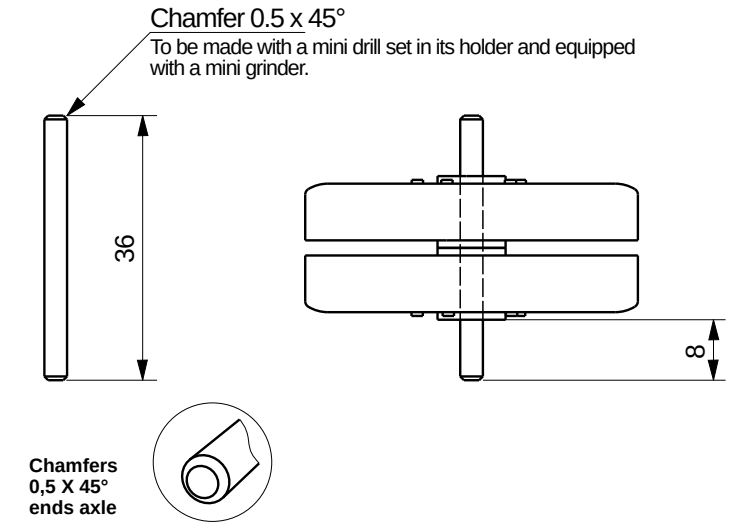
Name *Date*

PROJECT
Dragster Compétition

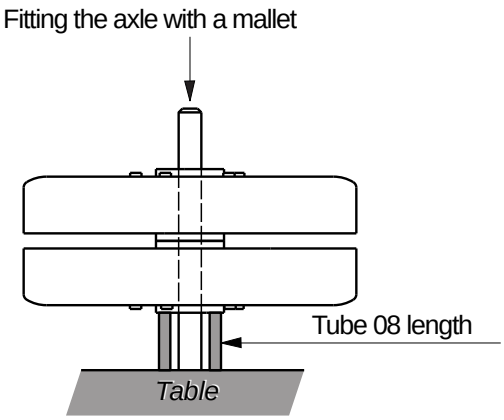
PART
Rigid body

DOCUMENT TITLE
Exploded view and perspective
Nomenclature of the function

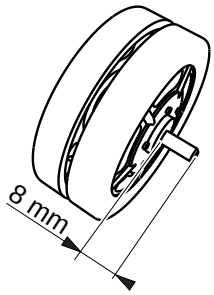
Wheels mounted on length 36 axle



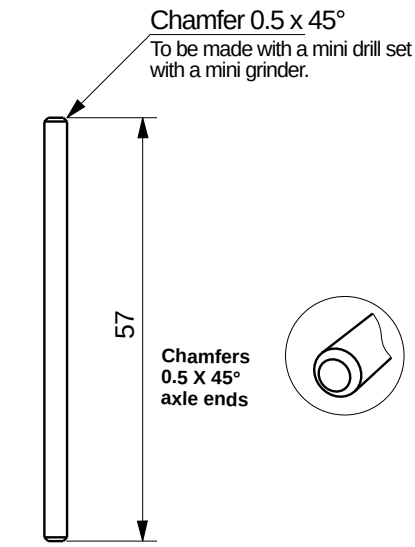
length36 axle



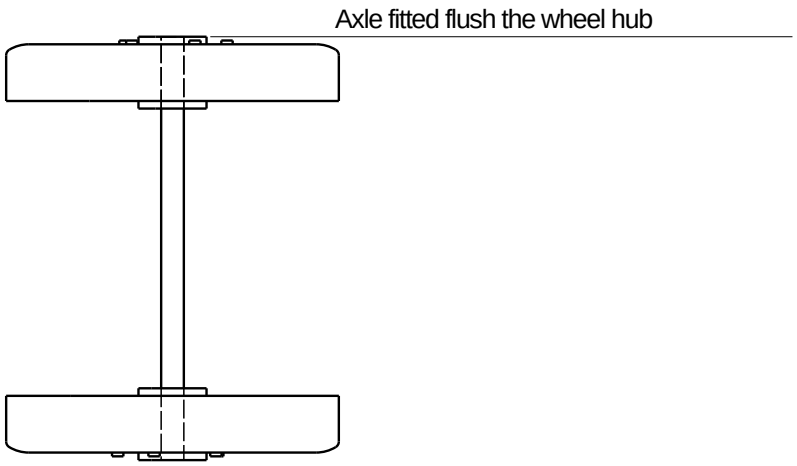
Fitting wheels



Wheels mounted on 57



57 length axle



Fitting wheels

MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
18	02	Ø 44 front wheel	Injected parts on set “Drag” Ref DRAG -GRAP
08	01	Front wheels axle	Steel Ø 3 x length according to the front axle configuration : 36 or 57

A4 TECHNOLOGIE www.a4.fr

Echelle 1 : 1 | **A4**

School *Class*

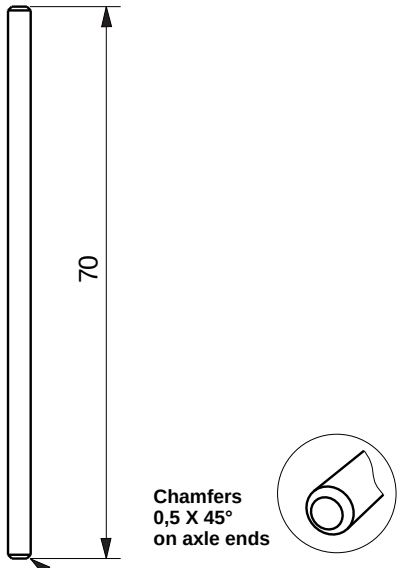
Name *Date*

PROJECT ***Dragster Compétition***

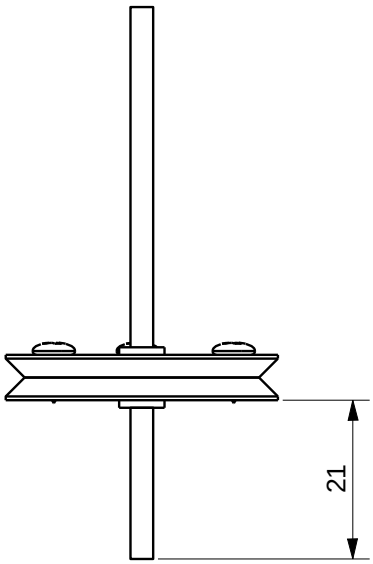
PART **Front hub**

DOCUMENT TITLE **Assembly plan**

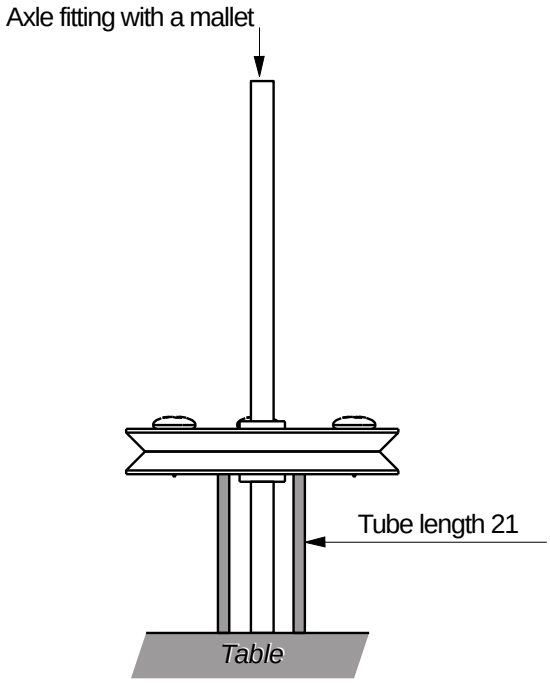
L 73 axle and pulley fitting



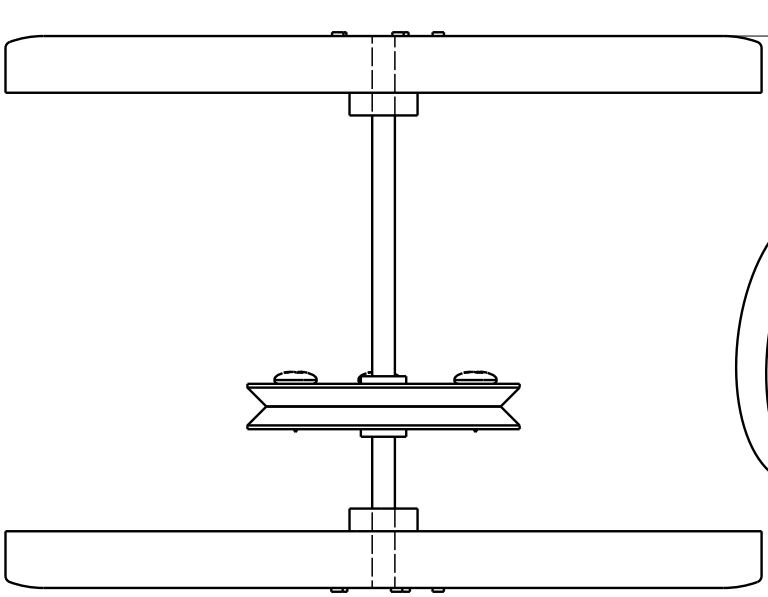
70 length axle

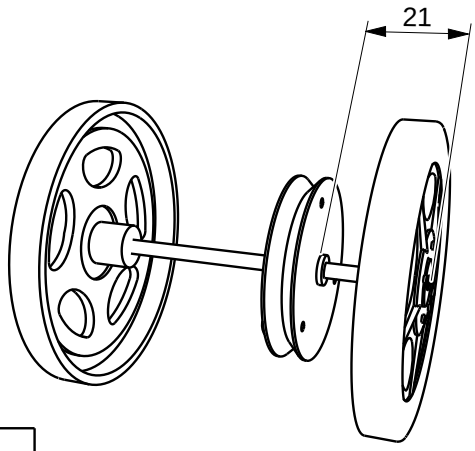


Pulley fitting



Wheels fitting (example with Ø 100 wheels)





MARK	NUMBER	FUNCTIONS	CHARACTERISTICS
19		Rear wheels : choice of various Ø :	Injected part on set “Drag” Ref DRAG -GRAP
19a	02	Ø 44 rear wheel	
19b	02	Ø 60 rear wheel	
19c	02	Ø 80 rear wheel	
19d	02	Ø 100 rear wheel	
07	01	rear wheel axle	Steel axle Ø 3 x length 73

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Scale 1 : 1 | **A4**

School *Class*

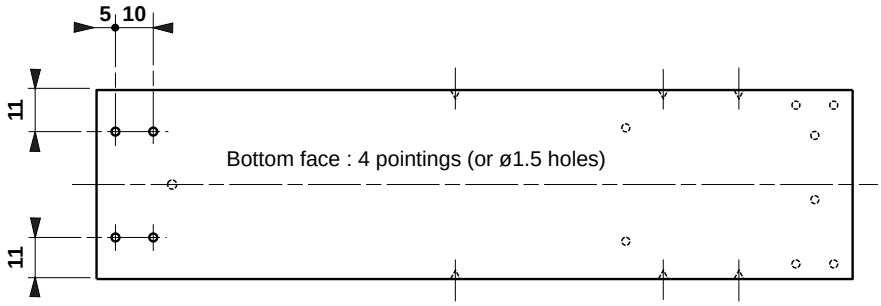
Name *Date*

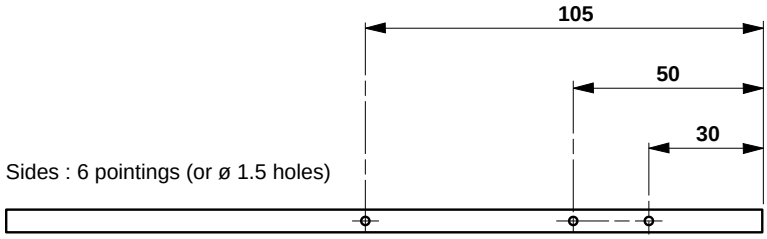
PROJECT ***Dragster Compétition***

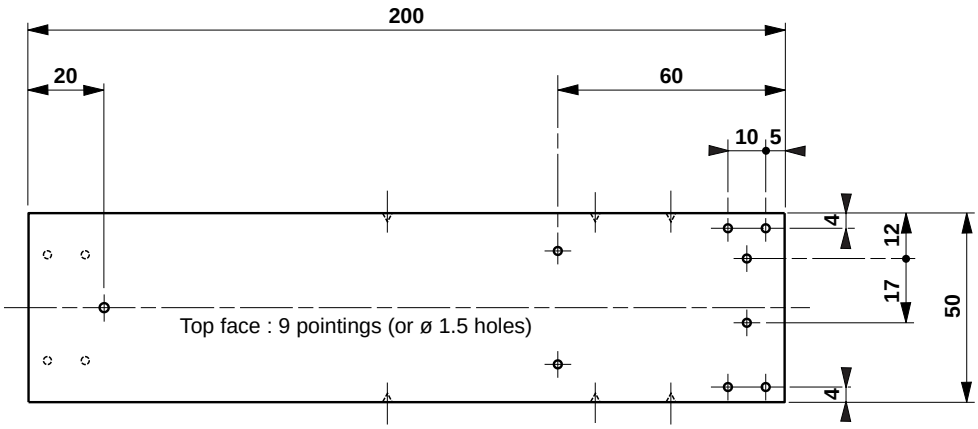
PART **Rear hub**

DOCUMENT TITLE **Assembly plan**

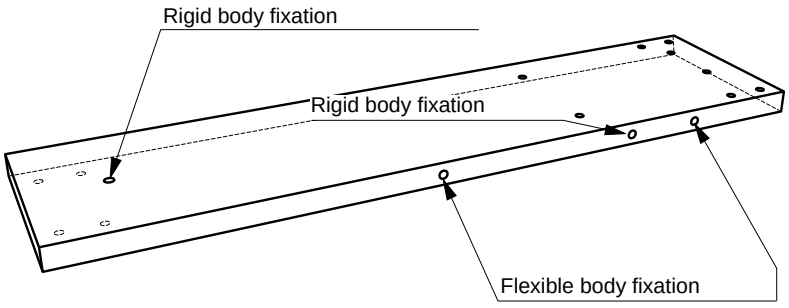
All pointing represented (9 on the top face, 4 on the bottom face + 6 on slices)
are used for assembly screws positioning. They can be performed with a punch or
a drill ø 1,5 x 2 mm depth.
If performing with Digital Command, for the bottom face 4 holes, holes can be made from the top face.





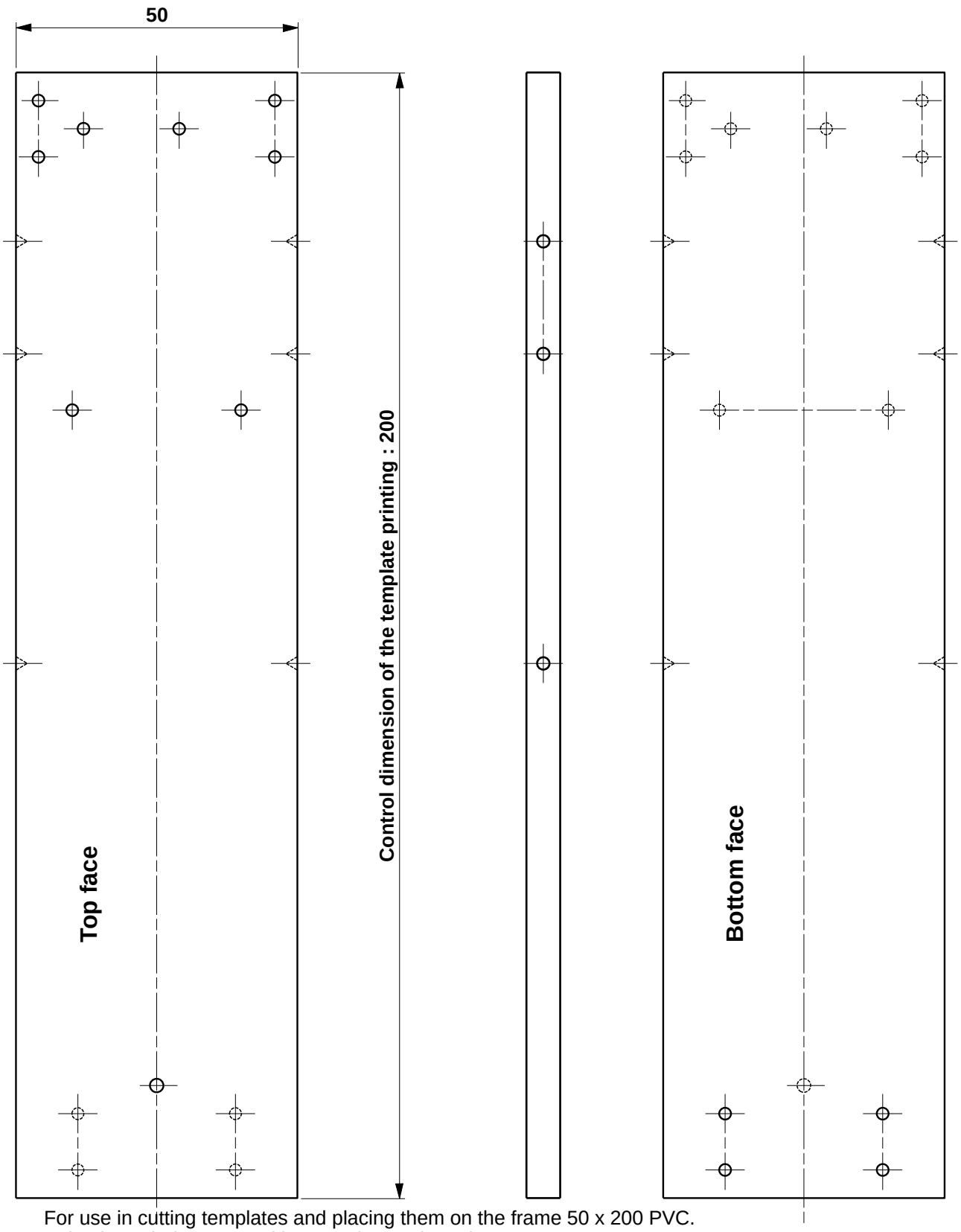


Depending on the mounted body type,
all pointings aren't useful :



01	01	Frame	200 x 50 x 6 mm thickness expanded PVC
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

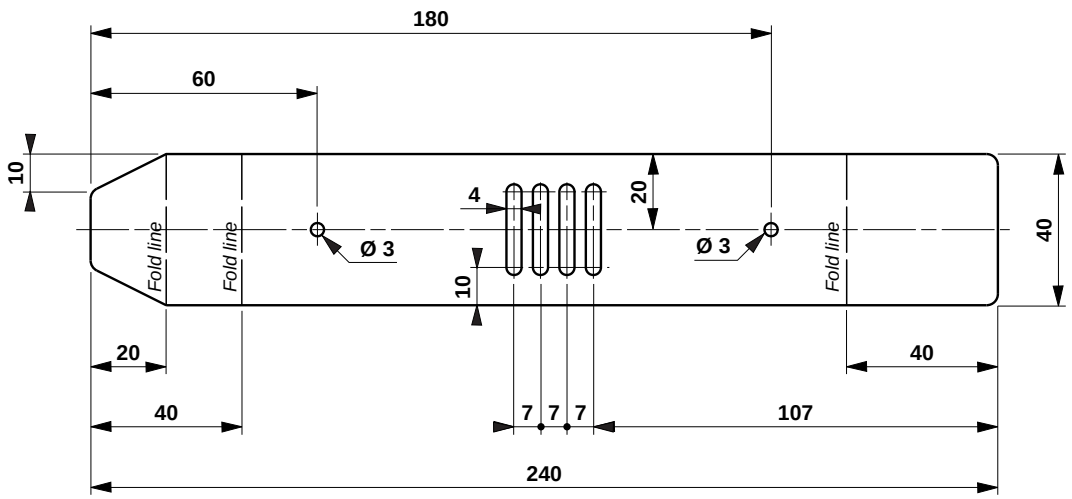
A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 2**	A4	*PROJECT* **Dragster Compétition** / *PART* **Frame**
	School / *Class*		*TITRE DU DOCUMENT* **Drawing definition**
Name / *Date*			

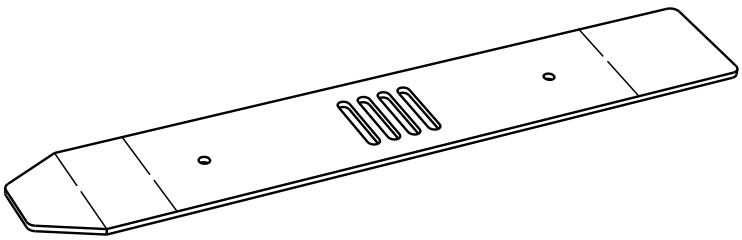


For use in cutting templates and placing them on the frame 50 x 200 PVC.
Point through the paper with a punch or a dry point.
For pointing on slices, it's easier to draw with a rule and then point.

01	01	Frame	200 x 50 x 6 mm thickness expanded PVC
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

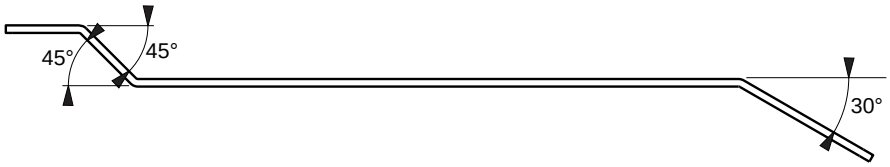
A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 1**	**A4**	*PROJECT* **Dragster Compétition** / *PART* **Frame**
	School / *Class*		*DOCUMENT TITLE* **Template for holes pointing**
Name / *Date*			

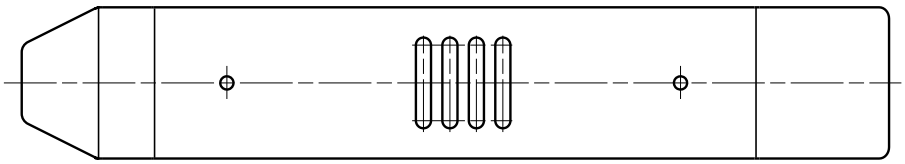


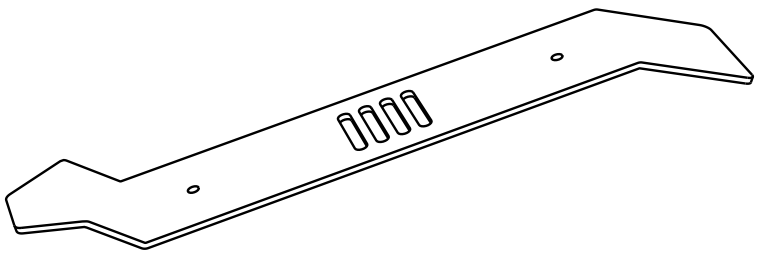


21a	01	Cowl	PS OR PVC 2 mm X 40 X 240
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 2**	A4	C *Dragster Compétition* / PART **Rigid body**
	School / *Class*		
Name / *Date*			*DOCUMENT TITLE* **Cowl drawing definition before folding**

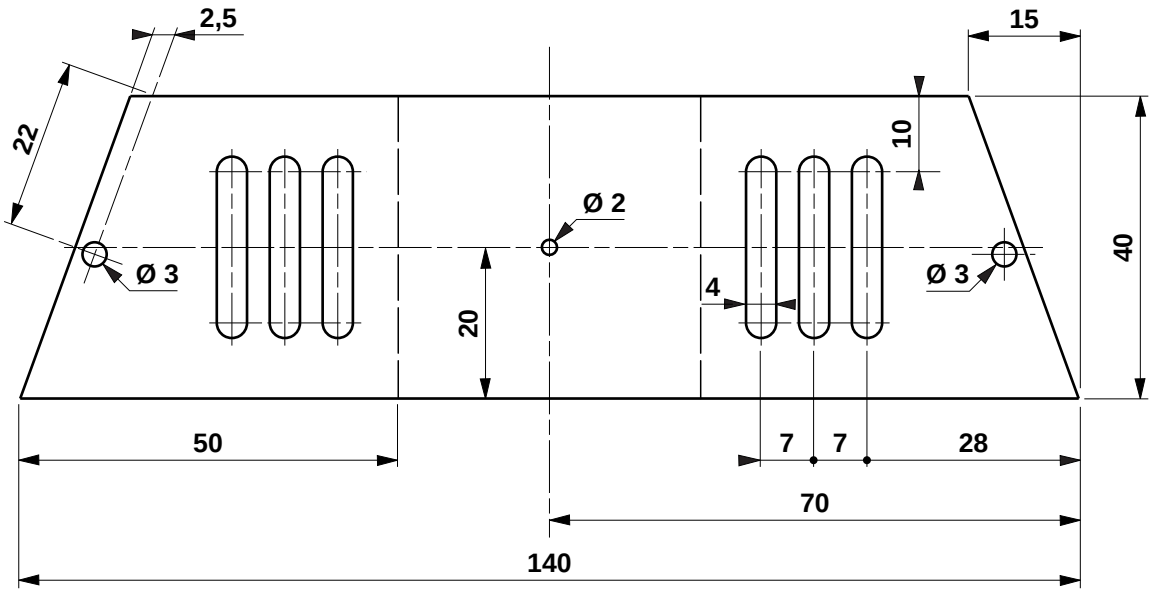


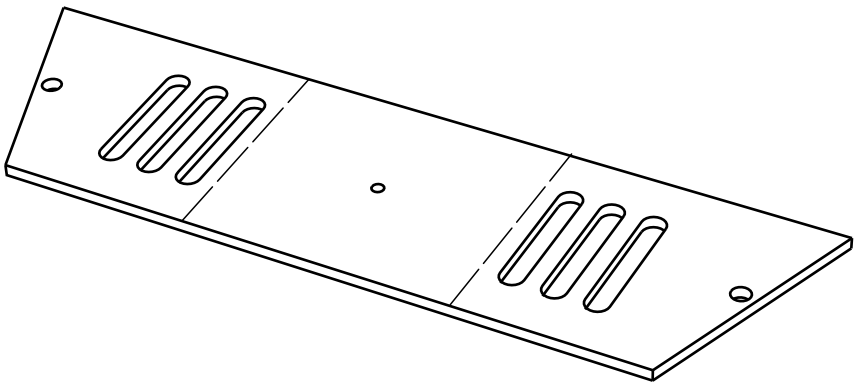




21a	01	Cowl	PS OR PVC 2 mm X 40 X 240
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 2**	A4	*PROJECT* **Dragster Compétition** / *PART* **Rigid frame**
	School	*Class*	*DOCUMENT TITLE* **Cowl folded drawing definition**
Name	*Date*		





21b	01	Hoop	PS OR PVC 2 mm X 40 X 140
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

A4 TECHNOLOGIE www.a4.fr

Scale: 1 : 1 | **A4**

School *Class*

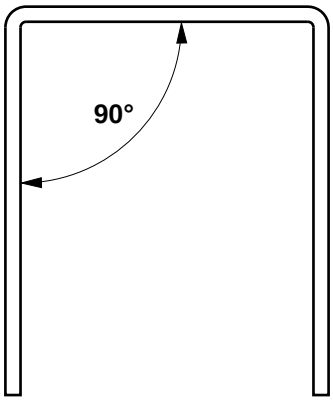
Name *Date*

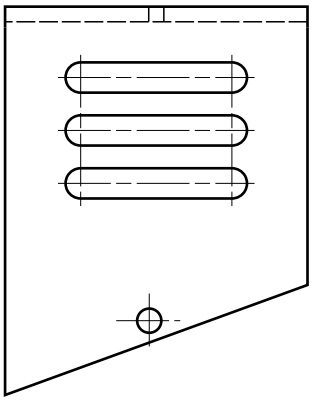
PROJECT ***Dragster Compétition***

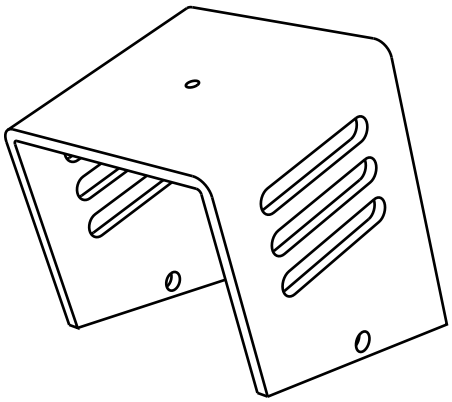
PART **Rigid frame**

DOCUMENT TITLE

Hoop drawing definition before folding







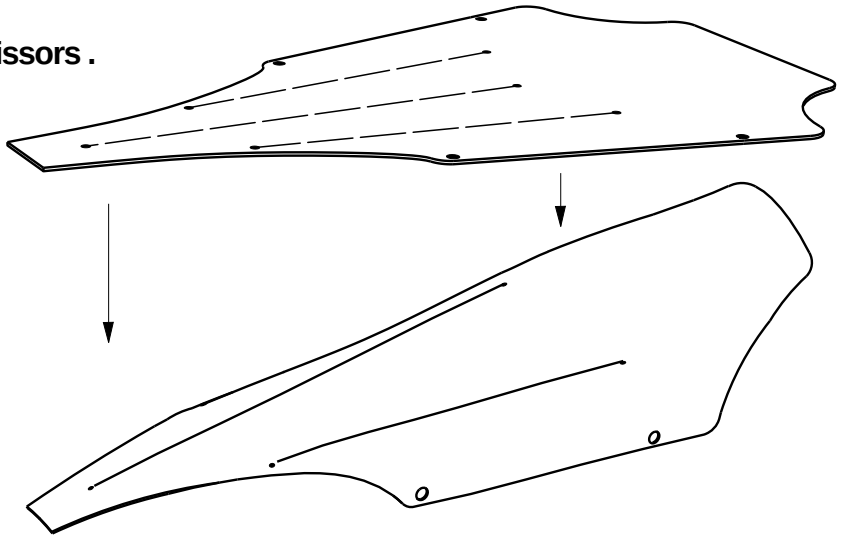
21b	01	Hoop	PS OR PVC 2 mm X 40 X 140
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 1**	A4	*PROJECT* **Dragster Compétition** / *PART* **Rigid frame**
	School	*Class*	*DOCUMENT TITLE* **Hoop folded drawing definition**
Name	*Date*		

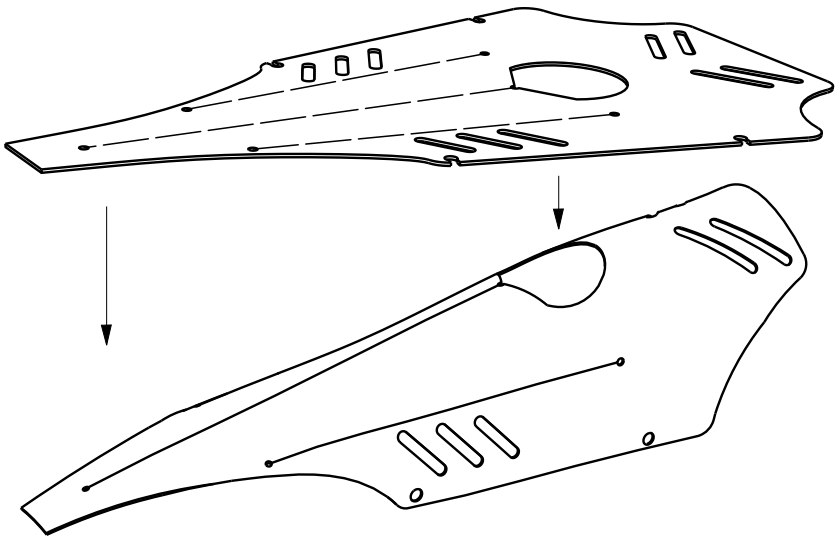
This body model is cut flat in a soft material (thin plastic) and shaped during mounting on the dragster.
The pre-folding with 3 ribs improves body design.

Two achievement methods are possibles :
1 - Manual cutting with scissors .
2 - Cutting with a mini digital command milling machine.
That latter method allows to improve the part easier with a more elaborate cutting.

1 - Model manually cut with scissors .



2 - Model cut with a mini digital command milling machine.
This method makes easy internal cuts to improve part design.
The 3D file and exports in .dxf and other "recoverable" formats abour F.A.O. softwares are on the project CDROM (ref. : CD-DRC).

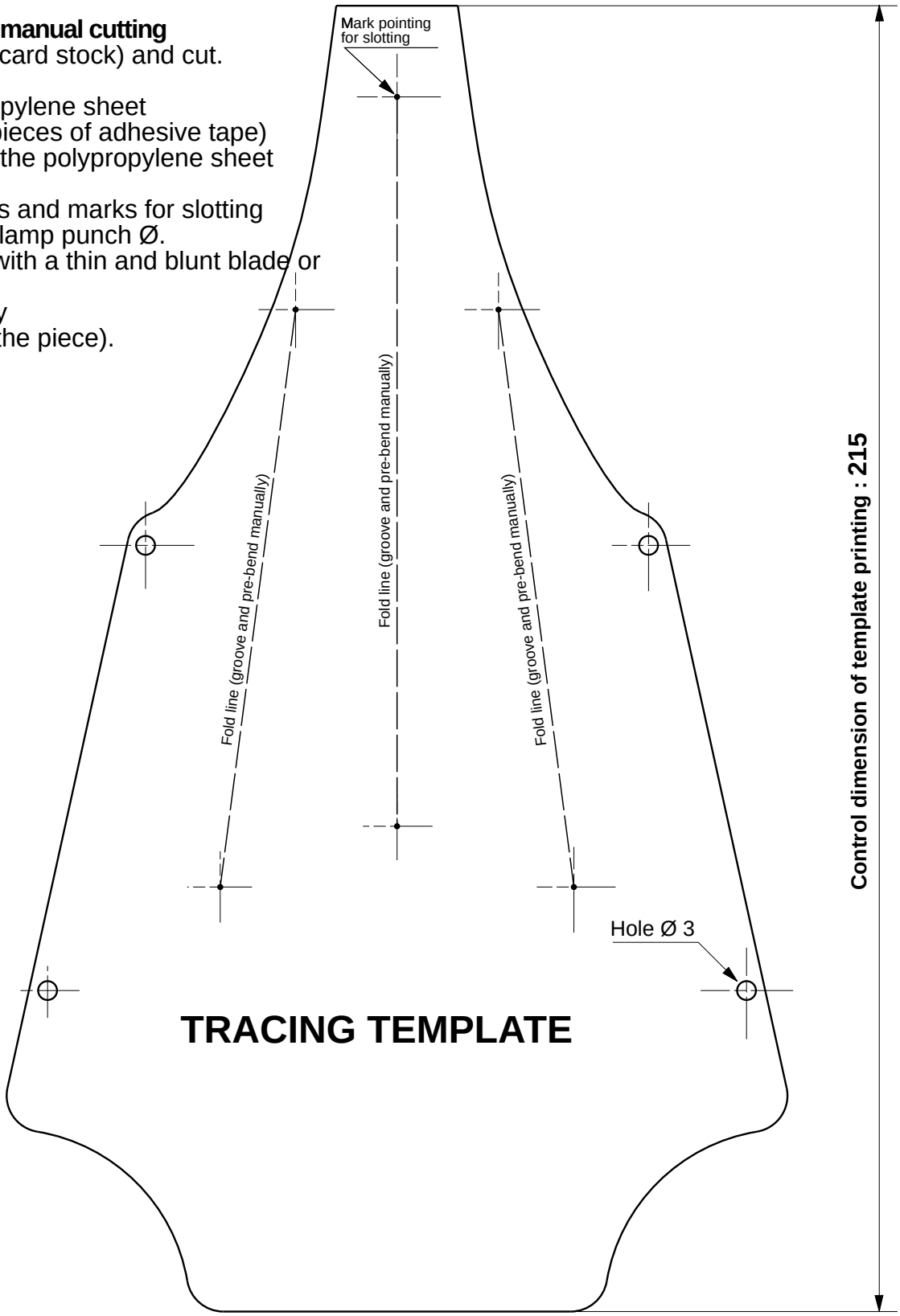


22	01	Flexible body	Piece cut in a paper or polypropylene sheet 190 X 235 raw format then cold bent during assembly.
MARK	NUMBER	FUNCTIONS	CHARACTERISTICS

A4 TECHNOLOGIE www.a4.fr	Scale 1 : 1	A4	PROJECT: Dragster Compétition / PART: Polypropylene flexible body
	School / Class		DOCUMENT TITLE: Presentation
Name / Date			

Racing template for manual cutting
print on thin board (card stock) and cut.

- Put on the polypropylene sheet
(Maintain with two pieces of adhesive tape)
- Draw template on the polypropylene sheet with a dry point.
- Point holes centers and marks for slotting
- Drill holes with a clamp punch Ø.
- Groove fold lines with a thin and blunt blade or a dry point.
- Pre-bend manually
(bending inward of the piece).



22	01	Flexible body	Piece cut in a paper or polypropylene sheet 190 X 235 raw format then cold bent during assembly.
MARK	NUMBER	FUNCTIONS	CHARACTERISTICS

A4 TECHNOLOGIE www.a4.fr

Scale 1 : 1 | A4

School | Class

Name | Date

PROJECT: Dragster Compétition

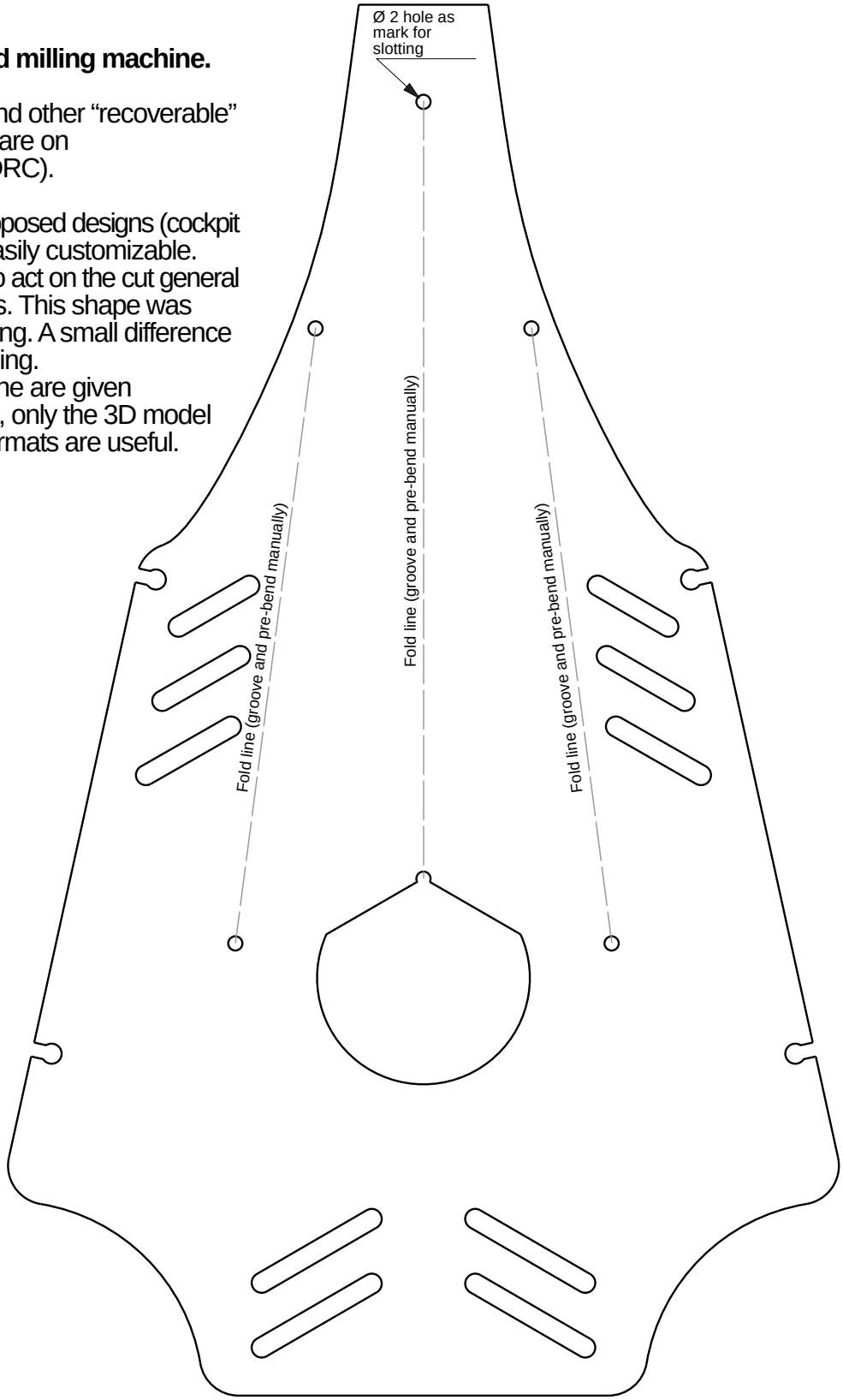
PART: Polypropylene flexible body

DOCUMENT TITLE: tracing template for manual cutting

Polypropylene body drawing
cut with mini digital command milling machine.

Thr 3D file and exports in .dxf and other “recoverable” formats about F.A.O. softwares are on the project CDROM (ref. : CD-DRC).

It goes without saying that the proposed designs (cockpit and engine vents cutting) are easily customizable. However, it will be more difficult to act on the cut general shape and on pre-bending lines. This shape was developped after extensive testing. A small difference in dimension may affect everything.
No dimension and no building line are given on this drawing as to machining, only the 3D model and exports under computer formats are useful.



22	01	Fexible body	Piece cut in a paper or polypropylene sheet 190 X 235 raw format then cold bent during assembly.
MARK	NUMBER	FUNCTIONS	CHARACTERISTICS

A4 TECHNOLOGIE www.a4.fr

Scale 1 : 1 | A4

School *Class*

Name *Date*

PROJECT **Dragster Compétition**

PART **Polypropylene flexible body**

DOCUMENT TITLE

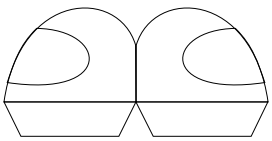
Drawing of the cut model on mini CNC milling machine

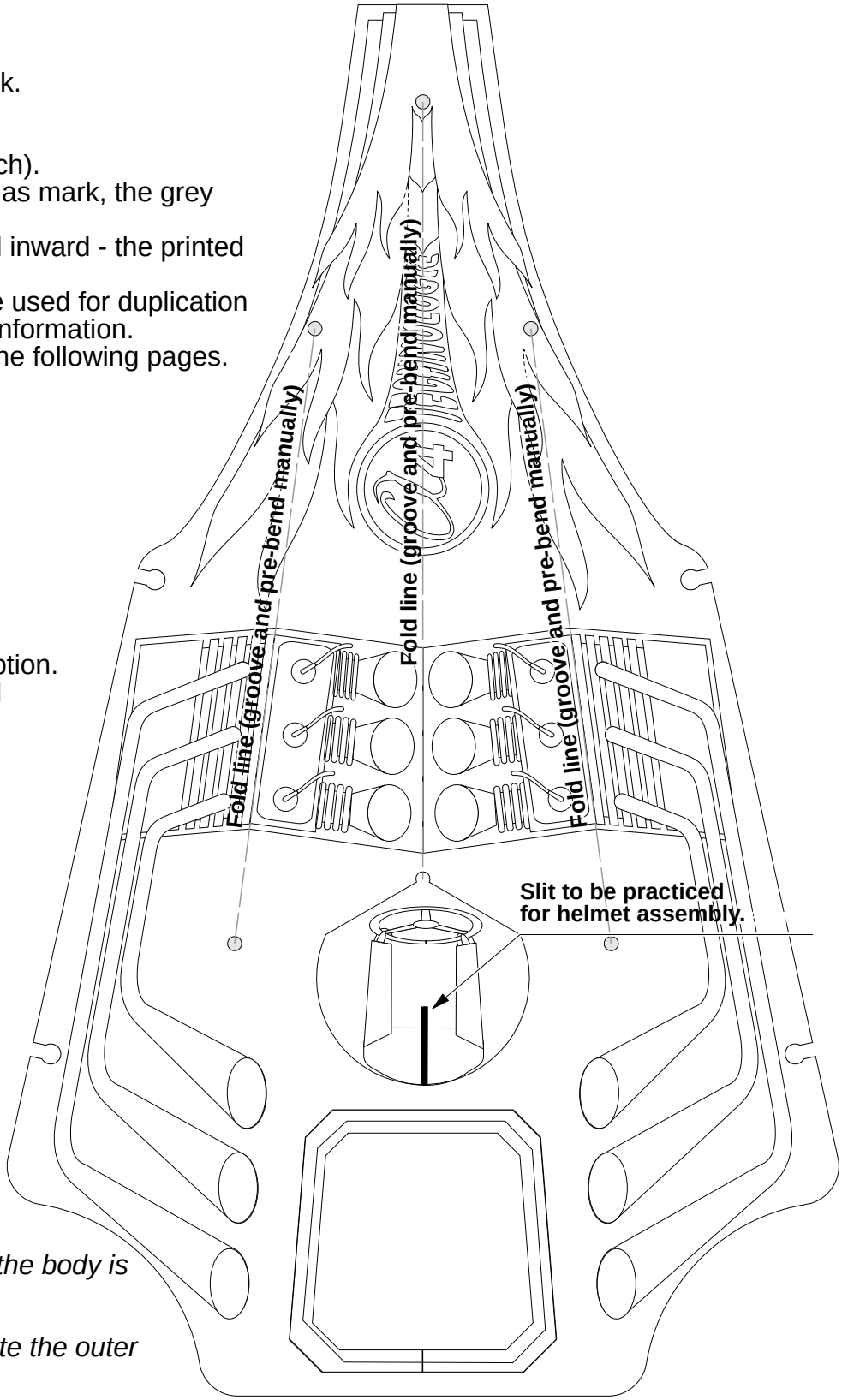
Paper body drawing

- Print on paper or card stock.
- Laminate
- Cut with scissors
(for fastener holes, use punch).
- Groove 3 fold lines, taking as mark, the grey circles on the plan beside.
- Pre-bend the 3 folds (bend inward - the printed face is outside the fold).

The beside model musn't be used for duplication because it contains folding information.
Models to be duplicated in the following pages.

The helmet is a mounting option.
Then a slit is to be practiced in the body's cockpit.





Note
Lamination isn't essential if the body is printed on a card stock.
Also possible to only laminate the outer face to save laminater film.

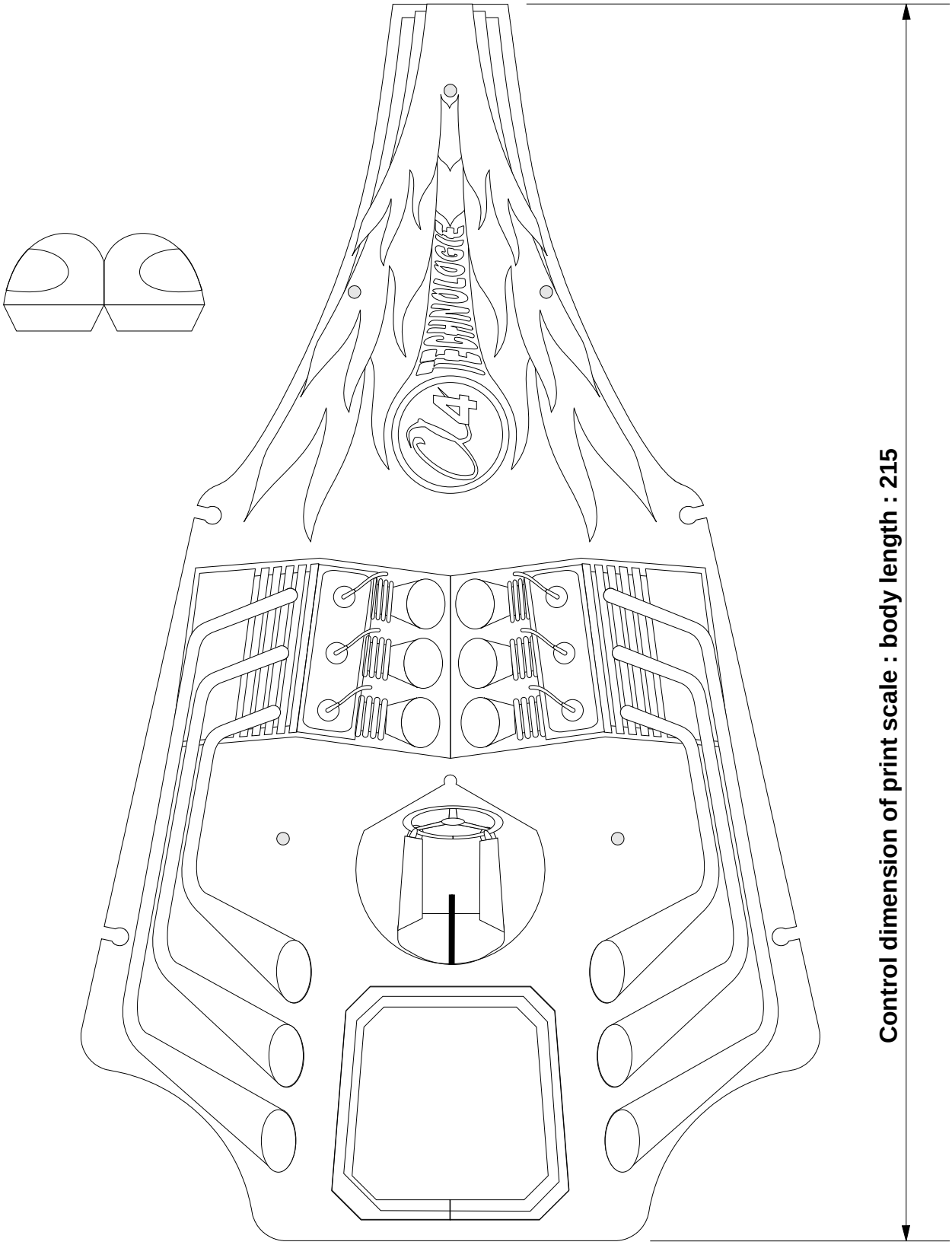
22	01	Fexible body	Piece cut in a paper or polypropylene sheet 190 X 235 raw format then cold bent during assembly.
MARK	**NUMBER**	**FUNCTIONS**	**CHARACTERISTICS**

A4 TECHNOLOGIE www.a4.fr	**Scale 1 : 1**	**A4**	*PROJECT* **Dragster Compétition** / *PART* **Laminated paper flexible body**
	School	*Class*	*DOCUMENT TITLE* **Cut model drawing with scissors**
Name	*Date*		

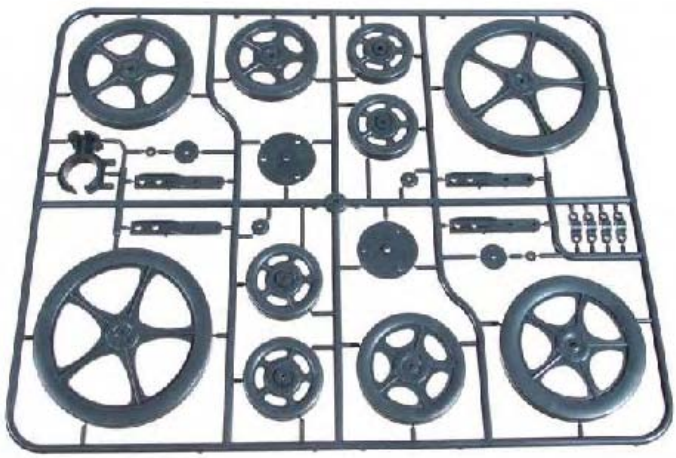
Paper body to print

Coloring model
- Print on paper
- Color
- Laminating
- Cut

Other color models in the appendix “paper bodies models”.



Some examples of realizations



Kit description and proposed bodies options 1/2

Basic kit contents

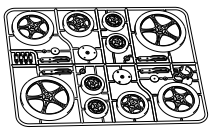
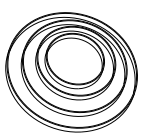
The belt dragster basic kit includes all needed parts to complete motorized frame in its various versions (choice of wheels diameter and driving wheels, choice of the front axle configuration).
The body's material is to be ordered separately as it can be made with either a simple paper sheet, a 0.8 mm polypropylene format or a 2 mm PVC or polystirene plate. The body mounting screws are already included in the basic kit.

The injected pieces set, supplied with the kit, includes particularly various wheels and pulleys diameter to enable achievement of various dragster versions.

The frame comes with finshed dimensions. If you want to charge your students to cut the different parts (using a saw or CN machine), you must supply detail pieces and materials according to the machines format and your choice of colors.
All parts and materials are available at retail.

- Unit packaging : parts and materials are individually wrapped for carrying out a single product.
- 10 grouped packaging : parts and materials are grouped to achieve 10 products.
This package is cheaper but requires sorting pieces upon reception.
Some additional original pieces are supplied with the packaging by 10.

Basic kit nomenclature for individual package (ref. K-DRC-G-01)

Designation and references A4	Quantity	Drawing
Cluster of dark grey ABS injection - Contains all injected mechanical pieces Ref. DRAG-GRAP	1	
Steel axle Diameter 3 x length 150 mm mini (Wheels axle) Ref. AX-AC-3X166	1	
Switch - Type micro inverter with slider Ref. INV-GLI	1	
Electric motor. Ref. MOT-D21-2A	1	
Cylindrical head screw for metal sheet Ø 3 x L6.4 Ref VIS-TC-TC-2M9X6M4 (21 needed + 4 for body fixation)	25	
Milled head screw for metal sheet Ø 3 x L6.4 (Batteries holder fixartion) Ref VIS-TF-2M9X6M4	2	
Cylindrical head screw for metal sheet Ø 2 x L6.4 (Switch fixartion) Ref VIS-TC-TC-2M2X6M4	2	
Batterie holder for 3 R6 batteries - Wires output Ref SUP-PIL-3R6FIL-01	1	
6 mm x 50 x 200 black expanded PVC format (Frame) Ref PVC-EX-6X50X200-N	1	
Elastic bracelet l2 x L 600 flat (Belt) Ref BRAELA-2X60-BD (1+1 spare)	2	
Elastic bracelet l 6 x L 60 flat (wheels tread Ø 44) - Ref BRAELA- 6X60-BD Elastic bracelet l 6 x L 80 flat (wheels tread Ø 60) - Ref BRAELA- 6X80-BD Elastic bracelet l 6 x L100 flat (wheels tread Ø 80) - Ref BRAELA- 6X100-BD Elastic bracelet l 6 x L 120 flat (wheels tread Ø 100) - Ref BRAELA- 6X120-BD	4 2 2 2	

Kit description and proposed bodies options 2/2

Plate for a cut polypropilene body realization

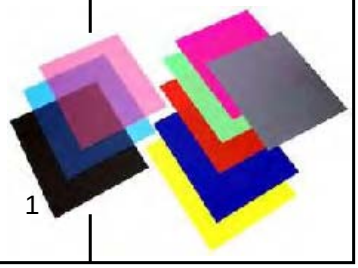
Designation and references A4	Quantity	Drawing
Polypropylene plate 190 x 235 format. To cut a body with scissors or CN machine. Choice of colors : Opaque black - Translucent blue - Translucent red - Opaque blue - Opaque red - Fluorescent green - Fluorescent pink - Metallic steel. Ref CT-CAR- (+ color)	1	

Plate for the realization of a cut body in a 2 mm shock polystirene

Designation and references A4	Quantity	Drawing
2 mm x 40 mm wide x 390 mm length mini shock polystirene band. To achieve by cutting, drilling and thermobending the two body parts. Cutting with cutter, saw or CN machine. Choice of colors : Yellow - black - Red. Ref DRC-CAR- (+ couleur)	1	

To achieve a paper body

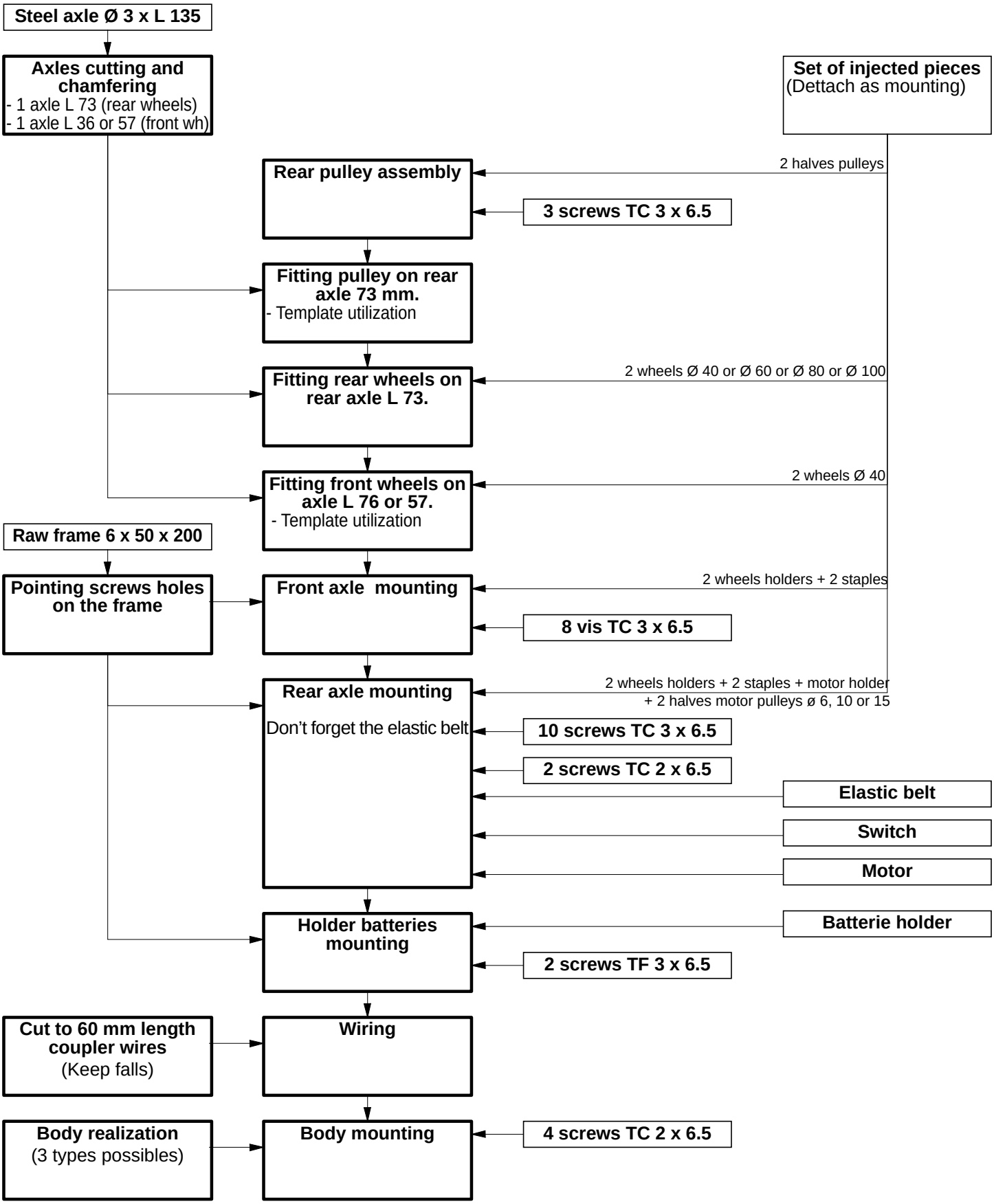
The body must be printed on A4 format (models in the record and files on the CDROM), laminating, cutting with scissors and drilling fixation holes with a punch forceps.

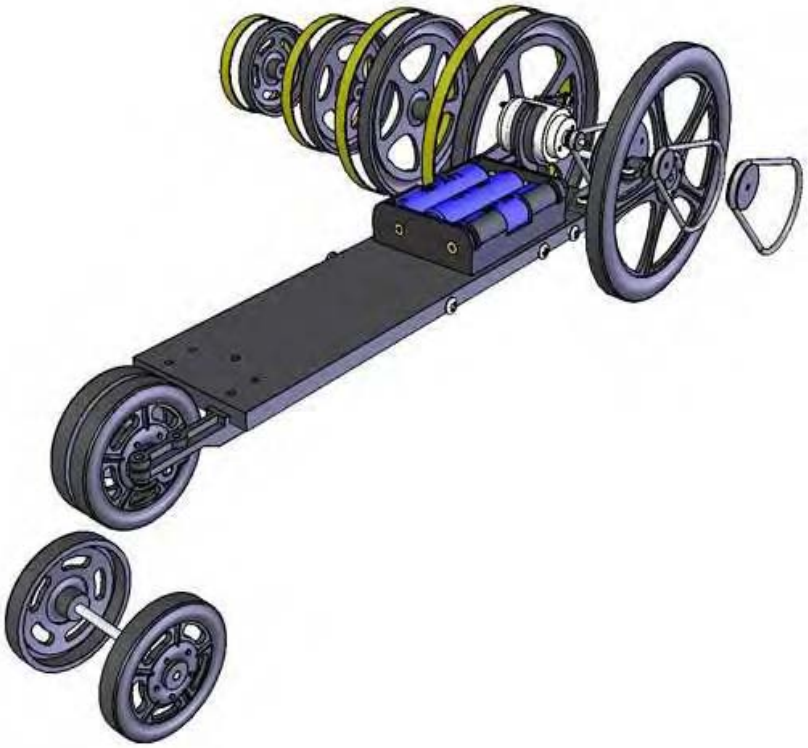
- Laminator A4 format : ref MA-PLAST-A4
- Laminating film A4 format, 75 microns thickness : PLASTIF-A4-75M
- Laminating film A4 format, 125 microns thickness : PLASTIF-A4-125M

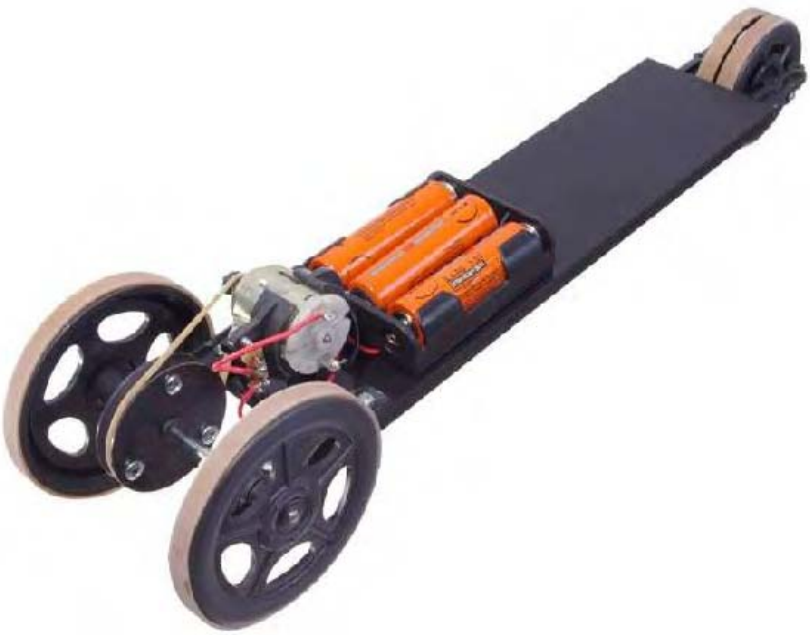
Punch pliers revolver :
- Pro punch pliers revolver multiplied : Ref PCE-EMPPCE6-PRO
- Basic punch pliers revolver : Ref PCE-EMPPCE6

K-DRC-G-01
basic kit

Chart for manufacturing and assembling



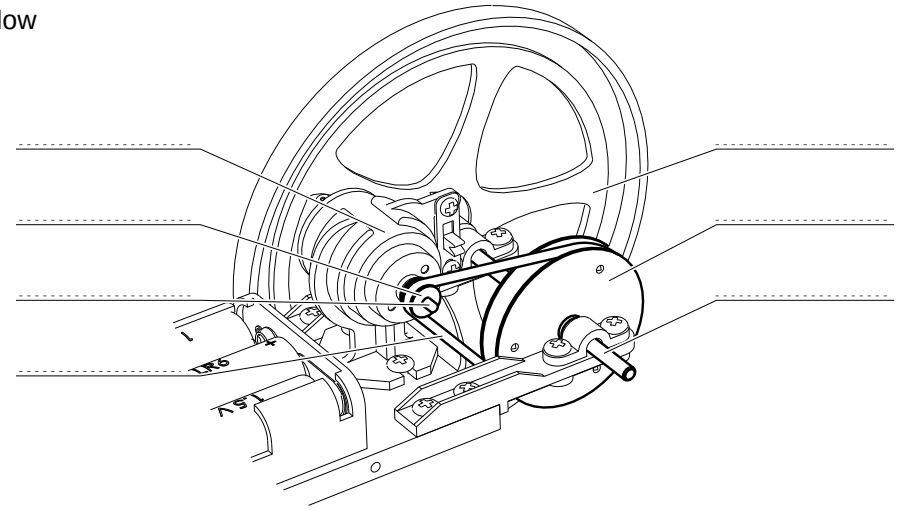




Transmission study- 1/2

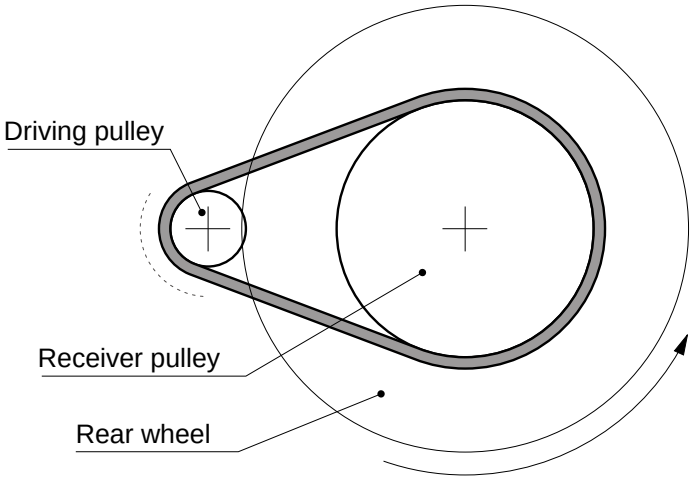
Identify transmission elements

Locate the drawing elements that allow
motor movement transmission
to the rear wheels :
- Motor
- Drive shaft
- Motor pulley
- Belt
- Receiver pulley
- Receiver shaft
- Wheel



Direction of rotation

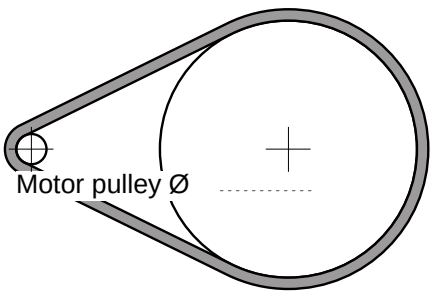
What direction the motor must rotate
to drive rear wheels in the good direction ?
Indicate the motor direction of rotation with an arrow.

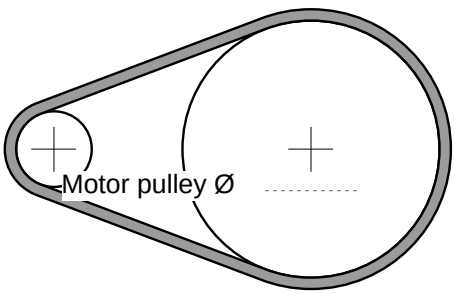


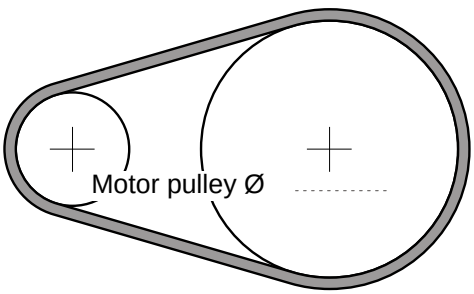
Reduced transmission

a choice between three various motor pulleys :
- Ø 4 motor pulley
- Ø 10 motor pulley
- Ø 15 motor pulley

The receiver pulley on the rear shaft is 34 mm diameter.







For a given motor rotation frequency,
Which motor pulley will allow a faster rear wheels rotation ? .....
For a given motor rotation frequency,
Which motor pulley will allow a lower rear wheels rotation ? .....

Transmission study - 2/2

Reduction ratio

The reduction ratio is the ratio betwwen :
- the motor pulley rotation frequency (speed of rotation) (in rounds per minute)
and
- the receiver pulley rotation frequency (speef of rotation) (in rounds per minute).

Formula : reduction ratio = Ø motor pulley : Ø receiver pulley
= 1 / (Ø receiver pulley : Ø motor pulley)

Complete the table:

Ø motor pulley	Ø receiver pulley	Reduction ratio as a fraction
4 mm	34 mm	1/ (34 : 4) = **1/8,5**
10 mm	34 mm	.....
15 mm	34 mm	.....

Rotation frequency

The receiver pulley rotation frequency depends on the motor pulley rotation frequency and the reduction ratio.

Formula : receiver pulley rotation frequency = motor pulley rotation frequency x reduction ratio

The no-load motor pulley rotation frequency is 13 000 rds/minute.

Complete the table :

Ø motor oulley	Reduction ratio	Motor pulley rotation frequency	receiver pulley rotation frequency
4 mm	**1/8,5**	**13 000 rds/mn**	13 000 x (1/8.5) = 13 000 x 0.117647 = **1529.4 tr/mn**
10 mm	.....	**13 000 rds/mn**	.....
15 mm	.....	**13 000 rds/mn**	.....

Conclusion

For a given motor rotation speed, the more large is the motor pulley, the more the receiver pulley,

it's to say the rear wheels will turn .....

But in reality, it's to note that more one try to turn the rear wheels.....

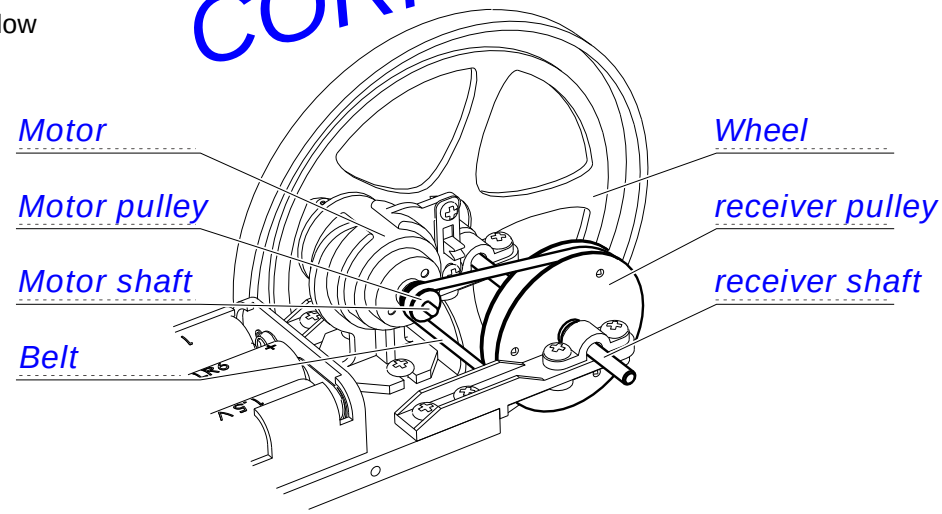
and more the vehicule has difficulties and take a long time to .....

Transmission study- 1/2

CORRECTING

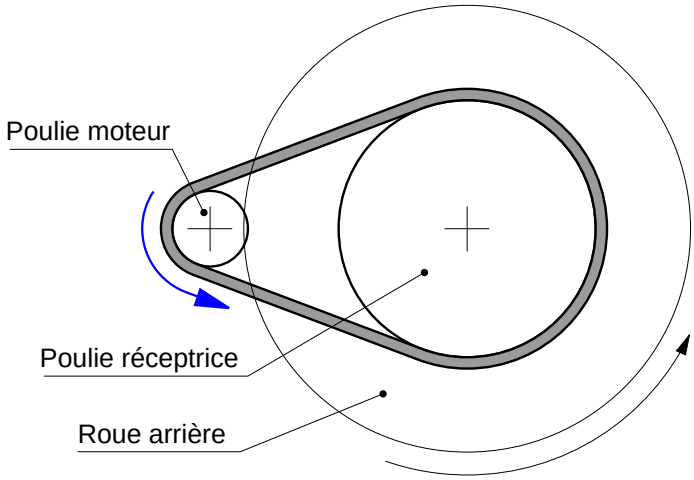
Identify transmission elements

Locate the drawing elements that allow
motor movement transmission
to the rear wheels :
- Motor
- Drive shaft
- Motor pulley
- Belt
- Receiver pulley
- Receiver shaft
- Wheel



Direction of rotation

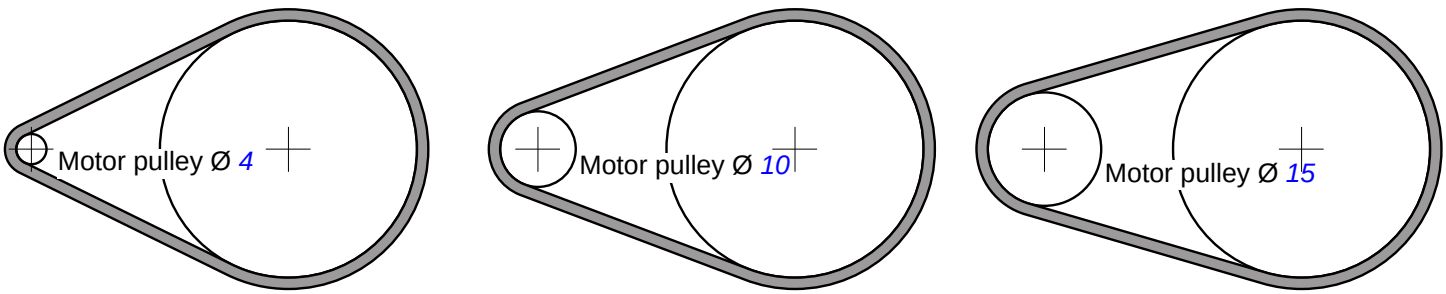
What direction the motor must rotate
to drive rear wheels in the good direction ?
Indicate the motor direction of rotation with an arrow.



Reduced transmission

a choice between three various motor pulleys :
- Ø 4 motor pulley
- Ø 10 motor pulley
- Ø 15 motor pulley

The receiver pulley on the rear shaft is 34 mm diameter.



For a given motor rotation frequency,
Which motor pulley will allow a faster rear wheels rotation ? *The diameter 15 pulley.*

Pour une fréquence de rotation donnée du moteur,
quelle poulie moteur permettra une rotation plus lente des roues arrière ?*The diameter 4 pulley.*

Transmission study - 2/2

CORRIGÉ

Reduction ratio

The reduction ratio is the ratio betwwen :
- the motor pulley rotation frequency (speed of rotation) (in rounds per minute)
and
- the receiver pulley rotation frequency (speef of rotation) (in rounds per minute).

Formula : reduction ratio = Ø motor pulley : Ø receiver pulley
= 1 / (Ø receiver pulley : Ø motor pulley)

Complete the table:

Ø motor pulley	Ø receiver pulley	Reduction ration as a fraction
4 mm	34 mm	1/ (34 : 4) = **1/8.5**
10 mm	34 mm	*1/ (34 : 10) = 1/3,4*
15 mm	34 mm	*1/ (34 : 15) = 1/2,27*

Rotation frequency

The receiver pulley rotation frequency depends on the motor pulley rotation frequency and the reduction ratio.

Formula : receiver pulley rotation frequency = motor pulley rotation frequency x reduction ratio

The no-load motor pulley rotation frequency is 13 000 rds/minute.

Complete the table :

Ø motor pulley	Reduction ratio	Motor pulley rotation frequency	receiver pulley rotation frequency
4 mm	**1/8.5**	**13 000 tr/mn**	13 000 x (1/8.5) = 13 000 x 0.117647 = **1529.4 tr/mn**
10 mm	**1/3.4**	**13 000 tr/mn**	*13 000 x (1/3.4) = 13 000 x 0,2941 = 3 823.5 tr/mn*
15 mm	**1/2.27**	**13 000 tr/mn**	*13 000 x (1/2.27) = 13 000 x 0.4405 = 5 726.8 tr/mn*

Conclusion

For a given motor rotation speed, the more large is the motor pulley, the more the receiver pulley,

it's to say the rear wheels will turn *quickly* .

But in reality, it's to note that more one try to turn the rear wheels *quickly*,

and more the vehicule has difficulties and take a long time to *accelerate and take speed* .

The straight-line guidance

The dragster is designed for straight line racing in a narrow lane.
Then, it must go straight for not going out of its lane and be disqualified.

What elements allow dragster straight line guidance ?

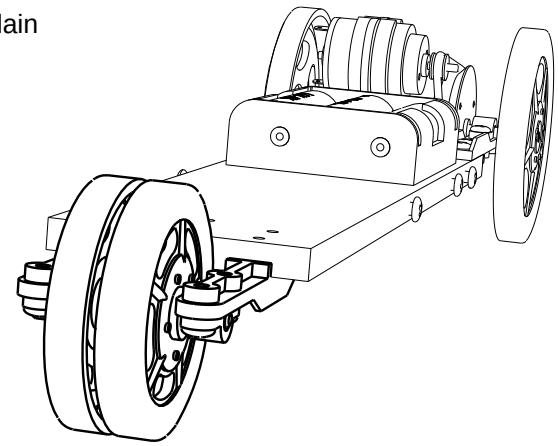
Is it really possible that the dragster go perfectly straight ?

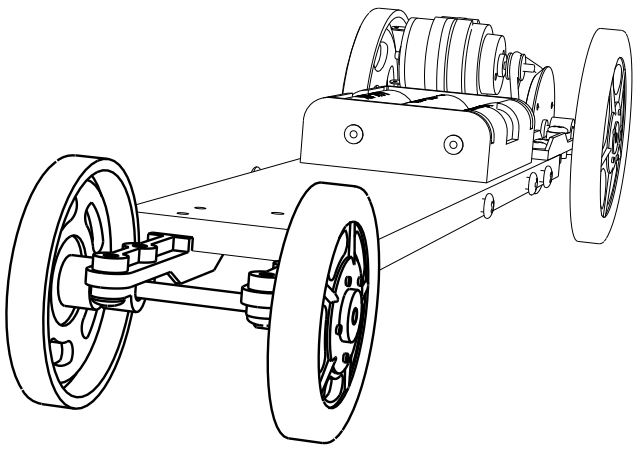
What are the possible causes of drift dragster ?

-
-
-
-
-

To better guide the dragster in straight line, is there a better front axle configuration that another one ?

Explain





What should be particularly careful in carrying out the dragster to ensure a good guidance in a straight line ?

The straight-line guidance

The dragster is designed for straight line racing in a narrow lane.
Then, it must go straight for not going out of its lane and be disqualified.

What elements allow dragster straight line guidance ?

Wheels alow the straight-line guidance of the dragster.

Is it really possible that the dragster go perfectly straight ?

The dragster goes never perfectly straight. There is always a drift more or less important.

What are the possible causes of drift dragster ?

- Ground bumps deflect the dragster.

- A misaligned front and rear wheels causes a dragster drift.

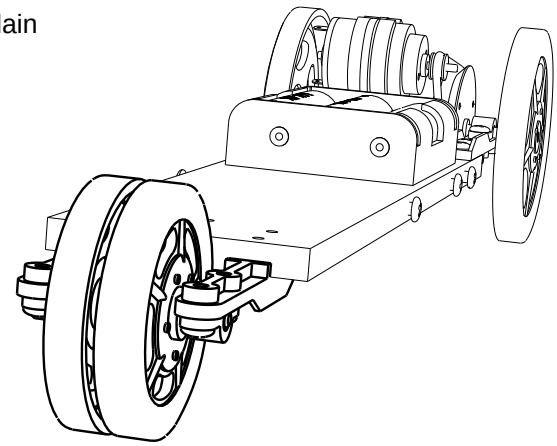
- A wheels axles gap cases also a drift dra ster..

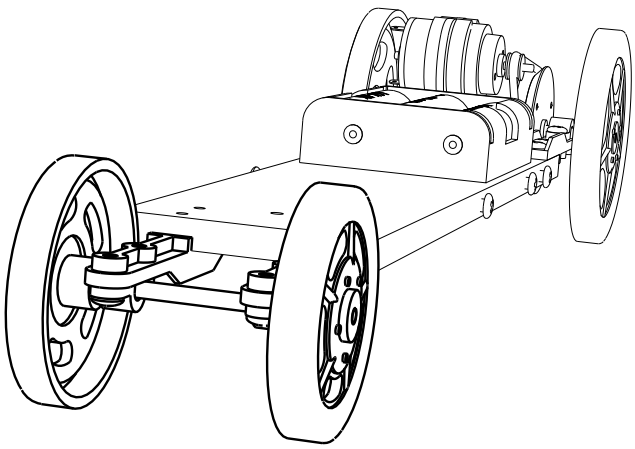
- The rear wheels slip at start causes an immediately a dragster drift.

- a poor front wheels adhesion favors the dragster drift.

To better guide the dragster in straight line, is there a better front axle configuration that another one ?

Explain





It seems that the mote the front wheels are spaced, better is stright-line guidance.

This is due to better stability of a large wheel base.

What should be particularly careful in carrying out the dragster to ensure a good guidance in a straight line ?

When carrying out the dragster, one must be particularly attentive to the holders wheels fixations.

In particular, frame pointing, for fixation screws installation, should be as accurate as possible.

The wheels fixations shoud be also secure. The screws should be tightened properly but not too much,

not to destroy the screws threads and no longer be able to tighten at all.

Adhesion and performance

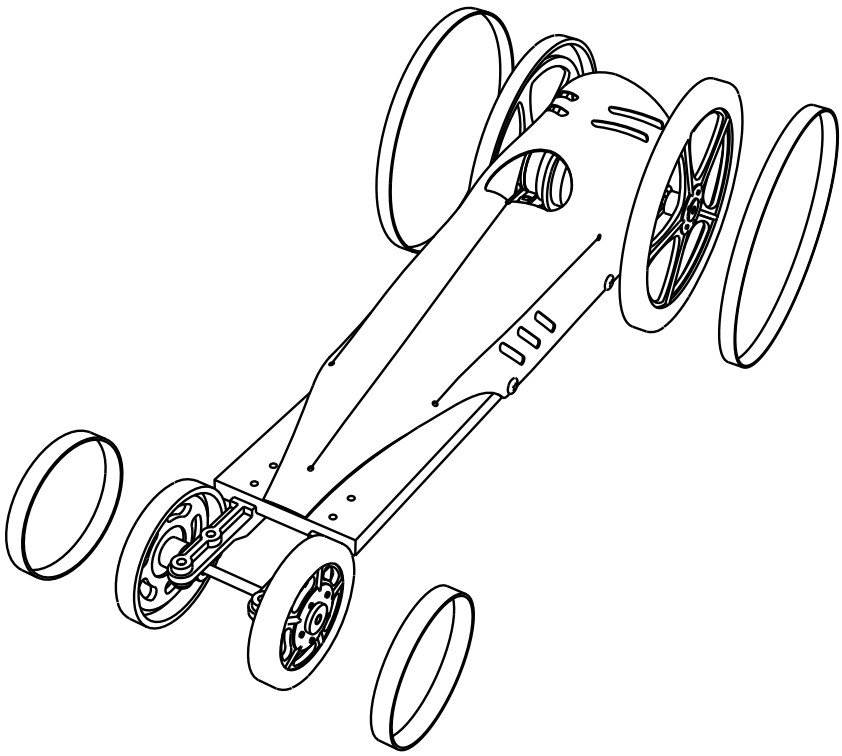
In what material the dragster wheels are they ?

Is that material well suited to tread ? Why ?

What is the best suited material for a tread ?

What material is proposed for the dragster wheels tread ?

Does the wheels tread improve very much dragster performance ?



Adhesion and performance

In what material the dragster wheels are they ?

Dragster's wheels are hard plastic injected (ABS).

Is that material well suited to tread ? Why ?

Hard plastic isn't particularly well suited to the treads because it's a hard and slippery material.

Then, rear wheels may spin at startup, causing a "half turn skid".

And the front wheels provide a poor guidance and hop on the ground.

What is the best suited material for a tread ?

A soft and adhesive material is best suited to reduce wheels slip.

Rubber is generally used as for tyres.

In addition, rubber is elastic, and reduce very much wheels hopping on the ground.

What material is proposed for the dragster wheels tread ?

The dragster's wheels tread are in rubber.

Does the wheels tread improve very much dragster performance ?

On smooth ground, treads are needed to avoid rear wheels slippage during startup.

We also note that the dragster's speed is imroved with treads mounting.

This is due to treads absorber effect which that prevent energy loss in vibrations

causes by hoppping on the ground.

The straight-line guidance is also improved by treads that provide a front axle better adhesion.