

# LES JEUNES ET L'ESPACE YOUTH AND SPACE

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A85-13262

## **EUROPEAN LAUNCHING CAMPAIGN**

presented by M. Eric SCHMITT

XXXVth IAF CONGRESS - Lausanne Switzerland  
7-13 October 1984



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# I YOUTH AND SPACE

## I . 1 HISTORY

### I . 1 . 1 Creation

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The YOUTH & SPACE association was created during the Conference of PARIS in February 1972 by 25 organisations representing 17 countries. 10 International Organisations including IAF, CIC and Space ones were represented at this 1st Conference as observers.

### I . 1 . 2 Resolutions

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The main decisions taken during the final session of the 1st Conference were the following ones:

- To organize a yearly conference.
- To organize summer camps.
- To encourage and help cooperation programmes between amator rocket organizations.
- To increase safety level in rocket activities.

## I . 2 CONFERENCES AND STRUCTURES

### I . 2 . 1 Conferences

-----

Until 1979, 6 Conferences were organized :

- Beograd (Yugoslavia) 1973
- Madrid (Spain) 1974
- Wuppertal (West Germany) 1976
- Tunis (Tunisia) 1977
- Eindhoven (Nederlands) 1978
- Beaumont (Belgium) 1979

This was the principal activity of the association with the following of cooperation programmes.

Many themes as Education, Programmes development, Safety, Launching Campaigns, Propulsion, Participation at the Spacelab project were discussed during that conferences and much work was done in the field of technical exchanges.

In Eindhoven, the Working Groups appeared and with them the real begining of the work between the Conferences. There main work was indeed to prepare the sessions of the Conference but from Beaumont, the Conference was scheduled every second year only :

- Roskilde (Denmark) 1981
- Autrans (France) 1983.

So, the coordination in the diverse fields and the research of new projects began to get an increased place in the Working Groups. The sessions during the Conferences became real working sessions following exemple of the European Launching Campaigns (E.L.C.) working group, instead of only presentations and communications.

## I . 2 . 2 Committee

-----

During each Conference, the plenary session decide the Committee's composition and this committee has in charge the life of the association between two Conferences. The members of the Committee are chosen for their capacities and they must be delegated by their national association.

They meet 4 times a year and they are able to invite any member of the Working Groups or of the Clubs, specially competent in the discussed subject.

Actually, the Committee is composed by:

- Claus Clausen (D.A.R.K.) President
- Michel Hallet (G.E.A.) Vice President
- Frans den Boer (N.E.R.O.)
- Jean Claude Guiraudon (A.N.S.T.J.)
- Dick Gordon (W.A.S.P.)

## I . 2 . 3 Publications

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Youth & Space is publishing a periodical review : IMPULSE, the reports of each Conference and some technical books concerning propulsion, trajectory calculations, launching campaigns ...

## I . 3 WORKING GROUPS

### I . 3 . 1 General Presentation

-----

The Working Groups were created in Eindhoven to try to increase the working possibilities of Youth & Space between the Conferences. Actually only 5 Working Groups are existing:

- Pyrotechnie
- Trajectory Calculations
- Experiments
- Software
- European Launching Campaigns (E.L.C.)

but some others did work from 1979 to 1983 they were:

- Electronics
- Recuperation
- New directions of Y&S
- Static Tests
- Safety

Different recommendations or publications concretised the work of these groups and some coordination in the works of the Clubs was the main effect of their action.

### I . 3 . 2 Pyrotechnical Working Group

-----

Leaded by Tony Vijverman (B.V.R.O. - Belgium) this group was mainly interested by the Zn-S propellant and all his possibilities (powder, melted, with or without coating, different ratios, type of ignition systems...). One book was written and a lot of communications were exchanged by the Clubs.

The group had also a big action about the safety of the realisation and the tests of the motors (recommandations about heating systems, testing procedures, ignitors ...).

They are working finally on other types of propellants ( PVC-Ammonium Perchlorate for exemple).

### I . 3 . 3 Trajectory Calculations Working Group

-----

It is existing so many calculations methods that it was very difficult to compare the different results obtained by the Clubs. The group, leaded by Chris Steyaert (B.V.R.O. - Belgium), has the task to find out the most reliable ways to calculate a trajectory and to measure or calculate or estimate all the factors wich have an effect on this trajectory.

He is working also on diverse types of calculations as 2 Stages optimisation, stability factors, ...

### I . 3 . 4 Experiments Working Group

-----

Created during the last Conference in Autrans, this group combine all the subjects of the old groups Electronics and Recuperation with an other way of thinking.

His purpose is to offer a structure to encourage cooperation, specially between "motors" and "experiments" clubs, to collect all the informations about realizations in this field and to increase the connections between the clubs and the industries (sensors, sounding balloons, tests, calibrations ...). He is leaded by Etienne Sigel (G.R.E.T.S.S. - France).

### I . 3 . 5 Software Working Group

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In the beginnig, included in the Trajectory Calculations Group, this subject was separated in Roskilde when it appeared that many more applications than trajectory calculations were possible with the computers and all kind of processors (application programmes, coding systems onboard, computer used as treatment unit for static test bench or decoders ...).

Jorgen Franck (D.A.R.K. - Denmark) took this group in charge and begin to edit a programmes library compiling the knowledge of the european Clubs.

## II EUROPEAN LAUNCHING CAMPAIGNS WORKING GROUP

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### II . 1 CREATION

At a Youth & Space Committee in Sivry (Belgium) the 23rd of August 80, in attempt to celebrate the 10 th anniversary of Y&S, it was decided to organise an International Launching Campaign.

Eric Schmitt (C.I.F.E. - France) had been delegated by the Committee to study the possibilities and to create a team around this project.

At the Roskilde Conference this team became a Working Group and after the success of the 1st E.L.C. this Working Group was maintained to continue his action.

### II . 2 OBJECTIVES

The actual objectives of the Working Group defined during the Autrans Conference are the following:

- Definition of a 2nd E.L.C.
- Definition of control procedures for rockets and motors in the idea of international campaigns.
- Definition of specific safety rules for international campaigns.
- Organisation of the 2nd E.L.C. and the following ones.
- Observation of all the campaigns (national and international)
- Collecting of results of launchings and technical datas about launched rockets.
- Realization of minimum recommendations for safety during national campaigns and the creation of an Youth and Space Label.

### II . 3 RESULTS

#### II . 3 . 1 1st E.L.C.

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see § III

#### II . 3 . 2 Campaigns Observations

-----

To increase our knowledge level about campaigns organisation and to collect informations about the works of the Clubs the Working Group was represented at 12 campaigns from the 1st E.L.C. in October 1982:

- E.L.C. France October 1982
- Split Yugoslavia December 1982
- Braas Sweden February 1983
- Oldenbroek Nederlands June 1983
- Le Ruchard France August 1983
- Borj El Amri Tunisia August 1983
- Oldenbroek Nederlands September 1983 (1st Label Y&S)
- Kumrovec Yugoslavia September 1983
- Oldenbroek Nederlands May 1984
- Kosta Sweden May 1984
- Le Ruchard France July 1984
- Le Ruchard France August 1984

51 rockets were launched.

37 with professional motors (one 2 Stages rocket)

15 with amator motors (all Zn-S)

26 by France

7 by Yugoslavia

5 by Denmark

4 by Tunisia

4 by Nederlands

3 by Belgium

2 by Sweden

This action will be continued and increased for the future because it has a very important role for the contacts between the Clubs and Youth and Space, for the preparation of the 2nd E.L.C. and for the safety of the campaigns.

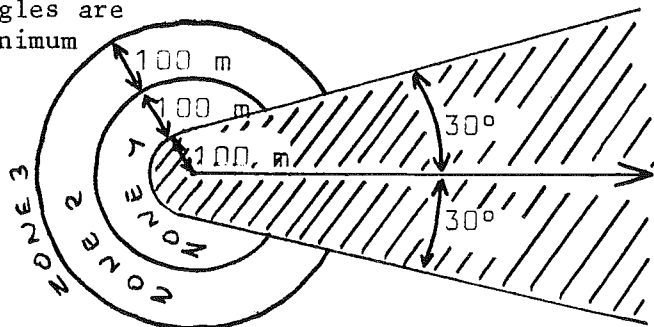
### II . 3 . 3 Safety rules

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Theses recommandations were established in a real international point of view, taking account all the campaigns of the year 83, to try to have acceptable rules for every country.

#### Launching Area:

All distances & angles are minimum



no man's area

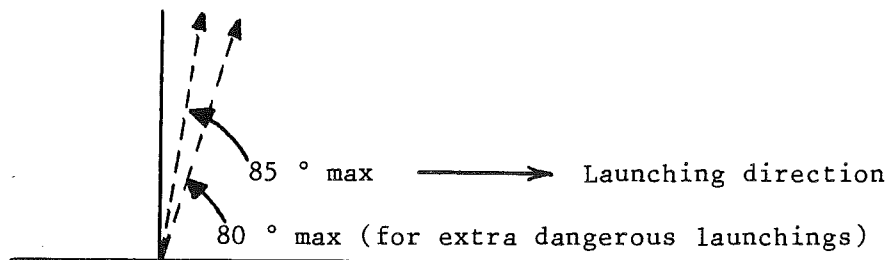
Zone 1 possibility to have 1 well informed people

Launching direction

Zone 2 operational zone (necessary people only)

Zone 3 spectators

#### Launching tower Elevation:



#### Controls:

It will be asked to the organizers to control for each rocket to be launched the following points:

- Strength, rigidity and linearity of the rocket
- Stability of the rocket
- All pyrotechnic systems (time switches, mecanical parts, safety positions and systems, 2nd stage ignitors... aso)
- Existence of static tests for new motors
- All the systems wich have an effect on the ballistic flight (separations, doors, attitude controls... aso)



### Speeds:

3 factors are used:

- Stability factor (static marge) of the rocket
- Speed of the wind ( $V_a$ )
- Speed of the rocket at the end of the ramp ( $V_r$ )

For a stable rocket (static marge between 1 & 3) the ratio:  
 $V_r/V_a$  must be 3 so  $V_a$  acceptable for launch is  $V_r/3$

For an overstable rocket (static marge between 3 & 7) and for any extra dangerous launching the ratio:  $V_r/V_a$  must be 5 so  $V_a$  acceptable for launch is  $V_r/5$ .

### First aid

This means must be available during the campaign:

- A vehicle ready to transport eventual hurt people
- Presence of well trained first aid people
- Extinguishers at every motor's place (Storage, ramp)
- Means to stop strong bleedings
- Water at any place with a motor

### Chronology

Maximum amount of people around the ramp when:

- Rocket without motor : undefined
- Rocket with motor : 10 and controlled public at distance
- Rocket with motor and ignitor : 2 for the club or ramp  
2 for pyro team  
1 for communications
- Before ignitor connected : 1 for connection  
1 for communications  
1 for first aid at distance

In case of long fire, no ignition, explosion at the start time waiting time of minimum 5 minutes before anybody comes back to the ramp.

Otherwise the working group strongly advise the organisers of a campaign to:

- Wet the launching area before the launchings
- Ask vibration tests for the rockets to be launched
- Reduce the amount of people in the operational area for any extra dangerous launching.

Is so called extra dangerous launching the launchings of:

- A rocket with a new motor
- A multi stage rocket
- A "shuttle" and any flight controlled rocket
- and any rocket with the presence of any kind of dangerous system.

## II . 4 YOUTH AND SPACE LABEL

### II . 4 . 1 Label -----

To obtain the Youth & Space Label one campaign must follow all the safety rules descibed at the § II.3.3

Two different labels are created, one given by an Youth & Space observer (mainly member of the E.L.C. Working Group), one given after the reception of a questionnaire filled up by the responsible of the campaign if an observer was not present at the campaign.

The Label is delivered under the only responsibility of the Working Group in the name of Youth & Space during one of his meetings.

### II . 4 . 2 Exemple of an labeledized campaign -----

The campaign in Oldenbroek (Nederlands) organised the 24th of September 1983, after the report of Eric Schmitt obtained the Youth & Space Label during the meeting of the Working Group in Kobenhavn in January 1984.

You can find enclosed the report of that campaign (Annexe 1).

## III FIRST EUROPEAN LAUNCHING CAMPAIGN (E.L.C.) VALDAHON 1982

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### III . 1 ORGANISATION

#### III . 1 . 1 Working Group -----

After the decision to organise the European Launching Campaign in 1982 two different views were possible. One more turned to the demonstration with launchings from different countries but an operational team only from the organising country. But to give a better view of Youth and Space and to prove the reality of it an international operational team was the best solution but the more difficult way.

The difficulties were important. Make work, prepare, organise such a team of 45 people from 7 different countries, all in english and essentially, have a good spirit between all the participants who are working with different methods all that points were so many problems to solve.

It took one year to build the bases of that project and a Working Group composed by :

- Eric Schmitt (CIFE) France
- Louis Robein (ANSTJ) France
- Michel Hallet (GEA) Belgium
- Chris Steyaert(BVRO) Belgium
- Kim Andersen (DARK) Denmark
- Michel Maignan(ANSTJ) France
- Vladimir Horvat (ARKZ)Yugoslavia
- Frans den Boer(NERO) Nederlands

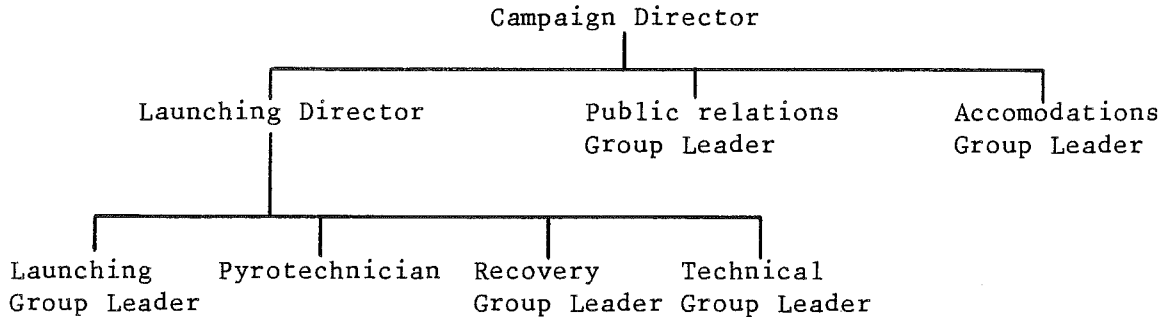
III . 1 . 2 Preparation

2 Campaigns, 4 meetings and one mission were necessary before the E.L.C.:

- Meetings of Roskilde (DK) October 1981  
Eindhoven (NL) December 1981  
Gosselies (B) March 1982  
Strasbourg (F) June 1982
- Campaigns of Valdahon (F) October 1981  
Le Ruchard (F) August 1982
- Mission at Valdahon (F) June 1982

Roskilde (October 1981)

With the base of the organisation for french campaigns (country where the campaign will be made) and with some adjustments due to the international nature of the E.L.C. the main responsibilities diagram is defined:



The Launching Committee is composed by the Campaign Director, the Launching Director and the 4 Group Leaders dependent on the Launching Director and will have the power of decision during the campaign.

The acceptance criteriums are also defined:

- 3 static tests with thrust curves
- 1 launching of the same type of motor
- Motor filled in the origin country
- and general carateristics as stability, electrical ignition and presence of a recovery system.

Valdahon (October 1981)

The campaign is defined, the place must be tested to verify the compatibility with the organisation and to try to solve all the difficulties. After this campaign, we ask officialy this field for the E.L.C..

Eindhoven (December 1981)

General safety procedures are defined. Many projects are registrated (6 over these 14 ones will be launched really). An official letter is sent to E.S.A. to solve the main problem of the motors transport.

Gosselies (March 1982)

The operational teams are filled little by little. The launching procedures are defined. An negative answer from E.S.A. about the motors transport is received. The budget is defined.

18 rockets are scheduled, 8 of them will be launched.

Strasbourg (June 1982)

Accomodations are defined. The motors transport is organised by Eric Schmitt and will be paid by C.N.E.S.. Animation is defined. All the technical points are solved. Quite all the operational teams are completed.

16 rockets are now scheduled, 8 of them will be launched.

Valdahon (June 1982)

The Launching Director and the Technical Group Leader are going in mission to discuss all the accomodations and launching area details with the camp authorities.

Le Ruchard (August 1982)

This campaign was scheduled as a training for the operational teams but the little number of presents people due to financial problems essentially prevent this training and it is more a contact with the materials and a similar organisation.

III . 1 . 3 Motors Transport  
-----

After the negative answer from E.S.A. about this difficult problem and because of the law in France wich do not allows the motors fabrication by amators we were obliged to organise the transport ourself of the filled motors.

Research about European rules, french legislation, papers for inportation, find a truck and a driver, modification of the truck to get into the rules, organisation of the trip around Europe all that in 4 months.

After a last trip in Nederlands to help the NERO in his paper work the truck left Paris with Eric Schmitt onboard to Eindhoven (NL), Charleroi (B) before leaving 3 motors in France.

The second part of the trip was more critical. Destination Zagreb (YU) for 3 other motors, and after a real adventure, all of them were stored in the military camp of Valdahon. It took seven days full of incidents to complete that Europe Tour.

III . 1 . 4 Infrastructure  
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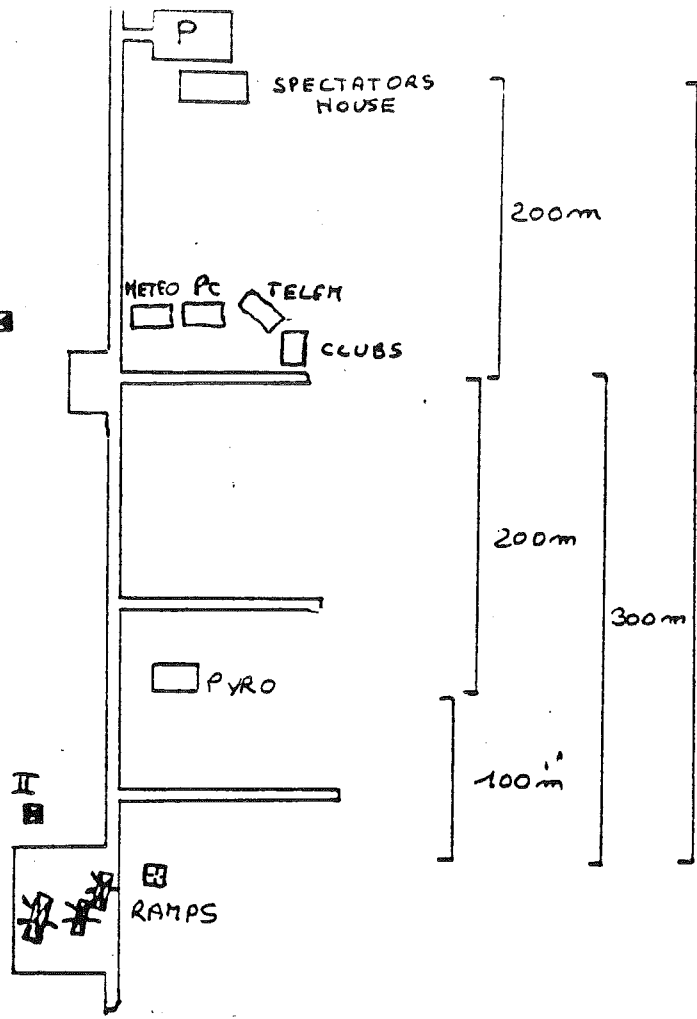
The main part of the materials used during that campaign was the french one to reduce a little the difficulties. Building a complete launching pad with parts from different countries will be a second step...

Here you can find the general drawings of the launching pad organisation:

# LAUNCHING PAD ORGANIZATION

GENE I

GENE II

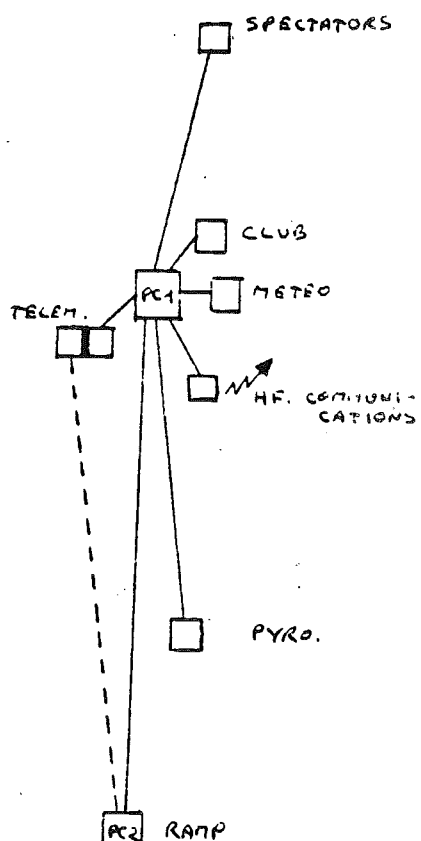
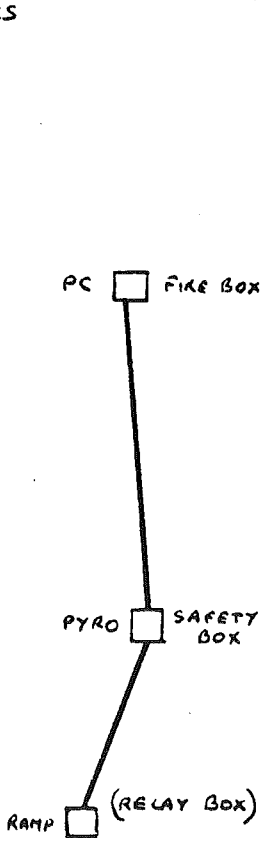
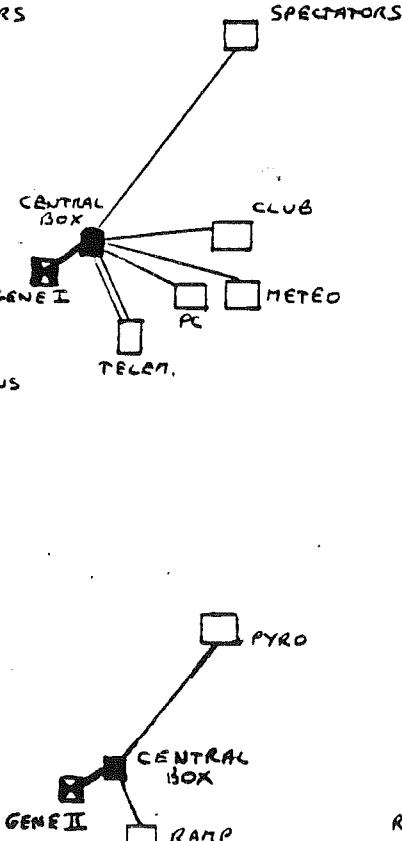
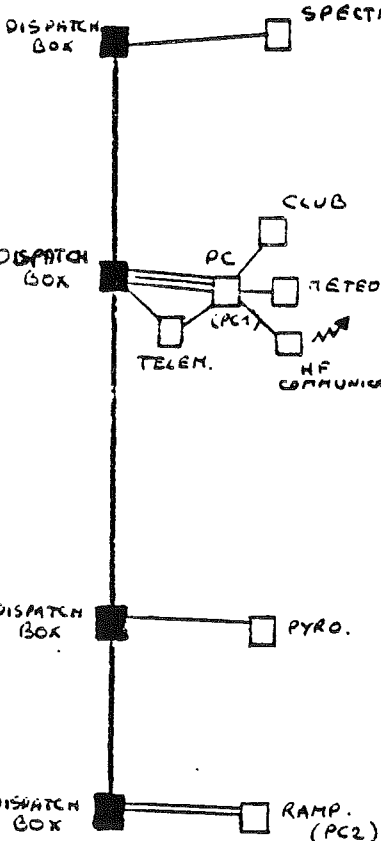


500m

200m

300m

100m



## COMMUNICATION LINES

## ENERGY

## FIRE LINE

## COMMUNICATIONS

### III . 2 CAMPAIGN'S PROGRESS

#### III . 2 . 1 Time Table

Tu 28 September 15 h 00 Arrival of the first team  
Verification of the buildings

We 29 September Installation of the R3, sleeping rooms, bar, welcome ...  
15 h 00 Start of the installation of the launching pad

Th 30 September Installation of the launching pad  
Arrival of the launchers

Fr 1 October End of the installation of the launching pad  
14 h 13 Start of the 1° Qualification Count-down  
14 h 50 Launching of "QUALIFICATION 1"  
15 h 41 Launching of "QUALIFICATION 2"  
17 h 00 Launching of "CROATIA 33" (YU) and Recuperation  
18 h 15 Launching of "H 4" (NL) Long burn

Sa 2 October 9 h 57 Start of the 3° Qualification Count-down  
10 h 17 Launching of "QUALIFICATION 3"  
13 h 15 Launching of "BELG'HIC" (B) and Recuperation  
13 h 26 Launching of "QUALIFICATION 4"  
14 h 38 Launching of "SINBAD SPACE" (TU)  
15 h 33 Launching of "AURORE" (F)  
16 h 34 Launching of "KIKKER" (B) Explosion in  
the launching tower  
17 h 25 Launching of "ICARE" (F) and Recuperation  
18 h 08 Launching of "MARIANNE 2" (F)

Su 3 October 9 h 51 Start of the "PERSEE" count-down  
11 h 10 Launching of "QUALIFICATION 5"  
12 h 00 Recuperation of "SINBAD SPACE"  
"AURORE"  
"MARIANNE 2"  
16 h 00 Launching of "INA" (YU) + (B)  
16 h 50 Launching of "IRIS" (DK)  
17 h 41 Launching of "PERSEE" (F)  
18 h 27 Launching of "LEVIATHAN" (F)

Mo 4 October Wrap up  
Cleaning of the buildings  
Recuperation of "IRIS"  
"LEVIATHAN"  
"INA"  
Wrap up  
Cleaning of the buildings  
Recuperation of "INA"

Tu 5 October Verification of the buildings  
Reception by the military camp's Colonel  
Departure of the last team

### III . 2 . 2 Accomodations

-----

Accomodations and welcome were planed, organised as well as possible and so, the relations with the camp's authorities. The free access to the camp (launching area) and the fact that our work and food accommodations were in a external part of the camp were two very important reasons for the success of the campaign.

80 participants and 170 spectators were presents.

The cooperation with militaries was excellent, minor incidents considered at their real level and no major problems. The result was the reception of the last organisers by the camp's responsible with medals and compliments.

### III . 3 RESULTS

#### III . 3 . 1 Operational Teams

-----

The game was hard to rule: make work an operational team of 45 people from 14 clubs, associations and organisations coming from 5 different countries. And the programme was so hard: 12 rockets (2 in cooperation) launched in 3 days.

##### - P.C. Coordination:

A training during a previous campaign as it was scheduled would have solved many start difficulties and some nervous state but in general, few differencies with a national campaign.

##### - Pyrotechny:

The black series everybody could see is not at all due to that team wich arrived to adapt itself to the many types of motors used during that campaign.

##### - Telemetry:

The ones who had the responsability of that team were not there and the ones who replaced them arrived to run that task without big problems.

##### - Transports:

When C.B. transmitters worked, coordination was good (during the launching pad building for exemple) Save, some little misunderstandings gave some hesitations without any real bad consequences.

##### - Ramp:

A good work of that team who had to follow a very changing programme and who stayed within correct nervous norm.

##### - Ramp Communications:

A very "key" team. Nothing to say about, what is a compliment.

##### - Meteo & Calculations:

Few previsional calculations, but a good localisation of rockets touch down. If a micro computer is used, one full time people must be used, different from Recovery Group Leader for a better team's dynamism.

- H.F. Communications:

All the technical problems occurred during that campaign, but that team arrived to maintain communications with localisation points, often with the material at hand plus efficiency.

- Localisation:

Very coherent observations, except for LEVIATHAN and PERSEE, launched in very bad meteo conditions. A good success rate.

- Recuperation:

Here too, all the rockets were found. Only PERSEE disappeared in low clouds stayed on the field.

- Infrastructure:

Launching pad built in a very short time, taking account of transmission's difficulties between a dansk and a french who spoke only french. Very good and efficient maintenance.

- Control:

His work was not enough defined and his powers too low. After the black series we had, his role has to be redefined very clearly at the rockets level and motors one.

- Spectators:

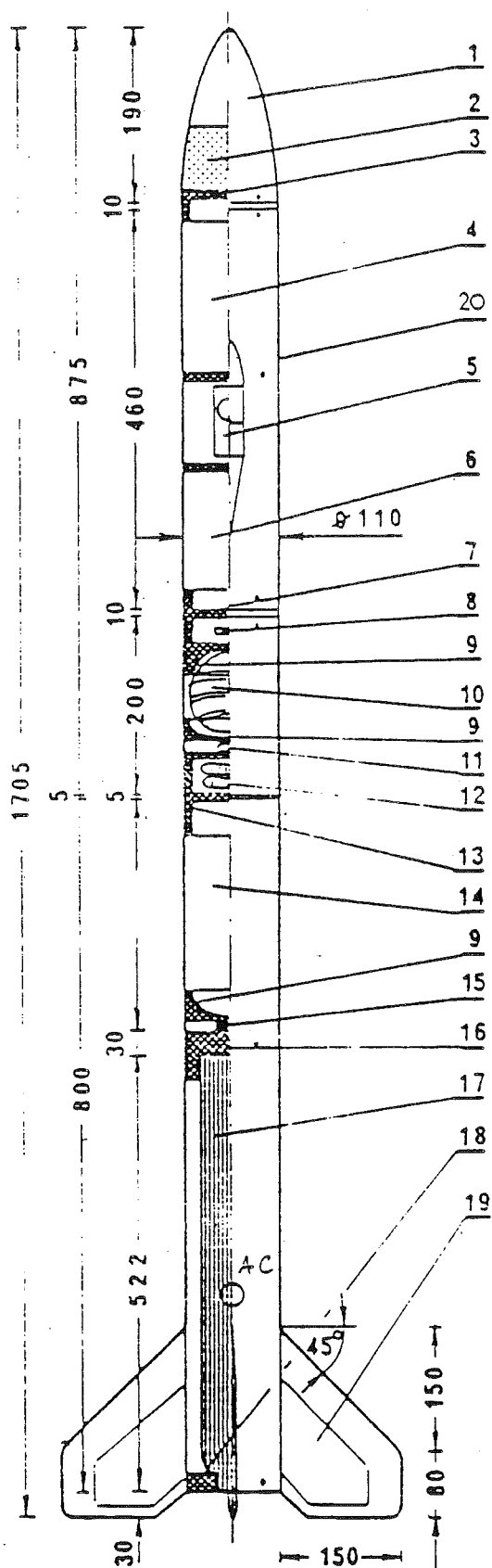
During organised visits, the disciplin was not enough high, so gave important lates in the count downs and some higher nervous level. We have to take account that if visits are short, precisely defined in time, and done in order, it gives the possibility to organise more of them.

- Press:

Arrive to mix safety operations and susceptibility of reporters is a great task wich was done out of all our hopes. And photos are fine.



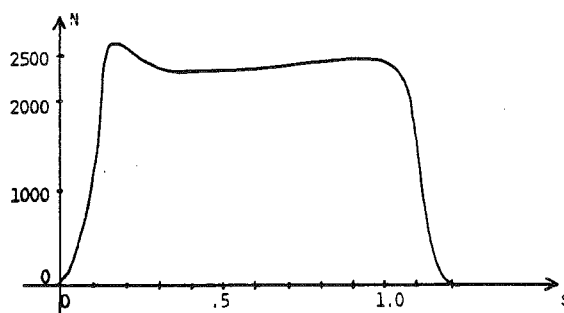
III . 3 . 2 Launched Rockets



CROATIA 33    ARKZ Zagreb (YU)  
 13000 g  
 Movie Camera with light time base  
 Separation by over pressure  
 2 Streamers & 2 Parachutes

**T G 10**

PROPELLANT :            DOUBLE BASE  
 BURNING TIME :        1 . 2 s  
 MAX. THRUST :         2500 N  
 TOTAL IMPULSE :       3000 N.s  
 MASS OF PROPELLANT : 1 . 5 Kg  
 SPECIFIC IMPULSE :    255 s  
 THRUST CURVE :        (THEORETICAL)



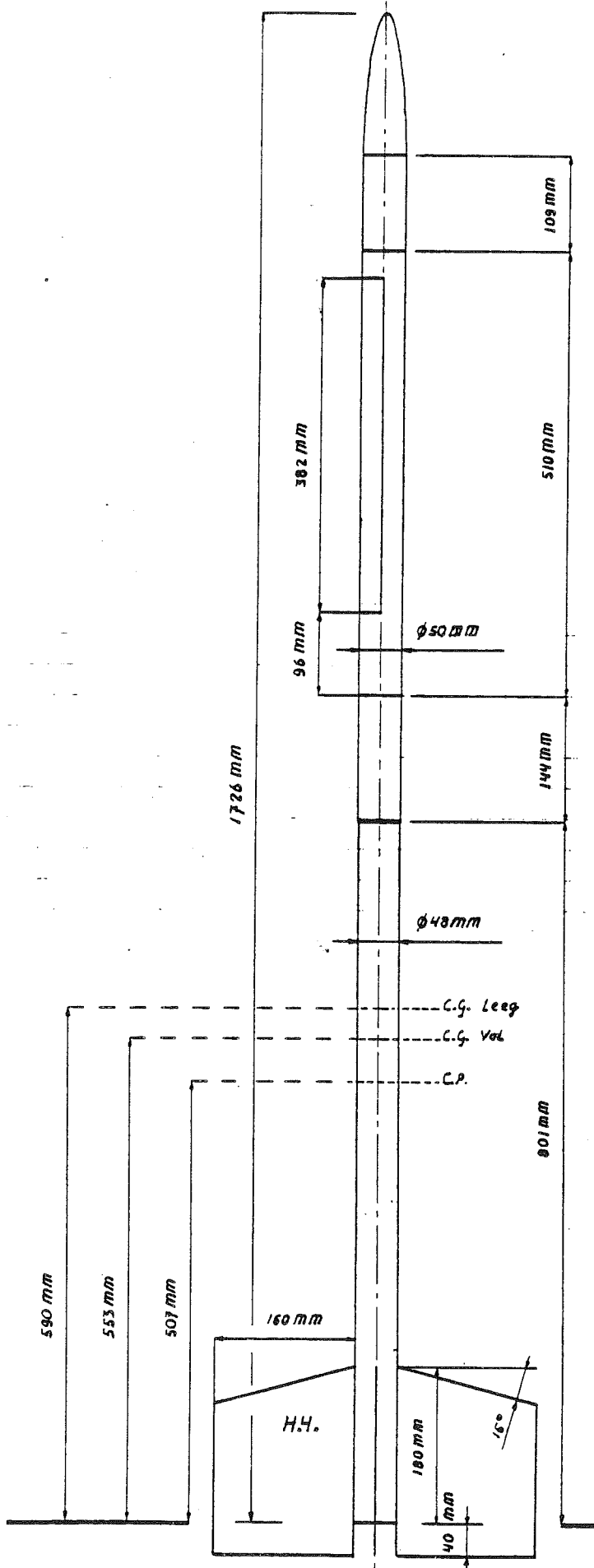
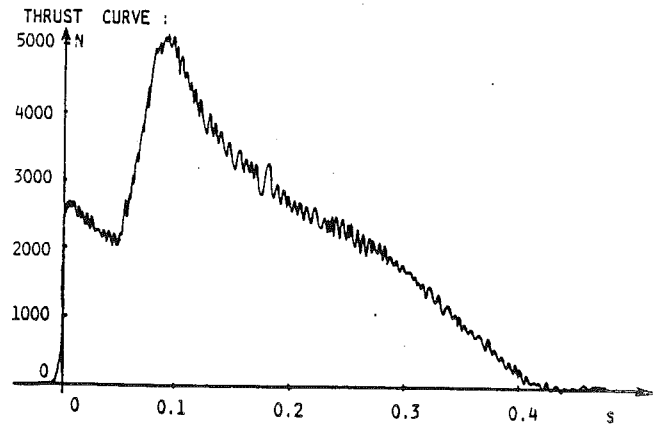
9 "    Culmination  
 32 "    Flight Time

Movie OK during 3 " but destruction  
 at the end of burning time

H 4 NERO Haarlem (NL)  
 7800 g  
 Motor Test  
 Lateral door

**O I R 8 I**

PROPELLANT : Zn./ S 3 / 1 POWDER  
 BURNING TIME : 0 . 39 s  
 MAX. THRUST : 5000 N  
 TOTAL IMPULSE : 912 N . s  
 MASS OF PROPELLANT : 2 . 1 Kg  
 SPECIFIC IMPULSE : 43 . 45 s



Long burning during 7 " in the ramp

BELG'HIC            GEA Gilly (B)  
8500 g  
Memorized signal and repeating  
Lateral door

### SIVRY X

PROPELLANT :            Zn / S    3 / 1        POWDER

BURNING TIME :            0 . 35 s

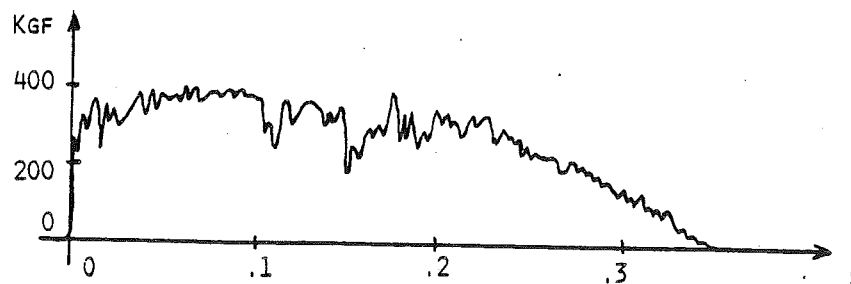
MAX. THRUST :            3920 N

TOTAL IMPULSE :            1029 N . s

MASS OF PROPELLANT :    1 . 6 Kg

SPECIFIC IMPULSE :        . 65 s

THRUST CURVE :



Low powerful burning and recovery's  
function on earth.  
Too low acceleration to initiate  
electronics

SINBAD-SPACE JST Tunis (TU)

3500 g

Telemetry of Rotation, Acceleration,  
Flight Phases and Internal Temperature

Commutated Channels

Separation by Explosive bolts

## BAMBI

PROPELLANT : BLACK POWDER

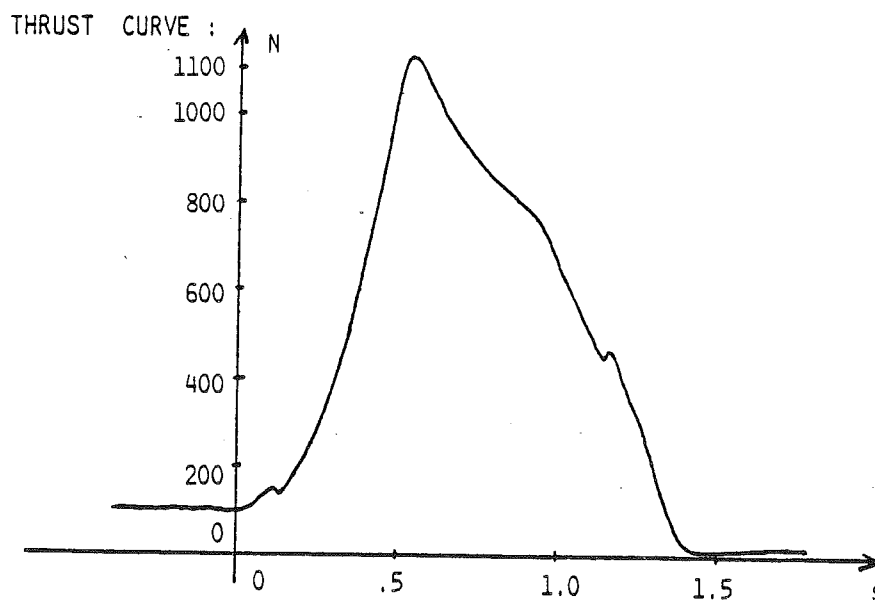
BURNING TIME : 1 . 4 s

MAX. THRUST : 1150 N

TOTAL IMPULSE : 940 N . s

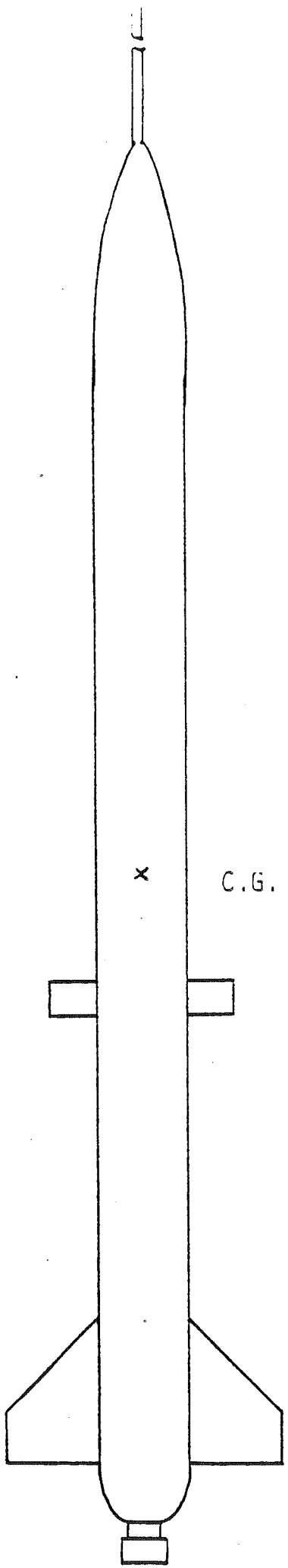
MASS OF PROPELLANT : 0 . 95 Kg

SPECIFIC IMPULSE : 90 s



11 " 2 Culmination  
17 " Parachute open  
133 " Flight Time

Telemetry OK during 60 "

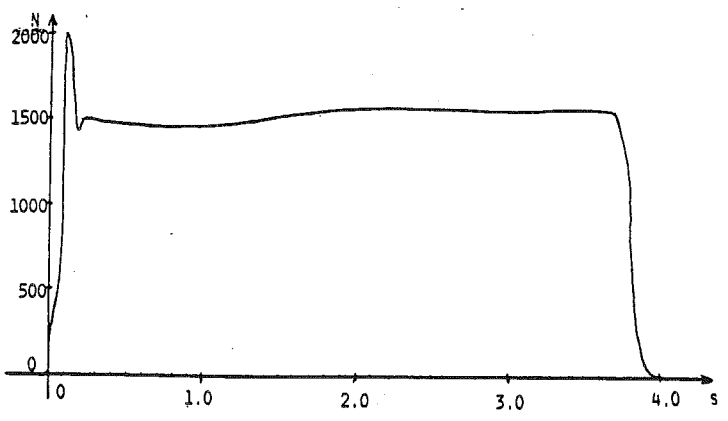


AURORE : CAT Toulouse (F)  
 26500 g  
 Telemetry of Rotation, Finn Angle,  
 Differential and Static Pressure,  
 and Flight Phases  
 Rotation Control, PCM Coding  
 Separation by Explosive bolts

**E I A N**

PROPELLANT : ISOLANE  
 BURNING TIME : 3 . 625 s  
 MAX. THRUST : 1560 N  
 TOTAL IMPULSE : 5600 N . s  
 MASS OF PROPELLANT : 2 . 650 Kg  
 SPECIFIC IMPULSE :

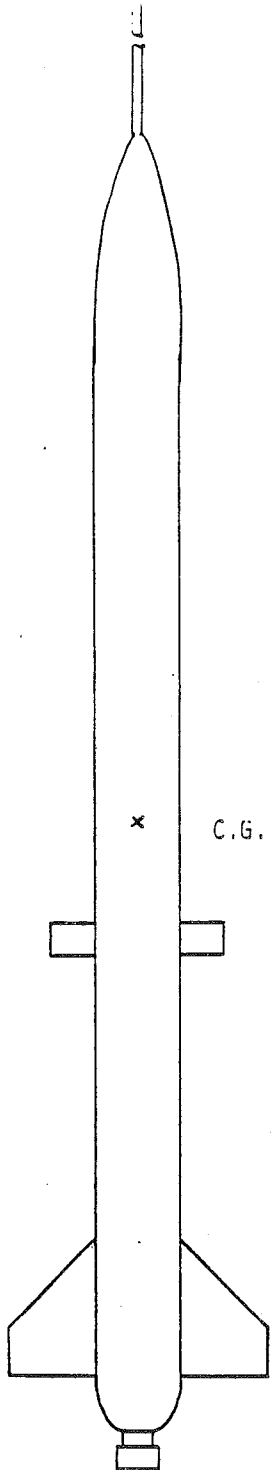
THRUST CURVE :



25 " 4 Parachute open  
 154 " Flight Time

Telemetry OK Rotation Control OK

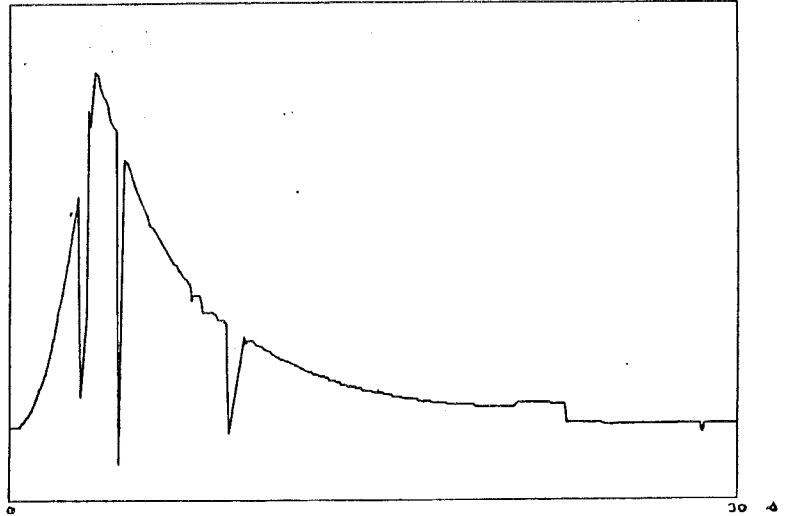
# AUORE TELEMETRY



## AUORE

## SPEED TELEMETRY

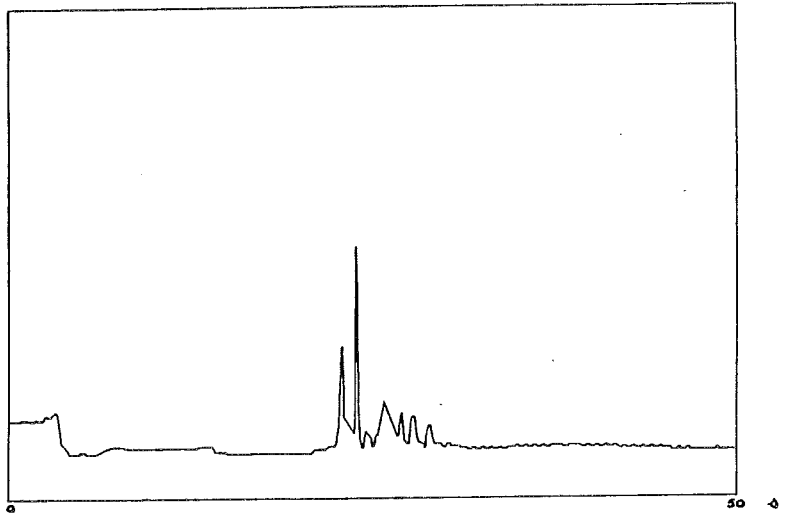
MO. X =  
1  
MIN =  
0  
MAX =  
50  
NO. Y =  
1  
MIN =  
0  
MAX =  
0



## AUORE

## ROTATION SPEED TELEMETRY

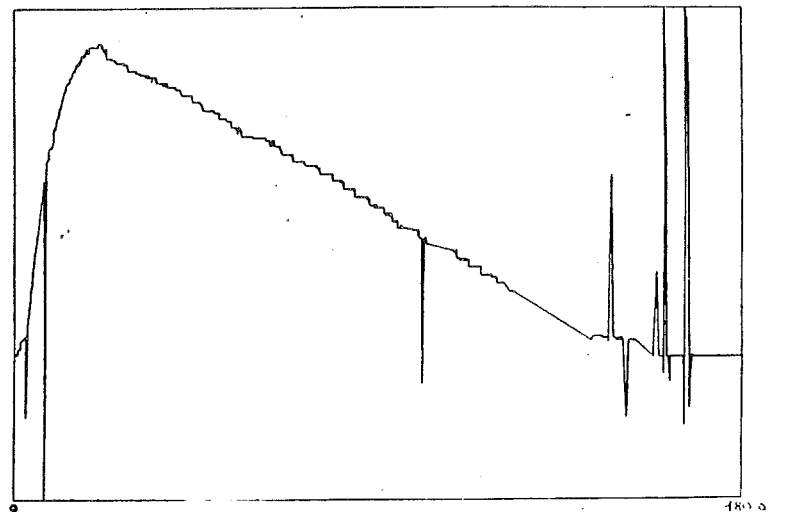
MO. X =  
1  
MIN =  
0  
MAX =  
50  
NO. Y =  
1  
MIN =  
0  
MAX =  
0



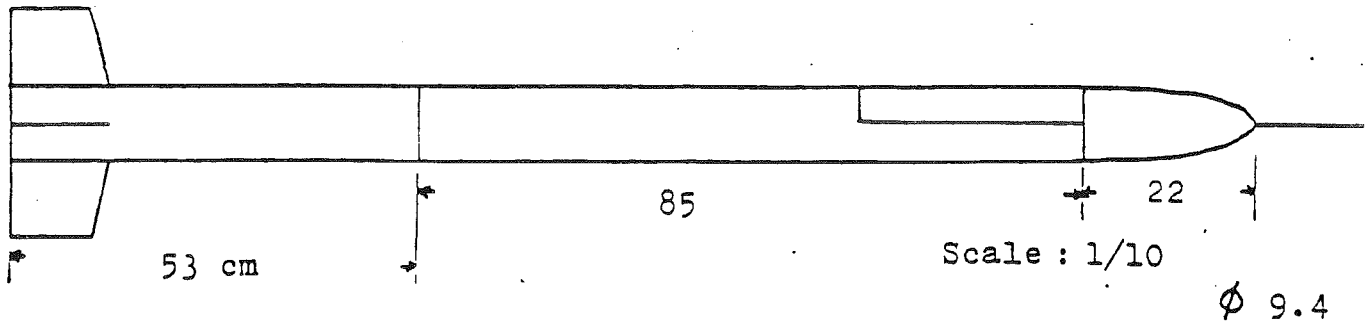
## AUORE

## ALTITUDE TELEMETRY

MO. X =  
1  
MIN =  
0  
MAX =  
100  
NO. Y =  
1  
MIN =  
0  
MAX =  
0



KIKKER            BVRO Gent (B)  
16100 g  
Motor Test  
Lateral door



### NEBEL

PROPELLANT :            Zn / S        3 / 1        POWDER

BURNING TIME :        2 , 4 s

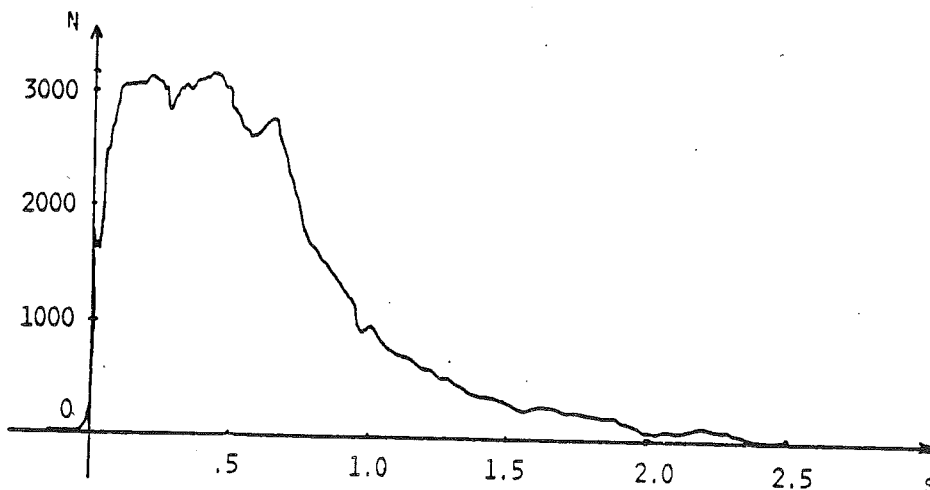
MAX. THRUST :        3136 N

TOTAL IMPULSE :        2200 N . s

MASS OF PROPELLANT :    5 Kg

SPECIFIC IMPULSE :        45 s

THRUST CURVE :



Nozzle ejected in the ramp.  
Destruction of the ramp

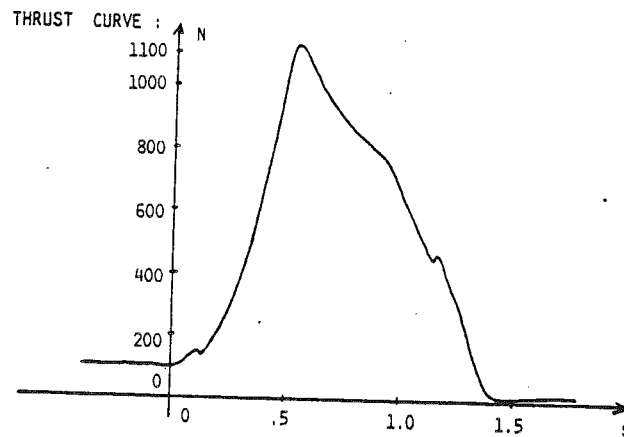
ICARE                    BETAH Haguenu (F)  
3130 g  
Gonio transmitter  
Separation by Explosive bolts

9 " 4            Culmination  
23 " 6           Flight Time

Payload OK after the touch down

**B A M F I**

PROPELLANT :            BLACK POWDER  
BURNING TIME :           1 . 4 s  
MAX. THRUST :            1150 N  
TOTAL IMPULSE :           940 N . s  
MASS OF PROPELLANT :   0 . 95 KG  
SPECIFIC IMPULSE :       90 s



MARIANNE 2            CLES Lyon (F)

Rotative Lateral door

29 " 3            Parachute open  
66 "              Flight Time



INA 82

ARKZ Zagreb (YU)

GEA Gilly (B)

20000 g

Two Stages Test

Memorized signal and repeating  
(BELG'HIC Equipment)

Separation by Over Pressure

2 Streamers & 3 Parachutes

### TG 10

PROPELLANT : DOUBLE BASE

BURNING TIME : 1.2 s

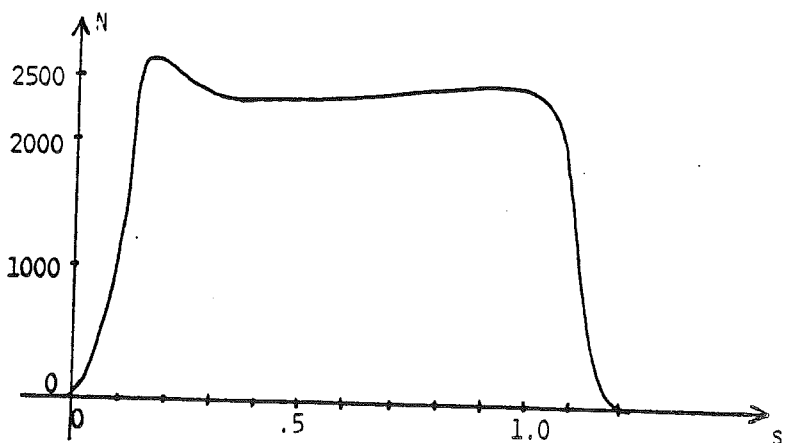
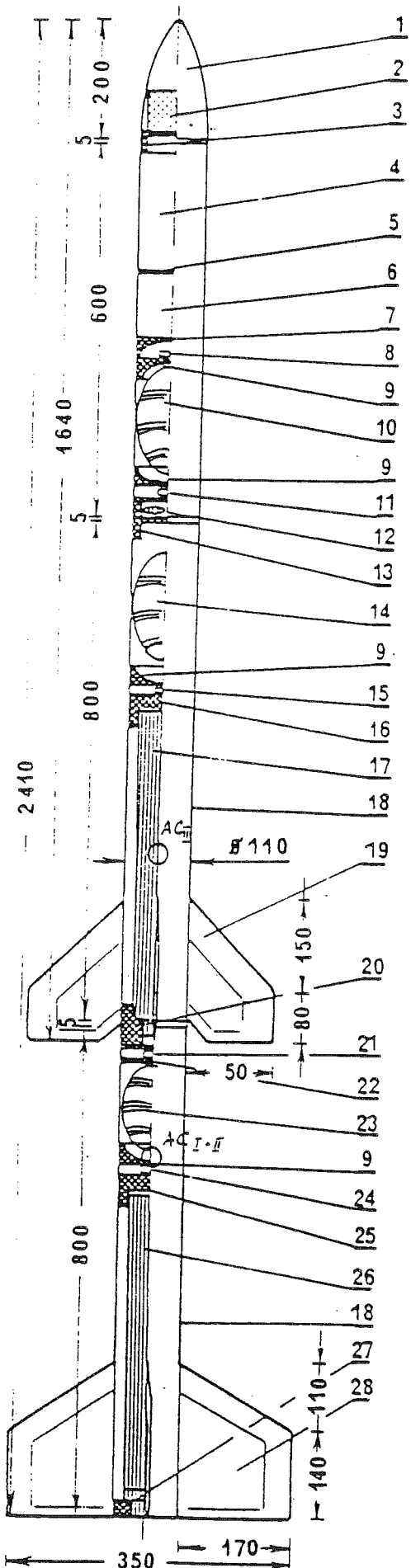
MAX. THRUST : 2500 N

TOTAL IMPULSE : 3000 N.s

MASS OF PROPELLANT : 1.5 Kg

SPECIFIC IMPULSE : 255 s

THRUST CURVE : (THEORETICAL)



29 " Flight Time

No Separation  
No Ignition of the 2nd Stage

IRIS DARK Vanlose (DK)  
 22000 g  
 Movie Camera  
 Separation by Explosive bolts

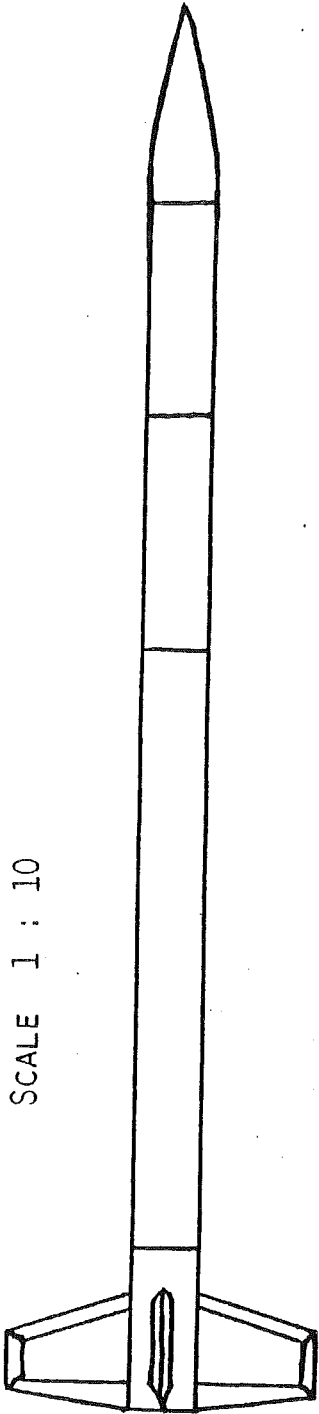
**BERA 3700**

PROPELLANT : ZN / S 3 / 1 POWDER  
 BURNING TIME : 1.2 s  
 MAX. THRUST : 5713 N  
 TOTAL IMPULSE : 3000 N . s  
 MASS OF PROPELLANT : 7.5 KG  
 SPECIFIC IMPULSE : 40 s  
 THRUST CURVE :

19 " Parachute open  
 62 " Flight Time

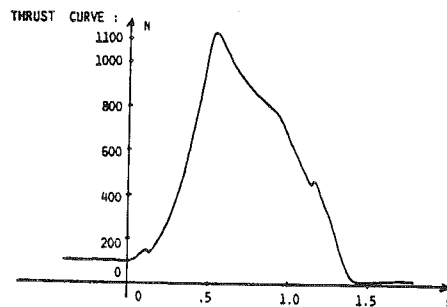
No Pictures

SCALE 1 : 10



**BAMFI**

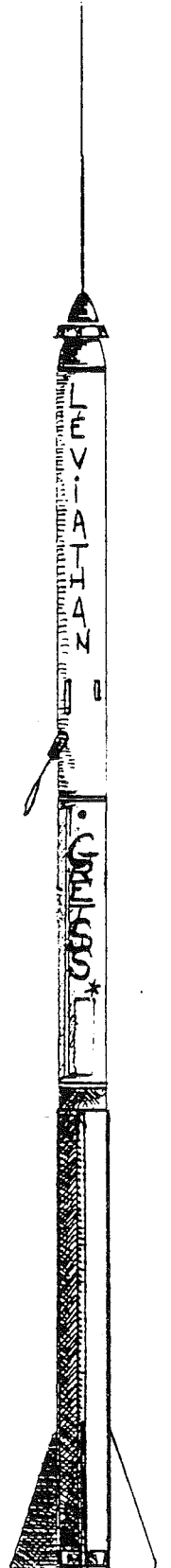
PROPELLANT : BLACK POWDER  
 BURNING TIME : 1.4 s  
 MAX. THRUST : 1150 N  
 TOTAL IMPULSE : 940 N . s  
 MASS OF PROPELLANT : 0.95 KG  
 SPECIFIC IMPULSE : 90 s



LEVIATHAN GRETSS Strasbourg (F)  
 3200 g  
 Telemetry of Speed by a little  
 Propeller and Flight Phases  
 Gonio Transmitter  
 Separation by Explosive bolts

10 " Culmination  
 20 " Parachute open  
 68 " Flight Time and Gonio

Telemetry OK



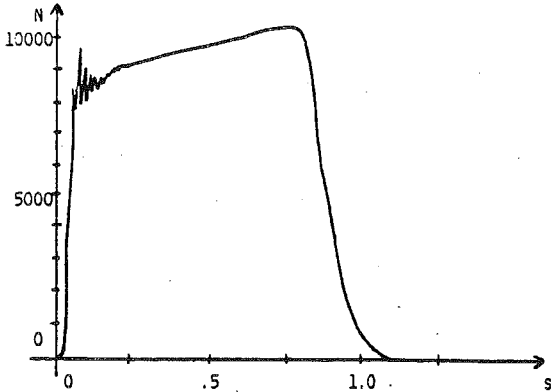
PERSEE CAC La Celle St Cloud (F)  
 CAT Toulouse (F)

27100 g  
 Telemetry of Acceleration, Static  
 Pressure, Cone Temperature and Flight  
 Phases  
 Gonio Transmitter PCM Coding  
 Pyrotechnical Umbilical Plug  
 Lateral door by Pyrotechnic Cutter

**MIRE B**

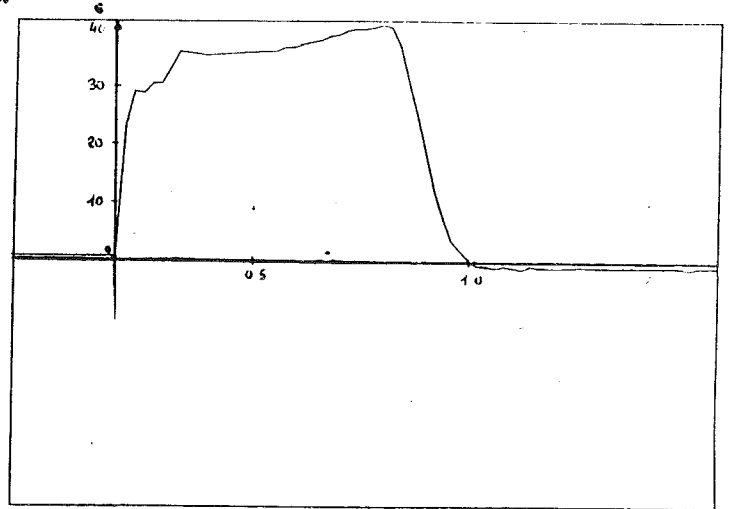
PROPELLANT :  
 BURNING TIME : 1.1 s  
 MAX. THRUST : 10500 N  
 TOTAL IMPULSE : 8270 N  
 MASS OF PROPELLANT : 3.85 Kg  
 SPECIFIC IMPULSE :

THRUST CURVE :



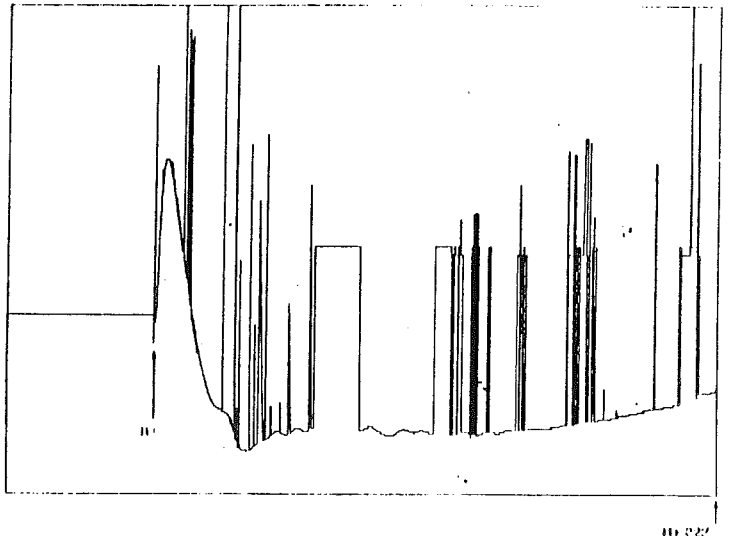
PERSEE ACCELERATION TELEMETRY (PROPULSION PHASE)

NO. X = 1  
 XMIN = 50  
 XMAX = 60  
 NO. Y = 11  
 YMIN = 0  
 YMAX = 0



PERSEE DYNAMIC TEMPERATURE (NOSE) TELEMETRY

NO. X = 1  
 XMIN = 0  
 XMAX = 200  
 NO. Y = 12  
 YMIN = 0  
 YMAX = 0

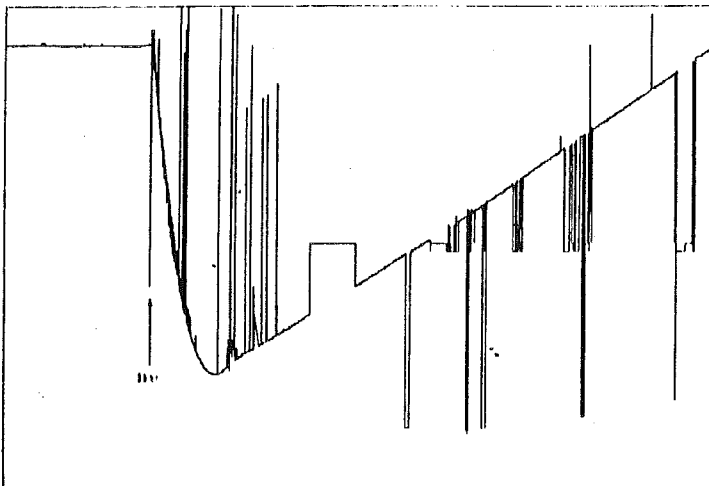


11 022

226 " Flight Time

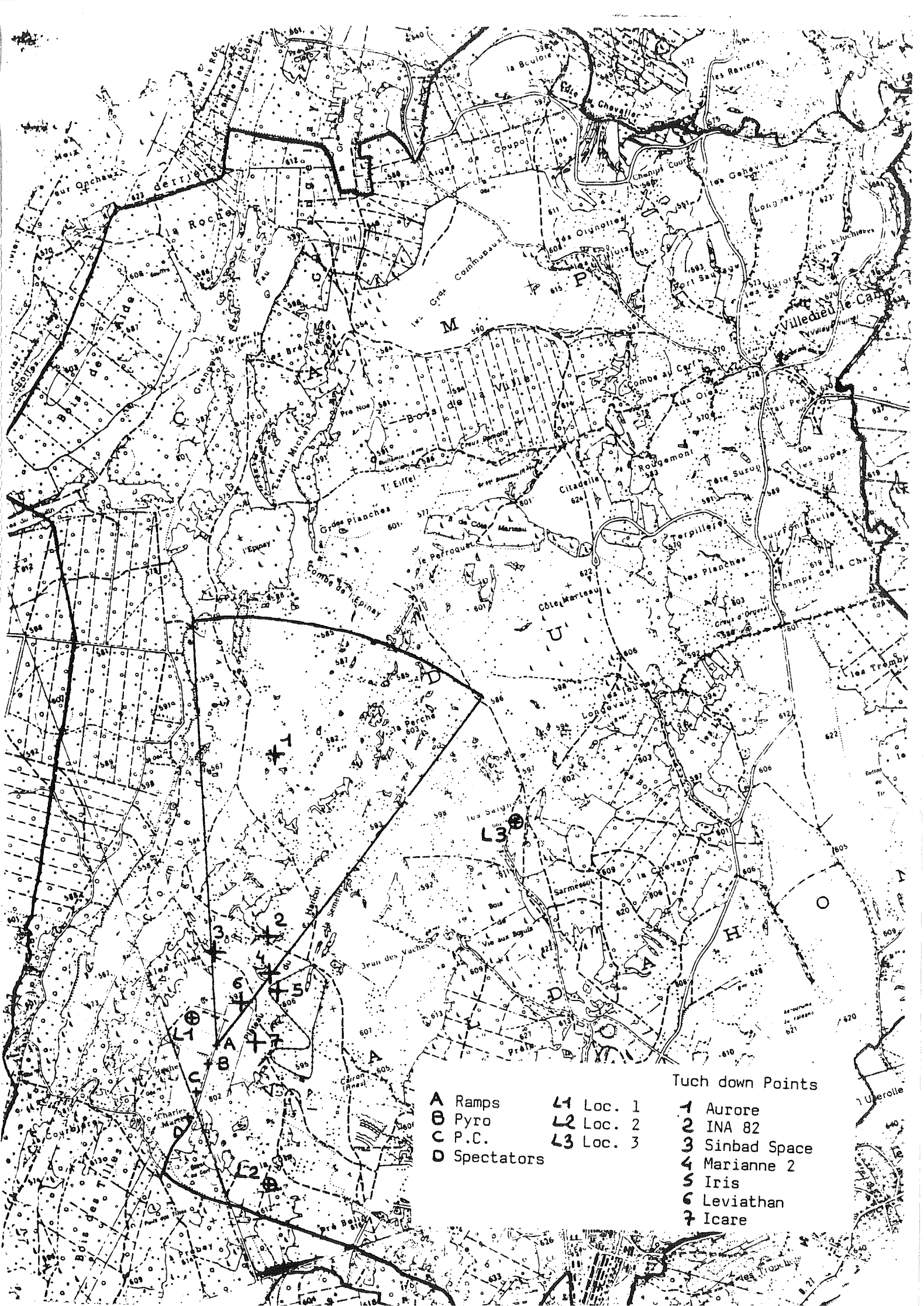
PERSEE STATIC PRESSURE TELEMETRY

NO. X = 1  
 XMIN = 0  
 XMAX = 200  
 NO. Y = 10  
 YMIN = 0  
 YMAX = 0



11 222 A

Telemetry OK



- A Ramps
- B Pyro
- C P.C.
- D Spectators

- L1 Loc. 1
- L2 Loc. 2
- L3 Loc. 3

Tuch down Points

- 1 Aurore
- 2 INA 82
- 3 Sinbad Space
- 4 Marianne 2
- 5 Iris
- 6 Leviathan
- 7 Icare



III . 3 . 3 Press Cover

---

7 September	L'Est Républicain	(Belfort)	
18 September	Radio Libre Paris	(Paris)	30 mn (radio)
21 September	L'Est Républicain	(Belfort)	
22 September	L'Est Républicain	(Belfort)	
26 September	Agence France Presse	(France)	
27 September	Le Parisien Libéré	(Paris)	
30 September	Le Bien Public	(Dijon)	
1 October	Le Nouveau Journal	(France)	
2 October	Le Quotidien du Médecin	(France)	
	La Liberté	(Lille)	
	La nouvelle République du Centre ouest		
	France Inter:		(radio)
	News in direct	Didier Lecat	
		Michel Forgit	13 H 00 à 13 H 30
4 October	France Région 3 (regional news)		(T.V.)
	Les dernières nouvelles d'Alsace		
	Agence France Presse	(France)	
5 October	Le Temps	(Tunisia)	
		(Tunisia)	
		(Tunisia)	
	L'Alsace	(Mulhouse)	
	Le Journal	(Lyon)	
	La Haute Marne Libérée		
	L'Indépendant	(Perpignan)	
	Le Soir	(Belgium)	
	Le Bien Public	(Dijon)	
6 October	Les Dépêches	(Dijon)	
9 October	France Inter:		(radio)
	Inter Service Jeunes		
20 October	Television Francaise 1 (youth broadcasting)		(T.V.)
	Antenne 2 (news)		(T.V.)
	2 other Belgium newspapers		
November	Sciences Loisirs	(France)	
December	Le Monde de l'Education	(France)	
	Technika Kultura	(Jugoslavia)	
	La Voix de l'Est	(Montreuil)	

### III . 4 CONCLUSIONS

#### III . 4 . 1 Operational Teams -----

The idea was to give the responsibility of the creation of one group to one leader. This system worked more or less but the clubs were not enough concerned by the organisation and the materials of the campaign. An effort must be done to increase this responsibilities by the clubs themselves instead of a little group of people.

An high responsibility level will be necessary if the campaign occur outside of France because this big infrastructure and organisation doesnt exist in the other european countries.

#### III . 4 . 2 Launchings -----

After motors and separation systems incidents, some conclusions are important to do:

- Be more vigilant with the real motor's quality (bench's tests obliged, control of the realisation's quality and of the motor itself).
- Never be obliged to open the rocket to initiate any system
- For explosive bolts, safety screws and chains are obliged.

We have to notice an high level of annulations of scheduled projects. This is due to a leak of motivation, internal problems, technical problems on high level projects, problems during the realisation or during tests and engagements took too soon and too softly.

That exemples show very well the difficulties to do plannings and a more efficient organisation (welcome of launching teams, motors transport, time tables ...)

#### III . 4 . 3 Infrastructure -----

The only mistake was the place and the too large dimensions of the laboratories wich gave dead ambiance in there. This campaign showed also the limits of the french materials in communications and count down specially.

All the other points were very well adapted to that type of campaigns (launching pad, energy, ramps, localisation points, transport).

## IV 2° E.L.C. & LONG TIME PROJECTS

### IV . 1 DEFINITIONS OF THE 2° E.L.C.

Considering the actual status of the clubs and the different events: Conferences in 1985 and 1987, it appears that the next E.L.C. cannot be before 1986.

The results of the 1° E.L.C. involve some changes in the organisation and in the choice criteriums for the rockets.

For the place of the campaign, some propositions were done: Sweden, Yugoslavia, Nederlands and Scotland. After many discussions, Sweden is choose and precisly Kosta in the neighbourhood of Vaxjo (around 300 Km from Kobenhavn) and the dates are fixed to the 3-4-5 of September 1986.

### IV . 2 OBJECTIVES

#### IV . 2 . 1 Operational Plan

-----

The E.L.C. must be organised with real international operational teams. The following general organisation shows the different teams to create, their place in the groups and the number of people needed:

<u>Launching Group</u>		<u>Recovery Group</u>	
P.C. Coordination	4	Meteo Calculations	3
Pyrotechnicians	2	H.F. Communications	1
Telemetry	2	Localisations points	6
Transport	2	Observers	3
Ramps	3	Recovery	3
Ramp Communications	1		
Flight Informations	2		
Launching Pad Infrastructure	2		
 <u>Control Group</u>		 <u>Accomodations Group</u>	
Stability	1	Accomodations	1
Strength	1	Welcome	1
Recovery	1	Spectators and Sonorisation	5
		Photos	2
		Press	1
		Campaign Newspaper	1
		Bar	1
		Infrastructure	2

The main boarder is composed by:

- Campaign Responsable
- Launching Director
- Control Responsable
- Project Leaders
- P.C. Coordination Responsable

Their attributions are completely redefined and well precised after the 1° E.L.C. to increase their efficiency.

The P.C. Coordination Responsable is busy with all the technical details of the operational teams and the launching area wich are not too critical for the launchings.

The Campaign Responsable is only able to Stop a countdown or a launching if he decides it for safety or legal reasons. He is the legal responsable of the campaign, so he must be a personality of Youth & Space.

The Launching Director is the one who takes all the decisions concerning the launchings. He is in permanent contact with the P.C. Coordination.

Different diagrams are established for the following situations to define the way for taking a decision:

- Safety problems on a rocket
- Experiments problems on a rocket
- Campaign problems.

The Project Leader must be at the P.C. and he is able to stop the count down or the launching at any moment if he decides that something can trouble the good progress of the launching of his rocket.

The Responsible of the Controls must be with the rocket or at the P.C. Coordination.

#### IV . 2 . 2 Rockets

The rockets to be launched during the E.L.C. will be the representation of the technics that the club is really able to do, and not specially a very sophisticated rocket with many untested systems. An effort will be made during the E.L.C. to present all the rockets launched with the description of all the different systems.

To increase the quality of the rockets to be launched, the controls will be strengthened and will follow this criterums:

- For all 2 stages and special rockets or for any culmination expected over 5000 meters, a system able to open all in case of wrong flight is necessary.
- One thrust curve at the minimum and mecanical drawings are needed and strength calculations are asked.
- The rocket must be compatible with the campaign:  
Countdown length no longer than 3 hours  
No separate tent  
No effect on the program and no other materials as power generators or other ground materials.
  - Professional ignitors must be used.
  - Recovery system tested one time.
  - No explosive devices onboard.
  - and the club must give the autorisation to use their ramp after his own launching if he comes with it.

In any cases the organisers (E.L.C. Working Group) have the power of decision about any launching.

A team of followers is created to maintain the contact between the clubs and the organisation and to obtain a better launching rate than in the 1° E.L.C.

The motors will be filled in Sweden to reduce the problems of transport on the control of the pyrotechnicians and Swedish organisers.

#### IV . 2 . 3 Infrastructure

To increase the engagement of the clubs in the preparation of the E.L.C., the responsibility of the materials will be dispatched between all the clubs and a specifications catalog will be made to standardise as far as possible these materials.



## IV . 3 LONG TIME PROJECTS

### IV . 3 . 1 Observation of professional Launching Campaigns -----

To maintain the contact with professionals and to compare our campaigns organisations to their own ones we plan to visit launching bases as:

- Kiruna (Sweden)
  - Kourou (French Guyana)
  - Cape Kennedy (U.S.A.)
  - Baikonour (U.S.S.R.)
  - Sounding Balloons bases
- at the occasions of launchings.

### IV . 3 . 2 European Launching Base -----

In the projects of the working group, the creation of an European Launching Base, standing or moving, is one of the biggest ones in organisation and in financial matter.

This base will be able to receive any rocket from the countries members of Youth and Space and must be runned by a kind of permanent team.

### IV . 3 . 3 Observation of all launching campaigns in the world -----

To increase our knowledge in the field of amator rocketry, it would be interesting to visit any amator launching campaign in the world.

One of the objectives of that project could be to create a kind of book as "Interavia" for professionals.

## V FINANCIALS

---

The budget of the E.L.C. Working Group for the next 2 years is the following:

<u>Expenses</u>	
Secretariat	2000
Campaign Observations	10000
Public Relations	6000
<u>2° E.L.C.</u>	
Accomodations	60500
Bus Transport	3000
Material Transport	1000
Secretariat	5000
Rent of Military Area	6000
Fire Brigade	1500
Transport to the Camp	6000
Projects Following	15000
Preparation Meetings	12000
Transport for the Tests	20000
Materials	5000
<hr/>	
	153000 FF

<u>Incomes</u>	
Youth & Space	23000
European Youth Fond	40000
2° E.L.C. participants	40000
rockets registration	10000
Swedish contribution	10000
Others to be defined	30000
<hr/>	
	153000 FF

Nota: The total budget of Youth & Space (including this one) is for the same period : 331000 FF

---

C/O Eric SCHMITT 7 Allée FRAGONARD 95200 SARCELLES FRANCE

SEPTEMBER 24 TH 1983  
OLDENBROEK (NL)

ROCKET LAUNCHED : R 12 (N.E.R.O. ROTTERDAM)

CLUBS REPRESENTED :  
N.E.R.O. EINDHOVEN  
N.E.R.O. HAARLEM  
N.E.R.O. ROTTERDAM

---

C/O Eric SCHMITT 7 Allée FRAGONARD 95200 SARCELLES FRANCE

TIME SCHEDULE

9.30                    *Launching pad installation*

10.30                   *Launching tower installation (12 people)*

11.00                    "                    "    *regulation (8 people)*

11.15                   *Meeting with military authorities*

11.20                   *Inspection of the ignitor*

11.30                   *Placing the rocket with the motor in the ramp*  
*(2 Pyro + 1, 2 ramps, 3 clubs + spectators at 3*  
*meters)*

11.45                   *Telemetry tests*  
*Evacuation (stay 4 people)*

12.00                   *Flight plug inserting*  
*Safety waiting*  
*Transmitter connection*  
*Ignitor connection*  
*Relay box connection*  
*Last evacuation (H - 10 mn)*  
*(white flying light when the rocket is ready to*  
*launch)*

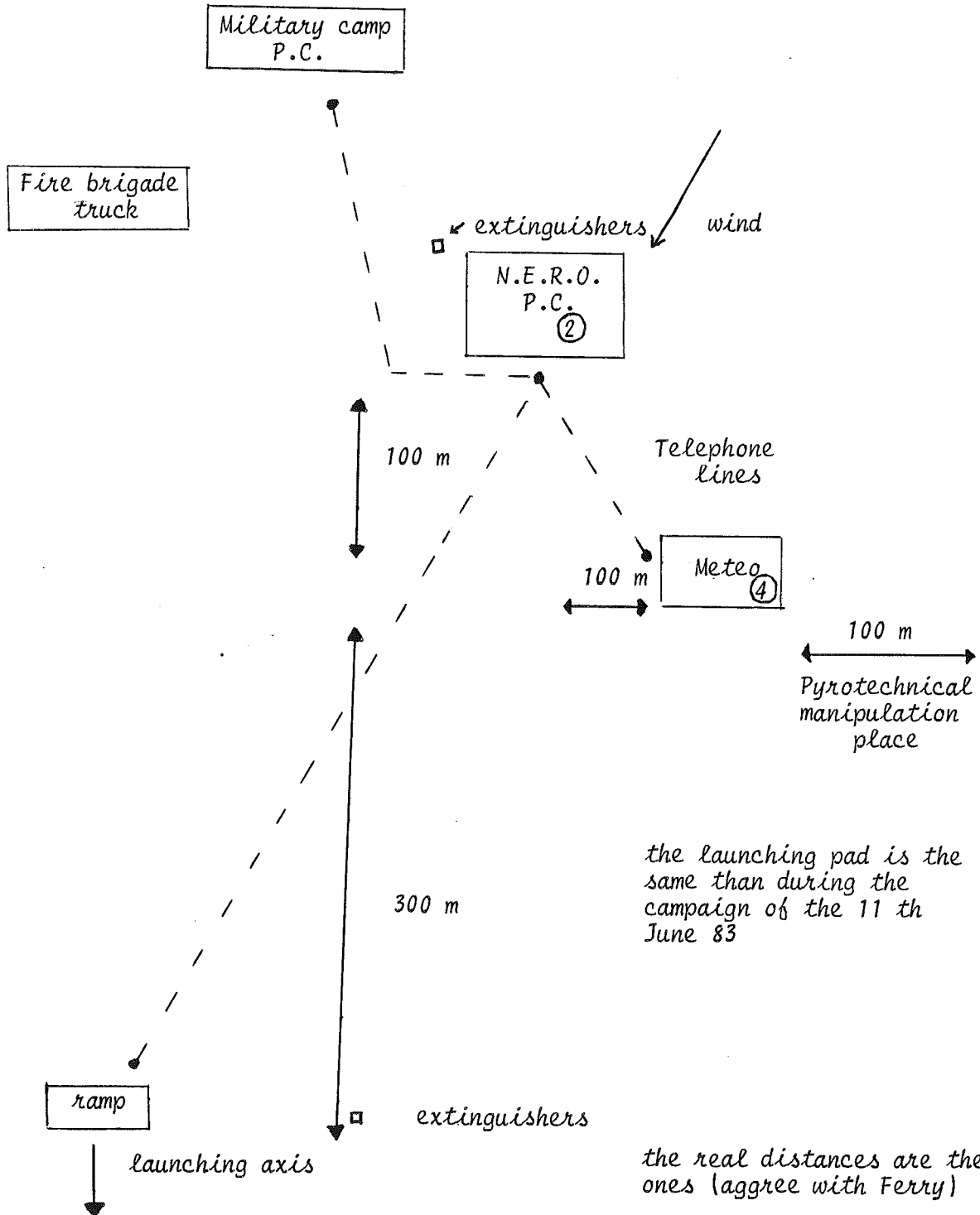
H - 30 s                *Red flying light*

12.20                   *Launching*  
*Green flying light when the rocket is on the ground*

12.50                   *Recovery of R 12 (4 people + jeep) and presentation*

C/O Eric SCHMITT 7 Allée FRAGONARD 95200 SARCELLES FRANCE

LAUNCHING PAD



C/O Eric SCHMITT 7 Allée FRAGONARD 95200 SARCELLES FRANCE

R 12

*This rocket had to be launched during the campaign in June, but electronic troubles cancelled the launching.*

Total mass : 18.4 Kg  
Propellant mass : 5.95 Kg Zn/S 3/1  
Length of the rocket : 2.000 mm  
Diameter of the rocket : 94 mm  
Theoretical max. height : 1.000 m  
Culmination time : 14 s.  
Transmission frequency : 144 Mhz  
Ignition by the top of the motor  
Digital time switch  
Telemetries : rotation (1.140 Hz pulse (1s.) / each turn)  
flight phases (1.400 Hz pulse (1 s.) / each phase)  
6.000 Hz to H.0

Recovery by 2 parachutes - lateral door for the motor  
separation by inner bolt and mechanical system  
little parachute and later big one for the rocket

Results

Culmination time :  $\pm$  9 s.  
Flight time : 89 s.  
Recovery : OK  
Telemetry : received but surely difficulties to decode (OK for rotation but ? for flight phases)

---

C/O Eric SCHMITT 7 Allée FRAGONARD 95200 SARCELLES FRANCE

CLUBS REPRESENTED

N.E.R.O. EINDHOVEN

Ramp leader : DIRK VAN GELDEREN  
General Marshallveg 104  
5623 HE EINDHOVEN  
Tlf. : (40) 43 03 54

N.E.R.O. HAARLEM

N.E.R.O. ROTTERDAM

Leader adress : GERRIT DORR  
Stellingmolen 141  
3552 BE PAPENDRECHT  
Tlf. : (78) 15 66 39

Chrono computer leader : FRANS JACOBS  
Mesdaglaan 35  
2951 PH ALBLASSERDAM

GENERAL INFORMATION

One campaign costs 500 NL Gulden, and one normal campaign per year is payed by N.E.R.O.

If one department wants a special campaign, this campaign is payed by the department (that was the case this time).

C/O Eric SCHMITT 7 Allée FRAGONARD 95200 SARCELLES FRANCE

COMPATIBILITY WITH "YOUTH & SPACE" LABEL

Launching angle :  $85^\circ$  (tuned with bubble level for vertical direction and angle calculation)

Distances (see launching pad )

Number of people (see time schedule)

First aid : - car near the ramp ready to go

- First aid people and means

- extinguishers

- fire brigade truck

Controls done for the wind

Speeds : 2/3 m/s. (mesured at ground level)

80 m/s. for the rocket at the end of the ramp

Static tests done

Stability of the rocket : static marge = 1.5

PC INSTALLATIONS

