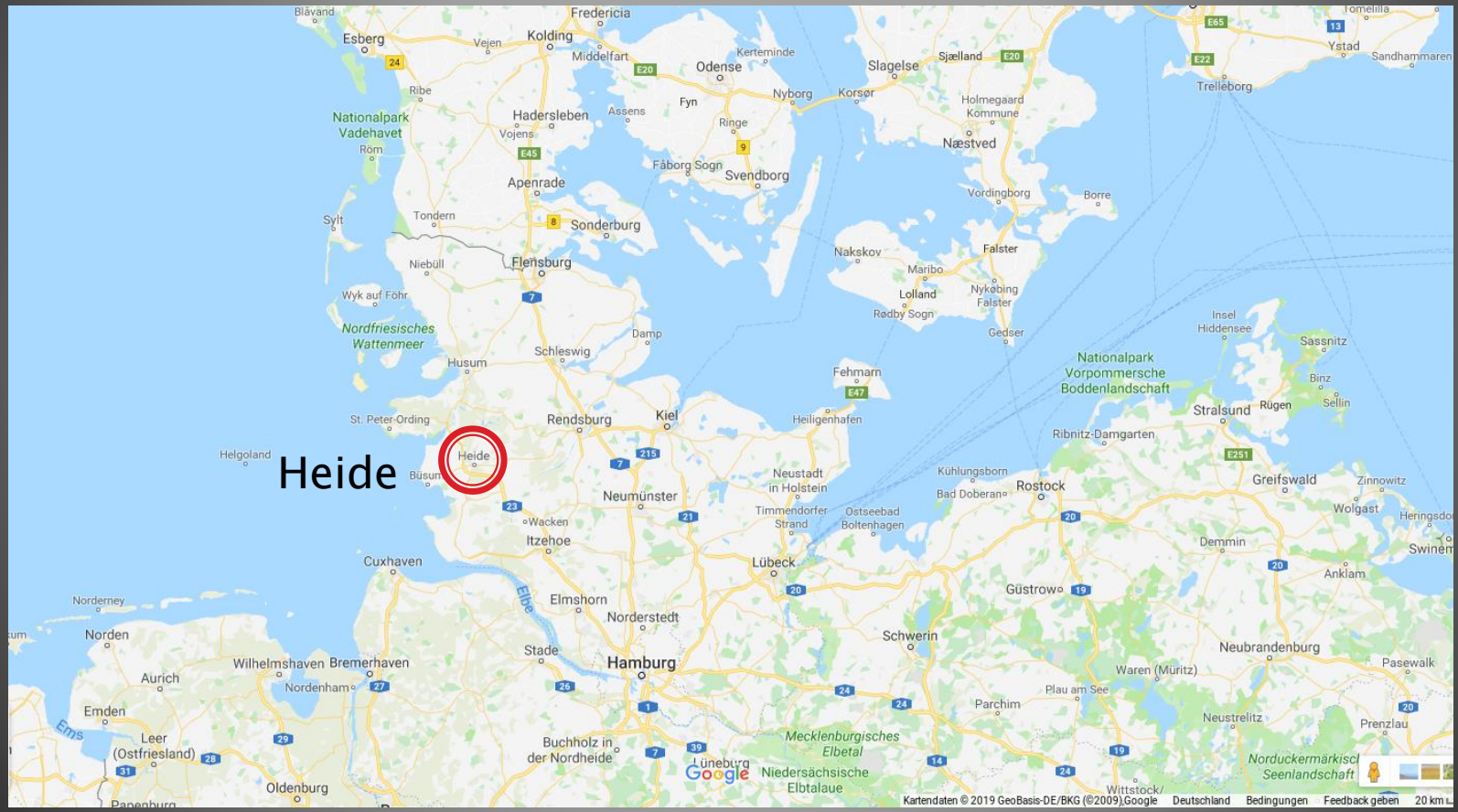
Born as a scientist

Axel's early career as a rocket engineer
Heide,1971-1975

Arranged by Matthias Steffen, April 2019

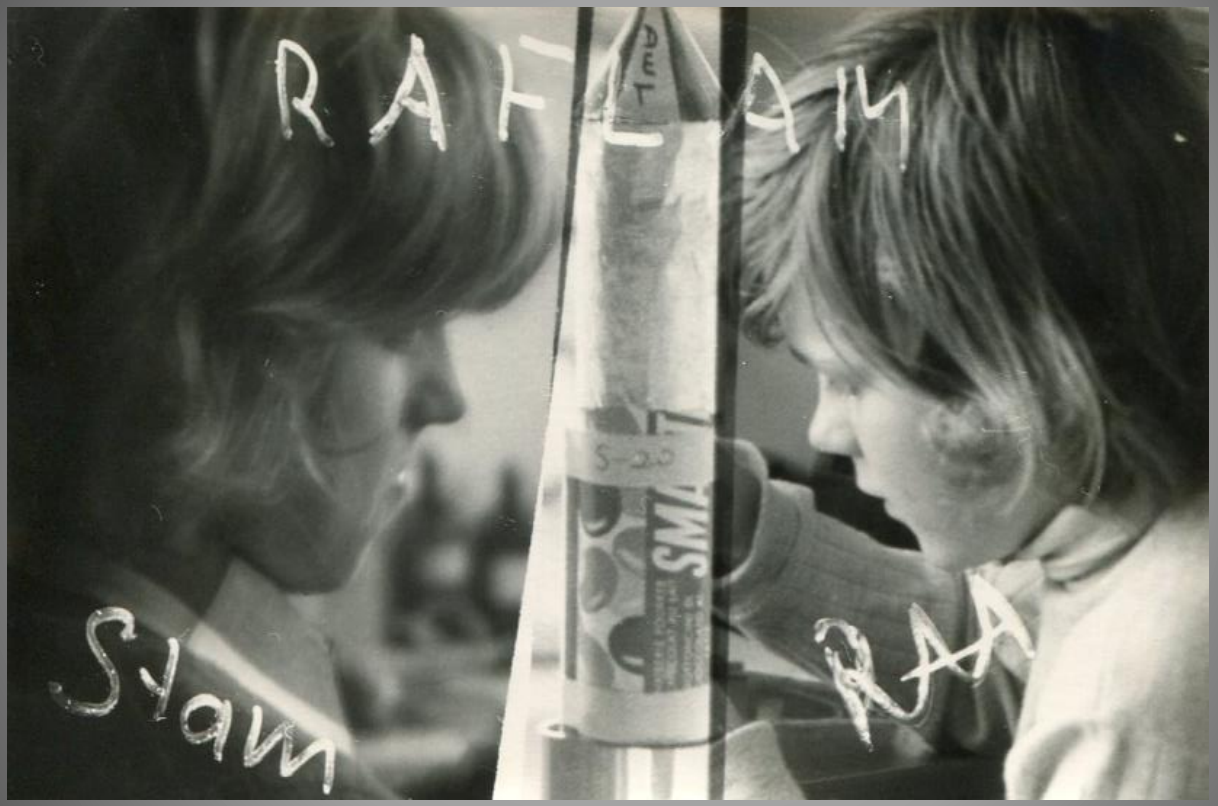
Axel's place of origin



Axel visiting, summer 1971

Launch of a Cheng rocket, summer 1971

RAFLAM: Rocket Flights Axel Matthias



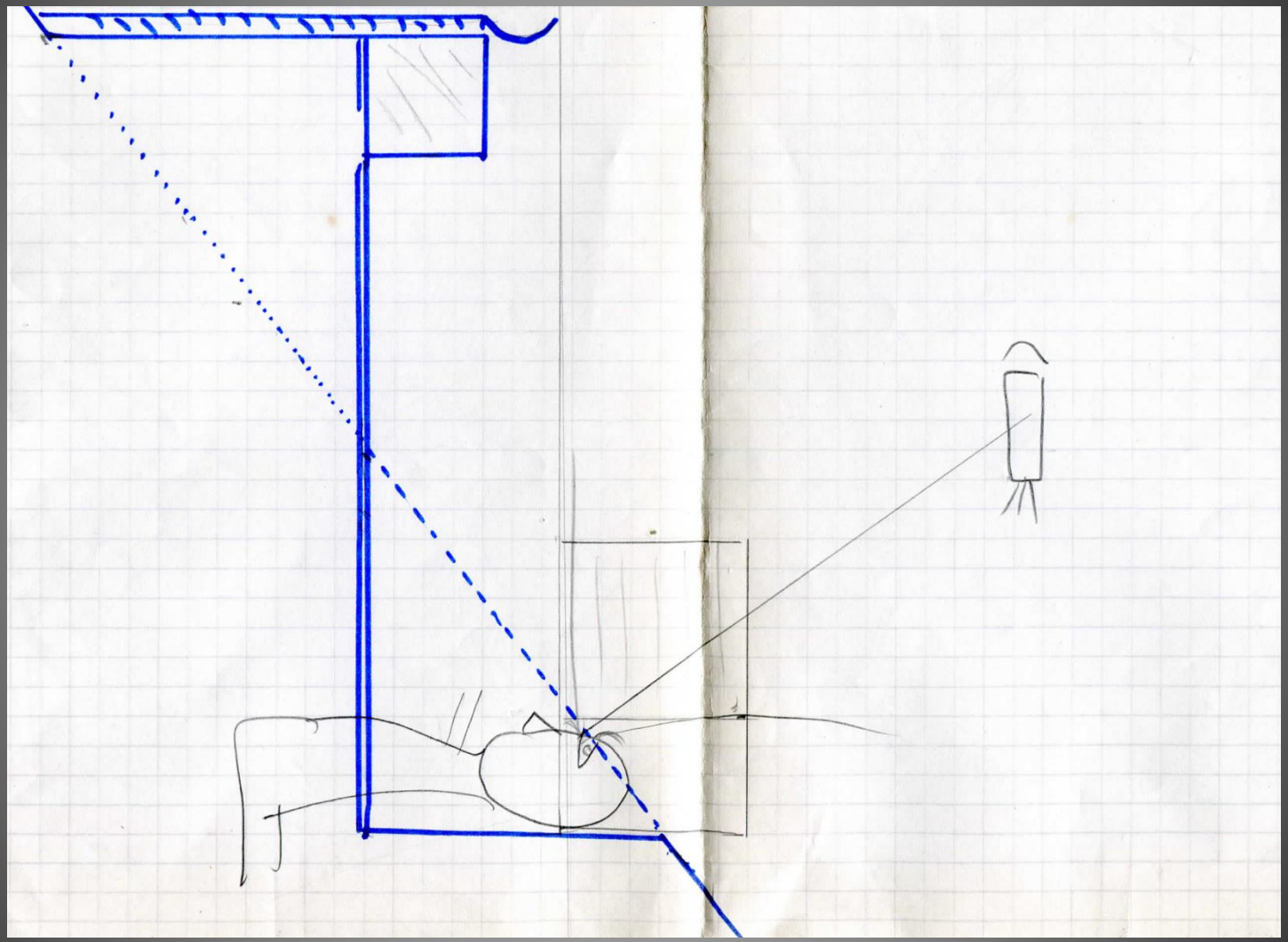
RAFLAM treaty, 30 March 1972

A Vital step: free voice over cable connection

Die “Anlage”

The new launch pad

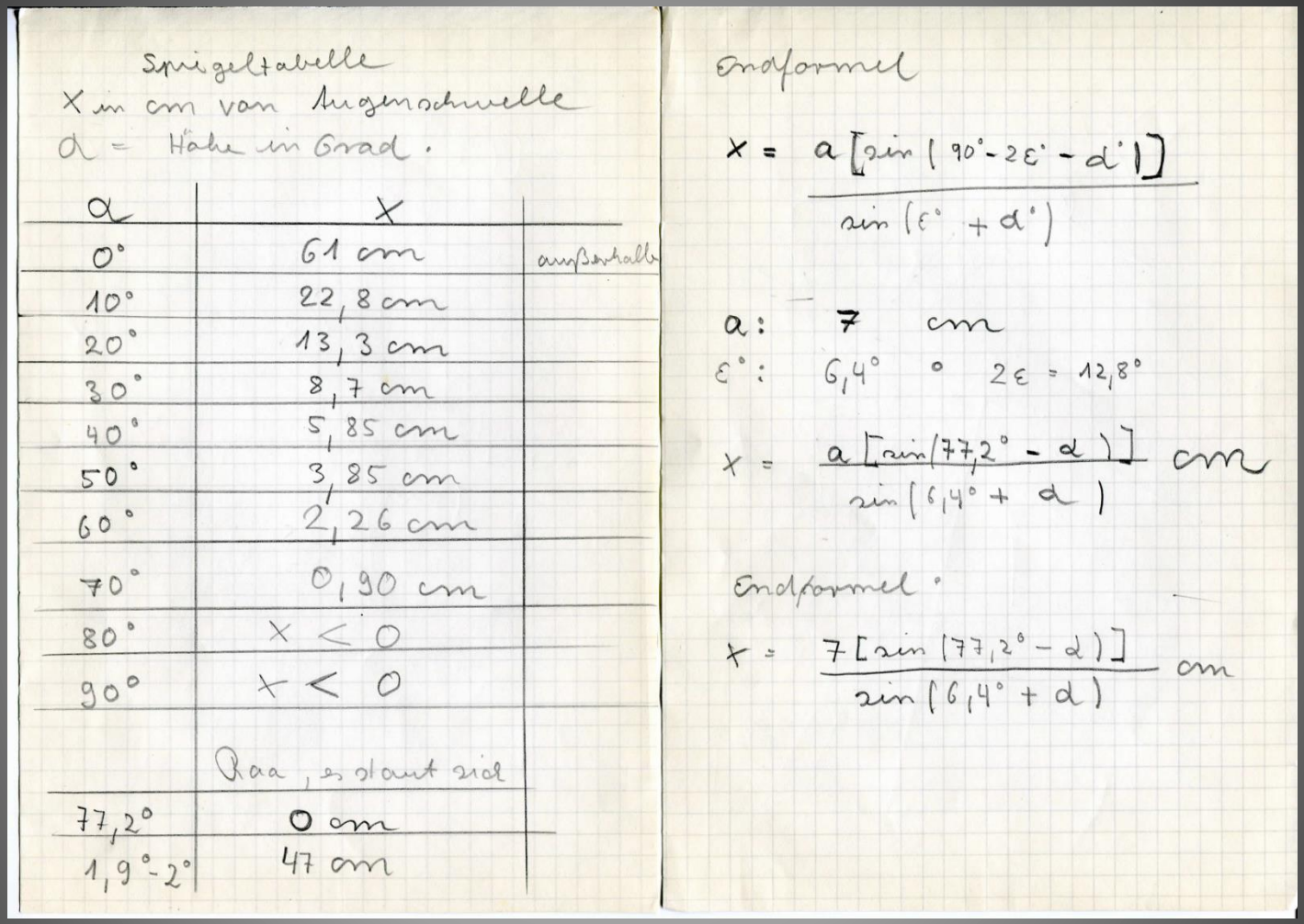
How to measure the rocket's height



First ideas, with observer in uncomfortable position

Triangulation from KZB (station 1)

Triangulation from KZB (station 2)



Spiegeltabelle

x in cm von Augenschwelle

α = Höhe in Grad.

α	x	
0°	61 cm	außerhalb
10°	22,8 cm	
20°	13,3 cm	
30°	8,7 cm	
40°	5,85 cm	
50°	3,85 cm	
60°	2,26 cm	
70°	0,90 cm	
80°	$x < 0$	
90°	$x < 0$	
	Raa, es staut sich	
77,2°	0 cm	
1,9°-2°	47 cm	

Endformel

$$x = \frac{a\,[\sin(90° - 2\varepsilon° - \alpha°)]}{\sin(\varepsilon° + \alpha°)}$$

a: 7 cm

ε°: 6,4° ° $2\varepsilon = 12{,}8°$

$$x = \frac{a\,[\sin(77{,}2° - \alpha)]}{\sin(6{,}4° + \alpha)}\ \text{cm}$$

Endformel:

$$x = \frac{7\,[\sin(77{,}2° - \alpha)]}{\sin(6{,}4° + \alpha)}\ \text{cm}$$

Some trigonometry is necessary

Observing station Kap Steffen

RAFLAM's sanctum

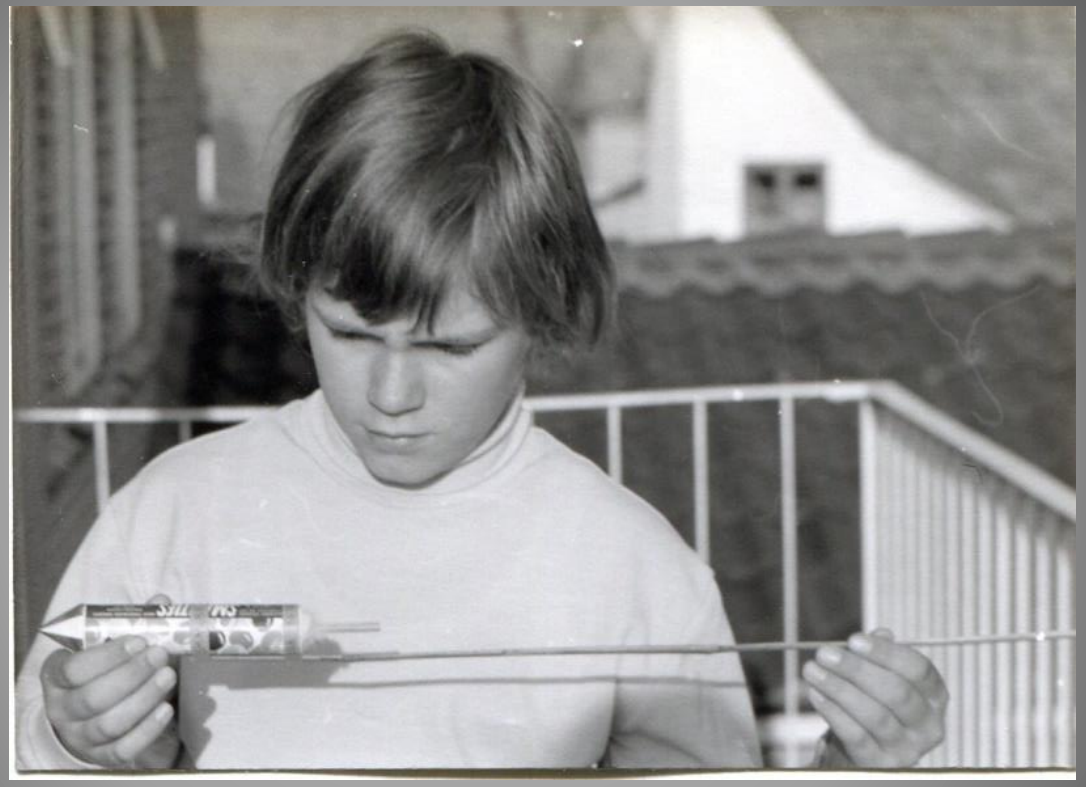
Top secret !

Axel taking care of our astronauts

Axel taking care of our astronauts

Conny being prepared for launch

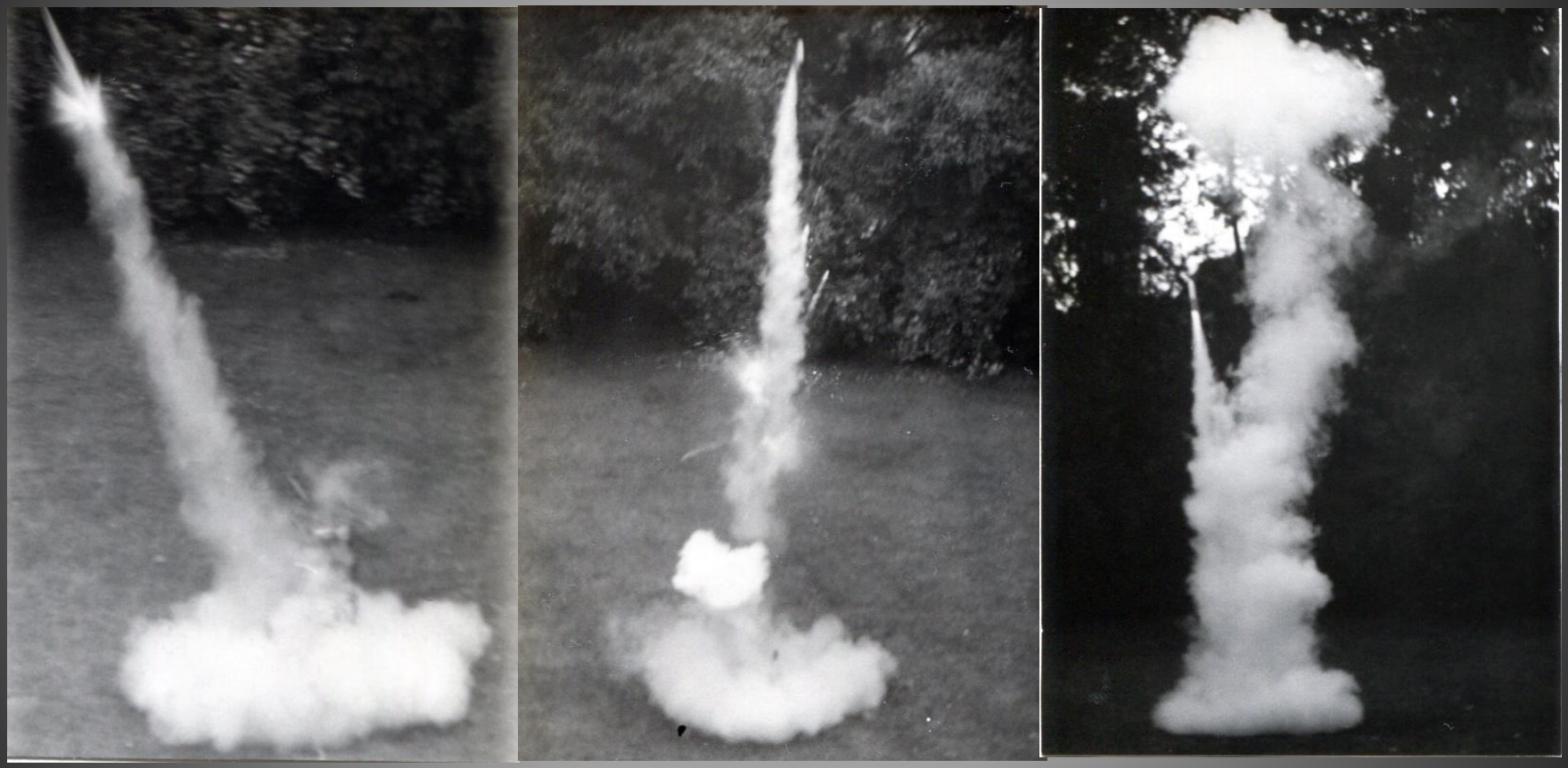
Axel inspecting rocket Smas 8



17. June 1972

Initial failures

Increasing success rate



Still some “Spotz” (June/July 1972)

As nice as in the picture book

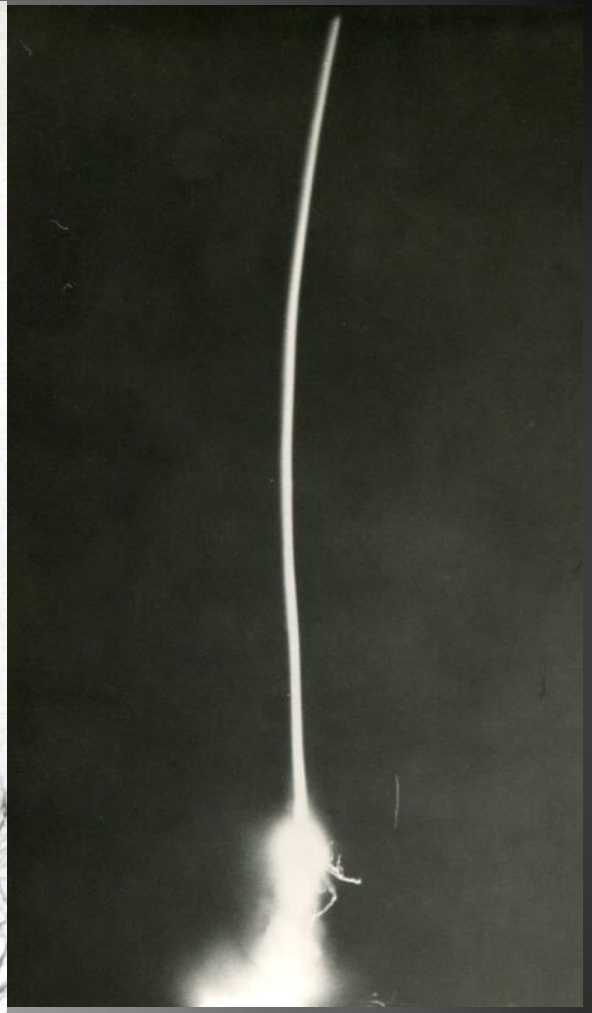
Launch of Pluto III (29 March 1973, taken by Wulf)

Tropopause 6
(13 April 1973)

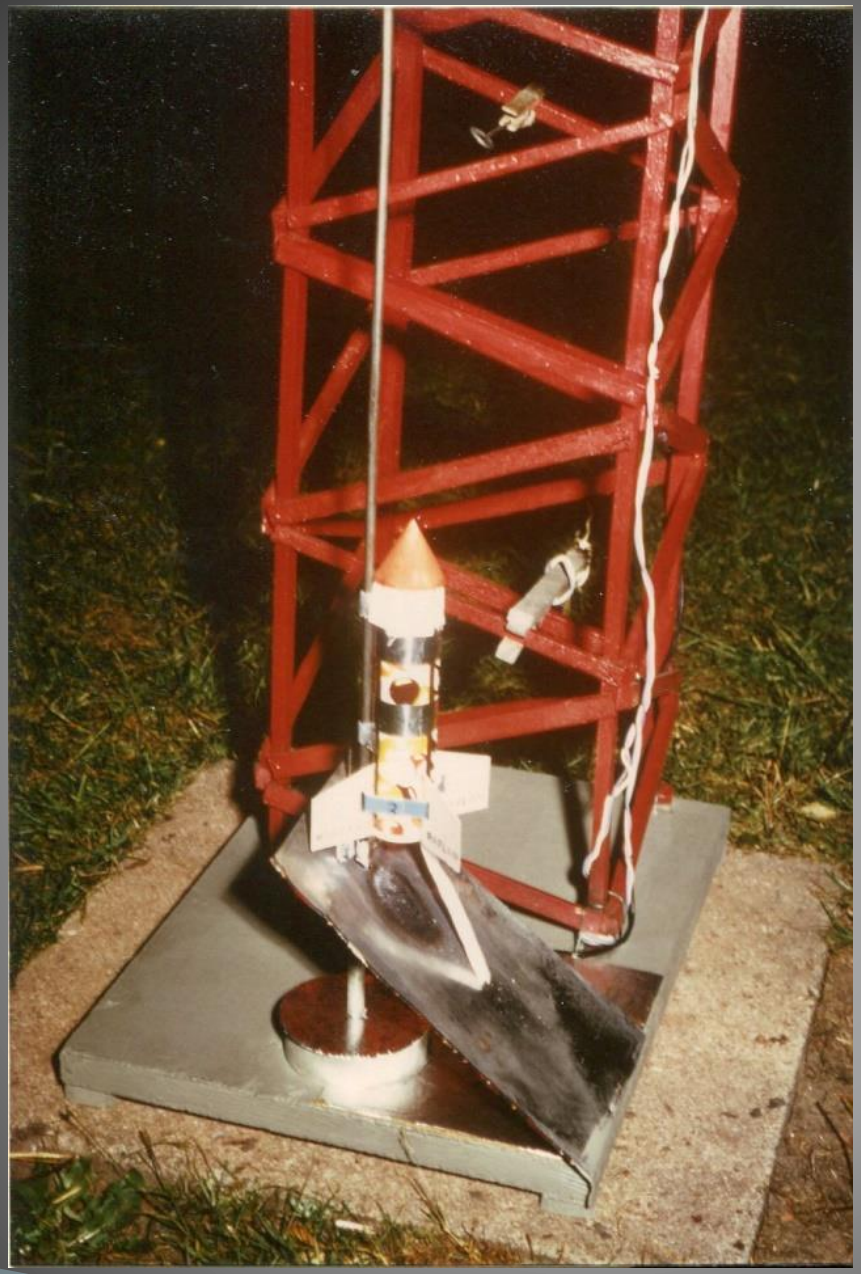
Tropopause 7
(14 April 1973)

Tropopause 3
(1 March 1973)

Pluto 1
(11 March 1973)



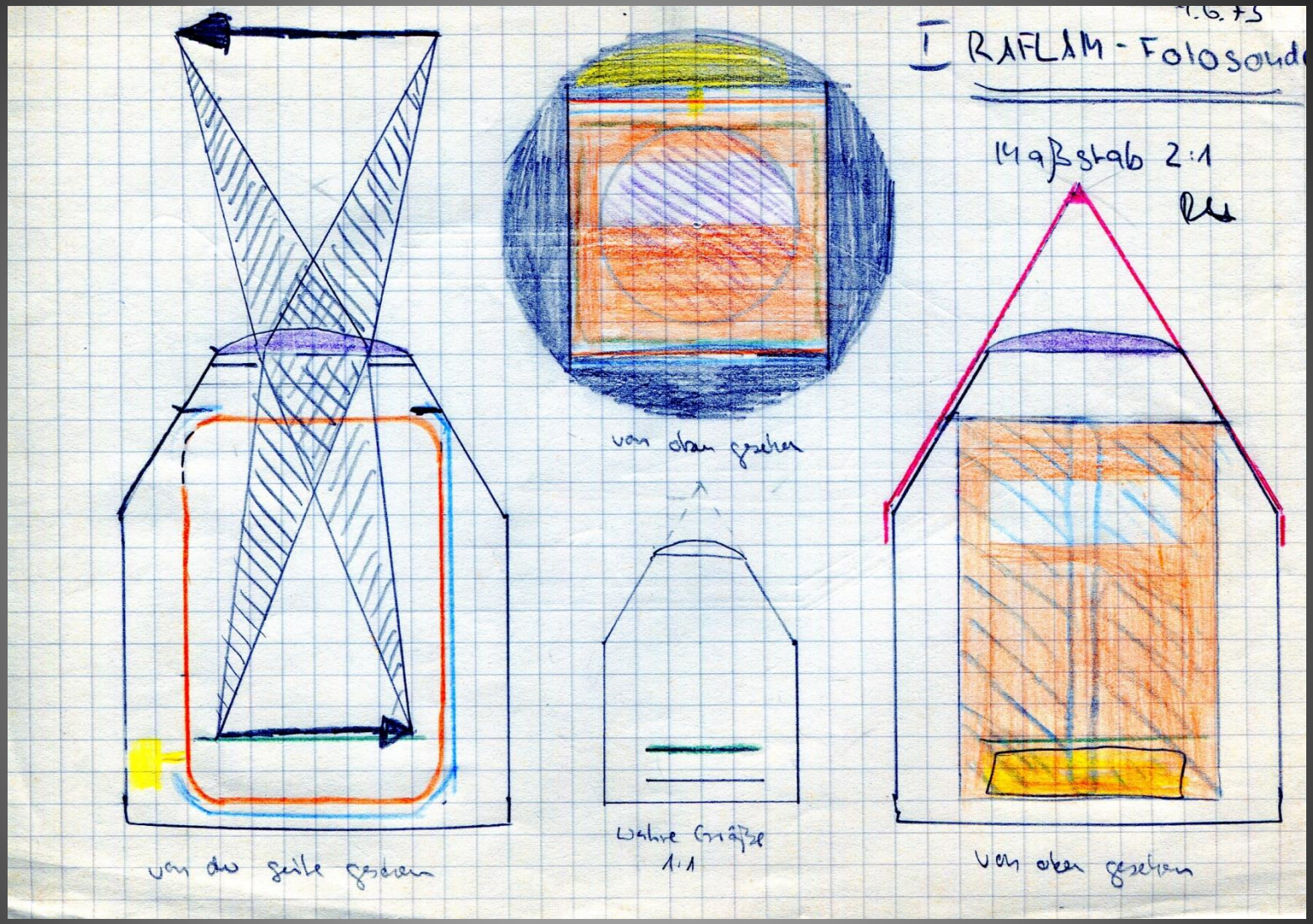
Tropopause 9
(24 April 1973)



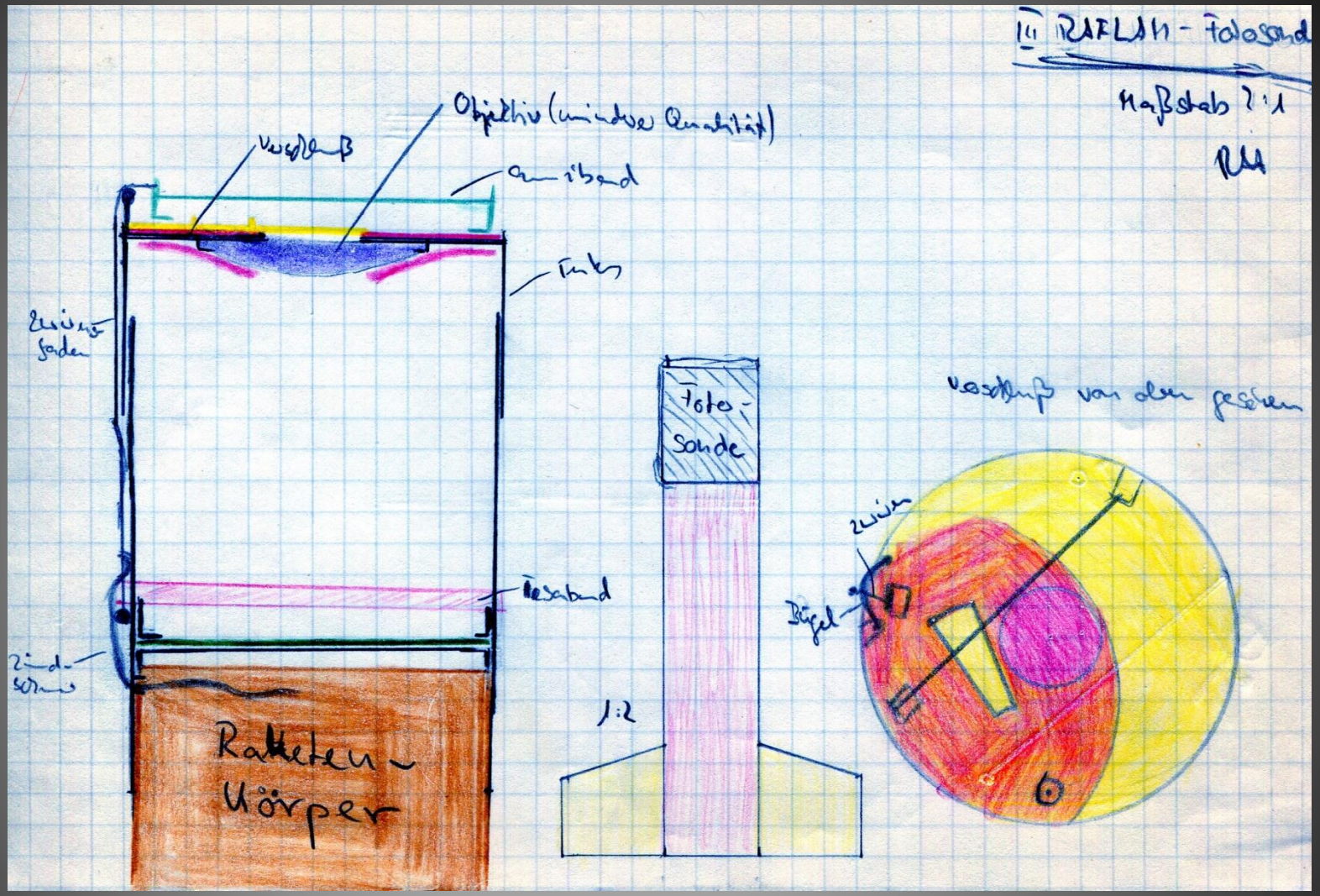
A breakthrough

First rocket
stabilized by fins
→ Heights above 200 m

Tropopause 12 (FL2)
(11 June 1973)



RAFLAM Fotosonde I, drawings by Axel, 4 June 1973



RAFLAM Fotosonde III, drawings by Axel, 6 August 1973

Satz 2.10.

Die Operatoren M, P_ν, $U(\Lambda)$ und B erfüllen die folgenden Eigenschaften (vgl. Satz 1.2., Abschnitt 2.1. mit $e^{i\lambda} = \sqrt{\frac{1+ic}{1-ic}}$):

1) $[B, U(\Lambda)] = 0$

2) $BM = e^{i\lambda} MB + (m_0 - e^{i\lambda} m_0)B$

3) $BP_\nu = \{e^{i\lambda} + \frac{m_0 - m_0 e^{i\lambda}}{m}\} P_\nu B \qquad \nu = 0, \dots, 3$

Beweis:

a) Eigenscharf 1 ist klar, da $U(\Lambda)$ nur auf den Variablen a, ϑ, φ wirkt, während B nur auf die Variable m wirkt.

b) Zu Eigenschaft 2:

$$BM f(m, a, \vartheta, \varphi) = g(m^\lambda)\,((m - m_0)e^{i\lambda} + m_0)\, f(m^\lambda, a, \vartheta, \varphi)$$

$$MB f(m, a, \vartheta, \varphi) = m \cdot g(m)\, f(m^\lambda, a, \vartheta, \varphi)$$

Also folgt:

$$BM f(m, a, \vartheta, \varphi) = m e^{i\lambda} + (m_0 - m_0 e^{i\lambda})\, g(m^\lambda) f(m^\lambda, a, \vartheta, \varphi)$$

$$= \{e^{i\lambda} MB + (m_0 - m_0 e^{i\lambda})\, B\} f(m, a, \vartheta, \varphi)$$

c) Zu Eigenschaft 3:

On the backside: Part of Wulf's Diploma Thesis

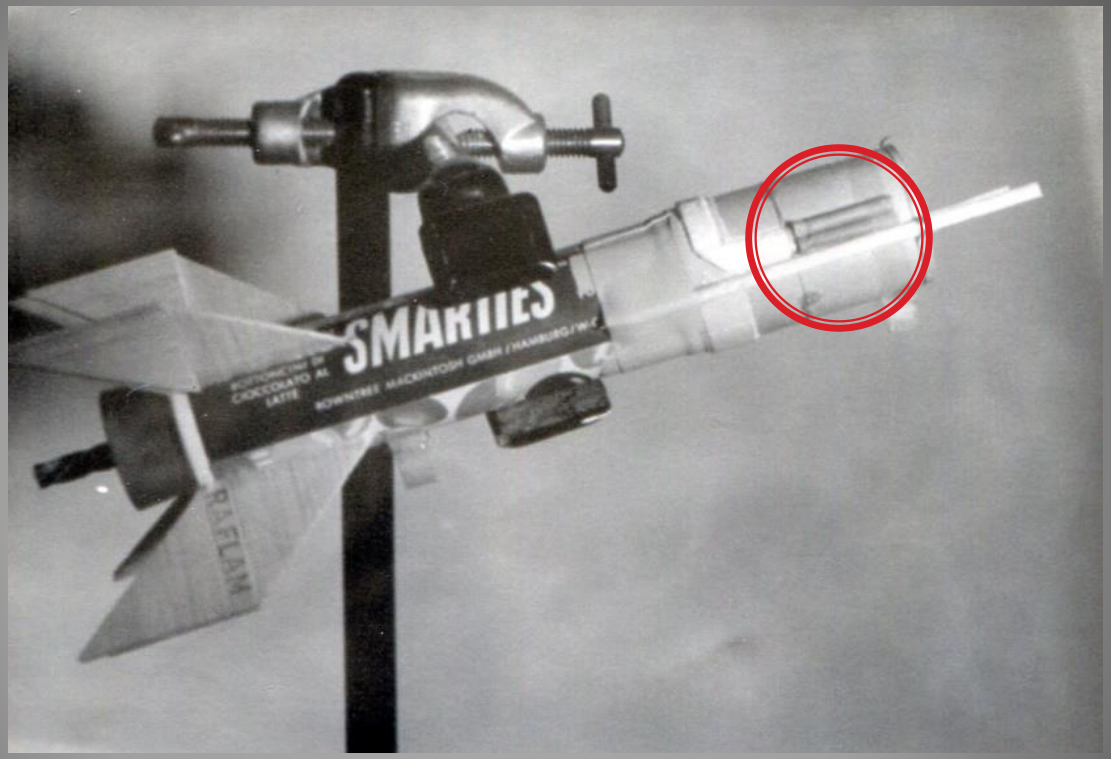
RAFLAM's photo probe project

From Axel's log book: "Die Nutzlast einer Rakete" ist doch eigentlich immer das einzige, was ihr einen Sinn geben könnte. Diese Fotosonde erfüllt diese Aufgabe geradezu vorzüglich."

RAFLAM's photo probe project

Mock photo probe with two crackers

RAFLAM's photo probe project

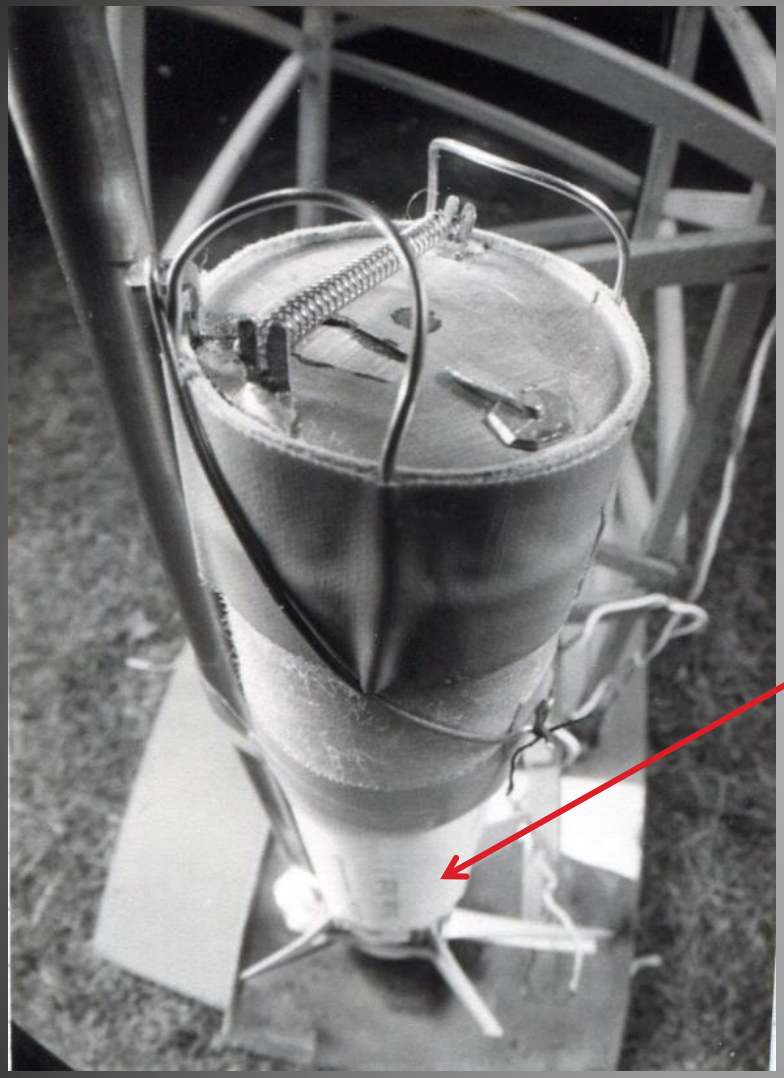


Mock photo probe with two crackers

Manufacturing the Observer photo probe

Axel working on the shutter mechanism

Observer 3: an engineering marvel



On the launch pad

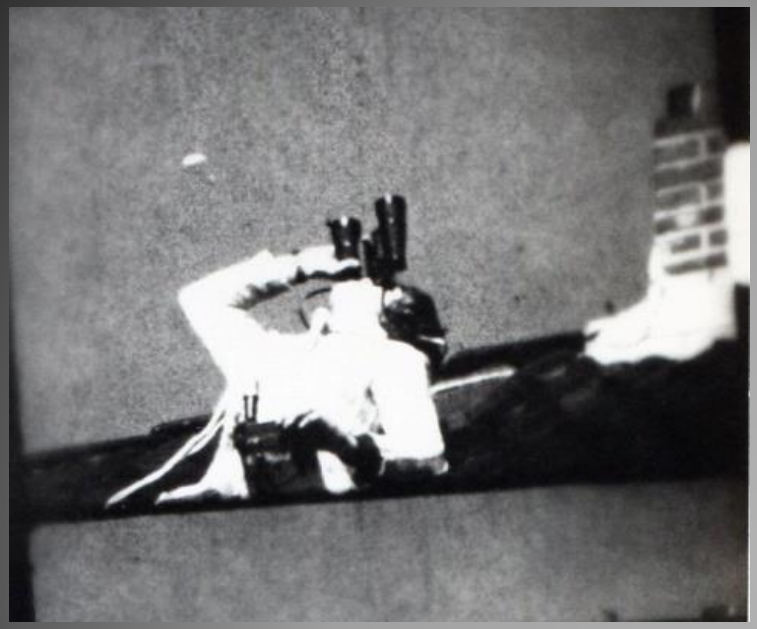
ACHTUNG !

Bitte legen Sie die-
sen Körper vorsichtig
hinter den Zaun des
freien Grundstückes
Beselerstr.26(Heide)!
Bewegen Sie bitte auf
keinen Fall den emp-
findlichen Mechanis-
mus an der Spitze des
Gerätes! ⟶

Vielen Dank !

Message to potential finders

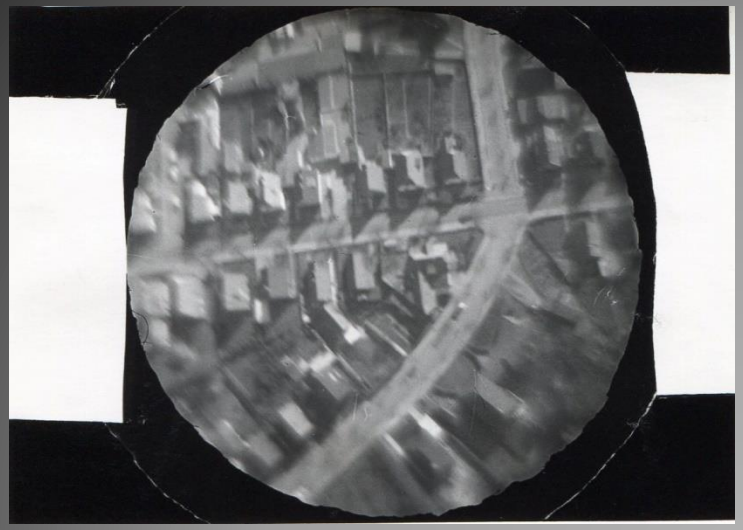
Successful flight of Observer 3

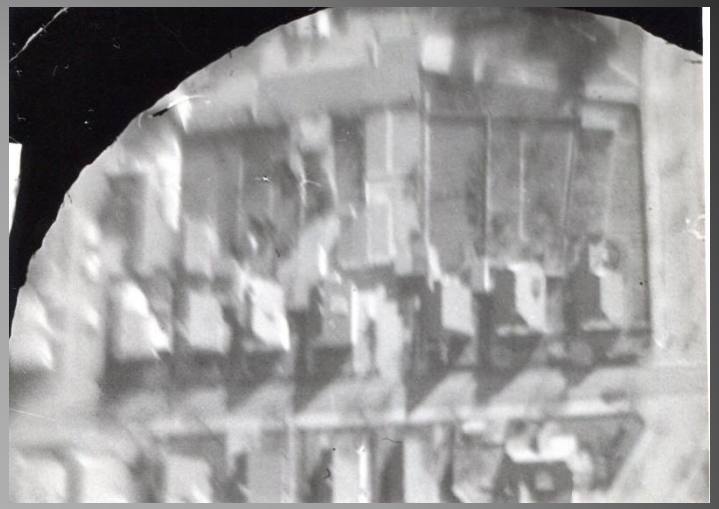


RAA keeps track of the flight path and estimates the landing site

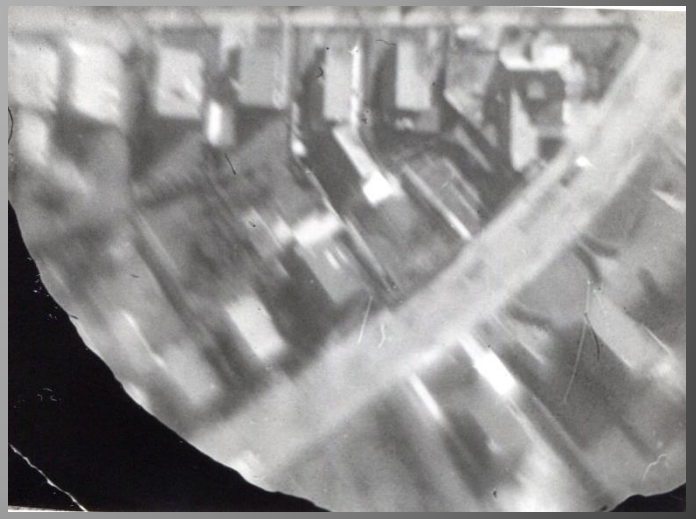
Observer 3 on the way to the dark room soon after recovery

The harvest of Observer 3





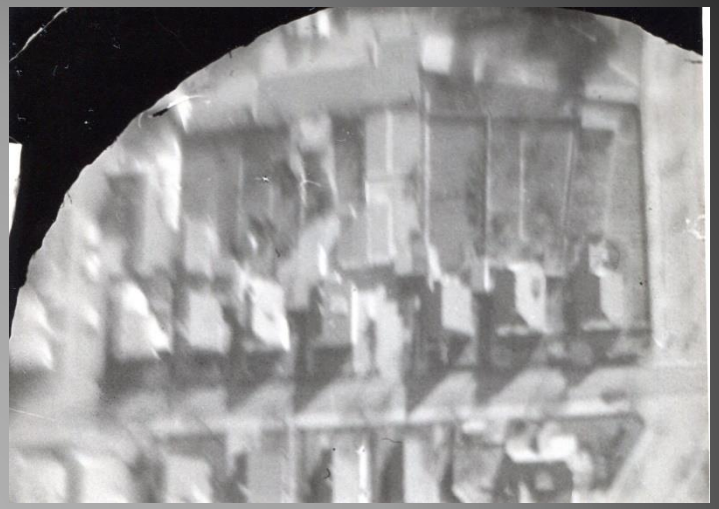
Height 202 m, FoV 174 m

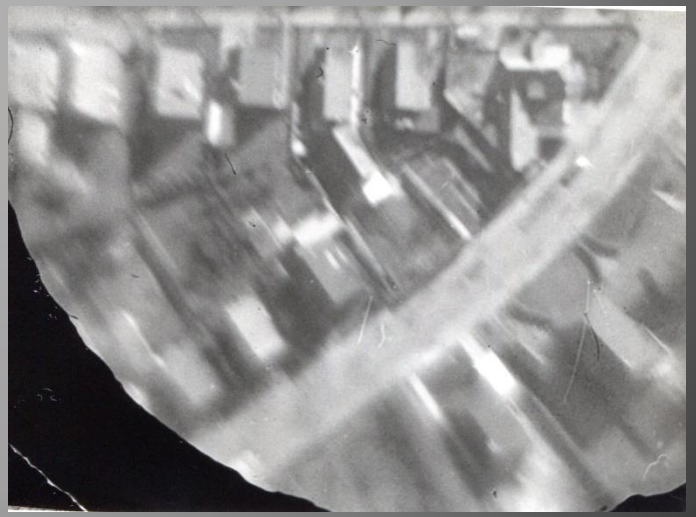


Exposure time 1/500 s, f-stop 1/5, Agfa-Isopan (21 DIN)

The harvest of Observer 3

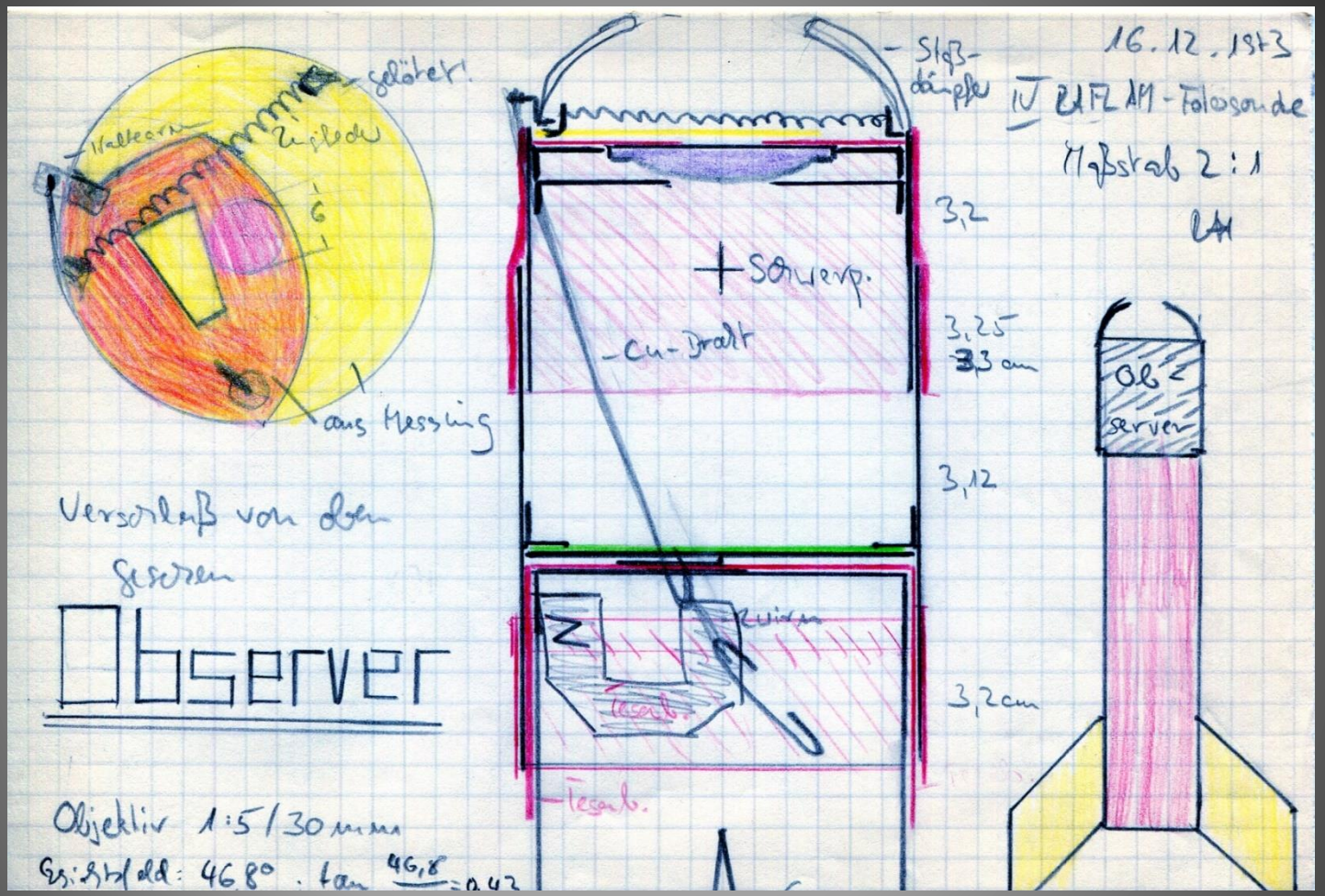
Google Maps 2019





Observer 3, 26.2.1975

Observer design improvements



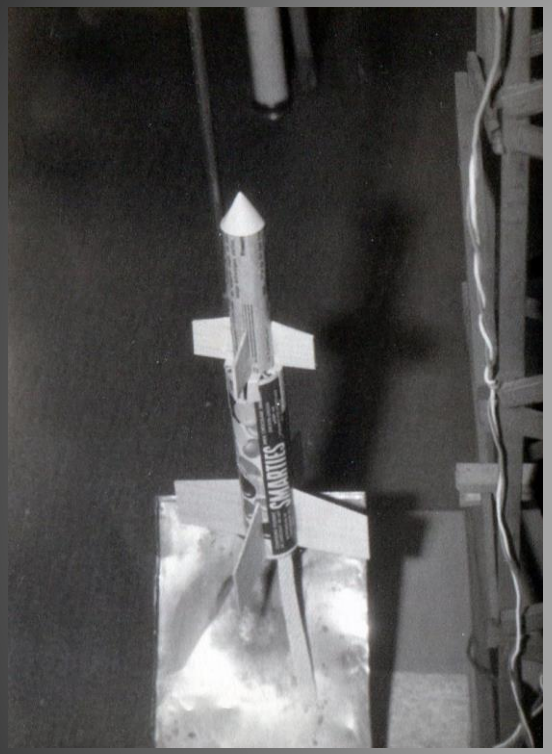
A reduced stop in combination with sensitive film Tri-X (also used for astrophotography!)

Tragedy Observer 5

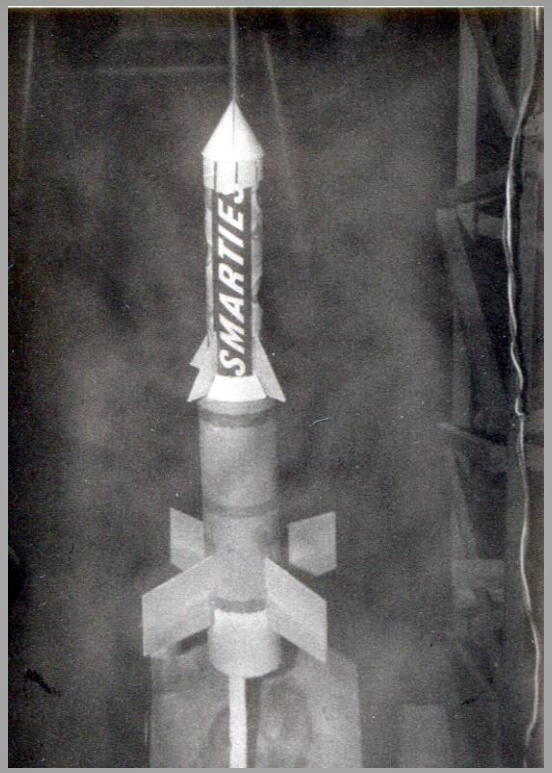
Major design improvements:
a reduced stop and more sensitive film Tri-X dramatically improved the image sharpness

On its way to Nirvana:
Observer 5 went down in inaccessible area and was lost forever

To greater heights with two stages



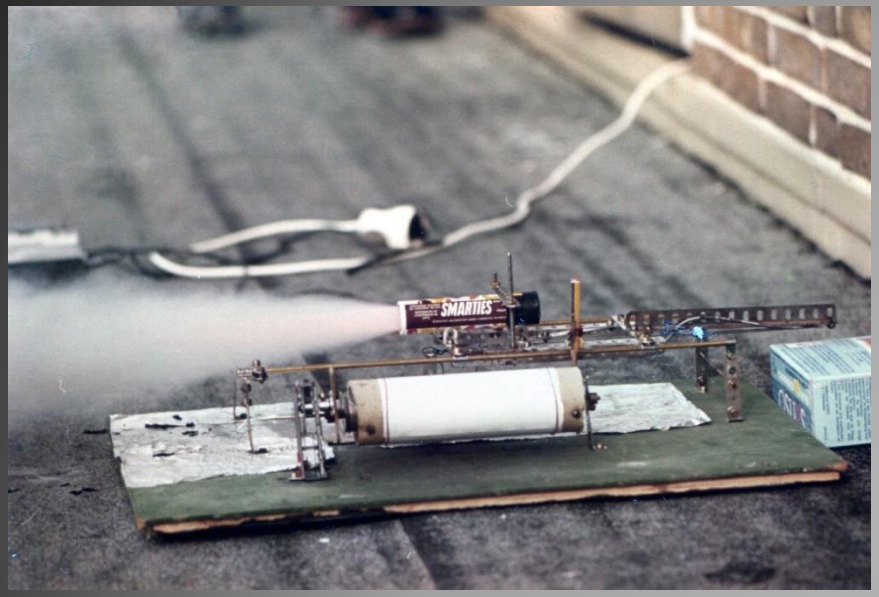
Smado 3
March 1975



Schern 1
April 1975

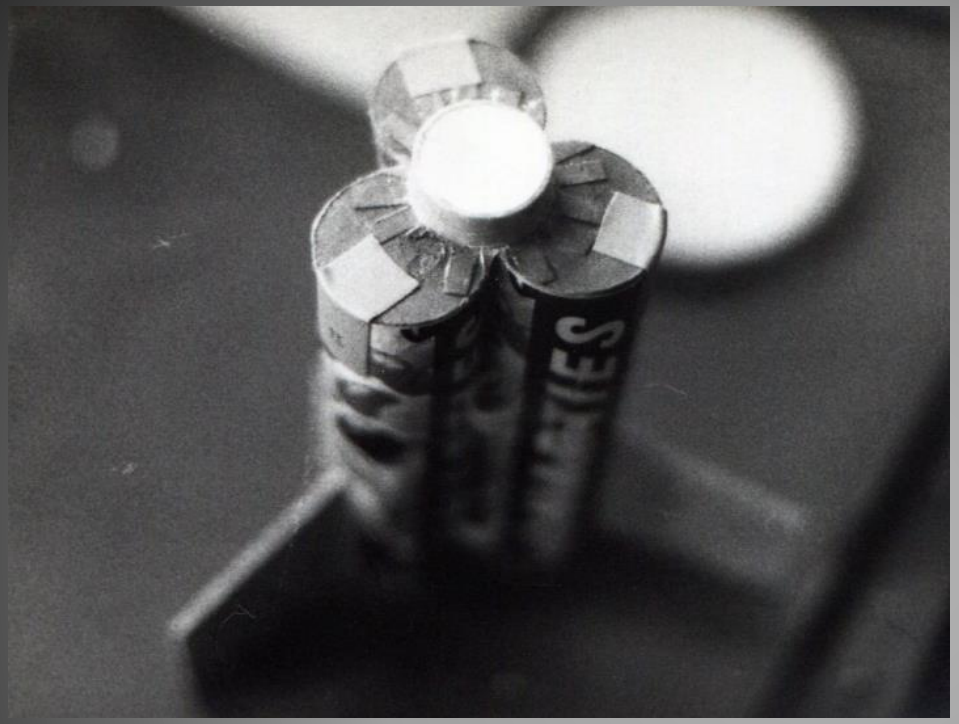
Lauch of Schern 1
5. April 1975

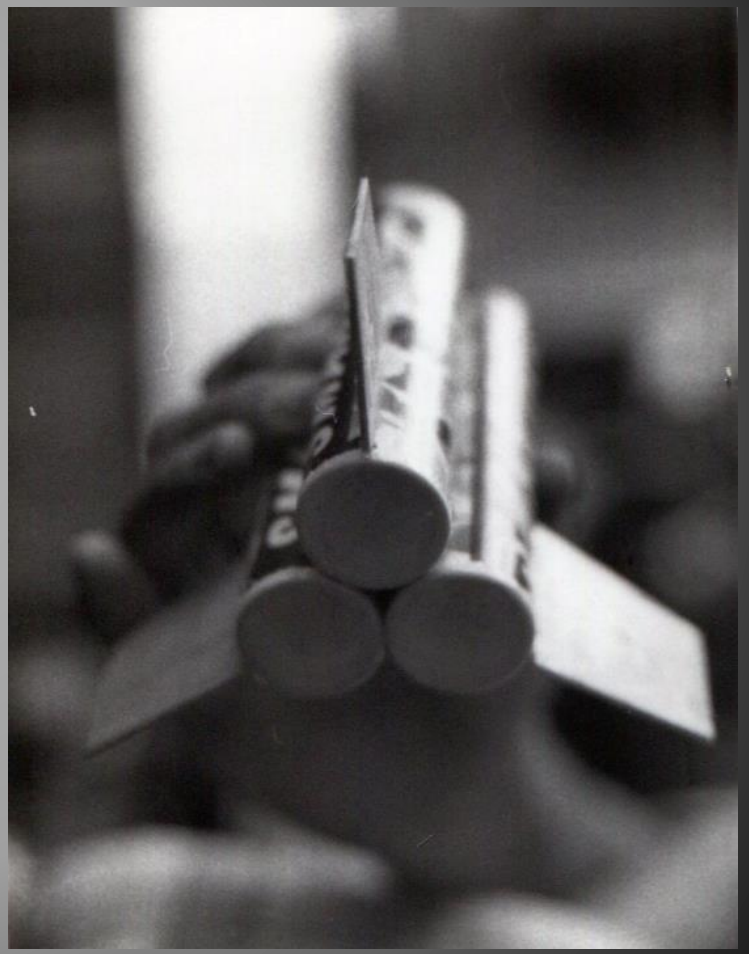
Performance optimization



Measuring and evaluating thrust-time diagrams

The Zirkon I booster





Tripause: a bundle of three Smas engines

Zirkon I second stage

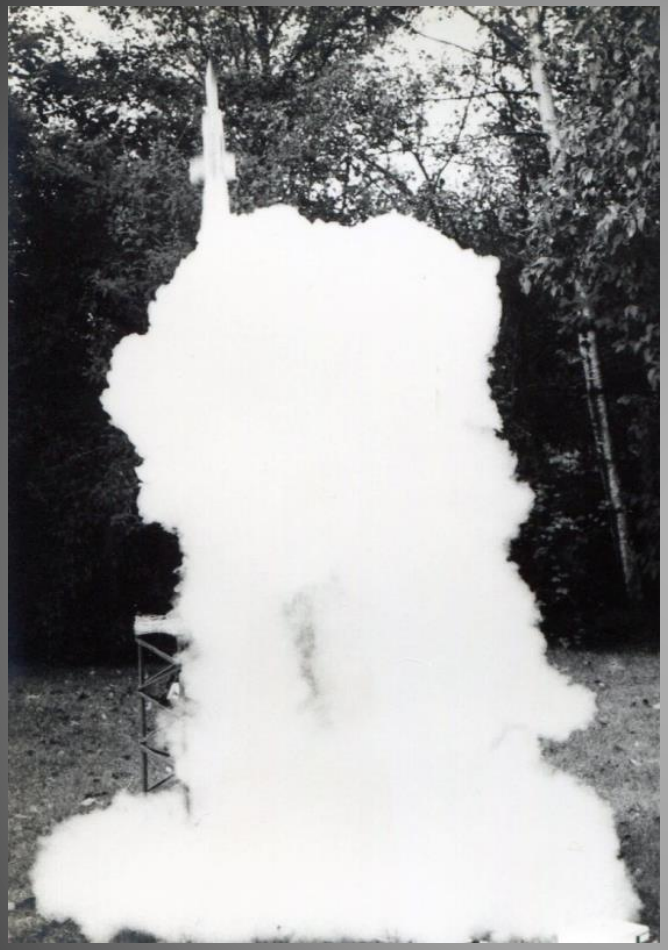
Payload: astronaut “Onkel Det”

RAFLAM launch # 100: Zirkon I

Launch preparations:
checking the electric ignition system

All systems GO

RAFLAM launch # 100: Zirkon I



Launch scene
(captured by Jacky)

Stage separation at
a height of 300 m

After the flight

Evaluation of audio tapes at KZB

Fact sheet
Zirkon I

das loo. raketensystem
der RAFLAM

16.9.75

$8^{h}\,10^{m}\,10^{s}$

zirkon 1

höhe: 6oo m; 1. stufe 3oo m
2. stufe 3oo m

ko hat gesammthöhe 676.o m gemessen

spiem/sfb : 1. stufe 83^{o}
2. stufe 92^{o}

brenndauer: 15 s ?!?
1. stufe 6.5 s
2. stufe 8.5 s ?!?

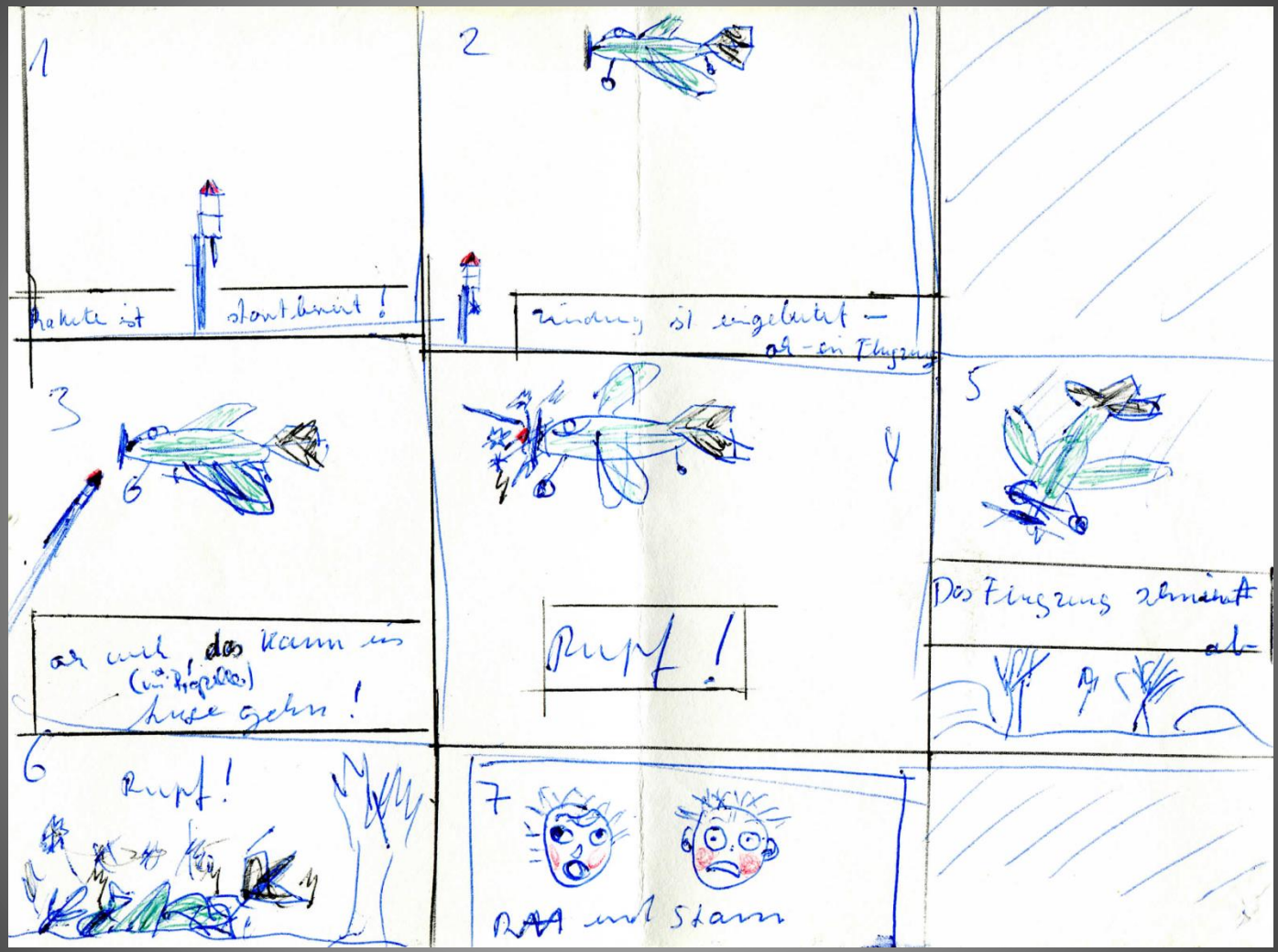
die 2. stufe zündete sofort nach brenn-schluß der 1. stufe.

kobold hat beobachtet, daß nach der stufentrennung (halbe höhe) die flugbahn nach E abknickte.

abfall: 1. stufe schätzungsweise 5o s
landeort : im rosenbeet von scheel
& (D/3)
angaben über 2. stufe liegen nicht vor

Onkel Det missing in action

Our nightmare … never came true



The end

12.1o.75
$17^{h}45^{m}oo^{s}$

tropopause 29

höhe: 29o m (kobold) ; 42o m (KZB)

brenndauer: 7.o s (StaM u. RAA)
zeit bis zum gipfel: 9.2 s
nach 9.8 s brennschluß des auswurfmechanismus

durchschn.geschw. 43 m/s ; 155 km/h

abfalldauer des "hantelmodells": 3o s
(1o m/s ; 36 km/h)

nach ca. 4.5 s war der fallschirm voll entfaltet.

verbesserungen gegenüber tr 28 :
es wurde die sog. reißleine verstärkt.
das leinenpaket wurde sozusagen übersichtlicher angeordnet.

raketensystem wurde nicht wiedergefunden
(landort ca. 48 strich von KZB-RAA.)

dieses ist das vorläufig letzte raketensystem, welches von StaM und RAA im kommunikationssystem kap steffen - KZB gezündet wurde.