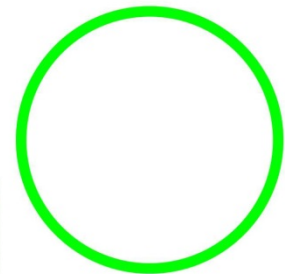


**FuG 136  
aircraft  
display**



**Nachtfee  
console**

© Wim Witt & AOB

Nachtfee Seminar 25 November 2017

## Reason why Nachtfee had been introduced:

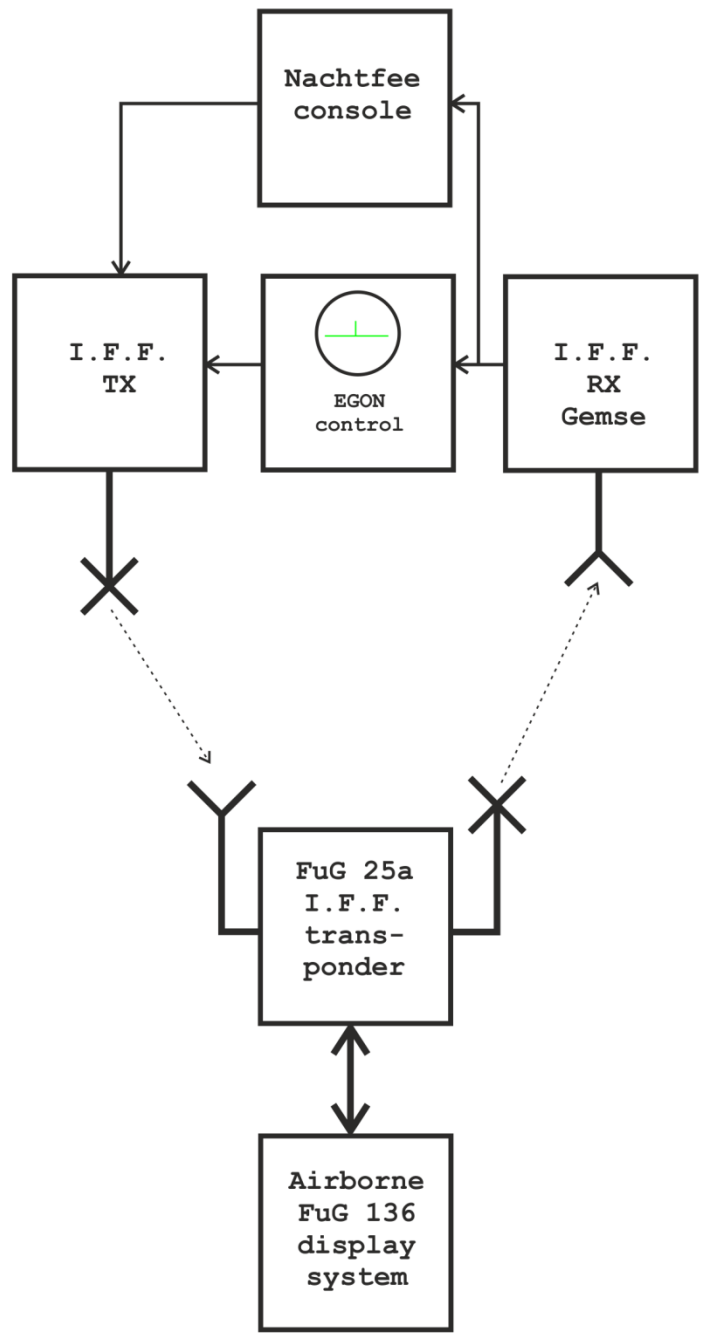
- To minimise jamming of operational communications
- Making it impossible that the content of communication can be intercepted

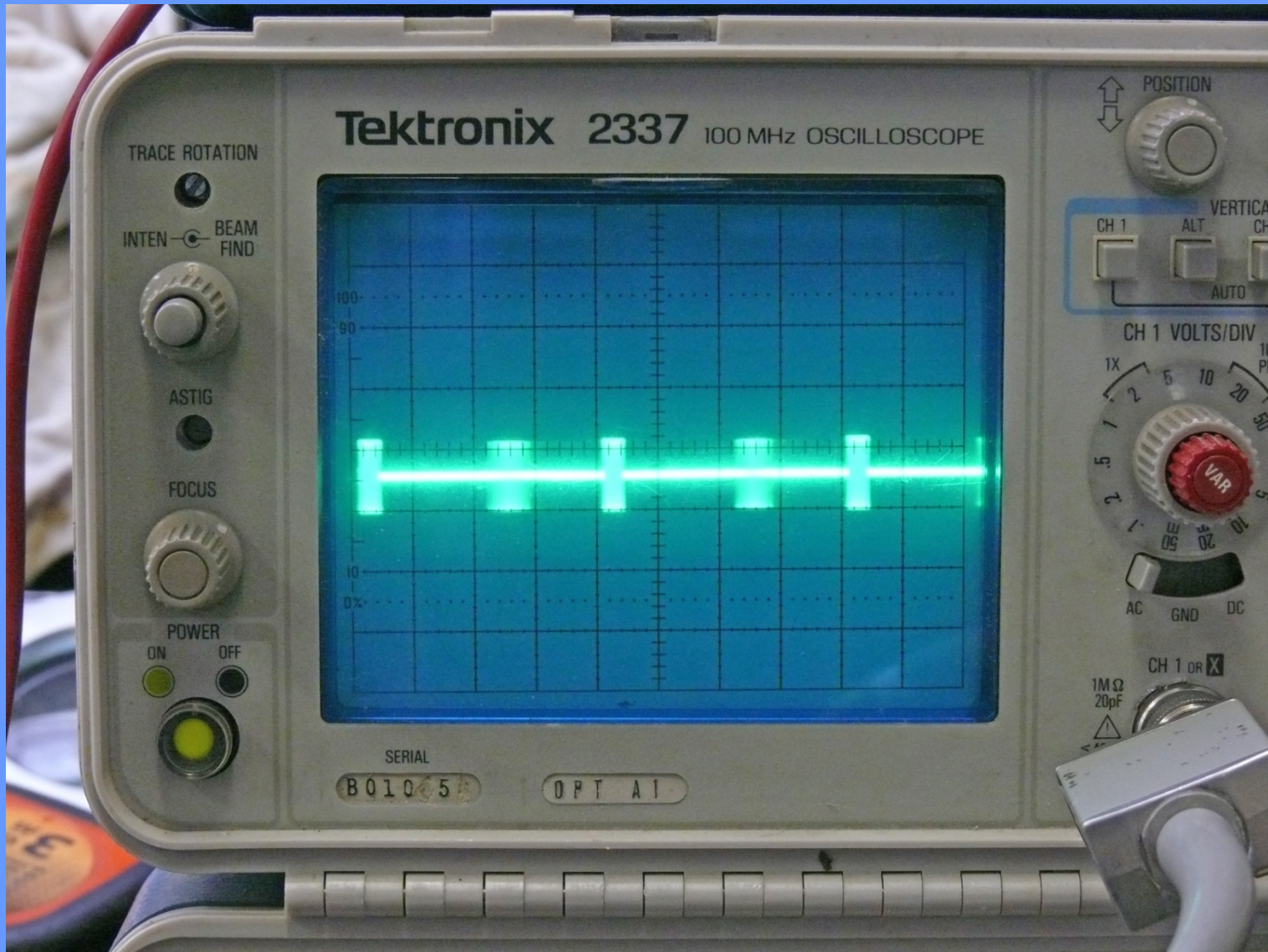
- Jamming can interrupt communication, but cannot corrupt restoring its data content

- Implementing technologies at hand, as far as possible



Nachtfee console with Command 'compass'

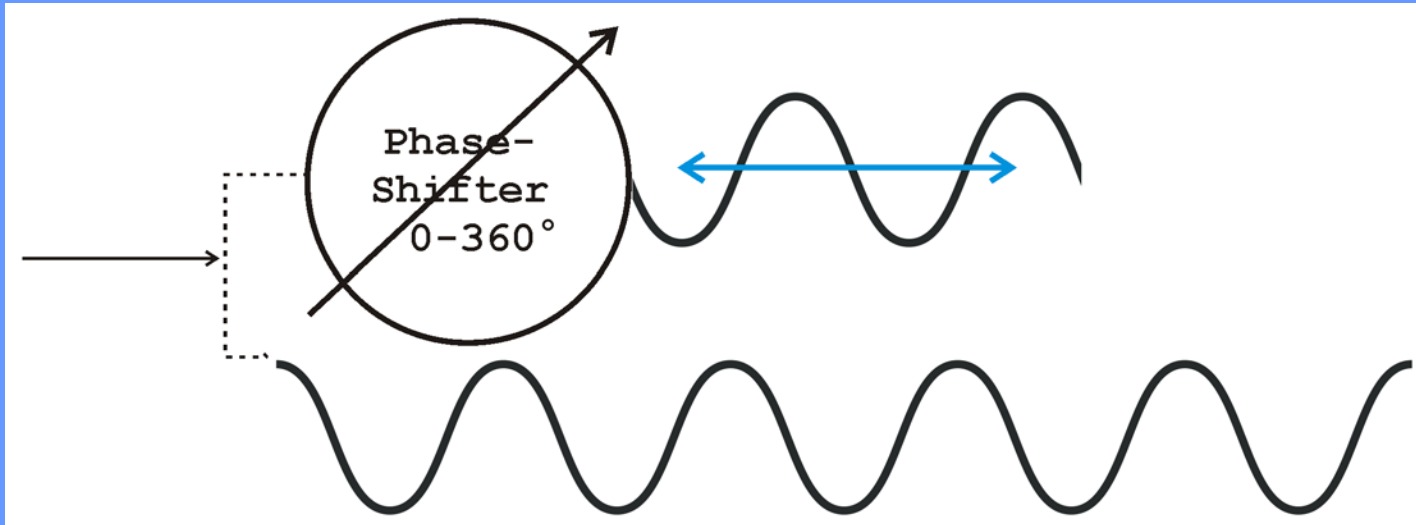




IFF signal combined with the Nachtfee order or command signal @ 124 MHz

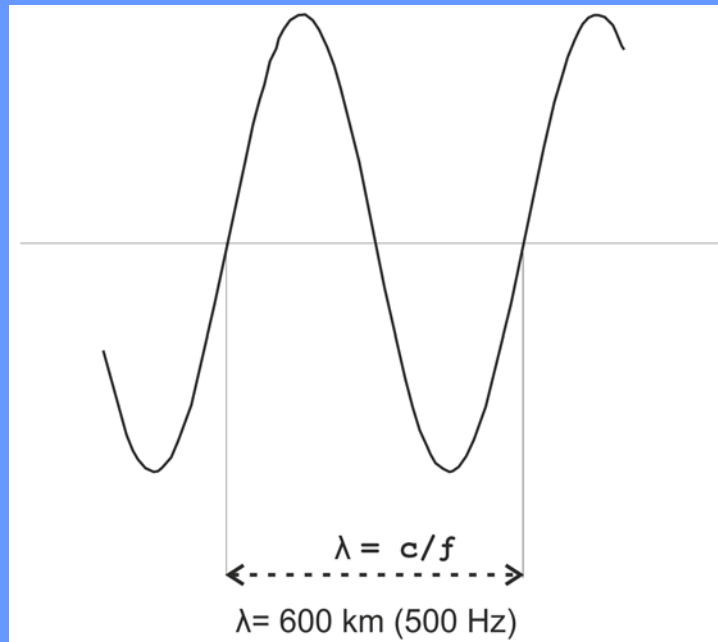


Nachtfee Order Compass scale



Nachfee type phase-shifter technique

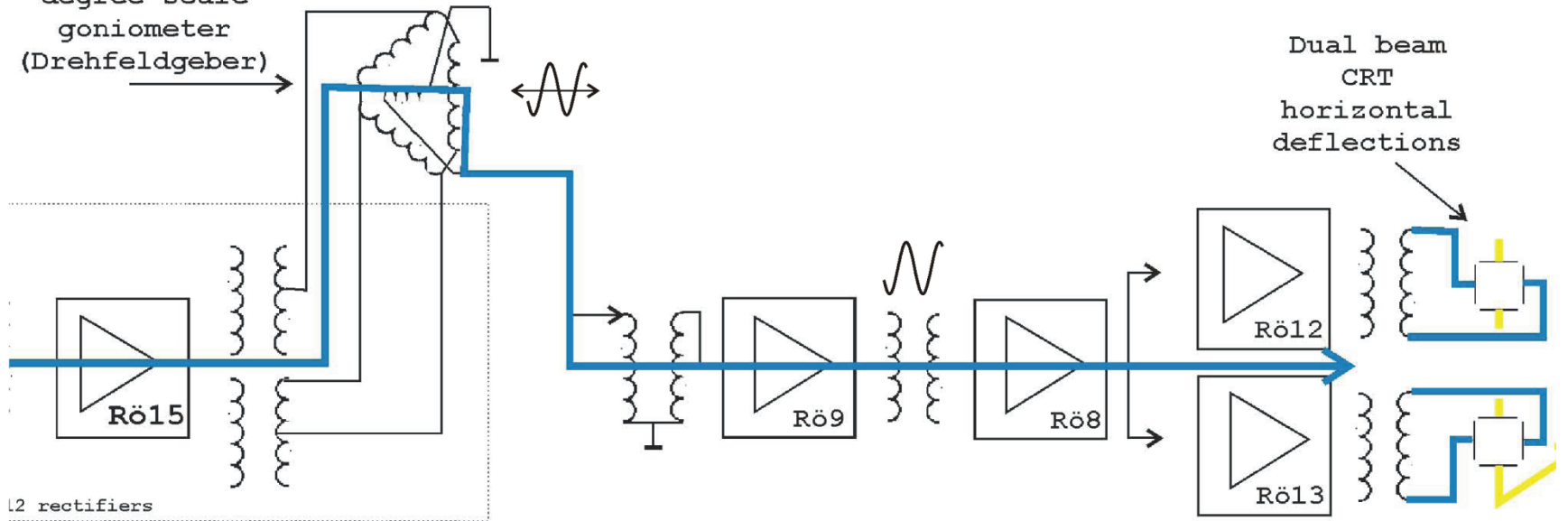


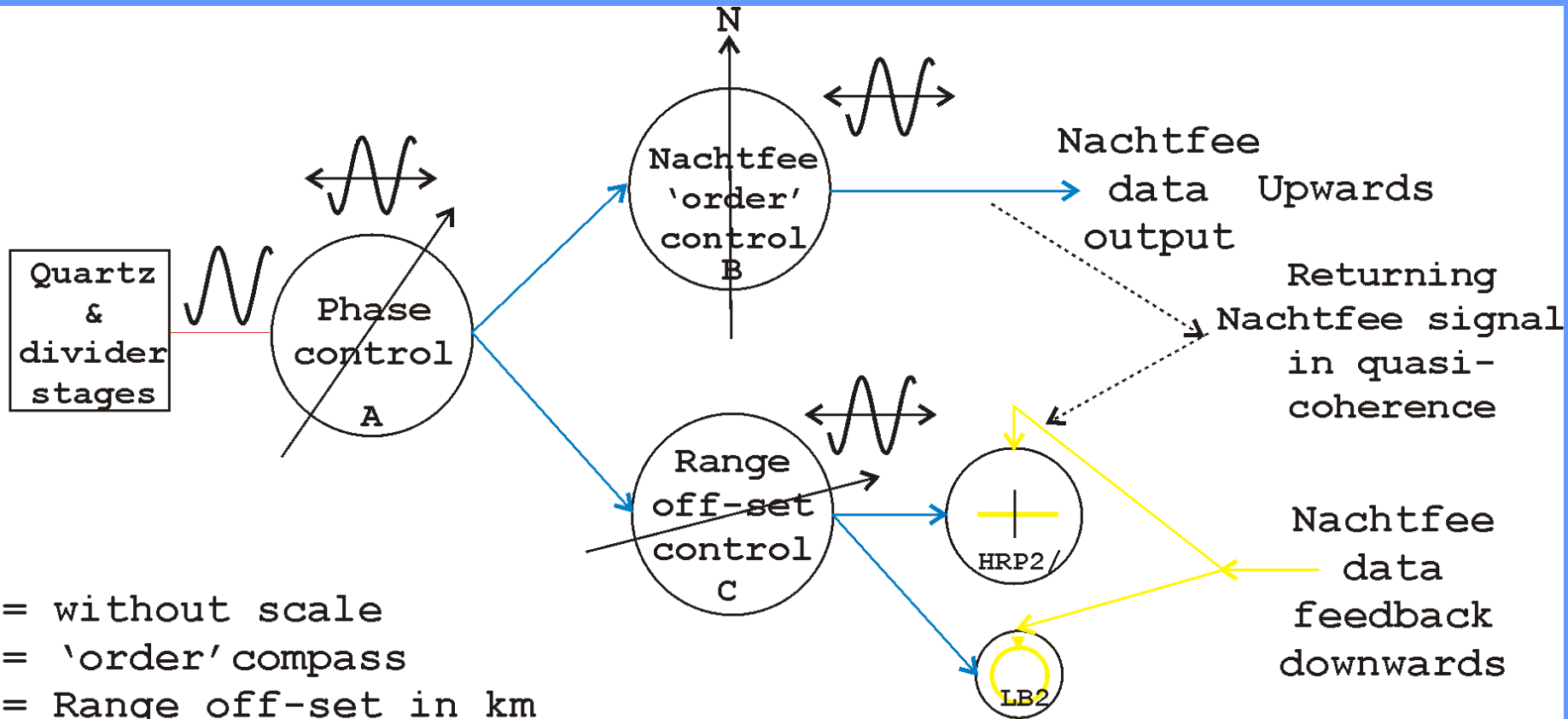


At a certain moment I had nothing to add onto our Nachtfee Survey, and considered: that 500 Hz represents a wavelength of 600 km. Then I became tantalised: would the unknown scale stands for the *system range* of 300 km; where '0' stood also for 300km? *Heureka*, we know since where the ominous, next shown, number-scale is to be utilised for.



'Number or degree' scale  
goniometer  
(Drehfeldgeber)





A = without scale  
 B = 'order' compass  
 C = Range off-set in km  
 A = B = C phase goniometers

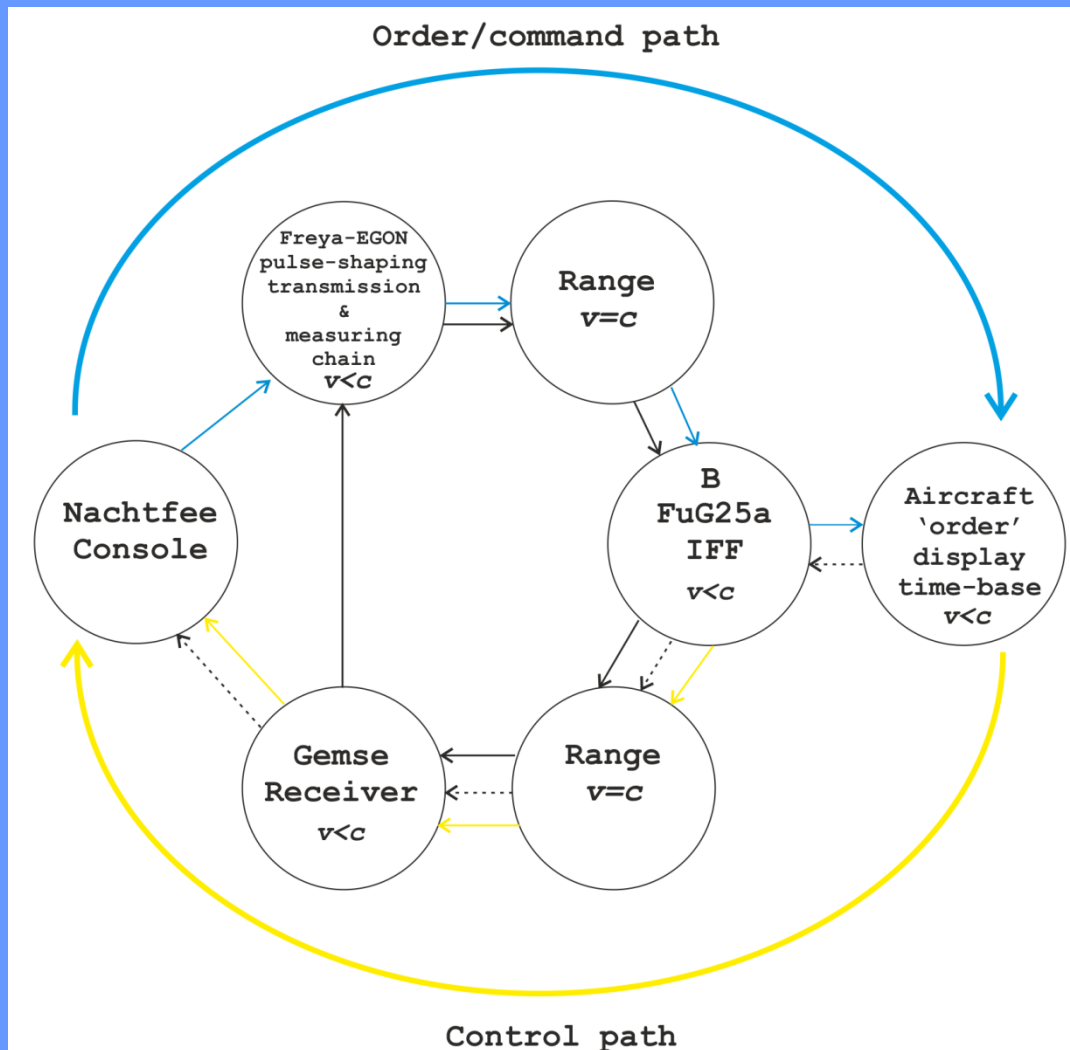
What was the real essence of the Nachtfee system?

The reconstruction of the Nachtfee order phase-shift,  
at the LB 2 control screen.

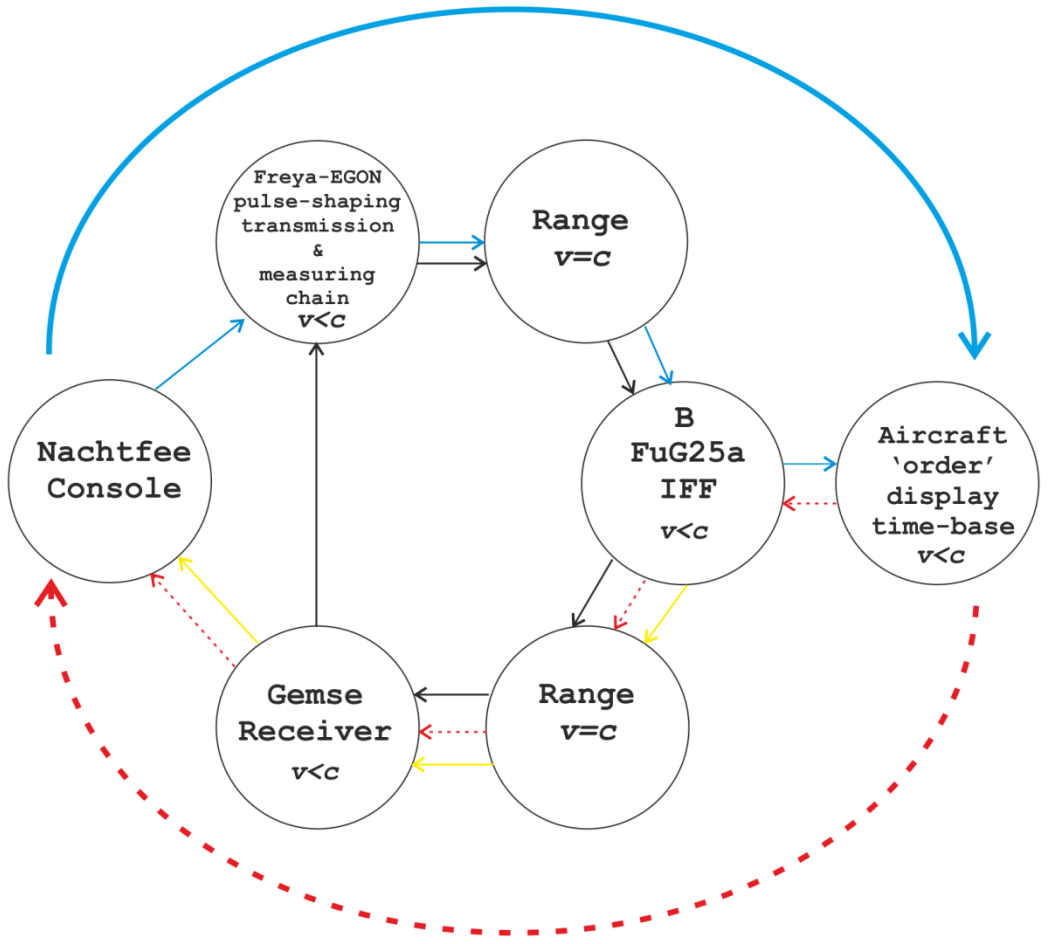
Doing so, is actually taking into account the  
necessary time of signal travel from:  
Nachtfee – I.F.F. transponder FuG 25a – Nachtfee.

Herewith **the actual 'factor' range (= time) being taken out of  
the system control**; albeit, 'Rang offset' has to be  
re-adjusted constantly due to the displacement of the aircraft.

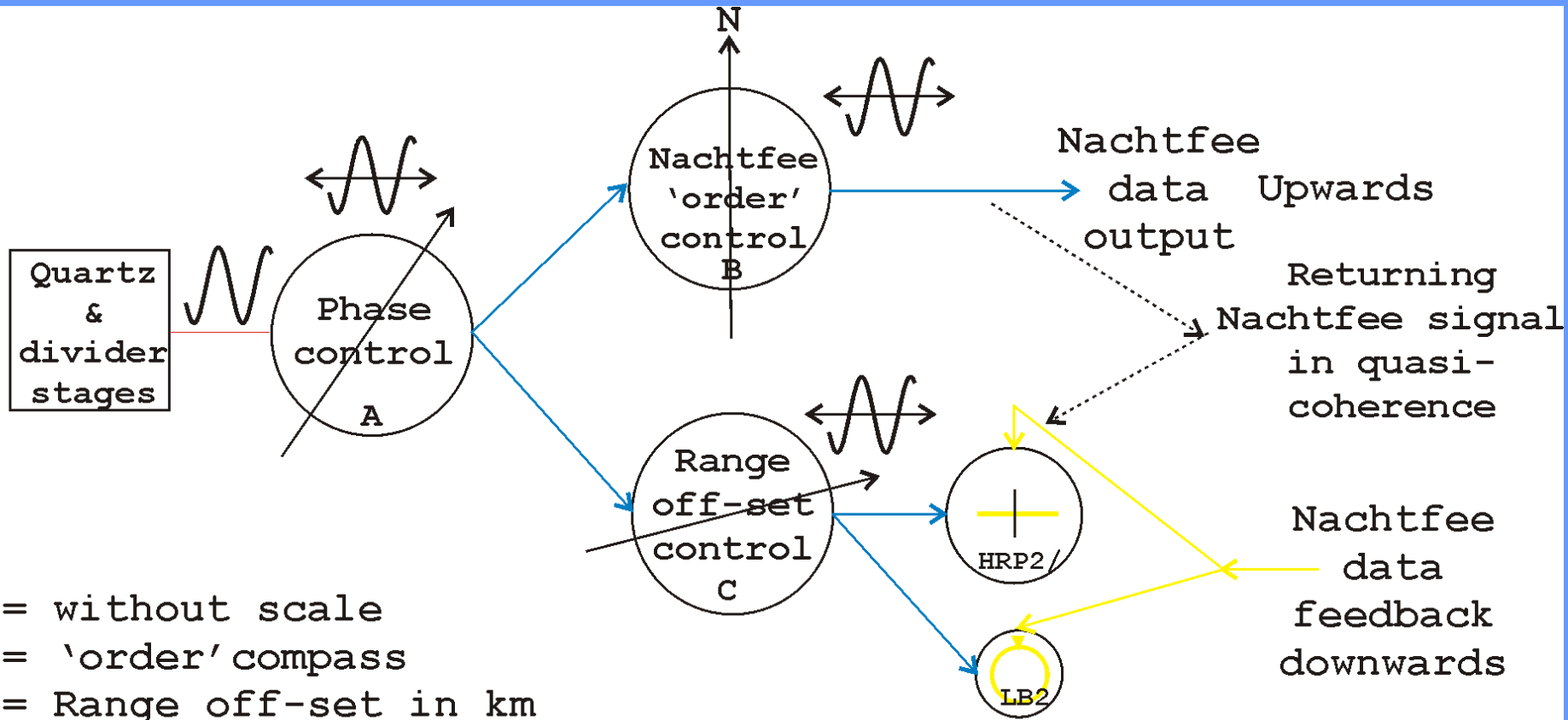




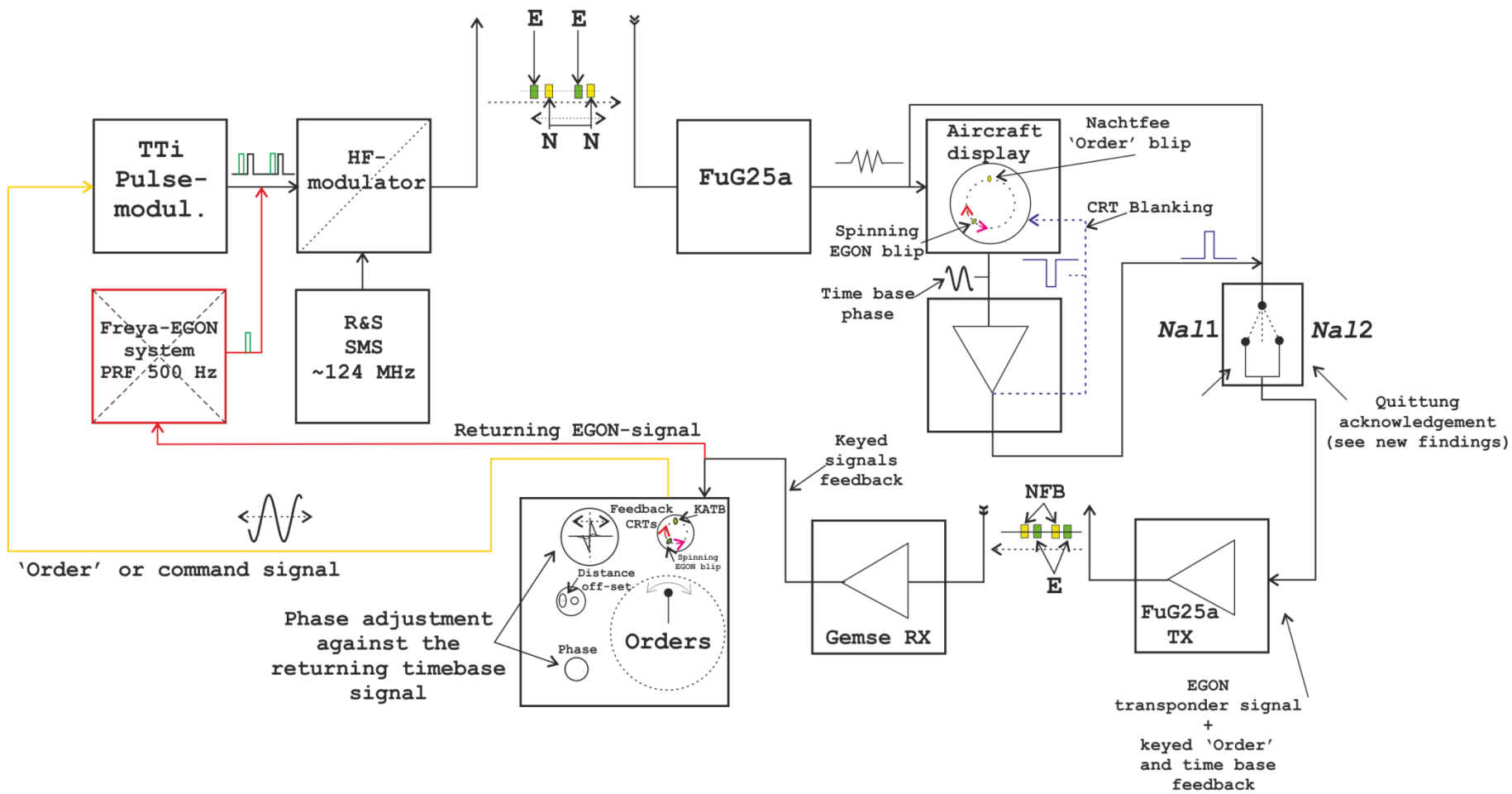
Phase timing corrected order/command signal (manually)



Aircraft time-base reference signal

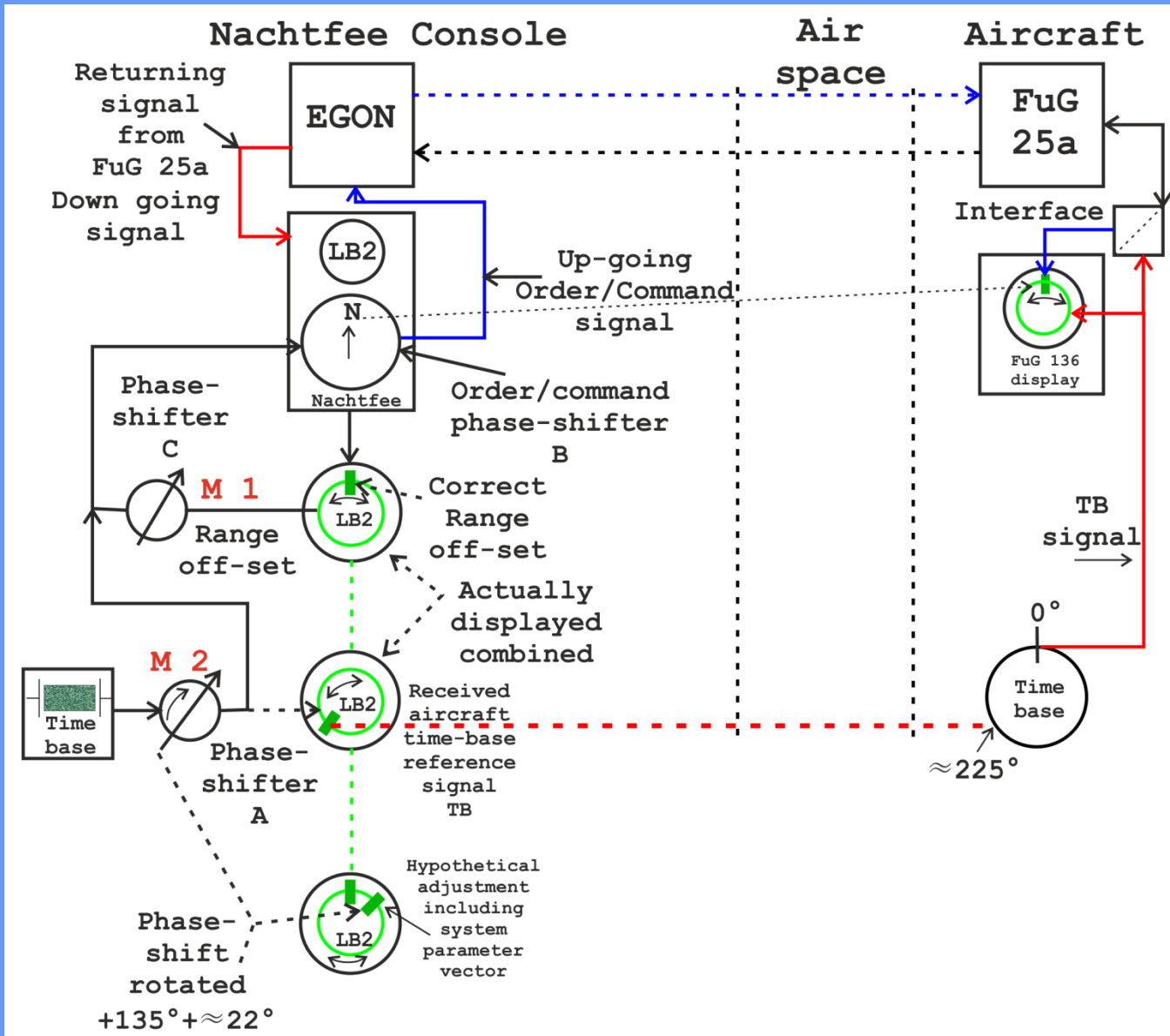


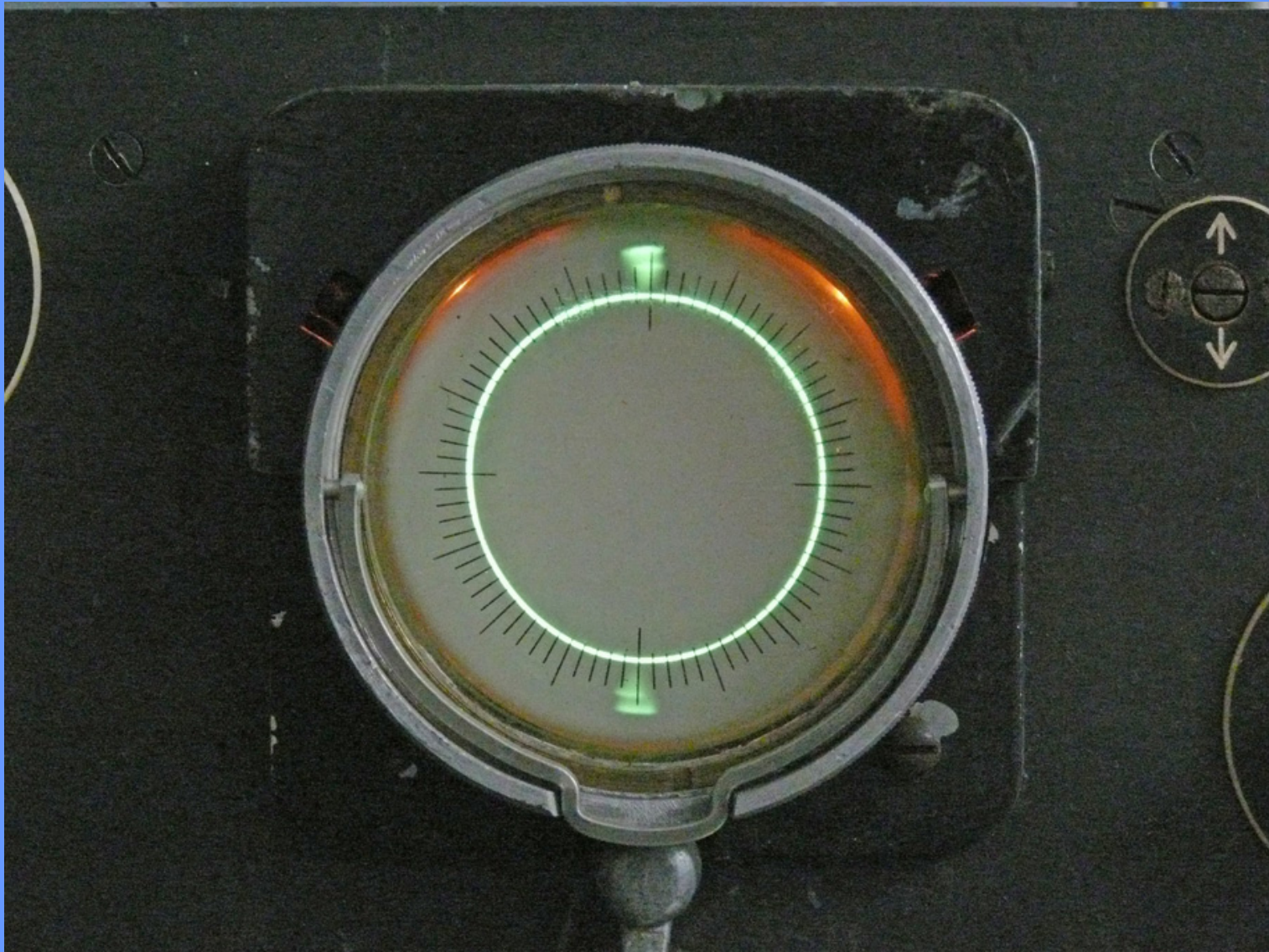
A = without scale  
 B = 'order' compass  
 C = Range off-set in km  
 A = B = C phase goniometers



Hypothetical Nachtfee system reconstruction







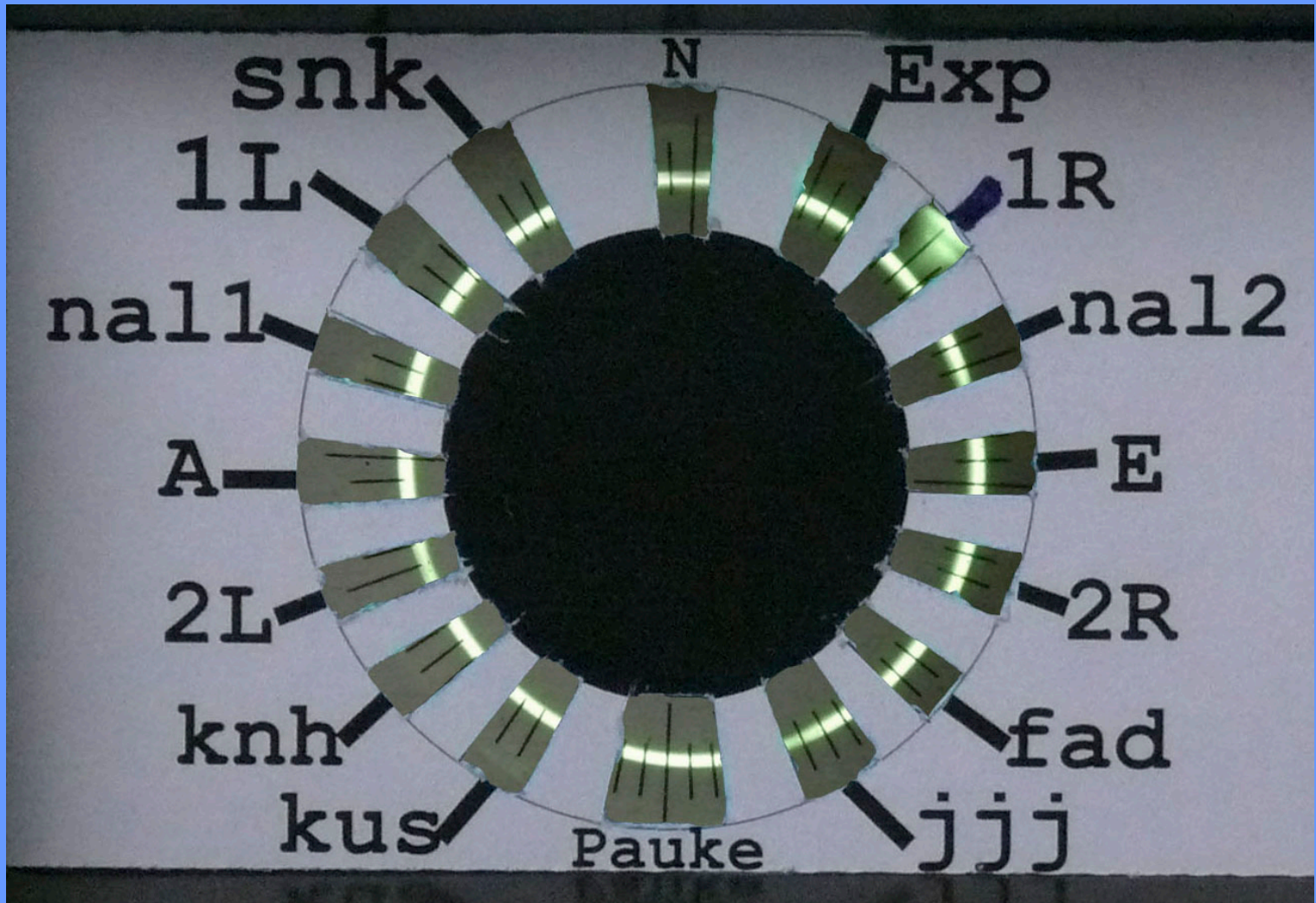
North is the order starting position, south the Freya-Polwender signal



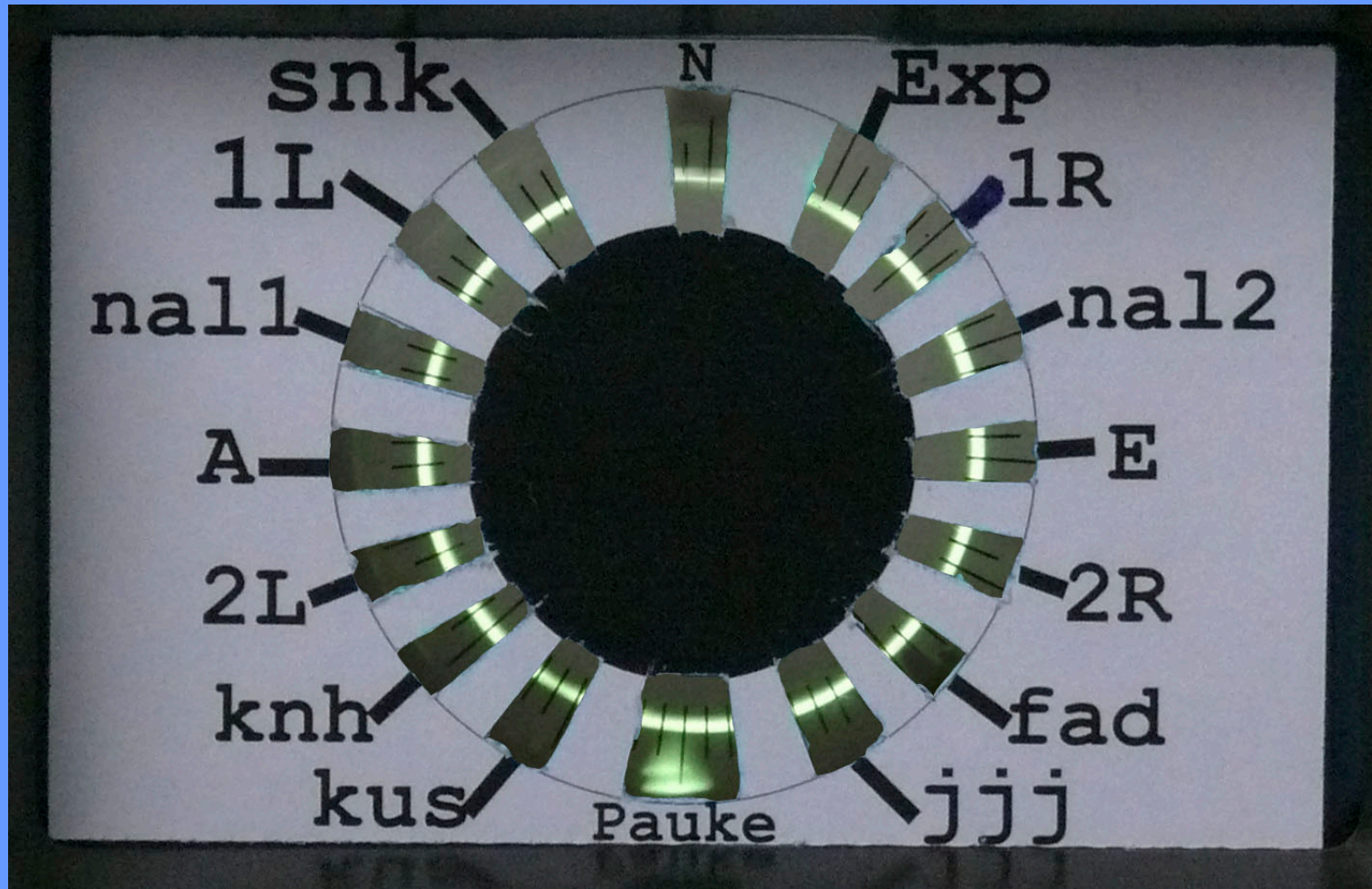
Current Nachtfee peripheral setup



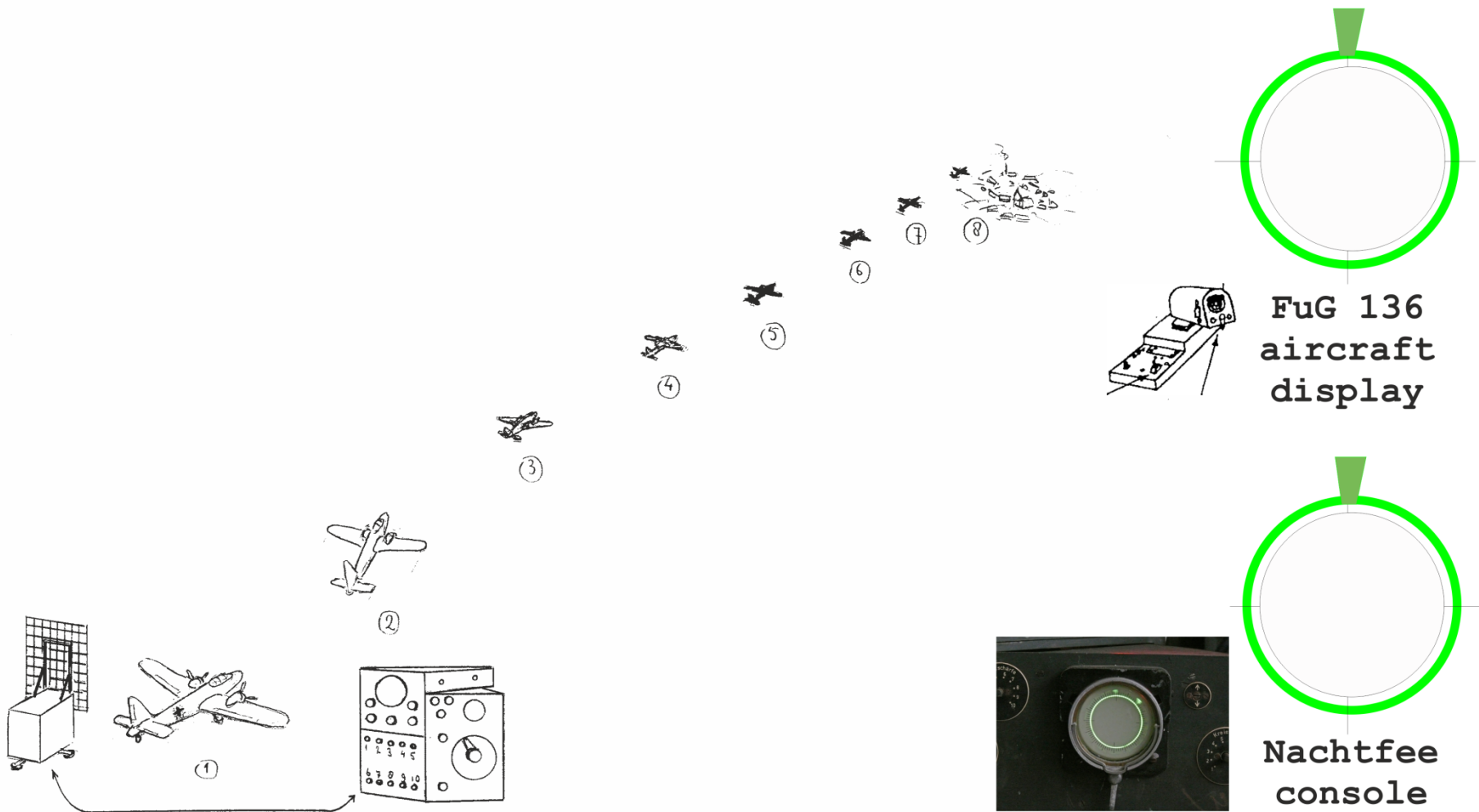
Hypothetical aircraft Nachtfee setup, but fully HF operational



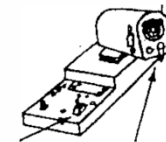
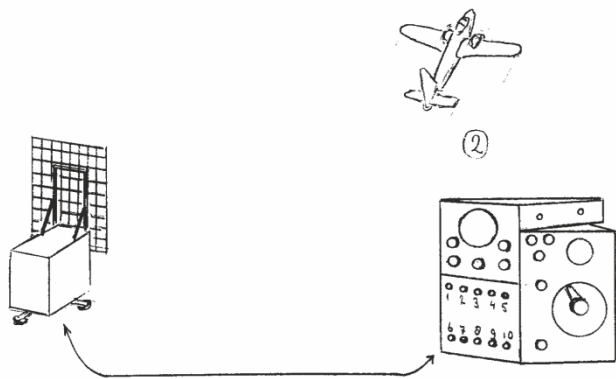
Simulated aircraft command display



Pauke, in German Luftwaffe jargon it stood for '*attack*', but according R.V. Jones it meant 'open your bomb doors'



Aircraft standing next to the Freya-Nachtfee station, both 'orders' adjusted equal



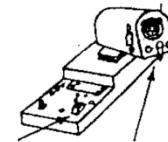
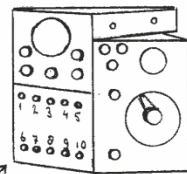
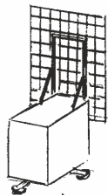
FuG 136  
aircraft  
display



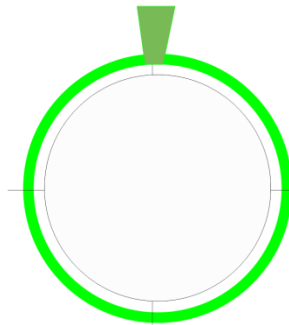
Nachtfee  
console

The aircraft moved from position ① towards ② without control.  
For this occasion we consider that each number constitutes 30 km  
 $10 \times 30 = 300$  km the max. Nachtfee system range  $\approx 36^\circ$  per blip rotation



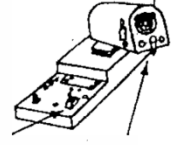


FuG 136  
aircraft  
display

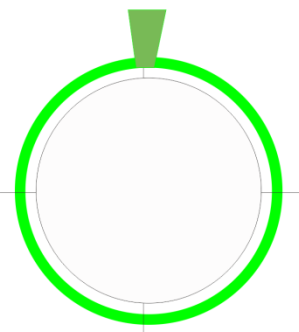


Nachtfee  
console

Our Junkers aircraft took off and has since reached position ③  
in the far distance about the target symbolised aircraft ⑧

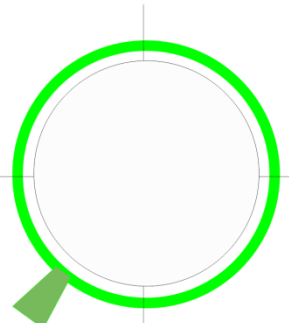
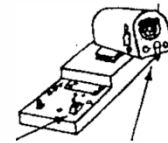
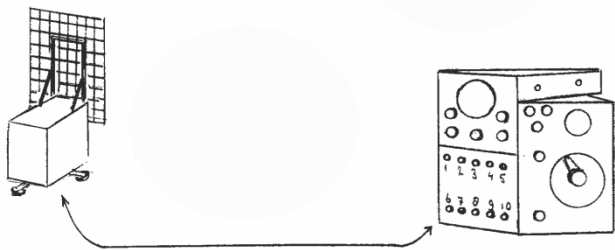


**FuG 136  
aircraft  
display**

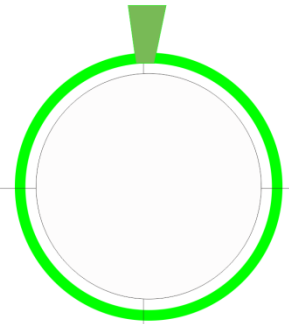


**Nachtfee  
console**

The aircraft reached position ④

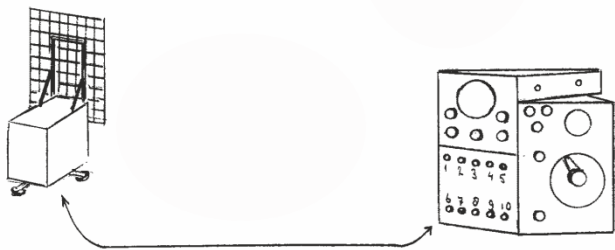


**FuG 136  
aircraft  
display**

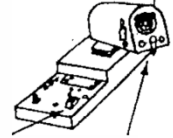


**Nachtfee  
console**

The Junker aircraft reached position ⑤



⑥

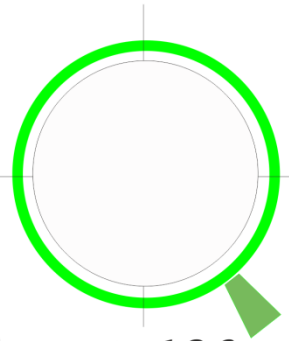
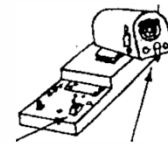
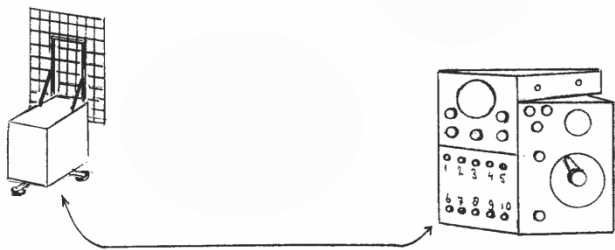


FuG 136  
aircraft  
display

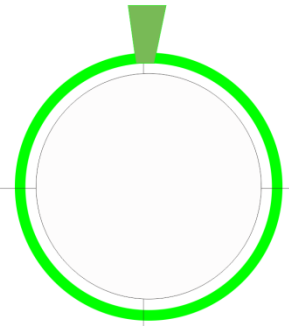


Nachtfee  
console

Our Junker aircraft reached position ⑥



**FuG 136  
aircraft  
display**



**Nachtfee  
console**

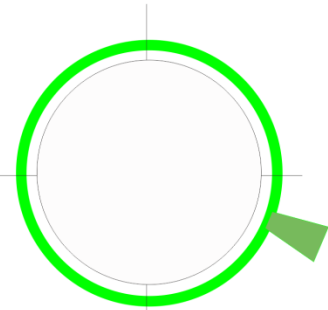
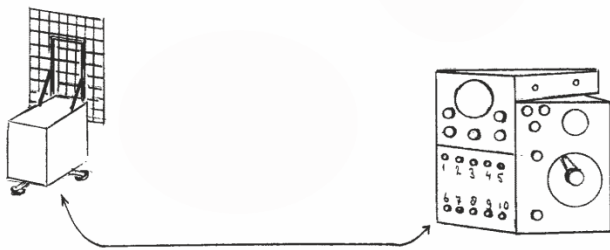
Reaching point ⑦, may be accompanied with the Pauke order (pointer at South)

My hypothesis what might tactically have been accomplished

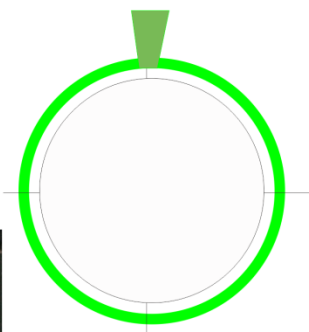
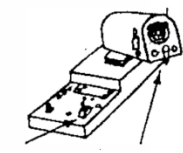
Between simulation point ⑦ and ⑧ the Freya-Nachtfee control might have sent the following order:



AUTO could have meant: releasing the computing X-Uhr



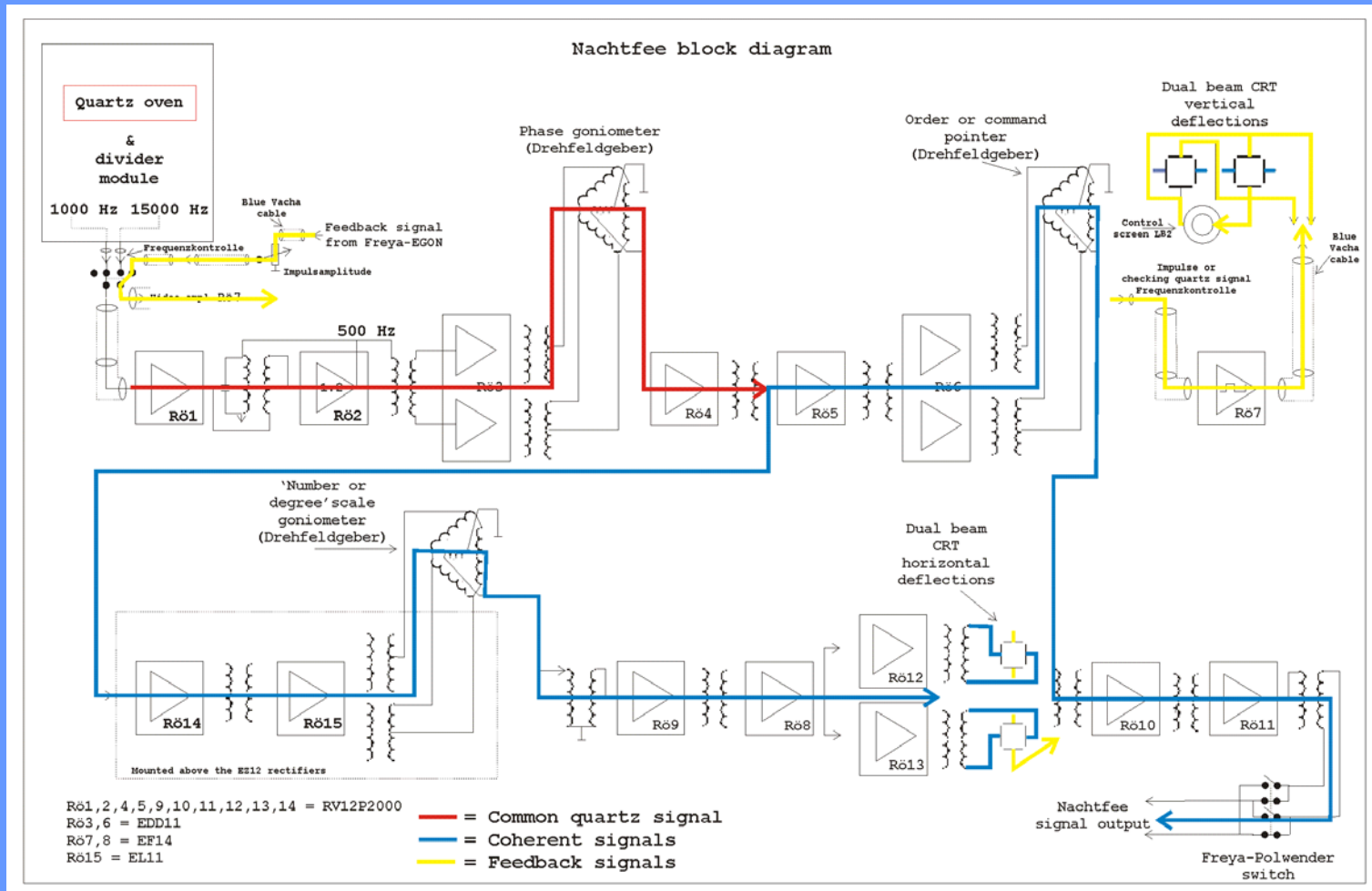
FuG 136  
aircraft  
display



Nachtfee  
console



Our pathfinder aircraft has reached the location ⑧ where he should drop his flares



The main block diagram of the Nachtfee console



# Coherence

Please bear in mind:

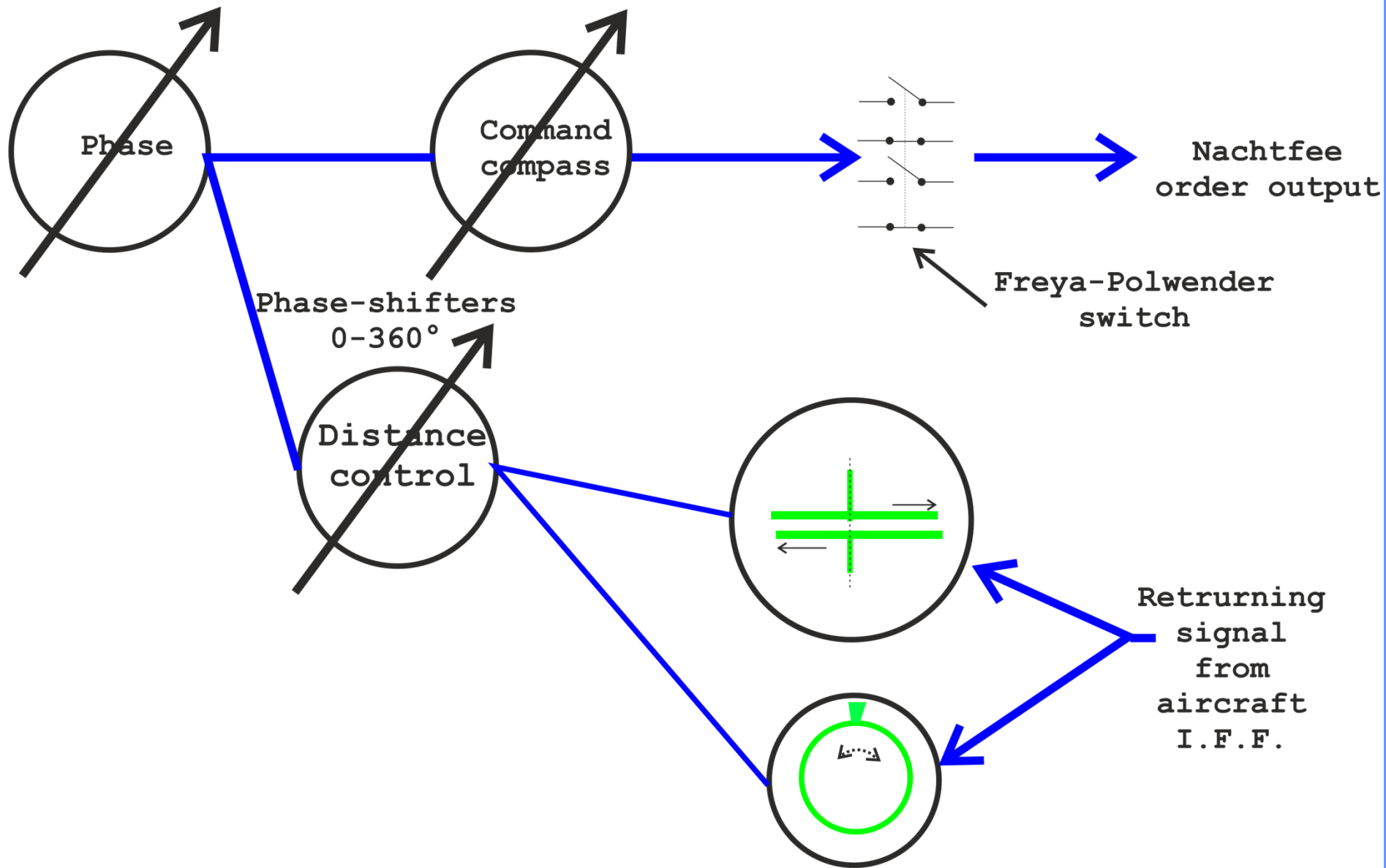
Generally speaking: when signals originate from a common source and these later coincide there still remains coherence, whatever their mutual phase-difference might have become.

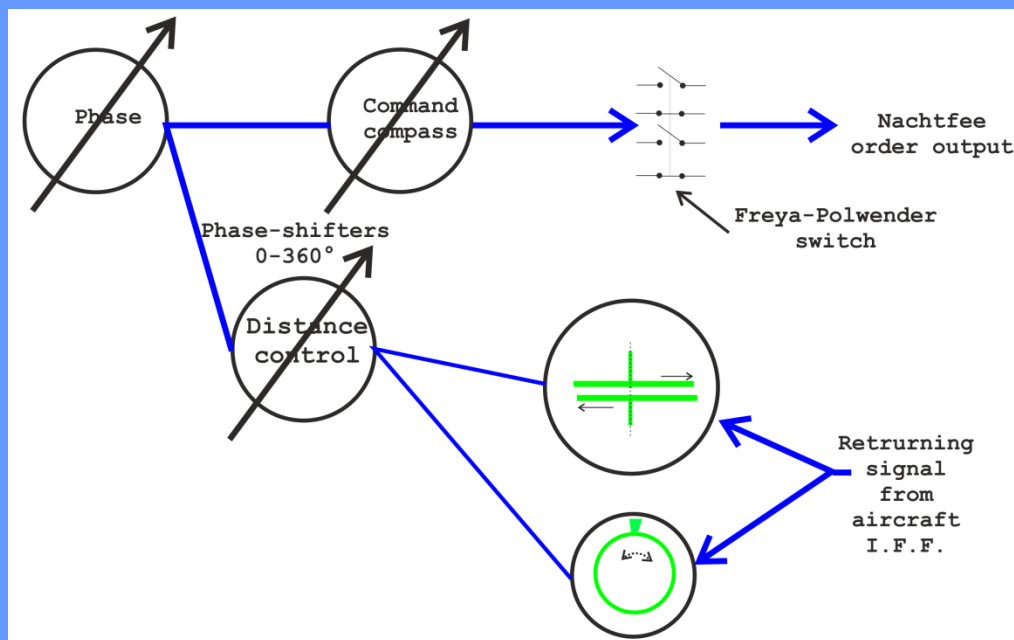
Because when the source changes its actual signal phase, there still remains coherence, as signal-phase deviations stay equal in both reference channels.

Therefore: sending a ground-signal towards an aircraft I.F.F. transponder and returning at the ground system, there still maintains signal coherence.



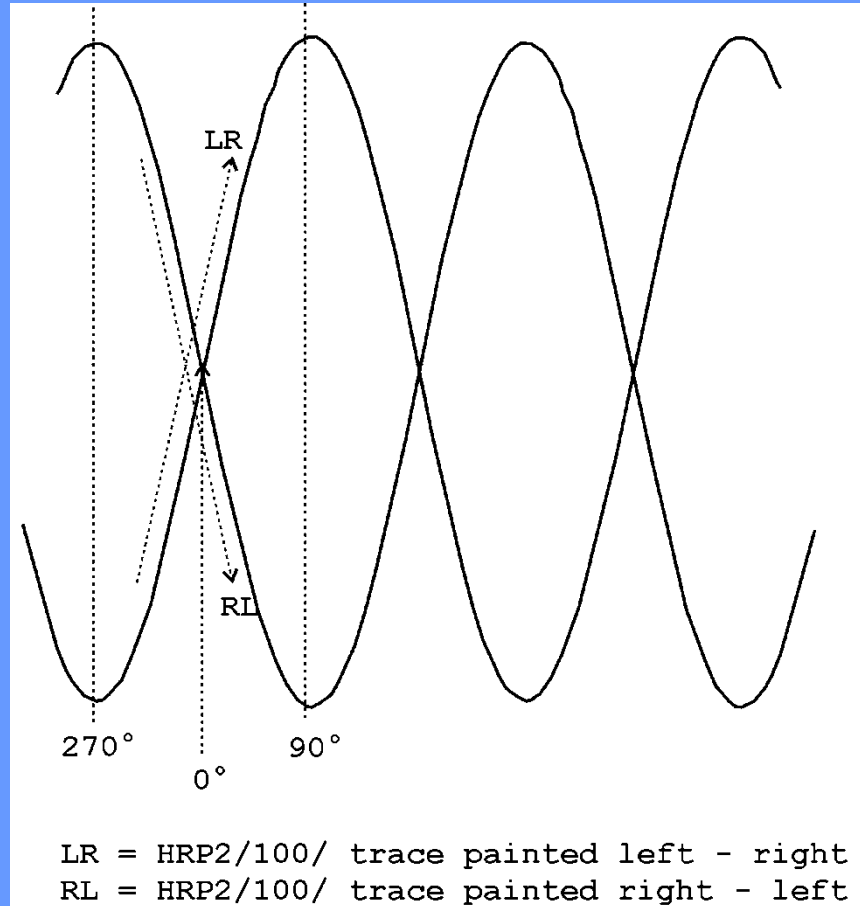
A nice example of a combined screen display of a coherent signal spot and a non coherent EGON signal (dashes 2 Hz PRF difference)

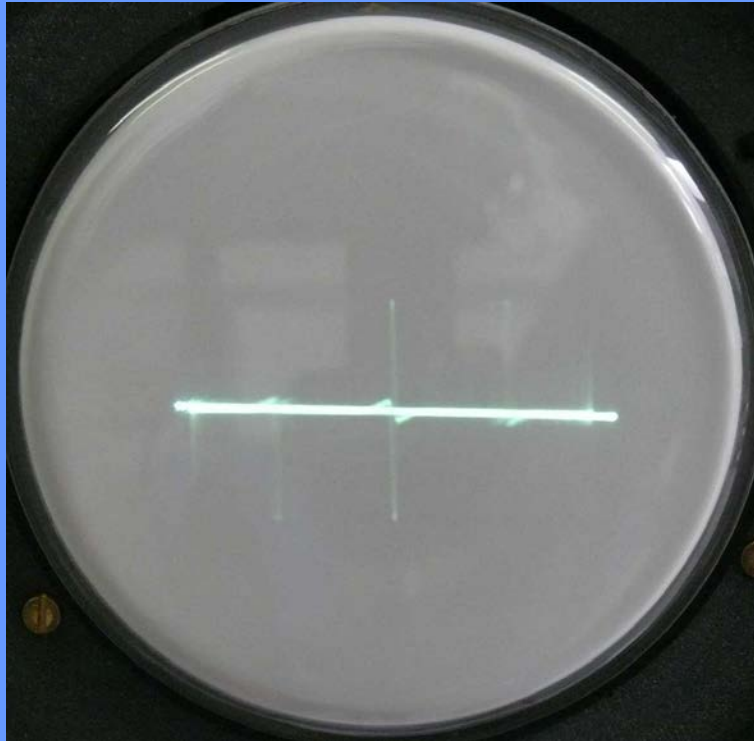






Please notice the non-linearity of the painted time-base line





Smart technique for adjusting  
the exact timing reference

Two base lines - one written from  
left to right the other right towards  
left; simultaneously getting  
back-to-back the same signals



When signal delays is  
corresponding exactly with  
the centre adjustment on  
the left-hand screen,  
signals are exactly set against  
one another on the  
range-scale

Could Nachtfee successfully have been operated?

- Why not?

- All our experiments have pointed onto the direction of not yet
  - Likely the required quartz stability wasn't yet available
  - It should have been in the order of better than  $10^{-8}$

Late 2015 and early 2016 we have implemented a Rubidium controlled frequency standard

Now it became apparent that indeed it could have worked well;  
but these devices weren't yet invented!





TOP SECRET U.

REF. 24

REF. CX/MSS/T461/18

(MODIFICATION IN (ROMAN) I KG 66)

PLEASE ADD FURTHER NOTE:-

1) ON 1/12/44 (ROMAN) I KG 66 REQUESTED AUTHORISATION FOR EQUIPPING 12 JU 88S WITH TRUHE 2, 12 WITH BENITO BOMBER EQUIPMENT AND 12 WITH KOMMANDOUEBERTRAGUNGS APPARATUS. IN THE LAST CASE FITTING OF LUFTKURIER WAS PROPOSED FOR TIME BEING AND IT WAS STATED THAT NACHTFEE MIGHT BECOME AVAILABLE LATER (T387/12).

New documents about the implementation and operational matters

I/ KG 66 (Staffel 1) consisted of 9 – 12 airplanes

NO 7657 FROM LUFTFLOTTE 3, IC, SIGNED HPTH KIRCH, TO  
ROBINSON 1A AND 1C DATED 15/5 :-

APPRECIATION BY FLIEGERKORPS IX OF THE NIGHT OPERATION  
AGAINST BRISTOL ON 14-15/5.

1) WEATHER CONDITIONS AS FORCAST : NO CLOUD, VISIBILITY  
OF THE GROUND MUCH HAMPERED BY HAZE. THE BRISTOL CHANNEL  
AND THE RIVER AVON WERE ONLY RECOGNIZED BY A FEW CREWS.

2) FLARE-DROPPING OPERATION :

(A) ((CELIBATE)) : TRANSMISSION WAS JAMMED BY THE  
ENEMY FROM THE BEGINNING (CONTINUOUS NOTE DAUERSTRICHE.)

(+) NACHTFEE (ONE SET OPERATING) : NOT USEABLE BECAUSE  
OF TOO GREAT DISTANCE.



Ju 88S

## Conclusions

- In contrast to foregoing information, Nachtfee, throughout the Baby Blitz (January-May '44), had been, in some respect, kept operational.
  - Did it perform as was once expected?
  - We must consider: partially due to inadequate time-base stabilities.
  - However, driven from our Rb-time standard, it performs rather good.
- Therefore, we may believe that with nowadays techniques it could have performed sufficiently.
  - But atomic timing devices had yet to be invented, more than a decade thereafter.
  - Quite many decades should pass before miniature modules reached application.