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LUMINARY Memo #35

TO: Distribution  
FROM: George W. Cherry  
DATE: July 30, 1968  
SUBJECT: Don't Wrap the Rendezvous Radar Around the Axle

The Problem

There are certain precautions the crew must observe when using R29, the Powered Flight RR Designate Routine. A problem arises because the RR CDU D/A converters send signals across the G&N/RR interface even when the signals originate from R10, the Landing Analog Display Routine, and are intended for the inertial velocity display meters. (See figure 1) The R10 signals could "designate" the radar in an unpredictable, erratic, and possibly harmful way if the switches on the RR side of the interface (shown in Figure 2 but not in Figure 1) are closed. The astronaut can open the designate line on the RR side of the interface by putting the RNDZ RADAR MODE switch into AUTO TRACK or SLEW. (The RNDZ RADAR MODE switch has three positions: LGC, AUTO TRACK, and SLEW.) Note that the designate line is also open on the RR side of the interface when the radar is locked on and tracking. Thus, if the LGC sends the track enable discrete and the radar locks up, the radar opens the designate line (ignores any "designate" signals that might be sent from the LGC), sends the DATA GOOD discrete to the LGC and extinguishes the NO TRACK light.

It should also be noticed that R10 operates only when the astronaut desires that the LGC drive the cross pointers and sends the display inertial data discrete to the LGC.

It should also be pointed out that R29 operates during P63, P12, P70, and P71 whenever it can. If the astronaut has the RNDZ RADAR MODE switch in LGC (so that the LGC receives the "AUTO MODE" discrete) and he is not requesting the display of inertial data (so that R10 is inoperative) the LGC will designate the radar, send the track enable, and, when the DATA GOOD signal is received, read and downlink the RR data. Thus, R29 operates "automatically" as long as the LGC receives the "AUTO MODE" discrete and does not receive the Display Inertial data discrete. Furthermore, once the radar is locked on and sends the DATA GOOD discrete to the LGC, R29 will continue to read and downlink the radar data even though R10 is activated by the display inertial data discrete so long as the LGC continues to receive the DATA GOOD discrete.

It would be tempting then to use R29 and R10 as follows, choosing as an example P63. Before ignition in P63 the astronaut turns on and warms up the RR. He places the RNDZ RADAR MODE switch in LGC and puts the MODE SEL switch in a non-PGNCS position. When average G is turned on R29 begins to operate by designating the radar, and the radar achieves lock on, sends the DATA GOOD signal (and extinguishes the NO TRACK LIGHT) whereupon R29 stops designating the radar and starts reading it. At some time later, while the radar is locked on and R29 is reading the RR and the LGC is downlinking the RR data, the astronaut activates R10 by putting the MODE SEL switch in PGNCS. R10 begins computing the inertial data and driving the cross pointers through the RR CDU D/A converters. The signals meant for the cross-pointers go to the RR but it ignores them because the radar is locked on. Everything is splendid. But then a maneuver of the S/C causes the RR to lose lock. Now the data good signal disappears and the RR closes the "designate" lines. The R10 signals "designate" the RR.

#### Avoidance Procedures

1. When the astronaut requests the LGC to display inertial data he also switches the RNDZ RADAR MODE switch to AUTO TRACK or SLEW.

2. When the astronaut puts the MODE SEL switch in PGNCS he keeps his eye on the NO TRACK light. When it goes on he turns off the radar.
3. Finally, if he wants to maximize the downlinked RR data he can switch off R10 whenever the NO TRACK light turns on and switch on R10 whenever it goes out, leaving the RNDZ RADAR MODE switch in LGC continually.

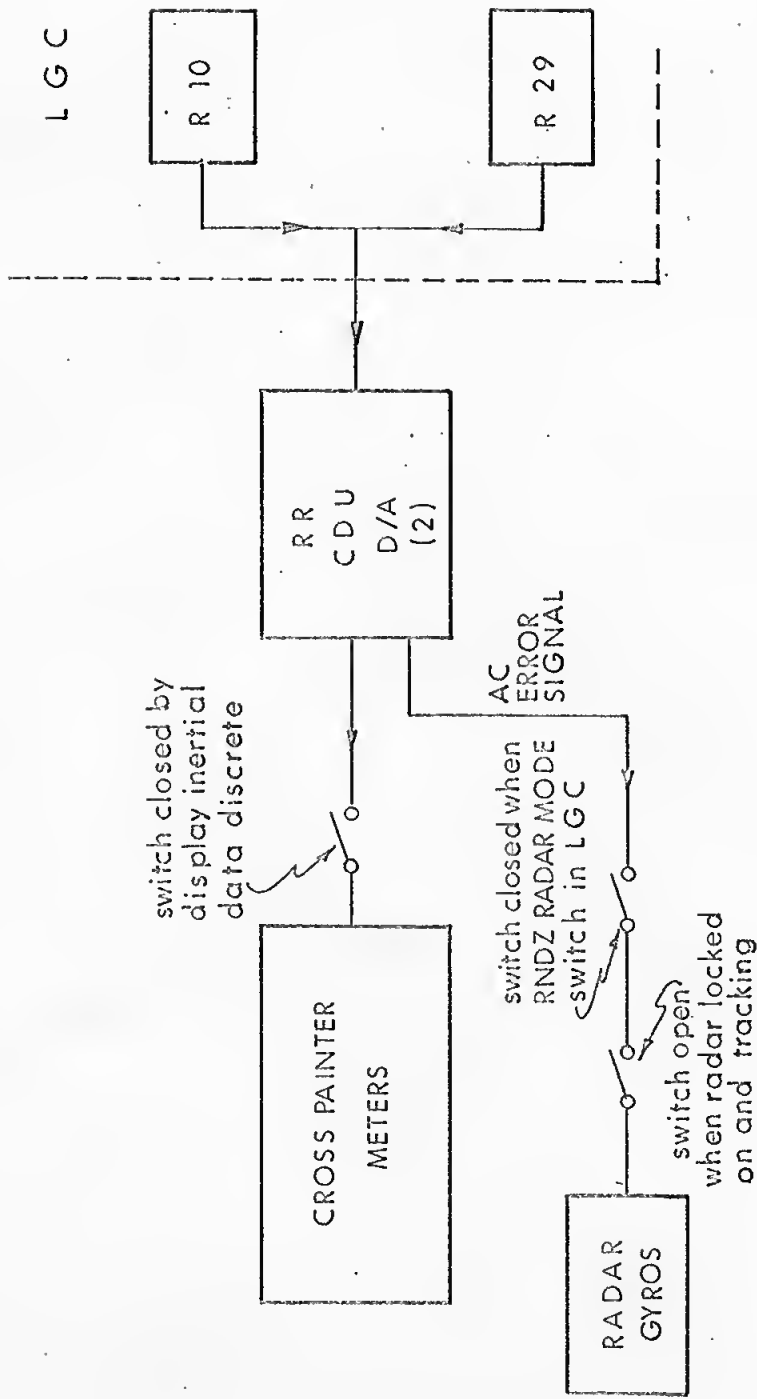
Evidently 1 is to be preferred to 2 and 2 to 3 for the crew procedures involved.

MIT Action: Forbes Little, Bob White: we must put some kind of statement about turning off the radar when R10 is activated in the GSOP description of R10 and R29.

Description

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Note 1: R 10 is turned on by reception of the "please display inertial data" discrete.

Note 2: R 29 will not try to designate the RR when R10 is on, but it will read the radar if the Data Good Discrete is present.

Fig. 2 R10 Can "Designate" the RR Sometimes