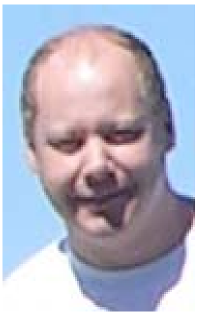
3. SeaSoar

OK RICHIE SO IT CAN BE DONE - NOW CAN WE GO BACK TO THE SHIP !!!!!

3.1 Penguin — Paul Duncan



3.1.1 Introduction

The Penguin system (originally developed at SOC by Nick Crisp and Vic Cornell) comprises two Linux computer systems, one at the surface, and one residing in the SeaSoar towed vehicle. The system in the vehicle logs data from several instruments to its hard disk, and sends pressure across its network connection (provided by a pair of ADSL modems) to the surface system (known as Emperor) which sends the pressure data to the flight control system. As well as this, the Emperor system regularly transfers data from the Penguin (underwater) system.

The underwater units previously used on UKORS supported cruises were prototypes, with two veroboard circuit boards (one for the power supply, and one for the interface board). Prior to this cruise, Seamap were contracted to develop the prototype Penguin system into a more supportable "production" system. Improvements to the system included:

- Improved robustness of power supply design
- Fuses on the sea power input
- Fuses on the low power +/-15V and 5V outputs
- Provision for control over individual instrument power
- Provision for voltage monitoring of the low voltage supplies
- Better shock mounting of the hard disk

Fig. 3.1 Prototype (left) and production (right) Penguin units

3.1.2 Problems

The majority of problems seem to have been related to instruments, such as the OPC's reluctance to reliably provide data when the vehicle was on deck (we suspect some kind of earthing problem) and problems with some sensors on both Chelsea Minipack units.

The OPC problem was solved by making sure we only switched it on once it was in water (see “Software” below). Even then, it sometimes still did not log properly immediately, and had to be shutdown for thirty seconds – this would not have been possible with the prototype system.

The Minipack problem is being addressed by loading SeaSoar with an additional payload – a Seabird MicroCAT 37SI. This device gives out temperature and conductivity, and so the Minipack will now mainly be used for pressure and fluorescence.

Apart from Instrument failures there have been occasional problems with the ADSL link which meant that pressure data were no longer available for the flight control system. Normally we have simply power-cycled the top-end ADSL modem. But during one such suspected case of ADSL link failure, this did not help. After a while an attempt was made to re-boot the Penguin system by power-cycling it from the surface, but only the ADSL modem in the SeaSoar was contactable. So another attempt was made to re-boot it – probably too soon, whilst it was still doing file system checking. This required the removal of the hard disk and manual file system checking on another Linux system. During investigation, Gareth Knight discovered that the cable connecting the ADSL modem to the TP-400 computer in Penguin had a break in it close to one of the RJ-45 connectors. This cable was then re-terminated by Gareth and has worked ever since. Since then, a communications monitoring system that had been disabled whilst Penguin was in the lab at SOC, has been re-enabled. This monitors the link between Emperor and Penguin. If the link appears to have gone down, the Penguin-end modem is re-booted. If this fails to bring the link up, the Penguin system shuts itself down properly, thus preserving the integrity of its file systems.

After the problem with the internal Penguin network cable had been rectified, the vehicle went in the water for another tow, only to find that now we had no control over the vehicle’s flight control. The vehicle was recovered after several attempts to control it.

Investigations by Dave Teare and Gareth Knight revealed a broken pin on the main sea-cable connection to Penguin. The bulkhead connector was replaced, and the flight controls tested on deck. The vehicle was then put back in the water to complete another tow.

3.1.3 Software

The Penguin system, as shipped to the ship, only carried software to switch all of the instruments on, or all of the instruments off. To solve the OPC problem, detailed above, the "mp_on" program that switched all instruments on, was modified, and the modified program, called "poweron" could be used to turn power on to one or more instruments, by specifying the port numbers of the instruments to be powered.

The original near-real-time graphics on Penguin used the Gnuplot program, with several scripts. This worked, but it was unable to produce an output similar to the Level C program "bandplot" which used to be used in the days of the Neil Brown CTD, logging through the ABC system. To deal with this, a new program called "dapsband" was written. This shows the SeaSoar pressure trace, but changes the colour of the trace to show changes in value of the particular channel being monitored. Currently, only data from the Chelsea Minipack can be viewed.

Fig. 3.2 An early version of "dapsband" showing the first part of a tow

Because of the problems with the Chelsea Minipack, the DAPS system needed a new module to log data from the Seabird MicroCAT 37SI. This was achieved with guidance from Nick Crisp (the author of DAPS) over the E-mail system. The new module was tested on the Emperor system, with the instrument directly connected to its only serial port (usually used for sending pressure data to the SeaSoar flight control system). The new software has now been loaded on the Penguin system, but will not be tested in the water until the next leg – Discovery 286.

3.1.4 Deployments

The SeaSoar was deployed 17 times in all, including trials. These are summarized in Table 3.1

Table 3.1 SeaSoar deployments

Cruise 285

station number	start date date	start time GMT	stop date	stop time GMT	duration	distance run (km) start	end	length of run (km)	notes
15488	7/11/04	1142	7/11/04	1610	4 h 28 m				trial only, data not processed
15497	13/11/04	1733	18/11/04	1510	4 d 21 h 37 m	3727	5448	1721	4-leg survey NE of M3, extended by severe weather
15514	23/11/04	1248	24/11/04	1738	1 d 04 h 50 m	6239	6672	433	survey south of Crozet past Ile des Pingoiuns
15519	25/11/04	1137	25/11/04	1608	4 h 31 m	6728	6872	144	trial of shallow OPC, early recovery forced by weather
15521	26/11/04	951	26/11/04	1144	1 h 53 m	6961	6978	17	no control, aborted?
15529	29/11/04	347	29/11/04	836	4 h 49 m	7516	7565	49	no control, recovery not possible until winch fixed
15530	29/11/04	1124	29/11/04	2328	12 h 04 m	7576	7762	186	straight run NW of Crozet Plateau
15536	30/11/04	1637	1/12/04	1928	1 d 02 h 53 m	7817	8227	410	triangular run north of M8
15541	2/12/04	1851	3/12/04	1718	22 h 27 m	8347	8699	352	run to NW M8 to M9
				Total	**9 d 7 h 32 m**			**3312**	

Cruise 286

station number	start date date	start time GMT	stop date	stop time GMT	duration	distance run (km) start	end	length of run (km)	notes
15551	17/12/04	600	18/12/04	1707	1 d 11 h 07 m	1664	2249	585	run into area through K to M9
15575	23/12/04	956	24/12/04	1159	1 d 02 h 03 m	3133	3544	411	W to E transect M3 to M5
15593	31/12/04	1500	1/1/05	1714	1 d 02 h 14 m	4325	4719	394	N to S transect M3 to M6
15601	5/1/05	2346	6/1/05	1236	12 h 50 m	5103	5291	188	NE transect M6 to M2
15608	7/1/05	636	7/1/05	1424	7 h 48 m	5344	5462	118	N run from M2 aborted early
15624	11/1/05	1758	12/1/05	1248	18 h 50 m	6232	6513	281	box round M3 bloom
15630	13/1/05	615	13/1/05	2232	16 h 17 m	6605	6789	184	zigzag run M3 to M10, slow speeds only, aborted
15631	14/1/05	1242	15/1/05	334	14 h 52 m	6951	7170	219	NW transect ending at M10
				Total	**6 d 14 h 1 m**			**2380**	