

US Naval Airship

David Field & Bryan Cordell
Westinghouse Airships Inc

Gaynor Murray & Geoff Cram
Ferranti International plc

Richard Patrick
GEC Avionics Ltd

In August 1986, an RFQ was released to the defense industry requesting quotations for the next generation AEW airship to be used with a US Naval Battle Group. This began as the Westinghouse and Airship Industries Ltd (UK) (W-AI) joint venture in non-rigid airship technology, but is now a Westinghouse Airships Inc. program.

This presentation addresses the software development effort, utilizing two major UK subcontractors, Ferranti International and GEC Avionics, for development of the flight deck avionics and flight control system respectively. This software development utilizes Ada, and employs two different software development design methodologies. It was initiated under software development standard DOD-STD-2167 and now uses DOD-STD-2167A.

This project was one of the first from the US DOD to use DOD-STD-2167 and one of the first to produce an Object Oriented Design (OOD). There was recognition of the need for the selection and integration of new tools and techniques because it was a novel project. Development methods had to be selected/developed. Ferranti amalgamated theirs into an Integrated System Development Environment (ISDE). The need for training in the impact of Ada and the new software engineering techniques was soon realised.

As the project evolved a number of problems became evident and solutions had to be found. In particular these included;

- The different methodologies employed by Ferranti and GEC. W-AI overcame problems this might have caused by extensively tailoring the Software Development Plan and holding detailed negotiations with the subcontractors prior to each review.

- Problems of reconciling DOD-STD-2167, which is oriented to functional decomposition, with either OOD or CASE based software analysis. This was only partly solved by moving to 2167A.
- Ferranti used Structured analysis at the front end, but this proved to be less than ideal as a starting point for OOD and led to a lack of clearly visible traceability. It is now felt to be preferable to move towards more Object Oriented Analysis if OOD is employed.
- GEC undertook a functional decomposition approach to both the requirements analysis and the software design. The software design uses an in-house CASE tool that automatically transitions to an Ada design which satisfies most criteria employed during the OOD process. GEC also suffered a traceability problem between the analysis and the design which is now being overcome by using the same tool during both processes
- Performance requirements meant that Ferranti had to tune the Ada code during the integration phase. In particular the number of acyclic tasks (mainly used for the protection of data) was reduced and those remaining were optimised. The code is still 100% Ada.
- Testing threw up some interesting questions for both subcontractors. Should traditional unit testing be employed or should more emphasis be placed on string and subsystem testing? Ferranti carried out unit testing in a bottom up fashion followed by incremental integration of the subsystems. GEC tested units, then gradually increased the emphasis placed on tests of the integrated system.

In conclusion this project has proved to be both challenging and intellectually rewarding at all levels. It has been a leading project for all three companies involved and significant experience has been gained from it.

1991 ACM 0-89791-445-7/91/1000-0457

David Field – Biography not supplied.

Bryan Cordell – Biography not supplied.

Caynor Murray is the Software Project Manager responsible for the development of the Ferranti software for the Airship Programme. She studied mathematics with the Open University and graduated in 1981. She joined Ferranti in 1978 and has mainly worked on the development of Human Computer Interface software for major UK and non-UK Naval Systems, using CORAL66. Gaynor has been involved in Ada development since 1987.

Geoff Cram graduated as a mathematician, and then entered the steel industry in the field of Operational Research. He spent several years associated with an on-line process control system, written in FORTRAN. Geoff did extensive mathematical modelling, also predominantly in FORTRAN.

He joined Ferranti in 1979 and has been associated almost exclusively with the development of avionic software. He has had a long involvement with a prototype of the command and control software for a new European helicopter (EH101). Until starting on the airship programme, all his experience within Ferranti has been with CORAL and MASCOT. Geoff started on the airship programme during the bid phase in 1986.

Richard Patrick is the Software Project Manager responsible for the development of the software embedded in the GEC Flight Control Computer for the Airship. He is a physics graduate of the University of Liverpool who has worked at GEC Avionics Limited for 27 years. For much of that time he has been responsible for software and system aspects of the Automatic Test Equipment and has been active in IEEE Standardization activities. He is also responsible for the ground and airborne software associated with a remotely piloted aircraft for artillery surveillance that is being developed by GEC Avionics for the British Army.

David Field

Education: AAS Community College of the Air Force, BS New School for Social Research, MS Troy State University.
Career: Retired USAF. 15 years experience in Avionics, 5 years system software test and integration in Air Defense Systems. Data Processing/Computer Science Instructor Wright State University. Product Assurance Manager MX software development, Logicon. Software Engineering Manager U.S Navy Airship Program, Westinghouse Airships Inc. Avionics Program Manager

Bryan Cordell

Education: Completing Masters, Business Administration (MBA) Loyola College, Baltimore, Maryland. Bachelor of Science, Computer Science, May 1984 Embry-Riddle University, Daytona Beach, Florida.

Career: July 1988 to Present – Systems Software Engineer, Naval Airship Program, Westinghouse Airships, Inc., Baltimore, MD. March 1987 to June 1988 – Deputy Program Manager for Computer Systems – B-1B Simulator System, Aeronautical Systems Division (ASD), Wright-Patterson AFB, OH. May 1984 to February 1987 – Computer Software/Hardware Configuration Specialist, Simulator Program Office, ASD, Wright-Patterson AFB, OH.

Gaynor Murray is the Software Project Manager responsible for the development of the Ferranti software for the Airship Programme. She studied mathematics with the Open University and graduated in 1981. She joined Ferranti in 1978

and has mainly worked on the development of Human Computer Interface software for major UK and non-UK Naval Systems, using CORAL66. Gaynor has been involved in Ada development since 1987.

Geoff Cram graduated as a mathematician, and then entered the steel industry in the field of Operational Research. He spent several years associated with an on-line process control system, written in FORTRAN. He did extensive mathematical modelling, also predominantly in FORTRAN. Geoff joined Ferranti in 1979 and has been associated almost exclusively with the development of avionic software. He has had a long involvement with a prototype of the command and control software for a new European helicopter (EH101). Until starting on the airship programme, all his experience within Ferranti has been with CORAL and MASCOT. Geoff started on the airship programme during the bid phase in 1986.

Richard Patrick is the Software Project Manager responsible for the development of the software embedded in the GEC Flight Control Computer for the Airship. He is a Physics graduate of the University of Liverpool who has worked at GEC avionics Limited for 27 years. For much of that time he has been responsible for software and systems aspects of the Automatic Test Equipment and has been active in IEEE Standardization activities. He is also responsible for the ground and airborne software associated with a remotely piloted aircraft for artillery surveillance that is being developed by GEC Avionics for the British Army.