

# RAID - TOWARD GREATER INDEPENDENCE IN THE OFFICE & HOME ENVIRONMENT

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## 1. Introduction

RAID - Robot for Assisting the Integration of the Disabled - is a system for allowing a handicapped person to operate independently of a human carer for periods up to 4 hours in the office and home environment. It is designed for those with full mental faculties but severe physical disabilities, whether traumatic or congenital in origin, and allows them

to handle papers, books, disks and CD ROM's, files, refreshments etc. Originally conceived as a natural extension of many year's work on the MASTER project at CEA-STR, Fontenay-aux-Roses, France, the development of the first three prototypes was undertaken by a European consortium with 50% support from the EC's TIDE programme.



**Figure 1.** The RAID workstation under development at Lund University Sweden.

The development programme led to a two-year period of clinical trials with some hundreds of quadriplegic users, funded and conducted by APPROCHE (Association pour la Promotion des Plates-formes RObotisée en faveur des personnes HandicappéEs), an independent syndicate in France comprising doctors, therapists, disability centres, insurance companies and Government agencies responsible for handicapped persons.

Five complete workstations were ordered by APPROCHE (with another for the CEA) for this evaluation. These were constructed by OxIM, who had acquired sole exploitation rights from the consortium. In clinical trials RAID proved to be a versatile product, popular with its disabled users, but requiring additional design work to eliminate problems of inadequate reliability, to reduce its physical size, and improve visibility.

OxIM has attempted to secure risk capital to complete the design and proceed to a production launch, but so far has failed to secure investment for this project nor has it identified an appropriate Venture Partner with the appropriate marketing capabilities.

## **2. The RAID Project: Adapting the Office to the needs of Quadriplegics.**

There is a wide variety of existing devices for enabling people with particular physical disabilities to

communicate with a PC. These include joysticks, detectors for chin and eye movement, and puff sensors. The aim of RAID is to enable such people to control the movement of objects in the physical world - both in an office environment, and also in a domestic setting. The goal is to enable severely disabled users to be independent for at least four-hours at a time, without intervention from a human carer.

The EC's TIDE (Telematics Initiative for the Disabled and Elderly) program supported two important phases of the MASTER-RAID development from 1992 - 1996, in projects called RAID and EPI-RAID respectively, with total support from DG XIII of some 1.9Mecu. The collaboration included groups from:-

France: CEA, Service Téléopération et Robotique.

UK: Oxford Intelligent Machines (OxIM), Armstrong Projects Ltd, and CambridgeUniversity.

Sweden: Rehabcentrum Lund-Orup, DPME, HADAR, CERTEC, and Lund University.

An exploitation agreement between the EPI-RAID partners gave OxIM exclusive marketing rights for RAID, as well as a licence to use the CEA's MASTER software, in exchange for royalties on total net sales of all units after those required for the clinical trials.

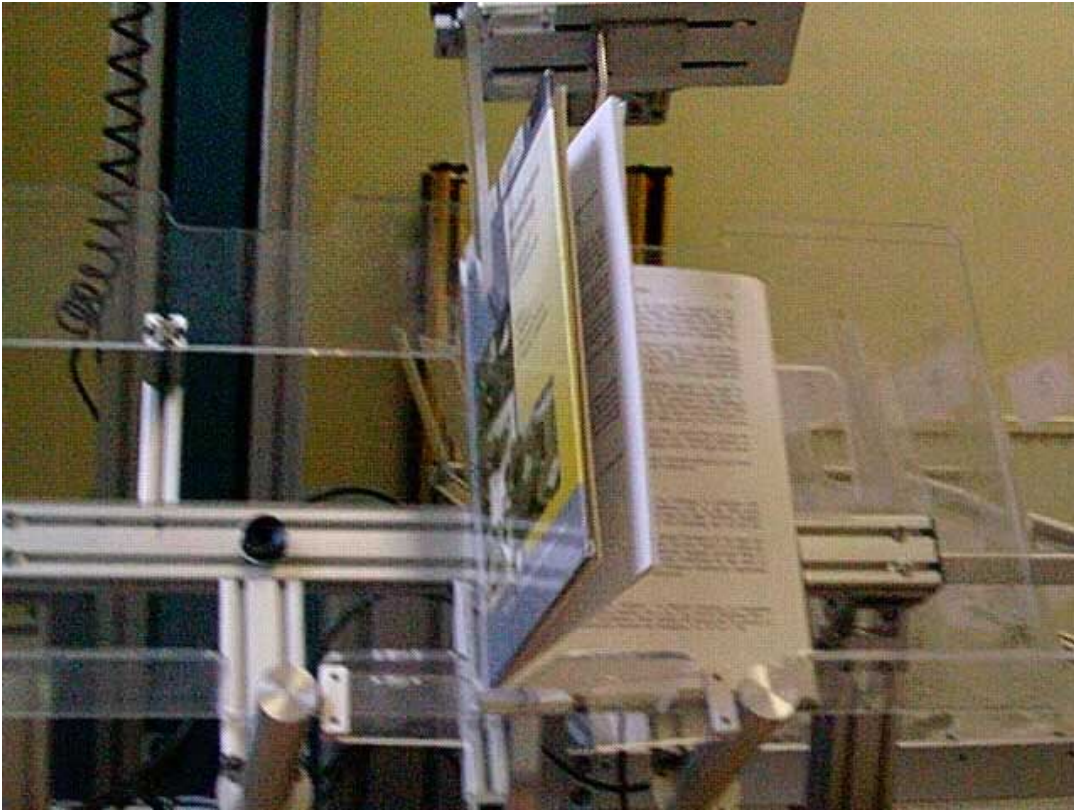
In 1994 APPROCHE, through the inspiration of its Director Dr M. Busnel, enabled the next phase to begin. APPROCHE raised sufficient funding from its members and from Government for the purchase of 5 OxIM RAID stations and their evaluation for 12 months in each of 10 co-operating disability centres distributed throughout France. By July 1995 the 5 stations had been delivered, and had passed acceptance tests witnessed by CEA as Project Engineers, at the first 5 selected Centres. By June 1996 the stations had been used extensively by some 45 handicapped people. Their disabilities were mostly C3 to C8 spinal column injuries (24) followed by 8 victims of neuromuscular disease such as Duchenne's syndrome, 6 patients with progressive disease of the nervous system such as multiple sclerosis, 5 with disease of the spinal column and cerebral cortex, and two with severe head injuries. Altogether some 58% had suffered traumatic injury - mainly road accidents - and 42% disease. The stations were then relocated by OxIM staff at the second set of 5 centres and the evaluation continued.

In parallel with this, clinical trials on the EPI-RAID stations continued at the Rehabcentrum Lund-Orup in Sweden

(featured above in figure 1) and, to a lesser extent at the Bradbury Progression Centre, Papworth, UK.

By the end of the trials in July 1997, some hundreds of handicapped users had been introduced to RAID workstations. At least 45 different tasks had been tried, mainly for office activities but also many for domestic life and leisure activity, ranging from handling books, papers ( See figure 2 below) and disks to operating a microwave (without adaptations) and a tape recorder. Comments from users were highly encouraging, and the power of the robot workstation was appreciated not only in relation to its functions in the office and at work, but also for leisure use. Always it was the element of increased independence that was most valued, allowing the use of human carers more for companionship and support, and less for mere physical assistance.

Unfortunately the trials were affected by certain reliability problems with RAID. These ranged from recurrent minor problems with the robot's control and end-effectors, particularly the one used for handling papers, to unexpectedly frequent problems with the PC's running the MASTER software.



**Figure 2.** The RAID page turner under clinical trials at Bradbury Progression Centre, Papworth, UK

Diagnosis and cure of these problems was made difficult and slow by the fact that the system is relatively complex, and that several major components were designed by different members of the original collaboration. The conclusion from these trials is that the RAID system has a commercial future if the technical issues raised are successfully addressed.

### **3. Route to Market.**

Further work is required both on the technical and commercial aspects of marketing RAID. OxIM has prepared a business plan for the elimination of the remaining defects, based on the

feedback obtained from the user trials in France, Sweden and UK. OxIM is also defining a strategy for the marketing of a simplified more compact RAID workstation.

### **Technical**

The product has to be developed so that it is *fit for purpose*. It has to be *Reliable* and provide the *functionality required by the users* at an *affordable cost*. It must also be *easily configurable, easy to maintain* and *re-programmable* without the need for highly trained individuals. It must also be compatible with the users environment, that is, *a sensible size*

and *discreet* (not noisy) with clear *user visibility* of the vital elements in the system.

The key to achieving much of this is to simplify the system, to make it more compact and to make it more accessible particularly in respect of the software. The exact details of how this will be achieved will be revealed in due course.

### **Commercial**

The benefits of the workstation have to be sold to:

*The users* - who must believe that the system will be of real benefit to them.

*The Clinicians* - who will specify the system for the users.

*The funding agencies* - Government organisations, Insurance companies, Charities etc.

*Investors / Joint venture partners* - to enable the development to occur.

There is a strong financial case for the use of RAID based on the savings that can be realised in carer costs. Unfortunately the agencies that pay for capital equipment are often not the same agencies that pay for care. Some creativity will be required in these instances (perhaps through leasing arrangements) so that the savings realised can provide an incentive to purchase.

Sales would be targeted firstly to the 80 assessment centres in the EU and

later to individuals and support agencies. The market forecast shows some 2,500,000 individuals in Europe of employable age, in disablement categories 6-9 (representing those with disabilities relevant to potential use of RAID). Allowing for a Eurostat estimate of 95% of these being unwilling to work, and the inevitable difficulty for individuals in securing funding, OxIM believes there is the potential to sell at least 1,000 units in Europe, and possibly ten times this amount. Similar figures apply to the USA. The challenge is to open up this difficult new market.

The projected cost of a RAID station varies according to the complexity of the configuration required, but at 1997 prices was about \$50,000. Given the right investment this will fall due to the simplification of the system, and could dramatically reduce with reasonable manufacturing batch sizes. An end user price under \$30,000 is entirely feasible given the right commercial circumstances. The capital cost then becomes comparable with certain other aids for the handicapped - e.g. specially converted cars.

### **4. The Way Forward**

There is clear potential for the RAID concept, but investment is required to take RAID forward. OxIM is still exploring potential avenues for achieving this and in the meantime is concentrating on keeping RAID in the public eye. OxIM believes that RAID

has a future and is committed to developing it further. What is required is a source of venture capital willing to accept the unusual mix of risks needed to take RAID through to production launch.

**For more information:-  
“<http://www.oxim.co.uk>”**