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THE UNIVERSITY OF MELBOURNE

JSF TECHNOLOGY FACILITATION PROGRAM

Proposal to

New Air Combat Capability
Integrated Project Team

Framework for the effective integration of simulations in training

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Visual-Haptic and Immersive Simulation Research Group

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ORGANISATION AND PERSONNEL

- Brief description of proposing group:
 - **University:** The University of Melbourne
 - **Departments:** Otolaryngology, Biomedical Multimedia Unit, Anatomy and Cell Biology, Dental Science, Computer Science and Software Engineering, Engineering, Respiratory Medicine, Physiotherapy, Information Systems
 - **Research Group:** Visual-Haptic and Immersive Simulation Research Group
 - **Lead Researchers:** P. Harris, S. O'Leary, L. Wise, J. Quealy, E. Kazmeierczak, L. Sonenberg, A. Smith, B. Pyman, R. Buyya, E. Reynolds, A. Goodwin, N. Eizenberg, C. Briggs, L. Irving, R. Dowell, G. Kennedy
 - **Other organisations collaborating with work:** DSTO (Air Operations Division)

ORGANISATION AND PERSONNEL

➤ **Area of specialisation:** Design and evaluation of virtual environments for authentic activity

- Our research capability is based on use of simulations and synthetic training environments (STEs) in the training of highly skilled professionals in high risk, high cost environments such as will be the case for the JSF Pilot Training Program.
- The research questions we address require an understanding of the relationship between the models used in simulation and the cognitive and perceptual processing capabilities of human cognition.
- Our cross-disciplinary approach allows a depth of understanding to inform the implementation of training programs using immersive simulations and other forms of synthetic training.

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DESCRIPTION OF TECHNOLOGY

- **Basic description of technology relevant to Proposal**
 - We draw on expertise in medicine, computer science, engineering, image processing, cognitive and behavioural psychology and educational technology to examine the role of immersive virtual reality simulations and other STEs in specialist training systems in medicine, dentistry and aviation.
 - We will also examine the ability of collaborative tools to support information exchange and situational awareness in advanced, networked environments.
- **What is the product at the end of the effort:**
 - *a framework for evaluation and integration of synthetic training environments(STEs) in the training of highly skilled professionals in high risk, high cost, uncertain environments where there is low tolerance of failure.*

APPLICATION TO JSF

- **Description of proposed application to JSF**
 - Our research program provides direction on the appropriate use of simulations and STEs in training and provides input on how best to incorporate new technologies for collaboration into production systems.
 - **Expected payoff in terms of capability the technology provides to JSF:**
 - Our *Framework of Application Criteria for Consideration of STEs* will enable synthetic training environments to be considered objectively for their application to the full range of flying training competencies and tasks. This includes developing an understanding of the different constraints on pilot training arising from single pilot JSF and JSF avionics
- **Development path:** The generalised framework will be applied to a range of specific curricula and organisational contexts including JSF.

STATUS OF TECHNOLOGY APPROACH

- **Current stage of development:** We have strong skills in the development, implementation and evaluation of sustainable training systems aligned with organisational and professional requirements. We also have extensive expertise in the development and evaluation of educational technology and STEs for a range of professional contexts.
- **Assessment of TRL:** The generalised STE integration and evaluation framework for placing STEs within a training environment is under development in 2006 / 2007.
- **What is required to improve maturity level?** The framework will need to be validated in a range of different curricula and organisational settings.

STATUS OF TECHNOLOGY APPROACH

- **What are the technical challenges/issues/risks associated with the technology?**
 - The biggest challenge is to capture the conceptual models of various stakeholders in the training system and to understand the mappings between the various perspectives and ways of understanding.
- **How are you going to solve the problem?**
 - The cross-disciplinary team we have assembled brings together a diverse range of discipline areas and conceptual tools from which to build shared understanding.
- **What are the interfaces and outside impacts required to transition this technology?**
 - Each iteration of the training system (eg around each JSF Block Upgrade) will require a re-evaluation of the training needs and STEs supporting the development of highly skilled professional pilots.

RELATED EFFORTS

- **Is there other work going on in this area - particularly in Australia, or JSF Partner countries - that complements the effort?**
- **Is there other work going on that competes with this effort?**
 - Our specialist understanding of training and education allows us to understand the complex nature of integrating specific technologies into specific training situations with a view to ensuring development of appropriate knowledge, skills and attitudes for professional practice.
 - Other groups also conduct research that complements or competes with our work, but that is the nature of research and is what stimulates the development of a deeper cross-disciplinary conceptual understanding of all aspects of the training curricula, organisational settings and STEs.

PROGRAMMATICS

- **Technology transition plan**
 - Our framework will be applicable to any training system and organisational setting
- **Proposed programmatic for the project:**
 - Our framework for evaluation and integration of STEs into curricula is being developed during 2006-2007
- **Are there other potential users or benefactors of the technology**
 - Our framework will be applicable to a range of training situations in medicine, aviation and dentistry, as outlined elsewhere in this presentation.
- **What are the programmatic risks (schedule, policy, etc) associated with the technology**
 - A cross-disciplinary shared understanding of the JSF training system needs to be fostered within the Defence organisational setting
- **When would you expect it to be ready to transition to JSF**
 - Our framework will be ready to be used with JSF from 2007.

COSTING

- **What is the ROM costing for the proposed project?**
 - ⇒ What funding has been invested to date
 - ⇒ \$300K / year 2006 - 2007 (UniMelb - SRIF)
 - ⇒ \$200K (CDE / DSTO - AIR5428)
 - ⇒ How much is required in the future
 - ⇒ \$300K / year to apply the framework to JSF
- **Quantify the cost risks for the proposed project.**
 - The risk associated with the proposed project is in the degree to which it is possible to develop a shared understanding of the training needs for JSF across an organisation to ensure appropriate support of any changes required by implementation of the new system.

CONCLUDING REMARKS

- Miscellaneous issues, qualifications to proposal
- What does Australia offer that the rest of the World does not:
 - What is it that is unique to Australia;
 - Australia's pilot training system produces world class pilots where all pilots are trained to captaincy levels. It currently does so with very limited use of STEs.
 - What is it that Australia does better than, or at least competitively with, the rest of the World.
 - Train military pilots
- QUAD Chart summarising proposal

Proposal

Background	Programmatics
<ul style="list-style-type: none"> • Research Group: University of Melbourne Visual-Haptic and 3D Immersive Simulation Research Group / DSTO (AOD) • Background to work: Our research capability is based on use of simulations and STEs in the training of highly skilled professionals in high risk, high cost environments such as medicine, aviation and dentistry. 	<ul style="list-style-type: none"> • Our framework for evaluation and integration of STEs into curricula is being developed during 2006-2007. • This framework will need to be validated in a range of training situations and organisational settings. Our current expertise relates to training for highly demanding situations encountered in medicine • Budget for transition to JSF context: \$300K
Description of Technology	Application to JSF
<ul style="list-style-type: none"> • Our research program draws on expertise in medicine, computer science, engineering, image processing, cognitive and behavioural psychology and educational technology and will also examine the role of collaborative tools to support information exchange and situational awareness in advanced networked environments. 	<ul style="list-style-type: none"> • The block upgrade system for developing JSF capabilities will require a responsive, efficient, effective and accountable training system which will need to be highly acceptable to accommodate new capabilities. New STEs will need to be evaluated and their effect on the training system as a whole will need to be rapidly understood for effective integration.