

## **PROPOSAL TO DUALEFFORT Ltd. FOR THE FEASIBILITY STUDY AND DEFINITION OF A DEVELOPMENT PROGRAMME FOR THE SWASHBALL DRIVE**

### **1 Introduction**

Ricardo have been approached by an innovation company called DualEffort Ltd. who have intellectual property relating to a device called the Swashball Drive. This device converts rotating motion into the reciprocating motion of multiple pistons, achieving a similar effect to the swashplate which is common in pumps and compressors.

DualEffort Ltd. and their financial backer Mr Paul Young wish to pursue a programme to develop this technology to a functional demonstrator unit with a quantification of its benefits.

This proposal is submitted in response for an initial feasibility study and definition of a development programme for the device.

### **2 Objectives**

- To conduct a brief review of the feasibility of the Swashball device
- To define a development programme for the Swashball device, which DualEffort Ltd. can use in discussion with third parties.

### **3 Scope of Work**

Ricardo will conduct the following tasks:

- Prepare a technical overview with existing technology, based on experience and literature survey. The overview will consider the following issues:
  - Cost
  - Weight
  - Durability
  - Friction
  - Efficiency
  - Inertia
- Review the design and development issues relating to the contact points of the motion conversion mechanism
- Review of other potential applications
- Define a development programme with outline budgetary costs and time scales

- Produce a presentation style report to be presented to a potential product end user

#### **4 Assumptions**

The following assumptions have been made:

- DualEffort Ltd. will supply free of all charges to Ricardo, sufficient detailed information on the theory of the Swashball device, in particular tooth contact, to allow outline analysis to be conducted
- Detailed computer based analysis would not be performed at this stage of the project
- Any literature survey made at this stage will be non-exhaustive
- The review of other potential applications at this stage will be non-exhaustive.

#### **5 Deliverable**

A presentation will be given to DualEffort Ltd. at a meeting at Ricardo, covering the issues discussed in Section 3. The presentation will be delivered in Adobe Acrobat "PDF" format.

#### **6 Price and Time**

The price for the work defined in Section 3 is £10,000

Estimated duration of this work is 4 weeks

#### **7 Terms and Conditions**

**7.1** The price quoted is firm and fixed, is valid until 29 December 2000 and assumes that work commences on or before 2 January 2001.

**7.2** In accordance with standard Company procedures, Ricardo will require full payment to be made in advance prior to commencing work for a new client. This is without prejudice to future projects.

**7.3** All data and design information provided by DualEffort Ltd. will be treated as confidential by Ricardo unless specifically designated otherwise by DualEffort Ltd.

- 7.4** If any innovative design or manufacturing technique is developed by Ricardo during, or as a consequence of, the project, Ricardo reserve the right to patent such item in its name and at its expense.

In recognition of the development opportunity having arisen as a result of DualEffort Ltd. placing the project with Ricardo, Ricardo will, on request, grant DualEffort Ltd. a free, non-exclusive, irrevocable licence to use any such patented item.

- 7.5** DualEffort Ltd. will not use the Ricardo Brand in promoting the Swashball Drive product or imply any indorsement by Ricardo of the Swashball Drive product without written permission of Ricardo. A representative of DualEffort Ltd. will be required to sign an agreement to this effect prior to commencement of work by Ricardo.

- 7.6** Ricardo maximum and cumulative liability in respect of any direct, indirect or consequential losses, liabilities, demands, damages or expenses to DualEffort Ltd. arising out of any breach in its performance of this work and/or the use of any know-how, inventions, patents, data or information supplied by Ricardo shall be limited to the price as set out in Section 6.