PART ONE – PROJECT APPRAISAL

1.0 TERMS OF REFERENCE/STATEMENT OF NEED

In order to meet the requirement of the Diploma in Management Studies, an analysis has been commissioned to assess the viability of a four-year contract for the production of eight Aargoni an Reducers. The report is to be submitted by 16th April 2002.

2.0 INFORMATION

This report is based on, and should be read in conjunction with, data supplied in the information sheet distributed on 19th February 2002.

3.0 AIMS AND OBJECTIVES

The aim of this report is to provide the following information:

3.1 Calculation of the minimum bid price for the contract.

3.2 Identify possible options/alternatives.

3.3 Explain rationale behind the findings.

3.4 Determine an appropriate figure for payment in two equal instalments; one at the beginning of the contract and one on completion.

4.0 METHODOLOGY AND BASIC ASSUMPTIONS

4.1 Costings are based on a Divisional perspective rather than that of the organization as a whole.

4.2 The calculations for the bid costing are based on the opportunity cost approach. Opportunity costs are those benefits that would be foregone or lost as a result of taking a particular decision (Dyson, 2001, p.374), and ensure only those costs that are relevant to a decision are taken into account when establishin g the minimum bid price.

4.3 Relevant costs, which are costs and revenues unaffected by this decision making process (e.g. fixed overheads) are excluded from this analysis because they will be incurred regardless of whether or not this contract is undertak en.

4.4 It is assumed that the financial year (FY) runs from 1 July – 30 June.

4.5 It is anticipated that the dearth of skilled labour will end before the start of year 2 following completion of the extensive training programme, thus eradicating the opportunity cost, this being the current contribution of £52 per hour net of labour costs.

4.6 Skilled and unskilled labour is not interchangeable.

4.7 Machine 1, though not working to full capacity, is not capable of producing two reducers per year, and therefore the purc hase of a second machine is essential.

4.8 Annual increases have been incorporated into calculations for individual categories before final pricing, as rates vary between categories.

4.9 Depreciation charges are a means of allocating historic costs and are therefore not relevant to marginal costs (but are relevant to absorption costs).

4.10 Material Bea may be bought in advance at today's cost (this is implicit in the data sheet, which states that Aye and Cee must be bought annually - see paragraph 5.1.2 for further details).

4.11 S.M.D. Ltd's money cost of capital is 20% per annum.

5.0 ANALYSIS

5.1 Cost of Materials.

5.1.1 Aye

5.1.1.1 Material Aye is in regular use, therefore the current purchase price of £485 per tonne is appropriate. The amount paid for existing stock is not relevant since whatever is used will need replacing. Costs for Aye are shown in detail at Appendix 1.

5.1.1.2 The price of Aye is expected to hold until 300601, after which there will be an anticipated annual increase of 12%.

5.1.2 Bea

5.1.2.1 Bea is no longer used within the Division, but the 100 existing stock have an opportunity cost of £145 each, which is the income that could have been generated had it been sold to another division within the organization. Therefore, the first year's supply (100) will be at

£145, thereafter increasing to the current purchase price (£255 plus annual percentage increase).

5.1.2.2 Material Bea may be procured in advance at today's price, or annually as for the other materials. If bought at today's price, then Bea will not attract the anticipated annual increase of 12%; however, it will require up-front finance of £91,000 (i.e. in Year 0). Both options are explored in Appendix 1.

5.1.3 Cee

5.1.3.1 Cee is rarely used, and existing stock will have to be disposed of immediately (I.E. Year 0) at a net cost of £180/tonne, or converted to Zed at a cost of £215/tonne. Therefore, there is an opportunity cost of -£180/tonne for existing stock (44 tonnes), which equates to the first year's supply for two reducers. This is effectively a saving of £180 per tonne as Cee no longer has to be disposed of if used in the manufacturing process.

5.1.3.2 The price of Cee is expected to hold until 30 June 01, after which there will be an anticipated annual increase of 12%. Costs for Cee are shown in detail at Appendix 1.

5.2 Cost of Labour

5.2.1 Skilled

5.2.1.1 Skilled labour wages are £30 per hour plus variable overheads of £9 per hour (p.h.).

5.2.1.2 Fixed overheads of £15 p.h. are not applicable as they are not relevant to opportunity costing.

5.2.1.3 Skilled labour is in short supply until at least mid may of the first year. For costing purposes, it is assumed that this will be the case until the end of the FY (30 June). As a result, the relevant cost of its use attracts an additional contribution of £52 p.h. It is assumed this will not apply in years 2-4. Therefore, costs p.h. for year 1 are £52+£30+£9 = £91, and £39

thereafter, plus the anticipated 6% increase per annum.

5.2.2 Semi-skilled Labour

5.2.2.1 As there is an agreement to pay idle semi-skilled workers2/3 of their normal wage of £21 per hour, there is an opportunity cost of £7 per hour in the first year as there are 1000 excess hours of this type of labour (it is assumed this will not apply to years 2-4).

5.2.2.2 There are no fixed or variable overheads for semi-skilled labour.

5.2.3 Costs for labour are shown in detail at Appendix 2.

5.3 Cost of Machinery

5.3.1 As Machine 1 is already in use elsewhere within the organization and has sufficient spare capacity, there are no marginal or opportunity costs relating to it.

5.3.2 Machine 2 needs to be purchased at an immediate cost of £255,000 and will only last for the duration of the project. As the anticipated residual value of the machine is £85,000, the cost to this project is the purchase price minus the residual cost, which is £170,000.

5.3.3 Costs for machinery are shown in detail at Appendix 3.

5.4 Cost of Transport

5.4.1 Transport required for delivery will be supplied by Logistics Ltd, at an expected cost of £2,400 for year 1, anticipated to rise by 5% each year (years 2-4).

5.4.2 Costs for transport are shown in detail at Appendix 4.

6.0 PRICING THE JOB

6.1.1 Once the above have been costed, it is possible to calculate the minimum bid price. The minimum price is the cost below which it is not viable to undertake the contract and does not take into account any desired profit.

6.1.2 Some costs will be incurred immediately. The main cost will be the purchase of the second machine at £255,000, needed before production can start. Material C will be a negative opportunity cost of £7,920 in year 0 as it would otherwise need to be disposed of immediately. Material B is a potential Year 0 cost if the option to procure it straight away in total is selected.

6.1.3 Appendix 5 shows the breakdown of the minimum price by category for both options (either buy material Bee all at once, or year by year) for the full term of the job, using data from Appendices 1-4; these include annual % increases. However, these figures do not take into account the time value of money. Over time, money is subject to the pressures of factors such as inflation and taxation. Where expenditure occurs over a number of years these costs should be discounted to ascertain their present value (Net Present Value, or NPV).

6.1.4 A revised table of costs, taking into account the time value of money, is at Appendix 6 and uses the standard Present Value table calculated using S.M.D. Ltd's money cost of capital rate of 20%. This illustrates the reducing effect time has on the minimum price in that it is reduced by between £80-100,000 depending on which option is selected.

6.1.5 However, the potential contract is to be paid in two equal instalments; the first at the start of and the second at the end of production. This can not be done simply by halving the figure(s) shown in Appendix 6 as the second half would be worth less than the first, again owing to the time value of money. To calculate this, the second instalment must be discounted by 0.482% (the 4 year discount rate for 20% cost of capital rate, using the Present Value tables). The results are:

a. Option 1 – Bea purchased in Year 0.
   2 x equal instalments of £455,534.55

   Total - £911,669.11

b. Option 2 – Bea purchased annually.
   2 x equal instalments of £449,243.94

   Total - £898,487.88

6.1.6 The calculations for this (including tests of the calculations) are at Appendix 7.

7.0 CONCLUSIONS

It is concluded that:

7.1 In order to fulfil the contract for Aargonian Reducers there are two main options; Option 1 involves procuring material B at the beginning of the contract at today's prices, Option 2 to purchase it annually as required.

7.2 Although first calculations indicate Option 1 to be the cheaper, when time value of money factors are introduced Option 2 is revealed to be cheapest (£898,487.88 versus £911,669.11).

7.3 The combined total of the two equal payments appears significantly higher than the NPV; however, the figures amount to the same allowing for the time value of money.

7.4 The calculations for the minimum bid price are based on the opportunity cost approach, using only those costs that are relevant to the decision whether to undertake the contract.

7.5 Although the time value of money is incorporated into calculations, these are based on rates of increases that may deviate over time and can not be seen as 'set in stone'.

7.6 The minimum bid price is the point below which it would not be financially viable to undertake the contract; it does not incorporate an element of profit.

8.0 RECOMMENDATIONS

It is recommended that:

8.1 Option 2 (purchase material Bea annually) be selected.

8.2 Assuming 7.1 to be the case, the contract is viable with a ***minimum*** bid price of £898,487.88, payable in two equal instalments of £449,243.94 on 1 July 2000 and 30 Jun 2004.

PART TWO – RISK

9.0 INTRODUCTION

Any project that has a number of possible outcomes is subject to risk, and this is particularly the case where time is involved. The purpose of Part Two of this report is to examine risk in general and discuss the

importance of incorporating 'Risk Analysis' into decision making, using Part One of this report to help illustrate this.

10.0 KEY TERMS

10.1 There are two key terms that must be understood when examining potential problems associated with financial projects; these are:

- **Risk.** A risky situation is one that although unpredictable, does have a number of alternative outcomes with *known* probabilities (such as flipping a coin).

- **Uncertainty.** A situation is uncertain when data on probabilities is *unknown*, (such as the likelihood of war in the Middle East in the next two months).

10.2 For the purpose of this assignment, we will concentrate on Risk.

11.0 RISK AND THE AARGONIAN REDUCERS

11.1 The Aargonian Reducers project is 'risky' for a number of reasons, as follows:

11.1.1 **Time.** The project is scheduled to run over four years; the further into the future estimates are projected the greater the risk of change. Financial situations change, firms go out of business and markets alter.

11.1.2 **Cost Estimates.** Certain types of cost are more significant than others to a project, and some costs are more volatile than others. Cost estimates relevant to this project are:

11.1.2.1 **Labour**. In the 1970's and 80's these co sts fluctuated and this could happen again with reducing unemployment making labour in short supply – which, in this scenario, is already the case particularly until skilled labour is replaced following an extensive training programme.

11.1.2.2 **Material.** Although estimating the quantity of materials is fairly certain, their cost can alter, particularly with changing world events (for example war or natural disasters, such as affected the cost of microchips following the Kobe earthquake in the late 20th Century). All three materials will need to be purchased at some point which means that price increases can only be anticipated. Material Bea could be

procured in advance at today's price, thus reducing the risk associated with anticipating the 12% annual increase. However, the disadvantages of this would be storage requirements and the 'time value of money' problems associated with having to provide the money in advance, which is covered in more detail in paragraphs 5 and 6 of Part One.

11.1.2.3 **Transport.** Again, owing to the timescale involved, transport costs can only be estimated and could deviate significantly in the future, particularly if fuel prices rise dramatically (possibly as a result of market reaction to Iraq's recent halting of oil exports).

11.1.2.4 **Machinery.** The purchase price of Machine 2 is unlikely to change and presents little risk in this decision. However, the residual value of the machine can only be estimated and is subject to change (up or down) over the next four years.

11.1.3 **Interest Rates.** This is again a volatile variable that can affect significantly the profitability of this project. Although relatively low at the moment, rates are likely to increase in the not too distant future as the economy shows signs of potential overheating. However, S.M.D . Ltd's money cost of capital of 20% should allow for this and indeed may well be set too high (thus pushing up the bid price).

11.1.4 **Inflation.** Similar to interest rates, inflation over time distorts the value of money. Given that the bid price must include two pre-fixed and equal instalments payable at the beginning and end of the contract, a significant increase in interest rates over the four years could reduce the value of the second payment.

11.1.5 **Revenue Estimates.** Possibly the most risky variable associated with investment, this is more applicable to a project where it is difficult to assess the profitability of a project, such as the development of a new product where demand or success is unknown. In the Aargonian Reducers scenario, this is less relevant as there is a known demand in that these are being potentially being produced in response to an order, part of which at least is being paid for in advance.

11.1.6 **Investments – Reward vs Risk.** Although not directly relevant to the Aargonian project, investment risk and reward is worthy of mention. The riskier an investment, the greater should be the potential return. For example, shares on average perform better than government fixed interest securities (gilts) and are seen as a better investment. However, shares are more susceptible to volatile changes, and occasionally lose value and give low or no returns (such as the recent case of Railtrack). Gilts are often seen as a 'safe bet' in uncertain times. From an individual investor's perspective, placing money in a savings account is one of the safest ways to invest money, but return is very low, particularly when interest rates are as low as they currently are.

12.0 SENSITIVITY ANALYSIS

12.1 Sensitivity Analysis is a method of analysing the risk surrounding a capital expenditure project, such as the Aargonian Reducers, and facilitates an assessment of how a project's Net Present Value (NPV) is responsive to change.

12.2 The method for doing this involves calculating the NPV by changing different factors according to how they may vary in reality. For example, changing the money cost of capital from 20% to, say 12%. This example is shown in Appendix 8, where the NPV increases from £665,779.52 to £700,993.59. This can then be transposed into the calculation for the instalments in Appendix 9, which shows an overall reduction of over £40,000 (from £898,487.88 to £857,222.37) for the combined total for the two instalments. This would obviously make the minimum bid price more competitive.

12.3 Sensitivity analysis can be used for testing any other 'critical variables' to which the NPV may be most sensitive (such as labour, materials etc, mentioned above) and a selection of options can be produced simply by changing data inputs on spreadsheet models. This form of analysis can also be used to determine what changes must take place for an unprofitable project to be viable (for example, determining how much a certain factor would need to fall by to bring the overall cost down to a specified level).

12.4 Although a very useful management tool, sensitivity analysis is limited in its' effectiveness. This method requires each key variable to be isolated and changed/tested, whereby in management decision-making it is the accumulative combined effects of change to two or more variables that is important. Also, this method ignores the probability factor (e.g. the *probability* of the money cost of capital changing from %20 to %12).

13.0 CONCLUSION

Risk is an important factor in decision making in accounting. Decision making is based on expectations about the future which almost certainly differ from what actually occurs. Where two or more outcomes can be identified and probability can be determined then sensitivity analysis should take place in order to help decide whether or not to proceed with a project.

14.0 APPENDICES

Appendix 1 – Cost of Materials.
Appendix 2 – Cost of Labour.
Appendix 3 - Cost of Machinery.
Appendix 4 – Cost of Transport.
Appendix 5 – Minimum Price (ignoring Time Value of Money).
Appendix 6 – Minimum Price (including Time Value of Money).
Appendix 7 – Instalments
Appendix 8 – Sensitivity Analysis – Minimum Price - Change in Cost of Capital.
Appendix 9 – Sensitivity Analysis – Instalments - Change in Cost of Capital.

15.0 BIBLIOGRAPHY

Dyson, J.R., (2001), 'Accounting for Non-Accounting Students', Financial Times/Prentice Hall.