



IENG 377 Final Project

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Problem and Possible Solutions



Problem:

- We have \$10.6 million that need to be invested

Possible Solutions:

1. Invest \$5.9 million for a new AI autonomous flight system
1. Update manufacturing with 10 new robots for 300,000 Euros each
1. Invest \$9.5 million to establish manufacturing capability to build company's next generation unmanned craft

Constraints



Finance Committee:

- Wants to make the best return on investment

Executive Team:

- Want to establishing manufacturing capability for next generation unmanned craft (Companies that can deliver these as production aircraft will have competitive advantage 10-15 years from now)

Assumptions



- An exchange rate of 1 USD = 1.01 Euro
- Annual inflation rate of 3.5%
- Projects must meet after tax MARR 10%
- State tax rate = 7.6%
- Federal tax rate = 21%
- Use MACRS GDS depreciation

After-tax MARR =	10%
Class Life =	5
State tax rate =	7.60%
Federal tax rate =	21%
Inflation Rate =	103.50%
effective tax rate =	27%
DB rate =	200%

Calculation Values (Depreciation, PW, AW)

MARCS 5 Year Recovery	
Year 1	20
Year 2	32
Year 3	19.2
Year 4	11.52
Year 5	11.52
Year 6	5.76

Year	P/F	A/F
Year 1	0.9091	1
Year 2	0.8264	0.4762
Year 3	0.7513	0.3021
Year 4	0.683	0.2155
Year 5	0.6209	0.1638
Year 6	0.5645	0.1296
Year 7	0.5132	0.1054
Year 8	0.4665	0.0874

AI Flight System

Capital Investment =	\$ 5,900,000
Market Value =	\$ 190,000
Annual Savings =	\$ 1,250,000
Useful Life =	8
Training =	\$ 70,000

EOY	BTCF	Depreciation Deduction	Taxable Income	Cash Flow for Income Taxes	ATCF	Adjusted ATCF
0	\$ (5,900,000)				\$ (5,900,000)	\$ (5,900,000)
1	\$ 1,180,000	\$ 1,180,000	\$ -	\$ -	\$ 1,180,000	\$ 1,180,000
2	\$ 1,293,750	\$ 1,888,000	\$ (594,250)	\$ 160,471	\$ 1,454,221	\$ 1,454,221
3	\$ 1,339,031	\$ 1,132,800	\$ 206,231	\$ (55,691)	\$ 1,283,341	\$ 1,283,341
4	\$ 1,385,897	\$ 679,680	\$ 706,217	\$ (190,707)	\$ 1,195,190	\$ 1,195,190
5	\$ 1,434,404	\$ 679,680	\$ 754,724	\$ (203,806)	\$ 1,230,598	\$ 1,230,598
6	\$ 1,484,608	\$ 339,840	\$ 1,144,768	\$ (309,133)	\$ 1,175,475	\$ 1,175,475
7	\$ 1,536,569	\$ -	\$ 1,536,569	\$ (414,935)	\$ 1,121,634	\$ 1,121,634
8	\$ 1,590,349	\$ -	\$ 1,590,349	\$ (429,458)	\$ 1,160,891	\$ 1,299,584
8	\$ 190,000	\$ -	\$ 190,000	\$ (51,308)	\$ 138,692	
					PW =	\$764,557.37
					AW =	\$143,311.70
					IRR =	13.5%

Update Manufacturing with 10 New Robots

Capital Investment =	\$ 2,970,297
Market Value =	\$ 210,000
Annual Savings =	\$ 710,000
Useful Life =	8
Sold for =	\$90,000
Handling/Ship =	\$9,000
Installation =	\$29,000
Training =	\$21,000
Sell Old Machines =	\$90,000

EOY	BTCF	Depreciation Deduction	Taxable Income	Cash Flow for Income Taxes	ATCF	Adjusted ATCF
0	\$ (2,970,297)				\$ (2,970,297)	\$ (2,970,297)
1	\$ 741,000	\$ 594,059	\$ 146,941	\$ (39,680)	\$ 701,320	\$ 701,320
2	\$ 734,850	\$ 950,495	\$ (215,645)	\$ 58,233	\$ 793,083	\$ 793,083
3	\$ 760,570	\$ 570,297	\$ 190,273	\$ (51,381)	\$ 709,189	\$ 709,189
4	\$ 787,190	\$ 342,178	\$ 445,011	\$ (120,171)	\$ 667,019	\$ 667,019
5	\$ 814,741	\$ 342,178	\$ 472,563	\$ (127,611)	\$ 687,130	\$ 687,130
6	\$ 843,257	\$ 171,089	\$ 672,168	\$ (181,512)	\$ 661,745	\$ 661,745
7	\$ 872,771	\$ -	\$ 872,771	\$ (235,683)	\$ 637,088	\$ 637,088
8	\$ 903,318	\$ -	\$ 903,318	\$ (243,932)	\$ 659,386	\$ 812,678
8	\$ 210,000	\$ -	\$ 210,000	\$ (56,708)	\$ 153,292	
					PW =	\$817,352.55
					AW =	\$153,207.85
					IRR =	17.2%

Invest in Unmanned Craft Manufacturing

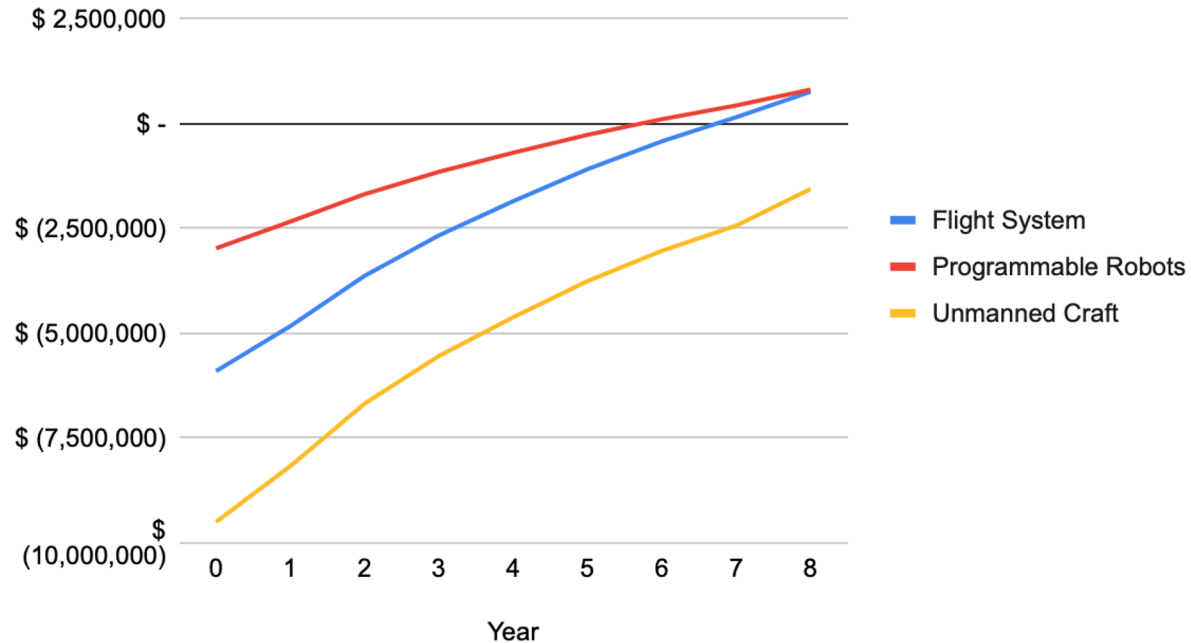
EOY	BTCF	Depreciation Deduction	Taxable Income	Cash Flow for Income Taxes	ATCF	Adjusted ATCF
0	\$ (9,500,000)				\$ (9,500,000)	\$ (9,500,000)
1	\$ 1,305,000	\$ 1,900,000	\$ (595,000)	\$ 160,650	\$ 1,465,650	\$ 1,465,650
2	\$ 1,350,675	\$ 3,040,000	\$ (1,689,325)	\$ 456,118	\$ 1,806,793	\$ 1,806,793
3	\$ 1,397,949	\$ 1,824,000	\$ (426,051)	\$ 115,034	\$ 1,512,982	\$ 1,512,982
4	\$ 1,446,877	\$ 1,094,400	\$ 352,477	\$ (95,169)	\$ 1,351,708	\$ 1,351,708
5	\$ 1,497,518	\$ 1,094,400	\$ 403,118	\$ (108,842)	\$ 1,388,676	\$ 1,388,676
6	\$ 1,549,931	\$ 547,200	\$ 1,002,731	\$ (270,737)	\$ 1,279,193	\$ 1,279,193
7	\$ 1,604,178	\$ -	\$ 1,604,178	\$ (433,128)	\$ 1,171,050	\$ 1,171,050
8	\$ 1,660,324	\$ -	\$ 1,660,324	\$ (448,288)	\$ 1,212,037	\$ 1,872,687
8	\$ 905,000	\$ -	\$ 905,000	\$ (244,350)	\$ 660,650	
					PW =	\$ (1,555,527.01)
					AW =	\$ (291,574.23)
					IRR =	5%

Capital Investment =	\$ 9,500,000
Market Value =	\$ 905,000
Annual Savings =	\$ 1,305,000
Useful Life =	8

Break-Even Analysis



Breakeven Analysis of Different Investments



Investment Comparisons



	AI Flight System	Programmable Robots	Unmanned Craft
Present Worth	764,557	817,352	-1,555,527
Annual Worth	143,311	153,207	-291,574
Internal Rate of Return	13.5%	17.2%	5%
Break-Even Time	7 years	6 years	> 8 years

Investment Analysis



- The best option would be to invest in both the new **AI Flight System** as well as **Updating Manufacturing Equipment with 10 new Robots**.
- Total investment would be \$8,930,000.
- Both investments have a positive present worth value.
- Both investments have a positive annual worth value.
- Both investments have a high internal rate of return.
- Both investments break-even before their 8-year useful life.

Investment Analysis



- Unmanned craft manufacturing investment has a negative present worth, negative annual worth, low internal rate of return, and does not break even within the 8 year useful life.
- The most strategic plans are not always the most economically feasible.