

BUSN 6071 – Case #2 – Dragonfly UAV

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Thompson Rivers University

Project Management and Consulting Methods: BUSN-6071

TO: Bob Lake

FROM: Shawn Berney

RE: Dragonfly Project Documents

Good afternoon Bob;

I have completed the requested project deliverables:

- 1) **Network Diagram** to visualize the order of activities
- 2) **GANTT Chart** for visualizing project sequencing and durations
- 3) **Critical Path diagram** that highlights both critical and near critical path items
- 4) **Estimate of the project budget and probability analysis** for on-time completion

While evaluating the project, there were a number of assumptions made. Based on these assumptions, it was determined that the project would meet the required date of July 15th approximately 40% of the time. A successfully completed project would have cost range of between €388,544 and €396,884.

In addition to the low probability of on-time completion, the possible need for iteration on the structural geometry only being determined at such a late stage in the project certainly increases project risk. If such a revision were needed, the timeline is not sufficient to undertake such a large project change. In this event, the majority of the project funds have been spent and a completed proposal may not be feasible. As such, the severity of this risk should be considered high with the frequency of the risk moderate.

Given the assumptions below, the critical path of the original most likely time estimates would not complete the proposal prior to the required delivery date. Only by applying two of the time saving scenarios (Scenario #1, Scenario #2) are we able to attain the delivery date of July 15th. Please note that by applying these two scenarios, the critical path route changes and leaves two remaining tasks very near the critical path. As a result, all but a single task must be executed and delivered on-time with virtually no project or task buffer. The only task with substantial flexibility is task A7 and is associated with Scenario #3. As this task is not on the critical path, and a reduction of 5 days would not put this item on the critical path, scenario #3 is deemed superfluous and should not be funded.

The above analysis is based on multiple assumptions. These next paragraphs will present these assumptions in the order they were assessed. Along with the assumption, the below paragraphs describe the rationale for the decision and the impact on the project plan.

The first assumption is that the project will be undertaken using a standard 5-day workweek without consideration for holidays or vacations. Assuming a 5-day workweek impacts the start and finish date for each project task. This constraint seemed reasonable, as standard business practice would be to operate using a 5-day workweek.

This analysis also assumes that the timeline for tasks can be more accurately estimated by applying the Three Point Estimation (PERT Estimation) technique to the provided Best Case, Worst Case and Most Likely time estimates provided. This assumption affects both task schedule and cost calculations. The resulting duration calculations are used as a baseline to assess the impact of the three optional

scenarios provided. This decision use Three Point Estimation technique for durations was made based on a desire to increase the accuracy of the estimate and reduce project risk.

The next assumption required handling of various alternative scenarios that could shorten the project schedule. The assumption here is that the time improvement and associated cost will be taken as provided and applied to the calculated three point duration and cost estimations. To evaluate the application of these scenarios, the reduced duration and added costs are applied to the project and the impact of the scenario cost and duration assessed against baseline measures. This assessment was completed programmatically using custom fields and the formula feature within MS Project (see the GANTT chart attachment for details on this calculation).

Finally, when calculating the project budget this analysis assumes that a reduction in time associated with a critical path item will not allow subsequent project tasks to start early. As such, tasks cannot reduce costs by ending early, nor can the following tasks start early because of another tasks early completion. In addition, the budget does not calculate the costs associated with an incomplete project such as in the event that a critical path item was not completed on time or revisions to structural geometry would be required. Both of these scenarios, however, are accounted for in the overall probability of project completion (approximately 40%).

Please let me know if you have any questions or concerns regarding the attached project deliverables or the accompanying explanation of assumptions and decisions.

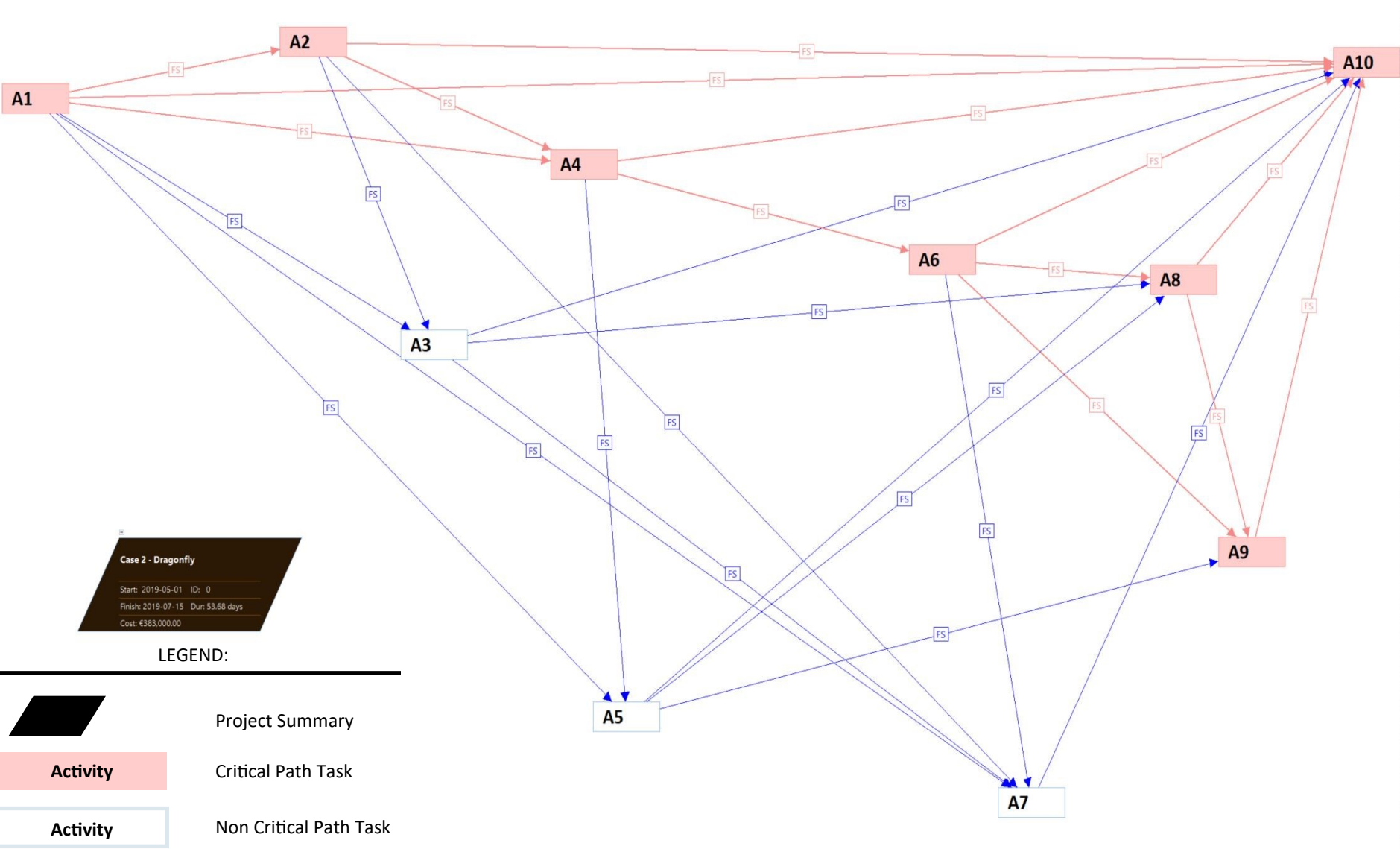
Sincerely,

Shawn

Shawn Berney, Junior Project Analyst
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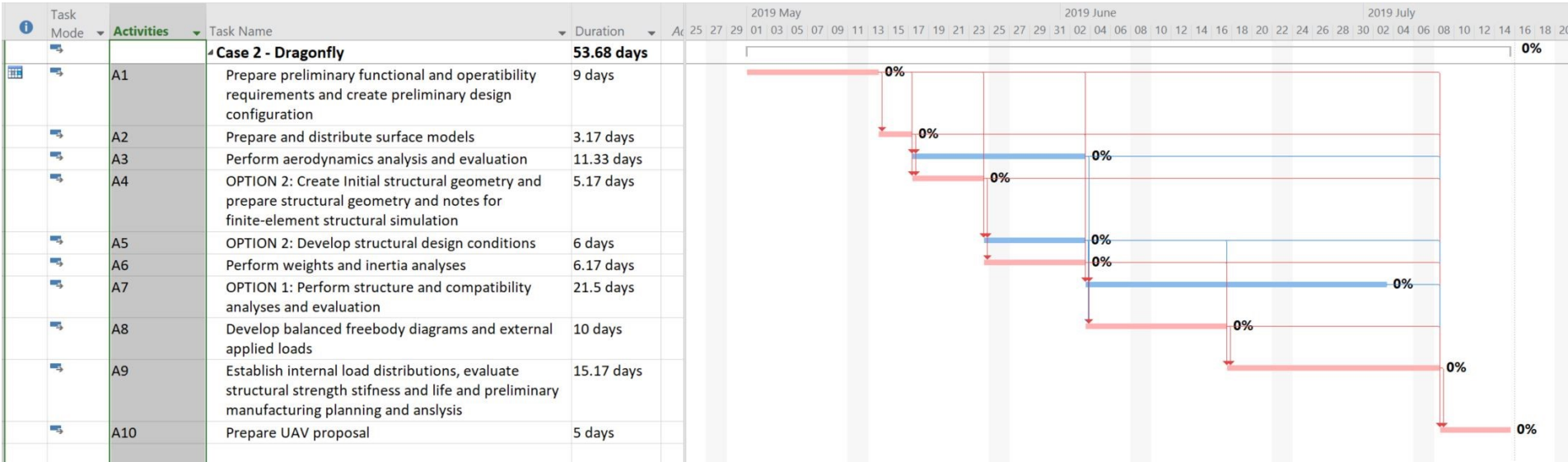
Network Diagram

Project: Dragonfly UAV



GANTT Chart - Simplified

Project: Dragonfly UAV



LEGEND:

Activity

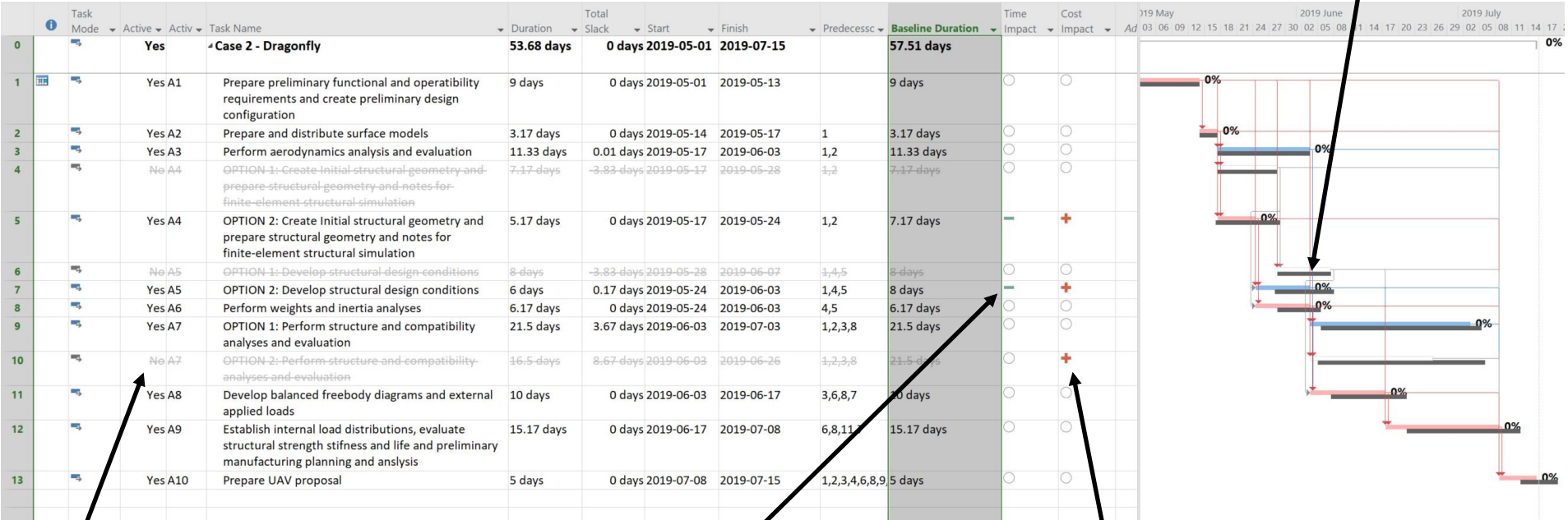
Task with Slack

Activity

Critical Path Task

GANTT Chart - Complete

Project: Dragonfly UAV



What-If Scenarios

Time Impact Calculation:

If ([Baseline Finish] = [Finish], 0, (

 If ([Duration] = [Baseline Duration], 0,

 If ([Total Slack] <= [Baseline Duration] - [Duration], 1, 0)

)

)

Cost Impact Calculation:

If ([Baseline Cost] < [Cost], 1,

 If ([Baseline Cost] = [Cost], 0,

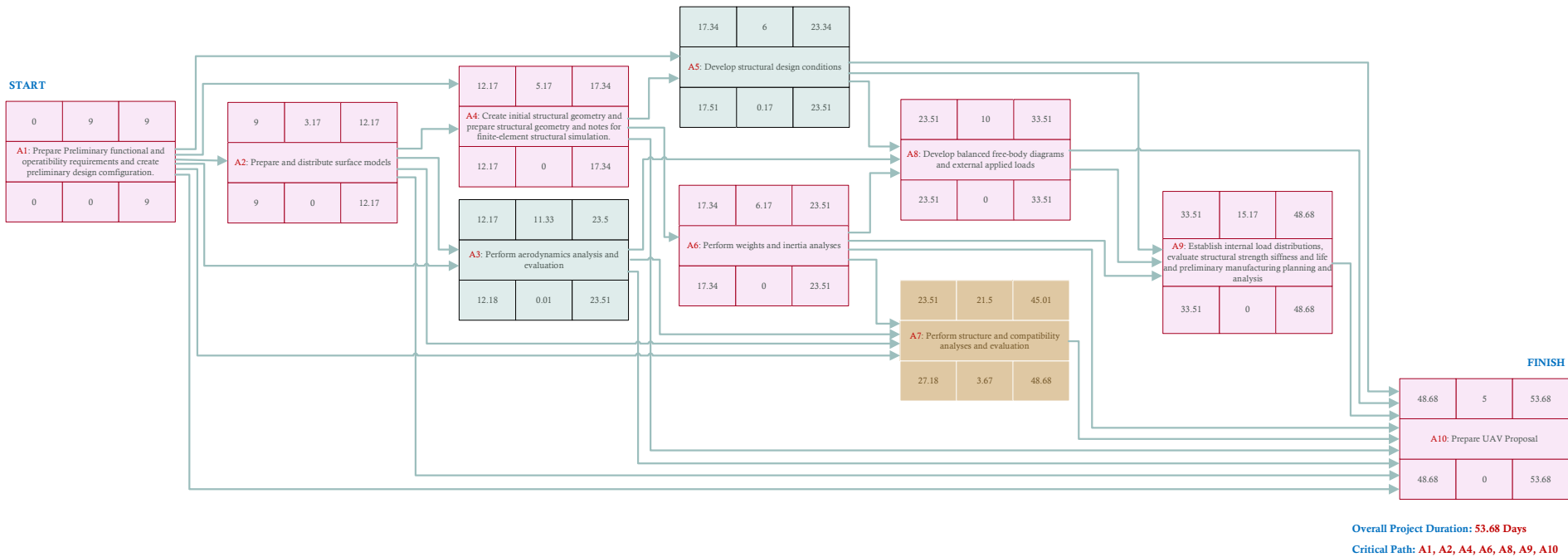
 If ([Baseline Cost] > [Cost], -1)

)

)

- LEGEND:
- Activity Task with Slack
 - Activity Critical Path Task

Critical Path Network Diagram



Estimate of Project Budget and Probability Analysis for On-Time Completion

Scenario	Activities	Task Name	TIME				COST			Critical Path
			BCV (days) [Optimistic Estimate]	WCV (days) [Pessimistic Estimate]	Most Likely Estimate	Three Point Estimate (PERT Estimate/Mean)	Variance	Est. Cost	TPE Cost	Critical? 1 = Yes, 0 = No, '-' = N/A
No	A1	Prepare preliminary functional and operability requirements and create preliminary design configuration	6.00	12.00	9.00	9.00	1.00	€ 15,000	€ 15,000	1
No	A2	Prepare and distribute surface models	2.00	5.00	3.00	3.17	0.50	€ 3,000	€ 3,167	1
No	A3	Perform aerodynamics analysis and evaluation	9.00	15.00	11.00	11.33	1.00	€ 8,000	€ 8,242	0
Yes	A4	OPTION 1: Create initial structural geometry and prepare structural geometry and notes for finite-element structural simulation	6.00	9.00	7.00	7.17	0.50	€ 140,000	€ 143,333	--
Yes	A4	OPTION 2: Create initial structural geometry and prepare structural geometry and notes for finite-element structural simulation	Two-Day Savings			5.17	0.50	€ 160,000	€ 163,333	1
Yes	A5	OPTION 1: Develop structural design conditions	6.00	10.00	8.00	8.00	0.67	€ 12,000	€ 12,000	--
Yes	A5	OPTION 2: Develop structural design conditions	Two-Day Savings			6.00	0.67	€ 30,000	€ 30,000	0
No	A6	Perform weights and inertia analyses	4.00	9.00	6.00	6.17	0.83	€ 10,000	€ 10,278	1
Yes	A7	Perform structure and compatibility analyses and evaluation	18.00	27.00	21.00	21.50	1.50	€ 22,000	€ 22,524	0
Yes	A7	OPTION 2: Perform structure and compatibility analyses and evaluation	Five-Day Savings			16.50	1.50	€ 38,000	€ 38,524	--
No	A8	Develop balanced freebody diagrams and external applied loads	8.00	12.00	10.00	10.00	0.67	€ 23,000	€ 23,000	1
No	A9	Establish internal load distributions, evaluate structural strength stiffness and life and preliminary manufacturing planning and analysis	12.00	19.00	15.00	15.17	1.17	€ 90,000	€ 91,000	1
No	A10	Prepare UAV proposal	4.00	6.00	5.00	5.00	0.33	€ 22,000	€ 22,000	1

Three Point Estimate Formula: =SUM(BCV + (Most Likely *4) + WCV) / 6

Scenario Base Costs (Scenario = "No") 172,686.87

Scenario Matrix	Scenario #1		Scenario #2		Scenario #3	
	A4 - OPT 1	A4 - OPT 2	A5 - OPT 1	A5 - OPT 2	A7 - OPT 1	A7 - OPT 2
Combination #1	1	0	1	0	1	0
Combination #2	1	0	1	0	0	1
Combination #3	1	0	0	1	1	0
Combination #4	0	1	1	0	1	0
Combination #5	0	1	0	1	1	0
Combination #6	0	1	1	0	0	1
Combination #7	0	1	0	1	0	1

Scenario	TPE Cost
Combination #1	€ 350,544
Combination #2	€ 366,544
Combination #3	€ 368,544
Combination #4	€ 370,544
** Combination #5	€ 388,544
Combination #6	€ 386,544
Combination #7	€ 404,544

** Combination #5 was selected based on two custom fields within the GANTT Chart. These custom field are titled "Time Impact" and "Cost Impact" and they include a formula that assesses the impact on the project based for each of the three provided sceanrios. These "What-If" scenarios are then applied using the MS Project "Active" flag.

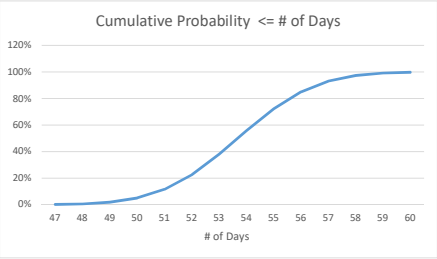
BUDGET RANGE

Total Buffer = SLACK from PERT + Remainder of July 15th
Total Buffer = 4.17 days @ €2,000 / day
Total Buffer Cost = € 8,340

	LOW	HIGH
Therefor, Budget Range is	€ 388,544	€ 396,884

Probability of On-Time Completion

Total Project Variance of Critical Path: 5 days²
Standard Deviation of Critical Path: 2.24 days
Latest Project Finish (from PERT Diagram): 53.68 days
Probability that project is finished in 54 days: 56% chance of the project being completed within the required 54 days if no iterations.
Revision to Initial Structural Geometry: 30% chance project requires iterations
Overall Percentage liklihood of project completion: 39% chance of project completion within the required number of days.



# Days	Probability of Completion
47	0%
48	1%
49	2%
50	5%
51	12%
52	23%
53	38%
54	56%
55	72%
56	85%
57	93%
58	97%
59	99%
60	100%