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Australian Government
Department of Defence
Capability Acquisition and Sustainment Group

Joint Confidence Levels

Combining Project Control Artefacts to Inform Decision Making

Andrew Butt Ships Divisional Controls CASG

Defending Australia and its National Interests
www.defence.gov.au

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Thank you to Tecolote Research Inc. for their graphical contribution to this presentation.

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Who am I?

- Andrew Butt DipPM, BSc(Hons)
- Divisional Controls Ships Division
- Land Systems
- Cost Estimator
- Scheduler
- Worked closely with risk

- Secretary of the Canberra Chapter of the International Cost Estimating and Analysis Association

ICEAA
International Cost Estimating and Analysis Association

- Joey Scout Leader – Scouts ACT
- Group Leader – Scouts ACT
- Assistant Leader Trainer (ACT/VIC) Scouts Australia National Training Team

Scouts ACT

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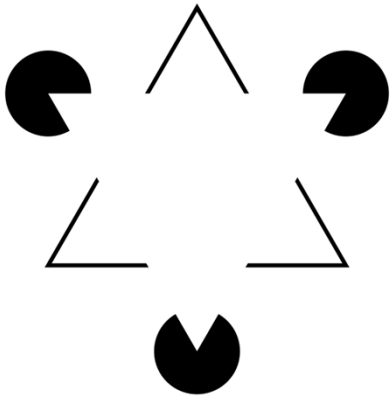
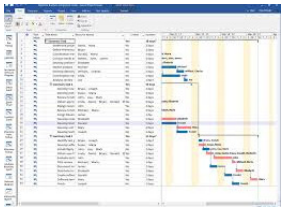
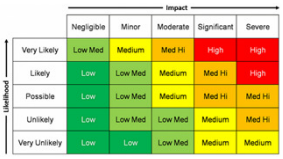
Gestalt – the whole is more than the sum of its parts !

- Gestalt – an organised whole that is perceived as more than the some of its parts:







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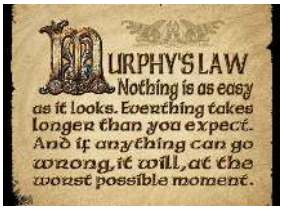
Are you sure? – Uncertainty what is it? Why is it important?

- There is uncertainty in everything we do.
- Uncertainty is the indefiniteness of the outcome of a situation[1] (of which both opportunities and risks make up a part)
- Sources of uncertainty
  - Cost estimates
  - Labour Rates
  - Cost Estimation Relationships
  - Inflation
  - Duration estimates
  - Schedule logic
  - Known/Unknown unknowns
  - Risks
  - Opportunities
  - Technical solutions
- To maximise the chances of project success we need to make allowances for all of this uncertainty



[1] NCCA, Joint Agency Cost Schedule Risk and Uncertainty Handbook (JA CSRUH), 2014, para. 1.2.2 "*The Difference Between Risk, Opportunity, and Uncertainty*", pg. 2

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Probability – You wanna bet?

- FACT[2]: It is impossible to estimate precisely how much something will cost or how long it will take.
  - Decision-makers, cost and schedule analysts should always think of an estimate as a probability distribution, NOT as a deterministic number or date
  - The best we can provide to decision-makers is the cost and/or Schedule probability distribution
  - It is up to the decision-maker to decide where (i.e., at which confidence level) they want to set the budget and completion date
  - The probability distribution provides a quantitative basis for making this determination

[2] Whole slide paraphrased from slide 11 2011-MT16 – International Cost Estimating and Analysis Association (iceaaonline.com) presented at the 2011 ISPA/SCEA Joint Annual Conference and Training Workshop

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Let's start at the beginning – It's a very good place to start!

- The Artefacts
  - Mature Schedule
    - Aligned with CASG WBS
    - Built with the help of Subject Matter Experts
    - Included anticipated activities and milestones from proposed Contract Master Schedule(s)
    - All work packages included until project closure
  - Detailed Cost Model
    - Bottom up cost model
    - Acquisition elements aligned with tenderer price schedule
    - Contracted support elements aligned with tender documentation
    - As many out of contract costs as possible anticipated and costed in the model
      - Known CCPs
      - Government Furnished Stuff (GFx)
      - Sparing and ammunition costs
      - Etc.,
    - Phased in alignment with schedule
  - Comprehensive Risk Register
    - Parsed correctly
    - Loaded into Predict
    - Reviewed on a regular basis

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The Analysis Schedule – the art of simplifying an integrated master schedule

- An Integrated Master Schedule (IMS) often provides too much detail for a simulation
- At the early stages of the project, notional summary level schedules provide insufficient detail for a simulation
- An analysis schedule lies between an Integrated Master Schedule (IMS) and a summary schedule
- *The objective of an analysis schedule is to capture enough content and interdependencies to support a simulation*
  - Displays major work-flows of a project
  - Identifies work required to support major deliverable/tracking items
  - Structured around management/budget responsibility
  - Allows linkage of budgeted work effort to schedule scope
  - Enables alignment with EVM generated data
- Creates a solid framework and the backbone for incorporating cost/schedule uncertainties and risk events
- Analysis schedules are designed for linking cost / schedule, providing budget insight, supporting what-if analysis, assessing risk posture, and identifying reserve management strategies

> This is Art holding a Mirror up to Life. That's why everything is exactly the wrong way around.
> *Terry Pratchett (2008). "Wyrd Sisters: (Discworld Novel 6)", p.312, Random House*

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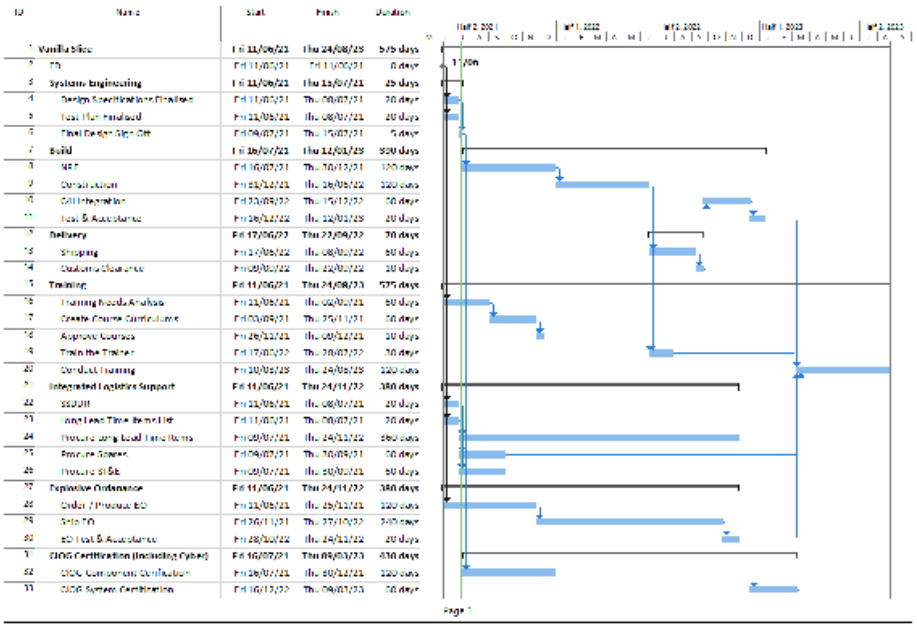
What an analysis schedule could look like



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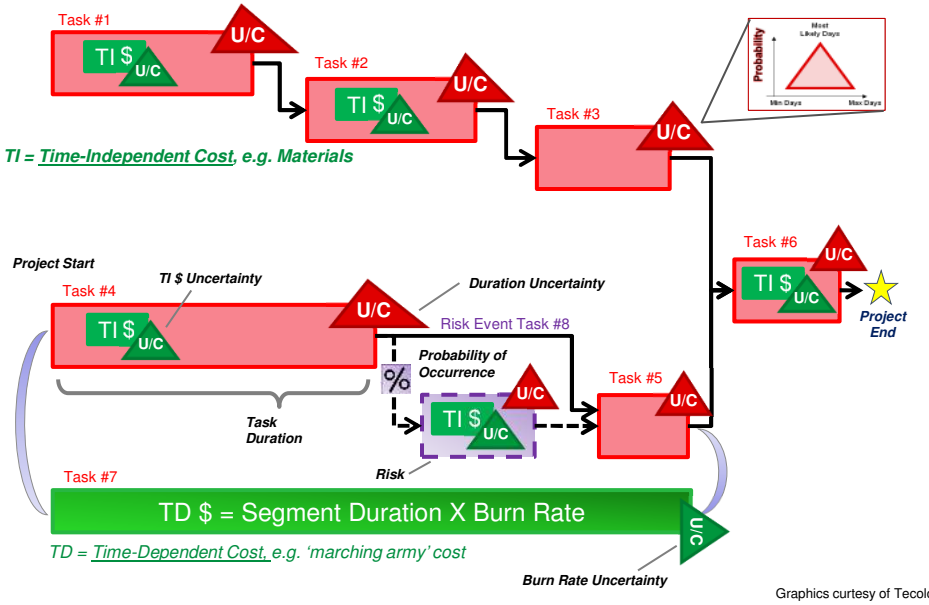
Bringing it all together – The What



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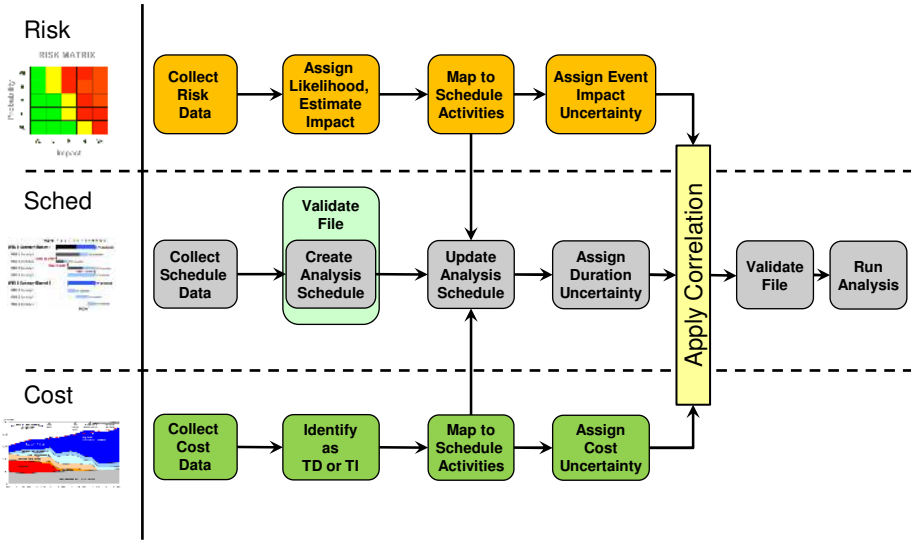
Bringing it all together – The How



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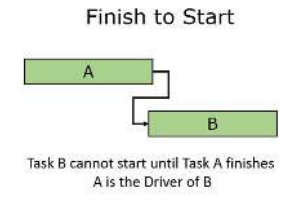
Bringing it all together – The Benefits to Schedule

- Just by following the process…
  - More rigour around schedule activity durations
  - Three point estimates (where SMEs available) caused stream leads to think about:
    - Work to be done
    - Differing abilities of teams to complete
  - Schedule logic was contested and improved
  - Risks were able to be built into schedule logic
  - Schedule moved from being deterministic to probabilistic
  - The schedule was used as a planning tool (rather than a reporting tool)
  - Schedules & schedule logic informed decision making
  - There was less – "just make it fit between those dates"
  - Less 'optimistic' schedules



"If you trust in yourself. . .and believe in your dreams. . .and follow your star. . . you'll still get beaten by people who spent their time working hard and learning things and weren't so lazy."

Terry Pratchett, The Wee Free Men

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Bringing it all together – The Benefits to Cost

- Just by following the process…
  - Focus moves towards individual lines of the model as opposed the totals
  - Documentation of the estimate to inform uncertainty becomes paramount
  - All uncertainty on each line must be justified
  - Estimates moved from being deterministic to probabilistic
    - No longer "can we do it for this amount or less" to "what is the chance we can achieve this for this amount or less"
  - Less 'optimistic' models
  - Can generally justify requesting more achievable levels of funding when compared to using the point estimate
  - Using probabilistic language empowers decision makers to understand the magnitude of the impact each decision they make has on an estimate

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Bringing it all together – The Benefits to Risk

- Just by following the process…
  - Risk events were placed in time (within schedule)
  - Durations of impact were considered (3 point estimates rather than selecting from a grid)
  - Cost impacts were considered through the lens of time & materials
  - Some risks in the register were identified as not being risks (100% likelihood, not impacting schedule, treated via business as usual)
  - In general people thought through their risks more as opposed to than the quick tick and flick exercise it often becomes
  - Decision makers could more easily use predicted cost and schedule impacts to scope acceptable mitigation activities
  - Risk register informed decision making
  - Risk impacts moved from being considered deterministically to probabilistically

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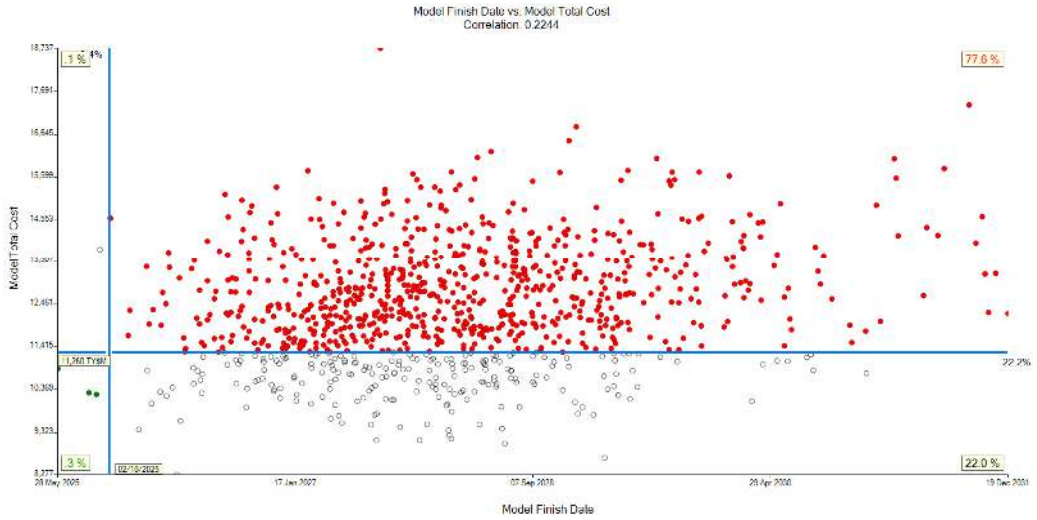
Running the simulation – changing the mind set



- By this analysis, if we were to be working with a deterministic estimate, we would have 0.3% probability of finishing the project on time AND under budget.

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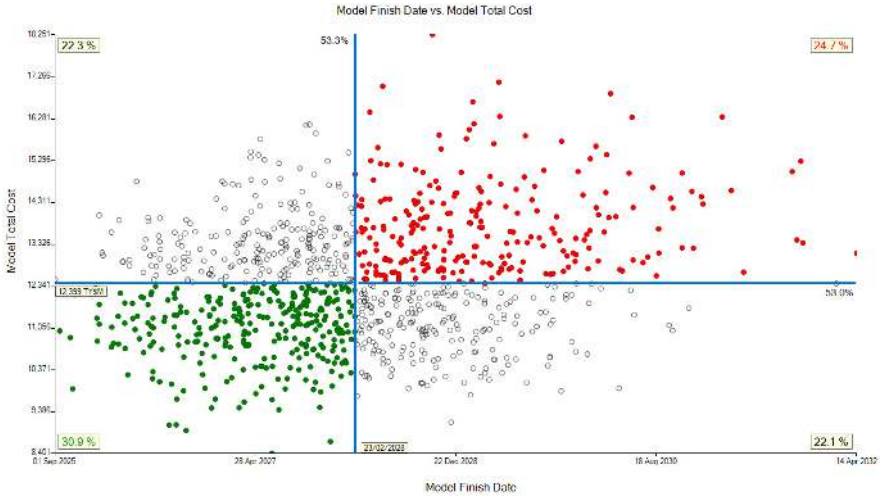
Risk – So what is the impact?



- With all risks turned on the mean results of this simulation are:
  - Finish Date: 23 Feb 2028
  - Total Cost: $12,399M (Out-turned)

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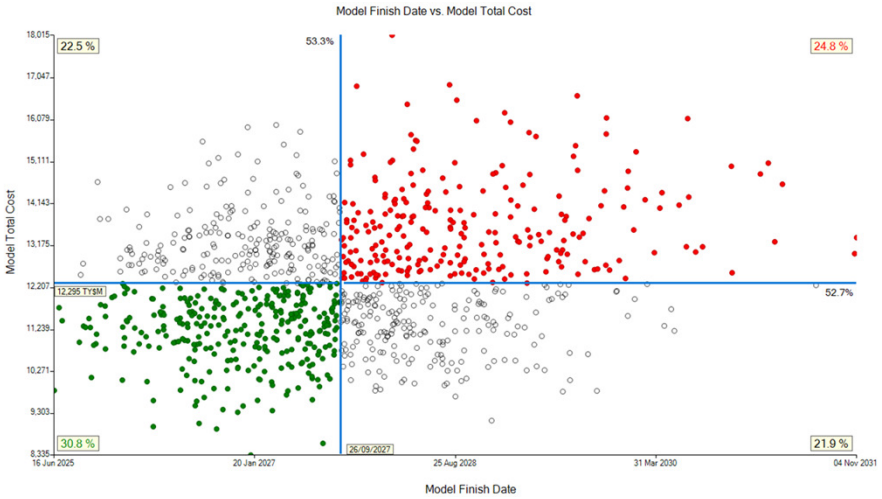
Risk – So what is the impact?



- With the one risk turned off the mean results of this simulation are:
  - Finish Date: 26 Sep 2027
  - Total Cost: $12,295M (Out-Turned)
- A mean difference of 5 months and $104M (Out-turned)

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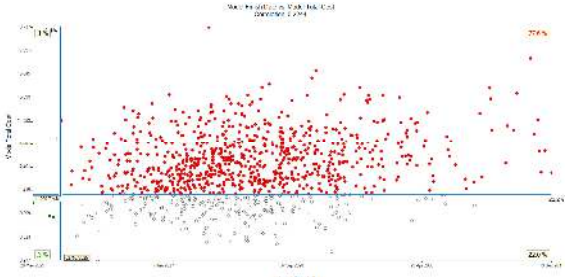
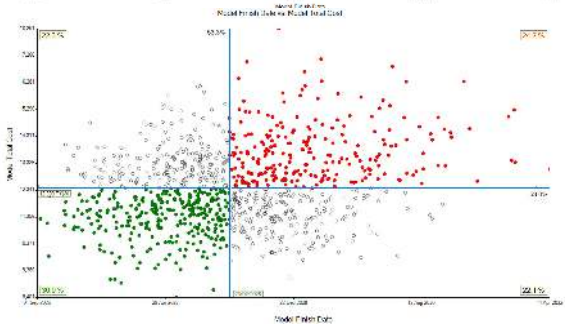
Joint Confidence Levels

- Committing to the Point Estimate
  - Budget $11,260M (Out-turned) (P22.2)
  - Completion 02 Oct 2025 (P0.4)
  - Joint Confidence Level (achieving both) 0.3%



- Working within our means.
  - Budget $12,399M (Out-turned) (P53.0)
  - Completion 23 Feb 2028 (P53.3)
  - Joint Confidence Level 30.9%



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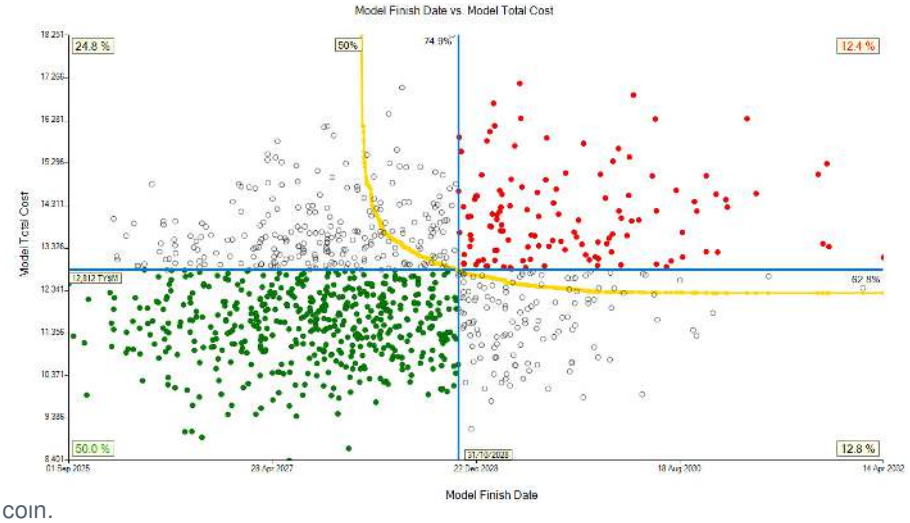
Joint Confidence Levels



- A flip of the coin.
  - Budget $12,812M (Out-turned) (P62.8)
  - Completion 31 Oct 2028 (P74.9)
  - Joint Confidence Level 50.0%

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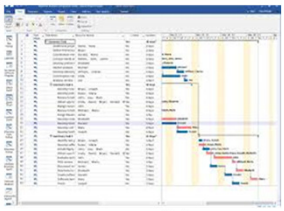
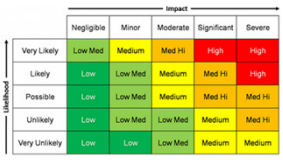
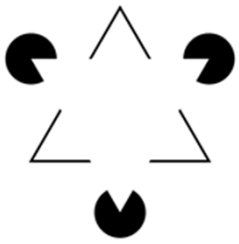
So what?

- So what if we always planned to joint confidence levels?
  - We could start having real, easy to understand conversations about the chances of project success
  - Based on current process we would reduce the possibility of signing up to a project that is more likely to finish late and over budget than not
  - We could have real conversations about the impacts of risks, project delays & funding cuts to project success
  - The quality of our individual artefacts are likely to improve
  - Contested assumptions are welcomed and strengthen the models
  - Cost models, master schedules and risk registers are more likely to be used to inform decision making
  - Our estimates improve – the total truly is more than the sum of its parts







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A thought to leave you with…

Presented at the 2011 ISPA/SCEA Joint Annual Conference and Training Workshop - www.iceaaonline.com

Administrator Griffin Confidence Level Policy

Confidence-level budgeting is an attempt to use statistical methods together with cost-modeling techniques (and yes, Doc, I know…) to produce, for a given level of program content, a budget and associated schedule that carries with it some statistical level of confidence – "belief" if you will – that the project will achieve its goals. The confidence level is selectable by managers; we've chosen 70% for agency projects in general, and I personally adjusted that to 65% for Cx. I can discuss reasons for that on another occasion if you like.

Now, what that means is this: I won't ask you to deliver on a date sooner than, or for a budget less than, the date and the budget associated with a 65% confidence estimate that you can achieve the goal. I won't promise the WH or the Congress that we can do better than such a date/budget. If they move the money, I will move the date to recover the 65% confidence. If they want it sooner, I will not agree until and unless a sufficient amount of money is supplied to recover the stipulated confidence level.

But that is my contract with you. It is not to be confused with the level of goal-setting that you do for those who report to you, within reason.

***Email sent 17 Feb 2007 by Administrator Dr. Michael Griffin to Cx & ESMD management*

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