Joint Confidence Level (JCL) FAQ

By NASA HQ – The Strategic Investments Division

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Commonly used Acronyms:

ABC - Agency Baseline Commitment
APMC – Agency Project Management Council
CAD – Cost Analysis Division
DPMC – Directorate Project Management Council (SMD, ESMD, SOMD, ARMD)
EVM – Earned Value Management
GPMC – Governing Project Management Council (determined by NPD 7120.5E)
ICE – Independent Cost Estimate
IMS – Integrated Master Schedule
IPAO – Independent Program Assessment Office
JCL - Joint Cost and Schedule Confidence Level
KDP – Key Decision Point
OCE – Office of Chief Engineer
OCFO - Office of Chief Financial Officer
OoE – Office of Evaluation
PCLS - Probabilistic Cost Loaded Schedule
PPBE – Planning, Programming, Budgeting, and Execution
NPR – NASA Procedural Requirements
SID – Strategic Investments Division
SMD – Science Mission Directorate
SRB – Standing Review Board
UFE – Unallocated Future Expense

JCL Policy

What is the official definition of JCL?
JCL is[1]
- The probability that **cost** will be equal or less than the targeted cost **AND schedule** will be equal or less then the targeted schedule date
- A process and product that helps inform management the likelihood of a projects' programmatic success
- A process that combines a projects' cost, schedule, and risk into a complete picture
- The JCL calculation includes consideration of the risk associated with all elements regardless of whether or not they are funded from appropriations or managed outside of the project.
- JCL calculations include the period form KDP-C through the hand over to operations, i.e. end of the on-orbit checkout.

What and where is the policy for JCL?
The JCL policy is located in NPR 7120.5E under Section 2.4.4. The agency augmented JCL policy for projects with lifecycle costs greater than $150 million in the FY14 Budget Request[2].

What is the Joint Confidence Level (JCL)?
In summary, NPR 7120.5E, NASA directs projects to generate a probabilistic cost-loaded schedule and produce a JCL for KDP I/C that is executable within the available annual resources. This JCL analysis will be evaluated by a non-advocacy body. The Decision Authority will decide the JCL (probability) for the associated development and life cycle cost at which the Agency commits to deliver the Program/project. It is recommended that the JCL value be at 70% with a minimum value of 50%.

Specifically, the relevant language from NPR 7120.5E reads as follows:

"Tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall develop probabilistic analyses of cost and schedule estimates to obtain a quantitative measure of the likelihood that the estimate will be met in accordance with the following requirements.

At KDP I/KDP C, tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million shall develop a resource-loaded schedule and perform a risk-informed probabilistic analysis that produces a JCL. The JCL is the product of a probabilistic analysis of the coupled cost and schedule to measure the likelihood of completing all remaining work at or below the budgeted levels and on or before the planned completion of Phase D.

Mission Directorates shall plan and budget tightly coupled and single-project programs (regardless of life-cycle cost) and projects with an estimated life-cycle cost greater than $250 million based on a 70 percent joint cost and schedule confidence level, or as approved by the Decision Authority.

Any JCL approved by the Decision Authority at less than 70 percent shall be justified and documented.

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[1] As specified in NPR 7120.5E Appendix A
[2] See page M&P 200 at http://www.nasa.gov/pdf/754125main_12-NASA_FY14_M&P508-pt3.pdf

Mission Directorates shall ensure funding for these projects is consistent with the Management Agreement and in no case less than the equivalent of a 50 percent JCL.

When a tightly coupled program, single-project program, or project with an estimated life-cycle cost greater than $250M is rebaselined, the JCL should be recalculated and approved as a part of the rebaselining approval process.

Loosely coupled and uncoupled programs are not required to develop program cost and schedule confidence levels. These programs shall provide analysis that provides a status of the program's risk posture that is presented to the governing PMC as each new project reaches KDP B and C or when a project's ABC is rebaselined."

Is the JCL policy for the 70th percentile or the 50th percentile?

NASA's JCL policy strategy is to **protect** projects to the 70th percentile for ABC and **fund** projects to at least the 50th percentile. This strategy is based off of portfolio management principles with an assumption that projects can be managed in such a way that their unused budget is available to other projects. Policy also gives leeway to adjust ABC and MA (funding) as directed by NASA decision authority. Lastly, recent analysis shows that for a typical portfolio of multiple loosely coupled missions, NASA's baseline JCL policy of budgeting projects at the 70th percentile and funding to at least the 50th is a sound strategy (e.g. SMD portfolios).

Are all projects to be set at the 70th percentile for the ABC?

No. The Decision Authority can approve a JCL not at 70th percentile. Per policy, any JCL approved by the Decision Authority at less than 70 percent shall be justified and documented.

When does the 70th percentile policy work best?

The policy works best if it is applied to a portfolio of projects with centrally-held reserves and the flexibility to move budget across projects. The SMD programs are a classic example of portfolios where the 70th percentile policy works best.

Are there situations where a less than 70th percentile JCL is warranted?

Yes. The Decision Authority can decide to take a more aggressive risk posture. However, the rationale for that aggressive risk posture must be justified and documented.

What are some justified reasons for an ABC JCL of less than 70th percent?

There are three broad reasons why the Agency may want to have an ABC JCL of less than 70th percent: external constraints, portfolio characteristics, and risk posture.

External constraints:

- Programs are in multiple budget accounts - limits NASA 's flexibility to move funds
- Reserves are not centrally held – limits NASA's ability to manage programmatic risk from a portfolio perspective
- Limited amount of annual unallocated future expenses to manage

Portfolio characteristics:

- Portfolio has a small number of projects, or is a single project program – limits "portfolio effect"
- Portfolio of "missions" are capability driven vs traditional mission driven paradigm

Risk Posture:

- Project is taking an aggressive or innovative approach programmatically.
- Any cost or schedule growth is not tolerated – cancel poorly performing projects

What are things to focus on if some of the broad reasons listed above apply to me or my portfolio?

- Challenge projects to aggressive internal management agreement
- Protect with reasonable ABC CL (may be lower than 70th percentile for reasons stated above)
- Challenge project managers to keep costs down without encouraging risky management/behavior
- Focus on management strategy that minimizes expected total cost and schedule (rather than focusing on protecting cost and schedule growth)
- Manage risk realization with schedule slips – due to low annual cost UFE

What organization owns the JCL policy?

NPR 7120.5E is the responsibility of the OCE, however, the specific JCL Policy language in NPR 7120.5E is assigned to and "owned" by the OCFO SID.

But wait, NPR 7120.5 says that the Cost Analysis Division (CAD) owns the JCL policy[3] – what's up with that?

Good point. The Cost Analysis Division was disbanded in March 2016 and all of its previous functions have been moved to SID. SID now owns the requirements. All the JCL expertise that resided in CAD has moved to SID too.

Why do we need to do a JCL?

The JCL is required to enable the Agency to assert that Programs/projects have robust and executable plans. The Agency has moved to this because External Stakeholders have demanded better cost/schedule performance.

Can JCL requirement be tailored or waived?

Yes. The latitude for completely waiving the JCL requirement is small. Since the implementation of the policy, no project (unless they were grandfathered through) was completely waived from performing Range Estimates or JCL analysis.

How do I tailor or waive the JCL Requirement?

There are two mechanisms for tailoring the requirements in NPR 7120.5E[4]. Requests for tailoring may be submitted in the form of the Compliance Matrix[5] or by using a waiver request (see the NASA Space Flight Program and Project Management Handbook) individually or in groups. Regardless of whether the waiver is documented as a stand-alone document or as part of the Compliance Matrix, signatures must be obtained from the organization responsible for that requirement. SID has further information regarding the JCLO waiver that will be made available via SID's website shortly. In the meantime, contact SID POC's listed in the footer for additional documentation.

When is JCL analysis needed?

Program and project JCLs are to be completed:
1. At Program/project KDP C/I

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[3] NPR 7120.5E Appendix C
[4] NPR 7120.5E, 3.5.6
[5] NPR 7120.5E, Appendix C

2. When a Program/project is rebaselined[6]
3. The decision authority council requests an update

My management says I don't need to do a JCL - do I need to do one?

Unless the project or program receives a waiver or does not fit within the criteria of the policy (e.g. non-flight projects), they are required to generate a JCL. To date, no project or program has been granted a complete waiver.

NPR 7120.5E states that the JCL threshold is for projects above $250 million but I heard that it's really $150 million. Which is it?

NPR 7120.5E does set the requirement for all missions of $250 million or greater. However, the Agency committed to using JCL analysis for projects with a lifecycle cost greater than $150 million in the FY14 Budget Request[7]. This commitment is being applied to all projects governed under NPR 7120.5E.

Do projects in ops (e.g. Shuttle or Station) have to do a JCL?

Only flight projects in formulation or development will be required to generate a JCL when the reach the appropriate KDP milestone. If an ongoing operational program pursues an upgrade or replacement of capabilities, then those new items will be required to develop and maintain a JCL.

Is this whole JCL thing working?

JCL is improving project planning by systematically integrating cost, schedule, and risk products and processes while providing a cohesive and holistic picture of the project ability to achieve cost and schedule goals and to help the determination of reserves (schedule and cost). NASA has received positive feedback from GAO[8] and the NASA OIG[9] that the JCL policy is having a positive impact on cost and schedule performance.

- Empirical Evidence: Since probabilistic policies have been put in place, programmatic performance has improved
- Theoretical Evidence: Recent analysis shows that for a typical portfolio of multiple loosely coupled missions, NASA's baseline JCL policy of budgeting projects at the 70th percentile and funding to at least the 50th is a sound strategy

Is JCL the only thing NASA is doing to improve and track cost and schedule management?

No, JCL analysis at KDP-C is not the only solution to cost and schedule management. JCL is just one of many tools that the Agency uses to assess a Programs/projects programmatic risk posture throughout the Programs/projects lifecycle, examples include:

- *Range Estimates:* In formulation, NASA utilizes range estimates to bound projects' risk posture for cost and schedule
- *Independent Cost Assessments (ICAs):* NASA facilitates independent cost and schedule assessments for major programs to help inform management (e.g. ESD ICA, CCP ICA)
- *Source Evaluation Boards (SEBs):* NASA conducts SEBs to understand risk posture of major contracts
- *Performance Metrics:* NASA leverages performance metrics (e.g. EVM) to help inform program/plan execution

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[6] Per NPR 7120.5E, 2.4.4.3

[7] http://www.nasa.gov/pdf/754125main_12-NASA_FY14_M&P508-pt3.pdf

[8] http://www.gao.gov/assets/670/669205.pdf

[9] https://oig.nasa.gov/audits/reports/FY15/IG-15-024.pdf

- *PPBE Process:* NASA undergoes a rigorous process every year to understand it's immediate resource requirements

JCL Implementation

How can I learn more about JCL?

More specific information can be found within the NASA Space Flight Program and Project Management Handbook[10] and within the NASA Cost Estimating Handbook Appendix J[11]. In addition, there was a session conducted in 2013 for the Virtual PM Challenge that provided a high level overview of JCL[12]. To learn more about JCL, please contact a SID JCL POC.

Is there a JCL kickoff available to help get the project started?

Yes, please contact the SID to schedule a kickoff or informational session. The SID points of contact are Mr. Charles Hunt and Mr. James Johnson.

Who does the JCL analysis?

Project is responsible for doing and communicating the JCL analysis. Most Centers have, or are providing, expertise for best practices in methodologies and techniques on doing a JCL. For appropriate Center POC, please contact the SID's JCL POCs.

What kind of skill mix do I need to perform a JCL analysis?

There are several key functions to be performed within the project, they are defined below[13]. Identifying roles and responsibilities early is very important to a successful JCL.

- JCL Leader: The JCL leader is the one individual to be responsible for coordination and integration of the JCL. This person should have a good understanding of the project plan including cost, schedule, and risk.
- Scheduler: This function is one of the most important functions in the JCL effort. This person must have intimate familiarity with the current project schedules. This person should have the expertise to construct a JCL schedule, if needed, and should be able to reach back to the technical experts.
- Estimator or Resource Analyst: This individual must be familiar with project current budget structure, cost estimates (including BOE's) and resource plan(s).
- Risk Manager: The Risk Manager must be familiar with current project risk management system. This person must be able to provide details supporting the risk register and should be able to reach back to the risk "owners" when needed.

Regardless how the functions get parceled out, it is important to be about to answer the following fundamental questions with performing a JCL:

- Who is in charge of the JCL effort?
- Who will ultimately be responsible for the development of the model and analysis (who will run the model)?
- Who will build the analysis schedule?
- Who has access to the detailed cost data?

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[10] http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20150000400.pdf

[11] http://www.nasa.gov/content/nasa-cost-estimating-handbook-ceh

[12] https://www.nasa.gov/content/2013-virtual-pm-challenge-includes-jcl-policy

[13] These roles are listed by responsibility. Though it is very important to have each function represented, the people-to-function ratio does not have to be 1 for 1.

- Who can link the cost data to schedule activities on the analysis schedule?
- Who can provide the risk information?
- Who can solicit and develop uncertainty data?

What is the difference between the JCL and old process of having an ICE?

The JCL baseline is to be reviewed by the SRB which will recommend any needed adjustments to the Project's JCL calculation. This revised approach puts the burden of justifying the probabilistic confidence level on the project rather than requiring the SRB to "disprove" the projects' cost estimate.

Can I do the JCL anyway I want?

No. JCL is a very broad term, but there are two very broad approaches to completing a JCL: 1). Bivariant distributions, and 2). Probabilistic Cost Loaded Schedule (PCLS). Both methodologies will fundamentally produce a JCL, however to fulfill the intent of the NASA JCL policy requirement, it is intended for a project or program to perform the latter (probabilistic cost loaded probabilistic schedule).

Does the JCL analysis include the entire lifecycle costs?

No, the scope of the JCL analysis typically includes content only through Phase D. This, by definition, is not the total lifecycle costs (as defined by NPR 7120.5E) or operational life of a project. The exact content of what is included in the costs and schedule to meet this Phase D requirement needs to be agreed upon between the project and the non-advocacy entity, as typically defined in the Terms of Reference (ToR) for the Non-Advocate Review (e.g. an SRB).

In a nutshell, what is the process to create a JCL?

The specifics will vary depending on the scope and characteristic of the project; however, the general process is as follows[14]:

- Step Zero: Identify goals of JCL for specific project
- Step One: Build a JCL schedule/logic network (a summary analysis schedule)
- Step Two: Load cost onto the schedule activities
- Step Three: Incorporate risk list
- Step Four: Conduct uncertainty analysis
- Step Five: Calculate and view results, and iterate as required

Are you telling me I have to have a detailed resource loaded schedule to do a JCL at PDR?

We use the term "resource-loaded" loosely. In general, we mean, at some summary level of detail, the costs associated with the project must be allocated to the schedule. The policy clearly states that the projects are required to generate a *resource-loaded* schedule. This terminology can be confusing and deserves some attention. NASA's definition of resource loading is the process of recording resource requirements for a schedule task/activity or a group of tasks/activities[15] (NASA, 2010). The usage of *resource loading* implies, to many people, that the tasks need to be loaded with specific work or material unit resources. This is NOT the intent of the policy.

The intent of the JCL policy is not to recreate the lower level management responsibilities of understanding and managing specific resources (labor, material, and facilities) but to instead model the macro tendencies and characteristics of the project. To do this, *cost loading* a schedule is sufficient and a resource loaded schedule is not required.

What does "risk informed" mean?

The policy states that a project will need to perform a *risk-informed* probabilistic analysis to produce a JCL. The terminology *risk-informed* can be ambiguous on interpretation. NPR 7120.5E defines Risk as "the potential for

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[14] For a more detailed discussion, please refer the NASA Cost Estimating Handbook (CEH) Appendix J. http://www.nasa.gov/content/nasa-cost-estimating-handbook-ceh
[15] NASA Schedule Management Handbook, 2010

performance shortfalls, which may be realized in the future, with respect to achieving explicitly, established and stated performance requirements". Typically, from a risk management perspective, discrete risks are identified, tracked, and mitigation plans are formulated. By *risk-informed*, the policy is stating that all appropriate discrete risks be modeled, but it is also the intent of the policy for *risk-informed* to also account for various uncertainties (that may not be discretely managed in the risk management system).

What's the difference between "risk" and "uncertainty"?

Risk is an event not in the project's baseline plan that is an undesirable[16] outcome (discrete risk). This definition is similar to one that one would see in a risk matrix. The event is characterized by a probability of occurring and an expected impact if the event did occur.

Uncertainty is the indefiniteness about a project's baseline plan. It represents our fundamental inability to perfectly predict the outcome of a future event.

It is clear that there is an overlap between these two terms. The indefiniteness about a project's baseline plan is partially caused by risks to the project. In JCL analysis risks from the project's risk register are modeled alongside uncertainties applied to the baseline plan. This is done to increase the usefulness of JCL analysis to a project manager; being able to discern the effect each risk has on a project's cost and schedule allows for the development of risk mitigation plans.

What kind of standards will be used to compare my JCL analysis?

There are established general quality standards for the attributes of an acceptable JCL:
- Overarching principles: transparent, traceable, defendable and timely (T, T, D & T)
- Cost and schedule base estimates must
  - Have a clear basis for the estimates
  - Include all the cost elements and schedule activities
  - Be supported by relevant data
- All possible risks, threats, liens, uncertainties, mitigation strategies and opportunities must be explicitly quantified
  - Probability of occurring
  - Estimated cost, schedule (or both) consequences
- Address available annual resources
- Incorporate impacts of cost and schedule performance to date
- Risks must be transparently incorporated into cost, schedule and/or both
- JCL product documentation/model must describe
  - The basis for estimate for schedule duration and logic
  - The basis for estimate cost estimates
  - Risks included and basis for probability and consequences (including residual post-mitigated risks if risk mitigation is part of the baseline plan)
  - Description of risks excluded and why

How long will it take, on average, to set up and run the JCL?

The answer is "it depends". How long and how much effort it takes to setup a JCL is heavily dependent on the maturity of the project's fundamental project management products including schedule, resource allocation, and risk management products. The time and effort needed is also heavily dependent on whether the JCL is managed to be synergetic to EVM. It is recommended to start thinking about JCL implementation after KDP-B.

Is it true that I will have to update my JCL analysis on short notice?

The anticipated events that trigger a JCL calculation or update are

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[16] Risks can also be opportunities if the outcome of the event is a positive outcome

- the KDP-C reviews for projects or KDP I for Programs
- When a Program/project is rebaselined
- The decision authority council requests an update

Can I apply future mission funding to improve my project's JCL calculation confidence level?

No, the Mission Directorate may choose to take funding from a future mission line and to rebaseline the project, then the revised cost and schedule baselines would be used in a new JCL calculation.

If I ask for SID's help, does that mean that I will be having an additional assessment of my project?

No, SID is available to provide guidance on generating the JCL. SID will not share data or insight to any independent authority.

What is the role of the SRB now that there is no ICE?

The SRB independent review role has not changed. They will evaluate the JCL and provide their assessment of the model and the inputs. The project then can provide a response to them for the GPMC.

What data do I need to begin generating a JCL?

The project will need to have: current cost data, project schedule and the risk management plan. Quantitative cost and schedule risk impacts must be identified and probability distributions determined.

Can I use an ICE as the basis for my JCL?

The project may use an independent organization to conduct an ICE using a parametric basis of estimate, but the ICE must be augmented with the risks mapped to the ICE as well as the schedule and resources assigned to the project schedule. Probability distributions can then be developed and a JCL can be calculated. An ICE alone will not meet the requirement for a JCL.

How is a JCL and an ABC related – or they the same?

No. The ABC is the baseline against which the Agency's performance is measured during the Implementation Phase. The JCL is the Agency's analytical technique to assess a project's programmatic risk posture of the ABC. Simply, the ABC codifies the Agencies commitment to external stakeholders and the JCL analysis quantifies the programmatic "health" of that commitment.

I heard there is SID consulting available for JCL implementation. Can you tell me more?

The legacy CAD had migrated JCL jumpstarting consulting responsibility to the Centers. Most Centers have, or are providing, expertise for best practices in methodologies and techniques on doing a JCL. For appropriate Center POC, please contact the SID's JCL POC's. With that said, the SID can provide guidance on generating a JCL and limited support to JCL implementation development.

What's the difference between SID and the SRB programmatic assessors for the JCL process?

SID is supporting the projects with the implementation of the JCL by providing guidance and support to the projects. SID also supports the Mission Directorates with finding expertise for SRB programmatic support from the pool of programmatic resources across the Centers. The SRB is the independent review authority per the NPD 7210.5E. The SRB team will include an assessment of the JCL in their review and reports.

What KDP milestone is the JCL done at?

At KDP C for projects and KDP I for programs.

Can I just do an ICE and will that meet the JCL criteria?

No, because the ICE calculation focuses solely on cost and the JCL is a joint cost and schedule confidence level calculation that incorporates an assessment of the project's risk.

What are the different methods to generate a JCL?

JCL is a very broad term, but there are two very broad approaches to completing a JCL: 1). Bivariant distributions, and 2). Probabilistic Cost Loaded Schedule (PCLS). Both methodologies will fundamentally produce a JCL, however to fulfill the intent of the NASA JCL policy requirement, it is intended for a project or program to perform the latter (probabilistic cost loaded probabilistic schedule).

Who will have access to my JCL analysis--How will you safeguard the results?

Ultimately the project owns all the data, analysis, and results of a JCL. SID is an advocate for the project and will not release any data to anyone without the projects permission.

How exactly are you going to use my JCL analysis?

The decision authority will use the JCL analysis to help inform the project's MA and ABC.

If the project creates the JCL, is the SRB going to create another JCL?

The SRB will assess the project's JCL inputs and provide their evaluation to the decision authority.

If the project disagrees with the SRB on the JCL, does the project have to use the SRB results?

The decision authority will select an appropriate JCL after hearing from both the SRB and the Project.

The JCL has been approved and there is difference between what the project is allocated and budgeted. Why is this?

The difference between agreed to JCL for budgeting and amount allocated to projects determine the Unallocated Future Expenses (UFE), previously referred to as Management Reserves. UFE is necessary for project success. The Agency budget will include the value of the baselined JCL (commitment baseline). The project may receive less funding if the Mission Directorate holds back a portion of the UFE. The project will be funded to the level of the management baseline (JCL funding less MD withheld UFE).

JCL Lifecycle

What are the roles of the organizations and Program Manager for maintaining the JCL?

- Project managers:
    - The Project managers *"own"* the project advocate JCL analysis. This means that planning, developing, iterating, and presenting the results of the advocate JCL model is the project's responsibility.
- Mission Directorates:
    - Monitor project JCL status and adjudicate UFE allocation
    - Ability to provide external risks to project as needed in support of JCL analysis (e.g. risks associated with International/interagency contributions, inter-project/program risks, launch vehicle costs and risks, etc.)
- Office of the Chief Engineer (OCE):
    - Owner of NPR 7120.5E where JCL requirement resides
    - Adjudicates, with OCFO coordination, JCL waiver requests

- o Advises Baseline Performance Review (BPR) leadership on project performance that may lead to a rebaseline and require a new JCL per NPR 7120.5E.
- Office of Chief Financial Officer (OCFO) :
  - o Owner of KDP-C Decision Memorandum where JCL results are documented in support of external commitments
  - o Owner of Major Program Annual Report (MPAR) which contains JCL results and is provided to external stakeholder (e.g. congress, OMB)
  - o Advises OCE on waiver requests
  - o Approves JCL waiver requests
  - o Advises Baseline Performance Review (BPR) leadership on project performance that may lead to a rebaseline and require a new JCL per NPR 7120.5E.
  - o Agency JCL policy advocate
  - o Coordinates and recommends Agency JCL policy - including derived requirements and implementation procedures
  - o Provides "jump start" advice and consulting support so programs and project may develop their JCLs
- Standing Review Board (SRB)
  - o Conducts evaluation of a project's JCL whenever a project is reviewed at KDP C
  - o When requested, evaluates project's JCL whenever there is a Special Review or Rebaselining
  - o Provides benchmark analysis for comparison to project's cost loading and schedule activity duration estimates

The JCL has been baselined, now what?

The Program Manager's responsibility is to maintain the Program JCL and provide required JCL lifecycle reporting. The Project Manager is responsible for managing the project in a manner that maintains the project JCL.

Rumors and Legends

I heard the SRB is going to do an ICE and you said no more ICEs. What's going on?

The SRB does not provide an ICE at any GPMC. The SRB will generate independent cost and schedule analysis, as appropriate, to assist in the JCL assessment process.

I heard that CAD got disbanded with OoE and we don't have to JCL's anymore.

On October 22nd, 2015 the Associate Administrator (AA) of NASA announced the decision to reorganize and realign the Agency's independent assessment function toward the goals of ensuring mission success and clarifying management accountability. In particular, Programmatic Capability – consisting of program management, resource analysis, scheduling, cost estimation, and independent assessment activities – was examined. The most significant action in support of this intent to date has been the dissolving of the Independent Program Assessment Office (IPAO) and its umbrella organization, the Office of Evaluations (OoE). The Cost Analysis Division moved to the Office of the Chief Financial Officer. Later in March 2016, CAD's roles, responsibilities, personnel were folded into the Strategic Investment Division (SID).

Personnel that supported CAD in JCL moved to SID. **NPR 7120.5E requirements**, including JCL, **have not changed** due to this decision.

Why is SID making the project do more work when the project is already working hard to preparing for the next major KDP?

SID does not have the authority to levy requirements on the Projects, the Agency decided to create the JCL policy. SID was designated to support the projects in implementing the policy. SID is actually trying to help (hold your laughter) the projects by providing JCL assistance.

Informational & Other

Do you have examples of JCL output?

An exhaustive list of possible output reports are not shown for brevity purposes. With that said, it is important to explain briefly the most commonly used JCL chart, the Scatter Plot. A JCL calculation result, commonly referred to as a scatter plot, often is graphically depicted as follows:
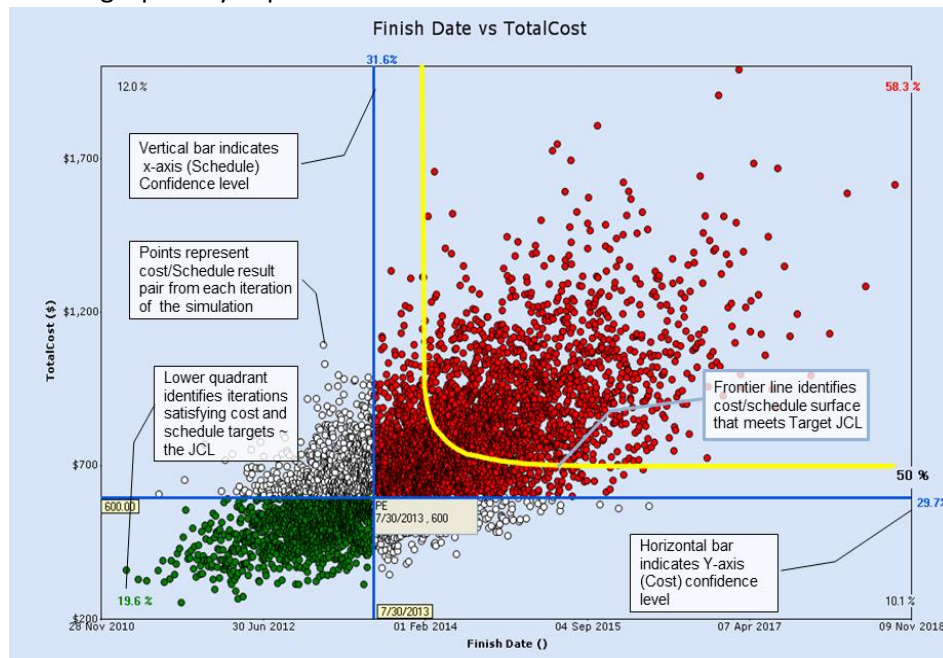
In figure above, the x-axis represents the final completion date and the y-axis represents the final cost through that completion date. The scatter plot shows the simulated outcomes of the cost and schedule risk analysis. Each dot in the scatter plot represents a specific result, or scenario, from the simulation calculation (cost and schedule). In this example the blue lines (the cross-hairs) intercept at the projects point estimate (baseline plan). To the bottom left, the green dots represent all the scenarios that are at or below the baseline cost and schedule. For this specific example, if one were to take the green dots and divide them by the total amount of dots, they would get 19.6% of the dots being within cost and schedule – or put another way, 19.6% Joint Confidence Level (JCL). The cross-hairs can be moved to a date and cost to obtain their joint confidence. The horizontal bar of the cross-hair indicates the (Cost) confidence level whereas the vertical bar of the cross-hair indicates the (Schedule) confidence level.

What is a "Frontier Curve"

The yellow line represented in figure above represents the "frontier curve", or indifference curve, that specifies all the cost/schedule combinations that will meet a targeted JCL. In this example, the frontier curve represents the 50 percent JCL frontier curve. As a cautionary note to the reader, the asymptotic tails shown are purely academic – it is recommended to be as close to the center of the cluster for that given frontier curve.

Is one point on the Frontier Curve better than another?

Academically no; however, it is recommended to be as close to the center of the cluster for that given frontier curve. Furthermore, which point on the Frontier Curve the project decides to use will partially depend on the characteristics and programmatic constraints of the project.

I don't like JCL, what can I do?

JCL is a required policy and the best option available is to provide lessons learned and comments to the SID to help improve the process.

JCL Myths[17]

Myth #1: It's just a number

It is a number, but it's not just a number. A JCL is a way of communicating a project's programmatic risk posture. So, if I look at the evening news tonight and they say there is an 80 percent chance of rain tomorrow, the 80 percent, .8, it's just a number. But what that number is representing to me, to you, to decision makers, is, "I really need to bring an umbrella tomorrow." Those are the kinds of things that we need to be able to communicate to our decision makers and also externally.

Myth #2: It will solve all of your problems

The JCL is a tool. It's a tool in your tool kit. Tools do different things. A JCL is looking at one aspect. It's not one-size-fits-all. It's not going to solve all of your problems. Again, it's a way of communicating externally and within the agency what our risk posture is.

Myth #3: The JCL takes over 9 months to perform

It is recommended for projects to start thinking about JCL analysis after they complete KDP-B, but the amount of time to conduct a JCL is highly dependent on the quality of the underlying data. JCL does require some new data that a project may not be already generating, such as if costs are time-independent or time-dependent, but the majority of inputs for a JCL analysis should already be generated from other project products.

Myth #4: You just have to survive the JCL process one time

NASA is requiring projects to do it one time at key decision point KDP-C, or when they get re-baselined. From a policy standpoint that's all that's required from an agency perspective. From a JCL advocate perspective, there's a lot of great information that you can get from the JCL process. Though from a policy perspective it's a one-and-done thing, it is highly encouraged that projects, as they're going through their JCL analysis, make it part of what they're doing as just good project management. We're seeing that from projects. They may not be re-running a JCL, but they're keeping a lot of the artifacts that they're doing with a JCL and moving forward.

Myth #5: JCL is hard

 'Hard' may not be the right term. JCL analysis can become hard if the underlying project management products, resource management, schedule(s), and risk management systems need additional work. The health of those products really depends on how hard a JCL is. If a project is doing all of its project management stuff, 101 stuff, really well, a JCL is not as hard as when as when the underlying products that still need work.

Myth #6: The JCL process requires me to produce lots of new products

It's not requiring you to produce a lot of new products. From a cost perspective, what it's doing is making you map the cost-characteristics. There are a lot of benefits associated with that. The other aspect that's more work from the risk perspective is this whole risk realization or risk recovery. At the end of the day we think we know what it costs to mitigate certain aspects, we know what the consequence is, but how we understand how that risk interacts with the other parallel activities that are going on in any complex project? That's where the JCL adds on top of what's already being done. Those are two big things that JCLs require projects to do that they may not be doing already

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Myth #7: JCL causes projects to get cancelled.

No project has ever been cancelled because of a JCL. Period.

Myth #8: JCL is just black magic

At the end of the day, a JCL is just an integration of products that are already there. If it's black magic, it's because a) the cost-schedule community is not explaining it adequately to the decision makers or b) there are issues with the products. If anything, we have as much statistical rigor in JCL analysis as anything, and we're constantly working on making the analysis more transparent - look less like black magic. We are doing this by asking fundamental questions: How do we make it more data driven? How do we make it more based off of history? How do we make it so it's based off of what we think the real, project unique, risks are going to be?

Myth #9: JCL requires expertise that doesn't exist within the program and costs a lot of money

It does not cost a lot of money. It does take resources and time. Most centers have the capability to support projects in terms of implementing JCLs. Because we're relying on the artifacts the projects already generate, of course we want to have the conversations with the schedulers, risk managers, and those conversations are going to take time, but it doesn't cost a lot of money. And the potential savings for understanding your risk posture—we're talking about programs that are hundreds of millions of dollars. The amount of time it takes for an FTE or a WYE to crank out a JCL to understand your risk posture is really not comparable to the understanding of risk it provides.

Myth #10: JCL is just a fad. It'll go away if we just wait it out.

Don't bank on it. The momentum is growing, if anything. We have GAO talking JCLs. It's in people's vocabulary. If there's any momentum at all, it's for doing them better instead of downshifting to not do JCLs.