

Joint Confidence Level (JCL) FAQ

By NASA HQ - Office of Program Analysis and Evaluation (PA&E) Cost Analysis Division

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Commonly used Acronyms:

APMC – Agency Project Management Council
BOE – Basis of Estimate Review conducted by PA&E
BPR – Baseline Project Review
CAD – Cost Analysis Division (of PA&E)
DPMC – Directorate Project Management Council (SMD, ESMD, SOMD, ARMD)
ESMD – Exploration Mission Directorate
EVM – Earned Value Management
GPMC – Governing Project Management Council (determined by NPD 7120.5D)
ICE – Independent Cost Estimate
IMS – Integrated Master Schedule
IPAO – Independent Program Assessment Office (of PA&E)
JCL - Joint Confidence Level
OCE – Office of Chief Engineer
PA&E – Program Assessment & Evaluation
PDR – Preliminary Design Review
PPBE – Planning, Programming, Budgeting, and Execution
PRLS - Probabilistic Resource Loaded Schedule
SID – Strategic Investments Division (of PA&E)
SPG – Strategic Planning Guidance
SMD – Science Mission Directorate
SRB – Standing Review Board
UFE – Unallocated Future Expense

JCL Policy

What is the official definition of JCL?

JCL is

- The probability that **cost** will be equal or less than the targeted cost **AND schedule** will be equal or less than 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

JCL is not a

- Specific methodology (e.g. resource loaded schedule)
- Product from a specific tool (e.g. @RISK)

What is the policy for JCL?

- The JCL policy is located in NPD 1000.5 under Section H3 with "Joint cost and schedule confidence levels are to be developed and maintained for the life cycle cost and schedule associated with the initial lifecycle baselines (e.g., for space flight programs and projects baselines established at KDP-I or KDP-C)." For tightly coupled programs policy begins at KDPII.

What is the Joint Confidence Level (JCL)?

1. For implementation of each major program segment, all space flight and information technology programs are to be baselined or rebaselined and budgeted in accordance with the following
 - a) There is a 70 percent probability (or a different probability that is approved by the decision authority) of achieving the stated life cycle cost and launch schedule
 - b) Projects are to be baselined or rebaselined and budgeted at confidence level consistent with the program's confidence level
2. At a minimum, projects are to be funded at a level that is equivalent to a confidence level of 50 percent, or as approved by the applicable decision authority

What organization owns the JCL policy?

JCL Policy in NPD 1000.5 is assigned to OCE.

If OCE has governance over the JCL then why is PA&E/CAD involved?

OCE delegated implementation responsibility to PA&E/CAD

Why do we need to do a JCL?

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

Can JCL be waived?

The OCE must approve waivers with advice from the Associate Administrator of PA&E. To date none have been approved, although waivers have been requested.

Why was my project selected for JCL and not someone else's?

The JCL is being phased in. All projects that reach milestone KDP-C or Programs at KDP-I must generate a JCL and maintain the JCL through the development lifecycle. Projects that are past these milestones are being phased in as part of the PPBE Strategic Planning Guidance (SPG) process. All projects must ultimately develop a JCL to support the PPBE process. CAD is providing consulting support in a "rolling wave." Project approaching their KDP C are being given the highest priority for consulting support.

When are JCL analysis needed?

Program and project JCLs are to be completed:

1. At project KDPs C & D milestones
2. Whenever the BPR leadership requests a JCL re-computation (informed by quarterly program manager status reports)
3. As part of SPG process (at least once per year)
4. The three pilot KDP-B missions selected by the Associate Administrator of Science

If the policy is for a JCL at KDP-C and KDP-D then why do I need to do one for KDP-B?

At the May 2009 Strategic Management Council (SMC), the Council decided to further understand the viability of JCL for the KDP-B milestone that three NASA flight projects would do a JCL for this milestone and report back to the Agency Project Management Council (APMC). The Associate Administrator of Science selected the three flight projects to report to the APMC with a JCL at KDP-B.

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 waiver.

Why is the JCL policy focused at the Program Level and not the Project Level?

The SMC decision authority chose the Program JCL policy to provide funding flexibility to the Program Level.

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 they 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.

JCL Implementation

How can I learn more about JCL?

To learn more about JCL, please contact a PA&E/CAD representative. PA&E/CAD is currently working on creating a JCL handbook. A release date has not been established.

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

Yes, please contact PA&E/CAD to schedule a kickoff or informational session. PA&E/CAD point of contact is Charles Hunt. Charles can be contacted at Charles.d.hunt@nasa.gov (202.358.0803)

Who does the JCL analysis?

Project is responsible for doing the JCL analysis. PA&E/CAD is assisting in providing expertise for best practices in methodologies and techniques on doing a JCL.

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?

With regards to projects, you can do a JCL with parametric models or probabilistic resource loaded schedule (PRLS) estimates. Typically projects use a parametric approach in the early design phases and then a resource loaded schedule approach in the later phases. The project or program has the option to choose their method and model. However, it is heavily encouraged to do a PRLS for KDP-C and beyond.

With regards to programs, it is recommended that JCL be calculated using summary statistics from the projects. PA&E/CAD has a tool that will assist Programs in this calculation.

Are there guidelines on which methodology to use for JCL?

The JCL consulting effort sponsored by PAE/CAD is intended to help the project decide. The JCL should be performed using the same data that is being used to manage the project. Agency leadership expectations are that projects will use parametric JCL approach prior to PDR (KDP-C) and resource loaded JCL approach afterward.

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

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. At some point, it is anticipated that the project will have fully vetted the resource loading and associated cost phasing.

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:

- **Step one: Identify goals of JCL for specific project**
 - What questions to answer?
 - Which project personnel will participate in JCL development?
 - What insight to gather?
- **Step Two: Review built schedule**
 - Logically linked network
 - Minimize use of constraints
 - Provides arcs to major milestones of the analysis

- Cognizant of cost and risk application
- Run Schedule Health check to analyze viability for analysis
- **Step Three: Cost load schedule**
 - Separate costs into Time Dependent and Time Independent
 - Map costs to schedule
 - Load costs as resources into schedule
- **Step Four: Implement risk list**
 - Quantify likelihood and impacts (cost and schedule)
 - Identify links to schedule activities
 - Derive probabilistic stats
 - Load risks into the IMS (multiple options)
- **Step Five: Conduct uncertainty analysis**
 - Schedule uncertainty (multiple options)
 - Identify method for assessment (consistency is key)
 - Incorporate correlation
 - Cost uncertainty- how much can resources vary
- **Step Six: View results**
 - Scatter plot
 - Critical path
 - Drivers
- **Step Seven: Analyze results**
 - Review risks and refine results

What kind of process will be used to compare my JCL to other project's JCLs

There are established general quality standards for the attributes of an acceptable JCL:

- Overarching principles: transparent, traceable, defensible 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
 - Basis for base schedule duration and logic
 - Basis for base cost estimates
 - Risks included and basis for probability and consequences
 - Risks excluded and why
 - Description of JCL method used

In theory, project JCL's would provide a comparable measure of the integrated risk associated with each project's baseline, thus JCL would provide a basis of comparison between unrelated projects.

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

Metrics are still being collected; however 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 schedule, resource allocation, and risk management products. The time and effort needed is also heavily dependent on whether the JCL is managed to be synergistic to EVM. Metrics will be made available upon request.

A JCL is required for the Program, why do I need to one for the project?

To calculate the Program Level JCL and understand the funding flexibilities of the program, all projects in the Program must have a JCL.

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

- the KDP-C and KDP-D reviews for projects or KDP I for Programs (KDP-II for tightly coupled Programs)
- The decision authority council requests an update
- The yearly PPBE SPG process

It is conceivable that a short turn around might be requested in conjunction with changes occurring during the budget process.

Can I apply future mission funding to improve my project’s JCL calculation?

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 use the PA&E/CAD consultants, does that mean that I will be having an additional assessment of my project?

No, the PA&E/CAD consultants are available to jumpstart the project or program and provide guidance on generating the JCL. The PA&E/CAD consultants are at the Projects command and 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/IPAO 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. The program will need, at a minimum, the individual JCL statistics (mean, standard deviation of cost and schedule) for each project in the program.

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

The project may use an independent organization (e.g. Aerospace) 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.

What's the difference between a JCL and BOE?

The PA&E SPG requirement for a BOE review is used to provide an assessment of new starts entering the PPBE process. This review is not to replace an independent authority review and is only to ensure the agency is moving forward with a programmatic baseline that appears to be achievable based on the limited available data on the planned mission. BOE's occur on missions in Pre Phase A, Phase A and Phase B for AO down selected missions. These activities are not a substitute for the development and review of a project JCL. The BOE reviews serve very different purposes. Please note that the SRB may use the term BOE for purposes of documenting a JCL; this is not the same as a BOE review.

I heard there is PA&E/CAD consulting available on JCL. Can you tell me more?

PA&E/CAD consultants are available to jumpstart the project or program JCL development and provide guidance on generating the JCL. They are at the projects' command and not supporting any independent authority. PA&E/CAD JCL point of contact is Charles Hunt. Charles can be contacted at Charles.d.hunt@nasa.gov (202.358.0803).

What's the difference between PA&E/CAD and PA&E/IPAO for the JCL process?

PA&E/CAD is supporting the projects with the implementation of the JCL by providing consulting support to the projects. CAD is not part of the planned project assessment processes. The PA&E/IPAO is part of the SRB that is the independent review authority per the NPD 7210.5D. The SRB team will include an assessment of the JCL in their review and reports. PA&E's SID personnel will also be evaluating the execution of the projects and externally reporting the JCLs as required.

What KDP milestones is the JCL done at?

At KDP C and D for projects and KDP I for programs (KPD-II for tightly coupled) but the JCL must be maintained through the projects lifecycle as it must support the PPBE, BPR, and Program JCL calculations.

Is there a lessons learned on JCL for the project to use?

No, not yet, but CAD is working on documenting the lessons learned and plans to make these available as soon as possible.

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

No, because the ICE calculation focuses 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?

You can do a JCL with parametric models or resource loaded schedule. Typically projects use a parametric JCL in the early design phases (pre-PDR) and then probabilistic resource loaded schedule (PRLS) estimates in the later phases.

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. PA&E/CAD is an advocate for the project and will not release any data to anyone without the projects permission. Any transfer of data between the project and PA&E/CAD can be done via the PA&E/CAD JCL secure group website. Access to specific project folders

will be limited to only the project and PAE/CAD consultants. Please contact PA&E/CAD for more info on the JCL website.

How exactly are you going to use my JCL analysis?

The decision authority will use the JCL analysis to determine the project's commitment baseline and the management baseline and the Program will use the approved project JCL as an input to the calculation of the Program JCL.

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

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

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

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

Is there a tool to generate a Program Level JCL?

Yes, CAD has developed a technique for calculation of the Program JCL for loosely coupled projects. . Please contact Charles Hunt Charles.d.hunt@nasa.gov (202.358.0803) for a copy and documentation. Please note that this technique has limitations with regard to highly complex, tightly coupled Programs (e.g. CxP).

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). NPD 1000.5 requires that the project receive funding equivalent to at least the 50% Joint Confidence Level.

JCL Lifecycle

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

- Program managers
 - Ensure that their programs maintain the agreed to JCL at all times
 - Provide computations annually in response to the PPBE process to Mission Directorates
 - Provide quarterly status reports at BPR
- Project managers
 - Develop JCLs before KDPs C and D
 - Provide computations annually in response to the PPBE process
 - Update upon request from Program Manager
- Mission Directorates
 - Coordinate and aggregate program JCLs in PPBE process

- Recommend when JCLs should be re-computed
- PA&E/IPAO - SRB
 - Evaluates the program’s JCL at PIRs
 - Evaluates the program and project’s JCL whenever a project are reviewed at KDPs C, and D
 - Evaluates, when requested, the program’s and project’s JCL whenever there is a Special Review or Rebaselining
- OCE
 - Adjudicates JCL waiver requests
 - Advises BPR leadership on nature of changes, provides evidence that warrant JCL re-computation
- S&MA
 - Advises BPR leadership on nature of changes, provides evidence that warrant JCL re-computation
- PA&E/CAD:
 - Orchestrates JCL and Consistency derived requirements and implementation procedures
 - Advises OCE on waiver requests
 - Helps programs and projects to develop their respective JCLs
 - Provides “jump start” advice and consulting support so programs and project may develop their JCLs
 - Collects metrics on effort required to develop project JCLs
 - Communicates requirements and orchestrates requisite education and training
- PA&E/SID
 - Promulgates Strategic Planning Guidance (SPG)
 - Advises OCE on waiver requests
 - Tracks Program and Project changes and provides evidence of changes that warrant a JCL re-computation

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.

What are the reporting requirements after a JCL baseline has been approved?

Reporting requirements occur: as requested from the BPR, supporting PPBE requirements, if the decision authority requests one, and at KDP D.

Rumors and Legends

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

The SRB/IPAO 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.

Why is PA&E making the project do more work when the project is already working hard to the next major KDP?

PA&E does not have the authority to lvey requirements on the Projects, the SMC decision authority decided to create the JCL policy. PA&E was designated to support the projects in implementing the policy. PA&E/CAD is actually trying to help (hold your laughter) the projects by providing JCL jumpstart assistance.

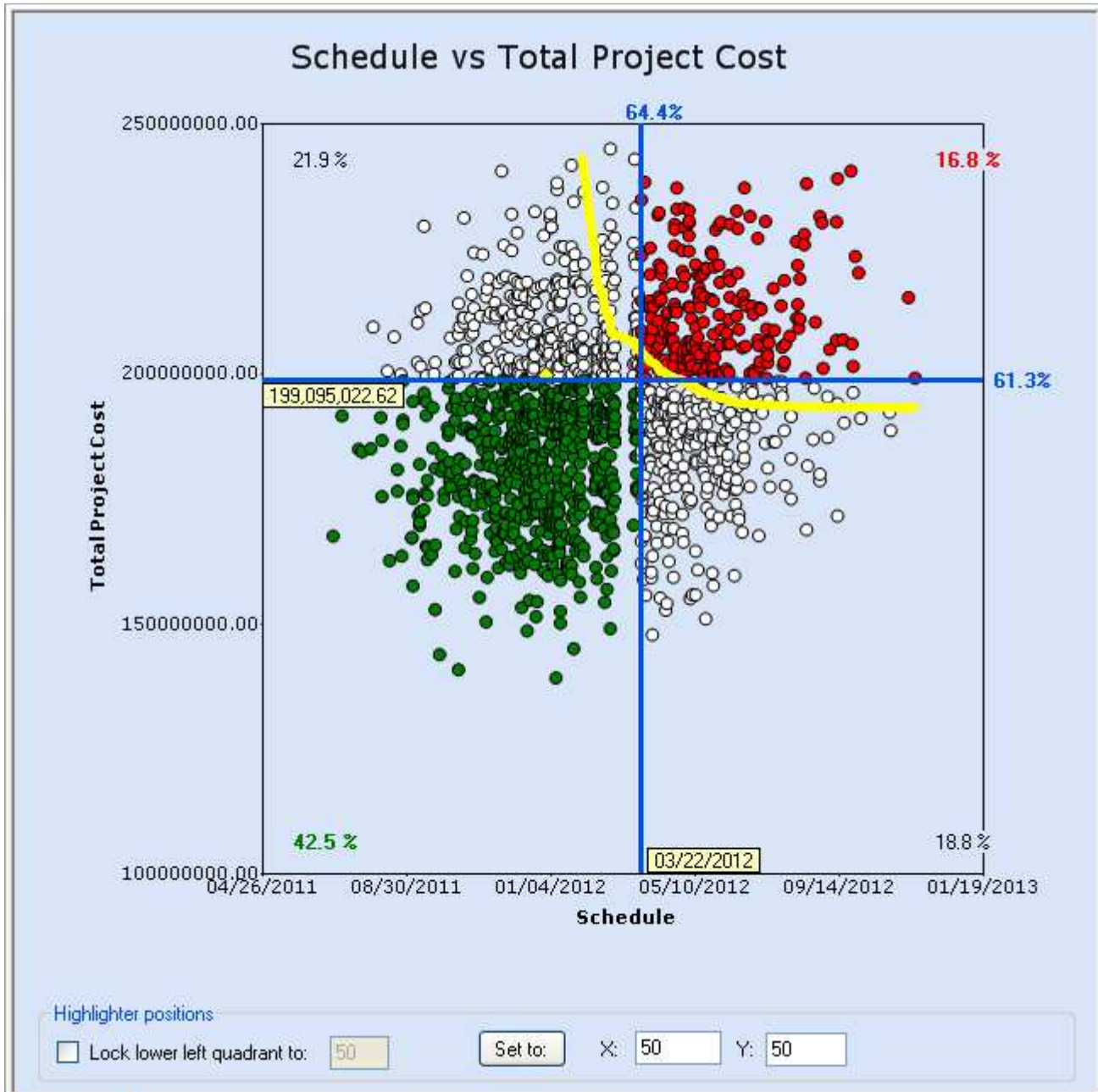
Someone said that it is illegal to not have an ICE for a government project. Is this true?

One current NASA Authorization Bill requires an independent analysis of project costs.

Informational & Other

Do you have examples of JCL output?

Yes.



What is a “Frontier Curve”

A Frontier Curve is an iso curve which represents all the possible combinations of cost and schedule that will give you a percent JCL. As an example, the Frontier Curve above shows all the protect scenarios for a 70% JCL. The Frontier Curve has also been coined “The Yellow Brick Road”.

Is one point on the Frontier Curve better than another?

Academically no; however, which point on the Frontier Curve the project decides to use will depend on the characteristics and programmatic constraints of the project.

What projects have done a JCL?

SOFIA, LDCM, MMS, and MSL were the first to complete the JCL with the following projects/programs actively generating a JCL: CxP, LADEE, MAVEN, JWST, and SMAP

Who is Charles Hunt that I keep hearing about with JCL?

PA&E/CAD JCL point of contact is Charles Hunt. Charles can be contacted at Charles.d.hunt@nasa.gov (202.358.0803).

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 PA&E/CAD to improve the process. Also did you use the PA&E/CAD consultants to provide a jumpstart in generating the JCL?