DETAILED OUTLINE OF INSTRUCTION FOR PERFORMANCE METRICS/INDICATORS	Course Number: IV.D Module: 2 Page 1 of 22 pages
INSTRUCTOR NOTES	**TRAINING MATERIALS AND SUGGESTIONS**
PERFORMANCE METRICS/INDICATORS An important ingredient needed for effective NASA program and project management is information. In this training module, we address a valuable source of information, performance metrics and indicators that can support the NASA surveillance of contractors.	Slide #1
TRAINING MODULE OBJECTIVES At the end of this module, you will be able to accomplish the training objectives shown on this chart: • Define performance metrics and indicators • Understand the current NASA contractor metrics program • Be aware of the types of information available through in-plant metrics First, we explain the meaning of the performance metric. Second, we look at the NASA Agency contractor metrics program as its exists today. Third, the crucial aspect of metrics and their part in NASA in-plant contractor surveillance will be detailed. The underlying goal is to give an awareness of performance metrics and their value as a tool in surveillance of a NASA contractor's performance against a Government contract. This training will not teach the mechanics of preparing specific metrics, but rather it exposes students to what performance metrics are, how they are used, and the types and sources of in-plant information that are available.	Slide #2
OUTLINE Here is the outline for this module. A simple overview is provided in which the definition and purpose of performance metrics are given in terms of application to NASA. In the second topic, the NASA Agency contractor metrics program is briefly discussed. As a third topic, performance metrics or indicators that pertain to NASA's in-plant surveillance of contractor activities are covered. Specifically, key metric areas, sources of some metrics, and the Government use and analysis of collected metrics, are provided. Finally, some examples are provided.	Slide #3

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OVERVIEW As an overview we will address the definition and purpose of performance metrics applicable for our use.	Slide #4
DEFINITION OF PERFORMANCE METRICS What is a performance metric? Here are several definitions related to metrics. • Webster's refers to a metric as a "standard of measurement." • The previous version of NHB 2340.4A, which is used to apply a standard of measurement in the contract environment, refers to contractor metrics as "the set of data that provides specific measures of contractor performance." • Other Government agencies with similar in-plant contractor surveillance activities have defined performance metrics as "workload or performance information used to determine the need for review and/or action." Indicators are information. They can take many forms. Whether a standard measurement, a set of data, performance information, or some other combination of forms, all metrics are used to track contractor performance and trigger appropriate surveillance actions. As a simple example, the salesman in the graphic on this chart has information that indicates sales are not good. This example shows that a performance metric can also be a trend of how a measured quantity changes instead of, or in addition to, an absolute number.	Slide #5 AFCMDR 178-13 NHB 2340.4A <u>Suggestion</u>: Conduct a survey among students asking "What does the term performance metric mean to you?" Ask this question from a general, everyday aspect as well as a Government aspect. Show other selected sample metrics to illustrate examples.
PURPOSE OF PERFORMANCE METRICS Defining what metrics are comes close to answering why they are needed. It is extremely important to understand the purpose of metrics. Simply collecting data for metrics is not valuable by itself. Their use is important and should be understood before metrics are chosen. Here are some purposes that NASA experience has shown to be valid: 1. First of all, document the baseline. The old saying, "If you don't know where you're going, any road will take you there" is right on. The baseline gives the reference point from which to map contract progress.	Slide #6

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PURPOSE OF PERFORMANCE METRICS 2. Metrics provide NASA personnel with a tool for measuring contractor performance. This is discussed in more detail later because the selection of the right data is critical to effectivity. 3. Metrics from the big picture perspective can give a systemic view of agency-wide or project-level issues and problems. 4. Of course, metrics, when properly managed, can predict trouble areas or trend progress. This allows preventive measures to be taken before problems arise. 5. Metrics also help monitor proper use of scarce resources, such as personnel, time, money, and space.	Slide #6 (concluded)
SUMMARY OF OVERVIEW In summary, keep in mind two aspects. For our purposes, performance metrics are the information collected and used to track contractor performance. Also, NASA will use the metrics to trigger preventative and corrective actions.	Slide #7
NASA CONTRACTOR METRICS PROGRAM This slide introduces a section on contractor metrics from the NASA Agency point of view. • NASA policy on contractor metrics is currently defined in the NASA handbook, NHB 2340.4A • This section provides a brief overview of existing policy along with the status of the policy revision. • The example provided is of an existing metric to highlight Agency-level items of interest	Slide #8
NASA CONTRACTOR METRICS PROGRAM The objective of the Contractor Metrics Program is to provide managers the information needed to monitor and assess the performance of selected contractors on NASA contracts. The policy as defined by NHB 2340.4A, as mentioned earlier, is currently being revised.	Slide #9 Note: Add current status of NHB 2340.4A update. Reference: NHB 2340. 4A, Contractor Metrics Handbook, Chapter 1.

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THE CURRENT POLICY IN BRIEF NHB 2340.4A established several basic requirements. Although the NASA policy on contractor metrics reporting is under study and pending update, the basics of the existing policy will assist us in understanding several aspects important to the Agency. • A system approach is used to report selected contractor metrics. – This system uses the contractor's own data from existing management and technical information systems. – The financial and management advantages of this approach spring from use of a common data set and by not asking the contractor to provide a data product that is not directly used to produce the contracted end product. • Products required by the policy – Current data from the contractor – A report back to the contractor on the NASA perspective on the data. – Communications using the same data base. • The policy outlines seven categories: – Cost – Schedule – Technical – Safety and mission assurance – Subcontracting plan – Award fee – Continual improvement	Slide #10 <u>Reference</u>: NHB 2340.4A, Chapters 1 and 3
STATUS OF METRICS POLICY REVISION The NASA Contractor Metrics Program as required by NHB 2340.4A was just covered. Now, the status of the new revision will be covered. • The work to revise the policy is underway. • The projected schedule has a draft of the policy due out early in the "Spring of 1996." • The future of NHB 2340.4A may involve an update or complete recision. • The objective is to rethink the idea of reporting contractor metrics at the headquarters level. <u>Need</u>: Current NASA status on the update of NHB 2340.4A!	Slide #11 What are some of your thoughts on new metrics reporting policies? <u>Suggestion</u>: Conduct brain-storming session as time permits to discuss the merits of an Agency metrics policy; reporting project data to the Agency level; and the kinds of data senior managers need.

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SAMPLE NASA COST METRIC CHARTS This generic chart represents the type of metrics that NHB 2340.4A currently requires on a project cost. Need: A current NASA Project cost metric or a graphic of NHB 2340.4A Examples 1D and 1F.	Slide #12 Instructor: Describe chart chosen as a sample. Do not stress details, but emphasize the purpose of the particular metric. Suggestion: The instructor may open the class for discussion on the merit of such a metric to the Government. How about the contractor?
SAMPLE NASA COST METRIC CHARTS Here is a generic chart that represents the type of metrics that NHB 2340.4A currently requires on a project cost. Need: A current NASA Project schedule metric or a graphic of NHB 2340.4A Examples 1D and 1F.	Slide #13 Instructor: Describe chart chosen as a sample. Do not stress details, but emphasize the purpose of the particular metric. Suggestion: The instructor may open the class for discussion on the merit of such a metric to the Government. How about the contractor?
CONTRACTOR METRICS SUMMARY This slide summarizes what we just covered on the NASA Contractor Metrics program. The current program is defined in NHB 2340.4A. It requires use of existing contractor data and NASA feedback. The NHB 2340.4A is being revised.	Slide #14

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PERFORMANCE INDICATORS This section deals with the area of performance indicators that is related to the direct surveillance of a NASA contractor's performance as compared to the Agency-level program previously covered. This next topic will be covered in four parts: • Key contractor surveillance areas • Sources of metrics • The Government use and analysis of a mountain of information • Examples	Slide #15
KEY POINTS TO CONSIDER • The environment for each NASA program or project involves many variables, but some basic thoughts should be addressed by all. – The project itself should be considered – The contract requirements are extremely critical. – NASA risks, interests, and mission objectives must be determined – NASA resources must be assessed. • The contractor must also be studied. – Is the contractor trustworthy and knowledgeable? – Consider past performance. Is a set of management metric processes in place? – Does the contractor have adequate available resources?	Slide #16
KEY POINTS TO CONSIDER (Concluded) • Metrics Data management is absolutely essential. – Choose only metrics that provide program insight. – Learning which metrics to choose sometimes involves trial and error. – Validate any data collected or use contractor-validated data. – Ensure the data are current. Establish the necessary frequency and timing of the needed data – Look for systematic type information, very low level detail can be distracting – Look for a correlation among the metrics. • Others – What are your thoughts?	Slide #17 <u>Suggestion</u>: Open discussion for class suggestions. What are the metrics you would choose for a particular type of contract? How often should these metrics be collected?

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TYPICAL KEY NASA AREAS • The spectrum of a contractor's operations runs from actually negotiating and contracting requirements to designing and verifying quality • The choice of surveillance areas and their importance will depend on the specific program/project • Typically of interest to NASA programs and projects are these five functional contractor management systems. • For each area, we will cover expected contractor activities and characteristics of performance indicators for that functional area.	Slide #18
PROGRAM MANAGEMENT • In the contractor's project manager office or department, the overall management of internal contractor program activities should be evident. It is fair to expect to see evidence that these activities do happen. – There should be evidence that planning has occurred and is continuing to occur. – Coordination of the functions to execute the planning should be evident. – Watch for effective communication among contractor personnel. – Cost, schedule, and technical data should be available for program control. – Contractor program resources must be allocated and managed to meet the contract objectives.	Slide #19
PROGRAM MANAGEMENT (Concluded) • Absence of the listed indicators is cause for concern • Elements should demonstrate certain aspects: – Status against an established baseline or plan should be evident. – Indicators should exist that status the program cost, schedule, and performance against contract terms. – Look for the contractor's internal self-imposed milestones that incrementally will lead to satisfying the contract terms. – Examine milestones on the critical path or those considered to be "show stoppers." – Risk areas and the critical path must be determined early in the life-cycle of a project. – The contractor should be statusing the known problems. – The contractor should also be establishing and statusing necessary corrective action. – Customer feedback is essential.	Slide #20

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CONTRACT MANAGEMENT • The area of contracts can be rather complex at times. Government Contracting Officers are the experts in this matter. The scope of this particular training will not address hard core contract management. However, NASA personnel can play a key role in assisting the Contracting Officers and the NASA program/project by being generally aware of some business aspects of the contractor's internal activities. – First, this function serves as the focal point for contract matters – This is a function reserved for the Government Contracting Officer or officers if contract administration functions are delegated to DCMC. – As one would expect, a litany of tasks is associated with this function. In general, this is the functional area usually involved with estimating and pricing the contractor's efforts in response to NASA requests for proposals and contract requirements. – We often forget about Government Furnished Items such as tooling, equipment, and facilities, but their management should generally be present in this functional area.	Slide #21
CONTRACT MANAGEMENT (Concluded) • Contract Management indicators should provide information more indicative of the status of the project contract/financial posture than of the measurement of precise contract terms. – A contract administrative status metric should show the currency of contract documentation such as a change order or proposal. – Responsiveness is very important to the Government – The Contracting Officer will be tracking many other complex contract issues. Indicators should demonstrate that project management knows the financial status of the contract. – The Government must know the business strength of the company to ensure a solid foundation for project resources. – Knowing the relative priority of the NASA project assists NASA's understanding of company commitment to project needs and priorities.	Slide #22 Does the contractor meet the requested NASA suspense?

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QUALITY ASSURANCE • In a company quality assurance organization or department, the listed types of key activities should be found. – The chief quality manager is part of the Quality Assurance organization and should be the focal point for Government interface on top quality matters. – The following should be easily recognizable tasks performed by this function with clearly defined and attainable metrics: • Quality planning • Quality engineering • Nonconforming material • Mandatory Government inspections – Inherent in quality assurance is also the need to verify the project end items actually meet the intended engineering design (i.e., as designed).	Slide #23 Comments?
QUALITY ASSURANCE (Concluded) • Listed are several types of indicators that one would expect quality to collect and manage. – The quality of the project products must be monitored closely, not in a reactive fashion, but in a positive preventive maintenance mode. – Inspection results supplemented by an awareness of escapes (defects found by quality) indicate directly if quality is designed and built in. – Component defect rates also provide this answer. – Indicators related to corrective action should be a mandatory part of any metrics. Cause and corrective action metrics and Corrective Action Board metrics should be sampled. – Indicators should reflect if root problems have been found and fixed. – It should be obvious that the prime contractor is tracking supplier quality. Supplier quality can be a majority of the contract cost.	Slide #24 What are your favorite metrics and why? <u>Suggestion</u>: Open issue for student ideas.
ENGINEERING • The project chief engineer or manager should be closely associated with this organization. – The company focal point for the NASA Project should come from the Engineering functional area.	Slide #25

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ENGINEERING – The engineers are responsible for the design. – Good design management encompasses configuration management. – This activity also performs technical analyses. – Research and Development may be a separate office from the project engineers, but typically the organizational boundaries and relationships are transparent. R&D specifically for the NASA project should be identified. – Engineering is where design activities directly charged to the project should be occurring.	Slide #25 (continued) <u>Note</u>: Included with this design responsibility is the requirement to ensure the proper flowdown of technical requirements to the subcontractors and vendors. Responsibility for failure analysis and the appropriate corrective and preventive actions is also a key engineering area.
ENGINEERING (Continued) • If the engineering job is to convert the project requirements into a predictable design, what type of indicators will demonstrate how their design task is proceeding? The particular project will dictate the specific tasks and activities. Typical engineering outputs and indicators are also available. – Early in a project's life-cycle, look for information that measures design status and maturity. – Measures of drawing and specification progress should be easily available. The engineer must have a plan that includes an estimate of how many drawings are required. – Compare planned tests to actual design for test and verification. – Collect indicators that demonstrate the contractor's status towards meeting planned requirements, demonstration, and design review schedules. – Incremental, internal contractor milestones are usually a good source of information.	Slide #26 <u>Note</u>: The traceability of design requirements is a very important aspect to monitor, and the contractor should have clear records and indicators showing traceability. Likewise, indicators should provide a closed-loop path for the close-out status of test anomalies, particularly those affecting design requirements.
ENGINEERING (Continued) – The configuration of the project design is always a vital area to monitor. – Look for metrics that the contractor will use to establish, maintain, and control the design. Shown are some examples that are common. – Compare actual release dates on drawings required by the design to planned release dates. The contractor should be monitoring the accuracy of the drawings. – Track how many are overdue.	Slide #27

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ENGINEERING • Track how many errors are detected per drawing. – This logic holds for other tasks such as test and/or qualification failure analysis. Find out what engineering tasks are planned for particular project of interest. Then, look for output towards meeting this plan.	Slide #27 (concluded)
MANUFACTURING OPERATIONS • Manufacturing is the functional discipline that takes the engineering design and produces it. – In this context, manufacturing refers to the contractor's manufacturing operations, and is the focal point for the manufacturing system. – This contractor area is typically assigned the responsibility for production and delivery of the Government-requested product (i.e., end item). – The productivity of the process to manufacture is also a key task of this function. – Since NASA missions and corresponding projects have become more and more technically challenging, industry contractors must not only become more productive, but must develop technologies to produce advanced designs.	Slide #28
MANUFACTURING OPERATIONS (Concluded) • The indicators for manufacturing should provide data on the production status of a particular NASA project. For instance, the acquisition contract will specify a required delivery date for hardware and/or software. – The contractor will have an internal plan that targets satisfying this requirement. • A delivery schedule for the end item and/or parts is a good metric. • Schedules for supporting factors such as tooling and fixtures are also good metrics. – Look for indicators reflecting the efficiency of the manufacturing direct labor. Performance indices and engineering labor standards are examples that reveal the status of actual labor progress and provide cost information. – Examine typical contractor-established metrics such as component yield rates and manufacturing capability. Statistical Process Control should be evident in terms of indicators of process capability and individual part quality capability rates.	Slide #29

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SUMMARY OF TYPICAL KEY NASA AREAS • Several contractor functional areas have been focused on during the surveillance of NASA projects. • Examples of these areas are Engineering and Manufacturing. Here is a summary of these areas.	Slide #30 Ask students to list other contractor functional areas.
SOURCES OF METRICS This chart introduces the possible sources of performance metrics. The following four sources are generally available: • The contractor's data • The contractor deliverable data requirements • Feedback from actual operations such as missions • Those gathered by NASA personnel Particular contractors will have different types, scope, numbers and categories of metrics sources.	Slide #31
CONTRACTOR • In a contractor's facility, the contractor is the most obvious source of metrics for surveillance. – The project data used by the contractor should be reasonably already available for Government access. – These data are the contractor's working materials being developed real-time. – The data are comprehensive in that all aspects of the project should be supported. – This type of information is also used by the contractor to make decisions. • Within the contractor facilities, metrics should be available from the project itself. – Project-wide data should be available from the contractor's project office. – Management system data such as quality indicators should be available from the quality department. – Valuable information is available from internal management correspondences (e.g., status reports). In a factory, look for metrics on the "floor" used by the shops.	Slide #32

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CONTRACT REQUIRED • The official source of data for the Government is that specified in the contract by the Contract Data Requirements List (CDRL). – Since NASA pays for the information, it is Government data. – Data submittals are typically for a specific period of time or result from a specific project milestone. – The contractor should be able to justify any data submitted to NASA whether the contractor prepares it or acquires it from suppliers. After all, its what commitments are based on. Technical types of data such as engineering analysis, drawings, and specifications can be included at a detailed level. Contract data such as financial or program status information is often at a summary project level. • In-plant contract data can be obtained in a couple of ways: – The best way to receive the data required for proper surveillance is through the contracting officer's formal data delivery list. – Within the contractor's facilities, courtesy copies are often available from the office of primary responsibility (e.g., the Configuration Plan from the Contractor CM Office).	Slide #33 <u>Note</u>: Data Management will be addressed in a separate training module.
OPERATIONS • The real merit of a finished project product is its performance in the real world. – Did it perform under the mission environment? – Did it perform during Government operation? – Is the total project design properly integrated at the systems level? • There are several possible sources: – Formal mission reports are a good source for the operational data. – Post-mission analysis performed by the Government and in-part supported by contractor analysis and inputs can also provide valuable metrics. – Contractors generally provide courtesy copies of mission support data. • Some data are restricted by the Government in the Government's best interest.	Slide #34 <u>Note</u>: Mission performance data or other project results during Government use, such as special tests at White Sands or Michoud, can provide tremendous feedback to the factory processes.

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INDIVIDUALLY CREATED • It is sometimes appropriate to develop new metrics. – A specific metric should be developed to meet a specific need. For instance, new metrics are often created to trend the results of a particular Government Mandatory Inspection on a project component. – The value of an RMO-generated metric is the independent view point or perspective of contractor performance data. – Individually created metrics can provide missing information needed in surveillance of contractor project operations. • Individually created metrics are prepared by NASA Resident Office employees working similar efforts on the same project or other in-plant NASA contracts.	Slide #35
GOVERNMENT USE/ANALYSIS We have talked about metrics in terms of several selected NASA surveillance areas such as quality assurance and engineering. These areas were discussed in general terms of their functional activities and expected indicators. We also addressed in a conceptual way where we may be able to obtain all the metrics needed to perform our contractor surveillance. Once all of the information is gathered, in paper or electronic format, what is done with it? We'll address the uses shown on this chart.	Slide #36
CONTRACTOR PERFORMANCE SURVEILLANCE The beginning of this module addressed why metrics are needed and, more specifically, several uses of them. This discussion addresses the following: • Contract performance surveillance should permit the verification of the contract terms and requirements. Surveillance metrics should supplement daily verification of current performance. • Metrics can assist in developing project trends for cost, schedule, and technical performance • Trends based on accurate and comprehensive metrics can provide early and timely awareness of problem areas. • Performance metrics provide necessary information to verify satisfactory incorporation of root cause fixes. Corrective action is mandatory to resolve system and project deficiencies.	Slide #37

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CONTRACTOR PERFORMANCE SURVEILLANCE • Metrics are often used in analyzing the overall status of a project – Scrap, Rework, and Repair information is a good indicator of the health of a contractor's quality in the plant as well as on a project. • Metrics can also provide the contracting officer hard contract data for the Government files.	Slide #37 (concluded)
CONTRACTOR PAST PERFORMANCE This second use is one that the Government tends to quickly pass by. • Establishing the past performance of a given contractor is often not given due attention. – The aerospace and space business in particular often seem to see history repeat itself. – Issues repeat themselves not only from one project to the next, but within various phases of a project itself. – Documented metrics provide the data to establish a record of a contractor's performance. • Metrics as past performance data can provide the Government a common basis for competitive comparisons among competing contractors. – These metrics can be used within a contract competition – Past performance data are also used for a given contractor commodity such as airplanes or satellites. • Past performance metrics can be used for future project planning in similar situations. • Also, metrics can be used for developing lessons learned for the successors on the next job.	Slide #38 <u>Suggestion</u>: Open discussion on these uses; are there others of value? <u>Note</u>: Past performance data are often contract sensitive.
TIPS ON USE AND ANALYSIS This section will cover some tips on the use of metrics. • There is no precise procedure or policy on how to use or analyze metrics data. There are some basic common-sense guidelines – Decide what is your need to adequately perform surveillance.	Slide #39 Remember the KISS principle - Keep it simple, silly.

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TIPS ON USE AND ANALYSIS • Recognize the practicality of managing the metric data base. • Keep the set to a reasonable size, look for "Big Picture" indicators. • Select a broad enough base to cover all project surveillance interests. – Determine the sources of metrics. • Existing information available from the contract • Contractor's internal data bases including computer on-line access • Access to automated configuration management accounts • MRB access for defect data • For proper control and tracking, data management techniques should be simple and repeatable	Slide #39 (concluded)
TIPS ON USE AND ANALYSIS (Continued) • As used on this chart, validate means to obtain confidence in the metric source chosen for monitoring. – Baseline can take many forms • It can vary from actually obtaining the metric data and confirming its validity through inspection or analysis. • Baseline may mean using prior experience and/or analysis that demonstrates the accuracy of the data. • The experiences of other RMO team members can be valuable. – Once a baseline is established, the source should be periodically checked. – Look for metrics that can support each other. For example, a manufacturing performance index must be consistent with scrap, rework, and repair rates. – An independent assessment may be needed if the contractor data base is not comprehensive or not clearly justified as to its traceability.	Slide #40 Contractor accounting systems can easily affect the method by which a contractor collects and reports manufacturing direct or touch labor, which is often used in manufacturing and quality metrics. A metric that is based on direct labor is Scrap, Rework, and Repair. Such an indicator is often normalized as a percentage of direct manufacturing labor.

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TIPS ON USE AND ANALYSIS (Concluded) • To serve as a catalyst for corrective action, metric data must be presented for review to the appropriate parties. In most cases, this is the contractor and, of course, the project office. – A set forum for reviewing the data is often the best procedure • This ensures that data are periodically reviewed. • Adverse trends can be identified early and preventive measures implemented. – At such a forum, the contractor should explain any unusual trends or glitches (abnormalities). – A mechanism must be in place for obtaining preventive and corrective action. – Track such actions for closure. – Consider senior corrective Action Boards. – Look for the root cause of the adverse indicator. • Insist on action to implement the solutions. – Understand the remedies considered as well as chosen for action. – Assign actions to responsible parties. – Use metrics to track progress and consistency with contractor analysis. Execute!	Slide #41
SUMMARY OF GOVERNMENT USE/ANALYSIS We have conceptually talked about the Government use of metrics. This chart provides a condensed summary for your quick recall.	Slide #42
EXAMPLES OF PERFORMANCE INDICATORS We will now show some typical examples for the key areas shown here.	Slide #43
PROJECT MANAGEMENT EXAMPLES • These are examples of project management metric types or categories. – Each project's set of metrics may look different and consist of entirely different indicators. – Project cost, schedule, and technical status are other typical indicators for project management.	Slide #44 Choose other sample metrics that may be more appropriate for the particular class of students and projects of interest.

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PROGRAM METRICS SAMPLE 1 • This is a Government-prepared "meatball" or "stoplight" chart that trends the Government's assessment of selected contractor areas of interest. – The key area is management functions. – The metric source is observation by Government personnel. – Government analysis gives each function a color-coded rating each month based on the stated rationale – NASA uses these metrics to assign and track corrective actions.	Slide #45 and 46 <u>Reference</u>: DPRO Pratt and Whitney Assessment of Contractor Operations
MISSION DATA SAMPLE • Mission data are vital to ensuring reliability of design in future manufacturing of deliverables. • Metrics such as this provide a closed loop back to the factory that corrective action was effective for a specific issue or that a new problem has occurred that possibly has a generic design and/or quality impact.	Slide #47 <u>Reference</u>: SSME In-flight Anomalies (IFAs) (95_ifa.PRE)
CONTRACT MANAGEMENT EXAMPLES We'll next look at a couple of contract management metrics. For contract administration or management you can normally expect to routinely see metrics related to proposal and request for proposal activities on a project. Such activity is very important. For our training, however, we have selected a couple different metrics to show other activities in this function.	Slide #48
CONTRACT MANAGEMENT EXAMPLES (Continued) As changes occur on a project, contract changes are required. It is important to track the status of the definitization of these changes in order to be aware of the Government's risk. That is until changes are negotiated, there is cost and schedule risk to the Government for contractor costs incurred. For example, the specific terms of the change have not been negotiated. This particular indicator can also be applied to the overage status of prime and supplier purchase orders. The prime and Government can be at cost and schedule risk until purchase orders are definitized.	Slide #49 <u>Reference</u>: NASA Lewis Contracts Completed Coverage (DPRO/REOS #7)

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ENGINEERING EXAMPLES (Continued) This sample tracks a contractor's change order activity with suppliers and subcontractors. Such an indicator is valuable in several ways. It indicates the level of project activity with suppliers as well as the status in obtaining support needed outside the prime contractor. Inherent in this is the prime's progress in defining the engineering requirements. For example the part or component engineering drawings/specifications and process planning must be definitized before seeking a purchase order.	Slide #50 Reference: ISSA Purchase Order Activity (dpro/reos#12)
QUALITY ASSURANCE EXAMPLES In the quality area, we'll discuss three metrics. Nonconformance costs are the first set and then we'll look at an indicator on Government inspection activity.	Slide #51
NONCONFORMANCE COSTS • Scrap, rework, and repair costs reflect extra effort from that planned. – Scrap costs are those related to the discarding of a part or material. – Rework relates to the effort needed to continue to make the part like the drawing yet remain within engineering tolerances. – Repair generally means the additional or special effort to apply a special process to make the part meet the drawing requirements. • This sample is a contractor's trend of project scrap, rework, and repair costs as a percentage of program costs. Contractors may vary the particular basis of scrap, rework, and repair costs. Many contractors will base the costs on direct (touch) manufacturing labor hours. The intent is to measure the labor and material charges that require effort beyond the planned drawing effort for manufacturing or fabricating the item.	Slide #52 SSME Cost of Quality (366A-1-2/1)
NONCONFORMANCE COSTS (Continued) • This metric specifically addresses the Material Review Board activity. – This sample shows the total of all project material reviews including those of suppliers.	Slide #53 Most contractors will have this type of metric broken down to the part level or even the engineering characteristic.

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NONCONFORMANCE COSTS – Material Review generally refers to the disposition actions for detected part defects that require repair or use as-is. • Rework normally is handled by manufacturing within the labor standard. • Most contractors will have this type of metric broken down to the part level or even the engineering characteristic. It should be noted that the number of MRs does not always equate to the number of defective parts. For instance, several defective parts may be dispositioned on one action.	Slide #53 (concluded) Reference: Material Review Actions (dpro/reos #8)
MANDATORY GOVERNMENT INSPECTION ACTIVITY SAMPLE • Indicators that track the response time for the Mandatory Government inspections can be used to identify potential Government resource issues. – Response time can assist in identifying potential impacts to the project caused by Government involvement. • Government personnel develop variations of this type of indicator that monitors the effectivity of the MGI. – Trend the number of defects per MGI to indicate the value added by the inspection. – Track how many defects are escaping contractor inspection points and being detected at the MGI.	Slide #54 and 55 <u>Reference</u>: Mandatory Government Inspection (dpro/reos #3)
ENGINEERING EXAMPLE METRICS For engineering, there are many types of metrics that can portray the design activity. The areas shown on this slide indicate two of the comment areas for design and configuration activity. We'll show examples for drawing releases, number of ECPs and number of major waivers/deviations.	Slide #56

INSTRUCTOR NOTES	TRAINING MATERIALS AND SUGGESTIONS
ENGINEERING EXAMPLE METRIC: DRAWING RELEASES • This sample shows drawing releases versus the plans trended over a period of time. There are several values to this type of metric. – The metric compares the engineering progress against the project plan. This can easily reflect engineering's schedule performance. Engineering must complete and release the design to other functions such as quality and manufacturing. Such an indicator as this one should indicate how the design is progressing. Will they make it? – The metric provides a trend of engineering drawing release performance. For example, a trend that shows actual releases lagging the plan would portened a project schedule delay.	Slide #57
ENGINEERING EXAMPLE: ECP A common indicator of engineering activity is that of design changes. This sample reflects number of Class I Engineering Change Proposals (ECPs) per month. Usually, a metric is also used to track class II ECPs. Such an indicator reveals: • Engineering designs stability as a trend; an increasing number of changes over time usually indicates the design *is not* maturing. This is particularly important as production phase nears. • An indication of engineering resource workload. In particular, the contractor needs to ensure engineering resources are not only available near term, but adequate to complete the contract requirements.	Slide #58 <u>Note</u>: On an indicator such as this, pay attention to the monthly level of activity, the trend (up or down), and any significant shifts in monthly activity. The contractor should be able to explain any of these points.
ENGINEERING EXAMPLE: WAIVERS As a comparison chart to the previous sample for Class I ECPs, another typical engineering metric is that of number of major waivers or deviations. Because of the significance of either a major waiver or deviation, careful attention should be paid to the contractor's trend in this area. The points made on the previous chart for the Class I ECPs also apply here.	Slide #59
MANUFACTURING EXAMPLE METRICS This next functional area is manufacturing. As expected, a typical indicator would naturally be delivery schedule. But, corrective action and process yields are also typical metrics that deserve manufacturing's attention. We will look at samples of these.	Slide #60

INSTRUCTOR NOTES	TRAINING MATERIALS AND SUGGESTIONS
MANUFACTURING ACTIVITY • In most cases, corrective action is the responsibility of manufacturing to solve hardware process defects. – This example shows the number of corrective action requests trended over time. • The requests are broken down by level of management action. • This type of indicator shows trends in overall quality on a project or company-wide basis. • Many contractors track corrective action under quality assurance.	Slide #61 <u>Reference</u>: SSME Corrective Action Requests
MANUFACTURING EXAMPLE: PRODUCTIVITY This chart shows a very important metric for manufacturing. The contractor should be tracking such an indicator as shown on this slide to portray the yield of his processes. The metric here is trending the yield over a period of time to reflect imporvement towards an established goal. The previous year's performance is used as a baseline as well as the goal.	Slide #62
WRAP-UP • At a high level, this course has covered several aspects of performance metrics. – It defined a metric in a very basic way. • The basic intent of a metric is to provide a baseline and a basis for measurement of contractor performance. – The status of the NASA Agency-level program on contractor metrics was discussed • Expect to hear more from NASA on the pending changes. – Although there is no precise set of key contractor areas for metrics, the more common ones expected from a typical NASA project have been covered. – Possible sources for the metric data were discussed. – How to use metrics for Government surveillance purposes were identified. – Finally, examples of NASA projects were presented.	Slide #63 Ask for comments or questions before proceeding to test questions.