Low Rate Initial Production Quantity Determination

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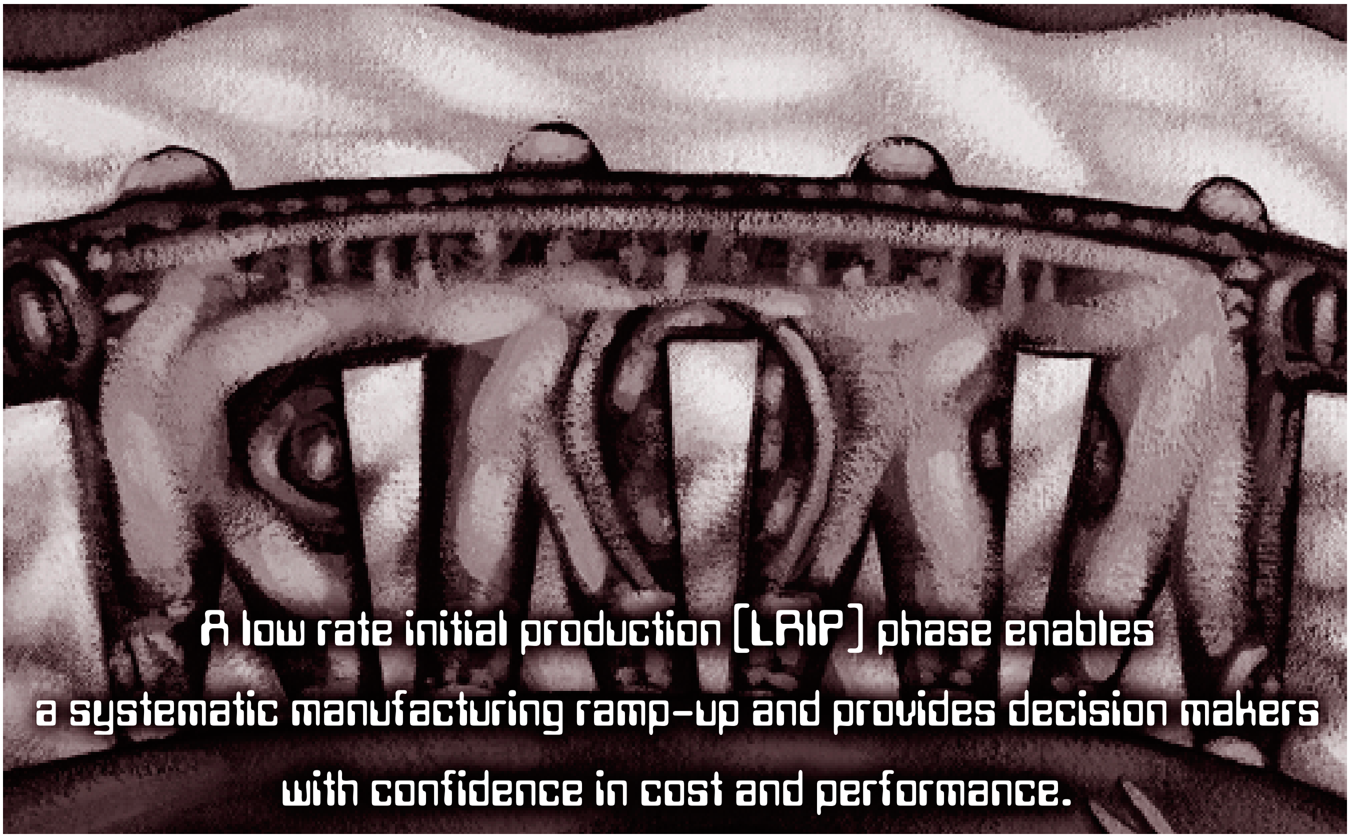

Maximizing value to the warfighter comes through rapidly achieving efficient product delivery rates that minimize program cost and schedule. Full rate production statutory and regulatory requirements, which were designed to assure meeting performance requirements before deployment, can delay efficient production and increase program cost. A low rate initial production (LRIP) phase enables a systematic manufacturing ramp-up and provides decision makers with confidence in cost and performance. LRIP quantity determination can be straightforward; however, it may also be difficult to balance the needs of all stakeholders. Understanding the role of the LRIP provision creates a basis for quantitative analysis leading to an equitable approach to quantity determination. The result should maximize the benefits of LRIP, while minimizing program cost, schedule, and execution risks and impacts.

Discussions of LRIP are usually replete with acrimony and misconception. Most major system program managers have been told (or assume) that LRIP quantity is 10 percent of the production quantity. But this is a guideline, not a rule. Further, the interrelationship between the operational test and evaluation (OT&E) requirements and the PM's program strategy development and planning as approved by the Milestone Decision Authority (MDA) is also often confused. The test community wants to make sure the product is right and minimize the dollars spent on non-performing systems. The MDA wants to field the best capability as soon as practical and at minimum cost. Understanding the role of the LRIP provision limits the conflict and provides boundary conditions for quantitative analysis. The quantitative analysis will, in turn, provide decision support in maximizing the benefits of LRIP while minimizing program schedule and cost impacts.

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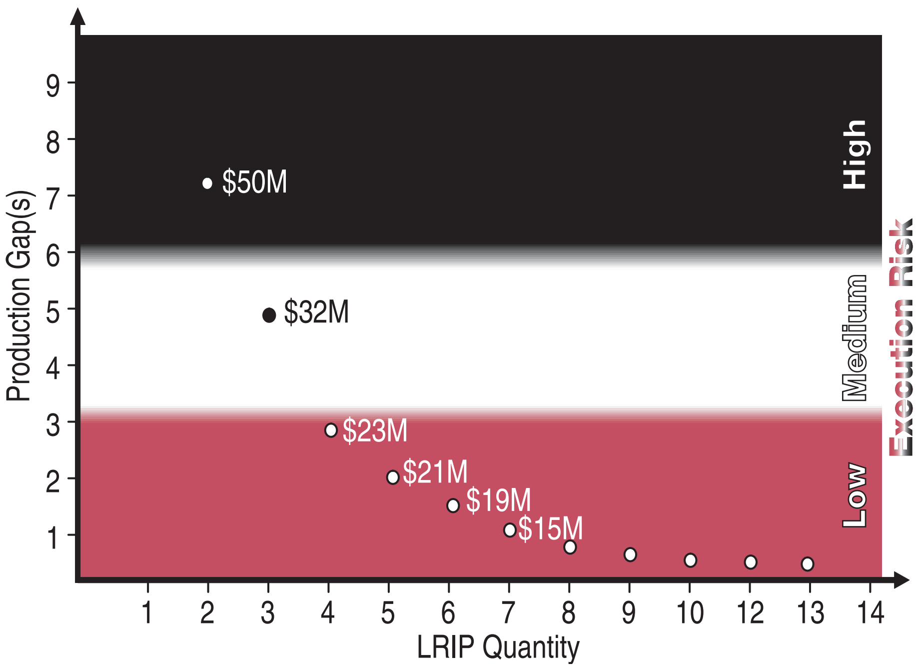
LRIP Quantity Impact Analysis Summary



Understanding LRIP

Title 10 of the United States Code defines the role of LRIP as determining the minimum quantity of articles necessary to:

- Provide production configured or representative articles for operational tests
- Establish an initial production base for the system
- Permit an orderly increase in the production rate for the system, sufficient to lead to full-rate production upon successful completion of operational testing.

Sections 2399 and 2400 of Title 10 address LRIP quantity determination from the perspectives of the director, OT&E (DOT&E), and MDA respectively. The two sections define the acquisition responsibility/authority and control process in which the LRIP quantity is determined. Section 2399 provides for the DOT&E to establish the quantity of articles required for operational testing; Section 2400 provides for the MDA to determine the quantity of articles to be procured as LRIP. The MDA's determination (architected by the PM) must consider factors that include the OT&E requirement as well as program risk and cost effective program execution. The two quantities will almost always be different, with the MDA's selection usually being higher to provide additional production units above the minimum DOT&E quantity. At times, the MDA number exceeds 10 percent of the production quantity.

The 10 percent guideline provided by the law is just that: a guideline, not a fixed maximum or minimum. The nature and structure of the program must be considered and analyzed to weigh the requirements of the acquisition process constituents, while balancing cost, schedule, risk, and execution performance of the program. The law states explicitly that if the quantity exceeds 10 percent of the total number of articles to be produced, the secretary of defense must include in the statement (part of the first selected acquisition report) the reasons for such quantity. While the law further defines special cases for ship and satellite acquisitions, this article doesn't specifically address those issues.

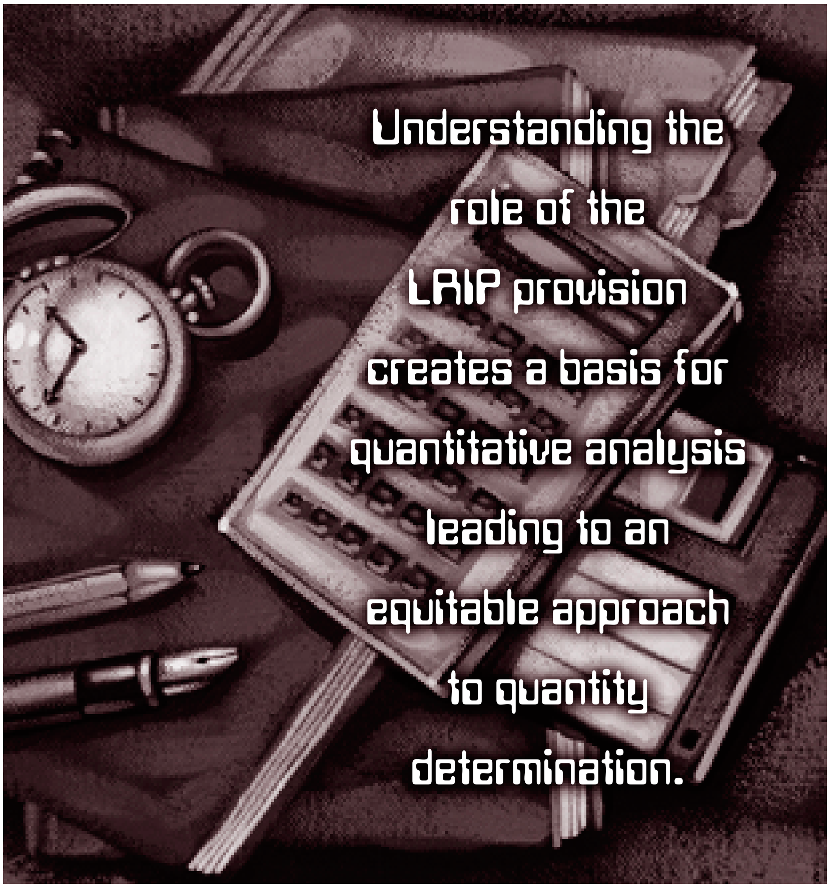
The traditional approach to LRIP determination goes something like this: First take the DOT&E requirement and add the quantity the program requires for transition to production; second, see if that the number is less than 10 percent of the total production quantity, and if it is, press on. But what if the number is greater that 10 percent, or the production lot size is small—so small that 10 percent makes no programmatic or economic sense? Or what if the resulting production break seriously and negatively impacts the program cost and risk? This is where the acrimony begins, and the resulting negotiations with constituents of competing priorities usually serve to harden their positions.

A Quantitative Approach to LRIP

A method successfully employed on a recent major defense acquisition program (MDAP) acquisition category (ACAT) 1D program used a quantitative approach. [*An ACAT ID is one for which the MDA is the under secretary of defense (acquisition, technology and logistics).*] The program was an electronics modification effort to a small fleet of combat assets. Program schedule was constrained to meet an external statutory mandate. The high-cost technical infrastructure required for development and testing was at risk of going idle and accruing cost if an extended production break occurred. The DOT&E requirements were met within the 10 percent guideline, but the cost and schedule impact risk of the anticipated production break had initial LRIP estimates as high as 80 percent of the production quantity (because of the small fleet size) to eliminate the production gap.

The method took the form of a risk analysis incorporating expected monetary value (EMV) techniques for management decision support. The steps of the analysis generally were as follows:

- Develop an integrated master schedule (IMS). The level of IMS detail must provide prime and subcontractor de-



velopment, lead time, fabrication, assembly, test, and installation activities with well-defined resource utilization and cost deltas.
- For decreasing LRIP quantities, starting at a quantity that does not cause a production break, determine and document the length of the production break for each LRIP quantity.
- Determine the cost or delta cost from a baseline of the LRIP and production phases of the program for each scenario.
- Assign risk metrics (high, medium, low) to qualitative factors such as parts obsolescence per unit time (e.g., 0–3, 3–6, above 6 months) and skilled worker retention per unit time (e.g., 0–3 months, 3–6 months, above 6 months).
- Lay out the resultant data as shown on page 49.

At this point, we can use EMV techniques to establish a cost-avoidance, worst-case value. Let's assume the development effort was on the order of $100 million and that the probability of OT&E's surfacing a deficiency that would cause a total redesign of the item is 50 percent. Then by EMV, we have a $50M risk ($100M x 50 percent = $50M). This is clearly an extremely conservative worst-case scenario, but it's what was actually used for this analysis.

Keep in mind that the combined Title 10 Section 2399/2400 goals are structural (program) risk reduction with checks and balances—that is, structuring the program such that maximum risk reduction/avoidance results. In this case, the underlying concept is to reduce the commitment to early production activities until OT&E reports suitability for use. We established above that the worst-case risk value we attribute to the OT&E activities is $50 million. The price paid for this risk reduction is the resulting production gap that accrues from the LRIP. With the data laid out as we did on page 49, we can now clearly determine how much we want to pay for this "insurance policy." Is it reasonable to pay a $50 million premium for an insurance policy with a $50 million payoff, while at the same increasing program execution risk (high) because of the qualitative factors of parts obsolescence and skilled worker retention? Definitely not. How about a $24 million premium and lower risk? Perhaps. It's important to remember that the cost outlined above is only the cost accrued to the production gap; other costs associated with OT&E testing and other government fixed and variable costs during the testing and gap period must be accounted for too. The method provides a way to structure and depict complex and interrelated data such that a decision maker can clearly visualize cost, schedule, and program execution risk issues in a single illustration.

For our example, it was determined reasonable to set the LRIP quantity to four, which represented 20 percent of total production and maximized the goals of and benefits to the OT&E team, while reducing the cost, schedule, and program execution risk to an acceptable level. There are no generally accepted guidelines for addressing reasonable EMV impact resulting from LRIP. This means each case is a negotiation. Methods as described in this paper increase clarity by simplifying the analysis and presentation of LRIP quantity determination.

Major system PMs have to address many issues in developing and coordinating their program plans and accomplishing their acquisition milestones. LRIP quantity determination is one key aspect of program planning. A quantitative risk analysis approach based on IMS and EMV and risk assessment techniques will result in an LRIP quantity that is clear, defendable, and that maximizes the benefits of the provision for LRIP, while minimizing the cost, schedule, and execution performance impacts to programs.

Editor's note: The authors welcome questions and comments. Contact Strauss at jstrauss@xcelsi.com and Dorr at robert.dorr@ngc.