Air Force managers have the information they need to measure the impact of funding cuts on various commodities (spares, equipment, and consumables) when compared to base-level readiness. What is still needed are tools to trade off one commodity for another or one resource (people, fuel, ammunition, spares, and so forth) for another.

contemporary issues

Logistics Support: Relating Readiness to Dollars

Contemporary Issues, in this edition, presents "Logistics Support: Relating Readiness to Dollars." In this article, Dr Douglas J. Blazer and Lieutenant Colonel Jeoffrey D. Sloan discuss relating funding to operational capability.

In the 1980s it became clear the Air Force logistics community needed a way to link dollars to readiness for the resources managed: spares, equipment, and consumables, as well as munitions and fuel. Since then, a number of models and tools have been developed. Today, there are four major models in use.

- Aircraft Availability Model
- Aircraft Sustainability Model
- Equipment Prioritization Model
- Customer-Oriented Leveling Technique

Blazer and Sloan examine each of the models and describe how each is used, along with individual strengths and weaknesses.

They make a number of salient points as they conclude the article. First, the Air Force now has the tools to relate funding to base-level supply performance. Second, these tools are currently being used to optimally determine what to buy, repair, and distribute. Third, as the Air Force moves to an enterprise management posture the tools available will become more important. Fourth, Air Force managers have the information they need to measure the impact of funding cuts on various commodities in terms of base-level readiness. Fifth, the logistics community needs tools that can analyze commodity or resource trade-offs. Finally, with the formation of the Global Logistics Support Center, development of the next generation of models that can be used to manage multiple resources across an enterprise is anticipated.

Douglas J. Blazer, PhD, LMI
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relating readiness to dollars

Logistics Support

The Air Force now has tools that relate dollars to base-level supply performance and can be used to trade off readiness against dollars. These tools are currently being used to optimally determine what to buy, repair, and distribute with available dollars. As the Air Force moves to an expeditionary combat support enterprise solution, these tools, and tools like them, will become more important.

How to Make Logistics Decisions

Air Force decisionmakers at all levels need tools that relate dollars to operational capability. For example, if the Air Force has $100M, where should it be spent to achieve the most combat capability? A more strategic question is whether to spend the $100M on weapon systems, logistics support, or people.

In the 1980's, the Air Force logistics community realized it needed a way to link dollars to readiness for the resources it managed—spares, equipment, and consumables, as well as munitions and fuel. Since that time, a number of models have been developed to do just that—link dollars to readiness for Air Force-managed peacetime and wartime spares, equipment, and consumables. In this article we briefly discuss the four major models and how they can be used (see Table 1).

In the late 1980s, the Air Force implemented the Aircraft Availability Model (AAM) as part of the Secondary Item Requirements System (D041 then, now D200A) in order to compute the safety-level component for Air Force spares. It has been used since then and continues in use today. The AAM models the complexity of the Air Force spares logistics system. It is a multi-echelon model that maximizes aircraft availability (total nonmission capable supply) given some level of funding. It also models depot- and base-level repair and resupply (retrograde and order and ship times) to a given operations tempo (usually flying hours). Further, AAM includes the spares indenture levels—only shortages of line replaceable units (LRU) will directly ground a weapon system, while shop replaceable units are needed to ensure LRUs are serviceable.

Article Acronyms

AAM – Aircraft Availability Model
AA – Aircraft Availability
ACC – Air Combat Command
AEF – Aerospace Expeditionary Force
AFMC – Air Force Materiel Command
ASM – Aircraft Sustainability Model
COLT – Customer-Oriented Leveling Technique
CRSP – Consumable Readiness Spares Package
CWT – Customer Wait Time
DLA – Defense Logistics Agency
EBO – Expected Back Orders
ECWT – Expected Customer Wait Time
ERS – Equipment Requirements System
FAD – Force Activity Designator
FRAT – Funds Requirement Analysis Tool
FY – Fiscal Year
GSD – General Support Division
LRU – Line Replaceable Unit
MAJCOM – Major Command
MDS – Mission Design Series
PEC – Program Element Code
RSP – Readiness Spares Package
SA – Supply Availability
SBSS – Standard Base Supply System
WMP – War Mobilization Plan

The AAM uses marginal analysis to build aircraft availability (AA) curves, which can then be used to identify and prioritize what spares to buy with available dollars. Under AAM, the item which creates the largest increase in aircraft availability per dollar (marginal analysis—*bang per buck*) is the next item selected to buy.

Figure 1 illustrates an AA curve and shows that for a given weapon system (or group of weapon systems) the Air Force needs $235M in spares funding to achieve 95 percent aircraft availability. Decreasing the amount of funding by $25M decreases aircraft availability to 94 percent. Figure 2 shows the AA analysis for four weapon systems. This illustrates how Air Force decisionmakers can determine where to take the funding cut and what the impact would be on each weapon system. For example, the Air Force may decide it is better to decrease the B-1 AA by 1.6 percent than to reduce the AA for any of the other weapon systems.

Model	Commodity	Readiness Measure
Aircraft Availability Model (AAM)	Peacetime Reparable Spares	Aircraft Availability
Aircraft Sustainability Model (ASM)	War Time Reparable Spares and Consumables	Aircraft Availability, Sortie Capability, S-ratings, Issue Effectiveness (for Consumables)
Equipment Prioritization	Equipment	Fill Rate, S-Ratings
Customer Oriented Leveling Technique (COLT)	Peacetime Expendable Items (DLA Managed)	Customer Wait Time, Expected Back Orders

Table 1. Tools to Link Readiness to Dollars

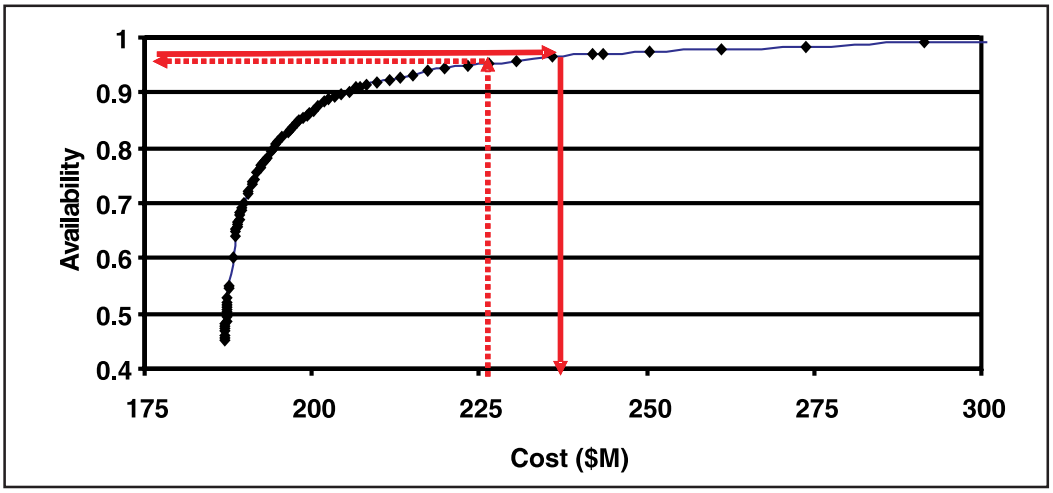

Figure 1. Aircraft Availability Curve

Category	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6	Tier 7	Tier 8
SPRS									
All Use Codes	100%								
Use Code A (Mobility)									
FAD 1, 2, and 3		90%	90%	90%	92%	94%	96%	98%	100%
FAD 4 and 5		80%	90%	90%	92%	94%	96%	98%	100%
Use Code C (Joint Use) and Use Code D (WRM)									
FAD 1, 2, and 3		90%	90%	90%	92%	94%	96%	98%	100%
FAD 4 and 5		80%	90%	90%	92%	94%	96%	98%	100%
Use Code B (Support Equipment)									
FAD 1, 2, and 3		80%	90%	90%	92%	94%	96%	98%	100%
FAD 4 and 5		65%	80%	90%	92%	94%	96%	98%	100%

Table 2. Prioritization Tiers

Aircraft Sustainability Model

The Aircraft Sustainability Model (ASM) uses similar logic to the AAM to compute requirements for wartime spares. It computes the minimum cost mix of spares to support a squadron for a 30- or 60-day wartime (War Mobilization Plan [WMP] 5) requirement to a given direct support objective target (which is the number of available aircraft). For example, ASM can be used to compute and assess the spares needed for an F-16 readiness spares package (RSP) to support a 30-day WMP requirement to achieve a 75 percent AA at the end of day 30. ASM is also used to provide a squadron's Status of Resources and Training System S-ratings given a level of spares for an RSP.

ASM has a capability, albeit more limited than the AAM, to link readiness to dollars. ASM is geared for the squadron level—for example, what spares should be bought to increase F-16 availability for a given squadron. Work is ongoing to expand ASM's capability to conduct fleet-wide assessments. An ASM has been built to compute RSPs for expendable items. It provides the least-cost mix of consumable items to meet a given (85 percent) issue effectiveness target.

Equipment Prioritization Model

Historically the Air Force has only received 40 to 50 percent of the funding required for support equipment buys. To make matters worse, there was no way to prioritize what portion of the equipment to buy with the available (less than full) funding. To correct this problem, the Air Force recently implemented the Logistics Management Institute and Air Force Logistics Management Agency-developed Equipment Prioritization Model in the Equipment Requirements System (ERS). This model uses marginal analysis to maximize the number of organizations' equipment fill rates, thereby maximizing the number of fully mission ready (S-rating) by force activity designator (FAD) and use code. Figure 3 illustrates how the Equipment Prioritization Model works.

The model prioritizes to increase the fill rate the most per

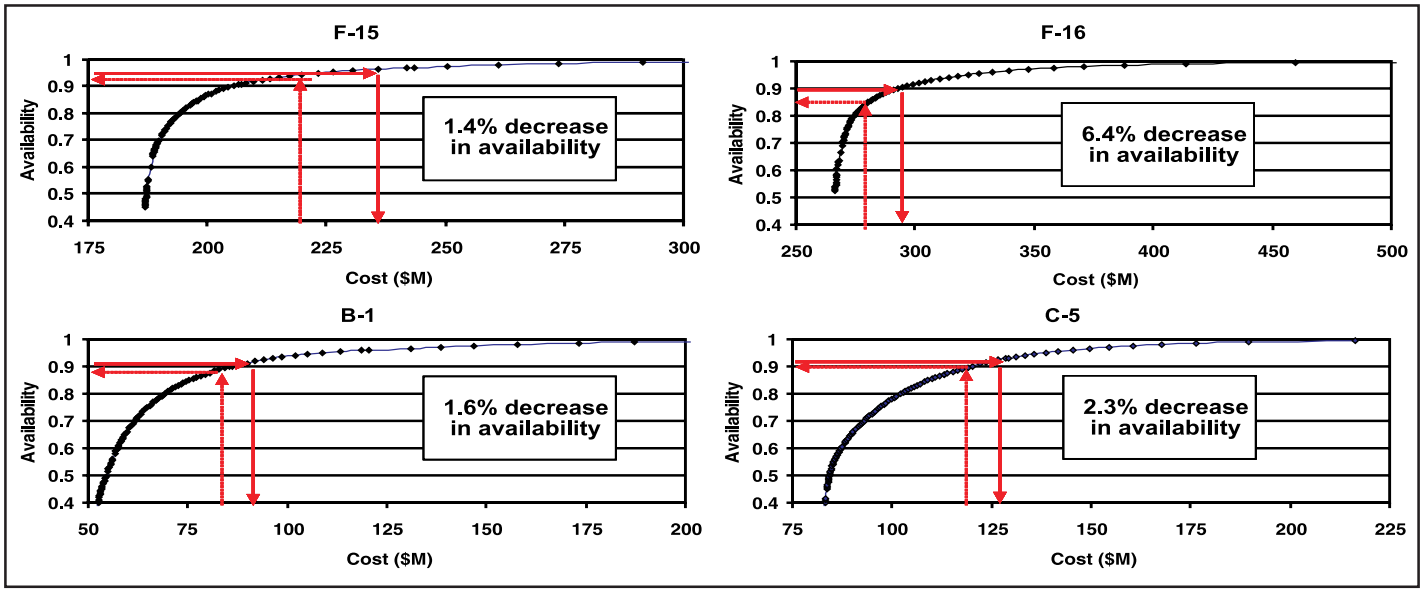

Figure 2. AA Curves - Four Weapon Systems

dollar. It prioritizes FAD 1, 2 and 3, use code A (mobility) organizations to a higher fill rate target than FAD 4 and 5 organizations. Use code C and D (war readiness materiel) is prioritized next and then use code B (peacetime). The model buys the items up to the fill rate target by *priority bucket* and then, like a waterfall, starts buying assets in the next bucket. Finally, when all of the buckets in a tier meet their fill rate targets, the model starts again at the top for the next tier. In this way, it still buys items for the lower priority units. The model optimizes the number of mission ready mobility and war reserve materiel organizations without neglecting the peacetime requirements. Table 2 shows the prioritization tiers.

The model can be, and is used to:

- Prioritize the equipment buy requirement
- Distribute and redistribute malpositioned equipment
- Prioritize repair
- Allocate operations and maintenance buy dollars

In the past, the Air Force allocated equipment funds to the major commands (MAJCOM) proportional to their gross requirements. If the Air Force received 50 percent funding, the MAJCOM with the greatest authorization total would get the largest share of the funds. For example, if Air Combat Command (ACC) had 70 percent of the gross authorizations, it would receive 70 percent of the available funds. With this is mind, we compared three alternative ways to allocate the available funds—the gross requirement, existing *holes* (net requirement), and the enterprise method (using the Air Force prioritization model).

Figure 4 provides an example comparing the gross requirement baseline to allocating using the net requirement.

In our simple example, Case 1 has 10 authorized and 9 in-use (on-hand) so it needs 1 item. Case 2 has 8 authorized and 4 in-use, so it has 4 holes. The gross authorization method would fund Case 1, since it has the most authorizations, whereas the net requirement would fund Case 2 since it has the most shortages. The gross requirement does not consider the asset position, so fully mission capable organizations could still be allocated funds over units that are not fully mission capable (rated S-2 or lower).

Next we compared the holes versus the enterprise allocation method (see Figure 5).

Case 1 has 1,014 authorized and 108 holes for a fill rate of 89 percent. The organization is a FAD 4, use code B (peacetime) priority. Case 2 has 400 authorized and 92 holes for a 77 percent fill rate for a higher priority requirement (FAD 2, use code A, mobility). The Holes allocation method would allocate to the

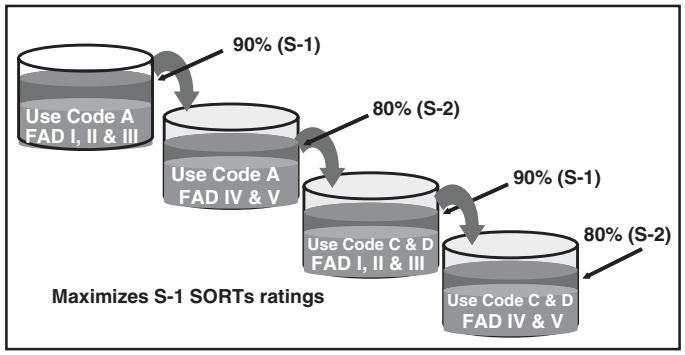

Figure 3. Equipment Prioritization Waterfall

Case 1 Authorized 10, In Use 9 (1 Hole)
Case 2 Authorized 8, In Use 4 (4 Holes)
Gross would fund Case 1 before Case 2
Gross allocation does not consider asset position

Figure 4. Example: Authorized (Gross Requirement) Versus Holes (Net Requirement)

Case 1 Authorized: 1,014; Holes: 106; Fill Rate: 89% FAD IV Use Code B
Case 2 Authorized: 400; Holes: 92; Fill Rate: 77% FAD II Use Code A
Holes would allocate to lower priority need (Org 1) before FAD II Use Code A
Holes method does not consider mission Importance

Figure 5. Holes Versus Enterprise

lower priority need (Case 1). The net requirement does not consider the importance of the shortage to the mission.

Figure 6 shows the differences in the allocation based on actual fiscal year 2006 (FY06) funding and asset position. Note the enterprise method allocates more to Air Mobility Command and Pacific Air Forces since they have relatively more net requirement (holes) and more high-priority shortages.

Figure 7 displays the number of S-1 rated (90 percent fill rate or higher) organizations by MAJCOM that could result from a funding allocation (using the Air Force prioritization model to optimally determine what to buy with the allocated funds). The starting position is the number for S-1 organizations with existing (as of FY06) assets before any buy funds are allocated. With the gross requirement, some MAJCOMs cannot get all of their organizations to S-1 (at least to the 90 percent fill rate). The gross requirement does not consider shortages, so funds are not allocated to some MAJCOMs that have relatively low fill rates. With the net holes allocation method, all MAJCOMs expect that Air Force Materiel Command (AFMC) can have all of their organizations achieve an S-1 rating. With the enterprise method, all MAJCOMs can have all of their organizations achieve the S-1 rating.

The Air Force has approved using the enterprise method to allocate available equipment buy funding and is programming that capability into the ERS. Note some equipment buy funds are allocated by program element code (PEC) or some other program (modernization replacement) constraint. ERS will allocate funds to fit the appropriate (PEC or program) constraint. That is, if a certain amount of funds is allocated to a certain PEC, then ERS will optimally allocate to those MAJCOMs within that PEC.

Customer-Oriented Leveling Technique

The Customer-Oriented Leveling Technique (COLT) sets consumable (Defense Logistics Agency [DLA]-managed) levels for the Air Force depot and bases to minimize customer wait time (CWT) constrained by available dollars. It relates General Support Division (GSD) stock fund dollars to base-level (time-weighted) expected back orders (EBO) and CWT. In this way managers can relate available dollars to base-level performance. COLT can:

- Link to the DLA wholesale level to reduce the total cost of DLA and base levels to reach a given base CWT target
- Determine how to allocate GSD funds to equalize or target support by MAJCOM, base, or weapon system (for example, provide higher levels of support for contingency bases)
- Identify funding trade-offs for unexpected needs (in the year of funds execution)
- Determine the next item to buy to decrease CWT from an Air Force perspective

Linking Base and DLA Levels

Currently DLA sets (wholesale) levels to achieve an 85 percent supply availability (SA) (off-the-DLA-shelf fill rate) target. COLT then uses that expected (depot delay) DLA performance with the 85 percent SA target to set base levels. For example, if the DLA level for an item is relatively high and therefore there is little expected depot delay (most requests are filled immediately), then

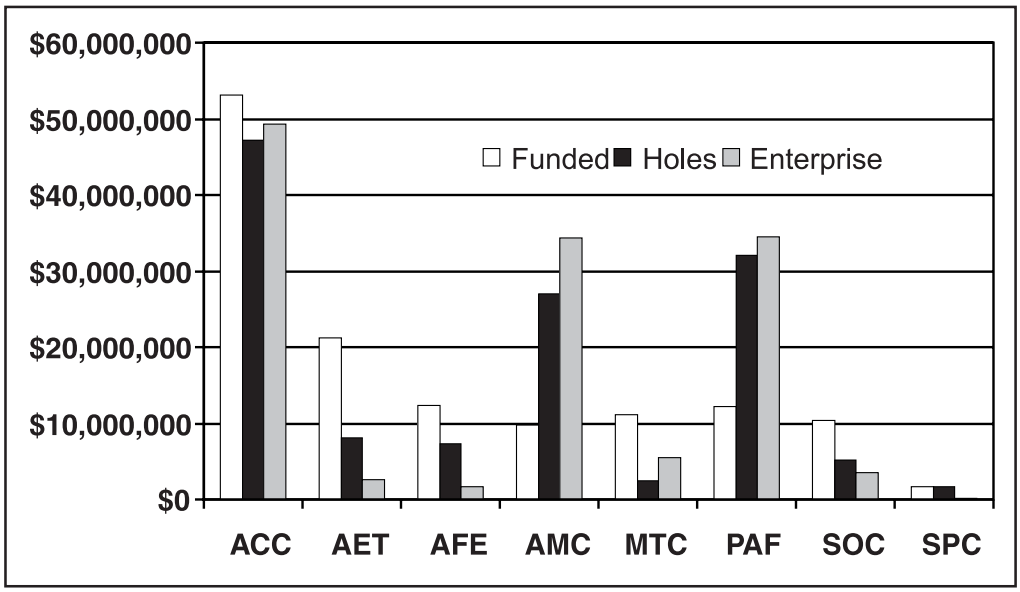

Figure 6. Funding Allocation by MAJCOM

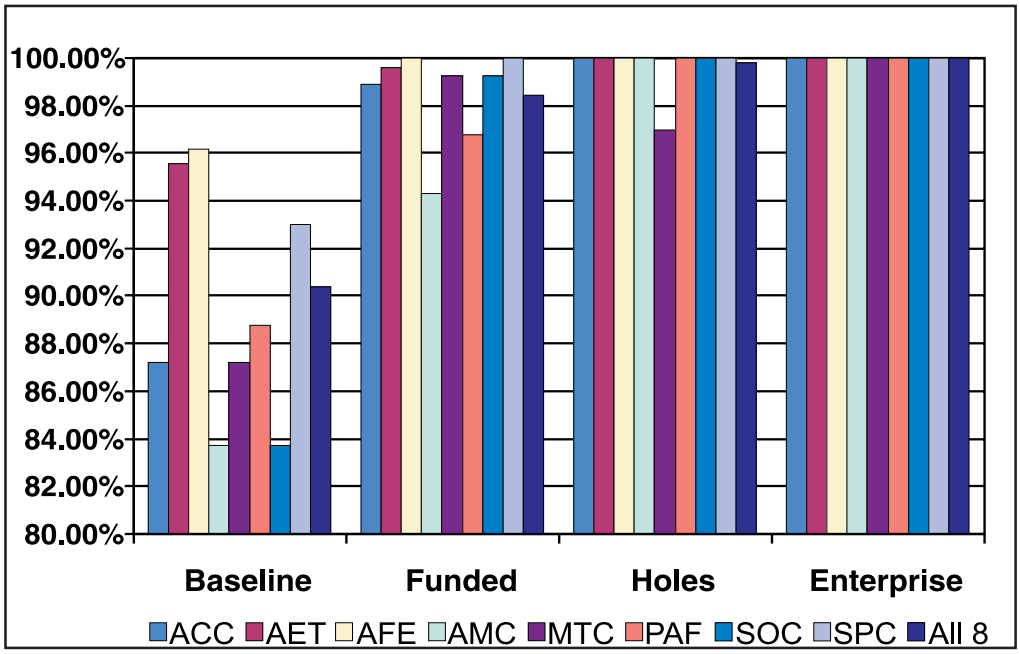

Figure 7. Percentage of SORTS 1 Organizations

COLT would stock less at the base. If DLA increased its SA target, COLT might reduce its base level (see Figure 8).

The question is what level of DLA SA target will result in the least overall (DLA and base) inventory investment—combined level. The Air Force is working with DLA to explore enterprise models (not just COLT) that address this question.[1]

Equalize or Target Support

COLT provides the opportunity to equalize or target support across the enterprise. The Standard Base Supply System (SBSS) levels (and SBSS levels of funding) do not equalize support. Table 3 provides an example for two C-5 bases, Dover and Travis AFB. COLT is constrained by the amount of funds that SBSS would spend at a base (COLT is run to be cost neutral at a base). Using the SBSS obligations, COLT provides unequal support—an expected CWT (ECWT) of .83 days at Dover and .68 days at Travis.

By changing the funding allocated to each base (without changing the overall obligation funding), COLT can provide equal support—.78 days. However, to do so requires Dover to receive some ($.95M) obligation funds from Travis. The Air Force can use COLT to allocate available funding to provide equal COLT performance (see Figure 9).

Without changing the Air Force obligation total, COLT can better allocate funds to various bases to equalize support.

COLT can also optimize CWT across the enterprise. In fact, the Air Force does so for the air logistics centers (ALC). Figure 10 shows how the Air Force sets COLT levels for the three ALCs. AFMC runs COLT for all three ALCs as if there were a single ALC. COLT then uses overall available ALC funding to set levels to minimize CWT across the ALCs. The result is the lowest overall CWT, but not equal CWT for each ALC.

To illustrate further, refer back to Table 3. The middle row shows the *merged* results for Dover and Travis. Running COLT merging the two bases into *one big base* results in the minimal overall CWT of .75 days. In summary, the Air Force can use COLT as a tool to allocate GSD stock fund dollars to optimize the enterprise CWT, to equalize support across the bases or to target support to various bases. Basically COLT provides the opportunity to take an

Run	Base	Total Obligations	COLT ECWT	DL ECWT
Baseline	Dover	$8.77M	0.82	2.18
Baseline	Travis	$8.66M	0.68	2.33
Merged	Both	$17.43M	0.75	2.25
Match CWT	Dover	$9.73M	0.78	2.18
Match CWT	Travis	$7.70M	0.78	2.33

Table 3. C-5 Example

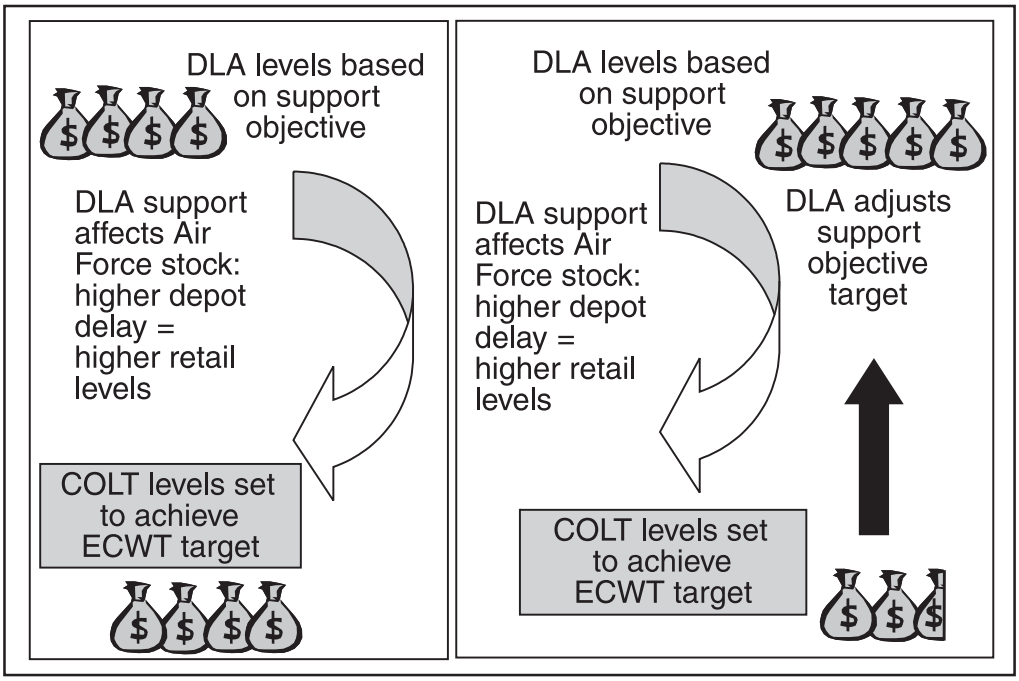

Figure 8. DLA COLT-Linked Levels

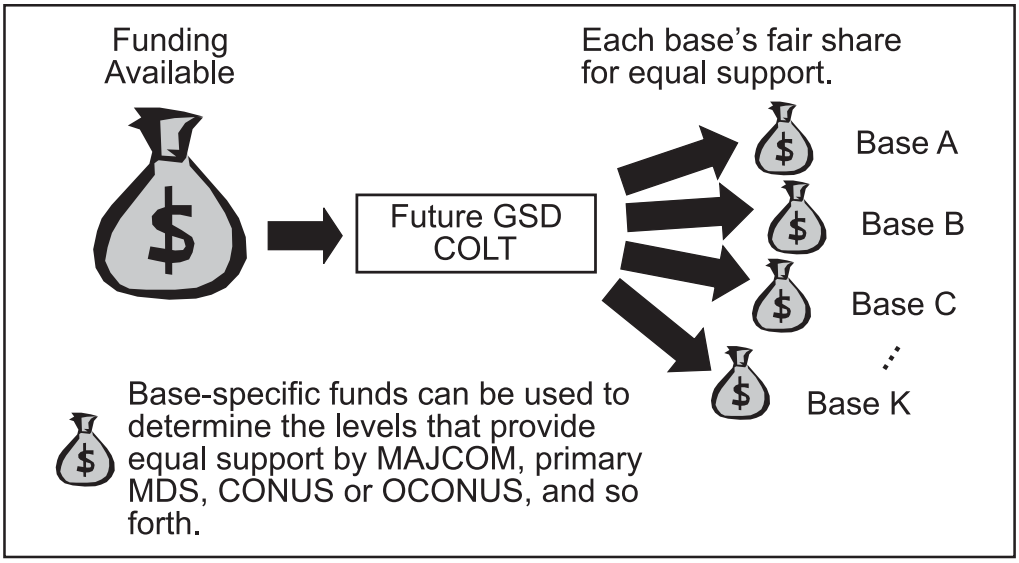

Figure 9. Optimal Merged Levels

enterprise view (instead of a base view) for stock fund management and level setting.

Funding Trade-Offs

COLT can provide stock fund managers with the information they need to make funding trade-offs.

As Figure 10 shows, COLT can optimally ration the amount of funds left after funds are taken for some other higher priority use. For example, if the Air Force needed some amount of funds for a new stockage policy initiative, COLT can identify the impact on ECWT (and EBOs) of taking money from selected bases, or from each base Air Force-wide.

For example, the Air Force recently set a policy to replace mobile bench stocks with consumable readiness spares packages (CRSP). CRSPs require stock fund dollars to implement and the Air Force wanted to implement CRSPs for the Aerospace Expeditionary Force (AEF) 5/6 rotation. The initial creation of the CRSP required an investment of stock fund dollars. COLT can identify prospective trade-offs for funding. In Table 4 we show three possible options to obtain this funding:

- Taking it all from the home station
- Taking it from the ACC bases using the same mission design series (MDS)
- Taking it from all active duty bases using the same MDS

As expected, when taking all the funds from a single base, the impact (in ECWT) is relatively large on that base. Spreading out the costs to multiple bases (based on the number of mission squadrons) reduces the impact to any one base and overall. Estimates of the four CRSPs needed for the next AEF rotation are $800K.

Buy Prioritization

Just as COLT can be used to allocate funds, it can also be used to execute (determine what items to buy with) those funds. In fact, we've developed a tool—the Funds Requirement Analysis Tool (FRAT)—that optimally determines the next item to buy if there are insufficient funds to buy the total requirement. FRAT currently is a base-level tool, it prioritizes all the shortages at a base and, given a level of funding, it will create requisition transactions to buy the items that result in the minimum CWT. (Note, this does not change the COLT levels—the requirement—rather it determines what portion of that requirement to buy.)

COLT also provides the opportunity to determine what DLA-managed items to buy next for a group of bases, a MAJCOM, a weapon system, or Air Force-wide. For example, rather than the next item to buy for the F-15 at Langley AFB, what item should the Air Force buy to reduce F-15 CWT Air Force-wide?

Summary

The Air Force now has tools that relate dollars to base-level supply performance and can be used to trade off readiness against dollars. These tools are currently being used to optimally

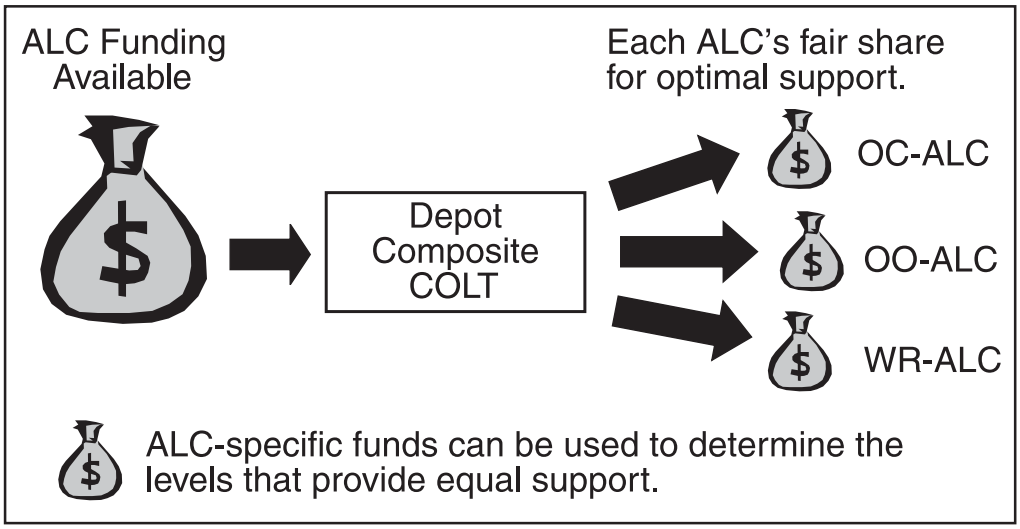

Figure 10. Optimized Levels Current Depot COLT

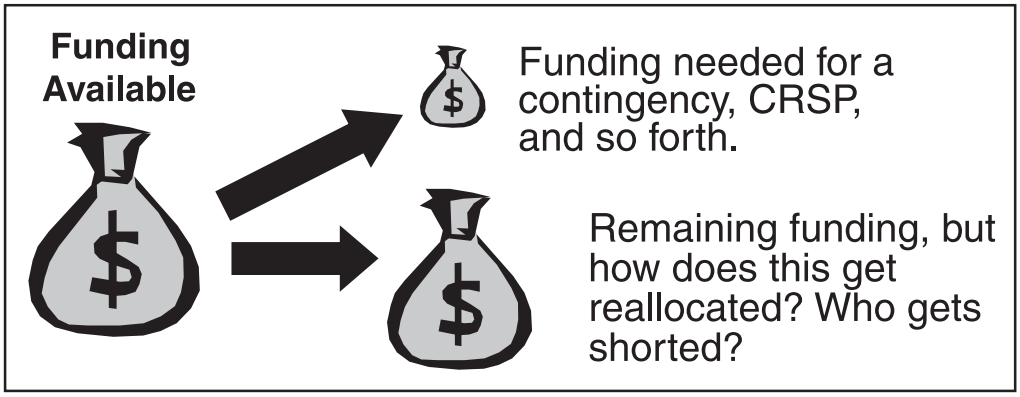

Figure 11. Sourcing Shortages

Option	Bases	Levels Change	ECWT Change
Home Station	Total	22.3K (3.2%)	+0.067 (8.2%)
	Mt Home (100%)	22.3K (3.2%)	+0.067 (8.2%)
ACC	Total	21.3K (1.4%)	+0.025 (3.0%)
	Mt Home (33%)	6.4K (0.9%)	+0.020 (2.4%)
	S-J (67%)	14.9K (1.8%)	+0.029 (3.5%)
Active	Total	18.7K (0.5%)	+0.012 (0.9%)
	Mt Home (17%)	2.8K (0.4%)	+0.009 (1.1%)
	S-J (33%)	7.1K (0.8%)	+0.013 (1.6%)
	Elmendorf (17%)	4.1K (0.3%)	+0.008 (0.4%)
	Lakenheath (33%)	4.8K (0.6%)	+0.019 (1.2%)

Table 4. F-15 CRSP Example

determine what to buy, repair, and distribute with the available dollars. As the Air Force moves to enterprise management organization and systems, these tools, and tools like them, will become more important.

Air Force managers have the information they need to measure the impact of funding cuts on various commodities (spares, equipment, and consumables) to base-level readiness. What is still needed are tools to trade off one commodity for another or one resource (people, fuel, ammunition, spares, and so forth) for another. With the formation of the Global Logistics Support Center, an organization that will need and use the existing models to make enterprise decisions, we anticipate the development of the next generation of models to meet the information needs to manage multiple resources across the enterprise.

Notes

1. An 85 percent SA does not mean every item will have an 85 percent fill rate. Rather, it means that, overall, DLA will satisfy 85 percent of item requests from off-the-shelf stock. Some (relatively inexpensive) items will have fill rates higher than 85 percent and some lower. COLT minimizes CWT, so COLT will stock relatively less of an item with little depot delay.

Douglas J. Blazer, PhD, is a program manager for the Logistics Management Institute. He is a recognized expert on matters concerning the Air Force supply system. He is also a frequent contributor to the Air Force Journal of Logistics.

At the time of writing, Lieutenant Colonel Jeoffrey D. Sloan was the Deputy Chief, Logistics Studies Innovation Division, Air Force Logistics Management Agency. He is a career maintenance officer and is currently the Commander, 8th AMXS, Kunsan AB, Korea.

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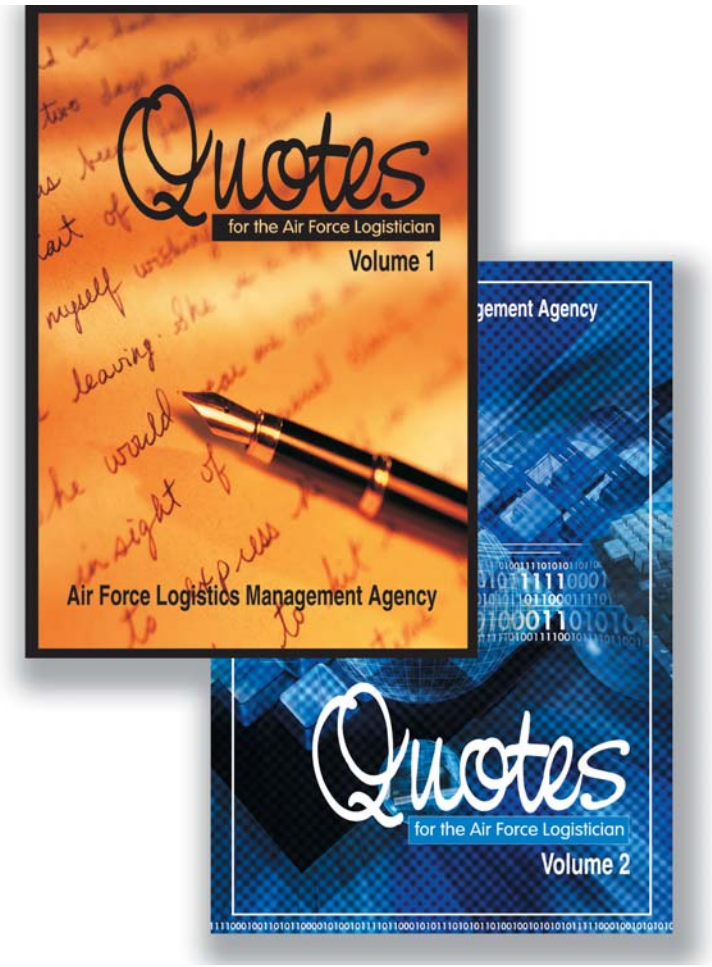

Why a set of quotations for Air Force Logisticians? An obvious answer is there isn't one. But that's not the only reason, and it's certainly not the most important reason. The primary reason for producing this set was to provide a teaching resource that can be used in classrooms, education, training, and mentoring programs for Air Force logisticians. It is a tool that can be used by instructors, teachers, managers, leaders, and students. It is also a tool that can be used in research settings and a resource that should stimulate comment and criticism within educational and mentoring settings. Copies of the set are provided free of charge to any Air Force logistician, educational institution, teacher, instructor, commander, or manager.

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