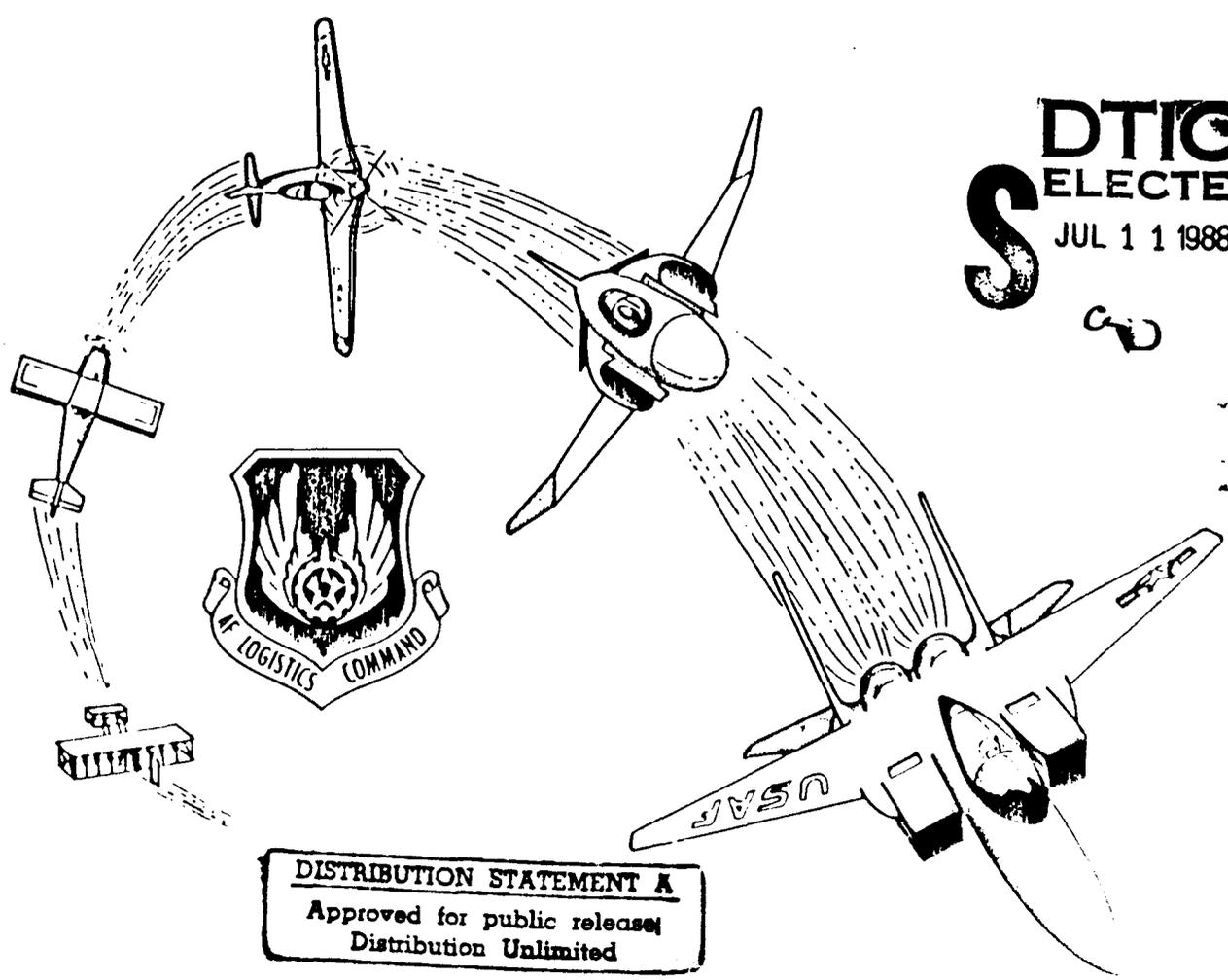


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AIR FORCE LOGISTICS COMMAND

MATERIEL ANALYSIS



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IMPACT ON THE AFLMC RECOMMENDED XD RETENTION POLICY
ON WORLDWIDE SAFETY LEVELS REQUIREMENTS

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE LOGISTICS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-5001

13 JUN 1988

REPLY TO
ATTN OF MMM

SUBJECT Final Report--Impact of the AFLMC Recommended XD Retention Policy on Worldwide Safety Level Requirements

TO SEE DISTRIBUTION

1. A recent Air Force Logistics Management Center (AFLMC) report recommended the Air Force increase the base-level retention period before declaring base-stocked repairable (XD) items completely excess at the base. The AFLMC report showed the current retention period is too short, causing the premature distribution of assets that will be subsequently needed at the base. Longer retention periods mean more base "users" of an item, which impacts the worldwide safety level computation. The Air Force needed to determine the impact of the proposed retention policy on the worldwide safety level requirement before approval to implement.

2. We document the impact in this report (Attachment 2). Our analysis shows increasing the retention period will increase the worldwide buy requirement by less than \$10 million, which is only .25 percent of the total buy requirement. The AFLMC report shows the longer retention period will reduce second destination transportation costs by \$.5 million annually and increase fully mission capable rates 8 percent. The benefits far outweigh the costs. We briefed our results to the Air Force Stockage Advisory Board and they recommended the Air Force implement the AFLMC proposed retention policy. We wholeheartedly concur. In light of the second destination transportation funding shortfalls, we recommend immediate implementation. Attachment 1 provides all our conclusions and recommendations.

3. Our point of contact is Capt Tim Sakulich, HQ AFLC/MMMAA, AUTOVON 787-4139.

FOR THE COMMANDER

Barry L. Oliver

BARRY L. OLIVER
Dep Dir for Future Systems
DCS/Materiel Management

2 Atch
1. Conclusions and Recommendations
2. Final Report

UNITED STATES AIR FORCE



SEPTEMBER 18, 1947

CONCLUSIONS

1. Current policy for XD items classifies base stock as completely excess if no demand was experienced in the previous year or if only one demand was experienced in the previous year and it was over 180 days ago.
2. The AFLMC determined that this policy causes AFLC to redistribute assets prematurely, producing MICAPs and unnecessary transportation costs.
3. The AFLMC recommended the base retain an item longer before declaring it completely excess to base requirements.
4. The AFLMC recommended new retention rules for complete excess based on a Mission Impact Code (MIC).
5. The AFLMC retention rules will increase buy requirements by less than \$10 million (0.25 percent of the total buy requirements).
6. The AFLMC report claimed the longer retention could reduce second destination transportation costs by more than \$.5 million annually and decrease MICAPs by 8 percent.
7. The benefits of the increased base-level retention period outweigh the costs.
8. The Air Force should implement the new retention rules by changing the Standard Base Supply System (SBSS) because base-level implementation is simpler and can be accomplished sooner.

RECOMMENDATIONS

1. Approve the AFLMC recommended retention policy to increase the retention period for recoverable items at base level. (OPR: HQ USAF/LEYS)
2. Implement the new retention rules by changing base-level retention procedures. (OPR: HQ SSC/SMS)

ABSTRACT

A recent Air Force Logistics Management Center (AFLMC) report recommended the Air Force increase the retention period before declaring base-stocked repairable (XD) items completely excess at the base. This study examines the impact on the worldwide peacetime safety level requirements of implementing the AFLMC recommendation. AFLC uses the Aircraft Availability Model (AAM) to compute peacetime safety levels for aircraft replenishment spares. We show how changing base retention for complete excess affects the number of base users in AAM and how this in turn affects item safety levels. We then estimate the dollar impact on XD safety level requirements of implementing the increased retention period and discuss implementation issues. (KF)



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EXECUTIVE SUMMARY

A recent Air Force Logistics Management Center (AFLMC) report recommended the Air Force increase the retention period before declaring base-stocked reparable (XD) items completely excess at the base. Longer retention for some XD items can increase the number of base users reported to AFLC's Aircraft Availability Model (AAM) peacetime safety level computation. We examined the impact on the worldwide peacetime safety level requirements of implementing the AFLMC recommendations and considered how to best implement the new policy within the Air Force supply system.

Our study showed that the proposed retention rules will decrease the AAM average base pipeline for items classified as completely excess in the current system. This will affect the AAM safety level computation. We found the items with changed safety levels were generally inexpensive, had a higher number of users, and had larger worldwide base pipelines. We also found the proposed retention policy affected the safety level for a small number of items even though the new retention policy would not have added any base users to them. This was due to the interdependence of items in the AAM marginal analysis tradeoff. In nearly every case where the total safety level changed, it was an increase. In about six percent of the cases the safety level decreased slightly. Overall, we project an Air Force-wide impact of less than a \$10 million increase in requirements. This is only 0.25 percent of the computed buy requirements.

The AFLMC report showed the current system declares an item excess and redistributes it only to find it is subsequently needed at that base. The AFLMC claimed the longer retention would reduce second destination transportation costs by more than \$.5 million annually and decrease MICAPs by 8 percent. Relative to these projected benefits, the \$10 million increase is negligible. We recommend the Air Force implement the proposed AFLMC retention policy.

We examined two major implementation alternatives; changing the AFLC automated data systems or changing the base level system. Embedding the new retention policy in the AFLC automated systems would result in major changes to the Air Force Recoverable Asset Management System (AFRAMS) Central Knowledge System (D143H), the Inventory Manager Stock Control and Distribution System (D035), the Standard Base Supply System (SBSS), and other interfacing AFLC systems. To implement at base level, the Air Force could change base-level procedures for retaining item demand levels. We recommend the new retention rules be implemented by changing base-level procedures. Base-level implementation is simpler and can be accomplished sooner.

TABLE OF CONTENTS

Abstract i
Executive Summary ii
Chapter 1 - The Problem 1
Chapter 2 - Analysis 2
Chapter 3 - Conclusions and Recommendations 7
Reference 8

Chapter 1

THE PROBLEM

PROBLEM STATEMENT

A policy change proposed by the Air Force Logistics Management Center (AFLMC) will increase the retention period before declaring base-stocked reparable (XD) items completely excess at the base. Longer retention for some XD items can increase the number of base users reported to AFLC's Recoverable Consumption Item Requirements System (D041). The number of base users is considered by the D041 system when it computes worldwide peacetime safety level requirements. We need to determine the impacts on the D041 peacetime safety level computation before implementing the AFLMC recommended policy. Also, we need to determine how to best implement the new policy within the Air Force supply system.

OBJECTIVES

1. Determine the cost impacts on the peacetime safety levels of increasing the retention period for XD items affected by the AFLMC's proposed policy.
2. Determine if the benefits of the increased retention period exceed the increased safety level costs.
3. Determine how to best to implement the AFLMC policy in the Air Force supply system.

BACKGROUND

A recent AFLMC study [1] recommends a longer base retention period before classifying reparable XD items as completely excess to the base's requirement. Current policy for XD items classifies base stock to be completely excess if no demand was experienced in the previous year or if only one demand was experienced in the previous year and that demand was over 180 days ago. The Air Force Recoverable Asset Management System (AFRAMS) central knowledge (D143H) system records these excess items and identifies them as available for shipment by AFLC's Inventory Manager Stock Control and Distribution System (D035) to meet demands elsewhere. The AFLMC determined that the current policy causes AFLC to redistribute assets prematurely, causing MICAP, backorders and unnecessary transportation costs. The AFLMC recommended the base retain an item longer before declaring it completely excess to base requirements. The AFLMC report also recommended the new retention rules for complete excess be based on a Mission Impact Code (MIC) which they define in [1].

The new retention rules will affect the the number of base users for each item. The number of users is considered in the D041 computation of peacetime safety level requirements. Since a base is more likely to remain a user of low demand items under the new retention rules, the average number of Air Force users will be greater than under the old retention policy. We need to determine the impact on D041 peacetime safety level requirements. Since 90 percent of the D041 safety level dollars are computed by the Aircraft Availability Model (AAM), we need to use AAM to examine the impact of the AFLMC's proposed retention policy for complete excess.

Chapter 2

ANALYSIS

OVERVIEW

In this chapter we first describe how the longer retention period affects the peacetime safety levels computation and discuss our approach for quantifying the impacts on safety level costs. Next, we discuss the results of our analysis. Finally, we discuss implementation issues associated with implementing the longer retention periods.

HOW RETENTION AFFECTS PEACETIME SAFETY LEVELS

In this section we describe how the number of base users affects the peacetime safety level computation. A candidate item for complete excess at a base has, by definition, a negligible demand rate at that base. Therefore, the demands at that base have little impact on the worldwide pipeline. When a base declares the item completely excess, the base is no longer reported as a user to the peacetime safety level computation in the D041 AAM. The worldwide pipeline is unchanged, but the number of base users decreases.

How does this impact the AAM computation? The AAM uses an "average base pipeline" concept in computing worldwide item safety levels. For each item, the average base pipeline is

$$\text{AVERAGE BASE PIPELINE} = \frac{\text{WORLDWIDE BASE PIPELINE}}{\text{NUMBER OF BASE USERS}}$$

Note that if the worldwide pipeline stays the same but the number of users decreases, the AAM average base pipeline increases. Conversely, if the worldwide pipeline stays the same but the number of users increases, the AAM average base pipeline decreases.

Under the proposed retention policy, the base waits longer before declaring the item completely excess. The worldwide pipeline still stays the same, but in this case the number of base users doesn't change either. Therefore, longer retention for an item means the base is more likely to remain a user of that item (the AFLMC study concluded the base will likely experience another demand for the item during the longer retention period). Because a base is more likely to remain a user, the average number of Air Force users will be greater than under the old retention policy. A higher average number of users implies a decrease to the average base pipeline.

So, the proposed retention rules will decrease the AAM average base pipeline for items where the item is classified as completely excess in the current system. This will affect the AAM safety level computation. AAM computes pipeline variability as a nonlinear function of the average base pipeline. Larger average base pipelines compute larger pipeline variability. AAM uses this combination of average base pipeline and pipeline variability to compute safety levels.

After computing the marginal analysis average base safety level, AAM computes the worldwide base safety level requirement as

$$\begin{array}{l} \text{WORLDWIDE BASE} \\ \text{SAFETY LEVEL} \\ \text{REQUIREMENT} \end{array} = \begin{array}{l} \text{AVERAGE BASE} \\ \text{SAFETY LEVEL} \\ \text{REQUIREMENT} \end{array} \times \begin{array}{l} \text{NUMBER} \\ \text{OF BASE} \\ \text{USERS} \end{array}$$

This average base pipeline concept is only used to simplify the computation of item safety levels in AAM. Worldwide stock leveling in the Air Force Central Leveling System (D028) is still computed using base-specific pipelines.

At first glance, it might seem that the number of base users in the second equation "cancels out" the effect of the number of base users in the first equation. Not so. The actual mathematics of AAM are far too complex to describe here, but suffice to say the AAM average base safety level is not a linear function of the average base pipeline. We already mentioned the pipeline variability as one nonlinear influence on an item's safety level. In addition, AAM marginal analysis determines an item's safety level based on how the item's average pipeline relates to the average pipelines of all other items. This means a change to pipeline factors for one item not only affects the safety level for that item, but it may affect how other items "compete" for safety level as well.

The combination of nonlinear pipeline variability and interdependence of the items makes it difficult to estimate how changing the number of users for an item affects safety level costs. We decided to estimate the cost impacts by running AAM simulations.

APPROACH

For our analysis, we selected a sample of items and changed (as the proposed retention policy would) the number of base users input to the safety level computation for those items, then compared results to the original baseline AAM safety levels without the increased retention period.

Our baseline consisted of scrubbed AAM data for the March 1986 D041 computation cycle. The database included 30,847 items. 27,717 of those computed AAM safety levels.

To pick a sample of candidate complete excess items we used 12 months of 1986 Central Stock Leveling System (D028) data from the San Antonio Air Logistics Center (SA-ALC). The D028 files contained 35,859 records of base-by-base daily demand rates for 4160 SA-ALC managed XD items. We included in our sample any item where a base user's daily demand was initially greater than one demand per six months (daily demand rate of 0.0056), then dropped to less than one demand per six months. Under the current retention policy this item would qualify as complete excess, however with the new proposed policy, these items would no longer be excess at the base. We identified 1134 stock numbers where this had occurred for at least one base. For 551 of these items, more than one base was involved.

We matched this sample of candidate complete excess items against the baseline AAM database. A total of 910 of the 1134 D028 items receive AAM safety levels. The remainder were non-aircraft items which receive VSL safety levels. For each of the candidate complete excess items we increased the number of base users by the actual number of bases that would retain their levels due to the proposed policy and recomputed the AAM safety levels.

ANALYSIS RESULTS

Increasing the number of base users for the 910 items affected the AAM safety levels for 928 of the 30,847 D041 items. We tried to characterize the types of items where safety levels changed. Table 2-1 summarizes the average characteristics of three groups: all items, items where the safety levels didn't change, and items where the safety levels did change. This table shows the items with changed safety levels were generally inexpensive, had a higher number of users, and had larger worldwide base pipelines.

	<u>ALL ITEMS</u>	<u>ITEMS WITH UNCHANGED SAFETY LEVELS</u>	<u>ITEMS WITH CHANGED SAFETY LEVELS</u>
AVERAGE UNIT PRICE	\$16,154	\$16,469	\$5987
AVERAGE NUMBER OF USERS	6.2	6.0	13.6
BASE PIPELINE	2.3	2.2	5.2
NUMBER OF ITEMS	30,847	29,919	928

Table 2-1

Table 2-2 shows in more detail the amount of change to safety levels for the 928 items.

AMOUNT OF CHANGE TO SAFETY LEVELS

<u>NUMBER OF USERS ADDED</u>	<u>STOCK LEVEL CHANGES</u>
0	135
1	487
2	172
3	69
4	28
5	15
6	9
7	6
8+	7

TOTAL: 928

Table 2-2

Note from Table 2-2, safety levels changed for 135 items even though the new retention policy would not have added any base users to them. Again, this is due to the interdependence of items in the AAM marginal analysis tradeoff. In nearly every case where the total safety level changed, it was an increase. In about six percent of the cases (59 items) the safety level decreased slightly.

The effect on overall cost was a very small percentage (0.033 percent) of the total safety level requirement. Our baseline requirement was \$4.070 billion. The net increase due to adding base users was \$1.3 million. Our database of candidate complete excess items only included SA-ALC items. Using the SA-ALC results to estimate the effects of the other four ALCs, we project an Air Force-wide impact of less than a \$10 million increase in buy requirements. This is still only 0.25 percent of the total computed buy requirement.

The AFLMC report claimed the longer retention could reduce second destination transportation costs by more than \$.5 million and decrease MICAPs by 8 percent that equates to more than 800,000 hours more fully mission capable time. Note fully mission capable times is not the same as flying hours. Relative to these projected benefits, the \$10 million increase in the safety level requirement is negligible.

IMPLEMENTATION ISSUES

So, we think the benefits of lengthening the base retention period outweighs the cost. The next question is how to implement the change. We considered two implementation alternatives; the Air Force could either change the AFLC automated data systems or change the base level system.

Embedding the new retention policy in the AFLC automated systems requires changes to two major systems: AFRAMS (D143H) and SC&D (D035). One of AFRAMS functions is to determine whether a base qualifies as a user of an item and to identify when an item is completely excess to a particular base's requirement. Basically

the DL43H system checks to see if the base has a demand level for the item; if it does it is considered a user. When an item becomes completely excess at a particular base, the base is no longer reported as a user to the D041 safety level computation and the assets for that item at that base are redistributed by the SC&D system.

To implement in the automated systems, the AFLC must modify AFRAMS to include the AFLMC retention rules and the Mission Impact Code (MIC) described in [1]. AFRAMS would continue to report the base as a user to the D041 safety level computation even if the base no longer computed a demand level for the item. Unfortunately, the AFRAMS system is frozen for changes until the new Stock Control and Distribution (SC&D) system is fully operational (FY89). The AFLC systems would also have to collect base-level mission impact code data, which will require changes to the Standard Base Supply System (SBSS) and other interfacing AFLC systems. Also, AFLC would need to change SC&D to prevent redistribution of assets identified as completely excess under the current policy.

To implement at base level, the Air Force must change base-level procedures for retaining item demand levels. Currently, the Standard Base Supply System (SBSS) deletes the demand level whenever an item meets the complete excess criteria; that is whenever there is no demand in 365 days or only 1 demand in 365 days and that demand was not in the last 180 days. The SBSS change would be to retain the demand level until an item meets the recommended AFLMC retention criteria. The retention would again depend on the item Mission Impact Code. Since the base still has a demand level, AFLC's automated systems would continue to count the base as a user of that item and those systems wouldn't identify the item as complete excess to the base's requirement. This would prevent premature redistribution of the assets.

We recommend the new retention rules be implemented by changing base-level procedures. Base-level implementation is simpler and can be accomplished sooner. We briefed the results of our analysis to the Air Force Stockage Advisory Board in 1988. They concurred with our analysis and recommended implementation of the AFLMC's proposed retention policy by changing the SBSS.

Chapter 3

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. Current policy for XD items classifies base stock as completely excess if no demand was experienced in the previous year or if only one demand was experienced in the previous year and it was over 180 days ago.
2. The AFLMC determined that this policy causes AFLC to redistribute assets prematurely, producing MICAPs and unnecessary transportation costs.
3. The AFLMC recommended the base retain an item longer before declaring it completely excess to base requirements.
4. The AFLMC recommended new retention rules for complete excess based on a Mission Impact Code (MIC).
5. The AFLMC retention rules will increase buy requirements by less than \$10 million (0.25 percent of the total buy requirements).
6. The AFLMC report claimed the longer retention could reduce second destination transportation costs by more than \$.5 million annually and decrease MICAPs by 8 percent.
7. The benefits of the increased base-level retention period outweigh the costs.
8. The Air Force should implement the new retention rules by changing the Standard Base Supply System (SBSS) because base-level implementation is simpler and can be accomplished sooner.

RECOMMENDATIONS

1. Approve the AFLMC recommended retention policy to increase the retention period for recoverable items at base level. (OPR: HQ USAF/LEYS)
2. Implement the new retention rules by changing base-level retention procedures. (OPR: HQ SSC/SMS)

REFERENCE

Ham, Martha P. Capt, Lt Col Douglas J. Blazer, Wayne Faulkner, "Reparable (XD) Item Retention Policy," AFLMC Report LS850321, August 1986.