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Finding the Balance Between Schoolhouse and On-the-Job Training

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PROJECT AIR FORCE

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Summary

How should enlisted initial training be divided between centralized initial skills training (IST) and decentralized on-the-job training (OJT)? This document provides recommendations to address this question based on a cost-benefit analysis of seven Air Force specialties. The underlying methodology includes a mechanism for developing specialty learning and productivity curves that are used to capture the full human capital development (HCD) cost (IST and OJT). All too often, only IST costs are considered when "pricing" training. When this is done, the overall cost to train an airman is seriously underestimated. When the full costs are considered, decisions related to the length of IST are better informed.

The Air Force typically trains 30,000 to 40,000 new airmen in some 300 specialties each year. We estimate IST costs at $700 million per year, with OJT costs reaching perhaps $1.4 billion each year. In developing new airmen to required levels of productivity, IST and OJT can, to some degree, substitute for each other. An appropriately designed cost-benefit analysis is necessary to find the best balance between them.

Productivity is difficult to measure. We equate a productive airman with one who possesses the skills to be fully mission capable. But then, in what ways must an airman in a particular specialty be skilled in order to be fully mission capable? How should a training program prepare airmen to obtain these skills and this experience? At what skill level do airmen currently graduate from IST? How does productivity increase with time in OJT?

To answer these questions, we fielded a survey among E-6s[1] and above from each of seven Air Force specialties[2] in four of the major commands (MAJCOMs)[3] in order to determine the effectiveness of the current IST and OJT training programs. A portion of the questions was designed to elicit the manner in which IST prepares airmen and how OJT increases productivity over time. We statistically averaged the responses and created the productivity curves shown in Figure S.1. Using these curves, we were able to decompose force costs into two parts: costs associated with productive effort (the proportion below the curve) and HCD costs (the proportion above the curve).

How does productivity change when IST course length changes? To make this assessment, we again relied on survey respondents to estimate the impact in both time and productivity. Unlike other attempts to determine the result of marginal (1-, 2-, or 3-day) changes in IST course length, we chose to request specific course material that could be added or deleted, the associated change in the course length, and the corresponding increase or decrease in productivity at graduation. For example, Figure S.2 shows curves statistically generated to fit the survey responses. Note that most of these curves increase initially but then level off, indicating that course lengths longer than a certain number of days will have diminishing impacts on productivity.

In our final methodological step, we combine the productivity curves with the course length changes and costs to examine total HCD costs. Costs include personnel cost, initial skills and advanced training costs, and other OJT-related costs, such as equipment and supervisor time. We use manpower data to determine the average number of

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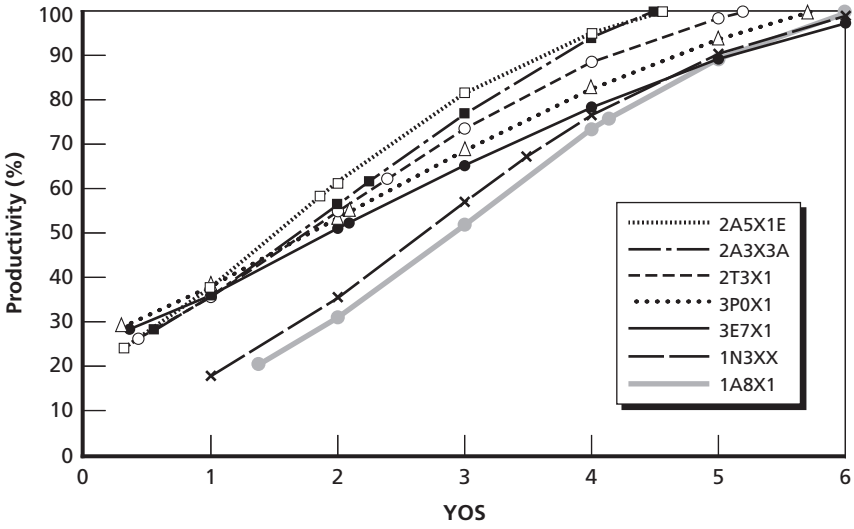
[1] Because of the small numbers in the airborne linguist (1A8X1) and cryptologic linguist (1N3XX) specialties, we also included E-5s from the 1N3XX specialty and E-4s and E-5s from the 1A8X1 specialty. The grades E-6 and above are primarily supervisors.

[2] Airborne Cryptologic Linguist (AFSC 1A8X1); Cryptologic Linguist (AFSC 1N3XX); Tactical Aircraft Maintenance, F-15 (AFSC 2A3X3A); Aerospace Maintenance, B-1/B-2 (AFSC 2A5X1E); Special Purpose Vehicle Maintenance (AFSC 2T3X1); Fire Protection (AFSC 3E7X1); and Security Forces (AFSC 3POX1).

[3] Air Combat Command, Air Mobility Command, Air Force Space Command, and Air Education and Training Command. Discussions with subject matter experts indicated that the selected MAJCOMs would provide an adequate sample of experiences for these AFSCs.

Figure S.1
Comparison of Fitted Productivity Curves

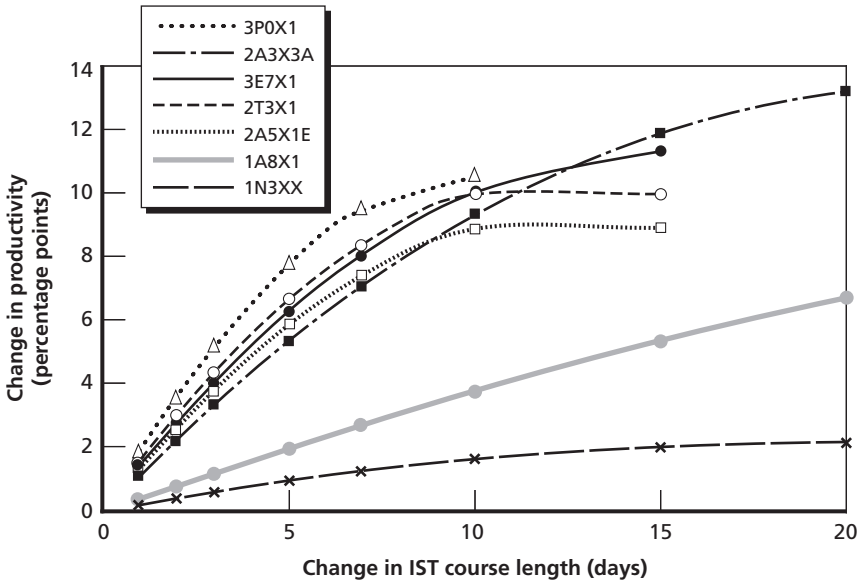


NOTE: 1A8X1 = Airborne Cryptologic Linguist; 1N3XX = Cryptologic Linguist; 2A3X3A = F-15 Maintenance; 2A5X1E = B-1/B-2 Maintenance; 2T3X1 = Special Purpose Vehicle Maintenance; 3E7X1 = Fire Protection; 3POX1 = Security Forces.
RAND *MG555-S.1*

airmen in each year of service. Combining the data, we can examine trade-offs among manpower, productivity, and cost.

Applying our analysis to the seven selected specialties, we achieved the results described in Table S.1. Our analysis of the survey responses was performed on a variety of dimensions. In addition to quantitative results, we included a qualitative analysis of comments from the survey respondents. Column 3, "Write-in Comments," summarizes free-response comments to questions suggesting course changes. The "Add vs. Drop" column is a comparison of the number of responses to specific questions on adding and deleting course content. The "Incremental Change Functions" column provides the direction of the average change in productivity for suggested changes to IST. The "Steady State Analysis" column summarizes the results of the steady state cost-benefit analysis.

Figure S.2
Changes in Productivity as a Function of Changes in Course Length



NOTE: 1A8X1 = Airborne Cryptologic Linguist; 1N3XX = Cryptologic Linguist; 2A3X3A = F-15 Maintenance; 2A5X1E = B-1/B-2 Maintenance; 2T3X1 = Special Purpose Vehicle Maintenance; 3E7X1 = Fire Protection; 3POX1 = Security Forces.
RAND *MG555-S.2*

We recommend that the utilization and training workshops (U&TWs) for each of the specialties perform a closer examination of IST course length changes that appear to lower overall HCD costs for the same or greater productivity. For AFSCs 1A8X1 and 1N3XX, there is strong evidence that reductions in the course length would result in only a small reduction in immediate productivity of graduates. For the other specialties, we believe a lower overall HCD cost per unit of productivity can be achieved by increasing course length. (See pp. 45–49.)

The seven specialties specifically examined in this study offer prototypes for our overall methodology. One essential element is the derivation of productivity curves. The Air Force's Occupational

Table S.1
Analysis Summary

AFSC	Specialty Title	Write-In Comments	Add vs. Drop Comparison	Incremental Change Functions	Steady State Analysis
1A8X1	Airborne Cryptologic Linguist	Don't add	Drop	Decrease	
1N3XX	Cryptologic Linguist		Drop	Decrease	
2T3X1	Special Purpose Vehicle Maintenance			Increase	Increase
2A3X3A	F-15 Tactical Aircraft Maintenance			Increase	Increase
2A5X1E	B-1/B-2 Aerospace Maintenance	Don't drop	Add	Increase	Increase
3P0X1	Security Forces	Don't drop	Add	Increase	Increase
3E7X1	Fire Protection		Add	Increase Don't decrease	Increase

Measurement Squadron (OMS) measures certain aspects of productivity through its occupational measurement surveys. We recommend that AETC investigate the use of current OMS tools and potential enhancements to develop productivity curves and the functional relationship between incremental changes in IST content, course length, and graduation effectiveness. We also recommend that the AETC Studies and Analysis Squadron use our HCD cost model and methodology for future IST course length studies. Other specialties can be readily examined. Improvements in methodology might include greater fidelity in generating the productivity curves, determining the impact of curriculum changes, and estimating costs. (See pp. 30–35 and 57–64.)

Finally, this analysis approach offers great potential for trades. In three of the AFSCs (2T3X1, 3P0X1, and 3E7X1), a 0.5-percent change

in total costs for increasing course length resulted in a tenfold (5.0-percent) change in total productivity. (See pp. 63 and 67.)

In summary, our analysis suggests the following:

- *A significant increase in productivity for small addition in IST course length* is likely to exist for five of the seven specialties we analyzed. (See pp. 63 and 67.)
- In some cases, *portions of the IST curriculum could be reduced with little impact on productivity.* We believe there is evidence from the qualitative responses for considering reductions in the 1A8X1 and 1N3XX specialties. (See pp. 47–49.)
- Although we believe these increases are plausible given the way we conducted the analysis, *it would be prudent to replicate the data with more specific and refined survey estimates.* (See pp. 70–71.)
- *The Air Force should also investigate other external measures* to validate the productivity functions we derived. (See pp. 23–31 and 71.)
- This analysis also demonstrates the *large role played by the cost of OJT and its importance in policymaking,* particularly for determining the course length of IST. (See pp. 62–68.)
- We recommend that *the specific results of this analysis should be briefed to the respective AFSC U&TWs* as they consider the suitability of the current IST curricula. (See pp. 57–68.)
- Finally, we recommend that *the AETC Studies and Analysis Squadron (SAS) adopt the models and methodology* developed in this study for future analyses involving the length of IST. (See pp. 57–68.)