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R E P O R T

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# Determinants of Productivity for Military Personnel

A Review of Findings on the  
Contribution of Experience,  
Training, and Aptitude to  
Military Performance

Jennifer Kavanagh

Prepared for the Office of the Secretary of Defense

Approved for public release; distribution unlimited



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## SUMMARY

The literature describing the determinants of military personnel productivity offers an empirical perspective on how experience, training, and individual aptitude affect personal and unit performance. It also provides insight into the determination of the optimal skill and experience mix for the armed forces. The relationship between personnel productivity and each of these determinants is important because it affects the personnel development processes of the armed forces and ultimately contributes to overall force readiness and capability.

Although this issue appears relatively straightforward, a deeper analysis reveals several challenges. First, it is important to note that the military carries out many different activities, ranging from combat to more technical operations, each of which may require a different experience mix or a different amount of training. For example, technical positions, such as communications or radar operations, may benefit from having a large number of highly proficient personnel, whereas administrative occupations may exhibit lower returns to additional training and experience. A second challenge is the difficulty of defining the proper unit of output for measuring productivity. There are several possible choices including supervisor ratings, which are more subjective, or individual task performance scores, which measure the accuracy or success of personnel on specific activities. Both of these are acceptable measures, but neither is able to capture the full meaning of productivity. Importantly, the choice of an output measure is related to the definition and measurement of experience more generally.

The majority of studies concerning the relationship between productivity and experience, training, or aptitude find that each of these three factors contributes significantly to personnel productivity. As one example of the effect of experience on productivity, Albrecht (1979) uses supervisor ratings taken at four separate points during individual careers to determine how the productivity of first-term personnel differs from that of careerists. He finds that careerists are from 1.41 to 2.25 times as productive as first-term personnel. Most

studies confirm the basic results of this study, although there is some discrepancy over the actual quantitative effect of experience.

Furthermore, it is important to remember that, as mentioned above, the size of the experience differential is likely to vary based on the nature and requirements of a given occupation.

Additional training has also been found to consistently affect productivity of personnel. Training appears to be significant as a source of skill acquisition, knowledge building, and capability development. Many studies suggest that it is the accumulation of training over a lifetime that has the largest effect on individual performance, rather than simply training in the previous six months. In order to study this effect, Hammon and Horowitz (1990) look at how additional hours of training, both short-term and long-term, affect performance on several different tasks, including marine bombing, carrier landings, and air-to-air combat. They find that positive performance effects result from additional training in each of these activities. In the carrier landing exercise, for example, individuals were scored on a seven-point scale, ranging from dangerous to excellent. The effect of a career decrease in training hours of 10 percent led to a 10 percent increase in the number of unsatisfactory landings, from 14 percent to 24 percent of the total, and a 5 percent decrease in the number of excellent landings, to 28 percent of flights. These results imply that additional training can improve proficiency, reduce performance error, and lead to a higher technical skill level among personnel.

A final determinant of personnel productivity that will be discussed in this report is Armed Forces Qualification Test (AFQT) score as a measure of individual ability. A representative study of the effect of AFQT on performance was conducted by Winkler, Fernandez, and Polich (1992). Their study looks at the relationship between AFQT and the performance of three-person teams on communications tasks, including making a system operational and troubleshooting the system to identify faults. They find a significant relationship between the group's average AFQT score and its performance on both activities. On the first task, they find that if the average group AFQT is lowered from the midpoint of

category IIIA to the midpoint of category IIIB, the probability that the group will successfully operate the system falls from 63 percent to 47 percent. Similar results are found for the troubleshooting task; the probability that a group would identify three or more faults falls drastically as average AFQT score fell. Another important observation is that the effect of AFQT is additive, meaning that each additional high-scoring team member increases the overall performance of the team. This is particularly important in the military context, given the number of group-centered tasks the armed forces are required to complete.

The results of these studies have several important implications for manpower requirement determination processes and the future development of the armed forces. First, in certain occupations--highly technical ones for example, where returns to experience are very high--a shift to a more senior force could be cost-effective, despite the fact that senior personnel must be paid higher wages and given larger compensation packages than their more junior counterparts. This may not be true in other occupations where technical expertise and experience are less important for performance. Second, military transformation<sup>1</sup> and the integration of technological advances into the armed forces have a profound effect on the appropriate skill and experience mix for the armed forces as well as on the returns to experience and training. Despite this rapid evolution, the majority of literature on this topic is fairly old and outdated. This suggests that issues relating the determinants of personnel productivity should be reevaluated in the context of transformation and the developments associated with it.

A more advanced understanding of the production of military activities would be valuable to the readiness of the armed forces, the effectiveness of the manpower requirement determination process, and the recruitment and retention programs used by each of the services. Additional evidence on the relationships among personnel productivity,

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<sup>1</sup> Transformation refers to the evolution and development of the military in the face of technological and national security environment changes. It includes the goal of making the force more agile and deployable.

experience, training, and ability would also allow policymakers and planners to pursue multiple, even competing objectives while also addressing technological and environmental changes that could affect the nature of their optimal structure. This report offers a framework for thinking about these issues by describing how previous research contributes to understanding the effects of personnel experience, training, and aptitude on productivity and performance.