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The Future Interface of Political and Industrial/Organizational Psychologies: The Case of Air Traffic Controllers

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Abstract. This article presents a brief overview of future psychological challenges bearing on the improving the performance of air traffic controllers. The most significant challenges appear to be philosophical, political, social, and cultural.

A review of over 280 psychological studies in the PsycINFO databases of the American Psychological Association covering the period from 1949 to the present and bear on the performance of air traffic controllers (ATCs) suggests that four main areas have been most researched.

The first comprises human attributes of ATCs. These attributes have varied in specificity, sensitivity to assessment, placement on a biopsychosocial continuum, and their personal meanings as ascribed by their possessors. Examples have included cardiovascular functioning, situation awareness, vigilance latencies, personality traits, and information processing styles and loads.

The second comprises equipment attributes confronted by ATCs. These attributes have varied in specificity, sensitivity to assessment, dimensions of space and time, functional significance, and their meanings as ascribed by ATCs. Examples have included the frequency, amplitude, number, and other physical aspects of auditory and visual cues, comparative variations of these cues, psychophysical affordances inducing figure to ground phenomena, and physical size, placement, and dimensionality of mechanical apparata.

The third comprises task attributes confronted by ATCs. These attributes have varied in specificity, sensitivity to assessment, structural/functional/process combinations, their psychophysical demands, and their meanings as ascribed by ATCs. Examples have included attentional demands and those of more sophisticated information processing that interact with semantic networks and heuristics concurrent with demands on interpretive strategies, comprehensional processes, and memories for policies/rules/regulations, and required motor behaviors.

The fourth comprises environmental attributes within which ATCs function. These attributes have varied in specificity, sensitivity to assessment, ecological significance, and their meanings ascribed by ATCs. Examples have included policies and effects of policies concerning workload and shiftwork, absolute and comparative measures of ambient noise and temperature through time, and organizational values concerning accountability and oversight.

The four main research areas have often been studied in combinations--e.g., human attributes dependent on the environment, task attributes dependent on equipment, or combinations of all four as they form systems as well as effects of the system on constituent components. However, the following recommendations for psychological research intended to improve ATC performance--if implemented--might best increase the reliability, validity, and utility of such research and set an agenda for the future. These two consequences may be especially likely in the current ATC era of free flight.

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(1) Research on equipment and task attributes--perhaps because previous research has been well-done--may at this time yield less significant increments than human and environmental attributes towards improving ATC performance. This is all the more the case when ATCs go through rigorous and realistic simulations as a foundation of selection and training.

(2) Among the many human attributes, personality traits may yield the least increment towards improving ATC performance. Why is this? Contemporary personality research suggests that not only is there variance among people for various personality traits, but also there is significant variance for a given personality trait for a specific person depending on a host of situational variables. Even for a specific person, personality trait, and situational variable, there may be significant additional variance of yet unknown origin that impede predictability. Although personality research can still be useful in selecting out extremes--e.g., individuals with extremely fragile psychological stress tolerances--people often do as well or better at selecting themselves out of dystonic occupations, i.e., situations that don't fit an individual's psychology.

(3) Environmental research should be based on the notion that there is not one but many environments affecting ATC performance. These include the work, family, social, ethnic, and personal environments not only of the ATC, but also of others on whom the ATC must depend--e.g., air crew, maintenance personnel, and administrators. In essence, all environments are political--which means that ATC performance is dependent on perceptions concerning infinite needs and finite resources and perceptual disparities between what is and what should be on the part of multiple participants in multiply-layered and interacting environments. Even more specifically, the political element involves not only conflicts, policies, and Issues commonly termed political--e.g., government decisions concerning unions and wages--but also the many daily victories and defeats in what are perceived to be zero-sum games--e.g., contentions with spouses, arguments with creditors, slights stemming from salutations or the lack thereof. Although assessment-based management can identify some of the fluctuations in these areas, of crucial import--and most easily identified by competent managers--are the many intentional and unintentional features of organizational culture. Especially with significant self-selection of ATC candidates and supporting personnel--as well as competent human factors research on task and equipment attribute--the ongoing monitoring of the psychological effects of organizational culture may be the most time and cost-effective towards improving ATC performance.

(4) Contemporary research on the philosophy of the social sciences suggests that there is a social transformation of applied psychological knowledge. That is, through time, the interaction of cultural, historical, political, economic, and other social science variables effects psychological change. What was once an empirically and experimentally validated linkage between a social science variable and ATC performance is no longer. This phenomenon--often ignored by consumers of social science research--necessitates an ongoing revalidation effort on the part of ATC organizations dedicated to improving performance.

(5) Given the increasing demands for strategic planning and controlled autonomy among ATCs in the current era of free flight, the final common pathways bearing on ATC performance may well comprise phenomena related to the psychological constructs of cognitive complexity, field independence, ethnocentrism, impression management, and resistance to contaminants of affective lability on form perception. The nature of final common pathways, of course, should be an ongoing empirical question.

An era of free flight--one that more strongly than ever encompasses international, multicultural, and other unique challenges--can greatly benefit from state-of-the-art social science support. This article--

through allowing the free flight of methodological critique--is suggestive of how to go about it. (See Borack, J.I. (1995). Alternative techniques for predicting success in air controller school. Military Psychology, 7, 207-219; Davis, C.G., Kerle, R.H., Silvestro, A.W., & Wallace, W.H. (1960). The air traffic control training program as viewed by training supervisors. Courtney Co. Rep., 3333; Luna, T.D. (1997). Air traffic controller shiftwork: What are the implications for aviation safety? A review. Aviation, Space, and Environmental Medicine, 68, 69-79; Naylor, G.F.K. (1954). Aptitude tests for air traffic control officers. Occupational Psychology, 28, 209-217; Shouksmith, G., & Taylor, J.E. (1997). The interaction of culture with general job stressors in air traffic controllers. International Journal of Aviation Psychology, 7, 343-352; Zeller, A.F. (August 30, 1959). Human aspects of mid-air collision prevention. Aerospace Medicine, 551-560.)(Keywords: Air Traffic Control, Safety, Security, Typology.)