



TWELFTH AIR NAVIGATION CONFERENCE

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Agenda Item 6: Future direction

6.1: Implementation plans and methodologies

A HUMAN-CENTRED APPROACH TO INTEGRATING PROCEDURES, TECHNOLOGY AND TRAINING

(Presented by Canada)

1. INTRODUCTION

1.1 This Information Paper describes the approach used by NAV Canada in integrating procedures, technology and training.

1.2 NAV CANADA is the private sector, non-share capital corporation that owns and operates Canada's civil air navigation system. Transport Canada is Canada's regulator for the civil air navigation system. NAV CANADA coordinates the safe and efficient movement of aircraft in Canadian domestic airspace and in international airspace assigned to Canadian control. Through its operations, NAV CANADA delivers air traffic control, flight information, weather briefings, aeronautical information, airport advisory services and electronic aids to navigation

1.3 Technological innovation in the accuracy and reliability of CNS systems, and in the integration of CNS and ATM systems have opened the doors to more aircraft flying to more destinations with better ways of getting there.

1.4 Along with the incredible advances in technology, moving aircraft from departure to destination still relies on the pilot and the controller. There have been significant changes in recent years in the human-technology relationship, and the way pilots and controllers carry out their tasks will continue to change and adapt as technology and procedures evolve.

1.5 History is a great teacher. The success that the air operators had during the transition in the 1980s and 1990s to the modern aircraft with flight guidance and flight management systems was not without its share of Human Factors challenges. They were confronted with a number of unanticipated situations with regards to the relationship between the pilots and the technology – situations where the flight crew “forgot”, “didn't notice”, or “didn't know how”. These situations reflect areas where the aviation industry has failed to design solutions (whether in technology, procedures or training) for the humans using the technology.

¹English and French translation provided by Canada.

1.6 These are issues the pilots faced in the 1980s, and still face today. The issues have led to many incidents and a number of fatal accidents. The solutions are complex. Each time a crew experiences one of these issues, the mitigation cannot solely be found in the procedures department, or the training department, or with the avionics supplier. For example, a crew has an altitude deviation because the incorrect vertical flight path mode was selected. Who takes ownership for solving this problem? These are not isolated problems; they are aviation system problems that need integrated solutions. Not an easy task in the aviation world, with a multitude of operators, aircraft types and avionics manufacturers, aeronautical information data suppliers, etc.

1.7 In some respects, ANSPs may be better positioned to deal with the Air Traffic Services version of these integration issues. For example, NAV CANADA designs ATM systems, writes manual of operations and trains controllers. This paper outlines a methodology applied at NAV CANADA to enhance the integration of technology, procedures and training.

2. METHODOLOGY

2.1 Understanding the relationship between controllers and the technology they use is central to the integration of technology, procedures and training. New functionalities change how controllers carry out their tasks. Therefore a shared vision of the human-technological relationship is needed by personnel who design the technology, write ATS procedures, develop and deliver training, as well as the end-users.

2.2 A key challenge was identifying a framework and process to develop the common understanding. It was decided to apply the 4P framework². The 4P framework refers to Philosophy, Policy, Procedures and Practices. The philosophy defines the over-arching view of how the technology will be used. Philosophy then drives the policies, which are management's description in areas such as training, operations and personal conduct. Policies are developed based on the company philosophy but further determined by commercial and operational factors. Procedures provide specific guidance on tasks, and are developed in line with company philosophy and policy. Practices are what actually occur in the operations room, and controllers are responsible for ensuring that these are in line with procedures. Problems areas typically arise when the Philosophy, Policies, Procedures or Practises are not in alignment. The business must then decide how to realign.

2.3 Within the established framework, a series of interview questions were developed aimed at capturing the philosophy of use of the new functionality. The questions were drawn from various publications on Human Factors issues in automation. Questions are aimed to describe the goals of the automation, the level of knowledge of the technology required of the controller, as well as impact in areas such as coordination, communication, workload management and job satisfaction.

2.4 Interviews take place with representatives from NAV CANADA groups involved in designing the technology, writing air traffic control procedures, and developing and delivering training. The interviews consist of capturing each group's response to the questions on the philosophy of use of a particular functionality, as well as identifying any relevant policies or procedures that either support or may not be aligned with the philosophy.

² Degani, A., & Wiener, E. L. (1994). [Philosophy, policies, procedures, and practices: The Four "P"s of flight deck operations](#). In N. Johnston, N. McDonald, and R. Fuller (Eds.), *Aviation Psychology in Practice* (pp. 44-67). Hants, England: Avebury Technical.

2.5 The process is iterative, as the answers and comments from one group are added to the output document and provided to the other groups to build on. At this stage, with the different perspectives from the different groups it is not uncommon identify areas of disagreement.

2.6 Representatives from all of the involved groups are convened to further discuss the draft output document with the goal of reaching consensus on the Philosophy, Policies and Procedures. Through this iterative process, the collective vision of the relationship between the controller and the technology is established and documented.

2.7 Input on the last “P”, that of Practices, is obtained directly from the end-users. Referring to the document describing the Philosophy, Policy and Procedures, controllers provide feedback to the multi-disciplinary group on their experiences using the technology. This feedback aids in identifying potential misalignment of Practices, Procedures, Policies and Philosophy. Where such misalignments exist, the multi-disciplinary group reconvenes to develop strategies for re-alignment.

3. SUMMARY

3.1 This paper describes a process that uses a multi-disciplinary team to articulate the collective view of the human-technological relationship, and incorporates end-user feedback to identify potential misalignments. This is one of the processes that NAV CANADA has implemented to assist in the integration of technology, procedures and training.

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