Air Traffic Workload Input Technique (ATWIT)

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HP Activity Categories:
Assessment of workload [1]
Resource Type:
Technique
Abstract:

Air traffic controller workload represents a human response to the demands or taskloads produced by the airspace system. The prediction of workload could be a useful tool for planning and staffing. The automated en route air traffic control (AERA) program proposes such a tool. Ten air traffic controllers were exposed to a series of 1-hour simulations which were designed to produce a workload range of low, moderate, and high. Controller and observer responses indicated that three levels of workload were generated and that the workload was directly related to the difficulty of the control tasks performed. Workload was particularly influenced by airspace factors of aircraft count, clustering, and restricted airspace. Overall results support the premise that workload could be predictable using measures of system inactivity.

References

Developer and source:


Year of development / publication, updates etc:

1985

General Description

Purpose:

ATWIT is a technique to measure the air traffic controller mental workload in "real-time" by presenting auditory and visual cues (a tone and illumination, respectively) that prompt a controller to press one of seven buttons on the workload assessment keypad (WAK) within a specified amount of time to indicate the
amount of mental workload experienced at that moment. The ATWIT tool has been developed and has been in use at the FAA Technical Centre.

Type (e.g. observation, questionnaire, interview, checklist, measurement instrument, etc.):

Measurement Instrument

**Technical description of method or tool etc**

Description of the content/study:

ATWIT is a ?real-time? workload measure that queries for estimates of workload while managing traffic in human-in-the-loop scenarios.

ATWIT is an online measure that requires the operators (i.e. ATCSs) to indicate, at set times, their perception of their current workload. ATWIT is, therefore, an instantaneous probe that investigates overall perceived workload.

Technical requirements for using the method, tool, etc:

A specialized device to implement (the Workload Assessment Keypad ?WAK or other functional equivalent input device) is required.

The device should be mounted within easy reach or should be incorporated directly on the participants interface of the participant to allow the input of workload ratings. Workload data can be recorded and time stamped with system data recording.

Measure/Response Type:

The Air Traffic Workload Input Technique (ATWIT) is a workload rating scale (provides subjective assessment) designed for use in air traffic control studies. With this technique, controllers rate their workload, while controlling traffic, on a scale from 1 (low workload) to 7 (very high workload). The Workload Assessment Keypad (WAK) device records each rating as well as the time it took to respond to the prompt.

Results obtained and interpretation:

This technique produces a workload profile that is thought to reflect accurately variations in task load related to airspace variables and communications

**Evaluation**

Advantages:

Subjective scales are easy to use, cheap, and easily accepted by controllers and other system operators.

In using a real-time workload measure the respondent can report the experience while it occurs, instead of relying on ATCS memory during the scenario.

Tailored for use with ATC tasks (Hilburn & Jorna, 2001).
May be more sensitive than the TLX, as it records each rating as well as the time it took to respond (Manning et al., 2001).

Contrary to the TLX, participants do not need to break down their workload by origin (Willems & Truitt, 1999); Respondents report the experience soon after it occurs, eliminating memory decay (Manning, Mills, Fox, & Pfleiderer, 2001).

Disadvantages:

Requires a specialized piece of equipment to implement.

The process of providing a real-time rating may increase the controller’s perceived workload or, worse yet, may interfere with the performance of certain tasks. (Manning et al., 2001).

Subjective workload measures, like many subjective scales, are potentially sensitive to various sources of bias (the halo effect, under- or overreporting of sources of workload, etc.).

Unidimensional scale is limiting (Manning et al., 2001).

Alternative Methods:

Other common used measure for workload are: NASA-TLX (Hart and Staveland, 1988) and SWAT (Reid and Nygren, 1988).

**Usability (ease of use, efficiency, effectiveness)**


Please rate the usability:

Ease of use:
high

Efficiency:
high

Effectiveness:
high

Constraints concerning conditions of use:
None

Reliability:

ATWIT is a reliable and relatively unobtrusive on-line measure of subjective workload. (B. Willems; T. R. Truitt Implications of Reduced Involvement in En Route Air Traffic Control - DOT/FAA/CT-TN99/22 - 1999- p.6)

Validity:

n/a

Required effort (to conduct & to analyse):
Low effort

**Level of HF expertise needed (required user qualification)**

HF Expert

Medium: limited level of expertise required, some training required
Other expertise needed (required user qualification):

n/a

**Cost Information**

**Estimated Cost:**

WAK: $3,000.00 (four WAK units and multiplexer). Programming is required. Acquisition Information: A & J Industries, (405) 794-6667. POC: Alie Burgin.

Functional equivalent of the WAK :Developer: Mark Peters: mpeters@seagull.com [4] NASA Langley Research Center Contact: David Wing. Estimated cost: n/a


Medium: (1000-5000 €) considerable cost to purchase or for licensing, or certain devices required
Experiences of use by SESAR partners (including references):

n/a

Reported and/or published experiences of use (including references):

?While controllers showed some initial reluctance to use the ATWIT system, they all managed to integrate it into their behavioural repertoire during training. The task did add somewhat to their workload; but during interviews, they indicated that ATWIT responses became easier to accomplish with training. Most indicated that if they missed a response, it was because they were completely occupied (Stein,1985).? Air traffic controller workload: An examination of workload probe. (Report No. DOT/FAA/CT-TN84/24). Atlantic City, NJ: Federal Aviation Administration Technical Center.

?Researches have used this method to measure workload in studies evaluating multi-sector control positions (Willems, Heiney, & Sollenberger, 2005), decision support tools (Sollenberger, Willems, Della Rocco, Koros, & Truitt, 2004), voice communications latency (Sollenberger, McAnulty, & Kerns, 2003), and ATC complexity (Yuditsky, Sollenberger, Della Rocco, Friedman-Berg, & Manning, 2002).? Cited in Terenzi, M., Bernard, L., 2008: Assessment of a remote eye tracker system in real-time simulator. Eurocontrol CRDS.

Applicability to lifecycle phase (E-OCVM):

V2, V3

Application Area:
ATWIT is a Subjective measures tailored more specifically to controller activities

Keywords:

Workload, Task-load, air traffic control workload prediction, workload probe, operator stress

Short Description:

ATWIT is a technique to measure the air traffic controller mental workload in real-time on a seven point scale to indicate the amount of mental workload experienced at that moment. The ATWIT tool was developed at the FAA Technical Centre.

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