**Designing Multiple UAV Displays Based on the Human Capacity to Process Information.**
***Marshak, W. & Collier, J.; SYTRONICS Inc.***

Placing information before operators is no longer sufficient basis for system display design. Unless the operator assimilates the information into their cognitive understanding of system state, nothing has been accomplished. Currently, the burden to accomplish this is on the operator and his or her training to learn how to facilitate the information assimilation. High cognitive demand tasks like multiple UAV operations push operators beyond their information processing and communication limits. Displays which facilitate assimilation must be based on the psychology of human information processing.

***SYTRONICS'*** Multiple UAV AGEncy (MAGE) is applying psychology to accelerate information assimilation and decision-making so a single operator can cope with managing multiple autonomous UAVs in a high mission workload environment. Two human information processing characteristics are being exploited to accomplish this. The first acknowledges the limits of human working memory (Miller, 1956) by creating a readily available relevant information pool no more than one click away from the operator's screen. Our model for working memory is conceptualized as including visible information and information easily accessible to the operator. Intelligent agent software screens are available net-centric information, choosing what is relevant for the display. Operators can verbally inquire about additional information they deem necessary. This flexible information mix extends working memory means more relevant information can be considered quickly in the decision process.

The second human information processing psychology principal being exploited is visual thinking or external cognition (Arnheim, 1969). Visual thinking asserts that vision processing was an instigator of higher cognitive functions in humans, and our cognitive processes were strongly influenced by evolution. Certain visual or other sensory representation (hence the expanded term external cognition) configurations should be easier to assimilate than others. MAGE operators are required to judge which of multiple alternative flight plans are better. Each flight plan is measured by 5-10 metrics which may include fuel economy, speed, threat exposure, and other dimensions. Simple bar graphs of these multiple dimensions, each of different significance and scale, were difficult to interpret. Humans are adept to visually judging the area subtended by different graphical representations. A multi-dimensional display representing the relative and absolute value of path alternatives was devised where the operator can judge route alternatives by area subtended and still have access to the relative and absolute merits of each dimension. This permits both rapid recognition-primed decisions (Klein, 1991) when time pressure exists or more deliberate decisions when more time is available.

MAGE's approach to operator displays is used to control the deluge of information from multiple UAVs and net-centric sources and shape them into forms which can be easily and quickly understood by human operators. The design process will be revealed and data will be presented to support the assertions of effectiveness.