SBIR Overview

A confined space is classified as a potentially hazardous work environment. Accordingly, Federal regulations and military orders have been drafted to govern the safety of workers entering these environments. For instance, entry into the fuel cells of airplanes creates unique hazards resulting from small entry/exit portals, prior presence of aviation fuel, irregular shapes, and above ground entry.

Regulations and Technical Orders mandate that the well being of entrants be monitored on a continual basis. Prior to the Air Force's utilization of the Life•line™ monitoring system, this activity was achieved by placing an additional attendant outside of the confined space that verbally or visually kept in contact with the entrant. The Life•line™ Monitoring System changed the way that Tinker kept watch over their maintenance personnel during confined space entries by eliminating the need for the additional attendant. By Tinker's own estimates Life•line™ is saving Tinker AFB approximately $8M/year while at the same time increasing production by 9%.

The Life•line™ Monitoring System is comprised of two main components, a Monitoring Console, which is manned by an attendant, and Portable Safety Monitors (PSM's), which are carried by individual workers (aka users, entrants). The monitoring console is a two-way voice and data communications system that periodically exchanges information with each PSM and communicates in real time to verify the safety of the worker. The attendant sits at the monitoring console and is capable of "watching" up to 99 workers performing their duties in various confined spaces all at the same time. Attendants can send alert signals or establish voice contact with individual workers, or groups of workers, routinely or to warn of hazardous situations. Additionally, workers are able to press the "panic button" on their PSM to quickly gain the attendant's attention- often more quickly than they would of an attendant sitting outside of the confined space.

Whereas the existing Life•line™ system provides an electronic and compliant means for monitoring confined space entrants and eliminating the need for physical person outside each space, it has reached its technical limits in its current design. There are four (4) key potential improvement areas identified by Safe Environment based on consultations with Life•line™ customers, users, and administrators. These areas of improvement are:

1) The system currently requires that a user log on at a central location or a location where the PSM's are distributed. (Larger work areas have satellite locations closer to the work sites where workers log into the system). The next generation of PSM will operate by using a means to log in the user from any location or operating terminal. This feature is expected to marginally improve the efficiency of using the system by further increasing available production time for each user.

2) Currently the system operates by entering a user's work location code(s) into the system. In many cases this operation provides sufficient information in determining the location of the user in an emergency (i.e. left wing fuel tank). However, when there is a location change during a shift, it becomes necessary for the user to inform the administrator of the change. The addition of a tracking component that can be overlaid onto site maps enables the location of roving personnel to be rapidly identified. This feature is expected to have a marginal impact on operational efficiency. However, the safety of the user is significantly increased in operations where confined space entry personnel make periodic changes to their work location during a shift.

3) Currently the system requires an administrator to input data based on the user's identity. In some cases the user identity is subject to typos and incorrect selections from a list. While this is typically a training issue, it is usually a problem when shift changes occur or new administrators are operating the system. The addition of a biometric identification system would significantly reduce these errors. This feature is expected to increase the accuracy of a user's identity in the system by eliminating human error. This feature is not expected to have an impact on operational efficiency, and will have an unknown impact on user efficiency. Coupled with the technologies above this could significantly improve safety by coupling the log in and identity process with user critical information (i.e. diabetic, heart condition, medication required, etc.) for future system upgrades.

4) Currently the system sends out an "are you ok" query to the confined space entrant. A non-response sends the system into an alarm. Conversely, if the entrant is experiencing trouble an alarm button can be pushed to alarm the monitoring station. The system is passive in its activities. By allowing for physiological monitoring of the entrant, the system can pro-actively monitor the entrant's well being while operating in the confined space. This feature is expected to improve the life-safety of the entrant and improve medical response required during an emergency.

The additions and/or improvements listed above increase the potential of the next generation's confined space monitoring system for additional uses in a variety of other markets. The system becomes useful for anything from monitoring first responders to tracking the location and condition of military personnel deployed in the field.