

Conceptual Integrated System Design
Focused on a Miner Safety System

FOR

DOL/MSHA/NIOSH/NAS
Mine Escape Planning and Emergency Shelters
Workshop
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BY

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Proposed Pilot Project
for
Integrated Technologies
(PPFIT)

PPFIT Missions

"Everyone Goes Home"

Reduce Line of Duty Deaths
(LODD)

Utilize State of The Art (SOA)
Integrated Technologies

Announcing!



The Elements of
PPFIT

Proposed Intellectual Capital for PPFIT's LODD Reduction Effort

Suggested 11- 15 Member Team Disciplines

- State Dept's of Mining and Minerals
- Universities
- Mining Companies- Miners-Labor & Trade Associations
- Dept. of Labor-MSHA-NIOSH
- NAS
- Federal Research Laboratories & DOD/NASA
- Nobel Laureates
- Private Sector for Technology Integration/Program Management

PPFIT Team Marching Orders

Fix It!

* * * * *

Potential Funding Sources For PPFIT team

- Homeland Security (Coal is vital)
- National Science Foundation (NSF)
- National Institute for Health (NIH)
- Economic Development (Coal is vital)
- Federal and State Grants
- State Budgets
- Private

PPFIT's Integrated System Priorities

- Early Hazard Detection
- Safe Refuge
- Extended Breathing Air Supply
- Enhanced Visibility in Smoke
- Improved Communications
- Personnel Locator
- Training in SOA Equipment
- Modification of Training Delivery

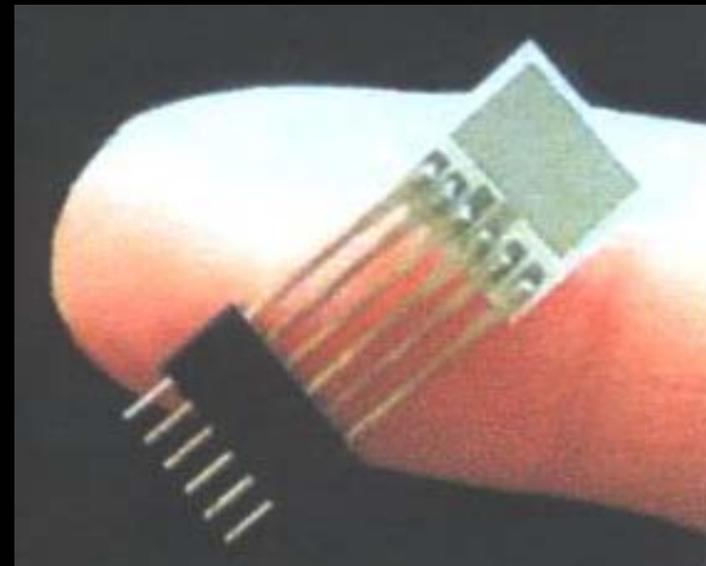
Early Hazard Detection

Argonne National Laboratory

New Sensors detect minute
changes in & the Levels of:

- Methane
- Oxygen
- Carbon Dioxide-Monoxide
(Including Inside refuge
Chambers)

Dr. Laura Skubal
630-252-0931
Email: lskubal@anl.gov



Safe Refuge

Tours of various Safe Refuge sites & NASA Kennedy should be considered by:

- Affected DOL/MSHA Leadership
- Affected Governors
- Affected Congressional & State Legislators

Extended Breathing Air Supplies For Miners & Rescuers

Dr. Donald F. Doerr
Chief, Biomedical Engineering
NASA-Kennedy Space Center
(KSC) Tel: 321-867-6387
Email: donald.f.doerr@nasa.gov
Dr. Hal Gier, Technical Director,
STS-Longmont, CO.
Tel. 970-535-0384
HalG@superthermal.com

NASA-KSC Cape Canaveral

Extended breathing air supplies for:

- Miners
- Mine Rescue personnel
- NASA-KSC has 40 yrs experience with extended duration breathing air supply systems

Extended Breathing Air Supplies

In - mine semi portable air supply available for 12 or 24 miners for 96 hours (4 days) **

Portable

STS one and two hour supplies

SCAMP = Self Contained Air Mobility Pack

Suggest:

- Tour NASA-KSC Cape Canaveral, FL
- **Experienced NASA/ASI/STS/UK team Design and Manufacture site specific prototype with proven technology on compressed schedule.

12-24 Miners 4 day Extended Breathing Air Supply

Conceptual Design for Safe Refuge Air Supply

Three foot diameter sphere with 12
masks, manifold and hoses = 12
individuals for 4 days

Four foot diameter sphere with 24 masks
manifold, and hoses = 24 individuals
for 4 days

Representative Extended Breathing Air Systems

- **Liquid Air**
- **Non-Liquid Cryogenic Air**

Liquid Air Packs For Rescuers At KSC

Liquid Air Pack in use by Shuttle Rescue Team



Liquid Air Pack

- supports 1 hr vigorous exercise
- up to 3 hr resting
- recharge in 5 minutes
- positive pressure, demand mask
- pack weighs 28 lb, full



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Self Contained Air Mobility Pack (SCAMP) - Non-Liquid Air Packs



One Hour, any attitude, cryogenic air pack.

Dr. Hal Gier (SCAMP Inventor)

970-535-0384 halg@superthermal.com

Two hour (at work) any attitude cryogenic air pack



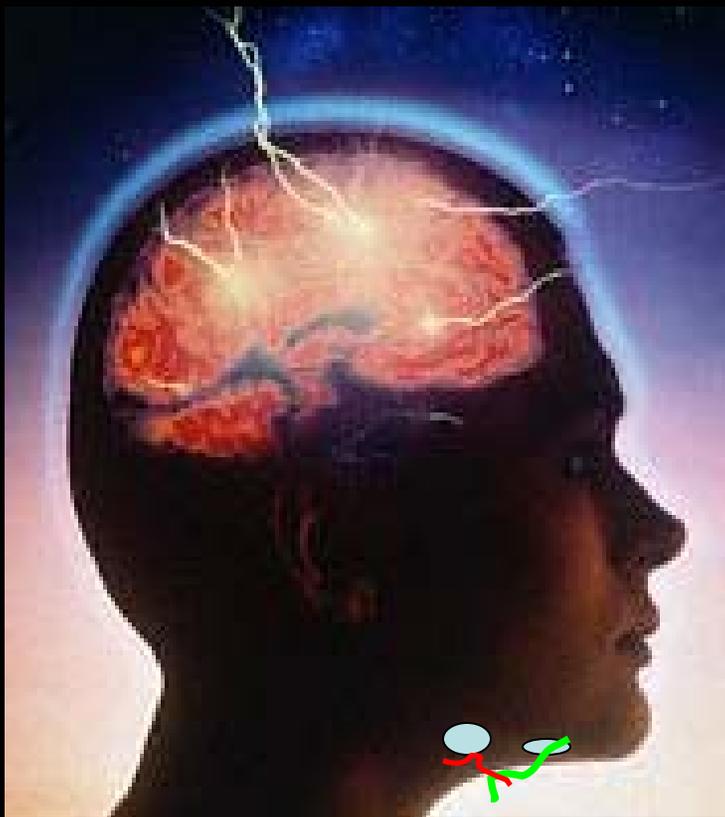
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Improved Communications

“ Thoughts to signals ”
conversion technology

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cjorgensen@mail.arc.nasa.gov



Sensors

Neuro
Engineering
Laboratory
NASA Ames
Research Center

Non-contact Signal Acquisition

Latest EMG Sensor



Early R&D Eight-channel EEG
plus EMG Sensor Recordings



Design Goals

2004

- Demonstrate non-contact technology
- E-field sensor (normal to scalp)
- No Shielded room

2005

- Differential sensor (tangential to scalp)
- Mini sensors (2-3X smaller, thinner, with manufactured cover)

2006

- Unshielded room
- Multichannel



Mini-differential
Sensor

QUASAR: Quantum Applied Science and Research Inc.

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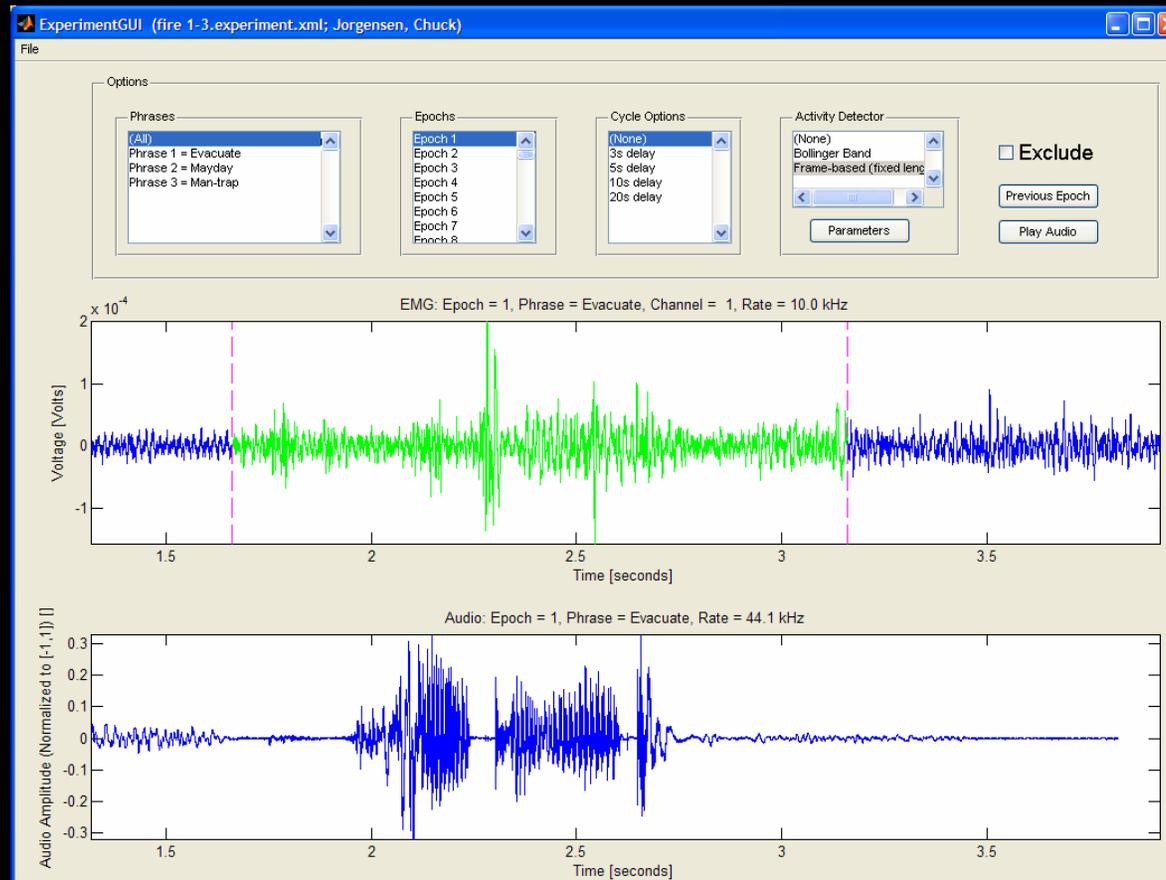
Sub Vocal Speech Definition

The use of non-audible, electro-myographic signals from the surface of the larynx and lingual areas of the throat to control devices and silently communicate

Subvocal versus an Audio Signal

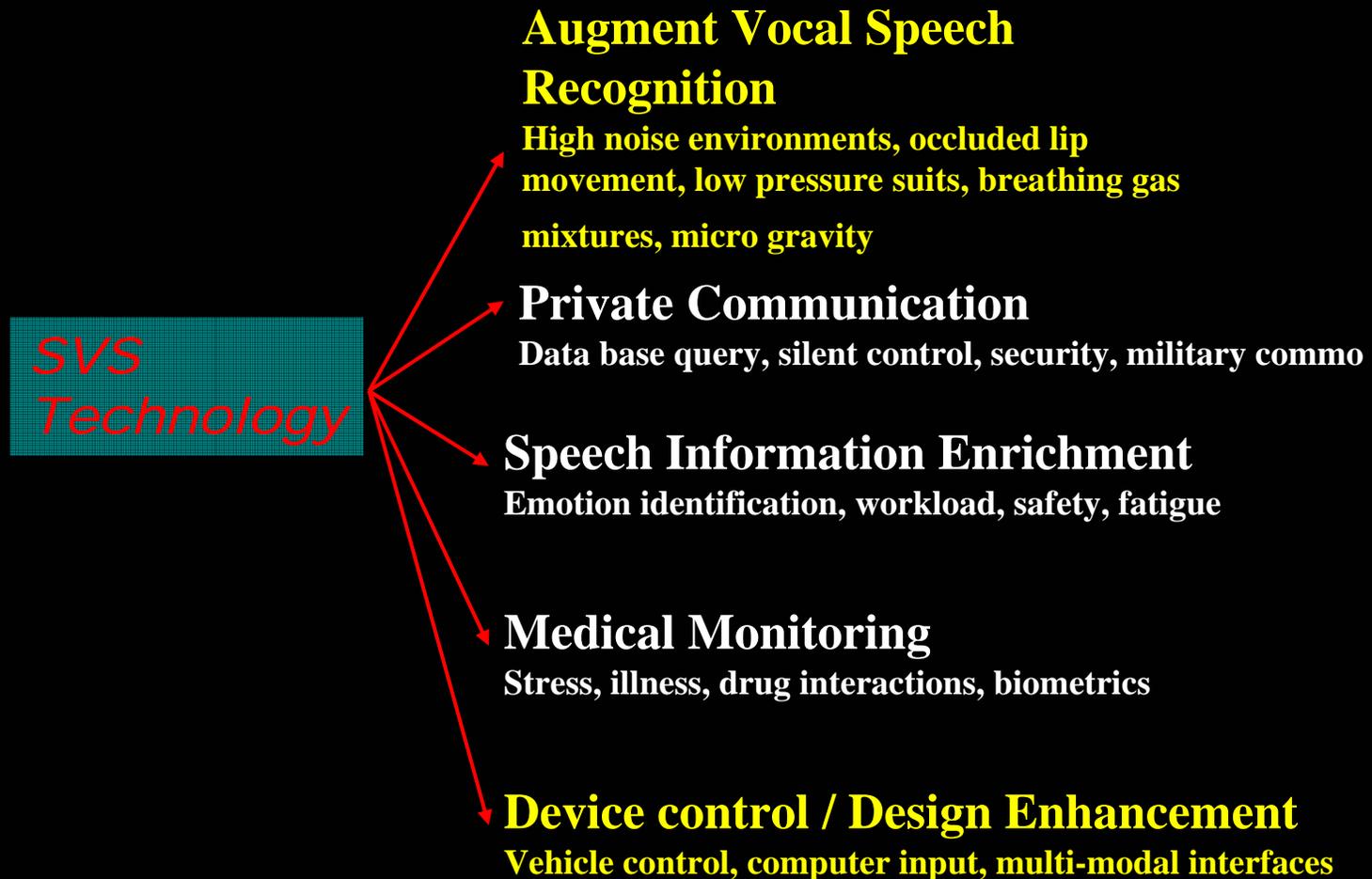
EMG
Subvocal

Vocal



Single-channel subvocal waveform for word “Evacuate”.
The time-synchronized audio waveform is also shown.

Sub Vocal Speech Applications



FLIR – Forward Looking Infrared see through smoke and other critical data displays (In development)



**FLIR
Display
unit**

**Heads up
Compass**

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See Through Smoke Hands-Free (in development)

- FLIR = Forward Looking Infrared Display



Personnel Locator Technologies

- DOD friendly fire avoidance
(May be classified)

Morris Hornik
Office of the Secretary of Defense
The Pentagon
703-607-0251
Email: morris.hornik@osd.mil

- NASA/Ames ... Breakthrough Locator Technology
Dr. Chuck Jorgensen
Tel: 650-604-6724
Email: cjorgensen@mail.arc.nasa.gov

Training in SOA technologies and methodology of delivery

- Provide qualified instructors in systems thinking and the adapted technologies
- Take systems training to the miners

There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system.

Because the initiator has the enmity of all who would profit by the preservation of the old system and merely lukewarm defenders in those who would gain from the new one.

Machiavelli 1513

It is never easy but we MUST try, as did the Kentuckian who invented the first gas mask.....

Thank You!

H.C. Bud Meyer

President

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