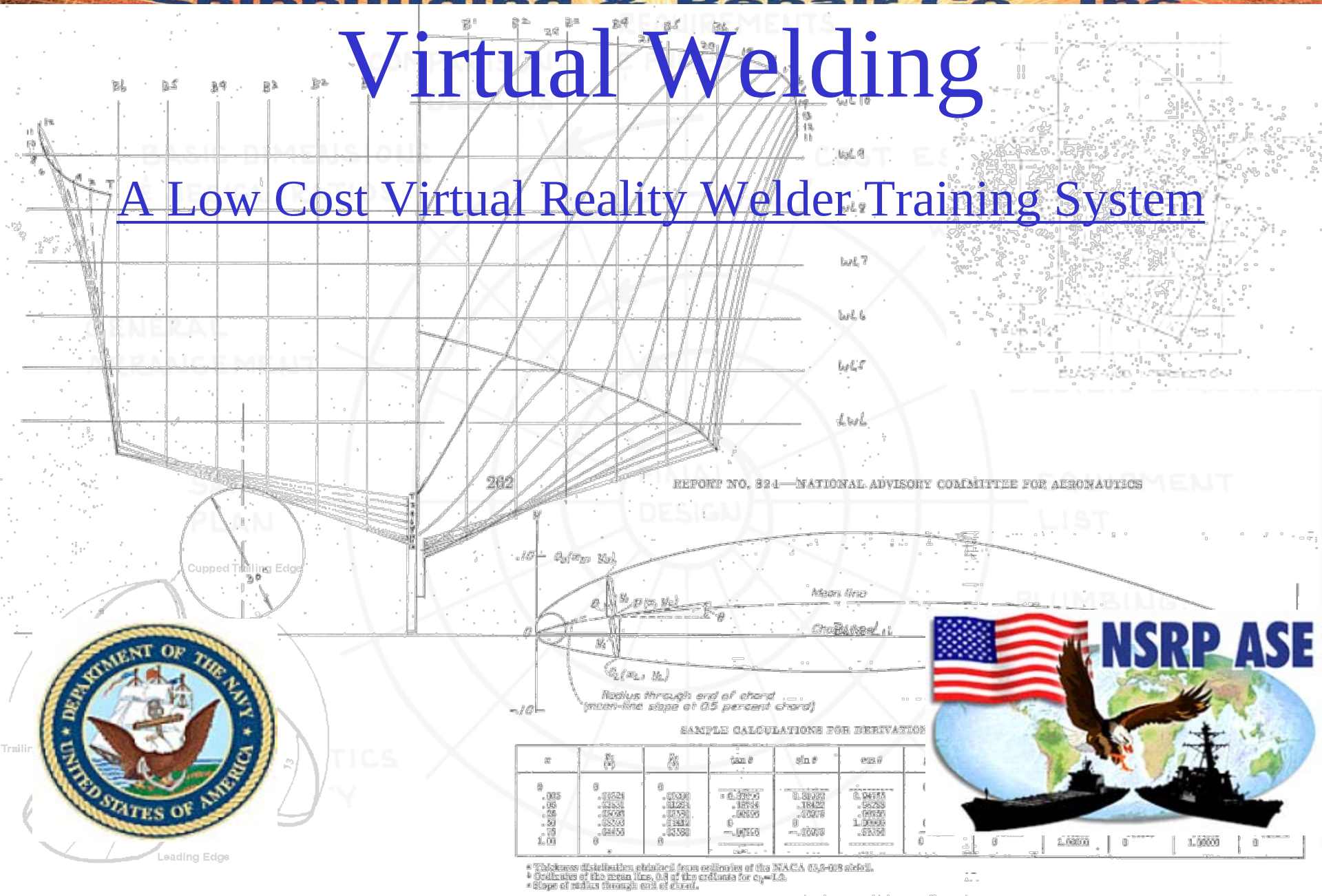
Virtual Welding

A Low Cost Virtual Reality Welder Training System



Virtual Welding

Project Team

NORTHROP GRUMMAN
DEFINING THE FUTURE

N·A·Tech
Native American Technologies inc.

THE UNIVERSITY of NEW ORLEANS

Bollinger
Shipyards, Inc.

BENDER
Shipbuilding & Repair Co., Inc.

DEPARTMENT OF THE NAVY
UNITED STATES OF AMERICA

GENERAL DYNAMICS
Electric Boat

NSRP ASE

BENDER Shipbuilding & Repair Co., Inc.

US NAVY





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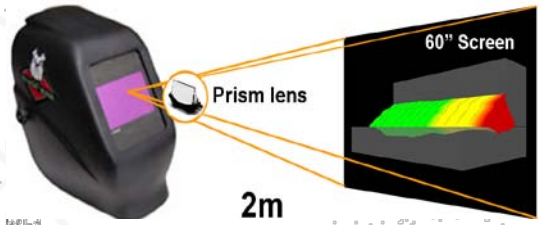
75% Manual GMAW

Commercial Welding:

1.3M Hours of Welding per Hull

- Improve weld pool graphics
- Improve sound
- Add real-time feedback



In Helmet – Heads-up Display – Video & Audio

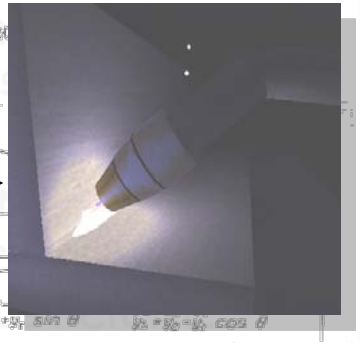
PROPOSED WORK

25% Manual GMAW

Submarine Welding:

1.3M Hours of Welding per Hull

- Improve weld pool graphics
- Improve sound
- Add real-time feedback
  - Help welder correct torch orientation or travel speed on the fly



Current Processes *Video Gaming* *Virtual Display*

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OBJECTIVE

Virtual Training

Low Cost

Maximize training efficiency, reduce training time, reduce materials cost, automated immediate feedback, screening tool.

Utilize new advanced sensing and fast/accurate artificial intelligence technology to reduce workstation cost.

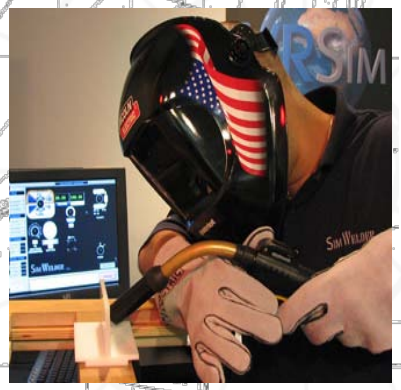
BENEFITS

SIM WELDER™

High Cost Virtual Welding

Developed to train Brain Surgeons

- High precision, high cost tools
- Massive computing requirements
- Clean room type fixturing
- Research demonstrated feasibility



Proven feasibility of V. R. for welder training

- U.S. Army Funded Testing Program
- Conducted by South Dakota School of Mines
- 60% reduction in actual welding time
- 70%+ reduction in consumables
- 40% reduction in total training time
- Improved welder skills

ONR

Analysis of Virtual Welder

Virtual Welder can train welders

- Reduced cost of training
- Improve skill of welders
- Reduce cost of welding ships

ONR Analysis of data from GDEB

- Reduce gas metal arc welder training costs at GDEB by $81K annually
- increase overall welder productivity by $1.3M per Submarine hull
- increase gas metal arc welder productivity alone will result in a $325K savings per submarine hull

VR Systems

Then

Costs ~ $100,000

NOW

Cost ~ $10,000

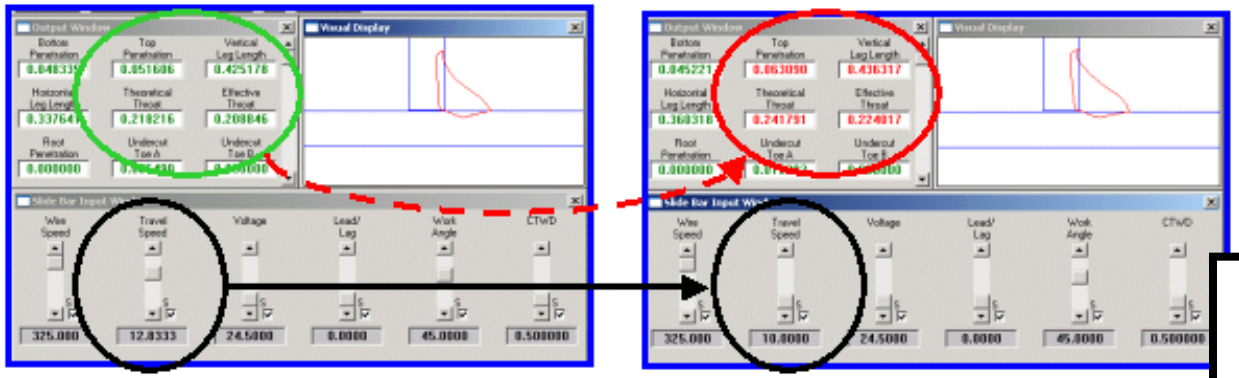
Hardware Developments

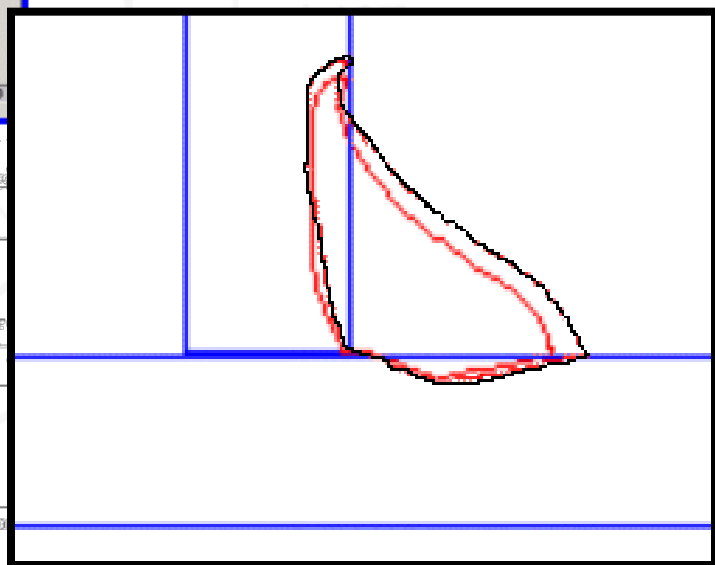
- Increased the number of WII remotes
- Altered the targeting of the remotes

The **Wii Remote**, is the primary controller for Nintendo's Wii console. A main feature of the Wii Remote is its motion sensing capability, which allows the user to interact with and manipulate items on screen via movement and pointing through the use of accelerometer and optical sensor technology.

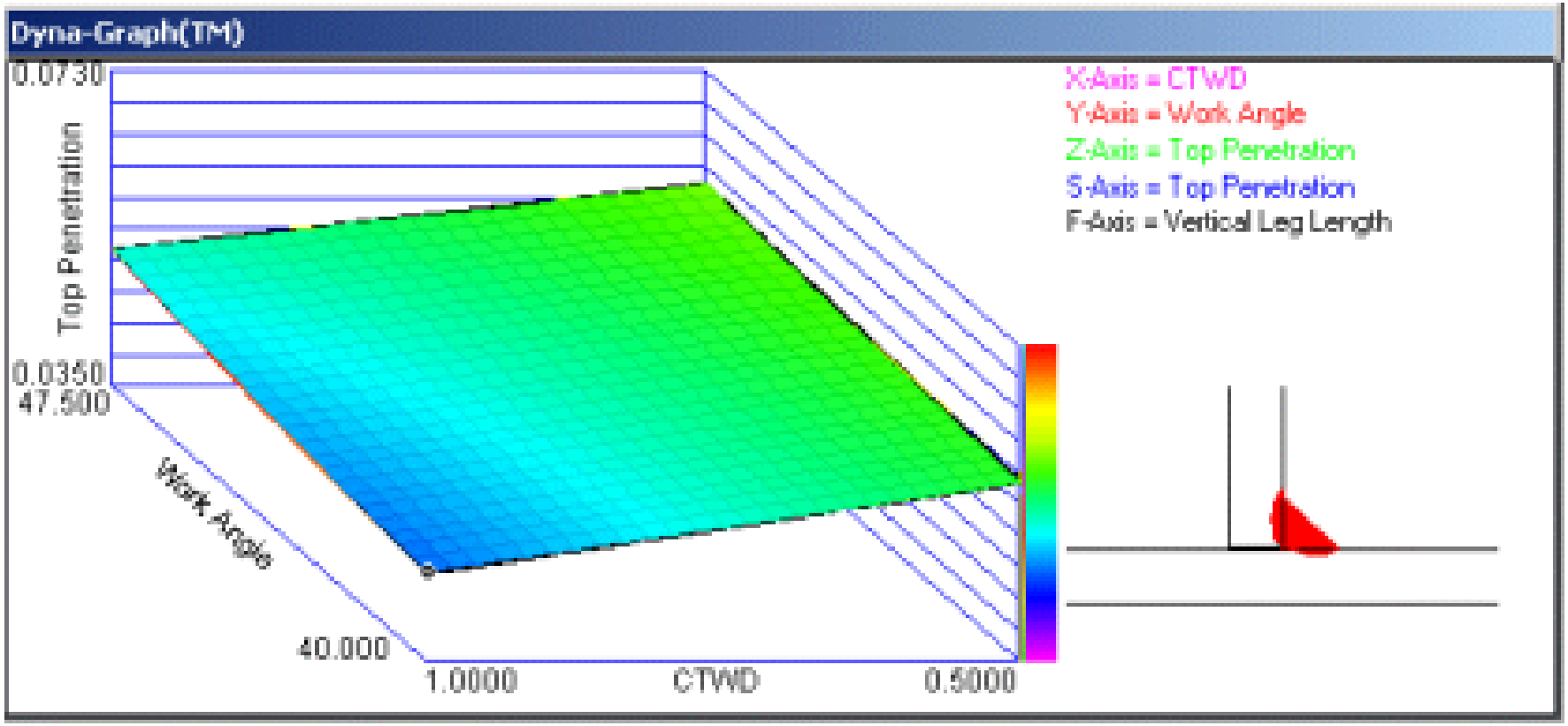
NAMES Software

- Used in over 200 automotive plants to monitor weld quality.



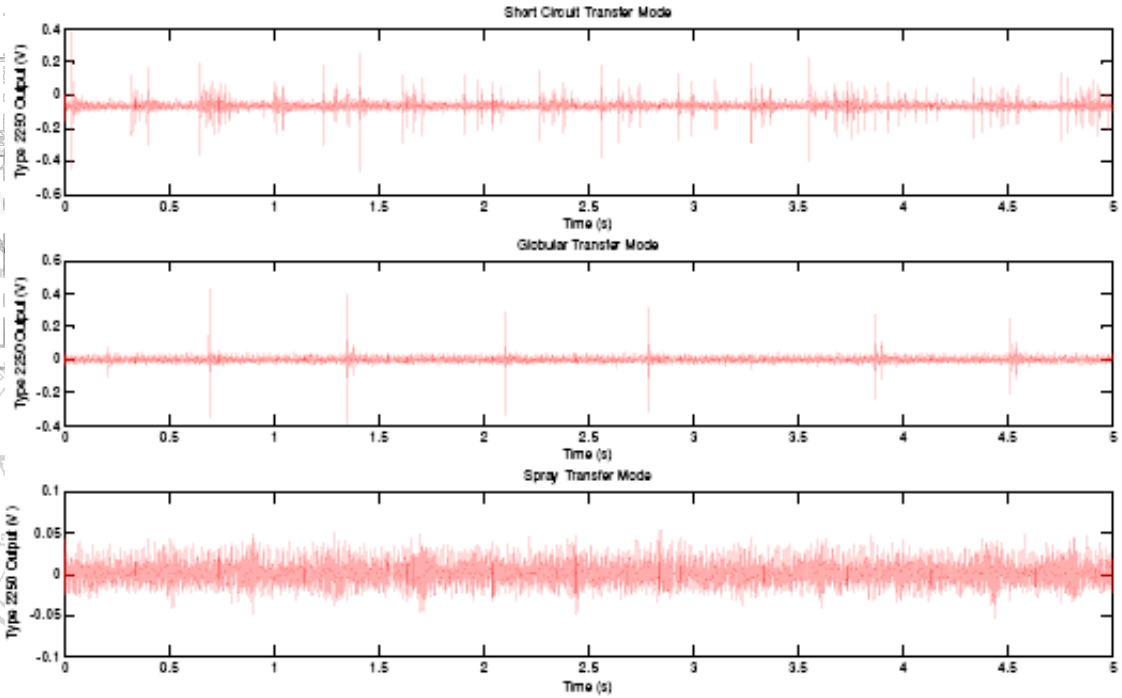


Neural Network Graph of Parameters



VW Sound Control

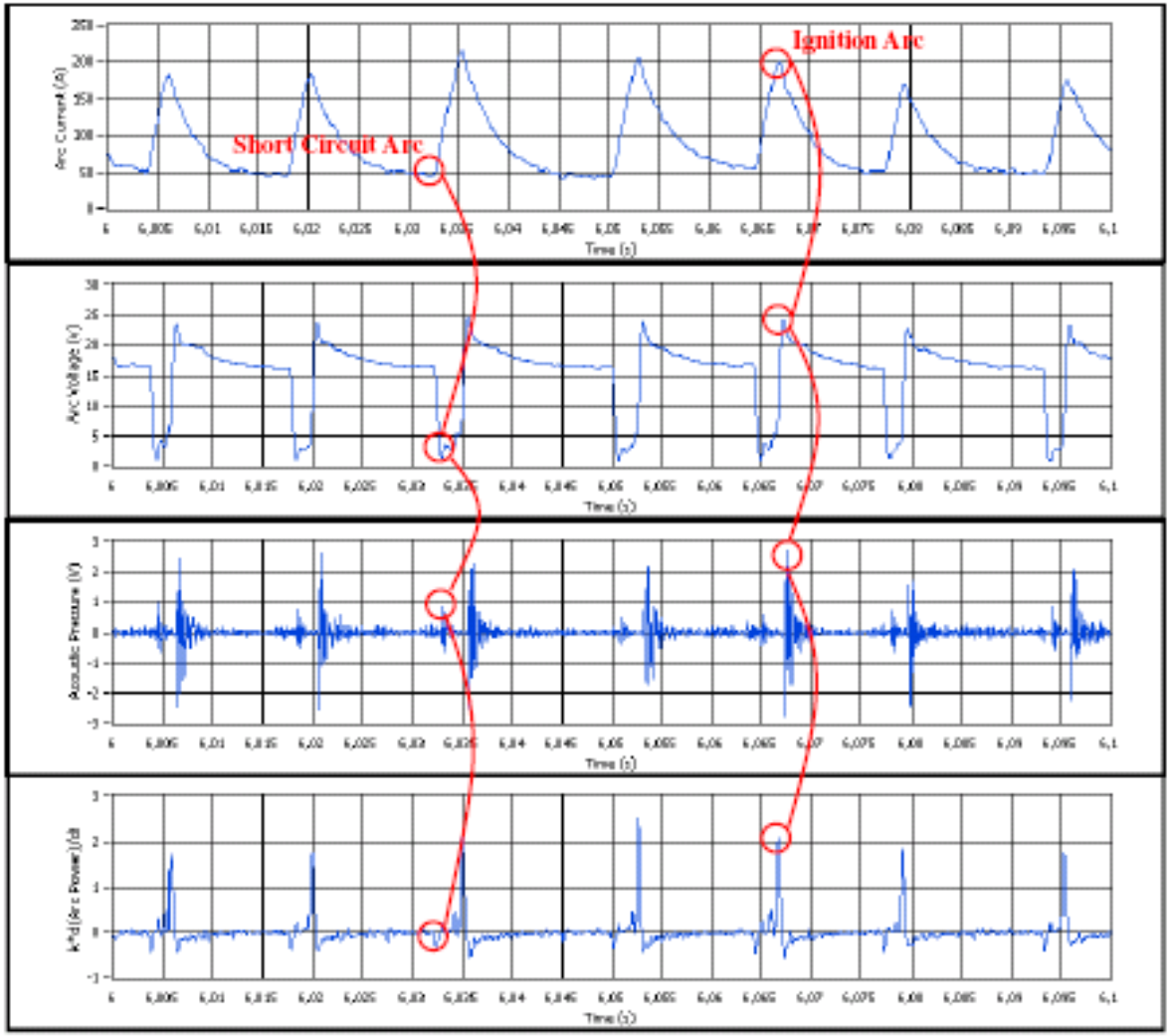
- During the weld tests Audio was sampled at the same 20Hz as the rest of the weld parameters
- The sample will be tied to the parameters and reproduced during the training to match what the weld is doing.



Sound Data

Correlation between:

- Current
- Voltage
- Sound Measured
- Calculated



Sound Related to Defects

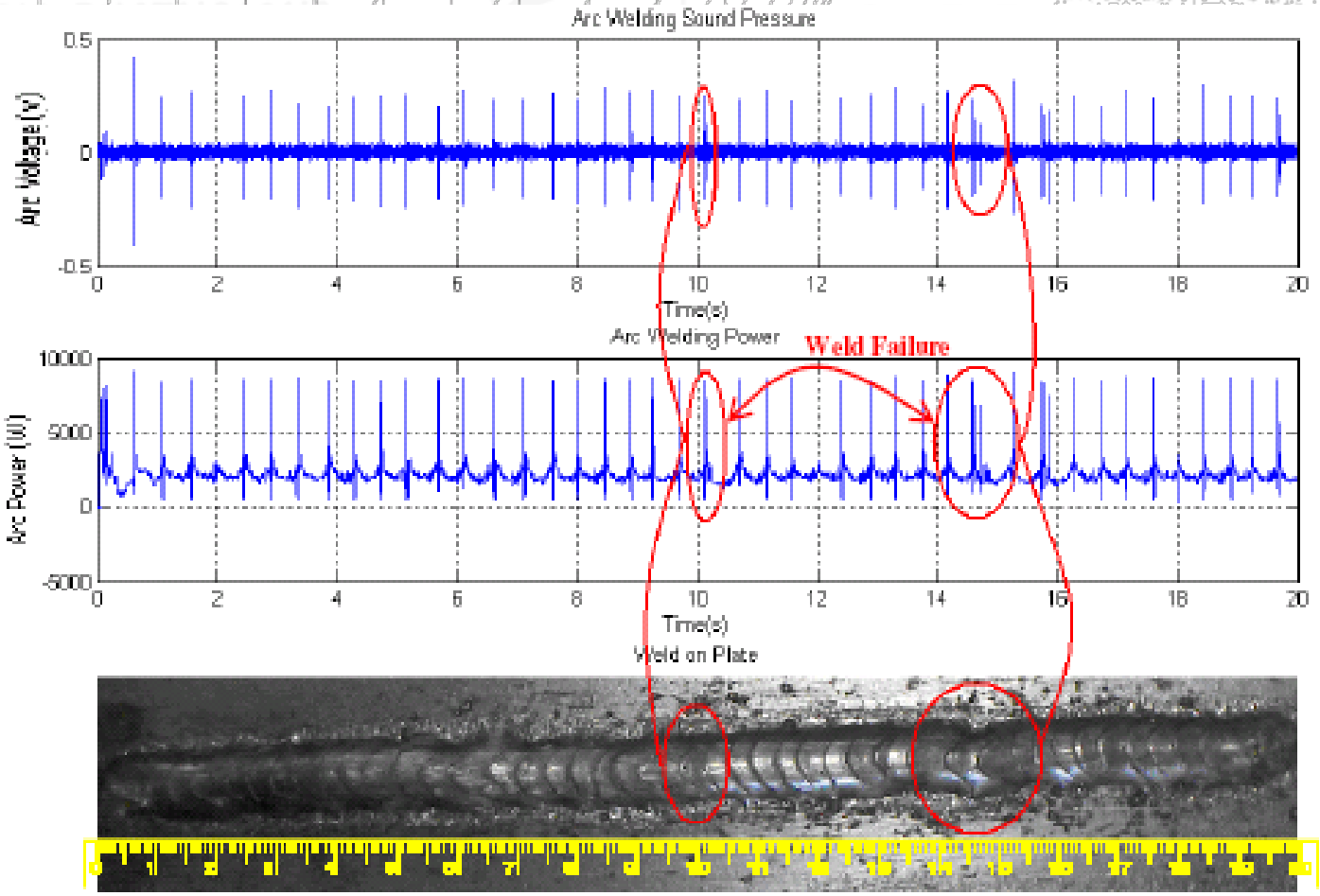
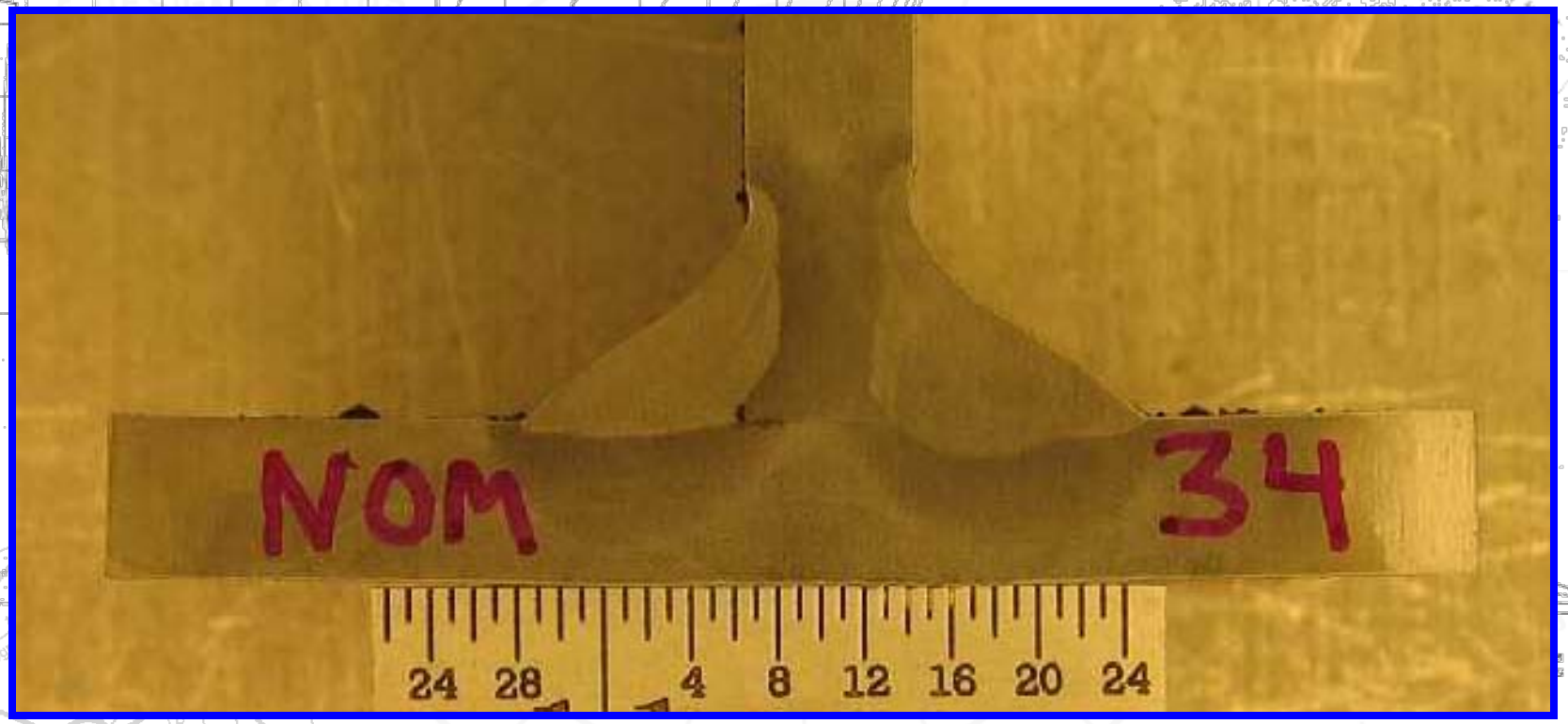


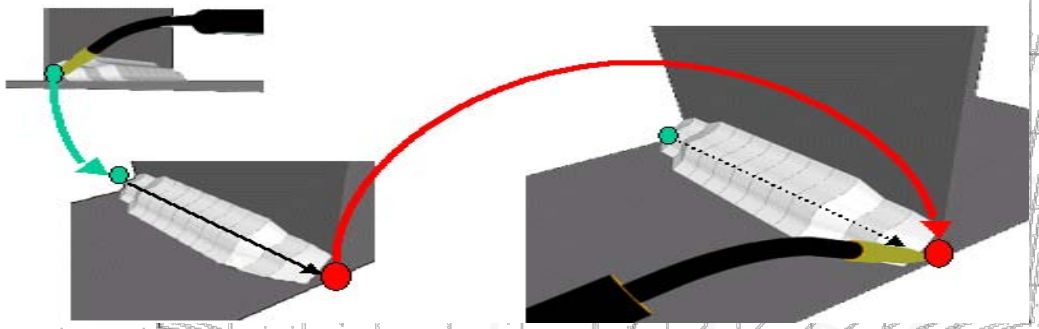
Figure – 10 Weld Defect Identification of power and sound pressure (Test 8)

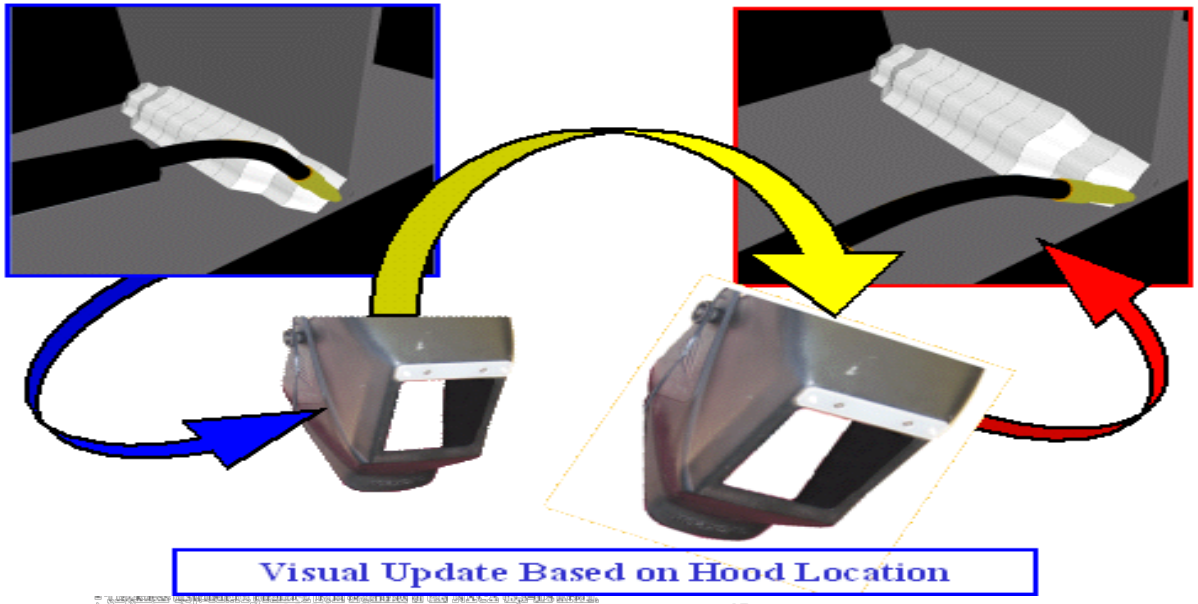
Weld Sample



Motion Control

Weld Hood and Torch





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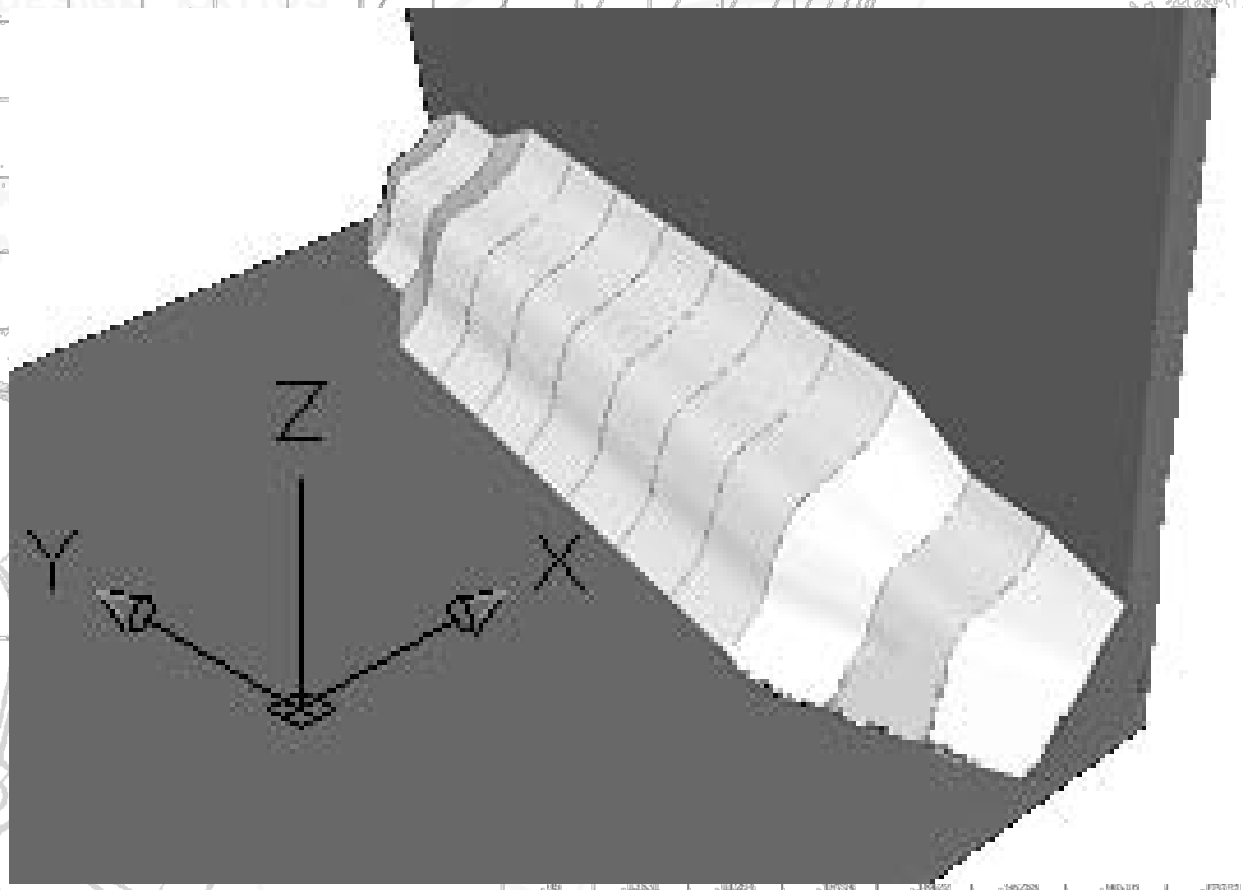
NAMES DEMO



The Weld Pool

What a welder can actually see while welding. A large key to truly knowing how to weld.

Visual Display

- While this task is not due to be completed until well into Phase II, the system will be tested and demonstrated using the dual video glasses inside the helmet. Although it was originally planned to only produce a pseudo-3D display, the glasses have two separate LCD projection displays and software that can accept two different renderings of the scene, offset to produce a virtual 3D image. Consequently, by using the glasses, it appears that it will be possible to generate a virtual 3D image for the Training System.

Questions

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