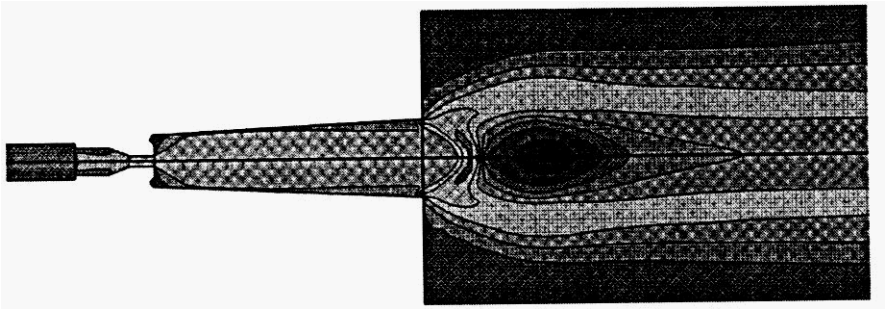

CFD MODEL OF HALON 1211 FLOW IN EXISTING FIRE EXTINGUISHING HARDWARE

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CFDRC

Problem Statement:

- Halon 1211 Alternatives Will Require Hardware Modifications to Optimize Agent Delivery
- Optimization is Currently an Uncertain, Expensive, and Difficult Process

Approach:

- CFD Analysis is an Ideal Tool to Model Phase Changing Flow in Extinguishers
- Geometry and Properties are Easily Changed
- Halon 1211 Extinguisher is an Ideal Benchmark to Validate Model for Use With Alternatives

Objective:

- Design a Suitable Extinguisher Including Optimum Nozzle Geometry and Storage Pressure to Deliver Optimum Quantities of Agent to the Fire

COMPUTATIONAL APPROACH

Use CFDRC To:

- Define Geometry
- Calculate Halon Flow
- Model Phase Change Process

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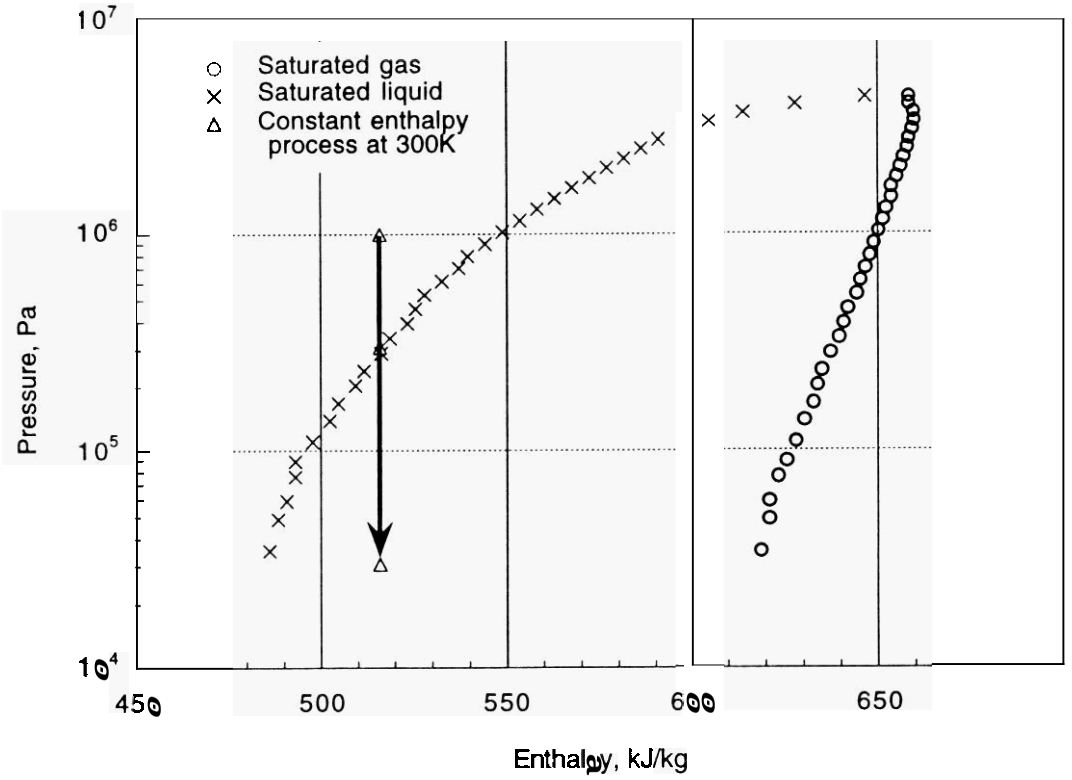
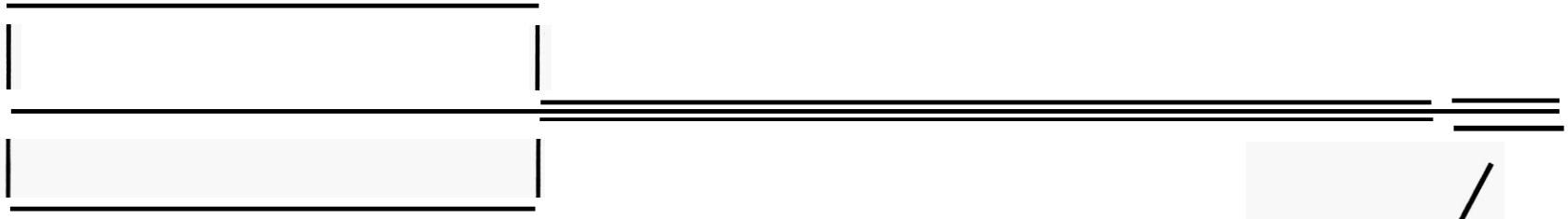
Most Work at Quasi-Steady State Near Beginning of Discharge

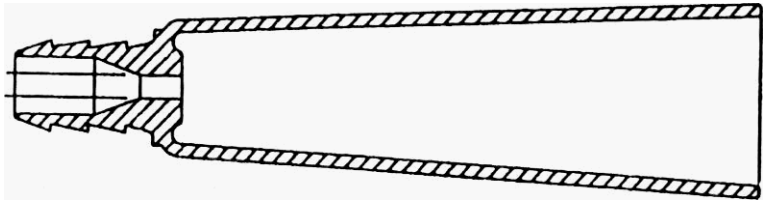


GEOMETRY DEFINITION

CFDRC



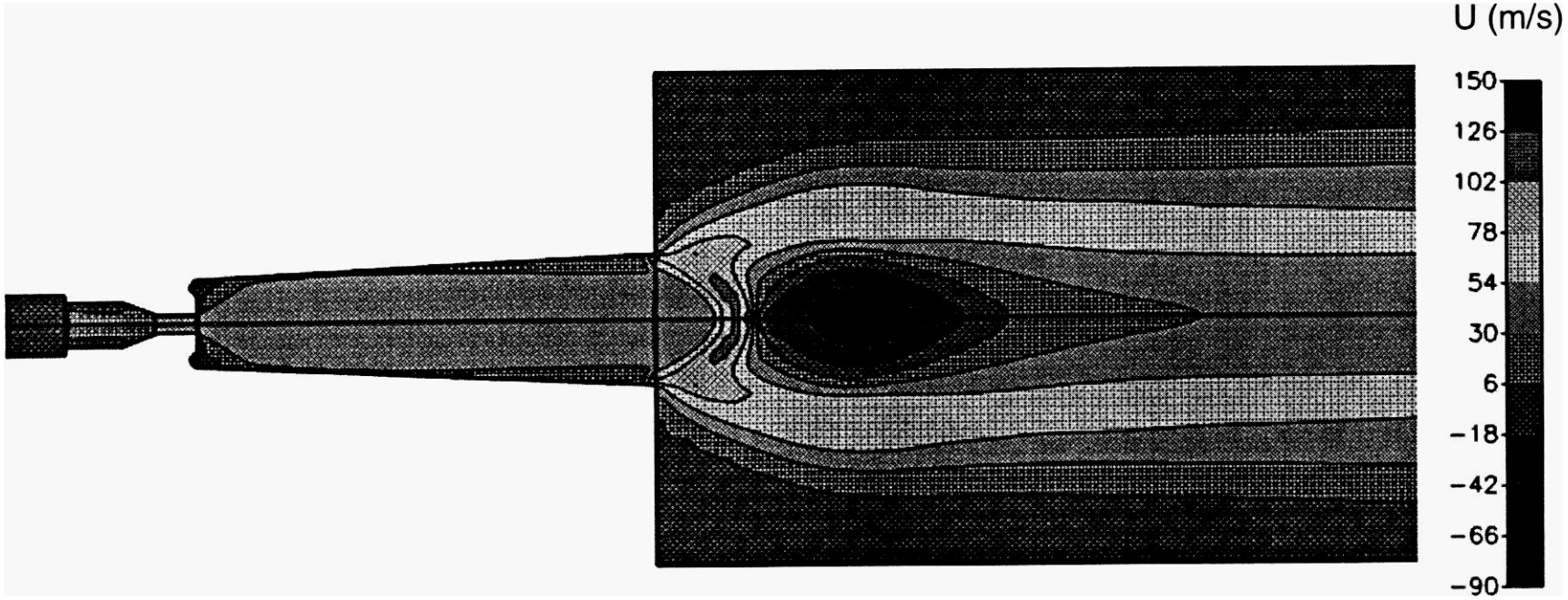
Assembly



Actual Nozzle

CFD Nozzle

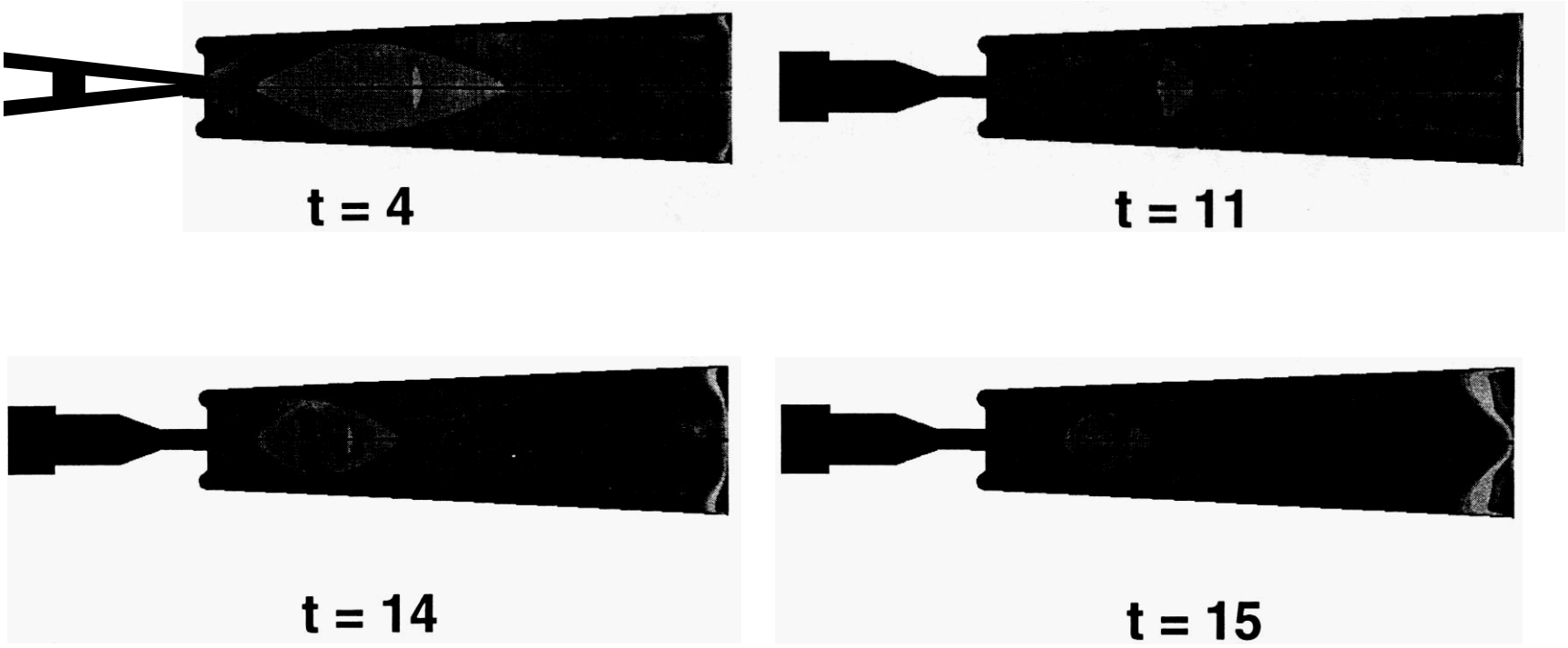
VELOCITIES INCREASE AFTER NOZZLE DISCHARGE



VELOCITY FIELDS DURING DISCHARGE

Shock is Drawn into Nozzle

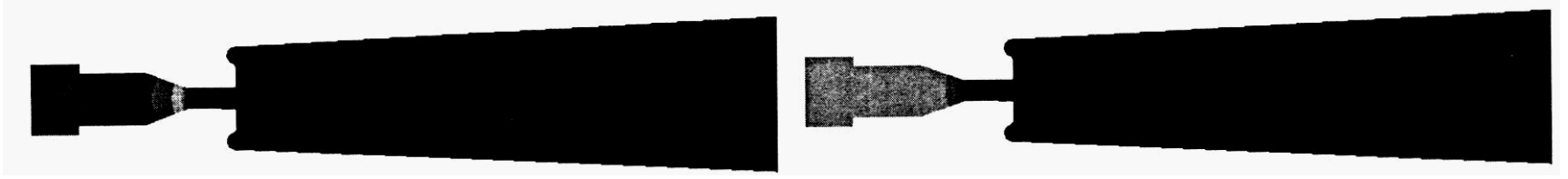
CFDRC



PRESSURE FIELDS DURING DISCHARGE

Most Loss Across Orifice

CFDRC



t = 4

t = 11

t = 14

t = 15

Pressure, Pa

1.0E5 1.8E6

CONCLUSIONS

CFDRC

- Geometry Can Be Modeled and Changed Easily
- Phase Change in Nozzle Can Be Predicted
- Pressure Drop Primarily Taken Across Orifice
- Velocities Increase Significantly in Nozzle
- Predicted Flow Patterns Are in Good Agreement with Experimental Observations
- CFD Analysis is a Good Tool to Predict Hardware Performance and to Optimize for Alternative Agents