

# *D8 Vacuum Excavation Panel*



**3rd Damage Prevention Convention  
Boston. MA**

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# Question



- Vacuum excavation is certainly safe
- How do we ensure it is both efficient and cost effective?

# *Answer*



- Efficiency demands best use of technology
- Cost effectiveness means right tools and right equipment for the job

# *Technology*



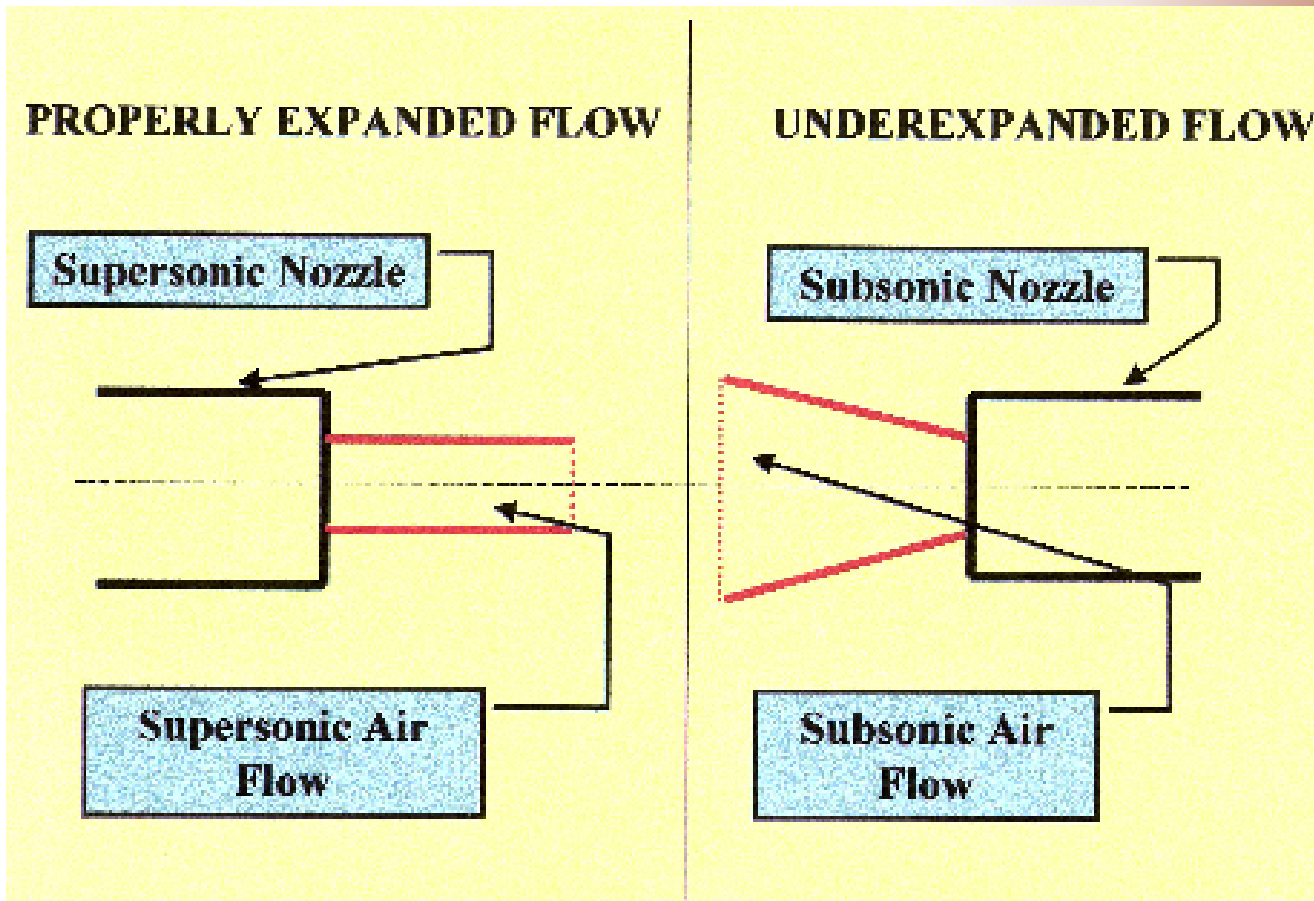
- Supersonic Air Jet Excavation
- Pneumatic Removal

# *Supersonic Air Jet Performance*

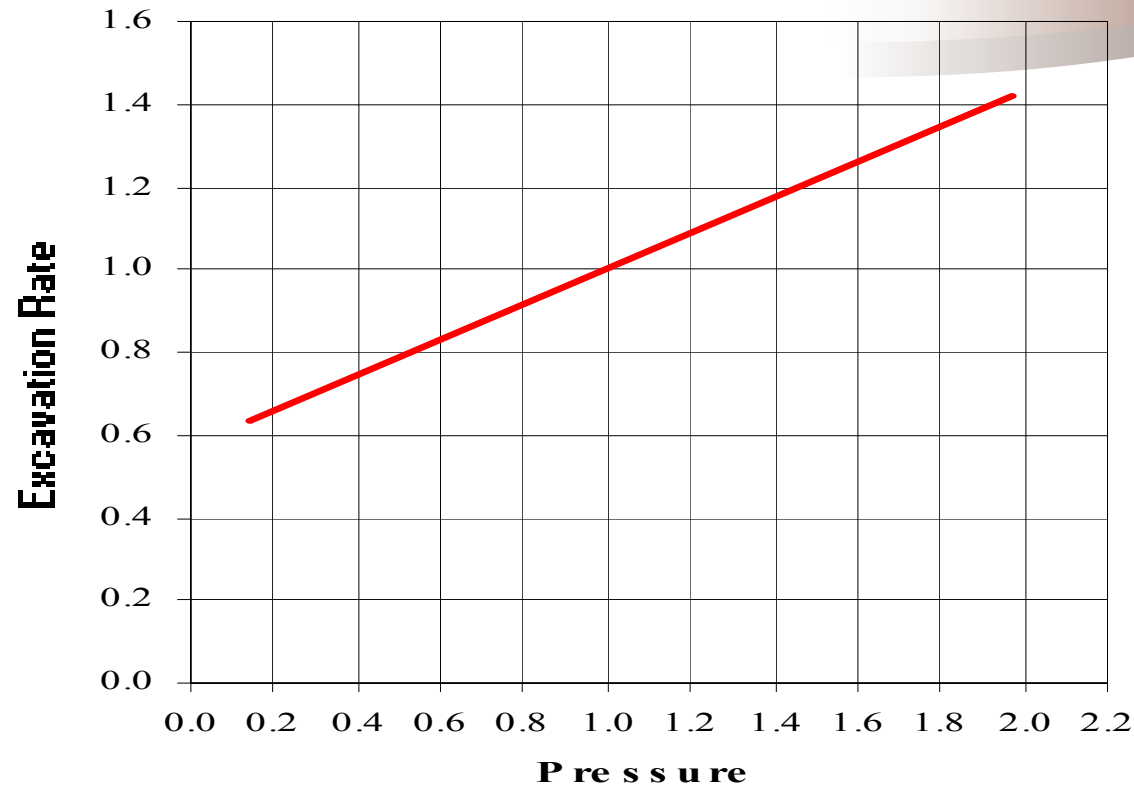


- More efficient than other air jets
- Increases with pressure
- Increases with air flow
- Decreases with soil strength

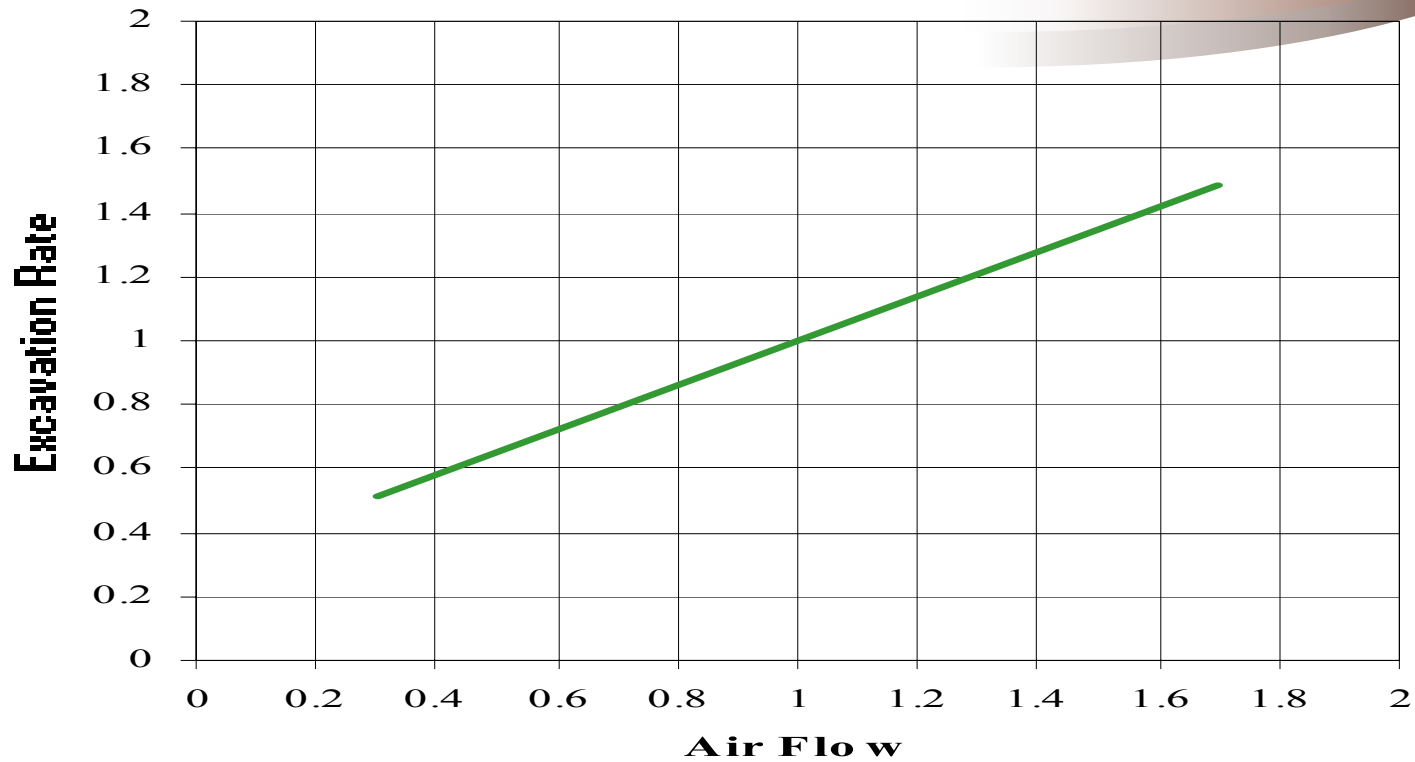
# *Supersonic Vs. other air jets*



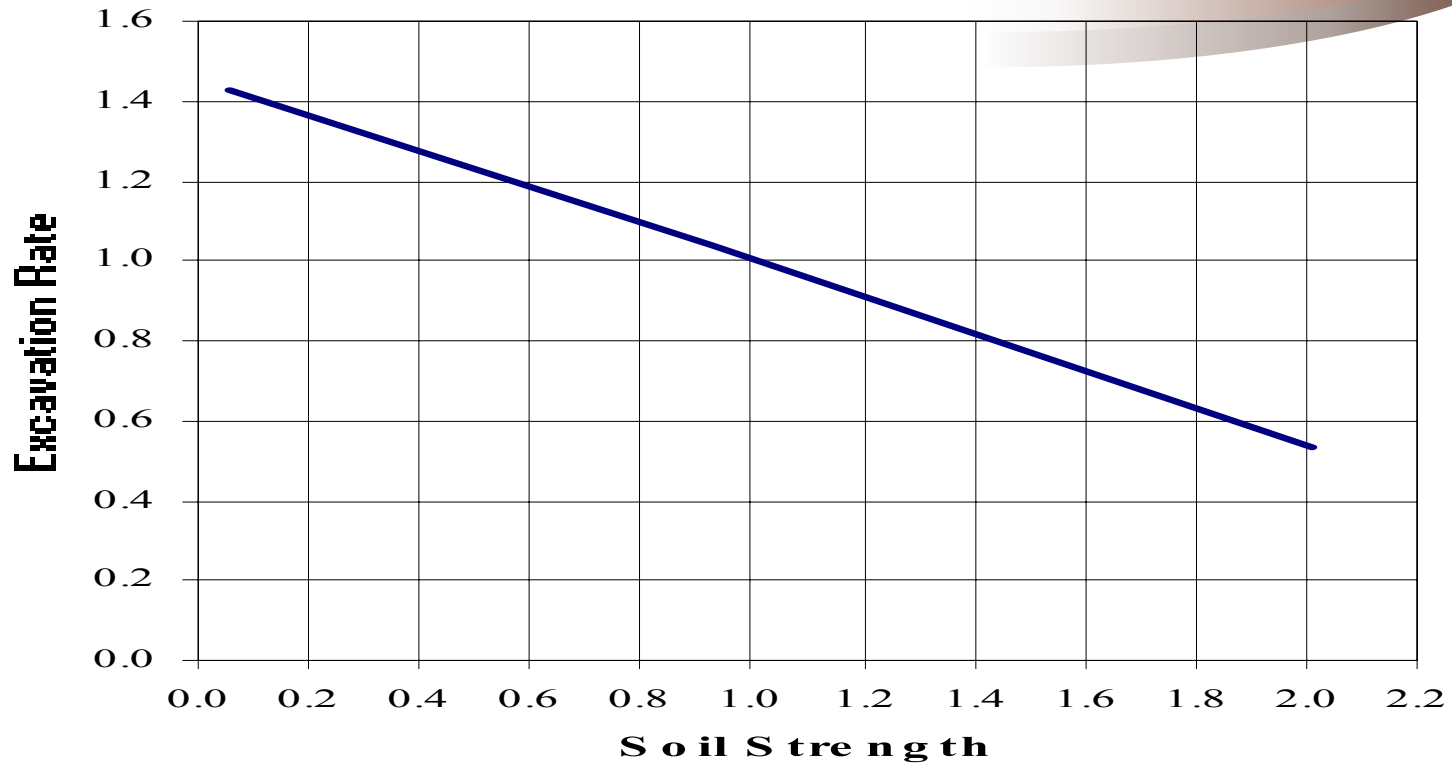
# *Supersonic Air Jet Rate Vs. Pressure*



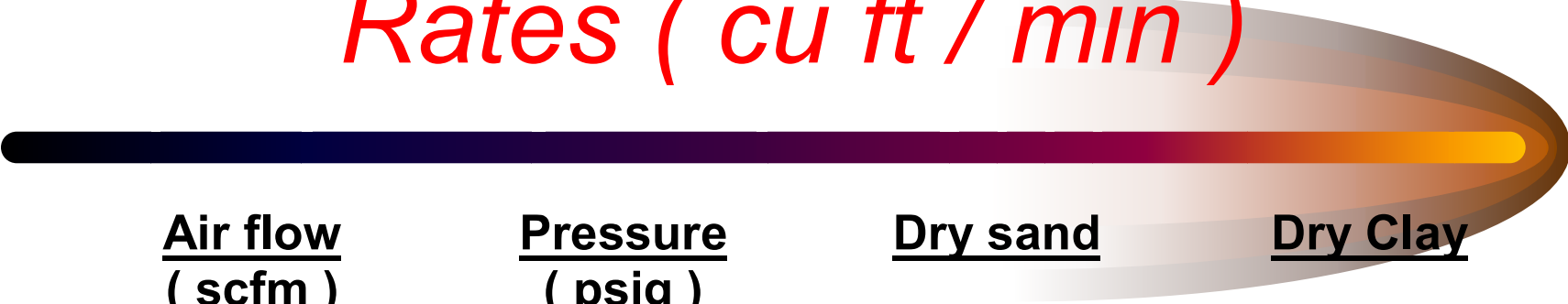
# *Supersonic Air Jet Rate Vs. Air Flow*



# *Supersonic Air Jet Rate Vs. Soil Strength*



# *Supersonic Nozzle Excavation Rates ( cu ft / min )*



<u>Air flow</u> ( scfm )	<u>Pressure</u> ( psig )	<u>Dry sand</u>	<u>Dry Clay</u>
25	90	0.9	0.4
60	90	1.1	0.7
60	135	1.3	0.8
150	90	1.8	1.2
225	90	2.3	1.7

# *Pneumatic Removal*



- Art rather than science
- Soil not a free flowing material
- Minimize bends
- Generally do not have to go a long way
- Do not need high vacuums
- Better to have more air flow

# *Vacuum Performance*



<u>Air Flow</u> ( scfm )	<u>Hose Diameter</u> ( in )	<u>Excavation Rate</u> ( cu ft / min )
260	2 ½	0.5
370	3	0.8
650	4	1.4

# *Tools / Equipment*



- AIR-SPADE<sup>®</sup> Model 2000 Tool
- AIR-SPADE<sup>®</sup> System Model 30/150
- SAFEX<sup>®</sup> Jr. Military
- SAFEX<sup>®</sup> Industrial Systems
- Custom Systems

# *Air-Spade® Model 2000*

## *Hand Tool*

- Utility locating, potholing, keyholing
- General excavation and trenching
- Pipe and cable repairs
- Joint, crack, and hopper cleaning
- Arboriculture



# *Air-Spade<sup>®</sup> Model 2000*

## *Specifications*



Maximum pressure	150 psig
Maximum flow	225 scfm
Standard length	5 feet
Weight	7 lbs
Standard nozzle	150 scfm / 90 psig stainless steel
Ergonomic handle	

# *Air-Spade<sup>®</sup> Model 2000*

## *Options*



- 25, 60, 105, or 225 scfm nozzles
- 3 ft to 8 ft barrels
- 45° adapter
- 10 ft Mantex<sup>®</sup> Light weight hose
- Dix-Lock<sup>®</sup> couplings
- Storage case

# *AIR-SPADE® System*

## *Model 30/150*



# *AIR-SPADE<sup>®</sup> System*

## *Specifications*



- 13 bhp air cooled 4 cycle gasoline engine
- 30 scfm, 150 psig air compressor
- 36" long by 32" wide by 34" high
- 300 lbs weight
- Air and oil pressure gauges
- ASME air tank w/ relief valve

# AIR-SPADE® System Uses



- Humanitarian Demining
- Highway joint cleaning
- Light duty digging
- Arborculture
- Landscaping
- Archeology

# Demining Angola



# *Demining* *Kandahar, Afghanistan*



# SAFEX<sup>®</sup> Jr. Military



# *SAFEX<sup>®</sup> Jr. Specifications*



- 24 hp air cooled gasoline engine
- 60 scfm 100 psig rotary screw air compressor
- 260 scfm 6 in Hg vacuum pump
- Polyester cartridge type secondary filter
- 44 in wide x 48 in long x 52 in high
- 1/8 cu yd hopper
- 940 lbs

# *Field Tests for U.S. Army at Ft. A.P. Hill*



# *Anti-tank land mine*

## *Ft. A.P. Hill*

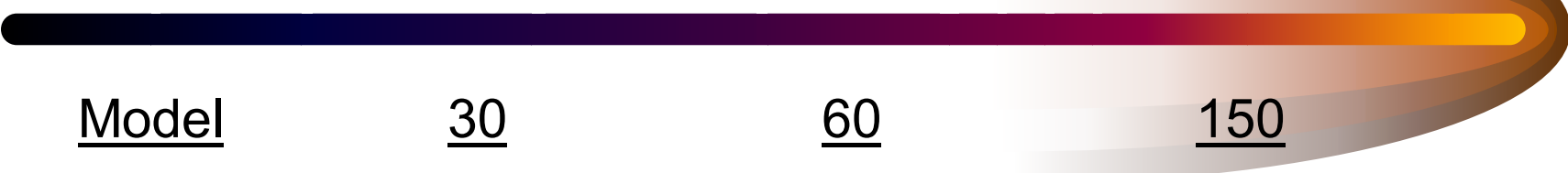


# *Unexploded Ordnance Jefferson Proving Ground*



# SAFEX®

## Industrial Product Line



<u>Model</u>	<u>30</u>	<u>60</u>	<u>150</u>
Nozzle ( scfm / psig )	25 / 90	60 / 90	150 / 90
Vacuum ( scfm / in Hg)	260 / 8	370 / 8	660 / 8
Engine	20 hp gas	35 hp gas	75 hp gas or diesel
Platform	Utility / small pickup	Standard pickup / trailer	Chassis cab / trailer
Storage ( cu yd )	1/8 – 1/4	1/4 – 1/2	1 – 5

# SAFEX®

## *Optional Equipment*



- Secondary filter blowback system
- 2 gpm 2000 psig water system
- Air / water hose reels
- Paving breaker / backfill tamper
- Tool boxes
- Auto-crane
- Auxiliary generator / hydraulics

# *UXO Remote Excavator Tyndall Air Force Base*



# *UXO Remote Excavator Specifications*



- 115 bhp diesel engine
- 175 scfm, 150 psig air compressor
- 1,000 cfm, 8 in Hg vacuum pump
- 18 in rubber tracks < 2 psi ground pressure
- 4 in diameter, fiber glass epoxy boom
- 7 ft digging depth below excavator boom
- 4800 lbs
- 115 in long by 60 in wide by 80 in high
- 2 cu yds / hr nom digging rate

# *Soft Trencher*

## *Electric Power Research Institute*



# *Soft Trencher Specifications*



- 270 bhp, 426 cid turbocharged diesel engine
- 600 cfm, 150 psig air compressor
- 4,300 cfm, 9 in Hg vacuum pump
- 31' long by 8' 6" wide by 11' 5" tall
- Weight 34,000 lbs
- 4 mph travel, 1 ft/min trenching
- Digs 8' flat bottom at 11' 4" deep

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