

# WJTA Jet News

Water Jet Technology  
Association



DECEMBER 1991

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Association  
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members*

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**Bureau of Mines research in water jet cutting of rock.**

**A 1000 psi, 350gpm jet cutting a slot in rock.**

## The Cutting Edge

A lot of interest has surfaced recently in the use of water jets to strip paint from airplanes. This interest centers around the speed at which this operation can be performed, the ability to follow irregular contours, and the assessment of the degree to which this operation can be performed without damaging the metallic substrate.

The debate continues regarding water jetting in flammable atmospheres. A letter to the editor was published in the September 12, 1991, issue of the *Chemical Engineer* addressing this issue.

The use of water jets in deactivating military ordnances is also under consideration. Deactivation of weapons is a growth industry, especially in Germany.

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## Water jets used in jet engine inspection

Flow International Corp. has introduced a new ultra-high pressure waterjet coating removal system developed over the last 2½ years that results in significant time and cost savings. Additional benefits include improvements in personal and environmental safety.

Flow already has several orders from major jet engine manufacturers.

The company initially developed the technology to remove plasma-sprayed ceramic and metallic coatings from jet engine components. Flow's application specialists teamed with Northwest Airlines and a major jet engine manufacturer to develop the process and improve coating removal from jet engine components, a key process in jet engine inspection and overhaul. Northwest Airlines refurbishes 240 JT8D engines per year at its Atlanta, Georgia, maintenance facility.

The initial design included two types of systems. One is a cell for removing ceramic thermal barrier coatings from the high-temperature burner cans. The other uses a computer-controlled, multi-axis gantry robot over a rotary index table to remove plasma-sprayed metallic coatings from diffuser cases, stators, bearing housings, and various other components. Newer versions allow either function within a single containment cell.

All systems combine Flow's patented intensifier pump that pressurizes water up to 55,000 psi with its patented, multiple rotary nozzle technology. High-velocity waterjets, up to Mach 3, are integrated with the manipulator within an advanced work cell that contains moisture, waste, and inherent noise. Custom designed by Grand Rapids-based Progressive Technologies, the cell is integrated with Flow's equipment, providing airlines a turnkey solution for precision coating removal.

Traditional methods are slow, costly, and can affect a part's substrate. Some examples include removal of ceramic thermal barrier and underlying bond coat from burner can interiors made of Hastelloy-X. Normally, the process includes a 22-hour soaking in acid nitrobenzene sulfonate strip, hand brushing and aluminum oxide grit blasting. The use of waterjets decreased the overall time to 8 hours and reduced chemical usage.

Removing plasma sprayed dimensional restoration sprays from a stainless steel diffuser case normally takes from 3 to 8 hours using mechanical machining, and some of the substrate may be removed during the process. Sodium cyanide is often used as a follow-up to removal of the remaining traces of coating. The waterjet process has reduced the coating removal time to 1 hour and has eliminated the need for sodium cyanide on this and other components.

In the cleaning of both burner cans and diffusers, water jetting yielded high quality results, but with less induced surface stress and parent metal loss as compared with traditional methods. Water jetting also results in longer component life. The waterjet coating removal process also enhances visual inspection by providing an extremely clean surface.



Two burner cans from a P&W JT8 engine. The left can has the ceramic coating in place. The ceramic coating and base coat have been removed from the right can with ultra high-pressure water.

(continued on page 7)

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## From the President's Desk

The Board of Directors will meet in Chicago on January 18, 1992, to select the site for the 7th American Water Jet Conference to be held in 1993. I urge members to contact me or other members of the Board of Directors if they wish to express an opinion on the venue for this Conference.

A subcommittee of the Board of Directors has been appointed to investigate possible sites. Dr. Mohamed Hashish is looking at sites on the West Coast. Tom Labus is investigating cities in the Midwest and Dr. Tom Kim will report on prospects in the East.

Seattle has been mentioned as a possible site as has New Orleans and Philadelphia. The Seattle area has a number of well-known water jetting users in the aerospace industry. New Orleans is close to the petroleum industry and would afford an opportunity to repeat the contractor session that was so successful in Houston. Philadelphia also has a well-developed petroleum industry and many contractors.

— George A. Savanick, Ph.D.

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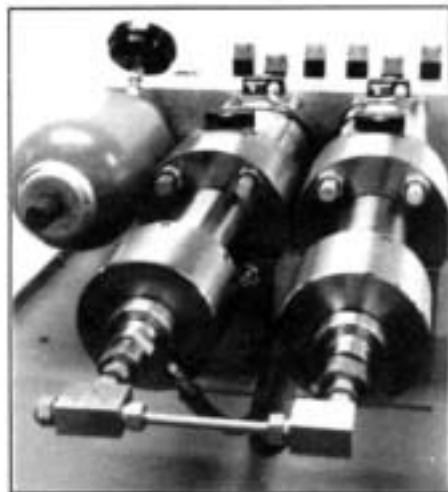
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## Ingersoll-Rand introduces new intensifier

Ingersoll-Rand Waterjet Cutting Systems has introduced a new water-jet interface, the Streamline® PHASE III. The new-phased intensifier is the first compact, fully-integrated system with a high-quality pressure signal for water-jet cutting. Opening the market to buyers looking for lower-cost solutions incorporating water-jet cutting, the unit measures just 24 by 50 by 62 inches and is easily installed and serviced.

The Streamline® PHASE III differs significantly from conventional double-acting intensifiers. Double-acting intensifiers utilize an attenuator, a high-pressure signal dampening device, to compensate for the pressure drops that inherently occur upon reversal of the piston/plunger assembly. The Streamline® PHASE III has two independent piston/plunger assemblies and uses Ingersoll-Rand's proprietary "phasing" technology to eliminate these pressure drops. "Phasing" involves preloading the water in the second cylinder while the first cylinder is on its power stroke. This insures no delay in the supply of high-pressure water to the cutting nozzle. The resulting high-pressure signal from the Streamline® PHASE III without an attenuator is smoother than that obtained from a double-acting intensifier with an attenuator.



*Ingersoll-Rand Waterjet Cutting Systems' New Streamline® PHASE III breakthrough intensifier has two independent piston/plunger assemblies and uses Ingersoll-Rand's proprietary "phasing" technology to eliminate pressure drops. "Phasing" involves preloading the water in the second cylinder while the first cylinder is on its power stroke.*



*Opening the market to buyers looking for lower-cost solutions, Ingersoll-Rand Waterjet Cutting Systems' new breakthrough, Streamline® PHASE III intensifier, is the first compact, fully-integrated system with a high-quality pressure signal for water-jet cutting.*

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Other features include: a full-integrated starter panel, low-pressure filtration system, electronic shift, and 24-VDC control for safety.

For more information, contact

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## **Water jets used in jet engine inspection, from page 2**

Because toxic chemical use is reduced or eliminated, difficulties and costs associated with worker safety and hazardous waste disposal are minimized.

The aerospace industry is Flow's major market for the coating removal process. The company, in cooperation with Northwest Airlines and the engine manufacturer, has gained the first substantial approvals for the use of waterjets for jet engine coating removal. Other engine components and coatings are undergoing tests for use of the new process.

The process also has potential for coating removal in gas-turbine shipboard and land-based engines. Other existing applications include airport runway and heat-exchanger tube cleaning as well as coating removal on vehicle paint carriers and paint booths, surface preparation and nuclear decontamination.

## **WJTA Conference participant list**

A complete list of participants in the 6th American Water Jet Technology Conference is available to WJTA members FREE of charge. The list is printed in alphabetical order by participant name and includes mailing addresses.

Pressure sensitive mailing labels are also available for a fee of \$50. To obtain a list or set of mailing labels, contact the WJTA Office at (314)241-1445.

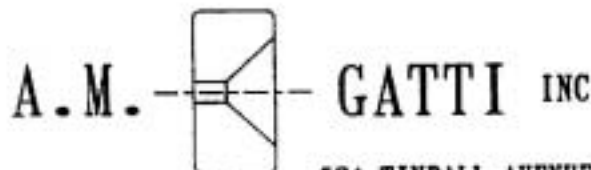
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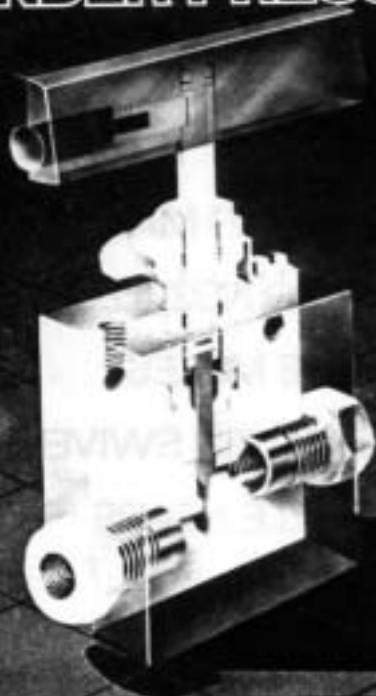
Forrest A. Shook

**F**orrest A. Shook, president and founder of National Liquid Blasting Corp. (NLB) has been named Michigan's 1991 Entrepreneur of the Year in manufacturing. The award, sponsored by the accounting firm of Ernst & Young, INC. Magazine, Merrill Lynch, WJR Radio, and Corporate Detroit Magazine, puts Shook in the running for the National Entrepreneur of the Year award to be given later this year. The national winner will appear on the January 1992 cover of Inc. Magazine.

Shook founded NLB Corp. in 1971 to fill the need of various industries for a reliable high-pressure water-jet system to remove unwanted product buildup and to clean surfaces. He took existing high-pressure pump technology and improved upon it with internal component design that resulted in water pressures up to 20,000 psi. Several of those pump and system improvements are protected by U.S. patents awarded to NLB. The company continues to advance the use of water-jet cleaning through engineering and innovative applications.

Today, NLB Corp. specializes in sophisticated automated water-jet systems for automotive, contractor, and industrial applications. Under Shook's direction, the company has risen to industry prominence and is a leader in the development of high-pressure water-jet technology. The company that Shook started in a garage 20 years ago now has a 130,000-sq-ft headquarters and manufacturing complex in Wixom, Michigan, near Detroit.

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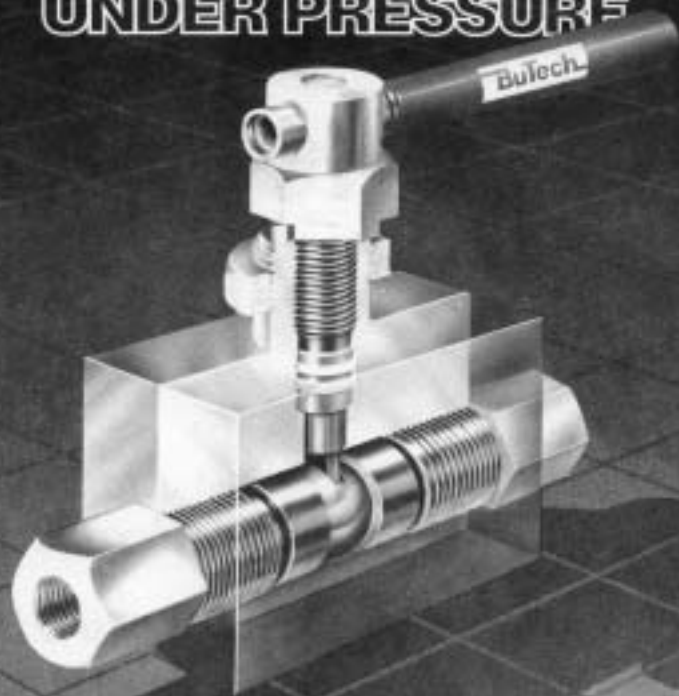
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## Flow appoints new President/CEO and CFO



*Ronald J. Tarrant*

**Ronald J. Tarrant**, an executive with solid marketing and general management experience, has become president and chief executive officer at Flow International Corporation.

Tarrant comes to Flow from Massachusetts-based Augat, Inc., where he headed Augat's Seattle division that manufactures and markets products for the telecommunications and cable television industries. He succeeds Dr. Y. H. Pao, Flow's chairman, president, and chief executive officer, who founded the company in 1970. Lloyd Andrews, a director of the corporation, was named Flow's new chairman.

Tarrant served as Augat Communications Division vice president from 1987 to this date. From 1983 through 1987, he was president of Telzon, Inc., the corporation purchased by Augat and formed into a subsidiary in 1984. When the Communications Division was formed in January 1987, that subsidiary was merged into the new division.

"My goal is to build on Flow's strong market position and technological expertise by focusing on markets of opportunity," Tarrant said. "This organization will become market driven, supplying high-tech, quality products that provide an advanced solution to the problems of today's industry," he continued.

Tarrant joined Telzon in 1982 as vice president of sales and marketing. Prior to joining Telzon, Tarrant was a partner in a Seattle consulting firm, specializing in marketing, sales planning, and communications. Previous to that time, he held positions with Cutler Hammer Inc., and Square D Co.

*(continued on page 10)*



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## New President/CEO and CFO, from page 8

A native of Saginaw, Michigan, Tarrant holds a B.A. degree from Asbury College in Wilmore, Kentucky, and attended graduate business school at the University of Kentucky, Lexington.

Thomas A. Cross has been named vice-president of finance and chief financial officer at Flow. Cross was formerly the finance director of the Communications Division of Augat, Inc. He is a certified public accountant with a degree from the University of Washington.

Flow International Corporation is a leading manufacturer of ultra-high pressure water-jet and abrasive-jet tools for industrial cutting and cleaning and hydromilling services.

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## Daniel J. Evans and Kenneth M. Roberts named directors at Flow International Corp.

**D**aniel J. Evans, former three-term Governor and U.S. Senator, from Washington, and **Kenneth M. Roberts**, president of Ken Roberts Advisory Group, have joined the Board of Directors at Flow International Corp.

"We are pleased that Dan Evans and Ken Roberts are joining our Board," Lloyd Andrews, chairman of the board, said. "Dan will bring a great deal of civic and government experience. In addition, he began his career in structural engineering and understands the construction industry - a key growth area of Flow."

"Ken Roberts brings a substantial background in the investment community, heading his own investment advisory firm and formerly serving as vice president of both Shearson Asset Management and Foster & Marshall Management," he said.

Evans currently heads Daniel J. Evans Associates, a consulting firm in Seattle. He also chairs the National Academy of Science's Commission on Policy Options for Global Warming and is co-chair of the Washington Wildlife and Recreation Coalition. Additionally, he provides political commentary on KIRO, Seattle.

Evans serves as a trustee, or director, of many public companies and civic and community organizations, including Washington Mutual Savings Bank, Puget Sound Power & Light Co., The Evergreen State College, and the Kaiser Family Foundation.

From 1965 through 1977, Evans was Governor of the State of Washington, followed by six years as president of Evergreen State College. In 1983, he was appointed to fill the Senate seat of the late Senator Henry M. Jackson and won a special election to serve the remaining five years of the term. He did not seek election for a second term.

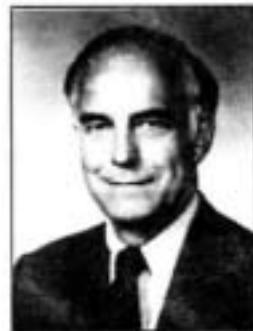
Evans holds both a B.S. and M.S. in Civil Engineering from the University of Washington. After Naval service, he practiced civil engineering for 15 years before becoming Washington's Governor.



*Kenneth M. Roberts*

He was first vice president - research and a registered representative for Foster & Marshall, Inc., a regional broker-dealer, from 1973 through 1982.

Roberts began his investment career with Composite Research & Management Co. as a securities analyst and portfolio manager of two mutual funds and individual client portfolios. He holds a masters degree in business administration from the Harvard Graduate School of Business Administration and a bachelor of arts degree in economics from Whitworth College.



*Daniel J. Evans*

Roberts is president and chief investment officer of Ken Roberts Advisory Group, an investment advisory firm that is a subsidiary of Shearson Lehman Brothers' Spokane office.

As vice president of Shearson Asset Management and Foster & Marshall Management from 1981 through earlier this year, Roberts was president of, and managed, the Shearson Lehman Fundamental Value Fund. He also was a director of the registered investment company from 1987 through 1991.