

year
of the
Ocean
1984-1985

NOVEMBER, 1985
SINGLE ISSUE PRICE \$1.75

SEA TECHNOLOGY

THE INDUSTRY'S RECOGNIZED
AUTHORITY FOR DESIGN,
ENGINEERING AND APPLICATION
OF EQUIPMENT AND SERVICES
IN THE MARINE ENVIRONMENT

*Marine Electronics • Instrumentation • Systems Design • Marine Pollution • Ocean Research • Diving
Ships and Structures • Antisubmarine Warfare • Offshore Engineering • Product Development*



Undersea Defense

Massa Leads By 'Doing the Impossible'

Not Just a 'Transducer House,' Massa Projects Embrace the Electro-Acoustic Gamut from Whale-Watching to Bowling.

By David M. Graham
Editor

Hingham, Massachusetts—Don Massa characterizes his Massa Products Corporation as a "midget among the giants" of transducer houses. The 70,000-square-foot plant, unobtrusive even in this small New England coastal town, might pale in the shadows of the major sonar transducer manufacturing giants. But Don Massa holds a few not-so-secret weapons that take the company well out of the "loft operation" category and undeniably entrenching it in a lead position.

One of them is his father, Frank Massa, the recognized pioneer of electro-acoustics.

The two Massas drive a taut ship that is a combination of new, energetic technology leadership and old, long-line practices. Now in its 41st year, Massa Products prides itself on making products no other firm has been able to do.

"Our place in the market is to do the difficult and the impossible; things nobody else has done or can do. We do it by being ingenious," Don Massa says. The company still has over 100 active patents in electro-acoustics.

Company history goes well beyond the 1945 beginnings as Massa Laboratories in Cleveland, Ohio. The elder Massa, who is now chairman of the board in this still-family-held entity, began in 1928 as a new graduate of Massachusetts Institute of Technology in electrical engineering, developing loudspeakers, microphones and phonograph pickups for the Victor Talking Machine Company—fore-runner to RCA-Victor. Frank Massa



Unobtrusive "midget," Massa plant nestled in Hingham covers 70,000 square feet.

also developed new test equipment for making electro-acoustic measurements in the emerging discipline.

During World War II, Frank Massa turned to underwater acoustics and sonar development. His efforts helped produce the first successful scanning sonar and he designed a measure-

ment hydrophone that became the calibration standard for making precise underwater sound pressure measurements in the 10-100 kHz frequency range.

Production Engineering Key

One of the turning points in Frank



(Continued from page 28)

Massa's career—and one that has given Massa Products a profound edge today—was his brush with a concept that was foreign then to his pure engineering background and training: production engineering.

He told *Sea Technology* he had

Massa's TR-208A sonar transducer assembly area has seen 60,000-plus units pass through.

"Those were the best years I ever spent," he relates, "because I got to work with a dozen highly skilled production engineers who taught me the importance of being able to produce transducers as well as invent them."

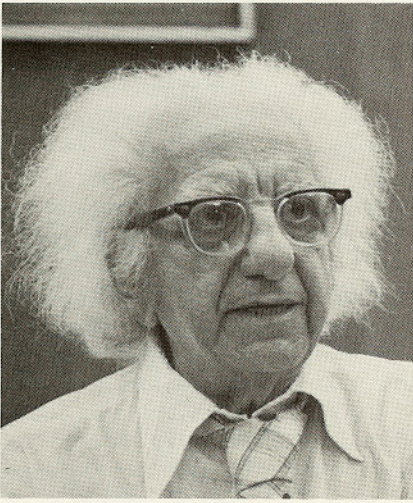
That concept is the backbone of Massa Products today. Company engineers are taught from the beginning that they will have to live with their designs from the lab bench through production to shipping.

"They have two worries: ingenuity in design and cleverness in manufacturing," Don Massa adds. When the production line stops or when there's a hiccup in testing, the design engineer feels the sweat.

Massa's transducer production house phase hit a high in the 1960s when it responded to an emergency call from the Office of Naval Research to manufacture a massive, high power, low frequency electromagnetic transducer array. An earlier ONR contractor had delivered a magnetostrictive scroll array that literally blew apart under full power tests. The Massa design for the megawatt sonar array—part of an acoustic DEW (Distant Early Warning) Line—contained 1440 separate transducers that weighed 63 kilograms each. The entire array weighed in at 136,000 kilograms and dwarfed its platform, the Navy's *USS Mission Capistrano*. It was the world's largest sonar array and it worked like a charm.

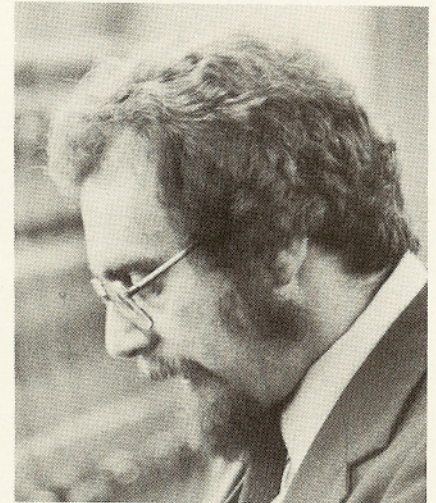
On the strength of that success,

ONR again turned to Massa to build another world's largest—a directional underwater receiving array that employed over 6000 precision hydrophones spaced in small groups on 200 towers anchored along several kilometers of ocean floor at 1500-meter



Frank Massa's brush with production engineering grew to be the backbone of Massa Products.

been assigned, somewhat against his wishes, as a production manager at Victor. "I didn't know then the first thing about production and there I was in charge of it," he says. The task was development and production design on a Navy contract for some electro-acoustic systems for shipboard applications.



Don Massa, president, has two worries: ingenuity in design and cleverness in manufacturing.

depths. Overall impedance tolerance for the hydrophones as well as the electrical networks was held to an unprecedented $\pm 1\%$.

Later, the company designed and delivered over 60,000 TR-208A transducer elements to the Navy for the AN/SQS-23 sonar system. Prior SQS-23 designs resulted in specifica-

tions waivers to other companies because they claimed the specifications were beyond the state of the art. Production engineering at Massa was again the key to success: control procedures for aging, selecting and matching ceramic elements eliminated the variables.

Another major achievement was the Massa design of the DT-282 and -283 line hydrophones for the PUFFS sonar system.

"These were the most precise hydrophones ever made," Don Massa states. "We controlled sensitivity to within 0.1 dB in production and controlled the acoustic-center-to-mechanical-mounting tolerance to ten thousands of an inch over the six-foot line."

The Navy testing facility at Orlando, Florida, evaluated three PUFFS hydrophones randomly selected from the production line. Their unusually brief report came back as a single sentence: "The uniformity of these elements is beyond our ability to measure."

Alter Course to Systems Business

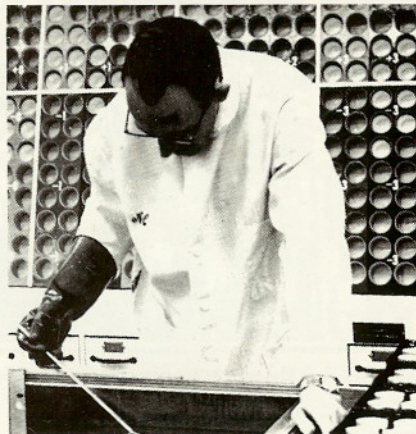
Today, Massa Products' well-honed business strategy reflects the change in direction taken in the 1970s with the advent of microprocessors. The large electro-acoustic companies had decided that only 10% of sonar developments were in the transducers, leaving 90% of the value in microprocessor-based electronics. That's where 90% of their effort went. Massa realized that it would be easier as a transducer company to add the systems capability than for the giants to add-back a transducer capability.

The firm is still very active in what Don Massa calls the "bedrock," transducers for sub-bottom profilers (TR-1075A and TR-1061A units similar to the Navy TR-208A), side-scan sonars (TR-1101 for 97 kHz operation), depth sounders (TR-1083A low frequency units and the TR-1002 and TR-1283E echo-ranging devices), deep ocean transponders (TR-1055C for depths to 6100 meters), underwater communications transducers (TR-1036D), and general purpose hydrophones (TR-1025C for the 1-30 kHz range and TR-1016 for 10-80 kHz).

The other end of the spectrum—electro-acoustic systems—is equally successful and the combination has resulted in Massa Products' business doubling every two years.

Don Massa allows that the mix of underwater versus ultrasonic systems is about 50/50. Of the "wet side," oceanography applications account for about 10-20% and military contracts for scanning sonars and anti-submarine warfare developments take the rest.

Ultrasonic transducers (for use in air) developed by Massa have figured successfully in a variety of applica-



Ceramic controls eliminate the variables, such as intrusion alarms, non-contact micrometers, motion detectors and remote control proximity indicators. Most notable of these—which also heralded a jump from transducer manufacturer to total system supplier—is the ultrasonic array for AMF's MagicScore automatic scoring system that has revolutionized bowling.

Don Massa, himself a graduate level electrical engineer and no slouch in the patents-held department (with more than a dozen for electro-acoustic devices and systems), is spearheading Massa's latest innovation—the M-1002 portable sonar system, a low frequency, long range sonar designed for small research or military vessels.

Development on the M-1002 began in 1981 as the result of yet another corporate look at ways to use Massa's built-in ingenuity for transducer systems development. Don Massa characterizes the resulting 3.3 kHz system as "the only one that two men can throw over the side."

In 1984, working with the ubiquitous Dr. Harold E. Edgerton—one of Frank Massa's peers in age and technological status and a recent addition to the company's board of directors—Massa Products heeded "Doc's" call first to use the device in another search for "Nessie" in Scotland's Loch Ness. Potential logistics headaches ruled that out. But Edgerton was ready with another problem:

locating and studying whales underwater.

The system consists of two 27-kilogram boxes containing all the electronics, power amplifier, computer-controlled processing and a pair of CRT displays for graphics and control. The M-1002's fish contains the transmitting transducer and a high-precision multi-element receiving array that can determine the exact bearing to a sonar target. Also included is an electronics module containing a magnetic compass, depth and temperature sensors and a communications microcomputer.

Inhale or Exhale?

The whale study question nearly became moot when an Edgerton-assembled panel of marine experts couldn't agree on whether whales inhaled or exhaled when diving. With little or no air in their otherwise huge lungs, whales would be virtually invisible to sonar.

After five outings in 1984—two aboard Massa's *R/V Decibel* to check out the M-1002 and three more on the *R/V Edgerton* to Stellwagen Bank in Massachusetts Bay—part of the question was finally settled.

During that third cruise aboard the *Edgerton*, Don Massa was below with Doc Edgerton and two Massa engineers trying to determine what went wrong because the system showed a consistent echo from something about 800 meters off the port quarter.

"I was trying to figure out either where the big rock was on the chart or why the equipment failed when Rich Linnehan, the *Edgerton's* captain, called down that he had spotted a humpback blowing in the same location," Don Massa relates. "It was then that we knew we had it."

The press of continuing business, he told *Sea Technology*, reduced this last summer's tests on the *Edgerton* to just a couple of outings. The research team recorded a wealth of data that has yet to be analyzed. Plans are already in the works for extended attempts for further tests next summer.

Massa Products Corporation still has an impressive backlog of products to deliver and new projects to develop. The pace and the promise for this relatively small company shows no sign of slowing. There are still several "giant steps" to be taken in Massa's future. /st/