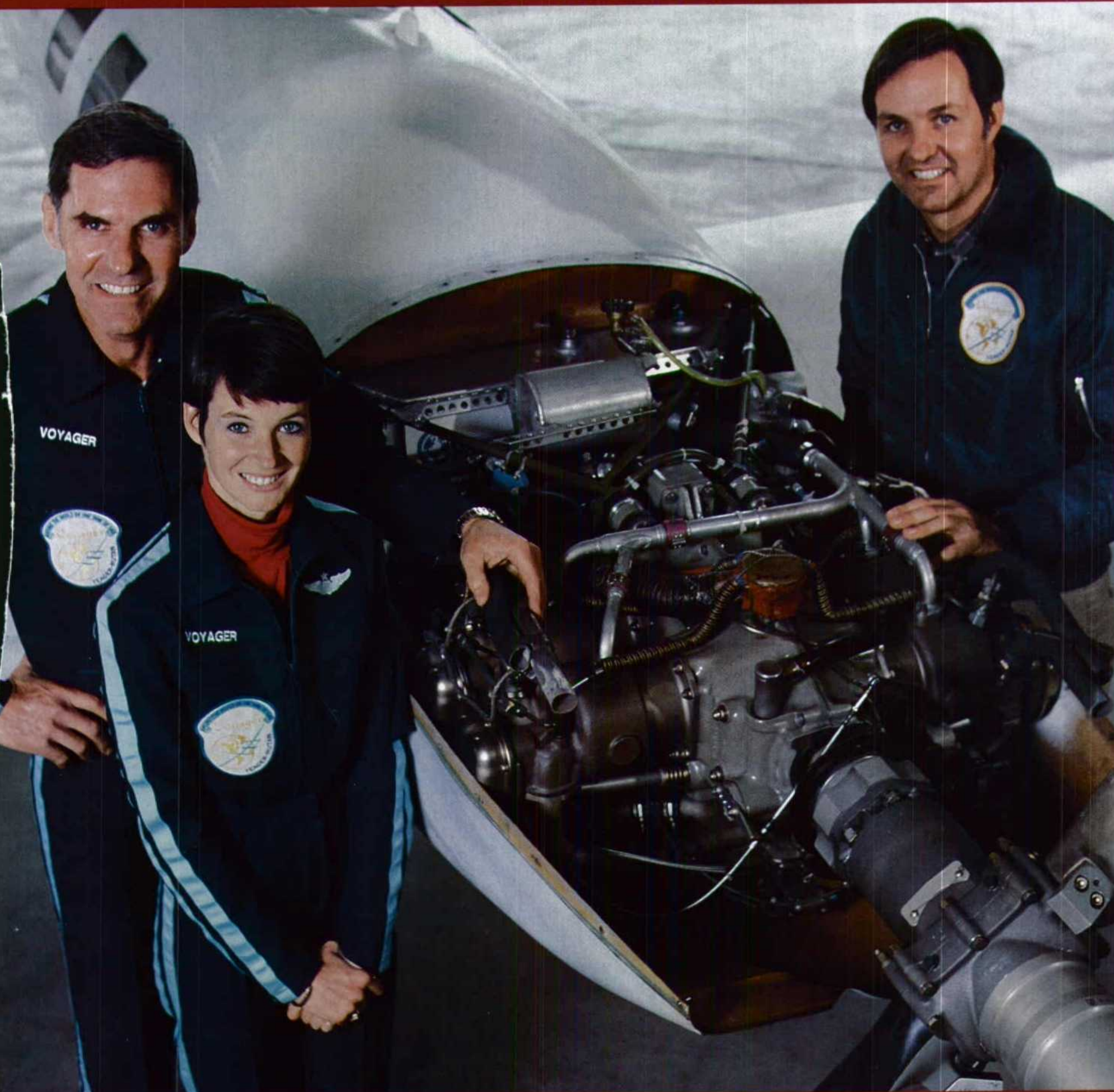
TeledyneReport

For the Year 1986

Liquid Cooled Voyager Engine: Around the World Nonstop in Nine Days



1927-Spirit of St. Louis

1986-Voyager

Ever since the 1903 flight of the Wright Brothers that covered 120 feet, nonstop distance records by airplanes have been pursued, but not always successfully. Teledyne is proud to include in its heritage close involvement with two of the most successful airplanes—the Spirit of St. Louis and Voyager—on two of the most notable flights.

In 1927, the Spirit of St. Louis, that carried Charles A. Lindbergh the 3,610 miles from New York to Paris in 33 hours and 39 minutes, was built in 60 days to Lindbergh's specifications, by Ryan Airlines, Inc. forerunner of today's Teledyne Ryan Aeronautical.

In 1986, Voyager took Dick Rutan and Jeana Yeager 26,178 miles in 216 hours, three minutes and 44 seconds. It was the first nonstop, unrefueled circumnavigation of the globe by an airplane. The main, liquid cooled rear engine and the front air cooled engine were designed and manufactured by Teledyne Continental.

In 1986, as it was in 1927, two primary concerns were fuel and weight. Each airplane was referred to in its time as a "flying fuel tank." And, at both ends of the nearly 60 year span, weight was an engineering challenge because of the amount of fuel the airplanes needed to accomplish their remarkable missions.

Liquid Cooled Voyager Engine

A new Teledyne Continental liquid cooled, high fuel efficiency engine was the power behind the Voyager aircraft on its recent record breaking nonstop, 216-hour, unrefueled 26,178 mile journey around the world. Smallest in Teledyne's new Voyager engine line, it represents new concepts in aircraft reciprocating engines.

Since the first powered aircraft took to the air, the history books of aviation have been dotted with the records of those who have flown faster, higher, longer and farther than others of their time. For every record set there have been dozens of failures. In the early days of aviation, many of these record attempts were mere stunts to gain publicity and notoriety. But, as aviation matured, more and more records were set by serious-minded aviators and aircraft designers who were sincerely trying to advance the art of flying.

In all these efforts, the determination, skill and courage of the men and women who attempted to break old barriers and set new records were opposed by the limitations of materials, design and technology that were possible in their time. Added to this equation has always been the final imponderable of nature itself, rolling the dice that could mean fair weather or foul, ultimate success or ultimate failure.

One of the most resistant of all firsts in aviation history finally fell just last month to an unconventional aircraft and a courageous man and woman who endured nine days in a tiny crew compartment that would make a telephone booth seem roomy by comparison. The aircraft was the Voyager, piloted by Dick Rutan and Jeana Yeager, and the records set included the first non-stop circumnavigation of the globe without refueling, in a heavier-than-air aircraft—a 26,178 mile journey that took exactly 216 hours, three minutes and 44 seconds.

The story of that journey can only be told by those who made it. But Teledyne is pleased to have contributed the engine technology, hardware and engineering support that helped make the journey possible. That story is told here.

Voyager

Voyager was conceived by Burt Rutan, one of today's foremost aircraft designers. His brother, Dick Rutan, Voyager pilot, and Jeana Yeager, co-pilot formed Voyager Aircraft, Inc. in 1981 with the intent of building a state-of-the-art aircraft that would be able to fly around the world non-stop without refueling. The key to this attempt was the design of an extremely fuel efficient airframe built with the latest space age materials and technology. Starting with an original canard design by Burt Rutan, who lent his expertise to the project, Rutan and Yeager built Voyager with a combination of solid graphite fiber composites for the load bearing spars, and lightweight honeycomb core with bonded graphite fiber skins for the aerodynamic surfaces. No metal parts, other than fasteners, were used in the basic structure of the aircraft. The structural weight of the finished airframe is 939 pounds, and the empty weight of the ready-to-fly aircraft with the two engines is 1,858 pounds.

The long endurance flight that was the goal of the endeavor meant that every available space in the airframe was needed for fuel. Seventeen individual fuel cells are linked together and distributed throughout the wings, fuselage and booms. The aircraft is capable of carrying almost 9000

On the Cover:
Voyager pilot Dick Rutan, co-pilot Jeana Yeager and designer Burt Rutan (right) at the rear, liquid cooled main engine built by Teledyne Continental, that powered them continuously on their nonstop, around-the-world flight in nine days without refueling. Teledyne also manufactured the air cooled engine at the front of the airplane which was used intermittently during the flight.

pounds of fuel, an amount equal to more than five times its own weight.

This left little space for the two pilots needed to fly the craft on a journey that was estimated might last over ten days. The cabin is just seven and a half feet long, and two feet wide. The cockpit is about five and a half feet long and 22 inches wide. Maximum height in the crew compartments is 40 inches.

Powering Voyager

Because of the long endurance required—a flight of some 26,000 miles on one loading of fuel — the propulsion for Voyager had to be extremely fuel efficient and reliable. A two engine system had been planned so that the full power of both engines could be used to lift the heavily fuel laden Voyager into the air on take off, while a single engine would be used at cruise through most of the flight to reduce fuel consumption.

One of these engines is located in the nose of the fuselage in conventional fashion, and the other at the rear of the fuselage in a pusher configuration. It was the rear engine that provided the low fuel consumption necessary to power Voyager on its journey around the world.

Teledyne and the Liquid Cooled Option

As so often happens in the technological world, a different development, carried on independently, provided an answer to Voyager's engine needs. About six years ago Teledyne Continental Motors Aircraft Products had begun the development of a new line of liquid cooled aircraft engines to complement its well-known line of air cooled general aviation engines. The development phase on these advanced engines was just being completed with excellent results when the company learned of the Voyager program.

The smallest of these new liquid cooled Continental engines, a 200 cubic inch, 110 horsepower, fuel injected, 4-cylinder power plant, was seen to have the right combination of compactness, low cooling drag, and power combined with the exceptionally low fuel consumption needed for this mission. Above all, during thousands of hours of full power operation in an altitude test cell, it had demonstrated the extreme reliability that would be required for the Voyager mission.

This engine was offered to Voyager and accepted as the main engine which ultimately provided continuous propulsion in the rear mounted pusher configuration for the entire 216-hour journey. The engine performed flawlessly, demonstrating its excellent low fuel consumption characteristics and an unprecedented reliability standard. The Continental Model 0-240 130 horsepower air cooled engine mounted in the nose was selected to be used primarily during full load take off.

Why Liquid Cooled Aircraft Engines?

The success of Voyager and the Continental engines that powered it are already history. But why has Teledyne Continental Motors developed a line of liquid cooled aircraft engines after 50 years of producing one of the most widely used and popular lines of air cooled engines in general aviation? To begin with, liquid cooled engines for aircraft are not new. Many of the very first engines that powered successful airplanes in the Wright brothers' era were liquid cooled. Liquid cooled engines were widely developed in World War I, and reached their peak in World War II where they shared popularity with air cooled engines (see pages 12, 13).

Some of the advantages that can be achieved with a well designed liquid cooled aircraft engine include lower metal temperatures within the combustion chamber, and more uniform metal temperatures throughout the cylinders and cylinder heads. These improvements are expected to increase engine life and time between overhauls by as much as 25 percent.

The Conquest of Cooling Drag

Cooling drag is another important factor in aircraft design that can be improved through the use of liquid cooled engines. Cooling drag is the resistance an aircraft encounters in flight caused by the mass of air that must be diverted through an engine to cool it. It adds to the total amount of aerodynamic drag that the aircraft's engines must overcome in flight. As cooling drag is reduced there is an option of increasing aircraft speed with the same fuel consumption, or maintaining the same speed with reduced power requirements and reduced fuel consumption.

Liquid cooled engines dissipate their heat through a liquid-to-air heat exchanger—essentially the same thing as a radiator on an automobile. Modern liquid-to-air heat exchangers are highly efficient. Recent analyses of a large liquid cooled engine show that at 20,000 feet, producing 375 horsepower, the total cooling air flow required may be as much as 50 percent less than is required for an equivalent air cooled engine.

The Quest for Higher Fuel Efficiency

Teledyne Continental's goal some years ago was to develop a new line of aircraft engines, complementary to their popular air cooled line, that would be capable of operating at high altitudes with extremely good fuel consumption. High fuel efficiency was achieved by going to a higher compression ratio of 11.4 to 1 compared to the usual air cooled engine's 7 or 8 to 1 ratio. To prevent harmful detonation at this high compression ratio, and to promote thorough burning of the fuel/air mixture, a high turbulence combustion chamber (HTCC) was designed. In this design, the fuel and air mixture is forced into a small recessed area beneath the exhaust valve. This allows the top of the piston to come to within 40/1000ths of an inch of the cylinder head, vigorously compressing the fuel/air mixture into the small combustion chamber. This imparts a high turbulence in the compressed mixture, which promotes more even and complete burning when it is ignited.

The results of this design have been a 20 percent increase in fuel efficiency, and a 10 percent increase in horsepower for the same displacement engine. Because of the higher combustion chamber temperatures developed in this higher performance design, liquid cooling was a logical choice to minimize combustion chamber metal temperatures and promote uniform temperature distribution throughout the cylinder head and cylinder barrel.

Teledyne's Patented Design

Teledyne Continental Motors' approach to liquid cooling has been unique. To minimize the weight of the coolant system, the coolant jacket encircles only the outer end of each cylinder, nearest the combustion chamber, with coolant passages extending through the cylinder head. The lower end of each cylinder which would normally also be enclosed in a coolant jacket in a conventional design is cooled internally by a large volume oil spray directed at the piston dome. This oil jet is the primary cooling mechanism for the lower barrel section and supplements cooling of the piston. In practice, this cooling jacket concept, in combination with the oil cooled barrel and piston has proved to be a very effective means of controlling engine heat rejection. The system weighs less than an equivalent air cooled cylinder and offers improved cooling uniformity in both the combustion chamber and cylinder barrel.

In keeping with aviation standards that apply to aircraft fuel and lubrication systems, all connectors and other components in the liquid cooling system are high integrity designs that have evolved from aerospace experience in developing reliable fluid handling methods.

The new engines utilize the same crankcase and bottom end design that has been proven over many years in the well-known and highly successful Continental air cooled engines.

The Voyager Engine Family

In honor of the first flight use of a Teledyne Continental liquid cooled engine in the Voyager mission, these new engines have been named the Voyager series. In addition to the four cylinder Voyager-200, which powered Voyager around the globe, the line will include the six cylinder Voyager-300 that will be rated in the 170 to 190 horsepower range, and the six cylinder Voyager-550 rated at 300 horsepower, with a 350 horsepower turbocharged version. Geared configurations of the Voyager-550 will also be available up to 425 horsepower.

1987 marks the 60th anniversary of the company's continuous involvement in the design, development and production of piston engines for aircraft. It began in 1927 with the introduction of a nine cylinder 220 horsepower sleeve valve radial engine that later evolved into the Continental

Model A-70 engine. This was followed by the Continental A-40, the world's first flat four cylinder opposed engine to enter production, establishing an engine format that has dominated the general aviation industry to this day.

Other Teledyne Continental innovations such as fuel injection, turbocharging, reduction gearing and dual ignition have contributed greatly to aircraft engine reliability and performance in the last six decades. During those years over 250,000 Continental aircraft engines have been produced, and some 150,000 of them are in daily use today in aircraft throughout the world.

Teledyne Continental's new Voyager engines are not the first liquid cooled engines in aviation, but they are certainly the most advanced. These engines are a bold step into a new generation of powerplants for general and commercial aviation that will set the standards for aircraft power into the 1990s and beyond.

Engine Talk With the Pilot of Voyager

MOJAVE, CALIFORNIA, JANUARY 6, 1987: Dick Rutan stood in the hangar at Mojave Airport. About an hour before, on a brisk morning, in a sky dotted with clouds, he and co-pilot Jeana Yeager flew Voyager from Edwards Air Force Base—about 25 miles away. It may have been the last flight for the unique airplane that only a couple of weeks before had taken them around the world in nine days on one tank of gas. Coffee cup in hand, he said "the engine ran great, just great. You know, that engine goes six nautical miles on a pound of fuel. That's as far as the horizon over there." He looked past the dutiful Voyager parked in front of the hangar, toward the desert where 20 Mule Teams hauled Borax laden wagons not that long ago. "That's about the same amount of fuel this cup holds. The engine was just great."

A few hours later in the simple, crowded office he and Jeana share in the hangar where Voyager was built, Dick Rutan gave his thoughts about the performance of the Teledyne Continental liquid-cooled engine that didn't stop for 216 hours, except for five minutes near the end of the flight—which he mentions in this interview.

Q: *Why did you decide to use a liquid cooled engine?*

A: We looked at fuel specifics of standard air cooled engines. We would have had to have a lot more fuel to make the mission and had to have a bigger engine and a lot more horsepower to carry the airplane. When Teledyne Continental offered us the liquid cooled engine we had heard about it, and its extraordinary improvement in fuel specifics and oil consumption. When it was offered to us we were really excited about that because it had a dramatic impact. We could use two engines, much smaller, and take off with less fuel. We found that performance was verified in the test cell and installed the engine in the airplane and flew around the world with it. And we did, in fact, find that it had real improvement in fuel specifics.

Q: *Did you have any reservations about using a liquid cooled engine—and an experimental one at that?*

A: We didn't know a thing about liquid cooling, how to install it, how to make it cool, anything about it so we just started from scratch. Teledyne Continental didn't have experience, either, putting a liquid cooled engine in an airplane. So we just tried to get educated as much as we could and basically we took a lot of knowledge from the automotive industry about radiators and cooling, where you put the air and how you make it efficient.

Q: *With an air cooled engine would you have to take more fuel aboard?*

A: Oh, yeah. We could not have done it with that fuel weight. It was really important. It may have turned out we couldn't have done the project anyway because of some other considerations aerodynamically. No, it made the mission possible. As we got into it, if it hadn't been for that engine I don't think it would have been possible.

Q: *Then, without a liquid cooled engine you'd have too much weight?*

A: Oh, too much weight and we'd have a center of gravity balance problem, too, without putting any more fuel on it. It probably would not have been possible to do it without that engine.

Q: *Three times the engine was referred to in the news during the flight. One time was at take off.*

A: Yeah, they overheat on the ground.

Q: *Did you have a blower on the engine?*

A: Well, see, the thing is if it was put in a conventional airplane you could use a blower.

We had to optimize things so much that we needed the air slip-stream to go over the engine radiator to cool, so we were overheating both engines. Both the air cooled and liquid cooled engines were starting to overheat.

Q: *Another time we heard about was low oil over Africa?*

A: Well, the two engine problems were both air-crew error. One was off the coast of Africa when we just ran the engine low on oil. What happened is it just reached the vortex down from the pick-up tube. When that happens it sucks air and it aerates the oil, so the oil turns into a froth, so the temperature went up and the pressure went down. So we put a couple, or three, quarts of oil back into the engine and then it took about 20 minutes for it to de-aerate and become a liquid instead of a froth and when that happened it just cleared right-up and we pressed on. That was an air-crew error because we ran out of oil. The other time near the end of the flight we were trying to use the engine's fuel system to transfer fuel because of a transfer pump failure. We lost one of the transfer pumps. See, the engines normally suck the fuel from the feed tank, which it did normally all the way around the world. We have pumps that pump fuel into the feed tank from the other tanks and we lost one of those pumps on one side. It was the one for the back engine and the right side of the airplane. So then we were going to go engine-direct-tank. We went engine-direct-tank a couple of times and it was too much draw. We had to suck the fuel through a couple of filters, the valves way out in the wings some place, and through a failed pump and then it just sucked air. The fuel pump cavitated and the engine quit. So, we had to reselect the fuel tank and get the nose up to let fuel run back into the engine for it to pick up again.

Q: *How long was it down?*

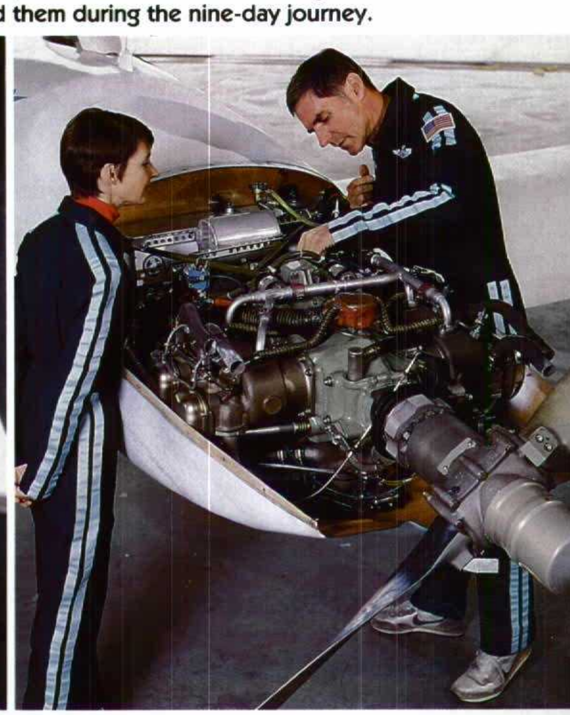
A: Five minutes. We were a glider for five minutes.

Q: *For the whole flight it was only off for five minutes?*

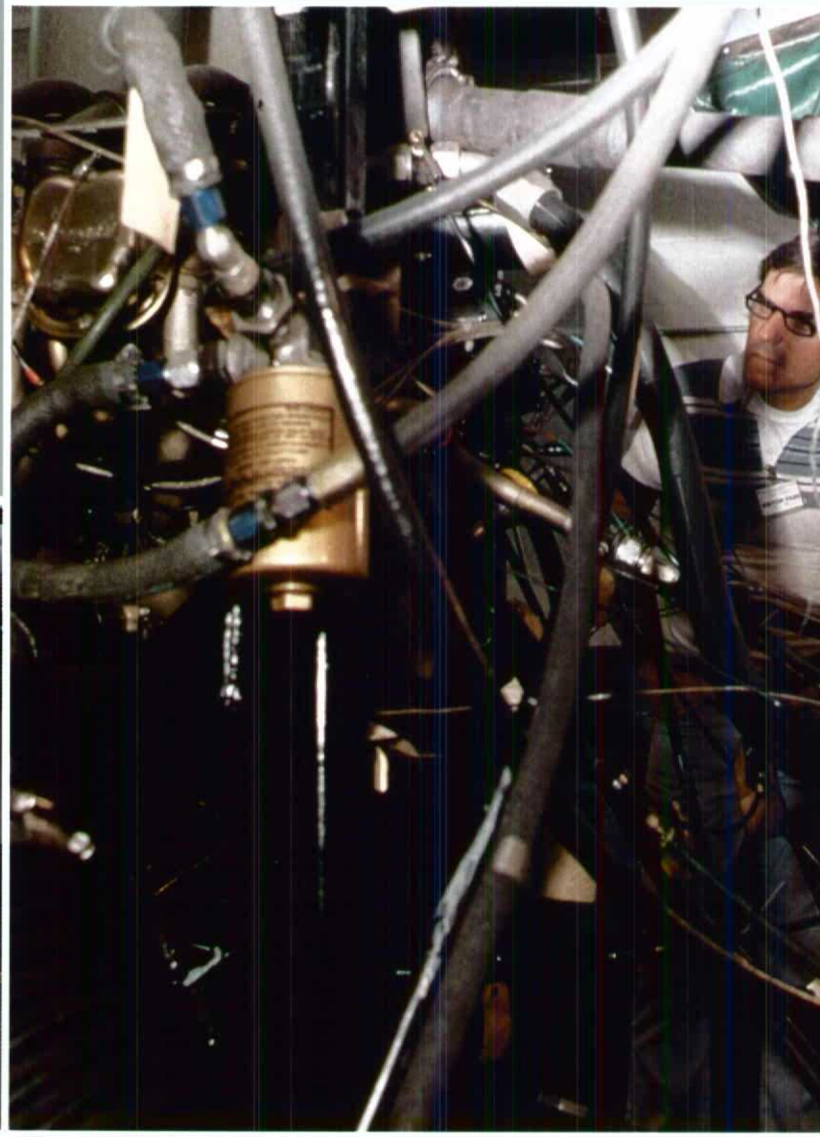
A: That's right. Well, it was windmilling. For five minutes it wasn't flying. Due to no fault of its own. We liked the engine because it ran real cool. The temperature was very low. It was less than 200°F, for the water temperature and the oil ran about the same temperature, it was the high compression and high swirl combustion chambers that led to fuel efficiency. I don't know what the oil consumption rate was. I haven't figured that out yet.

So, Dick Rutan gave some frank thoughts about an experimental engine that "made the mission possible." But what really turned a possible mission into an amazing accomplishment was the competence, perseverance and daring courage of Dick Rutan and Jeana Yeager.

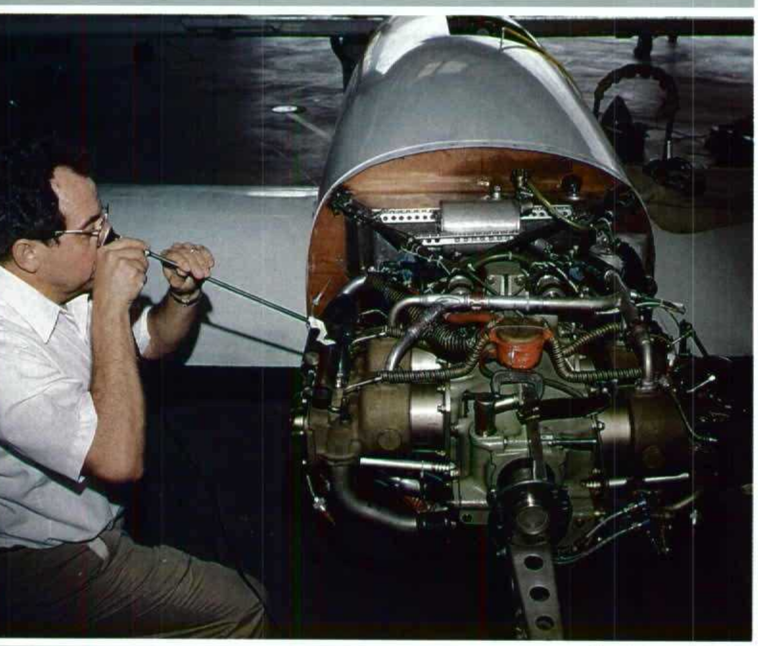
During and after: Self-portrait by Dick Rutan and Jeana Yeager in the cramped Voyager cockpit well into their arduous flight—and looking at the liquid cooled, Teledyne main engine that operated continuously just behind them during the nine-day journey.

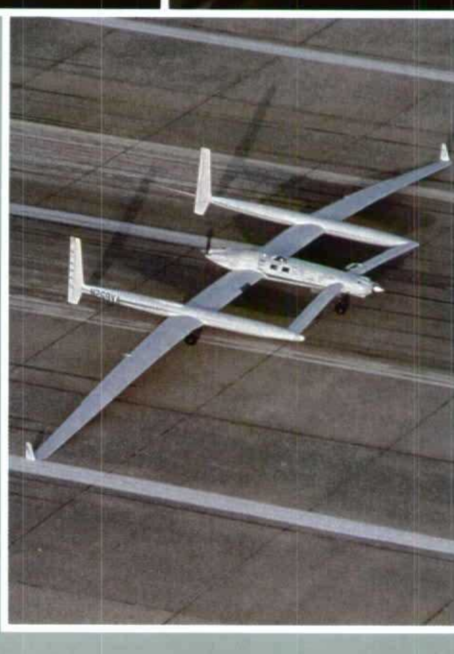


Inside a test chamber at the Teledyne Continental plant pilot Dick Rutan inspects the liquid cooled engine that would later provide the primary power for Voyager as the rear pusher engine. The two Voyager engines were run for 159 hours in Teledyne test cells.



Teledyne Continental assigned a project engineer to Voyager in November 1984 when the engines were selected for the flight. Here he inspects the rear engine at Voyager's hangar in Mojave near Edwards Air Force Base where the record flight began and ended. Approximately 10,000 man hours were devoted by Teledyne employees to the Voyager project.





During take off Voyager wings drooped to the ground under the load of 7011.5 pounds of fuel. Without the lower fuel consumption of the liquid cooled engine more fuel would have been needed, prohibiting a take off because of the additional weight. The winglets at the extremities of the wings were damaged during the take off. At the end of the flight nine days later pilot Dick Rutan has his first chance to inspect one of the damaged wings that he and co-pilot Jeana Yeager flew around the world with. Voyager consumed 6905.36 pounds of fuel during the flight.

Voyager pilot Dick Rutan (right) made many visits to the Teledyne Continental plant in Mobile, Alabama where the Voyager engines were made. Here with a technician he checks out performance while the experimental liquid cooled engine runs in a test chamber.

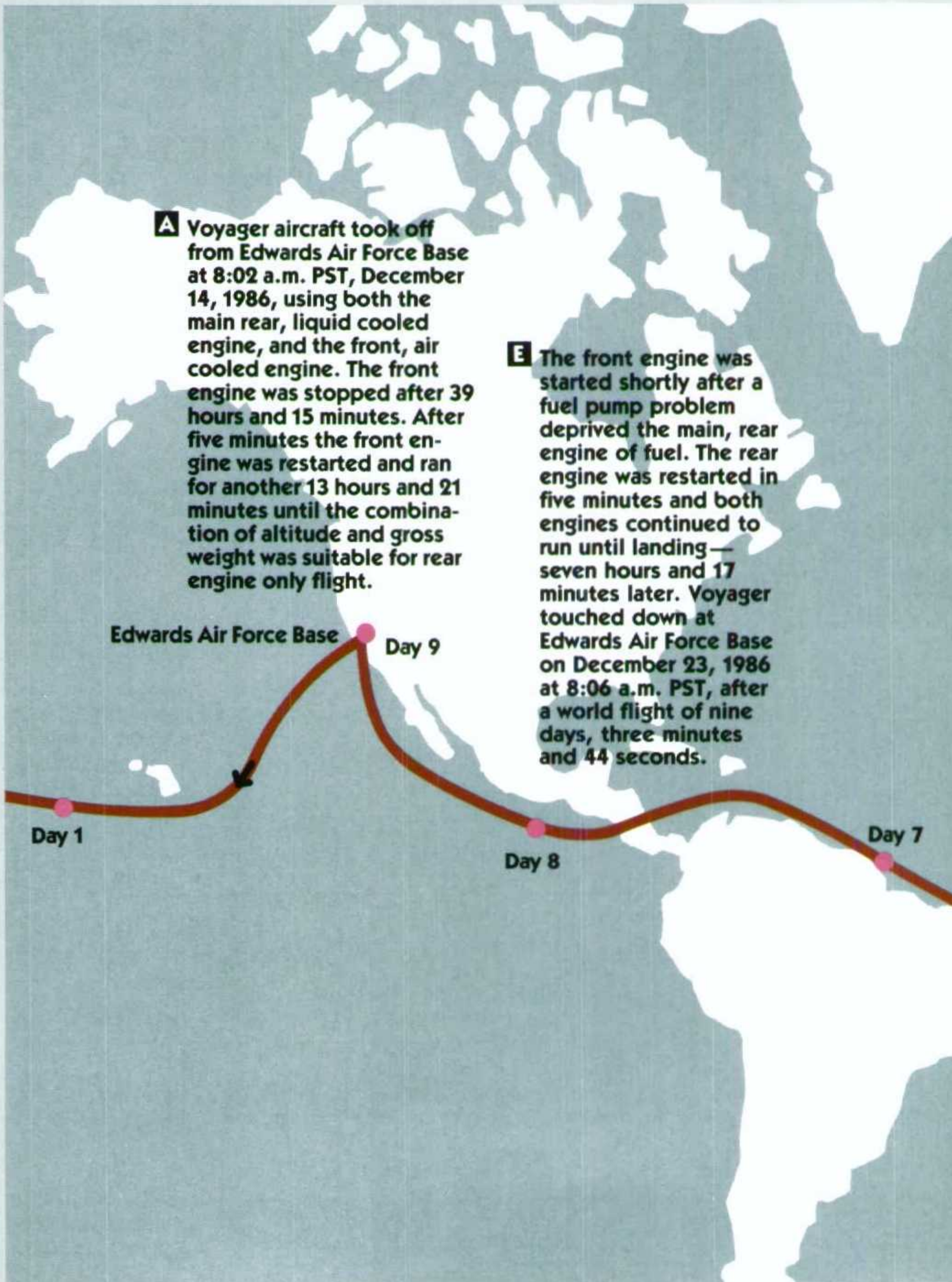
Designer Burt Rutan (left), co-pilot Jeana Yeager and pilot Dick Rutan were each awarded the Presidential Citizens Medal by President Ronald Reagan in a ceremony on December 29, 1986.

Route of the Voyager: 26,178 miles in 216 hours, 3 minutes, 44 seconds

The ideal time and place to fly around the world is in our summer months, June through August, on a route just south of the equator. That's when and where tail winds are strongest and global weather is the calmest. Tail winds reduce fuel consumption and increase speed. The absence of storms allows flying at optimum altitudes—for Voyager that's 5,000 to 8,000 feet. At high altitudes, because of the thinner air, an aircraft requires more speed and power to maintain altitude, and the heavier the load the more difficult it is. When a Boeing 747 takes off fully fueled it is two-and-one-third times its empty weight. When Voyager took off it was five times its empty weight. It took a lot to get it up. It used 14,200 of the 15,000 feet of Edwards Air Force Base runway. It took a lot to maintain the higher altitudes it had to fly. The airplane, the engines, the people were up to the challenge.

For Voyager the ideal situation would be to use the front helper engine at take off and, for the next two days, just long enough, until the combination of altitude and gross weight is suitable for the capabilities of the more efficient rear, main, liquid cooled engine. As it turned out, because of weather, Voyager had to fly at higher altitudes early in the flight than desired. Consequently, the helper front engine was used most of the time for the first 59 hours because of the heavy fuel load, higher altitude combination. Seven times during the flight it was used to assist the constantly running main, rear engine.

Dick Rutan and Jeana Yeager would have much preferred to fly in the calmer summertime. But, the preparations for the flight were staggering and by the time Voyager was really ready it was winter, when they would have to take a less favorable course mostly north of the



CHRONOLOGY OF THE TWO ENGINES: The highly fuel efficient Teledyne Continental Voyager liquid cooled, main rear engine ran for the entire flight except for five minutes when a fuel problem caused a temporary stop on the last day. The air cooled Teledyne front engine ran for 71 hours and 23 minutes during the heaviest weight phase, and to climb over unfavorable weather. It was started eight times during the flight, including the initial start.

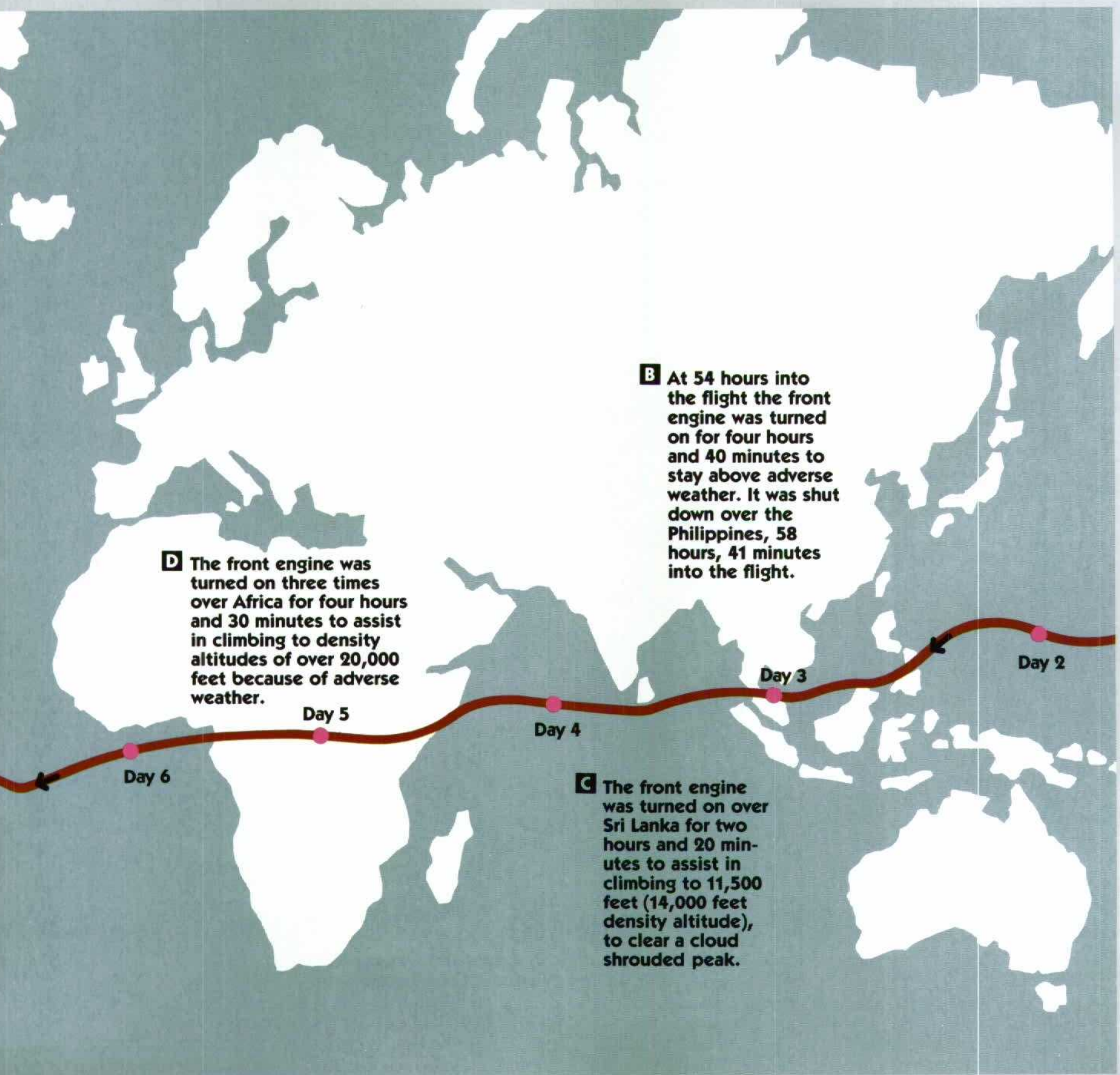
equator. When December came they had two choices: Wait until summer—or go for it. What they did is history, and makes the flight even a more remarkable story of human courage and engineering accomplishment.

Voyager went around the world at an average speed of 121.6 miles an hour. At the end they only had 106.4 pounds, or 18 gallons of fuel left. It averaged 22 miles to the gallon.

In a high technology age where flight records are usually broken by small percentages, Voyager accomplished the amazing feat of flying more than double the previous record distance of 12,532 miles set by a U.S. Air Force B52H in 1962.

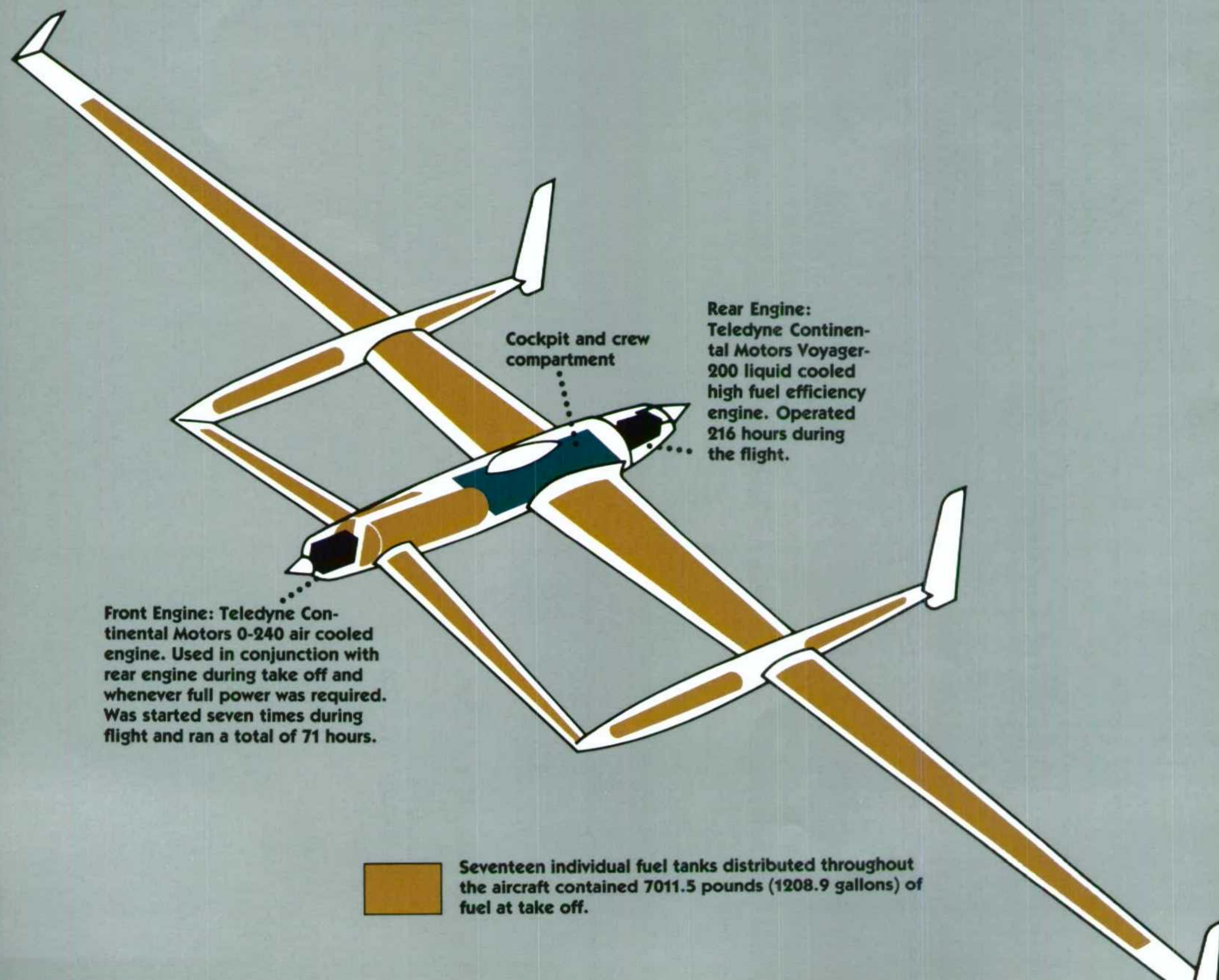
This map represents the route of the Voyager aircraft in 24 hour segments. The National Aeronautics Association, which is working with the Federation Aeronautique Internationale on an international record, initially credited an official distance of 25,012 miles, but as of this printing, Voyager Mission Control indicates a point-to-point flight distance of 26,178 miles. Both distances exceed the great circle of the earth at the equator of 24,903 miles. To be credited with a globe circling flight a distance of 22,859 miles must be travelled. That is the distance around the world at the Tropic of Cancer or the Tropic of Capricorn, about 23½ degrees north and south of the equator.

Data for this map was supplied by Voyager Mission Control. Teledyne is grateful to Voyager personnel for their enthusiastic cooperation in the preparation of this report.



DIMENSIONS	
Wing Span	110.8 Ft.
Canard Span	33.3 Ft.
Fuselage Length	25.4 Ft.
Boom Tank Length	29.4 Ft.
Vertical Tail Height	10.3 Ft.
Wing Area	363 Sq. Ft.
Canard Area	61 Sq. Ft.
Total Area	424 Sq. Ft.
Wing Aspect Ratio	33.8
Canard Aspect Ratio	18.1

CABIN/COCKPIT DIMENSIONS	
Cabin Length	7.5 Ft.
Cockpit Length	5.6 Ft.
Cabin Width	2.0 Ft.
Cockpit Width	1.8 Ft.
Maximum Interior Height	3.3 Ft.
WEIGHTS	
Structural Wt.	939 Lbs.
Operational Wt.	2,683 Lbs.
World Flight Take Off Wt.	9,694.5 Lbs.
World Flight Landing Wt.	2,789 Lbs.
Fuel Wt. (1,208.9 Gal.)	7,011.5 Lbs.



Patented Liquid Cooled Cylinder Design

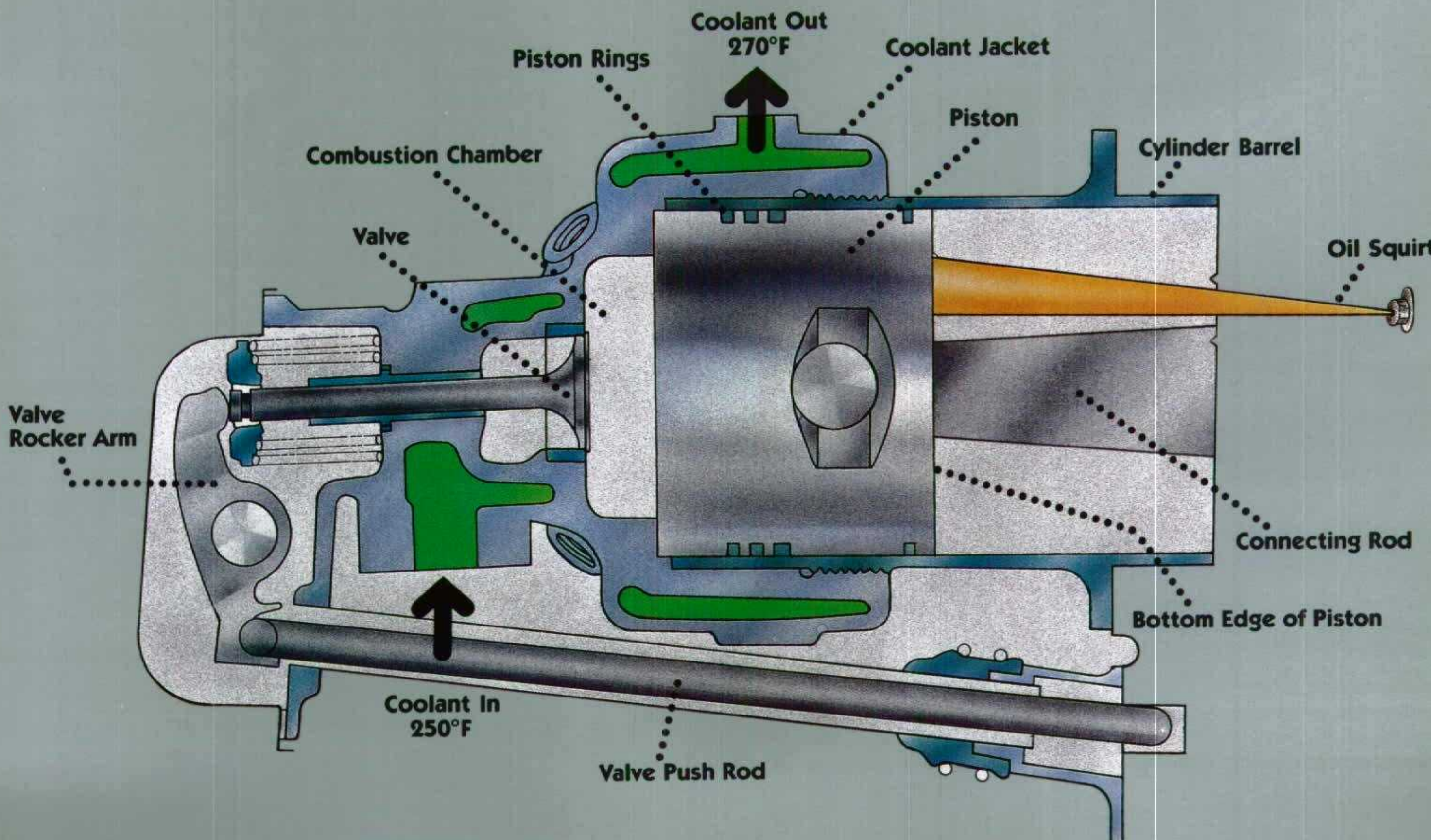
Teledyne Continental Motors' patented liquid cooled engine design utilizes individual liquid cooled cylinders, each with an integral coolant jacket that encircles the outer end of the cylinder barrel near the combustion chamber. This coolant jacket extends only part of the way along the length of the cylinder, stopping at a position just short of the skirt or bottom end of the piston when it is at its highest position in the cylinder.

This leaves the lower portion of the cylinder barrel free of the coolant jacket and results in a lightweight but extremely effective cooling system. Coolant is circulated through passageways in the hollow coolant jacket by an external engine driven pump. The coolant absorbs heat from the metal parts of the engine and then is conveyed out of the coolant jacket to a heat exchanger (similar to an automobile radiator) where the heat is dissipated to the external air.

The lower portion of the cylinder barrel is very effectively cooled by a high volume oil spray that is directed at the inside of the piston. The engine oil is circulated through a separate heat exchanger where the heat is again dissipated to the external air. The major advantage of this system is that the liquid cooling jacket extends only a short distance along the cylinder barrel, minimizing the weight of the cooling system.

The patented system weighs less than an equivalent air cooled cylinder and achieves more uniform temperatures throughout both the combustion chamber and cylinder barrel. This permits a reduction in piston-to-cylinder clearances and improves engine component life.

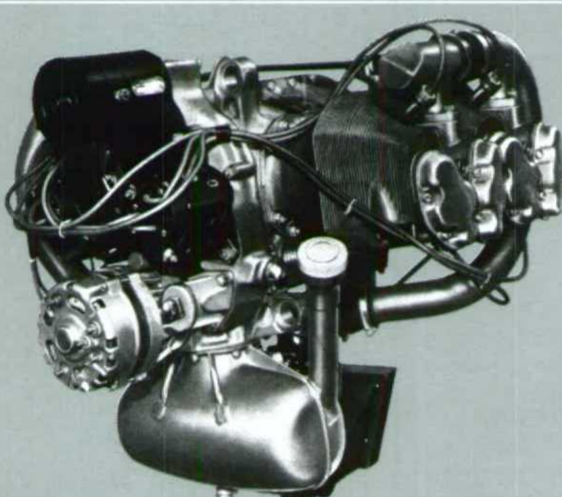
Because of this improved cooling system, Teledyne Continental Motors has been able to incorporate a high compression ratio (11.4 to 1) High Turbulence Combustion Chamber (HTCC) design on the naturally aspirated 200 and 300 cubic inch engines. This results in up to 20 percent better fuel efficiency and 10 percent higher horsepower than other engines of equivalent displacement, as well as improved high altitude performance.



Two Engines: One Old, One New Pushed & Pulled Voyager

Pushing and pulling Voyager around the world, one in the front, one in the back, one liquid cooled, one air cooled, one old, one new, were two Teledyne Continental engines. Pushing from the rear, full-time, was the liquid cooled main engine model TCM Voyager-200. An experimental engine, not yet in production, it provided the power throughout the 216 hour flight with such low fuel consumption that pilot Dick Rutan has said it made the mission possible (see interview on page 4).

Pulling from the front to complement the TCM Voyager-200 was the TCM 0-240, an old air cooled engine model no longer in production. Its weight and 130 horsepower were well suited to team with the new liquid cooled member of the engine family. It was developed in 1962 and hadn't been in production since 1980 so Teledyne Continental employees hand assembled an engine for Voyager. The engine performed flawlessly at take off, landing and whenever called upon in between for 71 hours of the historic flight (see map page 8). Two weeks after its record journey Voyager was flown from Edwards Air Force base to its home in Mojave, California. Pilot Rutan said "we had such confidence in the engine we didn't even remove the cowling to look at it, or even check the oil. We just started it up."



Model: Teledyne Continental 0-240
Production: 1962-1980 Cooling: Air Horsepower: 130
Voyager: Front Engine, Puller Running Time: 71 Hours

Model: Teledyne Continental Voyager-200
Production: Experimental Cooling: Liquid Horsepower: 110
Voyager: Main Engine, Rear, Pusher Running Time: 216 Hours

Internal combustion engines wouldn't have to be cooled at all if they were 100% efficient in converting the chemical energy available in the fuel to useful mechanical work. However, well established laws of thermodynamics prove that this is a physical impossibility.

Typical internal combustion engines convert about 25-30% of the available fuel energy to useful mechanical work. Of the remaining fuel energy, approximately 45-55% is lost as waste heat in the exhaust gas with 20-25% lost to engine cooling.

Throughout the history of the internal combustion engine many techniques have been utilized to increase the thermal efficiency and reduce the heat lost in the exhaust and to engine cooling.

Turbosupercharging and turbocompounding systems are examples of devices that convert exhaust gas waste heat energy to useful work. A better understanding of the combustion process and improvements in fuels has led to new combustion system designs that have also resulted in improved engine thermal efficiencies. Improvements in materials and lubricating oils have allowed higher operating temperatures which translate into less energy expended to cool the engine and oil.

Internal combustion engines for aircraft make use of ram air to cool the engine and oil. Efficient use of this cooling air can have a significant impact upon aircraft performance.

Two Ways to Cool

From the earliest days of piston engines two basic methods of cooling were used. One was to simply remove the heat by passing air over the metal parts of the engine. The efficiency of this method was gradually improved over the years by incorporating thin metal fins on the cylinders and cylinder heads in order to increase the heat transfer area.

The other method was to enclose the hottest parts of the engine—the cylinders and cylinder heads—in a hollow jacket through which water could be circulated to absorb the heat which was then transferred to the air through a separate heat exchanger or radiator.

Liquid cooling was generally dominant in aviation up to the end of World War I, after which the United States Navy set a trend toward air cooled engines by supporting the development of air cooled engines for its aircraft. In Europe, on the other hand, liquid cooled engines remained dominant in the military aircraft of Britain, Germany and other nations through the end of World War II.

The Problem of Cooling Drag

One of the early cases against air cooled engines for aircraft was cooling drag. This is the aerodynamic drag on the aircraft that is caused by the mass of air that must be diverted through the cooling fins of the engine. Early engines with exposed cylinders created considerable cooling drag. This situation was later improved by the use of more fins with greater cooling area, and cowling and baffles that made more efficient use of less air flow.

Raising the Boiling Point

The radiators of early liquid cooled engines posed similar problems, and with the improvements in air cooling techniques the two systems were about on a par. One of the drawbacks of early liquid cooled engines had to do with a basic law of physics: The greater the difference in temperature between two bodies, the faster the heat energy will move from one to the other. The outside air that ultimately carries away the heat from both air and liquid cooled engines is the same for either type of engine. The operating temperature of water cooled engines, however, was limited by the boiling point of the water used, while air cooled engines could run at higher temperatures.

Experiments in the 1920s with high boiling point liquids as coolants led to the development of engines in the 1930s that used a mixture of ethylene glycol and water and operated at temperatures approaching 300°F. Higher coolant temperatures permitted smaller heat exchangers (radiators) to be used and gave a boost to liquid cooled technology.

The Pinnacle of Piston Engine Power

The two systems progressed roughly in parallel through World War II until the debate became academic shortly thereafter when gas turbine engines emerged as the power plant of choice for most large aircraft. Liquid cooled piston engines for aircraft probably reached their pinnacle in 1945 with the Packard Merlin 12 cylinder V-type engine that achieved 2,250 horsepower with a weight of only .78 pounds per horsepower. Air cooled piston engine development went further with the introduction in 1955 of the Wright Turbo-Cyclone R-3350 18 cylinder 2-row radial engine that developed 3,700 horsepower with a weight of .96 pounds per horsepower. It was the largest piston engine to be used in military and commercial planes.

Liquid Cooled Engines for General Aviation

Teledyne Continental Motors has revived interest in liquid cooled engines for general aviation with its introduction of the Voyager series engines. These engines offer a number of advantages. It has been shown that a well designed liquid-to-air heat exchanger (radiator) is a more efficient heat transfer device than today's multi finned direct air cooled aircraft engines.

In addition a small radiator offers installation flexibility to optimize cooling performance and eliminate the large amount of cooling air leakage inherent in air cooled engine baffling systems. This adds up to a significant reduction in cooling drag. Teledyne Continental Motors' new patented lightweight liquid cooled cylinder design results in more uniform cooling of the cylinders and cylinder heads. This in turn eliminates cooling anomalies, improves durability, and reduces maintenance requirements.

For the Voyager-200 engine used in the Voyager aircraft, these lower, more uniform metal temperatures made it possible to increase the compression ratio of this engine to 11.4 to 1 compared to a ratio of 7 to 1 in the air cooled version. Combined with a newly designed High Turbulence Combustion Chamber, largely made practical by liquid cooling, this engine has achieved up to 20 percent better fuel efficiency and 10 percent higher horsepower than its air cooled counterpart. A brake thermal efficiency as high as 36% has been attained. Because of the higher cooling efficiency achieved, this type of engine has demonstrated superior performance during thousands of hours of development testing in test chamber operation.

Net income for 1986 was $238.3 million or $20.35 per share compared to $546.4 million or $46.66 per share for 1985.

Income after tax for the year ended December 31, 1986 was $204.6 million or $17.48 per share before gains on sales of investments of $17.2 million and equity in net income of Argonaut Group (which was spun-off at September 30, 1986) of $16.5 million. Income after tax for 1985 was $226.8 million or $19.36 per share before gains on sales of investments of $173.7 million, equity in net income of Argonaut Group of $64.2 million (including capital gains of $100.6 million) and the income effect of the Litton distribution of $81.7 million. Sales were $3.24 billion in 1986 compared to $3.26 billion in 1985.

Net income for the fourth quarter of 1986 was $47.0 million or $4.01 per share compared to $98.6 million or $8.42 per share for the fourth quarter of 1985.

Income after tax for the fourth quarter of 1986 was $42.7 million or $3.65 per share before gains on sales of investments of $4.3 million. Income after tax for the fourth quarter of 1985 was $44.3 million or $3.78 per share before gains on sales of investments of $31.9 million and equity in net income of Argonaut Group of $22.4 million. Sales increased to $834.8 million in the fourth quarter of 1986 from $819.8 million in the 1985 period.

Substantially all of the gains on sales of investments in 1986 were included in equity in net income of unconsolidated subsidiaries. Of the gains on sales of investments in 1985, $148.6 million were included in equity in net income of unconsolidated subsidiaries and $25.1 million were included in income of consolidated companies.

Equity in net income of investees, excluding amounts on shares held by Argonaut Group, was $16.9 million or $1.44 per share in 1986 (including a loss of $9.4 million or $0.80 per share representing Teledyne's equity in a net loss reported by Litton for its quarter ended April 30, 1986) compared to $30.3 million or $2.59 per share in 1985 (including a loss of $23.6 million or $2.01 per share representing Teledyne's equity in Curtiss-Wright's loss on its investment in Western Union). Equity accounting increased net income by $7.2 million or $0.61 per share for the fourth quarter of 1986. Equity accounting, excluding amounts on shares held by Argonaut Group, decreased net income by $7.8 million or $0.66 per share for the fourth quarter of 1985 (including a loss of $18.4 million or $1.57 per share representing Teledyne's equity in Curtiss-Wright's loss on the sale of its investment in Western Union as announced in December 1985).

Revenue and operating profit by business segment are shown in Note 13 to the financial statements on page 30. Management's Discussion and Analysis of Financial Condition and Results of Operations is presented on page 38.

Henry E. Singleton — George A Roberts

Chairman of the Board of Directors — President and Chief Executive Officer

(In millions except per share amounts)

Year	Sales	Net Income	Net Income Per Share	Assets	Shareholders' Equity
1986	**$3,241.4**	**$238.3**	**$20.35**	**$2,744.2**	**$1,636.6**
1985	**3,256.2**	**546.4**	**46.66**	**2,775.4**	**1,577.4**
1984	**3,494.3**	**574.3**	**37.69**	**2,790.7**	**1,159.3**
1983	**2,979.0**	**304.6**	**14.87**	**3,852.2**	**2,641.2**
1982	**2,863.8**	**269.6**	**13.05**	**3,290.7**	**2,111.1**
1981	**3,237.6**	**421.9**	**20.43**	**2,904.5**	**1,723.2**
1980	**2,926.4**	**352.4**	**15.62**	**2,575.9**	**1,410.2**
1979	**2,705.6**	**379.6**	**15.02**	**2,050.8**	**1,288.6**
1978	**2,441.6**	**254.4**	**9.63**	**1,588.2**	**890.3**
1977	**2,209.7**	**201.3**	**7.53**	**1,443.1**	**702.2**
1976	**1,937.6**	**137.6**	**4.78**	**1,228.5**	**516.1**
1975	**1,715.0**	**101.7**	**2.57**	**1,136.5**	**489.3**
1974	**1,700.0**	**31.5**	**0.55**	**1,108.9**	**477.8**
1973	**1,455.5**	**66.0**	**1.01**	**1,227.4**	**532.8**
1972	**1,216.0**	**59.3**	**0.67**	**1,127.8**	**484.0**
1971	**1,101.9**	**57.4**	**0.62**	**1,064.8**	**606.1**
1970	**1,216.4**	**61.9**	**0.69**	**952.6**	**576.3**
1969	**1,294.8**	**58.1**	**0.68**	**938.1**	**502.0**
1968	**806.7**	**40.3**	**0.56**	**602.4**	**316.5**
1967	**451.1**	**21.3**	**0.38**	**336.7**	**152.6**
1966	**256.8**	**12.0**	**0.29**	**170.4**	**90.2**
1965	**86.5**	**3.4**	**0.16**	**66.5**	**34.8**
1964	**38.2**	**1.4**	**0.10**	**35.0**	**13.7**
1963	**31.9**	**0.7**	**0.06**	**23.9**	**8.6**
1962	**10.4**	**0.2**	**0.02**	**10.8**	**3.5**
1961	**4.5**	**0.1**	**0.01**	**3.7**	**2.5**

As reported in the Company's annual reports, adjusted for stock dividends and splits. Years 1967 through 1982 were restated for certain accounting changes.

Consolidated Balance Sheets

December 31, 1986 and 1985
(In millions)

	1986	1985
ASSETS		
Current Assets:		
Cash and marketable securities	**$ 116.8**	$ 67.3
Receivables	**384.7**	421.6
Inventories	**211.0**	172.6
Deferred income taxes	**27.2**	9.4
Prepaid expenses	**10.2**	12.0
Total current assets	**749.9**	682.9
Investments in Unconsolidated Subsidiaries	**1,625.5**	1,723.0
Property and Equipment	**325.3**	337.3
Other Assets	**43.5**	32.2
	$2,744.2	$2,775.4
LIABILITIES AND SHAREHOLDERS' EQUITY		
Current Liabilities:		
Accounts payable	**$ 137.3**	$ 126.0
Accrued liabilities	**247.0**	228.3
Accrued income taxes	**29.9**	51.2
Current portion of long-term debt	**2.4**	1.9
Total current liabilities	**416.6**	407.4
Long-Term Debt	**572.7**	669.2
Deferred Income Taxes	**78.8**	89.1
Other Long-Term Liabilities	**39.5**	32.3
Shareholders' Equity	**1,636.6**	1,577.4
	$2,744.2	$2,775.4

The accompanying notes are an integral part of these balance sheets.

Consolidated Statements of Income

For the Years Ended December 31, 1986, 1985 and 1984
(In millions except per share amounts)

	1986	*1985*	*1984*
Sales	**$3,241.4**	$3,256.2	$3,494.3
Costs and Expenses:			
Cost of sales	**2,542.2**	2,529.2	2,762.1
Selling and administrative expenses	**455.9**	437.9	431.5
Interest expense	**20.5**	26.0	40.1
Interest and dividend income	**(7.2)**	(15.6)	(63.4)
Gains on sales of securities	**(0.3)**	(36.7)	(25.4)
	3,011.1	2,940.8	3,144.9
Income before Income Taxes	**230.3**	315.4	349.4
Provision for Income Taxes	**101.2**	132.8	88.7
Income of Consolidated Companies	**129.1**	182.6	260.7
Equity in Net Income of Unconsolidated Subsidiaries:			
Before gains on sales of investments, Argonaut Group and Litton distribution	**75.7**	69.3	118.7
Gains on sales of investments	**17.0**	148.6	93.8
Argonaut Group	**16.5**	64.2	101.1
Litton distribution	—	81.7	—
	109.2	363.8	313.6
Net Income	**$ 238.3**	$ 546.4	$ 574.3
Net Income Per Share	**$ 20.35**	$ 46.66	$ 37.69

The accompanying notes are an integral part of these statements.

Consolidated Statements of Changes in Financial Position

For the Years Ended December 31, 1986, 1985 and 1984
(In millions)

	1986	1985	1984
Working Capital was Provided by:			
Net income	**$238.3**	$ 546.4	$ 574.3
Equity in net income of unconsolidated subsidiaries (before allocated interest expense and income tax items):			
Life insurance companies, Trinity and other	**(122.9)**	(265.8)	(255.0)
Argonaut Group	**(12.7)**	(53.2)	(87.3)
Depreciation and amortization of property and equipment	**107.7**	111.9	106.6
Change in deferred income taxes	**(14.4)**	(63.2)	(54.2)
Other charges not affecting working capital	**5.9**	6.1	10.8
Working capital provided by operations	**201.9**	282.2	295.2
Decrease in investments and advances due to distribution of Argonaut Group	**212.3**	—	—
Dividends, advances and repayments of advances from life insurance companies, Trinity and Fireside	**63.0**	91.5	259.8
Increase in long-term debt	**1.6**	0.7	800.0
Dividends, repayments of advances and redemption of preferred stock by Argonaut Group	**—**	22.5	236.1
Other, net	**7.6**	(4.9)	(2.5)
	486.4	392.0	1,588.6
Working Capital was Applied to:			
Distribution of Argonaut Group	**217.2**	—	—
Reduction in long-term debt	**104.3**	408.0	305.0
Additions to property and equipment	**100.5**	115.6	84.9
Advances to and repayments of advances from life insurance companies and Trinity	**6.6**	—	9.4
Advances to Argonaut Group	**—**	1.3	10.0
Acquisition of stock, subsequently retired	**—**	—	1,732.2
	428.6	524.9	2,141.5
Increase (Decrease) in Working Capital	**$ 57.8**	$(132.9)	$ (552.9)
Increase (Decrease) in Working Capital:			
Cash and marketable securities	**$ 49.5**	$(130.7)	$ (609.6)
Receivables	**(36.9)**	(6.2)	55.6
Inventories	**38.4**	35.9	(31.0)
Deferred income taxes	**17.8**	12.7	(3.3)
Prepaid expenses	**(1.8)**	1.3	3.4
Accounts payable	**(11.3)**	9.7	15.1
Accrued liabilities	**(18.7)**	(14.3)	(12.8)
Accrued income taxes	**21.3**	(41.4)	29.7
Current portion of long-term debt	**(0.5)**	0.1	—
	$ 57.8	$(132.9)	$ (552.9)

The accompanying notes are an integral part of these statements.

Consolidated Statements of Shareholders' Equity

For the Years Ended December 31, 1986, 1985 and 1984
(In millions except share amounts)

	Common Stock	Additional Paid-In Capital	Retained Earnings	Equity in Net Unrealized Appreciation	Currency Translation Adjustment	Shareholders' Equity
Balance, December 31, 1983	$20.4	$144.8	$1,975.3	$502.9	$(2.2)	$2,641.2
Net income	—	—	574.3	—	—	574.3
Change in net unrealized appreciation	—	—	—	(315.1)	—	(315.1)
Acquisition and retirement of stock (8,661,053 shares)	(8.7)	(61.6)	(1,661.9)	—	—	(1,732.2)
Distribution of American Ecology Corporation	—	—	(7.2)	—	—	(7.2)
Currency translation adjustment	—	—	—	—	(1.7)	(1.7)
Balance, December 31, 1984	11.7	83.2	880.5	187.8	(3.9)	1,159.3
Net income	—	—	546.4	—	—	546.4
Change in net unrealized appreciation	—	—	—	(129.4)	—	(129.4)
Currency translation adjustment	—	—	—	—	1.1	1.1
Balance, December 31, 1985	11.7	83.2	1,426.9	58.4	(2.8)	1,577.4
Net income	—	—	238.3	—	—	238.3
Change in net unrealized appreciation	—	—	—	37.0	—	37.0
Distribution of Argonaut Group	—	—	(185.8)	(31.4)	—	(217.2)
Currency translation adjustment	—	—	—	—	1.1	1.1
Balance, December 31, 1986	$11.7	$ 83.2	$1,479.4	$ 64.0	$(1.7)	$1,636.6

The accompanying notes are an integral part of these statements.

To the Shareholders and Board of Directors of Teledyne, Inc.:

We have examined the consolidated balance sheets of Teledyne, Inc. (a Delaware corporation) and subsidiaries as of December 31, 1986 and 1985, and the related consolidated statements of income, shareholders' equity and changes in financial position for the years ended December 31, 1986, 1985 and 1984. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances. We did not examine the consolidated financial statements of Unicoa Corporation and subsidiaries (Note 4). The investment in Unicoa Corporation and subsidiaries represents 46 percent in 1986 and 43 percent in 1985 of consolidated assets and the equity in its net income represents 31 percent in 1986 and 29 percent in 1985 and 1984 of consolidated net income. These statements were examined by other auditors whose report has been furnished to us and our opinion, insofar as it relates to amounts included for Unicoa Corporation and subsidiaries, is based solely on the report of the other auditors. Additionally, we did not examine the financial statements of certain investee companies (Notes 1 and 7). The equity in net income of these investees, after taxes, represents 8 percent in 1986, 7 percent in 1985 and 12 percent in 1984 of consolidated net income. These statements were examined by other auditors whose reports have been furnished to us and our opinion, insofar as it relates to amounts included for these investees, is based on the reports of the other auditors.

In our opinion, based on our examinations and the reports of other auditors, the financial statements referred to above present fairly the consolidated financial position of Teledyne, Inc. and subsidiaries as of December 31, 1986 and 1985, and the results of their operations and the changes in their financial position for the years ended December 31, 1986, 1985 and 1984, in conformity with generally accepted accounting principles applied on a consistent basis.

Arthur Andersen & Co.

ARTHUR ANDERSEN & CO.

Los Angeles, California,
January 10, 1987.

Note 1. Summary of Significant Accounting Policies. *Principles of Consolidation.* The consolidated financial statements of Teledyne, Inc. include the accounts of all its subsidiaries except its insurance and finance subsidiaries. The investments in unconsolidated subsidiaries are accounted for by the equity method. All material intercompany accounts and transactions have been eliminated, including transactions between unconsolidated subsidiaries. Certain amounts for 1985 and 1984 have been reclassified to conform with the 1986 presentation.

Currency Translation. Balance sheet accounts of foreign subsidiaries are translated at current exchange rates. Income and expenses are translated at the average rate of exchange during the year. Gains or losses resulting from translation of foreign financial statements are included in shareholders' equity. Gains or losses resulting from translation of foreign currency transactions, which are not material, are included in operations in the period in which they occur.

Net Income Per Share. The weighted average number of shares of common stock used in the computation of net income per share was 11,709,478 in 1986 and 1985 and 15,235,393 in 1984.

Receivables. Receivables are presented net of a reserve for doubtful accounts of $8.4 million at December 31, 1986 and $9.2 million at December 31, 1985.

Inventories. Inventories are stated at the lower of cost (last-in, first-out and first-in, first-out methods) or market, less progress payments. Costs include direct material and labor costs and applicable manufacturing overhead. Sales and related costs are recorded as products are delivered and as services are performed, including those under long-term contracts. Costs relating to such long-term contracts are removed from inventory and charged to cost of sales at amounts approximating actual cost. Any foreseeable losses are charged to income when determined.

Other Investments. Investments held by Teledyne and its subsidiaries are accounted for by the equity method in the Company's consolidated financial statements when the aggregate voting percentage has exceeded 20 percent for one full quarter. Teledyne's voting percentage and share of earnings or losses of each investee company are determined using the most recent publicly available audited financial statements and subsequent unaudited interim reports. As a result, the amounts included in the results of operations of Teledyne represent amounts reported by the investee companies for periods ending two to three months earlier.

Depreciation and Amortization. Buildings and equipment are depreciated primarily on declining balance methods over their estimated useful lives. Leasehold improvements are amortized on a straight-line basis over the life of the lease. Maintenance and repair costs ($78.0 million in 1986, $77.2 million in 1985 and $70.5 million in 1984) are charged to income as incurred, and betterments and major renewals are capitalized. Cost and accumulated depreciation of property sold, retired or fully depreciated are removed from the accounts, and any resultant gain or loss is included in income.

Cost in Excess of Net Assets of Purchased Businesses. Other assets include cost in excess of net assets of purchased businesses of $28.0 million at December 31, 1986 and $27.7 million at December 31, 1985. Substantially all of this cost relates to businesses purchased prior to November 1970 and is not being amortized.

Research and Development. Company-funded research and development costs ($84.6 million in 1986, $95.0 million in 1985 and $90.5 million in 1984) are expensed as incurred. Costs related to customer-funded research and development contracts are charged to income as the related sales are recorded.

Pension Expense. Pension expense is accrued at amounts equal to normal cost plus a portion of prior service costs. Pension plans are funded in accordance with the requirements of the Employee Retirement Income Security Act of 1974.

Income Taxes. Provision for income taxes includes Federal, state and foreign income taxes. Deferred income taxes are provided for timing differences in the recognition of income and expenses and undistributed earnings of subsidiaries, except for the portion of the earnings arising from life insurance operations. Investment tax credits are amortized over the estimated lives of the related assets. Unconsolidated subsidiaries are included in the Company's consolidated Federal income tax return and, accordingly, accrued and deferred income taxes include amounts resulting from taxes on the operations of these subsidiaries.

Note 2. Inventories. Inventories at December 31, 1986 and 1985 were as follows (in millions):

	1986	*1985*
Raw materials and work-in-process	**$388.8**	$386.6
Finished goods	**61.2**	59.2
	450.0	445.8
Progress payments	**(239.0)**	(273.2)
	$211.0	$172.6

Inventories determined on the last-in, first-out method were $423.9 million at December 31, 1986 and $419.1 million at December 31, 1985. The remainder of the inventories was determined using the first-in, first-out method. Inventories stated on the last-in, first-out basis were $187.1 million and $199.4 million less than their first-in, first-out values at December 31, 1986 and 1985, respectively. These first-in, first-out values do not differ materially from current cost.

During 1986, 1985 and 1984, inventory usage resulted in liquidations of last-in, first-out inventory quantities. These inventories were carried at the lower costs prevailing in prior years as compared with the cost of current purchases. The effect of these last-in, first-out inventory liquidations was to increase net income by $6.6 million in 1986, $3.0 million in 1985 and $2.5 million in 1984.

Inventories related to long-term contracts were $197.5 million and $194.3 million at December 31, 1986 and 1985, respectively. Progress payments related to long-term contracts were $218.1 million and $229.8 million at December 31, 1986 and 1985, respectively.

Note 3. Investments in Unconsolidated Subsidiaries. The Company's investments in unconsolidated subsidiaries at December 31, 1986 and 1985 were as follows (in millions):

	1986	*1985*
Investments in:		
Life insurance companies	**$1,275.7**	$1,146.0
Trinity	**293.2**	316.9
Other	**53.1**	66.8
Argonaut Group	—	144.0
Advances to unconsolidated subsidiaries:		
Argonaut Group	—	48.3
Other	**3.5**	1.0
	$1,625.5	$1,723.0

The Company's investment in life insurance companies consists primarily of its 98.4 percent ownership of Unicoa Corporation (Note 4). Trinity Universal Insurance Company (Trinity) (Note 5) is a wholly-owned subsidiary of Teledyne. Other investments include the Company's investment in Fireside Securities Corporation (Fireside) (Note 6), a wholly-owned subsidiary.

In 1986, Teledyne distributed to its shareholders all of the outstanding common stock of Argonaut Group, Inc. (Argonaut Group). Teledyne shareholders received one share of Argonaut Group common stock on each share of Teledyne common stock. The distribution was reflected in Teledyne's consolidated financial statements as of September 30, 1986. Accordingly, in order to reflect the Company's operating results exclusive of Argonaut Group operations, equity in net income of Argonaut Group is presented separately in these financial statements. Equity in net income of Argonaut Group includes amounts related to equity accounting, allocated interest expense and income tax items.

Equity in net income of unconsolidated subsidiaries for the years ended December 31, 1986, 1985 and 1984 was as follows (in millions):

	1986	*1985*	*1984*
Equity in net income of:			
Life insurance companies	**$ 69.3**	$385.5	$168.7
Trinity	**27.5**	106.4	45.5
Other	**2.7**	1.4	0.7
Incremental effect of equity accounting for investees	**23.4**	(227.5)	40.1
	122.9	265.8	255.0
Allocated interest expense	**(49.2)**	(56.4)	(64.2)
Income tax items:			
Consolidated tax return effect	**1.8**	(9.8)	3.7
Deferred taxes on incremental effect of equity accounting	**(6.5)**	79.5	(13.6)
Allocated interest expense	**24.2**	27.7	31.6
Undistributed earnings	**(0.5)**	(7.2)	—
	19.0	90.2	21.7
Equity in net income of Argonaut Group	**16.5**	64.2	101.1
	$109.2	$363.8	$313.6

Equity in net income of unconsolidated subsidiaries differs from amounts presented on a separate company basis (Notes 4 and 5) primarily due to the elimination of intercompany gains.

In 1985, certain of the Company's unconsolidated subsidiaries received a distribution of $323.5 million in Litton debentures in exchange for 3,600,000 shares of Litton common stock. Since the investment in Litton held by Teledyne and its subsidiaries is accounted for by the equity method in the consolidated financial statements, the distribution resulted in a reduction in the carrying value of Teledyne's investment in Litton common stock. Because the exchange did not significantly change Teledyne's ownership percentage in Litton, the distribution was treated as a dividend for income tax purposes. As a result, the income tax liability previously recorded on Teledyne's equity in Litton's net income exceeded the amount required by $81.7 million, excluding amounts related to Argonaut Group. Accordingly, the 1985 income effect of the Litton distribution results from a reduction of $81.7 million in taxes provided on the equity in net income of unconsolidated subsidiaries.

Equity in net income of life insurance companies for the year ended December 31, 1984 was increased by $62.8 million as a result of a special tax credit recorded by Unicoa Corporation and subsidiaries.

Interest expense was allocated to unconsolidated subsidiaries based on the ratio of the Company's average investment in unconsolidated subsidiaries to average total capital.

The income tax item for the consolidated tax return effect represents the difference between the income tax credit or provision on a consolidated basis and the amount recorded by unconsolidated subsidiaries on a separate company basis. Deferred taxes, related to the consolidated tax return effect included in equity in net income of Argonaut Group, were primarily the result of a decrease in accrued policyholder dividends of $10.2 million in 1986 and $11.8 million in 1985, and an increase in accrued policyholder dividends of $18.4 million in 1984. The effective tax rate used in computing the consolidated tax return effect differs from the statutory U.S. Federal income tax rate of 46 percent principally because of the effect of tax-exempt income and a lower tax rate on capital gains.

The Company's investment exceeded its equity in net assets of its unconsolidated subsidiaries by $127.7 million in 1986 and $187.5 million in 1985. The decrease in 1986 was primarily a result of the distribution of Argonaut Group. Such excess is in addition to the excess included in the consolidated balance sheets and is not being amortized.

Note 4. Unicoa Corporation and Subsidiaries. The following condensed statements summarize the consolidated financial position and operating results of Unicoa Corporation and subsidiaries (in millions):

Consolidated Balance Sheets
December 31, 1986 and 1985

	1986	*1985*
Assets:		
Investments—other than investments in related parties:		
Fixed maturities, at amortized cost (market: 1986—$1,476.8; 1985—$1,392.8)	**$1,434.5**	$1,356.1
Equity securities, at market (cost: 1986—$262.1; 1985—$96.5)	**461.4**	193.2
Short-term investments	**45.8**	22.4
Other loans and investments	**84.9**	97.0
	2,026.6	1,668.7
Cash	**5.0**	2.3
Investments in related parties	**10.3**	215.2
Deferred policy acquisition costs	**115.5**	111.2
Other assets	**98.9**	110.6
	$2,256.3	$2,108.0
Liabilities and Shareholders' Equity:		
Policy reserves and liabilities	**$ 935.9**	$ 918.0
Long-term debt	**14.3**	19.9
Accrued and deferred Federal income taxes	**92.9**	37.4
Other liabilities	**57.5**	51.9
Shareholders' equity	**1,155.7**	1,080.8
	$2,256.3	$2,108.0

Consolidated Statements of Income
For the Years Ended December 31, 1986, 1985 and 1984

	1986	*1985*	*1984*
Premiums and Other Revenue:			
Premiums	**$451.5**	$470.5	$472.4
Net investment income	**163.1**	158.1	133.4
	614.6	628.6	605.8
Expenses:			
Benefits paid or provided	**277.8**	291.1	306.3
Underwriting, acquisition and other expenses	**250.3**	245.3	235.8
Provision for Federal income taxes	**27.7**	28.4	11.0
Special tax credit	**—**	—	(63.8)
	555.8	564.8	489.3
	58.8	63.8	116.5
Gains on Sales of Investments	**15.2**	95.6	52.7
Litton Distribution	**—**	228.0	—
Net Income	**$ 74.0**	$387.4	$169.2

Shareholders' equity includes retained earnings of $1,000.8 million in 1986 and $926.8 million in 1985.

Note 5. Trinity Universal Insurance Company and Subsidiaries. The following condensed statements summarize the consolidated financial position and operating results of Trinity Universal Insurance Company and subsidiaries (in millions):

Consolidated Balance Sheets
December 31, 1986 and 1985

	1986	*1985*
Assets:		
Investments—other than investments in related parties:		
Fixed maturities, at amortized cost (market: 1986—$337.1; 1985—$351.2)	**$329.8**	$ 345.7
Equity securities, at market (cost: 1986—$135.1; 1985—$196.6)	**454.7**	755.1
Short-term investments	**0.6**	0.6
	785.1	1,101.4
Cash	**7.2**	10.5
Receivables	**85.3**	77.1
Deferred policy acquisition costs	**24.5**	19.3
Other assets	**7.3**	7.1
	$909.4	$1,215.4
Liabilities and Shareholder's Equity:		
Reserves for losses and loss adjustment expenses	**$192.0**	$ 170.9
Unearned premiums	**143.4**	128.2
Deferred income taxes	**92.1**	156.9
Other liabilities	**26.4**	28.3
Advances from affiliates	**—**	165.0
Minority interest	**—**	71.6
Shareholder's equity	**455.5**	494.5
	$909.4	$1,215.4

Consolidated Statements of Income
For the Years Ended December 31, 1986, 1985 and 1984

	1986	*1985*	*1984*
Premiums and Other Revenue:			
Premiums	**$338.6**	$293.8	$237.8
Net investment income	**39.4**	48.6	50.0
	378.0	342.4	287.8
Expenses:			
Losses and loss adjustment expenses	**235.8**	227.7	199.5
Underwriting, acquisition and other expenses	**91.5**	83.7	75.5
Interest expense	**12.4**	14.9	13.0
Provision (credit) for Federal income taxes	**15.0**	1.2	(3.7)
	354.7	327.5	284.3
	23.3	14.9	3.5
Gains on Sales of Investments	**77.0**	44.5	48.6
Litton Distribution	**—**	32.4	—
Minority Interest	**(22.8)**	0.1	(5.0)
	77.5	91.9	47.1
Income Tax Reduction	**29.8**	5.4	4.5
Net Income	**$107.3**	$ 97.3	$ 51.6

Dividends of $47.8 million and $78.0 million were paid to Teledyne in 1986 and 1985, respectively.

Note 6. Fireside Securities Corporation and Subsidiaries. The following condensed statements summarize the consolidated financial position and operating results of Fireside Securities Corporation and subsidiaries (in millions):

Consolidated Balance Sheets
December 31, 1986 and 1985

	1986	*1985*
Assets:		
Loans receivable, net of unearned discount	**$243.6**	$202.9
Marketable securities, at amortized cost, which approximates market	**21.9**	4.4
Other assets	**15.2**	18.3
	$280.7	$225.6
Liabilities and Shareholder's Equity:		
Investment certificates and passbook accounts	**$254.5**	$199.2
Other liabilities	**9.5**	3.3
Shareholder's equity	**16.7**	23.1
	$280.7	$225.6

Consolidated Statements of Income
For the Years Ended December 31, 1986, 1985 and 1984

	1986	*1985*	*1984*
Revenues:			
Interest on loans	**$41.5**	$37.2	$32.4
Other income	**4.4**	2.2	2.3
	45.9	39.4	34.7
Expenses:			
Interest on investment certificates and passbook accounts	**18.0**	16.8	15.6
General and administrative expenses	**22.6**	19.9	17.6
Provision for income taxes	**2.6**	1.3	0.8
	43.2	38.0	34.0
Net Income	**$ 2.7**	$ 1.4	$ 0.7

Dividends of $9.1 million were paid to Teledyne in 1986.

Note 7. Other Equity Investments. Certain investments held by Teledyne and its subsidiaries are included in the Company's consolidated financial statements using the equity method of accounting. Prior to the Argonaut Group distribution discussed in Note 3, investments accounted for by the equity method were Brockway, Inc. (NY), Curtiss-Wright Corporation, Kidde, Inc., Litton Industries, Inc. and Reichhold Chemicals, Inc. Investments accounted for by the equity method after the Argonaut Group distribution and approximate voting percentages based on the most recent publicly available data were: Curtiss-Wright Corporation (45 percent) and Litton Industries, Inc. (27 percent).

Teledyne's equity in the net income of investees, excluding amounts on shares held by Argonaut Group and including the effect of dividends, was $24.8 million in 1986, $48.4 million in 1985 and $54.7 million in 1984. Income taxes have been provided at appropriate rates for that portion of the equity in net income received as dividends; capital gains rates were used to compute the provision on the undistributed balance. The incremental effect of equity in net income of investees, excluding amounts on shares held by Argonaut Group, was $16.9 million or $1.44 per share in 1986, $30.3 million or $2.59 per share in 1985 and $26.5 million or $1.74 per share in 1984. The 1986 amount includes a loss of $9.4 million or $0.80 per share representing Teledyne's equity in a net loss reported by Litton for its quarter ended April 30, 1986. The 1985 amount includes a loss of $23.6 million or $2.01 per share representing Teledyne's equity in Curtiss-Wright's loss on its investment in Western Union. The 1984 amount includes a loss of $21.6 million or $1.42 per share reported in the quarter ended March 31, 1984, representing Teledyne's equity in a net loss reported by Kidde, Inc. During 1985, certain of Teledyne's unconsolidated subsidiaries received a distribution of Litton debentures in exchange for Litton common stock, as discussed in Note 3. The incremental effect of equity accounting in 1985 also includes amounts related to this distribution.

Investments in Curtiss-Wright and Litton are carried at cost adjusted for Teledyne's equity in undistributed earnings since acquisition. This carrying value was $302.5 million and $298.1 million at December 31, 1986 and 1985, respectively, and the aggregate market value, based on quoted market prices, was $645.7 million and $724.5 million at December 31, 1986 and 1985, respectively. Teledyne's equity in the net assets of the investee companies exceeded the carrying value of the investments by approximately $38.4 million at December 31, 1986 and is not being amortized; a portion of this amount has been considered to be related to cost in excess of net assets of purchased businesses reported in the financial statements of the investee companies. The carrying value and aggregate market value of Brockway, Inc. (NY), Kidde, Inc. and Reichhold Chemicals, Inc. at December 31, 1985 were $286.9 million and $320.0 million, respectively.

Note 8. Long-Term Debt. At December 31, 1986 and 1985, the Company's long-term debt was as follows (in millions):

	1986	*1985*
10% Subordinated Debentures, due 2004, Series A and C, $29.8 payable annually commencing in 1994 (net of unamortized discount of $81.5 in 1986 and $87.7 in 1985)	**$506.7**	$504.9
Other	**68.4**	68.7
Variable Rate Notes	—	97.5
	575.1	671.1
Current portion	**(2.4)**	(1.9)
	$572.7	$669.2

The Variable Rate Notes were issued under long-term commitments from certain banks. The notes were repaid in 1986 and the long-term commitments were terminated.

Long-term debt is payable $2.4 million in 1987, $4.1 million in 1988, $5.5 million in 1989, $4.9 million in 1990 and $5.5 million in 1991. Interest expense was $73.0 million in 1986, $89.3 million in 1985 and $116.1 million in 1984. Amounts allocated to unconsolidated subsidiaries, excluding Argonaut Group, were $49.2 million in 1986, $56.4 million in 1985 and $64.2 million in 1984. Discount amortization of $6.2 million in 1986, $5.8 million in 1985 and $5.7 million in 1984 is included in interest expense.

The Company has domestic credit lines with various banks totaling $125.0 million at December 31, 1986; no amounts were borrowed under these lines during 1986 or 1985. Commitments under standby letters of credit outstanding were $52.4 million at December 31, 1986. Compensating balance arrangements of an informal nature exist. Such arrangements had no material effect on the Company's consolidated financial statements at December 31, 1986.

Note 9. Shareholders' Equity. The Company is authorized to issue 60,000,000 shares of common stock, $1 par value, and 15,000,000 shares of preferred stock, $1 par value. The Company had common stock issued and outstanding of 11,709,478 shares at December 31, 1986 and 1985. No preferred shares were issued or outstanding in either year.

Teledyne distributed to its shareholders one share of Argonaut Group common stock on each share of Teledyne common stock in 1986 as discussed in Note 3.

The Company's equity in gross unrealized gains, before taxes, on stocks held by unconsolidated subsidiaries, excluding those investments accounted for by the equity method (Note 7), was $88.9 million at December 31, 1986. This amount, net of the deferred income tax effect, is included in shareholders' equity.

Under various borrowing agreements, the Company has agreed to maintain minimum amounts of working capital, net worth and interest coverage, and has agreed to certain restrictions with respect to borrowing, sale of assets, purchase of capital stock and payment of dividends. At December 31, 1986, the Company was in compliance with these agreements and retained earnings of $1.18 billion were not restricted by these agreements as to payment of dividends.

Substantially all net assets of consolidated subsidiaries are unrestricted as to dividends, loans or advances. Various state insurance laws restrict the amount that certain insurance subsidiaries may transfer to the Company in the form of dividends, loans or advances without the prior approval of regulatory authorities. In addition, that portion of the insurance subsidiaries' net equity which results from differences between statutory insurance accounting practices and generally accepted accounting principles would not be available for cash dividends, loans or advances. At December 31, 1986, approximately $1.60 billion of the unconsolidated subsidiaries' net assets were so restricted. Retained earnings at December 31, 1986 included $171.4 million representing undistributed earnings of investees.

Note 10. Supplemental Balance Sheet Information. Cash and marketable securities at December 31, 1986 and 1985 were as follows (in millions):

	1986	1985
Cash	**$ 5.6**	$ 46.9
United States Treasury notes, at amortized cost, which approximates market	**100.7**	11.2
Other marketable securities	**10.5**	9.2
	$116.8	$ 67.3

Property and equipment at December 31, 1986 and 1985 were as follows (in millions):

	1986	1985
Land	**$ 23.0**	$ 22.2
Buildings	**198.4**	193.8
Equipment and leasehold improvements	**703.7**	745.5
	925.1	961.5
Accumulated depreciation and amortization	**(599.8)**	(624.2)
	$325.3	$337.3

Accrued liabilities at December 31, 1986 and 1985 were as follows (in millions):

	1986	1985
Salaries and wages	**$ 82.0**	$ 83.3
Pensions	**28.6**	12.3
Interest, taxes and other	**136.4**	132.7
	$247.0	$228.3

Accounts payable includes $19.9 million at December 31, 1986 for checks outstanding in excess of cash balances.

Note 11. Pension Plans and Post-Retirement Benefits. The Company sponsors several pension plans covering substantially all of its employees. The total pension expense of consolidated companies was $46.8 million in 1986, $46.4 million in 1985 and $42.3 million in 1984. The aggregate actuarially computed present value of accumulated plan benefits and aggregate plan assets as of December 31, 1986 and 1985, including plans of its unconsolidated insurance subsidiaries, assuming a rate of return of 6 percent, were as follows (in millions):

	1986	1985
Actuarial present value of accumulated plan benefits:		
Vested	**$ 651.0**	$ 663.7
Nonvested	**59.0**	56.9
	$ 710.0	$ 720.6
Plan assets and balance sheet accruals	**$1,312.1**	$1,172.1

The Company provides post-retirement health care and life insurance benefits to certain of its employees. The costs for these benefits, which were charged to costs and expenses as incurred, were $13.1 million in 1986, $14.2 million in 1985 and $13.7 million in 1984.

In 1987, the Company will change its method of calculating pension expense in accordance with Financial Accounting Standards Board Statement No. 87 on pension accounting. The Company estimates that this change will significantly decrease pension expense for the year ending December 31, 1987.

Note 12. Income Taxes. Provision for income taxes for the years ended December 31, 1986, 1985 and 1984 was as follows (in millions):

	1986	*1985*	*1984*
Current—Federal	**$117.5**	$108.2	$105.6
—State	**18.9**	24.8	28.6
—Foreign	**4.7**	5.5	4.6
	141.1	138.5	138.8
Deferred—Federal	**(28.3)**	7.8	8.3
—State	**(2.9)**	(2.0)	(5.6)
—Foreign	**0.2**	0.2	(0.1)
	(31.0)	6.0	2.6
Investment Tax Credits	**(8.9)**	(11.7)	(10.5)
Special Tax Credit	**—**	—	(42.2)
	$101.2	$132.8	$ 88.7

The special tax credit in 1984 results from the reversal of income taxes provided in prior years on undistributed earnings of the Company's domestic international sales corporations. As a result of the Tax Reform Act of 1984, these taxes are no longer payable.

Equity in net income of unconsolidated subsidiaries (Note 3) includes credits of $19.0 million in 1986, $90.2 million in 1985 and $21.7 million in 1984 representing the effect of income tax items related to unconsolidated subsidiaries. Substantially all of these income tax items were related to Federal income taxes and include deferred provisions of $1.2 million in 1986, deferred credits of $71.6 million in 1985 and deferred provisions of $10.9 million in 1984.

Income of consolidated companies before income taxes includes income from domestic operations of $220.1 million in 1986, $303.6 million in 1985 and $337.3 million in 1984. Income before income taxes from foreign operations was $10.2 million in 1986, $11.8 million in 1985 and $12.1 million in 1984.

The effective income tax rate on pre-tax income of consolidated companies was 43.9 percent in 1986, 42.1 percent in 1985 and 25.4 percent in 1984, which differed from the statutory U.S. Federal income tax rate for the following reasons:

	1986	*1985*	*1984*
U.S. Federal income tax rate	**46.0%**	46.0%	46.0%
State and local income taxes, net of Federal income tax effect	**3.8**	3.9	3.5
Amortization of investment tax credits	**(3.9)**	(3.7)	(3.0)
Capital gain rate differential	**(0.2)**	(2.7)	(1.3)
Special tax credit	**—**	—	(12.1)
Research and development tax credits	**—**	—	(6.0)
Other, net	**(1.8)**	(1.4)	(1.7)
	43.9%	42.1%	25.4%

The 1986 deferred income tax credit includes deferred credits of $21.1 million related to timing differences in the recognition of pension expense and $14.9 million related to the Argonaut Group distribution. The deferred income tax provision in 1985 and 1984 includes deferred investment tax credits of $7.7 million and $7.0 million, respectively. The 1984 deferred income tax provision includes $11.1 million related to domestic international sales corporation transactions. Unamortized investment tax credits of approximately $10.8 million and $17.9 million, to be amortized principally over periods of up to three years, are included in deferred income taxes in the consolidated balance sheets at December 31, 1986 and 1985, respectively.

The Tax Reform Act of 1986 will decrease the Federal income tax rate on ordinary income from 46% in 1986 to 40% in 1987 and to 34% in 1988 while the tax rate on capital gains will increase from 28% in 1986 to 34% in 1987. The financial statement impact of these and other enacted changes is expected to reduce the Company's effective Federal income tax rate. In addition, some acceleration in Federal income taxes currently payable will occur.

Note 13. Business Segments. The Company's major business segments include aviation and electronic products, industrial products, specialty metal products and consumer products. Aviation and electronic products include aircraft engines, airframe structures, remotely-piloted vehicles, drone systems, spacecraft and avionics. This segment also includes the assembly of computers, the manufacture of semiconductors, relays, aircraft-monitoring and control systems, military electronic equipment and other related products and systems. Internal combustion engines are the major product of the industrial segment, including the manufacture of air and water cooled, gasoline and diesel fueled engines. Other products in this segment include machine tools, dies and consumable tooling. Specialty metal products include zirconium, high-speed and alloy steels, tungsten and molybdenum. Other operations in this segment include processing, casting, rolling and forging metals. The consumer segment includes oral hygiene products, shower massages, water filters, high fidelity speakers and other products and services.

The Company's unconsolidated subsidiaries (Note 3) are primarily insurance companies. One group writes life and accident and health insurance. Another group writes a broad line of insurance including liability, automobile, homeowners and commercial multi-peril, fire insurance and workers compensation. Business is done primarily in the United States.

Sales between business segments, which were not material, generally were priced at prevailing market prices. The Company's sales to the U.S. Government were $1.37 billion in 1986, $1.29 billion in 1985 and $1.17 billion in 1984, including direct sales as prime contractor and indirect sales as subcontractor. Most of these sales were in the aviation and electronics segment. The Company did not engage in material manufacturing operations in other countries. Sales by operations in the United States to customers in other countries were $277.8 million in 1986, $281.9 million in 1985 and $287.7 million in 1984.

Information on the Company's business segments for the years ended December 31, 1986, 1985 and 1984 was as follows (in millions):

	1986	*1985*	*1984*
Revenues:			
Aviation and electronics	**$1,444.3**	$1,368.1	$1,486.4
Industrial	**819.8**	930.6	994.4
Specialty metals	**701.8**	692.6	730.7
Consumer	**275.5**	264.9	282.8
Sales	**3,241.4**	3,256.2	3,494.3
Insurance and finance	**1,311.4**	1,460.6	1,366.0
Total	**$4,552.8**	$4,716.8	$4,860.3

Insurance and finance revenues include revenues of $295.1 million in 1986, $451.7 million in 1985 and $443.5 million in 1984 of Argonaut Group.

	1986	*1985*	*1984*
Income before Income Taxes:			
Aviation and electronics	**$ 100.0**	$ 117.9	$ 134.2
Industrial	**58.8**	82.7	89.8
Specialty metals	**83.3**	78.4	79.6
Consumer	**31.6**	37.9	34.1
Total operating profit	**273.7**	316.9	337.7
Corporate expenses	**30.4**	27.8	37.0
Interest expense	**20.5**	26.0	40.1
Interest and dividend income	**(7.2)**	(15.6)	(63.4)
Gains on sales of securities	**(0.3)**	(36.7)	(25.4)
Total	**$ 230.3**	$ 315.4	$ 349.4

Income before tax in 1986 decreased in the aviation and electronics segment primarily due to increased expenses on research and development contracts and lower margins. The industrial segment's decline in income before tax in 1986 was primarily due to the effect of depressed economic conditions in various industrial and oil service related products. In 1985, income before income taxes for the consumer segment includes $7.2 million of gains on sales of property and equipment.

	1986	1985	1984
Depreciation and Amortization:			
Aviation and electronics	**$ 39.2**	$ 35.1	$ 28.9
Industrial	**29.8**	35.8	39.5
Specialty metals	**27.8**	30.8	29.4
Consumer	**4.2**	3.5	2.8
Corporate	**6.7**	6.7	6.0
Total	**$ 107.7**	$ 111.9	$ 106.6
Identifiable Assets:			
Aviation and electronics	**$ 347.0**	$ 337.9	$ 295.4
Industrial	**235.4**	281.2	292.1
Specialty metals	**245.5**	248.6	257.2
Consumer	**78.3**	73.7	73.2
	906.2	941.4	917.9
Investments in unconsolidated subsidiaries (Note 3)	**1,625.5**	1,723.0	1,647.1
Corporate	**212.5**	111.0	225.7
Total	**$2,744.2**	$2,775.4	$2,790.7
Capital Expenditures:			
Aviation and electronics	**$ 42.9**	$ 55.5	$ 30.3
Industrial	**20.8**	23.9	21.0
Specialty metals	**23.5**	20.4	22.7
Consumer	**6.8**	5.3	4.2
Corporate	**6.5**	10.5	6.7
Total	**$ 100.5**	$ 115.6	$ 84.9

Note 14. Commitments and Contingencies. The Company is defending a lawsuit brought in the Chancery Court of Delaware alleging claims relating to certain repurchases of its stock. The action seeks compensatory and punitive damages in an indeterminate amount and alternatively, rescission. The Company believes that the allegations made in the complaint are not meritorious and that the Company has adequate legal defenses.

The Internal Revenue Service (IRS) has proposed the imposition of an accumulated earnings tax of approximately $122 million for 1981 and $128 million for 1980 in connection with the audit of the Company's consolidated Federal tax liability. The same issue may be raised by the IRS in their audits of years subsequent to 1981. The Company believes the assertion of an accumulated earnings tax by the IRS is both legally and factually without merit and intends to defend vigorously against it. In the opinion of the Company, the ultimate resolution of this issue will not materially affect its financial statements.

OUTLINE OF PRODUCTS AND ACTIVITIES

Aviation and Electronics: Products in the closely related fields of aviation and electronics range from the microscopic world of semiconductor devices to full-scale air frames and complete aircraft.

Teledyne's hybrid microcircuits are widely used in military, space, industrial and medical applications. These compact and complex electronic building blocks combine multiple transistors and integrated circuits in the smallest possible packaging size, where reliability and light weight are of paramount importance. Thousands of these microcircuits, the size of postage stamps, have been produced, and provide the precise control required for heart pacemakers and interplanetary missions, as well as many other uses.

On a still larger scale are Teledyne's high power traveling wave tubes, used to simultaneously transmit thousands of telephone conversations–or a dozen television channels–around the world via satellite networks.

Similar types of traveling wave tubes are used in the latest airborne and ground-based electronic counter measure equipment.

Other components include operational amplifiers, digital-analog converters, miniature relays, hybrid switching devices, radar augmenters, lower power microwave tubes, flexible printed-circuit interconnections, high reliability wire and cable, switches, terminals and a line of aircraft, military tank and truck batteries.

In the microwave industry, Teledyne is a leading supplier of ferrite components and switching devices, as well as filters, oscillators and integrated subsystems.

At the systems level, Teledyne produces equipment for telemetering data from remote sources, for electronic counter measures, and for information processing, as well as the AIDS aircraft integrated data systems used by dozens of major airlines to record in-flight performance and maintenance data on their jumbo jets.

Teledyne also performs systems engineering and integration for ballistic missile defense, space defense, shuttle payloads, computer software, and designs and produces military airborne training and evaluation systems.

Computing and inertial systems are also produced for the control and guidance of aircraft and space vehicles. Teledyne on-board computers have successfully controlled the launching of dozens of spacecraft, including both Viking missions to Mars.

Teledyne is heavily involved in electronic navigation systems, as well, with Loran and Omega navigators for long range sea and air navigation and Raydist systems for precise radiolocation in coastal waters. Doppler radar systems produced by Teledyne were used on 24 successful space landings and guided each Apollo lander to the surface of the moon. Similar Doppler radars are used in military aircraft for anti-submarine warfare and search-and-rescue missions.

Teledyne avionic instruments and electronic systems contribute substantially to flight safety on both military and general aviation aircraft.

The use of the latest microcircuit technology and modern cryptographic algorithms permit Teledyne to supply very advanced identification equipment (IFF) used on military and commercial aircraft for peacetime air traffic control and for safe operation in a wartime environment.

Among Teledyne's many non-electronic products for aviation are controlled explosive devices that precisely time, sequence and actuate aircraft escape systems, and similar pyrotechnic devices used to separate the stages of space vehicles, and to eject or deploy instrument packages of many kinds. Teledyne also produces parachute delivery systems for accurate air-drop of military cargo or emergency supplies.

Precise hydraulic and pneumatic actuating systems and components are made for both fixed and rotary wing aircraft, as are ground support systems such as frequency and power converters and jet engine starters for commercial and general aviation use.

Continental piston engines have been powering airplanes for sixty years, and today about half of the general aviation piston engines produced in the United States are built by Teledyne and used worldwide. Teledyne turbine engines also power remotely piloted aircraft, military trainers and, in small, expandable versions, provide power for the Harpoon and cruise missiles. Teledyne also services and overhauls turbines manufactured by others for both military and general aviation use.

The Company's expertise in airframe manufacture goes back to Charles Lindbergh's Spirit of St. Louis which was built by Ryan Airlines, Inc., forerunner of today's Teledyne Ryan Aeronautical. More than twenty-five types of remotely piloted aircraft–usually called RPV's–have been built by Teledyne, in both supersonic and subsonic versions. These recoverable and reusable vehicles are used for sophisticated military missions with the pilots safely flying them from remote control centers. Teledyne is also building the airframe for the new Army attack helicopter and has produced thousands of feet of tapered, roll-formed stringers used in wide-body aircraft.

Through the production of sophisticated RPV's, Teledyne has also developed broad expertise in the use of advanced materials such as graphite composites, and has facilities for the numerically-controlled machining of airfoils from honeycomb materials.

Teledyne's participation in all these diverse areas of aviation, space and electronics has given the Company highly developed expertise in some of the most advanced technologies of our time.

Industrial Products: Engines of many sorts–air and liquid cooled, gasoline and diesel fueled–are products in this category. Teledyne piston engines range in power from lightweight, portable, air-cooled engines of a few horsepower up to heavy-duty turbo-charged diesel engines approaching 1,750 horsepower for use in military tanks and heavy construction equipment.

Another category of industrial products includes machine tools, dies and consumable tooling of all types. These range from numerically-controlled pipe and tube bending machines to a great variety of machines designed for the high speed production of precision machine threads by cutting, grinding and roll-forming methods, and a variety of similar equipment for the production of precision roll-formed gears. Presses, cut-off machines and can-making machines are also produced.

Other Teledyne production equipment includes transfer and assembly machines for the automated production of many kinds of products, as well as multi-gun automated resistance welding machines, single station manual resistance welding machines, welding power supplies, arc welding equipment and consumable supplies, such as welding electrodes and tubular and solid welding wire.

Unusual among Teledyne's welding products are the world's largest welding positioners and manipulators with capacities to 450 tons. These immense Teledyne machines are used worldwide by the nuclear industry for welding and cladding nuclear reaction vessels with stainless steel.

Teledyne also produces complete automated bakery production lines and mixing and processing equipment for a variety of chemical, food and pharmaceutical products.

Closely related to the machine field are Teledyne's optical encoders and digital readouts which may be added to existing milling machines and other machine tools to modernize them, increase operator output and improve the accuracy of the work produced.

Specialized Teledyne encoders are also incorporated in many electro-mechanical devices such as robots in order to provide precise positioning information.

Teledyne also makes a variety of analytical instruments for pollution control, mine and industrial safety, petrochemical process control, and for medical and deep sea saturation diving applications.

These include percentage and parts per million oxygen detectors, hydrocarbon detectors and photometric instruments for measuring oil or phenol in water and dozens of other chemicals in the parts per million or billion range. Other related products include a variety of instruments for the physical testing of materials; meteorological instruments; equipment and services for the detection, monitoring and analysis of radioactive materials including dosimeters for monitoring the exposure levels of nuclear industry personnel; high-speed motion picture cameras; and equipment for the film recording of video images.

Computer-based control systems are provided to the petrochemical industry for controlling the flow of natural gas and oil through nationwide networks of pipelines. Electrically actuated control valves and large safety relief valves are supplied to this as well as to other industries.

Teledyne also produces a complete line of geophysical instrumentation and related computer systems that are used throughout the world in earthquake monitoring and oil exploration.

In addition, Teledyne carries out seismic surveys on land and under the sea bottom on a contract basis to locate likely oil-bearing strata for major oil companies.

Related activities include the fabrication and installation of large offshore platforms for the oil industry, as well as drilling and workover services and a variety of maintenance and salvage operations carried out in offshore areas.

The Company owns and operates sea-going derrick barges with up to 800-ton lifting capacity and numerous submersible, jack-up, and platform-type drilling rigs to carry on this work for the oil industry.

Sophisticated computer-designed gas lift equipment and services are also provided by the Company for increasing the flow from oil wells and controlling the flow on the surface. In addition, producing reservoirs are studied using radioisotopic tracer services provided by the Company.

Uninterruptible power supplies are produced for the computer industry to eliminate computer failures caused by substandard power or momentary power interruptions.

In the event of power failures, Teledyne emergency lighting equipment can provide safe illumination for continuing operations.

Thermoelectric generators fueled with propane or natural gas are made for use in remote, unattended locations where electrical power is required, and other Teledyne thermoelectric generators powered by radioisotopic materials provide power for deep space missions. This same Teledyne company also produces high purity electrolytic hydrogen generators that are used in many laboratory and industrial applications.

Among Teledyne's remaining miscellaneous industrial activities are the production of solid rubber urethane tires and molded products for the automotive industry.

Specialty Metals: The products of this business segment are representative of the practical application of metallurgical science and technology as it is known and practiced throughout the world. Their unique characteristics are derived from the nature of the metals produced, the particular properties of the alloys melted, and the various processes, methods, forms, shapes and end products manufactured.

In specialty metals, Teledyne is the most diversified producer of reactive and refractory metals in the United States. Teledyne produces all of the larger volume, commercially important metals and their alloys. Reactive metals production includes titanium, zirconium and hafnium; refractory metals consist of tungsten, molybdenum, columbium, tantalum and vanadium.

Teledyne is the leading U.S. producer of zirconium, a highly corrosion-resistant metal that is transparent to neutrons. It is used for fuel tubes and structural parts in nuclear power reactors, in the form of foil in photographic flash cubes, and for corrosion-resistant chemical industry applications. Hafnium, derived as a by-product of zirconium, is used for control rods in nuclear reactors due to its ability to absorb neutrons.

Teledyne is the only integrated U.S. producer of tungsten obtained from its ore mines to finished products such as tungsten powder and tungsten mill products. Previously used cemented carbide parts are also recycled into tungsten carbide powder. Wrought or ductile tungsten products are used in diverse applications including light bulb filaments, inert gas welding electrodes, electrical contacts and aircraft counter weights.

Molybdenum, a sister metal to tungsten that also has a very high melting point, is produced by Teledyne in powder form and then shaped into solid forms through powder metallurgy techniques. It is an important alloying element for steels and is used for plasma arc spraying of piston rings and for electrodes in glass melting furnaces.

Columbium, also known as niobium, is a high technology metal produced by Teledyne in various forms and alloys. Conventionally, it is used as an alloying element in the manufacture of many steels. The higher quality grades produced by Teledyne are used in superalloys for jet engines and special alloys for aerospace applications such as rocket nozzles. When alloyed with titanium, columbium is used in applications requiring superconducting characteristics for high-strength magnets. This rapidly developing field includes medical devices for body-scanning, accelerators for high-energy physics and fusion energy projects for future generation of electricity.

Tantalum, one of the most corrosion resistant metals, is produced by Teledyne for medical implants, chemical process equipment, and aerospace engine components.

Specialty metals include the special alloys that are central to the production of virtually every modern metal product available today.

Teledyne high speed steels provide the high temperature hardness required for lathe bits, drills, milling cutters, taps and dies and other cutting tools. Related alloy steels, including a cobalt-free maraging grade, are produced for bearings, gears, special aerospace hardware and high-strength applications.

For the metalworking, mining and other industries requiring machine tools with extra hardness, Teledyne produces a line of sintered tungsten carbide products, made by combining carbon, tungsten and various other metals under heat, to produce a material that approaches diamond in hardness. These cemented carbide products are used as superhard cutters in the high speed machining and cutting of steel and other applications where hardness and wear resistance are important. Technical developments related to ceramics, coatings and other disciplines are incorporated in these products.

Furthermore, Teledyne is an integrated producer of vacuum-melted nickel base, titanium base and iron base superalloys that are used worldwide to meet the high performance requirements of the aircraft, aerospace, gas turbine, nuclear energy and chemical process industries. These products, in various forms, are engineered to retain exceptional strength and corrosion resistance at temperatures through 2,000 degrees F and are used in critical, high-stress applications. Notably, this manufacturing facility installed one of the largest high precision rotary forging presses in the U.S. for more efficient working of these products.

Teledyne also processes metals by a variety of methods, including casting, forging, rolling, drawing and extruding, into finished forms used in a diverse number of industries.

For example, Teledyne is a specialist in the cold rolling of thin and ultra-thin metal strip in over 60 different metals and alloys for applications ranging from watch springs and flash bulbs to aerospace honeycomb materials and camera products.

Teledyne also casts a variety of metals into forms ranging from 90-ton steel mill rolls to lightweight aluminum and magnesium aircraft parts. A variety of housings and parts are made for business machines, tools and automobiles by die casting methods. Cold-finished bar and shafting and cold-drawn stainless and custom fabricated tubing are also produced.

Other Teledyne companies are involved in roll-forming metals, forging heavy parts for construction and earth moving machinery and precision investment casting of difficult to produce parts.

Consumer: The Teledyne name is widely represented through its consumer products.

Teledyne's best known consumer products are sold under the brand name of Teledyne Water Pik. The Water Pik® oral hygiene appliance line includes a family of dental hygiene devices for use in the home, including oral irrigators, electric toothbrushes and an oral hygiene center combining both products.

Teledyne Water Pik also manufactures and markets a complete line of showerheads, including the Shower Massage® line of invigorating, pulsating showerheads and the Super Saver® line of energy saving, multi-mode spray showerheads.

The Instapure® line includes both faucet mounted and under-the-counter water filters for improving the quality of water used in the home, as well as a new line of air filtration appliances for the home and office that utilize a patented low temperature catalyst material to remove carbon monoxide and other noxious gases from the air.

Teledyne is also known throughout the world for its line of high fidelity speakers for the home and automobile and for its turntables marketed under the AR brand name.

In an entirely different consumer area are Teledyne Laars swimming pool and spa heaters. The company also produces a full line of water heating equipment that provides hot water for commercial, residential and industrial space heating.

Teledyne also makes supplies and equipment for dentists and dental laboratories. Among these are dental cements, impression compounds, filling materials, tungsten carbide and diamond drilling burs, air and electric drills, and articulators.

Teledyne produces drafting media and materials used for the creation of engineering drawings and diazo equipment required to reproduce and disseminate such information, as well as microfilm and microfiche.

Other products often sold directly to consumers include battery powered lamps, lanterns, engineering drafting supplies for professional and school use, plastic cups, containers, and wood specialty products.

Insurance & Finance: Unicoa Corporation, 98% owned by Teledyne, writes life and accident and health insurance. Policies sold include home service, ordinary, group life, group and individual annuities, group and individual accident and health and hospitalization.

Trinity Universal Insurance Company writes a broad line of insurance covering personal and commercial risks. Coverage includes liability, automobile, homeowners and commercial multi-peril, fire insurance and workers compensation. Fireside Thrift, a consumer finance company, operates in the state of California.

Selected Quarterly Financial Data

(In millions except share and per share amounts)

Quarterly financial data for 1986 and 1985 were as follows:

	Quarter Ended			
	March 31	June 30	September 30	December 31
1986–				
Sales	$805.9	$833.9	$766.8	$834.8
Gross profit	$174.4	$179.7	$175.2	$169.9
Income of consolidated companies	$ 35.1	$ 34.3	$ 35.8	$ 23.9
Equity in net income of unconsolidated subsidiaries:				
Before Argonaut Group	25.4	13.0	31.2	23.1
Argonaut Group	3.3	11.0	2.2	—
	28.7	24.0	33.4	23.1
Net income	$ 63.8	$ 58.3	$ 69.2	$ 47.0
Net income per share	$ 5.45	$ 4.98	$ 5.91	$ 4.01
Common stock price				
High	$367¾	$358¼	$339¾	$342¾
Low	$302½	$328¼	$291	$297
1985–				
Sales	$818.1	$823.8	$794.5	$819.8
Gross profit	$175.8	$179.3	$176.2	$195.7
Income of consolidated companies	$ 46.6	$ 58.5	$ 33.5	$ 44.0
Equity in net income of unconsolidated subsidiaries:				
Before Argonaut Group	76.1	116.1	75.2	32.2
Argonaut Group	0.8	50.0	(9.0)	22.4
	76.9	166.1	66.2	54.6
Net income	$123.5	$224.6	$ 99.7	$ 98.6
Net income per share	$10.54	$19.19	$ 8.51	$ 8.42
Common stock price				
High	$274⅛	$261⅞	$264⅞	$338
Low	$228¾	$234⅛	$227	$229

Income of consolidated companies in 1986 decreased in the aviation and electronics segment primarily due to increased expenses on research and development contracts and lower margins. The industrial segment's decline in income in 1986 was primarily due to the effect of depressed economic conditions in various industrial and oil service related products.

The Company announced the distribution of Argonaut Group to its shareholders in the quarter ended September 30, 1986 as discussed in Note 3 to the consolidated financial statements.

Equity in net income of unconsolidated subsidiaries before Argonaut Group for the quarter ended June 30, 1986 includes a loss of $9.4 million representing Teledyne's equity in a net loss reported by Litton for its quarter ended April 30, 1986.

Equity in net income of unconsolidated subsidiaries before Argonaut Group for the quarter ended December 31, 1985 includes $30.8 million of gains on sales of investments and a loss of $18.4 million representing Teledyne's equity in Curtiss-Wright's loss on sale of its investment in Western Union as announced in December 1985.

Equity in net income of unconsolidated subsidiaries before Argonaut Group for the quarter ended September 30, 1985 includes gains on sales of investments of $42.5 million.

Income of consolidated companies for the quarter ended June 30, 1985 includes $13.7 million of gains on sales of investments and $7.7 million, after tax, of gains on sales of property and equipment. Equity in net income of unconsolidated subsidiaries before Argonaut Group for the quarter ended June 30, 1985 includes $21.7 million of gains on sales of investments and the $81.7 million income effect of the Litton distribution as discussed in Note 3 to the consolidated financial statements.

Income of consolidated companies for the quarter ended March 31, 1985 includes $10.3 million of gains on sales of investments. Equity in net income of unconsolidated subsidiaries before Argonaut Group for the quarter ended March 31, 1985 includes $53.6 million of gains on sales of investments.

The weighted average number of shares of common stock used in the computation of net income per share was 11,709,478 in all periods presented.

Teledyne, Inc. common stock is listed on the New York and Pacific Stock Exchanges. No cash dividends were declared in either year. As of December 31, 1986, there were approximately 19,000 record holders of common stock.

Selected Financial Data

For the Five Years Ended December 31, 1986
(In millions except per share amounts)

	1986	*1985*	*1984*	*1983*	*1982*
Sales	$3,241.4	$3,256.2	$3,494.3	$2,979.0	$2,863.8
Income of consolidated companies	$ 129.1	$ 182.6	$ 260.7	$ 195.0	$ 218.7
Equity in net income of unconsolidated subsidiaries:					
Before Argonaut Group	92.7	299.6	212.5	97.4	69.7
Argonaut Group	16.5	64.2	101.1	12.2	(18.8)
	109.2	363.8	313.6	109.6	50.9
Net income	$ 238.3	$ 546.4	$ 574.3	$ 304.6	$ 269.6
Net income per share	$ 20.35	$ 46.66	$ 37.69	$ 14.87	$ 13.05
Working capital	$ 333.3	$ 275.5	$ 408.4	$ 961.3	$ 790.2
Investments in unconsolidated subsidiaries	$1,625.5	$1,723.0	$1,647.1	$2,097.2	$1,677.4
Total assets	$2,744.2	$2,775.4	$2,790.7	$3,852.2	$3,290.7
Long-term debt	$ 572.7	$ 669.2	$1,070.7	$ 570.0	$ 570.6
Shareholders' equity	$1,636.6	$1,577.4	$1,159.3	$2,641.2	$2,111.1

No cash dividends have been declared on the common stock.

Management's Discussion and Analysis of Financial Condition and Results of Operations

The Company's consolidated operations consist of a large number of divisions operating in a variety of industries. For reporting purposes these operations are summarized in the segments presented in Note 13 to the consolidated financial statements. It is not practical to attempt to identify and explain fluctuations for any operating units or groups of units smaller than these segments.

Sales were relatively unchanged in 1986 after decreasing 6.8 percent in 1985 and increasing 17.3 percent in 1984. The changes by segment are presented in Note 13 to the consolidated financial statements. Sales increased in 1986 in all segments except the industrial segment which decreased significantly. Sales decreased in 1985 in all segments with the major decrease occurring in the aviation and electronics segment. Sales increased in 1984 with significant increases occurring in the aviation and electronics and specialty metals segments. Operating results in 1986 decreased significantly in the aviation and electronics and industrial segments. The decrease in the aviation and electronics segment was primarily the result of increased expenses on research and development contracts and lower margins. The decrease in the industrial segment was primarily the result of the effect of depressed economic conditions in various industrial and oil service related products. Operating costs decreased in 1985 and increased in 1984 in line with sales. The effect of inflation did not have a material impact on net income from 1982 to 1986.

Interest expense decreased $16.3 million in 1986 and $26.8 million in 1985 after increasing $39.2 million in 1984. The portion of this interest expense allocated to unconsolidated subsidiaries decreased $10.8 million in 1986, $12.7 million in 1985 and increased $28.8 million in 1984. The changes in interest expense in 1986, 1985 and 1984 related to the issuance of variable rate notes in 1984 and the subsequent repayments in 1984, 1985 and 1986, as discussed below. Interest and dividend income decreased $8.4 million in 1986, $47.8 million in 1985 and $14.7 million in 1984 due primarily to corresponding changes in the level of investment in marketable securities. Gains on sales of investments, included in income of consolidated companies, decreased $24.9 million in 1986 after increasing $6.8 million in 1985 and $18.9 million in 1984.

The provision for income taxes in 1984 includes a special tax credit of $42.2 million resulting from 1984 tax legislation, related to the Company's domestic international sales corporations. The effective tax rate in 1984 decreased primarily as a result of the special tax credit and research and development tax credits. The Tax Reform Act of 1986 will decrease the Federal income tax rate on ordinary income from 46% in 1986 to 40% in 1987 and to 34% in 1988 while the tax rate on capital gains will increase from 28% in 1986 to 34% in 1987. The financial statement impact of these and other enacted changes is expected to reduce the Company's effective Federal income tax rate. In addition, some acceleration in Federal income taxes currently payable will occur. Additionally, the Financial Accounting Standards Board has issued an exposure draft which has proposed changes in accounting for income taxes. Although the final standard may differ from the exposure draft, the proposals, if enacted, would result in a substantial increase in the Company's deferred Federal income tax liability. The proposed changes are not expected to impact future liquidity.

Equity in net income of unconsolidated subsidiaries before Argonaut Group decreased $206.9 million in 1986 after increasing $87.1 million in 1985 and $115.1 million in 1984. These changes were primarily the result of equity in gains on sales of investments ($17.0 million in 1986, $148.6 million in 1985, $93.8 million in 1984 and $1.7 million in 1983), the $81.7 million income effect of the Litton distribution in 1985 (as discussed in Note 3 to the consolidated financial statements), and equity in net income of the $62.8 million special tax credit in 1984 of the life insurance subsidiaries. As presented in Note 5 to the consolidated financial statements, the underwriting results of Trinity Universal Insurance Company and subsidiaries improved since 1984 as a result of general economic conditions affecting the property-casualty insurance industry. As discussed in Note 7 to the consolidated financial statements, the incremental effect of equity in net income of investees was $16.9 million in 1986, $30.3 million in 1985 and $26.5 million in 1984. The 1986 amount includes a loss of $9.4 million representing Teledyne's equity in a net loss reported by Litton for its quarter ended April 30, 1986. The 1985 amount includes a loss of $23.6 million representing Teledyne's equity in Curtiss-Wright's loss on its investment in Western Union. The 1984 amount includes a loss of $21.6 million reported in the quarter ended March 31, 1984, representing Teledyne's equity in a net loss reported by Kidde, Inc. In addition, as a result of the distribution of Argonaut Group, Teledyne's results for the fourth quarter of 1986 do not include the use of equity accounting for Brockway, Kidde and Reichhold.

As discussed in Note 3 to the consolidated financial statements, the Company distributed to its shareholders all of the outstanding common stock of Argonaut Group at September 30, 1986. As a result, Teledyne's 1986 equity in net income of unconsolidated subsidiaries includes only nine months' results of Argonaut Group. Teledyne's equity in net income of Argonaut Group decreased $47.7 million in 1986 and

$36.9 million in 1985 after increasing $88.9 million in 1984. These changes were primarily the result of gains on sales of investments of $4.4 million in 1986, $100.6 million in 1985, $148.2 million in 1984 and losses of $1.0 million in 1983. In addition, Argonaut Group's underwriting results improved for the first nine months of 1986 after underwriting losses in 1985 and 1984, primarily the result of economic conditions affecting the property-casualty insurance industry.

During 1984, the Company acquired 8,661,053 shares of its common stock. This purchase of stock was financed through internally generated funds and through bank loans of $800.0 million. These notes were repaid as follows: $97.5 million in 1986, $402.5 million in 1985 and $300.0 million in 1984. Internally generated funds were obtained from sales of marketable securities by consolidated companies and from repayments of advances and return of amounts invested in unconsolidated subsidiaries. The effect of this reduction in outstanding shares was to increase net income per share by approximately $4.60 in 1986, $15.36 in 1985 and $6.54 in 1984.

Shareholders' equity increased $59.2 million in 1986 due primarily to net income of $238.3 million, the distribution of Argonaut Group of $217.2 million and an increase in equity in net unrealized appreciation of $37.0 million. Shareholders' equity increased $418.1 million in 1985 due primarily to net income of $546.4 million and a decrease in equity in net unrealized appreciation of $129.4 million. Assets decreased $1.06 billion and shareholders' equity decreased $1.48 billion in 1984. The decreases in 1984 were primarily the result of the acquisition of Teledyne stock for $1.7 billion discussed above, net income of $574.3 million and a decrease in equity in net unrealized appreciation of $315.1 million.

The Company has been able to meet all cash requirements during the past five years with cash generated from operations. The only significant increase in long-term debt in the past five years has been in connection with the repurchase of Teledyne stock in 1984 discussed above. Restrictions on the net assets of subsidiaries as to dividends, loans or advances, discussed in Note 9 to the consolidated financial statements, have no impact on the ability of the Company to meet its cash obligations. The Company is not aware of any impending cash requirements or capital commitments which could not be met through internally generated funds.

Working capital increased $57.8 million in 1986 and decreased $132.9 million in 1985 and $552.9 million in 1984. The current ratio was 1.80 to 1 in 1986, 1.68 to 1 in 1985 and 2.12 to 1 in 1984. The changes in 1986 were primarily the result of investing cash generated from operations and dividends from unconsolidated subsidiaries in marketable securities and other current assets. The changes in 1985 were primarily the result of the repayment of long-term debt discussed above. The changes in 1984 were primarily the result of the repurchase of stock discussed above. The Company is not aware of any circumstances which would adversely affect its liquidity or capital resources in the near future.

Board of Directors

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GEORGE KOZMETSKY, *Executive Associate for Economic Affairs, University of Texas System*

GEORGE A. ROBERTS, *President and Chief Executive Officer, Teledyne, Inc.*

ARTHUR ROCK, *Private Investor*

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CHARLES E. RINSCH, *Vice President, Treasurer and Secretary*

G. WILLIAMS RUTHERFORD, *Vice President*

Corporate Offices

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Common Stock Transfer Agent/Registrar

Inquiries or Delivery by Mail:
Bank of America NT&SA
Corporate Agency Service Center
Box 37002
San Francisco, California 94137

Hand Deliveries *(Transfers Only):*
Bank of America NT&SA
55 Hawthorne Street
San Francisco, California 94105

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This **Teledyne Report** describes the development and first record-setting use of a new line of liquid cooled aircraft engines that have recently been introduced by Teledyne Continental Motors Aircraft Products Division. This company has been one of the foremost producers of aircrfaft piston engines since it was founded in 1927. Today it is a leader in this field, producing a major portion of the piston engines used in private and business aircraft throughout the world.

The new liquid cooled engine line incorporates a patented lightweight cylinder design that achieves more uniform temperature distribution throughout the cylinder assembly contributing to lower engine wear and maintenance requirements. This improved cooling has permitted a higher compression ratio and a High Turbulence Combustion Chamber to be used in naturally aspirated engines that results in a 20 percent improvement in fuel efficiency and 10 percent higher horsepower compared to conventional engines of the same displacement.

In addition to its well known line of new and factory rebuilt piston engines for general aviation, the company has recently announced its entry into the field of regenerative gas turbines for ground power applications, as well as a new line of liquid cooled rotary engines for light aircraft use as well as ground power applications.

Teledyne Report features subjects of particular interest from Teledyne activities, and is issued on a quarterly basis. Previous topics include:

Forming Metal:
Lightweight structures for aircraft.
Radon:
Measuring it from the ground up.
IFF:
Electronic passwords for aircraft.
Star Wares:
Products & services for space.
The Water Products:
For health and personal care.
An Ideal Package:
A look at collapsible metal tubes.
Airline Communications:
The digital connection.
High Performance Metals:
Tough alloys for tough environments.
Airframes:
Structures for aircraft.
The Ladle and the Hammer:
Casting and forging iron and steel.
High Tech Wire:
Taking the heat safely.
Electronic Counter Measures:
Protecting friendly forces.
Rubber & Metal:
Working together in automobiles.
Stress Analysis:
How much is enough?
Drafting:
Designs to build by.
Systems Engineering:
Creating complex systems.
Flexible Printed Circuits:
The space age connection.
Mixing:
A fine blend of art and science.
Aircraft Ground Support:
Saving the airlines millions.
Turbine Engines:
Smaller in size and cost.
Heating Water:
For health and home.

Relays:
Thriving in an ultraminiature world.
Truth In Radiation:
A matter of accurate measurement.
Remotely Piloted Vehicles:
Those ingenious flying machines.
Mining Tungsten:
From glowing ore to versatile metal.
Hi-Fi:
Music reproduction goes hi-tech.
Columbium:
From superconductivity to computers.
Energy:
Fueling spaceship earth.
Radar:
Sensing the unseeable.
Fluid Power:
Muscle for machines.
Pipeline Controls:
Operating petroleum pipelines.
The Aerospace Metals:
Superalloys and titanium.
Screw Threading:
Machine tools for industry.
Aerial Mapping:
Advanced digital techniques.
The Water Pik Story:
Innovative consumer product designs.
Dental Health:
Supplies for the dentist.
Space Navigation:
Computers that guide space launches.
Analytical Instruments:
Chemical detection for industry.
1776-1976:
Technology then and now.
Life Insurance:
Financial security and investment.
The Refractory Twins:
Producing tungsten and molybdenum.
The Instrument Makers:
Instruments and optical encoders.

Industrial Engines:
Small piston engines.
Job Corps:
Teaching young people new skills.
Friendly Explosives:
Aircraft emergency escape systems.
Microelectronic Hybrids:
The step beyond integrated circuits.
The Energy Options:
Nuclear fuel versus coal.
Workman's Compensation:
Extending the coverage.
Drilling for Offshore Oil:
Getting the oil out.
The Search for Oil:
Finding new oil deposits.
High Speed Steels:
Premium alloys for machine tools.
Energy Crisis in the Computer Room:
Controlling power quality.
Raydist:
Super-precise radiolocation system.
Welding:
Advanced alloys for joining metals.
General Aviation Engines:
Piston power for aircraft.
Rubber:
Products for automobiles and industry.
Loran:
All-weather navigation system.
Seismology:
Instruments for earthquakes.
Casting:
Precision production of metal parts.
AIDS:
Monitoring commercial aircraft.
Thermoelectrics:
Conversion of heat to electricity.
Thin Metals:
How they are made and used.

TELEDYNE, INC.