TeledyneReport

For the Year 1975

Industrial Engines: Muscle for the World of Work

ON THE COVER: The piston and connecting rod, heart of the modern gasoline and diesel engine, have replaced man's muscles in the performance of most industrial and agricultural tasks.

This Teledyne Report deals with industrial engines. Teledyne also is active in the design, technology and manufacture of aircraft piston engines (see TDY Report for the Year 1972), air-cooled diesel engines used in military applications, and aircraft gas turbine engines.

The Industrial Products Division of Teledyne Continental Motors specializes in four and six cylinder heavy duty liquid-cooled gasoline engines and Teledyne Wisconsin Motor specializes in heavy duty air-cooled gasoline and diesel engines of from one to four cylinders.

The proprietary Variable Compression Ratio Piston developed by Teledyne Continental Motors General Products Division is now being tested in agricultural and military applications and may have industrial and automotive engine applications as well.

TELEDYNE REPORT featuring subjects of particular interest from Teledyne activities, is issued on a quarterly basis. Previous topics include:

Job Corps: A decade of motivating and training a half million alienated and disadvantaged young people has produced some remarkable new teaching methods . . . and a lot of good citizens.

Friendly Explosives: Using explosives to save lives in aircraft emergencies may sound unlikely, but it's the safest, fastest, most reliable method ever developed.

Microelectronic Hybrids: From vacuum tube to transistor to integrated circuit, the history of electronics has been one of fitting more and more complex electronic circuitry into less and less space. A hybrid microcircuit is a sophisticated form of microelectronic packaging that goes a step beyond the individual large scale integrated circuit.

The Energy Options: Nuclear fuels and coal are both abundant enough to make a significant contribution to U.S. energy needs over the next several decades. Unlike many other energy sources, the technology to use them on a large scale exists today.

Workmen's Compensation Insurance: Most working people are already protected. The goal is coverage for every employed person.

Drilling for Offshore Oil: Almost half our national resources of oil and gas are believed to lie under offshore waters. The technology for getting them out is here—but it won't be easy.

The Search for Oil: With supplies dwindling and demand growing, sophisticated geophysical techniques are being brought to bear on the problem of locating new oil deposits.

High Speed Tool Steels: These precision, premium-priced alloys are vital to the production of virtually every commodity we use in modern life.

Energy Crisis in the Computer Room: As the quality of utility electrical power falls off and brownouts and blackouts become more common, the incidence of computer failures goes up. Solid-state Uninterruptible Power Systems can solve the problem.

Raydist: This ultraprecise electronic navigation system can pinpoint locations at sea with sensitivity of one and a half feet at ranges of up to 250 miles from base stations.

Welding: One of industry's most versatile production techniques, welding is used in the manufacture of virtually every type of fabricated metal product made today.

General Aviation Engines: Propeller driven aircraft powered by conventional piston engines are not only alive and well more than 30 years after the advent of the jet, they dominate air activity today.

Rubber: Rubber compounds are being called on to do new technological jobs in applications ranging from industrial tires to Teledyne's new automotive bumper system that will dissipate five-mile-per-hour impacts.

Loran: Loran was one of the first all-weather electronic navigation systems. Recent Teledyne innovations have lowered costs and greatly improved its range and accuracy.

Seismology: This relatively young science has expanded from the classic study of earthquakes to become an important tool in oil and mineral exploration, detection of underground nuclear explosions and earthquake hazard reduction.

Casting: The simple process a small boy uses when he casts a tin soldier is the basis of a high technology industry that produces items ranging from high temperature turbine blades to 90-ton steel mill rolls.

AIDS: Aircraft Integrated Data Systems keep a running record of the vital functions of the new jumbo jets and provide airlines with an important tool for lowering costs associated with maintenance, fuel management and crew proficiency testing.

Thermoelectrics: Generators that convert heat directly into electricity are providing a practical new power source for applications ranging from space exploration to remote weather stations.

Thin Metals: Less becomes more when space-age metals are rolled out into thin strip and foil. These new materials, already being used in thousands of products, are making new metal-working techniques possible.

The Reproduction of Music: Men began experimenting with methods of recording sound over 150 years ago, but it remained for electronics and some very recent developments to allow music to be reproduced with concert-hall realism.

The Crowded Spectrum: The lower portion of the radio spectrum is already overcrowded with hundreds of wireless services. Microwave devices such as the traveling wave tube are opening higher frequencies for practical use.

Science and Cinematography: Modern techniques of slow motion cinematography let scientists and engineers analyze actions and events that happen too fast for the eye to follow.

Superalloys: Materials that retain high strength at temperatures approaching 2000°F make the jet age possible.

Jets of Water for Dental Health: Studies show that high-pressure pulsed jets of water are a valuable aid in the care of teeth and gums.

The Last Eight Miles: The controlled descent to the surface of the moon was accomplished through use of a century-old principle called the Doppler effect.

Industrial Engines

Compact portable power from gasoline and diesel piston engines has taken the drudgery out of manual labor. Now the goal is to reduce noise and emissions.

Gasoline and diesel-fueled piston engines ranging in output from a few horsepower to several hundred have become the "muscle" of today's working world. Quite aside from automotive type engines used in travel and transportation, these engines provide the power for literally dozens of industrial, commercial and agricultural activities that were once the province of heavy manual labor.

U.S. Department of Commerce figures show that a whopping 13,821,586 gasoline engines were produced in the United States in 1974, *not* including automotive, aircraft, outboard marine or diesel engines. Less than half a million of these went into recreational equipment such as snowmobiles, motorcycles or inboard boat engines. The rest were all used in some sort of labor-saving application ranging from home lawn mowers and garden-care equipment to heavy industrial and agricultural machinery.

These millions of engines represent well over 100,000,000 horsepower of work capacity. They include both air-cooled and liquid-cooled engines, single and multiple cylinder engines, engines designed for light duty applications and those meant for heavy duty industrial use.

TELEDYNE AND THE INDUSTRIAL ENGINE

In addition to Teledyne's activities in the manufacture of aircraft engines, high-horsepower air-cooled diesel engines and gas turbines, two Teledyne companies specialize in long-life, heavy duty industrial engines.

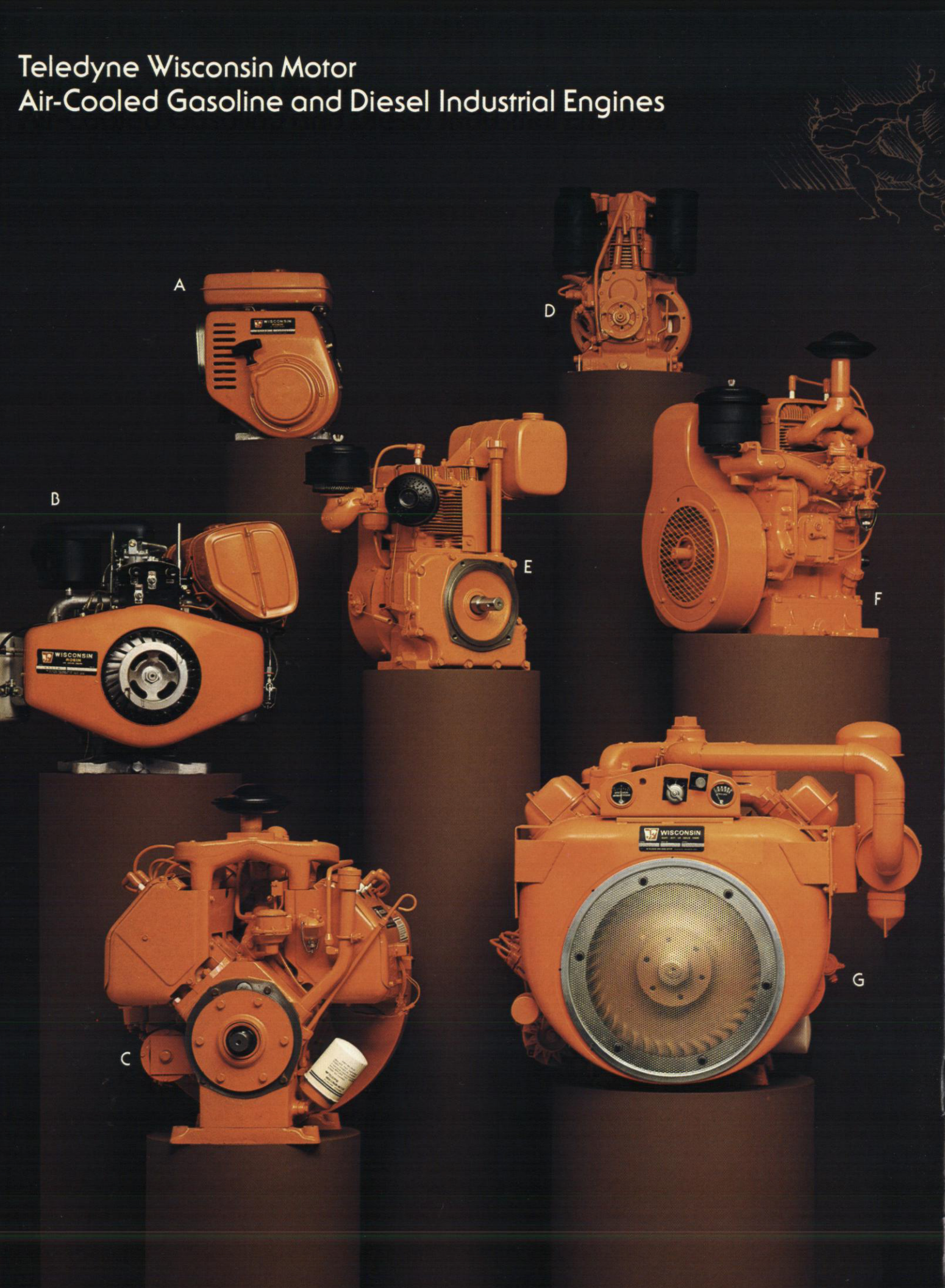
In the power range from 3 to 80 horsepower, Teledyne Wisconsin Motor markets a variety of air-cooled gasoline and diesel engines in configurations of one, two, three and four cylinders. These engines are widely used in construction equipment such as trenchers, compressors, generators, skid-steer loaders, concrete saws, welders, pumps and tampers, in industrial material handling equipment, and in agricultural and professional lawn care machinery.

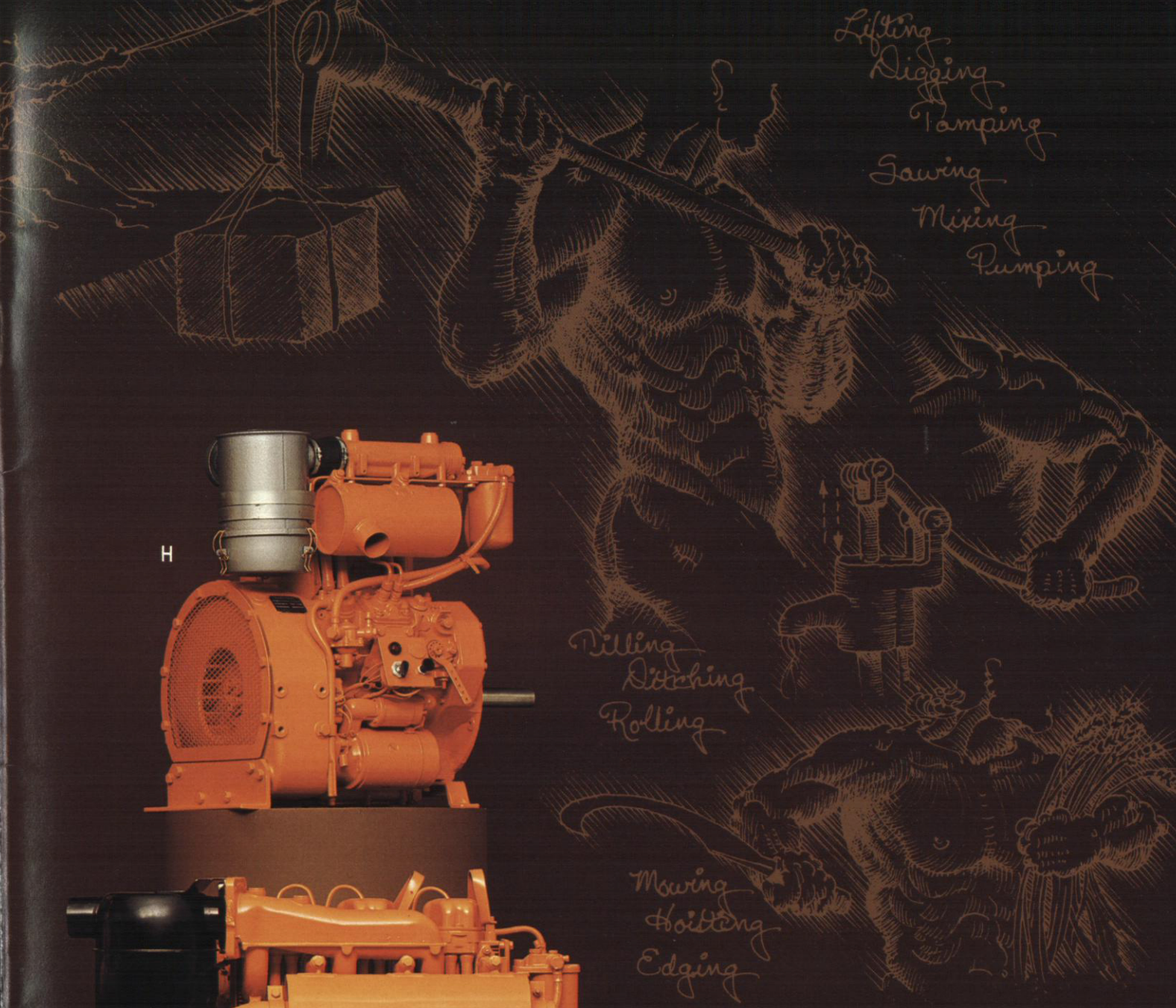
Covering a slightly different power range from 13.5 to 80.5 horsepower, the Industrial Products Division of Teledyne Continental Motors markets a basic line of ten liquid-cooled four and six cylinder gasoline engines. These find wide use in material handling equipment such as fork lift trucks and tow tractors, in engine-driven welders, small farm tractors, skid-steer loaders, industrial sweepers, professional lawn maintenance equipment, oil field pumpers and electrical generator sets.

HOW INDUSTRIAL ENGINES DIFFER

To put the term "heavy duty industrial engine" into perspective, consider the familiar home lawn mower engine. It probably runs only 20 to 40 hours in an entire year, and rarely more than an hour or two at a time, under light load. An industrial engine, on

Teledyne Wisconsin Motor
Air-Cooled Gasoline and Diesel Industrial Engines





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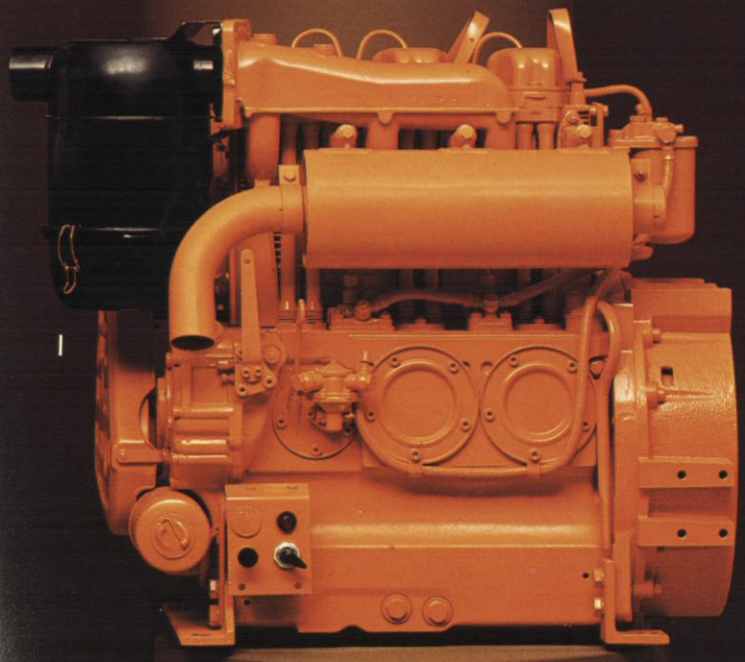


I

A **Wisconsin Robin EY18W** Single-cylinder 4.6 horsepower engine. Popular with equipment renters and contractors.

B **Wisconsin Robin EY21W** Two-cylinder 16 horsepower engine. Opposed design. Exceedingly light, compact and smooth runnin

C **Wisconsin VH4D** Four-cylinder, V-configuration 30 horsepower valve-in-head engine. Standard power for loaders, ditche and many kinds of construction machinery.

D **Wisconsin-Hatz Diesel E-672** Rugged, single-cylinder high-speed direct injection 6 horsepower diesel engine of modern design.

E **Wisconsin S-12D** Single-cylinder 12 horsepower industrial and agricultural engine. Popular with international manufacturer

F **Wisconsin TJD** Two-cylinder 18 horsepower engine. One of Wisconsin's biggest sellers. Popular for welding machinery.

G **Wisconsin V-465D** Compact four-cylinder V-configuration 65 horsepower valve-in-head engine. The only air-cooled industrial engine of this size made in the U.S.

H **Wisconsin-Hatz Diesel Z-788** Two-cylinder, 23 horsepower in-line diesel. Capable of continuous 3,000 rpm duty.

I **Wisconsin-Hatz Diesel D-108** Three-cylinder 60 horsepower in-line diesel. One of a family of one, two, three and four cylinde heavy-duty engines suited to many applications.

the other hand, is usually required to run 40 or more hours in a single week, frequently under heavy load and often under adverse conditions of dust, temperature or vibration. The lawn mower engine which gives many years of reliable service under home conditions is inadequate for industrial use.

Power demands on an industrial engine are also different. Many industrial applications require high torque (twisting force) at low engine speeds. Industrial engines typically operate in the speed range of 1200 to 2800 revolutions per minute (RPM) and achieve maximum torque in the 1400 to 1600 RPM range.

This is different from the characteristics of typical automotive engines which operate in a much higher RPM range and may develop maximum torque at 2500 RPM or higher.

To achieve good low-speed torque characteristics, industrial engines are designed differently than automotive engines. They are typically long stroke engines in which the stroke (distance the piston travels up and down) is greater than the bore (the internal diameter of the cylinder). In automotive practice, the engine bore is commonly equal to the stroke, and often greater.

The long stroke used in industrial engines gives better torque at lower speeds. The timing of the opening and closing of the intake and exhaust valves also differs from automotive practice. In the low-speed industrial engine the valves stay closed longer, and this, in combination with the longer stroke, allows the expanding gases to press on the pistons longer, extracting more energy from the fuel. A side benefit of the long stroke approach is generally better exhaust emission characteristics.

Because of the severe continuous service they must endure, Teledyne industrial engines are also designed and built more sturdily than ordinary engines. Forgings are used instead of castings for crankshafts and connecting rods. Bearings of the latest tri-metal type are generously sized to sustain continuous heavy loads, and careful control is exercised over the metallurgy of all parts. In many engines the valves are faced with a high nickel cobalt alloy that provides good high temperature properties, strength, and corrosion and abrasion resistance. Exhaust valve seats are high alloy steel for the same reasons.

Cast iron cylinders or cylinder liners are used on all engines for long life and minimal wear. The fit of pistons and bearings is also held to closer tolerances than in automotive practice to assure longer life.

Since many industrial engines must operate in severe abrasive environments, highly efficient air cleaner systems are provided, and even such small details as seals on the throttle and choke shafts are provided to prevent the entrance of abrasive dust into the engine. Lubrication systems are designed with similar care.

The end results of these efforts are engines that are remarkably tough and long-lived. Many well-maintained Teledyne engines have exceeded 10,000 hours of operation without overhaul. At least one has run 17,000 hours without overhaul. If an automobile were driven at 35 miles per hour for this length of time it would cover a distance of 595,000 miles – more than a round trip to the moon.

The technology of building reliable and durable industrial engines has been well-developed at Teledyne for many years. Now the focus of research and development efforts is on reducing exhaust emissions and operating noise levels, and improving fuel economy.

LOWERING THE BOOM ON NOISE

Studies have shown that intense sound levels can produce hearing damage and other physical or psychological disturbances in persons exposed to them. The U.S. Occupational Safety and Health Administration (OSHA) and certain state and local agencies have set standards defining the maximum sound intensities that workers may be exposed to, and the length of time they may be exposed to them.

Sound energy is measured in units that are abbreviated dBA, which stands for "decibels above reference noise, adjusted." These are logarithmic units. A reduction of 3 dBA means the sound energy has been reduced 50 percent; 6 dBA is a 75 percent reduction and 9 dBA is an 87½ percent reduction.

Teledyne Wisconsin Motor has made an intensive study of the sources of noise in air-cooled engines. These are primarily exhaust system noise, the noise from cooling air fans, the noise associated with the intake of combustion air, and mechanical noises from within the engine.

Work with the Wisconsin VH4 engine has resulted in a reduction in emitted noise energy of 3 dBA, or 50 percent, through improvements in the muffler system. When improvements in the ducting of the cooling air system were added, a total noise energy reduction of 6 dBA was achieved. This means that the modified VH4 engine was producing only one-quarter of the original noise energy.

Work is continuing on other sources of engine noise, and the results of these advances will be extrapolated to other engines in the Wisconsin line.

It is interesting to note that some engine-driven machines—such as air compressors, and vibratory rollers and tampers—produce more noise than the engine itself.

PUTTING THE LID ON EMISSIONS

For a number of years, Teledyne has been carrying on an active development program to reduce emissions from industrial engines even though no specific numerical emission limits have as yet been set for industrial engines when they are used out-of-doors.

California is the only state that has attempted to control engine exhaust emissions as a method of maintaining ambient air quality in a place of employment. This law, however, is very permissive and requires emission controls on engines only when other means of controlling air quality (e.g. better ventilation in the work area) fail.

One remarkably successful program carried out by Teledyne Continental Motor's Industrial Products Division has resulted in the development of an industrial engine that achieves very low emission levels without the use of add-on pollution control devices such as catalytic converters.

Tests comparing this new 6-cylinder liquid-cooled engine with a standard 6-cylinder engine showed that it was 19½ percent more efficient in its use of fuel, produced 63 percent less nitrous oxides, 60 percent less hydrocarbons and 96.8 percent less carbon monoxide.

Though not developed for automotive use, the engine was installed in an automobile and put through the Environmental Protection Agency (EPA) emission test cycle for automobiles (1974) and was well within emission requirements.

HOW EMISSIONS ARE LOWERED

The new engine is of the lean-burn type with high turbulence combustion chambers that give very rapid combustion. It uses a twin ignition system with two spark plugs in each cylinder. Unlike twin ignition systems that have been used in the past, the two spark plugs do not fire simultaneously.

As the piston nears the top of its stroke, the leading spark plug, located in an area of high turbulence, ignites the mixture at one point. This beginning combustion further increases the turbulence in the remaining mixture, and the second spark plug then ignites it at another point.

By igniting the mixture at two points, very rapid burning of the charge is achieved, and so spark timing can be relatively retarded compared to conventional engines. This late firing allows less of the combustion energy to go into slowing down the piston at the end of its compression stroke, and more to go into the power stroke.

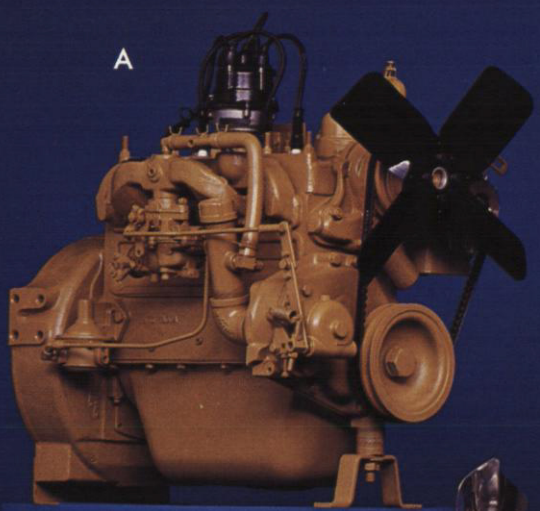
The quantity of mixture ignited by the first plug is small and spread out over a rather shallow area of the combustion chamber. Because of the great amounts of excess air and high turbulence, it produces very small amounts of nitrous oxides.

The secondary combustion, initiated by the second spark plug, is the main producer of nitrous oxides since it takes place very quickly in a relatively small chamber holding a large percentage of the combustible mixture. However, since the piston is already on its expansion stroke, the peak pressure and temperature are kept low and the amount of nitrous oxides formed is reduced. For this reason, it is called a "controlled pressure combustion system".

The already low hydrocarbon emission associated with lean mixtures is further

Teledyne Continental Motors
Liquid-Cooled Gasoline Industrial Engines

A



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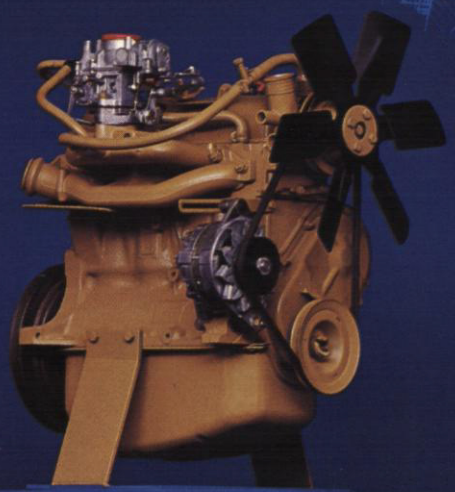

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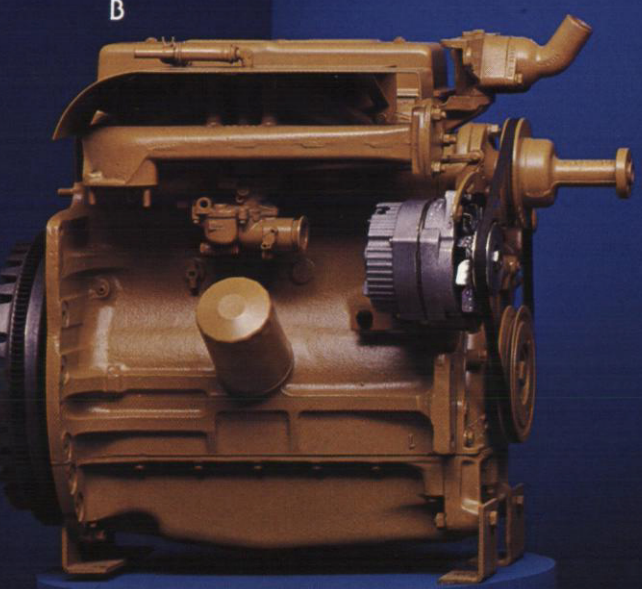

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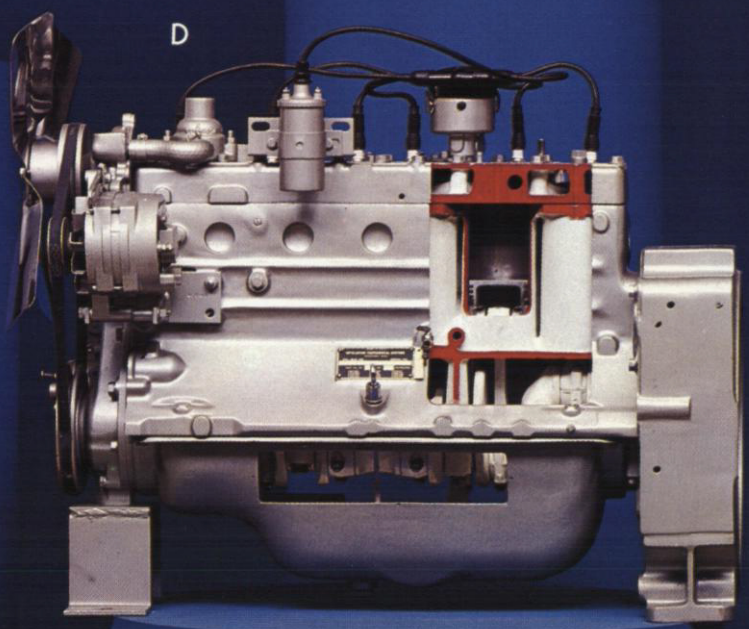
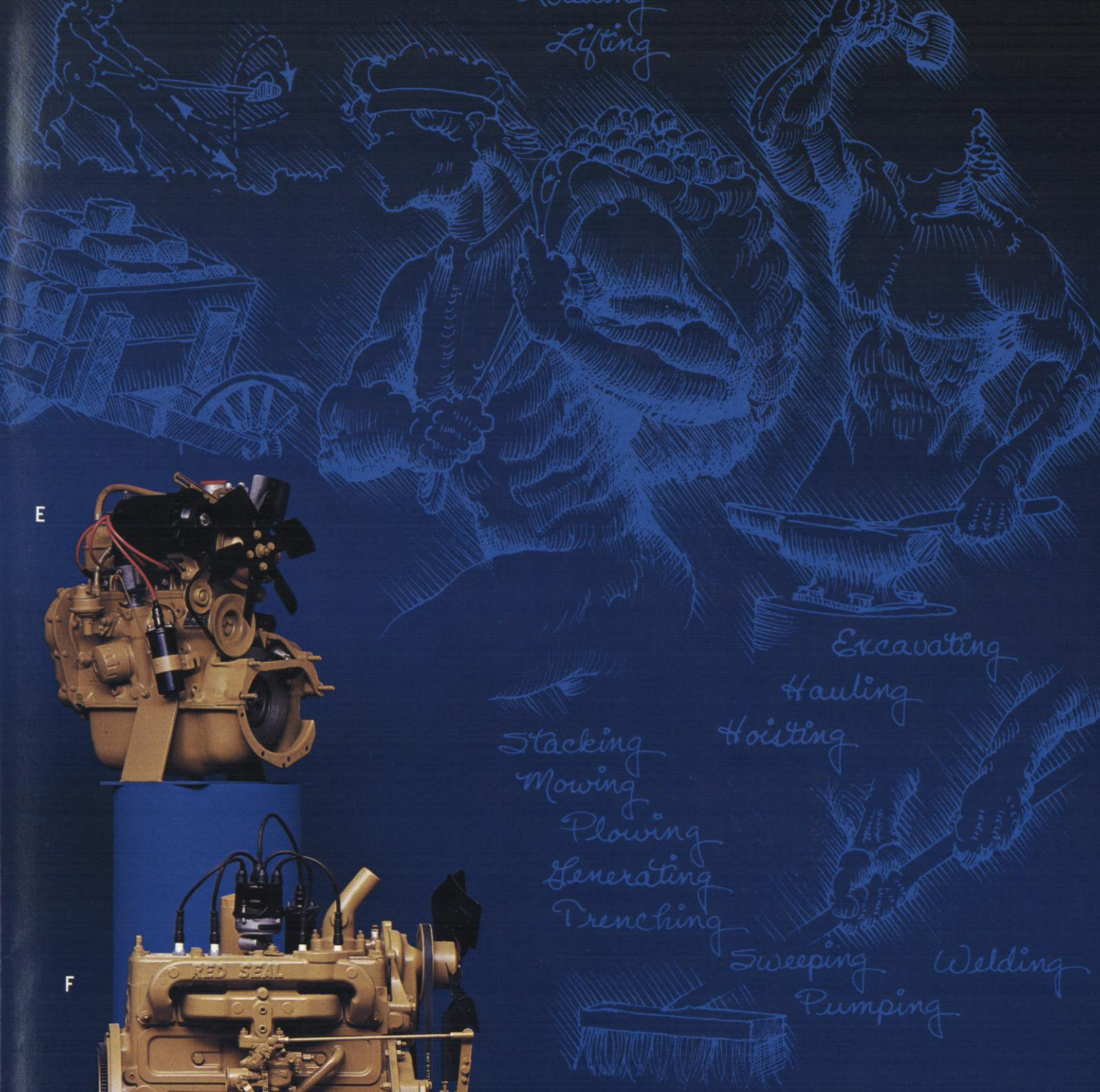




E

F

A **Y112** Versatile four-cylinder 37 horsepower engine popular in diverse applications such as lift trucks, loaders, sweepers and generator sets.

B **Z145** Rugged four-cylinder, 47 horsepower, overhead valve, wet-sleeve engine widely used in agricultural tractors.

C **R688** Overhead valve, four-cylinder 39 horsepower engine used for diverse material handling jobs and in skid steer loaders.

D **F227** Cutaway version of the six cylinder 78 horsepower engine. One of the largest in the Continental line, for industrial, agricultural and general use.

E **R839** Compact, high performance overhead valve, 25 horsepower engine ideal for professional grounds maintenance equipment and garden tractors.

F **F163** Low-silhouette, four-cylinder 58 horsepower engine, one of the most popular models in the fork lift truck and welder field.

reduced by the relatively late burning which assures flame penetration to all parts of the combustion chamber.

Carbon monoxide emissions, which are strictly a function of the air-fuel ratio, are held to extremely low levels.

Some additional benefits beyond low emissions include low exhaust temperatures, longer valve life, better fuel economy and unusually quiet operation.

TELEDYNE'S ELECTRONIC IGNITION SYSTEM

Because precise timing of the ignition is essential to the proper operation of this principle, the engine also has a unique solid state electronic ignition system, developed by Teledyne Ryan Electronics, which incorporates a digital advance system. The conventional gear-driven distributor with its timing inaccuracies is completely eliminated. Timing is set at the factory and remains accurate for the life of the engine, eliminating periodic ignition tune-ups.

Two magnetic pick-up coils sense crankshaft position and speed from a serrated ring mounted either on the flywheel or crankshaft pulley. This information is fed to an electronic module that contains a capacitive discharge ignition system. The low-voltage firing impulses from this system are fed directly to each plug which has its own individual ignition coil mounted directly on it. Thus all "high-tension" leads are eliminated. Digital logic within the ignition module uses information from the tachometer sensor to electronically advance or retard the timing of the firing impulses according to engine speed. All inaccuracies due to mechanical wear or misadjustment are permanently eliminated.

REWRITING THE BOOK ON CARBURETORS

Since the air/fuel ratio is extremely critical in controlling emissions, a new induction system, consisting of a specially-matched intake manifold and carburetor, was designed for the engine.

The carburetor offers an optimum match to the requirements of the controlled pressure combustion system at all loads and speeds. It is a two-stage unit with venturis small enough to assure the high velocities necessary for good mixture formation but with a large total area that will not restrict air flow at maximum load. A small primary barrel is used for starting and idling and operates from near maximum load at low speed, to about half load at rated speed. A larger secondary barrel is used for high speed, high load operation.

The carburetor incorporates an exclusive air modulator which adjusts the air/fuel ratio as a function of load by controlling internal air flow rather than fuel flow. The air modulator, replacing both the acceleration pump and the power system, acts as a superb anti-stalling device and partially enriches the mixture during starting.

By combining several separate functions into one, the air modulator allows the use of very large air and fuel passages, reducing carburetor maintenance problems.

Since the idle system is where most carburetor problems occur, it is eliminated in this system. The idle mixture is factory set, and only the idle speed requires field adjustment. High fuel wastage and hydrocarbon emissions during deceleration, typical with idle systems, is eliminated.

NEW DIESEL DEVELOPMENTS

Conventional gasoline engines are spark ignition engines. In most gasoline engines a carefully proportioned fuel and air mixture, provided by a carburetor, is inducted into the cylinder, compressed and then ignited by a precisely-timed electrical spark introduced by a spark plug.

Diesel engines are compression ignition engines. They require no electrical spark. They operate on the fact that air rises in temperature when it is compressed. The more highly it is compressed the hotter it becomes. In a diesel engine, only air is inducted into the cylinder on the intake stroke. The compression ratio of a diesel engine, however, may be as high as 24 to 1, compared to a top ratio of about 11 or 12 to 1 in a gasoline engine. This means that the amount of air taken into the cylinder is squeezed down to 1/24th of its original maximum volume when the piston reaches the top of its stroke. Compression ratios in the range of 14 to 1 or more heat the air hot enough so

that fuel introduced into the cylinder will ignite spontaneously. In a diesel engine, then, the fuel is injected into the cylinder under high pressure through a fuel injection nozzle at a precise instant after the air is highly compressed and hot. The atomized fuel ignites spontaneously and burns to provide energy for the power stroke.

The amount of power that can be developed by any engine is directly related to how much fuel and air can be delivered into its cylinders and burned on each power stroke. A naturally aspirated engine, which depends on the vacuum created by the descending piston, and ambient air pressure to force air into the cylinder, is definitely restricted by the size of the cylinders.

FORCE-FEEDING THE DIESEL

Engineers have turned to the technique of turbocharging to get around this limitation. A turbocharger is simply a small gas turbine (driven at high speed by the hot exhaust gases of the engine) which spins a centrifugal blower that takes in air, compresses it and forces it into the engine's intake manifold. In this manner a greater weight of air can be forced into each cylinder on its intake stroke and a correspondingly larger amount of fuel can be burned on each power stroke. The power output of a given-sized cylinder can be more than doubled with this technique.

Eventually, however, a point is reached where the peak combustion pressures inside the cylinder become so great that the structure of an engine of acceptable size and weight cannot be made strong enough to withstand them reliably.

Designers of turbocharged diesels have long faced this dilemma in the quest for more power from the same size engine. One solution is to reduce the engine's compression ratio. This permits higher pressure turbocharging to be used without peak pressures becoming too high, since the initial compression ratio is not as high.

Compression ratios as low as 12 to 1 with high pressure turbocharging permit substantial increases in power output, but create another problem. The heat of compression generated at this low ratio is not high enough to permit the engine to start or idle reliably.

TELEDYNE'S VARIABLE COMPRESSION RATIO PISTON

A number of schemes have been tried to get around this problem, including heating the intake air, but the most promising is a new type of piston developed by Teledyne Continental Motors, General Products Division, that permits the compression ratio of the engine to be varied while the engine is running. This Variable Compression Ratio (VCR) piston permits the engine to operate at a high compression ratio when starting, idling and operating under light load. Then, when heavy loads are applied to the engine, it operates at lower compression ratio to limit the peak pressures within the cylinders.

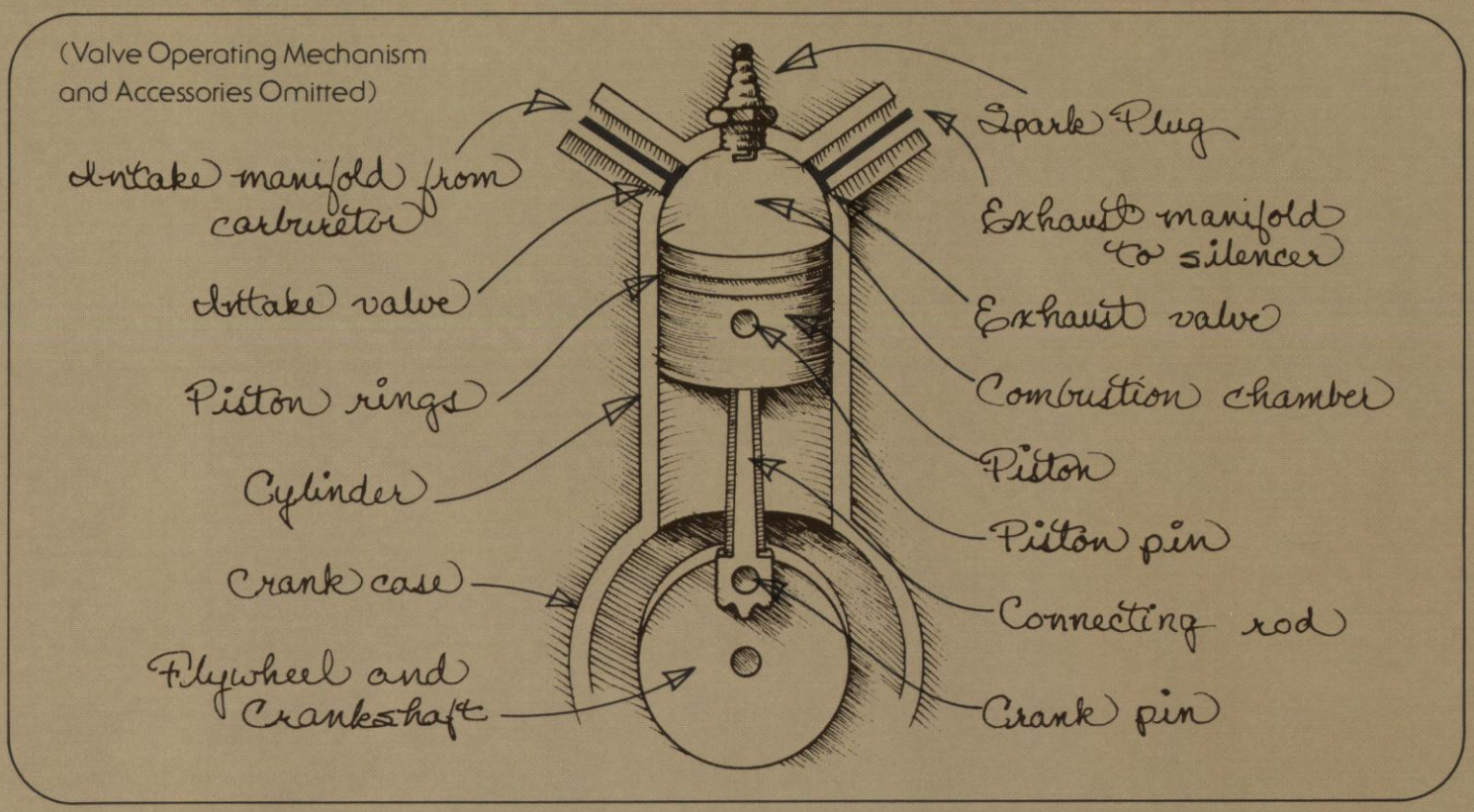
Teledyne has spent more than ten years in the development of this concept and holds numerous patents on the design of VCR pistons. The pistons are now being used in large high horsepower military engine prototypes, with a high degree of success.

Another program utilizing the VCR piston concept is being carried out for a major manufacturer of agricultural machinery. The experimental use of the VCR pistons in one of that company's existing 200 horsepower diesel engines has increased its output to over 300 horsepower. This concept of increasing power without changing the basic engine structure can save the manufacturer the cost of re-tooling for a larger engine and redesigning their agricultural equipment to accept one.

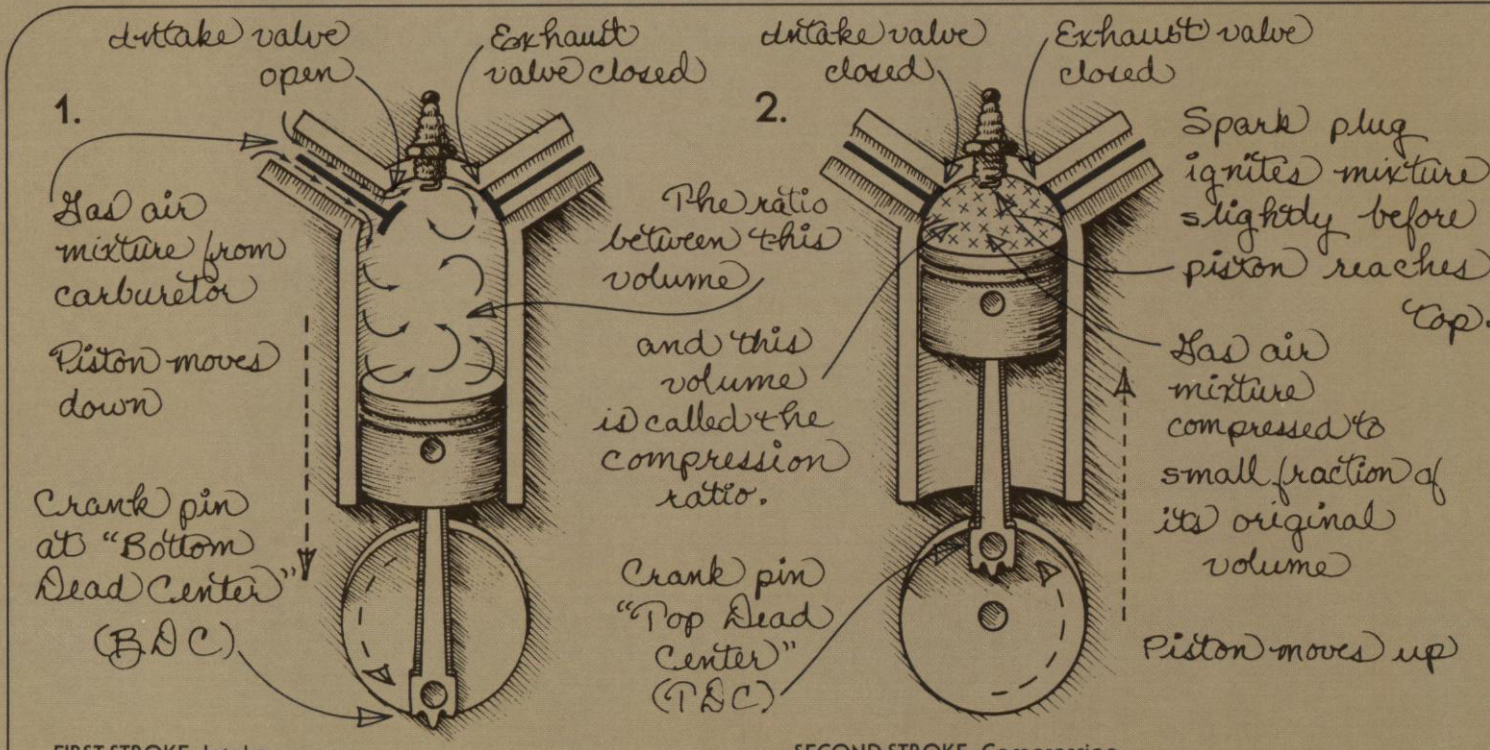
THE VCR AUTOMOTIVE DIESEL

Teledyne Continental Motors has also been awarded a contract for the development of an automotive diesel engine by the Energy Research and Development Administration (ERDA). This engine, employing the VCR piston concept, will be a six-cylinder, 130 horsepower engine, comparable in size to a conventional gasoline engine of the same power. The goal of the development program is to develop a diesel engine suitable for a car of about 3,000 pound curb weight, that will offer greatly improved fuel economy and reduced emissions yet be competitive with gasoline engines in terms of power-to-weight ratio, performance, and overall cost.

A: Nomenclature of a Simplified 4-Cycle Gasoline Engine



B: Operating Sequence of a 4-Cycle Gasoline Engine



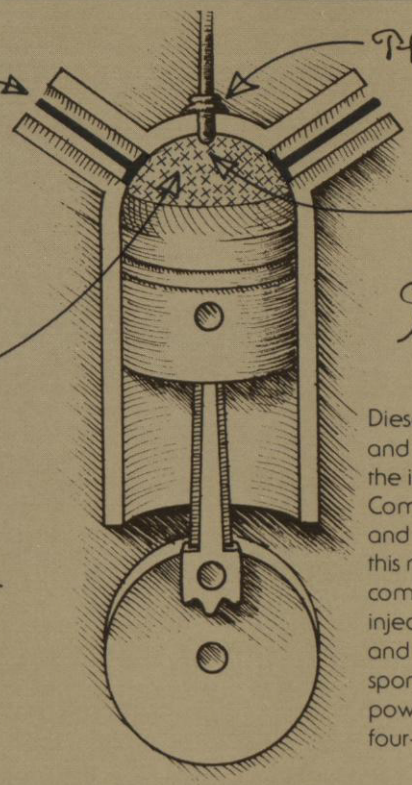
FIRST STROKE: Intake

On the first stroke the piston is pulled down in the cylinder by the inertia of the spinning flywheel (or by the starter motor) and creates a partial vacuum in the cylinder. The intake valve is open and outside air pressure forces air/fuel mixture from the carburetor into the cylinder.

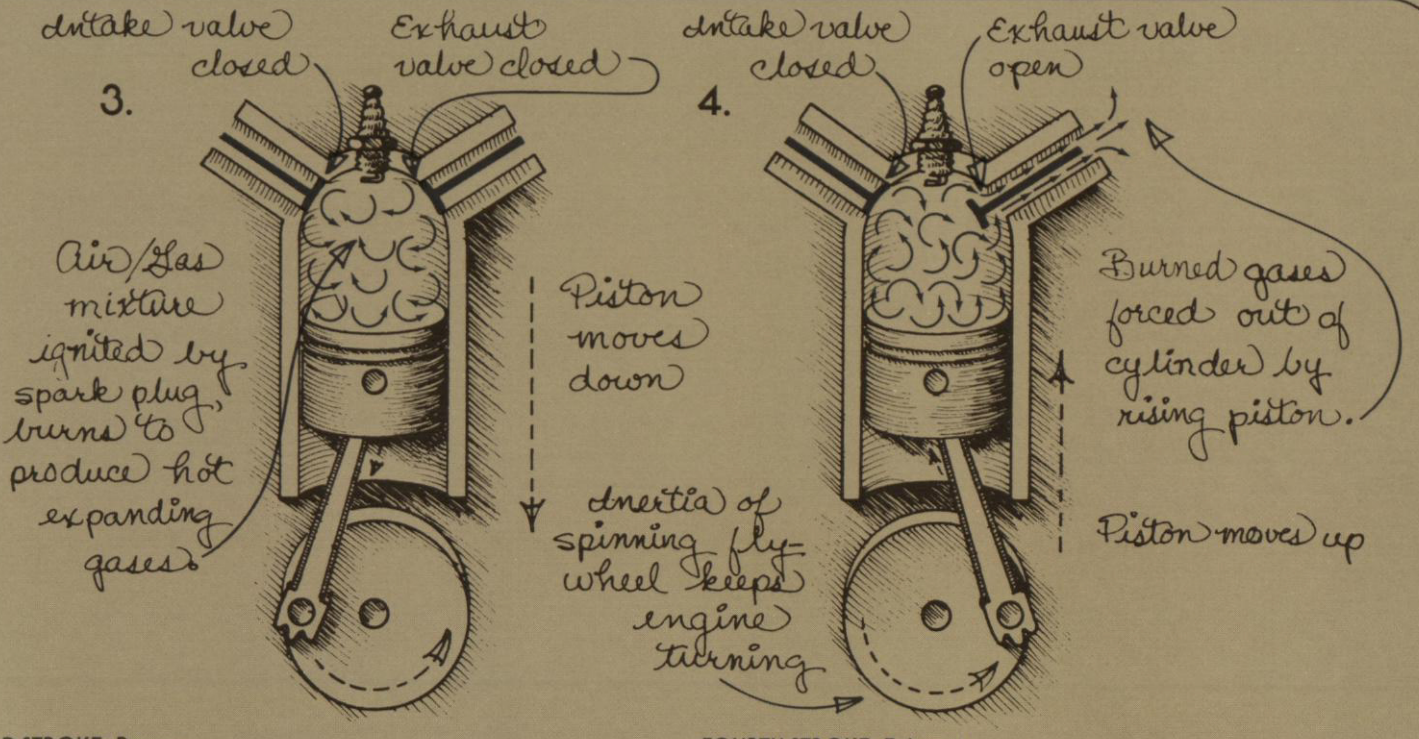
SECOND STROKE: Compression

Flywheel continues to spin, pushing piston back up to top of cylinder. Intake valve and exhaust valve are both closed so air/fuel mixture is compressed in the small space at the top of the cylinder called the combustion chamber. Sparkplug ignites mixture slightly before piston reaches top position so that mixture will have time to burn completely before next stroke ends.

C: How a Diesel Engine Differs



Diesel engines have no electrical spark ignition, and are classed as compression ignition engines. On the intake stroke air only is taken into the cylinder. Compression ratio is higher than in gasoline engines and may be as high as 24 to 1. Compressing air this much raises its temperature greatly. When combustion air has been highly compressed, fuel is injected directly into cylinder in atomized form, and heat of air is sufficient to cause fuel to ignite spontaneously. The four cycles: intake, compression, power and exhaust are exactly the same as in a four-cycle gasoline engine.



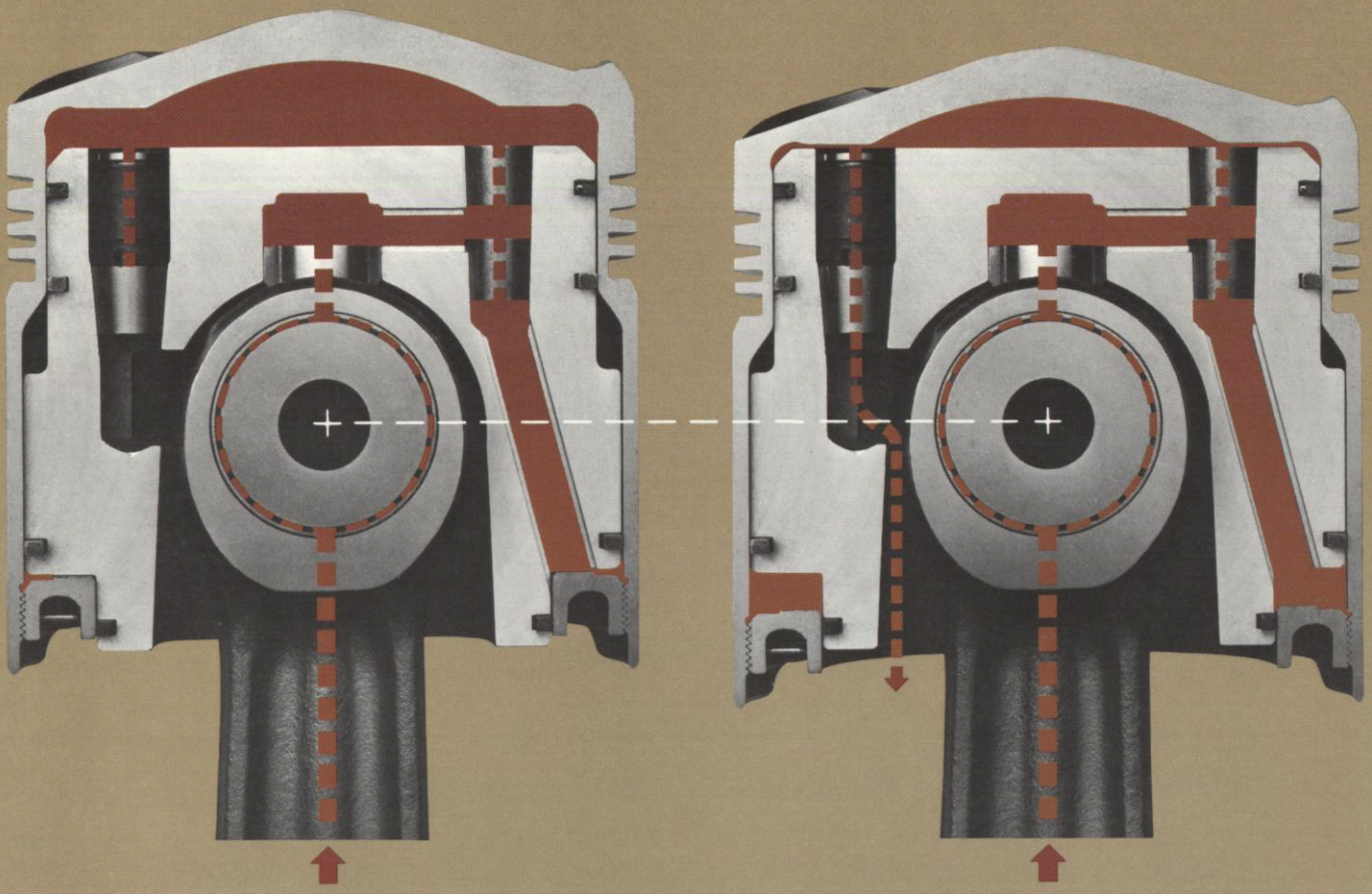
THIRD STROKE: Power

Both valves remain closed. Air/fuel mixture, ignited by sparkplug, burns to produce hot expanding gases that exert hundreds of pounds of pressure per square inch on top of piston. Force on piston is transmitted through the connecting rod to the crank pin of the crankshaft, causing it to turn and converting straight-line motion of piston into rotary motion.

FOURTH STROKE: Exhaust

Exhaust valve opens near bottom of power stroke permitting spent exhaust gases to escape into the exhaust manifold. Inertia of fly-wheel pushes piston back up to top of cylinder, forcing remaining exhaust products out of cylinder. At end of exhaust stroke engine is in its original position and cycle can begin again.

How Teledyne's Variable Compression Ratio (VCR) Piston Works



Teledyne's VCR piston permits the compression ratio of a diesel engine to vary during operation. During starting, idling and under light load the piston provides high compression for reliable operation. Under heavy loads the piston provides a lower compression ratio to limit the peak pressures in the cylinder, and to provide maximum power with high-pressure turbocharging.

The VCR piston is a unique piston-within-a-piston system. The inner piston is attached to the connecting rod in the conventional manner. The outer piston, however, is free to move up or down, relative to the inner piston, within certain predetermined limits. When the outer piston is in its upper position, maximum compression ratio is provided. When it is collapsed down onto the inner piston the compression ratio is at its lowest.

Engine oil, pumped into cavities between the two pistons through the connecting rod controls the relative position of the two pistons. A pre-set relief valve limits the maximum allowable pressure in the upper chamber. When peak cylinder pressures exceed this amount under load, oil escapes through this valve allowing the piston to move to a lower compression ratio position thus reducing peak pressure. Under varying loads the VCR piston regulates itself automatically to provide the appropriate compression ratio.

Oil in the lower annular space between the pistons controls the inertia forces that tend to make the outer piston move upward at the end of the exhaust stroke and the start of the intake stroke.

The system is simple, self-regulating and can be tailored to provide virtually any combination of high and low ratios. It is analogous in its design to the common hydraulic valve lifter used in automotive engines.

FINANCIAL INFORMATION

Letter to Shareholders:

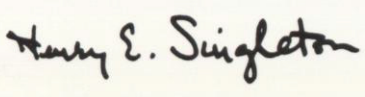
Teledyne's net income for the year ended December 31, 1975 rose to $101.7 million from $31.5 million in 1974, when earnings were depressed by heavy losses in the company's casualty insurance group. Earnings per share for 1975 were $6.09 compared to $1.31 in 1974, when a larger number of shares were outstanding. Sales of consolidated companies were $1.71 billion, up slightly from last year's $1.70 billion.

For the fourth quarter of 1975 net income was $31.1 million, or $2.01 per share, compared to last year's fourth quarter loss of $16.3 million, or $0.69 per share, when casualty insurance losses were especially severe. Consolidated fourth quarter sales declined to $419 million in 1975 from $440 million in 1974.

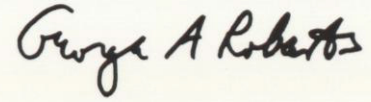
Equity in net income of Teledyne's unconsolidated subsidiaries (principally life insurance and casualty insurance companies) improved in 1975 to a profit of $19.1 million from last year's loss of $31.3 million. Income of consolidated companies also improved in 1975, from 1974's record of $62.8 million to a new record of $82.6 million. The improvement in results of consolidated companies was brought about by a combination of better cost control and increased productivity which resulted in somewhat better margins; and the company was able to increase sales during the year on some of its higher margin products, while reducing sales on some lower profit lines. In addition, interest costs and provision for currency translation were lower in 1975 than in 1974.

The improvement in equity in net income of unconsolidated subsidiaries resulted from a reduction of losses in the casualty insurance group, where losses before allocated expenses and taxes declined to $4.1 million in 1975 from the $105.6 million lost in 1974. Losses in 1975 were predominantly in general lines such as property, automobile, homeowners, and workers' compensation, in contrast to 1974 when the loss was largely in medical malpractice. The casualty insurance industry as a whole reported record losses in 1974, and indications are that the 1975 results were worse. It is uncertain as to how, or how soon, this general industry condition will be alleviated. But the situation in Teledyne's casualty insurance group appears to be improving.

Teledyne's life insurance group continued to show satisfactory operating results. Although net income of the life insurance group declined in 1975, most of the reduction resulted from an increase in realized capital losses on long term investments, rather than from insurance operations. A portion of the accumulated loss in market value of the investment portfolio was recognized in 1974 and 1975, when certain securities were sold in order to permit a restructuring of the investment portfolio.



Chairman of the Board of Directors



President

Historical Summary

	Consolidated Sales	Net Income	Net Income Per Share	Consolidated Assets	Shareholders' Equity	Average Common Shares
1975	$1,714,972,000	$101,706,000	$6.09	$1,141,883,000	$491,309,000	16,325,863
1974	1,699,987,000	31,505,000	1.31	1,132,913,000	501,793,000	22,407,795
1973	1,455,499,000	65,983,000	2.40	1,232,408,000	537,815,000	26,648,953
1972	1,215,991,000	59,285,000	1.58	1,128,809,000	503,545,000	36,140,926
1971	1,101,872,000	57,425,000	1.48	1,066,772,000	618,092,000	37,415,251
1970	1,216,448,000	61,864,000	1.64	960,607,000	584,349,000	36,574,564
1969	1,294,775,000	58,119,000	1.62	938,133,000	501,961,000	35,147,352
1968	806,747,000	40,289,000	1.32	602,428,000	316,469,000	30,592,043
1967	451,060,000	21,256,000	0.91	336,714,000	152,603,000	23,965,959
1966	256,751,000	12,035,000	0.68	170,369,000	90,205,000	17,690,818
1965	86,504,000	3,402,000	0.37	66,544,000	34,765,000	8,900,587
1964	38,187,000	1,441,000	0.25	35,040,000	13,672,000	5,529,227
1963	31,925,000	731,000	0.14	23,901,000	8,629,000	4,529,379
1962	10,438,000	157,000	0.04	10,844,000	3,527,000	3,588,763
1961	4,491,000	58,000	0.02	3,731,000	2,477,000	2,685,269

As reported in the company's annual reports, adjusted for stock dividends and stock splits. Years 1967 through 1974 are restated for certain accounting changes. Average common shares include common stock equivalents.

Consolidated Balance Sheets

December 31, 1975 and 1974

Assets

	1975	1974
Current Assets:		
Cash	$ 40,432,000	$ 34,893,000
Marketable securities, at cost which approximates market	173,097,000	54,135,000
Receivables, less reserve of $9,317,000 in 1975 and $9,690,000 in 1974	170,284,000	204,137,000
Inventories (Note 4)	148,984,000	186,100,000
Income tax refund receivable	—	21,100,000
Prepaid expenses	7,333,000	10,674,000
Total current assets	540,130,000	511,039,000
Investments in Unconsolidated Subsidiaries (Notes 2 and 12):		
Unicoa Corporation (Note 13)	199,883,000	199,364,000
Argonaut Insurance Company (Note 14)	99,605,000	102,377,000
Other	4,380,000	6,320,000
	303,868,000	308,061,000
Property and Equipment, at cost (Note 5):		
Land	16,646,000	16,781,000
Buildings	108,736,000	107,612,000
Equipment and improvements	409,949,000	419,830,000
	535,331,000	544,223,000
Less accumulated depreciation and amortization	282,017,000	276,144,000
	253,314,000	268,079,000
Other Assets:		
Cost in excess of net assets of purchased businesses (Note 12)	34,508,000	33,895,000
Other	10,063,000	11,839,000
	44,571,000	45,734,000
	$1,141,883,000	$1,132,913,000

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

Liabilities

	1975	1974
Current Liabilities:		
Accounts payable	$ 73,132,000	$ 97,930,000
Accrued liabilities	123,426,000	117,001,000
Accrued income taxes (Note 10)	9,300,000	—
Current portion of long-term debt	4,694,000	3,818,000
Total current liabilities	210,552,000	218,749,000
Long-Term Debt (Note 5)	362,963,000	364,864,000
Deferred Income Taxes (Note 10)	55,600,000	24,500,000
Other Long-Term Liabilities, including reserve for loss on currency translation	21,459,000	23,007,000
Commitments and Contingencies (Note 8)		
Shareholders' Equity:		
Preferred stock (1975 liquidation preference $31,464,000—Note 7)	516,000	692,000
Common stock (Notes 5, 6, 7 and 15)	32,340,000	32,340,000
Additional paid-in capital	407,689,000	413,387,000
Retained earnings (Notes 5, 7 and 12)	379,894,000	297,414,000
Equity in unrealized depreciation in marketable equity securities of unconsolidated subsidiaries (Notes 2 and 12)	(11,050,000)	—
	809,389,000	743,833,000
Less treasury stock, at cost (Note 7)	318,080,000	242,040,000
Total shareholders' equity	491,309,000	501,793,000
	$1,141,883,000	$1,132,913,000

Consolidated Statements of Income

For the Years Ended December 31, 1975 and 1974

	1975	1974
Consolidated Sales	**$1,714,972,000**	$1,699,987,000
Consolidated Costs and Expenses:		
Cost of sales	**1,323,703,000**	1,371,194,000
Selling and administrative expenses	**211,485,000**	201,969,000
Interest expense (Notes 5 and 12)	**22,254,000**	22,561,000
Interest income	**(10,389,000)**	(10,450,000)
Provision for currency translation (Note 12)	**—**	5,110,000
Gain on sale of assets	**—**	(17,423,000)
Provision for income taxes (Note 10)	**85,300,000**	64,200,000
	1,632,353,000	1,637,161,000
Income of Consolidated Companies	**82,619,000**	62,826,000
Equity in Net Income (Loss) of Unconsolidated Subsidiaries, after allocated expenses and income tax credits (excludes equity in unrealized appreciation (depreciation) in marketable equity securities of $10,746,000 in 1975 and $(9,251,000) in 1974—Notes 2, 5 and 12)	**19,087,000**	(31,321,000)
Net Income	**$ 101,706,000**	$ 31,505,000
Net Income Per Share of Common Stock and Common Stock Equivalents (Note 3)	**$6.09**	$1.31

Consolidated Statements of Retained Earnings

For the Years Ended December 31, 1975 and 1974

	1975	1974
Balance, Beginning of Year, as previously reported	**$ 292,829,000**	$ 274,688,000
Effect on prior years of change in accounting principle (Note 2)	**4,585,000**	4,217,000
As restated	**297,414,000**	278,905,000
Net income	**101,706,000**	31,505,000
Fair value of common stock dividends	**(5,704,000)**	(8,418,000)
Cash dividends on preferred stock	**(2,651,000)**	(4,578,000)
Redemption of Series B preferred stock, including retirement of shares held in treasury (Note 7)	**(10,871,000)**	—
Balance, End of Year	**$ 379,894,000**	$ 297,414,000

The accompanying notes are an integral part of these statements.

Consolidated Statements of Changes in Financial Position

For the Years Ended December 31, 1975 and 1974

	1975	1974
Working Capital Was Provided By:		
Net income	**$101,706,000**	$ 31,505,000
Equity in net (income) loss of unconsolidated subsidiaries before allocated expenses	**(6,860,000)**	84,368,000
Depreciation and amortization	**52,189,000**	47,518,000
Provision for currency translation	**—**	11,850,000
Change in deferred income taxes	**31,100,000**	(4,600,000)
Working capital provided from operations	**178,135,000**	170,641,000
Increase in long-term debt	**23,243,000**	54,301,000
Dividends from and intercompany transactions with unconsolidated subsidiaries	**—**	21,822,000
Dispositions of property and equipment	**3,998,000**	13,202,000
Issuance of common stock for employees' stock purchase and option plans	**5,698,000**	2,072,000
	211,074,000	262,038,000
Working Capital Was Applied To:		
Reduction in long-term debt (including currency translation)	**27,315,000**	138,778,000
Acquisition of treasury stock	**91,818,000**	77,826,000
Additions to property and equipment	**38,932,000**	44,951,000
Dividends on preferred stock	**2,651,000**	4,578,000
Redemption of Series B preferred stock	**12,296,000**	—
Other, net	**774,000**	(1,233,000)
	173,786,000	264,900,000
Increase (Decrease) in Working Capital	**$ 37,288,000**	$ (2,862,000)
Working Capital Increase (Decrease):		
Cash	**$ 5,539,000**	$ 26,204,000
Marketable securities	**118,962,000**	(31,235,000)
Receivables	**(33,853,000)**	13,379,000
Inventories	**(37,116,000)**	(15,436,000)
Income tax refund receivable	**(21,100,000)**	21,100,000
Prepaid expenses	**(3,341,000)**	1,129,000
Accounts payable	**24,798,000**	(19,731,000)
Accrued liabilities	**(6,425,000)**	(25,568,000)
Accrued income taxes	**(9,300,000)**	16,000,000
Current portion of long-term debt	**(876,000)**	11,296,000
	$ 37,288,000	$ (2,862,000)

The accompanying notes are an integral part of these statements.

Consolidated Statements of Capital Stock, Additional Paid-in Capital and Treasury Stock

For the Years Ended December 31, 1975 and 1974

	Preferred Stock ($1 Par Value)	*Common Stock ($1 Par Value)*	*Additional Paid-In Capital*	*Treasury Stock*
Balance, December 31, 1973	$692,000	$32,339,000	$418,310,000	$179,646,000
Exchange of debentures for common stock (3,963,014 shares)	—	—	—	53,776,000
Purchase of common stock (1,678,990 shares)	—	—	—	24,050,000
Common stock dividend (647,512 shares)	—	—	(3,778,000)	(12,196,000)
Stock purchase plan (168,571 shares)	—	—	(979,000)	(2,930,000)
Exercise of warrants (16,221 shares)	—	—	(166,000)	(306,000)
Conversions of preferred stock	—	1,000	—	—
Balance, December 31, 1974	692,000	32,340,000	413,387,000	242,040,000
Purchase of common (3,830,291 shares) and preferred stock (Note 7)	—	—	—	71,020,000
Exchange of debentures for common stock (1,884,500 shares)	—	—	—	20,798,000
Common stock dividend (496,058 shares)	—	—	(2,521,000)	(8,222,000)
Stock option and purchase plans (416,939 shares—Note 6)	—	—	(1,320,000)	(7,018,000)
Redemption of Series B preferred stock, including retirement of 6,575 shares held in treasury (Note 7)	(161,000)	—	(1,648,000)	(384,000)
Conversions of preferred stock (including 10,000 shares of Series B held in treasury — 12,718 net common shares issued)	(15,000)	—	(209,000)	(154,000)
Balance, December 31, 1975	$516,000	$32,340,000	$407,689,000	$318,080,000

The accompanying notes are an integral part of these statements.

Auditors' Report

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

We have examined the consolidated balance sheets of TELEDYNE, INC. (a Delaware corporation) and subsidiaries as of December 31, 1975 and 1974, and the related statements of income, capital stock, additional paid-in capital and treasury stock, retained earnings and changes in financial position for the years then ended. 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. The consolidated financial statements of Unicoa Corporation and subsidiaries (Note 13) were examined by other auditors whose reports thereon have been furnished to us. Our opinion expressed herein, insofar as it relates to the amounts included for Unicoa Corporation and subsidiaries, is based solely upon the reports of the other auditors. Teledyne's investment in Unicoa was 18 percent in 1975 and 1974 of consolidated assets and its equity in Unicoa's net income, after allocated expenses and income tax credits as described in Note 12, was 8 percent in 1975 and 51 percent in 1974 of consolidated net income.

In our opinion, based upon our examinations and the reports of other auditors referred to above, the accompanying consolidated financial statements present fairly the consolidated financial position of Teledyne, Inc. and subsidiaries as of December 31, 1975 and 1974, and the results of their operations and changes in their financial position for the years then ended, all in conformity with generally accepted accounting principles. In our opinion, except for the change (with which we concur) by Teledyne's unconsolidated insurance subsidiaries in the method of valuing their investments in marketable equity securities, as described in Note 2 to the consolidated financial statements, the accounting principles were applied on a basis consistent with that of the preceding year, after giving retroactive effect to the change (with which we concur) in the method of accounting for loss contingencies, as explained in Note 2 to the consolidated financial statements.

ARTHUR ANDERSEN & CO.

Los Angeles, California,
January 29, 1976.

(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 companies. The investments in unconsolidated subsidiaries, which include advances, are accounted for by the equity method. All material intercompany accounts and transactions have been eliminated.

Currency Translation. Current assets and current liabilities of foreign subsidiaries are expressed at the rate of exchange in effect at year end, and exchange adjustments are charged or credited to income. Non-current assets and liabilities are expressed at rates in effect at the time of the transactions. Long-term debt repayable in foreign currencies and foreign currencies held are translated at historical rates and the Company provides for the estimated effect of changes in exchange rates to the extent such debt exceeds the foreign currencies held.

Inventories. Inventories are stated at the lower of cost (last-in, first-out and first-in, first-out methods) or market, less progress payments received. Costs include direct material and labor costs and applicable manufacturing and engineering overhead. Sales and related costs are recorded as products are delivered and as services are performed, including products and services under long-term contracts. Costs of products delivered and services performed under 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.

Depreciation and Amortization. Buildings and equipment are depreciated on straight-line and declining balance bases. Estimated useful lives are 5 to 45 years for buildings, and 3 to 20 years for machinery and equipment. Leasehold improvements and patents are amortized on a straight-line basis over the life of the lease or patent. Maintenance and repairs are charged against income as incurred and betterments and major renewals are capitalized. Cost and accumulated depreciation of property sold or retired are removed from the accounts and the resultant gain or loss is included in income.

Cost in Excess of Net Assets of Purchased Businesses. Except for an immaterial amount being amortized, cost in excess of net assets of purchased businesses relates to businesses purchased prior to October 31, 1970 and is not being amortized.

Research and Development. Company funded research and development costs are expensed as incurred. Costs related to customer funded research and development contracts are charged to income as sales are recorded.

Pension Expense. Pension expense is accrued at amounts equal to normal cost plus a portion of prior service costs.

Income Taxes. Provision for income taxes includes state, Federal and foreign income taxes. Deferred income taxes are provided for timing differences in the recognition of income and expenses, income of the domestic international sales corporation not currently taxed, and undistributed earnings of subsidiaries, except for a portion of the earnings of life insurance subsidiaries. The investment tax credits are amortized over the estimated lives of the related assets.

(2) Changes in Accounting Principles. In 1975, the Company and its unconsolidated subsidiaries discontinued self-insurance accounting and the use of catastrophe reserves in compliance with Statement of Financial Accounting Standards No. 5. Financial statements for 1974 have been restated to reflect the retroactive application of this principle. In 1975, the effect of this change was to increase income of consolidated companies by $538,000, increase equity in net income of unconsolidated subsidiaries by $645,000, and increase net income by $1,183,000, or $0.07 per share. The effect in 1974 was to increase income of consolidated companies by $874,000, increase the equity in net loss of unconsolidated subsidiaries by $506,000 and increase net income by $368,000 or $0.02 per share.

In accordance with Statement of Financial Accounting Standards No. 12, the Company's unconsolidated insurance subsidiaries now record certain marketable equity securities at the lower of aggregate cost or market. These securities were previously carried at cost. Teledyne's equity in this reduction to the lower of cost or market is reflected in the consolidated financial statements as a reduction of $11,050,000 in the investments in unconsolidated subsidiaries and in shareholders' equity. This change had no effect on net income.

(3) Net Income per Share of Common Stock and Common Stock Equivalents. Net income per share is based on the weighted average number of shares of common stock and common stock equivalents outstanding during each year (16,325,863 in 1975 and 22,407,795 in 1974), including all convertible debt, Series B preferred stock and all dilutive options and warrants. Each common stock equivalent has been considered outstanding from the beginning of each year or date of issuance, and the related dividend requirement or interest has been eliminated.

(4) Inventories.

	1975	*1974*
Last-in, first-out method	**$171,303,000**	$211,295,000
First-in, first-out method	**34,506,000**	34,878,000
	205,809,000	246,173,000
Less progress billings	**56,825,000**	60,073,000
	$148,984,000	$186,100,000

Inventories and progress payments of $53,511,000 and $47,675,000, respectively, at December 31, 1975, and $66,781,000 and $43,467,000, respectively, at December 31, 1974, were related to long-term contracts in process.

Inventories stated on a last-in, first-out basis were $91,229,000 and $86,278,000 less than their first-in, first-out values at December 31, 1975 and 1974, respectively. During 1975, inventory quantities were reduced, resulting in a liquidation 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 1975 purchases. The effect of this last-in, first-out inventory liquidation was to increase net income in 1975 by approximately $6,150,000, or $0.38 per share.

(5) Long-Term Debt. At December 31, 1975, the Company's long-term debt was as follows:

10% Subordinated Debentures, due 2004, Series A, $5,452,000 payable annually commencing in 1994 (net of unamortized discount of $32,945,000)	**$ 76,093,000**
7½% Term Notes, due 1982, $15,000,000 payable annually commencing in 1979	**75,000,000**
3½% Subordinated Debentures, due 1992, $3,000,000 payable annually commencing in 1978 (convertible into common stock at $47.96 per share)	**37,162,000**
7% Subordinated Debentures, due 1999, $1,871,000 payable annually commencing in 1989	**36,077,000**
6½% Subordinated Debentures, due 1983, $7,500,000 payable annually commencing in 1979	**31,760,000**
7¼% Bonds, due 1988, payable in annual installments commencing in 1979	**29,936,000**
7⅞% Sinking Fund Debentures, due 1994, $1,400,000 payable annually	**22,307,000**
7% Promissory Notes, due 1989, $1,500,000 payable annually	**21,250,000**
6½% Sinking Fund Debentures, due 1992, $1,350,000 payable annually	**19,589,000**
Other (including $8,770,000 secured by land and buildings), due in various installments to 1990	**18,483,000**
	367,657,000
Less current portion	**4,694,000**
	$362,963,000

Long-term debt is payable $4,694,000 in 1976, $6,157,000 in 1977, $4,672,000 in 1978, $21,556,000 in 1979 and $31,052,000 in 1980, net of long-term debt repurchased to meet sinking fund requirements. Interest expense was $34,980,000 in 1975 and $37,785,000 in 1974, of which $12,726,000 in 1975 and $15,224,000 in 1974 was allocated to unconsolidated subsidiaries.

In order to meet current and future sinking fund requirements, the Company repurchased $20,142,000 and $59,071,000 face amount of its long-term debt in 1975 and 1974, respectively, with the resulting gains included in the results of operations in selling and administrative expenses. These transactions resulted in an increase in net income of $3,362,000, or $0.21 per share, in 1975 and $2,555,000, or $0.11 per share, in 1974.

Under the various borrowing agreements, the Company has agreed to maintain minimum amounts of working capital and net worth, and has agreed to certain restrictions with respect to borrowing, purchase and sale of assets and capital stock and payment of dividends. At December 31, 1975, these agreements were complied with, and retained earnings of $105,241,000 were not restricted by these agreements as to payment of dividends.

The Company has reserved 774,854 shares of common stock for issuance upon conversion of the 3½% Subordinated Debentures.

(6) Stock Options and Warrants. At December 31, 1975, 141,735 shares of common stock were reserved for issuance under outstanding options at prices from $12 to $20 per share (options for 109,806 shares were exercisable) and 540,356 shares of common stock were reserved for the granting of additional options. At December 31, 1974, 363,037 shares of common stock were reserved for issuance under outstanding options and 638,520 shares of common stock were reserved for the granting of additional options. During 1975, options to purchase 500 shares of common stock were granted, options to purchase 196,145 shares were exercised, and options to purchase 25,597 shares were canceled.

At December 31, 1975, 355,394 shares of common stock were reserved for issuance under warrants, each of which provides for the purchase of 11.19 shares at $44.72 per share until October, 1978. In addition, 1,573 shares were reserved for issuance under other warrants.

(7) Capital Stock. At December 31, 1975 and 1974, the Company's capital stock consisted of the following shares:

	Authorized	*1975*	*1974*
Cumulative convertible preferred stock, $1 par value	15,000,000		
$6 series — Issued		**516,136**	517,336
— Outstanding		**499,436**	517,336
Series B — Issued		**—**	174,507
— Outstanding		**—**	164,507
Common stock, $1 par value	60,000,000		
Issued		**32,339,685**	32,339,685
Outstanding		**13,611,930**	18,401,006

At December 31, 1975 and 1974, the Company's treasury stock was as follows:

	1975		*1974*	
	Shares	*Cost*	*Shares*	*Cost*
Cumulative convertible preferred stock:				
$6 series	**16,700**	**$ 1,024,000**	—	$ —
Series B	—	—	10,000	402,000
Common stock	**18,727,755**	**317,056,000**	13,938,679	241,638,000
Total		**$318,080,000**		$242,040,000

The 1974 financial statements and related notes, except for shareholders' equity, have been restated to reflect a 3% common stock dividend paid in May, 1975.

The holders of the $6 series preferred stock are entitled to voting rights and cumulative annual dividends at the rate of $6.00 per share. Such stock is redeemable at $100.00 per share after April 22, 1978, and is convertible at any time into 1.34 shares of common stock. The Company has reserved 669,244 shares of common stock for conversion of these preferred shares. The excess of the liquidation preference of the preferred stock over par value does not impose any restrictions on retained earnings. The Series B preferred stock was redeemed in November, 1975.

At December 31, 1975, 134,047 shares of common stock were reserved for issuance to employees under a stock purchase plan.

(8) Commitments and Contingencies. Total rental expense was $17,662,000 and $17,523,000 in 1975 and 1974, respectively. Annual rentals under long-term leases are $8,398,000 in 1976, $7,240,000 in 1977, $5,076,000 in 1978, $4,070,000 in 1979 and $3,184,000 in 1980. Aggregate rentals are $7,531,000 for 1981 through 1985, $2,560,000 for 1986 through 1990, $593,000 for 1991 through 1995 and $379,000 in total thereafter.

(9) Pension Plans. Total pension expense was $27,049,000 and $23,621,000 in 1975 and 1974, respectively. The Company contributes accrued pension cost on a current basis. The actuarially computed value of vested benefits and prior service costs for all plans as of December 31, 1975 exceeded the total of the pension fund assets and balance sheet accruals by approximately $61,800,000 and $84,500,000, respectively.

(10) Income Taxes. Income taxes for the years ended December 31, 1975 and 1974, excluding income taxes recorded by unconsolidated subsidiaries, were as follows:

	Consolidated Companies	*Unconsolidated Subsidiaries (Note 12)*	*Combined Provision (Credit)*
1975—			
Current	**$ 76,703,000**	**$(58,369,000)**	**$ 18,334,000**
Deferred	**9,500,000**	**33,416,000**	**42,916,000**
Investment credits	**(903,000)**	**—**	**(903,000)**
	$ 85,300,000	**$(24,953,000)**	**$ 60,347,000**
1974—			
Current	$ 55,100,000	$(64,148,000)	$ (9,048,000)
Deferred	10,700,000	(10,863,000)	(163,000)
Investment credits	(1,600,000)	—	(1,600,000)
	$ 64,200,000	$(75,011,000)	$(10,811,000)

The provision of consolidated companies is discussed below, and the amounts related to unconsolidated subsidiaries are discussed in Note 12.

The consolidated provision for income taxes was as follows:

	1975	1974
Federal	$ 71,200,000	$ 51,300,000
State	9,400,000	8,400,000
Foreign	4,700,000	4,500,000
	$ 85,300,000	$ 64,200,000

Deferred income taxes of the consolidated companies were related to the following:

	1975	1974
Domestic international sales corporation income	$ 5,700,000	$ 3,600,000
Gain on retirement of debt	3,500,000	2,500,000
Currency translation on retirement of foreign debt	400,000	1,300,000
Deferred investment tax credits	2,500,000	1,200,000
Other, net	(2,600,000)	2,100,000
	$ 9,500,000	$ 10,700,000

The total effective income tax rate on pre-tax income of consolidated companies was 50.8% in 1975 and 50.5% in 1974, which differed from the statutory U.S. Federal income tax rate of 48% for the following reasons:

	1975	1974
U.S. Federal income tax rate	48.0%	48.0%
Amortization of investment tax credits	(.5)	(1.3)
State and local income taxes, net of Federal income tax effect	2.9	3.4
Capital gains subject to capital gain tax rate	—	(2.2)
Costs and expenses not deductible for Federal tax purposes	.4	2.5
Other, net	—	.1
	50.8%	50.5%

Unamortized investment tax credits of $6,919,000 and $5,322,000, to be amortized over periods of up to seven years, are included in deferred income taxes as of December 31, 1975 and 1974, respectively.

(11) Research and Development Expenses. Company funded research and development costs of $21,150,000 and $21,000,000 were charged to costs and expenses in the years ended December 31, 1975 and 1974, respectively.

(12) Investments in Unconsolidated Subsidiaries. Equity in net income (loss) of unconsolidated subsidiaries, after allocated expenses and income tax credits, was as follows:

	1975	1974
Equity in net income (loss) of—		
Unicoa Corporation	$ 11,050,000	$ 20,876,000
Argonaut Insurance Company	(4,073,000)	(105,575,000)
Other	(117,000)	331,000
	6,860,000	(84,368,000)
Allocated expenses—		
Interest expense	(12,726,000)	(15,224,000)
Provision for currency translation	—	(6,740,000)
Income tax credits	24,953,000	75,011,000
	$ 19,087,000	$(31,321,000)

The income tax credits consist of amounts ($6,500,000 in 1975 and $11,167,000 in 1974) related to allocated expenses and amounts ($18,453,000 in 1975 and $63,844,000 in 1974) related to losses of unconsolidated subsidiaries which are recoverable in Teledyne's consolidated tax return but which are not available to the unconsolidated subsidiaries on a separate return basis. The effective tax rate used in computing the income tax credits related to losses of unconsolidated subsidiaries differs from the statutory U.S. Federal income tax rate of 48% principally because of tax exempt investment income and capital gains tax rates.

Interest expense was allocated to unconsolidated subsidiaries based on the ratio of Teledyne's average investment in unconsolidated subsidiaries to average total capital. Prior to 1975 a different formula was used to

determine the classification of interest. The financial statements for 1974 have been reclassified to be comparable with 1975, resulting in a decrease of $3,064,000 in income of consolidated companies and a decrease of the same amount in equity in net loss of unconsolidated subsidiaries. There was no effect on net income.

The Company's equity in the net assets of its unconsolidated subsidiaries, including advances, was $107,491,000 in 1975 and $111,475,000 in 1974, including its equity of $56,472,000 and $49,612,000, respectively, in their retained earnings. In consolidation, a portion of the difference between Teledyne's investments in purchased subsidiaries and the book value of their assets has been allocated to bonds and stocks and amortized over the applicable maturity of the bonds or charged or credited to income upon their disposition. The Company's investment exceeded its equity in net assets by $196,377,000 in 1975 and $196,586,000 in 1974. Such excess is in addition to the excess shown in the consolidated balance sheets and is not being amortized since, in the opinion of management, there has been no diminution in its value. The Company's equity in net income (loss) of its unconsolidated subsidiaries includes net realized losses on sale of investments of $9,435,000 in 1975 and $19,199,000 in 1974.

As discussed in Note 2, Teledyne's unconsolidated subsidiaries now carry certain marketable equity securities at the lower of aggregate cost or market. Teledyne's equity, $11,050,000 at December 31, 1975, in the reduction to the lower of cost or market is reflected in the consolidated financial statements as a reduction in the investments in unconsolidated subsidiaries and in shareholders' equity. The change had no effect on net income. Teledyne's equity in gross unrealized losses and gross unrealized gains of $17,317,000 and $6,267,000, respectively, was used to determine the reduction referred to above. Such unrealized gains and losses are not included in the determination of the results of operations.

(13) Unicoa Corporation and Subsidiaries. The following condensed statements summarize the consolidated financial position and operating results of Unicoa Corporation and subsidiaries. Teledyne owned 91.6% and 90.9% interests at December 31, 1975 and 1974, respectively.

Consolidated Balance Sheets

	December 31,	
	1975	*1974*
Assets:		
Bonds, at amortized cost (market: 1975—$259,000,000; 1974—$210,000,000)	**$283,634,000**	$247,462,000
Stocks, principally at the lower of cost or market in 1975 and at cost in 1974 (market: 1975—$81,000,000; 1974—$42,000,000)	**83,155,000**	60,556,000
Mortgage loans	**136,194,000**	154,802,000
Real estate, at cost less accumulated depreciation	**45,011,000**	41,867,000
Loans to policyholders	**14,664,000**	13,442,000
Cash, including certificates of deposit	**14,727,000**	31,752,000
Premiums deferred and uncollected	**29,973,000**	24,465,000
Deferred policy acquisition costs	**94,508,000**	92,947,000
Cost in excess of net assets of purchased businesses	**26,713,000**	24,192,000
Other assets	**17,519,000**	17,320,000
	$746,098,000	$708,805,000
Liabilities:		
Policy reserves and liabilities	**$556,800,000**	$524,755,000
Notes payable to bank	**—**	1,400,000
Mortgage loan payable	**8,135,000**	8,825,000
Subordinated debentures	**17,944,000**	17,746,000
Other liabilities	**54,478,000**	45,326,000
Shareholders' equity—		
Common stock	**18,732,000**	18,732,000
Additional paid-in capital	**1,975,000**	1,975,000
Retained earnings	**168,192,000**	158,997,000
Unrealized depreciation in marketable equity securities	**(11,207,000)**	—
	177,692,000	179,704,000
Less treasury stock, at cost	**68,951,000**	68,951,000
Total shareholders' equity	**108,741,000**	110,753,000
	$746,098,000	$708,805,000

Consolidated Statements of Income

	Year Ended December 31, 1975	1974
Income:		
Premiums and other insurance income	$258,730,000	$235,982,000
Investment income less expenses	32,729,000	32,948,000
Other income	2,960,000	2,719,000
	294,419,000	271,649,000
Expenses:		
Benefits paid or provided	144,870,000	127,239,000
Insurance expenses	120,051,000	105,699,000
Provision for income taxes	7,659,000	11,925,000
	272,580,000	244,863,000
	21,839,000	26,786,000
Loss on Sale of Investments, Less Applicable Income Tax Credit (excludes unrealized appreciation (depreciation) in marketable equity securities of $5,194,000 in 1975 and $(6,942,000) in 1974)	12,644,000	4,683,000
Net Income	$ 9,195,000	$ 22,103,000

The above statements have been prepared on the basis of generally accepted accounting principles which differ from statutory insurance accounting practices. Unicoa recognizes revenues from life insurance premiums when they become due and revenues, benefits and expenses on accident and health insurance over the period to which the premiums relate. Deferred taxes are provided for timing differences in the recognition of income and expenses.

In accordance with Statement of Financial Accounting Standards No. 12, Unicoa now records certain marketable equity securities at the lower of aggregate cost or market. These securities were previously carried at cost. This reduction to the lower of cost or market of these securities is reflected in the financial statements as a reduction of $11,207,000 in the investment in stocks and in shareholders' equity. The change had no effect on net income.

A portion of life insurance company income is not subject to Federal income tax until such amount exceeds certain limitations or is distributed to shareholders as dividends. At December 31, 1975, up to $52,000,000 (at current tax rates) would be required for possible Federal income taxes which might become due, in whole or in part, in future years if any portion of $108,000,000 of the gains from operations since January 1, 1959, becomes includable in taxable income as a result of such limitations, including distributions in excess of $10,000,000 as dividends.

(14) Argonaut Insurance Company and Subsidiaries. The following condensed statements summarize the consolidated financial position and operating results of Argonaut Insurance Company and subsidiaries.

Consolidated Balance Sheets

	December 31, 1975	1974
Assets:		
Bonds, at amortized cost (market: 1975—$490,000,000; 1974—$435,000,000)	$580,186,000	$519,446,000
Stocks, at lower of cost or market in 1975 and at cost in 1974 (market: 1975—$42,000,000; 1974—$36,000,000)	42,141,000	42,661,000
Invested cash	14,001,000	13,501,000
Cash	19,075,000	12,439,000
Agents' balances and uncollected premiums	56,853,000	84,016,000
Other receivables	37,549,000	35,733,000
Deferred policy acquisition costs	11,144,000	19,164,000
Property and equipment, at cost, less accumulated depreciation	10,731,000	11,520,000
Investment in unconsolidated subsidiary	24,720,000	22,678,000
Cost in excess of net assets of purchased businesses	8,589,000	8,589,000
	$804,989,000	$769,747,000

Liabilities:		
Loss and claim reserves	$522,447,000	$462,972,000
Accrued loss adjustment expenses	94,082,000	85,258,000
Unearned premiums	100,476,000	142,761,000
Accrued income taxes	780,000	780,000
Other liabilities	37,319,000	43,345,000
Shareholder's equity	49,885,000	34,631,000
	$804,989,000	$769,747,000

Consolidated Statements of Operations

	Year Ended December 31,	
	1975	*1974*
Income:		
Net premiums earned	$394,364,000	$404,518,000
Investment income less expenses	39,039,000	36,131,000
	433,403,000	440,649,000
Expenses:		
Losses and loss adjustment expenses	328,677,000	422,072,000
Underwriting expenses	111,054,000	104,437,000
	439,731,000	526,509,000
	(6,328,000)	(85,860,000)
Gain (Loss) on Sale of Investments (excludes unrealized appreciation (depreciation) in marketable equity securities of $5,988,000 in 1975 and $(2,941,000) in 1974)	213,000	(21,373,000)
Loss of Consolidated Companies	(6,115,000)	(107,233,000)
Equity in Net Income of Unconsolidated Subsidiary	2,042,000	1,658,000
Net Loss	$ (4,073,000)	($105,575,000)

The above statements have been prepared on the basis of generally accepted accounting principles which differ from statutory insurance accounting practices. Premium income, policy acquisition costs, and policyholder dividends are recognized ratably over the period to which the premiums relate. Losses and loss adjustment expenses are provided at the estimated amounts necessary to settle incurred claims. Deferred taxes are provided for timing differences in the recognition of income and expenses to the extent such deferred taxes are determined to be recoverable.

Shareholder's equity includes $20,000,000 of Certificates of Contribution issued in 1975 to Teledyne in exchange for $20,000,000 of Teledyne's 10% Subordinated Debentures (included in Bonds in the above consolidated balance sheet).

In 1975, the Company discontinued the use of catastrophe reserves in compliance with Statement of Financial Accounting Standards No. 5. Financial statements for 1974 have been restated to reflect the retroactive application of this principle. In 1975, the effect of this change was to decrease net loss by $1,240,000. The effect of restating 1974 was to increase net loss by $973,000.

In accordance with Statement of Financial Accounting Standards No. 12, the Company now records marketable equity securities at the lower of aggregate cost or market. These securities were previously carried at cost. This reduction to the lower of cost or market of these securities is reflected in the consolidated financial statements as a reduction of $673,000 in the investment in stocks and in shareholder's equity. This change had no effect on net income.

Argonaut and consolidated subsidiaries do not file separate tax returns but are included in the consolidated returns of Teledyne, Inc. In 1975 and 1974, no income tax credits have been included in Argonaut's consolidated financial statements since the losses could not have been carried back by Argonaut to recover prior years' taxes on a separate return basis.

(15) Subsequent Event. Subsequent to the date of the auditors' report, the Company announced an offer to shareholders to purchase up to 1,000,000 shares of its common stock at a price of $40 per share. This offer expires February 27, 1976.

Consolidated Summary of Operations

For the Two Years Ended December 31, 1975 and the Three Years Ended October 31, 1973
(000's Omitted)

	Year Ended December 31,		Year Ended October 31,		
	1975	*1974*	*1973*	*1972*	*1971*
Consolidated sales	$1,714,972	$1,699,987	$1,455,499	$1,215,991	$1,101,872
Consolidated gross profit	$ 391,269	$ 328,793	$ 284,661	$ 236,327	$ 218,421
Consolidated interest expense (Notes A and C)	$ 22,254	$ 22,561	$ 22,166	$ 12,781	$ 12,303
Consolidated provision for currency translation (Note A)	$ —	$ 5,110	$ 6,275	$ —	$ —
Consolidated provision for income taxes (Note B)	$ 85,300	$ 64,200	$ 39,400	$ 29,300	$ 27,100
Income of consolidated companies (Note E)	$ 82,619	$ 62,826	$ 38,640	$ 30,833	$ 30,086
Equity in net income (loss) of unconsolidated subsidiaries, after allocated expenses and income tax credits (Notes A, C and E)	19,087	(31,321)	27,343	28,452	27,339
Net income (Note E)	101,706	31,505	65,983	59,285	57,425
Dividend requirements of preferred stock	3,425	3,662	3,684	3,791	4,649
Net income applicable to common shareholders	$ 98,281	$ 27,843	$ 62,299	$ 55,494	$ 52,776
Net income per share of common stock and common stock equivalents (Note D)	$6.09	$1.31	$2.40	$1.58	$1.48

The Company has paid 3% stock dividends applicable to the common stock during each of the years presented above; no cash dividends have been paid on the common stock.

Notes to Consolidated Summary of Operations

(000's omitted except for average shares and per share information)

(A) Interest expense was $34,980 in 1975, $37,785 in 1974, $37,104 in 1973, $20,618 in 1972 and $18,963 in 1971, of which $12,726 in 1975, $15,224 in 1974, $14,938 in 1973, $7,837 in 1972 and $6,660 in 1971 was allocated to unconsolidated subsidiaries. Interest expense on long-term debt approximated total interest expense for all periods presented. In 1974 and 1973, the Company provided for the estimated effect of changes in exchange rates applicable to long-term debt repayable in foreign currencies; no such provision was required in 1975.

(B) The consolidated provision for income taxes includes state income taxes of $9,400 in 1975, $8,400 in 1974, $5,000 in 1973, $3,300 in 1972 and $3,600 in 1971, and foreign income taxes of $4,700 in 1975, $4,500 in 1974, $3,600 in 1973 and $1,600 in 1972 (foreign taxes in 1971 were not material).

The consolidated provision includes the following:

	1975	*1974*	*1973*	*1972*	*1971*
Current	$76,703	$55,100	$41,200	$26,000	$17,200
Deferred	9,500	10,700	(400)	4,500	10,900
Investment credits	(903)	(1,600)	(1,400)	(1,200)	(1,000)
	$85,300	$64,200	$39,400	$29,300	$27,100

(C) Interest expense was allocated to unconsolidated subsidiaries based on the ratio of Teledyne's average investment in unconsolidated subsidiaries to average total capital. Prior to 1975 a different formula was used to determine the classification of interest. The summaries of operations for prior years have been reclassified to be comparable with 1975. The effect of this reclassification was to decrease income of consolidated companies and increase the equity in net income of unconsolidated subsidiaries by $3,064 in 1974, $2,360 in 1973, $2,841 in 1972 and $2,427 in 1971. There was no effect on net income. The Company's equity in net income of its unconsolidated subsidiaries includes net realized gains (losses) on sale of investments of $(9,435) in 1975, $(19,199) in 1974, $(624) in 1973, $(1,071) in 1972 and $602 in 1971.

Teledyne owned 91.6% of Unicoa at December 31, 1975, 90.9% at December 31, 1974, 90.2% at September 30, 1973, 85.1% at September 30, 1972 and 67.4% at September 30, 1971. The Company owned 100% of Argonaut Insurance Company for all periods presented.

(D) Net income per share is based on the weighted average number of shares of common stock and common stock equivalents outstanding during each year (16,325,863 in 1975, 22,407,795 in 1974, 26,648,953 in 1973, 36,140,926 in 1972 and 37,415,251 in 1971), including all convertible debt, Series B preferred stock and all dilutive options and warrants. Each common stock equivalent has been considered outstanding from the beginning of each year or date of issuance, and the related dividend requirement or interest has been eliminated.

(E) In 1975, the Company changed its accounting for loss contingencies to comply with Statement of Financial Accounting Standards No. 5. The summaries of operations for prior years have been restated to reflect the retroactive application of this principle. The effect of this change was as follows:

Increase (Decrease):	*1975*	*1974*	*1973*	*1972*	*1971*
Income of consolidated companies	$ 538	$ 874	$ 241	$ 473	$ 206
Equity in net income (loss) of unconsolidated subsidiaries	645	(506)	379	1,368	1,040
Net income	$1,183	$ 368	$ 620	$1,841	$1,246

(F) In 1974, the Company extended its use of the last-in, first-out method of valuing inventory in order to reflect more accurately the results of operations by matching current costs against current revenues. As a result, income of consolidated companies and net income were reduced by $6,400, or $0.29 per share in 1974. Since inventories at the beginning of 1974 are the base inventories under the last-in, first-out method, there is no effect on the results of operations of prior years.

In order to meet current and future sinking fund requirements, the Company repurchased $20,142 and $59,071 face amount of its long-term debt and subordinated debentures in 1975 and 1974, respectively, with the resulting gains included in the results of operations. These transactions resulted in an increase in net income of $3,362 or $0.21 per share in 1975 and $2,555 or $0.11 per share in 1974. In 1974, the Company realized a gain of $12,196 or $0.54 per share, after taxes, on the sale of assets of consolidated companies.

Management's Discussion and Analysis of Summary of Operations

Consolidated sales increased in 1974, primarily due to general economic conditions and improved demand. Consolidated gross profit rose in line with the sales increase in 1974. In 1975, the improved gross profit was brought about by a combination of better cost control and increased productivity which resulted in somewhat better margins. Also, the Company was able to increase sales during the year on some of its higher margin products, while reducing sales on some lower profit lines.

In 1974, the Company provided for the estimated effect of changes in exchange rates applicable to long-term debt payable in foreign currencies. No such provision was required in 1975.

The consolidated provision for income taxes increased in 1974 and 1975 due to higher pre-tax income. There was no significant change in the effective tax rates, but, in 1974, a favorable effect of having a greater portion of pre-tax income taxed at lower capital gains tax rates was offset by the inclusion in pre-tax income of a larger amount of costs and expenses which were not deductible for tax purposes.

As discussed in Note F to the Consolidated Summary of Operations, the results of operations include the effect of valuing additional inventories using the last-in, first-out method in 1974, gains on repurchase of debt in 1974 and 1975, and a gain on sale of assets of consolidated companies in 1974.

In 1974, adverse underwriting results, primarily from the medical malpractice coverage written by Argonaut Insurance Company, were experienced by the property and casualty group of unconsolidated subsidiaries. In 1975, losses of this group were significantly reduced, although the lines of insurance generating losses were other general lines rather than the medical malpractice line. In addition, as discussed in Note C to the Consolidated Summary of Operations, there were realized losses on sales of investments incurred by the unconsolidated subsidiaries in both years.

Revenue by Line of Business

(000's Omitted)

	Year Ended December 31, 1975	1974	October 31, 1973	1972	1971
Industrial	$ 613,347	$ 599,604	$ 487,775	$ 404,262	$ 375,990
Aviation and Electronics	460,255	433,180	408,899	366,515	331,479
Specialty Metals	455,003	487,013	375,706	287,152	263,815
Consumer and Other	186,367	180,190	183,119	158,062	130,588
Consolidated Sales	1,714,972	1,699,987	1,455,499	1,215,991	1,101,872
Insurance and Finance	758,003	732,318	601,488	512,621	446,620
Total	$2,472,975	$2,432,305	$2,056,987	$1,728,612	$1,548,492

Net Income by Line of Business

(000's Omitted)

	Year Ended December 31, 1975	1974	October 31, 1973	1972	1971
Industrial	$ 36,788	$ 31,731	$ 13,374	$ 14,875	$ 13,547
Aviation and Electronics	17,709	10,098	12,154	7,705	5,760
Specialty Metals	15,046	21,687	15,151	7,405	6,532
Consumer and Other	13,076	(690)	(2,039)	848	4,247
Consolidated Companies	82,619	62,826	38,640	30,833	30,086
Insurance and Finance	19,087	(31,321)	27,343	28,452	27,339
Total	$ 101,706	$ 31,505	$ 65,983	$ 59,285	$ 57,425

The net income by line of business has been retroactively restated to reflect the effect of the change in accounting principle discussed in Note 2 to the Consolidated Financial Statements and to reclassify interest expense as discussed in Note 12.

Industrial

Teledyne offers a wide variety of products, services and expendable materials that are used for industrial purposes. A major activity is the manufacture of air and water-cooled gasoline and diesel engines. These range from small, lightweight units widely used in lawn mowers, garden tractors and generators, to heavier units used in construction machinery and materials handling vehicles. The largest engines produced are heavy-duty, high-performance types used in military vehicles.

Another major category includes machines and related tooling for thread cutting, grinding, cut-off, gear-rolling, tube bending and forming, pressing, can-making, assembly of complex products, and manual and automatic welding of various types. Other types of automatic equipment are made for the bakery and chemical industries. In addition, Teledyne produces many types of dies, tool bits and other expendable tooling, as well as a complete line of welding rod and wire in various alloys.

Teledyne is active in the area of geophysics, providing instruments and services for seismology, oceanography, meteorology, pollution monitoring, rock and soil mechanics, and structural dynamics. One specialty is geophysical exploration on land and at sea to locate oil deposits for major oil companies. Teledyne also provides off-shore drilling services, as well as the fabrication and emplacement of off-shore oil production platforms.

Other miscellaneous industrial products and services include molded rubber products other than tires for the automotive industry, as well as solid rubber tires for materials handling equipment. In the nuclear field, Teledyne provides instruments and services for the detection, monitoring and analysis of radioactive materials, and thermoelectric generators for space and terrestrial use.

Aviation and Electronics

Teledyne is a leading producer of piston engines for the general aviation industry. In addition the company manufactures small turbojet engines for use in manned and unmanned aircraft, and in recently-developed turbojet-powered missiles.

The company designs and manufactures unmanned remotely piloted aircraft which are widely used as military target systems and in aerial surveillance, and provides support services for these products.

A broad range of products is made for commercial, military and general aviation aircraft. Among these are batteries, avionic devices and instrumentation, hydraulic fittings and hydraulic and pneumatic actuating systems, explosive-energy actuating devices and emergency aircraft escape systems.

Electronic activities include the manufacture of solid-state semiconductor components ranging from individual semiconductor integrated circuits through larger micro-electronic assemblies which may encompass the complete functions of a micro- or mini-computer. Other electronic components include traveling wave tubes and amplifiers, related microwave components, wire, cable harnesses and hardware.

Electronic systems for navigation, guidance, control, reconnaissance, information processing, electronic counter measures, computing, automation, monitoring, communications, radiolocation and telemetry are also designed and manufactured by Teledyne.

Specialty Metals

Teledyne produces specialty metal alloys that have precise metallurgical properties for use in various critical applications. Among these are zirconium and hafnium for use in the nuclear power generating industry. Zirconium is also used as the active agent in photographic flash bulbs and in corrosion resistant applications in the chemical industry.

Teledyne produces tantalum for use in the manufacture of electrical capacitors, and columbium for various aerospace applications. Molybdenum and vanadium are widely used as alloying ingredients in various types of high quality steel.

Titanium is produced as ingot, billet, bar and coil and finds widespread use in the aerospace industry where its strength and light weight are important.

Teledyne is also a specialist in the development and production of high speed and alloy steels for tools, dies, bearings, gears and specialized aerospace hardware.

Double vacuum-melted superalloys are produced for applications where high strength at high temperatures is required. The major use of these alloys is in aircraft jet turbine blades and related parts.

Sintered carbides of tungsten and other metals are produced for use in cutting tools, dies and wear-resistant surfaces in metal-working, mining and other industries.

In addition to producing metals, Teledyne also reduces various ferrous and non-ferrous alloys to finished forms, such as thin and ultrathin rolled metal strip, cold-finished bar and shafting, cold-drawn seamless and welded tubing, roll-formed shapes, forgings and castings.

Consumer and Other

Consumer product activities of Teledyne range from product development and manufacture to retailing and servicing.

Teledyne produces and markets the Water Pik* Oral Hygiene device and the Shower Massage by Water Pik, a shower head that can be adjusted to give a conventional or a pulsating spray of water. Under the name of Olson Electronics, Teledyne operates a chain of 80 stores in 15 states and a mail-order service for the retailing of electronic products to the consumer for home use. Teledyne Service Company has centers in 12 states for the servicing of electronic home entertainment products and appliances.

Other consumer activities include the manufacture of AR speakers by Teledyne Acoustic Research for sale in the domestic and international markets. Teledyne Laars manufactures swimming pool heaters and other equipment to heat buildings and supply hot water for commercial users.

Dental equipment, instruments and consumable products used by dentists, dental laboratories and dental schools are also manufactured and supplied by Teledyne.

Insurance and Finance

Argonaut Insurance Company and Teledyne's other casualty insurance companies write a broad line of insurance including workers' compensation, liability, automobile, homeowners, and fire insurance.

Unicoa Corporation, 92% owned by Teledyne, writes life and health and accident insurance. Fireside Thrift, a consumer finance company, operates in the states of California and Hawaii.

*Trademark

Summary of 1975 Operations by Quarter

(000's Omitted)

	Quarter Ended (See Note)			
	March 31, 1975	*June 30, 1975*	*September 30, 1975*	*December 31, 1975*
Consolidated sales	$462,569	$424,382	$409,013	$419,008
Consolidated provision for income taxes	18,100	15,400	24,700	27,100
Income of consolidated companies	$ 16,957	$ 14,372	$ 23,961	$ 27,329
Equity in net income of unconsolidated subsidiaries	4,408	8,518	2,430	3,731
Net income	$ 21,365	$ 22,890	$ 26,391	$ 31,060
Net income per share of common stock and common stock equivalents	$1.13	$1.27	$1.68	$2.01

NOTE: As discussed in Note 2 to the Consolidated Financial Statements, the Company, in 1975, changed its accounting for loss contingencies to comply with Statement of Financial Accounting Standards No. 5. The effect on the year ended December 31, 1975 was to increase income of consolidated companies by $538,000, increase equity in net income of unconsolidated subsidiaries by $645,000, and increase net income by $1,183,000, or $0.07 per share. The effect by quarter, reflected in the amounts shown above, is as follows:

	Quarter Ended			
	March 31, 1975	*June 30, 1975*	*September 30, 1975*	*December 31, 1975*
Increase (Decrease):				
Income of consolidated companies	$ (62)	$ 103	$ 300	$ 197
Equity in net income of unconsolidated subsidiaries	496	(1,598)	958	789
Net income	$ 434	$(1,495)	$1,258	$ 986
Net income per share	$0.02	$ (0.08)	$ 0.07	$0.06

As discussed in Note 12 to the Consolidated Financial Statements, the Company has changed the formula used to determine the classification of interest expense. This had no effect on net income, but decreased income of consolidated companies and increased equity in net income of unconsolidated subsidiaries by $1,102,000 in the first quarter, $1,031,000 in the second quarter, $1,180,000 in the third quarter and $1,230,000 in the fourth quarter.

Stock Price and Dividend Summary

	1974				1975			
Quarters	*1st*	*2nd*	*3rd*	*4th*	*1st*	*2nd*	*3rd*	*4th*
Common Stock*								
High	13⅝	14⅝	14¼	10¾	14⅝	25½	24⅝	23⅝
Low	11½	10⅜	9½	7⅜	10	9½	17⅜	19⅜
Dividend		3% Stock Paid in April				3% Stock Paid in May		
Preferred Stock *$6 Cumulative Convertible Preferred Series*								
High	67½	68¼	59	55	57¼	58	62½	62
Low	63½	59	46¼	47	48¾	50	57¼	58
Dividend	$1.50	$1.50	$1.50	$1.50	$1.50	$1.50	$1.50	$1.50

**Prices have been adjusted for common stock dividends paid through May 26, 1975. Teledyne Common Stock and $6 Cumulative Convertible Preferred are listed on the New York and Pacific Coast Stock Exchanges.*

TELEDYNE, INC.

Board of Directors

HENRY E. SINGLETON, *Chairman and Chief Executive Officer, Teledyne, Inc.*

ROBERT C. JACKSON, *Honorary Chairman, Teledyne Ryan Aeronautical*

GEORGE KOZMETSKY, *Dean of the College of Business Administration of the University of Texas*

GEORGE A. ROBERTS, *President, Teledyne, Inc.*

ARTHUR ROCK, *Private Investor*

CLAUDE E. SHANNON, *Donner Professor of Science at Massachusetts Institute of Technology*

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First National City Bank

111 Wall Street

New York, New York 10015

TELEDYNE, INC.