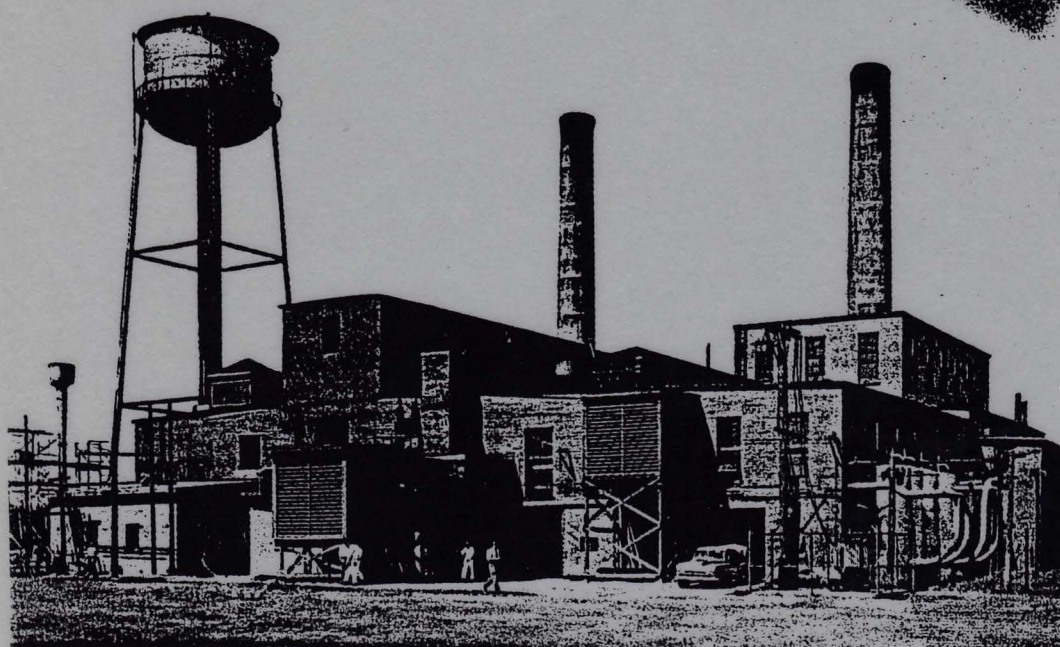
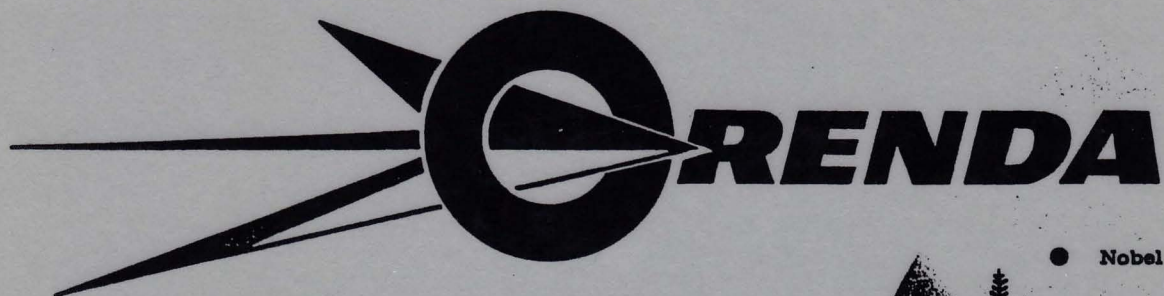


HISTORY OF THE



TEST ESTABLISHMENT AT NOBEL

John L. Armstrong



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***HISTORY OF THE
ORENDA TEST ESTABLISHMENT
AT NOBEL***

**John L. Armstrong
March, 1991**

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HISTORY OF THE OREND A TEST ESTABLISHMENT AT NOBEL
John L. Armstrong (1923-1996)

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Foreword

The History of the Nobel Test Establishment is not targeted for a wide distribution and readership. Its objectives are rather limited:

- to record and preserve the history of the Nobel Test Establishment in the West Parry Sound District Museum, the Parry Sound Library, the National Library of Canada and whatever other repositories we can interest;
- to rekindle and refresh the memories and pride of the many plant alumni who contributed to the development of the illustrious Chinook, Orenda and Iroquois engines;
- to provide an address list and career update of those surviving so that contacts can again be established and more personal memories shared; and
- to tell the story of the best years of our lives to our children and grandchildren.

Jack Thompson, then Editor of the Parry Sound North Star, suggested to me in the summer of 1987 that someone should write a history of the Orenda Test Establishment at Nobel. I was a bit slow picking up the challenge, but soon realized that it would be a race with the grim reaper.

Through the years I had found E. Roy Smith, formerly Maintenance Foreman at the Nobel plant, to be a storehouse of information, and also a moving target because of his many projects and causes. On the morning of September 14, 1989 we stopped for a chat on Pengally Road in the cottage subdivision which he had developed in the 50s. "Roy, when are we going to sit you down in front of a tape recorder and squeeze you for recollections on the plant?" "Next week for sure!" That night he died of a massive heart attack while collecting artifacts for the West Parry Sound District Museum.

The principal component of the Appendix is Orenda Report B20-56 which describes the formal history, facilities, test rigs and immediate prospects of the Nobel Test Establishment in October 1956. I prepared this report with much support from Phil Ross-Ross and Bill Kretschmer of the aerodynamics and combustion engineering offices, from John Otley's drafting office and from Malton photographic and publications services. It is not widely available, if indeed other copies still exist. What it covers in detail is treated only incidentally in the body of this history.

Another major component of the Appendix is a listing, as complete as we could make it, of all employees who worked at the plant during its thirteen years of operation, together with present addresses when available, and as much biographical information as could be obtained from the employees themselves or from others who could fill in the gaps. I am still most anxious to track down employees for whom I do not now have addresses, and to receive up-date addresses as our alumni relocate from time to time. Any help will be most welcome. I will endeavour to maintain an up-dated list and to provide addresses on request.

I am indebted to many Orenda Nobel alumni for refreshing my own fading memories and, in particular, for information and anecdotes on the earlier years before I appeared on the scene.

Last spring I mailed a preliminary draft and address list and have received a wealth of additional material and leads for tracking down other alumni. If I have not been able to use your particular anecdotes and photographs, I apologize. There was also some duplication, as is not surprising. Documentary material and photographs which you do not wish to have returned will be passed to the West Parry Sound District Museum, together with a descriptive listing and "source" acknowledgements, for cataloguing and preservation.

It is quite impractical to acknowledge in the Foreword all those who have contributed material for the text, and by comments on drafts have saved me the embarrassment of factual errors. Where I have not made direct reference to the contributor in the text, superscript reference numbers are keyed to a listing in the Appendix of contributors and sources.

I must particularly thank, however, Dennis Baskey, formerly Design Draftsman at Nobel and now the owner of Taurus Offset in Parry Sound, for preparing the half-tone masters of photographs and for their initial printing as his contribution to the history; Orenda Division, Hawker Siddeley Canada Inc. for permission to reprint Report B20-56 and to rework and recycle the cover of a subsequent publication as the cover of this history; Jack Hill, Phil Ross-Ross and Tom McCloghry for a final technical vetting; my wife and faithful helpmate, Ruth, and my nephew Chris Berry for editorial vetting and for valuable suggestions (informalities of expression are my own); and my daughter, Jane Peters, for preparing laser masters of the text.

I also acknowledge with gratitude my debt to Greig Stewart, author of "Shutting Down the National Dream", McGraw-Hill Ryerson Limited, Toronto, for the instances in which I have relied on his book for key dates, information and quotations to stitch the narrative together. His book is required reading for anyone interested in the broader story of A.V. Roe Canada Limited and of the people who made it all happen.

It has been a rewarding experience, renewing friendships with those who shared the Nobel years with us, and also establishing new friendships with those who were there at the beginning, before Ruth and I first knew and fell in love with Nobel and Georgian Bay.

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Prologue

The site of the Orenda Test Establishment at Nobel, and of the central complex of the WW I British Cordite and the WW II Defence Industries Limited plants before it, is again a wilderness.

But evidences remain. There are the concrete saddles which supported tanks of acid during the munitions years and, later, fuel tanks for the combustion development testing program. And there are the concrete structures of the new test cells which survived when Canadian Industries Limited, finally, regained control of the site after it was vacated by Orenda Engines Limited and by the two subsequent industries which shared the site.

Jim Brotchie, who had a way with words, was more prophetic than he knew when he wrote in 1951 for the short-lived AVRO Nobel "Outpost". He envisaged himself as an archaeologist in the distant future. The concrete saddles were positively identified: altars of worship for a primitive, warlike nation of Amazons who wore durable metal leggings (flame tubes) and amply proportioned hemispherical items of armour (nose cones) you know where.

Well, the Amazons we knew at Nobel in the A.V. Roe/Orenda days were not warlike, but what negative-thinker would have guessed? The plant where we worked together in the performance development of the Chinook, Orenda and Iroquois engines — in just a few years, reduced to an archaeological curiosity!

Antecedents

The Test Establishment was located at Nobel since the central facilities of the Defence Industries Limited munitions explosives plant — a power plant, electric power sub-station, cooling water supply, machine shop and office/laboratory building — were available after the war, and an admirable fit for the component development needs of the A.V. Roe Canada Limited Gas Turbine Division. British Cordite in WW I, and Defence Industries Limited in WW II, were located on this site as a logical expansion of the CXL/CIL operations across the road to the west.

But why, in the first instance, had CXL located in Nobel, or Ambo as the farming community which it displaced had been called?

A Canadian Industries Limited "Nobel History"⁷⁸, written in 1937, author unknown, states that "location was determined because of the close proximity to Northern Ontario mining districts and in anticipation of the construction of a Georgian Bay-Ottawa River canal."

There were proponents of a grander scheme, but whether it figured in the CXL choice of location is a good question.

In recent years we have heard much about the Grand Canal, a proposal to divert the water of rivers flowing north into James Bay to provide water for the water-parched mid-west of the U.S.A. The scheme is not new. Early in the century there were high hopes. Georgian Bay, Lake Huron and Lake Michigan were to be the principal reservoirs with the Ottawa and French Rivers serving as diversionary channels to direct the northern waters to Georgian Bay.¹ To quote again from the CIL Nobel History, "it is doubtful if our generation will ever see the completion of the canal".

Location on the Canadian Pacific Railway, with an already existing station at Ambo, would have been an attraction of the site, as was a source of industrial water from Simmes Lake, and later from the Parry Sound, a part of Georgian Bay. It was close enough to the town of Parry Sound, eight miles to the south, for availability of manpower and housing. Perhaps the most compelling consideration in location of an explosives plant was isolation.

An explosives plant is inherently hazardous, and to limit the extent of any possible disaster its operations are spread over a large area, with individual operations isolated both by bunkers and by distance. It is also protected by "powder limits", a radius intended to isolate any "blow" from adjacent residential or commercial development.

After the purchase, in an aura of secrecy, of some 5000 acres from the farmers of the area, CXL began construction in 1912 on the site between the CPR tracks and the shores of Parry Sound, and to the south of Simmes Lake.

To quote again from the Nobel History, "The old station on the CPR for the vicinity was known as Ambo but through the efforts of the local Member of Parliament it was fittingly changed to Nobel, in memory of Alfred Bernard Nobel, the founder of the high explosives industry."

(Nobel was the Swedish scientist who, in partial retribution for the wartime carnage which high explosives made possible, later established the Nobel Peace Prize.)

"The Works was originally designed for a small gelatin dynamite line.... Later in 1914 a cordite plant for the manufacture of size 8 cordite was constructed and in 1915 a gun-cotton unit was added.... As the World War continued, the demand for high explosives was far in excess of supply. A shrapnel loading plant was built and operated early in 1916, but a tragic fire and explosion in June of that year terminated the activities of this plant and these operations were transferred to Vaudrueuil, P.Q.

"At this time the Federal Government, realizing the ever-increasing necessity of getting military explosives, approached the private explosives plants with a view to building and manufacturing cordite at their desirable sites. As a result the British Cordite Limited plant was constructed and operated by CXL on its property at Nobel. It took nine months of furious activity to bring British Cordite Limited into being in August 1917, with a capacity production of 80,000 lbs of cordite per day.... Parry Sound was then known as a boom town, its population being supplemented by the four thousand employees at Nobel....

"British Cordite operated for three years through 1916, 1917 and 1918, and in March of 1918 a TNT plant was built to contribute to the insatiable demand for HE shells.... Due to the size and the expansion from the small 20,000 lbs per day of explosives in 1913 to the 80,000 lbs per day of cordite along with the TNT production, the management was divided. Mr. G. Oscar, with Mr. T.W. Smith as assistant, was in charge of the CXL Plant and Mr. E.E. Armstrong, with Mr. A.M. Chesney as assistant took over management of the British Cordite Works." Mr. Dave Thomas, Parry Sound area historian and brother of Art, Ernie and Earl who worked at Orenda Nobel, has a picture of Mr. Armstrong on horseback. This was how he managed to keep on top of a large and spread-out operation.

To resume the quotation from the Nobel History, "The Armistice in November 1918, was the beginning of the end for munitions production at Nobel. In January of 1919 activity was centred on the dismantling of this plant, the district's contribution to the Allies, and on bringing back production to the 20,000 lbs of gelatin dynamite per day."

The British Cordite plant site reverted to the natural state with only the stub base of the immense, natural draft smokestack of the hand-fired power plant remaining to mark the endeavour.

To quote again, "After two years of comparative inactivity the increased demand for mining explosives warranted the erection of a dynamite line, an idea hardly realized before it was terminated in 1922 by the depression in business and mining activity.... (This) terminated the operations at Nobel for five years.... In the autumn of 1926... the plant was put in shape for operation and in January 1927 the first powder was made.... Business was improving.... (But) within a period of a few months the District of Parry Sound had changed from wild activity to a quiet existence and finally complete relapse. As is still the case, the mines and mining interests were the barometers for estimates and production....

"In the beginning the town of Parry Sound was known as home to all of the employees, but soon a village was constructed and called the Lower Village. During the war era hastily built

camps were erected on the Company property, but most of the four thousand lived in Parry Sound. In 1917 the Upper or present Village was established and both sites were occupied until the Works shut-down in 1922. Shortly after the plant re-opened ten years ago (1927) the Lower Village was dismantled and the site is now grown over with brush and trees yielding sparse evidence of one-time habitation. The present village site of Nobel contains twenty-eight houses and a community club... in a setting which only the beautiful shores and surroundings of Georgian Bay can offer. Nobel Works has a personnel of 110, some living on CIL property, but the majority commute from Parry Sound — all in all, another happy gathering of the great CIL family."

Dave Thomas comments that the Lower Village, with houses for CXL managers on the shore of Parry Sound close to the more recent site of the CIL pump house, was removed because of concern about industrial residue flowing down Blair's Creek. Such was the sensitivity to environmental issues at that time. The Upper Village was established on land purchased from the Wilkinson family.²

Working at the Nobel cordite plant in WW I was no bed of roses. In the 1950's the gardener who tended the cenotaph park, between the old fire hall and the present Parry Sound Library, was Tom Hoddy who owned a greenhouse and also had a local reputation as a ventriloquist.³ In WW I, when he worked at Nobel, he already had one "peg leg", a result of some earlier accident. According to local lore, every morning and every evening, Mr. Hoddy on his wooden leg, with the other workers who resided in Parry Sound, would hike the eight miles to and from the plant through summer showers and winter snow drifts.

After 20 years of relative peace, war clouds were gathering again. This time Canada was not entirely unprepared. In 1938 Fraser Brace Construction Limited began construction of a new munitions explosives plant for a crown corporation, Defence Industries Limited (DIL), on the old site to the east of the highway. Planning, design and contracting would have begun earlier. The plant, using as a nucleus production and administration managers borrowed from the CIL plant across the road, was to manufacture nitroglycerine, TNT, guncotton, demolition slabs and primers, cordite for artillery propellant, and nitric and sulphuric acids.⁴

The plant had a peak payroll of about 4300.⁴ Employees came from all parts of Canada, but where did they all live? Parry Sound is a community which has had a relatively static population of 6000. During the War it undoubtedly managed to accommodate many more; Dennis Baskey's parents shared their home with two other families. There were several wartime housing developments in Parry Sound. For many years, CIL management had lived on the "square" in Nobel village. During the War the village was much expanded, again with "temporary" wartime housing; there was another similar development at the site of the present subdivision surrounding Armstrong Park opposite the Nobel Post Office.

Crawley McCracken, the catering organization, operated a two-storey dormitory and a cafeteria between the DIL plant and the school on the east side of the Old Nobel Road. The Malcolm Club, a recreation centre, was located between Old Nobel Road and Highway 69. Gregory & Greek, which for some years after the War had a food wholesale outlet in the building since converted to the Parry Sound Friendship Centre, ran a concession in the Malcolm Club. Behind the Nobel Club House in the village there were two more dormitories,

one for men and one for women. The dormitories provided accommodation for about 2000 men and women from the plant.⁵

And then there was "Back Road".

Back Road, also called the Old Nobel Road and now re-named Hammel Avenue, had been the original road from Parry Sound past the Nobel Plant to Carling Township. During the War, new employees who could not find accommodation elsewhere set up camps, interspersed with some very respectable homes, along Back Road using tents, and then shanties made from salvaged packing cases from the plant or whatever they could scrounge under conditions of restricted supply. Just temporary, of course, until something better turned up. Usually, nothing better DID turn up, and the temporary accommodations were improved and expanded to make life a little better. An informal water line was tapped into the water main to the plant, with stand pipes and valves kept open in the winter to prevent freezing. At the end of the war the owners sold for what they could get, and the purchasers were obviously not persons of great affluence. No evidence remains, but well into the 1950s much of Back Road, and to a lesser extent the highway between Portage Lake and the Nobel Public School, was something of an embarrassment to the community. But we digress.

Bill McDonald began work with Fraser Brace Construction in April 1939, starting as a blacksmith and progressing through head blacksmith, layout man, and finally night shift master mechanic. While he was a blacksmith he had been working killing hours of overtime. He was bending over the forge, blinking and shaking his head to keep his eyes open, when suddenly he realized the hot bed of coals was rising to meet his face. He caught himself just in time.⁴

Bill transferred to DIL in 1940 as a welder and subsequently became machinist, craftsman, and sheet metal lead hand. Roy Smith worked in the carpenter shop during the period 1940 to 1946.⁴ Jack Plowman, before he joined the RCAF in 1942 as a ground crew electrician, worked on the guncotton line operating wringers which extracted moisture from the guncotton. After this operation it was passed to the cordite line where toluene extracted more moisture before the guncotton was blended with acetone and nitroglycerine.⁵ Peter Johnston started at DIL in April 1941 on the blending and packing line, was transferred in October 1942 to the dehydration presses, and finally in the summer of 1943 to the power house.

Walt Smith joined DIL during the early 1940s, on crutches, later truncated below the elbows for greater ease of manipulation. It was in another machine shop that he'd been indulging in a little horse-play and was being chased by his victim. He grabbed the carriage wheel of a lathe to assist in a sharp, evasive turn but the wheel turned and threw him off balance. He fell back on his hip and pinched a nerve. He later told Bill McDonald that it was several years before he felt the first twitch in his leg. Fighter that he was, he refused to have his leg amputated at the hip as recommended by his surgeon and instead put himself in the hands of a chiropractor.⁴

It was not only Walt's gimpy leg which was incurable. He never gave up his love for a good practical joke. A favourite was his spark coil, salvaged from a Model T Ford. More than one hapless visitor to his office in the Nobel machine shop rose with alacrity from the proffered, hot-wired visitor's arm chair. A variation was his '34 Dodge. He would carefully park behind another car in Parry Sound so that the bumpers were touching, lower a grounding rod through

the floor, throw the switch on his never-fail coil and stand aside with a look of innocence to watch the armful of groceries thrown in the air when the victim tried to get into his car.⁵

Over 20 of the Orenda Nobel employees had worked for Fraser Brace, DIL, War Assets or all three. Many more were from DIL families with a memory of the anxieties which were a part of working at a wartime explosives plant.

Bill McDonald recalls several major accidents at DIL. On the night of November 18, 1940 Beryl Hammel, Bill's fiancée, was scheduled to tour the TNT line with other members of the office staff. Bill was living in Parry Sound at the time and had just gone to bed. It took him all of ten seconds to realize it was NOT the new brick chimney which had toppled over and tumbled down the roof directly over his head, but an explosion at the Nobel plant. He immediately phoned Beryl's house. Imagine his relief when she answered the phone herself! The tour had been rescheduled!⁴

Beryl then reminded Bill that her cousin, Gerald Hammel, who had been more like a big brother to her, was working overtime on a welding job on the TNT line. They had not had any reply to their queries. Beryl's father, Ed Hammel, was Master Mechanic at DIL and was off to the plant to investigate. They received word just after Bill arrived at the Hammel home.⁴

Gerald had been welding inside a large tank adjacent to a TNT building which had blown; the concussion killed him. His assistant, Mr. Pickles, survived for three days. Both TNT operators had escaped, but there was a third death. Bill Hall: "I was on shift on rifle cordite range 5 when the explosion took place. Three men died in the explosion, Hammel, Pickles and Totman. I recall digging in the dark with flashlights, through the debris, for hours trying to locate Totman. His body was not found till daylight the next day. It was well away from the explosion, in a swamp."

A word of explanation is required. The TNT blending was done in a building with walls bermed by embankments 18 feet thick at the base. The TNT buildings had roofs of very light structure, intended to rise and allow blast forces to be directed upwards. The buildings had escape chutes extending down and outwards through the berms. One operator was responsible for controlling the batching and mixing operation, and the second was responsible for monitoring mix temperature, with one hand on a valve which would admit water and drown the mix if the temperature rose too high. In this case, drowning was probably too long delayed, and the escaping operators had no time to warn Gerald and his assistant.⁴

A year or two later Bill and Walt Smith along with several others were on lunch break and sitting near the large, open north door of the machine shop. Directly in their line of sight was the loading ramp, across the CPR spur line, at the south end of #2 cordite line. Without warning it belched a huge volume of flame across the end of the carpenter shop.⁴ Jim Knight was Cordite Foreman on the line. Fifteen men were burned.⁶ "Incidents" were never announced officially; bad for morale.

Each cordite line was compartmented to minimize hazard. The operators were in concrete cells off to one side. Cordite had nitroglycerine and guncotton as its principal constituents, and was mixed and then pressed through dies in readiness for use as an artillery shell propellant. Each cell was supplied with nitro by an operator pushing a 500 pound capacity

hand cart along what was called the "Angel Walk". All shoes were grounded to eliminate sparking, and employees showered and changed their clothes before leaving the plant. Nitroglycerine fumes were invasive, and until the operators got used to the environment they would have acute headaches.⁴ One story has it that the "old sweats" would wipe a smear of nitro around their hatbands before leaving on vacation to maintain their immunity and avoid headaches on their return to work.

Another time, after Bill and Beryl were married and living next door to the Hammels, Bill was walking home with Frank Boggs, a sheet metal worker who lived across the road. They had just started down the highway when the whole roof of the TNT building nearest the road lifted two or three feet clear of the rest of the building. For a moment it seemed to be supported by thick, muddy, yellow smoke, and then settled back into place as though, except for the dirty cloud over it, nothing had happened. In this blow, there was no "BANG", just a soft swishing noise. By the time Bill got home, Beryl's mother had heard all about it. The two operators had barely enough warning to hit the escape chute. They landed running and never stopped until they were at the Hammel's back door, some 3/4 of a mile distant as a crow, or a thoroughly scared operator, flies. They were incoherent at first. What about the chain link plant fence with the barbed wire on top? "Plant fence? We never noticed any fence???"⁴

In another fatal accident, a duriron cone broke and flooded a worker's back with hot acid. Bill thinks that is about the sum of the major accidents at the DIL plant; better than the record in WW I when a major blow broke windows in Parry Sound. There was a warehouse in Depot Harbour, however, which was full of cordite awaiting shipment to Russia. It burned and lit up the sky for miles around.⁴

When there was no longer a need to guard England against invasion by the German armies, production of some of the explosives was sharply curtailed and DIL accepted a contract to salvage and re-work the TNT from 1.5 million land mines. After engineering had worked on the problem without success, Bill was asked if he could suggest a safe method for removing the top from the mine. He came up with a scheme and had the first prototype ready for trial within a week. Four more were produced, four lines were set up, and further contracts undertaken. There were no serious incidents even though some of the mines were received with the primers still in place. The machines were ultimately patented.⁴

The management at DIL:⁴

- Jake Malcolm — General Manager
- Harry Desbarats — Asst. General Manager
- Harold Brewer — Service Manager
- Dean Irwin — Production Manager (first)
- Ralph Collins — Production Manager (second)
- ? Scott — Production Manger (third, and later Ass't. Gen. Manager)
- John Shipley — TNT Superintendent
- R. Quigley — Guncotton Superintendent
- Barry Kale — Office Manager
- Ed J. Hammel — Master Mechanic
- Johnnie McGee — Sr. Supervisor for nitroglycerine production
- Dave Wanland — Foreman, Acid Production

Don Gallagher — Engineer, TNT
Frank Eckhardt — Carpenter Foreman

At the end of World War II, the plant, or at least those buildings where explosives were handled, was again blasted down to rubble. Walt Smith, who later became foreman of the Test Establishment shop, was responsible for setting off an explosive charge every few feet for the entire length of Guncotton Creek which passed through the plant, through the present Armstrong Park, and down to the Sound where it marked the eastern limits of the CIL property. Why blast? Explosives can remain a hazard for many years. Much better to set off any residues, in buildings or in Guncotton Creek, by controlled explosion than by accident at a later date.⁷

What could not be cleaned up were the acid spills, but more about that later.

Getting Started

After the end of hostilities, and after the surrounding explosives areas had been cleaned up, there remained the power plant, the shop, the office/laboratory building, the gatehouse, several storage buildings, and the two acid towers at the front of the property which survived until the early 1970s. Ernie Clifford believes these were all "Strategic Defence Facilities" which, in theory, could have been reactivated in minimum time if there were another national emergency.

The War Assets Disposal Corporation took over title to the facility, except for the land which remained in CIL ownership.⁸ CIL was to regain control of the site when it was no longer required for government purposes. The CIL supposition, naturally, had been that the company would regain occupancy, and re-expand their powder limits to the original boundary, just as soon as the wartime explosives operation could be wound down.

War Assets, however, hesitated to write off a still valuable facility. What is not generally known is that the story of Orenda Nobel very nearly had no beginning. Ron Page: "The Nobel site was... under consideration by the government when it was searching for a site for the then secret Atomic Energy Plant. The Nobel locality had all the prerequisites — lots of cold water for cooling the reactors, remote site, railway and highway access and an established living area for the employees. However, Chalk River was chosen because of the high flow of the Ottawa River compared to the limited circulation of Parry Sound. But Nobel did contribute by providing the apartments and war-time... houses. When Bette and I were posted to Chalk River we found all the houses that were missing from Nobel. Some of these still survive today. A few still have their characteristic looks, but many have been remodelled beyond recognition."

A.V. Roe had come into being on December 2, 1945,⁹ and in May 1946, it took over Turbo Research as the nucleus of a new Gas Turbine Division with Paul Dilworth as Chief Engineer.¹⁰ War Assets suggested to the Gas Turbine Division that the DIL power plant should be evaluated as the nucleus of a test facility.

An A.V. Roe delegation including Bert Marcoullier and Fred Tarnowetski visited the plant accompanied by a representative of War Assets. They were welcomed by Roy Smith, one of the last on-site employees of DIL, who had been transferred to War Assets payroll to complete the final phase of mothballing. There was immediate agreement that the plant would be ideal.¹¹ It was formally handed over to A.V. Roe in November, 1946¹² after an advance party had taken de facto possession early in the summer.

Arrangements were somewhat complex. The Crown retained title to the buildings and to any equipment transferred with the buildings. The terminus of a high voltage transmission line, from a hydro electric generating station at Ragged Rapids, was at transformers adjacent to the power plant, with switchgear and metering on the second floor. This sub-station provided power to the CIL pump-house as well as for Test Establishment operations.

The Crown bought and retained for A.V. Roe purposes two of the four 2300 gpm pumps in the CIL pumphouse. The CIL and Crown-owned pumps were to be maintained by CIL, which operated the pumphouse, and the pumps were to be used interchangeably depending on combined load. CIL was responsible for maintenance of the power lines to the pumphouse,

and also for the 30-inch water line up to a metering station close to, and to the east of, the tapered intersection between Back Road and Highway 69; A.V. Roe was responsible beyond that point. (The Back Road water line was connected to the A.V. Roe side of the meter.) The costs of pumphouse power, charged by Ontario Hydro to A.V. Roe, and of the maintenance and operating services by CIL, were allocated on a negotiated basis, a matter potentially of some heat as we shall disclose in due course.

The Central Mortgage and Housing Corporation retained title to 66 of the wartime housing units, built in Nobel village to the west of the tracks, which remained after many of the units had been moved to Deep River. The land in Nobel village on which these houses and apartments were built was owned by CIL, but leased to CMHC until April 1960. Some units were rented by CMHC to CIL employees, to the principal of the Nobel School, or to others in the community. A.V. Roe had right of first refusal on units as they became available, and by June 1958, 50 of the units were occupied by A.V. Roe families.^{13,14}

Now let's get back to people.

Ray Wilson started in the Mechanical Engineering Division, National Research Council, in September, 1938.¹⁷ In September 1943 Ken Tupper arranged for Ray Wilson, Bert Marcoullier and Ray Joyce to visit the U.K. to gain familiarity with jet engines, a new and still secret development in aircraft propulsion. Their trip was by Liberty bomber of the Ferry Command, leaving from St. Hubert field near Montreal; the only seating was on their duffel bags. They were met in England by Cars Crigger and Fred Tarnowetski who had come by sea on the Queen Mary, leaving from New York. (Russ Davis, Art Pearce, Norm Bickell, Ken Hedges, and Bruce Waters were others in the party but they did not subsequently join the A.V. Roe team.)^{15,16}

First stop was at the Rolls Royce production facility at Barnoldswick where they received their introduction to jet engines. Next stop was at Clitheroe, in northern England near the border of Scotland, where Rolls had a development facility with engine test cells, and here they had hands-on experience with the Rolls Royce B-23, an engine of the centrifugal type. Ray Wilson and Ray Joyce returned by boat from Liverpool on November 19, 1943. Others returned to Canada later.^{15,16}

In December 1943 Ray Wilson moved to the new NRC Cold Weather Test Station at Stevenson Field, Winnipeg.¹⁵ Ground had been broken for its construction on September 15, 1943, and it tested its first British engine on January 4, 1944, with Paul Dilworth in charge.¹⁰ It later became the nucleus for Turbo Research Limited, a crown corporation.

In 1944 Ray Joyce, Fred Tarnowetski, Cars Crigger and Norm Bickell returned to the U.K. At the Armstrong Siddeley plant in Coventry they had experience with the new ASX axial flow engine. During the Armstrong Siddeley plant shut-down, they visited the Lutterworth plant of Power Jets for training on the Whittle W2-700, another engine of the centrifugal type. The ASX was brought to Winnipeg for cold weather testing during the winter of 1944/45.¹⁶

Turbo Research Limited, which in turn became the nucleus of the Gas Turbine Division of A.V. Roe Canada Limited, was set up in August 1944¹⁸ with Ken Tupper, from NRC, as its Chief Engineer. The plant which Turbo Research took over in Leaside had produced 5-ton trucks for

the army during the War.¹⁹ Winnett Boyd was Chief Designer, and was responsible for several design studies including the TR4 and TR5, which later became the Chinook and Orenda engines. (TR stood for Turbo Research.) The Winnipeg Cold Weather Test Station became a part of the Turbo Research organization.¹⁵

Bert Marcoullier, Ray Joyce, Fred Tarnowetski and Norm Bickell were transferred to the Leaside plant in the spring of 1945. With Ray Joyce supervising, Fred and Norm repeatedly stripped and rebuilt a Rolls Royce B-23 engine, making sure that the most difficult bolts were always put back in, as a demonstration project to make neophyte engineers and draftsmen aware of the essential components of gas turbines and of the consequences of bad design.¹⁶

In the fall of 1945, Fred Tarnowetski and Norm Bickell returned to Winnipeg. One engine on cold weather test that season was a Rolls Royce B-37 centrifugal compressor engine of the straight-through flow type, a great improvement over the B-23 which was of the reverse flow type. A second engine on test was a Power Jets W2-700, similar in design to the B-23. A.V. Roe Canada Limited took over the Victory Aircraft plant at Malton in November 1945. In the spring of 1946 Paul Dilworth held a termination party at the Winnipeg Cold Weather Test Station. Bert Marcoullier, Ray Joyce, Ray Wilson, Cars Crigger and Fred Tarnowetski transferred to Malton with Paul Dilworth who had been appointed Chief Engineer of the A.V. Roe Gas Turbine Division, which came into being in May.¹⁶

Colin Finlayson had also been an employee of Turbo Research, as an engineer at the Leaside plant. In June 1946 he became the first Engineer in Charge at Nobel. The "Founding Fathers" on the A.V. Roe payroll at Nobel were Colin Finlayson, Bert Marcoullier, Ray Joyce, Ray Wilson, Cars Crigger and Fred Tarnowetski,^{15,16,20} although Arnold Hunt, and perhaps also Don Carson, continued in their positions as stationary engineers in the power plant through the DIL and War Assets periods and "came with the property" in November. Later in the summer they were joined by Art Rider and Walt Smith, both hired locally.¹⁶

Things were a little slow that first summer, since the plant was not formally transferred from War Assets until November. It was Bert Marcoullier's idea that some healthful exercise cutting a winter's supply of wood for their apartments would be good for morale.²⁰ Colin Finlayson: "Consultations... led us to a stand of hard maple not too far from Nobel village. We struck a deal with the owner; we were responsible for felling the trees, cutting them into 4 foot lengths, and having the wood trucked to our residences in the village. So each afternoon at 5 p.m. we sortied forth with our lunches, and with axes, saws and wedges drawn from stores, courtesy Walt Smith.... It became immediately obvious that we had the toughest, burliest maple going.... Later in the fall an enterprising 'local' appeared with a gasoline driven firewood saw, and some of us swallowed our pride and gladly paid to have the stuff reduced to 12 inch lengths."

Paul Nielsen transferred from Malton in October as draftsman, and Don Gordon in November as lab assistant. Bill McDonald's income tax returns for 1946 show that he worked two months for DIL, six and a half months for War Assets, three months for CIL and two weeks for A.V. Roe, in that order.⁴ Roy Smith joined A.V. Roe about the same time, but he had the distinction of receiving salary from both War Assets and A.V. Roe for a short overlapping period.¹¹ Ed Leroux also joined the staff in 1946 as storesman.

Colin Finlayson recalls with embarrassment that, as new boy in charge of Nobel, when it came time to order coal from Britt to restock the power house bunkers, he made the slight error of ordering delivery in side-discharge rather than in bottom-hopper cars. "For some time after the coal was delivered I was not regarded too favourably by those who had to shovel it into the chute between the rails!"

Art Sutton was hired by Doug Knowles at Turbo Research in June 1945 to head up a compressor test design team. The intention at that time was to test on site using an electric drive. A number of options went through preliminary design and costing: a Ward-Leonard system (AC motor driving a DC generator supplying variable voltage power to a DC motor), a Hewittic mercury arc rectifier system (variable DC voltage to DC motor), and many more. Art became quite disenchanted, since there was obviously no money available, and he left on the day in May 1946 when, coincidentally, Turbo Research was taken over by A.V. Roe Canada Ltd.²¹

Art Sutton had recruited George Best in April 1945 as an electrical engineer straight out of the University of British Columbia.²¹ At the same time Shad Williams was recruited from the University of Saskatchewan, and Axel Kielland from McGill University.

On his way east George Best had a brief stop at the Cold Weather Station in Winnipeg; Paul Dilworth was still in charge there. After a month at Leaside while travel arrangements were being made, George, Shad Williams and Axel Kielland left for England in the company of three others, Robert Lecavalier, Ed Crowther and Lou Scheffel, who did not later join the A.V. Roe team. Their main base was at Lutterworth where the first Power Jets plant had been. They had a three or four week basic course there on gas turbines. They also had hands-on work on an old Whittle W2-700 engine in a shed which had served initially as a test cell.¹⁹ George Anderson, still with the RCAF, was at Lutterworth at the same time.²²

They then commuted to the new Power Jets plant at Whetstone, some 5 miles south of Leicester. (Whetstone later became the National Gas Turbine Establishment.) George Best was assigned to the Compressor Test Department where he worked with Harry Gibson, who would later come to Canada and join A.V. Roe in about 1949. Shad Williams and Axel Kielland were assigned to the Combustion Department. Power Jets did its own combustion design and development and did not use a Lucas system.¹⁹

George Best returned to Canada in July 1946 and was by this time an employee of A.V. Roe, which had taken over Turbo Research. The plan now was to do major component testing in the DIL power house, in process of being taken over by War Assets, and to use the Worthington-Moore steam turbine, formerly used for electric power generation, as the drive for a compressor test rig. Arrangements were made to rip out six of the low pressure boilers to clear space for other testing.¹⁹

Since the DIL power house was within the CIL powder limits there were no close neighbours, and it was an excellent fit for noisy component testing. A jet engine is a thirsty device which burns kerosene or other petroleum distillates to produce power in the form of thrust. The 6700 pound thrust of the Orenda engine was roughly the equivalent of 6700 horsepower and indeed, in the post-1959 era, with the addition of a power turbine, industrial variants powered gas pipeline compressors in high horsepower applications. What may not be generally realized is

that roughly two-thirds of the power potentially available in the high pressure exhaust from the combustion chambers is recirculated; it is extracted by the turbine which drives the compressor. Similarly, if a complete combustion system were to be tested under conditions equivalent to sea-level at full thrust, some 13,400 horsepower, in the case of the Orenda, would be required to drive the compressors supplying compressed air.

The Nobel plant had available a steam turbine, used for power generation during the DIL years, which could be over-rated to produce, under certain circumstances, up to 6500 horsepower for the drive of test compressors. It had boilers appropriate to the requirements of the steam turbine. It had a bank of Ingersoll-Rand reciprocating compressors which, with some up-grading of equipment, could produce 15 pounds per second of air at 110 pounds per square inch pressure. And it had a supply of up to 9200 imperial gallons per minute of water, less the operating requirements of CIL. (For a complete description of facilities, see Report B20-56 in the Appendix D.)

Even this prodigy of power required careful use and compromises, such as the testing of compressors under conditions simulating moderately high altitude, and the testing of only a single Orenda combustion can (one of six) under conditions simulating a fairly low altitude.

Shad Williams and Axel Kielland, steeped in the art of combustion system design and development, returned to Canada, starting at Malton in early December 1946²³, and shared with George Best responsibility for designing modifications necessary to convert the DIL plant to a test facility. There were frequent trips to Nobel for information. The CPR line through Parry Sound was very busy in those days, as was particularly evident in Spence Lodge which was right under the Seguin River trestle.¹⁹

George, Shad and Axel provided engineering supervision for modifications to the plant after it was turned over to A.V. Roe, and in April 1947 they relocated to Nobel. By that time six of the boilers, those which had produced low pressure steam for heating and other purposes in the DIL era, had been removed on contract, but the concrete work for the test cells, which were to occupy the cleared space, was done under their supervision after the transfer.²³

The low-pressure Vickers-Keeler boilers were sold for re-installation. One was purchased by the University of Toronto for \$50,000. Not bad, since the boiler was in quite good shape, the price was favourable in comparison with that of a new boiler of similar specification in the post-War period, and it could be operational within six months. The waiting period for a new boiler would be two years. Also not a bad deal for War Assets. Reg Jones later showed Ernie Clifford an invoice he had found. The boiler had originally cost \$11,500 installed. During the war a number of boilers had been manufactured by Canadian Vickers Ltd. in Montreal. They all had a steam rating of 12,800 pounds per hour. They were available in several design pressure ratings, but in the interests of economy and rapid delivery they were otherwise identical. They were installed in all the wartime explosives plants, at Nobel, Beloeil, Valleyfield, Ajax and probably also in Alberta.²⁴

After a few weeks of temporary accommodations, George Best, Shad Williams and Axel Kielland became the first residents of Staff House, a four-apartment block at 153 Sandhurst Road which was a feature of Nobel village life until 1954.¹⁹

While some of the testing could not wait, much of the work in the Finlayson era was in preparation for the intensive testing which was ahead. Colin Finlayson: "War Assets had to find buyers for material not required by A.V. Roe. Included was a quantity of underground piping for which a Montreal firm was the successful bidder. The contractor moved a back hoe and a bulldozer onto the premises, and was to fill in all the ditches following removal of the piping. Late on Friday afternoon Walt Smith came to advise me that the contractor had not filled in the ditches and was about to remove the power equipment. So I ordered the main gate locked for the weekend. Shortly thereafter, a local carter hired by the contractor appeared and pleaded with me to let him, his cart and team of horses out; there was no hay or feed for his horses. So I ordered the gate unlocked just long enough for him to exit. The contractor returned the following Monday and filled in the ditches under Walt's supervision.

"The Worthington-Moore steam turbine had not been run for some time, so an internal inspection was in order. The top casing was removed, the inspection was completed, and the turbine was re-assembled. Malton then decided it would be prudent to have a W-M field service representative look things over before we turned on the steam. The rep's only comment was that the oil feed and drain pipes for the exhaust end bearing were reversed. Walt Smith argued that the lines were correctly connected, but the rep was obdurate, so I advised him that if anything went wrong we would hold the company fully responsible for damage. The steam was turned on, and a few seconds after the rpm built up, there was a trickle of babbit from the exhaust-end bearing... The company reimbursed A.V. Roe for the full cost."

Nobel lost three of the founding fathers to Malton in 1947. Bert Marcoullier left to become Superintendent of the Development Shop, Ray Joyce was in charge of assembling the first Chinook engine and, later, Fred Tarnowetski set up the first test cell at Malton and did the first testing of the Chinook engine on March 17, 1948.¹⁶

When Fred left in the fall of 1947, the establishment had expanded to include, in addition to those mentioned above, Jack Plowman, fitter-tester; John Woolacott, welder; Art Pollard, sheet metal mechanic; Harry Oldfield, toolmaker; Floyd Godfrey, millwright; Rolly Bernier, pipe fitter; Hector Smith, storesman; Johnny Wilbur, in charge of administration; Cora Robertson, clerk in the combustion office; John (Mac) MacLean, in charge of the power plant; Charlie Poytress, operating engineer; Nick Walwaski and John Wainwright, guards; and Mr. and Mrs. Bill Scriver who operated Staff House.¹⁶

Colin Finlayson left Nobel for the Air Transport Board in Ottawa on December 27, 1947 and Art Sutton became the new Engineer in Charge in January 1948.^{20,31}

The Early Years

Doug Knowles hired Art Sutton the first time in June 1945, for Turbo Research. He hired him a second time as a replacement for Colin Finlayson at the Test Establishment. When Art arrived on the scene the organization had Plant Engineering and various other supporting pieces reporting directly to Malton. Art had been plant engineer at John Inglis, in charge of a more modern power plant than the one at Nobel, and he had the organization changed to a single authority.²¹

The wheel turns. Just before John Armstrong took over as EIC in October 1953 it was decided that the total expense of Nobel, as a single item in the accounts, looked pretty staggering, principally because of the energy and support costs of satisfying the Test Establishment's appetite for power. A tempting target for the budget cutters? Better split up the organization to distribute and hide the costs! So once again plant engineering functions reported to Stan Cyma, Chief Plant Engineer in Malton, plant security reported to the Chief of Plant Protection Corps, etc. etc. — but everyone knew what he was there for, and the system worked quite well.

The early years at the A.V. Roe Nobel Test Establishment were a time of improvisation, of scrambling to get the first rough cut at component performance data in support of tight schedules on the engine programs. The TR4, re-named Chinook, ran for the first time on March 17, 1948. The first run of TR5, the Orenda, was on February 10, 1949.¹⁰

In early 1947 work was in progress on removal of six low-pressure boilers, followed by construction of five test cells along the north side of the cleared space. An additional 500 horsepower Ingersoll-Rand compressor was installed to raise total output to the 15 pounds per second required for the testing of Orenda components. Receiver capacity was added to dampen out fluctuations in compressed air delivery pressure.¹⁹

George Best, Shad Williams and Axel Kielland, when they first arrived at Nobel, were to provide engineering supervision on construction of the test cells, and to prepare for installation of the test rigs for which they were allocated. In the meantime, test results were urgently required for the Chinook engine program to answer the question "Will it run?"¹⁹

Several test rigs were installed on a lash-up basis, with air delivered from the Ingersoll-Rand (IR) compressors and exhausting through windows on the south wall of the IR compressor bay. They allowed initial testing to be done on the diffuser, combustor and turbine inlet duct, and also basic data to be generated on compressor and turbine blading. At the same time the Chinook compressor was tested using the Worthington-Moore steam turbine as its drive.¹⁹

One of the early rigs was a combustion rig with throttled entry; it exhausted to atmosphere. The brass from Malton, naturally, had to witness the first light-up. It refused to light. Extraordinary measures required. A red-faced Shad Williams obliged by poking a flaming, oil-soaked rag on a stick up the muzzle end!⁴

Axel Kielland and Shad Williams were initially on parallel projects. Axel was working on development of the Lucas fuel atomizing system for which the Chinook and Orenda had been

designed, and Shad was working on a back-up, vaporizing system. After Axel left in 1950 Shad continued as combustion supervisor.²⁶

Shad was an enthusiast in all things. Bill and Fran Allen had an upstairs apartment across the hall from the Williams. One night at 2 a.m., Bill heard a banging on the door. It was Shad. He'd just thought of a solution to a tricky problem in the combustion system. Bill sketched while Shad directed, so that the design concept would not be lost in the mist of vanishing dreams.²⁷

Ultimately the vaporizing system was abandoned, although the experience later became applicable to the Iroquois. The Orenda always had a pressure atomization fuel system. Lucas in the U.K. provided the initial design of the fuel and combustion systems, but showed no great enthusiasm for the development support which was inevitably required. Lucas was phased out of combustion system design, and the Orenda Series 11, 12, 13 and 14 engines had combustion systems developed entirely in Canada.²⁸

Objectives of the combustion development program, interrelated with development of the flow control unit which had service problems, were to improve altitude relight levels, broaden the stability of the combustion process, reduce pressure loss, improve the turbine inlet temperature profile, reduce carbon deposits and, using Thermindex paint and thermocouples, reduce temperature gradients.²⁶

When Don Morrison first came to Nobel as a combustion engineer in October 1948 (he was a mechanical engineering graduate of Queen's University in the veterans' class of Science 48-1/2) it was an early morning arrival at the Nobel CPR station. The station master was there and offered Don conversation and a cup of coffee until the plant opened. Nick Walwaski was the security guard at the gate when Don first entered the plant.²⁶

The test cells were still not completed although the concrete was in place. The cascade rig was being installed in its new location in Bay 4, but the high pressure combustion rig was not in, nor was the atmospheric combustion rig. The Sheldon blower, required as an air supply for the atmospheric rig, was not installed, and an electric air preheater was still required.²⁶

Commissioning the Sheldon blower required the resolution of alignment problems; it was driven by a steam turbine. But the atmospheric rig was probably the first one to be brought into service in the test cells. The high pressure combustion rig was probably the second. It was originally in Bay 1, but was moved to Bay 3. A later installation during the Orenda era was the altitude combustion rig, which exhausted to a vertically-mounted steam ejector. Extra tankage for combustion test fuel was added in 1952.²⁶

All combustion rigs were similar in this sense. There was provision for control and measurement of upstream conditions, and of the fuel supplied to the specimen on test, and there was also a downstream traverser for the measurement of total pressure and total temperature. It was possible to extract samples of combustion gas for analysis in the laboratory to determine combustion efficiency.

John Armstrong was equipment engineer on his first hitch at Nobel, and remembers Dan Kingston grumbling mightily about the heat around the high pressure rig. Surely he was

exaggerating! But a thermometer suspended at head height, where Dan stood to operate the outlet traverser, read 240°F! A water jacket on the traverser casing got immediate priority.

When Jack Hill started as a new graduate in April 1949 — after working at Malton the summer of 1948 as a student — he decided he had joined the right company. He told Winn Boyd, who had hired him, that he would like a week off without pay in several weeks time to get married. "Getting married? That's good for a week off, with pay. Company policy!"²⁸

Mark Rooney remembers arriving at Nobel, after an earlier hitch in Test Equipment Design, in the summer of 1952, at the same time as a new casing for the high pressure combustion rig. The casing had been designed in Malton by Pete Peterson. It held the combustion can more safely, and provided additional heat protection for the fitter-tester.²⁹

George Best, as Aero Test Engineering Supervisor, was initially responsible for the two aerodynamic test centrelines in the Ingersoll-Rand compressor bay. One was the diffuser rig on which a great deal of work was required in optimizing the contours of the diffusers. These shaped the airflow between the compressor delivery annulus and the circular entries to the combustion chambers so that the combustion cans, in turn, could provide a reasonable temperature profile at turbine entry.¹⁹

The original, fixed incidence cascade rig was installed on the second centreline. It tested in a static array a single stage of compressor or turbine blading.¹⁹ This was the first rig to which Jack Plowman was assigned when he joined A.V. Roe as a fitter-tester early in 1947.⁵ Don Gordon, who had been a draftsman in Malton, did some of the early blade set-up on this rig.¹⁹

When Bob Reed was posted to Nobel in May 1948, his first assignments were on the diffuser rig and on the fixed incidence cascade rig. Bob recalls that on the first cascade rig they "did manual traverses across the outlet airstream of the cascade rig, and manually recorded pitot and static pressures and exit angles at predetermined increments across three or four blades, and for a variety of Mach numbers. Then back to the office to reduce the readings to non-dimensional parameters, and a quick report to Malton so they could dream up the next variation. The air was provided by the Ingersoll-Rand compressors. It was noisy with the thumping of the compressors and the scream of the air through the cascade, and it was a hot summer — a good and proper introduction to gas turbine component testing in the late 1940s."³⁰

The new variable incidence cascade wind tunnel, when it was installed in the newly-commissioned test cells, was a great improvement on the original fixed incidence cascade rig which had itself generated much useful data.

Bob Reed: "I was given the variable incidence cascade test rig in which the aerofoils were mounted in holders and installed on a turntable at the end of a wind tunnel. Traversing could be actuated from the control room and data recording was automatic on a rotary plotter with selsyn driven coloured pens recording the variations in pitot pressure and exit angle as the sensors moved behind the blades. This was much faster, quieter and cooler than the original rig. An impressive jump in technology — at least from the operator's viewpoint — thanks to the instrumentation designed by George Kelk at Malton. Jack Plowman and I think Johnny Schneider worked with me on that rig.

"Malton thought it would be more precise and cheaper to use cast aerofoils for the cascade. The material chosen was plastic. And indeed, the first to arrive were a beautiful robin's-egg blue. They were very smooth and shiny and looked perfect. However, as we were initiating the loading conditions during the first test, I went out into the cell with Jack to view the condition of these beauties, and as I was peering upstream and signalling back to the control room to increase airflow — BAM — the whole plastic cascade shattered. Jack and I were lucky not to have received a faceful of high speed plastic shrapnel. Needless to say, this method of cascade manufacture was abandoned."³⁰

Bob Reed was followed on the cascade rig by Keith Hilditch who was in turn followed by Dick Joy. Dick: "We put out about five cascade test reports each week and these were produced on an assembly line basis directed by Gord Jennings. The traversing behind the cascade was done automatically with a rig that was a marvel of efficiency for its day. Traces of total pressure and angle were recorded on large circular charts, and areas under the traces were recorded by planimeters built into the recording gear. The data was written down on data sheets which were numbered like an 80 column IBM card so cards could be key punched directly from the sheets for processing on an early IBM machine. This was very advanced procedure for 1950. Although the big circular charts were not easily reproduced I did make fair copies and sent them to Clare Eatock and Charlie Miller in Malton. Before sending them I traced out a blade section on each chart to show the blade in proper relation to the blade wake."³¹

Another aerodynamic rig installed in the test cells was the probe rig which served a very basic and essential purpose in the development and calibration of a variety of aerodynamic and thermodynamic probes. It remained largely unchanged through to the end of the Iroquois era, but this rig centreline was periodically called into service for other aerodynamic tests. Dick Joy: "I believe that I calibrated most of the air meters at Nobel using a choked nozzle ... I also directed the aero test of the F-86 1/7 scale inlets, and the Orenda burner inlet diffusers."

George Best's major test rig responsibility at Nobel was the compressor test rig, later called CTR1.¹⁹ Ray Wilson's first assignment had been re-commissioning the Worthington-Moore turbine which had driven a generator, initially the sole power source at DIL and later maintained as a back-up.¹⁵

Alignment problems were a real headache when the compressor test unit was first installed. There were several bearing failures. These failures produced ominous rumbling and shaking as the rig coasted to a stop. There was a flexible coupling between the turbine and the compressor, but the problems were internal in the compressor and due to unequal heating of the compressor support structure components by steam and hot air currents from the turbine.¹⁹ Bill McDonald was assigned to work on the alignment of this rig. He returned to the shop when Art Rider became Test Foreman and took over the project.⁴ These problems were ultimately solved both by re-design and by localized cooling.¹⁹

The initial installation of the compressor test rig was "on the cheap". There was an intake filter house sitting on the roof over the Ingersoll-Rand compressor bay against the turbine bay wall. A vertical, reinforced plywood duct brought the intake air down to compressor intake. The rig relied on calibrated screens for airflow measurement, but these rapidly became dirty and changed their calibration. Compressor surge loosened the joints in the plywood inlet duct.

Another problem was that the inlet valve tended to seize up when the compressor inlet pressure was reduced.¹⁹

Compressor development testing has two principal performance objectives. One is to improve performance and efficiency under design operating conditions. The second, to provide for rapid engine acceleration from idle, requires testing at various rotational speeds with exit pressure progressively increased until the compressor surges. (Caused by blade stall; rapid-fire WHOOMP! WHOOMP! WHOOMP!) This series of tests defines the surge limits of the compressor. If, as may happen in a "first cut" compressor design, its surge line sags below linearity in the intermediate speed range, under conditions of rapid acceleration, the back pressure across the turbine may be higher than the surge limits of the compressor, and the engine will not accelerate properly. Compressor surge testing requires intake ducting which can withstand rather brutal operating conditions.

A further problem with the initial installation was that under winter testing conditions the compressor sucked snow off the power house roof. The snow then plugged the intake filter and caused it to collapse and be ingested by the compressor, with regrettable consequences.¹⁹

And then there was the manometer system, another victim of initial economies. The control room wall was lined with manometers for defining the flow and pressure characteristics of the compressor. For a cost one tenth that of a Meriam manometer, a respected standard in the industry, a home-grown substitute could be built. The vertical glass tubes were backed by graph paper so that the height of mercury could be recorded. They were connected to mercury reservoirs by standard rubber tubing. The reservoirs were fabricated using soft solder for the joints. After several months the tubing had deteriorated enough that it blew. The mercury ate through the soft solder and the reservoirs came apart. George Best recalls Bob Reed being caught in a real shower bath of mercury. Commercial manometers were found to be cheaper in the long run, and infinitely preferable.¹⁹

Bob Reed records his impressions of CTR1 shortly after he started at Nobel in May 1948: "It was so heavily instrumented we all had to pitch in to get the readings when it was running. George would set up the test conditions and signal us all to read, hopefully simultaneously, about twenty readings each on hundreds of manometer tubes, most of which contained a bouncing mercury column whose bounce became increasingly erratic as conditions approached the stall (or surge) point. I can still remember missing a couple of readings when I experienced my first compressor stall. I thought the whole power house had blown up and I was in the centre. I had previously experienced Luftwaffe air raids, V1 flying bombs and V2 rockets, but nothing as immediate as that first stall on CTR1.

"Another fright came when we were testing during a storm. We were waiting to take readings when there was a terrific, sudden noise and a greenish-yellow smoke drifted down from the end wall. Lightning had... evaporated the 1½" x ⅛" copper grounding strip running down the end wall on the inside."³⁰ George Best adds that "It jumped from the incoming bus on top of the switchboard to a grounding strap on the wall, vaporizing enough copper to coat the nearby window. Minimal damage, however — one scraped shin and some ringing in the ears of a fitter-tester."¹⁹

Dick Joy, straight from graduation at MIT when he started at Nobel in June 1949, had as a first assignment the design of a steam ejector for withdrawing air from the 2nd and 5th stage bleed manifolds of the Orenda compressor. (On the engine, these bleeds were used for cabin pressurization and the like. Since the compressors had to be tested under sub-atmospheric inlet conditions to limit horsepower to that available from the turbine, "bleed" had to be sucked, not blown.) On the first run, he was sick with disappointment. The ejector used too much steam and it did not provide the required vacuum. A kindly stationary engineer decided there was too much pressure drop in the steam line to the ejector, and doubled the steam supply lines to provide the steam pressure for which the ejector had been designed. It then worked quite well. Dick was later responsible for CTR1, beginning in early 1951.³¹

Ernie Clifford recalls that during this period, a maximum power run on CTR1 consumed all the steam the high pressure boilers could produce, and it required in total about 25 personnel including engineers, observers, fitter-testers and operating engineers.²⁴

When Tom McCloghry started his first hitch at Nobel in May 1949, CTR1 was still in close to its original configuration. "During a test run we might be standing on a ladder ten feet off the floor, slide rule in hand, watching the meniscus of several manometer fluids achieve a predetermined value as the air outlet valve of the test rig was gradually closed. At the appropriate point several technicians would read the manometers assigned to them, provided one could get their attention.

"This was all very routine when the noise emanating from the rig ten feet away was reasonably constant. But there was always 'What's that?' when the tone changed. I'd look at George Best and George would look at me. We'd both look at the technician responsible for the constant visual inspection of the oil returning from the bearings. He'd give thumbs-up, but holding a screwdriver against the rig and with an ear to the screwdriver, we'd listen to the bearings. With all O.K. we'd proceed. The technique was quickly improved with speed and accuracy in mind — get it over with before something happens!

"Improvements were made. Instead of a hand-held tachometer at the end of the turbine shaft for speed measurement, we attached a stroboscopic lamp and disc. It was still difficult for Cliff Ferris to maintain a constant speed using the 24" diameter handwheel on the 10" admission valve to the steam chest. At higher speeds it was much easier since the Woodward governor took over, and speed was re-set using a 1.5" diameter knob.

"Increasing speed and increasing the pressure ratio across the compressor caused a load increase, and therefore increased the demand on the power house boilers, coal fired at the time. If the steam pressure from the required number of boilers was not adequate, we lost power and speed. This could happen when there was too much ice in the coal! It then took perhaps an hour to get back to where we were. It is a great credit to Reg Jones and his crew that they anticipated and could generally meet the demand.

"The manometer system was home-made, crude but adequate until all the leaks started to appear. It was not long before commercial manometers were acquired, and with them we used water, Meriam #3 (a cherry coloured liquid), and mercury for the various pressure measurements. Specific gravities were nominally 1.0, 2.95 and 13.59 respectively. Most manometer wells were pressurized from another source on the compressor which was

accurately measured by separate means. All this was a bid for accuracy, as was the cleaning of the manometers and their fluids on a regular basis.

"The inlet duct was crude. We measured the pressure drop across a screen of known open area and used Bernoulli's theorem in calculating mass flow. This figure was compared with one deduced from rpm and torque measurements using a 100-inch beam to impress a force onto a scale one might find in a butcher's shop! The beam was attached to the casing of the compressor test unit which was allowed to rotate within fixed limits. The length of the arm was known accurately, but the figure on the dial face of the scale could only be an approximation due to the frictional forces at the rollers.

"Leakage from the radial seals at compressor outlet made the test area quite warm in the summer. The outlet valve was an annular affair which directed air to an exhaust plenum. It worked with a chain drive to four acme lead screws — all very effective when the chain was motor driven and the motor worked.

"Now you can imagine the situation when the compressor test unit was brought to the surge point and withdrawn: heat, noise, people up on ladders laughing and thinking 'Gotcha!', the stationary engineer trying to maintain turbine speed, and a manometer spewing its fluid in all directions because a connection had come loose! All this while the technicians read the instantaneous values and ducked into an adjoining room to write down their data."³²

At the end of 1950, George Best was posted to Malton as Supervisor, Test Equipment Design and Instrumentation, and was able to introduce many needed modifications. Colin Campbell, before coming to Nobel, had been in Test Equipment Design, first under Harry Gibson and then under George Best. He designed the new CTR1 intake system which sat on stilts, and was attached to the west power house wall. Colin: "The air inlet house was largely of wood construction and contained a large area of screen and napped fabric, which together functioned as a bird screen and coarse particulate filter." The aluminum inlet ducting, with a bell-mouth measuring venturi entry, ran from the filter house and overhead above the row of Ingersoll-Rand compressors to provide an axial entry to the compressor.³³

Tom McCloghry describes this phase in the life of CTR1: "After meticulous traversing of the boundary layer at the throat of the venturi we had fixed and repeatable data on which we could rely. The equipment on the test unit and on its support structure could then be made fixed and its behaviour more predictable. With mechanical changes to the bearing preload and to the lubrication system, we now had reliability.

"Instrumentation became more sophisticated and there was more of it, such as static taps between stages of the test compressors. Special individual probes and rakes (with multiple pressure measurement in one stem) were designed and calibrated on the probe rig. Spaghetti was the best idea ever for the transmission of the pressure from the sensing point to the manometer tubes. This plastic tubing, good for pressures higher than we needed, came in sizes up to macaroni. The most used was about 1/8" diameter with a bore of about 1/16" diameter. It came in rolls of about 100 feet, each having ten tubes lightly attached in a ribbon array. Thus lengths could be run quickly and neatly."³²

Phil Ross-Ross: "While the test crews changed compressor test units, the aero technicians plunked away on the mechanical calculators as they processed the thousands of readings. The guys could stand only a few days of this; they welcomed the relief of getting back to the testing of another noisy compressor unit. The women in the aero office could, and did, process results day after day. The test crews and data processors performed exceptionally well; it was an effective team."³⁴

Tom McCloghry: "Overall compressor performance was in the form of Pressure Ratio and Efficiency versus Mass Flow. All data was reduced to sea level conditions on a standard day (to ensure comparability), with calculations simplified by the use of compressible air flow tables."³²

Until the blade vibration problems were sorted out, loss of a blade in a test compressor was a not-infrequent hazard. Bruce Hisey: "One day I will never forget. While at high speed, a first stage rotor blade fatigued off and passed through the rest of the blading. It was the longest two minutes of my life as the sparks and dust flew, and the compressor roared and shook, sounding like a giant rock crusher as it came to rest driven by (the inertia of) the 6000 horsepower Moore steam turbine. I must have pushed the stop button a dozen times as I stood helplessly in the control room."³⁵

Special testing and analysis was required to deal with the problem of blade fatigue. Tom McCloghry: "Some compressor test units were equipped with strain gauges cemented to various areas of blades in different stages of the compressor. The wires were led to a slip-ring unit housed in the nose cone. From there the wires were led through one of the inlet struts to an array of power supplies, amplifiers, cathode ray oscilloscopes, sensitive voltmeters, cameras and chart recorders. Lissajou's figures were the determining method of frequency measurement in any mode of vibration.

"The engineering crew for this work came from Malton. (George Anderson was the first vibration specialist to visit Nobel, in 1948.)²² We worked together so that we changed the conditions to satisfy the vibration people while we took a rest and then vice versa. There were many problems in the analysis of a weak signal cluttered with background noise; and often no signal. Several times the slip-ring unit was suspected despite its silver rings and carbon brushes, but often it was contaminated by the very necessary air/oil mist lubricant. On other occasions it was loss of the entire strain gauge itself."²

Slip ring units were used for engine testing at Malton as well as for compressor testing at Nobel. Since resolution of blade vibration problems was critical to the whole development program, a slip ring test rig, designed at Malton, was brought into service at Nobel to improve the reliability of the slip ring units.

CTR1 was first on line; CTR2 was installed later, probably in 1951. In an orderly sequence of testing, the fundamental aerodynamic characteristics of blading, in a particular pitch and angular arrangement, would be explored first on the cascade rig. Next a single stage of blading would be tested and its characteristics further defined on CTR2 before graduating to CTR1 as one stage in a complete compressor.

Tom McCloghry describes CTR2: "There were none of the early adventures with this rig like those of the full scale CTR1. This rig was built to test single stage compressors only. Such compressor test units were consequently designed to simulate a particular set of full scale blading of modified constant reaction or half vortex designs for a particular stage of a particular compressor, as well as to confirm the results of cascade tests modified by whirl velocity. Much of the testing was done at one speed for extended periods while both manual and automatic traversing devices explored the segment behind rotor and stator from root to tip. Plotters and planimeters were used in the investigations, and in the final calculations the outward flow unbalance was determined as a particular answer to the theory of radial equilibrium."³²

Drive was by a Chinook turbine, adapted for steam, which exhausted into a jet condenser which was shared with the turbine test rig on the same centreline. Tom McCloghry: "The only problem with this rig was speed control due to the low inertia of the rotating mass. A slight change in steam pressure would make a vast difference in turbine and therefore compressor speed."³²

Phil Ross-Ross: "Compressor design was critical to engine performance, and most changes were in compressor blading. Sometimes new blades were required. Often new compressor discs or stator rings were required; it was only necessary to cut slots for the 'fir tree' roots at a slightly different angle in the discs or rings for one or two stages and rebuild the test compressor. If a change in the blade angle at the tip relative to the root was needed, it was not uncommon for blades to be locked in a vise and manually twisted in a controlled manner to give the desired change."³⁴ An assembly shop at Nobel was equipped to do minor rebuilds. New compressors or major rebuilds would be done at Malton.

Phil Ross-Ross: "(The work on) CTR1 was essential to improvements on the Orenda engine. The later versions of the Orenda, the series 11 and 14, became exceptionally fine units and powered the CF100 and the Sabre. The Orenda-powered Sabre was the best fighter (of its type and) of its time. Between the CF100 and Sabre, the Orenda had more running time than any other engine in the world."³⁴

Installed on the same schedule as CTR2 was the turbine test rig. These rigs occupied the space on the south side of the test bay corridor, and shared a control room and also a jet condenser in the middle of the test bay. The turbine test rig used steam as the test medium. The power output of the turbine on test was absorbed by a Heenan & Froude dynamometer which in a later incarnation in the Iroquois era became a part of the rotating blade cooling rig. Following a quick shut-down during a turbine test, it became violently unbalanced due to thermal distortion of the rotor and spent several months being repaired at the factory.³⁰

The turbine test rig, to which Bob Reed and Bruce Hisey were assigned, proved to be a heart-breaker and was ultimately abandoned as unusable. The theory was fine; there was no problem in the mathematical conversions between steam and air as the working medium. The Achilles heel was in pressure measurement. Despite use of steam tracers on the pressure sensing lines, and every other trick in the books, condensation in the lines made it impossible to measure pressure to the required accuracy.

A photograph of the turbine test rig control panel shows Stu Kerr and Tommy Fraser, with Fred Anthony servicing some instrumentation.

Phil Ross-Ross: "In late 1952, when I was transferred to Nobel from the Test Equipment Design Section, John Martin was Aero Test Engineering Supervisor, Bob Reed was on the turbine test rig, Dick Joy was on CTR1, Colin Campbell was on CTR2, Clay Margison was on the probe rig, and I was on the cascade rig.... The primary role of the Aero Test Engineering Section was to feed information to the aerodynamicists at Malton — Colin Wrong, Clair Eatock, Ken Thue, Charlie Miller and others. They digested the test information and passed it on with their requests (for new variants) to the Test Equipment Design Section for design or redesign of equipment or test units."³⁴

Colin Campbell: "In the aero office (of the renovated DIL office/lab building) John Martin's office was a small cubicle which was entered from a door in one corner. John would often issue comments without leaving the office by speaking loudly from where he sat. The person to whom he was speaking was often identified by colourful Yorkshire terms of address. Since it was an all-male office, this practice only slightly bent the rules of decorum and caused no offence.

"One day we needed extra help on reducing data, so one of the young ladies, Barb Peachey from downstairs, spent the afternoon with us running one of the clattery Marchant calculators. There were frequent eruptions from the corner office. By chance, whenever John poked his head out of the office Barb was away somewhere. John's custom at the end of each day was to come out of his office and sit on the corner of someone's desk to spend a few minutes chatting about the day's events. When he did so this day and saw Barb sitting there he was clearly taken aback. As all knew, John was a gentleman and would not have used some of his terminology if he had known a lady was within earshot.

"He started to fumble for the right words, but Barb relaxed all tensions by saying brightly 'And John, I would like to thank you for the liberal education I have received today.' All laughed heartily and John, of course, offered his apologies."³³

Testing at Nobel, particularly on the combustion rigs and on the aerodynamic rigs which used air from the Ingersoll-Rand compressors, was a very noisy business. It was always a little surprising that we heard no complaints from our CIL friends in the village. Perhaps, at nearly one mile range, we weren't quite as noisy as the 100-car CPR freight trains which passed the village at all hours of the day and night, and were reputed to be responsible for the high birth rate with their TOOT-TOOT-ta-TOOT as they approached the crossing.

Malton was not so fortunate. Axel Kielland tells the story, related to him as true, about the night-time running of engines in the test cells while Walter Deisher was President prior to October 1951. Malton village decided enough was enough when the caller at the local bingo game could not be heard above the racket. Council decided there should be no running of the engines after 8 p.m. Deisher was phoned, and he phoned Doug Knowles who forgot to relay the message to the test cells. The next night the noise continued past 8 p.m., and an irate mayor phoned Deisher at the Royal York where he was about to give an address. This time Deisher, properly steamed up, phoned the test cells directly and was answered by one of the fitter-testers. Deisher gave him an explosive ear-full and the fitter-tester, a lippy type,

responded in kind. Deisher: "DO YOU KNOW WHO I AM?" "No." "I'M WALTER DEISHER AND I'M PRESIDENT OF A.V. ROE CANADA LIMITED!" Short reflective pause. "Do you know who I am?" "No." "Thank God for that!" Click. The engine was shut down promptly.²³

Initially, the office was in the north-west corner of the machine shop building.^{19,27} One photograph in the Otley collection shows Paul Nielsen and John Otley hard at work in the drafting office there. The heating was primitive. On cold mornings the Marchant calculators which were, of course, mechanical, had to be warmed up for half an hour to soften their lubricant and get them working.¹⁹

Bill Allen recalls that when he transferred to Nobel in September 1948, Art Sutton, EIC; Jean Forth, secretary; George Best, Shad Williams, Axel Kielland and Bob Reed, engineers; Don Gordon and Gord Jennings, lab assistants; Paul Nielsen, John Otley and Bill Allen, draftsmen; and Johnny Wilbur, administration, were all crammed into the office at the west end of the shop. Ed Leroux, Hec Smith and Myrt McGinnis were in the adjoining stores area. In 1949 it was acknowledged that something had to be done, and a move was made to the refurbished, if somewhat saggy, office/lab building at the south side of the property.²⁷

Jack Plowman operated the chocolate bar and tobacco concession out of a large drawer in the cascade rig control room. He kept it stocked from his tourist business up the highway.²⁷

Reg Jones, who had established a record as the youngest first class operating engineer in Ontario to be so qualified, took over the power plant after Mac MacLean died in late 1948.⁵ Art Rider was Test Foreman until 1949 when he was posted to Malton and Bill McDonald became the new Test Foreman.

We had a resourceful bunch at Nobel. Art Pollard, a versatile sheet metal worker, joined the shop in 1947, as did John Woolacott, "Canada's Foremost Welder" who had a way with inconel. Walt Newbold, who did precision panel beating, a specialized art, started in 1948. Walt, familiar with the first angle projection system used on drawings in the U.K., encountered third angle projection for the first time at Nobel. He received a thorough ribbing from his work mates when he produced his first sheet metal part. He got his dander up, and salvaged the scrap by turning it "inside out".³⁶

Joke from the "Avro Outpost": Walt and a friend were walking along a woodland trail on a moonlit night. They heard the hoot of an owl. Walt's eyes opened wide. "Wot was that?" "It's an owl." "Of course it's an 'owl, but wot in bloody 'ell is 'owlin'?"

Bill McDonald recalls that the combustion chambers for the first tests were pretty crude. The snouts were developed from a series of truncated cones, welded down one side, welded together and then hand-bashed into a rough approximation of the required shape. Bill made the process a bit more civilized by preparing reasonably accurate upper and lower dies from low-melting temperature kirksite and using a hand press to form a snout out of a single truncated cone welded up one side.⁴ Later, Roy Smith, Maintenance Foreman, demonstrated how to spin an inconel baffle on a wood form he had turned in the wood shop.²⁷

Ernie Clifford: "A set of sheet metal rolls sadly got broken coming from Parry Sound when the pickup truck went around a corner too fast and threw the rolls onto the road. The big gear

wheel was shattered and the shafting bent. Nobody wanted to request replacement parts for a brand new machine. Walt Smith and Bill McDonald asked if they could try to fix it and I agreed. So they straightened the shaft and built a ring to hold all the gear pieces, about 15 or 20, in alignment while Bill welded or brazed. Success!"²⁴

There were the administrative contre-temps. Don Gordon: "The station agent at Nobel used to take in the mail. One day Johnny Wilbur was given the mail, but no bag with our pay! Our pay came in cash at the time, in little envelopes. It was decided that Johnny Wilbur had to take another person for guard, since he couldn't be alone, and drive up to Sudbury farther up the CPR line to pick up the pay. When they got back the passenger was fairly white, and said he didn't want to take any more low-flying flights with that guy again! But we only had to wait until 6 o'clock to get our pay; not too bad."³⁷ Bill Allen: "(At that time) Johnny Wilbur had one of the first cars in the village. It was an old 1934, 12 cylinder Packard. He had it in one of the garages at the end of Sandhurst, and we all helped him strip it down and put new valve liners and rings in it, and then he used it for everything."²⁷

Art Sutton: "We needed a 2" or 3" valve for one of the rigs. Walt Smith pinched one from moth-balled DIL equipment. Unfortunately, he didn't clean up the insulation he had to remove, and left rather a mess. The 'theft' was detected by the RCMP inspector on his regular rounds, and there was a big paper hassle."²¹

There seemed to be a slight deficiency in inventory control. For some weeks an operating engineer had been eyeing covetously an abandoned rubber-tired, metal wheelbarrow behind the power house. The poor thing was starting to get rusty, and he decided it should have a happy home. Over the fence with it! That evening, he was trundling it up the highway with his lunch box in it. A friendly truck driver pulled up in front of him. "Going far? Toss it in the back!" No sooner was it in the back of the pickup truck than the friendly driver, smiling even more broadly, took off in a squeal of burning rubber. And that was the last our hero saw of the wheelbarrow. Or of his lunch box.^{39,41}

Ernie Clifford: "Nick Walwaski was night shift guard. He had some bush experience, and claimed he understood skunks, of which we had a few. His knowledge of skunks was challenged. The result was that one morning, after he had left, there was a large wicker basket in the guard-house gateway containing one live, active but quiescent skunk. After speculative discussions about ways and means of effecting harmless entry, I turned the problem over to the great problem solver, Walt Smith, with instructions to clear the main entry, while we all trooped in through the guard house. At noon the way was clear. I don't know how the skunk was captured and placed there, or how it was removed."²⁴

The Nobel plant had its own volunteer fire brigade and an ancient fire truck, a circa 1926 GMC, which had to be started and run each week. There was initially heavy reliance on Jim Knight, a fitter-tester who was also an experienced fire fighter with the Parry Sound Volunteer Fire Brigade. Roy Smith, as Maintenance Foreman, was Fire Chief. Several of the others were John Otley, Art Pollard, Dan Kingston, Red Lawson, and Bill Allen. Fortunately, despite the obvious fire hazard of storing and using large quantities of jet fuel, there was never a significant fire; only several minor ones, while Bill Allen was there, including a couple of bush fires off the plant property.²⁷

As another economy, insulation on the boiler breeching had been covered with tar paper. It caught fire. No one had thought of a fire up there, and there had been no drill. To the immense entertainment of the spectators' gallery in the windows of the office building, the fire brigade all puffed up the four or five flights of stairs to the roof. "A rope! A rope! Who has a rope to pull up the hose?" Everyone charged down to get the rope, and then puffed back up. "Hey! Below! Tie on the hose!" Nobody down below. So they all... etc., etc. By that time the tar paper had burned back to naked insulation, and there wasn't enough fire left to toast a wieney. Metal jacketing was installed on the breeching. Fire drills for a roof fire were instituted, but there was no further need.

Russel Land, via Doug Nelson: "Sam Reid's '57 Plymouth station wagon caught fire in the parking lot. The alarm was tripped, the fire fighters responded, and they rolled back the doors. These were so well oiled and free running that they slammed against the stops and immediately bounced back in front of the already moving fire truck. They saved Sam's wagon, but the fire hall doors were a write-off."⁴²

Ernie Clifford was posted to Nobel as Engineer in Charge in April 1949, replacing Art Sutton who was transferred to Malton, and by 1952 Art had progressed to Service Manager. Ernie was replaced in Malton by John Armstrong as Head of the Mechanical Test Lab.

At the end of 1950, George Best was transferred to Malton as Test Equipment Design and Instrumentation Supervisor, and was replaced by John Martin as Aero Test Engineering Supervisor. George replaced Harry Gibson who came to Nobel as Engineer in Charge, replacing Ernie Clifford who became Chief Test Engineer at Malton. At the same time, John Armstrong came to Nobel as Equipment Engineer, but he returned to Malton in February, 1952 as Mechanical Development Engineer.

Finally, in October, 1953 John Armstrong was replaced as Test Equipment Design Supervisor by Pete Peterson, and came to Nobel as the last in a series of five Engineers in Charge.

The Iroquois Years

The Iroquois years at Nobel began rather earlier than the official go-ahead on the PS-13 project in December 1953, when \$3,500,000 of Hawker-Siddeley funds were allocated for its initial development.¹⁰ (The PS-13 was named "Iroquois" after program acceptance.) It was necessary to do some preliminary design work so that a proper project proposal could be presented, and also, using the facilities at Nobel, it was prudent to check out feasibility.

Don Morrison did the initial layout of the combustion system for the PS-13. In 1952 he took his layout to Armstrong-Siddeley, Coventry for vetting by Sid Allen, Chief Combustion Engineer. The PS-13 had a "walking stick" vaporizer similar to that in the Armstrong-Siddeley Sapphire engine. While in the U.K. Don spent some time at Power Jets, Farnborough, for a course on combustion and heat transfer. On the same trip he visited Burnley and received a chilly reception from Lucas when he urged improved combustion development support for the Orenda program. It ultimately became necessary for A.V. Roe to "go it alone" on re-design and development of the atomizing system of the Orenda engine.^{25,26}

When he returned to Nobel, Don started work on design of the full annular atmospheric rig, and saw it in operation in 1952.²⁶ After he transferred to Nobel in the summer of 1952, Mark Rooney designed the first traverser for this rig,²⁹ and John Condon designed the control panel.⁴³ Mark worked with George Sladek on development testing of the PS-13 combustor using the annular atmospheric rig.²⁹ George also replaced Jack White in responsibility for the gas analysis lab.⁴⁴

Russ Clark remembers keenly an "event that illustrates one unusual way in which Nobel, its facilities and people, played a role in the launching of the Iroquois program." It was necessary to obtain approval from the Hawker-Siddeley Group in England for the spending of the money required to launch the PS-13 program, in advance of any funding or commitment by the government.⁴⁵

Russ Clarke: "The Hawker-Siddeley Design Council of about ten members agreed to come to Canada in 1953 to consider Orenda's proposal and assess the company's capabilities. Charles Grinyer and others at Malton were very impressed with many of the research facilities at Nobel and felt it would be advantageous to have the Design Council see them. However, it was not feasible to have the team visit Nobel. The alternative was to bring a sample of Nobel down to Malton. This almost turned into a disaster.

"The cascade rig, with its automatic plotting of pitot and static pressures along with yaw angle versus probe position as it traversed immediately downstream of the blades, was chosen as an example of the state-of-the-art facilities at Nobel. Phil Ross-Ross and I were given the task of setting up this automatic data plotting system at Malton, in a location at the rear of an enlarged conference room, using a special 2" shop air line feeding into a simulated cascade rig, including blades. Charlie Sykes was on hand to arrange for special benches, extension cords and other furnishings. The day-long conference consisted of an almost non-stop series of presentations by about a dozen key Orenda personnel including Charles Grinyer, Burt Avery, Harry Keast, and Joe Purvis.

"Part of the instrumentation system on the cascade rig consisted of 110" manometers with light bulbs and photocells mounted in small boxes, dubbed 'monkeys', which ran up and down the tubes as the pitot, static and yaw pressures varied during the probe traverse of the blades. The electronic units, circa 1953 and before transistors, that controlled all this action were very sensitive to ambient conditions and required careful adjustment to avoid instability. Phil and I made the final adjustments and conducted a trial run when everyone else left the room for an early afternoon lunch break. Everything worked perfectly.

"The demonstration was scheduled for soon after everyone returned. However, there was a change in plans and the demo was delayed until late afternoon. When the time finally arrived, Phil and I turned on the air flow and pressed the 'Start Traverse' button. There was an impressive amount of air noise and the probe traverse began. It had been three hours since the electronic units had been adjusted and balanced during the trial run.

"The whole Design Council and twenty or so other attendees watched intently. Fluid in the manometers started to rise. Alas the 'monkeys' did not follow. When I realized the horrible consequences of what was happening I quickly and discreetly pushed the 'monkeys' up and down the manometer tubes more or less as the fluid levels varied. As far as I could tell none of the Design Council noticed. Terrible embarrassment was avoided. They were all greatly impressed with this sophisticated equipment; in fact the demonstration seemed to be the highlight of the day for them. Maybe, just maybe, my sleight of hand contributed to the decision to proceed with the Iroquois program.

"Incidentally, the 'monkeys' failed to follow the manometer fluid levels because the electronic amplifiers were very sensitive to line voltage. Although they had been balanced to line voltage early in the afternoon, poor regulation at Malton apparently always resulted in a sharp rise in voltage at the end of the day shift when most of the heavy machines were shut down. On this important day, shut down was just minutes before the demonstration began!"⁴⁵

Don Morrison transferred to Malton in late October 1954, when the Iroquois program was getting into full swing. He was replaced as Combustion Test Engineering Supervisor by Jack Hill who had been in Nobel on an earlier hitch beginning in 1949 as a combustion engineer.¹⁷

The basic differences between the combustion and aerodynamic testing programs at Nobel should be explained. Much of the work of the Aero Test Engineering Section was on compressors and turbines, high speed rotating assemblies which required the design support and the very expensive manufacturing facilities at Malton. The manufacture of blades, both for rotating test units and for cascade testing, also required specialized equipment and relatively long lead times. While much of the work of "number crunching", to put aerodynamic test results into a tidy and comparable form, was done at Nobel, the more intensive analysis and decisions on "What comes next?" were by the aerodynamicists at Malton. The aerodynamics program, in consequence, tended to be highly structured. Nobel produced test results, the aerodynamicists did the reflective head scratching and decided what new variants should be scheduled into the program, the Test Equipment Design Section did the design and arranged for manufacture and usually, assembly, and then back up to Nobel.

Combustion system components, in contrast, were largely fabricated from inconel sheet metal which the Nobel shop was equipped to handle on a one-off basis. While there was very close

liaison between Nobel and Malton, many important decisions on design innovation were made at Nobel. The Combustion Test Engineering Section in consequence used the lion's share of drafting office and shop output at Nobel, and had a major input on the final configuration of the combustion systems which finally found their way into production engines.

Heads met with a crunch, with the Engineer in Charge in the middle, over allocation of test time utilizing the output of the Ingersoll-Rand compressor bank. Testing requiring the full 2500 horsepower output of the compressor bank was limited to the graveyard shift since off-peak power was available at much reduced cost from midnight to 7 a.m. (A lullaby for the sleepers in the village!) Air during this period was used most regularly by aerodynamics. Daytime use in particular required careful scheduling, with time allocation bands for each rig marked in red pencil on pre-printed sheets.

Aerodynamics and combustion shared the services of the drafting office and of the shop. Another facility on which both aerodynamics and combustion were highly dependent was the Instrument Lab. It provided preventive maintenance, calibration and repair services, and also manufactured some highly innovative instrumentation to meet the specialized needs of the testing programs. The Instrument Lab, like other parts of the organization, expanded to meet the growing needs of the test program. Some of the recruits came from the U.K. Fred Anthony joined the instrument lab early in 1952, and then sponsored Les Pocock and his family as immigrants so that Les, too, could work in the lab.

In October 1953, when John Armstrong was posted to Nobel, John Martin was Aero Test Engineering Supervisor, Don Morrison was Combustion Test Engineering Supervisor, Charlie Sykes was Administration Supervisor, Bill McDonald was Test Foreman, Russ Clarke was Instrument Lab Supervisor, John Otley was in charge of the Drafting Office, Walt Smith was Shop Foreman, and Reg Jones was responsible for all plant engineering functions including the power plant, and also maintenance which reported through Roy Smith, Maintenance Foreman. Martin Lang was Plant Protection Sergeant. Myrt McGinnis was secretary to the EIC and general keeper of personnel records, and Don Cameron was timekeeper.

Tom McCloghry had been in charge of CTR1 and then left for Malton in August 1952 where he designed test equipment for Nobel. A major project was redesign of CTR1 as a closed circuit rig for the testing of PS13 compressors.³² He returned to Nobel in November 1954, replacing John Martin as Aero Test Engineering Supervisor. John became Test Equipment Design Supervisor at Malton. Tom in turn was replaced by Phil Ross-Ross in August 1956 when Tom went back to Malton where he had responsibility for the design and, later, commissioning of the altitude test facility.³² Phil had first come to Nobel in 1952 as an Aero Test Engineer. Jack Hill replaced Don Morrison as Combustion Test Engineering Supervisor in November 1954, when Don became Chief Development Engineer in Malton. Jack had been a Combustion Engineer at Malton after four years at Nobel. Jack in turn was replaced by Bill Kretschmer in December 1957. Bill had been specialist combustion engineer at Nobel. Jack became Chief Combustion Engineer at Malton. Charlie Sykes was replaced by Vic Sagar in early 1956. Russ Clarke was replaced by Gerry Pefhany in August, 1955, and Gerry in turn was replaced by Syl Signore in 1957. Reg Jones was posted to Malton in 1958 and was replaced by Clay Margison who had started at Nobel as an Aero Test Engineer but transferred to plant engineering about 1955. George Oman, a new recruit, was responsible for the power plant under Clay.

The A.V. Roe Gas Turbine Division was incorporated as a new company, Orenda Engines Limited, on July 29, 1954. Orenda's new President was Walter R. McLachlan who had become General Manager of the Division in October 1953.¹⁰

After the years of improvisation when Nobel was first getting under way, things were rather more civilized during the Iroquois years. The team had matured, the component development program was supported by an excellent test equipment design team at Malton, and there was more money to do things right.

Gord Baskerville: "In the summer of 1953 it was decided to make use of my survey experience to plot on the ground and later prepare a comprehensive plan of all existing surface and underground plant services — water, drains, steam, air, electric power lines etc. I mention this as it was a glorious opportunity to spend most of the summer outdoors in the sun. My boss was kind enough to let me in the office on rainy days! I had Ed Buchan assisting me. Walt and Roy Smith were invaluable in helping me locate underground services, drawing on their wartime experience at the plant. The services really were a tangled web!"⁴⁶

In the early years grass had refused to grow in the area between the acid towers and the old office building. Too many acid spills. The water line to the shop passed through this area, and keeping it operational was an on-going battle.¹⁹

For some years there had been acerbic correspondence exchanged between CIL and A.V. Roe. CIL knew how much water THEY were using. We had a pretty good idea how much WE were using, and in 1951 had even installed a V-notch weir in Guncotton Creek which received all our out-flow. We wondered if the un-metered Back Road line could account for the discrepancy, but it was a small-diameter line.

One morning in January 1955, Reg Jones arrived at work early, and there were no rigs running. Ah! Sounds of spring! Frogs chirping! In January? At 20 below??? His worst suspicions did not measure up to the reality.

Repairs to the water line were scheduled for the summer, and the contract was assigned to Macklaim Construction. Bill Hall owned a quarry and had considerable experience with blasting. Bill: "There was so much water and muck that they could not get equipment close enough to work, or even to do ditching to drain the water away. Roy Smith spoke to me about it. I suggested that I might be able to blast a drainage ditch with ditching dynamite.... I was on day shift at the plant, so Roy and I went up after dark and crawled around, with a couple of flashlights, in rain suits and hip rubber boots. We placed the charges; I had to be right the first time. The first blast would make a mess which would prevent a second go. We set it off, and what a shower of water and mud! That's the way with ditching dynamite. A blast is something to see in the daylight. Anyway it was a great success, and enabled the job site to dry up so work on the repairs could be done.

"The sequel is that there was a problem in arranging for me to be paid since I was on plant payroll and belonged to the union. It was decided to solve the problem by having Macklaim bill the plant, and then Macklaim would pay me. Roy and I were there about four hours. I eventually received a cheque from Macklaim for the grand sum of \$10."³⁸

In some places it was found, after the lake to the south of the plant fence had been drained to allow inspection, that acid had eaten six-inch holes in the wall of the 30-inch main. Work proceeded, including installation of a cathodic protection system so the corrosion damage would not recur. The crew went home, intending to re-commission the water line in the morning. When they returned, a new disaster! Water had seeped back into the trench, and the empty water line had floated up to the surface and buckled. Further salvage required.

The boilers were converted in October 1955 from coal-fired to oil-fired, using bunker "C", in order to improve operating flexibility. This made for a truly impressive line-up of tank cars on the rail siding, particularly after two major new Iroquois test rigs, the afterburner rig and the rotating blade cooling rig, were brought into service in the new test cells late in 1956. Both were very thirsty rigs; the afterburner rig, of which Shad Williams and Don Morrison did the conceptual design,⁴⁷ used an Orenda engine as a slave, with prodigious quantities of additional fuel consumed in the afterburner section. The rotating blade cooling rig used two-thirds of an Orenda engine, the compressor and combustion system, as a slave unit, and had a seventh slave combustor which preheated the blade cooling air supply to the Iroquois turbine section which was on test.

Pete Brennan, who had been a crew chief on engine testing at Malton, was brought to Nobel as Test Sub-Foreman in charge of these rigs. His crew on the afterburner rig was John Saintsbury, crew chief, with Dennis Farry, Ken Fowler, Vince Scott, Bill Gordon, and Alex Brooks. (Alex was fatally injured in 1958 in a car accident while driving to work under icy conditions). Crew on the rotating blade cooling rig was Cars Crigger, crew chief, with Earl Thomas, Bert Lee, Andy Milne and Howard Dewar as fitter-testers.⁴⁸

An array of new rigs, specifically for work on Iroquois projects, had already been commissioned. (See Report B20-56 in Appendix D.)

The first of the combustion rigs was the annular atmospheric combustion rig which used air from the Ingersoll-Rand compressor bank, preheated by a slave combustor, as the primary air flow in an air injector to supply a large volume of preheated air to the annular combustor. Another was the sector altitude combustion rig which used a horizontal centreline Graham steam ejector. It was on this rig that Jim Harding developed the Iroquois ignition; a patent application covered a configuration which demonstrated relight at 60,000 feet altitude, Mach 1.3, when tested at the National Research Laboratories.⁴⁹ A third combustion rig was the sector afterburner rig which used the output from the Ingersoll-Rand compressors in doing the primary development testing of Iroquois afterburners.

The guiding hand in the afterburner program was Bill Kretschmer who had been a rocket specialist in Germany during WW II. Bill: "There were a lot of problems with the Iroquois afterburner stabilizer system when I arrived. The system under test was built to a design bought from the Marquardt Co. in the U.S.A. It was not operating properly. During tests in the 1/8 sector afterburner rig (which simulated altitude conditions), unstable combustion was experienced. This caused severe vibrations and damage to the test section. Since the project had extreme urgency, we had to do some hard thinking.

"I proposed a new and different design which operated successfully in the segmented section. Based on the test results it was decided to go ahead with a full scale design. In the meantime,

a French design had been tested, but with less favourable results than with ours. I was proud of the team work and effort which made it possible to produce a superior design. Full scale testing of our bell-type stabilizer was carried out in the new afterburner test cell at Nobel, and it was an exciting project. The building was impressive and well designed. During its check-out phase some minor changes were made for better viewing and cooling of the exhaust plume.... The test rig was similarly impressive. An Orenda engine with afterburner provided the primary air for an air injector. The augmented gas flow passed through a mixing duct, and then to the 43-inch diameter Iroquois afterburner on test.

"I will never forget the first test. The afterburner lit up and ran smoothly. Soon the afterburner pipe began to heat up and became red hot and radiated heat into the test cell. Suddenly the fire alarm came on, initiating the automatic sprinkler system and dousing the test rig. There was some damage and further testing was delayed. By fitting a radiation shield around the afterburner pipe, the problem was eliminated. A lot of testing followed, and our own afterburner design was selected for the Iroquois engine. It was successfully tested under altitude conditions in 1958."⁵⁰

Other test rigs in the Combustion stable were the turbo pump rig and the waterflow analogue rig. This latter rig, designed and commissioned by John Condon,⁴³ used a slit beam light source, in various planes, for examination of flow patterns in a plexiglass test specimen which simulated a segment of a combustion system. It was located in the Ingersoll-Rand compressor bay because of availability in this location of a steam turbine drive for the recirculating pump.²⁶

An allocation sheet shows which test engineers were responsible for the various test rigs in the fall of 1956. Combustion rigs: Orenda atmospheric combustion rig, Bay 5, Bernie Perrior; Orenda high pressure combustion rig, Bay 3, David Rose, John Condon; Orenda altitude combustion rig, Bay 5, Bernie Perrior; annular atmospheric combustion rig, Bay 1, Mark Rooney, Ron Nutt; quarter sector altitude combustion rig, Bay 6, Jim Harding; sector afterburner rig, Bay 6, Bill Kretschmer, Jim Byrne; afterburner rig, New Test Cells, Bill Kretschmer, Jim Byrne; combustion waterflow analogue rig, IR compressor bay, David Rose; turbo pump rig, Jim Chant, Gord Mark; combustion airflow rig, Bay 6, David Rose; thermal shock rig, David Rose, John Condon; thermocouple response rig, Bay 5, David Rose, John Condon; Fuel Lab calibration rigs, Mark Rooney, Gord Mark, David Rose.

Aerodynamics Rigs: cascade wind tunnel, Bay 4, Cam Nicol; probe rig, Bay 4, Ron Page; compressor test rig #1, Joe Conrath, Roy Barnden, Bert Keyworth; compressor test rig #2, Ron Page; blade cooling rig, Bay 3, Cam Nicol; rotating blade cooling rig, New Test Cells, George Rogers; cooling air ejector test rig, Bay 4, John Grigor.

Jack Plowman and Leo Villeneuve were the Combustion Test Sub-Foremen; George Soper and Johnny Schneider were the Aerodynamics Test Sub-Foremen. Pictures from the Iroquois years show Leo Villeneuve and Wally Walwaski on the annular atmospheric rig in Bay 1; Vince Scott on the sector altitude combustion rig in Bay 6; Cars Crigger and Ed Leroux on CTR1, with Cliff Ferris operating the Worthington-Moore steam turbine; and Bob Rennie, Clarence Griffith and Joe Federico on CTR2.

According to notes from the various employees, Bill Hall started on the sector altitude combustion rig in Bay 6, and was then on the annular atmospheric combustion rig in Bay 1 and

the afterburner rig in the New Test Cells. Wes Calder worked on a new baseplate for the afterburner. Charles Dodd worked principally on high altitude ignition. Earl Thomas worked on the Orenda atmospheric combustion rig, the turbine test rig, the Orenda high pressure combustion rig, and finally on the afterburner rig. Lyle West worked on the sector altitude combustion rigs. Scotty Buchan worked in Bay 4 on the probe rig and cascade rig. Jack Plowman, prior to promotion as Test Sub-Foreman, was in Bay 5.

And then there were the test technicians, test observers, clerk computers and summer students. Barbara Savage Reed was one of our students who worked in the aero office for two summers, and later went on to greater glories as a Judge in the Federal Court of Canada. After her first hitch, in the summer of 1956, she thought it would be nice to express her appreciation to Paul Marcok, a test technician who had been tolerant and helpful beyond the call of duty.

Barb Reed: "I bought a case of beer at noon and put it in the back of his car, but I forgot to tell him. When he left work at the end of the day and saw the beer, he thought someone was setting him up to be stopped by the police. So he returned to the plant and worked a shift of overtime. He figured he had won doubly; he had a free case of beer and overtime to boot. The next summer when I returned there was great mirth — at my expense for having such a sieve-like memory."⁵¹

On the aerodynamics side, the cascade wind tunnel and the probe rig adapted to new work load without significant change. CTR1 was a major challenge. Responsibility for redesign fell to Tom McCloghry who was at this time a Design Group Leader in the Test Equipment Design Section at Malton. He was transferred back to Nobel in November 1954 as Aero Test Engineering Supervisor in time for installation and shake-down testing of the new rig.

Tom McCloghry: "The release of PS-13 to the engine design group was one thing, but to the Test Equipment Design team at Malton it was quite different. There was not enough power available at Nobel to drive the high pressure compressor let alone the low pressure, three-stage compressor (280 pounds per second air mass flow at sea level on a standard day). Only by reducing the air density at intake could the power reduction take place. The trouble was that pressure at intake had to be low enough that the outlet would also be at sub-atmospheric pressure, and so the concept of the rectangular closed circuit test rig was born.

"The design called for heavy, brute force right angled corners with crude cascades of half-round 10-inch pipe cut longitudinally and welded in place to minimize pressure drop across each of the 90 degree corners. The large air cooler on the ground floor below the test area was simply an array of eight identical sub-assemblies, each of several banks of vertical, finned copper tubes conducting water between upper and lower manifolds. Rating was basic: if 6000 hp is input mechanically to the compressor on test, the work done on the air is converted into heat, all of which must be extracted by the cooler. The consequent temperature rise, and the velocity over the tubes, defines the heat transfer requirements for the cooler. Obviously the air behind the cooler will be smooth and free from turbulence, and is the ideal place for air flow measurement. Three sizes of venturi and associated ducting were chosen to deal accurately with the range of air mass flow envisioned."³²

"The only problem left was the design of a flow control valve. It had to accommodate a wide range of air flows and pressure ratios, with minimum pressure drop at the highest velocities. It had to have sensitivity of adjustment so that it could creep up to the compressor surge point, yet a fast response so that it could open rapidly and back away from the surge point once it was established. The high pressure ducting at the first corner downstream of compressor discharge was 42-inch diameter. The vertical leg, downstream of this corner, expanded in an aerodynamically smooth contour to an annulus of 60-inch diameter, with a centrally located, 42-inch diameter, conically shaped plug robustly supported by radial struts. A long-stroke, vertically moving sleeve, with an aerodynamically shaped upstream nose, was designed to slide over the plug. This assembly was called a pintle valve. In the "opening" mode, the sleeve was allowed to slide down over the plug, assisted by gravity, guided by a 3-inch diameter steel central pin, and restrained by four steel, pulley-guided cables which entered the duct axially to minimize leakage. The cables were attached to a large diameter aluminum ring which was moved vertically by four or six synchronized mechanical actuators attached to a second ring which was moved in a similar manner by another set of actuators. One set was used to progressively close the valve; both were operated simultaneously for maximum speed of opening.⁷⁵ The annular, boundary layer steam ejector... (salvaged from the earlier configuration of CTR1) provided the means of maintaining the low pressure in the rig while exhausting... leakage air... from the point of highest pressure....

"The first tests in this closed circuit test rig were with an Orenda compressor about which we knew a considerable amount, but we had to calibrate the venturi first. Boring but essential. Next was performance testing using all newly arranged manometers in the Control Room. The compressor surged beautifully and every test aspect was nice and crisp. The most gratifying part was that after reducing all the performance test data (in the same manner as always) we could lay down the performance curves exactly on top of those from the normally aspirated test on the previous design of rig.

"Inspection of the inside of the 54-inch diameter ducting disclosed some cracking in the structure supporting the central 42-inch stationary cone of the 60-inch long pintle valve. This conical element took the full pressure drop across the valve. Repairs were made before the next tests.

"The proof of the design lay in tests on CT105, the Iroquois low pressure compressor. Everything worked, but before we were able to forward the test report with pride we were informed that the compressor blading had been pitted by flying particles. Inspection showed that we had not removed from the closed circuit all of the particles resulting from the welding repairs, and these particles had been picked in the high velocity air. Accordingly we instituted some changes.

"We cut manholes in the duct walls in strategic locations and removed the eight cooler cores for washing. That was not the last time for that event. Severe safety and cleanliness disciplines were instituted to keep the inside of the closed circuit clean. These had their effect.

"A number of versions of the CT105 were tested before the first CT106, the Iroquois high pressure compressor."³² The redesigned CTR1 had proved itself.

Phil Ross-Ross was the Aero Test Engineer responsible for initial testing on the new CTRL. Phil: "The PS-13 (Iroquois) engine had two compressors driven by two turbines in a concentric shaft arrangement; the low pressure (LP) compressor was driven by the low pressure turbine, and the high pressure (HP) compressor by the high pressure turbine. The LP compressor had three stages, with blades which were broad and long. The Iroquois was only slightly greater in diameter than the Orenda, but the airflow was much higher. To increase flow area, the nose cone and compressor discs were smaller. The smaller inside diameter of the annulus required longer blades....

"The rig with its associated steel work was assembled by a group of Mohawk Indians (yes, the renowned skyscraper steel workers). For them the rig was a toy, but just about everyone at the plant took the opportunity to drop in and watch them scamper up and down the steelwork."³⁴

The first run of the PS-13, the Iroquois engine, was on December 19, 1954. Phil Ross-Ross continues: "CTRL played a critical role in the development of the PS-13 engine. During the early stages of its operation, there was extreme difficulty in accelerating since the surge line at intermediate speeds was too low. A lot of running time at low speed resulted, and blades in the HP compressor were breaking off. When a blade in the HP compressor broke off the whole engine was essentially shredded by the debris from the first stages. The situation was desperate. Funding was based on progress which in turn was very dependent on engine running time at design conditions. With a continuing loss of engines and little running time the PS-13 program was virtually at a standstill.

"Compressor testing on CTRL was of extremely high priority. It was all I could do to keep the engine designers at Malton from descending on Nobel. The last thing needed was a horde of worriers from Malton. I assured them that we knew what we were doing; it would take three or four days to test the unit and results would be forwarded then and only then. It worked, and Nobel produced as promised. Although no one knew it at the time the problem was a new phenomenon which came to be known as 'rotating stall'. With the emergence of new and bigger jet engines with long blades at inlet, there were new problems to plague the aerodynamicist.

"The first stages of the Orenda compressor, at intermediate speeds of about 5000 rpm, would stall in a rather uniform manner because the air in the first stages was drifting through while the air in the last stages, only slightly compressed because of the low speed, was racing through the narrow annulus designed for highly compressed air at the design speed of 7800 rpm. The Iroquois, in contrast, had two compressors on separate shafts. This alleviated the problem to some extent, since the HP compressor would get up to speed well before the LP.

"But the PS-13 had long inlet blades. Instead of moving through the blades at a uniform, relatively low speed, the air broke into pockets of slow-moving and fast-moving air. The fast-moving air would enter the blading at about the design angle and be compressed (pushing backwards on the blade in consequence), while the slow-moving air would enter the blading at a completely wrong angle and cause gross, localized stalling. There were from three to five pockets of slow-moving air, causing stalling, uniformly distributed around the annulus and slowly rotating in the direction of blade rotation; hence the name rotating stall.

"This was brutal treatment for the HP compressor blades, alternately compressing and then passing through a stall zone several times per rotation. It was like hitting the ends of the blades with a hammer. If the rate of hammering matched the natural (tuning fork) frequency of vibration of the blade, the bending flexure did not take long to cause fatigue failure at the root of the blades. Cracks would form and propagate and a blade or blades would break off. When one blade goes, usually all are torn off and the compressor is shredded.

"Failure occurred on a few occasions during testing on CTRL. When the blades failed the unit ground to a halt in seconds. The torque was enough to twist the shaft; where the splines projected out beyond the compressor disc, they were twisted into a spiral. Fortunately the shaft did not shear off, and the broken blades never escaped the compressor casing. As I said, 'If I don't show faith by going out periodically to check, no one will!' There were always things to check on the rig. No one liked leaning over it, even though there was heavy wooden containment cribbing around the test unit.³⁴

Bruce Hisey, who by this time had transferred to the Test Equipment Design Section at Malton: "All the rotating stall work on the fourth stage rotor (the first stage of the HP compressor; the LP compressor had three stages) was done on this rig. The blades were in trouble at the first flap. On the high pressure test compressor we had adjustable inlet guide vanes. The final, engine version that was to go into production had a two-position guide vane ahead of the fourth stage rotor blades. The mechanical speed was brought up above 6000 rpm and then the inlet guide vanes were opened to let the mass flow increase, thus getting past the rotating stall range. Stator blade shroud rings were abandoned after compressor tests showed a large drop in performance due to the rings, which acted like ridges on the inner wall of the compressor annulus."³⁵

Phil Ross-Ross: "Many people contributed to solving the problem of rotating stall. The aerodynamicists eagerly analyzed the results sent down from Nobel. The strain gauge experts from the engine test group at Malton strain-gauged the blades and installed slip rings to feed out vibration information. The test equipment group scrambled to replace parts and modify the test compressors in readiness for test on CTRL, and last but not least the test crews and technicians worked long hours producing and processing test data.

"But it was Roy Barnden who was the hero in identifying rotating stall. He reached into his reservoir of knowledge and produced a 'hot wire anemometer', a very fast response device, which was inserted into the air stream behind the first stage blades. The 'hot wire' is a very short length of heated wire held between two prongs. The energy required to keep it at a constant temperature is a measure of air velocity. The on-off flow behaviour was thus identified and mapped by traversing radially in the annulus. A special room was set up behind the control room to monitor the various signals from strain gauges and hot wire anemometers. If strain gauges and anemometers were both blipping, then disaster was imminent.

"When testing was progressing on one of the few remaining intact HP compressors, I returned from lunch to find the control room empty. There had been another emergency, and since there were no blips on the recorders, the operator left to help out. But the compressor then drifted into rotating stall and by the time I got there, the recorders were blipping like mad. Hit the emergency trip!

"I was one of the smallest guys around and quite often was the one to climb through the manhole into the rig, and up the intake to inspect the blades. On this occasion I found two blades with cracks extending part way through the roots of the blade. During this period HP compressors were more valuable than gold and this one was only moments away from disaster."³⁴

Tom McCloghry: "The vibration folks from Malton used to wish that we could get a compressor just to the point that a number of blades were about to fly off, but before they could do catastrophic damage. Well, we did exactly that.... Another investigation was of the phenomenon known as rotating stall. Combining the data from strain gauges on the blades with data from hot wire anemometers, a pattern emerged. These stall cells numbered as many as six at the lowest speed, reducing in number as speed was increased until they disappeared at about 50% rated speed. It was later observed that the pattern of stall cells rotated at about 50% of the prevailing rotor speed. The cause had to be assigned to first stage performance and wakes from struts."³²

Phil Ross-Ross: "With rotating stall identified, it did not take long for the team — and Orenda really had a superb team — to solve the problem. In short order the Iroquois was showing the world it was one of the most advanced jet engines of its time. After Black Friday, I was interviewed at G.E. in Cincinnati. G.E. was only then encountering rotating stall, and clearly wanted me to join their aerodynamics group. (I didn't.) Only then did I appreciate just how big a jump Orenda and Canada had on the world."³⁴

CTR2 was suitable, without major modification, for use in the testing of single stages of Iroquois blading. Colin Campbell was responsible for this rig until May 1954, during the earlier testing for the Iroquois program. Colin: "The last series of blades I tested before leaving Avro were large inlet stage blades. John Martin had expressed doubt that they would stay together and since I had similar feelings I ran the test series cautiously. Starting with the lower speed curves, we succeeded in getting four full characteristics and about half of the high speed curve when a blade let go. That did a lot of damage, of course, as well as destroying most of the expensive All-Can-Do probes we had mounted on the traversing devices. That was another time I shut down the rig abruptly without warning the pumphouse. (The jet condenser used a very high flow of cooling water.) I believe Roy Barnden took over the rig after I left."³³

Phil Ross-Ross: "CTR2 had its share of nerve wracking tests. In the late 1950's there was considerable interest in "transonic" compressor blades — big, heavy blades about five inches long and five inches broad. By operating near the speed of sound (Mach 1), high compression ratios were possible. Even the designers were worried about the blades failing. Testing was reserved for the exceptionally cold winter mornings that Nobel always had — except when we wanted them. The speed of sound is temperature dependent. On cold days when the speed of sound is lower, the compressor could be run at a lower rpm, and hence there was less chance of a blade failure."³⁴

Don Puttick: "I conducted tests on both CTR1 and CTR2 after I arrived at Nobel in 1958.... I can well remember the intake filter of CTR2 collapsing in exactly the same manner as the filter in the original intake of CTR1. The cause was not ingested snow, but steam. A temperature inversion on that particular occasion resulted in the steam from the turbine outlet hanging around instead of dissipating. It was a very cold night and Phil particularly wanted me to

check the surge point at the maximum rated speed of 9000 rpm to give a non-dimensional speed of about 9800 rpm.⁴²

In a thermodynamic cycle, the greater the spread between maximum and minimum cycle temperature, the greater the proportion of energy input which can be extracted as useful work, and the higher the efficiency. In a jet engine, the highly stressed turbine blades are exposed to maximum temperature. Metallurgists are under constant pressure to develop materials which maintain their strength at ever-higher temperatures. One way to leap-frog the pace of materials development is to use a small percentage of the air from the compressor to provide cooling through the turbine blades. Two rigs at Nobel were designed to check feasibility, optimum configuration, and performance potential.

The first was the static blade cooling rig on which preliminary evaluative tests were performed on a variety of configurations. The second was the rotating blade cooling rig which used the Heenan & Froude dynamometer, formerly used with the Orenda turbine test rig, to absorb excess energy from an Iroquois turbine with cooled blades. The turbine drove an Orenda compressor which delivered compressed air to an integral Orenda combustion system supplying hot gas to the turbine.

When the Orenda components for the rotating blade cooling rig were shipped up from Malton by flat-bed trailer, special precautions were taken to protect the ball bearings from damage. Old Highway 69 via Bala was not in the best of shape, so every five miles the compressor rotor was rotated approximately 20 degrees by hand.⁴²

From the front of the dynamometer to the back of the turbine, shafting was quite lengthy, and careful alignment was important. Ernie Morris lined up the equipment on the rotating blade cooling rig, and also on the afterburner rig, with the help of Gord Baskerville and his transit.⁴² Andy Milne: "The entire length of shaft was aligned to less than 0.001 inch per foot from true. On the first run we fogged the test cell completely and covered the floor with lubricating oil. We had not realized that a shaft oil seal was missing in a section we received ready for installation, and there was no seal sent for us to install. This was probably why everything mounted on the main isolating block moved, and we had to realign to previous accuracy."⁴³

The final test rig in the aerodynamics stable was the cooling air ejector test rig. It was a scale model of the supersonic jet pipe of the Iroquois engine, and a generator of horrific noise. All fitter-testers and test engineers wore protective ear muffs with compliant, liquid-filled annuli to provide optimum sealing against noise transmission. Many also wore ear-plugs as additional protection. Although we didn't realize it at the time, this particular rig had a sound pressure level approaching the theoretical maximum of plus and minus one atmosphere. Sound at even lower levels is bone propagated and can overcome the balance mechanism of the ear.

One night, Ron Page was bending over the nozzle taking a traverse and suddenly, with no sense of loss of balance, he realized he was falling into the jet stream. If he had not caught himself, his head would have ended up in the plant fence! There was more. Ron Page: "That night the cooling air ejector test rig nearly killed Tom McCloghry. I was shining a flashlight up into the nozzle and Tom was standing a distance back trying to trace the source of a trail of oil smoke coming from the nozzle. It was then I lost my balance. The supersonic airstream ripped the flashlight out of my hand and hurled it past Tom, just missing him by inches.

"Bette remembers that rig well, as we could only run it on the night shift. It required all the air from the Ingersoll-Rand compressors, and then some. I used to walk to work in the winter through the woods and across the tracks. Bette was always relieved to know I had arrived safely when the screaming banshee started up."⁵⁴

During the Iroquois years there was a variety of testing not relating to the Iroquois development program. Further work was done on refinement of the Orenda engine combustion system. Jim Harding worked on a combustor for a small Fairchild engine for a trainer; Bill Hall recalls that this six week project was a contract from the USAF, and that Orenda improved the combustor quite a bit. Another of Jim Harding's projects was a theoretical exercise for Atomic Energy of Canada Ltd., on the burning of hydrogen peroxide and kerosene to simulate steam at very high pressures for heat conduction determinations.⁴⁹

One of the more memorable projects on the aerodynamics side was testing in support of the "flying saucer" project, headed by John Frost of Avro aircraft, who had managed to sell a development program to the USAF. The saucer was intended to have supersonic performance and spectacular manoeuvrability. (If the UFO's could do it, why couldn't we?) A large, radial flow jet engine was to be located at the centre, with its exhaust directed radially out and downward to provide both propulsion and lift.

Control was to be dependent upon the "coanda effect" which is the tendency of a fluid flow to adhere to a curved surface. At the outer periphery of the upper and lower surfaces of the radial airflow passages there were to be controllable, segmented knife edges. Lower edges retracted and upper extended, flow goes down. Both extended, flow detaches and goes straight out for thrust. In theory.

Harry Keast, Orenda's aerodynamic guru, predicted correctly that it simply would not work. The many redirections in flow path inherent in the design would be monstrously inefficient. And little knife edges for control? Hmm!

But we were good neighbours and tested a model of one segment. Smooth control? No. The flow flipped from top to bottom of the passage in an only slightly predictable manner, and with spectacular sound effects. Amazingly, enthusiasm for the project in the Frost camp was not dampened.

John Armstrong's mother was visiting Nobel at the time. How had she slept? "Well — until about midnight I slept quite well, but then a robin landed on my windowsill and sang all night. Oh, it was beautiful, of course, but I lay awake thinking how odd it was that he started singing after MIDNIGHT!" The testing of the one segment required the full 2500 horsepower output of the Ingersoll-Rand compressor bank, and this limited testing to off-peak power in the wee small. And the "robin on the windowsill" was at the test plant, over one mile distant from Nobel village.

Fortunately, most of the newer rigs had quite reasonable silencing.

The new office building was completed in November, 1956. It had a two-floor main structure, 60 feet square behind which was a high-ceiling, 40 by 60 foot assembly bay equipped with an overhead crane. The new building was a rather handsome structure sheathed in asbestos

board. The instrument lab moved in downstairs, with the aerodynamics test engineering office, library, administration and new automatic switchboard upstairs. The combustion test engineering office, the gas analysis lab and the drafting office remained in the old office building where space became available for the Test Foreman and Test Sub-Foremen offices.

The years from about 1955 to 1958 were a time of buoyant optimism and planning for a better future. The village was no longer serving adequately the needs of maturing families. The housing units occupied by Orenda were on land with an April 1960 lease termination date. Accordingly, John Armstrong did a survey and prepared Report MISC-N-40, dated June 20, 1957 which outlined the options and suggested four possible areas for a new residential development.¹³ He also suggested to some of the more "permanent" residents of the village that they should consider building or buying elsewhere. Ray and Ollie Wilson, for instance, and John and Jean Otley, built in the Crawford Subdivision which was kitty-cornered across the tracks toward the highway. Cars and June Crigger bought closer to town.

John Armstrong prepared another report, MISC-N-56 dated July 24, 1958, on options for a more remote plant location to permit the testing of future propulsion systems, likely either noisy or smelly or more likely both, well removed from neighbours.⁵⁵ The survey of potential plant sites — those which were reasonably accessible, distant from present neighbours, but located on a body of water or a river with adequate flow which could serve as a source of cooling water — was initially by map to narrow down the possibilities. The next phase required chartered aircraft to eye-ball potential sites, and then to photograph for evaluation purposes any hunt camps or other near neighbours who might have to be bought out. Finally there was a "drop in" and later pick-up so that the most likely sites could be assessed on foot, and the flow rate of water courses estimated.

This survey was supposed to be "hush-hush", but somehow John was greeted by a succession of pilots, each with an ill-concealed smirk on his face. The problem was the roll-film camera, poked out the side of the aircraft as it followed each water course within a five mile radius of each possible site, and banked for a good shot at each point of interest. The hunt camps were all on those wiggly little rivers, and required much swivel-necking to ensure each location was carefully marked on the map. The camera had to have its film changed after each batch of eight pictures. "Stay right here!" John would holler, and the pilot would do exactly that, with some truly amazing aerobatics, while his hapless passenger tried to concentrate on changing the film. Each expedition resulted in the use of the "sick bag" followed by a landing on a convenient lake for a clean-up.

Community Life

The Nobel Test Establishment was part of a broader community which included the town of Parry Sound, McDougall and Carling Townships, and extended beyond. But for the families living there, Nobel meant Nobel village.

The setting of the village was quite spectacular. It was located on the shore of Parry Sound which was part of the limitless and crystal expanse of Georgian Bay, and it was surrounded by tall trees, which, as Ollie Wilson expresses it, "gave it a feeling of serenity". The Orenda section of the village, however, was in sharp contrast to the well-groomed CIL portion of the village with many of its houses surrounding a central green and tennis court.

The Orenda portion of the village consisted of units of wartime housing which remained after many had been removed to establish the Atomic Energy of Canada community of Deep River. A few more bungalows and 1-1/2 storey units were removed in 1950. Betty Gordon: "It was the first time we'd seen a house cut in half, loaded onto a truck, and taken away."³⁷ In 1958 there were 66 wartime housing units in the part of the village for which Orenda had "first refusal" privileges, and 50 of these were occupied by Orenda families. (See map and lists of families in Appendix C). There were ten apartment blocks, each with four two-bedroom units; eight small two-bedroom semi-detached units; four large two-bedroom semis; four two-bedroom bungalows; seven four-bedroom 1-1/2 storey houses; and one three-bedroom house and two four-bedroom houses on concrete foundations. Most were on cedar post foundations, replaced in 1952, and had uninsulated floors. Only the three houses on concrete foundations had central heating.¹³

Except for the bungalows and 1-1/2 storey prefabs which had asbestos shingle siding, all buildings had stained and wrinkled "Asbestos Whiteside" roll siding. Roll roofs were the standard. Construction had been intended to last only "for the duration". Front walks were of wood. In 1946 there was a narrow board walk, three planks wide, on the north side of Sandhurst. At the east end, opposite Staff House, it was on stilts so that it bounced alarmingly while mummy pursued little people; no fences permitted.⁷⁴ Roadways were gravel, without curbs, graded and plowed by McDougall Township, and also oiled in the summer for dust control. Springtime run-off frequently deposited gravel on the lawns which were on the low, south side of Sandhurst Road.

They were not prestige accommodation but the price was right. In 1946, rent for an apartment was \$18 per month,²⁷ and by 1957 rents ranged from \$25 plus \$1 water rate for an apartment, to \$60 plus \$1.50 for a four-bedroom house on concrete foundation. Many new employees or transfers from Malton were attracted to Nobel by the low rentals; they fell in love with the community after they arrived.

Once, and only once, there was an evening of square dancing in a downstairs apartment on Sandhurst. The building resonated to the rhythmic thumping of feet so that pictures were knocked skew-whiff on the walls of every apartment of the block.

To complete the cataloguing of the warts on the face of paradise, however, one must mention BLACK FLIES. These were new to the experience of most city dwellers, and certainly to the

tasty newcomers from the U.K. For a period of some six weeks each spring, between the first hint of green foliage until the leaves were fully mature in June, the black flies were with us in swarms. Frank Farrow was the only male in the village who had the courage to spend his spring evenings patiently putting in his vegetable garden.³⁷ A Singer Sewing Machine salesman was unfortunate enough to hit the village at the height of black fly season. On leaving, he was heard to exclaim "My God! What a village! Nothing but kids, dogs, and black flies!"²⁴

It was standard technique to protect the youngsters' ears and hair with a cut-off nylon stocking tied in a knot on top. It was in the form either of a stocking cap pulled down over the ears, or of a balaclava with holes cut out for eyes and mouth. Any exposed parts of the face were smeared with stick repellent. Then, with eyes tightly closed, the child was sprayed with 6-12 head to heels down the back, and toes to neck up the front. Woe betide a wee tyke who came apart in the middle. One night young Ricky Gordon had 39 bites around his midriff.³⁷

When the black fly season came to an end the mosquitoes were with us, but they never caused quite the same dismay. It was Bob Reed, who loathed both species of the little vampires with a fierce intensity, who organized the first spray brigade; streams for black flies, ponds for mosquitoes. The annual spray became a tradition which continued through the Orenda years.³⁰

1950 was the year of forest tent caterpillars, and they were everywhere. In their quest for new territories to conquer, they found the going easiest on the steel rails of the CPR tracks. They made a marvellous lubricant, and actually stopped a train on the very slight grade between the plant and the village.³⁷

The CPR tracks and passing trains were a fact of life in Nobel; a strong attractant for kids and a source of worry for the parents. One time Linda Curtis in her little red snowsuit brought a train to a screeching stop; the engineer and neighbours saw her safely home.³⁷

Tom McCloghry: "There was the Saturday night when we promised to be beside the tracks when the evening CPR transcontinental roared by carrying a relative who promised to wave to us. Well, the train was late so we wandered the banks beside the tracks picking wild strawberries. "Dad, there's a bear behind you." "Oh, sure!", I said and went on picking. "You know, he's right!" said Enid, but it was the tone of her voice that made the bear real. Eventually it wandered off behind 164 Sandhurst and was not seen again. I don't recall the train going by."³² There were other bear sightings, including one which Ron Page remembers. The kids had to be dissuaded from pegging rocks at a mother bear and her cubs.⁵⁴

Then there were the raccoons, frequent marauders of the village garbage pails. The Otleys were losing the battle. Finally John spiked a 2"x4" between the shed and a tree, drove a nail into it, and hung the garbage pail from that. Next morning, same thing. Garbage strewn around. How did they do it? That night he booby trapped the can with the press camera and flash from the plant. Tripped. Film eagerly developed. There was mammy coon on the 2"x4", garbage pail lid in hand, looking back at her little ones behind and saying "See chillun? This is how it's done!"⁵⁶

One wildlife incident was definitely not funny. CIL closed its dump by back-filling around 1955, and the rats went on the prowl. Maria Rooney was bitten by one at the entrance to her

apartment block. The rat was despatched by Mark Rooney and Jim Byrne, and on the advice of Dr. Peter Scott, plant doctor and physician to many of the Orenda Nobelites, it was sent to the government laboratory in North Bay. Rabid! A lengthy and painful series of injections was required. Maria's picture appeared in the North Star and the Toronto Star, and the incident went on CP. The Rooneys had feed-back from friends as far away as Vancouver.²⁹

The Gordons had an Alsatian by the name of Duke. One year there was a new municipal ordinance which required all dogs to be tied up. Duke was tied. A little Yap-Yap terrier was not. It was his pleasure to make Duke's life miserable. Every time he was chased away he came right back to Yap-Yap again just beyond the reach of Duke's chain. One day the Gordons heard the familiar Yap-Yap and suddenly it stopped. Ollie Wilson waved them out for a chuckle. This time Duke had left generous slack on the chain, and when the terrier's nose was the usual 2 inches away, grabbed him by the scruff of the neck, dragged him over to the base of the tree to which the chain was attached, flipped him over on his back, and sat on him. There sat Duke, with a look of smug satisfaction on his face, while the terrier's legs thrashed wildly on either side.³⁷

In the early years many of the recruits to the Nobel plant were single and stayed at Staff House. Staff House also provided accommodation to new arrivals at Nobel, such as Bob Curtis, Tom Fraser and Stu Kerr,²⁷ until their families could follow, and to those who came to Nobel on temporary assignment. The Scrivers were not the first custodians, but they were there from shortly after Staff House first became home to George Best, Axel Kielland and Shad Williams in May 1947. Mr. Scriver died of a heart attack, and for an interim period "Aunty" Frances Hitchings helped out.¹⁹ (She was Olive Kingston's aunt.) Bill and Lill Walker took over in 1951 and continued to look after the "boys" for three more years, after which Staff House reverted to use as individual apartments, and Bill Walker joined the maintenance staff at the plant.

Staff House was a block of four apartments at 153 Sandhurst Road. The custodians occupied the ground floor apartment to the right and served meals to the hungry crew in what had been the living room. The living room of the apartment to the left was the common room, and the two upstairs living rooms and six bedrooms were used for sleeping. Room and board was \$52/month for spartan accommodations but plenty of food.¹⁹

Other early residents of Staff House were Don Morrison, Bob Reed and two students for the summer of 1948, Pete Stevens and Bob Warren.³⁰ In 1951, when he was up on his first hitch, John Armstrong remembers John Martin, John Otley, Don Morrison, George Best, Jack White, Dick Joy, Jim Brothie, Bob Reed, Bruce Hisey, George Sladek and Joe Magro as house-mates. Keith Hilditch had left by this time.

George Best remembers Joe Magro, who came from Malta and had a taste for seasoned food, making his eggs just black with pepper before he'd eat them.¹⁹ Poor Joe. He was a sincere and open type. He never could be persuaded that he really shouldn't subscribe to the Communist Daily Worker and have it delivered to his desk at the plant. Eventually the RCMP took an interest, and at last word he was having a tough time getting re-established.

It was a congenial bunch at Staff House, always ready for a good laugh. Like the time John Armstrong decided he'd install a real world-beater of a radio antenna in the attic, missed his

footing on a joist, and stuck his foot through the ceiling of the upstairs bunk room in 153D. The carpenters from the plant shared the chuckle while they made repairs.

A few years later, when Jack Hill was Combustion Test Engineering Supervisor, and after Staff House had reverted to apartment status, Jack was interviewing a prospective transfer from Malton in 153C on the other side of the upstairs hall. Jack Stuebing, a keen type who had an apartment downstairs in 153B, was rearranging assorted boxes in the attic when HE slipped and went through the boss's ceiling up to his armpits, over the head of one startled guest. In so doing he restored a proper sense of symmetry to the building.⁵⁷

Nobel was a place of romance, and of consequent stag parties at Staff House. Shad Williams was the first bachelor to hit the marriage trail, and married Dawn, daughter of the Woolacotts who lived just across Sandhurst from Staff House. John Otley was an early one. He married Jean Burgess from Parry Sound. Bob Reed married Rita Chenette. Clay Margison married Ruth Kennedy. Dick Joy married Mary Vasey, a nurse who was at the Parry Sound General at the time. John Martin married Vera Ryan. Bill McGee, a summer student, met his future wife, Nora, at a dance at Point au Baril.

Staff House closed progressively. By 1952 the need had shifted to family accommodation, so half of the building reverted to apartments. Finally, in 1954, Staff House closed and all four of its units were apartments. "Aunty" Hitchings, from that point until plant closure, filled a continuing need for interim and transient accommodation with a room and board establishment in a 1-1/2 storey at 23 Hillsdale.

The Wilsons had the first piano on Sandhurst and the Cliffords had the second. Shad Williams' mother, who was in the village for a time, had the third, a grand piano well remembered by the boys from Staff House since it had to be humped up the stairwell to an upstairs apartment. This involved removing, and then re-installing, the stair rail. Mrs. Williams was a very accomplished pianist, a Beethoven specialist, who gave Ollie Wilson once-a-week instruction in Beethoven interpretation.⁷⁴

In the village apartments there was no grumbling to the landlord about too much or too little heat. There was luxurious individual control — initially by means of a wood-and-coal stove with an annex water heater tank on one end, and with coal delivered by the bag through the living room and dumped into a bin in the shed opening off the kitchen. There was always a supply of hot water in the winter when the stove was in use, but laundry or a bath in the summer involved firing up the stove with wood, and then using every available pot on top of the stove for additional water heating. During the winter the standard technique was to store milk and other perishables between the inner window and the storm window in the kitchen.³⁷

It was the same thing in the semis and houses. When the McCloghrys were in 4 Pinecrest, during the summer they relied on once-a-week delivery of a block of ice for the ice box. There was a wood stove for heat, hot water and cooking. In the summer, cooking and baking with the wood stove could make the house quite hot. One day, after Enid had baked a pie, they left the doors open to the cooling breezes while they retreated to the front lawn. They returned just in time to see the neighbour's big dog skedaddling with their pie.³²

Progressively, individual tenants installed rangettes for cooking, electric water heaters, and oil space heaters which they then hoped to sell at discount to the incoming transfer. It was quite possible for a wood stove to get out of control, but just about everyone had an alarming experience with a botched light up — by a twist of burning paper or whatever — of the oil space heater. If there was an overly generous puddle of oil in the pan of the heater when it DID light up, the smoke pipe rapidly assumed a rosy hue while the heater expressed its displeasure with a thunderous roar. It was really quite amazing that no buildings were lost by fire.

Those already in residence were generous with their advice and support for new arrivals; one did not have to re-invent the wheel. The Armstrongs, when they took over 133B Sandhurst Road from Dick and Mary Joy in October 1953, were initially dismayed to find that in cold weather the living room was stifling at head height while the floor was freezing. The bedrooms, of course, were always cold. Clay and Ruth Margison, across the hall, shared their invention, an electric fan mounted on a bracket over the space heater, and directed down towards the floor of the bedroom hall. Improvements were commissioned on the coldest day of winter. George Soper, who lived in 133D upstairs, had been happily enjoying the generous conduction of free heat through the floor. He suddenly found himself making many trips each day to his fuel storage tank beside the apartment block.

The floors of the housing units were uninsulated, but the construction of the bungalows and 1-1/2 storey prefabs compounded the problem. The McCloghrys found that in 4 Pinecrest — removed in 1950 when they moved up to Sandhurst — ice extended three feet up the INNER walls in the coldest weather!⁷⁵ The Ross-Ross's and Gordons, who also spent some time in these units, found that dampness on the bathroom floor never really evaporated in the winter, and might indeed turn to ice.³⁷

Most Nobelites took a rather perverse pride in the cold days with which Nobel was visited. No one forgot them, particularly if he happened to arrive at the Nobel station for the first time on the coldest night of the year. The CPR train schedule was arranged for the convenience of passengers leaving Toronto in the evening, not for those arriving at Nobel at 4:00 a.m.

Bob Curtis had a doubly chilly reception. "When I applied for a job I was told at Malton I would be the first Englishman employed at Nobel, and they didn't like Englishmen up there. I asked why. I was told that those who had worked in Nobel during WW II were 'know-it-alls'. I arrived at Nobel by train on February 20, 1948. It was 45 degrees below zero. I stayed at Staff House for two months while I was waiting for my wife Jessie to arrive with our first child, Linda. We spent eleven wonderful years in Nobel until the closing of the plant." Despite that jolly send-off by the personnel officer at Malton.⁵⁸

In the early years, walking to the plant was the norm. There was a cinder trail, a short-cut from the end of Sandhurst Road, which was quite pleasant in the summer. In the winter, when the snow was deep, the CPR tracks were the preferred route. The freshest breezes came from the north. George Best recalls walking backwards up the tracks to keep the icy wind from freezing his metal-rimmed glasses to his nose.¹⁹

The Gordons were at Nobel in the winter of 1946-47. There was a memorable overnight blizzard. Don Gordon: "In the morning we went to the front door of the apartment block,

opened the inner door, and you couldn't see anything! The four fellows in the apartment took the window off the storm door. Solid snow. So we went to work, with our wives' help, digging the snow into pails and dumping it in the hall. We dug and dug and finally broke through halfway to the road. Then we had to get rid of all the snow dumped in the hall. We figured on a human chain using pails. Someone suggested we try the back door. Hardly a speck of snow! The blizzard had dumped it all in front.

"Those who had snow shoes or skis got to work just fine. The rest of us had to slog over a high bank at the side of the CPR tracks, and then follow the tracks to work. But then there was another one foot fall of snow. We were part way to the plant when along came a locomotive with a snow blower in front. I was first over the bank, but the others just nicely got to the top in time to be thoroughly plastered with snow. Sarnie Crawford had the roads plowed promptly in the village and over to the garage and store, but it was several days before the highway was plowed from Parry Sound."³⁷

Ron Page remembers the rifle-shot crack of trees splitting in winter; car tires frozen to the road, and then thumping until they warmed up enough to resume a round shape; working with Phil Ross-Ross to change a starter motor on the rope tow at the Parry Sound ski hill, on land leased a few miles southwest of Parry Sound, and a project of the ski club formed in about 1955; and sun bathing at the bottom of the ski hill in the bright cold days at the beginning of the sugar snow in the spring.⁵⁴

Joe Conrath: "We had a ski hill well attended by Nobelites. Phil Ross-Ross kept the tow rope in shape with his expert braiding repairs. I was one of the first casualties with a badly damaged ankle which I thought would earn me a few days off. Charlie Sykes abruptly ended my convalescence by sending a car and a pair of crutches to get me to work."⁵⁹

Fred Anthony remembers the dads spending a -20°F Sunday morning shovelling 30 inches of snow from the village rink so that the local kids, including his own son Brian, could play the Parry Sound Squirts in the afternoon. Bobby Orr, son of Doug Orr of CIL and a nephew of Howard Orr, a fitter-tester at Orenda, was one of the Squirts, but not yet of international renown.⁶⁰

The Nobel years were a time of babies and little tykes. It was a great place for newlyweds and young families. There was excellent health care in Parry Sound, with many fine doctors and two hospitals. There was no Kindergarten at the Nobel School, but Miss Ruby Cook was a marvellous Grade 1 teacher. Cecil Stephens, a neighbour in the village, was the warm and caring principal of Nobel school. For those few students from Nobel who attended the Parry Sound High School, the phone rang frequently; they were much in demand as baby sitters.

Phil Ross-Ross: "Parties on the weekends were plentiful, and sharing was in vogue. Few could afford to buy the booze and goodies; everyone brought something. It was not uncommon for the bedroom to have a few sleeping babies who were carried home on daddy's hip after the party. At 25 cents per hour (50 cents after midnight) baby sitters were still a luxury and often scarce."³⁴ The young marrieds often exchanged baby sitting services, and at Christmas time they'd compare notes to avoid duplicating toys. That way, when they went visiting, there was always something new for the children to play with.³⁷

The mothers remember the tedium of bundling up the children with extra scarves on the colder mornings so that even their noses were buried, only to have them banging on the door a few minutes later with an urgent need to go potty. Some of the mothers got smart. Betty Gordon: "In the kitchen we always kept a jar for the little boys and a potty for the little girl."³⁷ The first-born children of the early arrivals wore brown or navy melton cloth snow suits. When they were not actually being worn, the snow suits were hung on a line over the space heaters, dripping melted snow and sand on the floor. When the second round of children arrived — what luxury! — they got to wear nylon, perhaps even red! When Axel Kielland's mother was visiting she made a fur-lined carry bag for baby Sandy. Anne could carry the bag over her shoulders, with her hands free, while baby was snug and warm.⁷⁴

Betty Gordon remembers sleighing with the kids on fresh snow on the hill between Sandhurst and Pinecrest, on Lynwood — until the sand truck arrived; the ice build-up on the eaves of the poorly insulated roofs, and the 13 inch slab which smashed the railing on their porch; the laundry which became stiff as a board — a real challenge if the wind had blown some wet sheets over the top line before freezing — and had to be finish-dried in the kitchen; and skating on the village rink, pushing the baby in his carriage, with little tykes, her own and their friends, hanging onto the handle while they learned to balance on their skates.³⁷

The mothers would get out for a walk with the young ones after their nap. That was the time they'd meet the other mothers, have a chat, exchange a joke or two, and then someone would say "Come back for tea!" About 4 or 4:30 they'd have to scramble to get home to prepare supper for the hungry husbands.³⁷ It was difficult to be lonely or stand-offish at Nobel. There was always advice and help in an emergency — one just had to ask the veterans, the Criggers, Gordons or Wilsons!

The phone, up to late 1956 when a new exchange was installed in the Crawford subdivision, was on a party line with up to six families per side and a total of twelve per line. Ruth Margison, who continued with Ma Bell for a time after she was married, had rings with rhythm. Many of the operators, sadly, did not, so several people might pick up the phone at the same time. By general agreement, it had to be important before you used the phone. Dropping in for a chat and a cuppa was more fun anyhow. (See 1958 Bell directory for Nobel in Appendix C.)

Phil Ross-Ross: "Dick Joy loved to spin his car on the icy roads. He encouraged skijorers to take hold of the end of a long rope and be towed along the side of Back Road. As if that weren't dangerous enough, having the local dog population nipping at one's heels added to the excitement. Sometimes we'd ski out to Huckleberry Island across the frozen Sound. If conditions were just right, there would be no snow on the ice and the skaters could go for miles, with occasional moments of concern as they crossed crystal clear ice that gave one the feeling of being only inches away from the icy waters. The ultimate was to spread open one's coat and sail back with a stiff breeze.

"Cars on the ice were also common; the locals and most Nobelites understood the situation. A few of the new employees didn't. Bob Diepenhorst's claim to fame, after seeing all the other cars on the ice, was to decide to take his girlfriend out for a spin in his Volkswagen. But he picked the wrong spot; the ice was thin at the mouth of the Seguin River, and the car broke through. Fortunately Bob and his girlfriend scrambled to safety before the car sank from sight.

It was pulled out at night. A cable line was chopped through the ice from shore and a light located the car. After it was hauled to shore it dried out, more or less, and eventually it restarted. Bob immediately sold it. What about the wet seats? Well, the windows got left open one day."³⁴

That final winter of 1958-59 brought us even more snow than usual, and it was particularly deep behind the Ross-Ross and Armstrong houses on Parkway, with alternating layers of light crust and soft snow. The combined brood was equipped with little red shovels so that anyone breaking through the crust could dig out, or in the worst eventuality, wave the shovel so it could be seen over the snow bank, and holler for mummy to come to the rescue.

It was that same winter that Jean Barnden was awaiting the arrival of Debbie, a baby sister for Glen. When Glen's date was approaching in July 1955, in the worst heat wave in years, Roy had nipped down to Malton to meet his mother who had flown over from England for the arrival of her first grandchild. Too late!

This time Roy was determined to do everything right. Early on the morning of March 16, 1959 Jean announced that it was time; a 15 minute trip to the Parry Sound General should do it. A 15 minute trip it was not. Overnight there had been one of those spectacular, end-of-winter, last-lash-of-the-tail blizzards which deposited 12 inches of drifting snow. Roy somehow managed to get the VW through several deep drifts, and then became hopelessly stuck on a snowbank at the entrance to the highway. A neighbour managed to push him clear. Even the highway was reduced to a narrow two-tracker. Halfway to town a tractor trailer had jack-knifed, and the road was completely blocked. On the far side there was a line-up of vehicles headed for the change of shift at CIL. Eager volunteers jiggle-bounced the last vehicle in the line-up, a station wagon, so that it was headed back towards town, and carried Jean to it. By this time Jean was in dire straits. The driver gave her a leather glove to clamp between her teeth; she bit holes right through it. By the time they got to the hospital, Debbie was on the way, and Jean was rushed up to the delivery room. Jean's doctor was summoned from bed, pulled on his pants over his pyjamas, slid down the drifted-over and unshovelled steps at the rear entrance to the hospital, and rushed up to the delivery room. Too late! He officiated at the post-delivery tidy up and took Roy back to his home for a celebratory drink.⁶¹

One of the diversions on winter evenings was the woodworking class at the Parry Sound High School, well attended by the Nobel contingent.⁶¹ Don Ritchie, the teacher, didn't actually find much time for teaching; he was too busy keeping track of what the Nobelites were up to. For most of them it wasn't just a hobby. They had apartments to furnish, and they couldn't see all that lovely power equipment at the High School go to waste.

Some of the other families were more established, but most of the younger staff were just starting out with a bed, an orange crate for a bedside table, a box or two of wedding presents, and very little other furniture. Each new acquisition was a cause for celebration. A new sofa occasioned much oh-ing and ah-ing from friends. A record collection and a hi-fi, generally assembled from components and with a hand-crafted speaker enclosure, was a priority, particularly for enthusiasts such as Ron Page and Roy Barnden.⁶¹ Betty Gordon has happy memories of their first washing machine (thanks to Cora Robertson who maintained the Nobel post-war priority list for McKinley Hardware in Parry Sound), their first refrigerator, their first vacuum cleaner, and the gas stove which replaced their rangette.³⁷

In the first summer, 1946, the four Avro children on Sandhurst were David Wilson, the youngest at twelve months, Melvin Joyce, the eldest at 20 months, and Hal Finlayson and Paul Marcoullier in between. By early the next year, when David was close to two years, he was already a sturdy lad. Jean Finlayson, Ollie and the children returned from shopping in town one day and David decided to help carry the groceries into the house. Hal was in the way, so David picked him up by the back of the collar and the seat of his pants, set him aside, and then carried in a ten pound bag of potatoes. "A furniture mover!" gasped Jean Finlayson.⁷⁴

Nobel kids were enterprising, particularly at the age of two. Ann Clifford, a cookie cadger, wore around her neck on a string the round top from a Pabulum box emblazoned with the warning "Don't feed me cookies!" Darlene Dunn, not wishing to bother mummy on a Saturday morning sleep-in, went for a stroll wearing sleepers, snow boots and daddy's mitts.⁷⁴

A favourite Armstrong family hike was over the rocks, through and around pine, birch and juniper behind 109 Parkway to the promontory overlooking the Sound. One time Neal, 4, and Jane, 2, made the same trip, alone and unauthorized, in search of blueberries. "Mummy, WE knew where we were!" The bush between Sandhurst and the CIL plant was more forbidding. When David Wilson was 4 and Anne Sutton 2, they went exploring and were soon lost. It took manpower from the plant a full hour of organized search to find them. It was a real worry. During the war a small child from the village had disappeared in the bush and was never found.⁶²

The Nobel Club, operated by Jack Lawson and his wife, was the place the youngsters would blow their weekly allowances at the tuck shop.³⁷ Until a fire destroyed the kitchen beyond economical repair, it was a place one could buy a hamburger.⁷⁵ The club had a couple of bowling alleys and an active league, pool tables, a target range for .22 rifles in the basement, and a gym used for badminton.¹⁹ The trick was to avoid a violent confrontation with the walls, and to lob the birds up THROUGH the trusses.

The club saw many other community activities. There were dances arranged by the Avro Recreation Club — or later, the Orenda Recreation Club — perhaps with the four Nobelmen providing the music. Gord Jennings played trumpet, Ken Dunk, guitar, Tommy Fraser, piano and Art Prosser percussion.⁶³ One year Marge Farrow organized a nursery school at the club for the modest fee of \$5 per month, the amount of Family Allowance in those days.⁷⁴ There was a little concert at the end with the kids dressed up in costumes. Ricky Gordon was Little Boy Blue, but when the time came for him to say his lines, he was struck dumb; just terrified. Marge Farrow said his lines for him, everybody clapped, and the wound was healed.³⁷

Every Halloween there was a contest for the best costumes in each category. There had always been a category for pairs, so one year Don Gordon scrounged appropriate sizes of cardboard boxes and painted them so that Judy was a carton of Black Cat cigarettes and Grant was a box of Eddy matches. That year there were new judges and no pairs! So Judy won the prize and Grant was desolate.³⁷ One year Don Gordon, or perhaps Ron Bowman, set up a cardboard "mechanical man" by the road and scared the kids silly with conversations via a microphone and speaker.

There was a ball diamond, of sorts, on the far side of the track, and it was the scene of many evening games. One time, when Harry Gibson was Engineer in Charge, he decided that all

red-blooded males should play soccer. The field selected for the first — and last — game in the series was on the east side of the highway and to the south of the plant. If it ever had been level, it wasn't by that time. John Armstrong was rather relieved to sustain a non-catastrophic sprain within the first few minutes of play.

There must have been a decent field elsewhere, since there was a challenge game of soccer which brought Malton's best to Nobel. Nobel lost. Another time there was a challenge game of curling. Nobel won. The competitive juices really flowed in hockey season. Bill Allen has a number of pictures. First there was the Garside Cleaners team with good Avro Nobel participation. Then an Avro Recreation Club team was organized, with a few good CIL players sneaked onto the team.²⁷

Shad Williams modestly remembers that Willy Holmes, a CIL employee, was a star in the Avro Nobel team,⁴⁷ but we quote George Best: "Shad was an excellent skater. He could start and stop very quickly. He was the forward who scored the most goals for Nobel in the games he played."¹⁹ Bill Allen: "In one hockey game when we were playing off for a championship against Mactier, we were down three goals with about 2½ minutes to go in the game. Shad played so hard he almost had to lie down to catch his breath, but he went right back out. He scored two and then set up another within five seconds of the end of the game. He scored in overtime to win the series!"²⁷

Bridge was popular in the village. Bill Kretschmer remembers the chess club with particular fondness. Phil Ross-Ross, perversely, remembers one of the few times he was able to beat Bill. Due to good luck on Phil's part, and rotten luck on Bill's, that was the game which decided the championship!

At Nobel we felt ourselves one with nature and with the march of seasons. The fall was a season of spectacular colours, of the early, scarlet maples in flaming contrast to the pine and still-green deciduous trees, of a gradual muting to wines, rusts and yellows and finally, falling leaves to open up forgotten vistas; of air crisp and invigorating, with the occasional whiff of burning leaves or of pickling. Winter brought skiing, skating, hockey, and its occasional cold snaps and blizzards. Spring was the season of promise, of the first drive with the family on a dirt road, and getting mired in mud up to the hubcaps; of running sap, of rivulets and puddles which were the delight of small fry and the despair of mothers; the season of budding leaves and pesky insects.

Summer was the season for which Nobel was designed. It also brought tourist season. We saw visitors from Malton we never saw at other times. The wives learned to be prepared. They were lucky to get any warning, let alone a respectable 20 minutes, before hubby would arrive with a noon-hour guest.

Fred Anthony was Secretary of the Avro Recreation Club. He dug up a yellowed copy of the program for the Fifth Annual Avro Picnic, July 18, 1953, at Oastler Lake. Bus transportation was laid on, and there was something for absolutely everybody. In the evening there was a wind-up dance at the Club.⁶⁰

The beaches were the place for swimming and sunning and, as Gord Baskerville recalls, also for noon hour lunches and philosophical discussions. They are a focus for the warmest

memories of Nobel. There was one beach at the foot of the roadway which led to a walkway over to a small island which provided dockage for the boats, and there was another beach farther to the west, accessible only by a pathway. From a promontory halfway down the pathway there was a spectacular view across the Sound. The view was a place to pause on the way back up, with hot and tired children in tow. Or perhaps it was a jump-off place in a hunt for an as-yet-undiscovered blueberry patch. In the fall, when the colours were at their best, the view promontory was worthy of a special hike.³⁷

In the summer of 1950 disaster struck. Ernie Clifford: "In Parry Sound harbour Imperial Oil had a tank farm for gasoline, domestic heating oil and bunker C, which came in by Great Lakes tanker and was distributed locally. One day at the end of unloading a shipment of bunker C, the inflow pipe broke off close to the tank and above the shut-off valve. At that time, not one of the tanks at the tank farm had a dike, and the whole tank-full escaped into the harbour. A boom was placed to keep the oil inside the harbour but it broke or was broken. (A local not-so-bright was reputed to have said HE wasn't going to have HIS boat stuck inside the boom with all that muck!) An off-shore wind blew the oil out as far as Killbear Point. I saw six inches of oil on the surface that far out. There was a great to-do and dirty shores and beaches. The oil emulsified with water, reached neutral gravity, took on sand, and sank to the bottom with every storm. Imperial Oil sprang into action, cleaned beaches, repainted boats and was generally very gracious."²⁴

For some years, until bacterial action had done its work, it was hard to go swimming without mucky feet and oil-stained towels and clothing. The other John Armstrong, the one who owned the Imperial Oil station on the west side of the highway, now Crestview Heights, was perhaps the only one to profit by the spill. He had some free, cohesive, beach sand fill for a low-lying area behind the station.

There was tennis on the village green, golf for a very modest annual membership at the Parry Sound Golf Club, and fishing. In the early 1950s, before the sea lampreys had decimated the lake trout, Cy Dorer had quite a handsome cedar strip outboard which he kept at the Nobel docks. Most evenings in the summer, he'd head out to Killbear Channel for a bit of trolling. It was a poor evening if he didn't catch a couple of beauties.

Don Morrison remembers the "Annual Trip to the Mag", organized by Roy Smith on May 24 weekend, to a cottage on the South Magnetewan River. Don recalls John Martin, Art Prosser, Mo Satchell, Dave Rose, Cy Dorer, Gord Smith as some of the participants through the years, as well as Don himself, Roy Smith, John McGee of CIL, and Bob Campbell, a friend of Roy's from Weston, who owned the cottage, later purchased by Roy. The trip up was by a CNR passenger train on the Toronto-Capreol run, departing Parry Sound about 4 a.m. The train would stop by request at the "steel span" crossing the Mag. Provisions had to be carried down a steep embankment, and then through 200 yards of bug infested swamp to the camp beside the river. Bob Campbell was an organizer; the multitudinous chores of "opening the cottage" came first; fishing came later. Sunday was the big fishing day, and in the earlier years, before the encroachments of advancing civilization, the limit was taken quite easily.

No passenger train could be flagged down, so the return trip was by what was known as the LRS (Leaky Roof Special) which had a steam locomotive, a couple of freight cars, very occasionally a passenger car, and a caboose. It stopped at every second stump on the way

south to accommodate the residents of local communities without road transport, and at every siding in deference to higher priority traffic. The trip south was tolerable if the sporting types got to ride in the caboose instead of an empty freight car. Eventually, the north-bound passenger train refused to stop at the Mag, and two trips in one weekend on the LRS were one too many.⁷⁷

George Best remembers canoe trips. Johnny Wilbur, on one trip, wore rubber boots which were a comfort on portages or when dragging the canoe through stretches where the water was low. In the evening he was banished to a remote, down-wind corner of the camp site.¹⁹

One fall Shad Williams was driving the boys, guns at the ready, to a favourite hunting spot at Maple Island, close to McKellar. They were driving along a twisty road at about 40 miles per hour when suddenly Shad slammed on the brakes and pulled into a laneway. "There are two partridges under that tree down the laneway, and a pheasant over there!" The others hadn't noticed.²⁷

Joe Conrath: "Hunting was a favourite pastime. Bill Kretschmer would get me up at 3 a.m. to travel to some of the marshes on Georgian Bay for duck hunting. Bill was a great entertainer with his good sense of humour and expertise on the piano."⁵⁹

Boats were an integral part of life at Nobel. Colin Finlayson operated the "Admiral's Barge", later sold to incoming EIC Art Sutton, then to Ernie Clifford, then to Harry Gibson, and finally to a triumvirate of Dick Joy, Clay Margison and George Sladek. It was a "dippy", more formally Dispro, a cypress hull skiff with a prow at both ends, and a "disappearing propeller" protected by a skeg which would kick it up into a housing, and out of harm's way, if it hit one of those ubiquitous Georgian Bay reefs. It had a copper jacketed two-stroke one-lunger engine with a fly-wheel.³¹ To start, you judiciously set the timing — just so — and gave the flywheel a firm tug in the WRONG direction so that it would bounce off compression and start with a rumble in the RIGHT direction. And if you wanted to go in reverse, you yanked the flywheel in the RIGHT direction so the engine would go in the WRONG direction. Still with me?¹⁹

One time Colin was feeling downright dejected. He was out in the middle of nowhere, and the engine refused to start in the forward direction. Inspiration! He just started it in reverse and headed home backwards. Steering was a little tricky, but it had a prow at both ends. What he hadn't realized was that the packing was wound onto the shaft so that it stayed tight only as long as the dipper was in forward. The seal unwound after half a mile or so, and he ended up bailing furiously for the rest of the way home.¹⁹

It was a serene but troublesome beast, with planking that dried out in the winter. Colin Finlayson: "When I bought it, the varnish inside and out was in deplorable shape, so I removed the engine and seats and re-varnished it. The seller said it had a cypress hull."²⁰ Ernie Clifford: "Colin had carefully cleaned, scraped and varnished the hull, but it sank at the dock during a four day absence. That fall I pulled all the nails in the planks at the stern and stern and screwed and glued them in place again with marine glue. No leaks."²⁴

Dick Joy: "Ignition was by way of a model T coil with a trembler on top, and a hot shot battery. These critical parts we kept in a wooden box that we always took back to the apartment after using the 'dippy', since it could not float more than three days. The dipper was nearly always

sitting on the bottom by Friday night, but it could be re-floated without great effort and the engine required no more attention than draining the carburettor. The gas tank was pretty well sealed so no water could get into it. I think we abandoned the poor old dippy in 1953 because there was hardly a sound plank remaining."³¹

Colin Finlayson: "George Best and Axel Kielland bought a boat which I believe had originally been a double-ended lifeboat, but it had acquired a transom in place of the original pointed stern. It had a 'one-lunger' engine which even at idle drove the boat too fast for trolling, so they towed a bucket from the stern as a sort of sea anchor to slow it down. On their maiden fishing trip George and Axel had trolling rods, each loaded with 300 feet of copper wire. They proceeded to pay out their lines, but found their lures and quite a lot of their copper lines had gone into the bucket. There was no alternative but to head for the beach to untangle the mess."²⁰

Russ Clarke had an old but handsome mahogany inboard 21 footer, circa 1927, purchased from Otto Kraus. Don Gordon: "Bett, I and the baby went out with the Clarkes in their boat. The ladies were up front with the baby carriage, talking away. On the way home from a picnic on a little island, the engine raced and the boat lost way. The shear pin had gone. No spares. I was wearing my dad's old watch with an 18 carat gold chain, so we went to work with the chain. Russ cut out link after link, putting two links in the shear pin hole, and found that if he was very careful we could get about a mile out of each pair of links. We counted the links and figured we'd be a few links short. But we made it. And the ladies didn't know anything about it until we told them!"³⁷

The Seagull was a wooden hull sailboat originally owned by Harry Gibson, Rolly Andrews and Ron Meschino and sailed on Lake Ontario. Don Morrison bought it, had it hauled up to Nobel, and sold a half share to Shad Williams.⁶⁴ Shad Williams: "It was a Seagull class, 18 foot x 5 foot beam. I sailed her every day for a month, devoid of experience except for one hour of rudely coloured instruction by Don on a not very breezy evening on the Sound. The trips out into the Sound were truly voyages into the unknown, sans charts, sans life jackets, sans everything but the essential paddle and a bailing can, with a trusting Willy Holmes as crew, rubbing the centre board repeatedly on the (assumed) uncharted bottom of the Sound."⁴⁷

Don Morrison: "This was the summer of 1950, the year of the Imperial Oil spill of bunker C, so the Sea Gull was a bit of a mess by the end of the season. I bought out Shad's share, and the boat was stored behind Staff House for a year."⁶⁴ Phil Ross-Ross bought in. Phil: "We sat down in the Staff House kitchen and went over the list of everyone in the village, looking for a third man to be a co-owner and contribute to the overhaul. We ruled out just about everyone. No, he can't swim. No, his wife won't let him. No, he's nervous in boats. Don leaned out and called to John Martin, a non-swimmer, who was sitting in the living room and had overheard the discussion. 'John, want to buy into a sailboat?' 'Yah.' And so, after a lot of work the Seagull was made seaworthy. For years it was the only sailboat on the Sound."³⁴

Colin Campbell: "I went sailing with them in the Seagull whenever I could. One day Phil and I and perhaps Cookie invited Les Pocock to go along. When we were starting out, my dog Mitzi jumped in the water and swam after us. Since we couldn't get her turned around we hauled her into the boat with us. When we got south of Huckleberry Island we found sporty winds and very lumpy water. The dog was very frightened and cowered flat in the bottom of the

boat. The excitement increased when we broke one of the running backstays and had to tack over very quickly to get the load on the other. I don't recall the details but we managed some lashup repairs and got headed back in. With things fairly well under control and some distance to sail, Phil and I talked about the poor dog whose first time sailing had been pretty terrifying. We calmed and cajoled her and expressed our sympathy for her. After we had docked and Phil and I were tidying things up, one of us had a thought. 'Hey, this was Les's first time sailing, too!' We had no idea where his state of mind had gotten to on the scale from 'Elevated Concern' to 'Abject Terror'. Showing all sorts of concern for Mitzi while totally ignoring Les left us with mixed feelings of guilt and glee.

"Cookie did quite a lot of sailing with us until she was 8-3/4 months pregnant with Peter. When the winds got brisk and we had to work at keeping the sailboat upright, Phil and I often expressed our gratitude for the extra ballast provided by the fourth passenger."³³

Both Tom McCloghry and Les Howes picked up some extra change flying for Georgian Bay Airways from a float plane terminal in Parry Sound.³² It was Les who remembered flying John Armstrong around the village in 1951 to take pictures. Les produced the pictures from his files; John had completely forgotten them.

It was during a trip to the plant that Mike Cooperslipper stopped for a coffee in the Instrument Lab. The boys mentioned to him that they'd never seen the finished product. Some time later he managed to schedule one of his test flights up Nobel way. Word was relayed to the plant; get outside fast for a look. Don Gordon says it was only hearsay, but some startled Parry Sounders claimed that on his way to the plant Mike had flown the CF100 up the Seguin River UNDER the CPR bridge!³⁷

In the early years a wheezing old bus provided a service much used by Nobelites. The bus ran more often on Saturday; this was shopping day. Betty Gordon remembers shopping at the A&P down by the river, lugging the groceries up the hill to Shamess's sporting goods store, leaving the groceries there with the neighbourly owner, racing up to Stedmans to buy a few things for the children, and then back to the corner just in time to catch the bus for the return trip. Shopping in Parry Sound was really quite convenient. One could buy just about anything within a radius of 200 yards.³⁷

One day Betty Gordon was to take baby Grant into Parry Sound for his first medical check-up. Betty hustled him through his feeding so fast that after they'd caught the bus he promptly threw up over his new outfit. Off the bus, and a walk back home for a change. Marg Hill saw the predicament and drove them in so that they would not miss their appointment. Nobel was like that.³⁷

Progressively there were cars. Colin Finlayson had "Gracie", a vintage Plymouth which occupied the spare hours his dippy did not.¹⁹ Art Sutton drove a blue 1937 Austin GRL with a sunshine top. Art, a lanky type, delighted in poking his head up through the hatch while passing a cyclist on the road or when pulling into the plant parking lot. It wasn't a very big car, but it had an intemperate thirst for oil, two quarts of SAE 40 on a one-way trip to Malton.²¹

Both Tom McCloghry and Don Gordon report having witnessed the predicament of an unnamed Nobelite with a rumble-seat roadster. The road was a sheet of ice outside his garage

at the end of Sandhurst. The car refused to climb the door-stop into the garage. Leave it in gear, bounce on the rear bumper, and push! Suddenly the car found its feet, the owner lost his and landed on his face, the car door bumped against the garage door post and slammed shut, and the car crunched halfway through the back wall of the garage with its front wheels hanging over nothing.^{32,37}

His first hitch in Nobel, John Armstrong drove up a "new" 1934 Pontiac, thinking it would serve quite adequately as a puddle-jumper. It put the aforementioned Austin to shame; at least one quart of oil for every service station on the way, until a sympathetic mechanic suggested leaving the breather cap off the crank case. Once it was at Nobel, it refused to start in the chilly November weather. Les Howes expressed an interest and bought it. Working in mid-winter, he overhauled it in one of the garages at the end of Sandhurst. It ran quite well.

Les Howes still had his Pontiac at the conclusion of combustion testing in 1951 using "wide range" fuel, comparable to gasoline for explosivity. John Armstrong decided it would be an awful waste to burn at the dump all the drainings from the fuel distribution lines. Surely it must be pretty much like gasoline? He arranged to have a couple of barrels of the stuff put out in the parking lot. Most experimenters were quite cautious and took only four or five gallons. Les Howes was greedy and ended up with a mixture about 75% wide range. Gasoline it was not. He managed to burn it and keep running, but it smelled just dreadful. Harry Oldfield won the prize by staggering in for a fill-up with about a teaspoon of gasoline left in his tank, but his A-model Ford probably never noticed the difference.

By 1951 many families in the village had quite respectable cars, and the bus service withered from disuse. To keep our cars running we then became dependent on Sarnie Crawford, who had the Texaco station at the corner. He was a remarkable neighbour. Don Gordon remembers borrowing all tools necessary to re-bore the block and lap in the valves on the Olds. Sarnie was something of a carburettor specialist. He'd poke his head under the hood, twiddle a screw driver while cocking an ear until the car was purring like a kitten, and then say "That'll be fifty cents." "But Sarnie! You FIXED it!" "Oh, I didn't do much. Not like it was a new carburettor."

He also knew exactly what he could get away with. Nothing new-fangled in his garage. It had a pit rather than a hoist. "Let'sh shee that leak." he'd say, peering upwards under the carburettor and chomping on his smudging, big, black cigar. "Give 'er a shquirt on the acshelerator!" Horrifying!

Even aside from the cold snaps in winter, Nobel had some interesting weather. A sudden squall would come in off the Bay, and if one were lucky, toppling trees did not do damage. Trees (and laundry poles) did not have much grip in the scant soil cover over the rocks. One day George Soper was not so lucky. The neighbours had just finished admiring his new car, and he'd carefully parked it in his garage. Up came a storm, a big beech tree blew over, and where did it land? Smack on the garage in which George's car was parked. Another time there was a hail storm which left dents in every car, Don Morrison's '51 Chev and the Gordons' rather older Oldsmobile included, which made them look as though they had been attacked by ball peen hammer.³⁷

Nobel United Church was a community asset. It wasn't actually a community church, but it was the only one there at the time. The Women's Association put out a cookbook as a money-raising venture, and there were some 70 contributors, many of whom were members of Parry Sound congregations.³² During the Avro-Orenda years the Tristrams, Browns, Miss Hunter and the Leslies provided leadership from the manse. Marg Clifford was organist during her time there and Elsie Gibson was choir leader. As well as church, there was Sunday School. During his years in Nobel, Cars Crigger was Sunday School superintendent; Ollie Wilson played the organ for the Sunday School hymns.⁶⁵ In its short life, one project of the CGIT was a cardboard "stained glass window" over the entrance to the church, designed by Jean Harding as a sort of paint-by-numbers project for the girls. It was intended to be a once-only Christmas decoration but it's still there! Church suppers at the club were a community event, with everybody contributing. Miss Hunter's mother organized a regular get-together for the young mothers; she looked after the little ones in the basement of the manse while the mothers had a relaxed chat upstairs.³⁷

The new manse, built in 1954, was a real community project. John Armstrong designed it from a not-very-successful sketch Keith Brown had clipped from a magazine. A feature was a basement room which occupied all but one narrow slice in the basement. This was envisaged as a community resource. Cars Crigger and Ray Wilson were probably the most faithful volunteer workers, but many others in the community did their bit. Clay Margison used the plant bulldozer to dig the foundation. Roy Johnson dug, by hand, the trench for weeping tile run-off to Guncotton Creek. Wilf Burrige, plant electrician at CIL, did the wiring with some rather inexperienced "help". Cec Mayotte, local plaster contractor and also owner of Mayotte's Grocery on the Highway, stuccoed the ground floor exterior. Roy Couperthwaite, a Toronto building contractor who had retired to a farm in Carling because of an asthma problem, had more to do with the successful completion of the project than anyone else. He volunteered to supervise for a very modest, legal minimum wage of \$1.25 per hour. He spent just about the whole summer protecting the project from the blunders of amateurs and doing personally all the more demanding work of carpentry, kitchen cupboards and such. Just about everyone worked on the manse, but no one more than Roy!

Nobel village was part of the larger community, and the people from the Orenda family made their contribution. Roy Smith had been MPP for Parry Sound, representing the CCF, for the years 1943-47. Roy and Dr. Denholm were a two-man band in obtaining funding which made it possible to add the first modern wing to the Parry Sound General Hospital, which up to that time had been accommodated in what had been one of Parry Sound's more imposing residences. When the new wing was completed Roy was no longer MPP. There was an eager roster of those sharing in the honours of the ribbon-cutting ceremony. Roy was not invited. Bill Hall: "Dr. Denholm was a very kind, decent, benevolent citizen. When he arrived, and realized Roy was not there, he held up the ceremony while he drove to Nobel, found Roy, and brought him back to be a part of it."⁴⁰

Roy was on Parry Sound Council through 1946 and 1947, Mayor from 1970 to 1974, and Reeve of Carling Township for two years in the 1950's. In 1952 he helped start the Nobel Credit Union, which later became the Parry Sound Muskoka Credit Union Limited, and was its first President. He also served at various times as Chairman of the Parry Sound General Hospital Board, and as a director of the Parry Sound Chamber of Commerce. In the 1980's he was a director of the West Parry Sound District Museum and played an active role in getting the

museum underway. He was also the first Chairman of the Parry Sound Northern Development Council. Roy was a man of many causes!

Bill Hall was on Parry Sound Council for the three years 1970 through 1972, and during this time worked with another councillor to set up the first Parry Sound employees' union. "That was a war!" He was Mayor of Parry Sound for two terms, 1981 through 1985. He was a member of the first Board of Directors of the West Parry Sound District Museum and is still a member of its building committee. Sam Robinson was on Council in Parry Sound for two years, 1948 and 1949. Jack Plowman was first elected to Council in Carling Township in 1953, and was twice elected Reeve. John Armstrong was a director of the Parry Sound Chamber of Commerce for a number of years, and designed the Chamber of Commerce building on Bowes Street. He was President of the Chamber in his final year at Nobel, when it made arrangements to pull the Royal Tour through Parry Sound. He was a director and Vice-President of the Children's Aid Society, and was Chairman of the Corporate Canvass Committee in the campaign which funded construction of the second new wing of the Parry Sound General Hospital.

Nobelites were members and supporters of the Canadian Club and the Community Concert Series. Derek Carter followed John Grigor as instructor in meteorology and navigation to the Air Cadets in Parry Sound in the winter of 1958.

A very significant work of community support in Nobel was by the leaders of Cubs and Scouts. Tom McCloghry was the first cubmaster of "1st Nobel", and Joe Conrath was assistant cubmaster. Tom McCloghry: "There was a lot of good clean fun at weekly meetings and at the few camps we arranged. We had a real wolf's head for our totem. The wolf was trapped locally. There were many trips to Back Road where the children of the families living in the packing case houses were persuaded to join, or if they were members, why were they not at the last meeting? All told it was a great experience, and if the boys had as much fun I'm gratified."³² Others involved with scouting were Ron Page, Bud Shunk and John Otley.³⁷ After returning to Malton in 1959, John Otley went on to become District Commissioner and consultant on outdoor training. One of the projects at Nobel was reforestation. There is a handsome stand of pine between the highway and Simmes Lake on formerly unused land, and a stand of spruce on the other side of the road.

There were many recreational advantages in Nobel, but it was the sense of community, of extended "family", as Jean Barnden Atwell puts it, which brings back the most acute feelings of nostalgia. Perhaps Bill Kretschmer says it best: "We still remember the day we arrived in Parry Sound in November 1955. We were all tired from the long voyage across the Atlantic and the train ride from Quebec to Parry Sound.... The first weekend the Ross-Ross's invited us to a lovely dinner, and this was the beginning of a great friendship. Cookie took Edith under her wing, and from then on it was much easier for Edith to get used to the new life and to get over the early loneliness. Cookie was also Edith's English teacher. Over the years we made many wonderful friends.

"We had just bought a car, and we ventured into the countryside on a beautiful, sunny, cold winter day. It almost ended in disaster. We had left at 1 p.m., got lost in a remote area near Skeleton Lake, and got stuck on an icy lumber road miles away from any human habitation. There was a skating party that evening in the village. We had said we would come to the

party. When we did not show up, friends called several times. By 11 p.m. they were organizing a search party, but we arrived home at 11:30. The phone rang; one last check! We were touched by their concern."⁵⁰

Jean Barnden Atwell: "Once, while standing on the high rock looking out over the Sound, we wondered what we'd do if ever, for some reason, we had to leave!"⁶¹

Some didn't leave. Phil Ross-Ross: "With the advent of motorboats many more families got to appreciate Huckleberry Island. In 1957 Cookie and I decided to buy land and build a cottage while we were still in cottage country; we expected someday to be transferred back to Malton. Little did we know! In early August we made the commitment and placed our stakes for 300 feet of frontage on Huckleberry. On Monday morning we went in to the Department of Lands and Forests to make our claim. The rules had changed that weekend; one could have only 200 feet, not 300 feet, and the cost had gone from 60 cents a foot to \$1.00. Even then, inflation! When the Ross-Ross's committed, a group of others followed — Barndens, Kretschmers, Hills, Margisons, Perriors, Martins, and Saintsbury's, along with the DeBrays and Coultas's from CIL. Others, like the Armstrongs and Morrisons, took advantage of living at Nobel to buy mainland property nearby from Roy Smith at Pengally Bay. For most of these people, Parry Sound and Georgian Bay would be a permanent part of their lives."³⁴

The Beginning of the End

Perhaps the first inkling all was not well came during a plant tour which included Crawford Gordon, President of A.V. Roe Canada, and Walter McLachlan, President of Orenda. John Armstrong already knew Crawford Gordon as a manager with determination — a plus. He'd taken on responsibility as Chairman of the Queensway Hospital Building Fund; he wanted the drive to be a success. He leaned on his immediate underlings who leaned on Jack Nesbitt, Industrial Relations Manager of Orenda, who leaned on John Armstrong who.... Nobel employees gave support to a hospital they would never see.

On the tour, Crawford Gordon turned to Walter McLachlan, for whom John had considerable respect, pointed to a lathe in the shop and barked "Walter? Who owns that, the government or Orenda?" Walter: "Agha! Ah!" John: "That particular machine belongs to the Crown." Crawford: "Shut up! I'm having fun with him!" And that was our President who was negotiating with John Diefenbaker.

The Iroquois program was beginning to lose its steam in 1958, and it was necessary to lay off a few of the most recently hired employees. As 1959 approached, we began to hear disquieting reports of possible cut-backs. The Arrow-Iroquois program was to be reviewed by the government in March, 1959. John Armstrong was beginning to wish he had been less persuasive in encouraging Nobel residents to find more permanent housing.

It was assumed that the March review would at least take into account the technical merits of the aircraft and engine, and efforts were redoubled to ensure excellence. In consequence some longer-term, non-military projects were shoved aside. One we had found particularly appealing at Nobel was a proposal for a low-horsepower gas turbine outboard motor.

Word had it that the Arrow was being held below the capability of its Pratt & Whitney J-75 engines to avoid breaking the world speed record; that honour was reserved for the Iroquois engines. In a letter to the shareholders dated September 28, 1958, Crawford Gordon had said "The schedule calls for six aircraft to be test flown by next March."⁶⁶ In his article, "Flying the Arrow", Canadian Aviation, August, 1978, Jack Woodward, the only RCAF pilot to fly the Arrow, states that "Five airplanes had been built and flown; the sixth, and the first to have a production Orenda engine, was on the line and ready to go.... There is no reason to believe that the production aircraft with Iroquois engines would not have reached Mach 2.0 quite easily. The Iroquois engine had approximately 30% more thrust... and the airplane would have weighed approximately 5000 pounds less. I believe the Arrow Mk.II had sufficient performance capability to set a world speed and altitude record, which was held at that time by the United States. The first Mk.II Arrow was scheduled to fly at the end of February, and I believe it would have met all performance guarantees."⁶⁶ The current record, 1404 mph, had been established in the summer of 1958 by a Lockheed F-104 Starfighter.¹⁰

That an Arrow/Iroquois could break the world speed record before the March review was actually quite unlikely. Ernie Clifford: "I believe a mock-up of the Iroquois was fitted in the Arrow to check clearances. The three engines designated for flight in the Arrow were still in the Assembly Shop on February 20. They were nearly completed and would have gone for

green run on Monday or Tuesday following, so they probably would have been just barely available by the end of March."²⁴

It was also assumed that the Diefenbaker line of reasoning — we are in the missile age; the Arrow is obsolete and the Bomarc will be our shield — was so patently ridiculous that wisdom would prevail. But we were taking no chances. To ensure that we had community support, there were many showings in Parry Sound and Nobel of the twenty minute film on the Arrow, "Supersonic Sentinel".⁶⁷ The Parry Sound and District Labour Council, Harry Oldfield, President and Al Whistance, Secretary, sent a telegram to the Prime Minister, timed to coincide with his scheduled talks with representatives of the aircraft industry.⁶⁸

John Armstrong was in conversation with Gordon Aiken, MP for Parry Sound-Muskoka, about the Royal Tour which the Parry Sound Chamber of Commerce was arranging to swing through Parry Sound. Gordon mentioned that he'd been speaking to the PM on the impact the Arrow-Iroquois decision could have on his constituency. He had the ear of Diefenbaker! He received an immediate letter, dated January 30, 1959. (See "Correspondence Relating to Arrow-Iroquois Contract Cancellation" in Appendix E.)

It was all to no avail.

Black Friday

It was well on in the afternoon of Friday, February 20, 1959. Myrt McGinnis raised the guillotine which separated her office from that of the EIC. "Mr. Anderson on the line, from Malton." John picked up the phone. George's voice was hollow and completely dispirited.

"The Arrow-Iroquois contract has been cancelled. Everyone is laid off immediately. The whole plant is being cleared."

"Complete cancellation? Before the Arrow-Iroquois has had a chance to fly?"

"I'm afraid that was the idea, John."

Shortly everyone knew.

Friday was to have been John Grigor's last day before his transfer to Malton. A farewell party had been arranged by Phil and Cookie Ross-Ross. The sunny morning, appropriately, had become a rainy evening. When we arrived, there was a huge black bow on the door. It was an hilarious evening, in a wry sort of way. What else could we do but laugh? There were the good times to remember.

Shutdown at Nobel

After the shock of Black Friday, the story was not over. First came the sad formalities of lay off. And then came the relatively lengthy shutdown of the village and of the plant.

The Orenda section of the village was not vacated overnight. First one had to find another job, get established in it, and then make arrangements to move the family. Betty Gordon: "After five months, Don was finally successful in getting a job in Chicago. By October he had found a place to live, and so it was time to pack up and move. We thought it was the end of the world. We couldn't imagine a life beyond Nobel. However, our friends helped us. We stayed with the Wilsons for a few days because it was going to take a week before our furniture would arrive in Chicago. We had lunch with the Pages, and then piled into the car; it was so sad. We drove around the village two or three times. I remember looking through my tears and wondering if we'd ever see Nobel again. We stayed overnight in Detroit with the Hills who had gone before us, and then we went on to Chicago. But that's the beginning of another story."³⁷

When Orenda families did move out they were replaced by others in the community. Others, with increasing anxiety, were still hunting. The April 1960 termination date of the land lease was approaching. Dave Scrimgeour organized a petition dated January 5, 1960 which requested an extension by CIL of the land lease to CMHC, and continuing availability of the rental housing in what had been the Orenda part of the village. Ex-Orenda signators to the petition, still residing in the village, were Martin Lang, Frances Hitchings, Gordon Watt, Helen Sagar, David Scrimgeour, Frank Farrow, Margaret Monks, Otto Kraus, Phil Ayers, Fred Gerdes, Wally Walwaski, Dorothy Schneider and Bud Shunk.⁶⁹

The petition brought only a short reprieve. In a reply dated January 20, L.T. Clue, Director, Mortgage and Property Division, Central Mortgage and Housing Corporation, stipulated that "... no new tenants will be permitted and that the existing tenants vacate... as soon as possible... (but have) until September 30th, 1960 to afford them additional time to relocate to other accommodation."⁶⁹ Shortly thereafter, the "wartime housing" of Nobel village was no more.

The Wilsons were one of the original six Avro/Orenda families in the village, and they were one of the last to leave the community. Ray had decided to build in the Crawford subdivision, across the highway from Sarnie's Texaco station and the present Post Office. It was an ambitious project. Ray and Ollie moved in just six weeks before Black Friday, when the house was habitable but still not finished. It then had to be completed before it could be sold. At the end of August, before the big exodus, the Wilsons planned a final dessert evening for friends from the village. Cookie Ross-Ross, a month earlier, had painted the living-dining-hall areas. The night of the party, Phil arrived a bit early to find Ray laying the last tile in the hall. What should have been a house warming was really a time of farewell to a very great part of their lives. But it was still an evening with many chuckles. There were the good times to be remembered and recounted.⁷⁴

Nobel is a place of nostalgia. Bryan Wilson took his future wife, Gwen, all the way up from Toronto to the Nobel beach to propose.⁷⁴ Neal Armstrong, with his wife Carol Anne and with first-born Scott on one arm, re-visited the old haunts between where the house had been at 109 Parkway and the Sound. Trees matured; open spaces closed in; no more blueberries. Colin

Campbell: "When we visited Nobel a few years ago, in the middle of the re-grown forest where our house used to be, we found the collection of rocks that ringed what had been a flower bed on the bank in front of the house."³³

The Nobel plant survived for a few more years after Black Friday. Arnold Hunt, who had been in the power plant continuously since 1940, and through the DIL shutdown and War Assets periods, once again kept the heat on until final moth-balling at the end of 1961. John Armstrong stayed on until his transfer to Malton in July, 1959. Roy Smith became Termination Supervisor, assisted by Myrt McGinnis, responsible for inventory and disposition of equipment; they continued to the end of 1961. Others who had been on strength immediately prior to Black Friday were employed on shut-down activities for varying periods.

Bill Christie became Crown Assets Disposal Clerk. Pete Brennan was on test equipment inventory during July and August of 1959. Russel Land was employed for six weeks in 1961 on the loading of test equipment for transfer to the National Research Council in Ottawa. Others were called back for the final moth-balling operation.

Roy Smith, while Termination Supervisor, made no bones about it. He actively promoted moving other industry into the still-usable buildings of the plant. Early in 1961 there were negotiations with Stroud Bridgeman Press Limited of McKellar. William Stroud was a local inventor who had designed a printing press intended for short publication runs. He had a very impressive prototype which pulled through the press on an endless belt a series of platens, one for each page in the book, and had organized a company to undertake production. Roy arranged for a meeting of minds. Avro Aircraft would provide design, contract parts manufacture, and other start-up support. Stroud Bridgeman moved into the new office building, with attached assembly bay, on July 1, 1961.⁶⁹

On February 28, 1961 Macklaim Construction, a local contracting company employing between 30 and, at summer peak, about 100 on highway construction contracts, had a disastrous fire which destroyed their equipment overhaul shops in Parry Sound. Arrangements were made for Macklaim to lease the Shop building and to provide on-going plant maintenance.⁶⁹ For some years the sign at the front of the property, the one which had formerly read "Orenda Engines Limited Test Establishment" with the handsome Orenda logo on top, was re-painted to read "Macklaim Construction Limited."

By the end of 1961 water lines, except those required by Stroud Bridgeman and Macklaim, were drained and capped, alternative arrangements were made for power supply and heating for the leased buildings, the power plant was shut down, equipment was inhibited, and Orenda responsibility for the plant came to an end.⁶⁹

Roy Smith became Plant Superintendent of Stroud Bridgeman at the beginning of 1962 and participated in further development work on the press. It could do an impressively slick job. Connect the box of platens, feed in paper stock, and in rapid sequence, out popped bound and trimmed books, complete with covers, at the other end. The company was under-capitalized, however, and was unable to attract start-up financing from either private or government sources in Canada. Patents and production rights were eventually sold to a foreign company and Stroud Bridgeman wound up its operations in 1964.¹¹

Details on the final levelling of the plant are obscure. Gordon S. McIntyre was employed in plant operations at the CIL plant at Nobel until 1970, and then returned in 1975. The site of the Orenda Test Establishment had reverted to CIL control during this period, and the plant had been razed by 1975 except for the two smoke stacks which came down shortly thereafter. And except for the New Test Cells which continued in use as a safety compound for the burning of scrap explosives.⁷⁰ They had been designed to survive just about anything!

There is a parallel story at the Canadian Industries Limited explosives plant across the road. At peak in the late 50's when Orenda Nobel employed about 200, CIL employed about 450. The explosives industry was beginning to feel the impact of new technology. For many purposes, diesel fuel and ammonium nitrate fertilizer, an oxidizing agent, both of which were completely safe and stable as separate components, could be combined in a blast hole and required only a triggering agent to produce a quite satisfactory blast. The demand for commercial explosives was falling off, and there were the many discomforts which accompany a declining market.⁷¹

Gord McIntyre: "In the late 1970s and early 1980s the CIL plant was plagued by walkouts and strikes. By 1981, with new management in place, it appeared the plant would continue to operate, and in fact a study was underway to evaluate major improvements to the operations and expansion of nitroglycerine-based explosives operations. In early 1983, however, the decision was reversed and in the summer of 1983 the announcement was made to close the nitroglycerine based explosives operation, but continue the newer cap sensitive slurry operations. The late fall and all of 1984 were spent in decontamination of all areas, some by blasting as in the DIL plant, burning of explosives buildings, conversion of service buildings to other operations, and transfer or scrapping of all equipment. The power house was shut down and converted to a warehouse. The chimney was brought down by blasting in August of 1984. The remaining operations were converted to electric or electric/hot water heating.

"In the summer of 1985, due to declining explosives sales, and changes in mining operations to bulk explosives, it was decided to close the plant completely. More buildings and equipment were either moved or scrapped, and by the end of 1985 the plant was closed. Since then the storage magazines have been in use as a transfer point for northern and western shipment, operated by a local trucker, Tudhope Cartage. The only buildings now remaining are magazines, power house, shops and cap sensitive slurry buildings. Waterfront and the village were sold in 1986 or 1987. The future of the remaining property is uncertain, but it is unlikely there will be any change unless the storage magazines are closed.

"Effective in May, 1990 CIL no longer exists in Canada, but has been taken over by Imperial Chemical Industries, the parent British company, and all operations became ICI Canada.

"This will mark the end of an operation that was important to the development of this country. High explosives played a key role in developing Canada as an industrial nation."⁷¹

Little more can be added. The CIL houses surrounding the square were sold by the developer "as is" in the hope that the square would be preserved as a part of the community heritage. It somehow does not look the same. A new road, with entrance at the foot of Parkway, follows the brow of the hill with all of the new lots affording a sweeping view of the Sound. A new and

very large marina is planned between the old pump house and the mouth of Blair Creek. The shoreline sold for development within Carling Township already has many handsome homes.

Perhaps the only true reminder of the way it was, in the last of the Orenda years at least, is the enclave of cottages on Huckleberry Island still occupied by the Orenda faithful.

— And at Malton

The "shutdown" at Malton was effectively only for several days. The Iroquois was dead, and production of the Orenda had ended in 1958, but there were continuing contracts for repair and overhaul of Orenda engines, and also with Atomic Energy of Canada Limited for atomic power projects. There was now time to think about industrial gas turbines.

A number of Nobel alumni worked at Malton after Black Friday. Some had moved to Malton earlier, and some found employment there after lay-off at Nobel. The listing of Orenda Nobel Personnel in the Appendix F gives details. George Anderson, John Armstrong, Roy Barnden, George Best, Nels Boychuk, Ken Bradley, Russ Clarke, Joe Conrath, Keith Hilditch, Garnet Hunter, John Martin, Bob Marwood, Paul Nielsen, George Oman, John Otley, Bob Reed, Art Rider, Vince Scott, Dave Scrimgeour, Art Sutton, Charlie Sykes, Fred Tarnowetski, Wally Walwaski and Shad Williams all put their shoulders to the wheel at some time during the post-Iroquois period. Three of these remained with the company until quite recently. John Otley retired in 1986, Bob Reed in 1988 and Russ Clarke in 1989.

But let's back up a bit to review the history of the company in the years leading up to and following Black Friday. When first formed from the Gas Turbine Division in July, 1955, Orenda was a wholly owned subsidiary of A.V. Roe Canada Limited, itself a wholly owned subsidiary of Hawker Siddeley in the U.K. By prospectus dated September 28, 1956, A.V. Roe Canada became a publicly held company with the sale of 500,000 shares at an offering price of \$16 per share. Those slow off their feet bought in at \$25 and still thought they had a winner. Orenda had 1¼ million square feet of factory space and 5000 employees. The Orendas 11 and 14 were in production and powering the CF-100 and Sabre aircraft. The Iroquois was under development. Avro Aircraft had 1½ million square feet and 8500 employees. The CF-100 was still in production and the Arrow was under development. There were also Canadian Car & Foundry Company Limited with 2.1 million square feet and 3750 employees, Canadian Steel Foundries (1956) Limited with 640,000 square feet and 1900 employees, and Canadian Steel Improvement Limited with 180,000 square feet and 450 employees.⁶⁶

An August 18, 1957 letter to the shareholders announced the intention to buy a controlling interest in Dosco, the Dominion Steel and Coal Corporation, Limited which, the letter said, had 1/5 of Canada's steel making capacity.⁶⁶

The A.V. Roe Canada Limited Annual Report dated September 27, 1957 was a glowing document which outlined the growth of the company from an initial 300 employees in 1945 to 20,000 in 1957. The Iroquois engine, for which detailed design had begun in January, 1954, had passed its 100 hour endurance test in July, 1957. New additions to the A.V. Roe stable were Canadian Applied Research Limited, Canadian Thermo Control Limited, the Canadian General Transit Company, Limited and an associate company, Canadian Steel Wheel Limited.⁶⁶

The 1958 Annual Report stated that A.V. Roe had acquired a 77% controlling interest in Dosco. Orenda Industrial Limited, a new subsidiary of Orenda Engines Limited, was marketing industrial diesels manufactured by the Brush Group, a sister organization in Hawker Siddeley. The new Altitude Test Facility for the Iroquois was under construction. The Avro Arrow had flown for the first time, there had been further progress in development of the Iroquois, and the

CanCar Bobcat, an amphibious armoured tracked carrier for the Canadian Army, had passed its initial tests and pre-production models were under construction. Avro Aircraft, it was hinted obliquely, was working on the Avrocar, more popularly known as the flying saucer, financed privately by the company and by the U.S. Army and Air Force.⁶⁶

A slight cloud appeared on the horizon. On September 23, 1958 in a statement to the House the Prime Minister, John G. Diefenbaker, announced that "The government has decided that it would not be advisable at this time to put the CF-105 into production... (but) that the development program for the Arrow aircraft and the Iroquois engine should be continued until next March when the situation will be reviewed again in the light of all the existing circumstances at that time."⁶⁶

In a letter to the shareholders dated September 28, Crawford Gordon, President, put the best construction possible on this development. "Reports that 2000 are to be laid off at Avro Aircraft and Orenda Engines are quite erroneous. The 2000 referred to are employed on the Astra fire control system and the Sparrow missile which have been abandoned.... We are being asked to modify the Arrow to take the fire control system which replaces the Arrow-Sparrow combination.... The program as it now stands involves the building of 37 Avro Arrow aircraft and an appropriate number of Iroquois jet engines. This situation remains unchanged. The schedule calls for six aircraft to be test flown by next March at which time, Nos. 7, 8, 9 and 10, will be in flight test or on the production line."⁶⁶

He reported verbally to the Annual Meeting of Shareholders on October 27: "There are three Arrows flying now and the fourth is due for its first flight momentarily. The flight test results so far have been encouraging beyond our best expectations. The aerodynamic data has been such, for instance, as to indicate a very substantial improvement in radius of action over the specification requirement. These factors, along with the weight and space savings resulting from the change in the fire control system and armament, have materially increased the margin of superiority which the aircraft enjoys over other manned interceptors available in the time period.

"The change in the fire control system and armament has resulted in substantial reductions in the overall cost of the program.... We presently estimate that we can produce 100 Arrows, complete in every respect, including the cost of the engines and fire control system, and excluding only the missile armament, for a cost of approximately \$3,500,000 each. The average cost of the next 100 Arrows, similarly complete, would be of the order of \$2,500,000 each. The figure previously mentioned for 100 aircraft was \$9,000,000 each.... Our new estimates do not include the basic development costs... because these have already been substantially incurred and committed.... I wish to assure you that we are proceeding with the utmost despatch on the Arrow and Iroquois programs."⁶⁶

At the same Annual Meeting Sir Roy Dobson, Chairman of the Board, proved himself a better Canadian than some notable Canadians: "Canadians have proved to the world that in the fields of science, research, development and manufacture they are a power to be reckoned with, they should never take a back seat. We should be proud of these things. They should make us more determined to go ahead as fast as prudence will allow.... The report of the Gordon Commission... makes one realize even more clearly the potential of this great country. To maintain one's ambitions, however, there is sometimes a price to pay in money, hard work and

sacrifice, but if this is the price of nationhood, it is well worthwhile and we all know Canada will not shrink from it."⁶⁶

"The Orenda" dated November 28, 1958 uttered one last "Hurrah!" It stated "The Orenda engine passed another milestone this week. It reached, and passed, the million-hour mark in total flying time since it first went into operational service early in 1953.... The Orenda, in six different models totalling 3794 engines produced for service, today is a first-line engine of five air forces on four continents. Of the 1,000,000 engine flying hours, approximately 60 percent has been done in the CF-100 interceptor, and the remaining 40 percent in the Sabre aircraft. The flying hours represent some 350,000,000 miles, or roughly 700 round trips to the moon. The life — or time between major overhauls — was 50 hours initially, common to all new military engines with their introduction to service. Now this life is 400 hours. Six series of engines, the 2, 8, 9, 10, 11 and 14, have been manufactured as power plants for the Canadair-built Sabre and the Avro CF-100." The original Series 2 had a thrust of 6076 pounds and a weight of 2685 pounds. The Series 14 had a thrust of 7275 pounds and a weight of 2430 pounds."⁷⁶

February 20, 1959 was Black Friday, and by a letter to the shareholders dated July 2, 1959, Crawford Gordon announced his resignation effective July 31 "until which time I shall be on leave of absence."⁶⁶

Since all Arrow aircraft were ordered cut up for scrap, and all other evidences that there had ever been an Arrow/Iroquois program were to be destroyed root and branch, it has been something of a mystery that there survives at the National Aviation Museum in Ottawa, the cockpit and nose section of an Avro Arrow. When he was on a two-year hitch, 1971-72, as a Management Auditor with the Department of Veterans Affairs, John Armstrong had many interesting conversations with Dr. John Young, a medical consultant who had been at the Aerospace Medical Centre in Downsview when the Arrows were being scrapped. In the wee small hours one night, a flat bed trailer appeared carrying the cockpit and nose section of an Arrow. It was wheeled into a specially cleared corner of the building, and the wall opening was swiftly closed off with concrete block and then painted. The most valuable artifact in the country remained entombed to await a more propitious time.

In due course, Harvey Smith was appointed President. He had been with the Kaiser organization during WW II, and ram-rodged the production of Liberty ships. He had been similarly successful in the Avro Arrow production program. He displayed no notable management sagacity in the post-Arrow period. He filled the Avro aircraft shop with production of lap-strake aluminum hulls as contractor to Richardson boat works in the U.S., but had not checked the financial credentials of his customer. Richardson went belly-up and left Avro with a shop full of exquisitely finished, but undoubtedly very costly, hulls to be sold at a fraction of cost.

Orenda was eager to tackle the industrial gas turbine market. Could we have enough seed money for a demonstration prototype? No. Harvey Smith didn't trust gas turbines, but diesels he knew. Preparatory to producing the Cerlist diesel, which he had identified as ideal for the Orenda shop, Orenda checked it out. It was a dog. Its fuel consumption was terrible, its reliability was such that it could not be used for highway transport, and it had a very limited market for city buses. In short order, Orenda developed it into a reliable and efficient engine.

Then Sir Roy Dobson, Harvey Smith's immediate superior, heard about it for the first time. Not our business. End of project. Our new President did not last much longer.

On April 30, 1962 the name of A.V. Roe Canada was changed to Hawker Siddeley Canada¹⁰ but while this was a matter of some symbolic interest — A.V. Roe Canada, a company which had reached the heights and plumbed the depths, was no more — the change in name was of no practical consequence.

Eventually, Orenda did manage to sell "paper" engines, on the basis of specifications rather than on demonstrated performance. The OT5 was a rather conservatively designed 1500 horsepower engine which found its first application for power generation on the Pine Tree Line. The OT2, aerodynamically similar to the Orenda, was sold principally for gas pipeline pumping. The OT3 used an overhauled, service-expired Orenda engine as the gas producer, coupled to a power turbine of industrial configuration, largely for electrical power generation in stand-by and peak power shaving applications. The OT4 was a 600 horsepower engine of relatively light and elegant design which, by the time John Armstrong left in 1965 for other challenges in Ottawa, had been the subject of many contract proposals but no sales.

At last report, the engineering establishment at Orenda was principally in support of component manufacture, and of the repair and overhaul of engines designed and manufactured by others. Profitable perhaps, but a pale image of the excitement which was the Iroquois!

Retrospective

The saddest words of tongue, or pen, are these: "It might have been".⁷²

The years we spent at Nobel working on the development of the Chinook, Orenda and Iroquois engines were good years, perhaps for many of us the best years of our lives. They were the years of learning, of developing confidence, of optimism, of "We can do it!", of pride in individual and group accomplishment. They were the years of romance, of home and family formation, of a strong sense of belonging, of new friendships which would survive the buffeting of years, of swimming, boating, fishing, hunting, sports; of the good times.

And then came Black Friday.

We remember the good times, yes, but when we get together that hard lump comes surging up, the hard memories which the gastric juices of time cannot dissolve. The feelings of sadness, of loss, of what might have been, of betrayal, of anger.

Our Iroquois, a courageous project, state of the art. It was not yet fully developed, but it had potential as the genesis of a growing series of commercial as well as military engines. Five years later, U.S. aircraft manufacturers were still asking Orenda — could the Iroquois be revived?

One can accept intellectually the fact of the Arrow/Iroquois contract cancellation, but the emotional impact of the way it was done is a bitter pill which will not stay down. The brutal finality of the cancellation, advanced from the announced date of review to deny the Iroquois the opportunity to fly. Ordering the destruction of all the Arrow aircraft, all the Iroquois engines, all the tooling, all the drawings — even if the order was imperfectly executed. How do we forget? The cancellation of the Arrow is lodged in the visceral memory of Canada.

So — how did it happen?

Axel Kielland had left Nobel in May, 1950, and after an interim hitch with the Aluminum Company of Canada, joined the federal government in 1953. In October 1957 he was appointed liaison officer representing the Aircraft Branch, Department of Defence Production on a new Arrow project management team. Wing Commander Ray Footitt, who had been Director of Aeronautical Engineering, was appointed by Air Marshall Hugh Campbell to head the team. The Chiefs of Staff were alarmed by the bills rolling in, and were beginning to realize that if not brought under control, the Arrow project would gobble up the entire defence procurement budget.⁷³

The project management team was a high calibre group, with senior officers representing directorates responsible for airframe (which had been W/C Footitt's responsibility), armament systems, missile systems, fire control, electrical engineering, instrumentation, supply and the like. It also had technical officers from several government departments. The RCAF officers were all experts in their own fields, and Footitt asked them what the needs were for the various pieces of the whole for which they were individually responsible. It became evident that they

were all in business for themselves, and that no one had the global picture. How to get a handle on the whole program?⁷³

Axel suggested an outline and possible framework for control, and this was developed further. Managing contractor responsibility was assigned to A.V. Roe, under terms worked out by Footitt's group, to ensure that all the pieces would come together — from Orenda for the Iroquois, from Douglas/Canadair for the Sparrow missiles, from RCA for the Astra fire control system (with RCA Canada as a "Canadian content" supplier), from Minneapolis-Honeywell for flight control, and from Avro Aircraft for the airframe itself. Up to this point A.V. Roe had responsibility only for the airframe, engine, and flight control required to make an aircraft.⁷³

Avro and DND had initially wanted the Hughes Aircraft fire control system and the Falcon missiles rather than the RCA Astra system with Douglas Sparrow missiles. Hughes had most of the experience on fire control and a corner on the market in the U.S., but at the start of the Arrow program the U.S. military considered Hughes to be heavily committed on other contracts, and were disturbed by apparent arrogance in the Hughes organization. They wished to develop RCA as an alternative supplier and virtually refused to allow Canada to work with Hughes. There were some very able people in RCA but the fire control specification was extremely ambitious, and RCA had to hone its skills at Canada's expense. Despite rapidly escalating expenditures the Astra program was slipping further and further behind schedule. Finally, a year before Black Friday, and after very great expense, the decision was made to adapt the Hughes MX-1179 to the Arrow. It was an already developed system. This of course meant that the schedule of the fire control system was now very far behind that of the aircraft.⁷³

It must be realized that in the 1950s, the tools of project management — PERT critical path analysis and all the other systems of the 1960's — were still in their infancy, and the Arrow program was one of unprecedented challenge. It will also be realized that the A.V. Roe management team was cast in the mould of Crawford Gordon who had won his spurs in the "Damn the torpedoes — full speed ahead" days of wartime production. This was both the strength and the ultimate undoing of the organization.

It was a fight to impose the project controls devised by the project management team. Neither the contractors nor many of the officers in the RCAF itself welcomed the exposure and accountability. But the sheer enormity of the project began to come to light, and was reported to Prime Minister John Diefenbaker.⁷³

George Pearkes, Minister of Defence, was sent to Washington to see if the hardware could be sold there, but the competition for U.S. industry was not welcome and further, the Prime Minister was not highly regarded in the upper echelons in Washington. That was the beginning of the end.⁷³

"The spiralling costs of Astra and Sparrow development, which had precipitated their cancellation, had been pushing the cost of the Arrow into an impossible range. A.V. Roe had been trying to get the RCAF to back up on the armament and fire control system for some time."¹⁰

Joe Morley was Vice President, Sales and Service, Avro Aircraft Ltd. Joe Morley: "(Air Vice Marshall) John Easton (to whom the technical directorates reported) must hold himself as one

of those more than somewhat responsible for the death of the Arrow. He was responsible for the armament spec, and this was way, way beyond the state of the art. The cost of his program, mainly RCA Montreal and USA, was about one-third of the total cost of the program. Even in the dying days, when I implored him to let off and go with a less sophisticated system, he wouldn't relent. It took Wilf Curtis to break him down, and both went to Wright Field to negotiate a supply of USAF systems for a limited number of aircraft, but it was too late."¹⁰

Letters to Engineering Dimensions, published in the issue of January/February, 1989 in response to an article on the Avro Arrow by Paul Campagna in the September/October issue, provide a wealth of insights:⁶⁶

John L. Orr, P.Eng., then director of engineering research with the Defence Research Board: "The cancellation of the Avro Arrow aircraft and its challenging development program had a profound impact on technological innovation in Canada, the adverse effects of which persist to the present day. The obvious solution to the funding dilemma was to seek U.S. support for the Arrow program, based on our common concern with the air defence of North America. This was a realistic possibility, since in 1955 the U.S. Air Force had established a requirement for a "long range interceptor" aircraft (LRI) having similar characteristics to the RCAF specification for the Arrow issued in 1953. The LRI program was never implemented; the proponents of ballistic missiles wrongly insisted that manned fighter aircraft were obsolete.

"Nevertheless, when the capabilities of the Arrow aircraft became apparent, strong interest developed in both the operational and technical echelons of the USAF. This interest was tangibly demonstrated by the provision of access to USAF technology and testing facilities. Unfortunately, this interest was not consummated contractually before Prime Minister Diefenbaker prematurely terminated the Arrow development. At the same time, the U.S. aircraft industry had become alarmed by the prospect that they might lose a major USAF procurement contract to Avro Canada. U.S. aircraft firms lobbied against procurement of the Arrow for the USAF in hopes that the LRI project would be revived.

"Finally, when the Canadian government became concerned about the rising development costs of the Arrow, a confidential evaluation by USAF of its technical and operational capabilities was requested. It is my understanding that this task was assigned to a junior officer based in California and subject to influence from U.S. aircraft manufacturers having a potential interest in the outcome. Consequently, his report was highly negative, but nevertheless was accepted unquestioningly by the Diefenbaker government without providing either Avro or the RCAF any opportunity to refute its criticisms....

"The fundamental error in the Canadian government's handling of the Arrow affair was its failure to pursue the development program through to feasibility demonstration, given that a major portion of the development costs had already been incurred by February 1959. Only on the basis of such proof could the USAF be expected to make any serious commitment to participate. In retrospect, the decision to proceed with production concurrently with development substantially increased initial program costs and was evidently ill-advised. Finally, the destruction of all prototype aircraft and records was a vindictive act of vandalism which precluded all possibility of salvaging anything from our heavy investment in advanced aeronautical technology."

Prof. Julius Lukasiewicz, Carleton University: "... Sophisticated, expensive technologies and defence require a larger base than Canada and most countries can provide.... The mistake was to be swayed by notions of technological and military sovereignty, national pride and prestige.... The mistake was not to cancel, but to start the project."

Jeffrey F. Briginshaw, P.Eng., then a project engineer at Orenda: "... Much of my last year at Orenda (1958-1959) was spent... in the negotiations with the then Department of Defence Production on the Iroquois aspects of the Arrow program.... Even as early as September 1958 — when the writing began to appear on the wall regarding the Arrow's possible demise — about 70% of the total cost of the Arrow program, which included six squadrons of Arrows in service with the Royal Canadian air Force, had already been spent. In other words, we were past the 'point of no return' and it would have been more justifiable economically to proceed. Senior DDP officials were in complete agreement and encouraged us to believe that a favourable decision would be taken — just a few days before Black Friday!"

To draw again from "Shutting Down the National Dream" by Greig Stewart: "Pat Kelly advised Gordon to fly to Ottawa... and to neither drink nor smoke on the way up. Gordon refused, and with Kelly and Joe Morley in tow, he boarded a train for Ottawa, arriving many hours later at the Prime Minister's door, 'bombed' and 'in no shape for a solid conversation'.... The Prime Minister couldn't see Gordon right away, but left him cooling his heels for almost two hours.... When the Prime Minister was finally available, Gordon, still wearing his trench coat, got up, lit a cigar, and with something of his old, confident air, marched in to meet Mr. Diefenbaker.

"Gordon refused to sit or let the Prime Minister get a word in. One can only imagine the scene. On the one side of the desk, the Prime Minister of Canada, with all the assurance of a majority government; on the other side, the powerful but decadent industrialist, cigar in mouth, smelling of Scotch, pounding on his adversary's desk, demanding a guarantee that the Arrow not be scrapped.... When Gordon failed to lower his voice or stop the pounding, the Prime Minister warned he would be forcibly removed if he didn't settle down. At this, Gordon turned and stomped out, his trench coat flaring like a cape behind him. The 'meeting' had lasted less than twenty minutes."¹⁰

And to quote again from Briginshaw's letter to Engineering Dimensions: "Their notorious meeting in the P.M.'s office on September 17, 1958 may not be a matter of public record but is still recalled by contemporary Ottawa mandarins who claim the altercations could be heard from the next block!"⁶⁶

Perhaps that September 17 meeting, that final volcanic clash of egos, explains more than bushels of dispassionate analysis.

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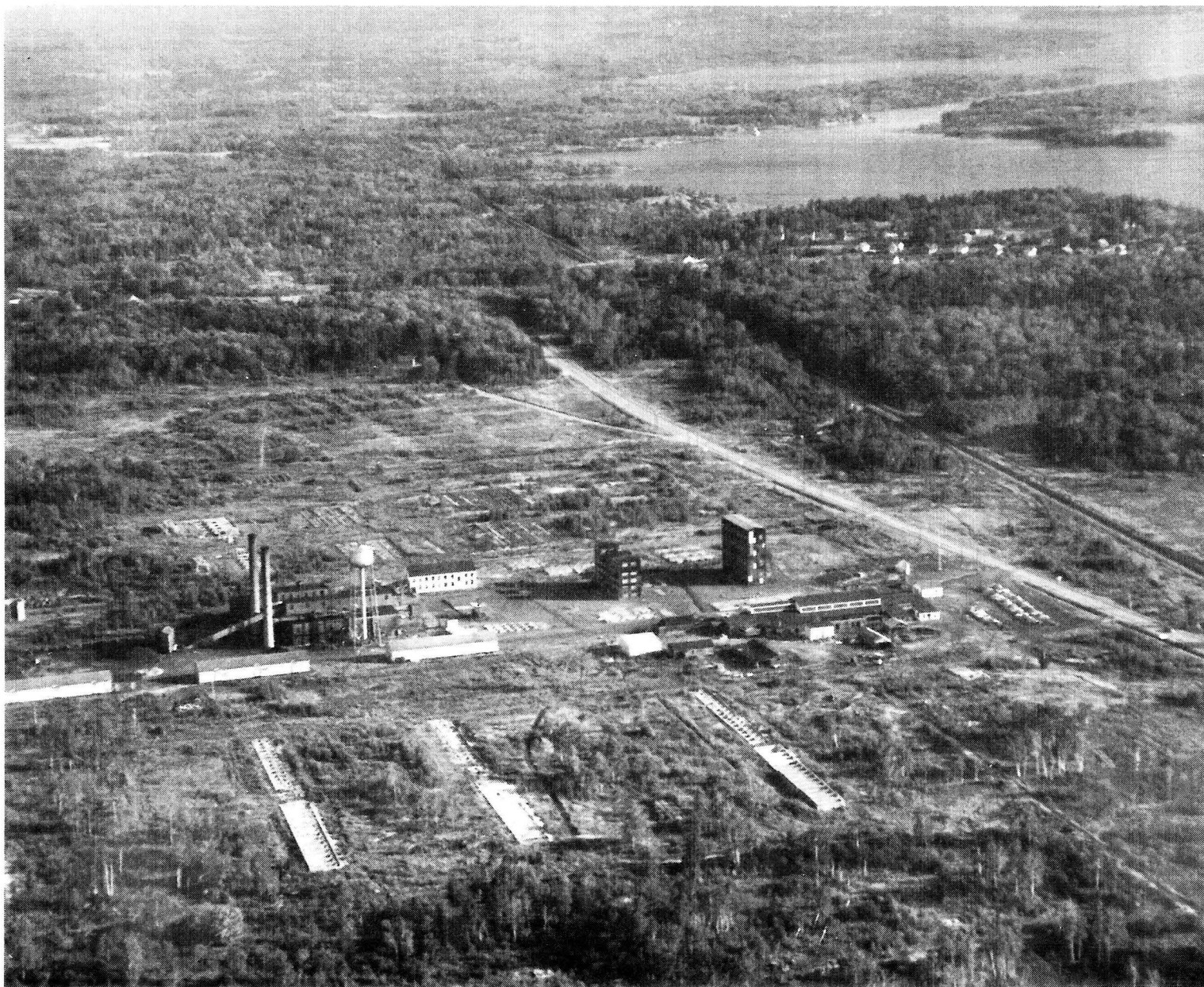
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8. Healey, C. Reg, recollection relayed by Gord McIntyre in phone conversation 91-02-12.
9. "Avro Canada News", 54-12-02.
10. "Shutting Down the National Dream", by Greig Stewart, McGraw-Hill Ryerson, Toronto.
11. Smith, E. Roy, conversations undated.
12. Report B20-56, "Test Rigs and Facilities, Nobel Test Establishment", 56-10-01. See Appendix D.
13. Report MISC-N-40, "Report on Nobel Housing Requirements", 57-06-20.
14. Personnel List, 58-12-12.
15. Wilson, W. Ray, interview 89-02-04.
16. Tarnowetski, Fred T., letter 90-11-28.
17. Wilson, Ollie, letter 90-10-08.
18. "The Aeroplane", 48-01-23, clipping from Tom McCloghry file.
19. Best, George, interview 89-12-28.
20. Finlayson, Colin, letters 90-05-11 and 90-09-23.
21. Sutton, Art L., letter 90-05-07.
22. Anderson, George E., phone conversation 89-02-10.
23. Kielland, Axel, phone conversations 90-04-13 et seq.
24. Clifford, Ernie A., letter 90-08-08.
25. Morrison, Don E., conversation 89-04-21.
26. Morrison, Don E., interview 89-10-16.
27. Allen, W.E. (Bill), taped reminiscences with letter 90-07-24.
28. Hill, Jack H., conversation undated.
29. Rooney, Mark L., letter 90-12-27.
30. Reed, R.G. (Bob), letter 90-05-13.
31. Joy, J.R. (Dick), letter 90-06-17.
32. McCloghry, Tom, letter 90-08-11.
33. Campbell, Colin, letter 91-01-20.
34. Ross-Ross, Phil A., letter 91-01-15.
35. Hisey, Bruce, letter 90-11-21.
36. Newbold, Mrs. Walt F., letter 90-12-12.
37. Gordon, Don W. and Betty, taped reminiscences 90-09-22.
38. Hall, W.J.R. (Bill), letter 90-11-20.
39. Hall, W.J.R. (Bill), letter 90-11-24.
40. Hall, W.J.R. (Bill), letter 91-01-21.
41. Christie, Don J., son of W.J. (Bill), phone conversation 90-09-27.
42. Nelson, C. Doug, letter 90-10-22.
43. Condon, John P., letter 90-10-09.

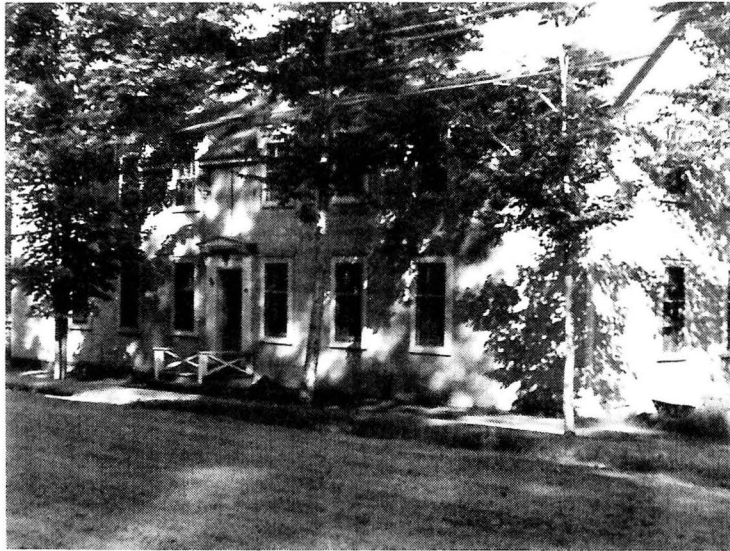
References, continued

44. Sladek, George, letter 90-11-21.
45. Clarke, Russ G., letter 90-12-18.
46. Baskerville, Gord H., letter 90-07-31.
47. Williams, F.D.M. (Shad), letter 90-07-30.
48. Brennan, Pete J., letter 90-06-11.
49. Harding, Jim P., letter 90-10-08.
50. Kretschmer, W.K. (Bill), letter 90-05-22.
51. Reed, Barbara J., letter 90-11-20.
52. Puttick, Don W., letter 90-05-28.
53. Milne, Andy R., letter 90-08-11.
54. Page, Ron D., letter 90-07-11.
55. Report MISC-N-56, "Site Survey for Remote Test Station", 58-07-24.
56. Otley, John H., conversation in 1950s.
57. Hill, Jack H., conversation 91-02.
58. Curtis, R.G. (Bob), letter 91-02-06.
59. Conrath, Joe J., letter 90-08-05.
60. Anthony, Fred, letter 90-10-30.
61. Atwell, Jean Barnden, letters 90-12 and 91-03-02.
62. Wilson, Ollie, phone conversation 91-02.
63. Jennings, Gord, letter 90-09-19.
64. Morrison, Don E., conversation 91-01-29.
65. Wilson, Ollie, letter 91-03-18.
66. Morrison, Don E., document from D.E.M. file.
67. Smith, E. Roy, "The Orenda", 59-01-30, from E.R.S. "Orenda" file.
68. Anthony, Fred, Sudbury Star clipping, undated, with letter 90-10-30.
69. Smith, E. Roy, document from plant termination file.
70. McIntyre, Gord S., phone conversation 91-02-17.
71. McIntyre, Gord S., letter 90-10.
72. Hall, W.J.R. (Bill), quotation, source unknown, from letter 90-11-24.
73. Kielland, Axel, phone conversations 92-02-01 et seq.
74. Wilson, Ollie, letter 91-03-18.
75. McCloghry, Tom, letter 91-03-14.
76. Smith, E. Roy, "The Orenda", 58-11-28, from E.R.S. "Orenda" file.
77. Morrison, Don E., letter 90-11-18.
78. McIntyre, Gord S., document from G.S.M. file.

Illustration Credits

- B1 Nobel Test Establishment, from Tom McCloghry.
- B2 Nobel Village, 4 pictures, by and from by Bob Reed.
- B3 Staff House Dining Room, by and from Bob Reed.
- B4 Aerodynamics Office, by and from Bob Reed.
- B5 Group, Gatehouse, from John Otley collection; duplicate by Art Sutton.
- B6 Old Timers, from John Otley collection.
- B7 Nobel station, from Ray and Ollie Wilson.
- B8, 9 Group, Machine Shop, from Ken Dunk.
- B10, 11, 12 Group, New Office Building, from Roy Smith.
- B13 Avro Nobel Hockey Team, from Bill Allen collection.
- B14 Bowling Champs, from George Best.
- B15 Curling Team, from Dennis Baskey.
- B16 Plant Tour, from John Otley collection.
- B17 The Nobelmen, from Gord Jennings.
- B18 Perforated Pipeline, sent to John Armstrong in 1955, with condolences, from Art Sutton.
- B19 CTR1, two pictures, and Drafting Office, from John Otley collection; Shop Icicles, by and from Bob Reed.
- B20 Nobel Docks and Village, by John Armstrong, from Les Howes; Firefighters, from Bill Allen; Party Group, from Don Gordon.
- B21 Nursery School, from Don Gordon; Nobel School, from Bob Reed.
- B22 Open House, "The Orenda", 56-11-23, from John Armstrong file.
- B23 Pictorial View of Nobel, "The Orenda", 59-01-30, from John Armstrong file.





Nobel Village, 1952?:

Staff House, 153 Sandhurst Road. Sandhurst Road looking south-west from Staff House - 147/149 and 143 to left, 144/146 and 138/140 to right, CIL houses 122 and 116 in distance. Nobel Community Club, 89 Sandhurst. Residence of CIL Managers, C. Scott Hannen to 1955, then Jack E. Godfrey.



Staff House Dining Room, 1949:

Clockwise - John Otley, Don Morrison, Keith Hilditch, Mrs. Scriver, George Best, Jack White, ?, Dick Joy, ?, Dave Caple (visitor from Malton), Jim Brotchie, and empty chair of Bob Reed, photographer.



Aerodynamics Office, October, 1949:

Betty (Hancock) Stack, Jim Brothie, Dick Joy, Don Gordon, Keith Hilditch, Gord Jennings, Bob Reed.



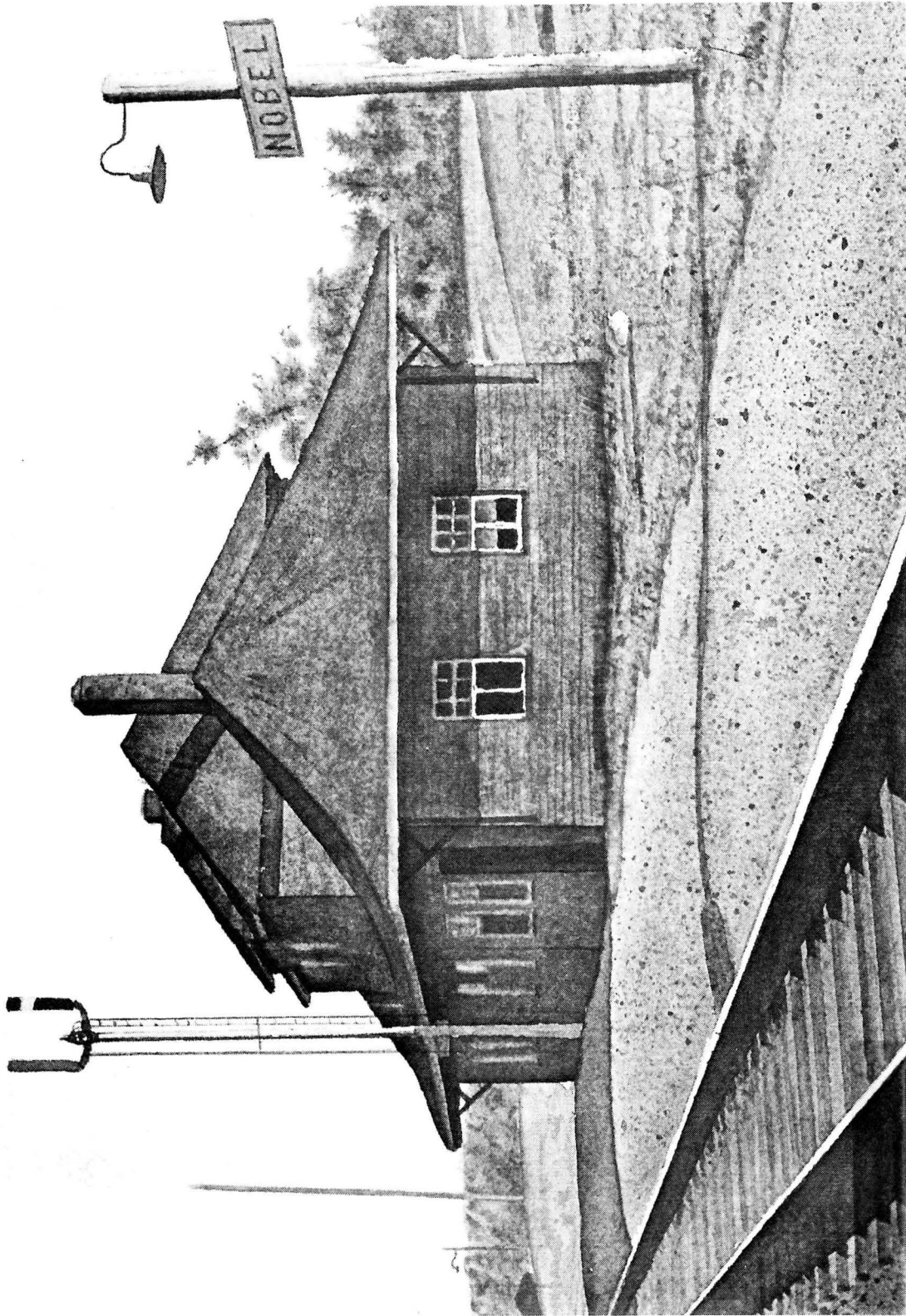
Group Photograph, Gatehouse, Summer, 1948:

Axel Kielland; George Thomas, Sid Britton and Jack Hill (visitors from Malton); Don Gordon; Pete Stevens; Paul Nielsen; George Best; Gord Jennings; Bob Reed; Shad Williams; Jean Forth; Johnny Wilbur; Myrt McGinnis; John Otley; Jim Walters; Bob Warren; Art Sutton.

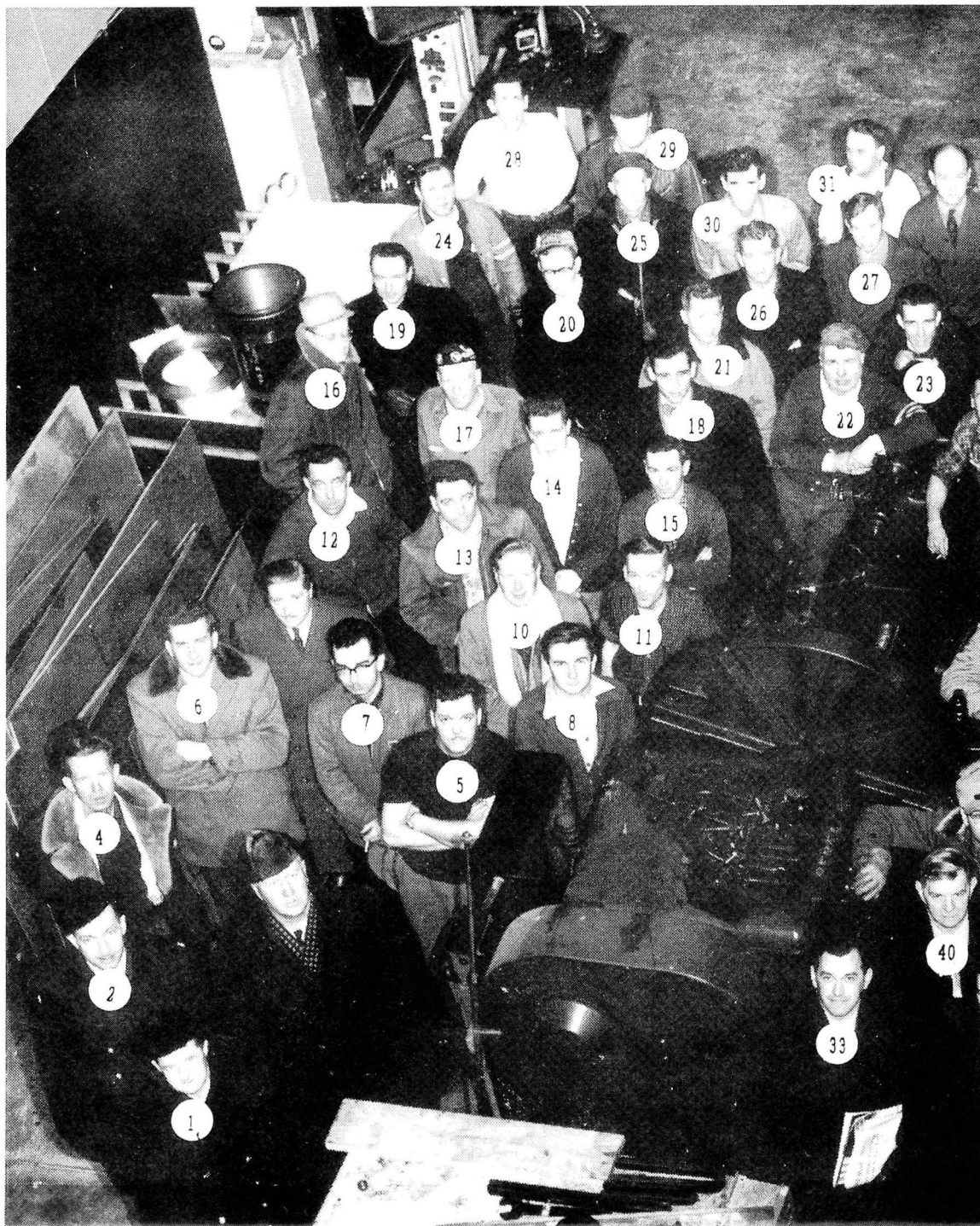


"The Old Timers", Fire Hall, 1954:

Floyd Godfrey, Walt Smith, Bill McDonald, Nick Walwaski, Roy Smith, John Martin, Cars Crigger. Kneeling - Don Gordon, Ray Wilson.



Nobel Station, 1951?



Group Photograph, Machine Shop, Late Winter, 1953, "A":

1 Tommy Coxon, 2 Bill O'Halloran, 3 Martin Lang, 4 Art Forth, 5 Al Whistance, 6 Laurie Davies, 7 Jim Brotchie, 8
 ?, 9 Les Pocock, 10 Fred Anthony, 11 Art Pollard, 12 Bill Hall, 13 ?, 14 Bill Barker, 15 Cy Dorer, 16 Clay Margison,
 17 Ernie Thomas, 18 Dick Joy, 19 Jack White, 20 Russ Clarke, 21 Ken Dunk, 22 Nick Walwaski, 23 Art Prosser, 24
 Rolly Bernier, 25 Art Thomas, 26 Stu Kerr, 27 Phil Ross-Ross, 28 Joe Federico, 29 Don Anderson, 30 Joe
 Battersby, 31 Jimmy Cooper, 32 George Johnston, 33 Harry Gibson, 40 George Soper.



Group Photograph, Machine Shop, Late Winter, 1953, "B":

22 Nick Walwaski, 23 Art Prosser, 27 Phil Ross-Ross, 31 Jimmy Cooper, 32 George Johnston?, 33 Harry Gibson, 34 Myrt McGinnis, 35 Betty Sheridan, 36 Barb (Peachey) Crosswell, 37 Cora Robertson, 38 Jackie Caldwell, 39 Bill McDonald, 40 George Soper, 41 Bob Curtis, 42 Bob Reed, 43 Ken Bradley?, 44 Gord Jennings, 45 Ross Beagan, 46 Norm Godin, 47 Hugh Leblanc, 48 Tom Fraser, 49 John Otley, 50 Bruce Hisey, 51 John Stuebing, 52 Dennis Baskey, 53 Gord Baskerville, 54 Tommy Holmes, 55 Colin Campbell, 56 Pearce Hughes, 57 Bob Rennie, 58 Paul Marcock, 59 Don Gordon, 60 Clarence Griffith, 61 Scotty Buchan, 62 George Brandwood, 63 Eddie Leroux, 64 ?, 65 Don McEachren, 66 Ted Dunk, 67 Ray Wilson, 68 Jack Hill, 69 Walt Smith, 70 Harry Oldfield, 71 Fred Gerdes, 72 Red Kearns, 73 Floyd Godfrey, 74 Ivan Harris, 75 Frank Gonder, 76 Cars Crigger, 77 Oscar Barry, 78 Alf Stevenson, 79 Tom Marwood, 80 Jack Dunn, 81 Wally Walwaski, 82 ?, 83 ?, 84 Ed Gougeon, 85 Audrey Forth, 86 ?, 87 Bill Walker, 88 Otto Kraus, 89 ?, 90 Steve Brewer, 91 Phil Ayers, 92 Allie McCallum, 93 Dan Kingston, 94 Keith Waddell, 95 Vince Scott, 96 Len Hobourn, 97 ?, 98 Harold Prosser.



Group Photograph, New Office Building, October, 1958, "A":

Back, on benches - Ian Macdonald, Don Gordon, Jim White. Centre - Ted Hurd, Walt Smith, John Lomax, Stu Kerr, Ed Monks, Don Kingston, Ron Ramsay, Gord Simpson, Don McEachren, Nels Boychuck, Ted Dunk, Fred Anthony, Les Pocock, G. Giles. Front, seated - John Otley, Derek Carter, Bernie Perrior, Gord Mark.



Group Photograph, New Office Building, October, 1958, "B":

Back, on benches - Roy Nakashima, Dave Scrimgeour, Jack Plowman, Johnny Schneider, Bill McDonald, Pete Brennan, Bill Christie, Ron Thompson, John Grigor. Centre - Ian Findlay, Gord Baskerville, Dave Rose, John Condon, Bud Shunk, Ron Nutt, John Armstrong, Bill Kretschmer, Dennis Rowse. Front, seated - Gord Mark, Marion Dunk, Anne Mullen, Sylvia (Rogers) Foley, Shirley Hurd, Cora Robertson, Audrey Federico, Elizabeth Hamilton, Connie (Healey) Findlay, Myrt McGinnis.



Group Photograph, New Office Building, October, 1958, "C":

Back, on benches - John Grigor, Roy Smith, Dennis Baskey, Ken Dunk. Centre - Bill Kretschmer, Dennis Rowse, Harry Payne, Jim Harding, Syl Signore, Ken Stewart, Bert Keyworth, Vic Sagar, Don Puttick, Roy Barnden, Bob Curtis. Front, seated - Myrt McGinnis, George Oman, Paul Marcock, Don Cameron, Phil Ross-Ross, Ed Buchan.



Avro Nobel Hockey Team, April 1950:

Back - Rolly Bernier, Coach; Keith Lawson*, Wally Walwaski, Gord White*, Willie Holmes*, Bill Allen, Bob Reed, Dan Kingston, Manager. Front - Bill Matthews*, Shad Williams, Don Coulis, Bun Ruscoe*, Ken Dunk, Lionel Dunk*.

* - not A.V. Roe employees.



Nobel Community Club Bowling League Champs, 49-50:

Gord Jennings, George Best, Bill Allen, Art Pollard, Paul Nielsen, Bob Reed.



Avro Nobel Curling Team, 1958?:

Back - Bill Barker, Paul Marcock, Howard Dewar, Austin Miller, Clay Margison, Bob O'Donnell, Gord Baskerville, John Condon. Front - Vince Scott, Rolly Bernier, Phil Ross-Ross, Ernie Thomas (R), Steve Brewer (F), Dennis Baskey, Clarence Griffith, Bob Curtis, Don Cameron.



Plant Tour, 1953:

Reg Jones; Earle K. Brownridge, > Executive Vice-President and General Manager; Sir Roy Dobson, Chairman, Hawker Siddeley Group and Chairman, A.V. Roe Canada Limited; Charles Grinyer, > Vice-President Engineering; ?; Phil Ross-Ross.

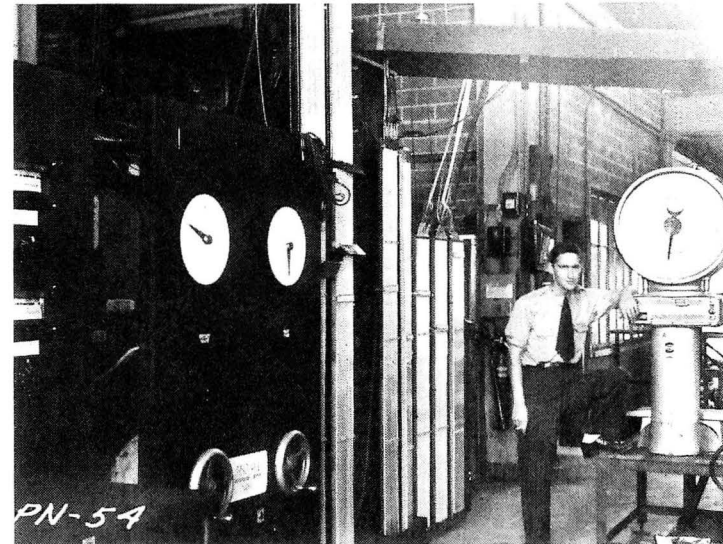
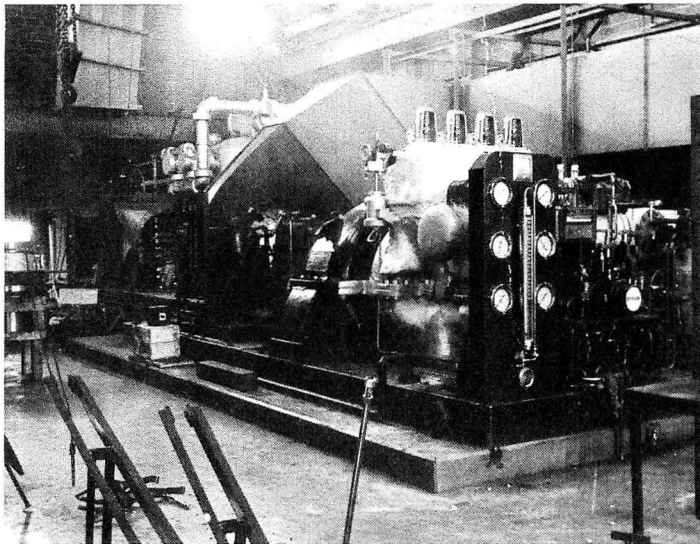


The Nobelmen, at the Community Club:

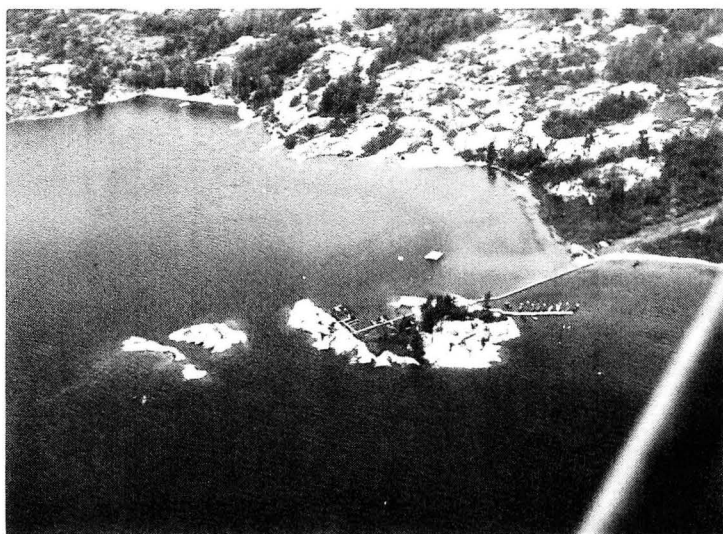
Gord Jennings, Art Prosser, Ken Dunk, Tom Fraser.



The Perforated Pipeline, 1955, with condolences from Art Sutton.



Compressor Test Rig No. 1 in original configuration, 1947?. Art Rider at the torque measuring scale of CTR1, 1948? Paul Nielsen and John Otley in the original office/drafting room, west end of the Machine Shop, 1948? Winter Wonderland - no insulation!



The Nobel Docks, beach above and to left. Nobel Village, view from square down Sandhurst. Our Noble Firefighters: John Otley, Art Pollard, Dan Kingston, Reg Lawson, Bill Allen. Big Kids' Party: Art & Nel Pollard, Bill & Fran Allen, Bill & Beryl McDonald, Bob & Jessie Curtis, Don & Betty Gordon, Johnny & Mary Wilbur, Cora Robertson (not in order).



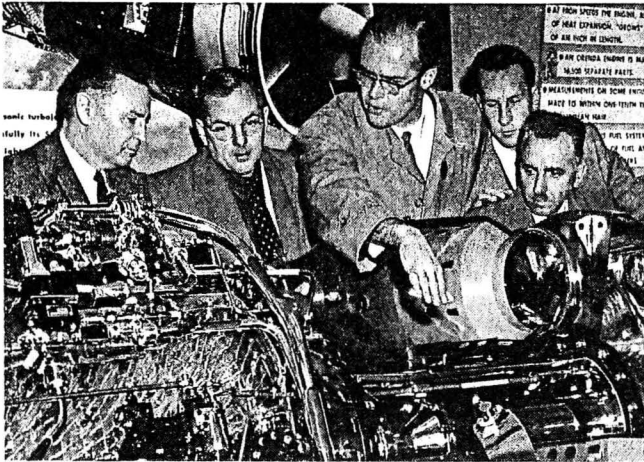
Little Kids' Party, the Nobel Nursery School, led by Marg Farrow, 1948?:

David Wilson, Lorna Foreman, Rick Gordon, Janet Ruscoe, Ron Burridge, Leslie Howes, Tommy McCloghry, Sandy Hoskins.



Kids at Work, Nobel School, Norma Harrison, teacher, 1951?:

Window row, from front, ?, Carolyn Stewart, Leslie Howes; second row, second from front, Sharon Besman, second from back, Tommy McCloghry; third row, front, David Wilson, back, Lorna Foreman; fourth row, third from front, Janet Ruscoe, back, Ronnie Burridge; fifth row, front, Pat Bernier, second from front, Patsy Piddington.



MAYOR GERALD TAYLOR of Parry Sound was joined by other community leaders in visiting Orenda-Nobel Open House. Getting explanation of Orenda 14 cutaway engine which was on display are, left to right, Mr. Taylor; William Green, Parry Sound Chamber of Commerce President; John Armstrong, Engineer-in-Charge at Nobel; Eric Garrett, representing CIL; Cecil Stephens, Nobel School Principal.

Mayor, Community Leaders Attend Nobel 'Open House'

The mayor turned up, and so did the school principal, Chamber of Commerce president, CIL, representative and 23 grades 12 and 13 students from Parry Sound High School.

Thus was clearly evident the community interest of Orenda-Nobel's Open House two Saturdays ago.

More than 30 persons from Malton turned up too, including President and General Manager Walter R. McLachlan and Mrs. McLachlan. Most of them travelled on a chartered bus which made the return trip of 175 miles each way in the one day.

Altogether 346 persons were counted through the Open House gates, a figure approaching twice the working population at the Test Establishment.

The mayor was Gerald Taylor of Parry Sound; Chamber of Commerce President, William H. Green; Principal of Nobel Consolidated School, Cecil Stephens; and, representing Canadian Industries Limited, Nobel's neighbor plant, Eric A. Garrett.

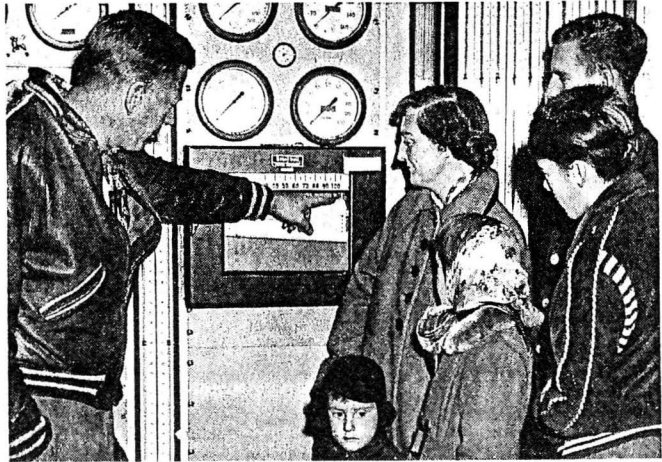
On view for the first time was Orenda-Nobel's new test facilities, including the afterburner facility and rotating turbine blade cooling rig.

The new administration and laboratory building was the scene of the Orenda 11 cutaway display, sent from Malton and staffed by Stu Girvan.

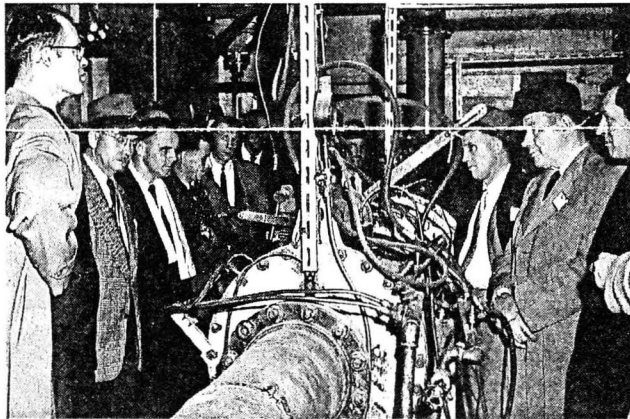
Free ice cream was distributed by the Orenda-Nobel Recreation Club and the Women's Aid of Nobel United Church—Nobel's only church—sold other refreshments.

Obituary

Alex Brown of Experimental Detail Inspection died last Friday after a lengthy illness. He was in his 80th year. Mr. Brown, who was single, had been with Orenda over eight years.



FAMILY GROUPS like that of Mr. and Mrs. Ernie Thomas and children, above, were much in evidence, taking advantage of the opportunity to see what goes on at Orenda's Test Establishment which, with a CIL plant, is the major industrial activity at Nobel. Mr. Thomas is a heliarc welder. Photograph was taken in the control room of the annular atmospheric combustion rig.



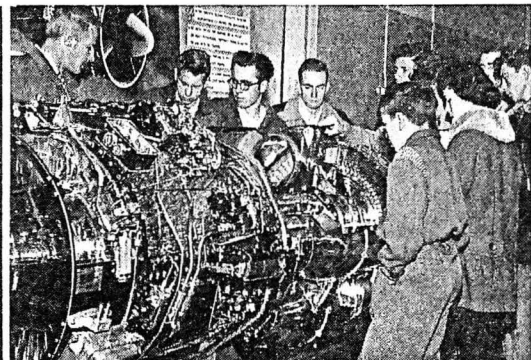
SPECIAL TOUR around Nobel facilities was conducted by John Armstrong, Engineer-in-Charge, for nearly 10 persons from Orenda-Malton who travelled to Nobel on chartered bus and returned the same day. For many it was the first time they had seen the Nobel Test Establishment. Part of the group is seen above in one of the many test rigs at Nobel where full-scale engine components are tested.



ASBESTOS SUIT is one of major items of protection for fire fighting crews at Nobel. Modelling a suit are the daughters of John Schneider, a Sub-Foreman in Aerodynamics. From left: Suzanne, 12, Joan, 9, and Wendy, 6.

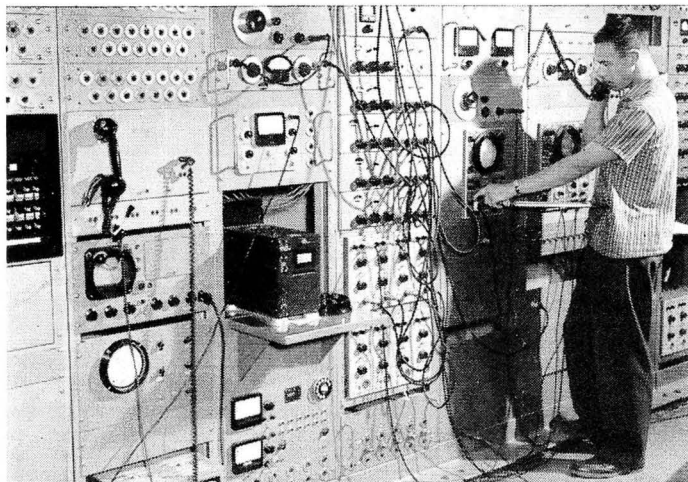


SPECIALLY DESIGNED EAR MUFFS afford protection for personnel against noise generated by test rigs. Trying a pair for size is nine-year-old Paul Turfiff, assisted by Plant Protection Guard Bill O'Halloran, while Mrs. Turfiff looks on with another son Larry, 13. Paul's father, Ed. Turfiff, a PPC guard, was on duty elsewhere around the plant.

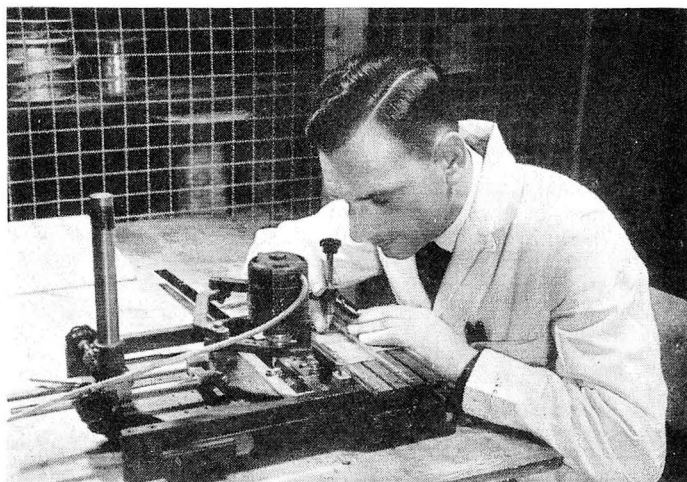


PARRY SOUND HIGH SCHOOL STUDENTS from grades 12 and 13 toured Nobel facilities in the morning, guided by John Armstrong, Engineer-in-Chief, Phil Ross-Ross, Aerodynamics Engineer, and Jack Hill, Combustion Test Supervisor, who is seen above at extreme left with some of the students. Saturday jobs prevented more students from attending.

Pictorial view of Nobel



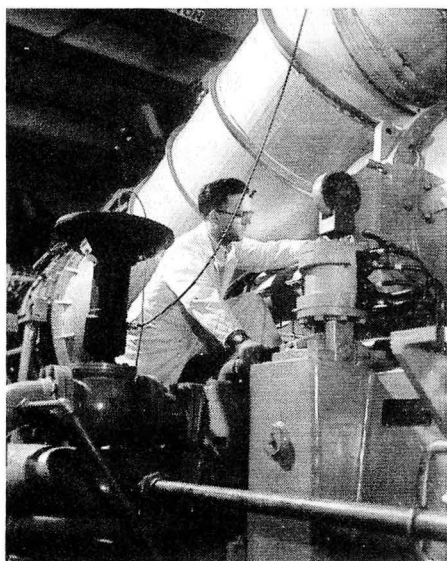
Don Kingston checks information at recording room.



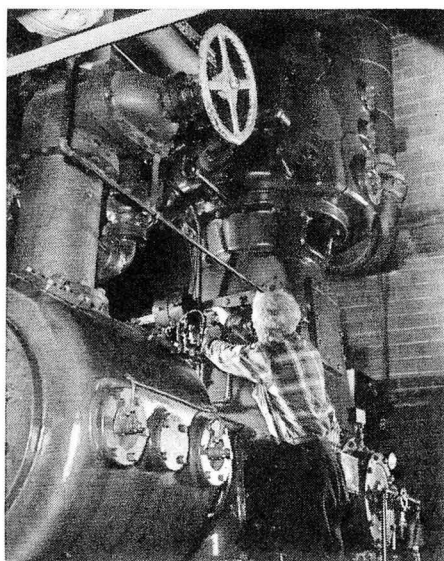
Bob Curtis operates engraver in instrument section.



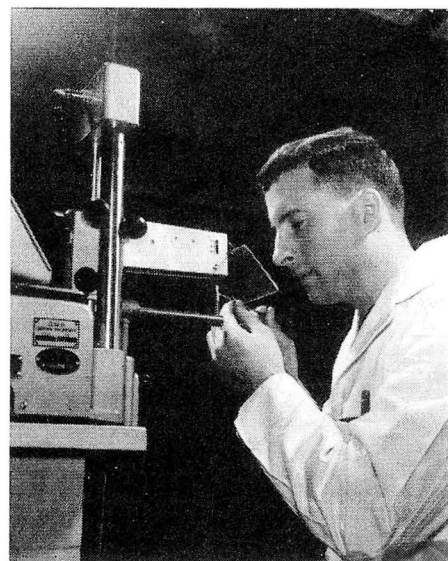
Lunch hour strollers provided this study of Orenda Nobel for photographer Cliff Heckel.



Carson Crigger checks C.T.R. valve.



Arnold Hunt works on generator unit.



Ian Findlay spot welds minute part.

Who Lived Where, When?

Addresses shown in the following listing are those of the Orenda section of Nobel village, with the addition of the addresses of CIL families with members who worked at Orenda, and also of families which moved from the village to new homes within the last several years prior to 1959.

Date codes 53 and 55 through 59 refer to listings in the Bell telephone directories issued in June of these years, and available from the Parry Sound Library. The Parry Sound directory for 1954 was missing, and the directories for years earlier than 53 referred simply to "Nobel" as the place of residence and so were not helpful. Information in the "pre-53" period is based on recollections. Date code 58-12 refers to a Nobel Orenda personnel list dated December 12, 1958. While earlier lists back to 1956 are available, they do not show addresses. Date code 60 refers to a petition⁶⁹ dated January 5, 1960, organized by Dave Scrimgeour, requesting continued availability of Nobel housing.

A sketch by Bill Allen showing families in residence during his stay at Nobel in the 49-50 period suggested that a "Who Lived Where, When" section in the history could be of interest. Betty Gordon was also particularly helpful in providing a listing for this earlier period. Vi Whittaker, formerly of 33 Hillsdale and 78 Parkway, loaned a tattered services map for the village, dated 1942, and this served as the basis for the sketch on page C4; this shows the streets, buildings and addresses in Nobel Village as it was 1950-59. Buildings marked "4" were the apartment blocks. Buildings marked "2" were semi-detached.

Pages C5 and C6 are a paste-up of a photocopy of the Nobel telephone directory for June, 1958. It will be of interest in locating the many families in the CIL section of the village, and in the broader Nobel community, with whom we established friendships.

Note that absence of a Bell listing for the years 53, 55, 56, 57, 58 or 59 does not necessarily indicate that the unit was vacant. The occupant may not have considered a phone to be necessary, or may have been listed in the directory simply as "Nobel" in which case the listing could have been missed for this record.

Parkway 101: E.A. Clifford; W.H. Gibson 53 (moved to Parry Sound later in 53); G.J. Jennings 55, 56; J.H. Hill 57; P.A. Ross-Ross 58, 58-12, 59.

Parkway 105: C.W. Stephens 53, 55, 56, 57, 58, 59.

Parkway 109: C. Groskorth 53; J.L. Armstrong 55, 56, 57, 58, 58-12, 59.

Sandhurst 119A: W.A. McMaster 53, 55, 56; G.I. Watt 57, 58, 58-12, 59.

Sandhurst 119B: E. Scott 56, 57, 58, 59.

Sandhurst 119C: G. Walwaski 53, 55, 56, 57, 58, 58-12, 59.

Sandhurst 119D: J.A. Ruscoe 53, 55, 56, 57; C.J. Barley 58, 58-12, 59.

Sandhurst 129A: E. May pre-53; A. Prosser pre-53, 53, 55, 56; S. McLean 58, 58-12.

Sandhurst 129B: D.W. Gordon pre-53, D.J. Kingston pre-53, 53; C. Sykes 55, 56; V.H. Sagar 57; L.M. Pocock 58, 58-12, 59.

Sandhurst 129C: J.D. Dunn pre-53, 53; J.D. Byrne 55, 56, 57; F. Churchill 58; T.S. Fearn 58-12, 59.

Sandhurst 129D: J.H. Hill pre-53; R.P. Hughes 53; M.L. Rooney 56, 57; D. Carter 58; S. McLean 59.

Sandhurst 133A: P.B. Nielsen pre-53; C.A. Margison 53, 55, 56, 57; D.E. Cameron 58-12, 59.

Sandhurst 133B: F.T. Tarnowetski pre-53; J.R. Joy pre-53, 53; (J.L. Armstrong 54); R.D. Page 55; J. Grigor 57, 58, 58-12.

Sandhurst 133C: C. Crigger pre-53, 53, 55, 56, 57, 58; G.A. Giles 59.

Sandhurst 133D: M. Burditt pre-53; G. Soper pre-53, 53, 55, 56, 57, 58, 58-12, 59.

Sandhurst 137: J.H. Hill pre-53, 53; D.J. Kingston 55, 56, 57, 58; D.H. Carter 58-12, 59.

Sandhurst 138: C. Finlayson pre-53; A.L. Sutton pre-53; E.A. Clifford pre-53; L.D. Howes pre-53; W.H. Gibson, pre-53; T.B. Hisey pre-53, 53; T. McCloghry 55, 56; P.A. Ross-Ross 57; V.H. Sagar 58, 58-12, 59, 60.

Sandhurst 139: S.L. Fielding pre-53, 53, 55; S. Kerr 56, 57, 58, 58-12, 59.

Sandhurst 140: W.R. Wilson pre-53, 53, 55, 56, 57, 58, 58-12; R.G. Barnden 59.

Sandhurst 143A: A. Pollard pre-53; R. Rennie pre-53, 53, 55, 56, 57, 58, 58-12, 59.

Sandhurst 143B: R. Curtis pre-53, 53, 55, 56, 57, 58, 58-12, 59.

Sandhurst 143C: F.D.M. Williams pre-53; R. Bowman 53, 55; J. Pefhany 56, 57; G.H. Hunter 58, 58-12, 59.

Sandhurst 143D: W.E. Allen pre-53; J.H. Otley pre-53, 53; J.A. Chant 55, 56; R. Sunday 59.

Sandhurst 144: D.W. Gordon pre-53, 53, 55, 56, 57; D.T.H. Farry 58; F.G. Churchill 58-12, 59.

Sandhurst 146: C.J. Ferris pre-53; G.J. Jennings pre-53, 53; P.G. White 55; R.D. Page 56, 57; D. Rowse 58, 58-12, 59.

Sandhurst 147: E.P. Leroux pre-53; C. Robertson pre-53, 53, 55, 56, 57, 58, 58-12, 59.

Sandhurst 149: A. Kielland pre-53; J.W. Schneider pre-53, 53, 55, 56, 57, 58, 58-12, 59, 60.

Sandhurst 153 (Staff House): G. Best, F.D.M. Williams, A. Kielland, J. Martin, D.E. Morrison, R.G. Reed, J.H. Otley, P. Stevens, R. Warren, R.G. Curtis, T. Fraser, S. Kerr, J. Brothie, J.H. Hill, W.K. Hilditch, J.R. Joy, J.K. White, B. Hisey, J. Magro, C.A. Margison, G. Sladek, J.L. Armstrong.

Sandhurst 153A: J.P. Harding 55, 56, 57, 58; E.L. Shunk 58-12, 59, 60.

Sandhurst 153B: J. Stuebing pre-53, 53, 55; W.K. Kretschmer 56; E.L. Shunk 57, 58.

Sandhurst 153C: (J. Martin to 54-10); J.H. Hill 55, 56; G.W. Todd 57; B. Neal 58; D.W. Puttick 58-12; G. Skilliter 59.

Sandhurst 153D: P.A. Ross-Ross pre-53, 53, 55, 56; F. Young 57; A.M. Federico 58, 58-12, 59.

Sandhurst 156: J. Wilbur pre-53; A.A. Whistance pre-53, 53, 55, 56, 57, 58, 58-12.

Sandhurst 158: E.P. Leroux pre-53; W.F. Newbold pre-53, 53, 55, 56, 57, 58, 58-12, 59.

Sandhurst 162: J. MacLean pre-53; C.J. Ferris pre-53, 53; J.H. Otley 55, 56, 57; A. Keyworth 58, 58-12, 59.

Sandhurst 164: J.L. Woolacott pre-53; T. McCloghry pre-53; C.G. Campbell pre-53, 53; S.V. Scott 55, 56; W.K. Kretschmer 57, 58, 58-12, 59.

Westbrook 171A: W. Orser 55, 56, 57, 58, 59.

Westbrook 171B: (R. Beagan); G. Mark 57, 58, 58-12, 59.

Westbrook 171C: J. McQueen 53; R.H. Nutt 56, 57, 58, 58-12.

Westbrook 171D: F. Anthony pre-53, 53, 55, 56, 57, 58, 58-12, 59.

Westbrook 174A: A.R. Besman pre-53; K. Morrison 57, 58, 59.

Westbrook 174B: L. Willett 57, 58, 59.

Westbrook 174C: D. Scrimgeour 57, 58, 58-12, 59, 60.

Westbrook 174D: W.C. McKinstry 53; S. Looby 55, 56, 57, 58, 59.

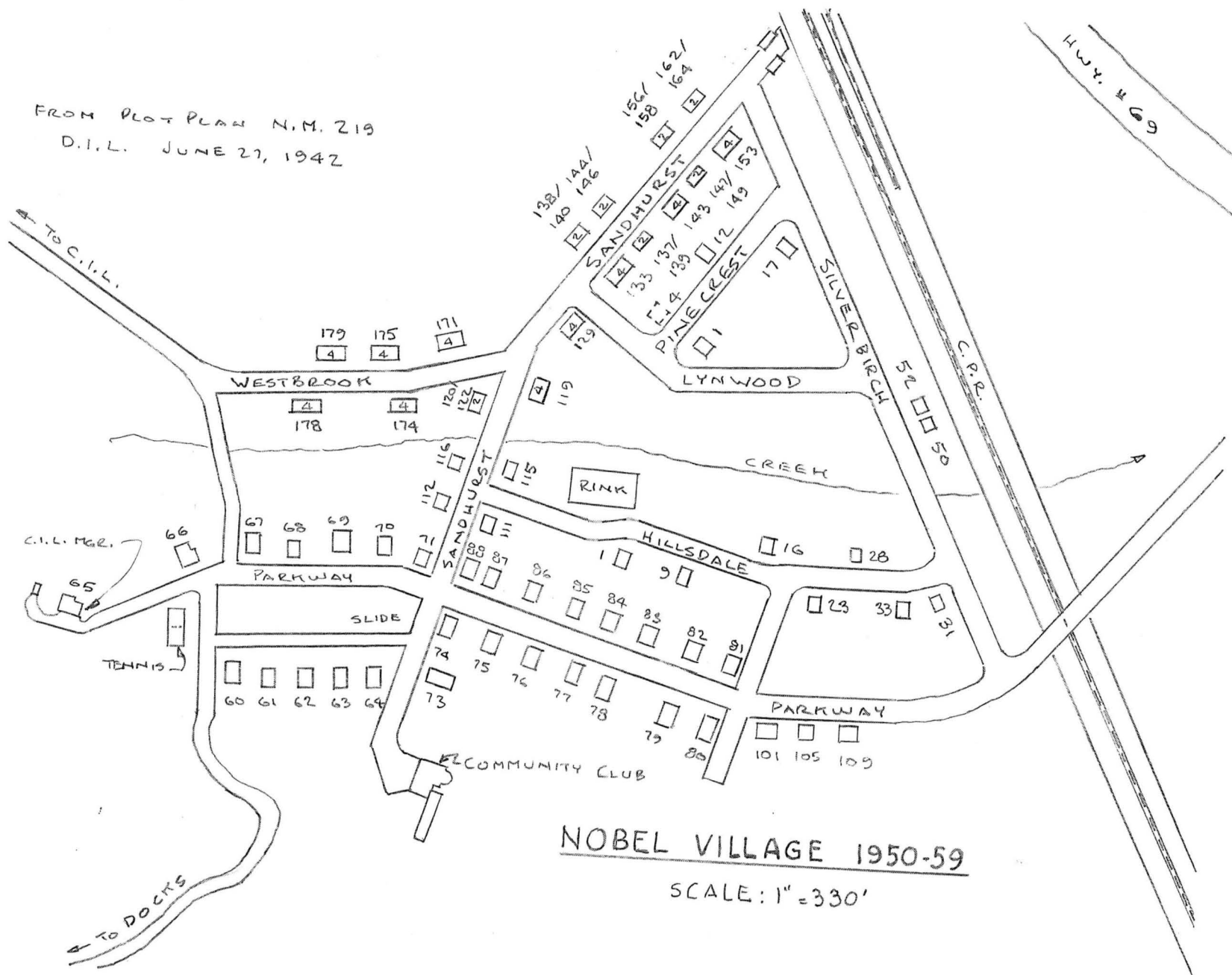
Westbrook 174 (apartment letter not listed): P.R. Scriver 53, 55; B. Caverhill 56. R. Smith 53, 55, 56. D. Badger 53, 55.

Westbrook 175A: C. Payne 55, 56, 57, 58, 59.

Westbrook 175B: F. Farrow pre-53, 53, 55, 56, 57, 58, 58-12, 59, 60.

Westbrook 175C: A. McDonnell 56, 57, 58, 58-12, 59.
 Westbrook 175D: A. Keyworth 57; A. Birkenstock 59.
 Westbrook 178A: R.J. Bernier pre-53, 53, 55, 56, 57, 58, 58-12, 59.
 Westbrook 178B: M.H. Ticknor 53; W. McKinstry 55, 56, 57, 58, 58-12, 59.
 Westbrook 178C: S. Kerr 53, 55; T.A. Dunk 58, 58-12, 59.
 Westbrook 178D: R.G. Clarke pre-53, 53, 55; E. Monks 57, 58, 58-12, 59, 60.
 Westbrook 179A: R.G. Reed pre-53, 53; R.G. Barnden 55, 56, 57, 58, 58-12.
 Westbrook 179B: A.E. Taylor 53; B. Perrior 56, 57, 58, 58-12, 59.
 Westbrook 179C: T.A. Fraser 53, 55; S. Signore 57, 58; O. Kraus 58-12, 59, 60.
 Westbrook 179D: F.M. Leigh 53, 55, 56, 57, 58, 59; F. Hitchings 60.
 Silverbirch 31: B. Caverhill pre-53; J.A. Saintsbury 57, 58, 58-12, 59.
 Silverbirch 50: P. Ayers 57, 58, 58-12, 59, 60.
 Silverbirch 52: A. St. Onge 53; A.A. Besman 55, 56, 57, 58, 59.
 Pinecrest 1: I.L. Ryman pre-53; T.S. Fearn 57, 58; J.P. Harding 58-12, 59.
 Pinecrest 4: T. McCloghry 49-50; removed 50.
 Pinecrest 12: no listings.
 Pinecrest 17: D. Coulis pre-53?; L.M. Pocock pre-53, 53, 55, 56, 57; D.W. Gordon 58, 58-12, 59.
 Hillsdale 1: A.P. Walters pre-53, 53, 55, 56; G.A. Rogers 57; C.A. Margison 58, 58-12, 59.
 Hillsdale 9: A. Kerr 55, 56, 57, 58, 59.
 Hillsdale 16: J.F. Gerdes 55, 56, 57, 58, 58-12, 59, 60.
 Hillsdale 23: F. Hitchings pre-53, 53, 55, 56, 57, 58, 59.
 Hillsdale 28: E.H. Piddington 53, 55, 56, 57, 58, 59.
 Hillsdale 33: ? Cummings, pre-53; P.A. Ross-Ross pre-53; H. Whittaker 55, 56; G.W. Todd 58;
 M.W. Lang 58-12, 59, 60.
 Parkway 68: C.R. Healey 53, 55, 56, 57, 58, 59.
 Parkway 84: G.F. Simpson 57, 58, 58-12, 59.
 Parkway 85: E.W.D. Hancock 53, 55; G.F. Simpson 56.
 "Nobel": N.S. Peachey 53, 55, 56.
 Glenrock 8: W.R. Wilson 59.
 Glenrock 12: N.S. Peachey 57, 58, 59.
 Glenrock 16: J.H. Otley 58, 58-12, 59.
 Glenrock 20: D.J. Kingston 58-12, 59.
 "Glenrock": E.W.D. Hancock 56, 57, 58, 59.
 "Nobel Highway": C. Crigger 58-12.

FROM PLOT PLAN N.M. 219
D.I.L. JUNE 27, 1942



NOBEL VILLAGE 1950-59

SCALE: 1" = 330'

NOBEL

J H GUEST
Manager
Huntsville

MISS A E CORBIERE
Local Representative
Parry Sound

No Long Distance Charge applies between
Nobel & Parry Sound

Alexander Thos 119 Old Nobel Rd.	DI 2-5301
Alves James Carling Rd.	DI 2-5449
Alves Lloyd Carling Rd.	DI 2-5539
Anderson Aubrey R Nobel Rd.	DI 2-5575
Andreae H 175b Westbrook.	DI 2-5432
Anthony F 171d Westbrook.	DI 2-5245
Armstrong J L 109 Parkway.	DI 2-5583
Armstrong Percy 48 Nobel Rd.	DI 2-5358
Armstrong's Service Station 172 Nobel Rd.	DI 2-5321
Atha Doyt Scott's Rd.	DI 2-5447
Ayers P 50 Silverbitch.	DI 2-5560
Baker E G Shawanaga Rd.	DI 2-5488
Barager A 208 Nobel Rd.	DI 2-5525
Barley D R 119d Sandhurst.	DI 2-5292
Barnden R 179a Westbrook.	DI 2-5425
Bates Carl 49a Old Nobel Rd.	DI 2-5460
Bates Robt 49 Old Nobel Rd.	DI 2-5209
Baxter D No 69 Hwy.	DI 2-5549
Beagan Ed RR 1 Nobel.	DI 2-5568
Beagan W J RR 1 Nobel.	DI 2-5489
Bel-Air Cottages RR 1 Nobel.	DI 2-5532

BELL TELEPHONE CO OF CANADA Business Ofc
Parry Sound Riverside 6-2121
To Report Telephone Out Of Order Dial 114
For Local Numbers Not Listed In Directory Dial 113
To Call Out Of Town Points Dial 0

Benard Jos 87 Old Nobel Rd.	DI 2-5465
Bernier R J 178 Westbrook.	DI 2-5279
Besman A R 52 Silverbitch.	DI 2-5258
Blacksky Edwin 72 Nobel.	DI 2-5265
Bosley Hartley 214 Nobel Rd.	DI 2-5466
Bouchier Leonard 120 Nobel Rd.	DI 2-5205
Bowman Oliver J RR 1 Nobel.	DI 2-5481
Brown Alexander Portage Lake.	DI 2-5507
Browne Michael 61 Parkway.	DI 2-5201
Bruckler A RR 1 Nobel.	DI 2-5468
Buchan Robt 226 Beach Bays Rd.	DI 2-5510
Burden L P Shawanaga Rd.	DI 2-5407
Burden Maurice RR 1 Nobel.	DI 2-5528
Burden Thomas Snug Harbour Rd.	DI 2-5477

Burridge W C 87 Parkway.	DI 2-5340
Bushey Jerome 82 Nobel Rd.	DI 2-5296
Bushey Thomas 34 Old Nobel Rd.	DI 2-5335
Bushey Waverley 20 New Nobel Rd.	DI 2-5318
Buttineau C 42 New Nobel Rd.	DI 2-5331
Buttineau Mrs Delina 162a Nobel Rd.	DI 2-5326
Buttineau Gilbert 38 Nobel Rd.	DI 2-5368
Buttineau Peter 245b Old Nobel Rd.	DI 2-5370
Buttineau Thomas 110a Nobel Rd.	DI 2-5591
Buttineau W 108 Nobel Rd.	DI 2-5359
Camp Louise RR 1 Nobel.	DI 2-5513
Camp Shebeshekong No 69 Hwy.	DI 2-5582
Campbell Malcolm 212 Nobel Rd.	DI 2-5405

CANADIAN INDUSTRIES LTD Nobel. DI 2-5213
Canadian Pacific Railway Station Nobel. DI 2-5312
Carling School No 8 Snug Harbour. DI 2-5433

Carter Derek 129d Sandhurst.	DI 2-5456
CEC'S GROCERY 46 Nobel Rd.	DI 2-5232
Chesney Mrs A F Nobel.	DI 2-5415
Chevrette Robt 47 Old Nobel Rd.	DI 2-5395
Christie D J Snug Harbour.	DI 2-5552
Christie W J Snug Harbour Rd.	DI 2-5577
Churchill Frederick 129c Sandhurst.	DI 2-5546

COLBERG SLIM Contractor Carling Bay.	DI 2-5472
Collison Mrs Charles 80 Nobel Hwy.	DI 2-5231
Collison Mrs Gerald 26 Nobel Rd.	DI 2-5239
Collison Loftus 9 Old Nobel Rd.	DI 2-5350
Coltas Alfred 63 Parkway.	DI 2-5269
Cooper Tom Dillon.	DI 2-5440
Corrigan T 1 Portage Lake Rd.	DI 2-5352
Couperthwaite Roy W Snug Harbour Rd.	DI 2-5497
Craig F 115 Sandhurst.	DI 2-5484
Crawford R J 6 Nobel Rd.	DI 2-5378
Crawford Sid E 200 Nobel Rd.	DI 2-5464
CRAWFORD'S GARAGE Nobel Rd.	DI 2-5364
Crigger Carson S 133c Sandhurst.	DI 2-5379

Curtis R G 143b Sandhurst.	DI 2-5360
Davidson R H 162 Nobel Rd.	DI 2-5369
Davis Arnold M Sand Bay Camp RR 1 Nobel.	DI 2-5412
De Bray Herbert 74 Parkway.	DI 2-5564
DEED BUILDERS Portage Lake Rd.	DI 2-5434
Demick Dave Nobel Rd.	DI 2-5424
Dillon General Store RR 1 Nobel.	DI 2-5521
Dixon Richard No 69 Hwy.	DI 2-5520
Donnelly Arthur 16 Nobel Rd.	DI 2-5235
Dube Ernest 96 Nobel Rd.	DI 2-5208
Dube William 159 Old Nobel Rd.	DI 2-5259
Dubie Mrs Fred Snug Harbour Rd.	DI 2-5597
Dumont Alphonse No 69 Hwy.	DI 2-5558
Dumont Tom 190 Nobel Rd.	DI 2-5266
Dunk L 76 Parkway.	DI 2-5553
Dunk T A 178c Westbrook.	DI 2-5212
Dupuis J M 146 Nobel Rd.	DI 2-5385
Edwards Mrs Dorothy 183 Old Nobel Rd.	DI 2-5311
Elliott D 80 Parkway.	DI 2-5322
Ellis Ian Parkway.	DI 2-5218
Farrow Frank 175b Westbrook.	DI 2-5304
Farry D 144 Sandhurst.	DI 2-5544
Fearn T S 1 Pinecrest.	DI 2-5505
Federico Mrs A M 153d Sandhurst.	DI 2-5372
Felger Harry Portage Lake Rd.	DI 2-5392
Ferris Clifford 198 Nobel Rd.	DI 2-5285
Fisher Francis 216 Nobel Rd.	DI 2-5580
Fisher L C Nobel.	DI 2-5459
Fisher Myrvin 179 Old Nobel Rd.	DI 2-5274

FITZMAURICE & BOYER Survys 24 Seguin
Parry Sound Riverside 6-5261

Flynn Thomas Snug Haven Snug Harbour.	DI 2-5543
Foley Mose 69 Hwy.	DI 2-5559
Foreman W Glenrock.	DI 2-5504
Gagnon Joseph 150 Nobel Rd.	DI 2-5396
Garrett Eric A 62 Parkway.	DI 2-5271
Garrity Mrs K 77 Parkway.	DI 2-5514
Gatien Raymond 32 Nobel Rd.	DI 2-5204
Gerdes Fred 16 Hillsdale.	DI 2-5240
Gibbons Orval 235 Old Nobel Rd.	DI 2-5452
Gibbons Ross Dillon Rd.	DI 2-5430
Godfrey J E 65 Parkway.	DI 2-5355
Gognavac Mrs A 59 Old Nobel Rd.	DI 2-5503
Gordon D W 17 Pinecrest.	DI 2-5357

GRAHAM WALTER J Commercial Fisherman
Snug Harbour. DI 2-5442

Green T F Bldr Portage Lake Rd.	DI 2-5434
Grigor J 133b Sandhurst.	DI 2-5346
Guloien E P 60 Parkway.	DI 2-5381
Hailstone Leonard Snug Harbour Rd.	DI 2-5467
Hamilton George R Dillon Rd.	DI 2-5417
Hammel Chas Scott's Rd.	DI 2-5426
Hammel E J 247 Nobel Rd.	DI 2-5493
Hammel Gordon Dillon Rd.	DI 2-5598
Hammel James R 83 Parkway.	DI 2-5339
Hammond Ken 22 Springmount.	DI 2-5595
Hancock E W D Glenrock.	DI 2-5362
Harding J P 153a Sandhurst Rd.	DI 2-5330
Harris C E Carling Bay.	DI 2-5535

HARRISON'S GEORGIAN BAY CAMP Nobel. DI 2-5572
Healey C R 68 Parkway. DI 2-5256

HIDDEN LAKE CAMP RR 1 Nobel.	DI 2-5463
Hitchings Mrs Frances 23 Hillsdale.	DI 2-5329
Hooker Wm Camp Louise RR 1 Nobel.	DI 2-5513
Hooney Edward RR 1 Nobel.	DI 2-5589
Hoskins R F H 66 Parkway.	DI 2-5455
Humphrey Robert Shebe Resort RR 1 Nobel.	DI 2-5422
Hunt Arnold 220 Nobel Rd.	DI 2-5217
Hunt Ivan R Glenrock.	DI 2-5576
Hunter Garnet 143c Sandhurst.	DI 2-5310
Inverlochy Lodge Deep Bay.	DI 2-5593
Johnson K A Carling Rd.	DI 2-5436
Johnson Lloyd R 75 Parkway.	DI 2-5246
Johnson R A 210 Nobel Rd.	DI 2-5345
Johnston Geo H 118 Nobel Rd.	DI 2-5414
Johnston Peter Portage Lake Rd.	DI 2-5547

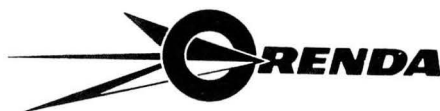
KENNEY SHOE STORE 68 James
Parry Sound Riverside 6-2911

Kerr A 9 Hillsdale.	DI 2-5319
Kerr Stewart 139 Sandhurst.	DI 2-5253
Ketching G L 227 Old Nobel Rd.	DI 2-5380
Keyworth Albert 162 Sandhurst.	DI 2-5490
King-Wilson N Carling Bay.	DI 2-5526
Kingston D J 137 Sandhurst.	DI 2-5594
Knechtel Norman 53a Nobel Rd.	DI 2-5287

Konoval Nicholas Snug Harbour Rd.	DI 2-5569	Ritchie Earl Dillon Rd.	DI 2-5427
Konoval William Snug Harbour.	DI 2-5498	Ritchie William Dillon	DI 2-5517
Kraus A 93 Nobel Rd.	DI 2-5404	Robertson Mrs Cora 147 Sandhurst.	DI 2-5233
Kretschmer W 164 Sandhurst.	DI 2-5250	Rockwood Camp Sand Bay	DI 2-5462
Lalonde Clifford 96 Nobel Rd.	DI 2-5298	Rosewell H 224b Nobel Rd.	DI 2-5429
Lamonday Ambrose 205 Old Nobel Rd.	DI 2-5216	Rosewell Lawrence Portage Lake Rd.	DI 2-5457
Lawson J R 82 Parkway.	DI 2-5249	Ross Alvin N 21 Nobel Rd.	DI 2-5323
Lawson Mrs Vera L 168a Nobel Rd.	DI 2-5592	Ross George 16a Nobel Rd.	DI 2-5314
Leigh F M 179d Westbrook.	DI 2-5289	Ross-Ross P A 101 Parkway.	DI 2-5260
Leslie Rev E G Springmount	DI 2-5273	Rowse Dennis 146 Sandhurst.	DI 2-5200
Little Mrs Emerson 150b Nobel Rd.	DI 2-5376	Roy J M 184 Nobel Rd.	DI 2-5586
Looby Stewart 174 Westbrook.	DI 2-5554	Ruscoe J 224a Nobel Rd.	DI 2-5234
MacCoubrey I L Beach Bays Rd.	DI 2-5519	Ruscoe J A Glenrock	DI 2-5342
MacCoubrey Roy 89 Old Nobel Rd.	DI 2-5435	Ryder Geo Glenrock	DI 2-5373
MacCoubrey Von 89a Nobel Rd.	DI 2-5294	Ryman I L 79 Parkway.	DI 2-5443
Mace O 196 Nobel Rd.	DI 2-5386	Sagar Victor H 138 Sandhurst.	DI 2-5277
MACFARLANE ON THE BAY Tourst Outftrs			
Carling Bay	DI 2-5451	Saintsbury J A 31 Silver Birch.	DI 2-5244
Mahon Roger 131 Nobel Rd.	DI 2-5361	Sand Bay Camp RR 1 Nobel.	DI 2-5412
Margison Clayton 1 Hillsdale.	DI 2-5366	Schneider Geo A RR 1 Nobel.	DI 2-5579
Mark Gordon 171b Westbrook	DI 2-5492	Schneider John 149 Sandhurst.	DI 2-5393
Marsh O J Bel-Air Cottages RR 1 Nobel.	DI 2-5532	Schobel J RR 1 Nobel.	DI 2-5478
Maule C S 88 Parkway.	DI 2-5237	Scott Earl 119 Sandhurst.	DI 2-5210
MAYOTTE CEC Plasterer 46 Nobel Rd.	DI 2-5232	Scott R C Nobel Rd.	DI 2-5483
McClean Stanley 129a Sandhurst Rd.	DI 2-5344	Scrimgeour David 174c Westbrook.	DI 2-5545
McDonald Wm 247a Nobel Rd.	DI 2-5336	Scriver James Snug Harbour.	DI 2-5567
McDonnell R 175c Westbrook.	DI 2-5348	Scriver Perry R 120 Sandhurst.	DI 2-5306
McEachren R 7 Glenrock.	DI 2-5523	Sharkey G 241 Old Nobel Rd.	DI 2-5363
McIlroy Robert W RR 1 Nobel.	DI 2-5439	Shebe Resort RR 1 Nobel.	DI 2-5422
McKenzie W Snug Harbour Rd.	DI 2-5587	Shunk E 153b Sandhurst.	DI 2-5512
McKinstry W C 178b Westbrook.	DI 2-5317	Signore Sylvester 179c Westbrook.	DI 2-5494
McLachlan Finley W Ltd Contrs Nobel.	DI 2-5590	Simpson Mrs Gordon F 84 Parkway.	DI 2-5584
Michaelis Elmore 224 Nobel Rd.	DI 2-5419	Slaght Arthur G Bower's Bay.	DI 2-5286
Miller J A Snug Harbour Rd.	DI 2-5557	Sly E Scott's Rd.	DI 2-5516
MILLER PLANING MILLS Slaght's Rd.	DI 2-5261	Smith Robert F 122 Sandhurst.	DI 2-5297
Milligan Mrs A T RR 1 Nobel.	DI 2-5428	SNUG HARBOUR CAMP Snug Harbour.	DI 2-5561
Milligan Allan RR 1 Nobel.	DI 2-5538	Snug Haven Snug Harbour.	DI 2-5543
Milligan Donald RR 1 Nobel.	DI 2-5448	Soper George 133 Sandhurst.	DI 2-5377
Monette Leonard 171 Old Nobel Rd.	DI 2-5320	Starkey Harold Nobel	DI 2-5302
Monette R 90 Nobel Rd.	DI 2-5585	Stephens Cecil W 105 Parkway.	DI 2-5293
Monette Raymond 128 Nobel Rd.	DI 2-5413	Stephens H Richard 112 Sandhurst	DI 2-5238
Monette Wilfred 106 Nobel Rd.	DI 2-5556	Stewart Ernest M 69 Parkway.	DI 2-5316
Monks E 178d Westbrook.	DI 2-5444	Stringer David 77a Old Nobel Rd.	DI 2-5446
Montgomery H R 111 Sandhurst	DI 2-5334	Temple Clarke RR 1 Nobel.	DI 2-5527
Murdoch Harvey J Nobel	DI 2-5563	Temple Harry RR 1 Nobel.	DI 2-5416
Neal Brian 153c Sandhurst.	DI 2-5349	THE—Look also under second word in Name	
Nelson Paul 73 Sandhurst.	DI 2-5371	Thompson Andrew RR 1 Nobel.	DI 2-5409
Newbold W F 158 Sandhurst.	DI 2-5257	Thompson James RR 1 Nobel.	DI 2-5509
Newton Peter Nobel	DI 2-5475	Thornton Arthur Dillon Rd.	DI 2-5437
Nobel Community Club 89 Sandhurst.	DI 2-5229	Tobias W V 116 Sandhurst Rd.	DI 2-5394
NOBEL CONSOLIDATED SCHOOL Nobel.	DI 2-5251	Todd G W 33 Hillsdale.	DI 2-5303
NOBEL SERVICE STATION Nobel Rd.	DI 2-5364	Tremblay Omer J RR 1 Nobel.	DI 2-5438
Norrie Earl Portage Lake Rd.	DI 2-5530	Tristram John 233 Old Nobel Rd.	DI 2-5268
Nutt R 171 Westbrook.	DI 2-5270	Tyson's Camp Dillon	DI 2-5524
ORENDA ENGINES LTD Nobel.	DI 2-5241	Vankoughnett E 182 Nobel Rd.	DI 2-5374
Orser W 171 Westbrook.	DI 2-5207	Vankoughnett Kenneth Portage Lake Rd.	DI 2-5482
Otley John H 16 Glenrock.	DI 2-5388	Vigrass J H Portage Lk Rd.	DI 2-5537
Paluck Julius 149 Nobel Rd.	DI 2-5278	Wainright Mrs H M 30 Nobel Rd.	DI 2-5254
Parry Sound Golf & Country Club Nobel Rd.	DI 2-5262	Wainright Roy Nobel	DI 2-5343
Payne Miss Clara 175 Westbrook	DI 2-5354	Wallace E G Glenrock Rd.	DI 2-5219
Peachey N S 12 Glenrock.	DI 2-5328	Walters A P 85 Parkway.	DI 2-5351
Perrior B 179b Westbrook.	DI 2-5308	Walwaski Giles 119c Sandhurst.	DI 2-5263
Phillips Norman 210 Nobel Rd.	DI 2-5267	Wanland D Nobel Rd.	DI 2-5495
Phinney Ralph 75 Old Nobel Rd.	DI 2-5327	Watt Gordon I 119 Sandhurst.	DI 2-5280
Piddington E H 28 Hillsdale.	DI 2-5398	WAWANAISA LOG CABINS RR 1 Nobel.	DI 2-5481
Pilgrim H Portage Lake Rd.	DI 2-5445	Wheatley Mrs Bertha 48b Nobel Rd.	DI 2-5347
Pilgrim Mrs Robt Portage Lake Rd.	DI 2-5570	Whistance A 156 Sandhurst.	DI 2-5313
Plant J Elven 133 Old Nobel Rd.	DI 2-5255	White J 2 Crawford.	DI 2-5230
Plowman J H Hidden Lake Camp RR 1 Nobel	DI 2-5463	Whittaker H 78 Parkway.	DI 2-5337
Plowman W H 168 Nobel Rd.	DI 2-5502	Wilder William 71 Parkway.	DI 2-5486
Pocock L M 129b Sandhurst.	DI 2-5206	Willett Laverne 174b Westbrook.	DI 2-5284
Portage Lake Lodge Portage Lake Rd.	DI 2-5573	Williams Harry 231 Nobel Rd.	DI 2-5383
Quinn Arden Hwy 69.	DI 2-5469	Wilson W R 140 Sandhurst.	DI 2-5307
Quinn Edwin 12 Old Nobel Rd.	DI 2-5338	Woodard Angus RR 1 Nobel.	DI 2-5548
Ramsay David Dillon Pd.	DI 2-5441	Wye R 255 Old Nobel Rd.	DI 2-5406
Ramsay Harold RR 1 Nobel.	DI 2-5518	Yorke Mrs Isaac 76 Nobel Rd.	DI 2-5384
Ramsay John Dillon Rd.	DI 2-5508	YOUNG E W Insc 92 James	
Ramsay John N RR 1 Nobel.	DI 2-5418	Parry Sound Riverside	6-2321
Ramsay Thomas Snug Harbour Rd.	DI 2-5420		
Ramsay William Snug Harbour Rd.	DI 2-5588		
Rand Stanley 65 Old Nobel Rd.	DI 2-5375		
Reid Wm 173 Old Nobel Rd.	DI 2-5474		
Rennie Robert 143 Sandhurst.	DI 2-5248		
Richmond Mrs Mary E Sand Bay Rd.	DI 2-5578		
Richmond Stanley G Snug Harbour Rd.	DI 2-5587		
Richmond Wm RR 1 Nobel.	DI 2-5458		
Riehm W C 64 Parkway.	DI 2-5211		

TEST RIGS AND FACILITIES
NOBEL TEST ESTABLISHMENT
NOBEL ONTARIO

B 20 - 56



OCTOBER 1, 1956

ORENDA ENGINES LIMITED
ENGINEERING and EXPERIMENTAL DEPARTMENT
MALTON ONTARIO

(Member A.V.Roe Canada Limited and Hawker Siddeley Group)

Issued to.....

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INTRODUCTION

This brochure describes the Orenda Engines Limited Test Establishment at Nobel, Ontario.

Engine compressors, turbines and combustion systems are tested at this establishment on a development basis and certain other testing is done in support of these main programs.

It will be appreciated that the testing of the main engine aerodynamic and thermodynamic components, other than in a complete engine, involves a large consumption of power. It is for this reason that large scale testing is centred in the Nobel power house, which was acquired as war surplus shortly after the last war.



AERIAL PHOTOGRAPH OF NOBEL TEST ESTABLISHMENT

PART I

DESCRIPTION OF BASIC FACILITIES

1.1 General

The Nobel Test Establishment is located some 120 air miles and some 173 road miles north of Malton, Ontario, resulting in a driving time of three and one-half hours between these points. The Canadian Pacific Railway transcontinental line and the new Trans-Canada highway both pass through Nobel (See Fig. 2). The Trans-Canada highway is still under construction in some important sections and when completed will reduce the distance from Malton by road to 130 miles. Continuous teletype communication is maintained with the engineering office at Malton.

The plant is about seven miles north of Parry Sound, and roughly one mile from Nobel Village. Its immediate industrial neighbour, one-half mile to the west across No. 69 Highway, is a plant of the Canadian Industries Limited Explosives Division (See Fig. 3).

The Test Establishment covers an area of some 17 acres. This area is substantially level, and the granite bed rock is generally only a few feet below the surface. This is occasionally inconvenient, but on heavy structures foundation costs are minimized.

The plant comprises the power house, new test cells, machine shop, new office (still under construction), old office, fire hall, assorted smaller buildings, and five buildings retained since the last war for storage purposes by Canadian Arsenals Limited (See Figs. 1 and 4).

1.2 Services

1.2.1 Steam: The boiler room contains six Vickers-Keeler boilers (Figs. 6 and 9) each rated at 394 horsepower and 12,800 pounds of steam per hour. They can, however, be over-rated to 25,000 pounds of steam per hour.

The four high pressure boilers have a working pressure of 250 psi and deliver steam to No. 1 compressor test rig, No. 2 compressor test rig, or the Graham ejector of the sector altitude combustion test rig. The two low pressure boilers operate at 135 psi and deliver steam to the Foster-Wheeler ejector of

the Orenda altitude combustion test rig, the turbine drive of the Sheldon blower, various auxiliaries, and the plant heating system.

These boilers were designed for a steady industrial steam load; however, test operation demands a rapidly fluctuating load and frequent overload. This necessary abuse naturally tends to shorten boiler life, and is reflected in an accelerated maintenance schedule.

All the boilers have been converted to oil firing in the interest of operational flexibility and economy. Our present storage tank capacity for Bunker "C" oil is 60,000 gallons and, as this is sufficient for only four days of heavy testing, the plant is somewhat dependent on rail service for the continuity of its operation.

- 1.2.2 Air: Compressed air is delivered from a bank of five 500 horsepower Ingersoll-Rand compressors (See Figs. 6 and 10), making available a total of 15 pounds per second at up to 110 psi pressure. This air may be delivered directly to the test rigs at compressor delivery temperature, or any portion of it passed through an aftercooler.

Air for the Orenda atmospheric and altitude combustion test rigs is supplied by a Sheldon blower which delivers 3.5 pounds per second of air at up to 3.0 psig. This blower is driven by a 180 horsepower General Electric steam turbine and can be over-rated to deliver up to 5.5 pounds per second of air.

- 1.2.3 Water: The plant is provided with water delivered through a 30 inch water line from a pumphouse located on the shore of Georgian Bay (See Fig. 4). The pumping plant consists of four 2300 gpm 231 foot head centrifugal pumps each driven by a 200 horsepower induction motor, and a 1000 gpm stand-by pump driven by a gasoline engine. Two of the main pumps are Crown Capital equipment assigned to Orenda Engines Limited, while the remaining equipment and building are owned by Canadian Industries Limited, who maintain and operate the pumphouse.

Water up to a maximum of 6500 gpm is normally available to the test establishment.

Two water storage tanks, each of 100,000 U.S. gallons capacity, are normally kept filled to cope with fire or other emergency. One is a gravity tank about 119 feet high, which would supply water for fire-fighting purposes for a substantial period in the event of a power failure. The stand-by steam

turbine driven fire pump could, in this interval, be brought into service and draw on the further reserves in the 100,000 U.S. gallon stove tank. The gasoline motor driven stand-by pump in the Georgian Bay pumphouse is, of course, the ultimate reserve.

- 1.2.4 Hydro: The main switchboard is located on the second floor level of the power house (See Fig. 6). Two 44,000/2200 volt, 3-phase, 60 cycle transformers of 3000 KVA capacity are located immediately outside the power house at this point. Only one 3000 KVA transformer is currently in use.

The present hydro contract permits the use of two of the Ingersoll-Rand compressors between the hours of 7 A.M. and 7 P.M., and provides for adequate power between these hours for full operation of the Georgian Bay pumps and all other normal services and auxiliaries. The additional three compressors can be operated only between the hours of 7 P.M. and 7 A.M.

Normally scheduled for operation between 7 P.M. and midnight are the sector afterburner rig and the annular atmospheric combustion rig. The Orenda high pressure combustion rig, which also requires five compressors, is now inactive.

Normally scheduled for operation between midnight and 7 A.M. are the cascade rig and the cooling air ejector test rig.

The main switchboard dates back to early wartime when Nobel was not connected with the Ontario Hydro power network, and the Nobel area was fed from a 3500 KVA turbo-alternator in the power house. All power for the plant of Canadian Industries Limited, the Georgian Bay pumphouse and the Orenda Test Establishment at Nobel passes through this panel.

- 1.2.5 Fuel: The test fuel tank farm (See Fig. 4) has a total of nine storage tanks, four 30,000, one 10,000, one 5000 and three 1500 gallon size, giving a total capacity of 139,500 gallons. The new afterburner rig uses JP 4 (wide range distillate), but all other combustion rigs normally use JP 1 (aviation kerosene) in the interests of safety.

1.3 Work Areas

- 1.3.1 Power Plant: The boilers, air compressors, fire pump, and main power panel occupy roughly half the available space in the power house, which is a steel frame and masonry building some 135 feet square (See Figs. 5 and 6).

- 1.3.2 Test Area: The other half of the power house contains most of the test rigs in space made available by removing power plant equipment not now required. Several of the rigs used for the combustion program are in small wings added to the basic power house structure. The two newest test rigs, the rotating blade cooling rig and the afterburner rig are in the new test cells which are specially designed for maximum safety and minimum sound transmission.

Test unit assembly, other than on multi-stage compressors which are built at Malton, is done in the fitting shop, a wing at the north-east end of the machine shop. A 40 foot by 60 foot area at the rear of the new office building has been designed for fitting operations, and as soon as suitable equipment can be provided, the fitting operation will be moved to this area, leaving the present fitting shop for component storage purposes.

- 1.3.3 Machine Shop: The machine shop is in a frame structure designed in 1940 to have a five year life, but is still basically sound. It is equipped with normal jobbing shop machines, and can handle most metal cutting operations as well as sheet metal forming, and heliarc, spot, D.C. arc and gas welding.

The shop can handle all routine plant maintenance and the manufacture of certain types of test equipment and specimens. For example, since the development of a combustion system requires almost day-to-day modifications and very close liaison between the test engineer and the sheet metal mechanics, the shops are fully equipped to handle the manufacture and modification of test combustors without assistance from the Malton shops. Compressor and turbine test units, however, which require blade manufacturing and precision boring facilities are designed and manufactured at Malton.

- 1.3.4 Maintenance Shops: The Plant Engineering maintenance shops, comprising a carpenter shop adjoining the machine shop, and a small electricians' and plumbers' work area adjacent to the power house, handles a heavy load of test rig installation and maintenance as well as normal plant maintenance functions.
- 1.3.5 Stores: The general stores area and test component stores are located at the south-west end of the machine shop. Stores for test equipment, lumber, and paint and oil are in out-lying buildings.
- 1.3.6 Office: (Fig. 4) The old office building houses the aerodynamics office, the combustion office, drafting office, darkroom,

library, teletype and switchboard room, administration and supervisory offices, gas analysis laboratory and instrument laboratories.

The gas analysis laboratory analyzes samples of combustion gas drawn from a combustion chamber, or its downstream ducting, to determine combustion efficiencies, fuel distribution, rates of combustion and the like.

The instrument laboratories are equipped to evaluate, calibrate and service all commercial instrumentation used at the Test Establishment, and to design, manufacture, develop and service specialized mechanical and electronic instrumentation as required.

The new office, a two storey 60 foot square steel frame structure, with a 40 by 60 foot fitting shop at the rear, is scheduled for completion in November, 1956, and will contain the instrument laboratory, aerodynamics office, and administration functions, relieving pressure in the overcrowded old office.

1.3.7 Fire Hall: (Fig. 4) The pump and ladder truck is kept in the fire hall which serves also as a lecture area for the 12 man volunteer fire brigade which, under normal circumstances, has a fire practice every two weeks. The maintenance foreman acts as Deputy Fire Chief for Nobel, or, in his absence on evening or night shift, one of the two fire watchmen who have had professional fire-fighting training, assumes the responsibility.

1.4 Personnel

The Nobel Test Establishment employs 20 engineers, 27 technicians five draftsmen, 112 shop and operating personnel, and 30 other staff.

1.5 Nobel Village

Built on land owned by Canadian Industries Limited, Nobel Village was founded in 1913 as a company town to house the supervisory personnel of their local explosives plant.

In 1940, to accommodate additional personnel of the wartime Defence Industries Plant, the village site was extended and additional houses and apartments were erected by Wartime Housing Limited. At the end of the war the administration of this housing was turned over to the Central Mortgage and Housing Corporation.

All but 66 of these units were removed to other government

projects, and of this number, 44 (largely of the 2-bedroom type) are now occupied by Orenda personnel.

The present land lease agreement between Central Mortgage and Housing Corporation and Canadian Industries Limited runs out in April 1960.

MAP OF SOUTHERN ONTARIO

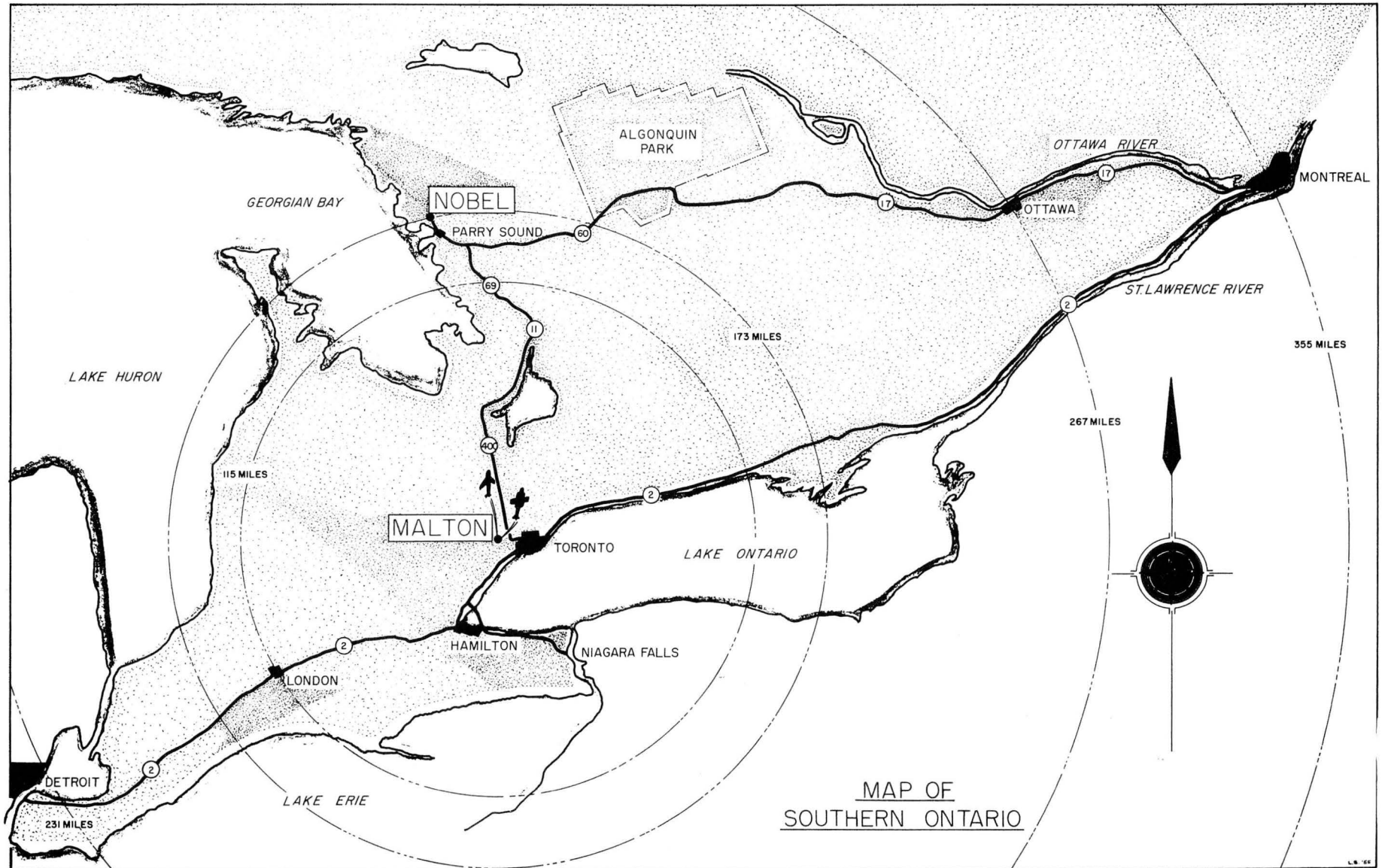
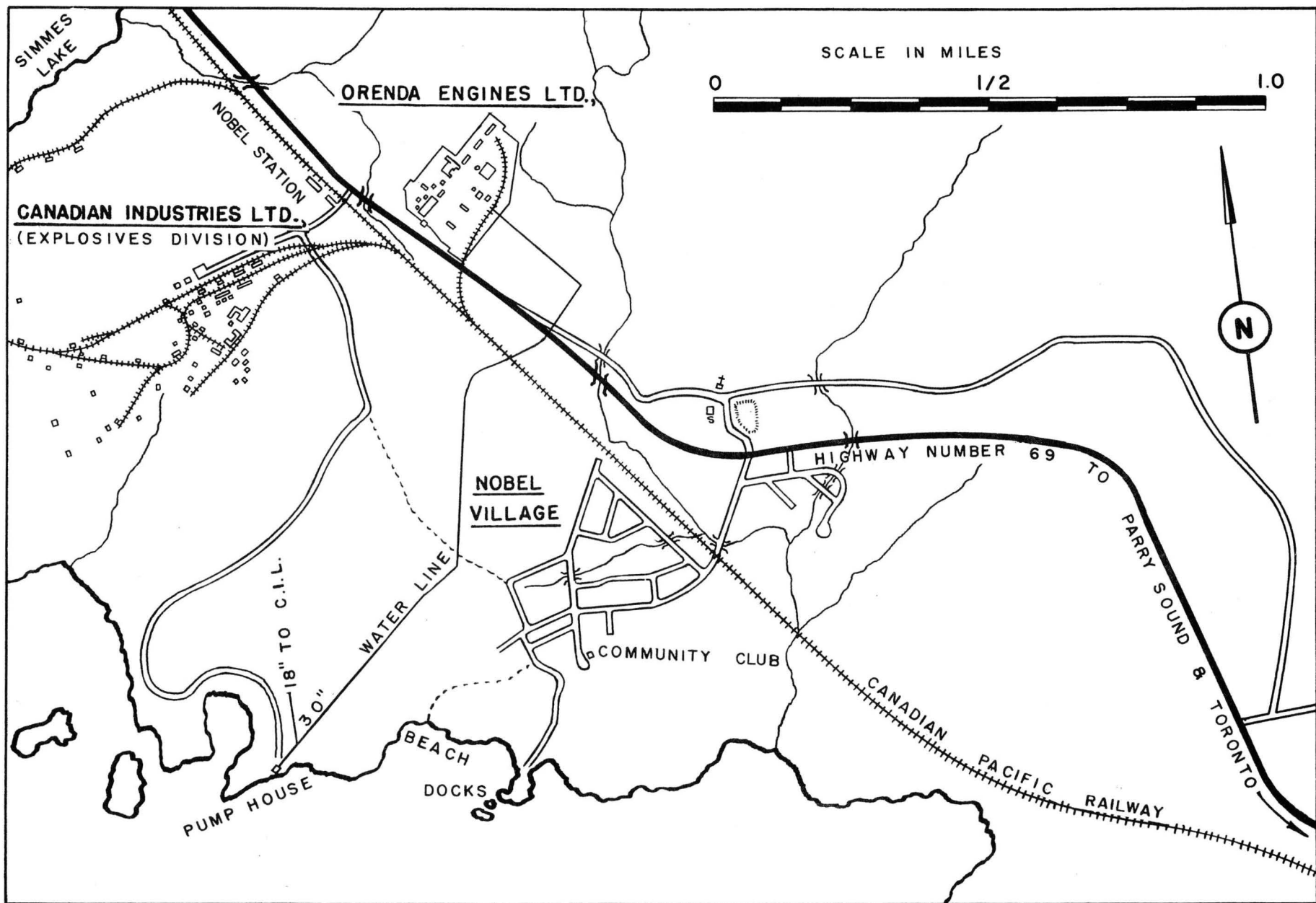
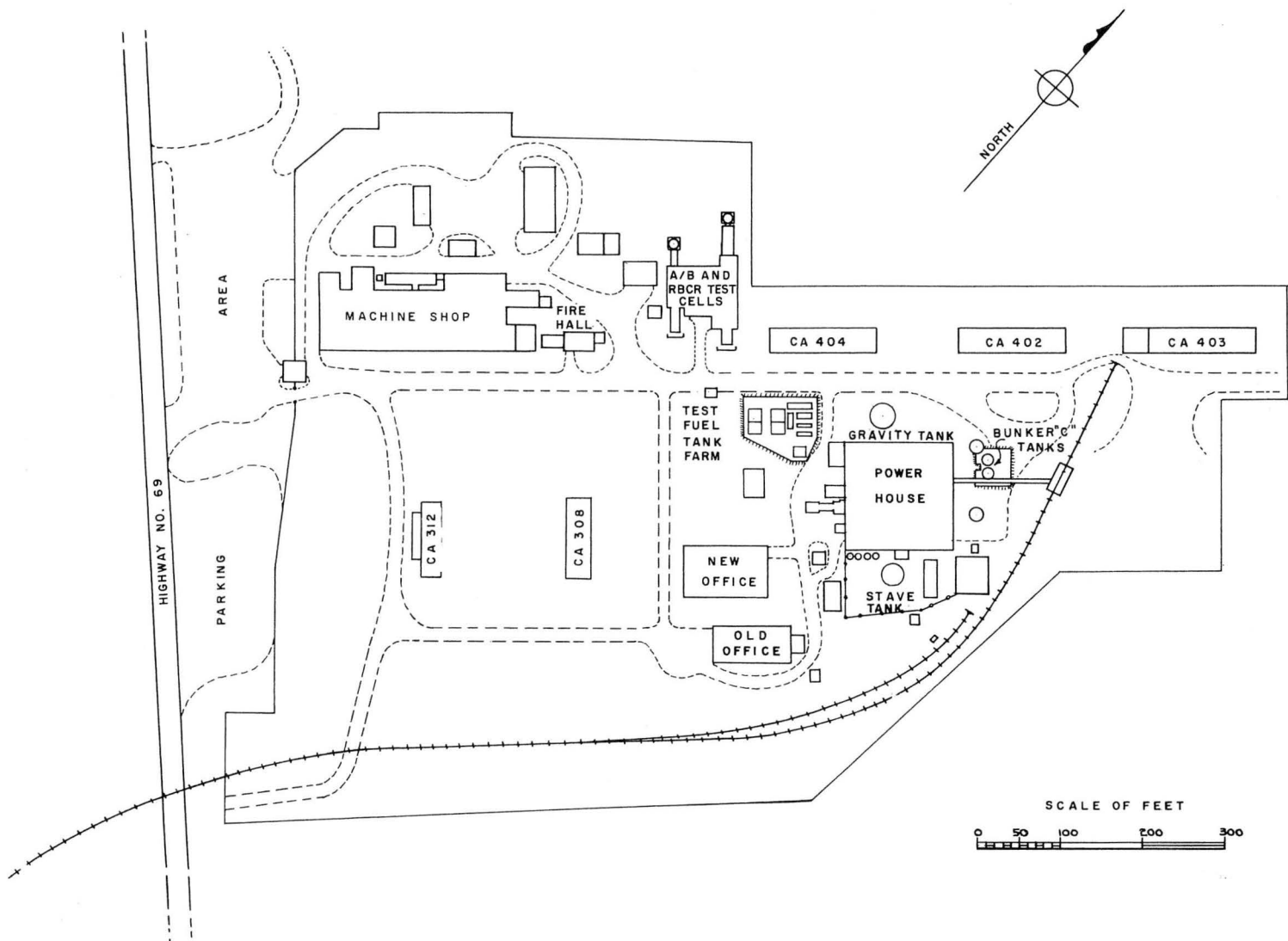


Fig. 2

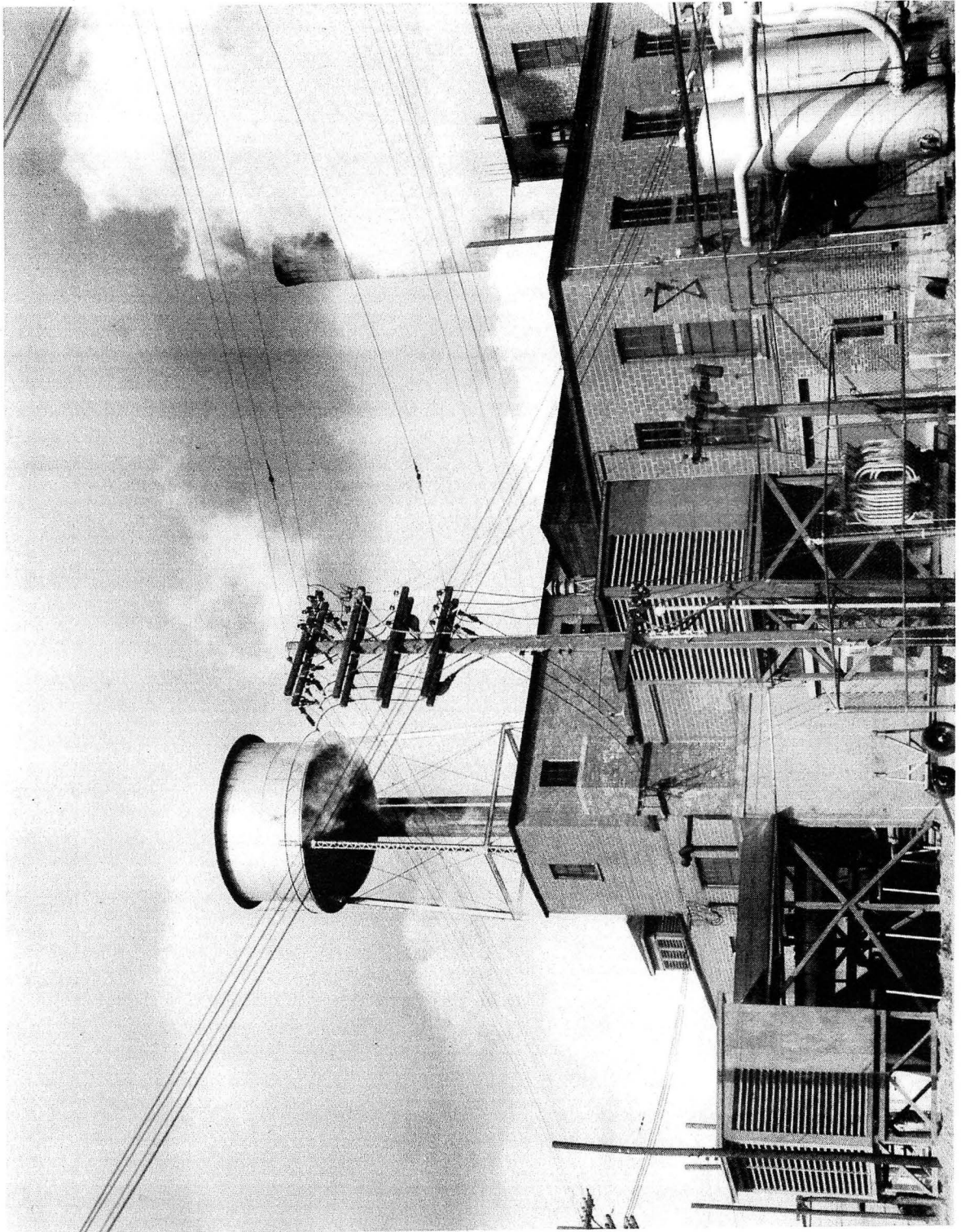


AREA MAP OF NOBEL



PLAN OF PLANT AREA

Fig. 4



POWER HOUSE

PLAN OF POWER HOUSE

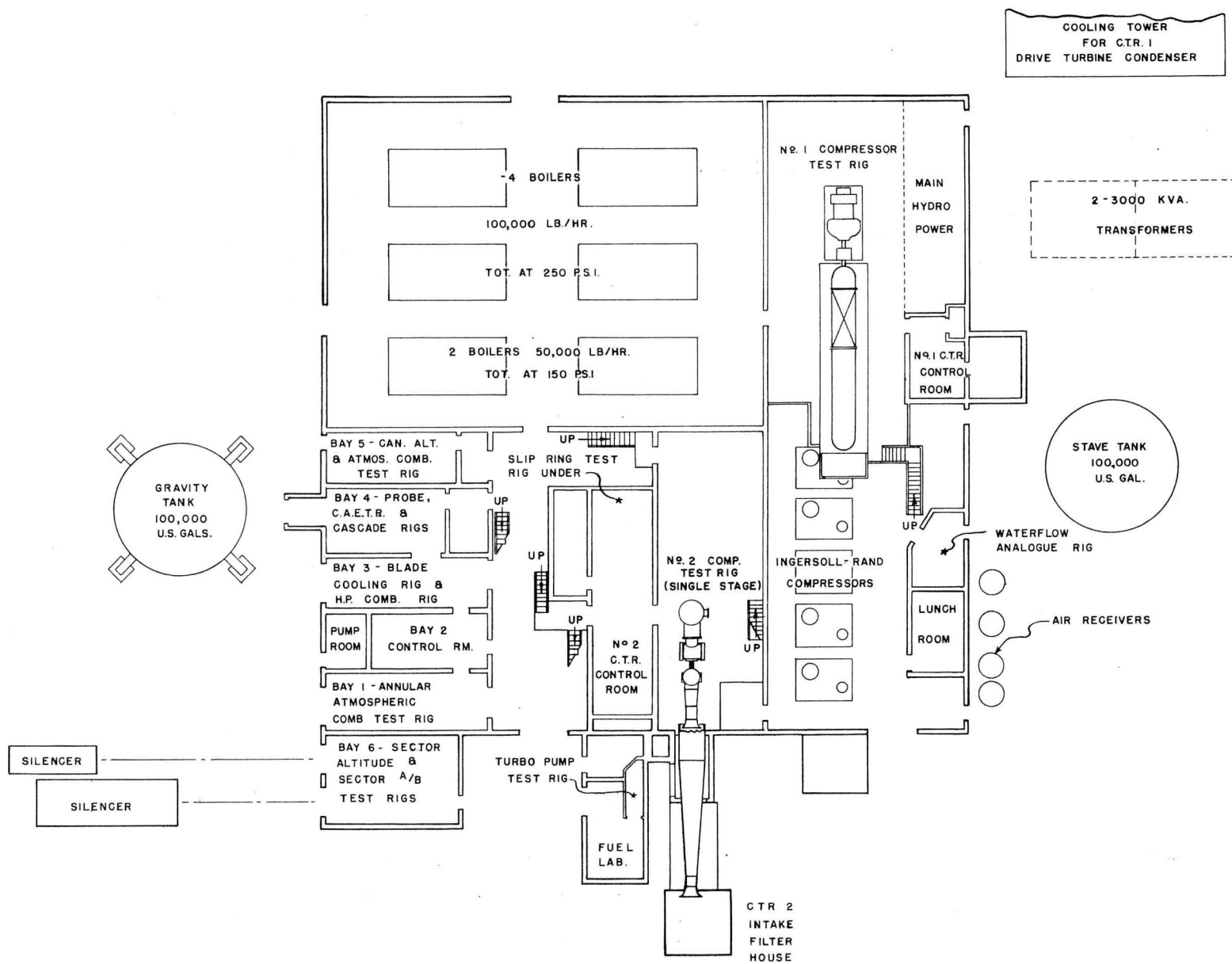
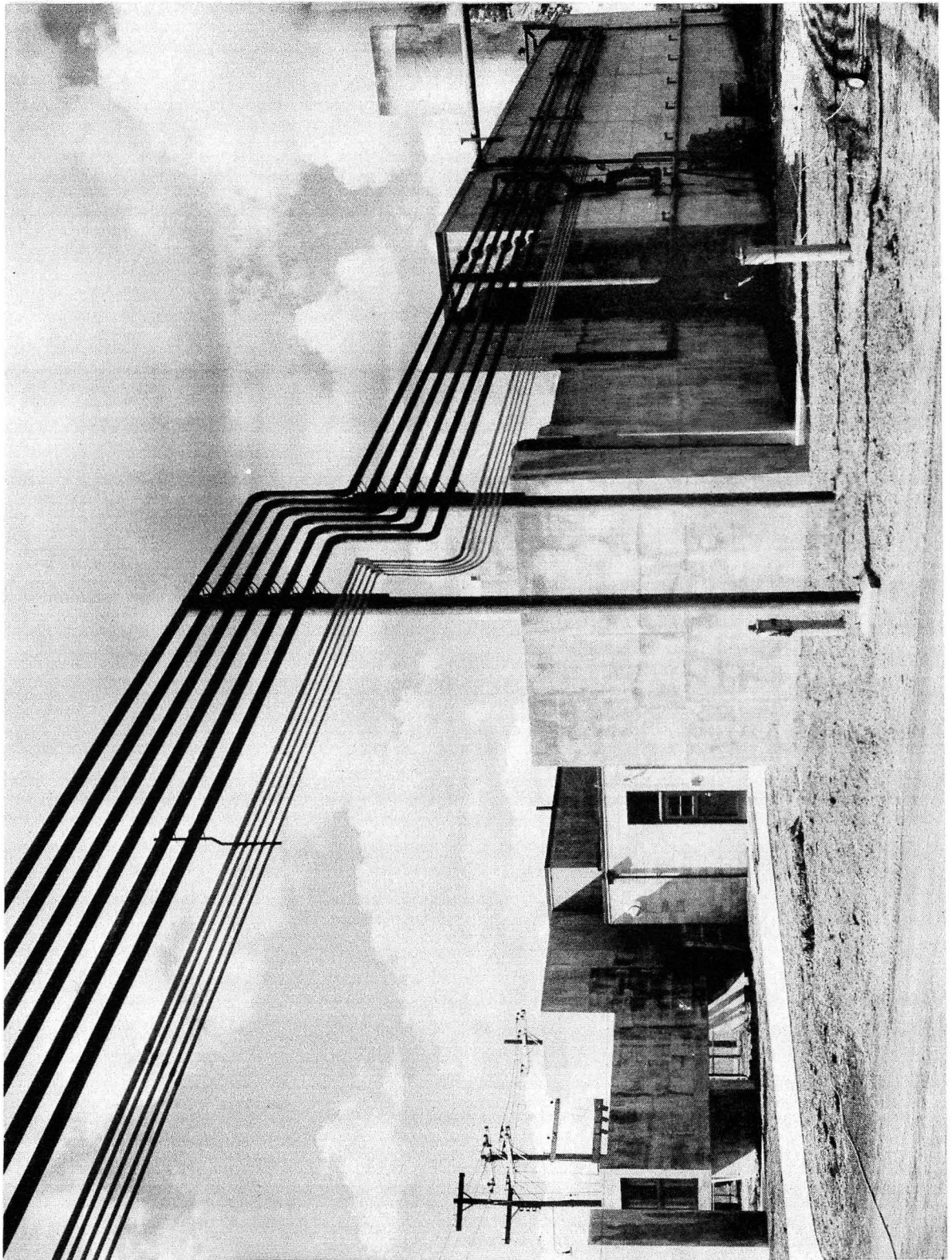
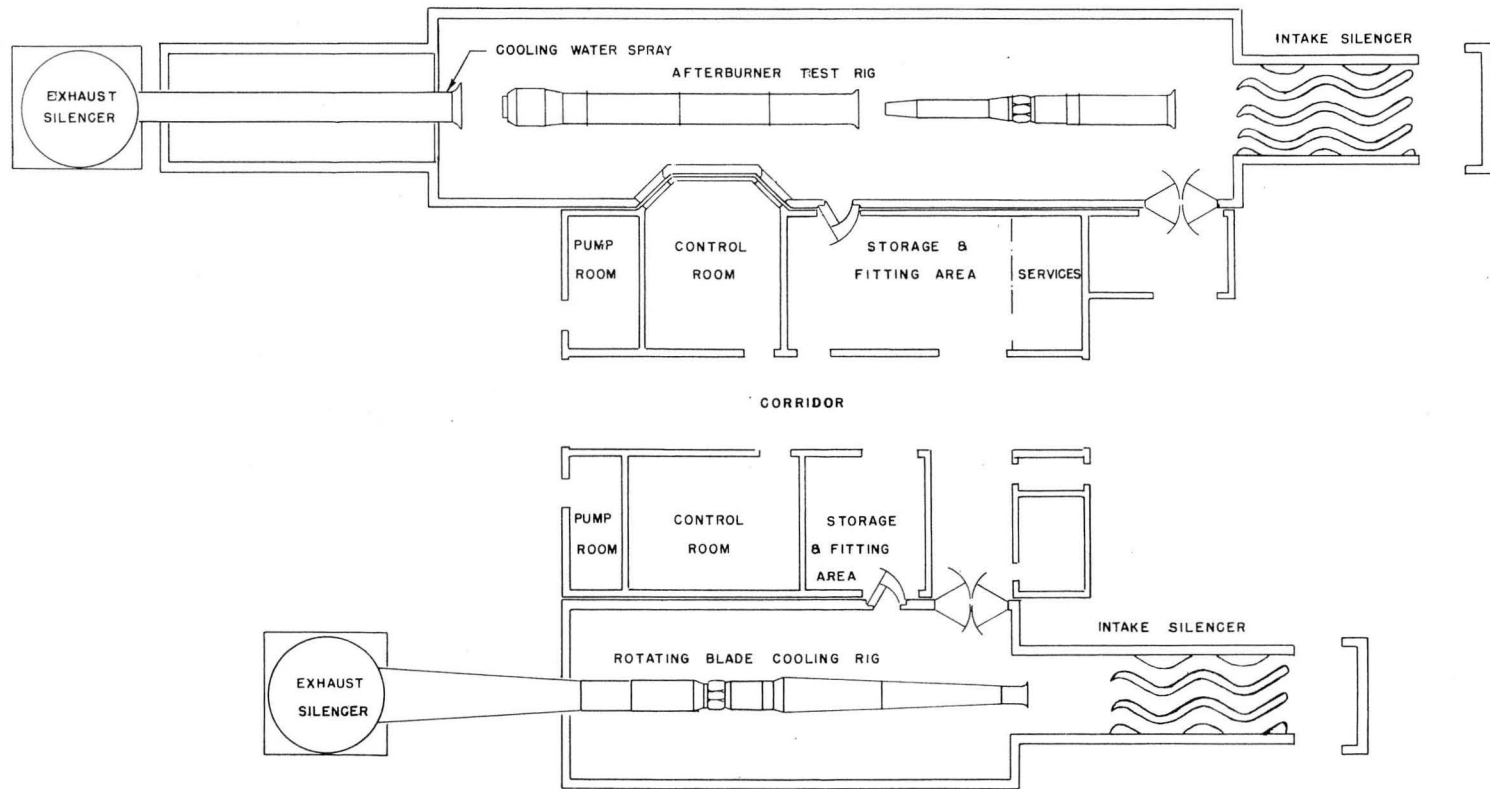


Fig. 6

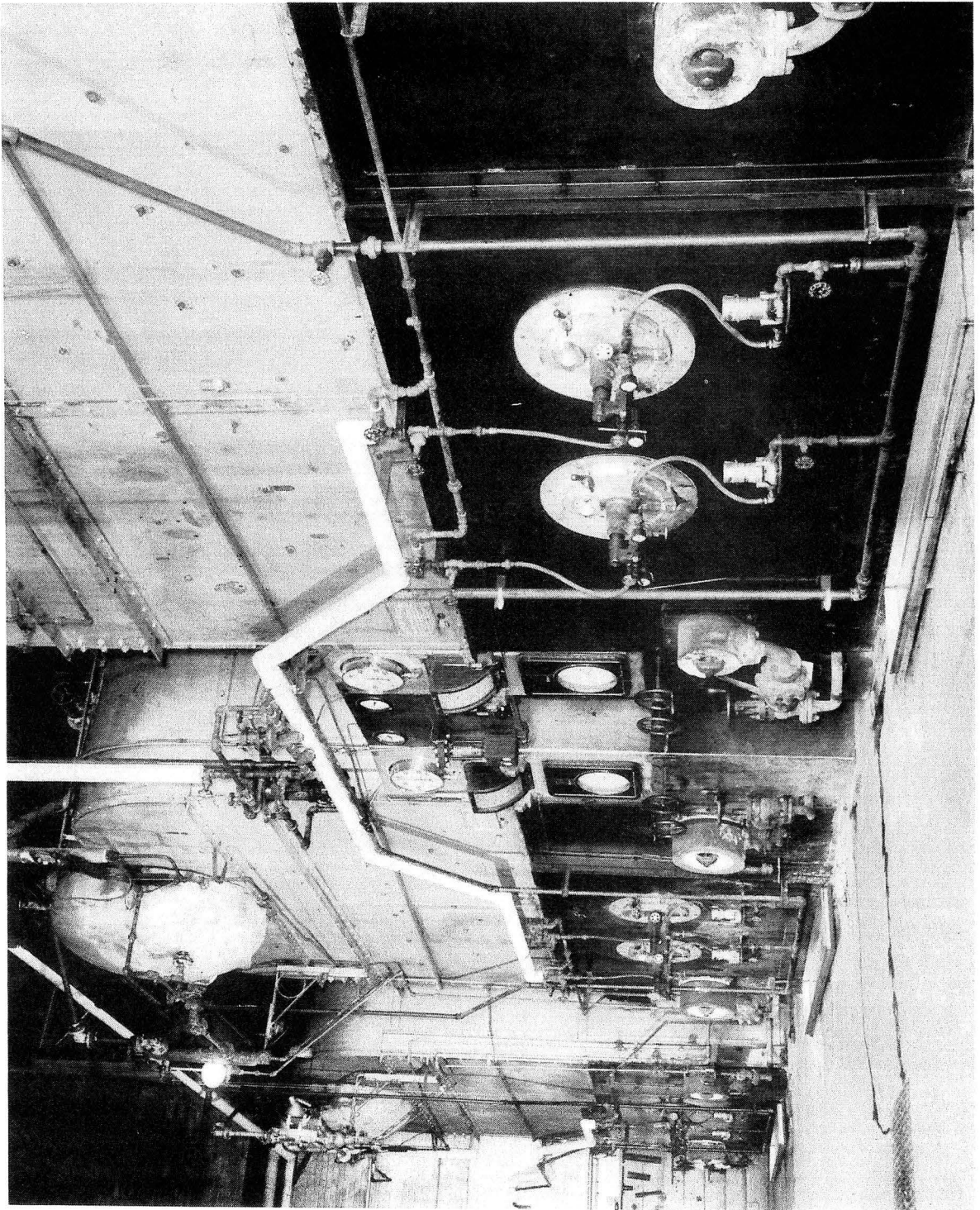


NEW TEST CELLS

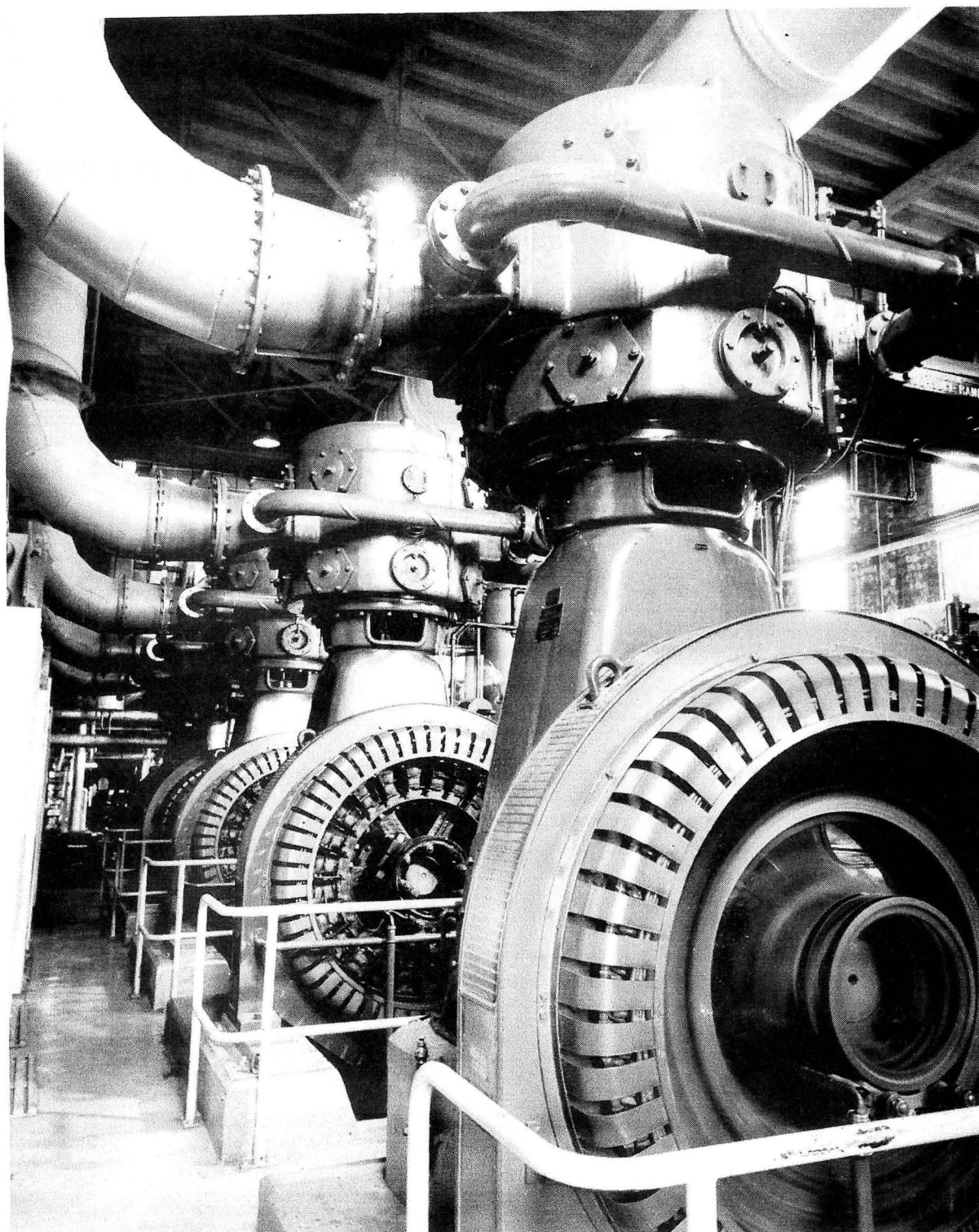


PLAN OF NEW TEST CELLS

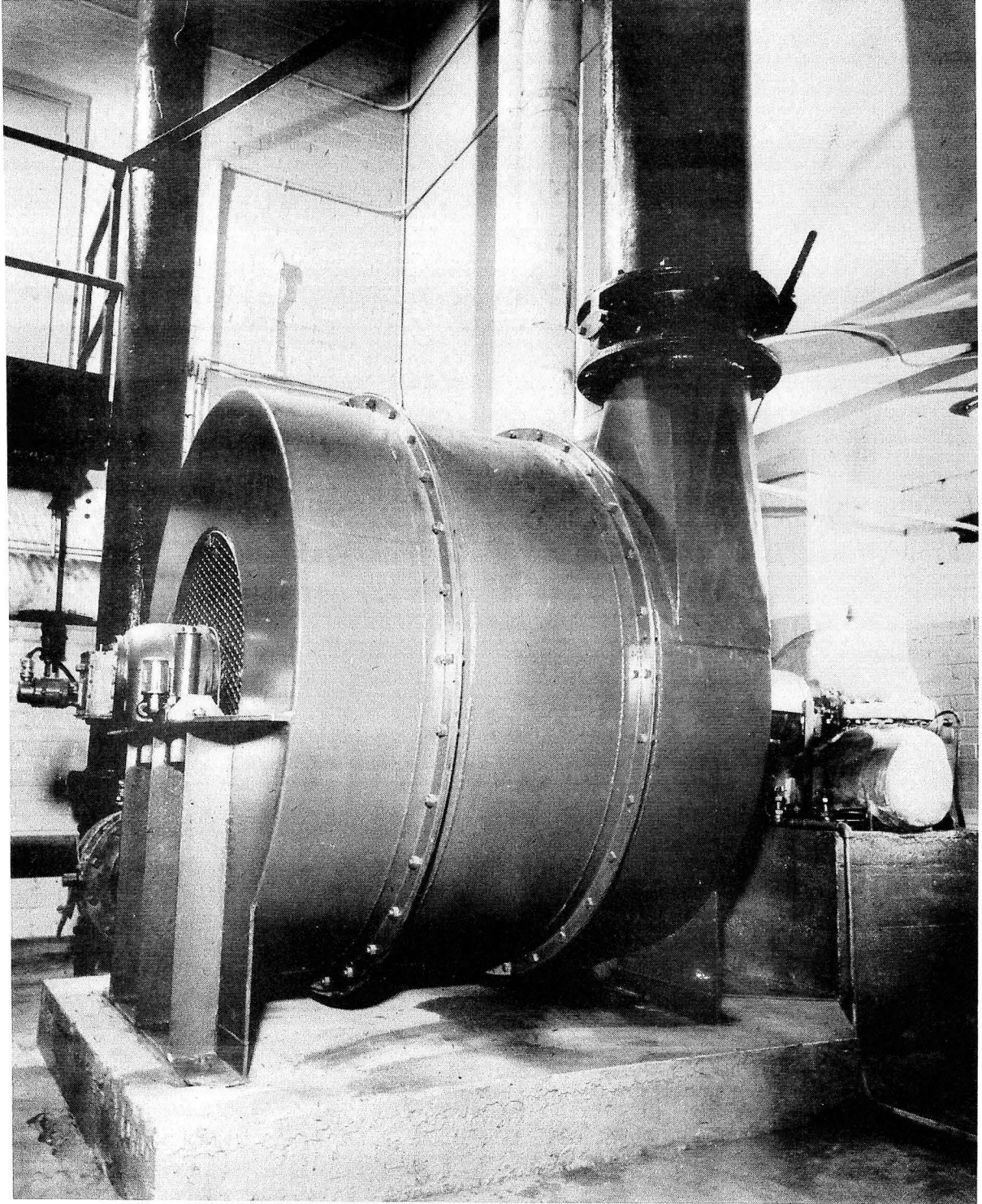
Fig. 8



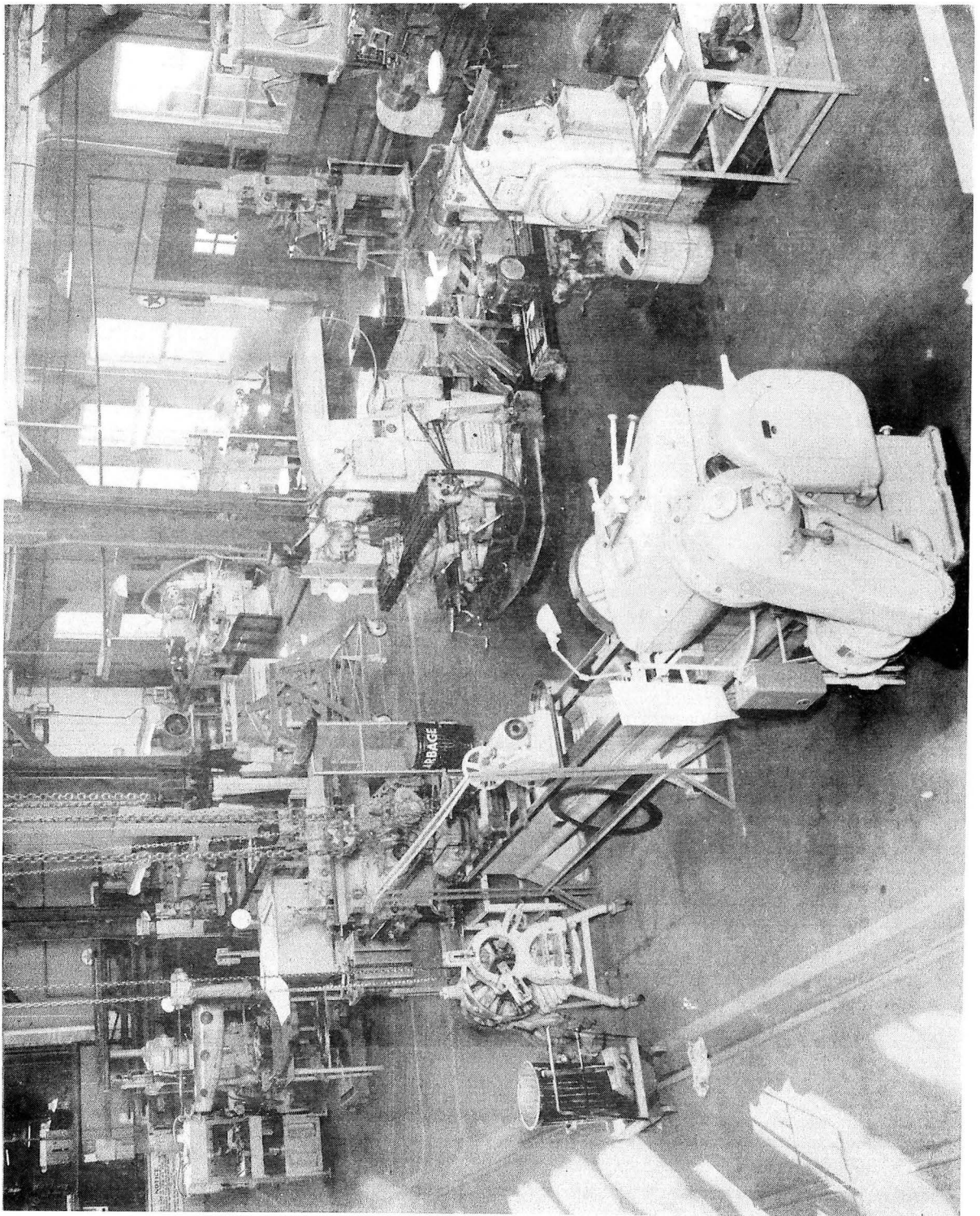
BOILER ROOM



AIR COMPRESSORS



SHELDON BLOWER



MACHINE SHOP

PART 2

DESCRIPTION OF TEST RIGS

2.1 General

As the overall efficiency of a gas turbine varies as the product of its component efficiencies, it is obvious that the individual component efficiencies must be developed to a high level.

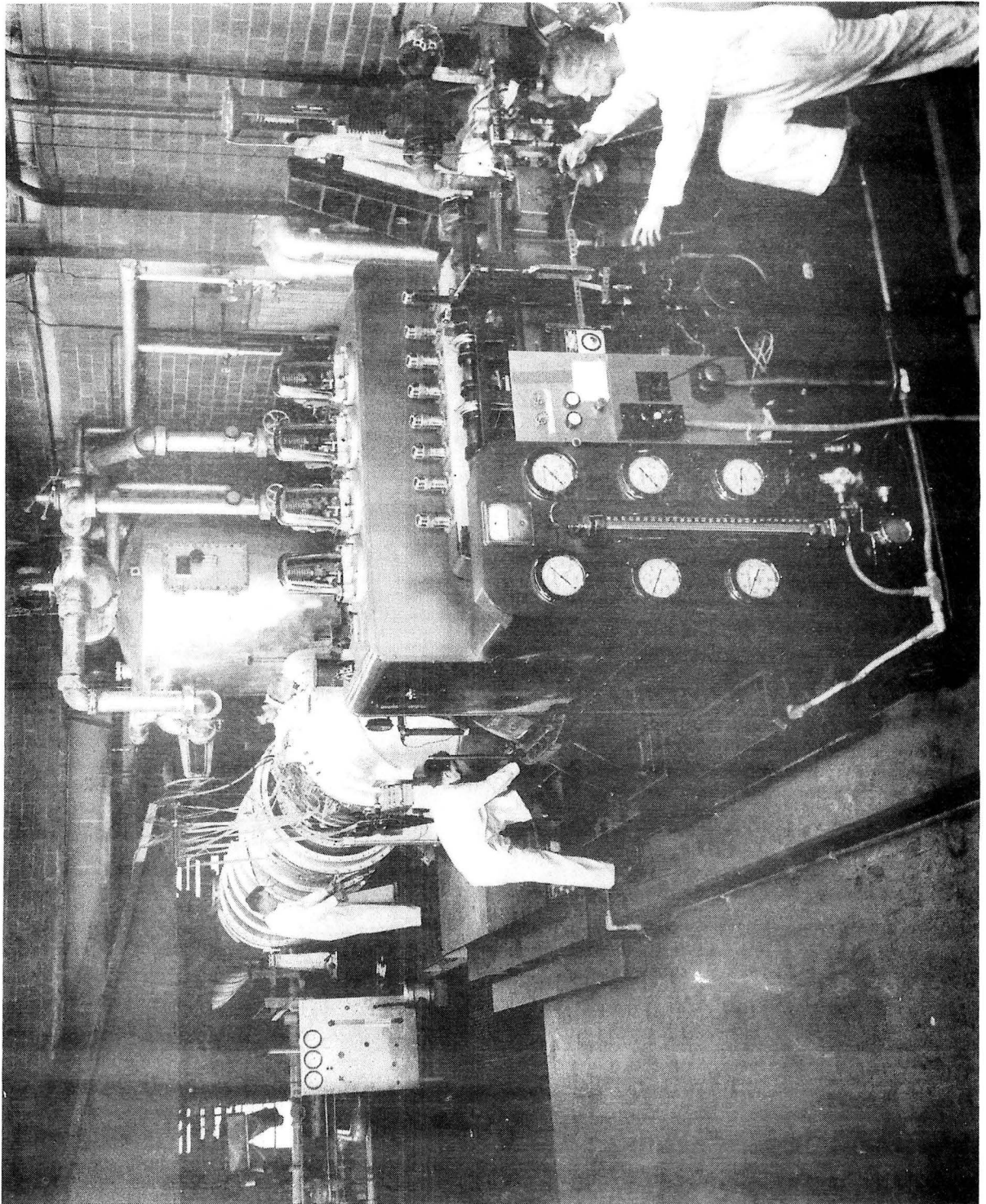
It is impractical to carry out performance development of the components solely by testing on a complete engine, as it is not possible to instrument an engine as fully or as accurately as is necessary. Further, mis-matching of components is not readily apparent on engine testing, as the operation of the components is interdependent, and only one curve on the characteristic family of curves of each component can be explored. Finally, the performance development of an engine is the result of a large number of minor modifications and the effect of each would be largely obscured by other variables on a full engine test.

It is necessary to evaluate these modifications on a test rig permitting analysis of the component in question independent of uncontrolled variables. The Nobel Test Establishment is equipped for testing of this nature.

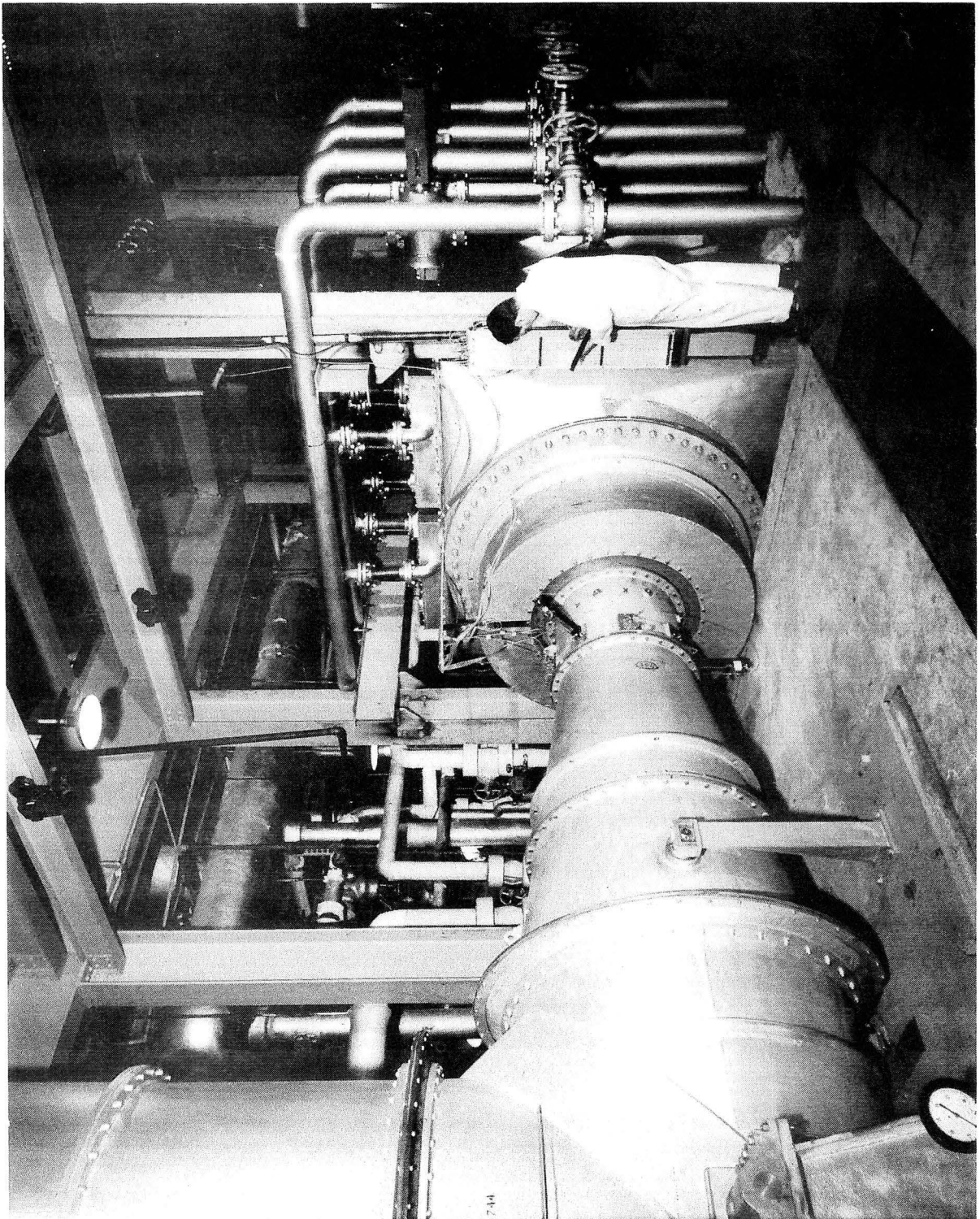
A detailed description of the individual test rigs located at the Test Establishment is given on the pages following.

2.2 No. 1 Compressor Test Rig (Figs. 13, 14 and 15)

The No. 1 compressor test rig was designed for the testing of multi-stage axial flow compressors in closed circuit operation. The closed circuit rig configuration, with provision for controlled evacuation of the circuit, simulates - for compressors currently on test - altitudes between roughly 70,000 feet and 28,000 feet. The available drive horsepower



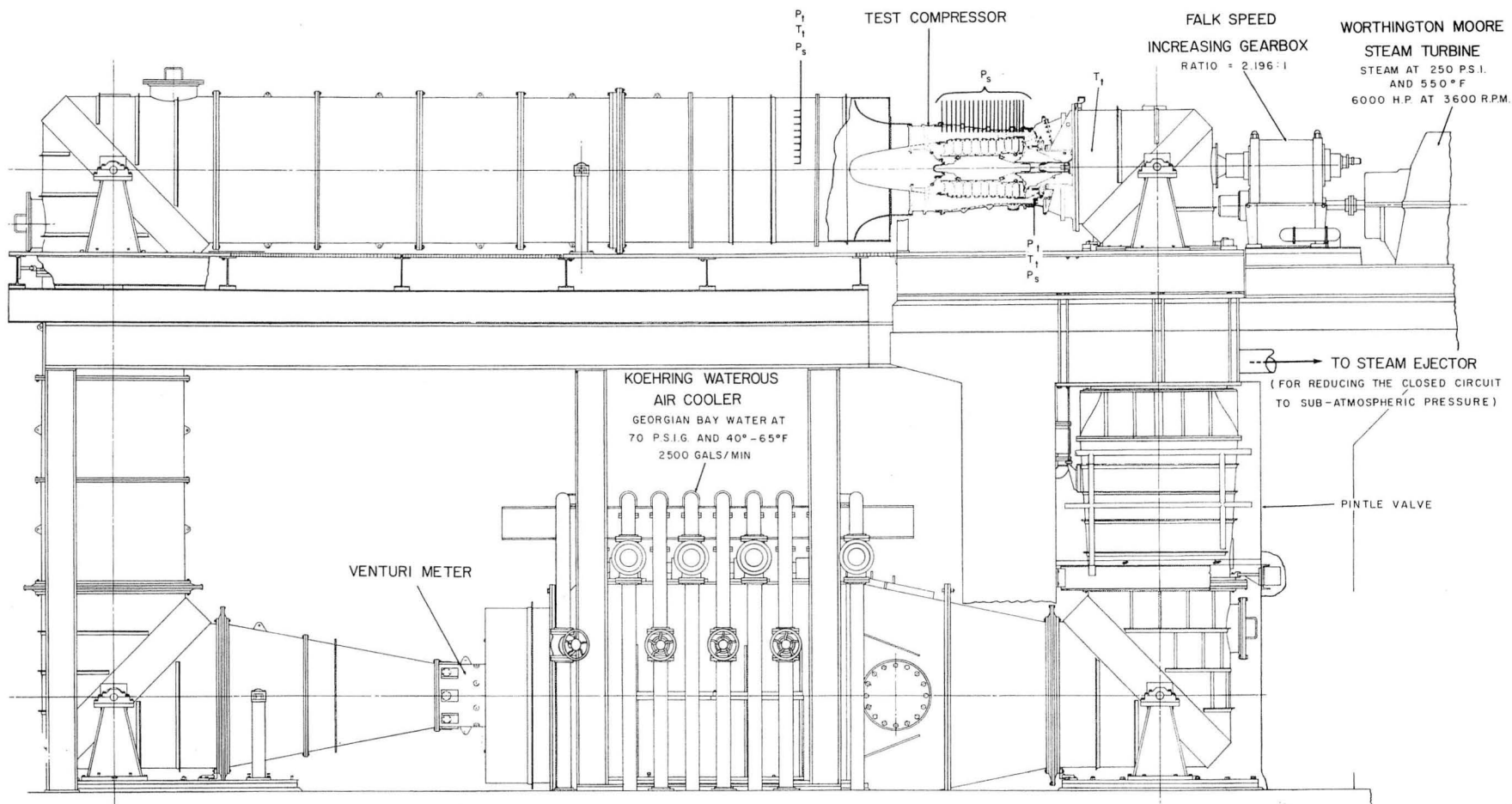
NO. 1 COMPRESSOR TEST RIG OPERATING FLOOR



NO.1 COMPRESSOR TEST RIG COOLER AND VENTURI

CLOSED CIRCUIT COMPRESSOR TEST RIG ASSEMBLY

Fig 15



defines the lower altitude limit.

In the closed circuit, the hot air leaving the compressor is turned downward in a vertical leg where it is throttled by a pintle valve which controls the compressor pressure ratio. It is then turned horizontally and drawn through the air cooler. The airflow is measured in one of three interchangeable venturi meters, depending on the compressor under test, before turning upwards in a vertical leg and finally turning horizontal again where it passes through a long duct and screen section before re-entering the compressor.

The Worthington-Moore multi-stage condensing extraction type steam turbine can produce a maximum of 6500 horsepower at 3600 rpm (its nominal rating is 4700 horsepower) with a steam consumption of 80,000 pounds per hour. The compressor rpm is increased through the Falk gearbox, normally by a ratio of 2.196 to 1, or optionally by rebuild of the gearbox, by a ratio of 2.976 to 1.

Air extraction from the circuit is from the highest pressure point of the rig - between the compressor and pintle valve - by a steam ejector which can reduce the air pressure in the rig to less than one psia at compressor inlet.

The air cooler operates with a coolant flow, normally 2500 gpm, of water pumped directly from Georgian Bay and discharged from the cooler to waste. The compressor inlet air temperature approaches the cooling water temperature under normal operating conditions; a minimum of four degrees C is attained during winter. By reducing the water flow in the cooler, inlet compressor air temperatures of up to 100 degrees C are obtainable.

Iroquois and Orenda compressors are tested on the rig to determine the characteristics of the configuration with new or modified blading.

On a normal test, some 75,000 separate readings are recorded and processed in determining the overall stage and rotating stall characteristics, surge line definition and strain gauge and vibration phenomena. This information is essential in the development of compressors to give higher mass flows for more thrust, improved or higher surge lines for better engine acceleration characteristics, and improved blade vibration characteristics for longer blade life.

2.3 No. 2 Compressor Test Rig (Figs. 16 and 17)

To investigate in detail the performance of a rotating blade row, it is simpler to investigate a single stage by itself rather than as one stage of a number on a multi-stage compressor test unit. The purpose, therefore, of a single stage unit is to allow the detailed examination of a single characteristic without the complication and interference of the multiple stages. No. 2 compressor test rig is used for single stage testing of advanced designs of compressor blading.

The rig consists basically of an inlet duct, compressor unit, outlet duct and exit throttle, drive turbine and condensor. The air is drawn through a filter house into an inlet venturi which measures the mass flow. The air then diffuses into a large diameter intake section and thence into the test unit proper.

In order to simulate actual compressor conditions, the test unit may have upstream of the blade stage under test - which comprises one rotor blade row and one stator blade row - several "tailoring" blade arrangements.

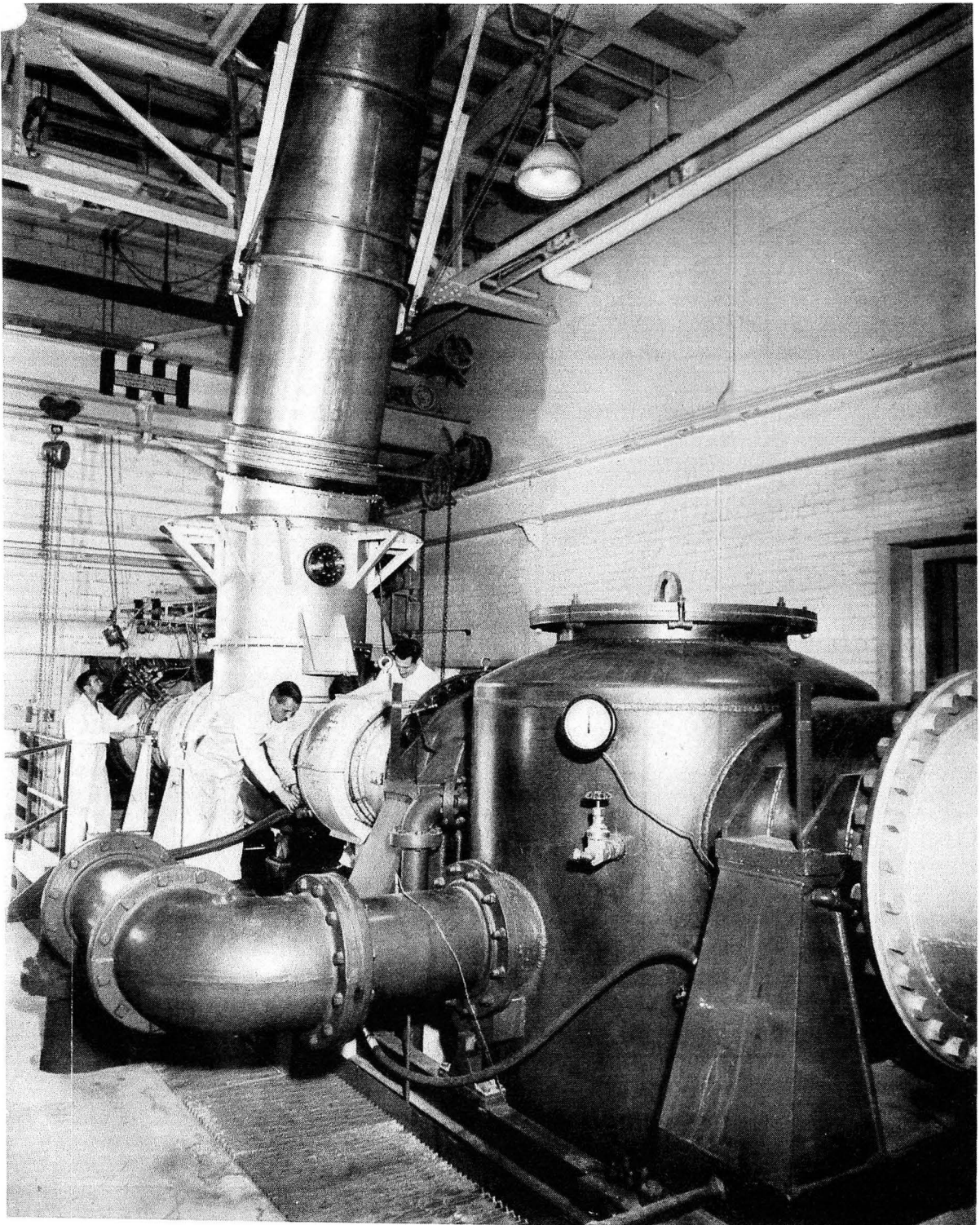
From the compressor unit the air is ducted to atmosphere via the corner turning vanes and a vertical leg of outlet ducting in which is situated a large electrically operated butterfly throttle valve for compressor pressure ratio control.

The compressor is fully instrumented with pressure and temperature instrumentation. Provision is made so that probes can be traversed simultaneously, both radially and circumferentially at entry and exit from each blade row. The probe traverse arrangement is such that mean values are obtained from three or four blade pitches for total head pressure, static pressure and yaw angle.

The drive turbine is presently a small reworked Chinook unit, which will shortly be replaced with a two-stage turbine capable of producing 2,600 horsepower at 8,500 rpm. The exhaust steam discharges into a Schutte-Koerting jet condenser capable of handling 45,000 pounds per hour of steam flow. The rig is capable of testing compressors which pass up to 150 pounds per second at pressure ratios of up to 1.3 to 1.

2.4 Cascade Test Rig (Figs. 18 and 19)

The cascade test rig, or variable incidence cascade wind tunnel, to use its full name, has been in use for nearly nine years, and has produced perhaps the largest quantity of useful



NO. 2 COMPRESSOR TEST RIG

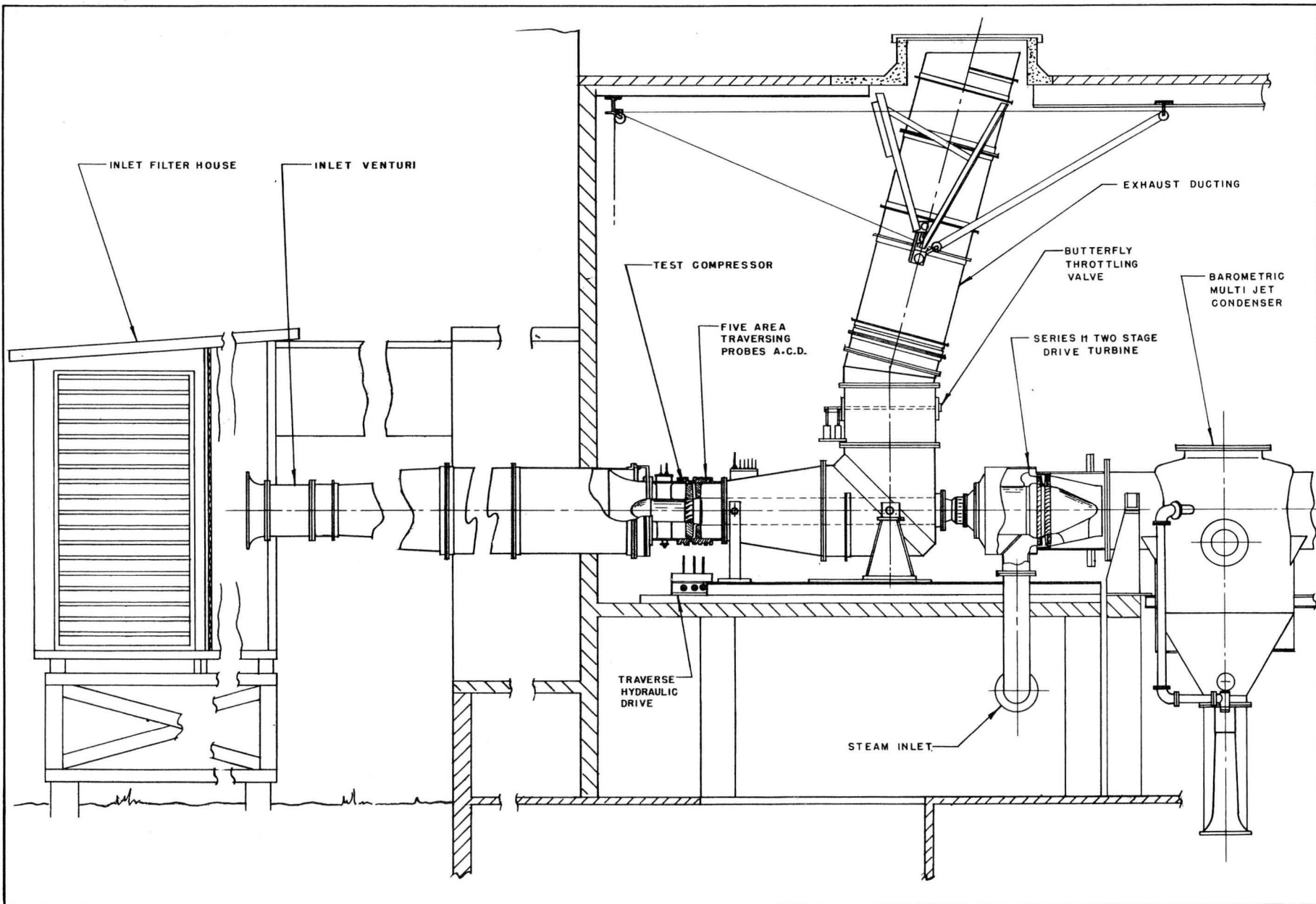
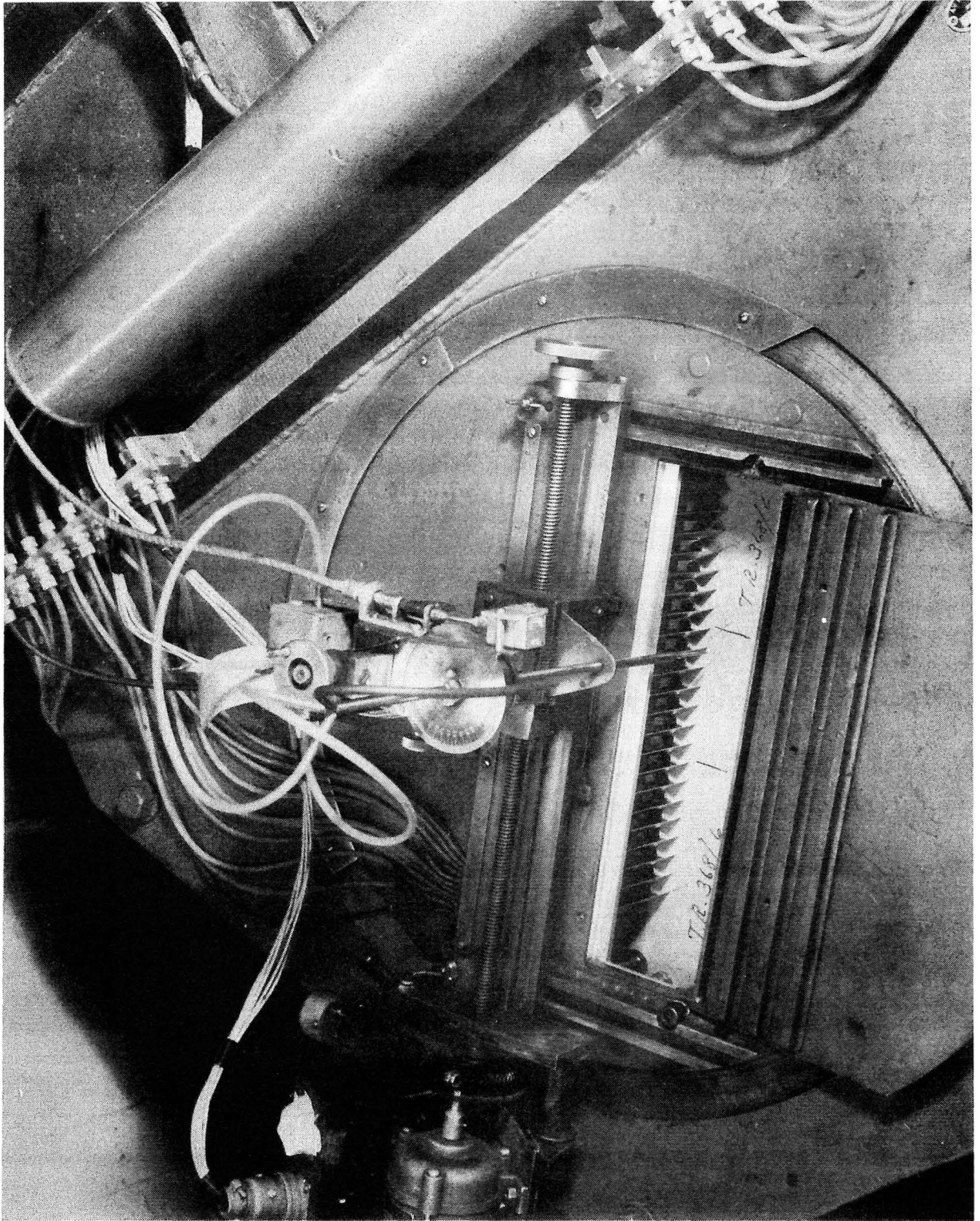


DIAGRAM OF NO.2 COMPRESSOR TEST RIG

Fig. 17



CASCADE TEST RIG

DIAGRAM OF CASCADE TEST RIG

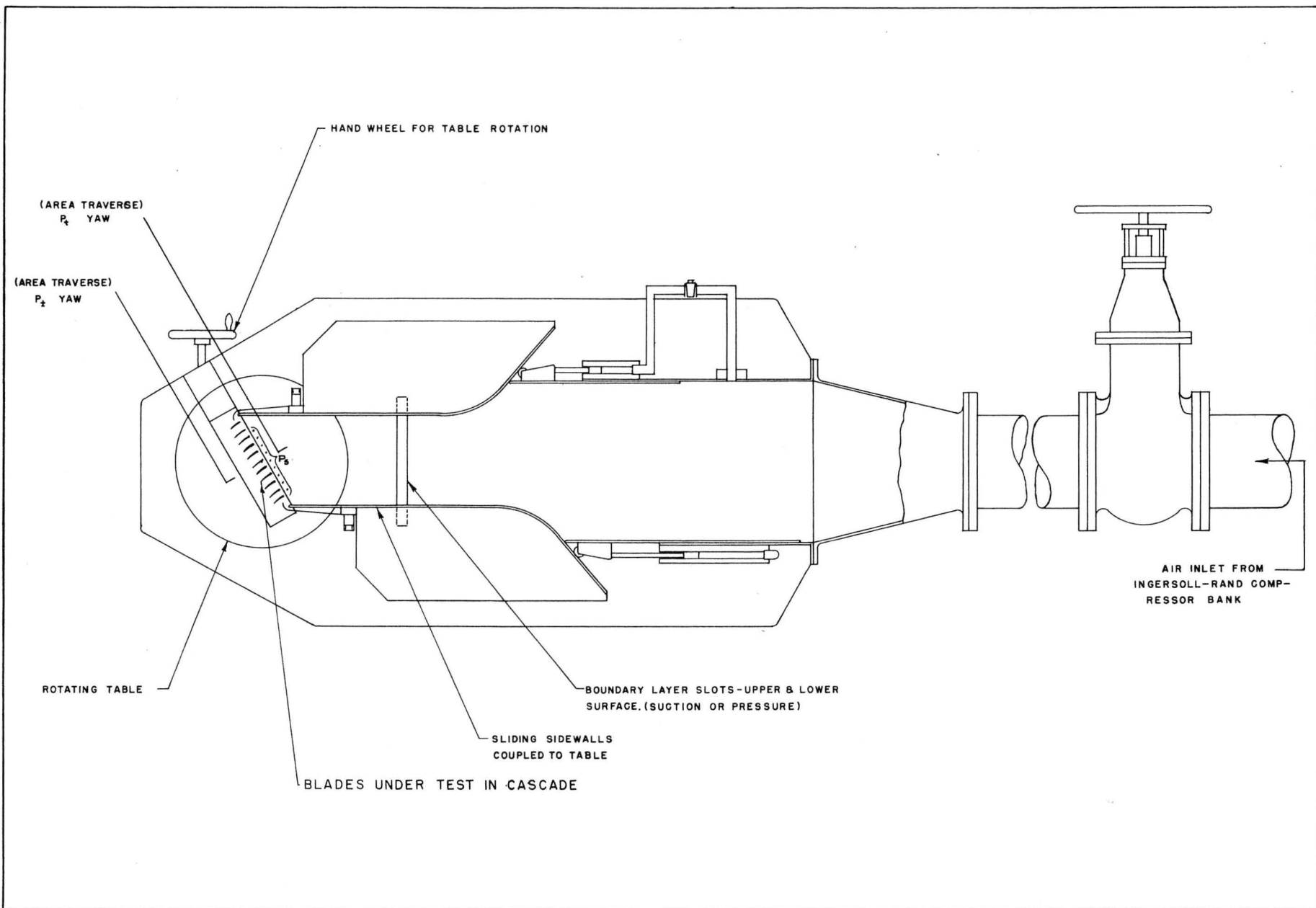


Fig. 19

results of any rig at Nobel. The rig has been in operation almost continuously and it has had only a few minor modifications since its initial installation. However, it has not reached the end of its usefulness, as there is still much to be covered in determining blade characteristics. It is through these tests that our basic knowledge of gas turbine blading for use in compressor and turbine design is obtained.

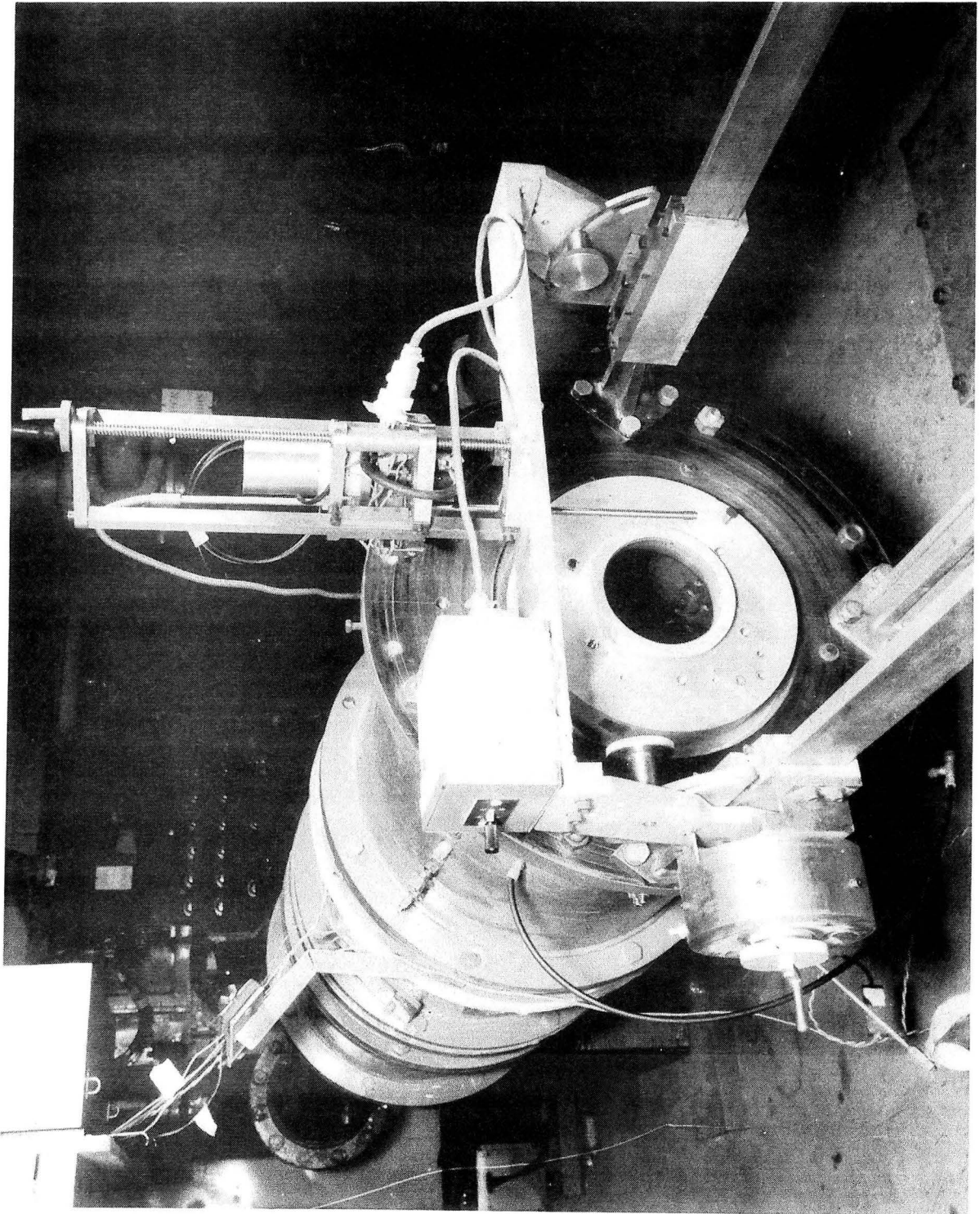
A cascade is made up of a number of constant section blades representing only one of many combinations of pitch/chord ratio, thickness/chord ratio, stagger angle and camber angle. In addition to these variables, there are also changes in basic profile, non-standard blade forms and special blades to be tested. A cascade is usually tested at various incidences and over a range of inlet Mach numbers to determine the positive and negative incidence stall point and the highest loss limiting Mach number at each incidence. The total pressure loss, static pressure rise, air deflection and deviation angles are found and in this way the working range of a blade is established, as well as its optimum operating conditions. Over 500 different cascade configurations of compressor turbine and inlet guide vane blades have been tested to date.

The rig is supplied with up to 15 pounds per second of air from the Ingersoll-Rand compressors through a 10 inch diameter pipe. From this pipe the air passes through a converging duct which changes the cross-section to a smaller rectangular shape (area ratio 1.7 to 1.0). The air then enters a tunnel which has parallel top and bottom plates but where a further reduction in area (approximately 1.8 to 1.0) is achieved due to the profile of the sliding side walls; this area depends upon the angle to which the tunnel is set. The cascade can be rotated to give air inlet angles from zero degrees to 67 degrees as required to cover the cascade incidence angle range. The air then passes through the cascade of blades and out to atmospheric pressure in the test cell and is directed through the cell wall by outlet guide vanes. Injection of high pressure air into the boundary layer - parallel to the gas stream - straightens out the gas stream at the inlet to the cascade.

Pitot and yaw traversing is conducted downstream of three blades of the cascade. An automatic recorder system in conjunction with a photo-cell manometer and a yaw capsule amplifier system gives a permanent record of each test as well as carrying out an integration and averaging of flow conditions downstream of the cascade.

2.5 Probe Rig (Figs. 20 and 21)

The calibration and evaluation of various aerodynamic and



PROBE TEST RIG

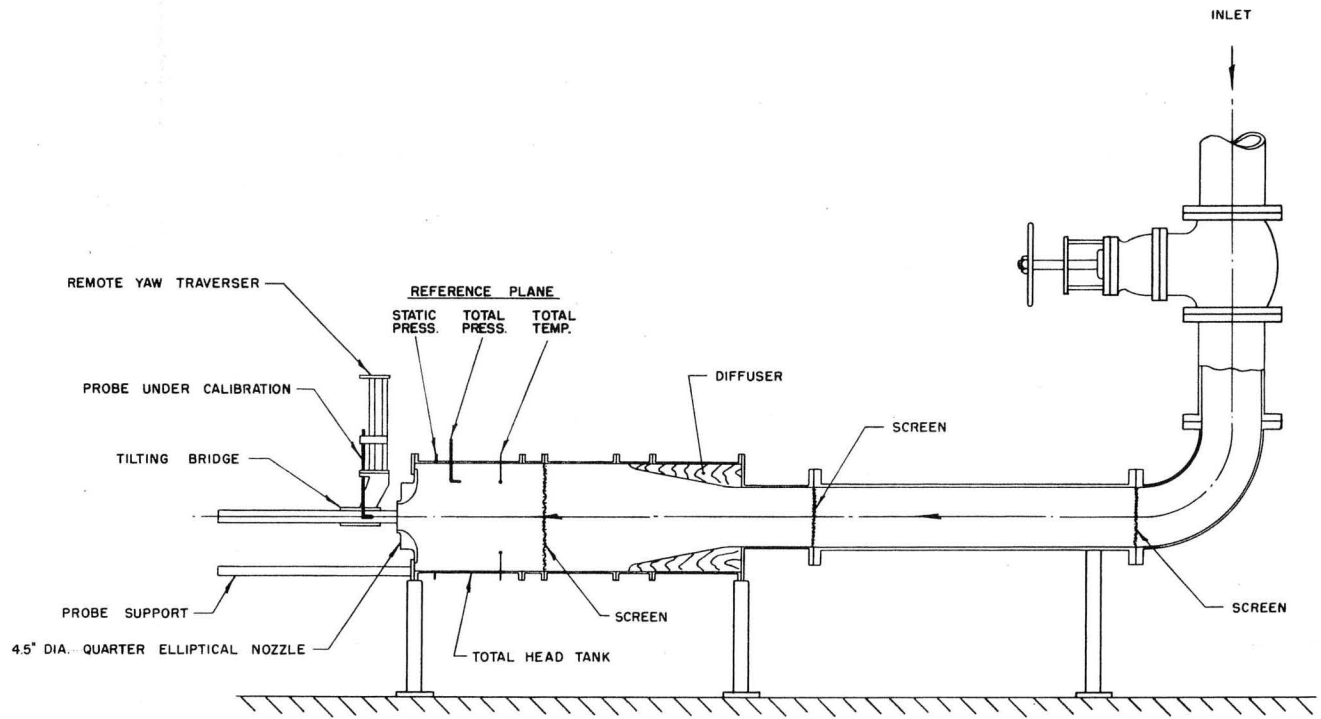


DIAGRAM OF PROBE TEST RIG

Fig. 21.

thermodynamic probes under known and controlled conditions in the probe rig is required in order to properly evaluate the results obtained when these probes are later used in engine and aerodynamic test units. In addition, this rig plays a major role in the research and development of probes.

The general aim in aerodynamic work is to obtain the necessary accurate data from the test unit with the least interference from the sensing devices. Hence, a demand always exists for smaller and stronger probes which will sense total pressure, static pressure, yaw and total temperature either in the form of a single or combined probe. Other factors which affect both probe design and performance are wall effect, Reynolds number, pressure gradients, turbulence and response. As the operating velocities of the various test units and engines increase, so the effect of compressibility and shock waves will become more prominent and require different probes and techniques.

The probe rig consists of a 17 inch diameter total head tank which is supplied with air from the Ingersoll-Rand compressors through a 10 inch diameter pipe, a diffuser and screens. Situated on the end of the total head tank is an aluminum 4.5 inch diameter quarter elliptical nozzle. The probe is held in the nozzle jet by a traverse micrometer with remote yaw control. The micrometer is mounted on a tilting bridge, which can be moved along the axis of the nozzle jet, spanning the nozzle stream.

The true total head pressure and temperature are obtained in the total head tank where the air velocities are very low and the values can be sensed accurately. These readings are compared with those obtained from the probe under calibration at various Mach numbers, over the operating range of the probe. The static pressure of the nozzle jet is assumed to be ambient and the static pressure of the probe is compared with the barometer at the time of test. The probe is normally evaluated under various conditions of tilt and yaw to obtain a general idea of its performance under non-axial flow conditions. The general operating range of the Probe Rig is from 0.1 to 0.65 Mach number which can be obtained from the air flow available during the day.

It is possible to choke the nozzle with the full output from the Ingersoll-Rand compressors but the nozzle is not generally suited to transonic and supersonic work. The limiting Mach number is approximately 0.80.

The probe rig is also used to provide air for other miscellaneous airflow rigs.

2.6 Cooling Air Ejector Test Rig (Figs. 22 and 23)

Afterburning in the modern jet engine for high speed flight has developed to the stage where it is imperative to cool the external surface of the jet engine and the afterburner fuel supply as a protection against the heat generated during afterburner operation.

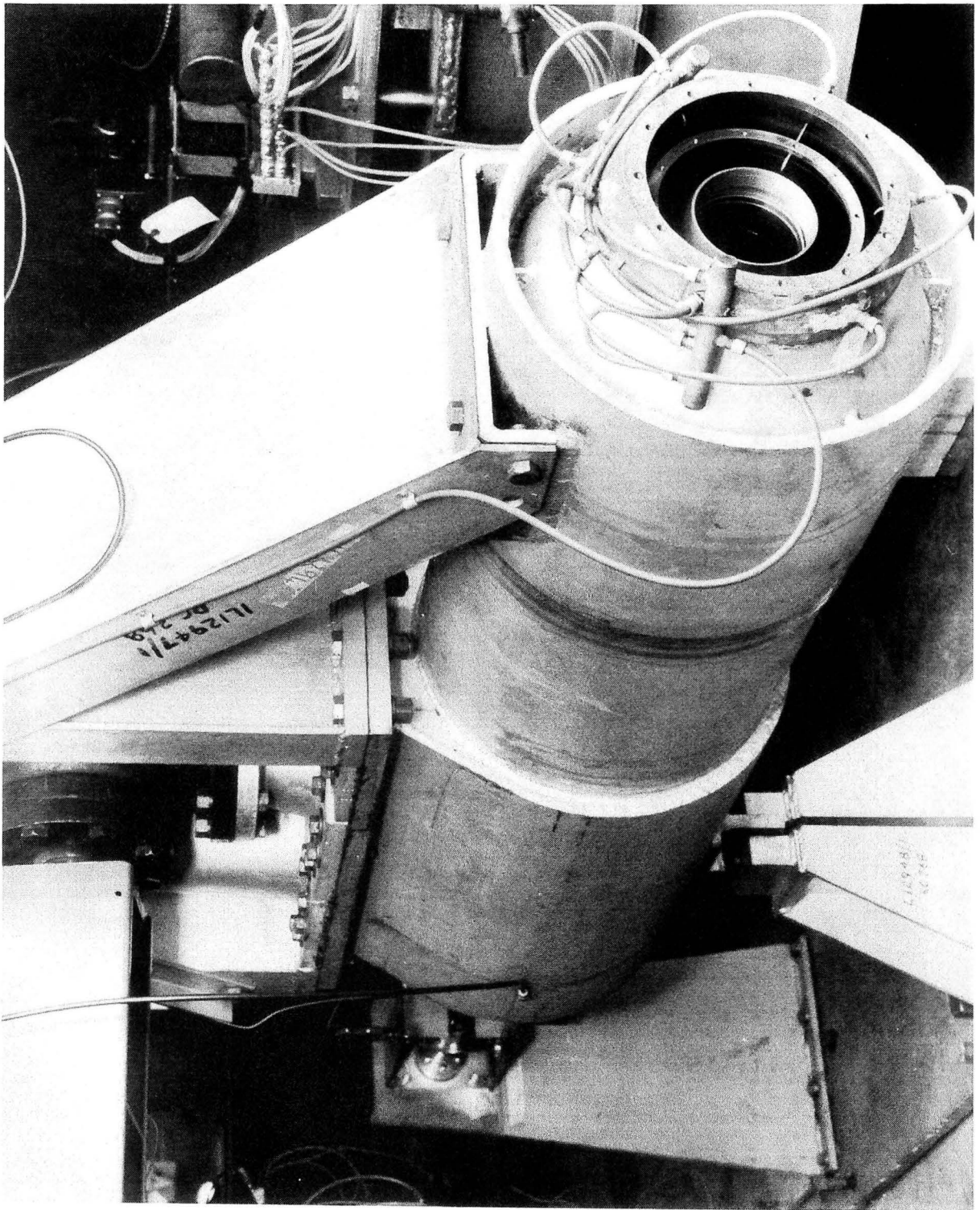
This is done by ducting air from the engine air intake around the engine in two passages. The inner or secondary cooling air is ducted concentrically around the jet pipe, while the tertiary air ventilates the fuel manifold and turbo-pump area to prevent contact of combustible vapours with hot engine parts. An adequate flow of air is maintained at all times by a double ejector in which the jet efflux from the engine final nozzle is used as the driving medium. The secondary and tertiary ejector nozzles are concentric with the engine final nozzle.

It has been found that the thrust of the primary nozzle can be increased or decreased by the addition of ejectors and that careful ejector nozzle design is necessary if full advantage is to be taken of its effects. The cooling air ejector test rig was designed to investigate the performance of small scale models of the ejector assembly.

The rig is entirely supported by flexible straps attached to the ceiling and is isolated from the inlet duct by an air bearing or seal which facilitates the measurement of the thrust of the ejector configuration. The main air supply is ducted through the air bearing arrangement into a plenum chamber whence it is ducted to the three nozzles of the ejector through flow tubes, venturis, and valves to the annular ducts in the header assembly, on to which the test nozzle specimens are attached. To enable constant flow ratios to be maintained between the cooling and primary airflow, the secondary and tertiary flow tubes are connected to a common source in which is situated a choked orifice.

The general characteristic of the ejector is obtained over a range of primary, secondary and tertiary pressure ratio during which the following measurements are taken: - primary, secondary and tertiary total pressure; primary, secondary and tertiary mass flow, and overall thrust of the ejector configuration.

The maximum pressure ratio across the primary nozzle is limited by the air supply of 15 pounds per second from the Ingersoll-Rand compressors. This has to serve the primary, secondary and tertiary flow paths but of these the largest proportion passes



COOLING AIR EJECTOR TEST RIG

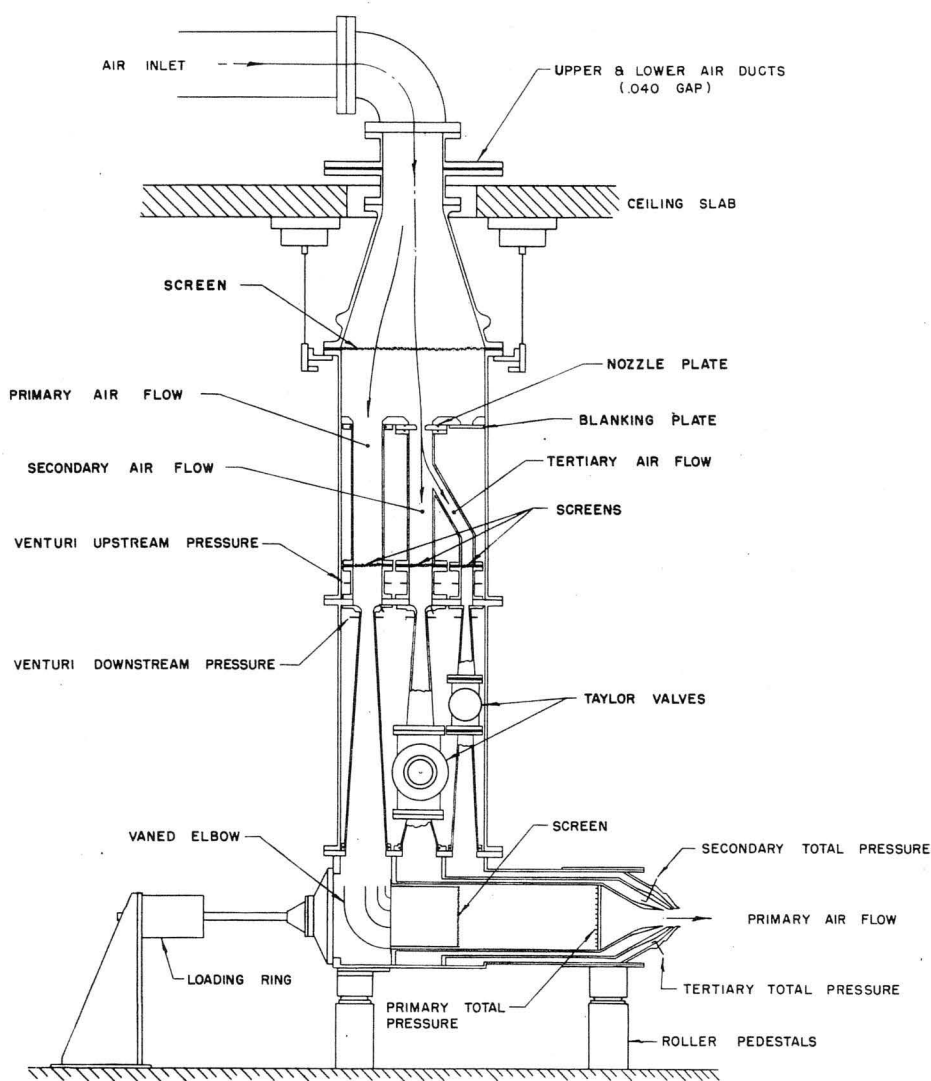


DIAGRAM OF COOLING AIR EJECTOR TEST RIG

Fig. 23

through the primary nozzle and limits the pressure ratio across it to slightly less than 7.0 to 1.

In addition to air ejector testing, this rig has been adaptable to jet deflection tests and to other work such as evaluation of the exhaust ejector for the engine altitude test facilities.

2.7 Slip Ring Test Rig (Figs. 24 and 25)

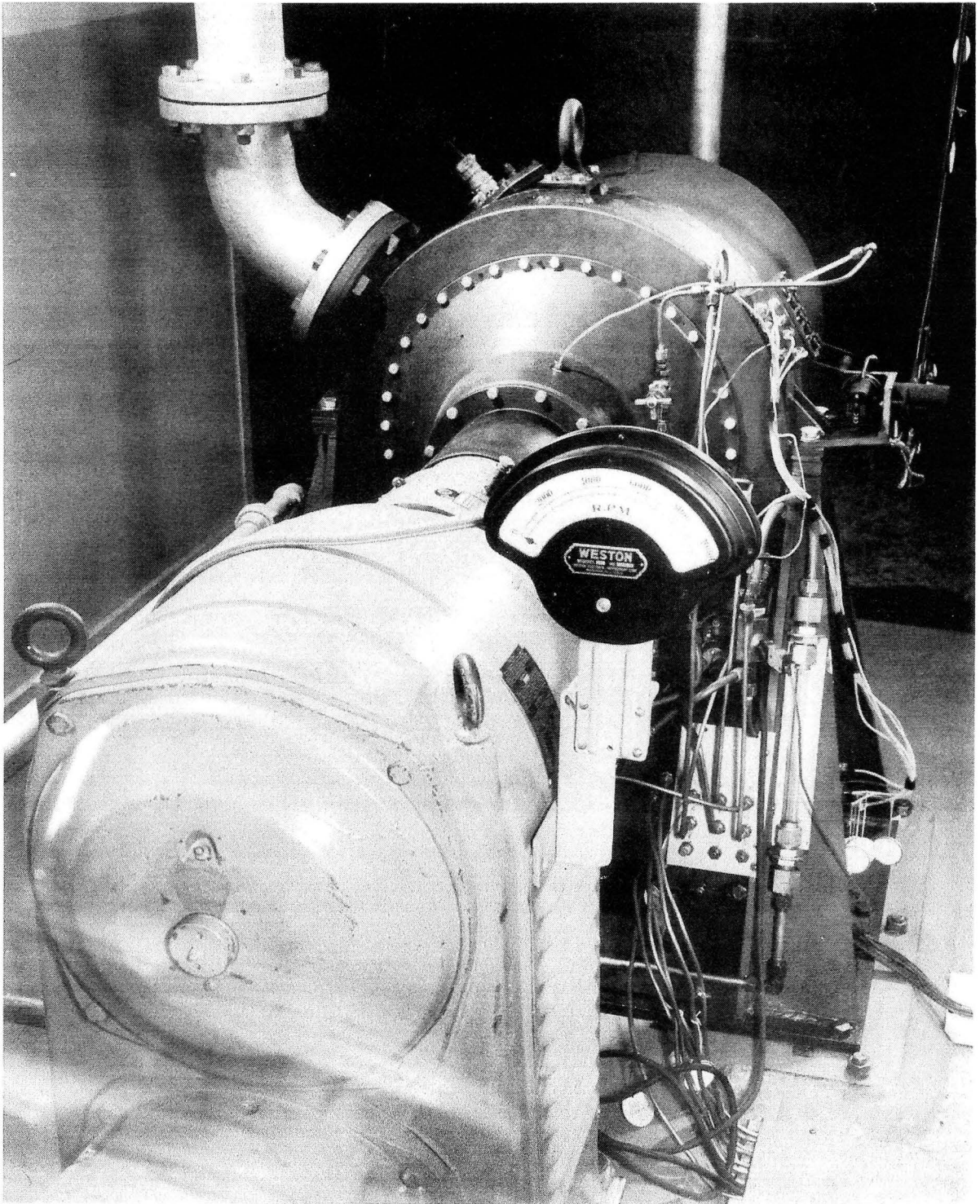
For engine development work, a slip ring is necessary to convey strain gauge, thermocouple, or any other low level signal, from the engine rotor assembly to the engine frame and thence to instruments for analysis. The development of a suitable slip ring unit for the modern engine poses a particularly difficult problem since, due to space limitations, the contact brushes must operate at rubbing speeds of the order of 500 feet per second. Since signals of less than 100 microvolts are often investigated, considerable refinement of design is required to ensure that the required signal is not masked by surface contact interference.

The slip ring test rig was designed to reproduce the operating environment of the slip ring unit on an engine. It encloses the unit in a case which can be flushed with air at up to 200 degrees C at various pressures, and has provision for the cooling of the brushes by a stream of CO₂ to isolate surface contact heating from other development problems. Drive is from a 15 horsepower electric motor through a U.S. Varidrive variable speed transmission which permits operating speeds from 1500 to 9000 rpm.

In addition to evaluating various basic designs for slip ring units, this rig can be used for comparing and analyzing such variables as ring material, ring surface finish, brush material, and brush design.

2.8 Static Blade Cooling Rig (Figs. 26 and 27)

To improve the performance and output of a gas turbine engine it is desirable to increase the combustion temperature and hence the temperature at the turbine inlet. If higher temperatures are to be tolerated, either improved turbine blade materials or cooled turbine blades are required. The static blade cooling rig was designed to carry out preliminary testing on various cooled blade configurations. The more promising blade configurations are then tried in the rotating blade cooling rig. The test blades have cooling passages of three basic types, chordwise, radial or helical. The type of construction of the blade is either load carrying shell, load carrying strut, hollow shell without baffles,



SLIP RING TEST RIG

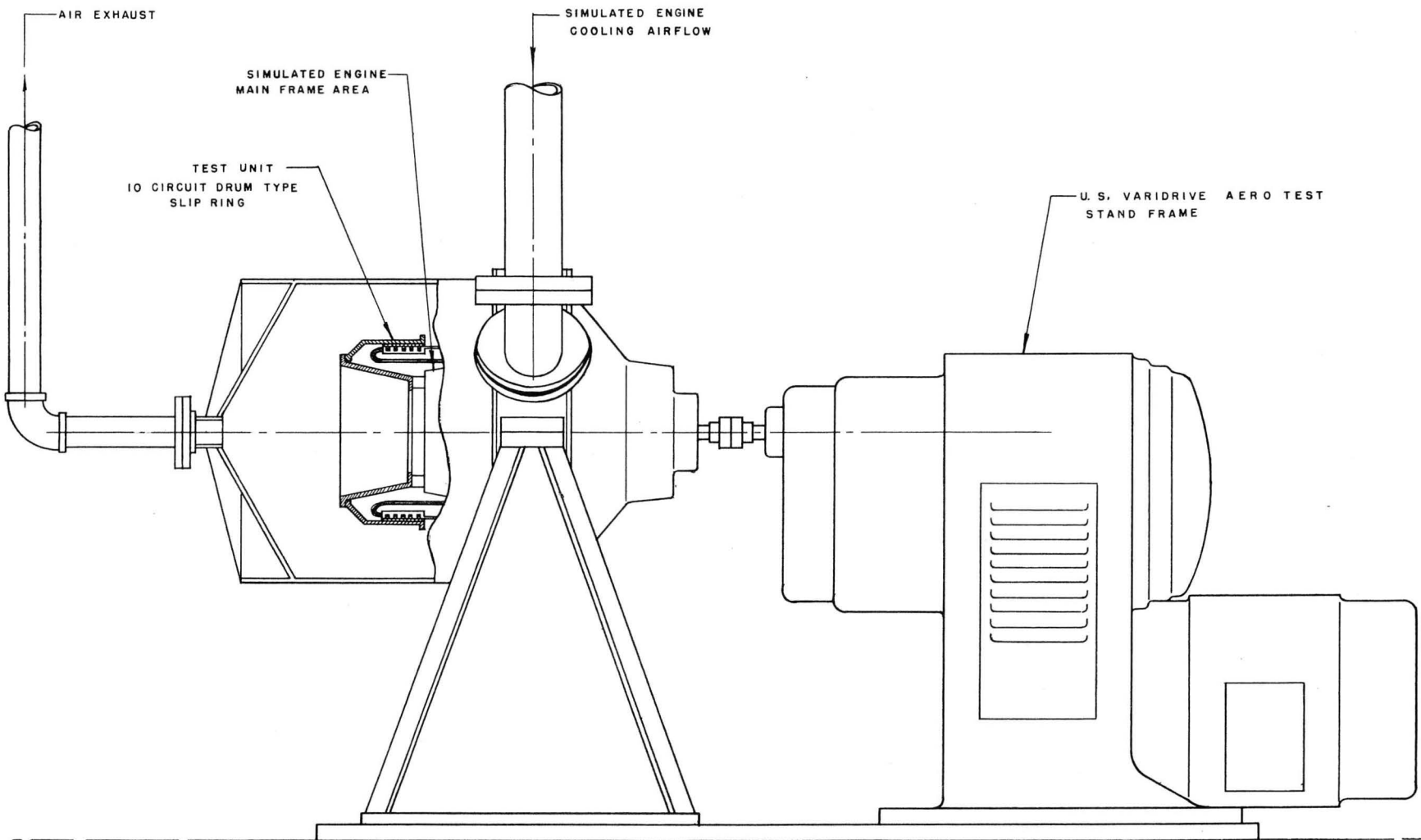
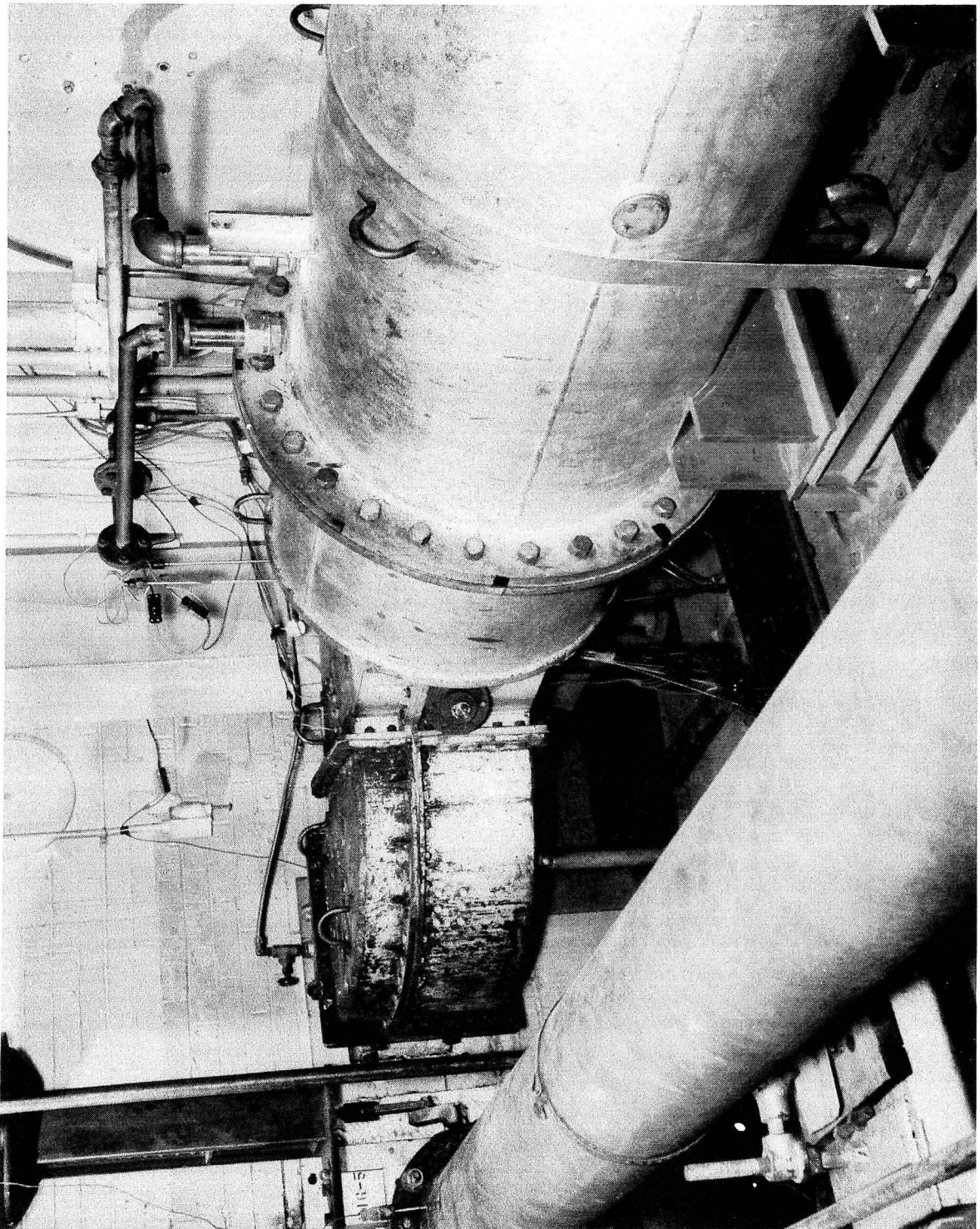


DIAGRAM OF SLIP RING TEST RIG



STATIC BLADE COOLING RIG

DIAGRAM OF STATIC BLADE COOLING RIG

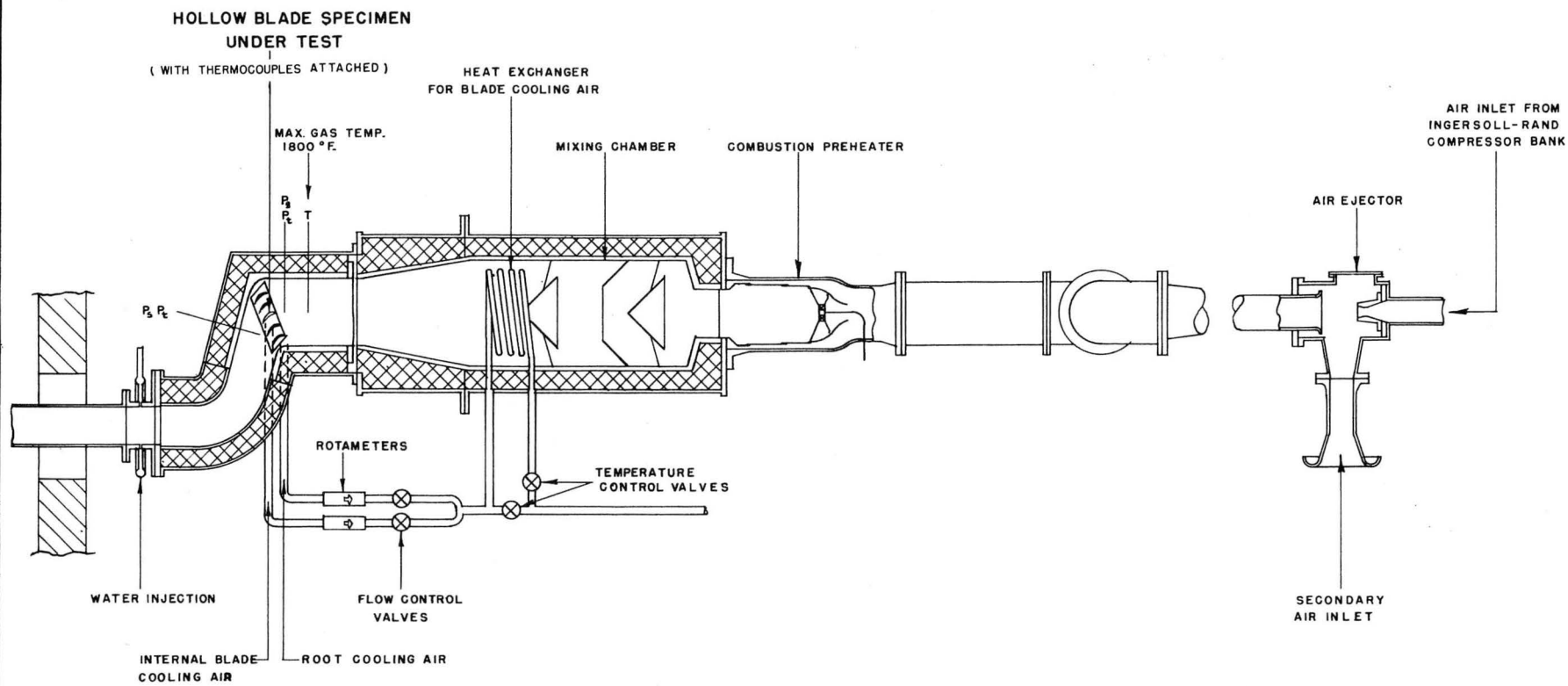


Fig. 27.

or integral construction. Blades made up of different combinations of the above are tested in the static blade cooling rig.

The airflow to the rig is supplied by two Ingersoll-Rand compressors giving six pounds per second. This airflow is augmented by an air injector which draws an additional 1.5 pounds per second. The air is brought to the rig through a 10 inch diameter pipe. Then it goes to the air injector after which it passes on to a preheater, basically an Orenda combustion chamber, and thence to a mixing chamber where the combustion gas flow is evened out. From the chamber it goes through a transformation duct conducting the flow from a circular passage to a rectangular passage. Here it enters the hot cascade box in which are mounted one centrally located cooled blade specimen with two dummy blades on either side, making a cascade of five blades. After passing from the hot cascade box, the gases are spray cooled with water and exhausted to atmosphere through a stack.

Blade cooling air and root cooling air are tapped off the air supply line upstream of the air injector. The root cooling air flow is fixed and does not change throughout the test. It is heated by two Chromalox heaters, then fed into the hot cascade box from the bottom. Here it enters the root cooling air chamber in the bottom of the liner where it cools the root of the blade and exhausts into the main gas stream. Both the blade cooling air and the root cooling air can be controlled for mass flow and temperature. The cooling flow is usually varied from one to four percent of the total flow past each blade. Thermocouples are located at the root, mid-section and tip of the blade. The testing is carried out then to determine the effective cooling, the blade temperature distribution and the pressure loss in the blade passages at various flow and temperature conditions.

2.9 Rotating Blade Cooling Rig (Fig. 28)

The rotating blade cooling rig, now being installed, is essentially a turbine test rig but is specifically designed to develop various types of cooled turbine blades both as to mechanical reliability and performance. Evaluated on this rig are the more promising blade designs as determined by testing on the static blade cooling rig.

Preheated air is supplied by an upstream slave unit consisting of a rig compressor which pumps air through a rig combustion system and modified combustor in series. The air so delivered to the turbine simulates a high altitude flight condition. After expanding through the turbine the gases are cooled with a water spray and passed through an outlet silencer.

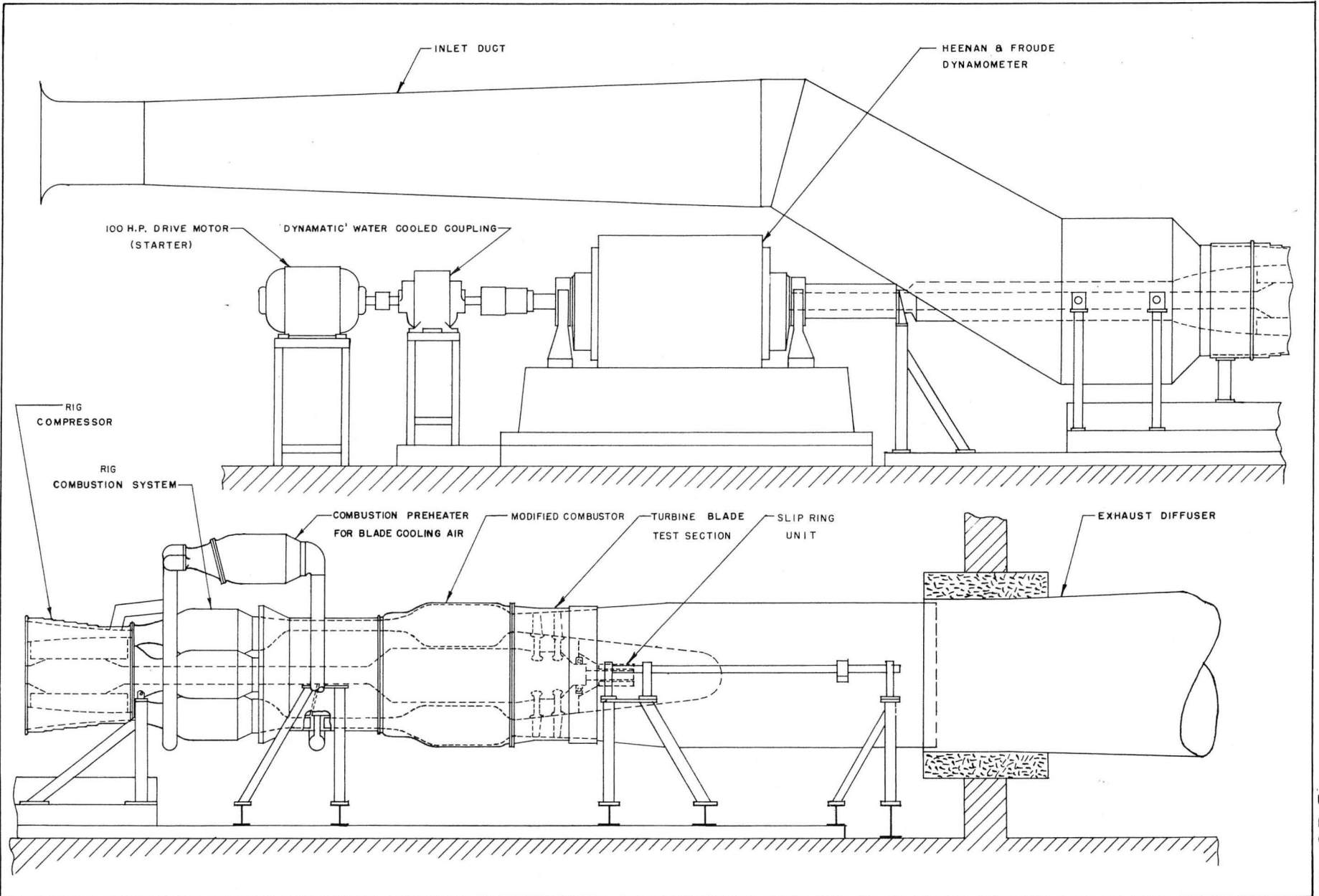


DIAGRAM OF ROTATING BLADE COOLING RIG

Fig. 28.

The rig is driven by the test turbine, but to allow for mismatching of this turbine with the rig compressor excess power is absorbed by a Heenan and Froude eddy current dynamometer (formerly used on the turbine test rig in the power house) which is capable of absorbing 6000 horsepower at speeds between 5000 and 9000 rpm. The rig is protected by special speed trips.

Blade cooling and root cooling air is drawn from the ducting downstream of the rig compressor and raised to the required delivery temperature in the combustion preheater. It is then reintroduced to the rig through radial tubes in the duct upstream of the modified combustor, and thence fed through an axial passage to the blade cooling and root cooling system.

The turbine test unit is heavily instrumented for the recording of blade temperature and vibration stresses by thermocouples and strain gauges which produce signals which are transmitted through a water-cooled slip ring unit in the tailcone to the recording instruments.

The turbine test unit is designed to duplicate closely the design of the rotating components so that gas loads, speeds, and vibratory forces are the same as on an engine. Provision is made for visual examination of the test blades and for removal and replacement of the first row of blades.

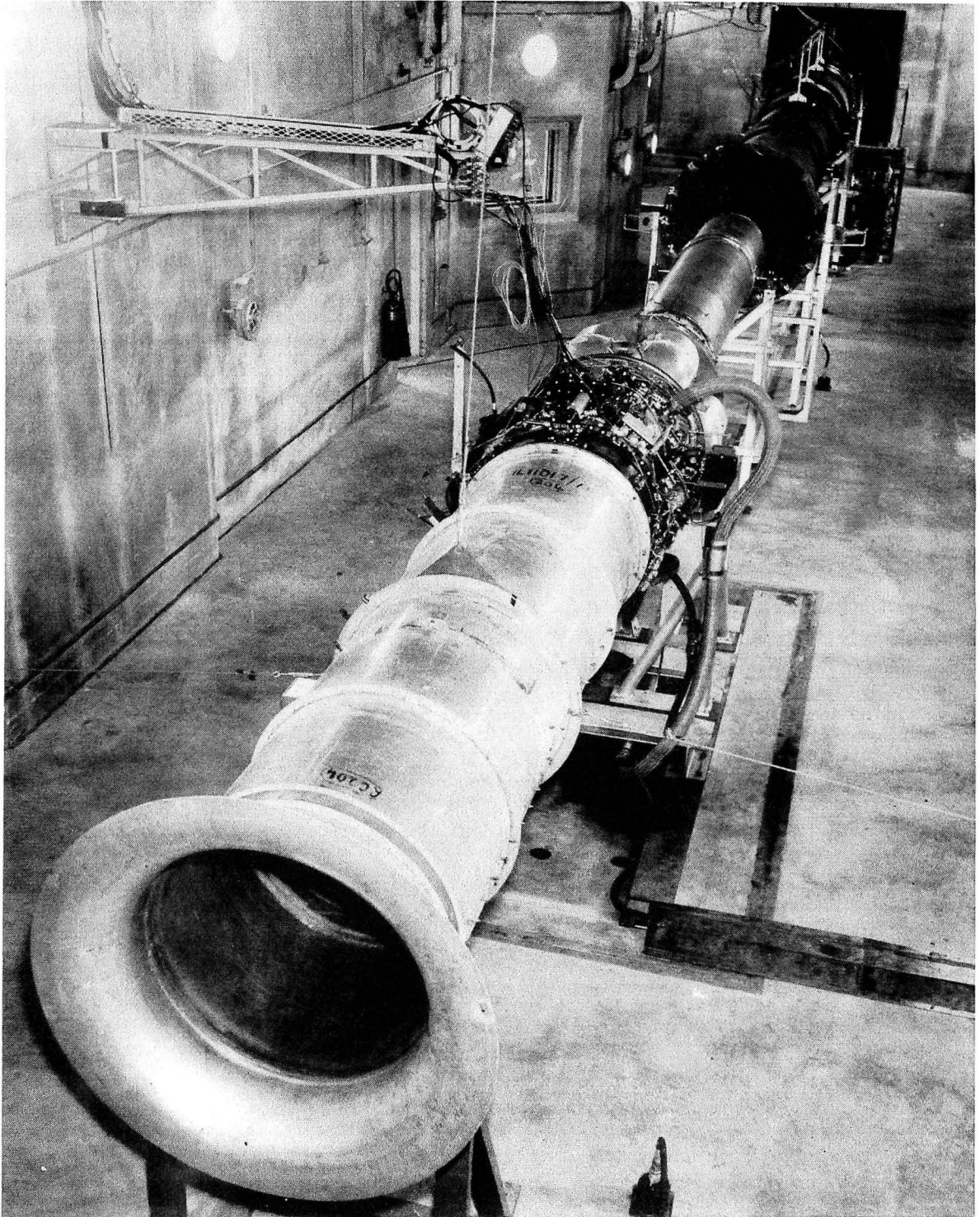
2.10 Afterburner Rig (Figs. 29, 30 and 31)

This rig, completed during the first week of September, 1956, is intended for use in evaluating the burning characteristics, stability range and mechanical properties of various full scale afterburner systems.

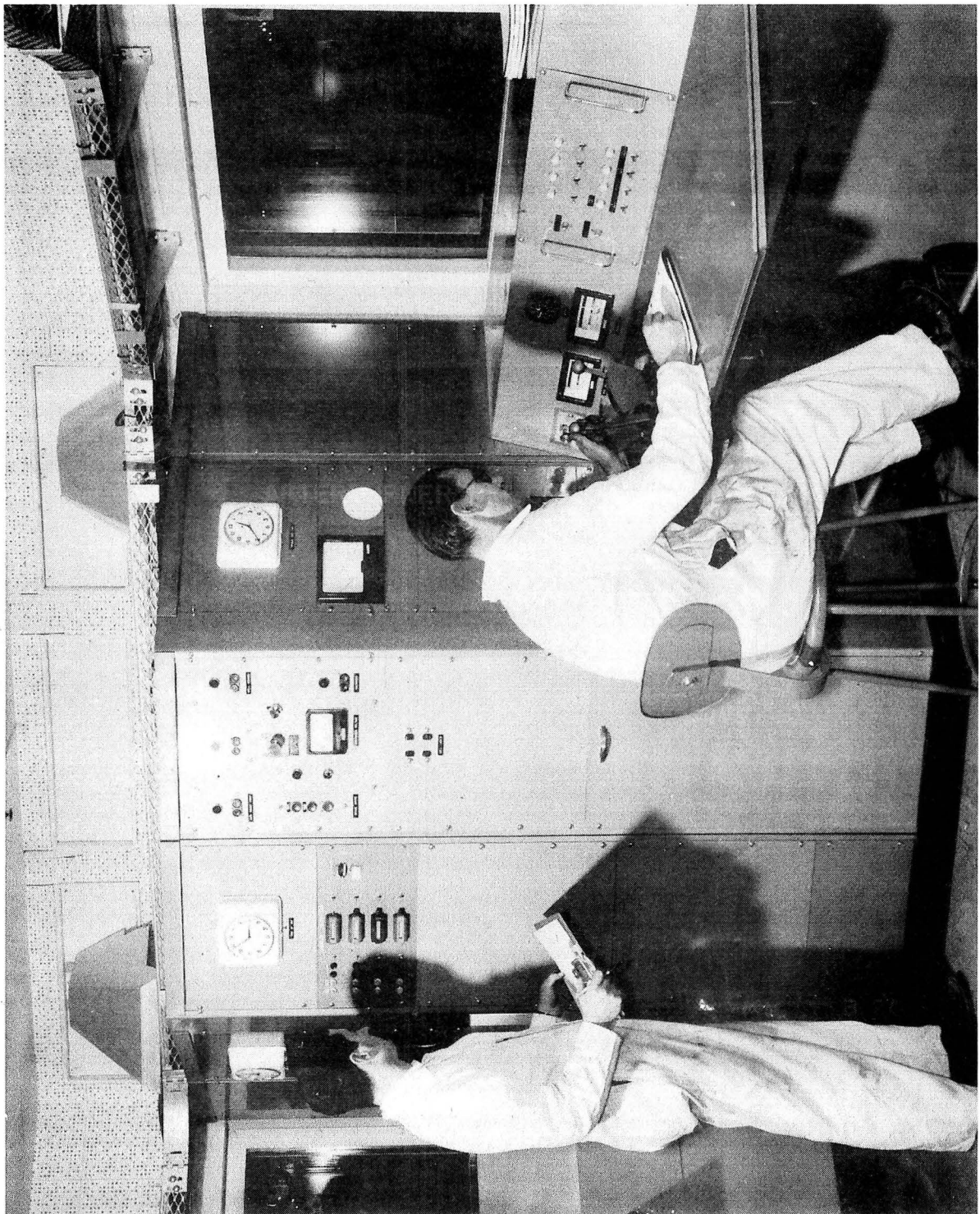
The rig consists basically of a slave engine with reheat exhausting into an injector. The augmented gas flow passes through a mixing duct, then through an annular measuring duct into a test rear frame and jet pipe in which afterburner test specimens are mounted. The exhaust gases are cooled in the exhaust duct and pass through a silencer to atmosphere.

By means of adjusting the slave engine reheat fuel flow and engine speed it is possible to vary the primary and augmented gas flow. Thus, it is possible to vary the test unit inlet Mach number and gas temperature.

The pumping capacity of the present rig configuration is 160 pounds per second of gas flow up to 750 degrees C at 5 psig.



AFTERBURNER RIG



AFTERBURNER RIG CONTROL ROOM

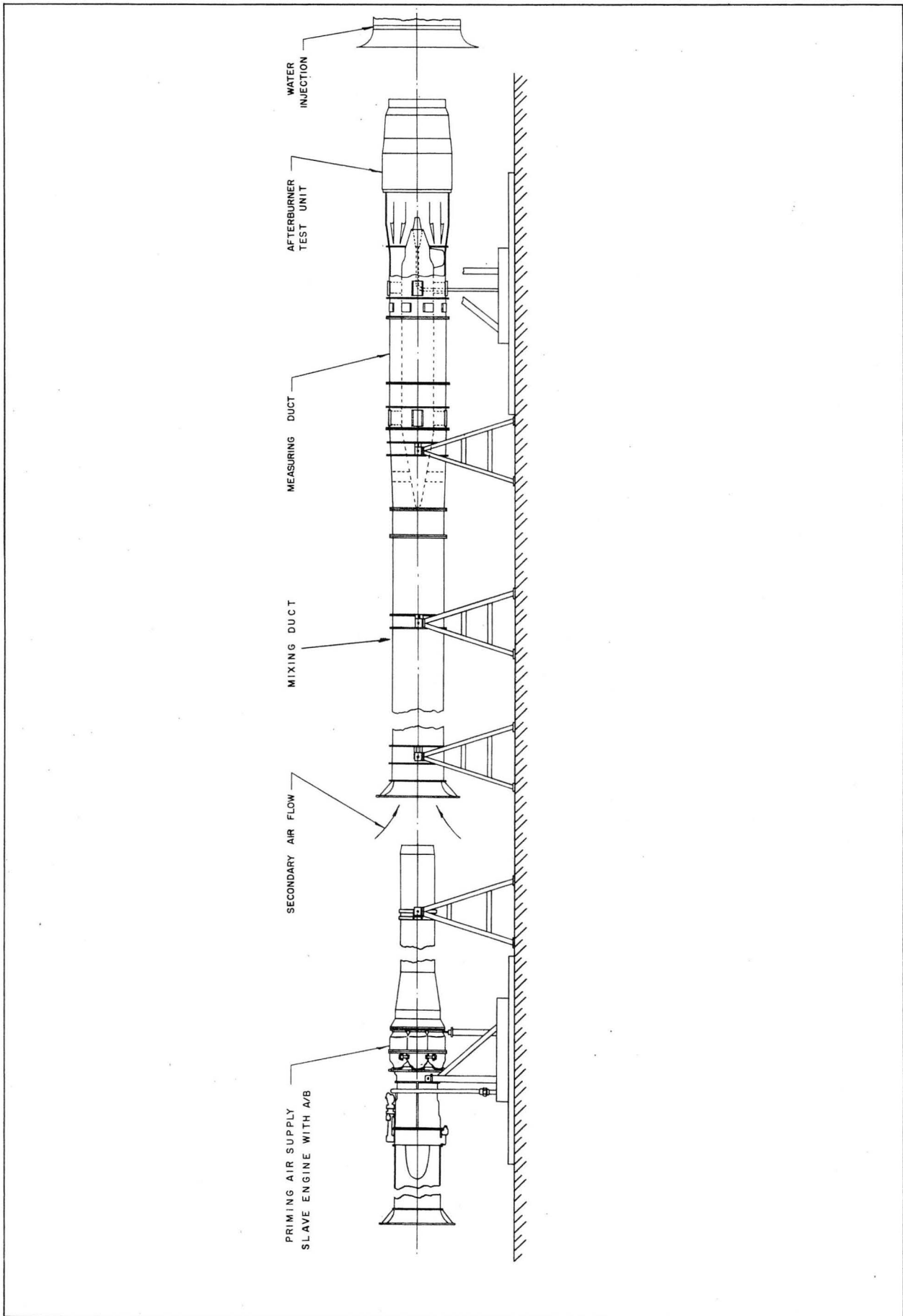


DIAGRAM OF AFTERBURNER RIG

2.11 Sector Afterburner Rig (Figs. 32 and 33)

The sector afterburner rig is intended for use in evaluating the stability range and burning characteristics of segments of various afterburner systems.

Air from the five Ingersoll-Rand compressors is preheated in a rig combustion chamber and passes through a mixing duct into the sector afterburner where the test specimens are mounted. Exhaust gases are water cooled and passed through a silencer to atmosphere.

A sector unit of this type cannot duplicate various types of screech instability sometimes found on annular afterburners, but to minimize temperature gradients and other end wall effects, the radial walls of the sector are ceramic which is allowed to heat up to the full gas stream temperature. The test unit is fitted with observation windows.

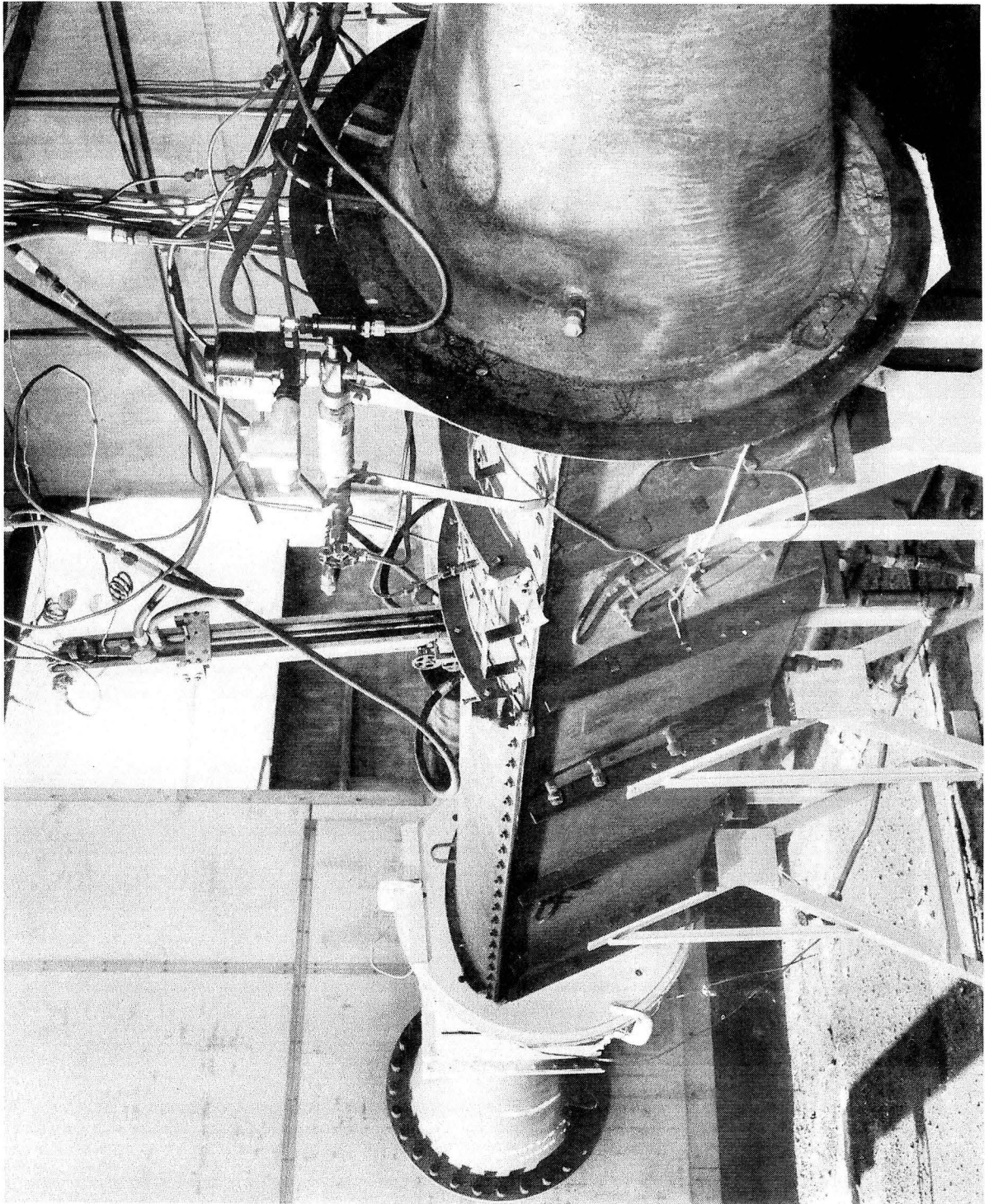
The upstream airflow is adjusted by means of a Taylor air operated valve, and the afterburner inlet temperature is varied by altering the preheater fuel flow. The maximum air flow obtainable is 15 pounds per second.

2.12 Sector Altitude Combustion Rig (Figs. 34 and 35)

The sector altitude combustion rig is used for combustion development work on altitude ignition, stability limits and performance.

Air is drawn from atmosphere through one of three interchangeable flat plate orifices, is throttled by a remote operated butterfly valve, is smoothed by two screens, and passes through a transition duct into the combustor inlet. The combustion unit is ceramic lined on the radial walls to minimize end wall effects and has viewing windows for observation of the combustion process. Downstream of the combustor a 60 degree sweep traverser is used to obtain gas samples and temperature and pressure profiles. The gases are then ducted to the Graham steam ejector which exhausts through a silencer to atmosphere.

The Graham ejector consumes 100,000 pounds per hour of steam at 205 psi and provides, for a typical combustion unit, cold air inlet conditions between 4.6 inches of mercury absolute at a mass flow of 3.0 pounds per second and 24.0 inches of mercury absolute at a mass flow of 18 pounds per second.



SECTOR AFTERBURNER RIG

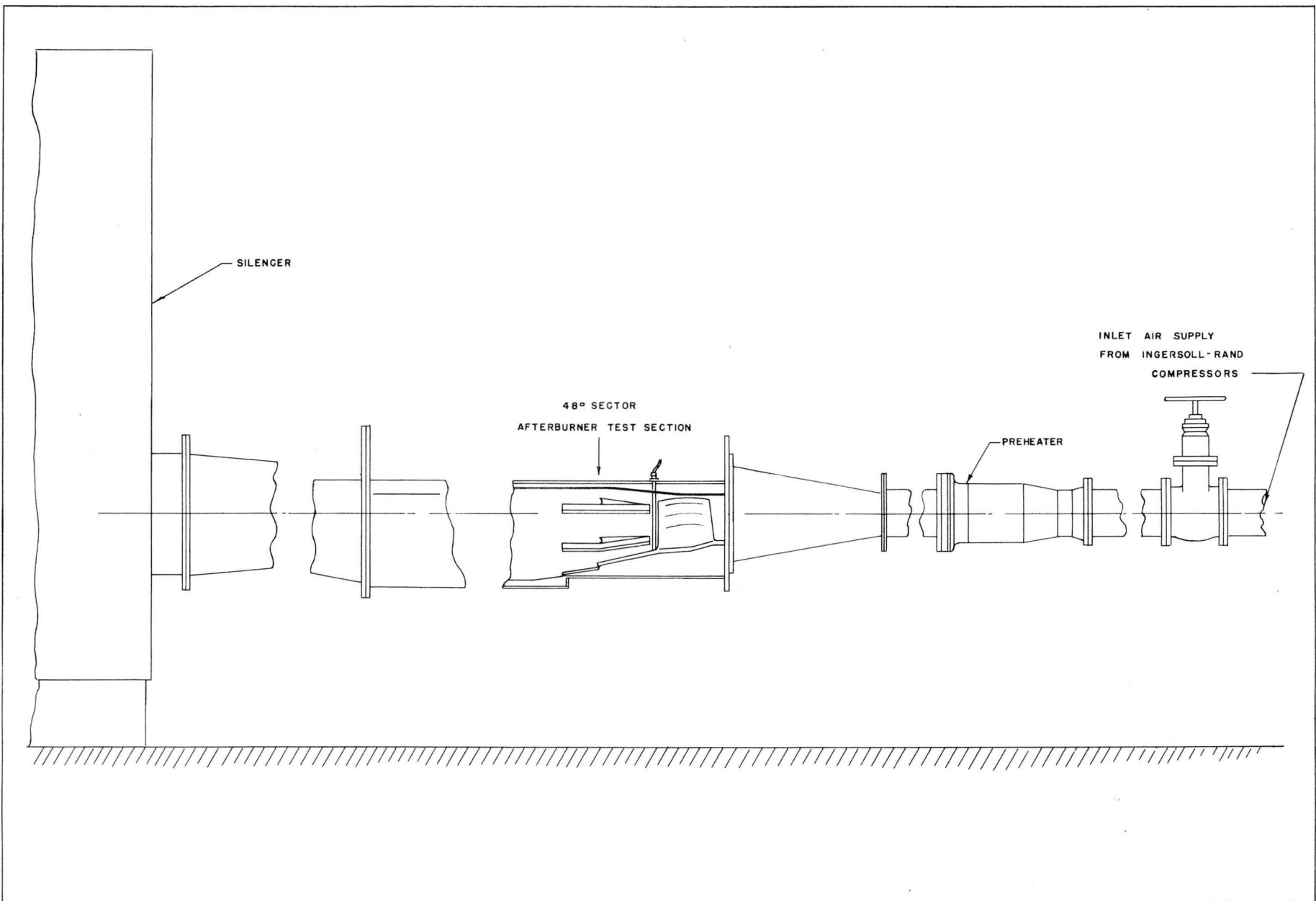
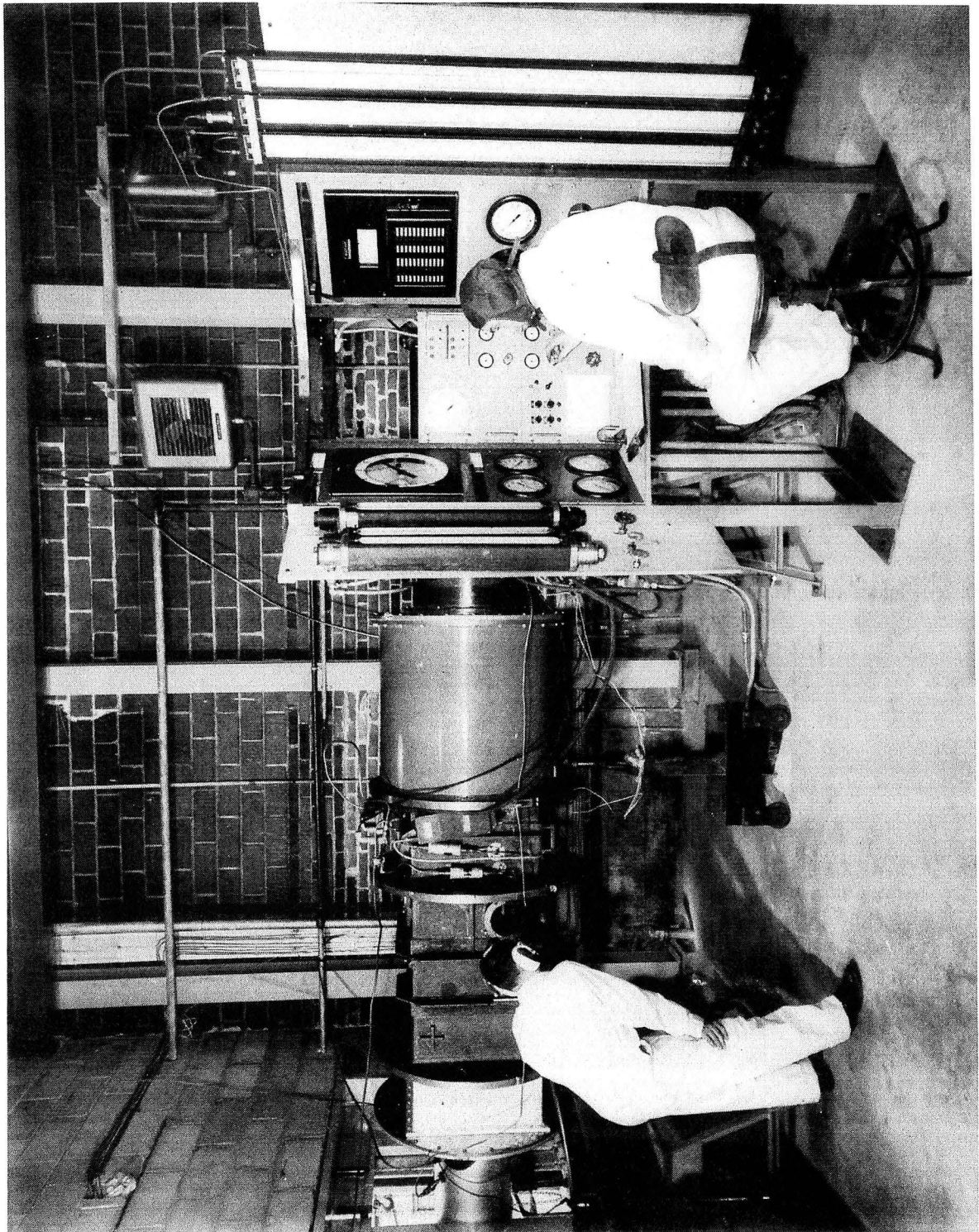


DIAGRAM OF SECTOR AFTERBURNER RIG

Fig. 33.



SECTOR ALTITUDE COMBUSTION RIG

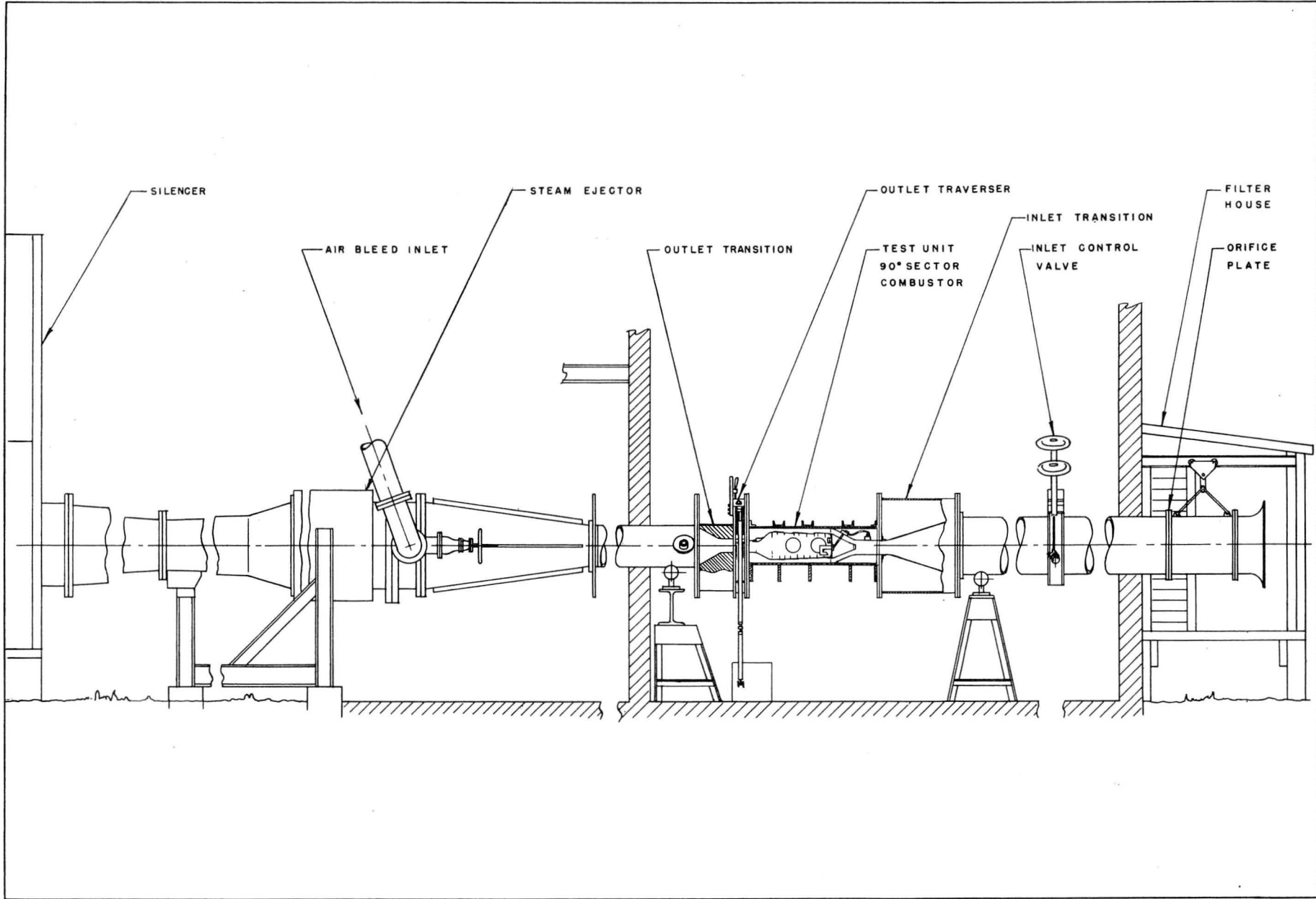


DIAGRAM OF SECTOR ALTITUDE COMBUSTION RIG

Fig. 35.

It is planned in the future to use this test rig for altitude afterburner work and to install a preheater so that realistic operating conditions can be set up for performance tests.

2.13 Annular Atmospheric Combustion Rig (Figs. 36 and 37)

This rig tests combustors at roughly sea level atmospheric pressure, and simulates altitude operation of the combustor in a complete engine.

The air supply to the combustor consists of a primary air system, fed from the Ingersoll-Rand compressors through a combustion preheater, and discharged through the primary nozzle of an air injector. Maximum primary flow is 15 pounds per second, and the secondary flow augmentation of some 28 pounds per second provides a total flow of approximately 43 pounds per second at slightly above atmospheric pressure. The combustor inlet temperature is set by varying the fuel flow to the primary air preheater.

A ring type traverser permits remote total pressure and total temperature traversing of the outlet area in a plane corresponding to the turbine stator leading edge.

2.14 Orenda Altitude Combustion Rig (Figs. 38 and 39)

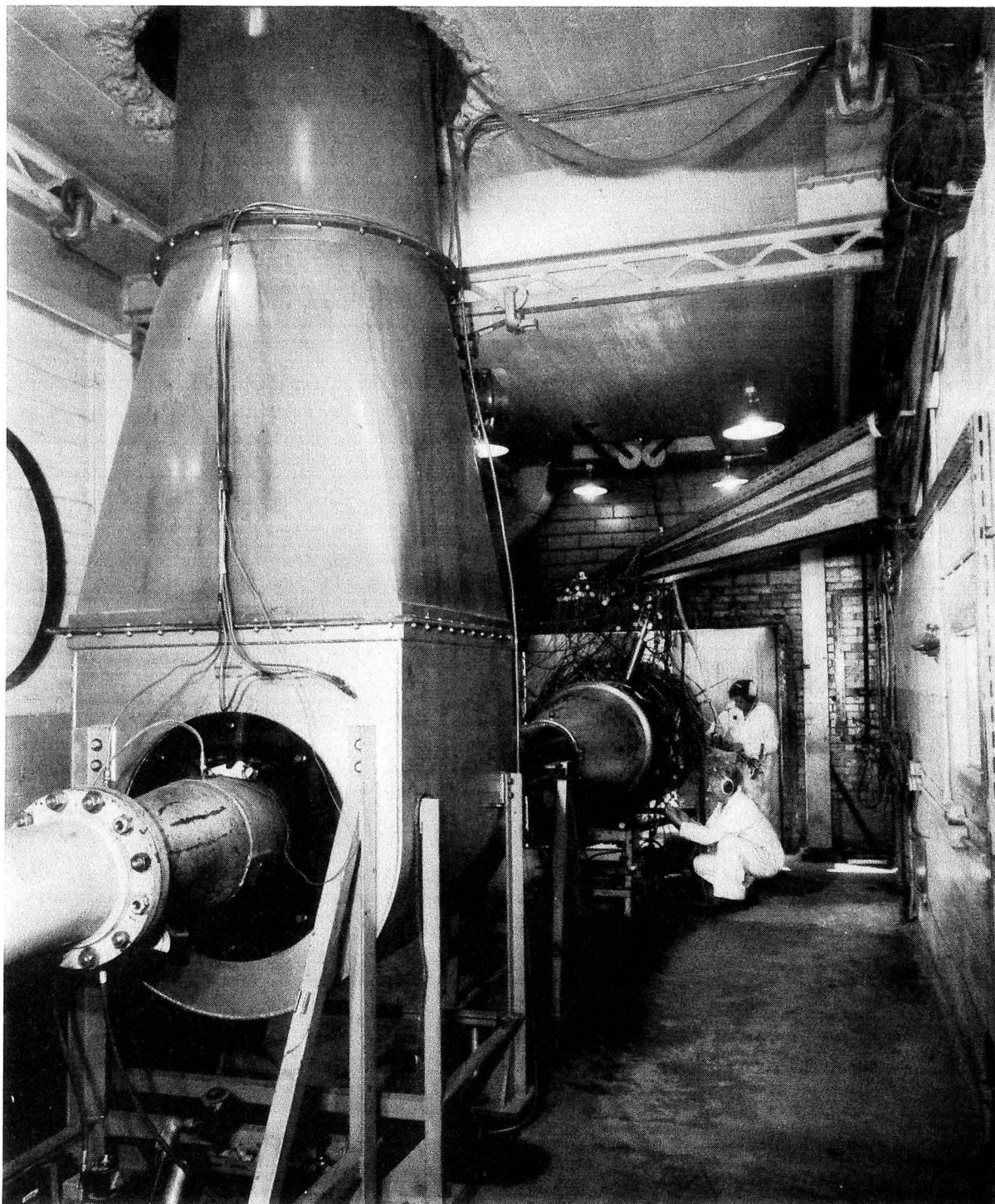
The Orenda altitude combustion rig is used for determining ignition and stability characteristics of various combustion chamber configurations under altitude conditions.

Air is drawn from the cell through one of a series of interchangeable orifice plates, or alternatively for higher mass flows, through an electric preheater which may or may not be used, and a low-loss venturi meter. The air from either source is throttled by a remote operated butterfly valve and flows to a total head tank from which the two dimensional primary zone box is supplied. This box is fitted with viewing windows.

The combustion gases are drawn from the test unit by a Foster-Wheeler ejector which uses 30,000 pounds per hour of steam at 125 psi. The characteristic curve of this ejector permits testing at a lower pressure in the test specimen than is attainable on the sector altitude combustion rig.

2.15 Orenda Atmospheric Combustion Rig (Figs. 38 and 39)

This test rig was originally designed to test Orenda combustion chambers of various configurations at roughly sea level



ANNULAR ATMOSPHERIC COMBUSTION RIG

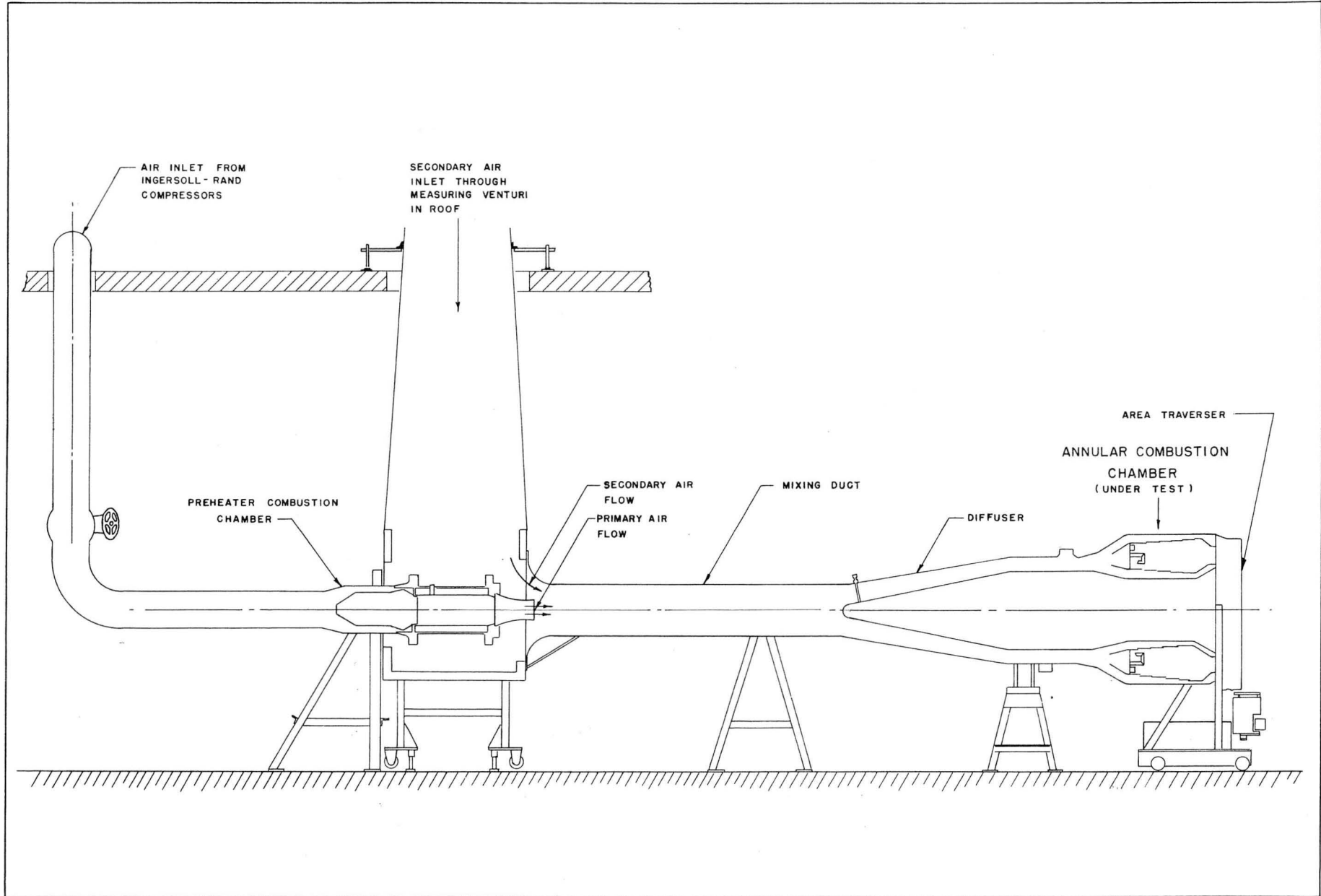
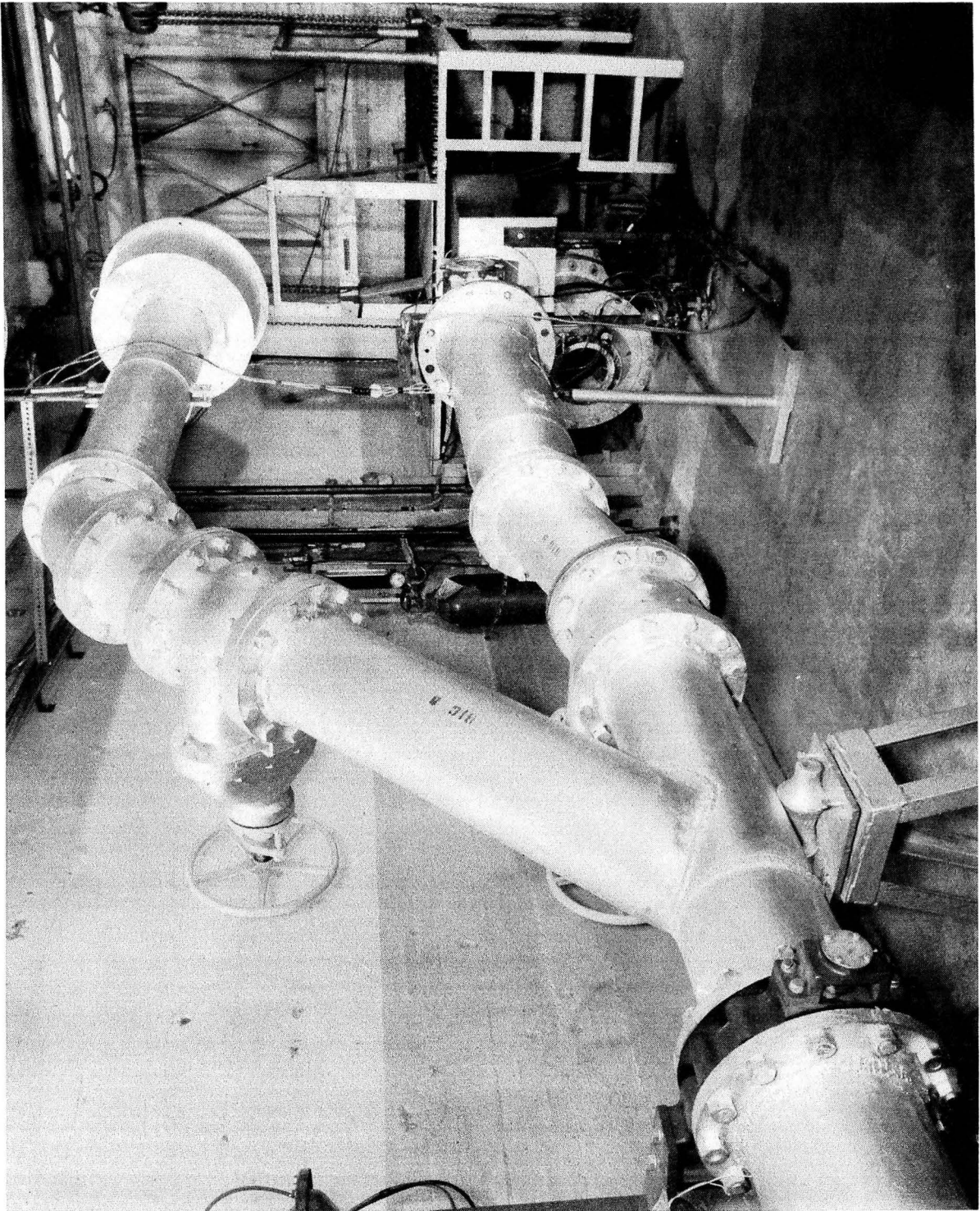


DIAGRAM OF ANNULAR ATMOSPHERIC COMBUSTION RIG

Fig. 37.



ORENDA ALTITUDE AND ATMOSPHERIC COMBUSTION RIGS

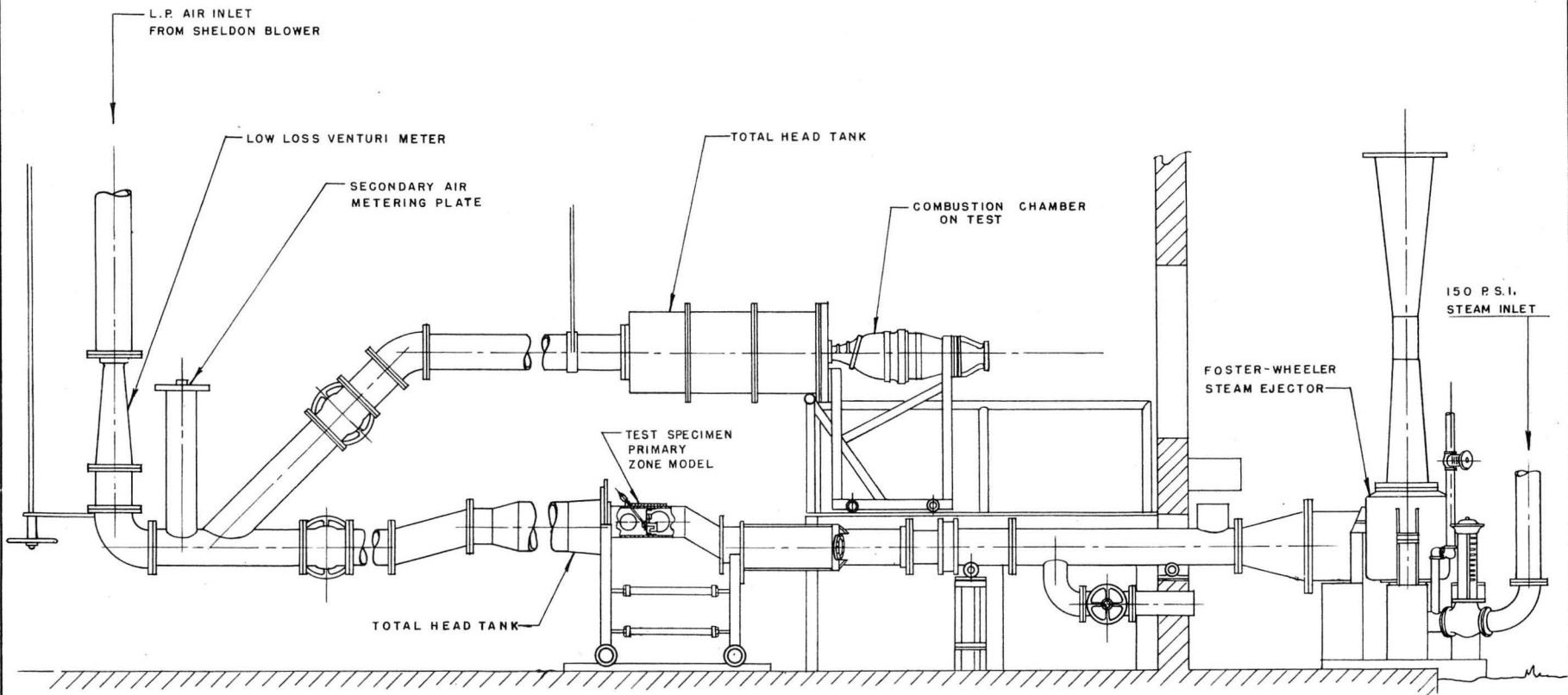


DIAGRAM OF ORENDA ALTITUDE AND ATMOSPHERIC COMBUSTION RIGS

Fig. 39.

atmospheric pressure, which simulates altitude operation of the combustor in a complete engine. The rig is now inactive for Orenda work, and is used for airflow studies, and with the addition of a combustion preheater and a special downstream duct, for thermocouple response tests.

The air supply for the rig is obtained from a Sheldon blower (Fig. 11 and item 1.2.2) which is rated to deliver 3.5 pounds per second of air at 3.0 psig. A 450 KW Hynes electrical air preheater equipped with a Brown temperature controller is installed in the air line downstream of the blower. An alternative air supply may be drawn from the Ingersoll-Rand compressors by means of a four inch diameter cross-over line entering the rig supply line downstream of the Hynes preheater. The Hynes preheater must be isolated when this supply is used. Air flow to the rig is measured by a venturi meter.

2.16 Orenda High Pressure Combustion Rig (Figs. 40 and 41)

This test rig has been used for the testing of Orenda type combustion chambers under conditions approaching sea level flight. The 15 pounds per second of air available from the Ingersoll-Rand compressors duplicates the mass flow in one Orenda type chamber under low altitude conditions, but permits set-up of correct air velocities and air fuel ratios for sea level investigations.

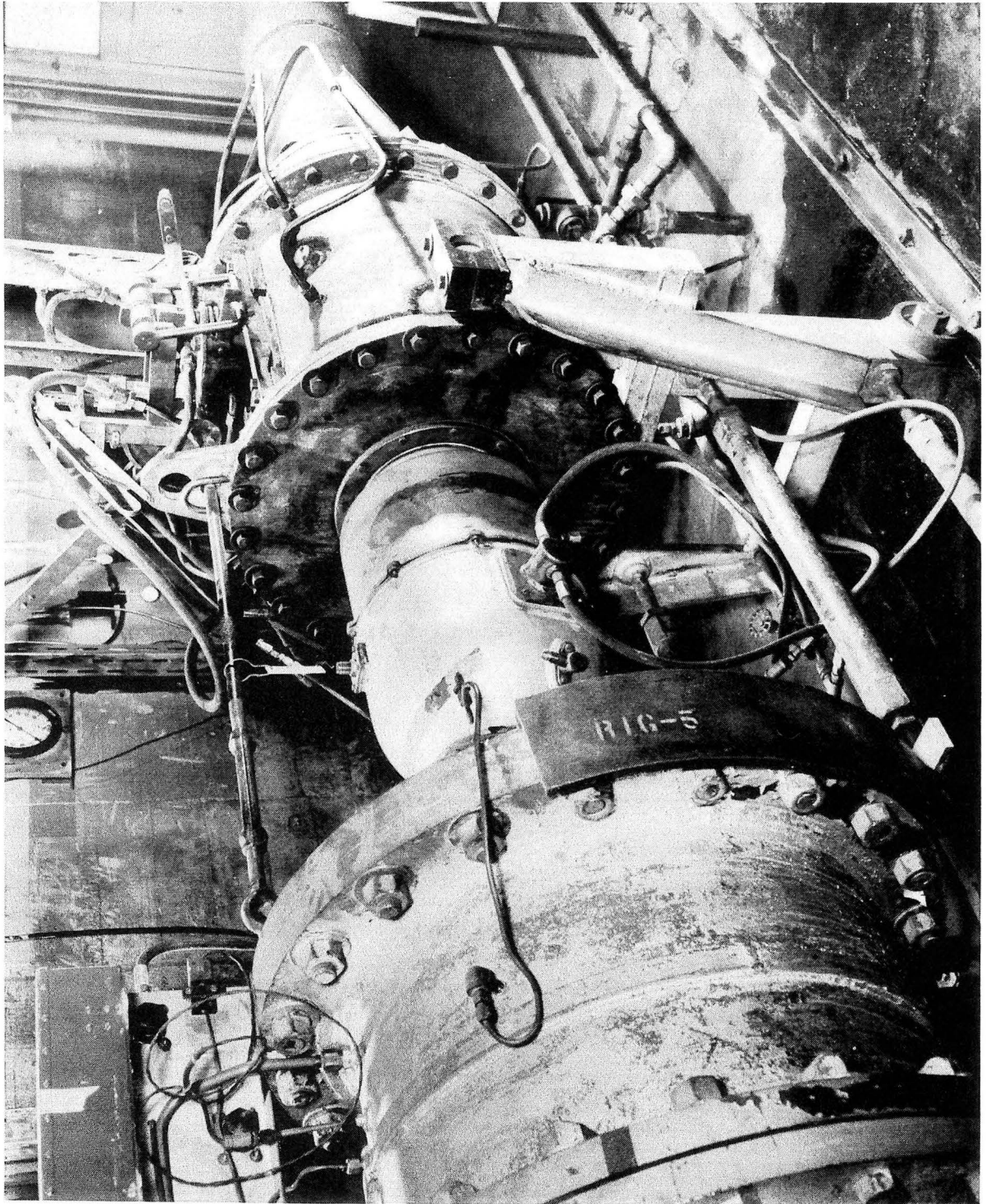
Outlet temperature distribution, metal temperature, pressure loss, and combustion efficiency determinations and "slam throttle" deceleration simulations typifies the work done on this rig.

Air from the Ingersoll-Rand compressors passes through an Orenda type combustion preheater to a total head tank and thence to the test combustor. A water-jacketed traversing section downstream of the combustor is used for determining temperature and pressure profile. The outlet gases are cooled with a water spray upstream of a remote operated butterfly valve which establishes the combustor outlet pressure.

2.17 Turbo Pump Rig (Figs. 42 and 43)

The turbo pump rig is used to evaluate and calibrate air turbine driven fuel pumps of various designs.

Air is supplied to the turbine after passing through a metering orifice, steam and electric preheaters (for low flows), and a combustion preheater (for high flows). Air from the turbine



ORENDA HIGH PRESSURE COMBUSTION RIG

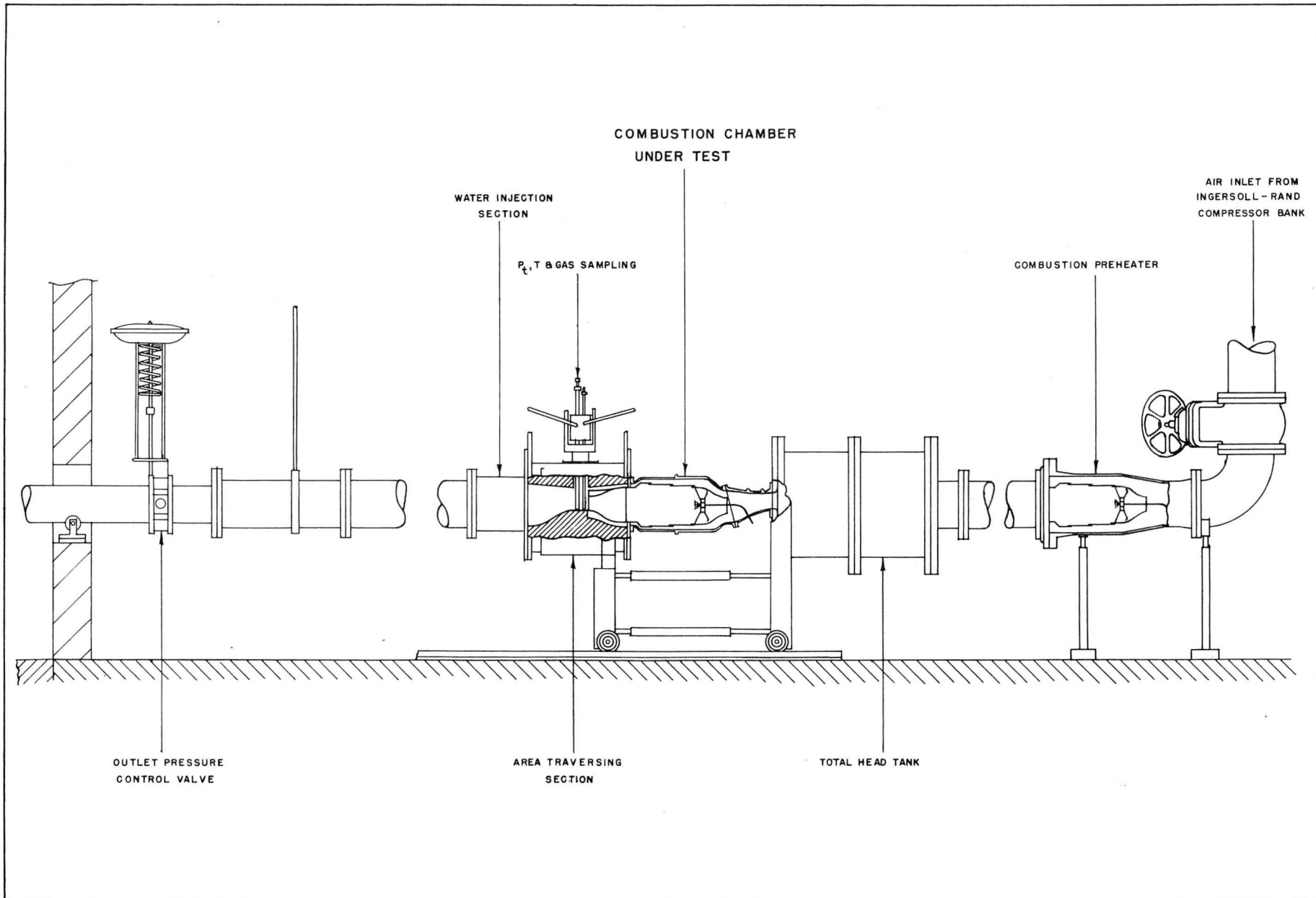
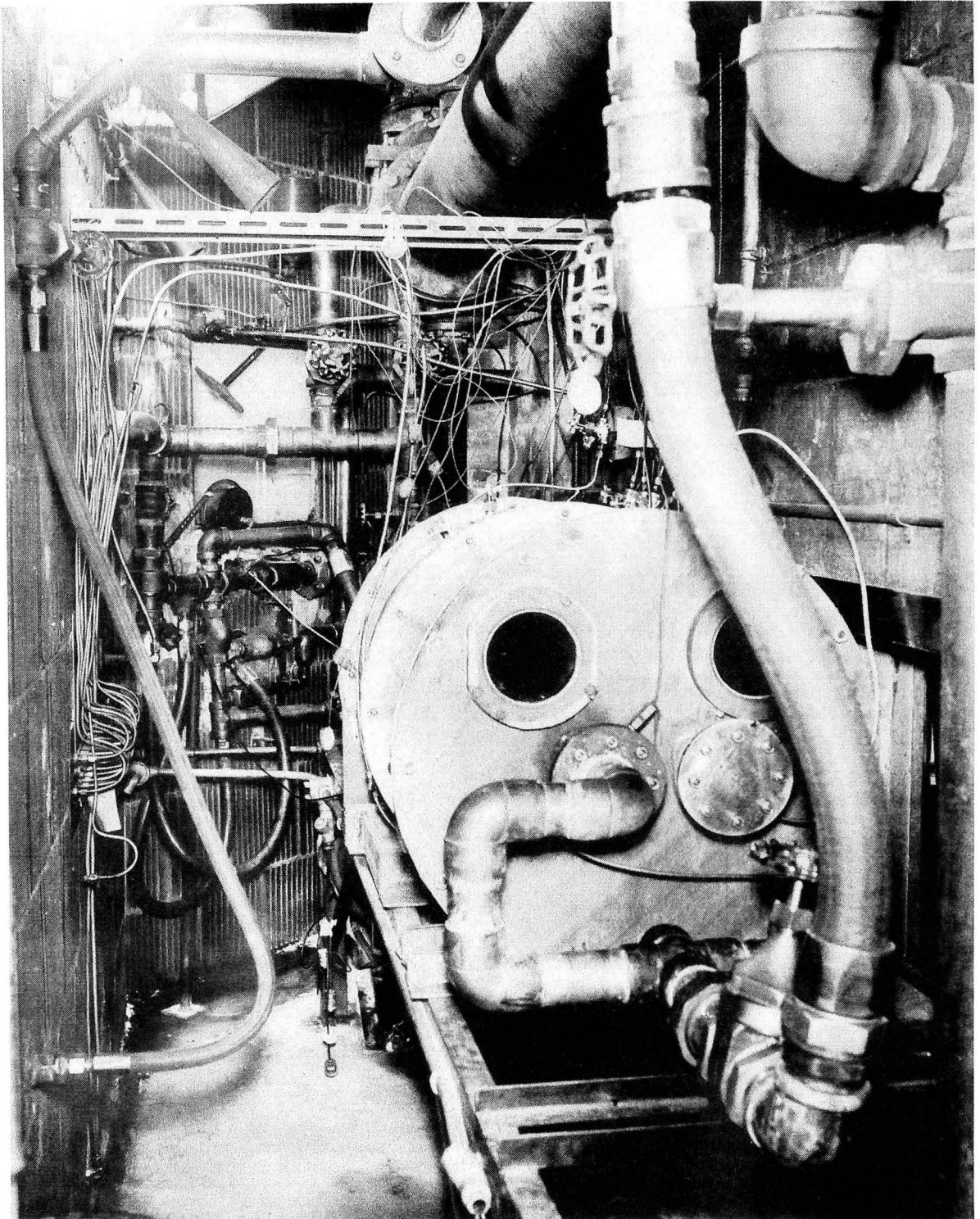


DIAGRAM OF ORENDA HIGH PRESSURE COMBUSTION RIG

Fig. 41.



TURBO PUMP RIG

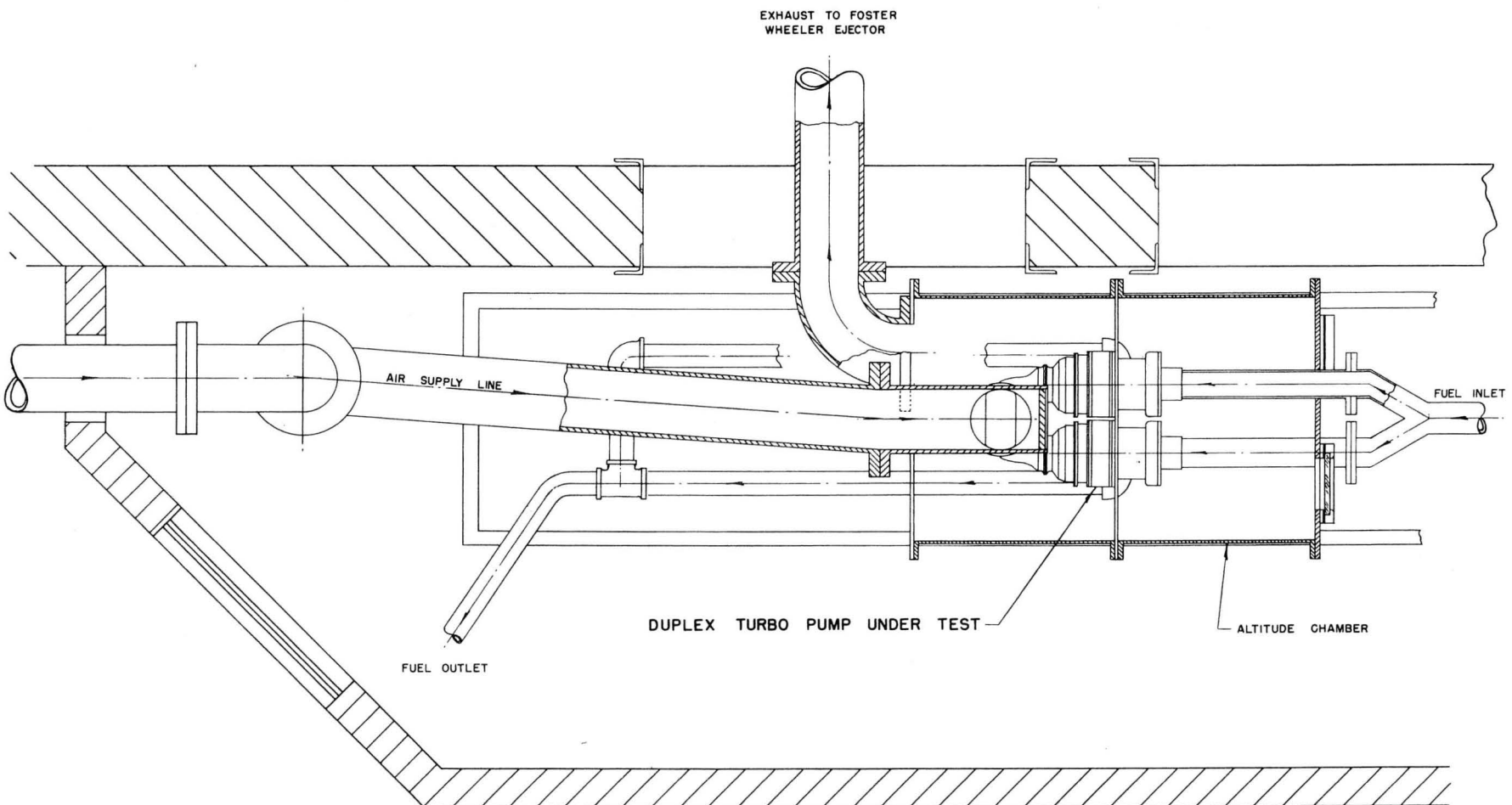


DIAGRAM OF TURBO PUMP RIG

may be exhausted to atmosphere, or drawn through piping to the Foster-Wheeler steam ejector (See item 2.14) for altitude work. Air requirements at turbine inlet may vary from four pounds per second at 100 psia and 300 degrees C, to one pound per second at seven psia. On a typical test, measurements are made of the turbine air flows and pressures required to give desired fuel flows and pressures. Speed indication is by an inductive pick-up which imposes no restraint on shaft rotation.

A closed circuit fuel system provides up to 65,000 pounds per hour of fuel at the test pump inlet at 15 psig pressure after passing from the boost pumps through a filter, a cooler and a flowrator. Fuel discharge is throttled and then returned to the supply tank. The discharge system is designed to withstand up to 1500 psig.

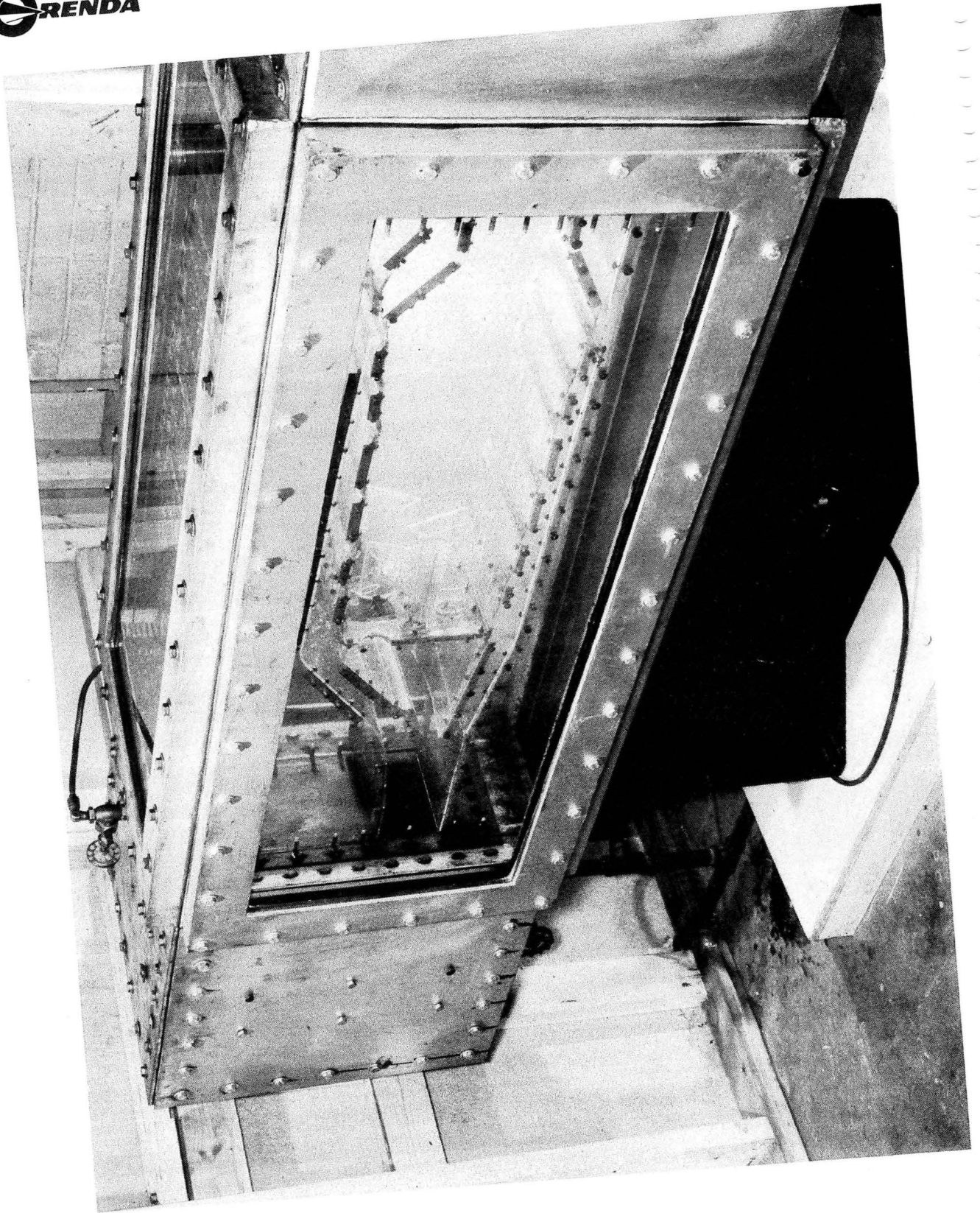
2.18 Waterflow Analogue Rig (Figs. 44 and 45)

The rig is used for visualization of flow patterns in main combustion chambers and in afterburners to determine, for example, reasons for flame tube hot spots, and optimum position for igniter plugs.

The test section of the rig is a plate glass tank which will hold a model, generally constructed of plexiglass, up to 15 by 15 by 48 inches. The rig is in the form of a closed circuit, using water as the flow medium with a pump which will deliver 2000 gpm, although for normal running much less than this is used.

The analogy follows the Reynolds' principle that different fluids can be made to have similar flow patterns if the Reynolds' number is made the same. It has been found by other waterflow rig operators that combustor flow pattern is sensibly independent of Reynolds' number so long as the flow is in the turbulent regime. This allows the rig to be run at velocities of the order of 10 feet per second which are low enough for convenient viewing and also low enough that the model is not overstressed.

In operation, air bubbles entrained in the circulating water reflect the light from a special slit-beam light source which can be adjusted to give the flow pattern in any desired plane. These patterns may be examined visually, photographed using flashbulb slit illumination, or filmed with a motion picture camera.



WATERFLOW ANALOGUE RIG

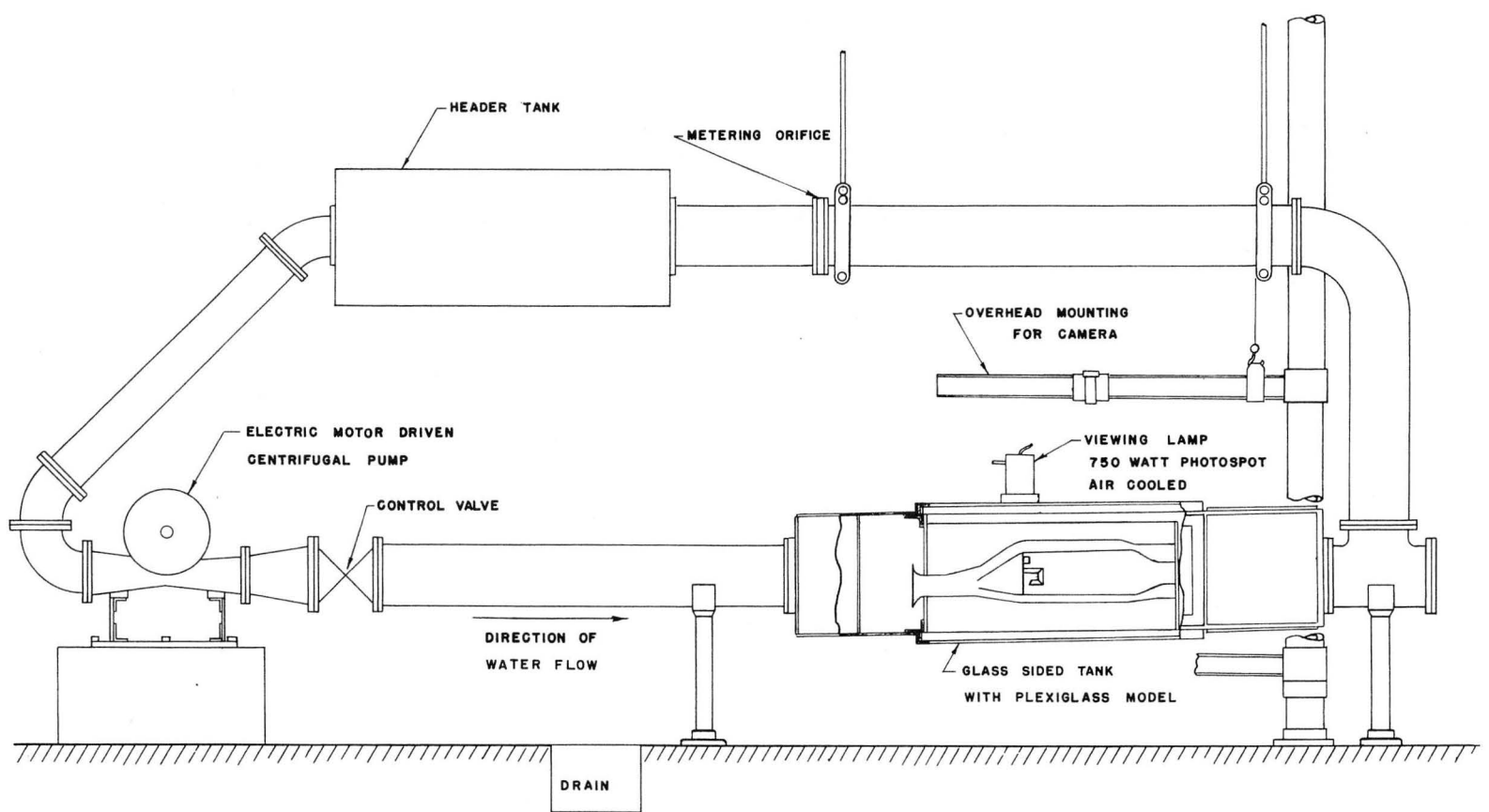


DIAGRAM OF WATERFLOW ANALOGUE RIG

Fig. 45.

PART 3**HISTORICAL NOTES**

on December 2, 1945,

Shortly after the Second World War, the newly formed company A.V.Roe Canada Limited, took over the facilities of Victory Aircraft Limited at Malton. It was decided to enter the aircraft gas turbine industry, and the Gas Turbine Division (the nucleus of which was the previously Crown-owned Company - Turbo Research Limited) contracted to design and build for the R.C.A.F. an engine which subsequently became known as the Orenda.

It was apparent that an extensive testing program would have to be undertaken to put the design and development of this engine on a firm footing.

The small mechanical components did not pose a major problem, but the compressor for an engine of the required specification would absorb some 12,000 horsepower under ground level intake conditions at full speed, and even under throttled intake, simulated altitude test conditions, it would require a prime mover of at least 4,000 horsepower for rig testing. Further, in order to test a single combustion chamber under ground level conditions, an air supply of roughly 15 pounds per second and 60 pounds per square inch was required.

To design and construct an establishment adequate for testing of this order would obviously take several years and be very costly. Accordingly, several plants available through the War Assets Corporation were inspected. The power plant of the Defence Industries Limited explosive factory at Nobel proved to be the most suitable.

This plant has^d been set up in 1940 for the manufacture of wartime explosives. It covered an area of about two square miles, and at its peak employed more than 4,000 employees. The plant was Crown-owned, built entirely for wartime use, and hence was

available with all facilities through the War Assets Corporation.

The power house contained a Worthington-Moore turbo-alternator of 4,700 horsepower nominal rating; four Ingersoll-Rand air compressors each delivering about three pounds per second of air at a pressure of up to 110 psi, and foundations and connections for a fifth machine; and 12 Vickers-Keeler boilers, eight with a working pressure of 135 psi and four with a working pressure of 250 psi, each capable of being over-rated to 25,000 pounds of steam per hour output.

Electric power and water were adequately available. The machine shop was fairly well equipped and of good size. There was space suitable for offices and laboratories.

Housing was available in Nobel Village.

Accordingly application was made to have this plant made available, and in November, 1946, the central facilities, located on some 17 acres of land, were formally turned over to the company.

It was decided that of the 12 boilers installed, six of the low pressure boilers were not required, and these were removed to provide space for test facilities. A fifth Ingersoll-Rand compressor was purchased and installed on the bed available, to increase the total compressor capacity to 15 pounds per second. The 3500 KVA alternator was removed from its bed, making the 4700 horsepower Worthington-Moore steam turbine available for compressor testing.

The power plant otherwise remained basically unchanged until October, 1955, when the boilers were converted from coal to oil firing in the interests of economy and operational flexibility.

Installation of new test rigs has kept pace with current engine development requirements. Until recently, these were installed in the Power House or in small additions to the basic structure. (See Fig. 6). The two newest test rigs, however, the afterburner rig and the rotating blade cooling rig, were installed in a new test house (See Fig. 8). This was the first major addition to basic plant since the facilities were first converted to test use in 1946.

PART 4

FUTURE PROSPECTS

The next few months will see first running of the rotating blade cooling rig and completion of the new office building.

Much of the equipment was recently removed from the Canadian Arsenal's acid towers (CA 308 and CA 312 on Fig. 4) at the front of the property, and it is anticipated that these buildings will be dismantled in the next year.

As the housing in Nobel Village is becoming an acute problem, both as to quality and quantity (the units presently occupied by Orenda personnel in Nobel village were erected in 1940 for a life of five years) we hope to sponsor a new residential suburb of Parry Sound.

The long-range prospects of the Nobel Test Establishment remain to be fully crystallized. It has periodically been proposed that the present functions of the Nobel establishment be relocated to Malton for convenience of liaison with the main engineering offices.

The distance from the main plant becomes less important as roads are improved. Within the next year or two, on completion of the Trans-Canada Highway through Nobel, highway distance between the two plants will be reduced to 130 miles.

Due to its location on Georgian Bay, water supply to the Nobel plant is no problem. While admittedly the use of water at Nobel is extravagant (the whole lake is used as a cooling pond), it is a very satisfactory arrangement for which no substitute of equivalent economy could be provided at Malton.

The Nobel plant lies across the road from the C.I.L. ex-

plosives plant and while it is a full half mile removed from the explosive hazard it is protected by the C.I.L. "magazine limits" from other construction within a radius of about three-quarters of a mile from the Orenda plant. This permits a certain degree of freedom in the operation of test rigs which are typically potent sources of noise. While silencing of test rigs is usually desirable and sometimes essential, on certain types of testing, silencing would introduce an operational difficulty. Frequently, also, Nobel is called upon to carry out short-term testing projects for which special silencing would occasion an unreasonable delay and expense.

As Orenda Engines Limited undertakes work on more powerful and advanced propulsive units, be they powered with petroleum, rocket or atomic fuels, increased value will inevitably be placed on the isolated location of the Nobel Test Establishment.

It is becoming increasingly certain that activity at the Nobel Test Establishment will continue at the same or somewhat increased level for at least as long as basic facilities of the type it has to offer are required for the Orenda Engines Limited test program.

Private

30 January 1959,

To: Mr. G. E. Anderson, Chief Technical Engineer,
From: J. L. Armstrong, Engineer in Charge - Nobel,
Re: DISCUSSION WITH MR. GORDON AIKEN, M.P. FOR PARRY SOUND-MUSKOKA

For the past month or two I have been working rather closely on several projects with Gordon Aiken, M.P. (Conservative) for Parry Sound.

Last Saturday, he phoned me from Gravenhurst on another matter, but raised the question of the Arrow-Iroquois program.

He said something to the effect of, "But when you get right down to it, what are the alternatives?" This I took at the moment to refer to the whole program, i.e. "What else can Mr. Diefenbaker do but cancel the Arrow?" I replied that I felt the facts argued pretty strongly for continuation of the program.

I later realized that what he meant to say was, roughly, "The Chamber has said that the Orenda Test Establishment is of critical importance to the Parry Sound community. But when the Arrow is cancelled, what other type of work can be done at the Test Establishment?"

He also said that Mr. Diefenbaker was very much disturbed by the intensity of the Arrow lobby. Mr. Diefenbaker felt that it would "interfere with his freedom of decision", that he was being "manipulated", and that the "lobby was 85% organized". I replied that the boys at the plant were quite hot on the subject, but I really felt they had a legitimate interest in the matter.

I gained the general impression that Mr. Diefenbaker has actually discussed the matter at some length with Mr. Aiken, but that he visualized himself as a lonely man who could not trust his senior departmental advisers.

Naturally, I have been doing some thinking. It occurred to me that just possibly I had better access to Mr. Diefenbaker than anyone else in the company, and I might as well "have a bash". Accordingly, I have sent a letter to Mr. Aiken.

With some embarrassment, I enclose a copy which you had perhaps better show to Mr. Grinyer, just in case the howls filter back down.



JLA:mm
Enc.

E1

109 Parkway,
NOBEL, Ontario,
January 28, 1959.

Mr. Gordon Aiken, M.P.,
House of Commons,
Ottawa, Canada.

Dear Gordon:

I was pleased to hear from you on Saturday that Gen. Graham was receptive to our suggestions that the Royal Tour be routed through Parry Sound. Confirmation came from Gen. Graham to-day, and it appears likely that something can be worked out through the Ontario Commissioner in Toronto.

I was also interested that you raised the question of the Arrow-Iroquois program and the possibility of repercussions in Nobel. The Nobel Test Establishment is of course very much the tip of the dog's tail, and is meaningless except in support of a substantial development program in Malton. Next time you are in the vicinity, I would be very pleased to show you our test facilities. They are not at all expensive or impressive. The results turned out are, I think, quite impressive. In the past several years, the U.S.A.F. has considered Orenda to be the technical leader in the field, and has referred some quite large U.S. manufacturers to us for technical assistance.

The lobby you referred to, so far as the Parry Sound Area is concerned, is indeed well organized. I arranged for quite a wide local showing of the new, and excellent, Avro Arrow film "Solitary Sentinel" which I had seen at the Orenda Ten Year Club in December. The union boys at the plant lost no time in organizing a lobby. I can't say I am even mildly surprised - I have never found them shy, retiring types when they feel that their job security is in any way threatened.

I feel, however, that the Arrow lobby - the like of which, to quote Blair Fraser, "Ottawa has not seen in living memory" - has a much more significant and alarming side. Most of those who write to the Editor, to their Member of Parliament, or to Mr. Diefenbaker, feel themselves well informed on at least one aspect of the question, even if only the effect on their own livelihood. They also have an uneasy feeling that all the facts are not getting through to the top level.

Certainly the question is one of utmost gravity. Canada can truly be said to be at the moment of decision. Mr. Diefenbaker has an unprecedented responsibility to be accurately informed on all aspects of the question.

The decision must be the right one. Any decision will be difficult, and Canadians must be convinced that it is the right one, arrived at after the most careful consideration of all factors and alternatives. So convinced, they will work for the success of the program decided upon.

I would suggest that Mr. Diefenbaker make a special point of consulting all those who have particular and pertinent knowledge. Such consultations should not go unnoticed by the press.

Obviously, senior public servants must be consulted. It is also desirable that Mr. Diefenbaker have direct contact with senior management of the companies most directly affected. In Orenda, for instance, Mr. E. K. Brownridge, Executive Vice-President and General Manager, is the authority on production. Mr. Charles Grinyer, Vice-President Engineering, is the authority on technical matters. He is a man of great breadth of understanding, and has an amazingly fertile mind.

There are a number of questions which apparently remain to be resolved. I list a few below. Where I simply cannot resist the temptation, I have supplied my own answers and comments.

1. What should be Canada's primary role in the development and manufacture of weapons for continental defence? (Not bomber or I.C.B.M. - these are not truly defensive. Not anti-I.C.B.M. missiles. Most of the I.C.B.M.'s will descend vertically on U.S. centres. First priority - long-range manned interceptors for the identification and elimination of enemy bombers as far north as possible. This requires a specialized machine. Fighting men and fighting machines on Canadian territory should be Canadian insofar as possible. Second priority - radar stations, since these are somewhat specialized installations. Third priority - unmanned interceptors of the Bomarc type. Since these are a relatively "close-in" defence, the U.S.A. will have a greater requirement than ourselves, and we should scarcely be developing competitive models. The important thing is to avoid over-extending, but to do a good job on whatever we undertake.)
2. How much defence can we afford? (Americans pay about \$275. per capita per year on defence. Canadians pay about \$110. Americans pay about \$525. per capita per year in federal taxes. Canadians pay about \$335. Until we are paying for defence at a rate approaching that in the U.S., we are selling our birthrate for a mess of pottage if we ask them to take over any substantial part of our defence responsibilities.)

3. Can interceptors profitably be based north of Sage control? Particularly for the critical identification role, could they not be "talked in" to aircraft radar and visual range of the unidentified aircraft?
4. Can the Arrow be made suitable for service in Europe? With its airborne radar, is sophisticated ground control necessary? Could it readily be converted to tactical bomber configuration?
5. Allowing for tax returns from defence dollars spent in Canada, what would be the relative costs of the various aircraft and defensive systems under consideration?
6. With the Iroquois installed, what will be the performance of the Arrow? Assuming continuing performance development, how will it compare with the F-108 at the earliest date the F-108 could be made available to Canada?
7. Could the Iroquois be installed in the F-108? How would its performance compare with the G.E. engine proposed? (The G.E. engine is intended to use high energy fuels. Deposits of boron compounds on combustion system components and turbine blades could prove to be a very difficult problem.)
8. What can we foresee of defence requirements in say, 1970, and what technical and industrial facilities will be required at that time?
9. If the Arrow is not ordered into production, would there be a requirement for our aircraft industry in a national emergency?
10. How long would it take the various companies to convert to alternative military and non-military projects? (Management and engineering personnel at Avro and Orenda are doing their utmost to make the Arrow a superb aircraft. Very little effort can be spared for developing alternative programs.)
11. Could the various companies survive conversion to commercial products without interim government contracts? Are there commercial products to which they could convert without losing their technical capability?
12. How much would it cost to continue the present development contract to completion? Could the later Iroquois engines of the development batch be made available to other governments at production prices? What prospects are there for a foreign market for the Iroquois? Would this contract provide adequate time for conversion to allied, but non-military projects?

I realize that this letter is presumptuous in the extreme, particularly in view of my position as Engineer in Charge of the Orenda Engines Limited Test Establishment at Nobel. My thoughts are entirely my own, and I have not discussed them with my superiors. I may of course do so in the future.

I am proud of Orenda management and I am proud to be on the Orenda team. I am proud of the part I have played in developing the Iroquois engine. I am convinced that Avro aircraft have a world beater in the Arrow.

My only concern is that the Arrow and Iroquois be given fair consideration, and that the decision, when made, is the right one for Canada.

I would be very grateful indeed if you would discuss my thoughts with Mr. Diefenbaker.

Yours sincerely,

A handwritten signature in cursive script, appearing to read 'J.L. Armstrong'.

J.L. Armstrong

JLA:mm

ORENDA ENGINES LIMITED
INTER-DEPARTMENTAL MEMORANDUM

DATE February 17, 1959
TO Mr. J.L. Armstrong - Engineer-in-Charge, Nobel
FROM E. K. Brownridge
SUBJECT

Mr. Grinyer has forwarded to me a copy of the letter which you sent to Mr. Gordon Aiken, M.P. for Parry Sound, Muskoka. I do hope very much that Mr. Aiken has let Mr. Diefenbaker read this letter because in my opinion it is very well set out and does give in condensed form the information the Prime Minister should have on hand before making his decision on the "Arrow" question.

I think your letter is more forceful because of the fact it is from the Engineer-in-Charge at Nobel rather than from the President of the company. In fact I don't think the President could have presented the facts as well as you did and I want to offer my congratulations and thanks for a job well done.


E. K. Brownridge,
Executive Vice-President
and General Manager

EKB:EM

cc - Mr. C. A. Grinyer

Orenda Nobel Personnel

Note that: an entry (10 yr) indicates a new member of the 10-year Club in 1958; an entry (pre-48) indicates, based on recollections, an employee who started at Nobel before 1948; and a number coding indicates the period of employment at Nobel, as follows:

- 1 - Period prior to July 25, 1956 for which no records are available.
- 2 - Name appears on Personnel List dated July 25, 1956.
- 3 - Name appears on Personnel List dated February 4, 1957.
- 4 - Name appears on Personnel List dated February 5, 1958.
- 5 - Name appears on Personnel List dated December 12, 1958.

Allen, Wm. E. (Bill), Draftsman, 1. 16 Frolick Cres., Scarborough, Ont. M1G 3E7 (416) 439-1288. Wife Fran, family Susan, Nelson, Bryan. Grad. Danforth Tech., Toronto. 74, Grad. Atkinson College, York University. Army. 45, Gutta Percha Rubber, Toronto. Feb. 47, A.V. Roe: Malton, Draftsman; Sept. 48, Nobel, Draftsman. March 51, Atomic Energy of Canada, Chalk River. 56, General Tire and Rubber, Welland. 58, TRW, St. Catharines. 64, Mansfield Rubber Co., Barrie. 68, teacher (drafting, math, electricity). 88, retired.

Anderson, Don E., Pipe Fitter, 1 (10 yr) 2 3 4 5, deceased 89. Wife Florence 15 Gibson St., Parry Sound, Ont. P2A 1W5 (705) 746-6323. Son Brian. Educated Parry Sound. 44, Army. After discharge, truck driving, then pipe fitting in Toronto. 48, A.V. Roe/Orenda Nobel, Pipe Fitter. 59, plumbing contracts, cottage construction and truck driving. 65, bought grocery store in Nobel.

Anderson, George E., not formally an employee of Nobel, but Chief Technical Engineer to whom the EIC reported 53 to 59. 1913 Garfield Ave., Ottawa, Ont. K2C 0W6 (613) 225-2578. Wife Vera, sons George, Frank, Hugh. RCAF, Bomber Command; seconded to Power Jets at Lutterworth; in 45, first met George Best, Shad Williams et al, at Lutterworth on course. Nov. 46, A.V. Roe/Orenda: Performance Analyst (during which time, on non-resident basis, did initial blade vibration testing and analysis on CTR1) > Chief Metallurgist > Chief Aerodynamicist > Chief Experimental Engineer > Chief Technical Engineer. 59, with Harry Keast, Technical Adviser to Harvey Smith, President, A.V. Roe Canada Ltd. 62, Orenda, Atomic Energy Group on projects for AECL. 63, Chief Engineer > Ass't. Director > Director, Legal Metrology Branch, Trade & Commerce > Consumer & Corporate Affairs. 80, retired.

Anthony, Fred, Electronics Instrumentation G/L, 1 2 3 4 5. 679 Cummings Ave., Ottawa, Ont. K1K 2K7 (613) 745-3250. Wife Gladys (Gay), sons Brian and Steven. 70, Algonquin College, Ottawa, Certified Electronics Technologist. 39, U.K., General Post Office, Engineer-in-Chief's Office, Radio Communications Technician. 50, General Electric Co. U.K., X-Ray Equipment Technician. Feb. 52, A.V. Roe/Orenda, Nobel, Lab. Technician; 57, G/L, Electronics Instrumentation. 59, National Research Council, Ottawa; Mechanical Engineering Division, Instrument Technician; 76, Railway Lab, (later Vehicle Dynamics Lab), Instrument Technologist; 80, Standard Pressure Test Technologist. 86, retired. While at Nobel, Secretary, Nobel Branch of Avro Recreation Club.

Armstrong, John L., Engineer in Charge, 1 (10 yr) 2 3 4 5. Pengally Bay #20, Nobel, Ont. POG 1G0 (705) 342-9937; winter, 280 McClellan Rd. #45, Nepean, Ont. K2H 8P8 (613) 828-0389. Wife Ruth, son Neal, daughters Jane, Laurie, Bev. 48, BSc, Queen's. 47, A.V. Roe/Orenda: Summer, Malton, Jr. Engineer, Mech. Test Lab.; May 48, Malton, Mech. Test Engineer; May 49, Malton, Head, Mech. Test Lab.; Nov. 50, Nobel, Equipment Engineer (Sept. 51, tour of jet engine component testing facilities in U.K.); Feb. 52, Malton, Mech. Dev't. Engineer (i/c cold weather testing at Fort Churchill, Man., of alcohol de-icing and thermal de-icing engines, April 52, and of low temperature starting, Dec. 52); Jan. 53, Malton, Supervisor, Test Equipment Design; Oct. 53, Nobel, Engineer in Charge; July 59, Malton, Applications Engineer, Industrial Powerplant. June 65, Gov't. of Can: various, inc. Chief Weights & Measures, Chief Standards Lab, Chief Product Safety Lab, Chief Engineer and Ass't Director in Legal Metrology Branch, Trade & Comm. > Consumer & Corp. Affairs. 82, retired.

Armstrong, Neil A., Fitter-Tester, 1 2 3 4 5, deceased 84.

Ayers, Phil, Machinist, 1 (10 yr) 2 3 4 5, ?

Barker, Cecil E., Fuel Oil Unloader, 1 2 3 4 5, deceased.

Barker, W. (Bill), Machinist and Welder, 1 2 3 4 5, deceased 90. Wife Teresa, 147 Gibson St., Parry Sound, Ont. P2A 1Y1 (705) 746-2357. Family Debora Ann, Michael, Kirby, Regan, Kara. 48, A.V. Roe/Orenda, Nobel, Machinist, then Welder. 59, odd welding jobs. 60, Canada Coast Guard. Retired 87.

Barkley, E.B., Stationary Engineer, 1 2 3 4 5, ?

Barley, Joyce H., Clerk, 5, ?

Barnden, Roy G., Aero Test Engineer, 1 2 3 4 5, deceased 85. First wife, Jean Atwell, Box 411, Maple, Ont. L6A 1S3 (416) 832-8800; family Glen, Deborah. Second wife Joyce, 4630 Lockside Drive # 21, Victoria, B.C. V8Y 2T1. Cranleigh Public school, England. Napiers, England. 52, A.V. Roe/Orenda, Malton; 54, Nobel on Cascade Rig, CTR2, CTR1; 59, Malton. Later, Pratt & Whitney Canada Ltd., Longueuil, Quebec, and until 85, De Havilland Aircraft, Downsview., Ont.

Barry, Oscar, Storekeeper, 1 2 3 4, deceased.

Bartlett, W.Lloyd, Fitter-Tester, 1 2 3 4 5, deceased early 60s. Wife Ruth.

Baskerville, Gordon H., Design Draftsman, 1 2 3 4 5. 504 Raymond St., Peterborough, Ont. K9H 5M8. Wife Doris, family Barbara, Jim, Sue, Tom, Carol. 44, grad. Weston Collegiate. 44, Moffats Ltd., Weston, Ont., Mechanical Draftsman. 47, J.T. Coltham, OLS, Parry Sound, Articled Student > Field Leader & Office Assistant. 52, A.V. Roe/Orenda, Nobel, mainly on combustion and afterburner systems, rigs and instrumentation, but surveyed and prepared plans of underground services with Ed Buchan assisting. 59, Pioneer Saws (O.M.C. Corp.), Peterborough, 2-cycle engine development. 66, Canadian General Electric, Nuclear Power Div., Peterborough,

Mechanical Design Specialist.

- Baskey, Dennis L., Design Draftsman, Plant Eng., 1 2 3 4 5. 79 William St., Parry Sound, Ont. P2A 1V3 (705) 746-8493; work (705) 746-9200. Wife Joyce, family Christine, Terry. 51, A.V. Roe/Orenda, Nobel, Draftsman in Engineering Office > Design Draftsman, Plant Engineering. 59, Bart Tompsett OLS, Draftsman. 60, Parry Sound Chamber of Commerce, Manager. 61, Simpson & Taylor, OLS, Draftsman. 64, Rockwell International: Personnel Manager; 71, Purchasing Manager. 76, Metropolitan Life, Sales Rep. for Parry Sound. 78, purchased Harrington Lithography; re-named Taurus Offset Inc.; burned out in 86; relocated to 43A James St., Parry Sound.
- Battersby, Joe, Tool & Die Maker L/H, 1 2 3 4 5. Elginburg, Ont. K0H 1M0 (613) 542-9885. Wife June, family Myrna, Emily, Marie, Eric, Bruce. 43, Army overseas. 46, Lands & Forests. 47, Miller Electric, Parry Sound. 51, A.V. Roe/Orenda. 59, Guard at Burwash Prison. 59, Dept. of Education > Northern Development, looking after building construction on 6 Indian reserves on Manitoulin Island. 67, Royal Military College, Kingston, Head Technician in Mechanical Engineering Lab.; some instructing. 87, retired.
- Beagan, Ed G., Storekeeper, 1 2 3 4 5. Highway 559 N., RR1, Nobel, Ont. P0G 1G0 (705) 342-5568. Wife Martha, family Ted, Maureen, Kelly, John, Ward, Paul, Neil. 35, uncle's farm. 40, CIL Nobel, acid line. 41, RCAF, Wireless Air Gunner on Cansos flying anti-submarine and troop escort, east coast, Iceland to Yarmouth. 45, CIL. 45, Unemployment Insurance Commission, > Ass't. Manager. 55, Avro Aircraft, Security Guard. 55, Orenda Nobel, Storesman. 59, Dibblee Construction, then Finlay McLaughlin Construction. 61, Ministry of Transport, Parry Sound, Clerk resp. for provisioning lighthouses. 74, retired; sells antiques at flea markets.
- Beagan, Ross, Cost Records Clerk, 1. 494 Mortimer Ave., Toronto, Ont. M4J 2G7 (416) 463-1699.
- Bernier, Rolly J., Pipe Fitter, 1 (pre-48) 2 3 4 5. CIL. 47, A.V. Roe/Orenda. 59, to Dupont, North Bay ?
- Best, George, Aero Test Engineering Supervisor, 1 (pre-48). 7130 Eastwick Lane, Indianapolis, Ind. 46256 (317) 849-1921. Wife Eleanor, family Neil, Susan, Nancy. 45, BAsC (Honours) University of British Columbia. April 45, Turbo Research. May 46, A.V. Roe/Orenda: Completion of jet engine familiarization in U.K.; July 46, Malton, Test Engineer; April 47, Nobel, Aero Test Engineering Supervisor; Dec. 50, Malton, Test Equipment Design and Instrumentation Supervisor > Chief Performance Engineer > Chief Advanced Projects > Assistant Chief Engineer > Chief Engineer. 67, General Motors, Detroit Diesel/Allison Gas Turbine Divisions: Dept. Head, Aero & Performance > Chief Project Engineer. 84, retired.
- Bose, B., Instrument Tech., 1 2, ?
- Boychuk, Nels, Designer, 1 2 3 4 5, deceased. 59, Orenda Malton. 67, General Motors, Detroit Diesel.

Boyd, Charlie G., Toolmaker, 1 2 3 4 5, ?

Bowman, Ron, Instrument Engineer, 1. 926 St. Charles St., Victoria, B.C. V8S 3P6 (604) 598-5922. Wife Claire, family Greg, Bev. 51, BA (Physics), University of British Columbia. 52, A.V. Roe/Orenda: Malton, Instrument Engineer; 53, Nobel, Instrument Engineer; 55, Malton, Supervisor, Instrument Development. 57, University of Waterloo, Assoc. Prof. of Applied Physics. 60, Wiancko Engineering, Pasadena, Cal., Manager Advanced Projects. 65, Electro Optical Systems, Pasadena, Cal., Staff Engineer > Manager Instrument Systems Dept. 69, Consultant, Instrument Systems, Laguna Beach, Cal. 73, CEC Instruments Div. of Bell & Howell > Transamerica Corp. > IMO Industries Inc., Division Manager, Engineering. 90, retired.

Bradley, Ken, Aero Observer, 1. Now at Fuel Lab., Orenda Malton.

Brandwood, George, ?, 1 ?

Brennan, Peter J., Test Sub-Foreman, 1 2 3 4 5. 1560 Caledon St., Ottawa, Ont. K1G 0H8 (613) 739-4685. Wife Aline, family John, Laura, Kathleen, Margaret. H.S. in Kamloops and Vancouver, B.C. 42, grad. Brisbane Aviation Co. School of Aeronautics, Vancouver Civic Airport. 42, RCAF: flying boat stations on west coast; 44, medium range transport squadron in India & Burma; 45, Croydon Airport. 46, Sicamous Hotel, Sicamous, B.C. 49, Imperial Oil, Ioco, B.C.; also RCAF Auxilliary Squadron in Vancouver. 51, RCAF Advanced Training School, Camp Borden, Ont. 51, A.V. Roe/Orenda: Malton, Engine Development Test Cells > Crew Chief; projects included cold weather engine testing at NRC Ottawa and at Ft. Churchill, Man.; 56, Nobel, Test Sub-Foreman i/c new Iroquois Afterburner Test Rig and Rotating Blade Cooling Rig; 59, Nobel, July & Aug. on test equipment inventory. 59, Canadian Pratt & Whitney Aircraft, Longueuil, Que., PT-6 program. 59, National Research Council, High Speed Aerodynamics Laboratory, Ottawa: Sr. Technical Officer on 5'x5' supersonic wind tunnel; 85, 5'x5' trisomic wind tunnel, Acting Head > 86, Head. 88, retired.

Brewer, Steve, Maint. Mechanic, 1 2 3 4 5, deceased.

Brooks, Alex M., Fitter Tester, 1 2 3, deceased 58 while at Nobel. Wife Janet.

Brotchie, Jim, Aero Observer, 1, A.V. Roe before June, 48. Editor of "The Outpost", an Avro Nobel periodical.

Brown, Alec, ?, 1, ?

Brunatti, Attilio, Fitter Tester, 1 2 3 4 5, deceased 70. Wife Muriel, 16 Summit Ave., Parry Sound P2A 2J3. CNR, South Parry Repair Shop. A.V. Roe/Orenda. 59, National Steel Corp. of Canada, Depot Harbour.

Buchan, Ed W., Draftsman, 1 2 3 4 5, ?

Buchan, R.M. (Scotty), Fitter-Tester, 1 2 3 4 5, deceased.

Buck, George L., Fitter-Tester, 1 2 3 4 5, deceased 90. 59, moved to Kitchener area as mechanic, then gas bar operator, then retired.

Buckerfield, E.D., Clerk Typist, 1 2 3, ?

Byrne, J.D., Combustion Test Engineer, 1 2 3. Iroquois Afterburner Rig and Bay 6 Sector Afterburner Rig. 57, National Research Council, Ottawa, National Aeronautical Establishment, Flight Research Engineer.

Calder, A.W. (Wes), Fitter-Tester, 1 2 3 4 5. 15 Louisa St., Parry Sound, Ont. P2A 2V3 (705) 746-9026. Wife Joy, daughter Arlene. Farm. 28, worked on laying of first pavement in Parry Sound, Seguin St., bridge to Municipal Building, and James St., Seguin St. to William St. 30, delivered groceries for Snelgrove's Grocery. 31, Demick's Garage, driving truck. 35, Hart's Garage, mechanical and body work. 45, Tait's Garage, Parry Sound, body work. 55, Orenda Nobel, Bay 4, new baseplate for afterburner. 59, Demick's Garage, Parry Sound, body work. 61, Calgary, body work in several shops. 65, Tait's Garage, Parry Sound. 69, operated own body shop, Parry Sound. 76, retired.

Caldwell, Jacqueline (Jackie), Combustion Lab Technician, 1, ?

Cameron, Don E., Timekeeper, 1 2 3 4 5, deceased 86. Wife June, 44 Riverdale Rd., Parry Sound, Ont. P2A 1N9 (705) 746-5330. Sons Paul, Michael, Stuart. 41, Defence Industries Limited, Nobel. 43, RCAF. 46, McKinley Hardware, Parry Sound. 49, A.V. Roe/Orenda, Nobel. 59, Canadian Industries Limited, Nobel, payroll. 61, Department of Transport > Coast Guard, Parry Sound, stores > payroll.

Cameron, Gary A.T., Maintenance Man, 5, ?

Campbell, Colin, Aero Test Engineer, 1. 1905 - 154th Ave. S.E., Bellevue, Wash. U.S.A. 98007 (206) 746-4235. Wife Victoria (Vicky), family Karen, Kevin. 48, B.A.Sc., University of British Columbia. Nov. 48, A.V. Roe/Orenda: Malton, Test Equipment Design Engineer (designed horizontal intake ducting and filter house on west wall of Power House for CTR1, and compressor test units for CTR1 and CTR2); Aug. 52, Nobel, Aero Test Engineer (CTR2; also commissioned balancing machine inherited from Malton, and trained crews in operation). May 54, Consulting Engineer, Calgary. Nov. 54, Powell River Pulp & Paper, Powell River, B.C., Plant Engineering Design Engineer. Sept. 56, Boeing, Renton, Wash.: Design Engineer, 707 Cabin Air Conditioning; May 65, Supervisor, 707 Air Conditioning Design; Sept. 67, Supervisor, Cabin Air Distribution, Supersonic Transport Program; March 72, Supervisor, Radar Cooling, AWACS; May 74, Supervisor 767 Prelim. Design; July 78, Project Engineer, 767 Environmental Control Systems Design; Aug. 83, Unit Chief, 747/767 Environmental Control Systems Design; Aug. 88, Unit Chief, 737/757 Environmental Control Systems Design; Jan. 92, planned retirement.

Campbell, R.D., Aero Engineering Ass't., 1 2. Now teaching in Sudbury area.

Carson, Don M., Stationary Engineer, 1 (pre-48) 2 3 4 5, deceased 87. Wife Rene, 79 Church

St., Parry Sound, Ont. P2A 1Z2 (705) 746-2227. Son Edward. 39, DIL, firing in power house. 46?, A.V.Roe/Orenda, Stationary Engineer. 59, St. Joseph's Hospital, Parry Sound, power plant. 77, Parry Sound General Hospital, power plant. 86, retired.

Carter, Derek H., Aero Engineering Ass't., 4 5. RR2, Kemptville, Ont. K0J 1J0 (613) 258-5650. Wife Beryl, daughters Helen, Jane. 57, Orenda: 6 weeks at Malton, then Nobel. 59, National Research Council, Ottawa, National Aeronautical Establishment, computer operator/programmer and i/c central computer facilities. 90, retired.

Chant, Jim A., Combustion Test Engineer, 1 2, deceased. Wife Patricia (Trish). Turbo Pump Rig.

Cheney, Peter, Aero Engineering Ass't., 1 2 3, ?

Childerhose, Mac, Mech. Engineer, 1, deceased 76. Wife Joanne, 61 Waubeek St., Parry Sound, Ont. P2A 1C4 (705) 746-8382. Family Marjorie, Marilyn, Nancy, Randy, Wendy, Janet, Steven, Martha. 45, M.E., Clarkson Tech., Potsdam, N.Y. 45, C.I.L. Paint Division, Toronto. 46, C.I.L., Nobel. 52, E.G. Childerhose Real Estate, Parry Sound. 53, A.V. Roe, Nobel, in Plant Engineering. 54, Department of Transport > Canadian Coast Guard.

Christie, W.J. (Bill), Lab. Stores Clerk, 1 2 3 4 5, deceased 82, age 94. Wife Mildred, deceased 88, age 100. Daughter Marian (wife of J.A. Miller, Fitter-Tester), son Don Christie, Fitzgerald Bay, RR1, Nobel, Ont. P0G 1G0 (705) 342-5726. Father was Wm. P. Christie, Crown Timber Agent for Parry Sound-Muskoka, and had a cottage S.E. corner of Franklin Island where, as a part of his duties, he entertained successive Ministers of Lands and Forests. In 1925, one Minister was enthralled by Franklin Island with its 13 small lakes, and made this and surrounding islands, except initially for the Christie property, a provincial park. While he was a theology student at Knox College, Toronto, Bill worked with Dan Bottrell, Lighthouse Keeper and Forest Ranger at Snug Harbour. Fire patrol was by canoe to Pointe au Baril and Sans Souci on alternate days. Cycled Sundays to Blair's Landing Presbyterian Church, McDougall Township, where he was Student Minister. 13, grad. from Knox College. Assistant Minister, Parkdale Presbyterian Church, Toronto. Instrumental in starting Shebeshekong Presbyterian Church, now amalgamated with Century United Church, Carling Township. Shebeshekong Presbyterian was on present site of Sidon's Garage, Hwy. 559. 21, started Minwandum Boys' Camp on Franklin Island; Regatta Bay was centre of many activities. Initially army surplus tents with circus tent as dining hall. 22, started girls' camp, same facilities, alternate schedule. 25, converted to Camp Franklin, a co-ed camp which progressively acquired permanent buildings and other facilities such as a saw mill and a generator. Peak registration 365, but bankrupt in 37. (Vince Dunn took over operation until all property became part of Franklin Island Provincial Park). 38?, Fraser Brace Construction on construction of DIL, Carpenter. 40?, Defence Industries Limited, i/c Machine Shop Tool Stores. 45, War Assets, closing down plant. 48, A.V. Roe/Orenda Nobel, > Lab. Stores Clerk. 59, Crown Assets Disposal, Clerk. 61?, retired to farm; gave it up when hearing failed, and Council passed by-law which ended general small-farm practice of allowing cattle to forage at large.

Churchill, Fred G., Fitter-Tester, 1 2 3 4 5. 59, Can. Pratt & Whitney, Longueuil, Que.

Clarke, John E., Aero Test Engineer, 1, ?

Clarke, Russ G., Instrument Lab. Supervisor, 1. 67 Morgan Ave., Mississauga, Ont. L5M 2A4 (416) 826-2796. Wife Joyce, family Linda, Blair, Gary. 48, grad. Ryerson. 48-05, Philco FM Specialist. 48-10, Polymer, Sarnia, Instrument Tech. 49-10, A.V. Roe/Orenda: Nobel; 55-08, Malton, Ass't. Supervisor, Instrument Lab.; 59-03, Instrument Specialist, Malton; 67-08, Instrument Lab. Supervisor; 72-06, Chief of Laboratories; 78-06, Chief of Testing Services. 89-09, retired.

Clifford, Ernest A., Engineer in Charge, 1. 15 Windor Ct., Box 277, Cannington, Ont. L0E 1E0 (705) 432-2796; cottage (705) 657-3856. Wife Margaret, family Gail, Ann, Peter, Paul. 40, BASc, Toronto. 40, British Air Commission at Canadian Car & Foundry, Fort William. 41, Dept. of Munitions & Supply. 42, RCAF. 45, Gutta Percha & Rubber Co., Toronto. April 47, A.V. Roe/Orenda: Malton, Head, Mechanical Test Lab.; April 49, Nobel, Engineer in Charge; Nov. 50, Malton, Chief Test Engineer; 52, Chief Flight Test Engineer; 53, Chief Test Engineer. 59, H.H. Angus & Assoc. 61, Pratt & Whitney Canada Ltd., Longueuil, Que.: Chief Experimental Engineer; 66, Engineering Manager, Industrial & Marine Div. 77, ret.

Collison, Gail L. (Stewart), Aero Engineering Ass't., 1 2 3, ? Husband Howard.

Collison, Gordon L., Aero Engineering Ass't., 4 5. 54 Varden Cres., Barrie, Ont. L4M 4P3. Wife Betty Ann, 4 children. Canada Post.

Condon, John P., Combustion Engineering Ass't., 1 2 3 4 5. 1037 Glebemount Cr., Peterborough, Ont. H9H 6M1 (705) 742-8747. Wife Elsie, daughter Siobhan, son John. 54, Institute of Technology, Dublin, Ireland, Higher Tech. Diploma. 70, P. Eng., Ontario. June 54, Orenda: Malton, Quality Control; May 55, Nobel, Combustion Engineering Ass't. (designed Annular Atmospheric Combustion Rig control panel, airflow test facilities for combustion components, and Waterflow Analogue Rig; developed analytical method for combustion chamber flow distribution; and provided test engineering support on these rigs and on Orenda re-light, SAE jet pipe thermocouple tests, and on Free Surface Water Table). 59, Outboard Marine, Peterborough, Development Engineer. 64, General Electric Canada, Peterborough: Nuclear Engineering Ass't.; 70, Mech. Design Engineer; 75, Technical Counsellor; 79, Supervising Engineer; 84 to present, Manager, Mechanical Equip. Engineering. 86, Chairman, CSA N285 Technical Committee on CANDU Power Plant Components.

Conrath, Joseph J., Aero Test Engineer, 1. 98 Willingdon Blvd., Toronto, Ont. M8X 2H7 (416) 231-3441. Wife Helen, family Christopher, John, Anne, Claire. 49, B.Eng., McGill; 51, M.Eng., McGill. July 51, A.V. Roe/Orenda: Malton, Mech. Test Equipment Design Engineer; 55, Nobel, Aero Test Engineer, CTR1; 57, Malton, Engine Performance Engineer; 58, Malton, Supervisor, Special Equipment Design; 59, Atomic Products Senior Engineer. July 67, Atomic Energy of Canada Limited, Sheridan Park Engineering Lab., various inc. Reactor Design Engineer, and Section Head and Branch Head, Reactor Component Development. 86, retired.

Cooper, E.T. (Jimmy), Carpenter, 1 (10 yr) 2 3 4 5, ?

Cooper, J.R., Fitter-Tester, 1 2 3 4 5, ?

Coulis, Don, Machinist, 1. 36 High Park Blvd., Toronto, Ont. M6R 1M8 (416) 531-7663. A.V. Roe 50 or earlier.

Coxon, Tommy, Guard & First Aid, 1 2 3 4, ?

Crigger, Carson S., Fitter-Tester L/H, 1 (pre-48) 2 3 4 5, deceased 79 at age 57. Wife June, d. Educated Chalk River, Ont. De Havilland Aircraft, Montreal. Sept. 43, jet engine familiarization course in UK. Dec. 43, NRC Cold Weather Station, Stevenson Field, Winnipeg. Summer 44, further familiarization course in UK, on Armstrong Siddeley ASX axial flow jet engine. May 46, A.V. Roe/Orenda: Malton; July 46, Nobel. 59, Pratt & Whitney Canada, Longueuil, Que. Superintendent of Nobel United Church Sunday School.

Croswell, Barbara A. (Peachey), Clerk Computer, 1 2 3. Site 5, Comp. 6, RR5, Riverbend Rd., North Bay, Ont. P1B 8Z4. Husband Bill, family Brenda, Susan, David, Michael. 52, A.V. Roe/Orenda, Nobel. 57, family. 81, Sisters of St. Joseph of Sault Ste. Marie: Secretary; 86, Generalate Secretary.

Curtis, Robert G. (Bob), Instrument Tech., 1 (10 yr) 2 3 4 5. 700 South Mead Ave., Fullerton, California 92633. Wife Jessie, daughters Linda, Brenda, Marlene. Feb. 48, A.V. Roe/Orenda, Nobel. July 59, Intelligent Machine Research, Alexandria, Virginia; 60, transferred to Los Angeles. 30 years with same company through 4 takeovers, now Transtechnology Co.

Davies, Laurie, Equipment Designer, 1 2, ?

Davy, A.S., Instrument Tech., 1 2, ?

Dewar, Howard J., Fitter-Tester, 1 2 3 4 5. 240 Oriole Parkway, Apt. 206, Toronto, Ont. M5P 2H1 (416) 481-0675; and McKellar, Ont. P0G 1C0.

Diepenhorst, R. (Bob), Aero Engineering Ass't., 1 2 3, ?

Dodd, Charles W., Fitter-Tester, 1 2 3 4 5. 2 Champaigne St., Parry Sound, Ont. P2A 2M9 (705) 746-2557. Wife Loretta, sons James, Albert. Army. 46, Service Manager, Parry Sound Motors. 52, Army, on instruction in administration. 54, A.V. Roe/Orenda, principally on high altitude ignition; worked on one project to correct high altitude flame-out; performance was improved to allow re-light at 90,000 feet. 59, Sutcliffe Motors, Parry Sound, Tune-up Man. 60, opened service bay at Canadian Tire. 61, Ontario Hydro, heavy equipment repair in far north. 69, Post Office, Letter Carrier. 79, retired on disability. Paying hobby is 2-way radio servicing.

Dorer, Cy H., Machinist, 1 2 3 4 5, deceased.

Dube, E., Labourer, Test Cells, 1 2 3 4 5, ?

Dunk, Ken H., Combustion Lab. Technician, 1 2 3 4 5. 4 Armstrong Ave., Nobel, Ont. P0G 1G0 (705) 342-5348. Wife Irene, family Roane (d.), Vance, Janice, Marcine, Lynn Anne. 65, B.A., Waterloo Laurier. Aug. 49, A.V. Roe/Orenda, Nobel. 60, Teacher, Nobel School. 65, Rockwell Corp., Lab. Technician. 69, Shaw-Almex Industries, Traffic Co-Ordinator. 87, retired.

Dunk, Marion I., Clerk, 1 2 3 4. 3150 Rutland Road, Victoria, B.C. V8R 3R8, or Gen. Del. Stn E, Victoria V8W 2L9. Daughter Andrea. 53, A.V. Roe/Orenda. 58, with husband to Stratford. 78, Q.C. Home & Office, Toronto, Calgary & Victoria, care for elderly.

Dunk, Ted A., Instrument Tech., 1 2 3 4 5. Highway 69 S., Otter Lake, Ont.; postal address: Gen. Del'y., Parry Sound, Ont. P2A 2X1 (705) 378-2311. Wife Shirley, family Warren, Laura, Wendy. 50, A.V. Roe/Orenda, Nobel. 59, Canada Post. Retired 90.

Dunn, Jack D., Plant Engineering, 1. 3301 - 8th Ave., Castlegar, B.C. V1N 2Y3. Wife Edith, daughter Darlene, sons John, Robert, Andy. 51, grad. Nova Scotia Technical College. 51, A.V. Roe Nobel, Plant Engineering. 54, Consolidated Paper: Pembroke; 57, Trois Rivieres. 64, MacMillan Bloedel: Port Alberni, B.C.; 65, Castlegar, B.C., Maintenance Superintendent. 85, retired.

Eldridge, Muriel, Clerk Librarian/Clerk Computer, 1 2 3 4 5, ?

Eldridge, Tommy W., Janitor, 1 2 3 4 5, deceased.

Farrow, Frank, Janitor, 1 2 3 4 5, deceased. Wife Marge, family Bob, Frances.

Farry, Dennis T.H., Fitter-Tester, 1 2 3, ?

Fearn, Tommy S., Fitter-Tester, 1 2 3 4 5. 59, to California.

Federico, Audrey, Clerk Typist, 4 5.

Federico, Joe S., Fitter-Tester, 1 2 3 4, deceased 75.

Ferris, Cliff J., Shift Engineer, 1 2 3 4 5. 42 Parkway Cres., Bowmanville, Ont. L1C 1C1 (416) 623-2464. Wife Winnifred, family Joan, Doug, Barbara, Ken.

Fielding, Les, Fitter-Tester, 1. 1950 or earlier, A.V. Roe. 55?, to UK. 57?, Avro Aircraft, Inspector.

Findlay, Connie J. (Healey), Teletype & Switchboard, 1 2 3 4 5. 4800 La Monte, Houston, Texas 77092.

Findlay, Ian E., Instrument Tech., 1 2 3 4 5, Australia.

Finlayson, Colin, Engineer in Charge, 1 (pre-48). 557 Edison Ave., Ottawa, Ont. K2A 1V5

(613) 722-4452 or (613) 722-1658; summer P.O. Box 413, RR1, Bristol, Que. J0X 1G0 (819) 647-5817. Wife Jean (d. Oct. 88), family Harold, Barbara, Judy. 40, BASc (Mech.), Toronto. 40, Proctor & Gamble, Hamilton, Jr. Industrial Engineer. 40, CIL, Brownsburg, Que., Ass't. to Factory Sup't. 41, RCAF School of Aero Eng., Montreal. 42, RCAF Test & Dev't., Rockcliffe, Ont., Research Aero Engineer. 45, Turbo Research Ltd., Leaside, Ont., Jr. Engineer. June 1946 to Dec. 27, 1947, A.V. Roe Nobel, Engineer in Charge. Jan. 48, Air Transport Board, Ottawa, Research Aero Engineer. 51, Dept. of Transport, Air Services Branch, Aero Engineer. 53, various positions with Dept. of Defence Production, Aircraft Branch, and with successor Dept. of Supply & Services, Aerospace & Armament Branch. 76, retired.

Foley, Sylvia D. (Rogers), Computer, 3 4 5. 14 Burd St., Parry Sound, Ont. P2A 1J3 (705) 746-8344. Husband B.J. (Bud), deceased 89. Family Allan, Steven, Lianne. 51, Armitage Grocery, Parry Sound. 52, Bank of Nova Scotia. 56, Orenda, Nobel. 59, Georgian Bay Propane. 61, family.

Forth, Art M., Electrician, 1 (pre-48) 2 3 4 5, deceased 59. Wife Winnifred, 18 Wood St., Parry Sound, Ont. P2A 2C6 (705) 746-9680. Sons Roger, Wayne. Forth Bakery, Parry Sound. 27?, Department of Transport, on Murray Stewart, cook and later, radio work. 40?, Defence Industries Limited. 47, A.V. Roe/Orenda.

Forth, Audrey F., Fitter-Tester, 1 2 3 4 5, deceased 86. Wife Audrey, 21 Wood St., Parry Sound, Ont. P2A 2C5 (705) 746-5462. Sons Jim, Paul. Pre-41, Georgian Bay Creamery. 41?, Defence Industries Limited, Nobel. 52, A.V. Roe/Orenda. 59, Medical Associates, Parry Sound, carpenter and custodian. 79, retired.

Forth, Jean, Secretarial Clerk, 1 (pre-48), ?

Fowler, Ken A., Fitter-Tester, 1 2 3, ?

Fraser, Tom, Fitter-Tester, 1. 11000 Woodruff Ave. #43, Downey, California 90241. Wife Cathy. 59, Boeing, Downey, California. Later, real estate.

Frewen, P.R., 1 2, deceased.

Fultz, J.M.T., Clerk-Typist, 3, ?

Gerdes, J. Fred, Toolmaker, 1 2 3 4 5. Wife Charlotte.

Gibbons, Orville, Labourer, 1 2 3 4 5. 10 Mill St., Coldwater, Ont., L0K 1E0. Wife Doreen, daughter Heather. Second wife, Audrey.

Gibson, Harry, Engineer in Charge, 1. Wife Elsie. 49, A.V. Roe/Orenda: Malton, Supervisor Test Equipment Design; Nov. 50, Nobel, Engineer in Charge; Oct. 53, Malton. 57?, to U.K. as Managing Director of a company.

Giles, G.A., Instrument Tech., 3 4 5. 59, U.K.

Godfrey, Floyd E., Millwright > Machinist, 1 (pre-48) 2 3 4 5, deceased. 47, A.V. Roe/Orenda.

Godin, Norm A., Sheet Metal Mechanic, 1 2 3 4 5. After Orenda Nobel, rehired at Malton, Sheet Metal Mechanic.

Gonder, J. Frank, Painter, 1 2 3 4 5, deceased.

Gordon, Donald W., Mech. Instrumentation G/L, 1 (pre-48) 2 3 4 5. 111 Aloma Cr., Bramalea, Ont. L6T 2N8 (416) 793-6858. Wife Elizabeth, family Richard, Judith, Grant, Blair. H.S. Hon. Cert. Calgary; Design Draft. & Metallurgy, Central Tech., Toronto. 42, RCAF > Sgt. Gunner. 45, Turbo Research Ltd., Draftsman. 46, A.V. Roe/Orenda: Malton, Draftsman; Nov. 46, Nobel, Lab. Assistant > Group Leader, Mech. Instruments. July 59, Aero Research, Chicago, Project Engineer. 60, Cook Research, Chicago, Designer. 63, Rosemount Engineering Co., Minneapolis, Designer. 64, Thermocouple Products, Villa Park, Ill., Design Engineer. 65, AECL, Chalk River, Development Tech. 66, Thermo Electric, Brampton, Ont., Foreman, Resistance Thermometer Detectors. 68, AECL, Sheridan Park, Mississauga, Senior Design Draftsman. 86, retired.

Gordon, W. (Bill), Fitter Tester, 3 4 5, ?

Gougeon, Eddie A., Carpenter, 1 (10 yr) 2 3 4 5, deceased 84. Wife Gladys 29 Victoria Ave., Parry Sound, Ont. P2A 2C3 (705) 746-2045. Family Jack (d.), Margaret (d.), Bill (d.), Doreen, Tom, Isabel, Norma, Audrey, Bert. Farm at Powassen. 41, DIL. 45, CIL. 48, A.V. Roe/Orenda, Carpenter. 59, CIL, then carpentry for others and then as contractor.

Green, H., Instrument Tech., 1 2, ?

Grey, J., Sheet Metal Mechanic, 1 2 3 4 5, ?

Griffith, Clarence E., Fitter-tester, 1 (10 yr) 2 3 4 5, deceased.

Grigor, John, Aero Test Engineer, 1 2 3 4 5. 137 Winchester St., Toronto, Ont. M4X 1B3. Wife Angela, sons Roderick, Angus, Neal. Cooling Air Ejector Test Rig. 59, U.K. Later, Pratt & Whitney Canada, Longueuil, Que. Retired.

Hall, W.J.R. (Bill), Fitter-Tester, 1 2 3 4 5. 20 Mill Lake Rd., Parry Sound, Ont. P2A 2Y1 (705) 746-5152. Wife Dorothy (sister of Roy Smith), family Edwin, Sharon, Llewellyn, Karen, Willow, Owen. Mobile Crane Operator Licence and Tower Crane Operator Licence. Sir Sanford Fleming College certificate on safe handling of explosives, but mostly learned "the hard way, practically". 36, Pipe Fitter. 38, CIL Nobel, Pipe Fitter. 40, Fraser Brace, Pipe Fitter on DIL construction. 40, Defence Industries Limited: after 2 months training on cordite presses at CIL Beloeil, Que., taught other employees at DIL and started up two of the cordite lines. 43, RCAF. 45, Canadian Corps of Commissionaires, Shift Boss in the Fire Department for DIL plant shut-down. 46, Parry Sound Public Utilities Commission, Lineman; with Mark Nichols, a stationary engineer at CIL and a Town Councillor, formed the first union of Parry Sound employees, now CUPE, and was its first President - "that was a war!"; part time, started up Mill Lake Quarry as one-man operation; had been dormant during war; started by grandfather in

1882. 51, full time at quarry. March 52, A.V. Roe/Orenda, Nobel: Fitter-Tester; 56, Fitter-Tester "A" - Sector Annulus Atmospheric Combustion Rig, Full Annulus Atmospheric Rig, Afterburner Rig; continued quarry operation with hired staff. 59, full time on businesses - Mill Lake Quarry, Seguin Construction, and marina/cottage business on Mill Lake. 70, 71 and 72, served on Parry Sound Council with Dr. Peter Scott, who had been Orenda Plant Doctor, and with Roy Smith who was Mayor. 81 to 85, two terms as Mayor of Parry Sound. Member of first Board of Directors of West Parry Sound District Museum; still on the Building Committee.

Hamilton, Elizabeth R., Stenographer, 1 2 3 4 5, ?

Hancock, Al E., Aero Test Observer, 1 2 3, deceased 57 while employed at Nobel.

Hardie, Clarence F., Guard, 5. RR1, Parry Sound, Ont. P2A 2W7 (705) 389-2160.

Harding, James P., Combustion Test Engineer, 1 2 3 4 5. RR1, Conc. 2, Lefavre, Ont. K0B 1J0. Wife Jean, sons David, Andrew. Higher National Cert., Willesden; P. Eng., Quebec. 48, De Havilland Engine Co., U.K. 52, RNVR, S/Lt. 54, Handley Page, U.K. 55, Orenda Nobel, Combustion Test Engineer; worked on Iroquois ignition, and patent applied for on a configuration which would relight at 60,000 feet at Mach 1.3 when tested at NRC, Ottawa; also worked on Fairchild small engine combustor, and on a theoretical study for AECL of a scheme to burn hydrogen peroxide and kerosene to simulate high pressure steam for heat conduction measurements. 59, Pratt & Whitney Canada, Longueuil, Que., Facilities Design > Test Engineer > Project Engineer > Works Dept. Manager > Project Manager, Small P.T.6. 89, retired.

Harris, C., Labourer, 1 2, ?

Harris, Ivan G., Welder, 1 (10 yr) 2 3 4 5, 153 Gibson St., Parry Sound, Ont. P2A 1Y1 (705) 746-2449. Wife Freda, family Alan, Clayton, Dean. 40, Johnson Marine & Outboards, Peterborough, Welder. 41, Toronto Shipyards, Toronto and Sault Ste. Marie. 43, Purdy-Mansell, Hamilton. 46, ice business in Parry Sound. 48, A.V. Roe/Orenda, Nobel. 59, welding shop > antique shop > contract welding. 74, partial retirement following heart operation.

Harris, Eric L., Stationary Engineer, 1 2 3 4 5, 5 Maplevue Dr., Parry Sound, Ont. P2A 1P8 (705) 746-5628. Wife Denie, family Delbert, Lois, Audrey, Marcia, Sandra. 37, Transport Driver, Toronto. 43, Century Coal: Toronto and 46, Depot Harbour, Stationary Engineer. 53, A.V. Roe/Orenda, Nobel. 59, Imperial Oil, Stationary Engineer. 60, Parry Sound General Hospital, Stationary Engineer. 72, retired.

Harrison, Maurice (Maury), Aero Observer, 1, RR1. Nobel, P0G 1G0 (705) 342-5572. Wife Merl, family Curt, Connie, Gord, Anne. 49, Harrison's Georgian Bay Camp, carpentry. 51, A.V. Roe. 52, took over Harrison's Georgian Bay Camp and marina; some winter jobs until 1960. Played on Avro Nobel hockey teams until 1954.

Hayes, A.R., Trucker, 1 2 3 4 5, deceased 80?

Herbert, Larry N., Aero Observer, 1 2. Vancouver. Wife Helen.

Hilditch, W. Keith, Aero Test Engineer, 1. 18 Toddbrook Dr., Etobicoke, Ont. M9V 1R4. Wife Joyce, family Steven, Thomas, Jennifer. 49, BASc, Toronto. 49, A.V. Roe/ Orenda: Nobel, mostly on Cascade Rig. 50, Malton, performance analysis; 52, Malton, Test Engineer on Orenda and Iroquois; 59, Test Engineer and Project Engineer on OT-4, J79 and other projects. 76, Ontario Hydro, Nuclear Systems Dept., engineering administration. 89, retired,

Hill, Jack H., Combustion Test Engineering Supervisor, 1 2 3. 9 Chinook Cres., Nepean, Ont. K2H 7C9 (613) 828-8781. Wife Margaret, daughters Anne, Sherry. 49, BASc, Aeronautical, Toronto; 65, MBA, University of Michigan. 42, RCAF, Flt. Lieutenant, Pilot and Flying Instructor. Summer 48, A.V. Roe, Gas Turbine Div., Malton. May 49, A.V. Roe/Orenda: Nobel, Combustion Test Engineer; July 53, Malton, Combustion Engineer; Nov. 54, Nobel, Combustion Test Engineering Supervisor; Dec. 57, Malton, Chief Combustion Engineer. March 59, Continental Aviation and Engineering Corp., Detroit, Mich., Combustion Project Engineer > Combustion & Heat Transfer Engineer, Advanced Engineering. 65, Gov't. of Can., Dept. of Industry > Industry, Trade & Commerce > Regional Industrial Expansion, dealt with gas turbine industry and suppliers, later with recreational boat industry. 87, retired.

Hisey, Bruce, Equipment Engineer > Aero Test Engineer on CTR1 and TTR, 1. 176 Pringle Drive, Whitby, Ont. L1N 6K5 (416) 668-5663. First wife Isobel (d.), family Doug (d.), Paul, Peter, Joyce, Stephen (d.), David, Karen, Julie. Second wife Evangeline (Van). A.V. Roe/Orenda: Malton; before Nov. 50, Nobel; before Oct. 53, Malton > Supervisor, Aero Test Equipment Design. 59, Hisey & Barrington, Consultants. 75, Ministry of the Environment. 91, planned retirement.

Hitchings, Frances, Staff House, 1, deceased. Assisted Mrs. Scriver after Mr. Scriver died. After Staff House was converted back to apartments in 52, and 53, "Aunty" operated a boarding house at 23 Hillsdale which was home to new arrivals and transients.

Hobourn, Bernard F. (Bun), Labourer, 1 2 3 4 5. 13 Wood St., Parry Sound P2A 2C5 (705) 746-5684. Wife Beatrice, family Allan, Ron. Moffat's Plumbing, Parry Sound. 42, Army. 45, general plumbing. 56, Orenda, Nobel. 59, Ernie Payne > Clift Bros., plumbing. 63, Parry Sound Public Utilities Commission. 77, retired.

Hobourn, Len A., Storekeeper L/H, 1 2 3 4 5, deceased 79?.

Hobson, G.W. (Win), Aero Test Engineer, 1, ?

Hodges, W.C., Shop Inspector, 1 2 3 4 5, ?

Holmes, C. (Scotty), Fitter-Tester, 1 2 3 4 5. 59, Boeing, California.

Holmes, Tommy, Fitter-Tester, 1 2 3 4 5, deceased.

Horne, N.S., Labourer, 1 2 3 4 5, deceased.

Howes, Leslie D., Fitter-Tester, 1. 1168 North Queen Mary Way, Queen Valley, Apache Junction, Arizona 85219, U.S.A. Wife Dorothy (Bunty), family Patricia, Lesley, Michael and Sheila. Grad. Greenwich Naval School. De Havilland Engine Co., England, Technical Ass't. on dev't. of piston and jet engines. 48, A.V. Roe, Nobel. 51, National Research Council, Ottawa, Technical Officer on combustor dev't. and design. AiResearch Mfg. Co., Sr. Prelim. Design Engineer on combustor design and dev't. Combustion Devices, President and Gen. Manager, combustion systems for industrial and gas turbine use. L.D. Howes Associates, consultant on combustion. Retired. Nineteen patents in field of combustion, including six on Orenda vaporizer system.

Hughes, Pearce, Combustion Test Engineer, 1. Montreal. Wife Betty, family Anne, Joan, Tom.

Hunt, Arnold R., Stationary Engineer, 1 (pre-48) 2 3 4 5, deceased 75. Son, Garry Hunt, RR1, Nobel, Ont. POG 1G0 (705) 342-9512. Wife Evangeline, family Gwen, Ron, Doug (d.), Garry, Lois. 40, DIL, Stationary Engineer, continuously through to A.V. Roe. 46, A.V. Roe/Orenda, Stationary Engineer, through to final moth-balling, end of 61. 62, Brock Corrugated, Toronto, Chief Stationary Engineer. 68, Alcan, Bracebridge, Stationary Engineer, 7 years.

Hunter, Garnet H., Fitter Tester, (10 yr) 4 5. RR2, Site 200, Box 137, Wasaga Beach, Ont. L0L 2P0. Wife Grace, family Ted, Patricia, Suzanne. Transferred from Malton to Nobel. 59, managed Point Pleasant Resort, Parry Sound. 60, Caland Ore, open pit mining at Atikokan, Ont., Mechanic, Heavy Equipment. 65, Orenda Engines, Malton, Gas Turbine Fitter > Maintenance Foreman. 71, Kaufman Furniture, Collingwood, Ont., Finishing and Packaging Foreman. 73, Nacan Products, Collingwood, Ont., Maintenance Supervisor, also resp. for health and safety. 90, retired.

Hurd, E.E. (Ted), Aero Observer, 3 4 5. 10 Borge Ave., North Bay, Ont. P1A 2S7 (705) 472-7842. Wife Anna, family Kathrine, Michelle, Carol. 56, CNR, Brakeman. 57, Orenda, Nobel. 59, Lacnor Mine, Elliott Lake, Geology Clerk. 60, Parry Sound Public Utilities Commission, Lineman. 65, North Bay Hydro: Lineman > Charge Hand > Inspector > General Foreman > Operations Superintendent.

Hurd, Shirley G., Filing & Printing, 3 4 5. 9 Cascade St., Parry Sound, Ont. P2A 1J7 (705) 746-2746. Husband L.G. (Jake), family Gerald, Scott, Lisa. 53, National Grocers. 57, Orenda Nobel. 59, Tudhope Cartage, Bookkeeper. 61, family.

Jackson, A.T. (Huck), Pipe Fitter, 1 2 3 4 5. 59, Department of Transport, Sailor.

Jackson, Walter T., Pipe Fitter, 1 2 3 4 5, ?

Jennings, Gord, Administration Supervisor, 1. 60 James Park Square, Scarborough, Ont. M1V 2E6 (416) 298-8755. Wife Vi, family Cheryl, Lynn, Glen, Jay. 40?, Toronto Police, cadet > i/c Accident Bureau. 45, Royal Canadian Navy. 48, purchased lodge in McKellar. Nov. 48, A.V. Roe, clerk-typist > Admin. Supervisor. 53, insurance adjusting. 83, retired. Provided typing services for the Avro Nobel "Outpost".

Johnston, George H., Fitter-Tester, 1 2 3 4 5, deceased.

Johnston, Peter, Stationary Engineer, 1 2 3 4 5. 30 Pine Ridge Dr., RR3, Parry Sound, Ont. P2A 2W9 (705) 342-5861. Wife Doreen, family Lee, Wanita. 41, CIL, Nobel, ammonia yard. 41, DIL: blending & packing; 42, dehydration presses; 43, power house (4th Class Cert. 43), fired high press. boilers until plant shutdown in 45. Construction and saw milling. 48, A.V. Roe Nobel, power house, but laid off. 52, A.V. Roe/Orenda, Nobel, power house, firing H.P. boilers. 59, saw milling. 68, CIL Nobel power house. 81, retired, but still has trap line.

Jones, W.S. (Reg), Plant Engineering Supervisor, 1 (10 yr) 2 3 4. 48, A.V. Roe/Orenda, Nobel, Power Plant Supervisor; 53, Plant Engineering Supervisor; 58, Malton, General Plant Services Superintendent.

Joy, J. Richard (Dick), Aero Test Engineer, 1. 4877 Split Rail Lane, Brighton, Michigan 48116. Wife Mary, family Janet, Douglas, Patricia. 49, SB, Massachusetts Institute of Technology. June 49, A.V. Roe/Orenda: Nobel, Aero Test Engineer on Probe Rig, including aero test of 1/7 scale F-86 inlets and Orenda burner inlet diffusers, Cascade Rig, and in 52, CTR1; 53, Nobel, Combustion Test Engineer; 53, Malton, Performance Engineer; 56, Malton, NACA Cleveland Project Engineer; 58, Malton, Supervisor, Thermodynamics. 59, Vickers Inc., Staff Engineer. 62 to present, Williams International, Performance Engineer > Assistant Chief Design Engineer > Manager Aerothermodynamics > Senior Engineering Specialist.

Joyce, Ray M., Fitter-Tester, 1 (pre-48), deceased 87. Wright Bros. Engine Co. in Montreal. 43, National Research Council: Sept. 43, jet engine familiarization course in U.K. on Rolls Royce B-23 jet engines; summer 44, further course in U.K. on Armstrong Siddeley ASX axial flow jet engine and on Whittle W-2-700; winter 44/45, NRC Cold Weather Test Station, Stevenson Field, Winnipeg, on ASX engine. April 45, Turbo Research Ltd., Leaside, i/c demonstration strip-down and rebuild of B-23 engine for staff training; winter 45/46, return to Winnipeg on testing of B-23 and W-2-700. May 46, A.V. Roe/Orenda: Nobel; 47, Malton, i/c build of Chinook engine for first run on March 17, 48 > General Foreman, Repair, Overhaul and Test, in Production Dept.

Kearns, Red, Trucker, 1, deceased.

Kemp, E.W., Fitter-Tester, 1 2 3 4 5, ?

Kerr, Stu, Test Technician > Shop Planner, 1 2 3 4 5. Picton, Ont. Wife Dorothy, family Karen, Ian. 59, printing business in Parry Sound.

Keyworth, A. (Bert), Aero Engineer, 3 4 5. CTR1. 59, returned to U.K.

Kielland, Axel, Combustion Test Engineer, 1 (pre-48). 5 Greenhill Way, Ottawa, Ont., K1K 0R5 (613) 746-0442. 45, BEng (Chemical) McGill. Wife Anne, family Sandy, Peter, Lissa. June 45, Turbo Research, Leaside; jet engine familiarization in U.K. May 46, A.V. Roe; completion of course. Dec. 46, Malton, design and liaison on opening Nobel Test Establishment; April 47, Nobel, on combustion system development. May, 50, Aluminum

Company of Canada, Arvida, Quebec. 53, Dept. of Trade & Commerce > Dept. of Defence Production > Dept. of Supply & Services, Aircraft Branch, monitoring programs of A.V. Roe, Canadair, Canadian Pratt & Whitney; Aircraft Branch liaison officer on the project management team for Arrow; later, Ships Branch. 83, retired.

Kingston, Dan J., Fitter-Tester, 1 (10 yr) 2 3 4 5, deceased 72. Wife Olive 237 Nobel Rd., Nobel, Ont. P0G 1G0 (705) 342-5594. Sons Don, Patrick. Educated County Cork, Ireland. 33?, General Electric, London, England, Foreman, Glass Section. 45, Wansworth Jail, i/c Materials Receiving. Oct. 49, A.V. Roe/Orenda Nobel, Fitter-Tester on most combustion rigs. 59, Postmaster, Nobel.

Kingston, Donald E., Vibration Tech., 1 2 3 4 5. Box 85, McKellar, Ont. P0G 1C0 (705) 389-2616. Wife Lois, family Daniel, Kathleen. Grad. Parry Sound High School. 56, Orenda: Malton, Vibration Tech.; 58, Nobel, Vibration Tech.

Knight, James L., Fitter-Tester, 1 2 3 4 5, deceased 86. Wife Isabell, 86 Isabella St., Parry Sound, Ont. P2A 1M6 (705) 746-2058. Family Jim, Charlie, Ted, Robert, Don. 31, Department of Transport, Sailor, then miner in Sudbury. 40, Fraser Brace, Pipe Fitter on construction of DIL. 40, Defence Industries Limited, Cordite Foreman; fire in which 15 men were burned. 43, RCAF. 45, Parry Sound Public Utilities, Lineman. 49, A.V. Roe/Orenda, Nobel, Fitter-Tester. 59, CKAR radio station, Parry Sound. 60, life insurance salesman. 45 to 60, Parry Sound Fire Department, Volunteer.

Kraus, Helmutt, ?, 1, deceased.

Kraus, Otto, Fitter-Tester, 1 2 3 4 5. 815 Miller St., Greenfield Park, Que. J4V 1W8 (514) 672-6511. 59, Pratt and Whitney Canada, Longueuil, Que.

Kretschmer, Willi K. (Bill), Combustion Test Engineering Supervisor, 1 2 3 4 5. 103 Discovery Bay Crt., Sequim, Washington 98382. Wife Edith, family Doris, Dietrich, Hans. 45, Dipl. Eng., Breslau, Germany; 54, C.Eng. MIMechE, London, England. 40, H. Walter Werke: Research Engineer, Kiel, Germany; 43, Group Engineer, Silesia. 45, British Control Commission, Rocket Research, Trauen, Germany. 47, Royal Aeronautical Establishment, England: Farnborough, Research Scientist; 48, Westcott, Rocket Propulsion Dept., Sr. Project Officer. Nov. 55, Orenda Nobel: Combustion Specialist on Iroquois afterburner; 57, Combustion Test Engineering Supervisor. 59, Continental Aviation, Detroit, Ass't. Dept. Head. 60, Vickers, Detroit, Manager, Advanced Systems. 63, Lockheed Missile & Space, Santa Cruz Test Base, Ca.: Research Scientist; 65, Staff Scientist. 78, retired.

Land, Russel R., Trucker, 3 4 5. 2 Mill Lake Rd., Parry Sound, Ont. P2A 2X9 (705) 746-5528. Fire Fighting Operations Course Certificate. Hoisting Engineer Certificate for Mobile and Tower Cranes. 56, Orenda. 59 to 64, summers, Mill Lake Stone Quarry; winters, various construction jobs, but 61, 6 weeks loading test equipment from Nobel for shipment to National Research Council, Ottawa. 64, summers, various projects for Ontario Hydro; winters, construction jobs. 66 to present, Ontario Hydro full time. 15 years Parry Sound Volunteer Fire Dept.

Lang, Martin W., Sgt. Plant Protection, 1 2 3 4 5, ?

Lavoie, V.J., Stationary Engineer > Fitter-Tester, 1 2 3 4 5, ?

Lavoie, V.L. (Bud), Shift Engineer, 1 2 3 4 5, deceased.

Leblanc, Hugh, Draftsman, 1. 50, A.V. Roe, Nobel. Returned to Malton.

Lawson, Reg, ?, 1, ?

Leblanc, Leo, Fire Fighter, 1 2 3 4 5, ?

Lee, Herbert F. (Bert), Fitter-Tester, 1 2 3 4 5, deceased 60. Wife Mina, 44 Carter St., Port Colborne, Ont. L3K 3J6 (416) 834-7940. Family Sandra, Alan. 36, RAF, #185 Fighter Squadron, flying Hurricanes. 39, British Expeditionary Force, France. 40, Dunkirk; to Flt. Sgt. 43, RCAF. 45, Dominion Bridge, Toronto. 47, National Steel Co., U.K., Fitter. 50, Goodyear Co., Pliofilm Div., Toronto. 53, A.V. Roe/Orenda: Malton; 53, Nobel, Fitter-Tester. 59, Babcock Wilcox Engineering, Galt.

Leroux, Ed P., Storesman > Fitter-Tester, 1 (pre-48) 2 3 4 5. 13 Lawson Ave., Orillia, Ont. L3V 3V5. Wife Eileen, family John, Bob, Sherry. 38, Department of Transport, Sailor. 42, Navy. 45, War Assets on shut-down of DIL. 46, A.V. Roe/Orenda. 59, odd jobs in Parry Sound. 60, Dorr-Oliver-Long, Orillia, Overhead Crane Operator. 86, retired.

Liness, Ed G., Instrument Tech., 1 2 3, ?

Lomax, John A., Combustion Test Engineer, 5, ?

MacDonald, A., Instrument Tech., 1 2, ?

MacDonald, Ian L., Instrument Tech., 1 2 3 4 5. 1 Victoria Ave., Parry Sound, Ont. P2A 2B9 (705) 746-5558. Wife Bonnie, family Malcolm, Murray, May, Morley, Brenda. 49, watchmaking grad., Central Tech., Toronto. 49, Lloyd Thompson Jewellers, Parry Sound. 55, Orenda Nobel, Instrument Tech. 60, Ian Macdonald Jewellers, Parry Sound. 85, retired.

MacLean, John (Mac), Power Plant Supervisor, 1 (pre-48), deceased 1948. 47, A.V. Roe Nobel.

Madigan, Irene E. (Draycott), Teletype Switchboard, 4. Sundridge and Parry Sound.

Magro, Joe, Equipment Designer, 1. A.V. Roe before June 49.

Marcok, Paul, Aero Test Tech., 1 2 3 4 5. 94 Vista Blvd., Mississauga, Ont., L5M 1V9 (416) 821-3420; summer resident, McKellar. 60, Pratt & Whitney Canada, Longueuil, Que., i/c fuel lab.; 80, Mississauga.

Marcoullier, J.A. (Bert), Fitter-Tester, 1 (pre-48). 2911 Oakmoor Dr. South West, Calgary, Alberta T2V 3Z3. Wife Germaine, d. 89. National Research Council. Sept. 43, jet

engine familiarization course in U.K. on Rolls Royce B-23. April, 45, transferred to Turbo Research Ltd., Leaside. May 46, A.V. Roe/Orenda: Malton; July 46, Nobel; 47, Malton > Superintendent, Development Shop > Superintendent, Assembly Shop in Experimental Dep't. Later, Alberta Gas Trunkline, Calgary. 86, retired.

Margison, Clay A., Aero Test Engineer > Plant Engineering Supervisor, 1 2 3 4 5. Box 348, 973 Massie Dr., Prescott, Ont. K0E 1T0 (613) 925-3288. Wife Ruth, family Scott, Mary, Steven. 51, B.E., Nova Scotia Technical College. Summer 50, A.V. Roe/Orenda, Malton; 51, Nobel, Aero Test Engineer (in 52, Probe Rig) > Plant Engineering Supervisor. 59, Algoma Steel Corp. 60, Department of Transport > 65, Canadian Coast Guard, Parry Sound > Prescott, Ontario. Retired 87.

Mark, Gordon, Fuel Lab. Tech., 1 2 3 4 5. WW II, officer in artillery. Turbo Pump Rig, Fuel Lab. Calibration Rigs. 59, National Research Council, Carleton University Labs., Ottawa, then to Philadelphia.

Martin, John, Aero Test Engineering Supervisor, 1. 314 Williams Ave., Milton, Ont. L9T 2G2. Wife Vera, family Michael, Mary, Catherine, Paul. July 51, A.V. Roe/Orenda: Malton; Aug. 51, Nobel, Aero Test Engineering Supervisor; Nov. 54, Malton, Supervisor, Test Equipment Design; 59, Atomic Products Senior Engineer. 67?, Canadian Pratt & Whitney: Longueuil, Que. > Mississauga. 88, retired.

Marwood, R.A. (Bob), Fitter Tester, 3 4. 55 McMurchy Ave. N., Apt. 504, Brampton, Ont. L6X 1X9. Orenda: 58, transferred to Malton, Plant 1; 61, transferred to Sheet Metal in Plant 2, Derry Road; 80, retired. 80, Canada East Pipeline Equipment Co. Ltd., pipeline construction equipment repair, part time.

Marwood, Tom D., Sheet Metal Mechanic, 1 2 3 4 5. 31 Old Garden River Rd., Sault Ste. Marie, Ont. P6B 5Y7. After Orenda, Algoma Steel.

McCallum, Allan A., Maintenance Man, 1 2 3 4 5. 50 Bowes St., Parry Sound, Ont. P2A 2L2 (705) 746-5346. Wife Esther, family Michele, Laurie, Leslie, Jill, Patrick. Before 47, coal docks at Depot Harbour, and various construction jobs including Dominion Bridge, then CIL, Nobel. 47, Dept. of Transport. 49, A.V. Roe/Orenda, Nobel. 59, Canada Coast Guard, Parry Sound. 82, retired.

McCauley, Jack, Guard, 1 2 3 4 5, ?

McCauley, Tom, Combustion Engineer, 1, ?

McCloghry, Tom, Aero Test Engineering Supervisor, 1. 17 Cold Spring Rd., Easton, Connecticut 06612 U.S.A. Wife Enid, sons Thomas, Gerald, Matthew. 41, Mech. Sc. Tripos, Oxford University. 42, RAF, Pilot. 46, College of Aeronautical Engineering, England. 47, Bristol Aeroplane Co., England, Lab. Tech. May 49, A.V. Roe/Orenda: Nobel, Lab. Tech. > Aero Test Engineer; Aug. 52, Malton, Specialist Engineer, Test Equip. Design > Design Group Leader; Nov. 54, Nobel, Aero Test Engineering Supervisor; Aug. 56, Malton, Supervisor, Altitude Test Facility Design > Chief, ATF. 59, Compudyne Corp., PA, Project Engineer. 70, Bridgeport Machines, CT, Product Mgr.

Numerical Controls (et al).

McDonald, W.M. (Bill), Test Plant Foreman, 1 (pre-48) 2 3 4 5. South River Rd., Box 637, Elora, Ont. NOB 1S0 (519) 846-0523. Wife Beryl. April 39, Fraser Brace Construction on construction of Defence Industries Plant, Blacksmith > Head Blacksmith > Layout Man > night shift Master Mechanic. 40, Defence Industries Ltd., Welder > Machinist > Craftsman > Sheet Metal L.H. March 46, War Assets on plant shut-down. Aug. 46, Canadian Industries Limited. Dec. 46, A.V. Roe/Orenda, Nobel: machine shop on welding, sheet metal development, machining > Ass't. Shop Foreman; 49, Test Foreman. 59, Babcock, Wilcox, Goldie & McCulloch, Galt, Boiler Layout Man. June 59, National Research Council, Ottawa; Mechanical Engineering Division, Engine Laboratories. 73, first retirement, to partnership with Art Sutton in "The Forgerie", an ornamental ironwork shop, Elora, Ontario. 85, second retirement.

McDonnell, R., Fitter-Tester, 1 2 3 4 5, ?

McEachren, Donald R., Aero Tech., 1 2 3 4 5. 2220 Sixth St., Santa Monica Ca 90405 (213) 396-3549. Wife Rhoda (d. 78), family Brenda, Craig. 59, Security Pacific Bank, Los Angeles. 85, First Interstate Bank, Los Angeles, Vice President.

McGee, Wm. F., Student Combustion Observer, 2. 73 Crystal Beach Dr., Nepean, Ont. K2H 5N3 (613) 828-9130. Wife Nora, family Bill, Tara, Barbara, Heather, Paul. 59, BAsC in Engineering Physics (Electronics), U. of Toronto; 60, MA in Applied Math, U. of T.; 62, PhD, Electrical Engineering, Illinois. Summer 56, Orenda, Nobel: Gas Analysis Lab. with David Rose; summer 57, calculations and instrumentation. Summer 58, National Research Council. Summers 59, 60, 61, Ferranti-Packard, Toronto. 62, U. of Waterloo, teaching Electrical Engineering. 66, Bell Northern Research. 86, University of Ottawa, Electrical Engineering Dept., Research Professor, 5-year Industrial Research Chair sponsored by BNR and the National Sciences and Engineering Research Council. At termination, plans to consult in digital signal processing.

McGinnis, Myrt H., General Office Group Leader, 1 (10 yr; pre-48) 2 3 4 5. 6 Avenue Rd., Parry Sound, Ont. P2A 2Z1 (705) 746-2985. Husband Merv, son Jack. 41, Defence Industries Limited. 45, War Assets Disposal. 47, A.V. Roe/Orenda: Stores Clerk > Secretary to EIC/Personnel Records Clerk; 59, Termination Clerk on plant shut-down. 62, Tudhope Cartage; also owned and operated Killbear Marina with Merv. 64, Hart's Garage, Parry Sound, Chev dealership. 75, took over Hart's Garage; re-named Bayview Chev Olds.

McInnis, D.W., Maintenance Man, 1 2, ?

McKinstry, W., Stationary Engineer, 1 2 3 4 5, deceased. Wife Merrilee.

McLean, S., Fire Fighter, 4 5, ?

McLeod, Lou (Chennette), Clerk, 1. 69 Highland Cres., Parry Sound, Ont. P2A 1H7 (705) 746-9688. Husband Vernon, family Kevin, Karen, Brian. 50, Bank of Commerce. 52, A.V. Roe. 53, family. 77 to present, Crown Attorney's Office, Parry Sound Court House.

Miller, J. Austin, Fitter-Tester, 1 2 3 4 5. 2292 New St., Burlington, Ont. L7R 1J3 (416) 634-6413. Wife Marian.

Milne, Andrew R., Fitter-Tester, 3 4. 47 William St., Parry Sound, Ont. P2A 1V2 (705) 746-5578. Wife Jean, daughters Patricia, Christina, Andrea. 46, RAF, U.K. and Aden, Flight Mech. Engines > Fitter II Engines, Cpl. Technician. 56, Orenda Nobel, Fitter Tester, Rotating Blade Cooling Rig. 59, Lowphos Iron Ore Co./National Steel, Depot Harbour, various inc. Dumphouse Op., Shiploader Op., Maint. Mech. 80, Victory School, Head Custodian. 89, retired.

Monks, Ed H., Instrument Tech., 1 2 3 4 5, ?

Moon, Harry S., Toolmaker, 1 2 3 4, ?

Moore, G.A. (Gerry), Stationary Engineer, 1 2 3 4 5, deceased 88. Wife Jean, daughters Julie, Stacey.

Moore, Howard C., Carpenter, 2 4 5. 17 Prospect St., Parry Sound, Ont. P2A 2B5 (705) 746-2459. Wife Zilpha, son Kerry, daughter Terry, son Randy. 44, Defence Industries Limited, Nobel. 45, Canadian Industries Limited, Nobel. 54, Orenda, Nobel. 59, Parry Sound Board of Education. 64, Department of Transport > Coast Guard, Parry Sound. 90, retired.

Morris, Ernie, Millwright, 1 2 3 4 5, ?

Morrison, Donald E., Combustion Test Engineering Supervisor, 1 (10 yr). 224 Joseph St., Box 146, Kemptville, Ont. K0G 1J0 (613) 258-2586. Wife Elsie, sons Bob, Ted, Doug. Kemptville High School. Spring 45, Queen's University (vets' special summer semesters); 48 1/2, BSc, Mech. Eng.; 64, MBA Xavier (Ohio). 41-45, RCAF, Pilot. 46, A.V. Roe/Orenda: Oct. 46 to April 47, Aircraft Div., C102 wing design; Oct. 47 to April 48, Gas Turbine Div., fuel system design; Oct. 48, Nobel, Combustion Test Engineer; 53, Combustion Test Engineering Supervisor; Nov. 54, Malton, Chief Development Engineer > Chief Controls Development Engineer. 59, General Electric Co., Aircraft Engine Div., Evandale, Ohio, advanced engine technology development. 71, Ottawa, Dept. of Industry, Trade & Commerce, industrial technology development. 56 to 59, RCAF Reserve. 87, retired.

Mullen, C. Anne, Clerk-Typist, 3 4 5, ?

Munnings, C., Storekeeper, 1 2, ?

Nakashima, J., Draftsman, 5, ?

Neal, Brian, Aero Test Engineer, 4. 6737 Beach Dr. S.W., Seattle, Washington 98136, U.S.A. (206) 935-0351.

Nelson, C. Douglas, Maintenance Man, 1 2 3 4. 6671 Ganymede Rd., Mississauga, Ont. L5N 4V3 (416) 824-4340. Wife Hazel, daughter Marnel, son Marshall. 56, Orenda,

Nobel. 58, Ryerson Tech., Toronto. 59, Marshall Sales & Service, Parry Sound, Manager. 64, AECL, Chalk River Nuclear Laboratories, Technician under Phil Ross-Ross working on creep of zirconium pressure tubes in CANDU reactors. 69 to present, Ontario Hydro, Central Production Services, Toronto, Senior Technical Officer, Inspection and Maintenance of, among other components, reactor pressure tubes.

Newbold, Walter F., Sheet Metal Mechanic, 1 (10 yr) 2 3 4 5. 11724 Hoback St., Norwalk, California 90650. Wife Marjorie (Madge), family Janet, Roger, John. Apprenticeship in father's sheet metal works, 7 years. War years, Fraser Nash Aircraft on Spitfires and Lancasters. 48, A.V. Roe/Orenda, Malton, then Nobel. 59, to California, first as an employee, then own sheet metal repair business.

Nicol, Cam M., Aero Engineer, 1 2. Cascade Rig and Static Blade Cooling Rig.

Nielsen, Paul B., Drafting Group Leader, 1 (pre-48). 10 Howard Dr., Toronto, Ont. M2K 1K5 (416) 221-8058. Wife Margaret, family Paul, Judy, Karl. 41, Walker-Wallace Ltd., Toronto, Machinist. 42, RCAF, Engine Mechanic > Navigator. Jan. 45, Turbo Research Ltd., Leaside, draftsman trainee at Central Tech. > Draftsman. May 15, 46, A.V. Roe/Orenda, by transfer from Turbo Research to Malton: Draftsman; Oct. 46, Nobel, Draftsman > Drafting G/L; 52, Malton, job evaluation specialist > Ass't. Industrial Relations Mgr.; Sept. 59, Manager Personnel and Industrial Relations. May 71, Oshawa Group Ltd., Mgr. Industrial Relations > Dir. of Industrial Relations > Corp. V.P. of Industrial Relations. July 89, retired.

Nutt, Ron H., Combustion Test Engineer, 1 2 3 4 5. 6004 Jeanine Drive, Louisville, Kentucky 40219, U.S.A. Wife Margaret, family Marian, Theresa, Judith, John. 52, BASc, Toronto. 52, National Research Council. 53, Brantford Coach & Body. Oct. 55, Orenda Nobel on Annular Atmospheric Rig. 59, Pioneer Saw, Peterborough. Nov. 59, General Electric, Aero Engine Division, Evandale, Ohio. Feb. 75, Air Pollution Control District, Louisville, Kentucky. Retired Jan. 89.

O'Donnell, R.J. (Bob), Electrician, 1 2 3 4 5, deceased. Wife Ethel, Belvedere Heights Home for the Aged, 21 Belvedere Ave., Parry Sound, Ont. P2A 2A2 (705) 746-5871.

O'Halloran, W.L. (Bill), Guard, 1 2 3 4 5, ?

Olafson, M.O., Aero Engineering Ass't., 1 2 3 4, North Bay, Ont.

Oldfield, Harry R., Toolmaker, 1 (pre-48) 2 3 4 5, deceased Feb 28, 1991. Wife Marjorie, deceased. Sons Robert, 47 Moore Place, Barrie, Ont. L4N 6P1 (705) 726-3245, Charles. 47, A.V. Roe/Orenda Nobel.

Oman, George, General Services Supervisor, 5, deceased. Wife Jessie. Had been manager of a textile mill in Lima, Peru. 58, Orenda Nobel. 59, Malton, sales engineer on industrial engines.

Orr, J.R.H., Fitter Tester, 3 4, ?

Orr, Virginia (Burditt), Clerk, 1. 1 Georgian Bay Ave., Parry Sound, Ont. P2A 3B1
(705) 746-6490. Husband, Howard. Now Stedmans Department Store, Parry Sound.

Otley, John H., Drafting Group Leader, 1 2 3 4 5, deceased Dec. 24, 86. Wife Jean, d. 90; family Nancy; Gordon Otley, 6679 Shelter Bay Rd. #20, Mississauga, Ont. L5N 2A2 (416) 826-3348; Barbara; Susan; Melodie. 43, diploma Harrow High School; 44-46, courses in aeronautics, math and engineering at London University. 45, De Havilland, London, England; worked beside Geoffrey De Havilland, Jr. at one stage. 47, A.V. Roe/Orenda: Malton; 49, Nobel, Draftsman > Drafting Group Leader. 59, self-employed, architectural drafting and design. 59, Orenda Malton, G/L, Industrial Turbine Design; also some work on nuclear reactor design. 86, retired. Worked with Boy Scouts of Canada 35 years > District Commissioner and consultant on outdoor training.

Page, Ron D., Aero Test Engineer, 1 2 3. 1351 Devon Rd., Oakville, Ont. L6J 2L9
(416) 845-5931. Wife Bette, family Tim, Kimora, Shelley, Pamela. 42 to 47, RAF; served in India. 52, degree in Aero, Loughborough Univ. 52, Bristol Engines. 54, Orenda: Nobel, Aero Test Engineer on Cascade Rig, Probe Rig, CTR2, and Cooling Air Ejector Rig; 58, seconded to Atomic Energy of Canada Ltd., Chalk River. 59, AECL, Chalk River, Head, Power Reactor Fuel Engineering. 70, AECL Engineering Co., Sheridan Park, R & D Program Manager for CANDU Power Reactor development programs; 80, Program Manager for CANDU Owners Group. 87, retired; Nuclear & Aviation Consultant & Historian. Co-author of "Avro Arrow CF-105"; author of "Avro Canuck CF-100", "Canada's Flying Museum", and "Fleet - the Flying Years"; assisted Bette in producing "Mynarski's Lanc"; writing "The Avrocar or Canada's Flying Saucer".

Payne, Harry J., Guard, 1 2 3 4 5, ?

Peacock, R.W., Electrician, 1 2 3, ?

Pefhany, Gerry, Instrument Lab. Supervisor, 1 2 3. Aug. 55, Instrument Lab. Supervisor. 57, Malton, Supervisor, Instrumentation Dev't. 59, started own instrument company in Acton, Ontario, then moved to U.S.A.

Perrior, Bernard, Combustion Test Engineer, 1 2 3 4 5. 14 Central St., Guelph, Ont. N1H 4K5. Wife Shirley, family Shelley, Denise, Robert. Orenda Altitude Combustion Rig, Orenda Atmospheric Combustion Rig.

Phillips, G.E., Janitor, 3 4 5, ?

Pilgrim, Herb, Stationary Engineer, 1 2 3 4 5, deceased.

Pitt, Victor L., Instrument Tech., 1 2 3, ?

Platt, A.S., Sheet Metal Mechanic, 3 4 5, ?

Plowman, Jack H., Test Sub-Foreman, 1 (pre-48) 2 3 4 5. Hwy. 559, Nobel, Ont. P0G 1G0
(705) 342-5585. Wife Marian, sons John, Kenneth. Educated in Orillia. 39, Villas Enamel, Orillia, grinding frit. 40, Defence Industries Ltd., Nobel, guncotton finishing

house. 42, RCAF. 45, purchased property and built Hidden Lake Camp, Carling Township. 47, A.V. Roe/Orenda, Nobel, Fitter-Tester > Test Sub-Foreman on a number of rigs. 59, full time Hidden Lake Camp. 61, built service station on new Hwy. 69. 69, sold service station and built motor cycle shop in Parry Sound. 72, retired. 53, first elected to Carling Township Council; elected Reeve twice in 25 years on Council.

Pocock, Leslie M., Instrument Tech., 1 2 3 4 5, deceased Nov. 89. Wife Hilda (Lincolnshire, England), family Dudley, Rita (Mrs. B. Peel, 9 Yarrowside, Little Chalfont, Bucks, England), Kandi. Pre-war, John Compton Organ Co., London, Eng., Apprentice > Organ Builder; during war, built electronic components for Hawker Hurricanes and De Havilland Mosquitoes; after war, resumed installation and repair of electronic organs. June 52, Orenda Nobel, Electronic Instrument Technician. 59, returned to England and electronic organs.

Pollard, Art, Sheet Metal Mechanic, 1 (pre-48), deceased. Wife Nel (d.), 2 boys. 47, A.V. Roe/Orenda: Nobel > Malton. 59, to Boeing, Downey, California.

Poytress, Chuck A., Scheduling Clerk, 1 2. 2003 - 19 Ave. N., Lethbridge, Alberta T1H 4G4. Wife Joan, family Alan, Glen (d.), Lynn, Shawn, Faye. 51, RCMP. Aug. 55, Orenda. 59, RCMP: Regina, Ottawa, Sault Ste. Marie, Moose Factory, Red Deer, Wesaskiwin, Airdrie and Lethbridge > Sgt. 88, retired from RCMP.

Poytress, Charlie H., Shift Engineer, 1 (pre-48) 2 3 4 5. 58 Waubeek St., Parry Sound, Ont. P2A 1C3 (705) 746-5275. Wife Mabel, family Chuck, Eugene, Stanley. 23, Department of Transport, Engineer Apprentice on ships. 27, Operating Engineer on commercial Great Lakes shipping. 40, Defence Industries Limited, Stationary Engineer. 47, A.V. Roe, Nobel. 48, returned to Great Lakes shipping. 52, A.V. Roe/Orenda, Nobel. 59, Gov't. of Canada, Penhold Airfield, Stationary Engineer. 70, retired.

Prosser, Art H., Fitter-Tester, 1 2 3 4 5. 43 Westvale Dr., Bracebridge, Ont. P0B 1C0 (705) 645-3485. Wife Dorothy.

Prosser, Harold S., Janitor, 1 2 3 4 5, deceased. Wife Edna, 60 Waubeek St., Parry Sound, Ont. P2A 1C3 (705) 746-5525.

Puttick, Donald W., Aero Test Engineer, 5. 473 Brierwood Ave., Ottawa, Ont. K2A 2H2 (613) 729-6292. Wife Esme, sons Stephen, Michael, James. 49, BSc (Eng), London, England. 49, English Electric Co., Stafford, Design Engineer. 52, Rolls-Royce Ltd., Derby, Ass't. Engineer, Mech. Rig Test. 56, Canadian Westinghouse Ltd., Hamilton, Ont., Circuit Breaker Engineer. 58, Orenda, Nobel, Aero Test Engineer. 59, Permali (Canada) Ltd., Project Engineer. 64, Gov't. of Canada, Patent Examiner. 67, Gowling & Henderson, Patent Agent. 74 to present, Gov't. of Canada, Patent Examiner.

Ramsay, Ron J., Aero Observer, 1 2 3 4 5. RR1, Nobel, Ont. P0G 1G0 (705) 342-5740. Sons John, Waylon, daughter Leslie. 56, Orenda Nobel. 59, Stelco. 60, started own contracting business, building roads etc., but winter 61-62, Stelco.

Read, H. Earl, Draftsman, 1 2, deceased.

Reed, Barbara J. (Savage), Student Aero Observer, 1 2. 160 Clearview Ave., Ottawa, Ont. K1Z 6S5 (613) 728-6670. Husband R. Barry, family Christopher, Bruce, Thea. 54, 17th birthday, Pilot's Licence. 60, BA, Toronto; 68, LLB, Dalhousie; 70, LLM, Dalhousie. 71, called to Bar, Ont. 82, Q.C. Summers: 52, A.V. Roe, Aircraft Div., clerical, Quality Control; 53, Aircraft Div., clerical support for RCAF; 54, Gas Turbine Div., clerical, Quality Control. Summer 55, weather office, Malton. Summers 56 & 57, Orenda, Nobel, Aero Observer. Summers 58 & 59, Canadian Kodak, technician. Family. 71, Ass't. Prof., U. of Ottawa, Common Law. 73, Dept. of Justice, Ottawa, Legal Officer. 74, Constitutional Adviser to Privy Council Office and Federal Provincial Relations Office; 80, Director of Legal Services, Federal Provincial Relations Office. 82, Legal Counsel to Privy Council Office. 83, Judge, Trial Division, Federal Court of Canada.

Reed, Robert G. (Bob), Aero Test Engineer, 1. 18 Suburban Drive, Mississauga, Ont. L5N 1G5 (416) 826-1643. Wife Rita, family Terry, Kimberley, Robert C. 46, AMIMechE, 47 AFRAeS, 48 APEO. 38, Sperry Gyroscope Co. Ltd., Middlesex, UK: Apprentice; 44, Research Tech. Ass't. 45, Rolls Royce Ltd., Hucknall, Notts., UK, Technical Ass't. Aug. 47, A.V. Roe/Orenda: Malton, Technical Assistant; May 48, Nobel, Aero Test Engineer on Diffuser Rig, Fixed Incidence Cascade Rig, CTRL (assisted), Variable Incidence Cascade Rig, and 52, Turbine Test Rig; Feb. 54, Malton, Field Service Representative; 57, Service Engineering Supervisor; 59, Senior Engineer; 67, Manager, Service Engineering; 69, Manager, Aero Engineering Support; 70, Manager, Turbine Engineering Support; 71, Manager, Military Programs Support; 72, Manager Military Programs and Laboratories; 72, Manager, Aeronautical Sales; 75, Manager, Aeronautical Programs Support; 81, Chief Engineer; 82, Director of Marketing; 83, Manager, Sales & Contracts - Product Support; 84, Manager, Strategic Planning; 87, Manager, Special Programs. 88, retired.

Reid, Sam J., Shift Engineer, 1 2 3 4 5, deceased 83?

Rennie, R. (Bob), Fitter-Tester, 1 2 3 4 5, deceased 89. 59, to Boeing, Downey, California.

Rider, Art H., Test Plant Foreman, 1 (pre-48), deceased. Late summer, 46, A.V. Roe/Orenda: Nobel; 49, Malton, Chief, Engine Test; 59, supervisor in service operations.

Robertson, Cora, Clerk Computer, 1 (10 yr and pre-48) 2 3 4 5, deceased 86. Sons Don, Jim, Kelly. Postmistress, Nobel Post Office, at this time located across #69 from plant. 47, A.V. Roe/Orenda Nobel.

Robinson, C.R. (Sam), Fire Fighter, 1 2 3 4 5. 7-A Addie St., Parry sound, Ont. P2A 2J9 (705) 746-2083. Wife Elsie, daughter Diane. 40, Fraser Brace on DIL construction. 42, Pigott Construction on construction of Polysar in Sarnia. 44, construction in Parry Sound. 56, Orenda, Nobel, when full-time firefighters were first hired. 59, C.R. Robinson Construction, Parry Sound. 90, retired. 48, 49, Parry Sound Council. 44 to 60, volunteer firefighter in Parry Sound.

Rogers, George A., Aero Test Engineer > Vibration Engineer, 4, deceased while at Nobel. Wife Irene, sons Brock, John, David. Rotating Blade Cooling Rig.

Rogers, Tom, Combustion Test Engineer, 3, ?

Rooney, Mark L., Combustion Test Engineer, 1 2 3. 58 Oxenden Cres., Etobicoke, Ont. M9C 4H6 (416) 621-3399. Wife Catherine, family Maria, Paul. Assoc. Mem., Inst. of Mech. Engineers (England). Studied at Canterbury University College, Christchurch, N.Z. 38, N.Z. Gov't. Railways. 42, RNZAF, Navigator (W). 45, N.Z. Gov't. Railways. 52, A.V. Roe/Orenda: Malton, Test Equipment Des. Engineer; 52, Nobel (principally on Annular Atmospheric Combustion Rig, designing the first traverser for it); 57, Malton, Specialist Engineer, Combustion. 59, General Electric Co., Cincinnati, Ohio, Specialist, Engine Evaluation. 61, Can. Westinghouse, Hamilton, Gas Turbine Test Engineer. 66, Ontario Hydro, Bruce Engineering Dept., Design Engineer. 83, retired.

Rose, A. David, Combustion Test Engineer, 1 2 3 4 5. Orenda High Pressure Combustion Rig, Combustion Waterflow Analogue Rig, Combustion Airflow Test Rig, Fuel Lab. Calibration Rigs, thermocouple response rate tests. 59, California.

Ross-Ross, Philip A., Aero Test Engineering Supervisor, 1 2 3 4 5. Box 962, 32 Laurier Ave., Deep River, Ont. K0J 1P0 (613) 584-2535. Wife "Cookie" Anne, family Peter (d.), Brian, Catherine. 49, B.Eng., 51, M.Eng., McGill. July 51, A.V. Roe/Orenda: Malton, Aero Engineer, Test Equipment; late 52, Nobel, Aero Test Engineer (52, Cascade Rig, 54, Compressor Test Rig #1); July 56, Aero Test Engineering Supervisor. 59, Atomic Energy of Canada Ltd., Chalk River Nuclear Laboratories, Head, Mechanical Equipment Development. 85, retired. 78-79, President, Can. Soc. for Mech. Eng.; 81-83, President, Can. Nuclear Society; 86, Engineering Medal from Association of Professional Engineers of Ontario.

Rowse, Dennis, Combustion Test Engineer, 5, deceased 75. Wife Dorothy, 1 Puritan Rd., Marblehead, Mass. 01945, U.S.A.; daughter Lesley, 120 Baldwin St., Apt. B, Laconia, NH 03246, U.S.A. Sons Chris, Nick. Grad. Hull Technical College, England. Rolls Royce, Derby. 58, Orenda, Nobel, Combustion Engineer. 59, General Electric, Cincinnati. 61, Avco, Massachusetts.

Russell, H.R., Maintenance Man, 1 2, ?

Sagar, Vic H., Administration Supervisor, 1 2 3 4 5. Wife Helen. A.V. Roe/Orenda: Malton; July 56, Nobel.

Saintsbury, John A., Fitter-Tester L/H, 1 2 3 4 5. 59, Pratt & Whitney Canada, Longueuil, Que. Retired.

Satchell, M.H. (Mo), Combustion Test Engineer, 1. Malton > Supervisor, Combustion Dev't.

Scarr, W.J. (Bill), Stationary Engineer, 1 (10 yr) 2 3 4 5, ?

Schneider, Johnny W., Test Sub-Foreman, 1 2 3 4 5, deceased. Wife Dorothy, daughters Suzanne, Joan, Wendy. 59, Pratt & Whitney Canada, Longueuil, Que., test house foreman.

Scott, Clarence H., Trucker, 1 (10 yr) 2 3 4 5. 146 Gibson St., Parry Sound, Ont. P2A 1X9 (705) 746-2418. Wife Hazel, family Keith, Edith. 34, farmer. 48, A.V. Roe/Orenda. 59, Slim Colberg, Carling Township, construction. 62, Brian McEwen, Parry Sound, construction. 79, construction contracting. 88, retired.

Scott, S. Vince, Fitter-Tester, 1 2 3 4 5. 113 Thickson Rd. South, Whitby, Ont. L1N 2C7 (416) 576-5189. Wife Betty, family Wayne, Susanne, Lynn, Richard. 42, Defense Industries Ltd., Nobel. 43, Victory Aircraft Ltd., Malton. 44, Defence Industries Ltd., Nobel. 45, Canadian National Railways, Port Arthur. 49, A.V. Roe/Orenda, Nobel. 59, Imperial Oil Ltd., Parry Sound. 62, Orenda Engines Ltd., Malton; first test driver of Sherman tank powered by Orenda OT4 gas turbine engine. 71, Ontario Hydro: Pickering; 85, Darlington Nuclear Generating Station, Trades Management Supervisor.

Scrimgeour, Dave, Vibration Tech., 1 2 3 4 5. 3 Armstrong Ave., Nobel, Ont. P0G 1G0 (705) 342-5545. Wife Betty, family Christina, Jim, Fiona. 45, grad. H.S., Perth, Scotland. 45, electrician apprenticeship. 51, British Army, Vehicle Electrician. 53, J. Scott, Scotland, Journeyman Electrician. 54, Orenda: Malton, Vibration Technician; 55, Nobel, Vibration Technician. 59, Hanna Mining Co., then National Steel, Maintenance Electrician; but one winter at Orenda Malton working on Cerlist diesel in the Sopwith Lab. 79, Shaw Almex, Maintenance Electrician. 81, West Parry Sound Board of Education, Maintenance Electrician.

Scriver, Mr. & Mrs. W. (Bill), Staff House, 1 (pre-48). Mr. Scriver deceased 48. Mrs. Scriver, 45 Franklin Blvd., St. Catherines, Ont. L2P 3E5. Daughters Anne, Marnie.

Selkirk, Larry, Fitter-Tester, 1, ?

Sellwood, R.G., Fitter-Tester, 1 2 3 4 5, ?

Sheridan, Betty, Filing & Printing Clerk, 1 2, ?

Shields, A.J., Stationary Engineer, 1 2, ?

Shunk, E.L. (Bud), Draftsman, 3 4 5, deceased. Wife Peggy 134 Parkview Ave., Orillia, Ont. L3V 4M1 (705) 326-5042. Family Pat, Kenneth, Dolly.

Signore, Sylvester (Syl), Instrument Lab. Supervisor, 1 2 3 4 5, RR2, Bancroft, Ont., K0L 1C0 (613) 332-2638. Wife Rachelle, family Paul, John, Silvia, Michelle, Charles. 55, BASc, Toronto. 55, De Havilland Aircraft, Malton. 56, Orenda: Malton > Nobel. 59, DND AFHQ, Telecommunications. 66, Dept. of Consumer & Corporate Affairs, Canadian Patent Office. 81, retired.

Simpson, Gord F., Test Technician, 5, ?

Simpson, J.E.S., Guard, 1 2 3 4 5, ?

Sladek, George, Combustion Test Engineer, 1, 107 Strath Ave., Etobicoke, Ont. M8X 1R8 (416) 239-7628. Wife Maude, family Robert G., Jennifer Ann, John A. 51, BSc, Manitoba.

RCAF, Air Navigator. 51, A.V. Roe/Orenda: Nobel (took over the PS13 combustion chamber project from Jack Hill and took it to point of acceptance for the Iroquois); 54, Malton, Ser. Des. Engineer for hot end of the Iroquois > Orenda project manager at Marquardt Aircraft for the reheat system of the Iroquois. 55, Underwood, McLellan and Associates, Consulting Engineers, Saskatoon, Special Projects Engineer i/c airports, arctic engineering, municipal utilities, and planning and construction of new Town of Thompson, Manitoba. 60, Sir Alexander Gibb and Partners, Deputy Chief Engineer, bridges, tunnels, roads, railways, seaports. 66, Traffic Research Corp. (Peat Marwick): Head of Transportation Section of Merseyside Land Use Transportation Study, U.K.; 69, Head of Planning Division for Mirabel Airport > one year in Jamaica planning airport system for World Bank > Senior Consultant to Transport Canada on Pickering Airport Project. 74, IBI Group, land use and transportation planners, a founding partner and Director of the world wide aviation practice. 85, George Sladek Ltd., own consulting firm specializing in aviation and airports.

Smith, E. Roy, Maintenance Foreman, 1 (pre-48) 2 3 4 5, deceased Sept. 14, 89. Wife Beatrice Williamson, family Donna Auld, 7705 Wrenwood Cres., Mississauga, Ont. L4T 2V8 (416) 677-8619, Hector, Barry, Linda. Plumber, electrician, trapper, conservation officer, miner. Parry Sound Public Utilities Commission, pump house and power plant operator. 40, Defence Industries Limited, Carpenter. 45, War Assets on plant shut-down. 46, A.V. Roe/Orenda, Nobel, Maintenance Foreman; 59, Termination Supervisor on plant shut-down. 62, Stroud Bridgeman Investments Ltd., Plant Superintendent on printing press development and prototype manufacture; based in New Office/Lab. Building at Nobel. 64, Tudhope Realty Ltd., Salesman. 58, developed Pengally Bay subdivision in Carling Township. 43 to 47, MPP for Parry Sound, CCF. 46 and 47, Parry Sound Council. 52, assisted in formation and first President of Nobel Credit Union which became Parry Sound Muskoka Credit Union Limited. 57 and 58?, Reeve of Carling Township. 71, 72, 73, Mayor of Parry Sound. Various Chairman of the Parry Sound Hospital Board, Director of the Parry Sound Chamber of Commerce, started the Parry Sound Waterfront Committee in 81, Director of the West Parry Sound District Museum, and Chairman of the Northern Development Council.

Smith, Gordon W., Fitter-Tester, 1 (pre-48) 2 3 4 5. Box 25, Utterson, Ont. P0B 1M0.

Smith, Hector, Storekeeper, 1 (pre-48), deceased 49? 47, A.V. Roe.

Smith, Walt F.A., Shop Foreman, 1 (pre-48) 2 3 4 5, deceased. 41?, Defence Industries Limited, machine shop. Fall 46, A.V. Roe/Orenda. 59, Logan's Funeral Home.

Soper, George H., Test Sub-Foreman, 1 2 3 4 5, deceased. After 59, had own contract toolmaking shop.

Stack, E. (Betty Hancock), Clerk Computer, 1 2. 106 Lee Ave., North Bay, Ont. P1A 2J9.

Stevens, Peter, Engineering Assistant, 1 (summer 48), ?

Stevenson, Alf, Storekeeper, 1 (10 yr) 2 3 4 5, deceased 87?

Stewart, Ken L., Maintenance Clerk, 1 2 3 4 5. 6 Mapleview Dr., Parry Sound, Ont. P2A 1P9 (705) 746-9610. Wife Alice, family Ann, Karen, Kevin. 55, Ont. Dept. of Highways, Huntsville & Parry Sound. 55, Orenda. 59, Imperial Oil, Blind River. 60, Imperial Oil service station, Parry Sound. 61, Ontario Provincial Police, Toronto; 62, Parry Sound. Retiring 91.

Stuebing, John, Combustion Test Engineer, 1. 24 Whipple Tree Rd., Chelmsford, Mass. 01824. Wife Muriel (d. 86), family John, Susan, Jayne. Malton > Specialist Accessories Engineer. 59, Honeywell, Computer Specialist. 87, retired.

Sutton, Arthur L., Engineer in Charge, 1 (10 yr). RR5, Georgetown, Ont. L7G 4S8 (519) 833-9120. Wife Dorothy, family Anne, Laurie, Christine. 39, BASc, Electrical Engineering, University of British Columbia. 39, San Francisco, steam plant operation. 40, Bahrein Island, Persian Gulf. 43, English Electric, electrical sales. June 45, Turbo Research, Leaside, i/c design of compressor test facility with electrical drive. May 46, John Inglis Co., Plant Engineer. Jan. 48, A.V. Roe/Orenda: Nobel, Engineer in Charge; April 49, Malton, various titles; 51, tour of jet engine facilities in U.K.; 52, Service Manager; 60, Orenda Industrial Ltd./Hawker Siddeley Diesels & Electrics Ltd., V.P. and General Manager. 77, first retirement, to co-ownership with Bill McDonald of "The Forgerie", Elora, Ontario. 84, second retirement. President of Wellington County Bee Keepers Association.

Sykes, C.P. (Charlie), Administration Supervisor, 1 (10 yr), deceased 79. Wife Marjorie, 38 Forthbridge Cres., Downsview, Ont. M3M 2A1. Family Pamela, Bryan, Sharon (d. 74). 48, A.V. Roe/Orenda, Malton; 53, Nobel; July 56, Malton, Supervisor, Engineering Staff Administration. 78, Atomic Energy of Can. Ltd.

Tarnowetski, Fred T., Fitter-Tester, 1 (pre-48). 320 Dixon Rd., Apt. 112, Weston, Ont. M9R 1S8 (416) 247-8453. Wife, Stella. 41, Saskatoon Technical School, Machine Shop Practice. 41, International Nickel Co., Levack, Ont., miner. 41, Canadian Propeller Co., Montreal. 42, Wright Bros. Engine Co., Montreal, on 9 cylinder Perseus and Bristol radial engines. 43, National Research Council: Sept. 43, jet engine familiarization course in U.K. on Rolls Royce B-23 centrifugal engine; Dec. 43, NRC Cold Weather Test Station, Stevenson Field, Winnipeg; summer 44, further familiarization trip to UK, on Armstrong Siddeley ASX axial flow engine and Whittle B-2-700; winter 44/45, cold weather testing of ASX in Winnipeg. April 45, Turbo Research Ltd., Leaside: demonstrating tear-down and re-assembly of Rolls Royce B-23 centrifugal engine for training purposes; winter 45/46, seconded back to Winnipeg for cold weather testing on Rolls Royce B-37 and Power Jets W-2-700 centrifugal engines. July 46, A.V. Roe/Orenda: Nobel, Fitter-Tester, operating Cascade Rig and helping Bill McDonald set up Compressor Test Rig #1; fall 47, Malton, setting up the first test cell and beginning March 17, 48, testing the TR4 engine which became the Chinook; beginning Feb. 10, 49, testing the TR5 engine which became the Orenda; testing the Orenda at Dayton, Ohio, for the USAF; flight testing the Orenda in an F-86 fighter at Englewood, California; development testing of Orenda engines up to series 12; 59 through summer 60, development testing of rotor for Avrocar flying saucer, and assisting with initial flight testing; projects for AECL, Chalk River; OT4 600 hp gas turbine engine, as supervisor i/c compressor, turbine and heat exchanger rigs, and later full engine testing. 67, General Motors, Detroit Diesel Plant, Fitter-Tester

on development of gas turbine truck engine; later worked on 3 new diesel engines. 82, retired.

Taylor, H.H., Fitter-Tester, 1 2 3 4 5, ?

Thomas, B. Art E., Electrician, 1 2 3 4 5, deceased 88. Wife Louise, Alberni Towers #403, 4204 Norton St., Port Alberni, B.C. V9Y 3T9. Daughters Helen, Carol, sons Bob, Neil. After 59, electrician; Canada Coast Guard; Parry Sound High School, Custodian.

Thomas, Ernie B., Welder, 1 2 3 4 5, deceased 90. Wife Ruby, 28 Addie St., Parry Sound, Ont. P2A 2K3 (705) 746-5487. Family Alex, David, Wayne, Joan, Heather, Roger, Debbie. 59, Canada Coast Guard, Welder. 79, retired.

Thomas, Earl S., Fitter-Tester, 1 2 3 4 5. 29 Marion Ave., Parry Sound, Ont. P2A 1H8 (705) 746-9842. Wife Betty, sons Rick, Paul, John, Gordon. 47, Public Utilities Commission, Parry Sound. 49, A.V. Roe/Orenda, Fitter-Tester, Atmospheric Combustion, Turbine, High Pressure Combustion, Afterburner Rigs. Georgian Bay Airways, Storesman; Glenn Burney Marina; Rockwell International, Storesman; Belvedere Heights Home for the Aged, Orderly; T & H Sporting Goods Store. 89, retired.

Thomason, Dennis, ?, 1. 273 James St., Box 44, Bracebridge, Ont. P0B 1C0. Wife May, son Leonard.

Thompson, Ron C., Combustion Engineering Ass't., 1 2 3 4 5. Australia.

Todd, G.W., Combustion Test Engineer, 3 4. Pratt & Whitney Canada, Longueuil, Que. Retired.

Trembath, T. Norm, Fitter-Tester, 1 2 3 4 5. Wife Irene.

Turriff, E.R., Guard, 1 2 3 4 5, ?

Vigrass, Johnny H., Stationary Engineer, 1 2 3 4 5, deceased Nov. 16, 73. Wife Elva, #3, 1247 Arbutus Road, Parksville, B.C. V9P 1R4. 59, Operating Engineer, Parry Sound General Hospital. Ret. 73.

Villeneuve, Leo A., Test Sub-Foreman, 1 2 3 4 5, deceased 65. Wife Myrtle, son Paul, in B.C. Leo's Partridge Point and adjoining acres, next to Roy Smith's Pengally Bay, was sold to a developer in 1976.

Waddell, M. Keith, Fitter-Tester, 1 2 3 4 5. 90 William St., Parry Sound, Ont. P2A 1V4 (705) 746-2615. Wife Ida, family Victor, Maurice, Maurine, Dan. 49, service station in Toronto. 50, A.V. Roe/Orenda, Nobel. 59, Public Utilities Commission, Parry Sound. 90, retired.

Wainwright, John, Guard > Janitor, 1 (pre-48). 47, A.V. Roe. Deceased 70?

Walker, W. (Bill), Test Cells Labourer, 1 2 3 4 5, deceased. Wife Lill. 51, i/c Staff House; 54,

Test Cells Labourer.

Waters, Jim, Engineering Ass't., 1, ?

Walton, Don, Combustion Engineer, 1, ?

Walwaski, G.A. (Wally), Fitter-Tester, 1 2 3 4 5. 10 Isabella St., Parry Sound, Ont. P2A 1L8 (705) 746-2264. Wife Geraldine, family Penny, Larry, Patsy. 43, Army. 46, McKinnon Industries, Parry Sound, motor winding plant. 49, A.V. Roe/Orenda, Nobel. 59, Orenda, Malton, Fitter-Tester. 60, Richardson Marine, Parry Sound. 65, Rockwell Motor & Lamp, Otter Lake. 66, Post Office, Parry Sound, Letter Carrier. 90, retired.

Walwaski, Nick, Watchman > Maintenance Man, 1 (pre-48) 2 3 4 5, deceased 88. Wife Phyllis, family Joseph, Wally, Doris, Gerald, Teresa. 47, A.V. Roe/Orenda, Nobel. 59, Parry Sound General Hospital, Grounds Keeper. 75?, retired.

Wassenauer, Johan, Aero Test Engineer, 1, ?

Warren, R. (Bob), Student, 1 (summer 48), assisted Bob Reed on Diffuser and Fixed Incidence Cascade Rigs.

Watkins, Mel, Student, 1. Professor and economic nationalist. Chairman of a task force on foreign ownership in 1967; the Watkins Report led to formation of the Canadian Development Corporation and the Foreign Investment Review Agency. Co-founder with Laxer of the short-lived Waffle group in NDP.

Watt, Gordon I., Fitter Tester, 3 4 5, 42 Parry Sound Rd., Parry Sound, Ont. P2A 2M6 (705) 746-9232.

West, Lyle M., Fitter-Tester, 1 2 3 4 5. McDougall Rd., Parry Sound, Ont. P2A 2W7 (705) 746-5151. Wife Elizabeth, family Rosalie, David, Kelly, Benjamin, Joseph. 48, Gregory & Greek, Wholesalers, Parry Sound. 51, Department of Transport, Sailor. 55, Orenda, Nobel, Altitude Combustion Rigs. 59, McDougall Township. 61, Milkman. 65, Department of Transport, Sailor. Retired 90.

Wheeler, J., Aero Tech., 1, ?

Whistance, Al A., Sheet Metal Mechanic, 1 2 3 4 5. Daughter Valerie. A.V. Roe/Orenda from 49? 59 or later, rehired at Malton, Sheet Metal Mechanic.

White, Jack, Combustion Test Engineer, 1. A.V. Roe before June 49; set up Gas Analysis Lab.

White, Jim K., Engineering Ass't., 1 2 5. RR3, Parry Sound, Ont. P2A 2W9 (705) 732-6340. Wife Carol, sons Rab, Ian, Vance. Sept. 54, Orenda Nobel, Admin. Clerk; Sept. 55, engineering at University of Toronto. Summer 56, Orenda Nobel: Aero Observer; fall 56, Malton, Plant 1, to participate in in-house APEO training program; 58, Nobel, Instrument Lab., Engineering Ass't. 59, Bart Tompsett, Ontario Land Surveyor, trainee; May 65, qualified as OLS, and ran Parry Sound office for Simpson & Taylor which had

bought out Tompsett. March, 70, started own practice in Orrville. 85, sold to Douglas E. Magee, OLS, but continuing part time as consultant.

White, Peter G., Aero Test Engineer, 1. P.O. Box 782, Yucca Valley, Cal. 92286. First wife Joyce, 5644 Ravenspur Dr. #411, Rancho Palo Verdes, Cal. 90274, family Cathy, Julie, Bill. Second wife in 72, Cookie, with family Vickie, Lisa. Feb. 52, A.V. Roe/Orenda: Nobel; April 54, Malton. 59, AiResearch Mfg. Co., Los Angeles, later TRW Systems, Redondo Beach, Cal. > Manager, Electro-Optical Systems. 75, opened computer store in Palm Springs and computer and camera stores in Yucca Valley. Oct. 90, retired.

Wilbur, Johnny, Administration Clerk, 1 (pre-48). Wife Mary, daughter Bonnie. 47, A.V. Roe, Nobel. 49, left Nobel. 50, RCAF. Later, insurance business in Winnipeg.

Wilcox, Jack, 1, Stationary Engineer, ?

Wilde, Doreen (Hancock), Teletype-Switchboard, 1. 9 Waubuno Rd., Parry Sound, Ont. P2A 2B3 (705) 746-8150. Husband Ron, family Sandra, Kathleen, Karen, Jennifer. 52 to 56, A.V. Roe/Orenda, Nobel. 76 to 88, Arc Industries, Parry Sound.

Williams, F.D.M. (Shad), Combustion Test Engineering Supervisor, 1 (pre-48). 47 Forest Harbour Trail, Victoria Place, RR1, Bobcageon, Ont. K0M 1A0 (705) 738-2998, and Holiday Travel Resort -264C, 28229 C.R. 33, Leesburg, Fl. 34748. Wife Dawn, sons Rhys, Bryn, Chad (d. 80), daughter Rhea. BSc Sask. '45. June 45, Turbo Research: jet engine familiarization in U.K. May 46, A.V. Roe/Orenda: completion of course; Dec. 46, Malton, Test Engineer; April 47, Nobel > Combustion Test Engineering Supervisor; 53, Malton, Chief Combustion & Controls Engineer (with Don Morrison, conceptual design of Iroquois Afterburner Rig for New Test Cells); 57, Chief Development Engineer. 59, AiResearch, Phoenix, Arizona, Project Engineer on GTP-30, a gas turbine engine uprated from 30 to 65 HP. 61, United Aircraft, Hamilton Standard Div., Product Chief of Turbo Machinery and Heat Exchangers. 64, Free Piston Dev. Co., Kingston, Ont., Chief Engineer, bringing their 70 HP diesel to 150 hour mechanical qualification. 66, Orenda, Chief Development Engineer, bringing 600 HP OT-4 marine & truck gas turbine to 500 hour qualification. 68, Ontario Research Foundation, Director of Engineering > V.P. Engineering. 78, F. Williams Research & Development Ltd., Consulting Engineer. 84, nominally retired, but continuing consulting.

Wilson, Allan, Shift Engineer, 1, ?

Wilson, W. Ray, Tool & Die Maker L/H, 1 (pre-48) 2 3 4 5. 1600 Dover Rd., Cornwall, Ont. K6J 1V8 (613) 932-6081. Wife Ollie, sons David, Bryan. Educated in Eastern Townships, Que. 38, Ottawa Car & Aircraft, Ottawa, Machinist. Sept. 38, National Research Council, Ottawa: Division of Mechanical Engineering, Tool & Die Machinist; Sept. 43, jet engine familiarization course in U.K.; Dec. 43, NRC Cold Weather Test Station, Stevenson Field, Winnipeg > April 46, Turbo Research Ltd. May 46, A.V. Roe/Orenda: Malton; July 46, Nobel, Toolmaker. 59, Outboard Marine, Peterborough, Toolmaker. 60, General Motors, Aluminum Engine Casting Plant, Messina, N.Y., Toolmaker. 79, retired.

Winn, M.A., Fitter Tester, 3 4, returned to U.K. 58.

Wheeler, J.K., Aero Observer, 1 2 3, ?

Woolacott, John L., Welder, 1 (pre-48), deceased Dec. 84. Wife Marjorie (d. Nov. 77), daughter Dawn. 47, A.V. Roe: Nobel; 50, Malton, on engine production. Later, to Cockshutt Plow, Renfrew, on combustion chamber production; then self-employed, Jack's Burner Service; then retired before wife's death.

Yorke, Isaac E., Stationary Engineer, 1 2 3 4 5, deceased.

ORENDA NOBEL PERSONNEL

- Revisions and additions as of December 8, 1993. Valid data from the March, 1991 printing are not repeated.

Beagan, E.G. (Ted).

Beagan, Ross. Address not known. Phone (416) 733-4168.

Bowman, Ron. 43-46, RCAF, wireless-electrical mechanic.

Brown, Alex P., Fitter-Tester, 1. 99 Pineridge Dr., RR3, Parry Sound, Ont. P2A 2W9 (705) 342-5397. Wife Shirley, family Pam, Christine, Debbie, Richard. 48, A.V. Roe Nobel. 49, Rock Island Railroad. 49, CPR, brakeman. 50, CNR, fireman. 88, Via Rail, on Canadian through Parry Sound. 90, retired.

Byrne, Jim D. (March, 1991 list shows him working at NRC beginning 57. NRC has no record.)

Campbell, Colin G. 1905-154th Ave. S.E., Bellevue, Wash. U.S.A. 98007-6107.

Condon, John P. K9H 6M1.

Coulis, Don. No address known.

Curtis, Robert G. (Bob). 700 South Meade Ave., Fullerton, California 92633-3435.

Dewar, Howard J. Box 256, McKellar, Ont. POG 1C0 (705) 389-3425. Wife Gwen. 59, Pratt and Whitney Canada, Longueuil, Que. and Mississauga, Ont. Retired 91.

Dodd, Charles W. Deceased Dec. 92. Wife Loretta 6 Birch Ave., Parry Sound, Ont. P2A 2P1 (705) 746-2557.

Draycott, Irene E. (Madigan), Teletype Switchboard, 4. Box 396, Sundridge, Ont. POA 1Z0 (705) 384-7615. Husband Fred, family Cathy, Kelly.

Findlay, Connie J. (Healey). 48 La Monte, Houston, Texas 77092 (713) 681-3484.

Godfrey, Floyd E. Son Dale, RR1, Parry Sound, Ont. P2A 2W7

Godin, Norman A. 17 Gulliver Rd., Apt. 404, Toronto, Ont. M6M 2M3

Harris, Eric L. Wife Anna J. (Jennie).

Hill, Jack H. Cellular phone at cottage, (705) 746-1828.

Hisey, Bruce. 49, BASc (Mech) Toronto. April 49, A.V. Roe/Orenda: Malton, Engine Test Engineer on Chinook and Orenda Engines; Oct. 50, Nobel, Equipment Engineer; June 52, Aero. Test Engineer on CTR1 and June 53, TTR; May 54, Malton, Test Equipment Design Engineer on compressors. April 59, Hisey & Barrington, Consulting Engineers, Richmond Hill. Oct. 75, Ministry of the Environment, Toronto, Design & Equipment Engineer; Nov.

88, Sr. Approvals Engineer. 91, retired.

Jones, W.S. (Reg). Late 60's, City of Toronto, Welfare Department, i/c power plants of all Toronto municipal hospitals.

Kerr, Stu. Simeon St., Picton, Ont. (613) 476-2759 KOK 2T0.

Kraus, Helmut. Fitter-Tester. Deceased 76. Victory Aircraft, Fort Erie. 43, Fleet Air Arm. 46, Merchant Navy. ?, A.V. Roe, Nobel. 51, Marine Engineer, Toronto Island > Marine Engineer, Department of Transport, Parry Sound > CPR, brakeman > CPR, engineer.

Kraus, Otto. Wife Joanne, sons Duff, Jory. 59, Joe Robinson Construction > CIL, powder line. 59, Pratt and Whitney Canada, Longueuil, Que.: Experimental Test Operator, combustion and compressor rigs; 61, Engine Test Operator, Experimental Test; 63, Experimental Test Technician; 64, Experimental Test Foreman; 65, Supervisor, Industrial & Marine Package Build (inc. Turbo Train); 67, Field Rep. Industrial Marine DDH 280 Destroyer Program; 70, Project Engineering Liaison Technologist; 79, Project Engineering Liaison Supervisor; 88, Production Assembly & Test, Technical Support Supervisor; 89, Production Assembly & Test, Project Planning Supervisor; 90, Product Support, Service & Safety Investigation.

Lavoie, Verne J. RR2, Box 251, Huntsville, Ont. POA 1K0. Wife Betty, family Joseph, Pennie, Chris. Educated in Parry Sound. 49, Dept. of Transport and Colonial Steamship Lines, sailing on Great Lakes. 53, CIL. 54, Orenda, Stationary Engineer > Fitter Tester, working in Bays 1, 2, 5, 6 and Fuel Lab. 59, Imperial Oil, Parry Sound, and Parry Sound Arena. 59, Ralston Purina, Clarkson, Ont., Shift Engineer. 65, Goodyear Tire, New Toronto, Shift Engineer. 70, Kimberley Clark, Huntsville, Shift Engineer.

Lavoie, V.L. (Bud). Educated in Parry Sound. Department of Transport and bulk freighters, sailing on Great Lakes. 39, Defence Industries Ltd., Nobel. 45, Dept. of Transport. 46, War Assets > A.V. Roe/Orenda. 59, RCAF, North Bay, Shift Engineer. 62, City of Toronto, Shift Engineer > Christie Street Hospital, Toronto, Shift Engineer. 70, deceased.

Leblanc, Hugh. 51 Place Charles Lemoyne, Condo Unit 302, Longueuil, Que. J4K 5G6 (514) 651-7489. Wife Loretta, family Marc, Claudine. 49, A.V. Roe/Orenda: Nobel, Draftsman; 59, Malton, Blade Loftsman. 63, Mutual Fund and Insurance Broker. 73, contract draftsman. 83, Pratt and Whitney Canada, Longueuil, Que., quality control rep. 91, President, Perm-a-Tem Inc., an engineering and drafting placement agency.

MacDonald, Jack, Welder, 1. 226 Michener Drive, North Bay, Ont. P1A 3J1. Wife Alma. WW II, Army, operating mobile machine shop in Italy. 47, A.V. Roe Nobel. 48, set up welding shop in Parry Sound.

Magro, Joe. (Joe is the bent head, second from the right, near side of the Staff House table, page B3).

Martin, John. Deceased Sept. 92 (prostate cancer).

McCloghry, Tom. 98 Robertson Crossing, Fairfield, CT., 06432, U.S.A. July 92,

retired.

McGinnis, Myrt H. Deceased Jan. 92.

Morrison, Don E. Deceased Sept. 93 (prostate cancer).

Newbold, Walter F. Deceased Sept. 91. Wife Marjorie (310) 863-2577.

Prosser, Art H. Present address 43 Westvale Dr., Bracebridge, Ont. P1L 1B5 (705) 645-3485. Moving to Pigeon Lake, Bobcaygeon, Ont. KOM 1A0 (705) 738-5630. Wife Dorothy, two daughters. 59, Black & Decker, Brockville. Retired.

Rowse, Dennis. Daughter Lesley, sons Chris, Nick.

Smillie, W.D. (Bill). Combustion Test Engineer, 1. (He is one of the bent heads, at the head of the table, in the Staff House photograph, page B3). 59 Queensdale Cres., Guelph, Ont. N1H 6W5 (519) 823-1952. 49, BSc, Queen's. May 49, Malton, Test Equipment Engineer; Sept 49, Nobel, Combustion Test Engineer; May 51, Malton, Test Equipment Design Engineer; 59, Dilworth Secord Meagher, Associate Engineer.

Stevens, Peter. Combustion Test Engineer, 1. P.O. Box 4032, Collingwood, Ont. L9Y 4T9 (705) 445-6165. Wife Sally, daughters Sandra, Wendy, Beth. 49, BASc, Mechanical, Toronto. WW II, RCAF. Summer 48, A.V. Roe: Nobel, Student; spring 49, Nobel, Combustion Test Engineer; fall 49, Malton. 50, George Hardie Ltd., industrial construction, engineer. 60's, Peter Stevens Ltd., President, industrial construction. 73, sold company and retired.

Sutton, Arthur L. 24 Marilyn Dr., Apt. 401, Guelph, Ont. N1H 8E9 (519) 837-3797.

West, Lyle M. McDougall Rd., RR1, Parry Sound, Ont. P2A 2W7.

Whistance, Alfred A. (Al), deceased Feb. 93. Wife Florence 213 - 126 Hamilton, Richmond, Ont. KOA 2Z0 (613) 838-5977. Daughters Donna, Valerie; son Tom. 59, apartment superintendent; 63, Orenda Malton, sheet metal mechanic; 68, Price & Knott, Scarborough, i/c stores; 81, retired.

Williams, F.D.M. (Shad). Deceased Feb. 93 (respiratory). Wife Dawn Holiday Travel Resort -264C, 28229 C.R. 33, Leesburg, Fl. 34748.

Wilson, W. Ray. Deceased July 92 (Parkinsons).

Young, Fred, Aero Test Engineer, 2? (name does not appear on personnel lists; could have been less than one-year period). Last address 3172 Maple Drive, Ypsilanti, Mich. 48197. Orenda Nobel, followed Ron Page on Probe Rig > C.G.E. > Ont. Hydro, Thunder Bay > Montecello Nuclear Plant, Minnesota > Bechtel Engineering.