REMINISCENCE OF THE GTCP85

My first encounter with the Gas Turbine Compressor Power Unit, Model GTCP85, a grand-old lady, was in the Los Angeles plant in early 1952. John Harkenrider and Ivan Speer were mothering over this enclosed monstrosity. In those days, all auxiliary power units were required to be in an enclosure. It wasn't until some time later that the cool skin turbine plenum, developed by Homer Wood, permitted dropping the enclosure requirement.

I was a laboratory technician, having been informed by Miles Cox (my interviewer for employment) that all engineering personnel were hired via the laboratory. Although the salary wasn't very good as a laboratory technician, it proved to be an excellent place to start, for I learned much about company procedures and equipment. In addition, I met and worked with many people who would influence my future with AiResearch. The first two of these were Johnny Axe and Vern Smith, both very dedicated and good supervisors, who contributed to the test techniques for a new industry.

This first encounter with the GTCP85-1 was in Eddie Butler's Assembly-no department number-just Eddie Butler's. Harkenrider and Speer were very possessive of this enclosed unit with all the wires, tubes and other gadgets hiding their new baby. One outstanding visible feature was the crossover-ducts. The GTCP85 differed from the Gas Turbine Compressor Unit, Model GTC43/44 and Gas Turbine Power Unit, Model GTP70 in that it had a double-entry, first-stage compressor impeller which discharged into the single-entry, second-stage impeller. The cross-over ducts presented quite a fabrication problem, they were an "impossible manufacturing dream" with square mounting flanges, hidden mounting bolts, turning vanes in square elbows and square cross-sections. They were all welded sheet metal construction and appeared to have been fabricated in a local garage.

The GTCP85 was a marriage of the GTP70 gear box and the GTC85 gas turbine section required to provide both shaft power and bleed-air in any combination specified by future aircraft. The GTC85 was being developed for the USAF MA1A Trailer as shown in Figure 1. The marriage of the GTP70 and the GTC85 ultimately proved to be very successful and the GTCP85 concept was on its way!

To this day Ivan Speer will swear that he and Harkenrider designed, fabricated and tested that first unit with a smaller budget than the budgets of any other programs in the history of AiResearch. I heard all about this many years later when Ivan was the Phoenix Plant Manger, I estimated 7000 man hours just for the design department to create the Constant Speed Drive and Starter, Model CSDS100 drawings. Ivan almost threw Del Getz and me out of his office!

It wasn't too long after this first experience with Ivan`s GTCP85, that I was given the opportunity to transfer into the Engineering Department. I was assigned to Don Furst's GTCP85-4 Project (Figure 2). The unit was to be utilized in the Glenn L. Martin XP6M "SeaMaster" flying boat. This was the first time a gas turbine Auxiliary Power Unit (APU) was required in an initial aircraft specification. Other APU's (GTC43/44 in the XP5Y and the GTP70 in the P5M flying boats). The APU specification contained another significant first, the requirement for a gas turbine APU to provide paralleled alternating current (A/C) electrical power with the four main engine constant speed drive (CSD) A/C generators. This proved to be an exciting task.
Figure 1-MA1A Trailer Ground Cart for USAF
Providing Pneumatic Power from a GTC85-70

<table>
<thead>
<tr>
<th>MARTIN XP6M-1 SEAMASTER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wingspan:</strong> 102 feet 7 inches</td>
</tr>
<tr>
<td><strong>Length:</strong> 133 feet</td>
</tr>
<tr>
<td><strong>Height:</strong> 32 feet</td>
</tr>
<tr>
<td><strong>Maximum takeoff weight:</strong> 160,000 pounds</td>
</tr>
<tr>
<td><strong>Engines:</strong> Four Allison J71-A-4 turbojets with 13,000 pounds of thrust each</td>
</tr>
<tr>
<td><strong>Maximum speed:</strong> 600 mph</td>
</tr>
<tr>
<td><strong>Service ceiling:</strong> 40,000 feet</td>
</tr>
<tr>
<td><strong>Range:</strong> 2,000 miles</td>
</tr>
</tbody>
</table>
My initial assignment was to develop the gearbox, ancillary systems and new accessories. The new accessories were an overrunning clutch for the output drive (A/C generator) shaft, the starter motor pawl and ratchet clutch, the fuel control governor trim system, the four speed switch, and the oil heat exchanger. In pursuit of these tasks, I met and worked with many interesting and knowledgeable people resulting in many good and lasting friendships.

One of the first was Herb Bergen! To this day, I believe Don Furst purposely set me up for my first encounter with this opinionated gentleman, i.e., Herb had a problem with Engineers! He was located in the back room of the 96th Street and Arbor Vitae Building, the Engineering Department location at that time. After I introduced myself and stated my purpose, which was to coordinate the fabrication of the GTCP85-4 hardware, Herb said "Sit down young fella"! He proceeded to inform me how his department worked with Engineering! I never forgot his lecture (I later learned that he was an ex-school teacher). As a result of our understanding we remained good friends and accomplished not only this task, but many more before Herb retired and I enjoyed every assignment!

Dick Fisher was the engineer who designed the pawl and ratchet start motor clutch and the four speed switch. He worked in Jim Kemper's development shop and I still do not know Fisher's department or who his boss was. I was assigned to assist Dick in the testing of these accessories.

Jim Kemper's shop was a development engineer's dream, it was truly the AiResearch "Skunk Works". One could give his shop people a "back-of-the-envelope" sketch and have a part or a modification thereof quickly without all the paper work and time required for normal channels.

The starter motor clutch was required to remain engaged under mechanical and spring forces during the turbine start cycle. At start termination, the pawls were to disengage and remain out of engagement due to spring force as the turbine accelerated and overrun the static starter motor. Dick's original design had a large hammer head mass external of the pawl pivot pin. This permitted adjustment of the pawl center of gravity location and thereby attain the balance of forces required. Dick did his cut-and-try design well, for our "Skunk Works" adjustments resulted in a very successful clutch.

The four-speed switch was an enigma of flyweights, springs, and electrical switches which was very difficult to adjust. It was ultimately developed into a workable configuration; but I imagine Bob Johnson remains thankful for this component. I am sure it paid for his home, swimming pool, etc. via suggestion awards!

While working in Kemper's Shop I met and worked with AL Silvers of pneumatic thermostat fame. Al was a brilliant engineer with terrible eye sight. This did not prevent him from producing some excellent articles on controls.

John Dannan, Jr.(his son John III was in engineering also) became my mentor as we worked on a speed governing system for the GTCP85-4. The first governing study was an adaptation of the pneumatic control system utilized on the GTC43/44 units. A crenulated cup, mounted on the cooling fan shaft, was utilized as a rotational speed sensor. The cup was composed of a series of thin beams which deflected due to rotation and provided a variable pressure by controlling a stationary orifice located in the fan discharge housing. This provided a modulating pneumatic pressure in the fuel control unit. It was determined that this system could not satisfy specification requirements due to temperature and pressure (altitude) effects on a pneumatic system. Therefore an adaptation of a speed trim system to the existing GTC85
John was a smoker! He smoked cigarettes, cigars and pipes. Tobacco was one of his great joys. He had his own drafting table in his office where he did studies for the Chief Engineer. At this time he was evaluating a one cylinder Freon compressor for aircraft cooling. The longer John worked on his layout, the middle of the drawing become darker and darker due to the steady flow of ashes. I enjoyed many good cigars with him and probably contributed to the ashes also.

I learned a very important lesson from John Dannan, Jr.- that is to give credit to the one who created or accomplished an idea or task. It happened because I was responsible for the monthly progress reports. I sketched one of the crenulated cup governor studies and signed it as the designer. John became very upset, for it was his design. My explanation and apology resolved this misunderstanding, and we remained very good friends for many years. Since that well learned lesson I have attempted to always to give credit (no matter how insignificant) to all with whom I worked. John was a true "Southern Gentlemen", a river boat gambler and a good story teller. Some tall, some factual; but all enjoyable and from them I learned, for which I shall always appreciate his advice and tutoring.

The development of a speed trim control for the flyweight governor (required for parallel operation of the A/C generators) was accomplished by using a Kearfott motor driving an Acme screw to vary the flyweight spring load. The system worked very well. I worked with Don Dechant, who was responsible for the fuel control and fuel system.

Don and I had an interesting first visit during the transfer of turbo-machinery to Phoenix. He was coordinating the fuel control and I was primarily involved in the transfer of the four-speed switch to Phoenix. Our motel, the Desert Inn on Van Buren, was the only good motel near the plant in those days. It is now a Salvation Army facility (what a difference time makes)!

During this first day, Joe Bull invited Don and I to visit his home, for all who were involved in the Phoenix transfer were house hunting. Joe's home (a Universal Home I believe) was in the 44th and East Thomas area and was generally considered to be in the country. After a drink or two with Joe, Don and I headed west on East Thomas Road looking for a place to have dinner. In those days East Thomas was a beat-up two lane road. The last street lights were at 16th Street. As we proceeded west on Thomas Road, Don, who was driving said "There is a Place!". There were gas torches on the corner but very dark. We proceeded beyond the dark corner (24th and Thomas) and turned into the very dark rear of the building. Suddenly, in the head lights appeared a white horse bearing a knight in shining armor who was waving a broad sword at us! Rapid braking and wondering what to do resulted in the knight, with a wave of his sword, demanding that we follow him. We proceeded to the front of the Green Gables, where two of Robin Hood's merry men escorted us into one of the finest restaurants in the Phoenix area.

For a while, we were afraid of being skewered by the white knight, for it appeared that we had wandered into a private club. Instead we enjoyed fine food, excellent hospitality and entertainment at the Green Gables.

In this time period, Aldo Romanin and Andre Boucher, with a crew of technicians, traveled to one of the high-mountain ski resorts in California. The objective was to conduct altitude and low-temperature start/operation of the MA1A Trailer (GTC85). After extensive preparation, in the early morning (3 to 4 o'clock), the first start was initiated. The cold-still night air made the ignitor sound like rifle fire. As light-off occurred and the unit accelerated to governed speed, every light in the area came on! These folks had never heard a gas turbine before and surely were convinced that a Banshee was loose on the mountain! There was much PR work
the next day.

5

Completion of component design and testing warranted the assembly of the first GTCP85-4 unit. My assignment was to coordinate this activity and get the unit testing underway. During this activity, I found Jim Bennett and Perry Sebring to be excellent assemblymen. Bennett never used a vise or torque wrench. He would assemble almost everything in his lap and his smock was one big grease/oil spot. But when he assembled with "feel", it was as he said "Right". Perry was a master mechanic who later became one of our best Development Engineers. He and I had many good years together creating new and interesting units (air turbine motors, constant speed drive-starters and other APUs).

The first GTCP85-4 (Figures 3 and 4) was placed under test in the open air test cells at the LA Main Plant.

Figure 3 Model GTCP85-4  Figure 4 Model GTCP85-4
Note the Overrunning Clutch, the Oil Heat Exchanger on the Compressor Inlet and the Governor Speed Trim Mechanism
The test cells were arranged with two test bays on each side of a common control room. There were four control consoles (one in each corner of the room) with complete instrumentation for each test unit. Four units could be installed in the test bays with each unit exhausting into individual centrally located ducts. The first day of testing was uneventful—break-in and ultimately attaining full speed with partial loading. Sometime during the second day, the unit would light-off but would not accelerate. After spending much time trouble shooting, I ask for the unit to be returned to Eddie Butler’s assembly area. Upon removal of the exhaust duct, the problem was revealed! Evidently, during one of the manually controlled starts, an unreported over temperature condition occurred and all turbine and educer blades had melted. The exhaust duct was metal sprayed with a thin layer of turbine wheel material.

Herr Dokter von Der Nuell, an engineering consultant at that time, visited our disaster and proclaimed "No-one could destroy a gas turbine that completely and that fast". We did! I was sure I wouldn't be around much longer for this was my second turbine failure. The first was during low temperature testing of Cliff Farrell's GTC43/44-6 dual bleed APU. But I survived and the GTCP85-4 was prepared for environmental testing.

Cliff Farrell and I spent about six weeks at the Naval Ordinance Test Station (NOTS) China Lake, California. The altitude and cold test chamber was a beautiful facility, far superior to the Phoenix "Black Thermos Bottle" we used a couple of years later.

We had some successes and some problems. Our problems were nothing compared to the problems of the Solar team that was time sharing the NOTS facility with AiResearch. Solar had a small generator set mounted on a wheelbarrow arrangement. The unit, an Army program, required hand cranking for starting. A two handle arrangement similar to the "Gibson Girl" emergency radio of WWII fame was used for the hand cranking. After a minus 65F temperature soak, a test technician much larger than Cliff Farrell, I mean he was big, would enter the test cell and hand crank—and crank—and crank—the poor guy would just wear out and never build a fire! They finally folded up and returned to San Diego.

We finally attained consistent low temperature operation, but I must say working in -65F conditions is difficult and unpleasant.

We had one exciting event. The test cell was insulated with thick red wood planks between stainless steel sheet metal. Evidently this was the first experience NOTS personnel had in gas turbine testing. They had routed our exhaust duct through these walls. During one of our extended periods of operation, the red wood began burning. There was much activity with the base fire department for awhile.

After completing the required development testing, the first two GTCP85-4 units were delivered to Glenn L. Martin facility in Baltimore. The unit operational life was specified to be 200 hours (with 50 hour hot end inspections). Think about that limitation in view of the operational life of today's gas turbines.

The Martin test people had an iron bird setup for evaluating many features of the XP6M electrical system. My first trip to Baltimore was to assist in the installation of a GTCP85-4 into this facility.

One of the objectives was to simulate parallel operation of the 400 cycle A/C electrical power generation system. Four Curtis Wright R1820 nine cylinder radial engines, driving a 40Kva generator via a Sundstrand constant speed drive (CSD), were utilized to represent the J71 main engine arrangement. The GTCP85-4 furnished constant speed to the 40Kva generator mounted directly on the gearbox output pad. An overrunning clutch was incorporated in the GTCP85-4
output shaft as a protective feature.

The test technicians had a very difficult time with this test arrangement, for any electrical load change resulted in large speed changes at the output of the piston engines. Since the operators could not cause the piston engines to respond fast enough, the speed excursions were beyond the CSD control limits which resulted in the piston engine driven units shedding their electrical load because of either under or over frequency. The total system electrical load was then assumed by the GTCP85-4!

I had a difficult time explaining and making Martin people believe that the little gas turbine appeared to be a very large flywheel due to its inertia being very much greater than the piston engines and therefore its speed excursions were smaller and its corrective action very much faster than the test technicians could respond.

During this time I met and worked with John Dailey who was the AiResearch field service representative at Martin. John helped perform the required 50 hour hot end inspections and maintain both units during Martin's test program. The 200 hour units were returned to AiResearch for overhaul at 205 and 210 hours of essentially trouble free hours.

Some interesting and tragic things happened during ground and flight testing. The first XP6M was subjected to initial ground testing at the Strawberry Point facility. One test required 7 main engine after burner operation. This revealed that flame from the inboard engines swept the aft fuselage causing severe damage. Flight testing was conducted on the first two aircraft without inboard engine after burning operation. Canting the engine nacelles approximately 5 degrees outboard was the corrective action on the “Y” series aircraft. The change was very noticeable in YP6M aircraft.

Our problem statement required the GTCP85-4 to provide bleed air for the first engine start and the remaining engines were to be started via cross-bleed from the operating engine. Guess what happens when a flying boat is in the water and a single operating engine is at a rotor speed sufficient to provide cross-bleed air pressure—theflycraft starts orbiting! Under this condition, the flight crew has a lot more to do than start engines. As a result, our duty cycle increased to four engine starts per flight.
During one flight test that I witnessed from shore, the flight crew inform us that after an engine start the GTCP85-4 would not provide pneumatic power for additional starts. The test supervisor decided that I should go aboard and attempt to correct the problem, for taking the aircraft out of and back into water was a big and time consuming task. The chase boat (an all wood Crist Craft speed boat) picked me up and started the high speed run to come along the port side of the aircraft where there was a large hatch under the wing. The flight test engineer was standing in the open hatch, which was well above our chase boat. He grabbed my outstretched arm and hauled me aboard. I soon determined that the GTCP85-4 had been forced into an underspeed condition, the 95% speed switch was deactivated, preventing loading the unit. The governor trim system had responded to a signal that caused an excursion below the permissible to
load signal. It was necessary to send a signal to the trim motor to increase unit speed. I asked for a jumper wire to accomplish this on a rather small relay. I was handed a battery cable! No way would it work and it was the only thing on board. I always carry a pocket knife. Fortunately this time it was very small, so by making a small "V" between the longest blade and the handle, I carefully touched the correct terminals, and the unit returned to the correct governed speed.

Getting off the flying boat was equally as exciting as getting aboard.

The under speed problem was resolved by adding a mechanical stop that limited the low speed trim range.

Tragically, this crew was killed during a subsequent flight. As I understand it, the aircraft did an uncontrolled outside loop at low altitude and impacted the water. The P6M was one of the first to have a fully operable "T" tail. This was one of the unknowns that had to be resolved.

On one of my last trips to Martin, I was to be gone for only three days. On the final day, I gave Carl Paul a status report via telephone and indicated I was on my way home. He told me to go to Dayton, Ohio to assist Andre Bouche with the Wright-Patterson MA1A Trailer qualification testing. Carl indicated that the unit was having much low-temperature starting trouble. His instruction was to stall and continue testing while his Engineering Project solved the problem.

When I arrived in Dayton, Andy was very glad to see me. His first question was "Do you have any money?" It seems that he had not had an expense advance or pay check for some time. He was almost sneaking out of his hotel, and he wasn't eating too well either, which was very difficult for a French food connoisseur! After my three day trip expanded into thirty days I soon realized the value of a credit card, and I became an American Express customer soon thereafter, for money became one of my concerns also.

This was my first working experience with Andy. I found it to be then and many years thereafter a happy and professional relationship. Much good food and wine definitely influenced this opinion.

The Wright-Patterson test facility for cold testing left much to be desired. It consisted of a large insulated plywood box constructed around the MA1A Trailer sitting outside on a receiving dock. Refrigerated air was induced into the box from a source inside the building. The idea was to maintain a positive pressure within the box during the extended cold soak period.

Unfortunately it was not very successful and ice accumulated on everything due to very humid conditions. Difficult working conditions and poor trouble shooting capabilities resulted. Even with the poor test conditions, it was revealed that the low-temperature starting problem was due to very low fuel pressure. The cause was ultimately found to be the o'ring packing within the positive face seal assembly beneath the flyweight governor assembly. The o'ring packing material (Buna N) was not suitable for -65F operation. A new elastomer (LS-53 I believe) was incorporated into the seal design, and the cold test requirements were completed.

Bill Savage was the civilian employee in charge of the MA1A qualification, and his service counterpart was Lt. Bob Trusela, who later joined AiResearch and ultimately attained a high position in the company.

After the move to Phoenix, Spud Peterson was the Production Engineer, who guided the P6M unit into production as the Model GTCP85-6. The major difference between this unit and the Model GTCP85-4 was the use of a fan-cooled oil heat exchanger in lieu of the compressor inlet mounted heat exchanger. Using compressor inlet air as a cooling medium was a good idea; but safety analysis precluded this feature on production units due to a potential uncontrolled overspeed condition in the oil leakage case.

Both the Air Force and the Navy had jet aircraft that required electrical power for engine
starting and new aircraft, which incorporated air turbine starting systems in their inventory. Carl Paul thought the GTCP85-4 would demonstrate the capability of furnishing both aircraft (electrical or pneumatic) system requirements. So at his direction, my next assignment was to package the GTCP85-4 system on an aircraft tow tractor (common called a Tug). This required a 3-pad gear box to mount one 40Kva, 400 cycle, A/C generator, one 300 amp d/c generator and one 500 amp d/c generator. This was accomplish by designing a dry gearbox (no lubrication system) utilizing a Gilmer timing belt.

The enclosure and various elements for mounting and storing equipment was outsourced to Goodyear, who were in the packaging business at that time. They had the advantage of being near by for close coordination.

The system is shown in Figure 5. The GTCP85-4 was mounted cross-wise on the rear of the tug, all control elements and the control panel were mounted on the drivers right. The electrical cables and pneumatic ducting were stored on the front left. It was necessary for the operator to enter from the left and the system was operated from the control panel next to his seat and on his right. You can imagine the problems this would present under todays regulations and legal requirements. An operator sitting in the rotational plane of three uncontained high speed wheels!

The unit was utilized for demonstrations to the Air Force and Navy. It was very successful. One failure did occur. The Gilmer timing belt came apart. It is unbelievable how much rag, elastomer, and steel cable is in a 2-inch wide 3-foot belt. The box was absolutely full. But with replacement of the belt, the unit was returned to service.

I do not know if this is true, but it makes a great story. The Tug was being used to return the aircraft launching shuttle to the launch position on an aircraft carrier when it was accidentally launched! I can imagine how that poor operator felt trying to fly a very large chunk of iron. Or he may have been shouting "Whoa! you S.O.B."

My next assignment was to join Curt Bradley and work on Helmut Schelp's Project 105, which became the GTCP100 Series gas turbines. That is another story to be told later. These early days were a time of innovation, creation, invention, free and independent work without regulations, political correctness or interference. They were very enjoyable times.
Figure 5-Model GTCP85-4 Mounted on a Tug
Note the A/C Generator and Two d/c Generators

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6. Many fond memories

I wish to thank my good friend, William W. Spragins (Bill), for once again editing and correcting my writing as he did for many years during our working together as AiResearchers. He is truly the best of technical writers!
Air Research: Gas Turbine Model GTCP85
Mechanical Characteristics

Turbine Wheel
- $J = 0.143 \text{ lb-in/sec}^2$
- $W = 13.2 \text{ lb}$

Quill Shaft
- $K = 263 \text{ lb-in per degree}$
  - Approx. 1.0° of clearance in splines

Impeller
- $J = 0.286 \text{ lb-in/sec}^2$
- $W = 2.80 \text{ lb}$

Impeller
- $J = 0.0417 \text{ lb-in/sec}^2$
- $W = 3.89 \text{ lb}$

Quill Shaft
- $K = 5.2 \text{ lb-in per degree}$
  - Approx. 10° of clearance in splines

Ring Gear & Hub
- $J = 0.860 \text{ lb-in/sec}^2$
- $W = 3.30 \text{ lb}$

7:1 Planet Reduction Gear
- Approx. 0.5° of clearance in gearings
- Spline Shaft
- $K = 13000 \text{ lb-in per degree}$
  - Approx. 0.5° of clearance in splines

Over-Running Clutch
- $J = 0.0821 \text{ lb-in/sec}^2$
- $W = 5.38 \text{ lb}$

Engine Drive Spline

E. Smith 1954
Of Cabbages and Kings and Crossover Ducts

I was one of those newly graduated engineers that Ed Gammill mentioned in his fine discourse about the early days in the Los Angeles plant who also entered employment through the L.A. laboratory. It was the early fifties and I remember getting all dressed up for the interview and having (I hope my memory serves me) Donn Loper (Sr) take me around. We ended up standing over a running turbine engine of some sort and Donn looking at me rather closely. I guess he wanted to find out how I would do around high speed machinery and I did just fine as I did not know that the thing was going around at about 40,000 RPM! The interviewer told me not to get so dressed up and I saw why when the first thing was I did was to repair a leaking fuel line.

The L.A. lab was testing a contraption called the "Black Box" which was supposed to be an all purpose turbine which was impossible to work on, as to change the burner required a full shift. They then bought out the GTCP 85 which really looked business like and make the job more interesting as we spent more time running it than we could with the Black Box which was always "down". For a while the 85 was having trouble making performance with the compressor crossover duct being suspected as the cause. Ed described the crossover ducts as square, which they were in the beginning. When Herr Dokter von Der Nuell came over from Germany with Helmet Schelp he took one look at the problem and said the solution was to place turning vanes in the corners of the duct. This increased the performance about two percent which still wasn’t good enough. Then a newly employed engineer from Cal Tech named John Stanitz came up with a duct that was rounded at the corners and which didn’t go straight back along the machines axis but allowed the air flow to follow a more natural course. This duct design improved the performance of the GCPT 85 a goodly fifteen percent and actually saved the 85 program from being greatly curtailed or even cancelled. I think the machine shop was glad to say goodbye the turning vanes anyway as when von Der Nuell went down to the shop to expedite things he didn’t quite find the German worker he was used to but ran into a lot of good old American know how and would come back to the office with an angry look on his face. Frank Roberts worked in Lab Engineering in L. A. for awhile at this time and then quit and came to Phoenix about a year later and was instrumental in developing the turbo-prop and turbo-fan engines. These engines and a variety of other items (air turbine starters, etc) kept us going.

Anyway a bunch of us went to Phoenix when they moved the Gas Turbine division down there in the middle fifties. Luckily they just started to get some good home air conditioners so we survived. When we got here the main lab wasn’t opened yet and we did most of the assemble and testing on the south side. We were finally allowed to assemble some test units in the nearly completed lab. I remember one weekend we were trying to get an 85 out the door and Bill Caan found out we hadn’t safety wired some bolts so we had to work late into the evening to correct that. When we went to go home we found the gates were locked so we had to “jump” the fence. The next day a guard laughingly said to me the he was making his rounds and he saw me on top of the fence and if I had jumped into the plant he was going to have to shoot me but luckily I jumped into the parking lot. Any way the GTCP 85 continues to be a bread and butter unit and my hat goes off to those who thought it up. Did Homer Wood come in there somewhere? I wish I had Ed Gammill’s memory.
When I was down in Phoenix for awhile, the chief engineer, Carl Paul, assigned me three precious GTCP 85s to keep an eye on. Well Woody Cox and Cliff Farrell were given the task of taking an 85 through a 200 hour endurance test. Carl put out a memo that stated that this endurance testing was the most important activity in the plant and we were to give Woody and Cliff whatever help they needed. It took a lot of hardware to do the endurance testing with having to rebuild the engine every so often. As a consequence I saw my three engines practically disappear before my eyes. Fortunately I had Woody or Cliff sign out every part they “borrowed”. Lucky I did for one day Carl marched in and said wanted the three engines right then. He almost fired me when I said “There’s no such animals”. I got off the hook by showing him his memo and the sign out signatures of Woody and Cliff. By the by, I was always grateful to Cliff Farrell for, when we had a downturn in the economy and they started laying off the veteran workers in Phoenix, he had the gumption to go to the company headquarters in L. A. and tell them how unfair it was target the long time, loyal workers which I was one of. Thanks Cliff.

One time the GTCP engines were exploding due to overspeed conditions. The cause was finally traced to a seal which was leaking and was allowing fuel to accumulate in the lower crossover ducts. To prove this out a couple of ducts were filled with the lubricating oil used in the engine and the start button pushed. Off it went, through the starter cut out, up through the governed speed (which was maintained at a constant rate by regulating the normal fuel supply) and, aided by the unregulated fuel supply (these gas turbines will run on anything) of the oil in the crossover ducts, up to burst speed. Needless to say that seal got redesigned in a hurry. (For some reason many employees claimed to be within ten feet of the test engine when it exploded).

We had several distinguished visitors tour the plant. One was Sir Frank Whittle, the English engineer who was one of the first to design a working gas turbine (although the Germans were first to use it for practical purposes). Another was Jack Nicklaus, the noted golfer who was going buy a personal jet and wanted to see how the engines were produced. (I don’t think Rich Stokes was with the company then or I am sure he would have cornered Jack about some golf points). Some Japanese delegations also came through the plant in the 1960s. The first time I remember they were all observing and taking a great deal of notes (cameras weren’t allowed). A couple of years later another Japanese delegation came through and they didn’t seem very interested in anything (quick studies these Japanese!) For a while it was feared the Japanese would get into the small gas turbine business but they seemed to like cars better, thank goodness. Barry Goldwater, the old pilot, came through a couple of times. He had much praise for our activities. We also had one visitor that wore a hearing aid. Well it seems that his hearing was poor except for one frequency that a gas turbine starting up put out about 20,000 RPM. You had to be there to see the poor visitor snatch his hearing aid out of his ear at that turbine speed.

Like Ed Gammill, I never met a fellow worker at Garrett that wasn’t ready to lend a helping hand to see that a job was done and done well. The only exception was that wise guy, who, when I described what I would like to have done, said “We will get your job done as soon as possible Bob and if we don’t see you in the meantime have a Merry Christmas and a Happy New Year”, which was all very nice except it was the middle of August at the time!

Bob Boorman (hired L.A. 1951: retired Phx. 1987)