PNSAC Newsletter

Project **N**orth **S**tar **A**ssociation of **C**anada March 2007

Merlin Musings

Second in a series

Ted Devey

The Rolls-Royce Company started as a partnership between Charles Rolls and Henry Royce to manufacture beautifully crafted automobiles of the highest quality-the best automobiles in the world! In 1910 Charles Rolls had the unhappy distinction of being the first aviation fatality in England when his Wright aircraft went into a spin, from which he was unable to recover, during a flying contest at Bournemouth. It was up to Henry Royce to achieve the goal of making products of outstanding quality. He always surrounded himself with the best designers, engineers and draftsmen available.

In 1914, the British Air Ministry requested Rolls-Royce to manufacture French Renault air-cooled engines that were of doubtful quality. Instead, Royce offered to build superior engines of his own design. These Rolls-Royce piston aero engines were named after birds of prey. Although, there were exceptions.

Eagle

The Eagle was the first of Rolls-Royce's long line of successful aircraft engines. It was naturally aspirated (no blower of any kind): a water-cooled V-12 with separate cylinders and 4 carburetors (two at each end). Rolls-Royce also produced a straight six cylinder engine, the Hawk, which was based on an engine used in the Silver Ghost car.

The last engine of World War I was the Falcon which was conceptually similar to the Eagle-a slightly smaller V-12. The Falcon was used in the Bristol Fighter introduced near the end of the War. (The CAvM recently took delivery of a fully-restored Bristol Fighter with Falcon engine 13. It is in the storage hangar ready for display.) The Falcon was followed by the Condor which was the first engine to be equipped with four valves per cylinder (two intake and two exhaust of the poppet type). This increased the breathing capability of the engine and valve cooling was much improved with considerably smaller valves.

After World War I, Rolls-Royce nearly abandoned the aircraft engine business due to a large surplus of engines on the market. There was little demand for military aircraft but there was a booming demand

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for Rolls-Royce automobiles. There was just enough work in overhauling Eagle engines and Condor development to keep the company in aviation. Because of the Eagle's reliability, many of them were installed on Vimy bombers and De Havilland commercial airplanes.

In 1923, the United States won the Schneider Trophy Air Race. The engine used was an improved version of the Curtis R3X. This led to the development of the 400 HP Curtis D-12 engine, a water-cooled V-12 of 1145 cu. in. displacement. It featured a monoblock cylinder construction of cast aluminum with wet steel cylinder liners. This engine established a standard for subsequent water-cooled and liquid (water plus ethylene glycol) cooled V-12 engines. Within a year, Fairey Aviation produced a Curtis D-12 powered single-engine bomber which outperformed other RAF aircraft with ease.. The RAF, pride wounded over the prospect of planes powered by American-built engines, arranged to have two D-12s delivered to the Rolls-Royce Works at Derby, where they were reverse engineered. Changes in design, such as, open-end cylinder liners (an improvement over D-12s closed end design) were incorporated to create the Kestrel engine with 1296 cu. in. displacement. The Rolls-Royce philosophy of a liquid-cooled V-12 with 4 poppet valves per cylinder continued to the end of the piston engine era.

Early Kestrels were naturally aspirated (no turbo - or supercharging) using two downdraft carburetors. Later, Kestrels were supercharged, a first for Rolls-Royce engines. Early superchargers were inefficient so engineers at the Royal Aircraft Establishment at Farnborough carried out extensive research and development work on superchargers during WW1. Superchargers of higher efficiency were developed and added to Kestrel engines, resulting in increased power and improved fuel economy .

Supercharger development was the basis for Rolls-Royce engine performance enhancement in the following years. Improved fuels allowed ever-increasing manifold pressures which spurred on even more supercharger development. (In airplane engines, the supercharger is a blower that is driven directly from the crankshaft and blower RPM is directly proportional to the crankshaft RPM.)

The Air Ministry persuaded Rolls-Royce to produce an engine for the 1929 Schneider Trophy Race. The Buzzard engine had many Kestrel design features with nearly twice its displacement at 2239 cu. in., and, it formed the basis for developing the "R" engine (not named after birds of prey.) This engine was installed in the Supermarine S6 racer which won the Schneider Trophy in 1929 and again in 1931. The "R" engine suffered many failures such as, connecting rods, crankshafts, valves, etc. In true Rolls -Royce manner, these failures led to design and manufacturing upgrades which further improved engine performance.

"R" engines were used in cars and boats to establish land and water speed records respectively and is on record as the only engine to power the world's fastest boat, car and airplane. Such achievements established Rolls-Royce as the premier builder of high-performance aero engines.

The British ran their aircraft engines at higher manifold pressures than other nations, resulting in more power for their front line World War 11 aircraft. This had drawbacks due to the weight penalty resulting from stronger internal components to overcome higher stresses and loads. Maintenance difficulties and shorter service periods between overhauls resulted, which Rolls-Royce satisfactorily resolved over time.

Merlin

Sir Henry Royce was knighted in 1931. He succumbed to failing health and died in 1933. However, he had laid out the most significant piston engine in history, the immortal Merlin, which can be described as a 60 degree liquid cooled V-12 displacing 1639 cu. in. Each bank of 6 cylinders has a single overhead camshaft actuating 4 valves for each cylinder, 2 intake and 2 sodium-cooled exhaust. Single-stage single-speed supercharging was initially employed. The propeller was driven through a gearbox having about a 2 1/2 to 1 reduction ratio.

Early Merlins were rife with problems. The first one was built in 1933 and it did not fly until 1935. By 1936, Rolls-Royce was under pressure from airframe builders to build Merlins, especially with clouds of war appearing on the horizon. The British Government was relying on Merlins for fighters. Early in the war demand far exceeded the production capabilities of Rolls-Royce and arrangements were made with the Packard Motor Company of Detroit to build Merlins. Many of these were shipped to Britain while others went to Canada for Canadian- built Hurricanes, Mosquitoes and Lancaster bombers. About 160,000 Merlins were built, 60,000 of them by Packard.

Griffon

Development of the Griffon started in 1939 initially at the request of the Fleet Air Arm as carrier borne airplanes tended to be larger and heavier than their land-based counterparts. The Griffon can be considered a modernized Merlin with a larger displacement and greater power. As the air industry was geared

up for Merlin production, priority was given to Merlins and Griffons were produced late in the War and after. These were the last piston engines designed and built by Rolls-Royce. Today, the company builds turbo shaft and jet engines for airplanes. gas turbines and diesels for a variety of marine applications and the energy sector.

The next in the series of Merlin Musings will discuss the Merlin engine from early days to the production of the 620 series. The Griffon will be looked at as a further refinement of the Merlin.

PNSAC

Interview – Bud Graves

Herbert G. (Bud) Graves was born on a homestead near McCreary, Manitoba, on October 18, 1919.He attended one- room schools for grades one to seven and then completed grade eight and high school at Rosmand School in McCreary. Bud applied for entry into the Royal Canadian Air Force (RCAF) in 1937 but was advised that he required a second language in order to qualify. Through self- study of correspondence course material borrowed from a classmate, he was able to get a passing grade in French. He was accepted into the RCAF (Permanent Force) in June 1938 and was assigned to No. 2 Technical Training School at Camp Borden for training as an Aero Engine Technician. His assignments between 1939 and 1945 included flying training schools at Camp Borden, Brantford, Deseronto, Saskatoon and Summerside which were operating Fleet Finches, Tiger Moths, Harvards, Cessna Cranes, Avro Ansons and Airspeed Oxfords. In 1943 he attended the School of Aeronautical Engineering in Montreal, then the Officer's Training School, and received his commission on graduation. In 1946 he was assigned to 164 (Transport) Squadron, operating Dakota aircraft, located at Moncton. The Squadron was relocated to Halifax, then to Dorval, renamed 426 (Transport) Squadron, and then re-equipped with North Star aircraft. Bud was one of three Aeronautical Engineering Officers assigned to Korean Airlift operations at McChord AFB, Tacoma Washington. In 1951 he left the Squadron , and served for another 20 years in various operations and staff assignments at Comox, Trenton and Ottawa. He retired from the RCAF in 1971 having served in every rank, 14 in all, from Aircraftsman 2 to Wing Commander.

You joined the RCAF Permanent Force in 1937. What were the entry requirements for the Permanent Force? How were they employed?

To be considered for training as a pilot and commissioning, one had to have a university degree or be attending a university. One exception to this policy was that a few technicians could be selected for pilot training as Sergeant pilots. Technician trainee candidates had to be high school graduates.

In view of the limited number of aircraft types in use by the RCAF at that time, the technical training was based on the need to provide the pilot with a crewman who could service and repair fabric-covered, open cockpit aircraft on wheels, skis or floats on operations in the far north. Due to the lack of funds in the depression years, little recruiting was possible until the late 1930s. In 1938 some 200 were enlisted for training as either Aero Engine or Airframe Technicians (fitters and riggers). Unfortunately only 28 of that group remain.

All promotions were based on seniority; that is the date of commissioning, enlistment, or promotion. So if Smith was commissioned on 1 July 1937 he would always be senior to Jones who was commissioned on 2 July 1937. However the requirements of World War II made it necessary to change that policy.

What were the responsibilities of an Aeronautical Engineering Officer (AEO) on an RCAF Squadron?

The AEO is responsible and accountable for all aircraft and related parts and equipment on the squadron inventory. This includes such items as spare engines, propellers, wheels, work stands, jacks, special tools, towing tractors, tow bars, outer clothing such as coveralls, parkas etc. In short, he owns it all and could be expected to pay for lost or missing items. Of course he is also responsible for the supervision of all technical staff and their assignments at home base or on detached operations.

Aircraft on the ground are under the control of the AEO. They cannot be flown until his staff have repaired, serviced, inspected and signed for any work done, indicating that the aircraft is serviceable. When an aircraft is damaged or crashes, the AEO and his technicians are responsible for its inspection and repair or salvage. When a question arises as to whether an aircraft is serviceable or repairable, the final decision rests with the AEO. For example, I was sent to the U.K. to examine a North Star that had been damaged while landing at North Luffenham. I determined that the main spar, that runs through both

wings, had been stressed to such an extent that it was not repairable. I advised Headquarters of my decision and salvage proceedings were initiated immediately.

What were your responsibilities at 426 Squadron?

At Dorval I worked for the Senior Aeronautical Engineering Officer (SAEO), Squadron Leader C.D. McLean, on both maintenance and servicing activities. When we moved to McChord AFB on the Korean Airlift, Squadron Leader Bill Lord was our SAEO and I was responsible for servicing the North Star aircraft.

The North Star was just entering service with the RCAF in 1947/48. What were your initial impressions of this new aircraft? Did it present new or different challenges for the maintenance and servicing staff?

To me the North Star was just another aircraft. It did have one attractive feature: oil dilution, which proved to be extremely helpful during our cold weather operations. This was originally developed by Rolls-Royce for use on the Lancaster aircraft in World War II . Two North Stars were fitted with four-bladed propellers to reduce the noise in the cabin. These were designated C54GM-1: C for cargo, 54G for the latest version of the C54, M for Rolls-Royce Merlin engines and -1 to indicate they had different props.

In the early days we were only allowed to operate six North Stars. The remainder were sent directly from the production line to storage because of a shortfall in funding for spare parts. Consequently, when an item failed, (it is a well known fact that there are always failures of some type whenever a new product such as an aircraft is produced) there were very few spares available. That meant we had to rob parts from aircraft in storage to keep the others flying. The situation got so bad that we had a couple of aircraft we referred to as "hangar queens". Eventually we were able to get all six aircraft flying, and feeling quite proud of our accomplishment, sent a signal to our Headquarters, something like the following ". We are pleased to inform you that of this date all of our North Star aircraft are flying". The reply: "Damn poor planning, don't you know you should always have one in the barn!".

What were the engine and airframe inspection and overhaul schedules? Which schedules were completed at 426 Squadron and which were contracted out?

While I can't recall the exact schedule periods for the North Star airframe and engines, both were coordinated and completed by Squadron technical staff. Once an engine reached its overhaul time, it was replaced and then sent to Rolls Royce at Dorval for overhaul. I should point out that times to overhaul were subject to change as the latest modifications were usually incorporated and all parts examined by the company's engineers so as to confirm or extend the overhaul times. Airframes were overhauled on a schedule established by Air Material Command.

426 Squadron was tasked for both scheduled and detached operations on a worldwide basis. How did you train and prepare for detached operations?

We completed an Operation Mobility exercise shortly before the start of the Korean Airlift. 426 Squadron moved its base of operations from Dorval to Edmonton for ten days. We took our usual spares boxes and selected technicians to Edmonton on the deployed aircraft. The exercise went very well.

426 Squadron was deployed from its base in Dorval to McChord Air Force Base, near Tacoma, Washington, on 25 July, 1950 on assignment to the Korean Airlift. Describe the initial phases of the deployment.

We departed Dorval with six North Stars filled with spare engines, work stands, mobile stairs, tow bars, spare parts, special tools and the technical support staff. From Dorval the aircraft flew in a double V formation over the Peace Tower in Ottawa and then individually to McChord AFB. On arrival, we stepped into a foot of ashes as they had burned off the tall grass in the area where we were to be located. A large tent had been erected as temporary storage for our spares. The only structure in the area, about the size of a single garage, was used as an engine bay. In a matter of days, two nose hangars were built permitting good access to the North Star for servicing. A small maintenance office was also built. We were assigned space in a hangar for one aircraft which was used for periodic inspections and engine changes. Within a week, the whole area was paved over, improving work conditions considerably.

How did you provide technical support for aircraft on detached operations?

On scheduled operations in Canada over fixed routes, the Flight Engineer provided the required servicing support. Flight crews were augmented with technicians for operations to remote locations in Canada or extended operations abroad. Initially, on the Korean Airlift, technical crews consisting of a Senior NCO, AE Tech, AF Tech, Telecom Tech and an Electrical Tech. were taken to stops along the route: Anchorage, Shemya and Tokyo. When we

sent out the first replacement crew, they would take over from the Anchorage crew who would move to Shemya and the Shemya crew would move to Tokyo so that crew could return to base. These rotations continued throughout the year I was there. Later when our flights returned via Wake Island and Honolulu to San Francisco, a servicing crew was assigned to Honolulu.

Can you recall some of the unusual events or incidents you have experienced during your service with 426 Squadron?

On Operation Sweetbriar at Whitehorse in the Yukon, a North Star had an engine failure on landing and there wasn't time to feather the propeller. The temperature was -35 degrees F so I was not ready to accept the Rolls Royce service representative's suggestion that we do an engine change. I instructed my technicians to "Get a couple of 2x4s and with some padding, bolt them onto the prop and turn the blades into the feathered position". The Rolls Royce rep protested "But you can't do that" to which I replied "Just wait and see". In no time the prop was feathered and I asked the operations staff to ferry it back to Edmonton where the engine was changed in warmer conditions.

During Operation Mobility, a North Star arrived in Edmonton on three engines. The Minister of National Defense was on board so the Squadron Commander, Wing Commander (W/C) C. Mussells, ordered an engine change overnight. When removing the dome in preparation for removing the propeller, we noted that the doughnut type O seal was damaged and would have to be replaced. A simple task, but in this case the aircraft was a C54GM-1 (4 bladed props) and the seal was a different size than that used on our other North Stars. There was no known source for a new seal in Edmonton, so it was decided that we could probably have to make a temporary repair to the damaged seal. While the engine change proceeded I searched the hangar area for anything that could be used to repair the seal. After several fruitless searches, to my great surprise, I found a seal of the exact size needed under a work stand. The engine change was completed and after a flight test departed on schedule.

We were having a number of engine failures on our North Stars for which there was no logical explanation. Rolls Royce engineers reviewed their overhaul procedures but did not find anything that could have caused the problem. However, they noticed that most of the failures involved a burning (melting) of the aluminum pistons up from the piston pin location to the top of the piston. This lead them to the spray booth where used pistons were cleaned. The young man charged with the cleaning task had been told how important it was that the pistons were clean before being installed in another engine. He had followed instructions insofar as the spray booth was concerned, but noting that a varnish-like finish remained after the spraying, used a buffing machine to polish off the varnish. This buffing removed too much material from the piston thereby permitting a bypass of the combustion gas past the piston rings. As a result we had to change all of the pistons in all but our new engines. The aircraft affected were progressively taken out of the Korean Airlift flow for the piston change, which was completed by a Mobile Repair Party and Rolls Royce representatives at Vancouver.

On the second or third day of our Korean Airlift operations I was directed to go to Tokyo to determine why one of our North Stars had all four engines fail just prior to takeoff. I left McChord AFB at 7 a.m. and arrived in Tokyo 26 hours later. The servicing crew in Tokyo had determined that the fuel was not contaminated and an inspection of the fuel system revealed nothing unusual. However, we discovered that each of the spark plugs was loaded with a lead blob as large as a BB gun pellet. Then it was determined that the aircraft had been refueled with the incorrect fuel, 115/145 octane used by the USAF C54s. The North Star Merlins required 100/130 octane. All the plugs were changed, and after refueling with the correct fuel and a satisfactory test flight, the aircraft returned to McChord AFB.

Security at McChord AFB consisted mainly of showing your identification card on entry to the Base. I was surprised one day to hear the Base siren go off. Shortly after I was informed that one of our guys had been arrested and that I should report to Base Security. I identified the person they had arrested as Paul Durand, the Rolls Royce service representative assigned to 426 Squadron. Paul was living off base in a small motel and had found a convenient shortcut through a wooded area to where our nose docks were located. He had used the route many times before and had never been challenged. On the day he was caught he had left his base pass at the motel and was carrying a report concerning an aircraft incident in Winnipeg. The Military Police were certain they had caught a spy. Paul was released and allowed to go back with me to our work area.

What assignments followed your service at 426 Squadron?

I was transferred from McChord AFB to the Aeronautical Engineering staff at Transport Command

Headquarters in Lachine, Quebec. Two years later I was sent to 407 (Maritime) Squadron at Comox as a replacement for a fired Tech AE officer. The challenge there was to determine why, out of a strength of 12 Lancasters, they were only able to muster two per day for operations and training. The problem was personnel, and once it was resolved the flying rate improved to four per day with spares. On promotion to Squadron Leader I was transferred to 409 Squadron, flying CF100s at Comox. My next assignment was with the Director of Personnel services in Ottawa where I was responsible for the training and postings of about 1700 engineering officers of different specialties. I was promoted to Wing Commander and transferred to CFB Trenton as the Chief Technical Services Officer. Within six months I was moved to Air Transport Command Headquarters at Trenton as a temporary replacement for the Deputy Chief for Personnel who had taken early retirement. I retired from this position six years later.

Did you take post service employment?

Yes, I took a position as a Claimant Assistance Officer with the Unemployment Insurance Commission in Ottawa. In the early 1980s I was asked to develop a better Record Of Employment (ROE), a form that the employer was required to fill out when an employee was laid off or quit. My efforts were recognized by Treasury Board with a $2000 merit award. The citation read in part: "Your daily guidance to the regions has contributed significantly to an overall drop in errors on ROEs by employers and commission staff. This resulted in estimated savings of 162 million dollars from 1978 to 1981. This is a remarkable achievement." On June 15, 1984 I decided to retire after 46 years of uninterrupted service with the federal government.

What have been your interests in retirement?

My wife Lillian and I have a large property in Ottawa which I still maintain. While I have to admit that advanced age tends to slow one down, I'm pleased to be able to mow our large lawn with my riding mower and use my snow blower to clear the snow from our 60 foot driveway. I was an active curler at the Navy Curling Club for many years but I gave that up last year.

PNSAC

Crew Chief Reports

Ted Devey

Merlin engines

The Power Pack (complete engine nacelle assembly) was removed from the #1 engine position of the aircraft last July. It was mounted onto the transport stand and moved to Bldg 193 for disassembly.

The supercharger and all the ancillary equipment (e.g. radiators, cooling flaps, wiring harnesses etc.) were removed, down to the bare engine support frame. In October a special sling for hoisting the 3000 lb engine from its support frame was built. An old rotary engine stand, that was in the warehouse, was modified to accept the Merlin engine, allowing it to be rotated for convenient access to components. The engine was then transferred to the rotary stand (which works similar to a rotisserie) for further disassembly.

Figure 1: Merlin Master Mech and Tex

By the beginning of January, 2007, removal of the magnetos with ignition harnesses, intercooler, intake induction manifolds and induction tube, camshaft covers, camshaft assemblies, coolant and oil distribution pipes was started. The starboard cylinder bank with head was removed using two chain hoists with straps, after applying liquid wrench and up to 80

PSI compressed air to drive the penetrating oil down cylinder walls and onto the pistons and rings. Two pistons demonstrated some reluctance to let go.

The port cylinder bank proved to be our big challenge, #5 piston was removed with some difficulty but #2 piston was stuck in place. Liquid wrench, lots of it, compressed air, and discrete applications of a large dead-blow plastic hammer failed to loosen it. To access this piston, the cylinder head needed to come off. Several cylinder head-to-block nuts were frozen and had to be cut off. Studs remained solidly in place at the rear of the cylinder bank, wedges and hammering finally released the head from the block. One of the two studs was broken.

Figure 2: Disassembly underway – intake and supercharger removed

With the tops of the pistons now accessible, #2 piston was dealt with by using more liquid wrench and application of a club hammer via a hardwood block around the piston periphery. The piston refused to budge so a 5" diameter piece of aluminum about 4" long was fitted inside the cylinder bore (5.4") on top of the piston. John Corby, big dead-blow hammer in hands, whomped the piston twice, thereby releasing the piston. Such drastic action was taken only as a last resort. No damage was caused by this approach to conquering the recalcitrance of inanimate things, resident for almost 40 years in the Great Canadian Outdoors. Examination of #s 2 and 5 cylinder bores revealed a 'fuzz' inside indicating rust. Both of these pistons had compression rings solidly frozen in grooves, but they we are not rusty. They can be freed up to function normally.

The remainder of the engine was dismantled into sub-assemblies by early February - starter, reduction gear, lower crankcase, pistons and connecting rods as port/starboard pairs, and finally the crankshaft. Cleaning of the upper crankcase, the foundation of the engine, has begun.

A superficial assessment of the engine's condition reveals that it is in pretty good shape. Four cylinder bores are rusty and it will require a thorough cleaning to ascertain the amount of pitting that is present and to determine whether or not cylinder liner replacements are needed. From this point onward, crankcase cleaning and returning it to the rotary stand, taking sub-assemblies apart, cleaning them and returning them re-assembled to the crankcase, will take much time, effort and patience.

My crew members are Peter Houston, Ed Hogan. I have had some assistance from others as well, especially John Corby and Bill Tate. The crew is learning a lot about this engine under the guidance of Mike Irvin, the PNS Project Manager.

PNSAC

PNSAC Launches Membership Drive

Robert Holmgren

At its inception, PNSAC focused its recruiting efforts on enrolling members who lived within commuting distance of the Canada Aviation Museum. This policy was based on the initial assumption that all members would be able to participate directly in Project North Star, the restoration of the North Star aircraft. Now it is accepted that not all members are able to or wish to do restoration work. But, these members can and do make a significant contribution to the project by providing funding support, through their membership dues, necessary to sustain the Association operations.. The membership drive is directed to a broadening of the membership base by inviting all who wish to be associated with Project North Star, to join PNSAC and support its activities through payment of a nominal annual membership fee ($25.00).

Membership fees are used to purchase tools and equipment, consumable products, cover administrative expenses and provide safety training for members . The Association , has acquired ground support equipment, computers, printers, scanners and video equipment needed to process thousands of image files essential for the restoration processes. Membership includes these benefits: a family pass to the Museum, newsletter, color print of the North Star,

and a voice in PNSAC affairs.

The membership drive is an appeal to all who believe it is important to preserve Canada's aviation heritage through the restoration and public display of a historically significant aircraft, the Canadair North Star. It will take the contributions of many "to get the job done".

Membership applications forms may be downloaded at the PNSAC web site: www.projectnorthstar.ca

PNSAC

Miscellany

Restoration activity continues

Figure 1: Kid Kodak at work!

Figure 2: Classic Air Rallye volunteer at the North Star

Figure 3: We got all our wheels in a row

Figure 4: Bill Tate

Figure 5: Garnet C. at the bench

Figure 6: Nelson Smith with heater "pant legs"

Figure 7: Fresh from the paint shop

TCA flights to the UK

Sixty years ago TCA began operating North Stars on its flights to the UK. The service was initiated with aircraft on loan from the Royal Canadian Air Force.

Fly safe

A student pilot on a solo cross country flight becomes lost and asks ATC for assistance. ATC: "What was your last known position" Student pilot: " When I was number one for take off"

International Women's Day

March 8th is International Women's Day. The Museum is marking this day by highlighting the accomplishments of Canada's women aviators. Admission is free all day for women of all ages.

Centralaires concert

On Sunday afternoon, March 18th, the Centralaires Concert Orchestra will be performing at the Museum.

A name for the Newsletter

A few suggestions on a name for the PNSAC Newsletter were received. The selection of a name is being delayed in anticipation of more proposals. Submit your proposal to Editor at the e-mail address listed below

Reader's comments

Future issues of our Newsletter will include a reader's comments section. The Editor will select items for publication. Submit your comments to the Editor at e-mail address listed below.

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