

## BACK TO THE FUTURE!

**Juniper has the Airbus A380 and Boeing 787 Dreamliner in it's sights...**

**A new concept engine wash rig has been developed to meet the requirement of the Engine Alliance\* GP7200 engine and GE's latest engine, the GENx.**

In the late 1950's Fighter aircraft were flying below radar over the seas to avoid detection. These aircraft often suffered catastrophic engine failures due to salt contamination.

Juniper was tasked by the Air Ministry to solve this problem. The solution was to inject a kerosene and water mix down the engine whilst it was running. The rig was patented and sold worldwide.

**Over half a century later...**

Juniper's latest Water Wash Cart has been developed for the Engine Alliance GP7200 engine that powers the Airbus A380 and for GE's GENx engine for the Boeing 787 Dreamliner. The GP7200 is the first commercial engine to fly with a water wash system built into the engine.



*Juniper's new Water Wash Cart being used for the first time on a GP7200 engine at the GE Peebles Test Operation in rural Southern Ohio*

The new Water Wash Cart connects directly to a water wash system in the engine and the water is injected at ground idle. During the wash, contaminants, and most of the water is evaporated / burned away. GE has designed the system to reduce the time taken to carry out water washing and eliminate water ingress into the engine oil during the washing process.

The system is designed to lower maintenance costs and extend time on wing by reducing the EGT margin deterioration rate. The system also reduces costs by lowering the rate of deterioration of specific fuel consumption (sfc). Taken together with the associated benefit of saving fuel, this is the most technically advanced way to wash aircraft engines.

**S. Marshall**  
*Managing Director*

*\*The Engine Alliance is a 50/50 joint company of General Electric and Pratt and Whitney, a division of United Technologies*

# Training is just the ticket!

For the price of a flight, there is a free commissioning and training service for Airlines that purchase the Juniper Compressor Washing Rig.



GE/US Airways, Philadelphia USA

Training and commissioning using the Juniper Hot Wash Rig PN JMP/CFM56/D/4777/C200 and JMP/LUFT/D/4792/C200

- Dec. 2004 Ryanair, Prestwick, Scotland, Boeing 737-300, CFM56-7
- Dec. 2004 Qantas, Sydney, NSW Australia, Boeing 747-400, CF6-80C2
- Feb. 2005 Eurocypria, Cyprus, Boeing 737-700, CFM56-7
- Feb. 2005 MNG, Istanbul, Turkey, Airbus A300-B4-200E, CF6-50
- April. 2005 British Airways, Gatwick UK, Boeing 737-300, CFM56-3
- July. 2005 GE/US Airways, Philadelphia, USA, Airbus A320-210, CFM56-5B
- Jan. 2006 Atlas Air/Polar Air, Prestwick, Scotland, Boeing 747-400, Cargo CF6-80C2
- Feb. 2006 BWIA, Trinidad, Airbus A340-310, CFM56-5C
- April. 2006 GE Peebles Test Operations, USA, Engine Alliance GP7200 (Airbus A380)
- April. 2006 Thomas Cook Airlines, Manchester UK, Boeing 757-300, RB211-535E4
- May. 2006 Virgin Atlantic Airways, Gatwick UK, Boeing 747-400, CF6-80C2



Atlas Air, Prestwick, Scotland UK



BWIA, Trinidad



MNG, Istanbul Turkey



Qantas, Sydney Australia

## Contracted Engine washes and hire of rigs carried out since Autumn 2004

- Jan. 2005 ATC Lasham, Thompson Fly CFM56-3, Boeing 737-300
- May. 2005 ATC Lasham, Air Astana, RR RB211-535E4, Boeing 757-200
- June. 2005 Astraeus, London Gatwick, Boeing 737-300, CFM56-3
- Sept. 2005 Rolls Royce, Cargolux Boeing 747-400 Freighter, RB211-524G/H-T
- Nov. 2005 Rolls Royce, Corsair, Orly, Paris, Airbus A330, Trent 772
- Nov. 2005 Rolls Royce, Singapore Airlines, Airbus A340-600, Trent 500
- Dec. 2005 KLM, Schiphol Airport, Easyjet Boeing 737-700, CFM56-7
- Jan. 2006 GE/KLM, Boeing 747-400, CF6-80C2
- Jan. 2006 GE/KLM, Boeing 777-200ER, GE90-94
- May. 2006 ATC Lasham, Southend-on-Sea, Excel Airways B737-800, CFM56-7
- May. 2006 Iberia Airlines, Madrid, Spain, Airbus A340-310, CFM56-5C



Eurocypria, Cyprus

# It's 'green' for Juniper

## Test Cell Magic applied down under

'The hidden benefits' - how Juniper contributes towards saving the worlds resources and keeping our airlines healthy.....

It is becoming more and more apparent that washing engines using the Juniper system has many hidden benefits:-

Extending the time on wing, saving fuel and providing a good tool for timely engine changes - which all adds up to reduced repair bills when the engines are eventually overhauled.

## Chemical fumes inhalation concerns for RAAF, Australia



**During the post wash test after a compressor wash on the T56 Engine fitted in their Hercules aircraft, fumes are often experienced in the cockpit.**

A re-designed T56 Spray Ring was delivered to the RAAF Richmond, Sydney for a trial in the Spring of 2005. The new

spray ring has an additional delivery hose connection allowing separate washing solution and demineralised water hoses to be connected. The ring has also been re-shaped and the jets increased in size to give a higher flow rate which gives a more effective rinse wash after the soak period with the washing solution.

The results were so encouraging Juniper has forwarded a proposal to modify their compressor washing rigs, PN JMP/HER/D/1144/C500NL to incorporate these new features.

The rig already has two delivery hoses for connecting two engines up at the same time, and this facility has had to be sacrificed. The re-configured rig has a hose reel for the washing solution and one for the rinse solution with both hoses being connected to a single modified spray ring.

The proposal also adds immersion heaters to each tank to enable Hot Water Washing at 70°C to be carried out in lieu of using a washing solution. Additional tooling is also supplied which will make the new rig a universal washing tool covering the following aircraft in the Australian Defence Forces :- C130H and P3C, C130J, Boeing 737BBJ, Boeing 737 Wedgetail, Chinook.

The new rig will be designated JMP/HER/D/1144/C600

**Long Engine Probes designed for GE South Wales for use on RB211-524G/H engines were loaned to Qantas Airways for a trial using their new 2 x 50 Gallon Juniper Rig. The result on their Rolls Royce Powered Boeing 747-400 were positive and the long probes were purchased.**



A Second rig with another set of these probes -

PN JMP/RB211/D/4249, was ordered later in the year. The rig was also supplied with CF6-80C2 and CF6-80E1 Probes for their Boeing B 767- 300ERs, Airbus A330-300s and Boeing 747-400ERs

## Keeping out of hot water and beating the curfew!



**Hot Water Washing "Down Under" with Juniper's 2 x 50 Gallon Rig, PN JM/LUFT/D/4972/C200 and CF6-80C2 Engine now enable Qantas to wash engines on their wide bodied fleet 24/7 without upsetting the neighbours!**

Hot water washing is attaining similar results to Chemical washes, with the added benefit of eliminating the need for a high-power Post Wash Test after cleaning. This obviates the need to run the engines at high power during the night and enables Qantas to beat the curfew. Qantas are now washing 24/7 and reaping the benefits.

# Japan - First Airline to visit Ash House -

## Juniper's new factory



A delegation of six overseas visitors from the Japanese Airline ANA (All Nippon Airways) visited Juniper and placed orders for three, 2 x 25 Gallon rigs, PN JMP/CFM56/D/4777/C200. With the rigs they have purchased tooling for CFM56-3, CFM56-2/5, CFM56-7, CF6-50, CF6-80C2 and GE90-115B.

Further orders have also been received for two 2 x 50 Gallon Rigs, PN JMP/LUFT/D/4972/C200

All rigs have been painted in their colours and customised to suit exact requirements



The 2 x 25 Gallon Rig



The 2 x 50 Gallon Rig



# Iberia Airlines visit Juniper factory

## Sea King - a follow up



Following on from our story in the last newsletter - 'A try and a conversion' - here is a photograph of the final version of the rig, PN JMP/HYD/D/2098/C400.

Twenty of these handy little rigs have been supplied to the MOD this year. The rig's purpose is to test the Torquemeter Indicating system on the Westland Sea King gearbox. The AMM stipulates that whenever it is disturbed it should be functionally tested.

Iberia Airlines visited Juniper and placed orders for our Rolls Royce 2 x 50 Gallon Rig, PN JMP/RR/D/6326 coupled with tooling for Trent 500 and CFM56-5B/C engines to cover their fleet of Airbus A320 and A340 aircraft.

# Built to last!

# Largest Rig leaves Juniper factory



HMS Gannet SAR Flight, Prestwick Scotland

During a courtesy visit to their Hangar, a 55 year old designed Juniper MK2 Can Fluid Replenishing Unit was seen being used to top up the Gearbox oil on their SAR Seaking Helicopter. A fitting tribute to Mr Albert Thomas Juniper who died nearly half a century ago.

All hands were needed to crate up and despatch the largest rig ever to leave the Juniper factory. The Juniper Water Wash Cart, PN JMP/GP720/D/6355 was despatched to the GE Peebles Test Operations site in rural Ohio, USA (see cover story).



## 'Piggy back' job for Juniper



An American airline has taken delivery of three 2 x 50 Gallon Rigs, PN JMP/LUFT/D/4972/C200 and two static 2 x 50 Gallon Rigs, PN JMP/LUFT/D/4972/C300 for use on their wide bodied fleet of aircraft. Primary use is for the CF6-80C2 engines fitted in their Boeing 767-300ER.

The two static rigs have been mounted on the rear of pick up trucks. The trucks are being fitted out to enable line engineers to Hot Water Wash at remote areas of the airfield and at the departure gates.

## KLM- First Wide Bodied Hot Wash

In January 2006 General Electric and Juniper assisted KLM in carrying out the first Wide Bodied Hot Water Wash on three of their aircraft - two Boeing 747-400s cargo and one Boeing 777-200ER passenger. (CF6-80C2 and GE90-94B engines).

Preliminary results are very positive.



Pictured right is a commemorative sponge bag to mark the occasion!



# Juniper to the rescue - even when the engines have to be removed!

Juniper's latest Inhibiting Rig for the Rolls Royce GEM Engine. PN JMP/GEM/D/6310 was loaned to Virgin Atlantic Engineering to inhibit the fuel system of a CFM56-5C engine prior to its removal for engine overhaul.

Fifty of these handy little rigs have been ordered by the UK MOD. Primary use is for Inhibiting the Rolls Royce GEM engine fitted in the Lynx Helicopters, however there are many other potential uses.



## Eurofighter Typhoon EJ200 Engines

Rolls Royce, Bristol have purchased more rigs for their Test Cell for use on the EJ200 Engine. A Compressor Washing Rig PN JMP/T800/D/4796/C300 and an Engine Oil Top Up and Replenishing Rig PN JMP/125/D/0174/C501.



Compressor Washing Rig



Engine Oil Top Up and Replenishment Rig

## KLM Test Cell

A static 2 x 25 Gallon Rig, PN JMP/LUFT/D/4972/C300, has been supplied to KLM for use in the Test Cell for washing CFM56-7, CF6-80C2 and CF6-80E1 engines.



## Turkish Train Wash Success



During the visit to MNG Airlines in Istanbul, Turkey in February 2005, my agent Mr Zeki Koroglu, MD of Millennium Aerospace Supplies and Trading, took the opportunity to arrange a train washing demonstration using our Foamer 50, PN JMP/FOAM/D/1644/C800.

The top of the train had not been cleaned for two years. The original colour was light grey and there was no trace of this colour before the wash. The products presently used to remove this dirt are caustic and damage the paintwork on the top and sides of the carriages. We demonstrated that Ardox 6085 (Green Gel) could do the job without harming the paintwork. After the demonstration the manager at TUVASAS informed us that out of over 100 companies approached to do the work, we were the only ones who were successful.

**List of Juniper Engine Washing Probes for use with Juniper's  
2 x 25 Gallon Rig (PN JMP/CFM/D/4777/C200) and the  
2 x 50 Gallon Compressor Washing Rig (PN JMP/LUFT/D/4972/C200).**

<b>Aircraft Type</b>	<b>Engine</b>	<b>Juniper Part Number</b>
Boeing 737-300-400 RE-Engined DC8, AWACS	CFM56-3	JMP/CFM56/D/4538
Airbus A320	CFM56-2 & 5A	JMP/CFM56/D/4435
Airbus A320, A340	CFM56-5B/C	JMP/CFM56D/4605
Boeing 737-700/800	CFM56-7	JMP/CFM56/D/4462
McDonnell Douglas DC10-30	CF6-50	JMP/CF6/D/4966
Boeing 747/767	CF6-80C2	JMP/CF6/D/4037
McDonnell Douglas MD-11	CF6-80C2 D1F	JMP/CF6/D/6418
Airbus A310	CF6-80A2/A3	JMP/CF6/D/4247
Airbus A330	CF6-80E1	JMP/CF6/D/4947
Boeing 777	GE90 (Short Probes)	JMP/GE90/D/4081
Boeing 777	GE90 (Long Probes Thrust Reverser closed)	JMP/GE90/D/4599
Boeing 777-300ER	GE90-115B( Short Probes)	JMP/GE90-115B/D/4949
Boeing 777-300ER	GE90-115B (Long Probes Thrust Reversers closed)	JMP/GE90-115B/D/4948
Embraer 190 & 195	CF34-10E	JMP/CF34/D/6000
Boeing 757	RB211-535E4	JMP/RB211/D/4153
Boeing 747-400	RB211-524 G & H	JMP/RB211/D/4249
Airbus A320	V2500	JMP/V2500/D/4040
MD90	V2525 D5	JMP/V2500/D/4703/MD
Airbus A340-600	TRENT 500	JMP/TRENT/D/6188
Airbus A330	TRENT 772	JMP/TRENT/D/4702
Boeing 777-200ER	TRENT 800	JMP/TRENT/D/6328
Boeing 767-200/300	P & W 4000-94 inch Fan	JMP/PW4000/D/4856
Airbus A330-200/300	P & W 4000-100 inch Fan	JMP/PW4000/D/6216
Boeing 747-200	P & W JT9D	JMP/JT9D/D/4154
BAE 146, RJ70/100	Allied Signal LF507	JMP/LF507/D/4809
Puma Helicopter	Hand Washing Lance	JMP/PUMA/A/4470
Hercules	T56 Spray Ring	JMP/HER/D/1851
P3 Orion	T56 Spray Ring	JMP/T56/D/1847
Seaking Helicopter	RR Gnome Washing Lance	AND/AAC/911
Various Helicopters	P & W PT6 Washing Wand	JMP/PT6/D/1365

# NEW ORDERS for Juniper

**Air Canada, Air Berlin, Monarch and Lan Airlines (formerly Lan Chile) have placed additional orders for our 2 x 25 Gallon Compressor Washing Rig, PN JMP/CFM56/D/4777/C200**

Orders have also been received for the following:

**8 x Hercules Compressor Washing rigs,**  
PN JMP/HER/D/1144/C500NL were delivered to Standard Aero of Winnipeg, Canada in March this year. They have customised the rigs to suit the exact requirements of the Canadian Air Force and have successfully commissioned them at a CAF base in Nova Scotia. The rigs are for use on the T56 Engines fitted in their P3 Orion and C130 Hercules aircraft.

**2 x Diesel Powered Foamer 250 Rigs,**  
PN JMP/FOAM/D/3088 are in current production for delivery to the RNLAf. These are for use on their Chinook aircraft.

**2 x 205 Ltr. Gel Drum Dispensers,**  
PN JMP/GEL/D/4464 are in current production for Dasic International overseas customers. The dispenser clamps directly on top of a 205 ltr. drum. Dasic A320 Gel is a heavy duty aircraft cleaner used to clean the heavily soiled parts of an aircraft such as; undercarriage legs, oleo legs, flap areas, wheel bays and areas affected by engine exhaust.

**15 x Lightweight Diaphragm Pump Rigs,**  
PN JMP/AGT/D/6003 and 6004 have been delivered over the past two years to Siemens in Lincoln. These rigs are supplied with their industrial Gas Turbine Packages.

**2 x Industrial Pressurised Lightweight Rigs,**  
PN JMP/RGT/D/1052 have been received from Gulf Helicopters for one of their overseas clients.

**8 x EH101 Compressor Washing Rigs,**  
PN JMP/EH/D/0760/C400 are in current production for an overseas customer of Westland Helicopters in Yeovil.

## CF6-80C2D1F Engine Probes

GE Caledonian brought to Juniper's attention that the CF6-80C2 probes do not fit on the CF6-80C2 D1F. Investigations revealed that the fixing bracket required modification and the probe lengthening 25 mm. The probes for this engine has been given a new part number JMP/CF6/D/6418

Commercial Airlines Juniper now deals with:

All Nippon Airways	GE Structured Services
Air Algerie	Hapag Lloyd
Air Arabia	Iberia Lineas Aereas De Espana
Air Astana	Iberworld (Mallorca)
Air Atlanta Aero Eng. Ireland	Japan Airlines
Air Berlin	Jet Airways
Air Canada	Jet Blue
Air Europa (Mallorca)	Jit Aviation
Air France	KLM
Air Jamaica	Korean Air
Air Luxor SA	Kuwait Airways
Air New Zealand	Lanchile
Air Pacific	Lauda Air
Air Transat	LOT Polish Airlines
Air Transport International	Lufthansa (Frankfurt)
American Airlines	Lufthansa Technik Philippines
Amre Flight UAE	MNG Airlines
ATC Lasham	Monarch Airlines
Atlas Air	North West Airlines (Sneema)
Austrian Airlines	Nova Airlines
BASCO	Oman Air
BH Air Bulgaria	Pakistan International Airways
Britannia	Pegasus Hava
Britannia Sweden	P & W America
British Airways (Gatwick Airport)	Qantas Airways
British Airways (Heathrow Airport)	Qatar Airway
British Midland International	Rolls Royce (Derby) England
BWIA	Royal Air Maroc
Carnival Airlines	Royal Jordanian
CCM Airlines	Ryanair
China Southern Airlines	Safair (Pty) Ltd
Continental Airlines	Sahara Airlines
Copa Airlines Panama	Saudi Airways
Cyprus Airlines	Shezhen Airlines
Czech Airlines	Sichuan Sneema China
EI Al Israel Airlines	Slovak Airlines
Emirates	Sneema Service North America
Euralair Industries	Sneema Services (CFMI Factory)
Eurocypria Airline Ltd	South African Airways
Eva Air	Sun Country Airlines
Evergreen Aviation tech Corp.	Tam Linhas Aereas SA
Taiwan	Thai Airways
FLS Aerospace (Dublin)	Transavia
FLS Aerospace (Ireland)	Turkish Airlines
FLS Aerospace (Manchester)	US Airways
FLS Aerospace (Stansted)	Varig Airlines
Futura Internac (Mallorca)	Vietnam Airlines
GAMCO - UAE	Virgin Atlantic Airways
GE Greenwich Caledonian	West Jet (Calgary Canada)
GE Peebles, Cincinnati	Yemen
GE South Wales	

## STOP PRESS

Beijing power-Ring & Trade is a China NDT focused company and China Civil Aviations are their traditional customers. Some of their customers asked them to contact Juniper with a view to cooperating with us in promoting our products in China.

Mr Zhang Quan has invited Juniper to a conference on June 28th 2006 in Beijing to meet these potential customers.



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