

POURING WATER ON TROUBLED OILS



The new improved 2 x 25 gallon rig

Fuel costs are very much on the minds of airline operators as the volatility of the price of a barrel of oil hits profitability.

Engine water washing is now accepted as a most effective way to save fuel and keep engines longer on the wing. It is also useful in determining the timely changing of engines.

Juniper continues to give a reliable and flexible response to the need for precise maintenance, performance efficiency and safety, particularly in today's circumstances.

Juniper's Engine Water Washing System is now being used by over 80 airlines, and the rigs can be found in every continent.

Rigs and an operative have been hired out 25 times to airlines in the UK and Ireland since our last newsletter reported a growing demand for our expertise.

Among our most recent successes was a demonstration for Snecma Services North America, which led to the purchase of the Water Wash Rig and its immediate use in a mass cleaning programme.

Snecma were contracted to wash 44 CFM56-5B engines on US Airways' Airbus A321s. The work was completed in four weeks at the airline's Charlotte maintenance base, North Carolina.

Our latest and largest model: The 2 x 50 gallon rig

Preliminary results show that the overall EGT improvement was 12 degrees, with some engines seeing up to 20 degrees. SFC gain is in the region of 0.2 to 0.5 degrees. Retention of these margins is being monitored, and at two months they were still looking good.

The 2 x 25 gallon rig used (JMP/CFM56/D/4777/C200) is Juniper's latest model with an improved trolley and 6 kilowatt heaters. These elements take under one hour to raise the temperature to 70 degrees; highly efficient and time-saving if more engines have to be washed on the same working shift.

Complementing our range, the 2 x 50 gallon rig JMP/LUFT/D4972/C200 was purchased by Lufthansa, Frankfurt, for its wide-bodied fleet fitted with CF6-80C2 engines or others of similar rating. An order from Qantas in Australia has been received for this larger rig for use on their CF6-80C2 engines fitted to their Boeing 767 aircraft.

More information about our rigs can be viewed on our website: www.juniper-liverpool.com

S. Marshall
Managing Director

Commercial Airlines Juniper now deals with:

- All Nippon Airways
- Air Berlin
- Air Canada
- Air Europa (Mallorca)
- Air France
- Air Jamaica
- Air New Zealand
- Air Pacific
- Air Transat
- Air Transport International
- American Airlines
- ATC Lasham
- BASCO
- Britannia
- Britannia Sweden
- British Airways (Gatwick Airport)
- British Airways (Heathrow Airport)
- British Midland International
- BWIA
- Carnival Airlines
- CCM Airlines
- China Southern Airlines
- Continental Airlines
- Czech Airlines
- El Al Israel Airlines
- Emirates
- Euralair Industries
- Eurocypria Airline Ltd
- FLS Aerospace (Dublin)
- FLS Aerospace (Manchester)
- FLS Aerospace (Stansted)
- Futura Internac (Mallorca)
- GAMCO - UAE
- GE Greenwich Caledonian
- GE Pebbles, Cincinnati
- GE South Wales
- GE Structured Services
- Hapag Lloyd
- Iberworld (Mallorca)
- Japan Airlines
- Jet Airways
- KLM
- Kuwait Airways
- Lanchile
- Lauda Air
- LOT Polish Airlines
- Lufthansa (Frankfurt)
- Lufthansa Technik Philippines
- MNG Airlines
- Monarch Airlines
- North West Airlines (Snecma)
- Oman Air
- Pakistan International Airways
- Pegasus Hava
- P & W America
- Qantas Airways
- Qatar Airway
- Ryan Air
- Royal Air Maroc
- Royal Jordanian
- Safair (Pty) Ltd
- Sahara Airlines
- Saudi Airways
- Shezhen Airlines
- Sichuan Snecma China
- Slovak Airlines
- Snecma Service North America
- Snecma Services (CFMI Factory)
- South African Airways
- Sun Country Airlines
- Thai Airways
- Transavia
- Turkish Airlines
- Varig Airlines
- Vietnam Airlines
- Virgin Atlantic Airways
- West Jet (Calgary Canada)
- Yemen
- with additional rigs for Lufthansa, Air France and Qantas

Training is just the ticket



Lufthansa Technik- Philippines

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

Since our last newsletter in Spring 2003, personnel have been instructed at the following locations:

Lufthansa Technik, Manila, The Philippines. Lan Chile, Santiago, Chile.

Air Transat, Mirabel, Montreal, Canada.

Snecma Services North America, Charlotte, North Carolina.

British Midland International, East Midlands, UK.



Staff & Technicians - Lan Chile



Engine Team - Lan Chile



Steve Marshall at US Airways, Charlotte, North Carolina giving training to SNECMA Services, North America.



On site training, Air Transat



Functional wash after training at BMI, East Midlands Airport

The **Baby** is Born!



Steve Marshall at the commissioning of the service line car, RNLAF base at Gilze Rijen

Juniper has been the partner in the production of a fleet of service line vehicles for out-of-area maintenance of the Royal Netherlands Air Force's Chinook, Cougar and Apache helicopters.

The Volvo trucks have been fitted out by the Terberg Company in the Netherlands.

Juniper supplied them the compressor washing system for installation on the trucks. The Juniper system consists of a 25 gallon washing solution tank and a 50 gallon insulated heated rinse water tank.

Also built in is an automatic filling system incorporating a



The service line car alongside a Chinook at the RNLAF base Soesterberg

Christ Filter to demineralise contaminated water.

Adaptors for Chinook, Cougar and Apache compressor washing are also supplied. The delivery and bleed hoses are fitted on stainless steel hose-reels conveniently mounted on the rear of each vehicle.

Apaches use their own power

Cut the job in **half!**



Compressor wash carried out on a RNLAF Apache



The GE T700-701c engines fitted to the RNLAF Apache helicopters periodically undergo heavy maintenance. During this process, two gas generator turbine wheels and one stator wheel in each engine have to be thoroughly cleaned to ensure all the tiny cooling holes are cleared of any blockages.

Four special to-type rigs for compressor washing of the GE T700-701C engines have been manufactured for the Royal Netherlands Air Force and commissioned at the Gilze Rijen base.

These 2 x 20 gallon units are powered by nitrogen cylinders, but Juniper also supplied an air inlet hose to enable IPAS air to be taken from the 7th stage of the engine compressor to power the rig.

This is very useful for out-of-area operations.

The prototype rig was a response to a call for assistance during an after sales visit to the base. The new rig reduced the time in cleaning the wheels by hand from 8 hours to less than 4 hours and released the engineer to work on other parts of the engine during the cleaning process. The condition of the wheels is as good as new after the process.

A further two units have now been ordered for out-of-area operations. See letter on back page for more details on this story. The Part Number of this high speed equipment is JMP/GE701/D/6185.



Juniper to the rescue

Engine probes for a P & W 4000 100 inch Fan engine could not be obtained in time to carry out a hot water wash on a US Airways A330 engine.

Juniper despatched a set of P&W 94 inch fan probes to Mark Benson of Snecma Services North America in the hope they could be modified to fit the 100 inch fan engine.

Mark was assisted by US Airways personnel who added an extra 8 inches to the length of each probe.

The engine on a US Airways A330 was successfully hot water washed later that week using the modified engine probes and Juniper's latest 2 x 25 Gallon Rig.

Air France Special

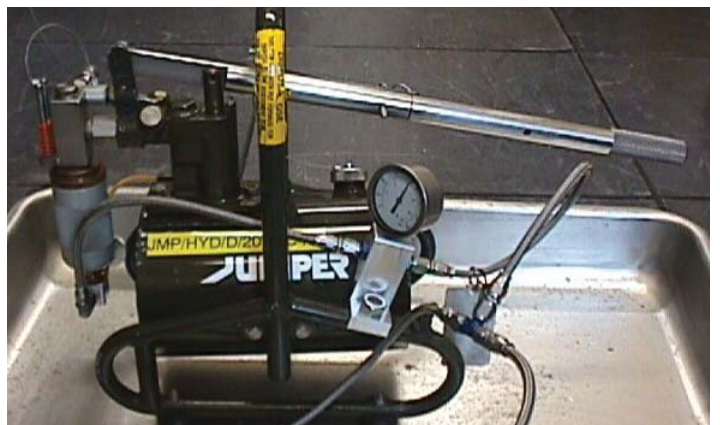


Three of this type of rig has now been delivered to Air France. Two for CFM56 engine's and one for GE90 engines. This latest rig had immersion heaters fitted in the tanks to enable the washing solution to be heated to 70 degrees centigrade.

Air France have also taken delivery of a set long engine probes for the GE90-115B engines fitted in their Boeing 777-300ER.

The GE90 engine is one of the few that can be fitted with probes without opening up the engine.

A try - and a conversion



The Sea King aircraft Maintenance Manual (AMM) specifies that the Torquemeter Indicating System must be functionally tested whenever it is disturbed.

The RAF at St Mawgan have introduced a modification to a Juniper Purging Rig to enable this task to be performed. Juniper has been asked to incorporate this modification and supply new rigs. The part number of the converted rig is JMP/HYD/D/2098/C400.



It's an Outside Job

Juniper's 2 x 25 gallon Compressor Washing Rig has been specially modified for Snecma Moteurs at the Villaroche site in Paris, by the provision of a longer (20 meter x 3/4 bore) delivery hose to allow the operator to work outside the test cell during the process.

The tooling box from the front of the rig has been relocated to the side of the rig and replaced by the new hose reel.

The ability to operate externally has great health and safety advantages and is seen as a great step forward in this area of maintenance.

Part No JMP/CF6/D/4038/C600

Keeping the RAF clean

Duties in Iraq, Afghanistan and elsewhere is putting great pressure on RAF maintenance crews, so it became necessary to provide extra training and refreshers for personnel in the use of Juniper's foaming machines for cleaning aircraft exteriors.



RAF Odiham



RAF Waddington

This was given with the 250 Dual Outlet Foamer at RAF Waddington and RAF Odiham, using the AWACS Sentry E3A aircraft and a Chinook helicopter.

As a result of the conflicts abroad, the RAF has ordered seven more cleaning rigs.



Merlin high speed "Wizard"?

When washing the Royal Navy Merlin's three engines, the APU oil temperature often exceeds limitations and washing has to be delayed to allow the oil to cool down.

Juniper was asked to overcome the problem by modifying the rig to enable all three engines to be washed together.

A successful trial was conducted at Royal Naval Air Station, Culdrose, using the built-in pipe work on the helicopter and measuring the flow at each engine outlet through a simulated spray ring.

An actual water wash to confirm the results is to be set up in the near future to ratify the results and procedure.



Rolls-Royce oil orders

A 5 gallon Oil Replenishment Rig has been supplied to Rolls-Royce (Part No JMP/125/D/0174/C500) for use on the EJ200 engine fitted to the Eurofighter.

They also ordered a 1 US gallon refillable replenishment gun for topping up engine oil (Part No 11071)

Cool response to train problem



Juniper's expertise is not only in the aircraft field. When last year's hot summer created a problem with the recharging of the air conditioning systems on Alstom Transport's London trains, we loaned them a hand-operated Hydraulic Charging Rig. This was an immediate success.

We have since delivered two new units based on our popular Hydraulic Rig.

Part No JMP/HYD/D/1326

Nuclear customers

Juniper's Foamer 50 (Part No JMP/FOAM/D/1644/C800) is becoming very popular with the nuclear fuel industry for washing down the flasks before the removal of fuel rods in the ponds.

Oil Replenishment Rigs



The Royal Australian Navy's satisfaction with our earlier equipment has led to the ordering of ten 5 Gallon rigs at HMAS Albatross, Nowra, NSW. The rigs enable the replenishment and top up of Gearbox Oil in the Seasprite SH2H(A) helicopter.

This rig (Part No JMP/125/C/0174/C901) was to the RAN's own specification.



Westland Order



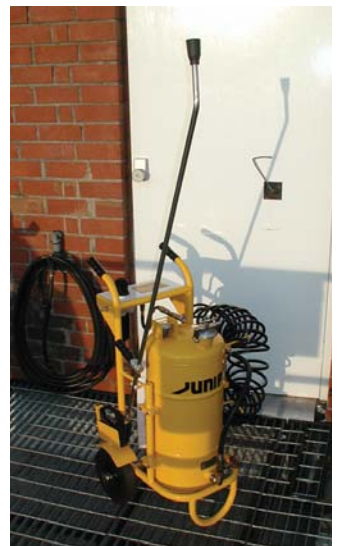
Westland Helicopters have taken delivery of a 1 US gallon Re-fillable Replenishment Gun for RAF Apache engine oil.
Part No JMP/APACHE/A/4939

Salt Water Laden Atmosphere Causes **Rapid Corrosion** Of Helicopter Airframes

A special rig to dispense WD40 was ordered by FB Heliservices for the maintenance of the Bell 412 Helicopter at RAF Valley.

The rig is used to effectively coat the airframe with WD40 after the flight training operations each day.

Part No JMP/WD40/D/6028



**List of Juniper Engine Washing Probes for use with Juniper's
2 x 25 Gallon Rig (Pt No JMP/CFM/D/4777/C200) and the
2 x 50 Gallon Compressor Washing Rig (Pt No. JMP/LUFT/D/4972).**

Aircraft Type	Engine	Juniper Part Number
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
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 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
Bae146, 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

Han, I wish you a very **Happy Retirement**



Farewell to my best friend.

Han G De Leeuw, my Dutch agent, and I, have worked together for over 15 years. During this time we have worked on many projects, producing special to-type rigs for military and commercial customers.

Among these was the Service Line Car mentioned elsewhere in this newsletter, and now has come to fruition. The first prototype was tested in Croatia in 1997.

This is his final year before he settles in Spain, and I take this opportunity to thank Han for his services to Juniper and wish him a long and happy retirement.

Han signs off with yet another satisfied customer

maandag 27 September 2004

Verhaaltje Juniper hot section cleaning device

At our Engine shop on Gilze-Rijen airbase we are proud to work with special cleaning equipment from Juniper, which they made to our special requirements.

Juniper translated our technical needs for turbine hot section cleaning of the T700-GE-701C engines powering the Apache helicopters into a very reliable, easy-to-use, transportable air-flushing and rinsing container. With the air-driven membrane pump, Juniper provided us with a unique pulsation in a steady water flow, so that dirt is easily removed from the tiny cooling holes in the turbine blades.

With this special cleaning equipment I can perform this cleaning task at any place, anywhere and at anytime (out-of-area conditions). With this new washing container I can clean a hot turbine section in half the time it took me to clean it in the normal way. So now I can reduce the time an engine is in the shop for cleaning. This specially designed washing and rinsing container by JUNIPER, will provided me with a good and easy solution for future operations.

Royal Netherlands Airforce



Juniper opens its second factory

Juniper celebrated the New Year by opening a second factory.

Buoyed by substantial military contracts and a growing order book, the company which has been in Liverpool since 1943, now produces fabricated frames and stainless steel tanks for its products in Wirral.

It continues to design and manufacture at both centres a comprehensive range of servicing equipment for military, industrial and commercial operators worldwide.

Marshall Works, Liverpool, remains the Head Office.

Address of the new premises is:

Ash House,
Prenton Way
North Cheshire Trading Estate
Prenton
Birkenhead
Wirral
CH43 3DU



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