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Mr XXXXX
CAA
Canberra

Good morning XXX

RE: Robinson R22 Helicopter operations in Australia.

"The Australian Experience"

OVERVIEW

Australia has been instrumental in the successful intergration of the R22 into light helicopter operations.

Instead of using the aircraft as original intended for personal transportation use - it was put to work in the burgeoning aerial cattle herding (mustering) business. Dominated by the Bell 47G series of helicopter - mustering operations were, and still are, conducted in outback Australia under some of the most arduous climate conditions possible.

With its unique hard gritty (iron oxide) dusty ground, high ambient temperature (up to 45 degrees C), high humidity (during the wet season), isolation and lack of amenities - the outback's abrasive high density altitude gave major problems to the Bell 47 helicopter, with engine failures, bearing failure due to dust ingress and severe M/Rotor blade erosion usually halving the blade normal life.

The R22 coped well and after initial serious problems with drive belt pulley wear (fixed with a hardened pulley) it has been the backbone of Australia agriculture. **The average ambient wind of 15 to 20 knots has not caused one main rotor / tail boom strike or mast bump.** Many machines have operated in emergency cyclonic conditions to shift cattle to higher ground as flooding occurred. **Wind speeds of 100 km per hr did not deter the work - which was safely accomplished.**

The accident rate **has been as high as the Bell 47 in the same operating environment in some areas** - due pilot error (fuel exhaustion, wires, trees etc.)

There have been a large number of accidents where low time pilots (70 - 150hrs) have put themselves into a low Rotor RPM situation (NOT overpitching) and then crashed a perfectly serviceable Helicopter from low altitude. This phenomena was unrecognized by our CAA, BASI and many pilots - even though the R22 flight manual warned of problems and R22 Safety Courses were held at the Robinson Factory explaining how to avoid this situation.

As training schools accepted the R22, due its economy of operation, the helicopter has now become the most popular helicopter in Australia.

With nearly 700 helicopters on the register, approx. 220 of those are of the R22 variant .

What is interesting, is that over 300 have been imported into the country and of the 220 registered - many have been rebuilt a number of times due to accidents.

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Being deeply involved in our industry - **we know that many accidents are not reported to BASI or the CAA** as the high insurance premiums would need to be paid up front if the insurance Co. found out about the incident.

It is more economical to park a unserviceable helicopter away from scrutiny and put it onto ground risk (even though it has been damaged !), while paying off the bank or lease company.

This explains the missing 80 helicopters not currently registered.

OPERATIONAL HISTORY

Like many evolving machine, the R22 has had mechanical failures.

1981 - 1983: **The early variant R22 and R22HP were prone to drive belt failure**. This problem was caused by pilots not recognizing excessive pulley wear at the Preflight. No fatalities were recorded - however one pilot received a broken back and serious other injuries.

Many of the aircraft imported between '81 and '86 are still operating. An example is S/N: 004 - VH-ECP which is still flying - after many rebuilds. Some airframes have over 6,000 hrs time in service, with others approaching 8000 hours.

Manual Main Rotor RPM control was, and still is, awkward for inexperienced pilots who found the early lightweight blades prone to easy under and over revs. The governor fitted to later model aircraft cannot keep up with the control requirements of a muster pilot unless he radically changes his style.

Little in country pilot education, as well as engineering expertise was available and most operators treated it like a mini Bell 47. Overspeeds were rarely reported, though they are a daily occurrence.

The influx of machines between 1986 - 1992 firmly established the R22, mainly because its low fuel usage provided economy of scale in the bush.

It was not, and is still not uncommon for an aircraft to fly 1,500 hours per year which gave it an annual fuel saving of approx. \$10,000.00 per year compared to the Bell 47G-3B-1.

The overall accident rate for the R22, until 1993 has been approx. 25:100,000 hrs (min).

Note: these hours are the known accidents reported to insurance companies. The probable rate was 30:100,000.

Except for a series of main drive belt failures due to manufacturing defect and some loose mast nuts - **the R22 has had virtually not mechanical failures of properly maintained aircraft.**

Improper maintenance caused many accidents - e.g.: fitting commercial bearings to the top and bottom of the clutch drive, sticky exhaust valves, illegal main and tail rotor transmission o/hauls, 200 hours operation for 100 hours on the maintenance release, eroded tail rotor blades etc, etc.

Environmental problems (heat and dust) require the following extra (**Non RHC approved**) maintenance to be carried out to ensure the aircraft reached it's 2000 hr TBO.

- a. Both top and bottom clutch bearings to be cleaned and greased every 300 hrs (requires unapproved disassembly).
- b. Alternator greased every 300 hours.
- c. Main x/missions oil change every 1000 hours.
- b. T.R. G.Box oil change every 300 hours.
- e. Compulsory engine 3 minute cool down @ 75% at engine shut down (stops sticky valves).
- f. Swash plate reshim and re-grease @ 1000 hours.

Pilots and operators found the aircraft so mechanically safe and reliable that a new type of accident crept in: - **"ATTITUDE"**.

Overloading: Full fuel, 85kg pilot and 110kg stockman = "normal load" (gross overload)

Overloading caused "over revving" and over boosting is also common. These conditions lead to accumulated airframe stress and failures e.g.: flexplates.

Due to flight and duty time regulation and distance constraints for proper CAA surveillance - **many aircraft flight hours are not recorded** (2 for 1 is not uncommon).

One fatal crash was caused by blade separation - probably due to various operational factors **including exceeding finite life time**.

With the Robinson factory based in the U.S.A - an "us and them" attitude prevailed and the aircraft were abused by many pilots.

We have heard many times the following line: **"What would Frank Robinson know about operating helicopters in Australia - He only makes them and is a low hour pilot"**

Approx. two years ago ('93) the R22 hull insurance rates rose to nearly 30% with 15% excess due to the high pilot and poor maintenance accident rate.

We had recognised for some time that "attitude" was causing a stumbling block in pilot education during AB INITIO training.

Most helicopter flight schools in this country are founded by experienced helicopter pilots **who usually have their own fixed focus on the correct way to train a pilot**.

There is no standard - except for the CAA syllabus - and emphasis is placed on the CFI's interpretation of the syllabus. As most schools have their own ATO on staff - **the standard of the graduate pilot is that of the CFI**.

With the increase in flight training schools around 1985 - many instructors have no regard for all the flight manual limitations and also have no idea at all of mechanical forces and stresses (metal fatigue) caused by **over** revving, over boosting, low RPM etc.

Post graduate pilot accident rate can be pitched directly at schools and the instructors' attitude: **many R22 low RPM situations come from graduates of certain schools.**

Early '94 found the introduction - with no encouragement from industry leaders or CFI's - **of a R22 Pilot Safety Awareness Course in Australia.** Based on (with the help but not approved by) the RHC factory course, this expanded course emphasizes common basic values and why operations should be conducted as per the flight manual and Frank Robinson's personal recommendations. **Metal fatigue is explained in Laymans language to the approx. 300 pilots who attended these courses.**

In the period that the course has been going (approx 2 years) the accident rate has been reduced to virtually zero. (Two wire strikes of Ag spray machines and one private operator who conducted illegal commercial ops, overloaded - hit a tree.)

An Insurance Broker recognized the value of pilot education and placed the following value on the R22 Pilot Safety course.

1. Reduction in Hull rate to 14% (approx.).
2. Reduction in Hull excess to 7.5%.
3. **The Insurance Co. paid for pilot attendance.**

They budgeted on a reduction of the accident rate to 1 in 5 instead of then 1 in 4, per year.

Of the 50 machines on the scheme - this budget meant 6 write offs and 4 rebuilds plus approx. \$50,000.00 expenses per year.

After two years, there has been only one write off (ag spray wire strike) and one rebuild (ag spray wire strike). **This is a reduction (over 2 years) to 1 in 50!!**

The accident rate for non course attendees remains very high!

TO SUMMARIZE:

The R22 has operated in harsh, hot, very windy Australian conditions since 1980.

The Australian R22 fleet averages 600 hrs approx. *per day* in the Muster season.

After initial teething problems, recognised by the manufacturer, mechanical failures on properly maintained and flown aircraft are rare.

There has been one M/Rotor blade in-flight failure.

There have been no confirmed Main Rotor divergent accidents.

Management, pilot attitude and bad maintenance has caused a high accident rate in other

areas.

Training is fragmented by a lack of an overall standard.

Many instructors will not attend Pilot R22 Safety Awareness Courses as they "know it all".

Pilot Safety Awareness Courses have helped the accident rate plummet to a better achievement than the local Military.

With the lack of properly trained maintenance personal in the understanding of the helicopter, metal fatigue and it's cause, aging airframes and corrosion - engineering related accidents still commonly occur.

Education is the key to the safe operation of any aircraft.

Enclosed: We requested some operators for an estimate of their experiences and any main rotor blade divergent problems.

1. Helimuster = **60,000 hrs** - NO divergent problems.
2. HeliWork = **42,000 hrs** No divergent problems.
3. AA Company = **50,000 hrs** - .No divergent problems
4. Aust. Helicopter Corp. = **96,000 hrs** - No divergent problems
5. Chopperline = **22,000 hrs** - One unresolved problem.
6. Pro Rotor Services = **3,000 hrs** - No divergent problems
7. E. Beresford = **2,000+ hrs** - No divergent problems
8. Tipperary Station = **6,000+ hrs** - No divergent problems.
9. Helicentre = **8,000 hrs** - No divergent problems.
10. Dwyer Aviation = **2,600 hrs** = No divergent problems.
11. AeroStar Aviation = **6,000 hrs** = No divergent problems.

As you can appreciate - we have only been able to contact the above companies in the short time since our last conversation.

I hope this short documentary of Australian Ops. helps you, the CAA and the FAA to practical solution to the US. NTSB request.

Best regards
Tony Carmody
18 January 1995