

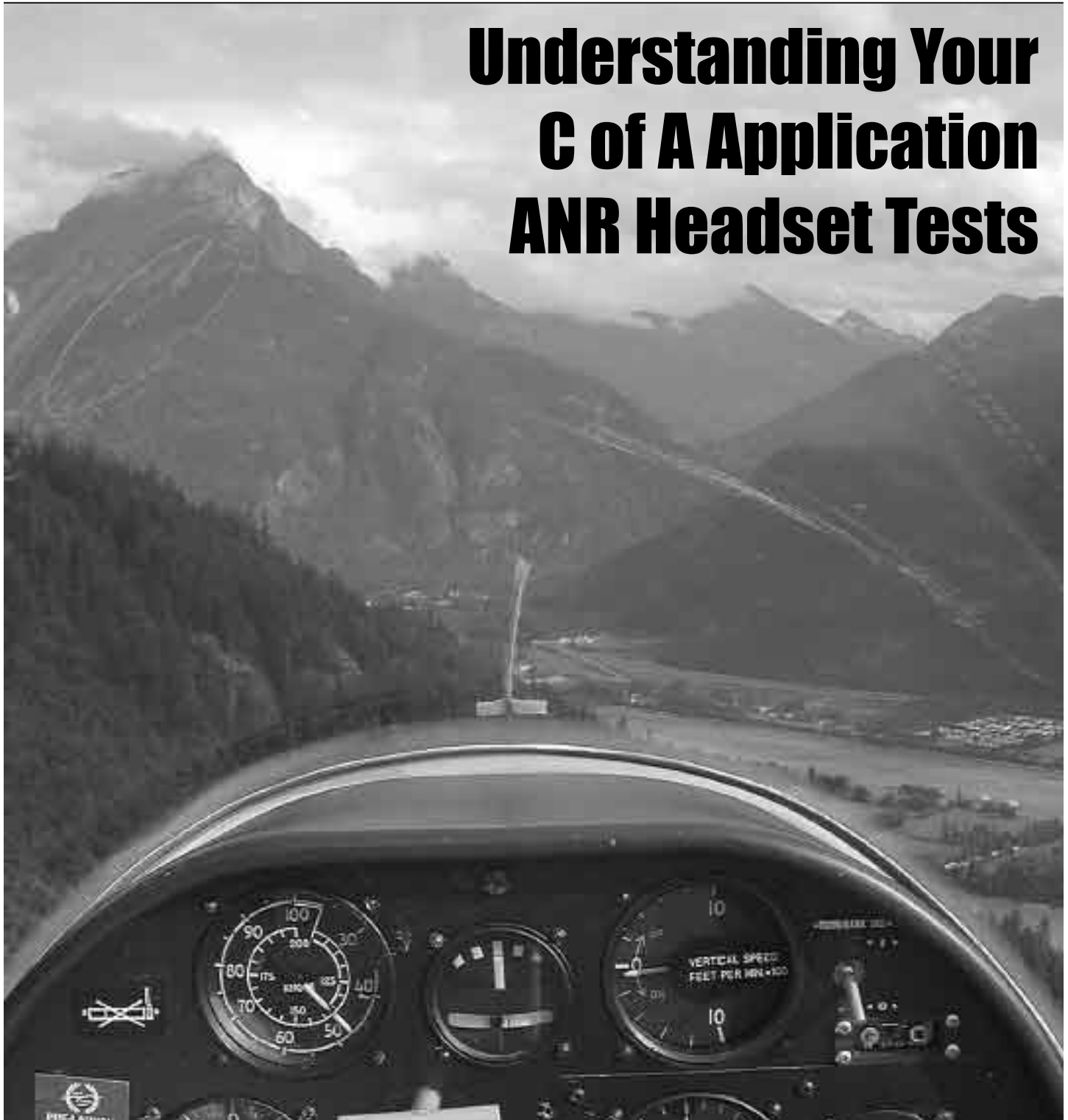
Turn & Bank



OFFICIAL NEWSLETTER OF RAAC CHAPTER 85

January-February 2002

Understanding Your C of A Application ANR Headset Tests





On the Cover:

Gliding just northwest of Hope in a Blanik. Above: a Beaver taxis in. Daniel Weinkam photos.

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The TURN AND BANK is the monthly publication of RAAC Chapter 85 and is intended to keep members informed as to the club's activities, and to promote safety and technical excellence in the field of sport aviation. No responsibility or liability is assumed, expressed or implied as to the content of articles contained in the Turn and Bank: the intention is to provide a forum for discussion and exchange of ideas.

Newsletter contributions should be mailed to George Gregory, 19470-88th Avenue, Surrey, B.C. V4N 3G5 no later than the 12th of each month. Business Fax is (604)-469-3495. Please remember to indicate "attention George Gregory" on your fax. Contributions can be e-mailed to George at:

gregdesign@axion.net

Enquiries to the Membership Chairman should be mailed to Rob Prior, 3032 Carina Place, Burnaby, BC, V3J 1B5

For inspections of Amateur Built Aircraft Projects contact the MDRA Inspection Services , ph. 1-877-419-2111 fax 1-519-457-0980 email: mldrainsp@on.aibn.com
 Regular Meetings are held on the first Tues. of each month at 20:00 in the clubhouse:

Delta Airpark, 4103-104th Street Delta, B.C. Clubhouse
 phone: 596-3644

Mailing Address: Chapter 85, RAAC
 c/o Delta Heritage Airpark, 4103-104th St.,
 RR#3, Delta, B.C. V4K-3N3

Executive meetings are on the third Tues. of each month at 19:30 in the clubhouse.

Chapter aircraft pilots, mail cheques (Payable to RAAC Chapter 85) to: Tedd McHenry

RAAC National Homepage:

<http://www.inforamp.net/~raac>

RAA Chapter 85 Homepage:

http://www.b4.ca/raa_85

Delta Heritage Air Park Homepage:

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Technical Guy

Terry Elgood

Initial application for a special certificate of airworthiness for amateur-built aircraft , procedure for filling out form 24-0079
List of Revisions
DateRevision
3 May 2001 Cover sheet added
8 July 2001 General revision , rotary wing added

This is an attempt at improving the understanding and accuracy of the forms that are required for the Amateur Built Aircraft inspections.

Are you having trouble filling out the forms required for the final inspection? You are not alone. These forms are the main reason for delays, they are frequently incorrect and must be returned to the builder or inspector. The MD-RA Regional Chief Inspector (for Amateur Built aircraft) cannot submit inaccurate data to Transport Canada for the permanent record.

Some of the formula in chapter 549 are next to impossible for a builder (and a lot of inspectors) to understand. Let's run through the most difficult one first, form 24-0079, INITIAL APPLICATION FOR A SPECIAL CERTIFICATE OF AIRWORTHINESS FOR AMATEUR BUILT AIRCRAFT.

On this form each box, numbered 1 through 29, must be filled out. Some of the entries are obvious, others require a little thought. Make a few copies of the form to work on, get your calculator and have a go at it.

1/ Registration Marks

Answer ; As shown on your C of R. Note; provide a copy of your C of R for the inspector at your final inspection.

2/ Aircraft Type and Model

Answer ; From the kit or plans, if its an original use a bit of common sense in naming, don't use a name that will confuse air traffic control or fellow pilots.

3/ Serial Number

Answer ; From the kit or plans, for your original you could use your initials plus dash 1 or whatever number of airplanes you have built.

4/ Was design modified by builder? If yes, attach details of modifications(s).

Answer ; No? Simple go to 5

Yes? Make a list of the modifications you

made. Note; this includes an increase in the gross weight, it is a change in the kit or plans design and requires a letter of approval from the designer.

5/ Name and address of person responsible for design.

Answer ; From the kit or plans or yourself for an original.

6/ A 3/4 side view photograph of the aircraft at least 2"x3" shall be attached to this space.

Answer ; This can be a bit tricky getting a photo cut to size so that the airplane fills the 2"x3" space. Staple it in place.

7/ Name and address of builder

Answer ; Your mailing address, where you want your C of A sent to.

8/ My base of operations will be.

Answer ; Where the airplane will be based for the first 25 hours of operation.

9/ Class of aircraft

Answer ; Check as appropriate.

10/ Number of seats

Answer ; Number of seats including pilot, maximum of 4 for fixed wing, maximum of 2 for rotary wing.

11/ Capacity of fuel tanks

Answer ; The total capacity in Litres. I recommend you do not use US gallons, this is Canada. Your fuel gauge and the weight and balance should also show Litres.

12/ Is aircraft provided with flaps?

Answer ; Yes or No

13/ Gross wing area

Answer ; From kit or plans or by calculation. Use disk area for rotary wing.

14/ One flap area

Answer ; From kit or plans or by calculation.

15/ Flap deflection

Answer ; From the actual aircraft, check they are both the same and record the degrees.

16/ Maximum empty mass

Answer ; NO this is NOT the actual empty weight as in box 17, do the calculation. Formula from 549.107

Below are four simplified examples based on the number of seats. I have used 1650lbs. gross and 180 HP as examples, substitute your weight and power as required, do not change the underlined figure, enter the corrected number in box 16

1. Pilot only no passengers.

Gross weight from box 19 - [175 + (.5 x Horsepower from box 25)]

Example 1650 - [175 + 90]

then 1650 - 265 = 1385 lb. enter answer in box 16

2. Pilot plus one passenger. (Note 2 seats maximum for rotary wing)

Gross weight from box 19 - [350 + (.5 x Horsepower from box 25)]

Example 1650 - [350 + 90]

then 1650 - 440 = 1210 lb. enter answer in box 16

3. Pilot plus two passengers.

Gross weight from box 19 - [420 + (.5 x Horsepower from box 25)]

Example 1650 - [420 + 90]

then 1650 - 510 = 1140 lb. enter answer in box 16

4. Pilot plus three passengers.

Gross weight from box 19 - [477 + (.5 x Horsepower from box 25)]

Example 1650 - [477 + 90]

then 1650 - 567 = 1083 lb. enter answer in box 16

17/ Actual empty mass.

Answer ; The empty weight from your weight and balance.

18/ Maximum permissible take-off mass.

Answer ; Take the number in box 20 x the number in box 13 = box 18

Next month, the conclusion

AIR Frame



Aircraft Portraits

Rob Prior
www.b4.ca/airframe
rv7@b4.ca

3032 Carina Place, Burnaby, BC, V3J 1B5

604/422.8446

Bulletin Board

Last I heard, Norm Helmer is looking for someone to help with his Paradyne project. The Paradyne is a cutting edge new concept in STOL aircraft that shows promise. If you're interested give him a call at 943-7887.

Dan Lawler would like you to send your email addresses to him at:

dan.lawler@kvaerner.com

He will create a database so he can send announcements about meeting programs, etc. Currently he has a list of about 20 e-mail addresses, and would like to expand it and keep it up to date.

Want to learn more about aircraft construction? Get involved in the J-5 project! Also, we are looking for help from someone knowledgeable in fabric work. Talk to a member of the executive and they'll put you in contact with the right people.

The Chapter's second aircraft carrier trailer is for sale. It's a gem! \$480 or best reasonable offer. It's at John Keon's place 16301 - 20 Ave., Surrey ph. 536-8589 or call Jim Hunter at 576-2678.

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Minutes Jim Hunter

Minutes of the General Meeting,
8 January, 2002

Call to order: 8:00 pm by President Tim
Nicholas.

Hunter/Meyer: that the minutes of the
General Meeting of 6 November, 2001. be
adopted as printed in the Turn and Bank.

Discussion Carried.

Committee Reports:

Treasury: Don Souter: Verbal report by Don.
We are in good shape considering that this

is the fiscal low point of the year.

Membership: Rob Prior: Time to renew for
2002. \$60 if before the end of the February
meeting, \$65 after that. As of the end of
the year, we had 137 members of whom 26
were complimentary.

Buildings: Dan Weinkam: Dan reminds ten-
ants of the Chapter hangar and tie-downs
that rent is now due.

Library: Tim Baker: Going well. Please
remind Tim that you have returned an item
when you do (so he doesn't slander you!)

Vice President: Emily Clemens: Emily will
be booking a place for the Annual Bash
within a couple of months.

Newsletter: George Gregory: going well.
The usual supplication.

Program: Dan Lawler: Tonight we have Mr.
Graham Scott on painting an aluminum air-
plane about as painlessly as that painful job
can be done.

RAAC: Rob Prior: RAAC election over.
Apparently a bit of an upset. Watch Turn

and Bank for results.

Aircraft: Tedd McHenry: Turbi was flown
7.7 hours in December which is amazing
considering the crumminess of the month.
Gaetan reports that some work done on the
J-5. Still room to come on board to learn
how to do fabric work.

DHAPCOM: Terry Wilshire: Caretaker's
trailer moved. It's now up by the BBFC
Club House. Plans for next year include
hangar repairs and improvements. Wright
Flyer Committee meets February 12. Hope-
fully, some of the sponsors will be in atten-
dance.

Old Business: None.

New Business: Congratulations to good
member Peter Timm on the first flight of his
home-built. It's a "Europa".

Meyer/Spence: that we adjourn. We did.

Jim Hunter, Secretary.

ANR Headset Test

by Rob Prior



Background

When the idea for this article started growing in my mind, I started thinking about all the things I wanted to do to make it better than all the other articles on the topic that I had seen previously. Most notably, I noticed that nobody else had ever compared all of the headsets that I was interested in. Unfortunately, shortly into attempting the procurement of the sample units for this article, it became apparent why nobody wrote such an article.

I contacted close to a dozen manufacturers regarding their headsets, from Bose to Telex, and only three replied. Three out of 12, or 25%. The initial contact was done all via e-mail, based on information on the manufacturers' websites. Followup calls were made to the 9 companies that hadn't replied within a week. None were returned. As much as I'd like to give the companies the benefit of the doubt (after all, I was asking for a free headset loan...), I can't help but think that the lack of response is an indication of the level of service that I would receive if I had a problem with my headset. As I write this article (a few months after the initial contact was made) there's still been no response from the other manufacturers.

The Tests

Empirical "Laboratory" Testing

Empirical testing consisted of concocting an arrangement whereby we could broadcast discrete sound frequencies at the headset, and measure the level of attenuation that the headset provided. The highly scientific test fixture for the headsets con-

sisted of my head (Figure 1) and an ear-plug with a sensitive microphone glued to the end of it (Figure 2). A signal generator was hooked up to a high-end home theatre system (Figure 3), which broadcast the signal out a large speaker located approxi-



figure 1



figure 2



figure 3

mately 2' from my ear. The microphone fed its signal into a fancy oscilloscope (Figure 4), which my assistants manipulated to measure both the active and passive attenu-



figure 4

ation at each frequency.

I'm sure you're thinking that this is a pretty mickey-mouse arrangement, and it kind of felt like it during the test. We found many gotchas about the method, that forced us to re-do some measurements. In the end, however, the attenuation curve that is published by Lightspeed for their 20XL model headset fit very closely to our measurements. So, even if it wasn't the most scientific of measurement systems, I expect that it is at least representative for the group of headsets tested, and can be confidently used to make a relative comparison.

Practical "Real World" Testing

The practical tests consisted of a series of flights conducted in real-world situations.

Our first flight was a night flight from Boundary Bay (CZBB) to Victoria (CYYJ), Nanaimo (CYCD), Pitt Meadows (CYPK), and back to Boundary Bay. The aircraft

selected for this operation was a Cessna 172, rented from the Pacific Flying Club. Apart from being a nice night for a flight, stops at Nanaimo and Pitt Meadows allowed us to change seating and headsets between three occupants.

The second flight was done in a Druine Turbi, which is a two (tandem) seat wooden homebuilt powered by a Lycoming O-235 engine. With the different construction material and powerplant, we thought we may find that different headsets performed better or worse depending on the aircraft, but none of the testers came up with different opinions of the headsets based on the aircraft they were testing them in.

The Active Headsets

Headsets are listed in alphabetical order. Prices are street prices taken from the Marv Golden Discount Sales website at www.marvgolden.com. I have no affiliation with Marv Golden, rather I have found their site to consistently have the best prices on headsets. MSRP may be higher for each model.



David Clark 10-13XL

Street Price: \$625US for XL model, \$549.95US for X model.

Power Source: 1.5V AA (6)

Pluses: Passive attenuation equal to 10-13.4 (non-ANR) model, Feels just like every other David Clark headset, comes with David Clark's almost legendary reputation for quality service.

Minuses: ANR circuitry seems to remove noise well, but adds a background hiss in the process.

Accessories Included: none.

David Clark provided for us their standard test unit, a 10-13XL. This model differed slightly from the X model that you may choose to buy in that it had connectors that allow you to disconnect the ANR module and plugs from the system. This allows for panel mounting, etc. The hard-

wired model is reportedly identical functionally, but doesn't come apart, and sells for slightly less money.

All testers reported noticing a faint background hiss when using the headset, which is believed to be an effect of the ANR circuit design, which adds white noise first before removing it again. It's not loud, but it's there and it's noticeable.



Flightcom Denali

Street Price: \$439US

Power Source: 9V (1)

Pluses: Looks. Comfort. Looks. Weight. Did I mention looks?

Minuses: Passive attenuation is not as good, so the overall performance is poor.

By agreement of the entire test team, Flightcom has done a great job of making a headset that's pretty to look at and comfortable to wear. Everyone who saw it immediately hoped that it would be the winner of the group, as it was certainly the best looking. Unfortunately, both the empirical and the practical tests proved that the headset was not the best in the group at attenuating noise. Flightcom could teach the other manufacturers a fair bit about packaging, however. The Denali arrived in its own zippered, contour-lined bag for storage of the headset when not in use. I originally thought this would be a nuisance in practise, but it turned out to be easy to use, and made me a lot more comfortable about handling an expensive headset.



Lightspeed 20XL

Street Price: \$399US

Power Source: 1.5V AA (2)

Pluses: Comfort. Good attenuation.

Minuses: Non-intuitive power/battery test controls. Poor Passive attenuation.

This headset turned out to be the second largest surprise of the test. Widely regarded as the second headset in line for anyone buying an Active headset (first choice being Bose, if you could afford one), we expected this to be the best performer of the bunch. That was not the case. While the headset worked admirably below 110 Hz, above that point the headset struggled to perform as well as many of the Passive-only headsets we tested. Add to that the poor Passive-only performance of this headset, and you're left with a very poor choice in noise attenuation, in the opinion of all of our testers.

We should note that this is not the top-of-the-line model, so there may be more performance available if you are willing to spend the extra \$115 to get the 25XL model. It apparently uses a different ANR circuit design that improves attenuation even further, but retains the same overall package that the cheaper models use. This may translate into poor Passive performance as well, which is a significant consideration for a battery-powered unit.



Lightspeed QFR Cross Country

Street Price: \$265US

Power Source: 1.5V AA (2)

Pluses: Price. Good Active Performance. Good Passive Performance.

Minuses: Looks. Cable mounting.

Despite the fact that this headset was the least attractive (physically) of the set, we quickly found that you can't judge a book by its cover. The QFR proved to be the best overall headset of the entire bunch, and at the best price of the entire bunch as well. In fact, it worked so well, that one of our testers received it as a Christmas present. This headset when turned off attenuated noise as well as a stock Passive David

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Fuselage, canopy, tail group complete. Air frame control components done except for cable. Main-wheel gear, wheels and brakes done. Tail-spring and wheel included. Panel made, no instruments. Lycoming 0-290 GPU Zero-timed. Will Neubert stainless cross-over exhaust with stainless muffler/shrouds. Bendix PSC5 carb. Bendix mags with non-shielded leads. No starter, starter ring or alternator. Weldtech engine mount. McCauley prop.

Wings: ribs and minor spars done. Spar diaphragms done. Two spar-grade spruce planks. No other wing parts.

\$15,000 firm, complete and not interested in parting-out

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Wanted: PA 18 or PA 20/22 Wings. Some damage OK. 946-5881

For Sale: Electronic Tach 2.25" with generator (new) \$125, 6" castoring tailwheel, \$50, Electronic dimmer control, \$25, 2 New 600.6 Goodyear Tires, \$125 for pair, Combo EGT/CHT (needs probes), \$50, Tach Cont.C85-0200, \$35, Temp (OAT) gauge, new, \$35, Windscreen Ant., Van's, new, \$15, 525 battery (new) never had electrolyte, \$75, Fuel Pressure Gauge O/H, \$35, Lycoming Starter 0-290, 0235, 0320, 0360, for \$375.

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Pat O'Donnell 533-1839

FOR SALE: Zenith 250 plans and parts, wing rib moulds \$360. Christavia Mk IV project, 4130 steel tube, wing ribs, flaps ailerons, gear legs, wheels and brakes, tail stab and rudder, \$3600.

Paul Trudel 532-8570

Building Partner Wanted:

partially completed Kitfox Model IV-1200. Time too limited to complete myself. Seeking building partner with some experience. Partnership arrangement - terms to be discussed. Call Marty Billinkoff Days (604) 322-7545 Cell (604) 351-0222 Evenings (604) 946-6475 email: martyb888@aol.com

Headsets -2 David Clark H10-30 \$125 / \$100 -2 Telex DBM-1001 \$75 for both

Bendix starters for Lycoming - 2 @ \$ 250 each Terry Elgood 604-279-2062

email: elgood@aebc.com

Clark headset, and when turned on attenuated noise better than any of the Active headsets.



**Radio Shack
Active Noise Cancelling Headset**

Street Price: \$70CDN
Power Source: 1.5V AA (2)

This headset was tested alongside the other active headsets in our laboratory test. We were curious what the performance of a consumer-grade headset would be compared to an aviation-oriented headset. We discovered that while it may be useful for travel by commercial airliner, it really isn't suitable for use in light aircraft. We didn't bring it along on our flying tests.

The Passive Headsets

Also for this test we brought out a few of our passive headsets, so we could test them alongside the Active ones and see just how much of an improvement we would get. Between us we were able to find a David Clark 13.4 (Figure 5), a David Clark 20-10 (Figure 6), an older FlightCom

(Figure 7), and a new headset called a Vector (Figure 8).

I should point out that below 120 Hz, all of the Active headsets (when turned on) outperformed all of the Passive headsets. Above that point, it was very frequency sensitive as to which headset (passive or active) performed the best. At some points it's an Active headset, at others it's a Passive one.

The Data

In the interests of saving publication space, I'm going to point anyone interested in seeing the raw data and graphs from our "lab" tests to the Chapter website, where I will post a Microsoft Excel spreadsheet with all of the numbers and graphs so you can form some of your own opinions. There's a lot of data there, take the time to look through it. The other reason for not publishing it here is that there is a significant amount of colour used to try and make the graphs clear, that would not reproduce well in a black-and-white publication.

So, point your browser to the following website: http://www.b4.ca/raa_85/story/index.html

There you will find a link directing you to an HTML-formatted version of this story, complete with graphs and pictures.

The Results

Comparing the construction of each headset, it may not be too hard to understand why certain headsets performed

better than others. The 10-13XL and the QFR Cross-Country were both derived from existing Passive headsets, and as a result brought along a long history of effective Passive noise cancellation technology. The 20XL and Denali were designed from scratch to be Active headsets, that clearly rely on the ANR circuitry to maintain the level of attenuation they provide. When that circuitry is disabled (by batteries dying or electrical malfunction), performance suffers.

Weighing all the factors of price, weight, active performance, passive performance, and durability, by unanimous opinion of the testing team the clear winner was the Lightspeed QFR Cross Country. Tied for second place are the David Clark 10-13X/XL and the Lightspeed 20XL. The David Clark edges out the Lightspeed a in accoustical performance, but the Lightspeed edges out the David Clark in price. In third place is the Flightcom Denali.

It should be noted that all of the Active cancelling headsets performed well, and in general performed better than the Passive headsets we tested. If you're in the market for a new headset, and are considering ANR models, we believe that any of these models would outperform your existing headsets. In particular the QFR Cross Country, at it's attractive price/performance point, would be an excellent choice.


Our thanks go out from the test team to all of the manufacturers who allowed us the opportunity to conduct this test. 



figure 5



figure 7



figure 6



figure 8

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