The Lynx HUD concept

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Abstract :
RC pilots are demanding extra hardware to improve their flight and their fun. Immersion flight replacing the view of the pilot with a video from an onboard camera have proven to be of little use and rather dangerous. Another approach is presented here with a dedicated affordable head up display. A good experience has been accumulated with this device and key factors of success are given.

1. Introduction

Pilot radio Controlled (RC) models give great pleasure to a lot of people. In view of progressing and getting the best of performance or pleasure, it is often dreamt of being aboard to pilot with all the information a full-scale pilot has. In this direction, several approach have been followed. Among them: audio variometers in planes or developing immersion flight with a blind pilot looking at an onboard video. These approaches have shown their limits and many of theses devices stay on the shelf while the pilot is on the airfield. The least inconvenience of video immersion flight is that the pilot ends up loosing his equilibrium and the worst the loss of control of the model. After several accidents, the legislation has been enforced and now the constraint is to find somebody to pilot in double command. After all, if the goal is to have the feelings produced by an aircraft, why not seat inside a true one.
We have developed another approach that keeps natural piloting as it is but complements the ordinary model pilot with "surnatural" powers to know with high precision the parameters of his choice on the flight. This concept is described here.

2. The RC pilot feed back loop

Thinking of how we pilot our model is useful, even if we do it without even thinking of it.
1 - We act on the organs of the vehicle (control panel, engine throttle…) through the emitter. The information goes from the pilot to the model with radio waves.

2 - then we consider the behaviour of the model and if satisfactory, we let it go and if not we control again. The information goes from the model to the pilot through visual attitude and pilot's eyes.
The path of information 1 is usually well equipped with many possibilities of surface or functions control.
For the path 2, from the model, the pilots have developed outstanding skills and many can sense the smallest balance movement of the wings to sense the presence of a thermal for example. Nevertheless, the human being's sight is highly limited to estimates and lacks of precision on tiny details.
The idea is to install a second feedback loop to complement (and not to suppress or supersede) the first one. With technology, the information transferred can be almost infinitely precise and address a wide variety of parameters.
The first feedback loop will give a global appreciation of the situation and the second one fully detailed information on demand.
The question is now how to mix the information at the pilot's end without disturbing him.

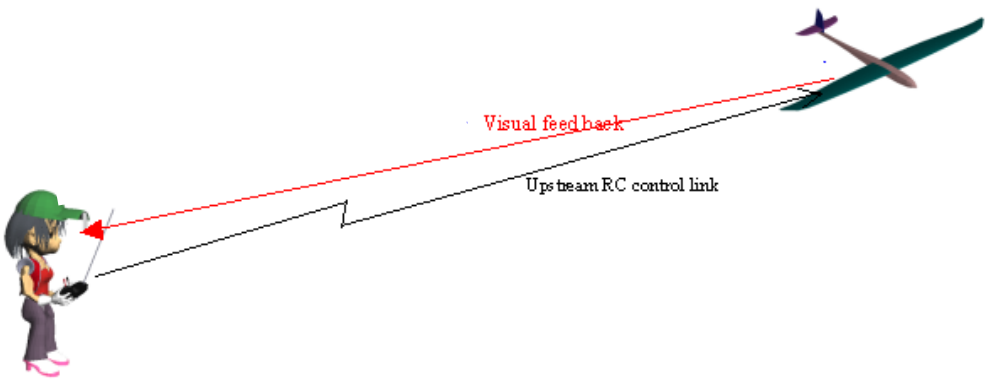


Fig 1 – The basic feedback loop

3. Mixing the information in pilot's brain

Any of the human senses can be chosen and several have been attempted. Many were using audio, this sense being under used during piloting. Audio variometers used this approach. However, if the musician have a good appreciation of a frequency in a concert, this brain input is limited in variety and precision. Practically, only vertical speed has been provided this way.
Humans being's eyes are far more developed in terms of variety and precision of information since the adoption of the alphabet and the figures.
The approach we followed is to mix in the pilot's eyes the view of his model and the chosen parameter displayed in his field of view. This display must be sufficiently unobstrusive and stealthy in order to be a plus and not a mask or a limitation to the natural view.

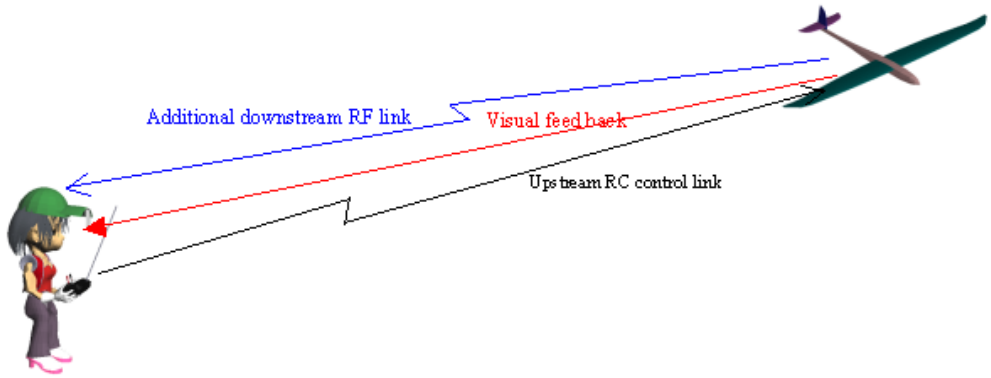


Fig 2 – Improved feed back loop with addition RF link

4. The patented Lynx RC head up display (HUD) from Xerivision.

We have tried several types of HUD; only one met our stringent requirements.
1 - to be non obstructive: the full field of view must be available without obstacle.
2 – to be comfortable: the device must induce no eye's fatigue. Wearing it must be natural.
3 – to be readable in all outdoor conditions. The readability of the information must be total against all the sky conditions: blue skies, grey or white clouds.
The experience is that the pale grey skies are the most demanding.
The system is completely integrated in a comfortable tissue cap. Tired of using it ? Just fold up the mirror or flip up the cap with the visor.

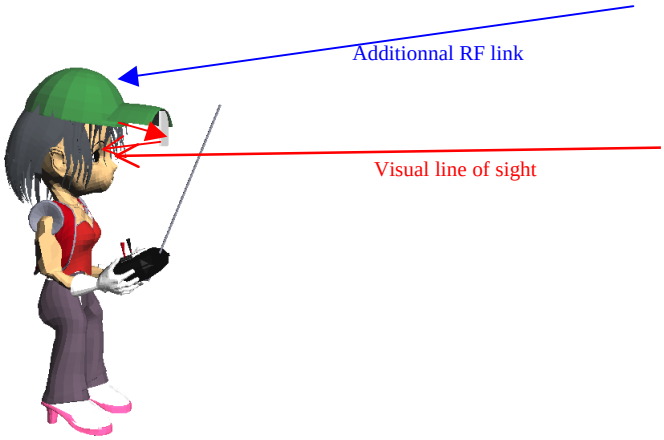
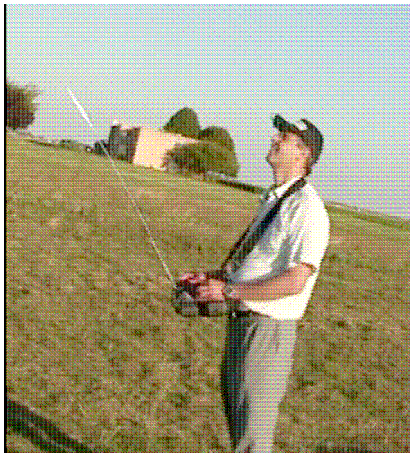


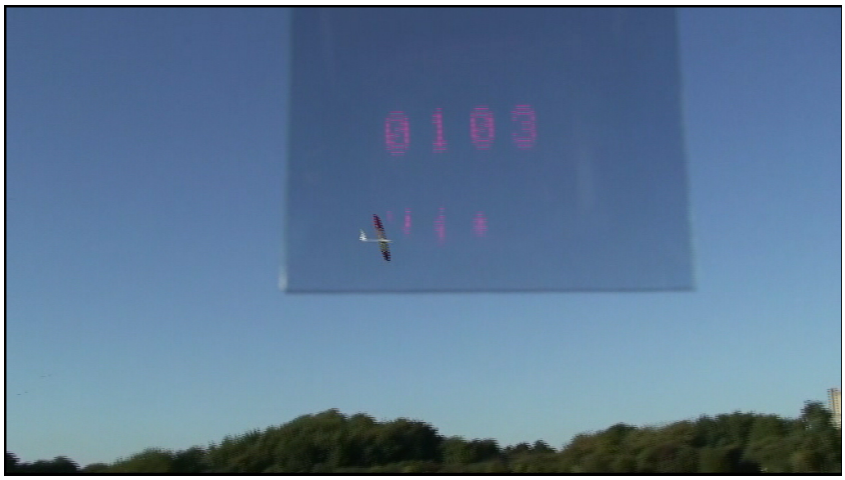
Fig 2 – The patented Xerivision HUD

This design is covered by a patent.



Flying the model with Xerivision Lynx HUD is completely natural

This is what is seen in the display during a flight; the values are in decimetres:



Air speed 10.3 m/S

5. How data should be displayed?

From the experience, we currently applied the following choices. They are not the only ones possible, if needed the display will be adapted by firmware change.

1. One information at a time along with the data type.
2. Alphanumeric displays or semi graphic
3. Switchable at pilot's command from the emitter.

The pilot chooses the information he needs in function of his goal or his phase of flight.

6. Which data should be displayed ?

Naturally, the kind of data to be displayed is function of the instrumentation and transducer equipment set up in the model and of the configuration of the onboard data management system firmware. At the moment, the system is configured in such a manner that the pilot can choose between:
- Altitude
- Airspeed
- Yaw
- Distance over longitude
- Distance over latitude.

Many others are in our list, some very useful, others amazing.

7. All this what for?

The benefits of using this device fall in several areas:
First: increase pleasure to fly or to pilot (other vehicles than air planes). Pleasure to know the speed, the altitude, to discuss with friends of the performance, to challenge them.
Second: better knowledge of the environment. Having the basic flight variable values allow correlation with natural phenomena's: presence of thermals, fore and aft wind behaviour. By decoding the flights on and on in various situations the feeling and the sense of piloting is increased. This gives also the pleasure to better understand and control the environment.
Third: anticipate dangerous situations.
Fourth: Increased training. For the competitors, this system allows repeating critical phases of flights with an invaluable monitoring of the progresses. This is true in various disciplines: aerobatics, F3B, F3J competition, racers. Concerning F3J where the winches are powered by a team of friendly workhorses, the use of the HUD leads to interesting discussion around a bier.
Fifth: the model designers will see directly the result of their most advanced ideas in real situations.
There are surely many further benefits that we let you the pleasure to discover.

8. Conclusion

The device presented is new and has been developed initially for RC fly control.
This is a demanding discipline and for that purpose, it works fine. It can surely provide more pleasure in other RC control discipline: cars and boats.
This display is proven to be efficient in outdoors in the most difficult situations. No doubt that it will be adapted and used for other outdoor sports.
Xerivision will also provide systems for other cultural, sporty events and professional use.
Visit us on our web site: Xerivision.com

And more to come…..