The Expocrank Advantage (Reprint)

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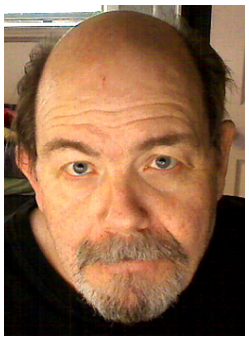
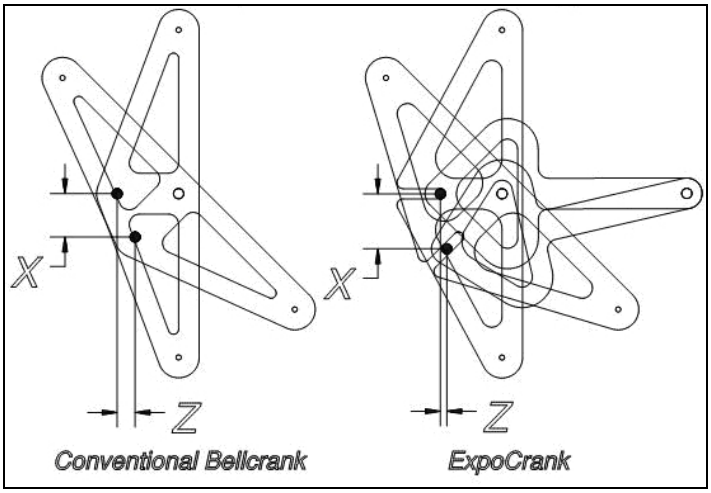
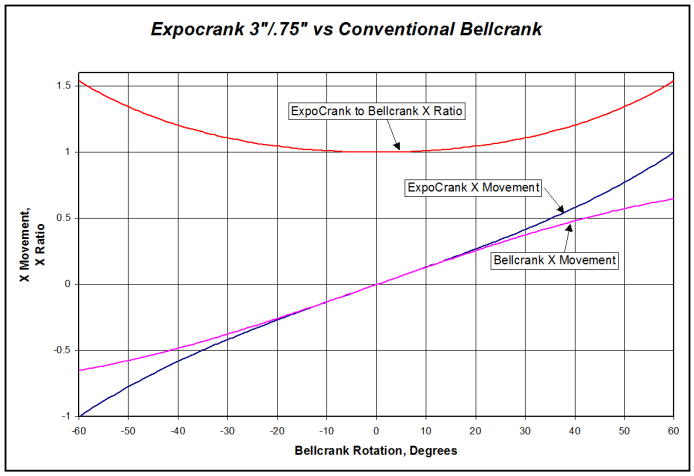


The following is a reprint of my article *The Expocrank Advantage* published several years ago in *PAMPA Stunt News*. An updated version of the **EXPO.XLS** spreadsheet is available by email request to me at the above address.

My friend **Bill Jacklin** recently commented that no serious RC pattern flier would buy a transmitter without exponential control rates, yet the whole concept seems to have escaped the CL stunt crowd. Is **Fred Bachl's** ExpoCrank invention (see May/June 1998 Stunt News) a solution without a problem? How can we know unless we try one?

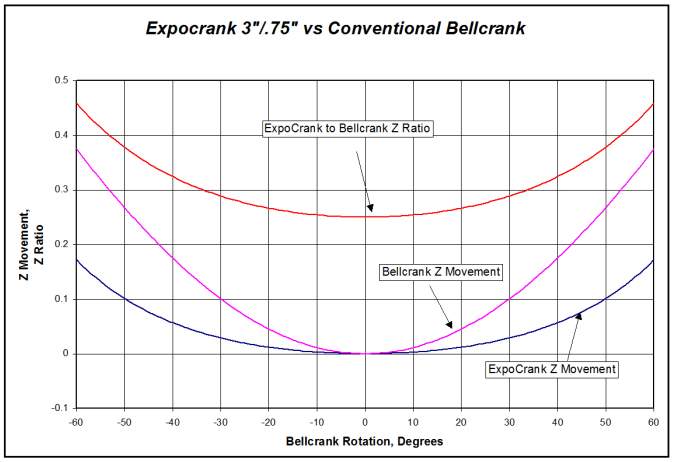


To graphically illustrate the difference between an ExpoCrank and equivalent conventional bellcrank, I created a Microsoft Excel spreadsheet which calculates and plots drive point "X" movement of each versus bellcrank rotation. This corresponds approximately to the control rod stroke, and demonstrates how control sensitivities differ.



A conventional bellcrank provides maximum sensitivity around neutral, decreasing as it is rotated. Just the opposite is provided by an ExpoCrank. The top plot illustrates that the ExpoCrank stroke is about 27% greater at 45 degrees than the conventional bellcrank. At 50 and 60 degrees, the ExpoCrank stroke is about 33% and over 50% greater, respectively. The exponential nature of its control sensitivity is clearly visible.

It is also interesting to compare lateral movements of the control rod drive points. The large radius of the ExpoCrank's control arm has a much smaller lateral "Z" movement than a conventional bellcrank. At 45 degrees bellcrank rotation, the ExpoCrank drive point Z movement is only about 35% of the conventional bellcrank. Around neutral position, it approaches a value of 25% (ratio to bellcrank radius to ExpoCrank swing arm radius). This characteristic is another positive benefit of the ExpoCrank.



I'll not belabor the math involved; if you are truly interested, take a look at the spreadsheet column formulas (Hint: Law of Cosines again.) The particular example used has a 3/4" bellcrank drive radius with a 3" ExpoCrank swing arm radius, which corresponds to the template previously published in *Stunt News*.

You can easily experiment with these parameters and see the effects plotted immediately just by typing in a different value at the appropriate cell on the spreadsheet. Radius values for the swingarm, ExpoCrank bellcrank, and conventional bellcrank reside in cells C4, D4, and H4 respectively.

I hope these graphs will provide some insight into ExpoCrank advantages. The ExpoCrank control system provides "snap" for hard corners, yet recovery to level flight is smooth, with less tendency to bobble. There is definitely a different "feel" to this system, but we quickly adapt to the ExpoCrank effect, which translates into easier control.

Larry Cunningham