



☒ Doty Wins FlightLine Editor by Landslide...

(some other people also elected)

☞ Reminder: January's CMA meeting is Thursday the 4th. After the meeting there will be an informal display of electric aircraft. If you have an electric plane, motor, speed controller, battery, etc. that you'd like to show please bring it to the meeting



January's Featured Model — Rich Dean's Sig Fazer

January's Featured Model

Rich Dean brought his new Sig Fazer to the December CMA meeting. The Fazer is a four channel plane (rudder, elevator, aileron and throttle) with a separate servo for each aileron. All of the radio gear is in the wing. The fuselage is a 1/2" balsa plank that was pre-shaped. The engine being used is an OS Max-H .40. It is a ringed piston engine with dual ball bearings three generations old but still runs good. Rich hopes to fly it early next spring but says "I don't think it will be the first plane I want to fly after getting rusty thumbs over the winter!" *JAD* →

Election Results

In December's club meeting, the 1996 CMA officers were elected. Duane Smith had previously offered to serve as if no one else wanted to run, so when no one at the meeting offered to run, his name was added to the nominees list. All the positions were unopposed so the entire slate was elected by unanimous consent.

The following candidates were elected as 1996 CMA officers

- President: John Michael
- Vice President: Tom DeWulf
- Secretary/Treasurer: Duane Smith
- FlightLine Editor: Jim Doty

The candidates thank you for your support. *JAD* →

In This Issue:

- Featured Model 1
- Election Results..... 1
- From the President 1
- From the Vice President..... 2
- What's new in FlightLine '96 2
- Minutes of December's CMA meeting 2
- Winter Projects 3
- How can I help FlightLine?..... 4
- Hawkeye 100—Add-hock Airfoil Design 5
- Heads Up, CMA activities 7
- Local News and Events 7
- CMA Staff..... 7

From the President

Here we are beginning another year, and looking forward to when the weather starts getting warmer and we can think about flying again. The days are getting longer, so flying time will be coming before we realize it. I hope everyone is working hard on their planes and can have them ready.

This year again promises to be exciting. Even more people will be getting their wings, hopefully me included. This year I'll be starting to fly my own plane in the spring instead of late summer, so the time I spend can be on flying, not



building. We are also looking forward to seeing the first of the SEA-CATs ready and flying (or at least floating), and the beginning of a new phase of flying for the club: float plane flying. Flying off the lake by Doc's office should attract a lot of attention. Has anyone thought of a radio controlled boat that can be used to retrieve planes stuck in the middle of the lake?

Then there are all the other planes I can only imagine that are being built. We should all try our best to have a plane ready by the April meeting. If I remember right, that is when we have our annual club beauty contest, before everyone has a chance to get out and fly much, with the chance of messing up the beautiful new creations.

I encourage everyone to attend the club meetings, show up at the build sessions, get out to the field as much as possible this coming year, and to support all the club activities. The more all of us get involved the more we all learn and the more fun it is for all of us.

John Michael, CMA President ➔

From the Vice President

Greetings fellow model aviation enthusiasts! As your new vice president elect of the Collins Model Aviators, I wanted to thank everyone who voted for me. This will be my third year of involvement with CMA and I hope it will be the best yet! I wanted to take a few minutes to introduce myself.

After several R/C cars, I started (attempting to) flying models about 10 years ago when I was in college. I didn't have much success, and quickly went through 2 models in about 3 flights. I gave up flying for a few years and started working at Rockwell in 1987. In 1993 my interest was rekindled, I joined CMA, and got (much needed) assistance learning to fly. Since that time, I have been quite active in CMA, building and flying several more planes. To date, I have been through about 7 models (including the 2 ill fated initial attempts) and have several more on the work bench. Those who know me say I'm kind of a hot-dog, but I just get bored flying 3 mistakes high with the wings level so I tend to push my aircraft to their performance envelopes. At last year's CMA picnic, my souped up P-51 got it's wings ripped off during flight, and became a guided missile. I plan to go back to the crash site this year to harvest some lumber from the balsa tree that should be growing there.

I will also be doing flight instruction for CMA this year. At the December meeting, a motion was made and approved to purchase a Sturdy Birdy II to use as a trainer. I am familiar with this aircraft and know it to be one of the most durable on the market. I personally flew one straight into the ground (so that it planted itself like a fence post, ... no kidding) Only damage was a ripped off servo wire when the main wing detached, and a broken carburetor. The plane itself was wholly intact and lived to fly again. The radio and engine were supplied by Dave Dillman from a previous club trainer.

The plane and other accessories cost \$80 and will be on display at the January meeting. It is my intention to be available at least 1 night a week throughout the 96 flying season at the CMA field for flight instruction. So if you are just learning to fly, or would like to refresh your skills before flying your own plane, then check the voice bulletin board at 395-8888 for details on the next scheduled flight instruction night.

I have also been pursuing the use of Rockwell's computer network to set up a World Wide Web home page for CMA. Results have been very positive so far. If everything works out, then we should have a new method to distribute *FlightLine*, *RConline* (and electronic RC magazine available on the internet), shareware flight simulators, club news, etc. This will be excellent publicity for CMA and should increase the enjoyment of the club for those with access to the internet (almost all Rockwell employees). I hope to know more by the January meeting. Until then, I'll see you in sky...

Tom DeWulf, CMA Vice President ➔

What's New in FlightLine '96

As we start a new year we also start a new FlightLine (at least a new FlightLine editor). FlightLine will still bring you the club news, announcements, and interesting articles you've come to expect, but this year we're introducing a more eye-catching graphics-oriented format. You can look forward to seeing more photos, plans, circuit diagrams, icons, illustrations, etc..

Each month I'll feature a photo of a club member's model, and some details on its design or construction.

In addition to the CMA related news and projects I'll add an occasional item of interest about local modeling and aviation events. I will also try to come up with some articles on the history of modeling and aviation.

But to be successful I'll need your help. I need your articles and letters, photos of your planes, announcements of CMA activities, and all the information I can get on area RC modeling activities.

I promise to do my best to put it all together, make it look pretty, and get it mailed on time. The rest is up to you. Thank you for your help and support, I'm looking forward to having a great year.

Jim Doty, FlightLine Editor ➔

Minutes of December's CMA Meeting

CMA Club Meeting, December 7, 1995

Irv Anderson called meeting to order at 5:00.

Minutes from November meeting were read and approved.

Treasurers report was given. We have 29 members for 1996.

Old business:

Snow Fence: Rich Dean reported that he and Basil Tilley took down the snow fence at the flying site.

Dependent dues: Mark Woytassek reported on his finding about the AMA guidelines on dependent dues. The guidelines for AMA are:

- Primary family member pays full dues.
- Second and following members over 19 years old pay half dues.
- Second and following members under 19 years old pay one-third dues.
- Retired persons pay three-quarters dues.

Discussion followed. It was pointed out that there seems to be no reason from a financial point of view, at least at this time, for additional dues from dependents. A point was also made about putting a additional financial burden on dependents for a hobby that is already expensive.

Mark Woytassek made an motion, seconded by Rich Dean that the following dues structure be adopted by CMA:

- Primary member dues: \$20.00
- Second and following members of household over 19: \$10.00
- Second and following members of household under 19: \$7.50
- Retired members: \$15.00

The motion was approved.

A motion was made by Tom DeWulf and seconded by Basil Tilly that the above dues structure be implemented by the 1996 year. Discussion followed.

The motion was approved.

Non-membership funds: A motion was made by Rich Dean that the dues received from dependents be reserved in a separate fund, since the company does not recognize dependents as members. This fund could also contain funds earned from other club activities. The fund would be kept by the club treasurer and used for club activities that may not be able to be covered under the company guidelines.

Discussion followed.

The motion was seconded by Tom DeWulf and was approved by the members present.

Second trainer: Tom DeWulf indicated that his preference for a second club trainer was the Sturdy-Birdy, which would use the club .25 engine. The new plane would cost about \$75.

Rich Dean made a motion that the club approve the use of that plane for a second club trainer and allow Tom to proceed with the purchase. Mark Woytassek seconded. The motion was approved.

Eagle 2: It was reported that contact was made with the owner of the Eagle 2 that was offered to the club. People were still working of acquiring the plane.

Community flying site: Work on acquiring a community flying site with other clubs in the CR area was still in progress. It was suggested that CMA members support the Skyhawks swap meet and their mall show to show support for the activities of other clubs.

New officers for 1996: The members present approved the following people as officers for 1996:

- President: John Michael
- Vice-President: Tom DeWulf
- Secretary/Treasurer: Duane Smith
- FlightLine Editor: James Doty

New Business:

Rich Dean suggested a fun fly for float planes in the spring. This depends on progress made on the planes currently under construction at the build sessions.

John Michael, '95 CMA Secretary, '96 CMA President ➔

❄️ **Winter Projects**

Rich Dean circulated a "What are you building this winter?" list at the November meeting. This is what he learned:

- Irv Anderson..... Goldberg Tiger 2
- Rich Dean..... Sig Fazer
Precision Hobbies OV-10
- Dave Decker Sig 4-Star 40
Knight Wing
- Tom DeWulf..... Lanier P-51
.25 size racer original design
- Dave Dillman P-51
Great Planes Sportster Bipe (maybe)
- Jim Doty Hawkeye 100
- Bob Holman..... FW 190
- Darrin Nebraska Sig Mid-Star 40
Top Flite AT-6
- Basil Tilley Hobby Shack P-47
Lanier Laser
- Michael Tribuno Goldberg Tiger 2
- Peter Tribuno..... Great Planes P-51
- Mark Woytassek Rubin 1.20 AC
Meridian .91 AC

How can I help FlightLine?

To fill the pages of FlightLine I'll need lots of input from the CMA members. The following lists some of the ways you can help, and the best format for the submissions:

News, Announcements, and Buy/Sell/Trade: Although I don't refer to FlightLine as a newsletter (I prefer to think of it as a very short monthly magazine) its primary function is to keep CMA members informed of club activities and local events. I really need your help to keep up to date and find out what's going on in the club.

Short announcements are best sent by EMAIL, I try to check my EMAIL every day (especially near the deadline), but a short hand-written note is fine too. I prefer that even short messages be sent in some kind of written form because there is less chance I'll mess up than if I try to write down a phone message. However, always feel free to call if you want to talk about FlightLine, modeling, electronics projects, or if you want to check that I've heard about some important news.

Photos of Projects and Models: I can always use photos of your models and projects. Work in progress shots are always interesting because they show the structure of the aircraft before it is covered.

FlightLine 96 is produced using Word for Windows 6.0. Photographs are scanned into BMP (Windows bitmap file) or TIF files and pasted into the FlightLine file. It's best if I scan in the photographs myself so I can adjust the resolution and contrast for best printing. I can scan in just about any photo size, so the format is not important. However, I don't have a slide scanner or a video frame grabber. If you want me to publish a image from a slide or video, you'll need to get it digitized yourself.

I like to publish some information with the pictures, so include any vital data you can think of with the picture (a handwritten sheet enclosed with the photo is fine). For example, for photos of planes include such things as wingspan, length, weight, engine size and type, radio gear and number of channels, and whether the model was an ARF, kit, scratch built from plans, or your own design.

You don't need to include all the above information, but be sure to include the name of the model and manufacturer (if there is one), and anything special you've done to the design (such as convert it from tricycle gear to a tail dragger).

Text-Only Articles: I'm not a fast typist, so I'd appreciate if any article more than one of two paragraphs in length was submitted in electronic form. If the entire article is plain text (no special fonts or bold, underline, or italics) then an ASCII text file is as good a format as any.

If you use ASCII make sure the file is saved without line breaks (without carriage returns at the end of every line) that way I don't need to remove them.

If you use any special fonts or use bold or italics then the file will need to be Word for Windows or RTF format. If you use RTF you may want to mail me a hard copy printout of the article so I can check to make sure none of the formatting was lost.

I'm currently on BANYAN EMAIL. Both ASCII and RTF files may be attached to an EMAIL file without problem, and if you're on BANYAN or PCNFS you can also attach a binary Word file. On other EMAIL systems you may need to encode any binary files before you send them with uuencode or binto hex.

Articles with Figures or Photos: If your article includes figures or photos the best way to submit your piece is as a Word for Windows with the figures already embedded in the file. However, if you don't use Word, (or if you don't have a way to get the figures into the word file) you'll need to submit the text and figures separately. Just include any captions for the figures in the text and put a note indicating which figure goes with each caption.

Remember, your figures don't need to be computer generated, a neat pencil drawing will work fine. Hand-drawn figures and photos don't need to be digitized, I can scan them. If you do use a computer drawing package to generate your figures try to send a non-bitmap format such as WMF, DXF, or HPGL.

Preferred Formats for FlightLine Submissions:

Short text messages like announcements of CMA and local events and activities, Buy/Sell/Trade, very short text-only articles:

- EMAIL in the body of the message
- Handwritten note

Text-only articles:

- EMAIL as an attachment or mail on 3½" IBM format disk as: Word 6, Word 2, RTF, or plain ASCII without line breaks
- EMAIL in message body without carriage returns at ends of the lines

Photos:

- Mail any size photograph but no video tapes or slides
- Mail 3½" disk or attach to EMAIL a 256 grayscale (8-bit) black and white or 24-bit color image in BMP or TIF format (GIF OK for black and white but not color). Files may be compressed with PKZIP.

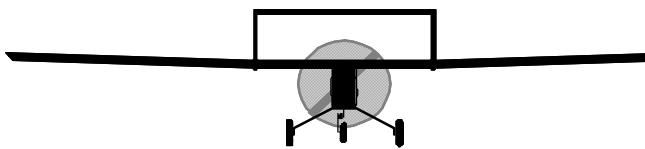
Hand-Drawn Figures

- Mail the original or a clean, sharp photocopy. There is no need to reduce the drawing to its final size. I can scan up to 8½" × 11". Larger figures will be reduced on a copier or scanned in multiple pieces.

Computer Generated Drawings and Figures:

- Attach a file to EMAIL or Mail on a 3½" disk in one of the following formats:
 - ◆ WMF — Windows Metafile
 - ◆ DXF — AutoCad data exchange format (single layer drawings only)
 - ◆ HGL — HP Graphics Language (HPGL)
 - ◆ Ask about other formats

Jim Doty, FlightLine Editor →



Hawkeye 100 — an RC Observation Aircraft Part VI — Ad-hoc Airfoil Design using a Spreadsheet, by James H. Doty

One of the difficult things in designing a model airplane from scratch is getting the airfoil shape right. This month I'll describe an ad-hoc airfoil design approach using a spreadsheet program.

Its not as hard for models: Model airplanes have utilized nearly every airfoil shape imaginable with a considerable degree of success. This is because small models have an advantage, over full size aircraft, in that their general performance is less dependent on the exact airfoil properties.

Typically model aircraft have a much higher power to weight ratio than full scale aircraft (unless your modeling jet fighters), this means that the model can tolerate lower lift to drag ratios. Another important factor is that the smaller wings of the model are more dominated by surface layer affects than full size planes. Therefore, small changes in airfoil design are less important than in full sized aircraft.

As a practical matter, RC models are typically not operating at a fixed airspeed or altitude for long. Models tend to be constantly climbing, diving, turning, or changing speed. The airfoils of full sized aircraft are carefully tuned for cruise operation in a small airspeed range. Even if a model airfoil was designed as carefully as a full size aircraft, it would seldom be at its optimized cruise condition for long anyway.

So unless your building a high-performance glider, or are intending to fly your model cross country, you will be able to tolerate a wider range of airfoil parameters than full size aircraft designers.

Airfoil Properties: Even though models are less sensitive to the shape of their airfoils, than their larger brethren, a model designer cannot ignore fundamental aerodynamic properties in his design. Certain factors such as the sharpness of the leading edge and whether the wing is symmetrical, or cambered will critically effect the lift, stall, and pitching moment characteristics of the wing.

Definition of Terms: Before we go too far we need to define a few basic terms:

Cord line—A line running from the leading edge to the trailing edge. Cord is the length of this line

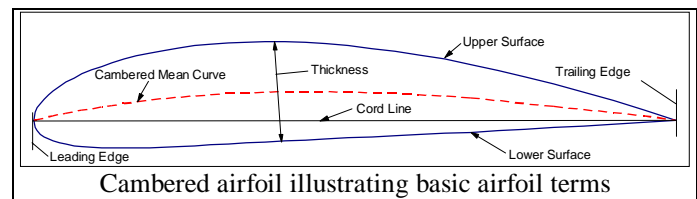
Cambered airfoil—An airfoil whose upper and lower surfaces are not symmetric about the cord line (i.e., a non-symmetric airfoil)

Cambered mean curve—A curve defining the mean point between the upper and lower surface. The amount of curvature in this curve defines the camber

Thickness—Maximum thickness of an airfoil

Angle of attack (AOA)—The angle between the cord line and the flow of the air. Note that the AOA is not equal to the angle between the cord line and the ground if the aircraft is climbing or diving

Pitching moment—The torque on the wing due to the airflow at a given AOA. Torques trying to pitch the leading edge down are defined as positive pitching moment



The airfoil designer should keep in mind the following general characteristics:

1. Thin wings with sharp leading edges tend to have lower drag than thick wings with rounded leading edges, but they also have more abrupt stall characteristics.
2. Symmetric airfoils have no lift at zero angle of attack, tend to have low drag, low pitching moment, and more abrupt stall characteristics
3. Cambered airfoils (such as flat bottomed wings) produce positive lift at zero AOA, produce higher lift, higher drag, and higher pitching moment, and tend to have more gentle stall characteristics

Pitching moment is important to consider because high pitching moment means that the tail (or canard) will have to work harder causing more drag.

Designing The Airfoil: With the above considerations in mind we can examine the airfoils of our favorite planes and make a fairly good guess at how we can make minor adjustments to tune the performance. For example, if we have a trainer with a thin flat-bottomed wing that flies too fast and stalls abruptly, we can thicken the wing and round off the leading edge to increase drag and give a milder stall characteristic.

Producing the shape: Now that we know what kind of shape we want, how are we going to produce it? There are a number of good programs for producing airfoils (the January 1995 issue of Model Airplane News listed 32 different model design programs, and by now there are probably more), but if you already have a spreadsheet program you can enter a few equations and plot out some nice-looking airfoils without buying anything (and without having to learn how to use another program).

In my design of the Hawkeye 100 I used Excel to generate the airfoils and pasted the curves into my cheap CAD program.

The Generation Equations: To produce a curve in a spreadsheet you need an equation. By looking at the shape I wanted I was able to guess at a pretty good formula for the airfoil.

I noted that at the leading edge I wanted a function that increased rapidly at first, and then increased more slowly. The function x^y with $y < 1$ has this characteristic, so I picked the square root function. Now I needed a function to subtract from the square root to get the trailing edge to go gradually to zero. After some playing around I found that a combination of a first and second order term gave me the best looking curves. So my upper surface formula was:

$$f_{us}(x) = a_x \sqrt{x} - b_x \cdot x - c_x \cdot x^2$$

The lower surface function is just the negative of this.

Now I had the function but I needed a good way to come up with the a_x , b_x , and c_x values. I decided on defining three terms: curvature (C), position (P), and thickness ($T = 1/2$ the thickness, as fraction of cord, at $x=P$), and deriving the a_x , b_x , and c_x values from them. Most airfoils are published with the cord normalized to 1 so I didn't need to include this term

We can start by assigning:

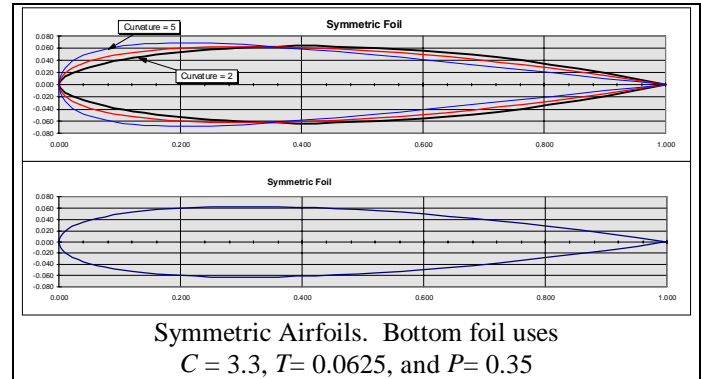
$$a_x = C \cdot T$$

From the fact that $f_{us}(0) = f_{us}(1) = 0$, and $f_{us}(P) = T$ we can determine the other two terms:

$$b_x = a_x - c_x$$

$$c_x = \frac{T - a_x(\sqrt{P} - P)}{P - P^2}$$

The plot below show airfoils for three different curvature values. For the Hawkeye I chose $C = 3.3$.



Cambered Airfoils: But what about cambered airfoils? Cambered airfoils are just symmetric airfoils bent around a mean cambered curve. A good cambered foil can be produced by adding a third-order camber curve to the upper surface curve and subtracting the same curve from the lower surface function.

$$f_{uc}(x) = f_{us}(x) + C_{mc}(x)$$

$$f_{lc}(x) = f_{ls}(x) - C_{mc}(x) = -f_{us}(x) - C_{mc}(x)$$

$$C_{mc}(x) = a_0 + a_1 \cdot x + a_2 \cdot x^2 + a_3 \cdot x^3$$

Again we set the values for the mean camber curve constants by defining two more meaningful values:

$$C_1 \equiv C_{mc}(1/3), \quad C_2 \equiv C_{mc}(2/3)$$

From these values and the fact that the camber curve must go to zero at $x = 0$ and $x = 1$ we get the following expressions for the camber constants:

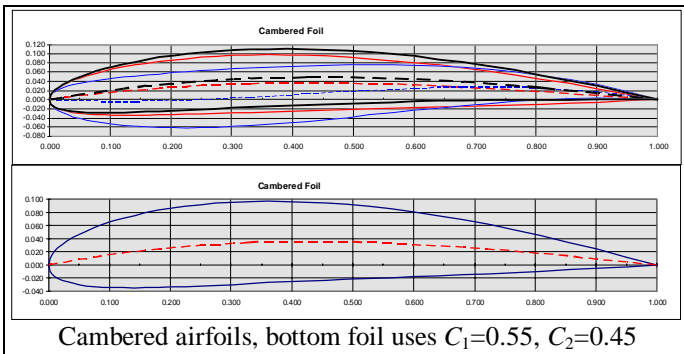
$$a_3 = \frac{27}{2}(C_1 - C_2)$$

$$a_2 = -\frac{45}{2}C_1 + 18 \cdot C_2$$

$$a_1 = -a_3 - a_2$$

$$a_0 = 0$$

Below are cambered foils for various camber values:



Conclusion: With the above equations you can generate a wide range of usable airfoils for many types of aircraft. If you have Excel and would like to play with the curves, just EMAIL me and I'll send you a copy of the spreadsheet. ➔



Heads Up, CMA Activities

- Thursday, January 4, 4:45 pm—Club Meeting
- Thursday, January 11, 6-9 pm—Build Session
- Friday, January 19, 5 pm—FlightLine Deadline
- Thursday, February 1, 4:45 pm—Club Meeting
- Thursday, February 8, 6-9 pm—Build Session
- Friday, February 23, 5 pm—FlightLine Deadline

Local News and Events

Eastern Iowa Regional R/C Swap Meet

Sunday, February 25, 10 am - 3 pm
 Palo Community Center
 1006 1st Street, Palo, Iowa
 General Admission \$2.00
 Sponsored by Cedar Rapids Skyhawks

R/C Adventures Expanded Winter Hours

From now until the end of January
 Open Sunday noon-4 pm

1996 CMA Staff

President: John Michael
Vice President: Tom DeWulf
Secretary/Treasurer: Duane Smith
FlightLine Editor: Jim Doty

Flight Instructors:
 Rich Dean
 Dave Decker
 Dave Dillman
 Mark Woytassek

Flight Instructors in training:
 Irv Anderson
 Tom DeWulf

Test Pilots for first flights of new airplanes:
 Rich Dean
 Mark Woytassek



Send your input for FlightLine to:

James H. Doty
 MS 124-300
 x2931
 johdoty@crems.rockwell.com

1996 CMA Membership

| <u>MAIL STATION</u> | <u>NAME</u> |
|---------------------|--------------------------------------|
| 108-103..... | Irvin Anderson |
| 108-166..... | Geoffrey Barrance |
| 124-111..... | Bob Buschette |
| 124-115..... | Raleigh Dean |
| 153-120..... | Timothy DeWit |
| 153-160..... | Tom DeWulf |
| 153-163..... | David Dillman |
| 124-300..... | James Doty |
| 120-131..... | Ron Menti |
| 108-166..... | John Michael |
| 108-166..... | John Michael (for Kevin Michael) |
| 153-163..... | Darrin Nebraska |
| 108-136..... | Patrick Neu |
| 108-136..... | David Neu |
| 137-136..... | Marion Payne |
| 120-105..... | Elio Picchetti |
| 124-123..... | Wayne Savold |
| 106-165..... | Gerald Showman |
| 108-136..... | Duane Smith |
| 108-136..... | Brian Smith |
| 105-152..... | Basil Tilley |
| 124-111..... | Robert Tribuno |
| 124-111..... | Robert Tribuno (for Peter Tribuno) |
| 124-111..... | Robert Tribuno (for Michael Tribuno) |
| 120-131..... | Ron Menti (for Tony Veit) |
| 181-100..... | Charles Ward |
| 153-264..... | Bryan Wesner |
| 107-110..... | Victor Wolfe |
| 124-115..... | Mark Woytassek |

Is someone you know missing from this list?
Give them a call and ask them to *Come Fly with us in CMA!*