

Long Range Flying in Mooney M20E

Yesterday I wanted to go out and put the Yuri Avrutin economy cruise theories to the test. My real desire was to head out east and see how far I could get. But that plan had the disadvantage that I would have to fly back from Kansas and I really didn't have the time for a two day test (besides, it's Easter weekend and my wife is strongly hinting that brunch is in order today). So I decided to do an "out and back" test. In my usually test pilot excesses, I have documented the flight in some detail, and it quite interesting. Here are the results:

I flew a route I often fly, Salinas California (KSNS) to Sunriver Oregon (S21). It is 433 nm in an almost exact north-south heading. There was a quartering south west wind with a north south component of about 7 knots. So I had a 7 knot tail wind going out and a 7 knot head wind coming back. The total flight took 7 hours and 12 minutes to traverse the 866 nm route. I flew at 12,500 feet for most of the flight (for terrain clearance) except for the last 1h 45m when I flew at 7,500 feet to minimize the headwind.

At 12,500 feet I pulled the prop back to about 1700 RPM. I was getting about 18 in. MP and I leaned until the engine started missing and then enriched it a bit more until I was maybe slightly lean of peak. I couldn't lean it as aggressively as on my earlier short test flight at 8,500 feet where I was able to get the fuel flow down to about 4.0 gph (and an airspeed of 101 knots). It seemed comfortable at about 5.7 gph where I was getting a true air speed of 122 knots.

So the flight took 7h 12 minutes and used 42.9 gallons. Thus at the end of the flight, I had a reserve of about 8-9 gallons or another 90 minutes.

I leaned in the climb, which seemed reasonable since I was using low power settings (similar to my normal cruise power) for most of the climb, 2400 rpm and 20 inches. I calculated that the climb to 12,500 used exactly two extra gallons beyond what I would have used to travel that same distance at my En route low power settings.

I used what I think is the Yuri fuel management technique: climb on left tank and then cruise for 2 hours; then switch to right tank for two hours; at 4 hours, go back to the left tank till it quits. Using the actual endurance of the left tank (which was used in the climb), plan to be on the ground well before the right tank has run as long as the left.

The left tank quit at 6 hours and 21 minutes into the flight. It really quit in a big hurry! No tell-tail misses or warning fluctuations of the fuel pressure. One minute it's running strong and the next minute we are a glider. I switched tanks as quickly as I could and flipped on the fuel pump. Much to my dismay, the engine didn't pick up right away. It kind of surged weakly. Full mixture didn't really help much. I finally gave it full RPM and it roared back into life (quite noisy after 6 hours at 1700 RPM). I need to review the mail list archives as to the required throttle and mixture positions for a restart. I had full throttle throughout this restart, and I recall something about needing to retard the throttle. Anyway, I returned to the economy settings for the last 45 minutes of the flight, not leaning quite as aggressively.

The 7+ hour flight was surprisingly tiring and toward the end I was a bit tuckered. I used O2 throughout which is really the secret weapon for clear-headed thinking above 8,000 feet. I recommend it to you since I don't think you have an O2 set. Another thing I have to get organized for future longer duration flights is a suitable large capacity "pissaire". My small bottle or two are awkward. I think Don Maxwell suggested a wide mouth juice bottle. I need to check out the super market shelves.

In any case, the flight was a success and greatly expands the range envelope of my Mooney. A few years ago, I flew to Ketchikan Alaska, and using normal cruise settings I was uncomfortable with the 550 nm over water leg from Bellingham Washington in terms of IFR reserves. As a result I made a stop in Canada which then caused my to have to go through customs, pay the \$25 sticker fee and a \$50 overtime charge. I could easily have made it non-stop by slowing down a bit.

Here were some of my calculations on this flight:

Summary Statistics

Avg Fuel Flow Out /climb	6.1	Avg Fuel Flow in Climb	8.6
Avg Ground Speed Out	128.0	Avg Ground Speed in Climb	104.9
Avg Miles per Gallon Out	21.0	Avg Miles per Gallon in Climb	12.2
Avg Fuel Flow Return /descent	5.9	Avg Fuel Flow Cruise	5.7
Avg Ground Speed Return	113.4	Avg Ground Speed Cruise	122.1
Ave Miles per Gallon Return	19.4	Avg Miles per Gallon Cruise	21.5
Avg Fuel Flow Total	6.0	Extra Fuel For 12500 Climb	2.0
Avg Ground Speed Total	120.3		
Ave Miles per Gallon Total	20.2		

Flight Log

Hours	Minutes	Time	GPS	Distance	Fuel	Altitude	GS	GS Kts
0	0.0	0.0	433	0	0.0	0	0	
0	7.0	7.0	424	9	1.5	4700		77
0	11.0	11.0	407	26	2.1	6600		255
0	16.3	16.3	407	26	2.7	8500	112	0
0	20.6	20.6	399	34	3.3	10500	114	112
0	24.8	24.8	391	42	3.8	12000	118	116
0	32.6	32.6	376	57	4.7	12500	117	115 Top of Climb
0	35.4	35.4	370	63	4.9	12500	122	129
0	39.4	39.4	362	71	5.3	12500	120	120
0	40.9	40.9	359	74	5.3	12500	122	120
0	45.0	45.0	351	82	5.8	12500	125	117
0	47.7	47.7	346	87	6.0	12500	121	111
0	53.5	53.5	334	99	6.6	12500	126	124
1	0.7	60.7	318	115	7.3	12500	132	133
1	7.5	67.5	303	130	7.9	12500	129	132
1	14.0	74.0	289	144	8.5	12500	124	129

1	24.0	84.0	268	165	9.5	12500	131	126
1	37.5	97.5	238	195	10.8	12500	135	133
1	46.5	106.5	218	215	11.6	12500	135	133
2	0.0	120.0	189	244	12.8	12500	141	129 Switch to Right Tank
2	10.7	130.7	164	269	13.8	12500	133	140
2	20.0	140.0	142	291	14.8	12500	136	142
2	30.5	150.5	119	314	15.8	12500	133	131
2	40.2	160.2	97.2	335.8	16.7	12500	134	135
2	55.5	175.5	62.3	370.7	18.1	12500	136	137
3	1.5	181.5	49.1	383.9	18.6	12500	140	132
3	10.5	190.5	28.5	404.5	19.4	12500	136	137
3	23.0	203.0	0	433	20.6	12500	140	137 Turn Around Point (S21)
3	30.0	210.0	419	447	21.3	11500	118	120
3	40.0	220.0	400	466	22.2	11500	105	114
3	53.9	233.9	375	491	23.4	11500	107	108
4	0.0	240.0	365	501	23.9	11500	110	98 Switch to Left Tank
4	10.0	250.0	347	519	24.9	11500	110	108
4	20.0	260.0	328	538	25.9	11500	114	114
4	33.0	273.0	306	560	27.1	11500	113	102
4	40.0	280.0	295	571	27.8	11500	110	94
4	50.0	290.0	275	591	28.7	11500	108	120
5	0.0	300.0	257	609	29.6	11500	110	108
5	10.0	310.0	238	628	30.7	11500	100	114
5	20.0	320.0	219	647	31.5	11500		114
5	27.0	327.0	206	660	32.0	11500		111
5	30.0	330.0	200	666	32.5	11000	126	120Begin Descent to 7500
5	40.0	340.0	181	685	33.5	7500	111	114
6	0.0	360.0	142	724	35.3	7500	116	117
6	10.0	370.0	123	743	36.3	7500	112	114
6	20.0	380.0	104	762	37.2	7500	110	114
6	21.0	381.0	102	764	37.5	7500		120Left Tank Empty
6	30.0	390.0	84	782	38.5	7500		120
6	34.0	394.0	74	792	39.0	7500	120	150
6	40.0	400.0	62	804	39.7	7500	121	120
6	50.0	410.0	41	825	40.4	7500		126Begin Final Descent
7	0.0	420.0	20	846	41.3	4000		126
7	12.0	432.0	0	866	42.9	80		100