

# Max Gross Weight

*Eat food, not too much, mostly plants.*  
Michael Pollan

**Caution:** This essay may arouse guilt or annoyance. You may wish to consult your life-coach-equivalent before reading further, or read on at your own risk.

A few years ago, I bought a self-launching sailplane. The next spring, I took it to my friendly FBO and checked the weight and balance. To see how much leeway I had against max gross weight, I loaded the portable oxygen, full fuel, snacks, handheld toys, and me – with moderately warm clothing and parachute.

The result? We were 12 lbs – 4.5 kg – over gross! What were we to do? We could leave the parachute and oxygen behind, and be comfortably under gross. We could subtract six liters of fuel. Instead, I chose to take some personal fat off, a good thing for health anyway.

Today's challenge is to look in the mirror: what if you weighed yourself, equipped for flight, in a glider you normally fly? Would you be in the pickle I was? As I meandered around in the exhibit hall at the SSA convention, it was tempting to guess which pilots might need liposuction to be within their glider's performance envelope.

There are two themes this month:

- 1: Let's be honest about our weight, and that of our passengers, before flight.
- 2: I'll offer some clues on how & why to decrease Personal Gross Weight.

In case you haven't taken a good look around lately, there's a steadily worsening epidemic of obesity in the Westernized world, which does include most of us pilots. This trend affects many things, from the proliferation of SUVs on our highways, desired by the corpulent for comfortable conveyance to calorie vendors, to changes in our hospitals. For example, recently I've admitted two ill people to hospital – each weighed about 400 pounds – about 180 kg.

This is an unsafe weight for them. They are altered metabolically. Whenever they move, it's like moving a sack of rocks. When sick, they do not have the strength to move themselves about, and hospital staff can be seriously injured trying to help. Drug doses must be altered, veins are difficult to find, resuscitation becomes impossible. Recently, a line of ceiling cranes has become available for hospitals that echo the engineering of shipyard cranes.

We are all floating down the same river; we're merely in different eddies. Humanity shares certain tendencies...

The FAA-standard pilot weight of 170 pounds (77 kg), aimed decades ago at the average male, long ago became largely a figment of imagination. In my clinic, we weigh everyone, of course, and we discover very few men and not very many women under that weight.

When was the last time you did an honest weight-and-balance for the glider *you* fly, at your own actual, measured weight *in full regalia, including parachute*? Never? I'm not surprised.

And – do you give rides? Do ever ask your passengers their weight? It's embarrassing to them and to ourselves, and socially awkward, like asking if they experience constipation. My passengers usually lie, except in those rare instances where I say, "It's a matter of life or death. It's OK to whisper." Or, with my airplane, I may say, for example, "I can take up to 190 pounds more. Would you care to ride?" Often, the answer is, "Um... I guess not."

Have you ever actually weighed a passenger at boarding time? Neither have I, though I've regretted the lack of a scale more than once.

When was the last time, before giving rides, you actually weighed yourself *as equipped*, and *then* calculated maximum and minimum passenger weights for the ride aircraft? Or did you use the number

your scale showed four months ago after you finished that successful dieting program, with you nude and empty?

Do you know the maximum seat weight? Some aircraft specify a maximum seat weight, though I've found this somewhat difficult to extricate from the Pilots Operating Handbook. This is seldom over 250 lb, in my limited experience, and sometimes much less. I found out about this years ago, when I chartered an aircraft to do a tour; my passenger claimed 220#, and afterwards, his seat was broken. I then discovered the seat had a rated max weight of 240#.

I don't want to be seen as self-righteous or carping here. I just want to point out that this is relevant to safety. For example, Wiley Post killed himself and humorist Will Rogers by not recalculating CG after installing floats and by not managing CG and gross weight on their flight to Alaska. They were more than 650# over gross (*after running the front fuel tank empty!*) and out of CG to the rear when the engine failed on takeoff and they cartwheeled back into the lagoon they'd just left, south of Barrow.

The point is not that we must do a full weight-and-balance calculation before every flight. But we must at least do this honestly, often enough, that we understand clearly where the envelope's borders are for ourselves as the pilot, with all the normal detritus aboard, so that we know our margins; for example, how much passenger weight we can safely accept. This varies, depending on the flight profile and conditions.

(The last time I reweighed my Mooney, we first left in all the manuals, tiedowns, spare fluids, handhelds, cushions, tarps, and whatnot. Then we took *everything* out. The difference was about 50 lb. It didn't seem that much, looking at it, scattered around the interior. A good lesson.)

As we all have learned, the maximum gross weight and center-of-gravity limits are relevant to the conditions of flight, to the anticipated stresses that will be experienced by the landing gear, seats, wings, and empennage. For example, MGW for aerobatic flight is different than for utility flight.

We also know that MGW can be carelessly exceeded from time to time, and many of us have done this, including me;





but this significantly increases risk, and seldom is a passenger informed of this risk. (In my experience.)

I have discovered that an excellent way to handle this is to simply tell my happy friend how much weight I can safely add to that empty seat. Every time, there is quick mental arithmetic. Often, the face falls, the flight is declined without mentioning that the minuend was quite a bit smaller than the subtrahend, yielding a negative difference.

(Grade-school math *does* have it's own jargon – I'll bet this jogs your memory; or maybe, at that point, you were sharing a shy smile with the soft brown eyes across the aisle instead of focusing on the teacher, a willing victim of Gender Inattention Disorder, one reason you're in management now instead of nuclear physics.)

People do care about their own safety, and are not always as confident in our skills and judgment as we are.

#### Your personal gross weight.

Let me quit carping on aerodynamics and talk about health. We all expect to live until we die, related to the fact

that the mortality rate has been stuck on 100% for millennia. In the West, thanks to modern medicine (physiology, pharmacology, and anesthesia), people expect life meanwhile to be comfortable and functional. This is not correct.

How much you weigh is important not merely to flight safety, but also to health, which affects whether you are, as a pilot, safe for your passengers and other innocent bystanders, and will affect how much you suffer in your later days.

I have devoted most of my career to trying to persuade portly Packer-backers to put aside pizza (a physiological poison). I do this because it's sad to see people suffer, and our obese people are trucks going down the back side of life's mountain without brakes.

Yet we all have the fully operational brakes of *abstention* and *self-discipline*, but so many people consciously and deliberately avoid using them. Last month, a friend responded to my heartfelt education on diet and health by saying, "But I haven't had a heart attack yet!"

Kiddos, atherosclerosis is *not* reversible! It is preventable! The high-fat, high-

sugar, delicious Western diet conspires with our indolent Western sedentary lives, to make us rot from within. The visible sign of this rot is our convex bellies.

#### The paradoxically amplified appetite of obesity.

The paradox is that hunger varies properly with weight only near ideal body weight. Then, hunger increases as we add extra weight. Hunger is not a form of pain, but is a *drive* to eat.

Obese patients have sometimes said thoughtfully to me, "I don't think I've ever experienced hunger." In the sardonic sense, this may be true, but after more than 35 years of practice, I've come to believe that the reality is that few people *recognize* true hunger, which seems to be more a drive than a feeling.

In this regard, the cardinal mistake in obesity is to eat until we're satisfied (which is our appetite driving the fork). If we're obese, we *need* to be chronically hungry, or we're gaining weight. Snack, don't eat Real Meals (people seem to think of a "meal" as when you sit and eat until you're satisfied or in pain; a "snack"

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is when you take a little something to take the edge off).

When we say "hunger increases," we are actually summarizing animal studies. The animals cannot, of course, confide their feelings to researchers – instead, hunger is inferred from eating *behavior* in response to various changes of external or internal conditions, drugs, social situations, etc. We don't really know how the Norwegian rat feels about the cheese at the end of the maze.

Medically – physiologically – the control of appetite is dauntingly complex. If you want the details about leptin receptors, adiponectin, hypothalamic regulation of appetite, and other fascinations, search for "physiology of appetite regulation" or "pathophysiology of appetite regulation."

The vernacular "appetite" encompasses delight as well as hunger or satiety. Bacon cheeseburgers, *pâté de foie gras*, or turtle sundaes are not eaten from need, but from desire. Gluttony may be one of the seven deadly sins, but like all moral exercises, involves instinctive central drives and deep-seated emotions.

To some extent, though, our obesity epidemic is related to indiscipline of desire. We live in an enthusiastically hedonistic culture, with many "side effects." Obesity may be among the least of these, except beyond the edge of the loading envelope.

Physiologically, becoming obese is a lot like sledding. It's a fast, fun, ride down and a long slog back up. The main reason that we can't lose the extra weight is that obesity disrupts the body's regulation of appetite: when we're fat, we're inappropriately hungry (driven to eat) – a paradox.

Thus, losing weight involves a willingness to become and *stay* hungry, to not satisfy the drive to eat. It involves figuring out how little we have to eat in order to lose weight, and meanwhile managing our hunger so that it doesn't become overwhelming.

### Exercise does not produce weight loss.

Physical inactivity is a key to becoming obese, but "working out" does not cause weight loss, and walking to the mailbox is not exercise. (Working all day at a physically demanding job such as a

lumberjack doing cutting and bunching, a laborer using a pick and shovel, or other prolonged and vigorous work *will* cause weight loss.)

On the other hand, trying to lose weight by decreasing calories and *not* exercising is very difficult, because it requires pretty severe restriction, possibly under 1000 calories/day. That's hard to do while maintaining good nutritional balance.

Research has shown pretty conclusively that 30 minutes of pleasantly vigorous exercise (enough to break a light sweat or get mildly short of breath) each day is optimal for health. More increases fitness or strength, but not health.

### Fad diets are useful in establishing weight loss.

It does not matter how you do it: decreasing total energy intake below energy expenditure causes weight loss. I think the signal advantage of most fad diets is that they involve a complete change: tweaking our habits a little is never successful.

Still, for years, the Weight Watchers program, which involves a carefully

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devised healthy diet, has consistently and repeatedly been successful against the fad diets of each decade. Typically, these group programs involve women, as men have only one *connexion* chromosome, and tend to try and fail alone.

**Western diets promote obesity** (are "orexigenic").

These diets involve a predominance of *cooked fat*, especially *animal fat*, large amounts of *refined grains* and *sugar*, and a relative absence of *vegetable fiber*. The Western diet is strongly associated with cancer of the prostate, breast and colon, diabetes, and atherosclerosis (especially heart attacks), dementia, and degenerative eye disease, as well as obesity.

Most writing on the hazardous Western life fails to emphasize the importance of physical indolence, which amplifies the effects of diet. The relative social estrangement of modern Western society is equally important. (The type of people who prefer soaring clubs to playing solo tend to live longer and healthier lives.)

**Healthy eating is centered in plants.**

Any dietary tradition that includes at least 50% of calories (and thus most of the bulk) as unrefined plants (fruits, vegetables, and whole grains) is associated with healthier longevity. Modest amounts of lean protein are satisfactory. You can kill the fatted calf, but on feast days, not three times a day. It appears that meat best comes from vegan animals (herbivores).

Refined plant products are *not* healthy: don't become a cake-aterian. Refined carbohydrates – sugar & white flour – and other "white carbs" – pasta, potatoes, white rice – are not what we're recommending here.

**Mr. & Mrs. Jack Spratt**

Individual differences are very important. You can learn much about what's the best dietary balance by checking a fasting lipid profile and blood sugar. If triglycerides are high, HDL (good) cholesterol low, or blood sugar borderline to high, it's extremely important to eschew fats and oils and refined (rapidly absorbed) carbs, but lean protein seems not to be a problem. If your LDL (bad) cholesterol is high, it will help to

assiduously avoid cooked fats and severely minimize animal proteins.

## Summary

Eat food the way God made it: fresh from nature. Eat frequent snack-like meals unless you are doing some kind of heavy lifting, then eat for fuel. Your meals should all be based in vegetables and fruits, supplement by whole grains. Lean protein should be an occasional (weekly at least) treat.

## References

Healthy longevity: **Healthy at 100.** John Robbins. 2007

<http://tinyurl.com/lfnu97j> This is the best book on healthy longevity you'll find. No hype, good science. It's long, and worth the time.

Readable journal review: **Can We Say What Diet Is Best for Health?** D.L. Katz1 DL and Meller S. Annu. Rev. Public Health 2014,35:83-103. doi: 10.1146/annurev-publhealth-032013-182351.

<http://tinyurl.com/lecaosd>

A succinct, expert, good-natured summary of what we know and don't know about diets and health.

Appetite management: **The Three-Hour Diet.** Jorge Cruise. 2007

<http://tinyurl.com/kmpxweb>

This is not a fad diet. This book outlines an effective strategy for managing the false hunger of obesity and its metabolic abnormalities. My patients who have actually followed this program have lost 40-100 pounds in a year and sustained the weight loss.

Carbohydrate choice: **Glycemic Matrix.** Richard A. Price. 2008 <http://tinyurl.com/n8erhr8>

This unique, self-published book, though geeky, nicely correlates the amount of carbs (glycemic density) with the rate of absorption (glycemic index) in a table on pages 61 and 62.

Technical: **Appetite Regulation: From the Gut to the Hypothalamus.** Neary NM, Goldstone NP, Bloom SR. Endocrinol. 2004;60(2)

For the scientists among us, a representative review. I didn't find a more recent comprehensive review. ✈

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