

Designers and Builders and Design-Build

Regular readers may recall my allusion to the [ice-breaker I tell](#) at the first site meeting of the design and construction teams.

That is, there has always been some amount of friction between the design and construction communities, and the story I tell is to mitigate that friction. After all, there's no reason to be wary of each other until there's some demonstrable reason for such.

Why does this friction exist?

I mean, we all know that wet-behind-the-ears architects and engineers have no more told grizzled old tradesmen how to build something, than have field-educated tradesmen told design professionals that no matter what the latter say will work, the former, with respect, know better.

Nah, that's never happened. OK, OK, it really happens all the time, but *why*?

Every prototype is hand made, *but*, every building, structure, or system which must exist in harmony with its environment is a prototype. Even 'mass-produced' modular housing must be adapted to the site it will sit on, and even automobile assembly lines are not devoid of people performing manual labor.

While the number of options and combinations thereof available on a modern automobile are a far cry from the Model T's availability in any color so long as it was black, there is no comparison between the former and a habitable structure, or the factory in which the automobiles are built.

When humanity was dealing with nothing more complex than pyramids or log cabins, trial and error was a reasonable way, in fact, the only way, to get things right, but this started to change almost immediately; that is, as far back as [ancient Egypt](#). This separation between design and construction accelerated at the dawn of the industrial revolution with the establishment of the [oldest engineering school in the world](#) in France.

It was a bit different in the British Isles, with the [Scottish Enlightenment](#) not yet having driven towards technical universities such as those in France. This found its way to the United States as "[Yankee Ingenuity](#)," and there's an exchange between John Wayne (the field-educated engineer) and Anthony Quinn (the college graduate) in their 1947 film, [Tycoon](#), where each argues for his own point of view.

The point is, as many of you know, I'm a self-educated engineer who passed the same licensing exam as the college graduate, and because of *how* I learned, I believe I know whereof I speak with regard to the differences between designers and builders, and am more than a bit tired of the friction.

I've met many contractors who were also pretty good designers, but there's a world of difference between doing what you're

comfortable with and doing it well because you've done it for so long, and doing something for the first time.

The former is why contractors are licensed, but the latter is why design professionals are licensed, and the two are *NOT*, no matter what a very few of my contractor friends may think, equivalent. If nobody's done it before, there's the small matter of trying to ensure the public safety when implementing an unproven design.

But this is not necessarily a valid argument against design-build as a business model. After all, a contractor can employ an engineer and therefore offer design services too, can't s/he?

Well, no. Not here in New York State.

In New York State, [a general service corporation cannot offer professional design services](#) such as [architecture](#) or [engineering](#).

It is not so in all States, and multi-state corporations must adhere to different forms of practice on a State-by-State basis.

Bechtel, one of the largest design-build companies in the world, is headquartered in San Francisco as [Bechtel Corporation](#). When I worked for them in their New York City office in the mid-sixties, however, the NYC division of the company was Bechtel Associates because, with the exception of grandfathered firms already practicing when the licensing law was passed, *corporations* cannot offer engineering services in New York State.

On the flip side, a *professional corporation* (P.C., *not* Corp. or Inc.) which offers design services might not be clearly prohibited from offering construction services, but, aside from case law driving insurability issues, there is, in my belief, an implied conflict of interests in doing so. That is, if I'm making a markup on installed equipment and materials, might I not be tempted to install somewhat inferior items if I make a greater markup on them, notwithstanding the fact that my professional judgment argues the superior items are more suited to the project? Or, might I not be tempted to install what I've been comfortable with installing, notwithstanding the fact that something I've never installed before might be a better solution to the problem at hand?

Having said all of this, how is it that really large industrial megaprojects usually end up as design-build? I believe it's because when you're out on the bleeding edge of technology, you have an abiding interest in making the thing work, and work safely, so you can *stay* on the bleeding edge, and make the really big bucks.

To do this reasonably well you need to have more than a passing familiarity with the many ways things can go wrong, or as has been so often said, "Judgment comes from experience, but experience is the result of a lack of judgment." Engineering school is a start, but only a start. Hence, internship.

More will be said in a future issue about how to make designers and builders play nice, but now for something completely different -

Airplanes, Dynamic Stability, Stalls, Landings, Spins, and Crashes

For 70 years or so, Flying magazine has published a column of reader submissions entitled, "I Learned About Flying From That," and the content of that column in the June 2010 issue is called "[Hands-Off Spin Recovery](#)." As they haven't put this piece on their website yet, I've linked to a pdf of it on my site that you may read it if interested.

When I started to learn to fly in 1967, the FAA had just recently rescinded the requirement for instruction in spins and spin recovery in order to obtain a private pilot's license. Being the masochist I'm sometimes told I am, I requested such training and learned first-hand the dynamic stability designed into civil aircraft. Not so much with military fighter aircraft, as instability actually enhances maneuverability.

Civil aircraft and large transport category military aircraft, on the other hand, not only tend to go where you point them, but they also try and return to level flight if left alone. Hence the [Payne Stewart Learjet](#) flying on until it ran out of fuel after all on board were incapacitated.

Lift is proportional to airspeed, and if you put such an airplane into a dive, and remove your hands from the controls, the resulting increase in lift will pull the airplane out of the dive. It will then begin to climb and bleed speed off until it falls through into another dive. The cycle will repeat itself with the oscillations getting smaller and smaller until the aircraft resumes level flight. Aircraft are most stable around this [pitch axis, and a bit less so in the roll and yaw axes](#).

Airplanes fly because the shape of an airfoil is such that the pressure difference between the top and underside of a wing is such that it's lifted into the air. When landing an airplane, the object is to gradually kill this lift until the plane settles on its wheels. The reason you see airplanes land with their noses high is that as the nose comes up, more and more of the airflow misses the top of wing, going past it rather than over it, and lift bleeds off. In aviation parlance this is a "stall" and has nothing to do with the stoppage of an engine.

When one learns to fly, one practices stalls, and stall recovery at altitude because it's one thing to intentionally stall an inch or two above the runway, and another to do so unintentionally when turning towards the runway on a landing approach.

Such a stall usually turns into a spin, which is a situation where only one wing has stalled, while the other is still generating lift, putting the aircraft into a corkscrew dive.

To recover from both stalls and spins, the thing to do is to get the nose pointed down more than it already is, such that the airflow once again goes over the top of the wing again rather than past it.

When already close to the ground, this is easier said than done, and the instinctive response of trying to pull the nose up is exactly the wrong thing to do. In fact, it was the proximate cause of last February's [Colgan Air crash](#).

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