About Paul Messinger the President of MTF Industries

MTF Industries was founded in 1992 to be a design company specializing in robotics and solid state electronics. The designs are limited to prototypes and not production. Consulting for other companies is also a function of MTF Industries.

Since the president has a major interest in experimental aviation and automotive engine conversions, several of the projects in the past were to support that interest. These included dual ignition conversions, angle of attack systems, and internal regulated alternator safe control (in the event of a failure for example) and the latest project; Smart Aircraft Management Systems (SAMS).

The following describes the background of the president and the design philosophy of MTF Industries

During college I worked part time at Lockheed Aircraft on the Constellation and the Electra commercial aircraft. After college I worked at Douglas Aircraft on the Nike Zeus and on the DC8. I was one of the first 50 to form the Douglas Missiles and Space Division. After a few years in the USAF, I returned to Douglas and I worked on the Saturn moon rocket. I then moved from Los Angeles to Northern California to Lockheed Missiles and Space Company and as soon as security clearances were granted went into the “black” world very similar to the widely known Lockheed “Skunk works” but this was for spacecraft. My resume shows a few of the non-classified projects over nearly 30 years at Lockheed.

In spacecraft design there is no room for failure so it’s critical that designs be reliable and parts are never overstressed. With the exception of the Space Telescope the satellites orbit was out of reach and service was not an option. It’s interesting that often the more flexibility in the design, the lower the design’s reliability. If there is a dual string of boxes in series and one fails, it’s intuitive to be able to switch to another box instead to switching to the other string. However, sometimes the needed switching logic results in a lower overall reliability. In a non-serviceable satellite there is more reason to have lots of switching logic as over time more failures can occur. In an aircraft more than one failure in a single flight is very unusual so string switching is far simpler and more reliable for the design application and usage, not to mention lower cost and weight.

The detail design approach starts with an analysis of the parts and their specifications. For example a solid state switch specification may state the maximum current is 100 amps. But after carefully reading the specifications and using the part in a real world design and hardware package the real usable maximum current might be less that 20 amps worst case and perhaps 30 amps best case. We never design to anything but worst case. Not only must we design for worst case we need to de-rate parts both for reliability and also to account for imperfect mechanical packaging etc. Also there is the unaccounted transient or peak load that might have been overlooked in the analysis. It’s important to always use the specified data in the data sheet and always look for the manufacturer’s general information in application notes etc. For example; in the previous example of the solid state switch rated at 100 amps on the first page of the specification there is a general application note discussing the different packages that parts were available in and that specific package was limited to 75 amps. So the 100 amps are not real either as the package limits it to 75 amps. Then looking at another application note on heat dissipation the 75 amps is further reduced because the part in the real world cannot be mounted on an infinite heat sink at 20 degrees C. In a real world heat sink design the part might be only rated at 20 amps. Operation outside the specified range should never be done under any circumstances. The problem is it may take research to find all the related details determining constraints not included in the part specific data sheet. Toggle switches, relays, and power contractors also have similar traps to fall into if you only look at the first page of a specification and/or ignore general limitations not spelled out on a specific part data sheet. ALL mechanical contact devices have different contact ratings depending on the AC or DC voltages and currents as well as the type of loads. This information can be hard to find in component data sheets and is usually found in the general information of large product line information. It's also important to know there are minimum voltage and current limits as well as the common maximum limits. For example a 10 amp relay may have a 1 amp minimum current rating and that rating may vary depending on the voltage. This is rarely considered in the application but is increasingly important with the advent of solid state avionics where the required current is under one amp and any switch used must consider the application current for reliable long-term use.

It's far too easy to design a circuit from part ratings and then build a testable hardware example and find it works and proclaim it to be good!, and then find that others who try to build it from their parts and have failures from a high percentage to a very small percentage depending mostly on luck and/or the similar type parts with different specific characteristics. Only when a worst-on-worst design analysis is completed (as well as part de-rating), can a real test be meaningful to verify the design and a design be proclaimed ready for use. You cannot test a bad or marginal design into a good design.

The approach we use here is worst on worst analysis and always use the specified limits and we never assume non-specified values. The assumption of extrapolation of the data sheets where performance graph is extended to "Create specifications" beyond the defined limits is never used.

Lack of a worst case circuit analysis and making assumptions are a very common problem in the industry and is largely based on not taking the time or the knowledge required to properly design electronics. If proper design is not done the design may fail. Sadly, all too often it is that way. I cannot count the number of times a prototype design worked and then all (or many) failed in production.

In later years at Lockheed I became a trouble-shooter and went from one program to another program that was having problems to help find and resolve the problems. Most of the time it was the lack of a worst case design or a complete lack of part application where the generic part class limits were not recognized.

We do not recommend any use of any part application where the part industry does not recommend its use. If it's not specified for the specific application and load type, find another part as there is always one available that is specified for your application. The de-rating of parts based on the type of load is important. In solid state design its even more important in the design of a combined solid state switch and circuit breaker as you do not want the inrush of a lamp load to trip the over current setting. Also you do not want the inductive load to over-voltage the part when the load is turned off.

In the design of the SAMS systems we have used parts developed for the automotive industry and we have the design requirements for aircraft components. We also have the design requirements for two automobile manufacturers. It's interesting that the automotive requirements are higher in some cases. Not all that surprising, as in automobiles, where there are no government regulations to slow technology down.

About The President: Paul Messinger

Education: Pre and/or Post Graduate studies at: California Institute of Technology, University of Southern California, University of California at Los Angeles, and University of Santa Clara. He is both an Aeronautical and Electrical Engineer.

Work Experience: Extensive aerospace experience at both at Douglas and Lockheed.

Designed and conducted the first fully automatic computer controlled command and limit checking of a complete spacecraft during systems testing and at the launch base. The satellite was launched based on this test. He was Manager of the Command and Control systems on several programs, including the Hubble Telescope and the Milstar Satellite system as well as many other classified government programs. He was the electrical system manager of the proposed Bio Astronautics Laboratory module on the space station.

As Director of Engineering of an Electronics company he was the chief designer of a full line of single board computers sold world wide and used (for example) in the NY trade schools.

Awards: Numerous awards related to aerospace work including many cost savings totaling over $20,000,000 in both hardware and software design; Selected as the President's outstanding achievement award at Lockheed for individual performance.
He has been personally congratulated by the President of the United States at the White House for scientific achievement.

Related info: Radio "HAM" since 1956 (K6QMI).
He has been a Pilot since 1954 with Commercial, Instrument, SEL, SES, MEL, and former CFI.
He was a Captain in the USAF.
He is an AOPA member since 1968 and the EAA since 1972
He is a Young Eagle pilot #4255 with 120 flights.
He is an EAA Technical Counselor and Flight Advisor. (EAA 55789)
He was selected to be one of 5 members on the committee to select the Tony Bingelis award winner for 2008.
Past president EAA 430 and 2008 president of EAA 1026

He has published articles in several national publications on auto engine conversions for experimental aircraft. Designed and sold kits to convert Subaru EA81 engines to dual ignition. More than 14 years experience in adapting automotive engines to experimental aircraft and the design of the fuel and electrical support systems needed for the fault tolerance generally accepted as required for aviation. He is in the last stages of completion of his experimental Pegazair Super STOL aircraft powered by a Subaru EA81 inter-cooled and turbocharged of his design. This aircraft incorporates dual independent electrical systems with automatic fault detection and switching of his design. The aircraft is extensively modified from the plans and built from scratch using extensive tooling he made to form the parts etc.