Solar T-62T-32 ECU Pro's and Con's

Many experimental aircraft, especially rotorcraft, utilise the Solar T-62T-32 engine as their primary power plant. The engine itself can be considered robust and reliable, yet there's the inconvenience that its fuel control unit (FCU) isn't equipped with a mechanical (flyweight) governor but requires an electronic governing system.

Well, here are my two (euro...)cents of information regarding ECU operation and possible malfunction.

1. A severe overspeed (or failure of a single channel engine RPM pickup) is the most severe malfunction a pilot may encounter. Either way, an improper, or uncertain RPM reading to the ECU is always a clear indication for a shutdown of the engine. If the engine, for any reason, actually overspeeds, the result of an uncontained disintegration of the rotating assembly of a turbine engine is always more dangerous than a forced autorotation.

If the engine RPM signal to the ECU (in case of an electronically controlled engine like the Solar T-62T-32) is interrupted, there's no way to control RPM or keep the engine from overspeeding. In this situation, forget about manually controlling the engine if there isn't a mechanical (flyweight) backup device (which isn't standard on the SOALRs that we love so much -- for good reasone I have to say).

2. If you are worried about the main fuel shutoff valve of the Solar T32-T62 engine, forget it. The main fuel valve is one of the safest devices of this engine's fuel control unit. If you want to worry, then rather think about the flexible wires inside the torque motor that connect its (mobile) armature to the external socket. Even though these wires are of reasonably high quality (meaning very thin individual strands), the insulation may solidify and cause damage to the strands. Every time I get my hands on a Solar T62-T32, one of the first things I do is replacing the flexible wires inside the torque motor with high quality measurement equipment wires of approximately the same cross-section. Also, when converting a T62 to experimental aviation usage, always replace the original wiring loom, if possible also use new connectors!

3. I agree that solely an electronic contol of the engine RPM is only second best, but if done properly, it's pretty good anyway. In the specific case of the Solar T-62T-32, it is mandatory to check the return spring of the torque motor for condition and especially corrosion during EVERY pre-flight check. As long as this spring is intact as well as the torque motor itself (including the wires), the system is a very safe and reliable, configuration.

4. Electrical supply to the ECU / Governor. This is the single weak point (in standard installations) that can cause the engine to fail. Especially, since usually the electrical supply is shared among many devices on a typical helicopter. There's a considerable amount of wiring involved and then there's the question to put a fuse into the ECU supply or not. All this may fail, wires may fray and cause shorts and so on. Yet, there's a simple way to solve this problem, and that's adding a backup battery only for the ECU, located in close proximity of the ECU. Since the current consumption of the ECU and engine, once running, is reasonably low (about 2 amps), this backup battery wouldn't need to be big and heavy. Use decouplig diodes and you should be fine.

5. In order to control engine RPM, you need to record engine RPM and nothing else. In case of a single shaft engine, compressor delivery pressure will vary considerably during load changes, even if the engine is running at the same speed all the time. Also, it depends on atmospheric conditions. So any other input to the ECU than RPM is an improper replacement. Of course, manual control may be an option for an experienced pilot. But if he'll react fast enough in case of an ECU failure to prevent the engine from flaming out is another question.

So im my opinion the clue from all this is quite simple: Do the installation as accurate as possible, double-check everything. Make sure you use the proper tools and techniques when doing electrical installations. Add an electrical back-up power supply system to the engine control circuitry. Adjust the hydromechanical fuel control unit properly. Do a proper pre-flight check before each start that includes testing the engine back-up systems and a visual inspection of the torque motor return spring. And then, probably the most important single thing: Practice autorotations so you know how your machine will behave in case of an engine failure!

I hope all this makes sense to you...