Unraveling Aircraft System Noise Bugaboos

I. Intro

II. The goal

The goal of this little chat is to give you some tools to help track down the source.

III. The table

Handout

IV. Some terms

Bonding, grounding, static, potential

V. Static Electricity

Electrostatic discharge - ESD
“p” static
arcing or discharging
Why do we care?

VI. Bonding / Grounding

electrical integrity
static wicks

VII. The Table

A. Ignition
B. Alternator or generator
C. Other Whiners
D. Batteries
E. Spinning Parts
F. The Radios Themselves
G. Digital Electronics
H. Wire Routing
I. Strobes
J. Airframe Electro-mechanical Integrity

VIII. Conclusion

It is important to be organized and methodical in your approach to the problem. You can follow the table, which breaks the possibilities down into easily analyzed pieces that you can go after one at a time.

Aircraft Electrical System Noise

Symptom	Probable Cause	Test	Possible Cure
Popping and clicking varies with engine RPM	Poor shielding on ignition leads, frayed or poorly grounded leads	Listen on really cheap AM radio with engine(s) operating	Repair or replace damaged leads, properly ground leads
Continuous stream of static	Poor grounding between mag and engine or engine and airframe	AM radio test	Clean flying surfaces, add or repair ground strap
High pitched siren-like whine - varies with engine RPM	1. Generator - arcing of commutator or bad ground caused by dirt and/or corrosion 2. Alternator - arcing brushes and slip rings, bad ground, failing diodes, switching transients	Try cures, test diodes	1. Clean commutator, add RF filter, clean faying surfaces from case to engine 2. Add RF filter, clean flying surfaces from case to engine, replace diodes
Whining - does not vary with engine RPM	Electric motors (ie rotating beacon)	Isolation game	Clean flying surfaces, add ground strap or rebuild motor
Lower frequency noise	Battery - damaged or loose connections	Rock battery - listen for looseness, check connections	Replace battery, tighten connections
Other baffling noises	Rapidly spinning parts (ie gyro flywheels / motor shafts)	Turn off engines, turn on radios during wind down - listen for lowering pitch, then isolation	Could mean rebuild or replace time if the noise is annoying enough
Squeals & wails, Poor radio performance, crackling	Poorly bonded, corroded, loose antenna connections, chafing cable, moisture degradation from fractured shielding	Wiggle test, inspect cabling	Clean flying surfaces, repair or replace parts and material as required
Steady ticking	Clock harmonics of microprocessor based equipment	Isolation game, could be combinations, bond test suspected equipment	Bonding yet again!
Squeals, wails and crosstalk	Poorly routed wiring, transmitter cable next to speaker leads or intercom wiring	inspect	Reroute cables to minimum of 2 feet between transmitter and audio or other antenna cable
Crosstalk and interference	Audio panel - poor shielding in wiring	Inspect	Use twisted pair or shielded wiring, throw out any cheap, yucky panels
Annoying ZIT, ZIT, ZIT, especially on intercom	Strobe light capacitor	Turn off strobe	Move strobe power supply at least 5 ft. From avionics or intercom, use twisted pair wiring
Hissing & snapping especially during precipitation	Poor condition wicks, frayed or broken ground straps, corrosion or paint isolating parts causing arcing	inspect wicks and bonding straps, bond test, turn on radios with engines off - one person listens to radio while another moves control surfaces and slaps airframe	Replace wicks and ground straps, good luck and good shop practice with the rest