

**AVIONICS OPERATIONAL TEST STANDARDS (FS/OAS A-24)
Revision B**

January 21, 2005

The following operational test standards apply to all contractually required/offered avionics equipment under USDA Forest Service contract and DOI Aviation Management Interagency Fire contract.

Item	Standard
1. Installations, Maintenance and Other Items	
<u>A. Visual Inspection</u>	Inspect for obvious damage, inoperative displays, missing or incorrect parts, proper labeling, and documentation.
<u>B. Antennas, Mounting & Installation</u>	Forward/Reverse ratio of 2.5:1 or better, broadband, aircraft type, rigidity, doubling plates, proper bonding, proper RF cable, security, proper wire size
<u>C. Schematics/wiring Diagrams</u>	Presence, coverage of all contractually required systems, legibility, currency
<u>D. Accessory Power Source</u>	
▪ Connector	MS3112E12-3S installed, proper location, polarity, voltage at correct pins
▪ Circuit Breaker	Amperage value, operation
<u>E. Remote Cargo Hook Connector</u>	
▪ Connector	MS3101A24-11S installed, polarity, switched voltage, within 6" from cargo hook, securing lanyard
▪ Wiring	Per FS/OAS A-16 for intended application
▪ Circuit Breaker	50 Amp, operation
<u>F. Cargo Bell and Light System (Smokejumper)</u>	
▪ Cargo Bell	Location, activation, sound level
▪ Light System	Activation, location, indicators
2. Communications Systems	
<u>A. Emergency Locator Transmitter (ELT)</u>	
▪ Type	TSO-C91a or TSO-126C
▪ Mounting	Per TSO and Manufacturer instructions
▪ Antenna	External, proper mounting, correct location, portable antenna available (AP type)
▪ G-Switch	Subject ELT to a quick jerking motion (if easily removable)
▪ Battery Date	ELT date not expired, matching dates on ELT and in aircraft records
▪ Operation	Manually operates, PRF acceptable, remote function and indication
▪ Remote Location	Visible & accessible to pilot
▪ Logbook	Annual 14 CFR 91.207(d) test completed, battery date

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B. VHF-AM Transceiver

- Type Selectable frequencies in 25 kHz increments, 760 channel minimum. 720 channel acceptable if it is a second radio and contractually permitted (2 ea RX in IFR A/C)
- Operation To and from service monitor
- Receiver Squelch breaks at an acceptable level
- Transmitter Modulation from 15% to 85%, frequency within 30 PPM (\pm 3.69 kHz using 122.9250 MHz)

C. VHF-FM Transceiver

- Type An acceptable aeronautical VHF-FM radio transceiver per:
<http://www.fs.fed.us/fire/niicd/documents.html>
- Power Output 10 watts nominal value, 5 watts nominal value (light fixed wing reconnaissance only)
- VSWR Forward/reverse ratio of 2.5:1 or better @ 150, 160 & 170 MHz
- Antenna Comant CI-177 or equivalent, installation & mounting
- CTCSS Tone Encoder 32 TIA/EIA-603 standard tones, 300 to 600 Hz level in narrowband, frequency within 1.5 Hz
- Guard Receiver Squelch breaks @ 1 to 2 uV with direct connection at 168.625 MHz, audio output of at least 100 mV with narrowband (1.5 to 2.5 kHz modulation) and wideband (3 to 5 kHz modulation) inputs, less than 10% distortion
- Guard Transmitter Quickly selectable, operates @ 168.625 MHz, narrowband deviation 1.5 to 2.5 kHz, wideband deviation 3 to 5 kHz
- Main Receiver Squelch breaks @ 1 to 2 uV with direct connection at 150, 160 and 170 MHz, audio output of at least 100 mV with narrowband (1.5 to 2.5 kHz modulation) and wideband (3 to 5 kHz modulation) inputs, less than 10% distortion
- Main Transmitter Narrowband deviation 1.5 to 2.5 kHz, wideband deviation 3 to 5 kHz, narrowband frequency within 2.5 PPM (\pm 421 Hz using 168.3500 MHz), wideband frequency within 5 PPM (\pm 842 Hz using 168.3500 MHz)
- Mounting Meeting AC 43.13-2A, controls equally convenient to pilot and observer/co-pilot
- P25 Aeronautical Radios Must also meet FS/OAS A-19 in addition to the above requirements

D. AUX-FM Provisions

- Operation Check RX & TX functions through audio system(s), sidetone available, transmitter deviation output matches handheld's stand alone output
- VSWR Forward: reverse ratio of 2.5:1 or better @ 150, 160 & 170 MHz
- Antenna Comant CI-177 or equivalent, installation & mounting
- Mounting Facilities Available meeting AC 43.13-2A (Field Support Services AUX-EPH-RB or equivalent), within 18" of AUX-FM connectors, controls convenient to observer/co-pilot
- Connectors MS3112E12-10S and female BNC bulkhead mounted

E. Automated Flight Following

- Operation Accurate & current position data displayed on Webtracker, required data in Webtracker database current
- Installation Per manufacturer's manual & AC 43.13-2A, uses aircraft power
- Antenna External antenna with clear path to satellite

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<u>F. Public Address System</u>	Acceptable operation (required on A/C w/19+ PAX seats & Smokejumper A/C)
<u>G. Fuel Service Vehicle VHF-FM Mobile Radio</u>	
▪ Operational Check	Proper RX & TX operation
▪ Power Output	30 watts minimum
▪ VSWR	Forward: reverse ratio of 2.5:1 or better @ 150, 160 & 170 MHz
▪ Antenna	Antenna Specialists ASPR-7490; Maxrad MWB-5803, or equivalent, installation & mounting
▪ CTCSS Tone Encoder	32 TIA/EIA-603 standard tones, 300 to 600 Hz level in narrowband, frequency within 1.5 Hz
▪ Receiver	Squelch breaks @ .25 to .5 uV with direct connection at 150, 160 and 170 MHz, audio output of at least 100 mV, less than 10% distortion
▪ Transmitter	Frequency within 750 Hz, narrowband deviation 1.5 to 2.5 kHz, wideband deviation 3 to 5 kHz
▪ Field Programmability	Contractor demonstration
<u>H. Ground Proximity Warning System (GPWS)</u>	Installed, acceptable audio, (expires 3/29/05)
<u>I. Terrain Awareness and Warning System (TAWS)</u>	Installed, acceptable audio, (required 3/30/05 on turbine powered airplanes w/6+ PAX seats)
<u>J. Cockpit Voice Recorder</u>	Installed, proper mic & audio system operation, locator beacon battery date current (required on multi-engine, turbine powered, A/C w/6+ PAX seats requiring two pilots by TC)
<u>K. Flight Data Recorder</u>	Installed, locator beacon battery date current (required on multi-engine, turbine powered, A/C either mfrd/registered after 10/11/91 w/10+ PAX seats or w/20+ PAX seats)
3. Navigation Systems	
<u>A. Panel Mounted GPS</u>	
▪ Type	Panel mounted, aviation type
▪ Installation	Convenient to both pilot and observer/co-pilot
▪ Operation	Correct present position or lock-on, database age does not exceed contract limit
<u>B. Handheld GPS (Specific Light Fixed Wing Aircraft)</u>	
▪ Type	Handheld type
▪ Installation	Convenient to pilot, install meets AC 43.13-2A, uses aircraft power
▪ Antenna	External antenna with clear path to satellite signals
▪ Operation	Correct present position or lock-on
<u>C. VOR</u>	Maximum bearing error of $\pm 4^\circ$, maximum variation between dual systems of 4° , flag pull. Logbook entry for IFR 30 day check (IFR aircraft) (2 ea in IFR A/C)
<u>D. LOC</u>	Maximum error of $\pm 4^\circ$, flag pull
<u>E. Glideslope</u>	Maximum error of $\pm 2^\circ$, flag pull

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<u>F. Marker Beacon</u>	Indicator operation, acceptable sensitivity, acceptable audio level (IFR required)
<u>G. DME</u>	Proper heading to station, proper distance to station
<u>H. ADF</u>	Points to station, 360° operation, acceptable audio
<u>I. Weather Radar/Thunderstorm Detection Equipment</u>	Acceptable operation (required on aircraft w/10+ PAX seats) (IFR required in weather in lower 48)
<u>J. Radar Altimeter</u>	Acceptable operation
<u>K. Altitude Encoder, and Pitot-Static Systems</u>	14 CFR 91.411 & Appendix E logbook entry not expired (two year maximum)
<u>L. Transponder</u>	14 CFR 91.413 & Appendix F logbook entry not expired (two year maximum)
<u>M. GPS Data Connector</u>	Proper installation of 9 pin "D" connector
<u>N. GPS Additional Antenna</u>	Proper installation, contractually required connector
<u>O. TCAS/TAS</u>	
<ul style="list-style-type: none"> ▪ Type ▪ Installation ▪ Range ▪ Operation 	<p>Interagency approved system</p> <p>Manufacturers display or MFD mounted convenient to crew, acceptable audio level</p> <p>Operator selectable from 2 NM (or less) to at least 10 NM</p> <p>360° target acquisition with minimal airframe shadowing, on MEL (when applicable) with inoperable status NTE 15 days</p>
4. Audio Systems	
<u>A. Audio Control System (General Requirements)</u>	
<ul style="list-style-type: none"> ▪ Location ▪ Labeling: ▪ Specifications <ul style="list-style-type: none"> ○ Hum, Noise and Crosstalk ○ Specified Audio Output ○ Distortion 	<p>Convenient to specified operator(s)</p> <p>Legible, understandable, permanent</p> <p>40 db below specified audio output</p> <p>100 mW with an input of 250 mV, both @ 600 ohms</p> <p>Less than 10%</p>
<u>B. Audio Control System (Helicopter)</u>	
<ul style="list-style-type: none"> ▪ General Requirements ▪ Required controls ▪ Operation <ul style="list-style-type: none"> ○ TX Select ○ RX Select ○ ICS and RX Volume ○ Sidetone 	<p>See Audio Control System (General Requirements)</p> <p>TX selectors, individual RX select switches, separate RX & ICS audio level controls</p> <p>Selects proper radio & companion receiver</p> <p>Selects proper radio</p> <p>Proper operation</p> <p>Present for each transmitter</p>

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<ul style="list-style-type: none"> ▪ Rappel/Shorthaul (when required) 	Additional Audio Control System (3 rd station) with Hot Mic capability at Spotter's position, spotter cord long enough for Spotter to see below helicopter out of both doors. Type III may slave CP Audio Control System functions to Spotter's position in lieu of 3 rd station - FS contract option/DOI required.
<u>C. Audio Control System (Light Fixed Wing)</u>	
<ul style="list-style-type: none"> ▪ General Requirements 	See Audio Control System (General Requirements)
<ul style="list-style-type: none"> ▪ Required controls 	TX selectors, individual RX select switches
<ul style="list-style-type: none"> ▪ Operation <ul style="list-style-type: none"> ○ TX Select 	Selects proper radio & companion receiver, rear PAX seat operates TX from observer/co-pilot's audio control (when required)
<ul style="list-style-type: none"> ○ RX Select 	Selects proper radio
<ul style="list-style-type: none"> ○ RX Volume 	Proper operation
<ul style="list-style-type: none"> ○ Sidetone 	Present for each transmitter
<u>D. Audio Control System (Airtanker)</u>	
<ul style="list-style-type: none"> ▪ General Requirements 	See Audio Control System (General Requirements)
<ul style="list-style-type: none"> ▪ Required controls 	TX selectors, individual RX select switches
<ul style="list-style-type: none"> ▪ Operation <ul style="list-style-type: none"> ○ TX Select 	Selects proper radio & companion receiver
<ul style="list-style-type: none"> ○ RX Select 	Selects proper radio
<ul style="list-style-type: none"> ○ RX Volume 	Proper operation
<ul style="list-style-type: none"> ○ Sidetone 	Present for each transmitter
<u>E. Audio Control System (Smokejumper)</u>	
<ul style="list-style-type: none"> ▪ General Requirements 	See Audio Control System (General Requirements)
<ul style="list-style-type: none"> ▪ Required controls (Pilot/Co-pilot) 	TX selectors, individual RX select switches
<ul style="list-style-type: none"> ▪ Required controls (Spotters) 	TX selector, individual RX audio level controls, TX indication, separate RX master and ICS audio level controls
<ul style="list-style-type: none"> ▪ Operation <ul style="list-style-type: none"> ○ TX Select 	Selects proper radio & companion receiver, PA system capable of conveying intelligible messages to all occupants from all required stations with jump door open
<ul style="list-style-type: none"> ○ RX Select 	Selects proper radio
<ul style="list-style-type: none"> ○ RX Volume 	Proper operation, level sufficient for intelligible reception to helmeted spotters with jump door open while inflight
<ul style="list-style-type: none"> ○ Sidetone 	Present for each transmitter

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5. Intercommunications System (ICS)

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| ▪ Available at required positions | Per contractually required locations |
| ▪ Operation | Proper audio & mic operation at each required position |
| ▪ Hot Mic/Vox | Presence per contract requirements, proper operation |
| ▪ PTT and Volume controls | Presence per contract requirements, proper operation |
| ▪ Specifications | |
| ○ Hum, Noise and Crosstalk | 40 db below specified audio output |
| ○ Specified Audio Output | 100 mW with an input of 250 mV, both @ 600 ohms |
| ○ Distortion | Less than 10% |
| ▪ Turbine Airtankers | ICS capability to exterior of aircraft |