

interface unit (AIU) replace the existing altimetry system. This system uses electronics to a far greater extent than the original altimetry system, and may be more susceptible to electrical and magnetic interference caused by high-intensity radiated fields (HIRF). Disruption of these signals could result in loss of altitude, or present misleading information to the pilot.

#### Type Certification Basis

Under the provisions of 14 CFR 21.101, Amendment 21-69, effective September 16, 1991, LJSC Ltd. must show that the Learjet Model 24/25 series airplanes, as changed, continue to meet the applicable provisions of the regulations incorporated by reference in Type Certificate No. A10CE, or the applicable regulations in effect on the date of application for the change. The regulations incorporated by reference in the type certificate are commonly referred to as the "original type certification basis." The certification basis for the modified Learjet Model 24/25 series airplanes includes 14 CFR part 25 effective February 1, 1965, as amended by 25-2 and 25-4. Other applicable amendments, regulations, and special conditions are noted in Type Certificate Data Sheet (TCDS) A10CE.

If the Administrator finds that the applicable airworthiness regulations (that is, 14 CFR part 25, as amended) do not contain adequate or appropriate safety standards for the Learjet Model 24/25 series airplanes because of novel or unusual design features, special conditions are prescribed under the provisions of § 21.16.

In addition to the applicable airworthiness regulations and special conditions, the Learjet Model 24/25 series airplanes must comply with the fuel vent and exhaust emission requirement of 14 CFR part 34 and the noise certification requirement of part 36.

Special conditions, as defined in 14 CFR 11.19, are issued in accordance with § 11.38, and become part of the type certification basis in accordance with § 21.101(b)(2).

Special conditions are initially applicable to the model for which they are issued. Should LJSC Ltd. apply at a later date for a supplemental type certificate to modify any other model already included on the same type certificate to incorporate the same novel or unusual design features, these special conditions would also apply to the other model under the provisions of 14 CFR 21.101(a)(1).

#### Novel or Unusual Design Features

The Learjet Model 24/25 series airplanes will incorporate the installation of dual IS&S air data display units (ADDU) and a single IS&S analog interface unit (AIU). Because these advanced systems use electronics to a far greater extent than the original altimetry system, they may be more susceptible to electrical and magnetic interference caused by high-intensity radiated fields (HIRF) external to the airplane. The current airworthiness standards (14 CFR part 25) do not contain adequate or appropriate safety standards that address protecting this equipment from the adverse effects of HIRF. Accordingly, these instruments are considered to be a novel or unusual design feature.

#### Discussion

There is no specific regulation that addresses protection requirements for electrical and electronic systems from HIRF. Increased power levels from ground-based radio transmitters and the growing use of sensitive avionics/electronics and electrical systems to command and control airplanes have made it necessary to provide adequate protection.

To ensure that a level of safety is achieved equivalent to that intended by the regulations incorporated by reference, special conditions are needed for the Learjet Model 24/25 series airplanes, as modified to include the new altimetry system. These special conditions will require that the new dual IS&S air data display units (ADDU) and single IS&S analog interface unit (AIU), which perform critical functions, be designed and installed to preclude component damage and interruption of function due to both the direct and indirect effects of HIRF.

#### High-Intensity Radiated Fields (HIRF)

With the trend toward increased power levels from ground-based transmitters, plus the advent of space and satellite communications, coupled with electronic command and control of the airplane, the immunity of critical digital avionics/electronics and electrical systems to HIRF must be established.

It is not possible to precisely define the HIRF to which the airplane will be exposed in service. There is also uncertainty concerning the effectiveness of airframe shielding for HIRF. Furthermore, coupling of electromagnetic energy to cockpit-installed equipment through the cockpit window apertures is undefined. Based on surveys and analysis of existing HIRF

emitters, an adequate level of protection exists when compliance with the HIRF protection special condition is shown in accordance with either paragraph 1 OR 2 below:

1. A minimum threat of 100 volts rms (root-mean-square) per meter electric field strength from 10 KHz to 18 GHz.

a. The threat must be applied to the system elements and their associated wiring harnesses without the benefit of airframe shielding.

b. Demonstration of this level of protection is established through system tests and analysis.

2. A threat external to the airframe of the field strengths indicated in the table below for the frequency ranges indicated. Both peak and average field strength components from the table below are to be demonstrated.

Frequency	Field strength (volts per meter)	
	Peak	Average
10kHz–100kHz .....	50	50
100kHz–500kHz .....	50	50
500kHz–2 MHz .....	50	50
2 MHz–30 MHz .....	100	100
30 MHz–70 MHz .....	50	50
70 MHz–100 MHz .....	50	50
100 MHz–200 MHz .....	100	100
200 MHz–400 MHz .....	100	100
400 MHz–700 MHz .....	700	50
700 MHz–1 GHz .....	700	100
1 GHz–2 GHz .....	2000	200
2 GHz–4 GHz .....	3000	200
4 GHz–6 GHz .....	3000	200
6 GHz–8 GHz .....	1000	200
8 GHz–12 GHz .....	3000	300
12 GHz–18 GHz .....	2000	200
18 GHz–40 GHz .....	600	200

The field strengths are expressed in terms of peak of the root-mean-square (rms) over the complete modulation period.

The threat levels identified above are the result of an FAA review of existing studies on the subject of HIRF, in light of the ongoing work of the Electromagnetic Effects Harmonization Working Group of the Aviation Rulemaking Advisory Committee.

#### Applicability

As discussed above, these special conditions are applicable to Learjet Model 24/25 series airplanes modified by LJSC Ltd. to include the dual IS&S air data display units (ADDU) and a single IS&S analog interface unit (AIU). Should LJSC Ltd. apply at a later date for a supplemental type certificate to modify any other model already included on Type Certificate A10CE to incorporate the same novel or unusual design features, these special conditions would apply to that model as well under the provisions of 14 CFR 21.101(a)(1).