REPORT OF THE ICAO ELT TASK FORCE

11 – 12 August 2005, Washington

**Prepared by Brian Day, Technical Officer, ATM Section,
Air Navigation Bureau, ICAO Secretariat.**

At the direction of the ICAO Air Navigation Commission, the ICAO Secretariat convened a meeting of an informal task force at the premises of Computer Sciences Corporation, Washington, D.C. on 11 –12 August 2005 to discuss matters relating to a proposal for a delay in an applicability date of an ICAO Standard pertaining to carriage of automatic ELTs operating on 406 MHz and 121.5 MHz. The meeting was chaired by Mr. Brian Day, Technical Officer, ATM Section, ICAO Secretariat, and was attended by twenty-one experts representing the International Air Transport Association (IATA), the Air Transport Association (ATA), United States Coast Guard (USCG), International Business Aircraft Council (IBAC), International Aircraft Owners and Operators Association (IAOPA), International Federation of Airline Pilots (IFALPA), Transport Canada, the National Oceanic and Atmospheric Association (NOAA), the Cospas-Sarsat Secretariat, United States Air Force (USAF), Northwest Airlines, Radio Technical Commission for Aeronautics (RTCA), the Federal Aviation Administration (FAA), Artex Aircraft Supplies (ELT manufacturer), Metocean Data Systems and Delta Airlines.

A list of participants is at Attachment A.

Terms of Reference are at Attachment B.

The Agenda is at Attachment C.

Relevant ICAO Annex references are at Attachment D.

Introduction

At its ninth and tenth meetings of its 169th Session, held on 9 and 14 June 2005 respectively, the Air Navigation Commission discussed the results of a consultation with States and international organizations on proposed amendments to Annex 6 Parts I, II and III concerning a delay of the applicability date of 1 January 2005 of Standards for the mandatory carriage of automatic emergency locator transmitters (ELTs) operating simultaneously on 406 MHz and 121.5 MHz by certain aircraft on particular flights. During its discussions, the Commission came to the conclusion that changing the applicability date of Standards would not be effective in alleviating the purported implementation problems. Furthermore, some aircraft operators were already compliant. The Commission considered, rather, that the types of automatic ELTs suitable for carriage, their availability and respective procurement and fitment costs need further research and closer definition.

The Commission, therefore, instructed the Secretariat to conduct a study, in consultation with experts from the worldwide search and rescue community, to explore the full range of options for

compliance with a view to gaining a better understanding and providing clarification of the alternatives. The results of the study will be presented to the Commission before the end of October 2005, in the light of which the Commission will review the need for any amendment to existing provisions and will ensure that any proposals will take into full consideration the fact that several States have already regulated compliance with the existing Standard.

Note: It is important for readers to understand that the mandate of ICAO, as far as determination of Standards and Recommended Practices (SARPs) is concerned, extends only to the conduct of civil international flights. Thus the work of the task force and, subsequently the ICAO Secretariat and the Air Navigation Commission, has no direct relevance to ELT carriage requirements pertaining to civil flights conducted wholly within the national airspace of individual States. This is a regulatory responsibility of those individual States.

ICAO definitions of ELTs

The meeting concurred with the definitions and descriptions of functionality of ELTs, including those for automatic fixed (AF), automatic deployable (AD), automatic portable (AP) and survival ELT (S-ELT), recorded in Annex 6, Part I, Chapter 1 but the meeting noted the information that one type of S-ELTs is water-activated. RTCA specifications, however, require S-ELTs to be manually activated.

Functionalities of AF, AP, and AD 406 MHz ELTs with respect to their suitability for meeting ICAO provisions, paying particular regard to evidence concerning:

- **i. reliability of ELT gravity switch activation function,**
- **ii. survivability of ELTs subject to crash forces, and**
- **iii. any other aspects of reported abnormal ELT operation.**

In discussing the installation of AF ELTs, the meeting noted that, while this type of unit was generally considered best suited to the task of signaling crash alert and location for international commercial air transport aircraft, it was necessary or, at least, highly desirable, that the ELT unit be located at the rear of the aircraft for purposes of optimum survivability and the activation monitor be mounted on the flight deck, thus necessitating the laying of cable along the length of the fuselage. This is an expensive operation, requiring a pressure bulkhead to be cut. The activation monitor is considered an essential component of the equipment for crew to maintain awareness of inadvertent activation, to self-test the ELT and, in the unlikely event of an imminent ditching or forced landing, for crew to manually activate the ELT. The meeting noted, however, that the primary means of activating automatic ELTs is by way of the G-switch.

The meeting noted that ELT manufacturers are currently investigating wire-less remote switches (to obviate fuselage-long cabling) and initial studies indicate that their satisfactory development is probable but only for smaller aircraft. Larger aircraft present problems due to the number of bulkheads and other structures within the aircraft that would shield effective wire-less capability.

The meeting agreed that with respect to its survivability, the rear section of an airplane is the optimum placement for an ELT in commercial air transport aircraft. In smaller general aviation aircraft, while the same observation can be made, the degree of greater protection offered by rear fuselage placement may, in the minds of some, be less of a persuasive factor than the accessibility and somewhat reduced cost of having the ELT installed in the cockpit. It is considered practicable for AP ELTs to be mounted in the cockpit of small general aviation aircraft. The meeting noted that S-ELTs are probably best situated in the cockpit or areas that are easily accessible.

Advice was given by an ELT manufacturer that AF and AP ELTs are commonly used interchangeably although AP ELTs can be more expensive to purchase because of the portable antenna integrated with the ELT.

The meeting noted expert opinion that the AD ELT is unlikely to be chosen as a means of compliance with ICAO Standards requiring carriage of automatic ELTs. They are reportedly fitted to the outside skin of an aircraft (an installation that is critical in terms of position and function), deployed by explosive charge, are less reliable than fixed and portable units and are expensive, both to install, (requiring development of a Supplemental Type Certificate - STC), and purchase, costing in the order of US$15,000 to $20,000. Some later models are activated by a spring mechanism rather than explosive charge. They are generally equipped only to military rotary wing aircraft although they are also known to have been installed on civil helicopters operating over the North Sea for extended periods.

The meeting noted that with respect to the data captured by air safety investigators pertaining to crash-impact activation of ELTs, (or failure to activate), that it is little and, reportedly, becoming less. A participant from NOAA/NASA reported that the United States National Transport Safety Board (NTSB) no longer collates data on ELT failures during accident investigations. This participant gave an opinion that the U.S. National Search and Rescue Committee (NSARC) may want to address this matter with a view to the NTSB resuming its collection of this data. There is, reportedly, no procedure for the systematic return of failed ELTs to a research laboratory or the manufacturer for investigation. The FAA participant undertook to explore the action taken by the FAA with respect to ELT failure investigations. A manufacturer reported that he had been involved in some such investigations with the FAA. The meeting noted that in a study of the topic by NOAA Delta, published in 1996, reference was made to an 85% expected improvement in antenna survivability for 406 MHz ELTs as against the situation pertaining to 121.5 MHz ELTs.

The meeting expressed concern at the paucity of data relating to the performance of ELTs, particularly 406/121.5 MHz automatic ELTs that have been involved in crashes.

The meeting noted advice that the percentage of false alerts experienced in the ELT/Cospas-Sarsat system is of a similar order to the incidence of false alerts in the United States community emergency programme: E-911, and other electronic alerting programmes such as home security

alarm systems. Such a rate of false alerts is accepted as being of normal measure and is not generally perceived to be of any account in determining the viability of systems.

The meeting noted that since their first introduction, AF-ELTs have been required to have a gravity switch (G-switch) activation function in order to produce an alert upon impact. Evidence was taken from an ELT manufacturer that the reliability of last-generation ELT G-switches is high, being of the order of 97%. Further, expert opinion was given that notwithstanding the need to offset the integrity of ELT construction (as it impacts on unit crash-survivability) with cost, the survivability of ELTs is similarly high. While there is oft-repeated questioning in some industry sectors with respect to G-switch activation reliability and crash-survivability of units, the meeting considered that much of the critical anecdotal information owes its origin to first generation ELTs which functioned poorly. These units were hastily constructed to meet market demand and were never designed to be compatible with a satellite monitoring system. Regular improvements in design and functionality since, have resulted in highly reliable ELTs whose specifications have been carefully developed as the result of the collective input of industry and governmental experts, rigorous testing and determination of minimum performance operating standards. The meeting noted expert opinion that there was no good reason for either skepticism about or revision of any ELT specifications. The meeting was strongly supportive of the effectiveness of ELTs operating on 406 MHz and 121.5 MHz simultaneously and considered that the burden of proof for any modification of ICAO provisions should not be placed upon ELT technology which had already proven its ability to meet ICAO's objectives and responsibilities in establishing Standards and Recommended Practices. The Task Force heard a report that present-day G-switch reliability in AF 406 MHz ELTs is very good.

The meeting noted advice from a SAR services provider that the resolution of 406 MHz false alerts are several magnitudes easier than resolving false alerts generated by 121.5 MHz ELTs on account of the contact information embedded in the transmitted digital signal which can be correlated by rescue coordination centre (RCC) staff with the database associated with all registered 406 MHz beacons. It is a major improvement, too, that false alerts in the 406 MHz band beacons are attributable only to 406 MHz beacons; by way of contrast, false alerts generated on 121.5 MHz may be caused by diverse electronic sources as disparate and untraceable as microwave ovens, discotheque equipment, faulty television sets and automatic teller machines.

Availability of ELTs suitable for compliance with ICAO provisions

The meeting noted advice from an ELT manufacturer that the availability of ELTs is very good and any number of 406 MHz ELTs required by the industry can be readily supplied.

Purchase cost of ELTs suitable for compliance with ICAO provisions

While an ELT manufacturer testified that:

- For commercial air transport aircraft, purchase costs of AF 406/121.5 MHz ELTs, start from approximately $2000, including antenna,

an airline participant, on the basis of a number of recently received industry quotations, testified that:

- For commercial air transport aircraft, purchase costs of AF 406/121.5 MHz ELTs, including the unit, remote control panel, antenna and wiring (STC installation kit), ranged in price from US$6,500 to $12,000.

There was closer agreement on the purchase costs of AF ELTs for general aviation aircraft and of S-ELTs:

- For general aviation aircraft, purchase prices start at under US$1000 for the beacon and the antenna.
- For S-ELTs, purchase costs approximate US$2500 to $5000 including bracket.

Industry standards external to ICAO related to fitment of ELTs, their impact on fitment cost and their continuing relevance or necessity.

The meeting noted advice from the RTCA participant that RTCA recently set out to update document RTCA DO-204 with respect to its references to 406 MHz ELTs. The standards were first developed in 1989. The meeting expressed interest in the outcome of this RTCA work from a cost-impact perspective.

Fitment cost of ELTs suitable for compliance with ICAO provisions for

a) fitting to new aircraft and
b) retrofitting

The meeting noted advice from an airline participant that retrofits of ELTs can be accomplished during an aircraft's scheduled check cycle. The typical cycle of a major American airline involves "L", "H" and "M" checks occurring at intervals of approximately 18-24 months, 4-6 years and 10-12 years respectively. Advice was given that 70-130 person-hours would be necessary to retrofit an aircraft with an automatic fixed 406 ELT system. This number of hours would best be accommodated on the longer H or M checks. The L check extends over a lesser time, about 4-10 days, (depending on the fleet) and it would be difficult to inject another significant task such as ELT installation into that time frame. Labor costs of installation, including benefits, were quoted to the meeting as being in the order of US$80 to100 per hour. Downtime for an aircraft, whether by way of extended checks or "special visits", was quoted to cost the operator US$50,000 to US$100,000 per day.

A significant factor in pricing ELT retrofits was reported to the meeting as being the preparatory engineering work required for issuance of a Supplemental Type Certificate (STC), without which, (or an installation document from the original aircraft manufacturer), most airlines will not proceed with installation, notwithstanding that there are some provisions for fitment of ELTs by way of a log book entry process. A new STC will cost about US$20,000 to $25,000 to develop. If however, this work has already been completed for the aircraft type concerned, the individual cost of an STC development was reported by an airline participant to reduce to approximately US$7500. To date, much work has been done on the development work necessary for STCs and they are now available for most aircraft utilized in international airline fleets. Thus, STC development costs may, in most cases, now be amortized over the range of aircraft requiring retrofit. For airlines with many different types of aircraft, however, the total cost of STC development may (have been) be high.

One airline participant summarised the actual cost of retrofitting automatic ELTs to aircraft in its fleet. There are variables in costing equipment installation and the participant stressed that these costs are, if anything, "on the optimistic side".

- Total material cost, including panel, wiring, antenna, ELT transmitter and optional programming module, is US$11,500.
- Total installation cost for automatic fixed ELT system, including STC, fleet engineering, materials and labour, is US$22,000 per aircraft.
- TOTAL: approximately US$33,500.

By way of contrast, the participant reported the cost of the S-ELT as about US$7000 for transmitter and mount.

Another airline participant summarized the actual cost of retrofitting automatic ELTs to A330 aircraft in its fleet as follows:

- Total material cost including ELT, remote activation panel and antenna, is either US$7,600 or $8,200, depending on manufacturer;
- Total installation cost for automatic ELT system, including service bulletin, wiring kit and labour, is US$26,000;
- TOTAL: approximately US$34,000.

These figures do not include aircraft out-of-service costs which can amount to between US$50,000 and $100,000 per day.

Advice was given to the meeting that it is possible to perform various maintenance and installation tasks simultaneously during maintenance checks, thus reducing the total separate down time periods to a lesser, collective figure, but the extent to which this is possible is dependent on various practical factors such as accessibility and is difficult to quantify.

The meeting noted comments from the FAA participant that the work involved in retrofitting an automatic ELT is approximately equivalent in its complexity to installing a secure cockpit door.

If a Supplemental Type Certificate (STC) has already been developed for the aircraft, one airline participant reported the cost to be approximately US$10,000 to $15,000 for a retrofit and approximately US$25,000 to $30,000 without a STC having been previously developed.

For new aircraft the total cost of installation is approximately US$25,000. The airline participant reported to the meeting that two survival type 406 ELT's can be installed in 4 to 8 person-hours. This can be a demanding task to complete overnight and would be best done during a L (or H or M) check, which in this airline's schedule is conducted at intervals between 18 and 24 months.

(Note: At least two sets of maintenance check terminologies are in use in the industry. In addition to the terminology employed above in this report, maintenance checks are also described as A, B C and D. The L check referred to in this section of the report roughly equates to the C check in alternative terminology which is scheduled every 18 to 24 months; a D check is roughly equivalent to the H check described above and is scheduled every 5 to 7 years.)

An airline participant reported the costs of fitting automatic fixed ELTs to new aircraft during production as follows:

- purchase cost of AF ELT including remote activation control panel, either $6,200 or $6,800, depending on manufacturer;
- installation cost $13,000;
- TOTAL cost approximately US$20,000

The meeting noted comments provided by the IAOPA participant that total price to a general aviation aircraft owner for purchase of a 406 MHz/121.5 MHz ELT and installation was approximately $US5000. An ELT manufacturer affirmed that prices have lowered with the advent of newly released 406 MHz ELTs to, for purchase, less than US$1000 and, for installation, between US$1500 and $2000. Retrofit of ELTs to small general aviation aircraft in the United States is usually undertaken under the authority of an FAA Form 337, an airworthiness document of approval that is simpler and far less expensive in its processing than an STC. It is common practice that in general aviation and rotary wing aircraft, ELTs are mounted in the cockpit within reach of the pilot. This positioning of ELTs is not favoured, or possible, in the case of larger commercial air transport aircraft.

The meeting noted advice from a participant from the FAA that airlines are authorized to use Form 337 practices, so they are not strictly limited to general aviation. Airlines, however, are often reluctant because their engineering departments are often of the mindset to document every change as if it were a major change to the type design. These actions are expensive and entirely unnecessary provided the work is accomplished under a work instruction prepared by the airline and adequately documented in the aircraft records, using the data approved either by the FAA Administrator or her designee.

Institutionally, if elected, an airline can also save considerable expense by producing its own parts to support the alteration. This is allowed under the FAA provisions as "owner-produced parts" and could include such components as mounting plates for the ELT bracket and doubler plates to support the structural mounting of the antenna.

These initiatives, if undertaken by either an airline or general aviation aircraft owner/operator can save considerable cost and downtime, the essential requirement being that the alteration is done properly, using approved data which satisfies the requirements and intent of the regulations.

The meeting agreed that the installation of 406 MHz ELTs during manufacture of new aircraft does not present the same burden of expense as retrofitting.

Of interest in the development of Standards regarding carriage of on-board equipment is the advice of an airline participant that the typical timeline requirement for introducing a recognized, new system to an aircraft type before the aircraft is produced by the Original Equipment Manufacturers (OEMs - Boeing, Airbus, Bombardier, etc.) is a minimum of six months.

Areas designated as especially difficult for search and rescue

The meeting noted the contention of IATA that under existing ICAO provisions, the designation of these areas by States imposed an ELT carriage requirement upon aircraft operators. When such a designation is made at short notice, the effect upon airline equipage and scheduling can be disruptive and, in extreme cases, force unexpected retrofit of ELTs. The meeting noted that the prerogative for such designation of areas rests with the States in whose areas of jurisdiction the areas are declared. This is consistent with the principle of Article 1 of the Convention but gives States unilateral control of such decision-making. Historically, decisions regarding designated areas were taken at regional air navigation meetings where discussion of all the implications from a regional perspective was possible. The meeting noted that from an aircraft operator's perspective, the imposition of a designated area that superimposed a regularly operated air route had the potential to both disrupt and economically prejudice operations on account of a designation decision to which the operator had no opportunity to contribute.

The meeting noted the historic aspects of designated areas, that the procedure had its origins in the mid-twentieth century when the incidence of aircraft becoming uncertain of their position, lost and subject to forced landings in areas difficult to navigate was markedly higher than at present.

Presently, ICAO makes no guidance material available to States with respect to either the factors to be taken into account in the designation of areas or the manner and time frame in which they should be promulgated.

Traditionally, in designating areas, State administrations took into account the geographic remoteness of areas, the paucity of ground based radio navigation aids, the hostility of the

climate, the harshness of the terrain and the commonly base level of on-board navigation equipment, especially in the case of general aviation aircraft. This combination of factors does not as much present itself in the contemporary world of aviation and, to the extent that it does, it portends significantly less hazard. Further, while the oft-quoted adage that "satellites have taken the search out of search and rescue" may be an oversimplification, it is indicative of the greater sophistication and global effectiveness of contemporary search tools than was the case when the concept of designated areas came into effect.

While there remain areas that are especially difficult for search and rescue operations, they may arise at random – in the case of the onset of hazardous weather, for example – and just as much on account of the non-availability of SAR resources with appropriate range and capacity as they do on account of the nature and locality of the areas themselves. Thus the meeting was persuaded that, in the present aviation environment, in which almost all aircraft operating internationally are equipped with satellite navigation systems, areas especially difficult for SAR are volatile in nature and more likely to arise on account of an aggregation of dynamic rather than fixed geographic factors. A strong case can be made, then, for ELT carriage requirements having uniform application worldwide, regardless of the nature of the terrain over which aircraft fly.

Long range flights over water

The meeting noted that long-range flights over water would probably not benefit from mandatory carriage of an automatic fixed ELT, in as much as the ELT, being fixed, would, failing a successful ditching, sink with the aircraft and be rendered useless. It is noteworthy that the great majority of automatic ELTs being fitted to commercial air transport are of the AF type. In the event of an accident at sea and the aircraft sinking in short time, ELT propagation would be dependent on a secondary unit which, the meeting noted, would best be of the S-ELT type. Otherwise, in the case of a successful evacuation of the aircraft, survivors' electronic location would be dependent on the operation of ELTs stowed in the escape chutes/life rafts or removed by crew during emergency evacuation.

Alternative options for meeting crash alert and location requirements

The meeting engaged in protracted discussion of means other than the ELT/Cospas-Sarsat system of satisfying the agreed need for speedy, accurate and reliable crash alert and location notification. In particular, suggestions were made for the incorporation into SAR services of existing systems for flight following, (radio, radar and ADS-B) and company-provided operational control (by ACARS, VHF and HF) in conjunction with S-ELTs as viable means of meeting requirements.

Special consideration was given to the emergence of ground and airborne components of Automatic Dependent Surveillance – Broadcast, (ADS-B), a system that is providing cost-effective aircraft position data both to ground stations and in-flight aircraft. Presently, the area of coverage of ADS surveillance is limited, trials having been successfully conducted in Australia, across the Pacific, within the Miami area of jurisdiction and in other limited areas.

The meeting noted advice from the participant from ICAO that policies, standards and procedures for the use of ADS-B surveillance are currently under development. Many aircraft are being fitted with on-board equipment as they come off manufacturers' lines, including a significant percentage of Airbus and Boeing aircraft. However, while by the end of 2005 a large percentage of high-flying jets will be fully equipped, the same cannot be said for the manufacturers of regional aircraft, which, generally, have not yet included ADS-B avionics in new aircraft deliveries. The matter of regulating carriage of ADS equipment is still in its infancy, pending determination of appropriate airspace for carriage and the range of functionality desired. Industry is also considering how mandatory equipage can best be funded.

Even in those areas where ADS coverage at high levels is extensive, as in the airspace for which Australia has responsibility, further extensive deployment of ground stations is required to provide increased surveillance in regional areas and at the lower flight levels not yet served. While two of the uses to which ADS is deemed ultimately useful are those of operational control and fleet management, the time frame in which that target can, realistically, be achieved is extensive and somewhat indeterminate; that is especially the case in consideration of worldwide coverage at all levels of operation.

SAR service providers advised the meeting that ADS-B, as distinct from ELTs, would cease to identify an aircraft's location upon crash impact thus, unlike ELTs, would neither provide a constant stream of location and identification data nor distribute crash data to SAR providers without human intervention. On-going indication of survivors' location is especially important at sea after survivors take to life rafts and are subject to the effects of sea current, wind current and leeway. ADS-B equipment is expensive, a cost of US$10,000 being cited. Airborne ADS-B equipment is not designed to be crash-survivable. Because the ADS-B system, at this time, is neither geographically extensive in its coverage nor effective at low levels, it cannot be construed as presently or in the short term meeting global SAR service needs.

With respect to the ever-improving facilities that support the provision of operational control and company flight watch, the meeting noted comments from the participant from ICAO that a necessary part of both the alerting and response aspects of SAR service provision is the special training, competence and on-going proficiency of air traffic services personnel. Air traffic controllers, for example, are highly trained in the provision of in-flight emergency procedures upon becoming aware of aircraft encountering emergencies in-flight and, in the case of emergencies being ongoing, in the classification of those emergencies and the coordination of vital data with rescue coordination centres (RCCs). In doing this they utilize purpose built communication systems with appropriate integrity and reliability. To graft operators' company personnel, (who practice operational control and flight watch and are untrained in any air traffic services, SAR alerting or SAR coordination activity), into a SAR alert/response system would be inadequate. The ICAO participant also contended that the speed, accuracy and reliability of data transmission in the case of SAR actions, where accident victim survivability is a critical element, are of a distinctly different order to those appropriate to the conduct of operational control and

company flight watch that have to do with the initiation, continuation, diversion and termination of flights.

In the context of the discussion of alternative means of compliance, the meeting discussed the emphasis now being given by regulators to performance based Standards. Opinion was expressed that the issue of crash alert and location is an area amenable to Standards of this type and that it is desirable that flexibility be given operators to determine the most acceptable means of compliance.

The participant from the United States Coast Guard averred that, in general terms, SAR performance requirements could be summarized as requiring:

- Crash alert location to an accuracy of no more than a 5km radius;
- Crash alert to SAR service providers within 5 minutes;
- Crash alert to SAR service providers with no human intervention;
- Global coverage;
- Capability for broadcast of distress position for a significant time after onset of distress.

In consideration of this discussion, the meeting recorded its desire that ICAO be open to the prospect of new technology having effective application to the provision of SAR services, that ICAO continually review SAR system needs from a performance perspective and, particularly, give consideration to the development of performance based SAR Standards.

The participant from ICAO undertook to have the matter of SAR performance criteria put on the agenda of the ICAO/International Maritime Organization (IMO) Joint Working Group on SAR. This group meets annually to facilitate the development of harmonized policy, provisions and procedures for aeronautical and maritime SAR services.

The meeting noted comments from SAR service providers and IFALPA that Cospas-Sarsat and ELTs, in conjunction, would, presently and into the immediate future, seem to provide the best capability in meeting SAR requirements for immediate alert and location.

Further, the meeting noted the contention of IATA that, although the capabilities afforded by 406 ELTs are indisputable, retrofit of ELTs is not justified. The participant from IATA further contended that ICAO's present provisions limit the ability to explore alternative means of compliance.

The participant from Transport Canada suggested that even if national regulatory agencies such as the FAA and Transport Canada do not regulate the carriage of 406 MHz ELTs for domestic operations in the near term, the Cospas-Sarsat/406 MHz ELT system may well ultimately prove to be the only satisfactory solution and airlines will comply of their own volition. General aviation, however, operates under different imperatives and may not follow suit.

There was broad agreement that, apart from the ELT/Cospas-Sarsat system, there are no technologies presently extant that meet ICAO's international civil aviation SAR objectives

Recommendations of the meeting

The chairman summarized the four issues generally perceived by the meeting to be most significant in the short-term development of crash alert and location Standards:

- recognition of the efficacy of 406/121.5 MHz ELTs in conjunction with the Cospas-Sarsat system;
- recognition of the relative, contemporary irrelevance of areas designated as especially difficult for search and rescue;
- the cost of retrofitting ELTs to older aircraft is of sufficient significance as to have adverse economic impact on the viability of airline operations and to give rise to dissatisfaction about cost-benefit (although this is difficult to quantify); and
- automatic fixed ELTs may not be the best solution for carriage by aircraft operating long-range over water (LROW) flights.

As the meeting considered the formulation of provisions that took due account of these imperatives, the participant from IBAC brought to the attention of the meeting the fact that a number of business aviation operators are presently conducting flights internationally without being required to carry automatic ELTs because present Standards required automatic ELT carriage only over designated areas or on LROW operations. Care should be taken to ensure that there was no unnecessary additional burden imposed on the business jet community by way of any revised provisions that disregarded LROW flights specifically.

The meeting noted an input from the participant from the FAA to the effect that common regulatory practice is to mandate separate levels of requirements for commercial air transport above and below a stated passenger carrying capacity. In particular, there are requirements in place for aircraft with a seating configuration of 19 or more persons and this benchmark would seem appropriate to the provisions under review. This strategy would overcome the potential problem cited by IBAC.

The meeting agreed to the above imperatives as being appropriate to the development of revised draft ICAO provisions and that they pertained in both the domains of international commercial air transport and international general aviation operations except that the seating capacity aspect and the perceived disbenefit of retrofitting ELTs would not apply to GA.

In final consideration of all discussion, the meeting agreed to the following proposed provisions being advanced to the ICAO Secretariat for considered referral to the Air Navigation Commission in its deliberations on this important issue.

- Annex 6, Part 1 (Commercial Air Transport), Chapter 6:

6.17.2 "All aeroplanes for which the individual C of A is first issued after ????? shall, in the case of aircraft configured for more than 19 passenger seats, be equipped with at least two ELTs, one of which shall be automatic, and in the case of other aeroplanes, be equipped with at least one automatic ELT.

- Annex 6, Part 1 (Commercial Air Transport), Chapter 6:

6.17.3 "From ?????, all aeroplanes shall**,** in the case of aircraft configured for more than 19 passenger seats, be equipped with at least two ELTs of any type, and in the case of other aircraft, be equipped with at least one ELT of any type."

- Annex 6, Part 2 (International General Aviation), Chapter 6:

6.12.2 "All aeroplanes for which the individual C of A is first issued after ????? shall be equipped with at least one automatic ELT."

- Annex 6, Part 2 (International General Aviation), Chapter 6:

6.12.3 "From ?????, all aeroplanes shall be equipped with at least one ELT of any type."

- Recommendation (existing provision): All aeroplanes should carry an automatic ELT.

- Annex 10, Chapter 5, (existing provision):

5.1.4 "From 1 January 2005, emergency locator transmitters shall operate on 406 MHz and 121.5 MHz simultaneously."

The important features of these proposals are in the case of commercial air transport aircraft:

- they delete all reference to designated areas and LROW operations. This is in consideration of designated areas being considered of dubious contemporary value, their promulgation by States under the present regime having the potential to be harmful to the conduct of operations and the present requirement for ELT carriage requirement in such areas in any case being absorbed into the carriage requirement for global operations. As far as LROW operations are concerned, the proposed provisions allow, as before, a certain amount of flexibility in the selection of ELT type. It might be argued that the lesser relevance of automatic fixed ELTs to LROW flights (as highlighted by the meeting) remains. To make entirely specific provision for LROW flights, however, taking into account the common usage of international civil aircraft over both extensive sea and land areas, would either degrade the benefits of automatic ELT function for over-land operations or unduly restrict the usage of aircraft to either LROW operation or over-land operation, thus imposing an unacceptable practical constraint to fleet management;
- they retain the agreed benefits of the 406/121.5 MHz ELT in conjunction with the Cospas/Sarsat system for all aircraft and, in the case of new aircraft, the benefits of automatic activation;
- they delete the requirement for expensive retrofit of automatic ELTs to older existing aircraft. In so doing, the provisions pay regard to a principle thought reasonable by the

meeting that existing aircraft can only be expected to take advantage of evolving technological advances in a measure consistent with a balanced consideration of cost and benefit. Over time, by virtue of attrition, all aircraft will tend to fully utilize improved technology; and

- they bring the ICAO provisions into closer conformity with existing JAR provisions which read as follows:

> *An operator shall not operate an aeroplane first issued with an individual C of A on or after1January 2002 unless it is equipped with an automatic ELT capable of transmitting on 121.5 MHz and 406 MHz.*
> *An operator shall not operate on or after 1 January 2002 an aeroplane first issued with an individual C of A before 1 January 2002 unless it is equipped with any type of ELT capable of transmitting on 121.5MHz and 406 MHz, where any type includes a Survival ELT (which is not automatically activated).*

In the case of international general aviation aircraft, the important features of the proposed provisions are:

- they cement the requirement for carriage of the 406/121.5 MHz ELTs that offer far greater functionality than 121.5 MHz types. This changeover is required before February 2009 in any case if global monitoring and effective SAR response is to be provided; after this date, Cospas-Sarsat satellites will no longer monitor 121.5 MHz; and
- they relieve the GA community of any requirement for the added expense of automatic ELTs (while still including a Recommendation that aircraft should carry an automatic ELT) thus giving greater prospect of universal compliance than do the present provisions. The meeting also noted the contention that this more moderate provision for carriage by international GA aircraft may prove positively influential in State administrations similarly regulating domestic GA operations.

Post-meeting Secretariat considerations

Subsequent to the task force meeting, the Secretariat gave consideration to aspects of the proposed provisions that were beyond the meeting's capacity to address. With respect to the applicability date, the Secretariat suggests November 2006. With respect to the date from which aircraft will be required to carry designated ELTs, the Secretariat considers 1 July 2007 to be appropriate. This accords, approximately, with the initial IATA proposal for extension of the existing applicability date and takes into account the lead-time of up to six months required by OEMs for fitment of additional equipment to new aircraft. (On this latter aspect, advice was rendered after the meeting that this six month time frame may need to be extended if the ELT to be fitted is not of a type yet qualified.)

The Secretariat proposes the following revised provisions for international helicopter operations.

Annex 6, Part 3 (International Operations - Helicopters), Chapter 4:

4.7.1. This provision is now made redundant by the passage of time.

4.7.2 "Helicopters operated in Performance Class 1 and 2 for which the individual certificate of airworthiness is first issued after 1 July 2007 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in 4.5.1 a) and, for helicopters operated in Performance Class 3 for which the individual certificate of airworthiness is first issued after 1 July 2007, operating as described in 4.5.1 b), with at least one automatic ELT and one ELT(S) in a raft."

4.7.3 "From 1 July 2007, all helicopters operated in Performance Class 1 and 2 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in 4.5.1 a) and, for helicopters operated in Performance Class 3 operating as described in 4.5.1 b) with at least one automatic ELT and one ELT (S) in a raft."

4.7.4. This Standard is now made redundant by the passage of time.

4.7.5. *This Standard is now unnecessary on the basis of designated areas being made of no account for this purpose.*

4.7.6. *This Standard is now unnecessary on the basis of designated areas being made of no account for this purpose.*

4.7.7. *This Recommendation is no longer required as all helicopters, regardless of designated areas, are required by the above Standards to carry an automatic ELT.*.

4.7.8. ELT equipment carried to satisfy the requirements of 4.7.2 and 4.7.3 *(references need to be amended as appropriate)* shall operate in accordance with the relevant provisions of Annex 10, Volume III.

The important features of the above proposals are:

- they establish a measure of uniformity across Standards for international commercial air transport, general aviation and helicopter operations, while still paying regard to the distinctive nature of helicopter operations, particularly the greater criticality of helicopter operations over water.
- they take account of both the greater operational effectiveness of automatic 406/121.5 MHz ELTs (over manually activated 406/121.5 MHz ELTs) and the cost of retrofitting such ELTs as being decidedly less of an economic burden for helicopters than for fixed wing aircraft. (Automatic ELTs are commonly fitted in the cockpit of helicopters, thereby minimizing cabling.) As a consequence of purchase and installation costs being of less difference than for fixed wing aircraft with respect to fitment in newly manufactured and older aircraft, the carriage requirements for both "new" and "old" helicopters are proposed to be the same.
- they represent a rationalization of Standards, namely the deletion of separate Standards for flights over designated areas, taking into account the argument against

such areas as being of sufficient present, operational significance as to justify special regard.

Complete set of proposed provisions

Thus, the Secretariat offers the following proposals as a complete set of provisions for international commercial air transport, general aviation and helicopters predicated upon the collective work of the task force. *(Paragraph renumbering is required as appropriate.)*

- Annex 6, Part 1 (Commercial Air Transport), Chapter 6:

6.17.2 "All aeroplanes for which the individual C of A is first issued after 1 July 2007 shall, in the case of aircraft configured for more than 19 passenger seats, be equipped with at least two ELTs, one of which shall be automatic, and in the case of other aeroplanes, be equipped with at least one automatic ELT.

- Annex 6, Part 1 (Commercial Air Transport), Chapter 6:

6.17.3 "From 1 July 2007, all aeroplanes shall**,** in the case of aircraft configured for more than 19 passenger seats, be equipped with at least two ELTs of any type, and in the case of other aircraft, be equipped with at least one ELT of any type."

- Annex 6, Part 2 (International General Aviation), Chapter 6:

6.12.2 "All aeroplanes for which the individual C of A is first issued after 1 July 2007 shall be equipped with at least one automatic ELT."

- Annex 6, Part 2 (International General Aviation), Chapter 6:

6.12.3 "From 1 July 2007, all aeroplanes shall be equipped with at least one ELT of any type."

- Recommendation (existing provision): All aeroplanes should carry an automatic ELT.

- Annex 10, Chapter 5, (existing provision):

5.1.4 "From 1 January 2005, emergency locator transmitters shall operate on 406 MHz and 121.5 MHz simultaneously."

- Annex 6, Part 3 (International Operations - Helicopters), Chapter 4:

- Annex 6, Part 3 (International Operations - Helicopters), Chapter 4:

4.7.1. This provision is now made redundant by the passage of time.

4.7.2 "Helicopters operated in Performance Class 1 and 2 for which the individual certificate of airworthiness is first issued after 1 July 2007 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in 4.5.1 a) and, for helicopters operated in Performance Class 3 for which the individual certificate of airworthiness is first issued after

1 July 2007, operating as described in 4.5.1 b), with at least one automatic ELT and one ELT(S) in a raft."

4.7.3 "From 1 July 2007, all helicopters operated in Performance Class 1 and 2 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in 4.5.1 a) and, for helicopters operated in Performance Class 3 operating as described in 4.5.1 b) with at least one automatic ELT and one ELT (S) in a raft."

4.7.4. This Standard is now made redundant by the passage of time.

4.7.5. *This Standard is now unnecessary on the basis of designated areas being made of no account for this purpose.*

4.7.6. *This Standard is now unnecessary on the basis of designated areas being made of no account for this purpose.*

4.7.7. *This Recommendation is no longer required as all helicopters, regardless of designated areas, are required by the above Standards to carry an automatic ELT.*.

4.7.8. ELT equipment carried to satisfy the requirements of 4.7.2 and 4.7.3 *(references need to be amended as appropriate)* shall operate in accordance with the relevant provisions of Annex 10, Volume III.

ATTACHMENT A

List of Participants

	Name	Organization	Address	E-Mail Address
1.	Bertoia, Cheryl	Cospas-Sarsat Secretariat	700 de la Gauchetieve Ouest Suite 2450 Montreal, Quebec, Canada	Cheryl-bertoia@imso.org
2.	Boyle, Patrick	International Federation of Airline Pilots Association (IFALPA)	535 Herndon Parkway Herndon, VA 20170	Accidentsurvivalprograms@msn.com
3.	Chedrawy, Anthony	METOCEAN Data Systems	21 Thornhill Drive Dartmouth, N.S. Canada B3B1R9	tony@metocean.com
4.	Damato, Berty	International Business Aviation Council (IBAC)	1200 18th Street N.W. Suite 400 Washington, DC 20036	bdamato@nbaa.org
5.	Day, Brian	International Civil Aviation Organization (ICAO) Secretariat	999 University Drive Montreal Quebec Canada H3C5H7	bday@icao.int
6.	Defalque, Henry	International Air Transport Association (IATA)	800 Place Victoria, P.O. Box 113 Montreal, Quebec Canada H4Z1M1	defalqueh@iata.org
7.	Dell, Jay	U.S. Coast Guard	2100 Second Street, S.W. Washington, DC 20593	jdell@comdt.uscg.mil

	Name	Organization	Address	E-Mail Address
8.	Edwards, Dave	U.S. Coast Guard	Commandant (G-OPR) 2100 Second Street, S.W. Washington, DC 20593	dedwardsl@comdt.uscg.mil
9.	Hart, Bill	Artex	P.O. Box 1270 Canby, OR 97013	billh@artex.net
10.	Heffernan, Kevin	Delta Airlines	1623 Clarklake Drive Acworth, GA 30102	Kevin.heffernan@delta.com
11.	Hofmann, Frank	International Council of Aircraft Owner and Pilot Associations (IAOPA)	4413 Graham Pierrefonds, Quebec H9H2C1 Canada	fhofmann@hoftec.com
12.	Huhn, Michael	ALPA/IFALPA	535 Herndon Parkway Herndon, VA 20170	Michael.huhn@alpa.org
13.	Huq, Manzur	Transport Canada	330 Sparks Street, 6th Floor Ottawa, Ontario K1AON8 Canada	hugm@tc.gc.ca
14.	Karlson, Dann	NOAA/CSC	GT-IV, Room S507 7700 Hubble Drive Lanham, Maryland 20706	Daniel.karlson@noaa.gov or dkarlson@csc.com
15.	Knox, Alan	US Air Force	22 Elm Street Langley, AFB VA 25665	Allan.knox@langley.af.mil

	Name	Organization	Address	E-Mail Address
16.	Lund, Rodney	Northwest Airlines	13713 Eidelweiss Street Andover, MN 55304	Rodney.lund@nwa.com
17.	Moses, Harold	Radio Technical Commission for Aeronautics (RTCA)	1828 L Street, NW Suite 805 Washington, DC 20036	hmoses@rtca.org
18.	Pearsall, Terry	FAA	800 Independence Ave. S.W. Washington, DC 20591	Terry.pearsall@faa.gov
19.	Peel, Robert	Air Transport Association of America (ATA)	1301 Pennsylvania Ave. N.W. Suite 1100 Washington, DC 20004	rpeel@airlines.org
20.	Quiring, Duane,	Artex	P.O. Box 1270 Canby, OR 97013	duane@artex.net
21.	Shoup, Jeff	NOAA	E/SP3 Room 3320, Federal Bldg. 4 5200 Auth Road Suitland, MD 20746	Jeffrey.shoup@noaa.gov
22.	Weller, Jeff	FAA	Room 835, AFS 800 800 Independence Ave. Washington, DC 20591	Jeffrey.t.weller@faa.gov

ATTACHMENT B

DRAFT TERMS OF REFERENCE – ELT Task Force 2005

Determine the most cost-beneficial means of complying with the ICAO provisions for carriage of automatic ELTs by

- researching the functionalities, availability, procurement cost, fitting cost and retrofitting cost of automatic deployable (AD), automatic portable (AP) and automatic fixed (AF) ELTs with a view to determining the suitability of AD and AP ELTs for carriage by fixed and rotary wing aircraft;
- determining the need for remote activation by pilots of automatic fixed ELTs;
- determining the need for a reported RTCA standard for fuselage-long cabling for remote (flight deck) activation of automatic ELTs and if found to be necessary, researching whether any alternative RTCA standard might be promulgated allowing for installation of ELTs without the need for fuselage-long cabling;
- researching the incidence of gravity switch ELT activation in accidents;
- researching the incidence of automatic 406 MHz ELTs functioning other than as designed and specified;
- researching the contemporary need for areas designated as being especially difficult to search;
- developing, as appropriate, guidance material for designation of areas especially difficult to search;
- outlining options and consequences for States' compliance with ICAO ELT carriage provisions.

References:

ICAO Annex 6 Part I Chapter 6 paragraphs 6.17.1, 6.17.3, 6.17.4, 6.17.6, 6.17.7

ICAO Annex 6 Part II Chapter 6 paragraphs 6.12.1, 6.12.3, 6.12.4

ICAO Annex 6 Part III Section II Chapter 4 paragraphs 4.7.1, 4.7.3, 4.7.4, 4.7.6, 4.7.7

ICAO Annex 6 Part III Section III Chapter 4 paragraphs 4.10.1, 4.10.3, 4.10.4, 4.10.6, 4.10.7.

It is the above Annex 6 excerpts that are primarily at issue. Supporting provisions are to be found at:

ICAO Annex 10 Volume III Part II Chapter 5 including Appendix 1

Copies of these sections of the Annexes are included for ease of reference.

ATTACHMENT C

ICAO ELT TASK FORCE MEETING

Washington, 11 and 12 August 2005

AGENDA

1. Introduction to relevant ICAO Standards and Recommended Practices - Chairman

2. Background briefing on discussions of automatic ELT carriage requirements in the ICAO Air Navigation Commission - Chairman

3. Terms of Reference : Discussion

4. Discussion of functionalities of automatic fixed, automatic portable and automatic deployable 406 MHz ELTs* with respect to their suitability for meeting ICAO provisions for both fixed wing (commercial air transport and general aviation) and rotary wing aircraft, paying particular regard to evidence extant concerning
   i. survivability of ELTs subject to crash forces,
   ii. reliability of ELT gravity switch activation function, and
   iii. any other aspects of reported abnormal ELT operation.

5. Discussion of need for Activation Monitor of automatic fixed ELTs on the flight deck.

6. Discussion of availability of ELTs suitable for compliance with ICAO provisions.

7. Discussion of purchase cost of ELTs suitable for compliance with ICAO provisions.

8. Discussion of any industry standards external to ICAO related to fitment of ELTs, their impact on installation cost and their continuing relevance or necessity.

9. Discussion of installation cost of ELTs suitable for compliance with ICAO provisions: a) installation to new aircraft,
   b) retrofitting, taking into account
   i. implications of agenda item 5, and
   ii. implications of agenda item 8.

10. Discussion of the continuing need for States to designate areas especially difficult to search and, as appropriate, the criteria for doing so that could be advanced as guidance material to States.

11. Summary discussion of available options for compliance with ICAO ELT carriage provisions and the consequences of each.

12. Any other business.

* The term “406MHz ELTs” is descriptive of those ELT’s that transmit a digital signal on 406 MHz and a simultaneous low powered signal on 121.5 MHz for final homing procedures by search aircraft.

ATTACHMENT D

RELEVANT ICAO ANNEX REFERENCES

Annex 6 — *Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes*

. . .

CHAPTER 6. AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

. . .

6.17 Emergency locator transmitter (ELT)

6.17.1 Except as provided for in 6.17.2, until 1 January 2005 all aeroplanes operated on long-range over-water flights as described in 6.5.3 shall be equipped with at least two ELT(S).

. . .

6.17.3 From 1 January 2005, all aeroplanes operated on long-range over-water flights as described in 6.5.3 shall be equipped with at least two ELTs, one of which shall be automatic.

6.17.4 Except as provided for in 6.17.5, until 1 January 2005 aeroplanes on flights over designated land areas as described in 6.6 shall be equipped with at least one ELT(S).

. . .

6.17.6 From 1 January 2005, aeroplanes on flights over designated land areas as described in 6.6 shall be equipped with at least one automatic ELT.

6.17.7 **Recommendation.—** *All aeroplanes should carry an automatic ELT.*

. . .

— — — — — — — —

Annex 6 — *Operation of Aircraft, Part II — International General Aviation — Aeroplanes*

. . .

CHAPTER 6. AEROPLANE INSTRUMENTS AND EQUIPMENT

. . .

6.12 Emergency locator transmitter (ELT)

6.12.1 Except as provided for in 6.12.2, until 1 January 2005 all aeroplanes operated on extended flights over water as described in 6.3.3 b) and when operated on flights over designated land areas as described in 6.4 shall be equipped with one ELT.

. . .

6.12.3 From 1 January 2005, all aeroplanes operated on extended flights over water as described in 6.3.3 b) and when operated on flights over designated land areas as described in 6.4 shall be equipped with one automatic ELT.

6.12.4 **Recommendation.—** *All aeroplanes should carry an automatic ELT.*

. . .

— — — — — — — —

Annex 6 — *Operation of Aircraft, Part III — International Operations — Helicopters*

. . .

CHAPTER 4. HELICOPTER INSTRUMENTS, EQUIPMENT, AND FLIGHT DOCUMENTS

. . .

4.7 Emergency locator transmitter (ELT)

4.7.1 Except as provided for in 4.7.2, until 1 January 2005 all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.5.1 a) and Performance Class 3 helicopters operating as described in 4.5.1 b) shall be equipped with at least one ELT(S) per raft carried but not more than a total of two ELTs are required.

. . .

4.7.3 From 1 January 2005, all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.5.1 a) and Performance Class 3 helicopters operating as described in 4.5.1 b) shall be equipped with at least one automatic ELT and at least one ELT(S) in a raft.

4.7.4 Except as provided for in 4.7.5, until 1 January 2005 helicopters on flights over designated land areas as described in 4.6 shall be equipped with at least one ELT.

. . .

4.7.6 From 1 January 2005, helicopters on flights over designated land areas as described in 4.6 shall be equipped with at least one automatic ELT.

4.7.7 **Recommendation.—** *All helicopters should carry an automatic ELT.*

. . .

— — — — — — — —

Annex 6 — *Operation of Aircraft, Part III — International Operations — Helicopters*

. . .

CHAPTER 4. HELICOPTER INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

. . .

4.10 Emergency locator transmitter (ELT)

4.10.1 Except as provided for in 4.10.2, until 1 January 2005 all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.3.1 a) and Performance Class 3 helicopters operating as described in 4.3.1 b) shall be equipped with at least one ELT(S) per raft carried but not more than a total of two ELTs are required.

. . .

4.10.3 From 1 January 2005, all Performance Class 1 and 2 helicopters operating on flights over water as described in 4.3.1 a) and Performance Class 3 helicopters operating as described in 4.3.1 b) shall be equipped with at least one automatic ELT and one ELT(S) in a raft.

4.10.4 Except as provided for in 4.10.5, until 1 January 2005 helicopters on flights over designated land areas as described in 4.4. shall be equipped with at least one ELT.

. . .

4.10.6 From 1 January 2005, helicopters on flights over designated land areas as described in 4.4 shall be equipped with at least one automatic ELT.

4.10.7 **Recommendation.—** *All helicopters should carry an automatic ELT.*

. . .

— — — — — — — —

Annex 10 — *Aeronautical Telecommunications,* Volume III — *Communication Systems*

. . .

CHAPTER 5. EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

. . .

5.1 GENERAL

5.1.1 Until 1 January 2005, emergency locator transmitters shall operate either on both 406 MHz and 121.5 MHz or on 121.5 MHz.

Note.— From 1 January 2000, ELTs operating on 121.5 MHz will be required to meet the improved technical characteristics contained in 5.2.1.8.

5.1.2 All installations of emergency locator transmitters operating on 406 MHz shall meet the provisions of 5.3.

5.1.3 All installations of emergency locator transmitters operating on 121.5 MHz shall meet the provisions of 5.2.

5.1.4 From 1 January 2005, emergency locator transmitters shall operate on 406 MHz and 121.5 MHz simultaneously.

5.1.5 All emergency locator transmitters installed on or after 1 January 2002 shall operate simultaneously on 406 MHz and 121.5 MHz.

5.1.6 The technical characteristics for the 406 MHz component of an integrated ELT shall be in accordance with 5.3.

5.1.7 The technical characteristics for the 121.5 MHz component of an integrated ELT shall be in accordance with 5.2.

5.1.8 States shall make arrangements for a 406 MHz ELT register. Register information regarding the ELT shall be immediately available to search and rescue authorities. States shall ensure that the register is updated whenever necessary.

5.1.9 ELT register information shall include the following:

a) transmitter identification (expressed in the form of an alphanumerical code of 15 hexadecimal characters);

b) transmitter manufacturer, model and, when available, manufacturer’s serial number;

c) COSPAS-SARSAT* type approval number;

d) name, address (postal and e-mail) and emergency telephone number of the owner and operator;

e) name, address (postal and e-mail) and telephone number of other emergency contacts (two, if possible) to whom the owner or the operator is known;

f) aircraft manufacturer and type; and

g) colour of the aircraft.

Note 1.— Various coding protocols are available to States. Depending on the protocol adopted, States may, at their discretion, include one of the following as supplementary identification information to be registered:

a) aircraft operating agency designator and operator's serial number; or

b) 24-bit aircraft address; or

c) aircraft nationality and registration marks.

The aircraft operating agency designator is allocated to the operator by ICAO through the State administration, and the operator's serial number is allocated by the operator from the block 0001 to 4096.

Note 2.— At their discretion, depending on arrangements in place, States may include other relevant information to be registered such as the last date of register, battery expiry date and place of ELT in the aircraft (e.g. "primary ELT" or "life-raft No. 1").

5.2 SPECIFICATION FOR THE 121.5 MHZ COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

Note 1.— Information on technical characteristics and operational performance of 121.5 MHz ELTs is contained in RTCA Document DO-183 and European Organization for Civil Aviation Equipment (EUROCAE) Document ED.62.

Note 2.— Technical characteristics of emergency locator transmitters operating on 121.5 MHz are contained in ITU-R Recommendation M.690-1. The ITU designation for an ELT is Emergency Position — Indicating Radio Beacon (EPIRB).

5.2.1 Technical characteristics

5.2.1.1 Emergency locator transmitters (ELT) shall operate on 121.5 MHz. The frequency tolerance shall not exceed plus or minus 0.005 per cent.

5.2.1.2 The emission from an ELT under normal conditions and attitudes of the antenna shall be vertically polarized and essentially omnidirectional in the horizontal plane.

5.2.1.3 Over a period of 48 hours of continuous operation, at an operating temperature of minus 20°C, the peak effective radiated power (PERP) shall at no time be less than 50 mW.

5.2.1.4 The type of emission shall be A3X. Any other type of modulation that meets the requirements of 5.2.1.5, 5.2.1.6 and 5.2.1.7 below may be used provided that it will not prejudice precise location of the beacon by homing equipment.

Note.— Some ELTs are equipped with an optional voice capability (A3E) in addition to the A3X emission.

5.2.1.5 The carrier shall be amplitude modulated at a modulation factor of at least 0.85.

5.2.1.6 The modulation applied to the carrier shall have a minimum duty cycle of 33 per cent.

5.2.1.7 The emission shall have a distinctive audio characteristic achieved by amplitude modulating the carrier with an audio frequency sweeping downward over a range of not less than 700 Hz within the range 1 600 Hz to 300 Hz and with a sweep repetition rate of between 2 Hz and 4 Hz.

5.2.1.8 After 1 January 2000, the emission shall include a clearly defined carrier frequency distinct from the modulation sideband components; in particular, at least 30 per cent of the power shall be contained at all times within plus or minus 30 Hz of the carrier frequency on 121.5 MHz.

5.3 SPECIFICATION FOR THE 406 MHZ COMPONENT OF EMERGENCY LOCATOR TRANSMITTER (ELT) FOR SEARCH AND RESCUE

5.3.1 Technical characteristics

Note 1.— Transmission characteristics for 406 MHz emergency locator transmitters are contained in ITU-R M.633.

Note 2.— Information on technical characteristics and operational performance of 406 MHz ELTs is contained in RTCA Document DO-204 and European Organization for Civil Aviation Equipment (EUROCAE) Document ED-62.

5.3.1.1 Emergency locator transmitters shall operate on one of the frequency channels assigned for use in the frequency band 406.0 to 406.1 MHz.

Note.— The COSPAS-SARSAT 406 MHz channel assignment plan is contained in COSPAS-SARSAT Document C/S T.012.

5.3.1.2 The period between transmissions shall be 50 seconds plus or minus 5 per cent.

5.3.1.3 Over a period of 24 hours of continuous operation at an operating temperature of –20°C, the transmitter power output shall be within the limits of 5 W plus or minus 2 dB.

5.3.1.4 The 406 MHz ELT shall be capable of trans-mitting a digital message.

5.3.2 Transmitter identification coding

5.3.2.1 Emergency locator transmitters operating on 406 MHz shall be assigned a unique coding for identification of the transmitter or aircraft on which it is carried.

5.3.2.2 The emergency locator transmitter shall be coded in accordance with either the aviation user protocol or one of the serialized user protocols described in Appendix 1 to this chapter, and shall be registered with the appropriate authority.

APPENDIX 1 TO CHAPTER 5. EMERGENCY LOCATOR TRANSMITTER CODING

(see Chapter 5, 5.3.2)

Note.— A detailed description of beacon coding is contained in ITU-R Recommendation M.633-1. The following information is specific to emergency locator transmitters used in aviation.

1. GENERAL

1.1 The emergency locator transmitter (ELT) operating on 406 MHz has the capacity to transmit a programmed digital message which contains information related to the ELT and/or the aircraft on which it is carried.

1.2 The ELT shall be uniquely coded in accordance with 1.3 below and be registered with the appropriate authority.

1.3 The ELT digital message shall contain either the transmitter serial number or one of the following information elements:

a) aircraft operating agency designator and a serial number from 0001 to 4096;

b) 24-bit aircraft address;

c) aircraft nationality and registration marks.

1.4 All ELTs shall be designed for co-operation with the COSPAS-SARSAT* system and be type approved.

Note.— Transmission characteristics of the ELT signal can be confirmed by making use of the COSPAS-SARSAT Type Approval Standard (C-S T.007).

2. ELT CODING

2.1 The ELT digital message contains information relating to the message format, coding protocol, country code and identification data consisting of one of the information elements listed in 1.3 above.

2.2 For ELTs with no navigation data provided, the short message format described in ITU-R Recommendation M.633-1 shall be used, making use of bits 1 through 112.

2.3 Protected data field

2.3.1 The protected data field consisting of bits 25 through 85 shall be protected by an error correcting code, and shall be the portion of the message which shall be unique in every distress ELT.

2.3.2 A message format flag indicated by bit 25 shall be set to “0” to indicate the short message format or set to “1” to indicate the long format for ELTs capable of providing location data.

2.3.3 A protocol flag shall be indicated by bit 26 and shall be set to “1”.

2.3.4 A country code, which indicates the State where additional data are available on the aircraft on which the ELT is carried, shall be contained in bits 27 through 36 which designate a three-digit decimal country code number expressed in binary notation.

Note.— Country codes are based on the International Telecommunication Union (ITU) country codes shown in Table 4 of Part I, Volume I of the ITU List of Call Signs and Numerical Identities*.*

2.3.5 Bits 37 through 39 shall designate one of the user protocols where values “001” and “011” are used for aviation as shown in the examples contained in this Appendix.

2.3.6 The ELT digital message shall contain either the transmitter serial number or an identification of the aircraft or operator in bits 40 through 83 as shown below. This information shall be encoded in binary notation with the least significant bit on the right, or using the modified Baudot code shown in Table 5-1.

2.3.7 In the serialized user protocol (designated by bits 37 through 39 being "011") bits 40 through 42 shall indicate type of beacon where:

— "000" indicates ELT serial number is encoded in bits 44 through 63;

— "001" indicates aircraft operator and a serial number are encoded in bits 44 through 61 and 62 through 73, respectively;

— "011" indicates the 24-bit aircraft address is encoded in bits 44 through 67 and each additional ELT on the same aircraft is numbered in bits 68 through 73.

Note.— States will ensure that each beacon, coded with the country code of the State, is uniquely coded and registered in a data base. Unique coding of serialized coded beacons can be facilitated by including the COSPAS-SARSAT Type Approval Certificate Number which is a unique number assigned by COSPAS-SARSAT for each approved ELT model, as part of the ELT message.

2.3.8 In the aviation user protocol (designated by bits 37 through 39 being "001"), the aircraft nationality and registration marking shall be encoded in bits 40 through 81, using the modified Baudot code shown in Table 5-1 to encode seven alpha-numeric characters. This data shall be right justified with the modified Baudot space ("100100") being used where no character exists.

2.3.9 Bits 84 and 85 shall indicate any homing transmitter that may be integrated in the ELT.

Table 5-1. Modified Baudot Code

Letter	*Code* MSBLSB	Figure	Code MSBLSB
A	111000	(-)*	011000
B	110011		
C	101110		
D	110010		
E	110000	3	010000
F	110110		
G	101011		
H	100101		
I	101100		
J	111010	8	001100
K	111110		
L	101001		
M	100111		
N	100110		
O	100011	9	000011
P	101101	0	001101
Q	111101	1	011101

R	101010	4	001010
S	110100		
T	100001	5	000001
U	111100	7	011100
V	101111		
W	111001	2	011001
X	110111	/	010111
Y	110101	6	010101
Z	110001		
( )**	100100		

MSB=most significant bit
LSB=least significant bit
*=hyphen
**=space

EXAMPLES OF CODING

ELT serial number

25		27 36	37			40				44 63	64 73	74 83	85	
F	1	COUNTRY	0	1	1	T	T	T	C	SERIAL NUMBER DATA (20 BITS)	SEE NOTE 1	SEE NOTE 2	A	A

Aircraft address

25		27 36	37			40				44 67	68 73	74 83	85	
F	1	COUNTRY	0	1	1	T	T	T	C	AIRCRAFT ADDRESS (24 BITS)	SEE NOTE 3	SEE NOTE 2	A	A

Aircraft operator designator and serial number

25		27 36	37			40				44 61	62 73	74 83	85	
F	1	COUNTRY	0	1	1	T	T	T	C	OPERATOR 3-LETTER DESIGNATOR	SERIAL NUMBER 1-4096	SEE NOTE 2	A	A

Aircraft registration marking

25		27 36	37			40 81	83		85	
F	1	COUNTRY	0	0	1	AIRCRAFT REGISTRATION MARKING (UP TO 7 ALPHANUMERIC CHARACTERS) (42 BITS)	0	0	A	A

T 0 Beacon type TTT = 000 indicates ELT serial number is encoded;
= 001 indicates operating agency and serial number are encoded;
= 011 indicates 24-bit aircraft address is encoded.

C 0 Certificate flag bit: 1 = to indicate that COSPAS-SARSAT Type Approval Certificate number is encoded in bits 74 through 83 and
0 = otherwise

F 0 Format flag: 0 = Short Message
1 = Long Message

A 0 Auxiliary radio-locating device: 00 = no auxiliary radio-locating device
01 = 121.5 MHz
11 = other auxiliary radio-locating device

Note 1.— 10 bits, all 0s or National use.

Note 2.— COSPAS-SARSAT Type Approval Certificate number in binary notation with the least significant bit on the right, or National use.

Note 3.— Serial number, in binary notation with the least significant bit on the right, of additional ELTs carried in the same aircraft or default to 0s when only one ELT is carried.

— END —