MAINTENANCE OF TRANSPORT AIRCRAFT IN CENTRAL AND EASTERN EUROPE

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Note. For the purposes of this paper, the use of the generic term, Eastern designed aircraft, means aircraft and systems designed in the former Soviet Union.

Abstract

Major differences exist between Eastern manufactured aircraft and Western built transport aircraft, in the areas of design philosophy and standards. These differences translate into unique methods and processes which need to applied to the different fleets, especially during the maintenance phases. For operators who will maintain mixed fleets of Western and Eastern transport aircraft, it is necessary to be aware of those differences which affect the various maintenance practices. The key to successfully operating and maintaining a mixed fleet of Western and Eastern aircraft within a given organization is planning, and making the appropriate adjustments within the corporate culture. Manufacturers and standard setting organizations can also make important contributions to the success. As an example, a six year time period of experience within MALÉV/Aeroplex for mixed fleet maintenance is reviewed.

Introduction

When attempting to introduce Western designed and certificated aircraft into countries and areas dominated by Eastern originated aircraft, some major differences in operation and maintenance philosophy become obvious, very rapidly. The differences are more emphasized when new Western aircraft are added to an ageing Eastern fleet. Because of this, and in order to ensure a smoother, more successful introduction of such Western aircraft into an Eastern fleet, one also needs to address other, not so obvious differences. This paper broadly reviews the obvious differences, and will attempt to highlight the more subtle but nonetheless, important "other" factors that could affect maintenance efforts.

Differences

Certification

Taken as a whole, the design philosophy, standards, procedures, and oversight practices for Eastern aircraft are far different than those which the West are familiar. A complication is the fact that the USA and Europe have different approaches to satisfying their own type certification requirements. At the

heart of the production question are the twin difficulties of traceability and materials qualification.

Material Specification

Materials equivalency are usual questions between Western and Eastern aircraft, especially in the area of repairs. There is a lack of cross reference documentation for Western standard hardware and sheet metal to equivalent Eastern material standards. Also, specifications that are not in metric standards could add additional burden to a maintenance organization which utilizes the metric systems only.

The technical challenge also centers on the issues such as compatibility of electronic equipment produced by manufacturers in the West and the East. The Western system of "TSO" type authorization to allow installation of equipment in multiple aircraft types, does not exist in the Eastern countries.

Operational and Maintenance Issues

To begin, technically the Eastern design philosophy of airplanes still used widely mandates a finite life of the aircraft structure, very much like the West, before MSG-2. That is to say, the typical Eastern designed civil air transport airframes (for example the Tupolev TU-134, TU-154), have a fixed life of x thousand hours / cycles. Only the Design Bureau can authorize continued operation of the airframe beyond this fixed limit, and such an approval will require an on-site inspection by the Design Bureau staff. One odd feature of this life extension process, is that advanced information regarding the required inspection areas or methods is not available to the operator. This information is available to the operator only after the Design Bureau staff are physically on-site. The inspection can take place at the operator's facility or during an overhaul at a designated facility. If the inspection and testing are satisfactory, a life extension Protocol is signed allowing that one airframe to go beyond the design life. There is no method of performing and documenting fleet type data to allow a general extension of the airframe life. Furthermore, Eastern and Western philosophies on service bulletins differ. Dissemination of service difficulty information among Eastern countries is almost non-existant.

This practice differs from a Western airframe, which by design do not have a specific hard life, but instead will have a "Design Service Goal" of x thousand hours / cycles. Assuming those Western aircraft are maintained using an approved maintenance program, with inspection findings inside the defined ageing aircraft program criteria, the airframe can continue operation indefinitely. Further, unlike the Eastern system, the ageing aircraft inspection programs such as the Supplemental Structural Inspection Program (SSIP), or the Corrosion Prevention and Control Program (CPCP), clearly defines all the required inspection areas and methods. In essence, economics is the primary factor for continued operation of a Western aircraft beyond the "Design Service Goal". Operation would cease if and when the aircraft becomes uneconomical to maintain or operate.

The hard time position for Eastern designed and certificated engines applies as well. Most of the operators of these equipments are allowed to do limited maintenance and adjustments on the engine. However, the need for any heavy maintenance or overhaul requires the return of the engine to a designated overhaul facility.

As for aircraft system components, there is also a defined life or time between overhaul limit stated in

calendar periods for many components. An operator can obtain an extension beyond the expiration date for a single item, based on testing, documentation, and justification of the results.

This process is only valid for a single item. The range of items covered extends from rubber hoses, pneumatic valves to metal bar stock. Essentially, the Eastern aircraft are maintained using predominantly Hard Time Maintenance practices.

Western standards see this practice as far too restrictive. In the West, the size of the investment that an operator is willing to make, will typically dictate the level of maintenance or overhaul allowed on airframes and power plants.

Operationally, one major difference is the absence of a Minimum Equipment List (MEL) for earlier Eastern designed aircraft, which would allow flight operations to continue with an inoperative component or system. Under the Eastern system, essentially every item is a no-go item. One has to question, how can operations continue under so strict rules without grounding the aircraft for such a minor defect as a "burned out light bulb". Such restrictive policies could resort to a system of chicanery, whereby the Pilot Reports (PIREPS) are controlled. That is, the burned out light bulb entry is not made in the log book, until after take off. Obviously, the crews would only resort to this for minor, non-safety items.

Regarding the maintenance and support of the two diverse fleets within a given organization, both Eastern and Western design fleets have all of the required planning, training, spare parts recommendations, etc., to accomplish the tasks. However, one important aspect of aircraft maintenance is the human element. To this side, the following observations are made.

Personnel

The introduction of Western equipment into a organization operating Eastern airplanes could create a two-tier system and possible conflict amongst the labour force. The 'elite' and more capable technicians will gravitate towards the Western equipment, while the 'others' remain working on the older Eastern equipment. Furthermore, the younger members of the staff will most likely be more adaptable to the newer technology and language than their seniors, creating additional problems. If the introduction phase of the new equipment does not address these issues, the new equipment will be hailed by a few, but viewed as a genuine threat by the majority.

High Technology Test Equipment

The use of high capital Automatic Test Equipment (ATE) to a country with relative low labour rates and an abundance of qualified staff may not be cost effective. When considering the opportunity cost of capital for the expensive ATE, a sound economical alternative may be to stay on the side of labour intensive. This approach requires a frequent review, with due consideration to the operator's labour rates and potential through-put of those high technology components.

In-House Repair Capability

Another potential pitfall while operating mixed Western and Eastern equipments is to introduce western 'low tech' shop capability first, usually wheels, tires, brakes, etc., as opposed to Western 'high tech' areas. One must consider that there is a high probability that the personnel in such shops (wheel, tire, brake) will not be sufficiently fluent in English to use the Western manuals.

Therefore, a language up-grade program would be necessary, or the required manuals must be translated, with additional associated costs.

Training and Language

The standard level of training provided for Western equipment is usually more than sufficient to ensure proficiency at performing a given set of tasks on those airplanes. However, consideration must be given for the trainee's response to additional or revised information, post training. For example, is the trainee capable of comprehending and carrying out a change to the procedures received later via a revision to the manuals? If translation is required by the operator, then a system is required to ensure that the process has been reviewed, and that the translation is true and correct. It is a potential problem area.

Introduction of new documentation technology (i.e. microfilms, CD-ROMs) makes the translation problem practically unsurmountable or unacceptably expensive.

Manufacturers can ease reading and comprehending of English documentation by standardizing vocabulary they use across their Manuals, Service Bulletins, and other technical data.

MALÉV/Aeroplex experience

MALÉV Hungarian Airlines added the first Western aircraft to its TU-134, TU-154 fleet in 1988. It added two new types at the same time: B-737-200 and BAe-146-200QT. The first type served as a long term candidate for passenger transport fleet expansion and the second was used for cargo operations in a joint venture formed with TNT Express Cargo. Different approaches were applied to each type. MALÉV Engineering Division at that time had only a handful of English speaking technicians and engineers. This limited resource was mainly used for BAe-146 operations and B-737 operation was started under an engineering contract with Lufthansa. This contract embraced provision of a field team, planning and engineering functions, stock rent, component and engine repair. In few weeks two more B-737-200 aircraft were added to the fleet. Gradually, as the English and type rating courses of Hungarian technicians and engineers progressed, the scope of the Lufthansa contract diminished and after four years from the beginning only material supply functions remained in force.

In 1991 three B-737-300 aircraft were leased by MALÉV and in 1993 a B-767 was leased for a short period, which was followed by inauguration of two acquired B-767-200ER airplanes. Surmounting of the language barrier required lot of money and worktime spent on training. Maintenance philosophy differences were elaborated easier because MALÉV engineering pioneered - in close collaboration with Tupolev Design Bureau - to introduce an MSG-2 type maintenance schedule for its TU-154 fleet, and an MEL document was worked out for the type.

In 1992 on the basis of what used to be MALÉV Engineering a joint venture was formed by MALÉV Hungarian Airlines and Lockheed Aircraft Service International. This joint venture is called Aeroplex of Central Europe Ltd. and has a goal to provide excellent maintenance services for MALÉV and in an increasing portion for third party customers. In a short time, the Company was capable of performing D check level maintenance on B-737s and in the present year acquired an FAA Repair Station Certificate. Right from the beginning the Company offered start up services for airlines in CIS countries adding Western aircraft to their existing fleet or newly formed airlines with technical staff experi-

enced on Eastern types before. Being familiar with both Western and Eastern maintenance philosophies and practices, English and Russian languages gave a very good opportunity to bridge the gap between cultures. This has been the experience on which the statements provided above are based.

Summary

In summary, for airlines who have experience with operating only Eastern aircraft, but wish to integrate Western aircraft into their fleet, a customized transition plan should be developed and implemented. A replacement plan only, with no consideration to the unique differences in design, certification, and maintenance philosophies would be inadequate. A well structured plan by the potential operator would transfer the basic knowledge and processes required to effectively operate and maintain Western equipment, independently, based on an acceptable and pragmatic timetable. This planning would require joint manufacturer and operator studies to be conducted on how to best use the existing personnel and infrastructure. By not looking at a systematic process for integrating a Western fleet into the operator's system the result could be tantamount to producing a clone of Western airline operation in an Eastern country.

Glossary

ATE - Automatic Test Equipment: Equipment which automatically carries out a predetermined program of testing for possible malfunction with minimum reliance upon human intervention.

CPCP - Corrosion Prevention and Control Program is a defined set of guide-lines and instructions to prevent and control deterioration due to corrosion.

Hard Time - A primary maintenance process under which an item must be removed from service at or before a previously specified time.

MEL - Minimum Equipment List is an approved list of items which may be inoperative for flight under specified conditions.

MSG-2 - Maintenance Steering Group #2: A process and logic to be used in the development of an approved continuous airworthiness total maintenance program for airframe, engines, systems and components.

PIREP - Pilot Report: Suspected or known malfunctions or unsatisfactory conditions entered by the flight crew into the aircraft log and which require maintenance action.

Service Bulletin - A document issued by the manufacturer to notify the airline of recommended modifications, substitution of parts, special inspections / checks, reduction of existing life limits or establishment of first time life limits and conversion from one component model to another.

SSIP - Supplemental Structural Inspection Program is a defined set of guide-lines and instructions applied to major airframe components to ascertain structural integrity.

TC - Type Certificate: approval of the design of an aircraft, aircraft engine, or propeller to airworthiness standards.

TSO - Technical Standard Order: a minimum design and performance specification published by the FAA which has no specific aircraft application.