A Successful Plan for Maintenance of Your Aircraft

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The substantial cost of maintaining your aircraft must be planned and should not be underestimated. This cost is incurred in a number of different manners depending on when your period of ownership of your aircraft will fall within the life cycle of that aircraft. You will need a clear understanding of scheduled maintenance costs and advice about the foreseeable relationship between the age of your aircraft and its likely market value at different points in its life cycle.

A successful plan for maintenance of your aircraft, for the purposes of this article at least, is one that provides, most importantly, a high level of safety in flight; but also full compliance with all laws and regulations regarding maintenance; a predictable, budgetable level of expense; maximum charter revenue, if desired; and disposition of the aircraft at its maximum potential market value.

Planning for maintenance costs for used aircraft operated in Russia is taking on more importance as several trends appear in the marketplace:

First, with aircraft prices currently down in the US and Europe, there are a number of transactions involving the purchase or lease of used aircraft by Russian companies. Used aircraft are being customs-cleared and registered in Russia, as well as continuing to be registered in Europe and the US. Certain Russian corporations are registering purchased and leased used aircraft in Russia so that these aircraft may be flown in Russia without the restrictions on cabotage flights within Russian on foreign-registered aircraft.

There are examples of Russian corporations operating "heavy" business jets registered outside of Russia on flights to and from Russia, and registering lighter business jets in Russia so that they may be flown domestically. Customs clearance involves the cost of payment of import VAT, but not customs duties, if an aircraft weighs less than 20,000 kilograms.

Second, all the new aircraft Russian corporations and individuals previously acquired have, with the passage of time, become used aircraft. The issue of how to maintain these aircraft after the warranties on their major systems will expire, or expensive scheduled maintenance will be due, how to preserve the value of these aircraft, and when to dispose of them during their life cycle, is unavoidable.

Third, the era when used aircraft became more valuable than new aircraft due to their immediate availability at a time when aircraft were appreciating in value appears to have passed. Maintenance costs may not be expected to be recaptured upon sale of an aircraft at a future time at an appreciated value. Instead, the opposite is true. Many aircraft have depreciated in value and maintenance costs have become unrecoverable costs.

Certain aircraft have been grounded and placed into storage due to their owners' inability or unwillingness to pay all maintenance and other costs of ownership. Lessees may be unwilling to take

on the owners' maintenance obligations during long-term leases. The rate of decline in value of grounded aircraft will only accelerate with the passage of time, and there will come a time when a grounded aircraft will no longer be marketable as there will be newer aircraft that will be more attractive to companies seeking aircraft. Reputable brokers may also refuse to market a used aircraft with known maintenance issues.

Fourth, the average period of ownership of an aircraft appears to be rising, as compared to past norms. It has been a rule of thumb that a business planning to buy an aircraft should have a detailed five year plan for use and maintenance of the aircraft. Prior to the recent economic crisis, in the US, an aircraft was typically owned not for five years, but for three years. Now, it appears that, due to the still depressed market for business aircraft, the average actual period of ownership of aircraft is growing to be more than three years since it has been more difficult to re-sell used aircraft. Used aircraft are staying on the market for longer than previously and owners are having to grapple with the continuing cost of maintenance over longer periods than they originally expected.

1. New Aircraft

One aircraft manufacturer's representative explained at a conference in 2010 that the Russian aircraft market has developed differently than other global markets. The majority of acquired aircraft have been new, heavy, high-end, long range, luxurious aircraft which have had mission capabilities and costs of operation far in excess of what was actually needed based on actual usage of acquired aircraft. So, this aircraft manufacturer expects the Russian market to evolve in the opposite direction of other global markets, away from aircraft that have unneeded, excess capabilities to smaller, much more efficient aircraft that accomplish their users' actual required missions.

Of course, a new aircraft, larger, mid size, or light, is delivered with warranties covering its fuselage, engines, avionics and other major components. Certain warranties are given by the aircraft manufacturer and certain by the original equipment manufacturers of the component systems. Manufacturers offer computerized maintenance programs (CMPs) that assist owners' and operators' maintenance staff in complying with an inspection program for new aircraft and preparing status reports. Usually, a free period for use of a manufacturer's CMP is provided with new aircraft. Manufacturers also promise quick repairs of new aircraft and well-planned maintenance work, reducing downtime. Manufacturers seek to extend their required service intervals, for example, to 18 and 24 months, and to reduce planned maintenance costs on new equipment as much as possible. A typical maintenance schedule will require inspections on 12 and 24 month intervals, and airframe maintenance after 72 months. Other inspections are required after 5,000 landings. Manufacturers have on-site FAA approval authority and work to quickly generate required paperwork and return new aircraft to service. Maintenance in a manufacturer's own facilities establishes that an aircraft has been well maintained, which will serve to preserve the aircraft's value.

Aircraft engine manufacturers each have an hourly cost maintenance program (HCMP) to allow owners to have predictable level of engine maintenance expense. Such programs require payment of substantial sums per hour engine operation, and also include an insurance component to cover the cost of unforeseen maintenance expenses. It is a usual requirement of banks and aircraft finance companies that an aircraft be enrolled in an HCMP in order to keep an aircraft in optimal condition as collateral for the financing. Examples of the manufacturer's programs are: for Honeywell, its "Maintenance Service Plan"; for Pratt & Whitney, its "Eagle Service Plan"; for Rolls Royce, its Corporate Care and Power-by-the-hour programs. In addition there, are independent HCMPs such as Jet Support Services, Inc. (JSSI). JSSI offers slightly lower rates and allows its clients to keep accumulated funds in trust and to transfer them to any replacement aircraft, or an aircraft may also be sold together with its coverage, which most people do. In these HCMPs, all hourly rates are based on actuarial studies on fatigue tests, unscheduled losses, replacement values, fleet history, warranty coverage, in-service versus out of service aircraft, the amount of hours flown, and the location and use of an aircraft.

If all the optional benefits are chosen, at a higher cost, HCMPs now cover routine periodic inspections of engines at authorized service centers, and major inspections, including the cost of life limited parts, and labor, and the cost of transporting removed engines for overhaul, and reinstallation of engines. HCMPs also cover unscheduled maintenance, and it is in this connection that the insurance aspects of an HCMP come into effect as not all expenses are foreseeable and there may not be adequate reserves built up based on the fees charged by HCMPs based on hours of flight. Yet, the HCMPs must have their own financial plan for how to cover unexpected maintenance costs that may be incurred by the entire number of aircraft covered by an HCMP.

In these plans, aircraft owners and operators will "save" toward the cost of scheduled maintenance by paying amounts into such programs based upon hours of flight, multiplied by the number of engines. The different providers of HCMPs for aircraft engines, airframes and other components compete on the comprehensiveness and affordability of their financial programs for managing the costs of maintaining and operating business jets. There are a number of contract issues that may arise with operators of HCMPs that may involve accuracy in the numbers of flight hours reported to HCMPs, the scope of coverage provided by an HCMP for covered, and uncovered events, and other issues.

2. Used Aircraft

The regularly scheduled maintenance checks of an aircraft are referred to informally as A, B, C and D-Checks with the timing for each varying depending on the type of aircraft, number of takeoff and landing cycles, or hours flown. C-Checks are typically done every 12 or 18 months and the aircraft will be out of service for a day. A D-Check, or heavy maintenance visit, will occur every 4 or 5 years and involve taking an aircraft out of service for several weeks. In a D-Check, an aircraft will be taken apart completely and put back together after every component has been checked, exchanged or repaired.

Aircraft maintenance service providers, such as Lufthansa Technik, are very well organized in their conduct of periodic maintenance and contend that optimum maintenance is the key factor in preserving the safety, reliability and value of aircraft. Time lost while an aircraft is out of service is expensive in terms of lost revenue if an aircraft is chartered and the continuing of financing of the aircraft while it is out of service. A D-Check may require a couple of weeks to be completed since it is an overhaul rather than routine maintenance, with all parts to be replaced that wear out, exterior paint to be replaced, engines removed, repaired and re-installed, the landing gear removed and re-installed, and fuselage panels removed and reinstalled after a search for metal fatigue, cracks and damage.

For Russian buyers of used aircraft, it should be noted that the Russian Ministry of Transportation has a policy that commercial aircraft acquired by Russian commercial airlines should not be older than 10 years at the time they are first acquired. Staff members in the Ministry of Transportation have confirmed that this policy does not extend to business aircraft, though this policy of the Ministry of Transportation is not stated in any documents and remains an unwritten rule. The 10 year age restriction is for commercial airlines purchasing commercial aircraft. An aircraft acquisition transaction may be structured so that no airline is purchasing and importing the aircraft, but rather a leasing company or special purpose company. There are many examples of importation and registration of business aircraft older than 10 years in Russia. The policy objective of the limitation on the import of aircraft older than 10 years is to preserve a market for comparable Russian manufactured aircraft. The policy is not aimed at small business jets which are not manufactured in Russia, but at commercial aircraft that compete with, for example, the Sukhoi Regional Superjet.

Of course, a point in time will come when a decision will be made to scrap an older aircraft rather than incur the expense of conducting a D-Check. The high cost to maintain the aircraft will no longer be justified by the aircraft's value. Presumably, an aircraft owner will want to have disposed of his

business aircraft before this point in time arrives where it is rational to turn off the life support systems on an aircraft.

3. Aircraft in the Hands of Distressed Owners Lose Value Fast

Aircraft in the hands of distressed owners lose value fast. Recently, two separate transactions have been underway to bring two comparable 1992 US registered aircraft to Russia, to two different owners. One transaction succeeded where the aircraft was in pristine condition with a complete maintenance history. The other transaction failed, partly due to concerns that there are overdue maintenance bills and expensive upcoming scheduled maintenance, the cost of which the owner was hoping to shift to a lessee in Russia. The aircraft in the second transaction is in storage at a repair facility where it may remain for some time as some brokers do not want to deal with this aircraft or even present it to potential lessees. Would be lessees closely examine CAMP reports on alternative aircraft they are considering and have not chosen the aircraft with maintenance issues. Would be lessees find it more attractive to commit to a substantially more expensive lease for a different aircraft that they expect will be trouble free during the entire lease period, and a higher lease cost compares well to a lower lease and responsibility for expensive foreseeable maintenance. The owner of the aircraft that has been passed will likely see continued substantial loss in the value of his aircraft, but, due to his own, hopefully temporary financial difficulties is not able to remove the maintenance issue that is impeding his ability to lease out or sell his aircraft. This situation will likely only get worse for this owner.

4. Typical Contractual Requirements of a Buyer of a Used Aircraft

An aircraft owner should keep in mind the typical maintenance requirements at the time of re-sale of his aircraft. The practical point is that, if an owner gets behind on maintenance of his aircraft, then any shortcomings will be discovered in a pre-sale inspection of the aircraft, or an inspection prior to a long-term lease of an aircraft, and that prospective transaction may not go forward, or the owner will have to place into an escrow a sum more than adequate to pay the cost of all required maintenance to bring an aircraft into compliance with a buyer's or lessee's requirements.

An aircraft purchase and sale agreement for re-sale of an aircraft will typically provide that the aircraft must be delivered to purchaser in the following condition, and a detailed inspection will be completed to assure the aircraft is in this condition. The aircraft must be maintained in compliance with the aircraft’s type certificate and standard airworthiness certificate and in an airworthy condition suitable for operation in private use and on commercial charter flights, in the US, under Parts 91 and 135 of the US Federal Aviation Regulations (FAR), with all systems and installed equipment and engines in normal working order and operating to manufacturers’ specifications, and with each engine able to produce its rated takeoff power in a ground power run.

Upon re-sale, an aircraft must be up to date on all manufacturers’ recommended maintenance and inspection schedules, including all calendar and hourly inspections, and in compliance with all applicable US Federal Aviation Administration (FAA) airworthiness directives and manufacturers’ service bulletins that have been issued with respect to the aircraft. The aircraft must be maintained in accordance with all applicable airframe, engine, and avionics maintenance programs and contracts, if any, which are all required to fully paid and transferable to purchaser. The aircraft must be delivered with no corrosion or damage, and no history of corrosion or damage, and all aircraft documents must be maintained in accordance with industry standards and the FAR.

5. Legal Requirements with Regard to Maintenance in US, Europe and Russia

One reason that the great majority of Russian owned aircraft are not registered in Russia but in the US or Europe is that the majority of banks and others aircraft finance companies that finance or refinance

acquisitions of aircraft require that the financed aircraft may not be registered in Russia. Partly, this is to facilitate legal recourse in the event the aircraft financier ever has to exercise its legal rights to seize an aircraft. Partly, this is due to the absence in Russia of authorized service centers that may carry out many types of inspections and repairs. And, partly this is because the legal and regulatory regimes setting out requirements for mandatory maintenance of aircraft are much more advanced in the US and Europe.

As discussed below, there are many US and European maintenance requirements for which there is no analogous requirement in Russia. Consequently, there is a perception that an aircraft registered in Russia will be maintained at a lower standard than an aircraft registered in the US or Europe.

Also, there are "horror stories" about poor maintenance of aircraft in Russia, and even the falsification of maintenance records by Russian operators which has led to aircraft being flown while in an unsafe condition with equipment failing during flight that was overdue for replacement.

The discussion below summarizes the regulations governing the maintenance of business jets in the US, Europe and Russia, providing an overview comparison of the requirements of the FAR, EASA Regulations, and Russian regulations.

What Law Governs Aircraft Maintenance?

The US regulations governing maintenance of business jets are, for the most part found in Part 91 and Part 135 of the FAR. Part 91 governs the maintenance and preventive maintenance requirements for U.S.-registered civil aircraft operating within or outside of the United States. Part 135 provides additional requirements for the maintenance and preventive maintenance for aircraft used for passengers on charter flights. There are different requirements for aircraft with up to 9 passengers, or 10 or more passengers.

The European regulations governing maintenance are found in Part M of the EASA Regulations. Section M.A.101 of the EASA Regulations sets out requirements to ensure that airworthiness is maintained, including maintenance. It also specifies the conditions to be met by organizations involved in airworthiness management.

The Russian regulations of maintenance of business jets are found in Order No.333 of Federal Agency of Air Transport setting out “Methodological recommendations on operator manual to regulate maintenance”; and Order No. DV-58 of Ministry of Transportation setting out an “Instruction on maintenance and repair of aviation equipment in civil aviation”. There is no distinction between general and commercial aviation in respect of maintenance.

Who is responsible for maintenance?

The US regulations provide, in Section 91.403, that the general rule is that the owner or operator of an aircraft is primarily responsible for maintaining an aircraft in an airworthy condition. No person may perform maintenance, preventive maintenance, or alterations on an aircraft other than persons authorized under additional regulations. And, no person may operate an aircraft for which a manufacturer's maintenance manual or instructions for continued airworthiness has been issued that contains an airworthiness limitations section unless the mandatory replacement times, inspection intervals have been complied with.

For aircraft used in charter operations, Section 135.413 adds that each certificate holder is primarily responsible for the airworthiness of its aircraft and shall have its aircraft maintained in accordance with these rules, and shall have defects repaired between required maintenance. Each certificate

holder shall perform maintenance and preventive maintenance; or make arrangements with another person for the performance of maintenance and preventive maintenance.

The EASA regulations provide, in Section M.A.201, that The owner is responsible for the continuing airworthiness of an aircraft and shall ensure that no flight takes place unless: the aircraft is maintained in an airworthy condition, any operational and emergency equipment fitted is correctly installed and serviceable or clearly identified as unserviceable, the airworthiness certificate remains valid, and the maintenance of the aircraft is performed in accordance with an approved maintenance program. When an aircraft is leased, the responsibilities of the owner are transferred to the lessee if the lessee is stipulated on the registration document, or detailed in the leasing contract. Any person or organization performing maintenance shall be responsible for the tasks performed. The owner of an aircraft may contract the tasks associated with continuing airworthiness to a continuing airworthiness management organization.

Russian law provides, in Article 37 of the Air Code, that compliance with the rules for operation and maintenance of civil aircraft envisaged by the operational documentation of the civil aircraft and providing the maintenance of its airworthiness is the responsibility of the operator or owner of a light civil aircraft of general aviation.

What Maintenance is Required?

The US regulations provide, in Section 91.405, that each owner or operator of an aircraft shall have that aircraft inspected as [required by these regulations] and shall between required inspections have discrepancies repaired; shall ensure that maintenance personnel make appropriate entries in the aircraft maintenance records indicating the aircraft has been approved for return to service; and shall have any inoperative instrument or item of equipment, permitted to be inoperative, repaired, replaced, removed, or inspected at the next required inspection. Part 135 adds, in Section 135.421, that each certificate holder who operates an aircraft type certificated for a passenger seating configuration, excluding any pilot seat, of nine seats or less, must comply with the manufacturer's recommended maintenance programs, or a program approved by the FAA.

The EASA regulations require, in Section M.A.302, that maintenance of each aircraft shall be organized in accordance with an aircraft maintenance program. The aircraft maintenance program and any subsequent amendments shall be approved by the competent authority. The aircraft maintenance program must establish compliance with instructions issued by the competent authority; and instructions for continuing airworthiness issued by the holders of the type certificate, major repair design approval, or any other relevant approval. The aircraft maintenance program shall contain details, including frequency, of all maintenance to be carried out, including any specific tasks linked to the type and the specificity of operations.

Russian law provides, in Order No.333 dated September 2008, that, in accordance with Chapter 8 of Annex 6 to the Chicago Convention, all operators are obliged to take measures to ensure that (a) each aircraft, which they operate is maintained in appropriate airworthiness; (b) the operational and emergency equipment required for the planned flight, is intact; and (c) airworthiness certificate for each aircraft, which they operate, is valid.

In addition to the foregoing general maintenance requirements, the US regulations include additional requirements for preventive maintenance of aircraft. See Section 135.423 of the FAR which provides that each certificate holder that performs any of its maintenance must have an organization adequate to perform the work, and each certificate holder that performs any inspections and each person with whom it arranges for the performance of that work, must have an organization adequate to perform that work. Section 135.425 of the FAR provides each certificate holder shall have an inspection program and a program covering other maintenance, preventive maintenance, and alterations, that

ensures that: maintenance and preventive maintenance performed by it, or by other persons, are performed under the certificate holder's manual; competent personnel and adequate facilities and equipment are provided for the proper performance of maintenance, preventive maintenance, and alterations; and each aircraft released to service is airworthy and has been properly maintained for operation under this part.

What Inspections are Required?

The US regulations provide, in Section 91.409, that no person may operate an aircraft unless, within the preceding 12 calendar months, it has had an annual inspection; or an inspection for the issuance of an airworthiness certificate. No person may operate an aircraft carrying any person (other than a crewmember) for hire, unless within the preceding 100 hours of time in service the aircraft has received an annual or 100-hour inspection and been approved for return to service. Each registered owner or operator of an aircraft desiring to use a progressive inspection program must submit a written request to the FAA Flight Standards district office having jurisdiction over the area in which the applicant is located, and shall provide a certificated mechanic holding an inspection authorization, a certificated airframe repair station, or the manufacturer of the aircraft to supervise or conduct the progressive inspection; and a current inspection procedures manual available containing, in detail: (i) an explanation of the progressive inspection, including the continuity of inspection responsibility, the making of reports, and the keeping of records and technical reference material; (ii) an inspection schedule, specifying the intervals in hours or days when routine and detailed inspections will be performed; (iii) sample routine and detailed inspection forms and instructions for their use; and (iv) sample reports and records and instructions for their use; enough housing and equipment for necessary disassembly and proper inspection of the aircraft; and appropriate current technical information for the aircraft. No person may operate a large airplane unless the replacement times for life-limited parts specified in the aircraft specifications are complied with. The registered owner or operator of each airplane must use one of the following programs for the inspection of the aircraft: (i) a continuous airworthiness inspection program that is part of a continuous airworthiness maintenance program currently in use by a person holding an air carrier operating certificate, or (ii) an approved aircraft inspection program, or (iii) a current inspection program recommended by the manufacturer. Neither EASA or Russian aviation regulations sets out a comparable set of requirements for inspections.

What Maintenance Records are Required?

The US regulations provide, in Section 91.417, that each registered owner or operator shall keep records of the maintenance, preventive maintenance, and alteration and records of the 100-hour, annual, progressive, and other required or approved inspections, as appropriate, for each aircraft. The records must include: (i) a description (or reference to data acceptable to the Administrator) of the work performed; (ii) the date of completion of the work performed; and (iii) the signature, and certificate number of the person approving the aircraft for return to service. The records must contain the following information: (i) the total time in service of the airframe, each engine, each propeller, and each rotor; (ii) the current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance; (iii) the time since last overhaul of all items installed on the aircraft which are required to be overhauled on a specified time basis; (iv) the current inspection status of the aircraft, including the time since the last inspection required by the inspection program under which the aircraft and its appliances are maintained; and (v) The current status of applicable airworthiness directives (AD) and safety directives. The records specified shall be retained until the work is repeated or superseded by other work or for 1 year after the work is performed. The records shall be retained and transferred with the aircraft at the time the aircraft is sold. A list of defects furnished to a registered owner or operator shall be retained until the defects are repaired and the aircraft is approved for return to service. The owner or operator shall make all maintenance records required to be kept by this section available for inspection by the FAA or any authorized representative of the National Transportation Safety Board (NTSB).

With regard to aircraft used in charter operations, the US regulations provide, in Section 135.439, concerning maintenance recording requirements, that each certificate holder shall keep the following records: (1) all the records necessary to show that all requirements for the issuance of an airworthiness release have been met; (2) records containing the following information: (i) the total time in service of the airframe and engines; (ii) the current status of life-limited parts of each airframe, engine, propeller, rotor, and appliance; (iii) the time since last overhaul of each item installed on the aircraft which are required to be overhauled on a specified time basis; (iv) the identification of the current inspection status of the aircraft, including the time since the last inspections required by the inspection program under which the aircraft and its appliances are maintained; (v) the current status of applicable airworthiness directives, including the date and methods of compliance, and, if the airworthiness directive involves recurring action, the time and date when the next action is required; and (vi) a list of current major alterations and repairs to each airframe, engine, propeller, rotor, and appliance. Each certificate holder shall retain the records required to be kept by this section for the following periods: the records shall be retained until the work is repeated or superseded by other work or for one year after the work is performed; the records of the last complete overhaul of each airframe, engine, propeller, rotor, and appliance shall be retained until the work is superseded by work of equivalent scope and detail, and the records shall be retained and transferred with the aircraft at the time the aircraft is sold. The certificate holder shall make all maintenance records required to be kept by this section available for inspection by the FAA or any representative of the National Transportation Safety Board.

The EASA regulations require, in Section M.A.305, that, at the completion of any maintenance, the certificate of release to service shall be entered in the aircraft's continuing airworthiness records. The aircraft continuing airworthiness records shall consist of: 1. an aircraft logbook, engine logbook(s) or engine module log cards, propeller logbook(s) and log cards for any service life limited component as appropriate, and, 2. when required, the operator’s technical log. The aircraft type and registration mark, the date, together with total flight time and/or flight cycles and/or landings, as appropriate, shall be entered in the aircraft logbooks. The aircraft continuing airworthiness records shall contain the current: 1. status of airworthiness directives and measures mandated by the competent authority in immediate reaction to a safety problem; 2. status of modifications and repairs; 3. status of compliance with maintenance program; 4. status of service life limited components; 5. mass and balance report; and 6. list of deferred maintenance. In addition to the authorized release document, the following information relevant to any component installed shall be entered in the appropriate engine or propeller logbook, engine module or service life limited component log card: 1. identification of the component; and 2. the type, serial number and registration, as appropriate, of the aircraft, engine, propeller, engine module or service life-limited component to which the particular component has been fitted, along with the reference to the installation and removal of the component; and 3. the date together with the component’s accumulated total flight time and/or flight cycles and/or landings and/or calendar time, as appropriate. All entries made in the aircraft continuing airworthiness records shall be clear and accurate. When it is necessary to correct an entry, the correction shall be made in a manner that clearly shows the original entry.

Russian law provides, in Order No. DV-58 of Ministry of Transportation “Instruction on maintenance and repair of aviation equipment in civil aviation” dated June 20, 1994, , that an inspection record shall be made in aircraft history sheet and log book, in a section called “condition monitoring”. A list of aircraft defects list, signed by all inspection members, shall be kept in an aircraft's documentation. Records are to be made by authorized employees in accordance with the rules contained in the logbook.