ABOUT US

Wojskowe Zakłady Lotnicze Nr 1 S.A. (WZL1) is one of the leading aerospace companies in Europe and one of the key subsidiaries of the Polish Armaments Group. Basing on the latest technologies, innovative solutions and highly skilled, experienced personnel, WZL1 provides maintenance, repairs, major overhauls, modifications and upgrades of the Mi family helicopters (Mi-8, Mi-14, Mi-17, Mi-24), major overhauls of the TW3-117 turboshaft and SO-3W jet engines, periodic maintenance of the TS-11 ISKRA jet trainers, services for commercial aviation, composite structures manufacturing, production of wire harnesses, galvanic coating and painting, metrology, machining, Non-Destructive Testing and many other services.

Currently, Wojskowe Zakłady Lotnicze Nr 1 S.A. faces many opportunities and challenges. The priority made of R&D as well as the company's infrastructure modernisation and optimisation of the manufacturing process allow for extending the core business continuously.

On top of this, numerous certificates that confirm high quality of our services and reputation we have earned both in the national and global market make WZL1 a credible and reliable partner.

The mission of the Wojskowe Zakłady Lotnicze Nr 1 S.A. is to be a modern, constantly developing company that provides high availability level to aircraft operated by the Armed Forces of the Republic of Poland and by other customers, to satisfy both the customers and our personnel.

SERVICES

INFORMATION

MAJOR OVERHAULS OF HELICOPTERS

The standard major overhaul process for the Mi-family helicopters, their equipment, systems, accessories and installations, conducted by WZL1, consists of the following phases supervised by the Quality Assurance Department:

Receipt of a helicopter and a detailed assessment of its condition as confirmed by the Handover Report signed by representatives of both WZL1 and the customer.

Full disassembly of entire helicopter, its components and assemblies.

Assessment of the airframe, dismounted components, installations and assemblies.

Process of repair, maintenance and/or replacement of dismounted assemblies and installations.

Re-assembly of the airframe or assemblies depending on service type.

Checks, tests and adjustments of the helicopter and its systems.

Ground checks and tests.

Helicopter repainting.

Finishing operations.

Flight tests.

Acceptance of helicopter after maintenance/ repair.

Within the helicopter major overhaul, WZL1 extends the aircraft's calendar service life in cooperation with Instytut Techniczny Wojsk Lotniczych (Air Force Institute of Technology - ITWL). Currently, these life extensions for individual helicopter types are as follows:

Mi-8	Unlimited	Service life extension depends on the technical condition of the airframe
Mi-14	Up to 42 years	
Mi-17	Unlimited	
Mi-24	Up to 50 years	

All phases of operations conducted by WZL1 are traceable and documented according to standards of the Polish Armed Forces' aviation. This allows the customers to trace the delivered service process in its every phase.

MAJOR OVERHAULS AND ENHANCEMENTS OF ACCESSORIES

WZL1 provides overhauls, repairs and maintenance of the following helicopter accessories, installations and assemblies:

HYDRAULIC UNITS:

- GEAR AND PISTON-TYPE HYDRAULIC PUMPS
- HYDRAULIC BOTTLES
- HIGH PRESSURE FILTERS
- CHECK, SHUTTLE AND SIDE-WALL VALVES
- HYDRAULIC ACTUATORS - LANDING GEAR RETRACTION
- ACTUATORS - FLAP ACTUATORS
- EXTENDABLE HYDRAULICALLY CONTROLLED
- PULL RODS

FUEL SYSTEM COMPONENTS:

- VALVE ASSEMBLIES, VALVES, SOLENOID VALVES
- FUEL FILTERS, FUEL PUMPS

VENTILATION AND HEATING SYSTEM COMPONENTS:

- KO-50 KEROSENE AIR HEATER
- AIR CONDITIONING UNITS OF Mi-24 AND Mi-14 HELICOPTERS

COOLING UNITS OF ENGINES AND MAIN GEARBOX OIL SYSTEMS:

- TURBOCOOLERS
- FANS
- SHUTTERS
- VALVES AND FILTERS

HELICOPTER LIFT AND CONTROL SYSTEM ASSEMBLIES:

- MAIN ROTOR HUBS
- SWASHPLATES
- CONTROL SYSTEM PULL RODS

HELICOPTER DRIVETRAIN ASSEMBLIES:

- TAIL ROTOR
- DRIVE SHAFTS
- INTERMEDIATE GEARBOXES
- TAIL GEARBOXES

ASSEMBLIES OF FIRE PROTECTION AND INERT GAS INSTALLATIONS:

- CYLINDERS
- VALVES

PNEUMATIC SYSTEM ASSEMBLIES:

- AK-50P-10 COMPRESSOR OF Mi-2 AND Mi-8 HELICOPTERS
- COMPRESSED AIR CYLINDERS AND VALVES
- AIR PRESSURE GOVERNORS
- AIR DEHUMIDIFIERS

INSTRUMENTS:

- WD-10 ANEROID ALTIMETERS, US-450 AIRSPEED INDICATORS, WAR-30 VARIOMETERS
- GYROSCOPIC INSTRUMENTS (EUP-53 TURN INDICATORS, AGK-47, AGB-3K ARTIFICIAL HORIZONS)
- COURSE SYSTEM SUCH AS: GIK-1, GMK-1AE, GREBEŃ-1
- PRESSURE AND TEMPERATURE INDICATORS

ELECTRIC DEVICES:

- GENERATORS, PO AND PT TYPE CONVERTERS, FUEL PUMPS, RN-120, RN-180, RN-600 VOLTAGE CONTROLLERS
- ELECTRIC MECHANISMS, APD-78A, APD-9W AUTOMATIC STARTERS

RADIO-ELECTRONIC DEVICES:

- SPU-7, SPU-8 INTERCOMS, ARK-9, ARK-U2 RADIO DIRECTION FINDERS RW-3, RW-5 RADAR ALTIMETERS
- Ł-166W1AE ADROS IR MISSILE JAMMER

525 AND 624500M SHUTTERS

ELECTRIC EQUIPMENT FOR WEAPONS

RADIO-NAVIGATION EQUIPMENT

GENERATORS

HELICOPTERS MAINTENANCE

Wojskowe Zakłady Lotnicze Nr 1 S.A. offers both periodic and non-scheduled maintenance for both rotary and fixed-wing aircraft. Periodic maintenance procedures are conducted on helicopters in 12 or 24-month intervals and/or after 100, 200, 250, 300 and 400 flight hours depending on the helicopter platform type and type of its systems: airframe, engines, accessories, radio-electronic devices and weapons.

Mi-8	Maintenance No.1 (every **12** months and/or **250** flight hours) Maintenance No. 2 (every **24** months and/or **500** flight hours)
Mi-17	after **100**, **200**, **300** and **400** flight hours
Mi-24	after **100** and **200** flight hours

HELICOPTERS UPGRADES

Following Poland's accession to NATO in 1999, Wojskowe Zakłady Lotnicze Nr 1 S.A. launched a process of upgrading the Mi-family helicopters delivered for repairs and overhauls, by equipping them with advanced communication, navigation and identification devices in order to provide compliance with NATO requirements and interoperability within the alliance.

This upgrading process was conducted by WZL1 in collaboration with Western companies - the manufacturers of devices installed in the helicopters operated by Polish operators. The aircraft have been equipped with advanced equipment that provided to them interoperability within NATO forces and successful participation in combat missions abroad including those in Afghanistan, Chad and Iraq.

All modernisation projects were developed in-house by WZL1's experts and some of them were submitted to the Polish Patent Office as utility designs.

EQUIPMENT INSTALLED BY WZL1 IN HELICOPTERS WITHIN THE UPGRADE PACKAGE

VHF, UHF, HF RADIOS
(Mi-2, Mi-8, Mi-14, Mi-17, Mi-24, SH-2G, W-3)

RADAR ALTIMETER
(Mi-2, Mi-8, Mi-17, Mi-14)

GPS – GARMIN (Mi-2, Mi-8, Mi-14, Mi-17, Mi-24)

GPS MAGR RECEIVER (SH-2G)

ELT EMERGENCY LOCATION TRANSMITTERS
(Mi-17)

VOR/TAC/MKR NAVIGATION SYSTEMS
(Mi-8, Mi-14, Mi-17, Mi-24)

S2-3A DIGITAL FLIGHT DATA RECORDING SYSTEM
(Mi-8, Mi-14, Mi-17, Mi-24)

AVR8220 DIGITAL VIDEO RECORDER (Mi-8)

CVR AR-30 COCKPIT VOICE RECORDER
(Mi-8, Mi-17, Mi-24)

INTEGRATED COMMUNICATION SUITE
(Mi-8, Mi-17, Mi-24)

KMA-24 INTERCOM SYSTEM (Mi-8)

CYKLOP HELMET-MOUNTED FLIGHT DATA DISPLAY (Mi-17)

KT-76 IFF SYSTEM (Mi-2)

SC-10D2 IFF SYSTEM
(Mi-8, Mi-14, Mi-17, Mi-24)

AIS R4A AUTOMATIC VESSEL IDENTIFICATION SYSTEM (Mi-17)

ŁEBA AUTOMATIC VESSEL IDENTIFICATION SYSTEM (Mi-14)

MNISZKA MAGNETIC ANOMALY DETECTOR SYSTEM (Mi-14)

SO-121 ICING INDICATOR (Mi-8, Mi-14, Mi-17, Mi-24)

BURAN-A WEATHER RADAR (Mi-14)

CABIN AIR CONDITIONING SYSTEM (Mi-17)

NVG EXTERNAL AND INTERNAL LIGHTING (Mi-2, Mi-8, Mi-17, Mi-24)

TW3-117WMA ENGINES (Mi-24W)

SX-16 SEARCHLIGHT (Mi-8, Mi-17)

SŁP-350 EXTERNAL HOIST SYSTEM WITH THE **ŁPG-300** HOIST (Mi-14PŁ/R)

SŁG-300 EXTERNAL HOIST SYSTEM WITH THE **ŁPG-300** HOIST (Mi-17)

76379-040 ON-BOARD HOIST (Mi-17)

75378-500 ON-BOARD HOIST (Mi-8)

ŁPG-150 ON-BOARD HOIST (Mi-8)

ATTACHMENT UNIT FOR **APA-5** EMERGENCY HOIST (Mi-14)

SIDE STATIONS OF FAST ROPE TROOP INSERTION/EXTRACTION SYSTEM (Mi-8, Mi-17)

REAR STATIONS OF FAST ROPE TROOPS INSERTION/EXTRACTION SYSTEM (Mi-8, Mi-17)

FLIR ELECTRO-OPTICAL SYSTEM (Mi-8)

COMPOSITE ARMOUR PANELS PROTECTING THE COCKPIT, CABIN AND VITAL POWERPLANT COMPONENTS (Mi-17)

MASE TERMA SELF-DEFENCE AND SELF-PROTECTION SYSTEM (Mi-17, Mi-24)

EWU ENGINE EXHAUST IR SUPPRESSOR (Mi-17, Mi-24)

ADROS IR MISSILE JAMMER (Mi-17, Mi-24)

PK MACHINE GUN REAR AND SIDE GUNNER STATIONS (Mi-8, Mi-17)

REAR AND SIDE GUNNER STATIONS FOR MULTI-BARREL **M-134G** MACHINE GUN (Mi-17)

APS-107B SYSTEM FOR **MU-90** TORPEDO CONTROL AND DROP (Mi-14, SH-2G)

OKA-2M, **OKA-2** ACTIVE SONAR (MI-14)

SONOBOUY SYSTEM (Mi-14)

SPECIALISED HELICOPTER VERSIONS MADE BY WZL1

Mi-8 FOR **AVIATION SAR GROUP AND SAR** (Mi-8) MISSIONS

Mi-14 FOR **SAR** MISSIONS (MI-14PŁ/R)

Mi-14 FOR ANTI-SUBMARINE WARFARE (MI-14PŁ)

Mi-17 FOR **MEDEVAC** MISSIONS (AIRBORNE HOSPITAL) (MI-17 AE)

Mi-17 FOR **CASEVAC** MISSIONS (MI-17 T/U)

Mi-2, Mi-8, Mi-17 AND **Mi-24** HELICOPTERS CAPABLE OF NIGHT-TIME OPERATIONS WITH **NVG** USE

NVG

Responding to the needs of the Armed Forces of the Republic of Poland in respect to:

> improvement of helicopter capability of night flying at low altitudes
>
> enhancement of target detection and identification capabilities
>
> allowing for covert operations without disclosing the helicopter position to the enemy, which is especially important during international missions in which Polish helicopters participate.

WZL1 has developed and implemented a design of Gen. III Class B NVG compatible lighting according to MIL-STD 3009.

This enhancement was implemented in collaboration with well respected manufacturers including the UK's Oxley Developments Company Ltd. that is the world leader in the area of NVG-compatible lighting.

Armour

Wojskowe Zakłady Lotnicze Nr 1 S.A. has developed, made and tested a set of ballistic protection plates for the Mi-17-1V helicopters that provides protection to the crew, troops in the cabin and the powerplant.

The armour system design was based on the concept of providing the required ballistic protection level by means of armour as light as possible. WZL1 has been the first company to use lightweight armour plates made of polyethylene composite to protect the aircraft's critical areas. This composite is much lighter than steel armour, ceramics and Kevlar while providing the same level of ballistic protection.

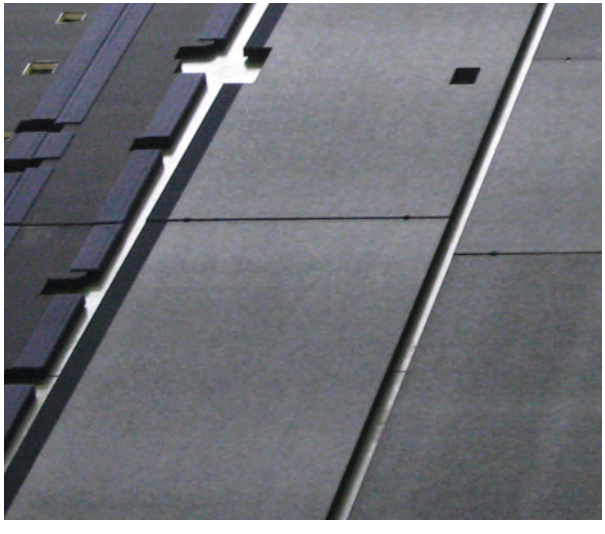
The armour protects the following helicopter areas:

Cockpit (windscreen, floor, side walls, side windows and backs of the pilots)

Cabin (floor and side walls up to the windows line)

Critical components of helicopter powerplant and systems (elements of the engines, oil system, main gearbox and hydraulic panel).

In addition, an aircraft gunner station was installed in the rear part of the fuselage.



Mi-24

UPGRADE COMPONENTS INSTALLED BY WZL1 IN HELICOPTERS

in the Mi-24 (versions W and D)
depending on the modernisation scope and helicopter variant

ZSŁ-1 INTEGRATED COMMUNICATION SUITE

VHF RADIO **30-88MHZ**

HF RADIO **2-60MHZ**

UHF/VHF RADIO 30-400MHZ

KT-01 ADROS, JAMMER PROTECTING AGAINST HEAT-SEEKING MISSILES

GPS

S2-3A FLIGHT DATA RECORDING SYSTEM

VOR / **TACAN** / **ILS** / **MARKER** SYSTEMS

EWU ENGINE EXHAUST IR SUPPRESSORS

Wojskowe Zakłady Lotnicze Nr 1 S.A. has been in charge of maintenance, repairs and overhauls of the Mi-24 W and D combat helicopters since 1991. These aircraft have been used by the Armed Forces of the Republic of Poland at many missions outside the country and thus equipment installed in them must meet the most demanding standards in the world. The upgrade that made the Mi-24 compatible with NATO standards has additionally enhanced its combat capabilities.

Moreover, the Mi-24s are also compatible with NVG Gen III Class B according to MIL-Std 3009 to make them capable of nigh-time operations.

WZL1, in cooperation with Mesko S.A., Zakłady Mechaniczne Tarnów S.A., Wojskowe Zakłady Elektroniczne S.A. (WZE S.A.), Wojskowe Centralne Biuro Konstrukcyjno-Technologiczne S.A. (WCBKT S.A.), and the Rafael company, Polska Grupa Zbrojeniowa S.A. (PGZ S.A.) and Instytut Techniczny Wojsk Lotniczych (ITWL) have developed and implement the Mi-24 modernisation package.

This package responds to growing needs of both Polish and international operators of the helicopter aimed at adjusting the Mi-24 platform to demanding missions of modern battlefield. The modernisation is a creative solution, based primarily on Polish engineering concepts and covering the weapon systems, aircraft self-protection as well as the communication and navigation suite.

Mi-24 Upgrade

SYSTEM INTEGRATION

performed by WZL1 and ITWL

ZSP INTEGRATED HELICOPTER SYSTEM (ITWL)

WW-15 MULTI-TUBE ROCKET POD (MESKO S.A.)

NLPR-70 UNGUIDED AIR-TO-GROUND ROCKETS (MESKO S.A.)

AIRCRAFT MISSILE SYSTEM (MESKO S.A./ITWL)

PIORUN AIR-TO-AIR MISSILE (MESKO S.A.)

TOPLITE MHD ELECTRO-L SYSTEM (RAFAEL)

SPIKE ATGM MISSILES AND LAUNCHER (RAFAEL)

NVG COMPATIBLE EXTERNAL AND INTERNAL LIGHTING (WZL1)

SRV VIDEO RECORDING SYSTEM (WZL1)

SPS AIRCRAFT SELF-PROTECTION SYSTEM (WZE S.A.)

12.7 MM MULTI-BARREL MACHINE GUN (ZM TARNÓW S.A.)

LZE-6/M GROUND POWER SUPPLY UNIT (WCBKT S.A.)

Mi-17

The Mi-17 is used for both combat and transport missions. It features very good flight and operational performances that have been confirmed within deployments of Polish forces abroad.

COMPONENTS INSTALLED BY WZL1 WITHIN THE MODERNISATION PACKAGE

in the Mi-17
depending on the modification scope and helicopter variant

ZSŁ INTEGRATED COMMUNICATION SUITE

VHF RADIO **30-88MHZ**

HF RADIO **2-60MHZ**

UHF/VHF RADIO **30-400MHZ**

UHF/VHF RADIO **110-162**, **975 MHZ** AND **220-399**, **975 MHZ**

EMERGENCY LOCATION TRANSMITTER

SWPL-1 CYKLOP FLIGHT DATA DISPLAY SYSTEM

S2-3A FLIGHT DATA RECORDING SYSTEM

SEARCH DIRECTION FINDER

SX-16 SEARCHLIGHT

VOR/TACAN/ILS NAVIGATION SYSTEMS

SEARCH EQUIPMENT AND MEDICAL GEAR

76379-040 HOIST

ŁPG-150 HOIST

RAPPELLING ROPE BRACKET AND **MARLOW** RAPPELLING ROPE

CW-6300 EXTERNAL STATION FOR FAST ROPE INSERTION FROM LOW-ALTITUDE HOVERING FLIGHT

BOARDING STEP

EXTERNAL CARGO HOOK

EXTERNAL AND INTERNAL BALLISTIC PROTECTION

EWU ENGINE EXHAUST IR SUPPRESSOR

ADROS HEAT-SEEKING MISSILES JAMMER

ASO-2W COUNTERMEASURES DISPENSER

SIGHTING DEVICES (**PKW SIGHT**, **OPB-1R SIGHT**)

GUNNER STATIONS FOR **7.62 MM WPKM** MACHINE GUN

UNGUIDED ROCKET WEAPON SYSTEM (**UB-32 PODS**)


SAR

Mi-14

Mi-14 maritime helicopters in the PŁ (Anti-Submarine Warfare) version have been subject to not only a major overhaul, but also modernisation (test flight of the first upgraded helicopter No.1007 took place in 2001). This modernisation included fitting the aircraft with a modern radio and navigation suite, search and rescue (SAR) equipment as well as digital systems for both detection and engagement of submarines (dipped sonar, magnetic anomaly detector and sonobuoys).

COMPONENTS INSTALLED BY WZL1 IN Mi-14 HELICOPTERS WITHIN MODERNISATION PACKAGE

depending on the modernisation scope

Mi-14 PŁ/PS

VOR/TACAN/ILS SYSTEMS

HF, VHF AND UHF RADIOS

GPS

RADAR ALTIMETER

S2-3A FLIGHT DATA RECORDING SYSTEM

ADVANCED FRANCO-ITALIAN SYSTEM **APS-107B** FOR DROP OF **MU-90** TORPEDO (IN COOPERATION WITH EUROTORP)

ASW SYSTEM ZOP (FOR SUBMARINES SEARCH, DETECTION AND TRACKING AND TRANSMISSION OF THEIR TACTICAL DATA TO OTHER AIRBORNE, SURFACE AND LAND PLATFORMS VIA THE ŁEBA SYSTEM)

Mi-14 PŁ/R is a version developed after the modernization of the Mi-14PŁ no. 1009 and 1012.

Mi-14 PŁ/R

VOR/TACAN

HF, VHF, UKF RADIOS

GPS

DIRECTION FINDER FOR SEARCH OPERATIONS

SEARCHLIGHTS

WEATHER RADAR

SŁP-350 EXTERNAL HOIST SYSTEM FOR PERSONNEL AND CARGO HOISTING

MEDICAL AND RESCUE EQUIPMENT

MEDICAL SUPPORT AND RESCUE EQUIPMENT

Mi-8T VARIANT

The transport version that was additionally equipped with the following items: unguided rockets (UB-16 pods), cabin gunner stations, external cargo hook, sighting devices (PKW and OPB-1r sights) and ŁPG-2 hoist.

Mi-8 LGPR AND Mi-8 SAR VARIANTS

Search and Rescue versions that were equipped with the following items: external hoisting system with the 76378-500 hoist from GOODRICH, KD2-353 hoist control panel and many others. Also the Mi-8 helicopters in both the passenger and VIP versions were modernised.

Mi-8

Wojskowe Zakłady Lotnicze Nr 1 S.A. commenced overhauls of the Mi-8 helicopters in 1992. On top of repairs and scheduled maintenance, the Mi-8Ts have been also upgraded to the Mi-8S, Mi-8 LGPR and Mi-8P versions.

The Mi-8P helicopters were modified for SAR (Search & Rescue) missions. They were fitted with advanced equipment for search and life-saving operations including: hoist, stretchers, medical aid gear, and a FLIR-integrated searchlight. This helicopter can be operated in two configurations: passenger transport and SAR.

Moreover, the Mi-8s are also modified for night flights using the Gen III Class B night vision goggles compatible with MIL-Std 3009.

COMPONENTS INSTALLED BY WZL1 IN Mi-8 HELICOPTERS WITHIN MODERNISATION PROJECT

in the Mi-8
depending on the modernisation scope and helicopter variant

ZSŁ-1 INTEGRATED COMMUNICATION SUITE WITH COMMUNICATION SERVER

VHF RADIO **30-88MHZ**

HF RADIO **2-60MHZ**

UHF/VHF RADIO **30-400MHZ**

VHF RADIO **118-137MHZ**

UHF/VHF RADIO **110-400MHZ**

GPS

VOR/TACAN/ILS/MARKER, **IFF** SYSTEMS

AN/APN - 209 RADAR ALTIMETER

DF-430F DIRECTION FINDER FOR SEARCH OPERATIONS

S2-3A FLIGHT DATA RECORDER

INTERCOM SYSTEM

IR ELECTRO-OPTICAL SYSTEM

SX-16 SEARCHLIGHT

EXTERNAL HOIST SYSTEM WITH **GOODRICH** HOIST

SIDE AND REAR FAST ROPING STATION USING **MARLOW** ROPES

MAINTENANCE AND REPAIRS OF TRAINER AIRCRAFT

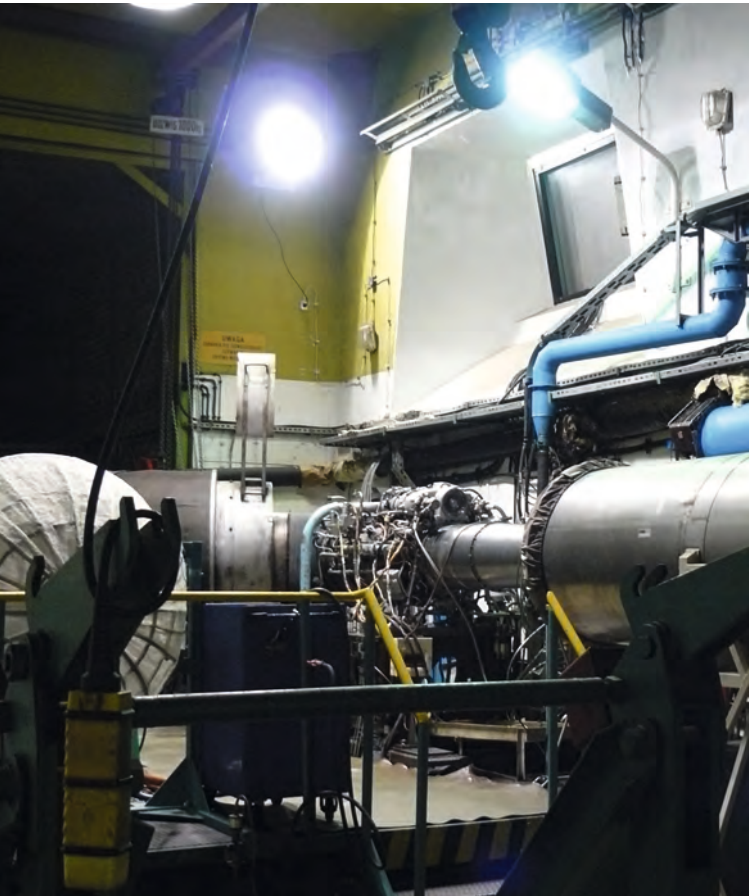
The Dęblin branch of the WZL1 performs comprehensive maintenance of the TS-11 Iskra jet trainers. The contract covers both ongoing maintenance and also scheduled and unscheduled maintenance procedures and improvements.

Efforts are also undertaken in the area of building the competences needed to perform maintenance on such aircraft operated by the Polish Air Forces as e.g. the M-346 Bielik advanced jet trainer. This will be continuation of the historical tradition of maintaining the aircraft used for training of Polish military pilots at the Dęblin facility.

The WZL1's Dęblin branch is also experienced in periodic maintenance of such platforms as the: PZL W-3 SOKÓŁ helicopter and M-28 BRYZA/SKYTRUCK turboprop aircraft. This branch has also extensive competences in the repairs and maintenance of components of the PZL-130 Orlik trainer's all on-board systems.

MAJOR OVERHAULS OF AIRCRAFT ENGINES

For 25+ years the Dęblin Branch of Wojskowe Zakłady Lotnicze Nr 1 S.A. has been conducting major overhauls of the TW3-117 turboshaft engines of the III, M, MT, W, WM and WMA series for the Mi-14, Mi-17 and Mi-24 helicopters operated by the Armed Forces of the Republic of Poland. The final operation of the TW3-117 engine major overhaul is a performance test at the engine test cell facility that also allows for testing the TW2-117 engines powering the Mi-8 helicopters.



ENGINE MAJOR OVERHAUL PROCESS

broken down into individual phases

1. ENGINE DISASSEMBLY INTO SUBASSEMBLIES
2. DISASSEMBLY OF ENGINE SUBASSEMBLIES
3. ENGINE COMPONENTS WASHING
4. ASSESSMENT OF ENGINE CONDITION BROKEN INTO ITS SUBASSEMBLIES
5. OVERHAUL OF INDIVIDUAL ENGINE SUBASSEMBLIES (RENOVATION, PERFORMANCE CHECKS, COAXIALITY CHECK)
6. REASSEMBLY OF SUBASSEMBLIES
7. ENGINE TEST IN TEST CELL
8. ENGINE PRESERVATION AND PACKING

The repair process is conducted by means of advanced process lines (semi-automatic NDT line and automatic washing line for aircraft engine parts). All parts are subject to detailed assessment and measurements using state-of-the-art measuring instruments such as the Zeiss Prismo Navigator 7 CMM coordinate measuring machine that provides a measurement accuracy of 0.005 mm.

COMPOSITE STRUCTURES

Responding to the demand of both defence and commercial market, Wojskowe Zakłady Lotnicze Nr 1 S.A. has established the Composite Structures Manufacturing Department that has a manufacturing floor area and advanced equipment allowing for manufacturing elements of any shape and complexity level.

This equipment includes:

Equipment	Maximum Workpiece Dimensions	
CNC PLOTER	**Width:** 1.8 m / **Length:** 2.5 m	
OVEN	**Width:** 2 m / **Length:** 3 m / **Height:** 1.8 m	
COMBINED PAINT SPRAY AND DRYING BOOTH FOR COMPOSITE STRUCTURES PAINTING	**Width:** 5 m / **Length:** 8 m / **Height:** 4 m	
AUTOCLAVES	**Width:** 1.8 m / **Length:** 8 m	**Width:** 1.02 m / **Length:** 1.5 m
5-AXIS MACHINING CENTRE	**Width:** 3 m / **Length:** 1.5 m / **Height:** 1.2 m	

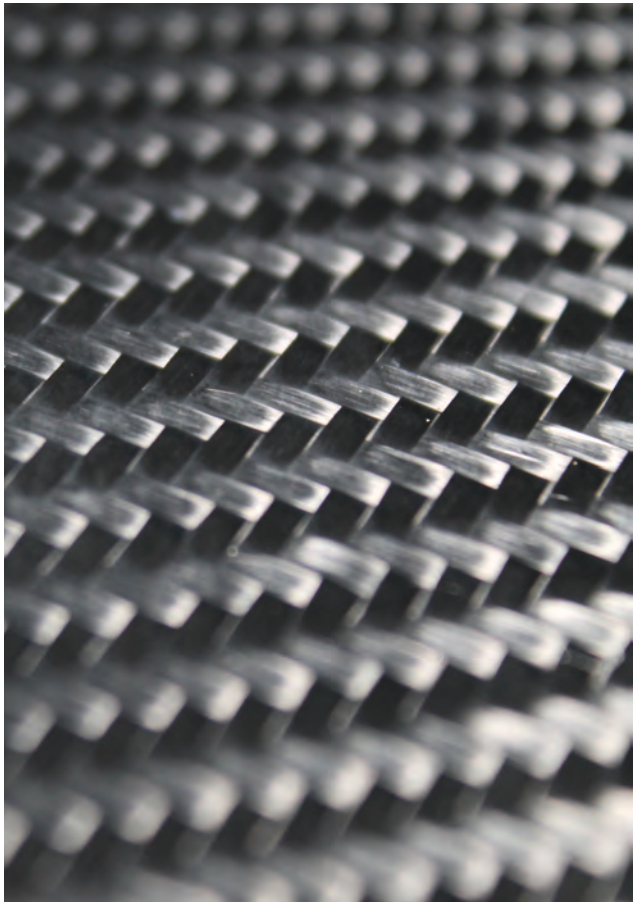
Composite structures are manufactured using the following methods:

FABRICATION METHODS

PREPREG,
HAND LAY-UP,
INFUSION.

CURING METHODS

AUTOCLAVE,
OVEN,
HEATING BLANKET.



GALVANIC COATING

WZL1 provides electroplating both for in-house needs and for external customers, according to their individual requirements. These processes include:

- CHEMICAL DEGREASING
- ELECTROCHEMICAL DEGREASING
- HYDROCHLORIC ACID ETCHING
- CADMIUM PLATING
- CADMIUM COAT BRIGHTENING
- CADMIUM COAT PASSIVATION
- ZINC PLATING
- ZINC COAT WHITE PASSIVATION
- ZINC COAT YELLOW PASSIVATION
- ZINC COAT BRIGHTENING
- NICKEL PLATING

- ANODISING
- HARD ANODISING
- BLACK AND RED ALUMINIUM COLOURING
- CHEMICAL OXIDISING
- CADMIUM COAT PHOSPHATISING
- PHOSPHATISING
- COPPER PLATING
- SILVER PLATING
- TINNING
- BRASS PLATING

WIRE HARNESSES

Wojskowe Zakłady Lotnicze Nr 1 S.A. makes wire harnesses using either the soldering or crimping technology. The company has a broad spectrum of tooling for pin crimping and assembling of electric connectors. All types of wire harnesses are designed, manufactured, re-made, repaired and tested in-house.

FOR AVIATION, COMMERCIAL AND MILITARY APPLICATIONS

FOR AIRCRAFT, LAND VEHICLES AND OTHER EQUIPMENT

FOR HIGH-SPEED DATA TRANSFER (E.G. MILBUS)

FULLY HERMETIC, OPERATING IN VERY HIGH HUMIDITY ENVIRONMENT

Wire harnesses manufactured by WZL1 are suitable for both prototype and serial production. For long-term purchase orders, the production tooling (connection testers, positioners, crimping devices, pin crimping fixtures, harness marking systems) is tailor-made according to customer's needs and requirements.

Wire harnesses are manufactured basing on materials delivered by international manufacturers, such as: TE Connectivity (Raychem), Esterline Connection Technologies (Sourian - Sunbank) and Amphenol.

METROLOGY

Within its metrological authorisation the WZL1's Measurements Chamber provides calibration of torque wrenches and screwdrivers within the following measurement ranges:

- 0.04 – 2 NM
- 1.25 – 25 NM
- 20 – 400 NM
- 30 – 1500 NM

The calibration is performed for single- and two-end wrenches as well as for those set for a single torque value. Moreover, repairs (adjustments) can be done without replacement of damaged parts.

METALWORKING

MACHINING

Wojskowe Zakłady Lotnicze Nr 1 S.A. has both conventional machine tools for machining and abrasive machining as well as advanced CNC machine tools.

MACHINING OF STEEL, ALUMINIUM ALLOYS AND COPPER ALLOYS (CONVENTIONAL MACHINE TOOLS)

machining workpiece limits

Turning (Ø MAX 450 mm, L MAX 1000 mm)

Flat grinding (800 x 550 x 200, MAX worktable load 800 kg)

Shaft grinding (Ø MAX 315 mm, L MAX 1000 mm)

Hole grinding (Ø 15-50 mm, L 30-65 mm)

Milling (1400 mm x 650 mm x 500 mm)

CNC MACHINE TOOLS

machining workpiece limits

DMC 835V Vertical CNC Machining Centre
X = 835 mm, Y = 510 mm, Z = 510 mm,
MAX worktable load 800 kg

CTX 410 V6 2-axis CNC Turning Lathe
Ø MAX 265 mm, L MAX 550 mm

BPF 1520 Milling Plotter with Cutting Head and Oscillating Cutter
X = 1300 mm, Y = 2000 mm, Z = 300 mm

AU-300 IA Wire Contour Cutter
X = 350 mm, Y = 250 mm, Z = 220 m

PLASTIC FORMING

Aluminium alloy sheet metal cutting
MAX cutting thickness 5 mm
MAX cutting length 2550 mm

WELDING

GAS WELDING
ELECTRIC WELDING: MIG, TIG, MAG
PRESSURE WELDING AND SOLDERING

Ordered parts are made in single copies or by series production, basing on delivered customer's technical documentation, specifications, or a master specimen with specifications. The input materials for machining include various steel grades (in the form of forgings, castings, rods, etc.) as well as light alloys and non-ferrous metals. Moreover, the company offers fitter's and similar operations. All parts (not only those for aircraft applications) are subject to throughout quality control including flaw detection. WZL1 manufactures also standardised minor machine elements for the aerospace industry, i.e. bolts, nuts, washers, pins, pegs, etc. including their heat treatment and electroplating operations.

HEAT AND THERMOCHEMICAL TREATMENT

ANNEALING
NORMALISING
QUENCHING
TEMPERING
BOX CARBURISING

All processes are conducted according to detailed process descriptions for both heat treatment and thermochemical treatment, and they are supervised in accordance with the Manual of the Integrated System for Managing Special Processes: Galvanic Coaing, Heat Treatment, Welding.

CONTROL AND MEASUREMENT STATIONS

ME 25070 CONTROL AND MEASUREMENT TEST STATION FOR TESTING **NVG**-COMPATIBLE LIGHTING INSTALLATIONS

TESTER FOR **SWPL-1** FLIGHT DATA DISPLAY SYSTEM

TESTER FOR **CVR AR-30** COCKPIT VOICE RECORDER

MMZ-25080 TESTER FOR **XM 6013P** RADIO WITH **GB 6500** CONTROL PANEL

NR **PME-25075** STATION FOR FLIGHT DATA DISPLAY FROM **SWPL-1**

ME-25060 TESTER FOR GENERATING MALFUNCTION SIGNALS IN HELICOPTER INSTALLATIONS - INTERFACE WITH **SWPL-1**

BKO TESTER FOR AIRCRAFT AIR PRESSURE SENSORS INSTALLATIONS

SK-WH TESTER FOR HYDRAULIC AMPLIFIERS

NON-DESTRUCTIVE TESTING

WZL1 uses the following Non-Destructive Testing (NDT) methods that allow for detecting both surface and subsurface defects:

Optical diagnostics – endoscopic inspections inside engines and accessories, with a capacity to record the results in the form of photographs and videos.

Magnetic powder tests (MT) – inspection on a magnetic bench, in UV light that allows for detecting both surface and sub-surface defects.

Penetration tests (PT) – inspection by means of the portable fluorescent method, conducted under a fume hood or on aircraft to detect surface defects.

Eddy current tests (ET) – inspection by means of a portable flaw detector, allowing for detecting both surface and sub-surface defects.

3D SCANNING, PHOTOGRAMMETRY AND REVERSE ENGINEERING

WZL1 offers the full range of reverse engineering services. Quick and precise 3D measurements allow for generating CAD/CAM documentation with replication of the object's geometry and its accurate parameters. This enables efficient preparation of manufacturing documentation. The measurement area of blue light scanners is 761 x 592 (large measurement field) and 355 x 266 (small measurement field). Using reference methods (e.g. photogrammetry), it is possible to measure objects even of several metres dimensions.

DPA MEASUREMENT SYSTEM

The DPA measurement system allows for conducting measurements both in our place and in any location indicated by the customer. The system can be used to measure objects of any dimensions - from small components to complete airplanes. Its typical applications are as follows:

- DIMENSIONAL CONTROL AND ANALYSIS OF TOLERANCES
- COMPARISON WITH CAD MODEL
- MOBILE MEASUREMENTS OF LARGE STRUCTURES
- COLLECTING REFERENCE POINTS FOR MEASUREMENTS USING THE MOVEINSPECT' AND 3D SCANNER

MOVIEINSPECT HR

Movieinspect HR dynamically analyses three-dimensional processes in respect of geometry changes. This allows for conducting tests without any time limitations. Tests conducted by means of Moveinspect HR take a short time and do not require use of strain gauges or other tools used in laboratories. The application scope of the scanners is as follows:

- 3-DIMENSIONAL CONTROL OF COMPONENTS' QUALITY
- DIGITALISATION OF COMPONENTS
- DEFORMATION ANALYSIS AND MEASUREMENT OF DELICATE OR HOT PARTS

CNC MEASUREMENTS

The Dęblin Branch of WZL1 offers high-precision measurements conducted by means of the CNC Zeiss Prismo Navigator 7 machine with the working space of 1500 x 900 x 700 mm. The measurement can be conducted on elements of various complexity levels, allowing for verification of reworking and manufacturing processes for critical and precise subassemblies or final products.

PAINT SHOP

The WZL1's Paint Shop is designed for painting small and medium-sized parts, but first of all for large structures, such as helicopters, light aircraft of the Cessna type, semi-trailers, etc. The painting process uses both innovative coat application methods and the conventional ones (manual spray guns, pressure sprayers), polyurethane and epoxy of a high solvent content, High Solid type enamels as well as phthalate and cellulose ones. Also water-soluble paints have been implemented for application.

The Paint Shop has the following equipment for paint coat application:

- COMBINED SPRAY PAINT AND DRYING HALL WITH ITS MACHINE ROOM
- KMWW-20 SINGLE-STATION SPRAY PAINT BOOTH
- KMWW-40 2-STATION SPRAY PAINT BOOTH
- SKME-3 MINOR PARTS DRYING BOOTH

The company carries out the following operations related to the paint application process:

- DEGREASING
- SANDING
- PRIMING
- TOP PAINT APPLICATION

COMBINED PAINTING AND DRYING HALL

The combined spray paint and drying hall is a stand-alone building with two large-dimension electric driven doors.

Dimensions:

Length x Width: 25.8 m x 18 m

Height: min: 9.8, max: 11.4 m (average 10.6 m)

Working area: approx. 464.4 sq. m.

Volume: approx. 4,922,64 cu.m.

Operation Cycles:

Manual Work Cycle: old coat stripping, degreasing, putty-ing, sanding, etc. - blown-in air temperature +20˚C;

Paint Application Cycle: blown-in air temperature +25˚C;

Drying Cycle: circulating air temperature max. +35˚C

The working area of the hall is divided into two parts with a folding, manually extended segmented wall of the B x H dimensions = 15,500 m x 7,500 m that allows for painting operations either across the whole hall area (with the dividing wall folded) or in two independent working areas (dividing wall extended).

Minor parts paint shop

Dimensions:

Length x Width: 11.8 m x 11.35 m

Height: min: 3.9 m, max: 4.98 m (average 4.44 m)

Working area: approx.101.52 sq.m.

Volume: approx. 452.89 cu.m.

After paint coat application the painted parts are placed in the drying booth where the coating is partially dried and then hardened at the temperature range from 35°C to 220°C.

GENERAL AVIATION SUPPORT

Wojskowe Zakłady Lotnicze Nr 1 S.A., basing on the PART-145 regulations, offers flightline and hangar maintenance for Cat. A2 aircraft of the Cessna 150 and 152 type, powered by Rolls Roys, Continental and Lycoming engines, and also shop maintenance of Cat. 3 instruments including total energy compensators, magnetic compasses, turn indicators, variometers and airspeed indicators. Moreover, the company offers paint coat removal and application services.

AIRCRAFT

Category A2: Aircraft of weight < 5,700 kg

Cessna

Type

150, 150A, 150B, 150C, 150D,
150E, 150F, 150G, 150H, 150J,
150K, 150L, 150M
A150K, A150L, A150M
F150F, F150G, F150H, F150J,
F150K, F150L, F150M
FA150K, FA150L, FA150M,
FRA150L, FRA150M

Engine

Continental O-200-A
Rolls Royce O-200-A

Propeller

McCauley 1A100/MCM,
1A101/DCM, 1A101/GCM,
1A101/HCM, 1A101PCM,
1A102/OCM
Sensenich 69CK, 9CKS12

Type

152, A152, F152, FA152

Engine

Lycoming O-235-L2C,
O-235-N2C

Propeller

McCauley 1A103/TCM
Sensenich 72CKS6

Type

172, 172A, 172B, 172C, 172,D,
172E, 172F, 172G, 172H, 172I,
172K, 172L, 172M, 172O, 172P,
172Q, 172R, 172S, F172, F172D,
F172F, F172G, F172H, F172K,
F172L, F172M, F172N, F172P

Engine

Continental O-300-A, O-300-B,
O-300-C, O-300-D
Lycoming O-320-E2D,
O-320-H2AD, O-320-D2J,
O-360-A4N, IO-360-L2A

Propeller

McCauley 1A170,
1A170E/JFA 7658,
1A170E/JHA7660,
1C160/CTM 7553,
1C160/DTM 7553, 57
1C172/EM 7652, 53, 55,
1C172/MDM 7652, 53, 55,
1C172/MTM 7653,
1C235/LFA7570
Sensenich 74DC-0-56, 74DR,
M74DR

CERTIFICATES

LICENCE OF MINISTRY OF INTERIOR AND ADMINISTRATION

NO. B-017/2003

AQAP 2110 : 2016 CERTIFICATE

NO. 173/A/2018 08.06.2018

Overhauls, repairs, modernisations, up-equipping, scheduled maintenance of aircraft, improvements and overhauls of technical equipment used in operation of aircraft and ground support, flight safety and flight security equipment. Aerospace equipment trading.

ISO 9001 : 2015 CERTIFICATE

NO. 173/S/2018 08.06.2018

Overhauls, repairs, modernisations, up-equipping, scheduled maintenance of aircraft, improvements and overhauls of technical equipment used in operation of aircraft and ground support, flight safety and flight security equipment. Aerospace equipment trading.

ISO 14001 : 2015 CERTIFICATE

NO. 173/E/2018 08.06.2018

Overhauls, repairs, modernisations, up-equipping, scheduled maintenance of aircraft, improvements and overhauls of technical equipment used in operation of aircraft and ground support, flight safety and flight security equipment. Aerospace equipment trading.

PN-N 18001 : 2004 CERTIFICATE

NO. 173/B/2018 08.06.2018

Overhauls, repairs, modernisations, up-equipping, scheduled maintenance of aircraft, improvements and overhauls of technical equipment used in operation of aircraft and ground support, flight safety and flight security equipment. Aerospace equipment trading.

BS OHSAS 18001 : 2007 CERTIFICATE

NO. 173/O/2018 08.06.2018

Overhauls, repairs, modernisations, up-equipping, scheduled maintenance of aircraft, improvements and overhauls of technical equipment used in operation of aircraft and ground support, flight safety and flight security equipment. Aerospace equipment trading.

CERTIFICATE OF INTERNAL CONTROL SYSTEM

NO. W – 112/8/2018 08.05.2018

Export, intra-Community transfer, brokerage services, technical assistance, import, transit of goods, technologies services services towarów, technologii i usług and services of strategic importance according to provisions of Act dated 29.11.2000 (Dz.U. 2004. No. 229, item 2315 as amended).

AS 9100 REV. D CERTIFICATE

NO. AS 9100-0062486

Design and modernisations of aerospace parts and components and manufacturing parts and subassemblies from steel, aluminium alloys, copper alloys and other metals, plastics. Manufacturing of wire harnesses for aviation and defence using special processes such as painting, electroplating, thermoforming and NDT.

PART 145 CERTIFICATE

NO. PL.145.086

Certificate of Maintenance Organisation allowing for activities in general aviation in the area of aircraft maintenance according to conditions and limitations set forth in the Approval Scope and approved Maintenance Organisation Exposition (MOE).

QUALITY POLICY

According to the license held, Wojskowe Zakłady Lotnicze Nr 1 S.A. of Łódź including its Dęblin Branch have set as a goal for their aerospace MRO and manufacturing business operations to achieve such a position in the market that makes them competitive comparing to the best manufacturers.

This goal is being achieved by continuous improvement of the Quality Management System based on requirements of the ISO 9001:2015 and AS 9100 rev. D standards as well as by continuous improvement of its compliance with quality-assurance-related NATO requirements. These efforts are based on the AQAP 2110 ed. D standardisation publication and they lead to timely offering of high quality products and services to our customers at competitive prices, contributing to a high level of operational safety.

The mission of Wojskowe Zakłady Lotnicze Nr 1 S.A. is to be a modern, constantly developing company that provides operational effeciency to the aircraft fleet operated by the Armed Forces of the Republic of Poland, satisfactory to both its customers and the personnel.

Our Quality Policy is reflected in a continuous strive for the following objectives:

- Fulfilment of customer's needs and expectations
- Ensuring delivery of products to customers that meet their expectations
- Making the engineering and organisational potential always fit to evolving needs of the aerospace industry
- Continuous optimisation of maintenance and manufacturing processes
- Enhancement of products reliability.

The Quality Policy is known to the personnel and they adhere to it in their everyday work. On behalf of all employees of Wojskowe Zakłady Lotnicze Nr 1 S.A. I declare that the Integrated Management System shall be maintained and continuously improved.

Marcin Nocuń

CEO AND PRESIDENT OF THE BOARD

INTERNAL CONTROL SYSTEM

Wojskowe Zakłady Lotnicze Nr 1 S.A. in Łódź including its Dęblin Branch participate in international trade striving for compliance of our business operations with both Polish and international regulations on rules for international trading in goods, technologies and services of a strategic importance to security of the State and also to maintain international peace and security, by observance of the following rules:

The Internal Control System is based on requirements of the ISO 9001:2015 standard, extended by additional requirements arising from legal provisions

No collaboration shall be initiated with foreign counterparts if it would be against relevant regulations, and in case of already established collaboration it shall be immediately cancelled

No collaboration shall be initiated with foreign counterparts involved in proliferation of weapons of mass destruction, and in case of already established collaboration it shall be immediately cancelled

A possibility of generating a profit in any way contradicting the policy of international defence equipment trade is not allowed

Should any violation of the relevant international defence equipment trade be found out steps aimed at restoration of procedures compliant with relevant legal regulations shall be immediately undertaken

Employees who violate the relevant legal provisions and internal regulations concerning international defence equipment trade shall be subject to disciplinary and criminal sanctions provided for by the law

Assessment and verification of operations related to international defence equipment trade shall be made possible at any request of authorised supervising authorities, and recommendations and decisions arising from the supervision shall be implemented

There is a functioning Internal Control System for international defence equipment trade in Wojskowe Zakłady Lotnicze Nr 1 S.A. and this System is supervised by a Management Representative for International Defence Equipment Trade who is both responsible and authorized for supervising the international defence equipment trade

The rules for international defence equipment trade according to relevant legal provisions and internal regulations are known and adhered to by all employees involved in functioning of the Internal Control System.

Marcin Nocuń

CEO AND PRESIDENT OF THE BOARD

PROJECT: STUDIO SFERA

RESEARCH AND DEVELOPMENT

Alike any rapidly growing company, Wojskowe Zakłady Lotnicze Nr 1 S.A. is fully aware that implementation of the latest technologies is a must. One of its top priorities is activity in the Research and Development (R&D) area. Currently, the company runs several projects directly related to use of helicopters. Coming across customers' expectations and evolving advanced technologies market, our experts, either acting on their own or in collaboration with other entities, are developing innovative projects resulting in the fact that WZL1 is one of the best service providers in the industry.

Moreover, basing on analyses of new trends in aviation, the company has been developing for a couple of years its competences in the area of composite technologies. On top of this we have been participating in programmes run by global aerospace manufacturers as well as in R&D projects of Polish research organisations and industrial companies.

INFRASTRUCTURE

Construction of the modern hangar that meets the world's aviation standards took just 18 months - from March 2018 to September 2019. It has total floor area of 5,572 sq. m. out of which 4200 sq. m. is the production area where work can be conducted on 12 helicopters in the same time. The hangar has two large-dimension doors (40 x 8 m and 24 x 7 m) allowing for operations on big aircraft (helicopters).

The hangar infrastructure includes also the workshop area where minor maintenance procedures are carried out (including maintenance of main rotor blades), conference rooms, office area and employees amenities.

This investment of the company steams out directly from indication of WZL1 as the Maintenance Centre for Helicopters of the Armed Forces of the Republic of Poland. The new hangar will contribute to an extension of the manufacturing and sales capabilities, further improvement of quality and a reduction of duration of the overhaul and maintenance procedures as well as tasks directly linked to fulfilment of needs in the area of the State's security and defence.

The New Aviation Hangar is also a proof of the WZL1's readiness for further growth, implementation of the latest technologies, performing R&D efforts, diversification of strategic plans as well as expansion with its services into international markets of helicopter and general aviation aircraft industry.


WOJSKOWE ZAKŁADY LOTNICZE NR 1 S.A.


WOJSKOWE ZAKŁADY LOTNICZE NR 1 S.A.