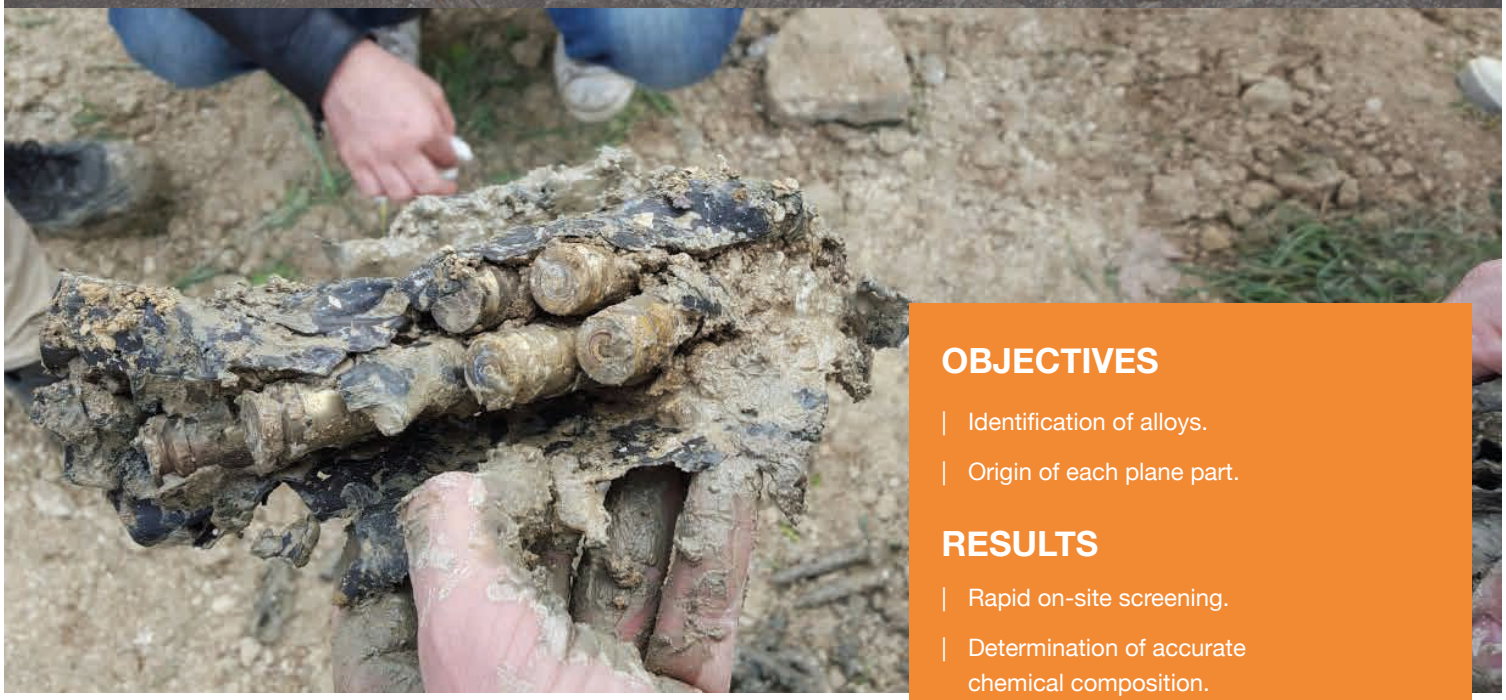
CASE STUDY

HITACHI
Inspire the Next

X-MET8000 Optimum



OBJECTIVES

- Identification of alloys.
- Origin of each plane part.

RESULTS

- Rapid on-site screening.
- Determination of accurate chemical composition.

XRF analyser solves the 70 year mystery of a WW2 plane crash

It was late April 1945 during the last days of World War II for Italy. Just one week before liberation from fascist rule, a group of five Messerschmitt BF 109 planes took off from the Vicenza airbase heading to Ghedi, near Brescia. This was not a combat mission but a transfer flight. Soon after take-off, the planes were intercepted by US fighters and attacked. All five planes suffered damage but one was hit more severely than the others. The plane commanded by Italian Captain Carlo Bianchini went down. After challenging manoeuvres, turning the plane 180 degrees and opening the cockpit window, Captain Bianchini managed to jump out of the plane and parachute to safety. The plane crashed into a field close to Castiglione delle Stiviere Mantova.

Seventy years later, a joint team of archaeologists including Xplora, Air Crash Po and Dog Fighters started an investigation to establish what became of the Messerschmitt BF 109 that day in 1945. In August 2015 they miraculously found an old man who was just five years old when he saw the plane go down near his home village. Even after seven decades he was able to point out the exact location of the plane wreck.

In early September 2015, a team of archaeologists scanned the area with ground radars and metal detectors and found a large metallic object buried approximately five meters deep in the field. They found that the plane was almost completely shattered into small pieces. They also found larger parts including pieces of the engine cylinder blocks and a thick iron and lead plate that had been placed under

> **“Rapid on-site screening with a handheld LIBS analyser and determination of accurate chemical composition with a handheld XRF analyser.”**

the pilot's seat to protect him from shrapnel and bullets during aerial dogfights. It was not possible to recover all of the parts because the villagers had used the tail section of the plane to manufacture tools and pots and pans soon after the crash.

THE ANALYSIS

Hitachi High-Tech Analytical Science brought in LIBS and X-ray handheld analysers to support the archaeological excavation team. The metallic pieces were cleaned with water and preliminary identification of alloys was carried out using the handheld LIBS (Laser Induced Breakdown Spectroscopy) analyser. Every piece brought to the surface was carefully analysed. The analysis helped to identify the origin of each part and what its use had been.

The LIBS analyser was able to identify the majority of different alloys found at the excavation site. The speed of the analyser made it possible to rapidly screen several hundred pieces including even the smallest ones. Several different aluminium grades were identified from 1000, 5000 and 7000 series as well as lead-impregnated aluminium alloys, which were commonly used in aircrafts during World War II.

When more accurate information was required, including more detailed grade identification and concentrations of heavier alloying elements in aluminium alloys, the handheld X-MET8000 Optimum analyser was used. Handheld XRF analysers provide very fast analysis of a wide range of elements from magnesium to uranium. Because it is equipped with universal standardless FP (fundamental parameters) calibrations, it is the perfect tool for identifying unknown and untypical samples.

THE RESULTS

After some interpretation of the results, there was a suspicion that there was a high level of zinc present in almost all of the samples. This is uncommon and unexpected for an aluminium alloy aircraft. On closer inspection it became obvious that most of the aluminium parts were covered with a thin layer of engine oil which contained a zinc additive and therefore some of the analysis results were compromised. For decades, the same engine lubricant had preserved the parts from corrosion caused by rain and later by groundwater. After cleaning up the samples, the correct identification and chemistry were obtained.

Although a rather unusual application, the analysis of the Messerschmitt aircraft wreckage was an excellent opportunity to show the benefits that Hitachi High-Tech's full metals analysis solution can provide. The initial rapid on-site screening was carried out using a LIBS analyser. After preliminary screening, the analysis, including the determination of accurate chemical composition, was completed using the X-MET8000 Optimum analyser. The end result was that the parts of the aircraft were rapidly and reliably identified at the site and this information can now be used for more detailed studies.

X-MET8000 RANGE

Our range of handheld XRF analysers, the X-MET8000 series, delivers the speed and performance required even in the most demanding applications. Suitable for all analysis needs from scrap metal analysis, precious metals and jewellery analysis to positive material identification (PMI) for inspection and manufacturing applications, and regulatory compliance screening.

If you would like to see the X-MET8000 analyser in action visit www.hitachi-hightech.com/hha or book a demo.

Hitachi High-Tech Analytical Science