ISSUE #1

April 2026

Waterjet Edge

Cognitive Insights Newsletter

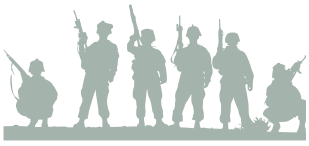
From the Desk of 2Do

With the wars around us impacting in various ways, we find that waterjet cutting and defense are becoming a strategic inflection point. India is entering a phase where manufacturing capability equals strategic strength.

We know waterjet cutting sits at the intersection of precision, flexibility & material integrity. Our view is that the biggest opportunity is not with large OEMs but with hundreds of MSMEs entering the defence supply chain.

This is where:

- Technology adoption will accelerate
- Capability gaps will emerge
- Business opportunities will multiply



"In modern warfare, precision manufacturing is power and waterjet cutting is one of its sharpest tools."

Industry Intelligence

Waterjet Cutting in Defense Manufacturing: India's Silent Force Multiplier

Modern warfare is no longer defined only by weapons, it is defined by how precisely and efficiently those weapons are manufactured. In this context, waterjet cutting is emerging as a critical enabling technology across India's defense ecosystem, from missile systems to naval platforms.

Why Defence Manufacturing Needs Waterjet Now ?

1. Zero Heat, Zero Compromise

Defense materials such as:

- Ballistic steel
- Titanium alloys
- Carbon composites

require zero thermal distortion. Traditional cutting methods introduce heat-affected zones, which can compromise structural integrity. Waterjet cutting eliminates this risk entirely.

2. Multi-Material Warfare Systems

Modern defense systems combine:

- Metals
- Composites
- Ceramics
- Polymers

Waterjet's ability to cut all these materials on a single platform makes it indispensable.

In this newsletter you can expect:

3. Precision at Scale
From UAV components to missile casings, defence manufacturing demands:

- Tight tolerances
- Repeatability
- Clean edges without rework

Waterjet delivers all three.

Where Waterjet Is Used in Defence
Aerospace & Missiles

- Structural parts
- Engine components
- Composite panels

Driven by organizations like Defence Research and Development Organisation and Hindustan Aeronautics Limited.

Land Systems

- Armoured vehicle panels
- Ballistic protection systems

Used by players such as Mahindra Defence Systems and Kalyani Strategic Systems Limited.

Naval Systems

- Shipbuilding alloys
- High-speed vessel components

With major contributions from Mazagon Dock Shipbuilders Limited and Larsen & Toubro.

The India Opportunity
India's defence push under Atmanirbhar Bharat is driving:

- Indigenous manufacturing
- Vendor ecosystem expansion
- Precision fabrication demand

This directly translates into:
1. Increased demand for waterjet cutting
2. Growth of MSME fabrication units
3. Higher adoption of advanced cutting technologies

The Bottom Line
Waterjet cutting is not part of the battlefield, but it is essential to everything that reaches it.

For India, this positions waterjet as a strategic manufacturing capability, not just a fabrication tool.

Stakeholder Spotlight

Hindustan Aeronautics Limited (HAL): Precision Manufacturing at the Core of India's Air Defense

Hindustan Aeronautics Limited (HAL) stands at the center of India's aerospace and defense manufacturing ecosystem.

With programs spanning:

- Fighter aircraft (LCA Tejas)
- Helicopters (ALH Dhruv, LCH)
- Aircraft engines
- Structural assemblies

HAL represents high-precision, high-reliability manufacturing at national scale.

As per its 31st March 2026 media release FY 2025-26: HAL Registers Revenue of Rs 32,250 Crores, Sustains Growth Momentum Amid Global Disruptions.

HAL's order book remained healthy at around Rs 2.54 lakh crores as on 31st March 2026, against the opening order book position of Rs 1.89 lakh crores, after adjusting current-year liquidation. The increase is mainly due to the signing of major orders with the MoD for the supply of 97 Light Combat Aircraft (LCA) Mk1A aircraft for Rs 62,370 crores, six ALH CG for Rs 2,704 crores, and eight Dornier CG for Rs 2,186 crores. The outstanding manufacturing orders for helicopters, aircraft, and engines provide long-term revenue visibility over the next 7-8 years. Also, the ROH, spares and other order book remained healthy and are expected to remain robust in the coming years.

Yes, Hindustan Aeronautics Limited (HAL) utilizes waterjet cutting technology in its manufacturing facilities. In 2024 it released technical specification of water jet machines it wanted, do take a look at it.

The Vendor Ecosystem Connection
A critical insight: HAL does not operate in isolation, it depends on a large ecosystem of Tier-1 and MSME suppliers.

These vendors handle:

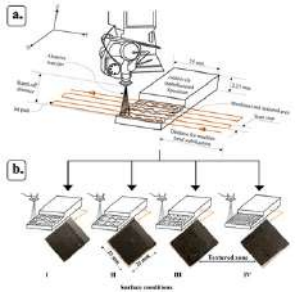
- Sheet metal fabrication
- Composite cutting
- Precision part preparation

This is where waterjet cutting is most actively used

Source : https://hal-india.co.in

Case of the Month

Surface engineering strategies for aerospace composite repairs: Machining and texturation of additive manufacturing parts by abrasive waterjet



Abstract

In aerospace maintenance, repair and overhaul operations, additive manufacturing (AM) holds great potential for composite repair, providing a precise and customized approach to fabricating repair patches for damaged structures and reduce waste. Given the circularity and economic advantages, repairing composite structures is often preferable to replacement. This study explores the use of abrasive waterjet process for machining and texturing AM composites composed of micro carbon infused nylon matrix and continuous carbon fiber reinforcement. Four surface conditions were investigated: (I) machined without additional surface preparation, and (II, III, IV) machined followed by three levels of texturation - good, medium, and poor. These surfaces are quantitatively evaluated based on crater volume (Cv) and arithmetic mean height (Sa). The mechanism of material removal was investigated by surface texture analysis and scanning electron microscopy. A prediction model was developed and experimentally validated for assessing the correlation of Cv and Sa. Results show an ascending trend in both Cv and Sa values from condition I to IV. The study reveals important findings on machined surface characteristics and their preparation for adhesive bonding, which are crucial for integrating repair patches onto parent structures.

by

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Download their research paper as a pdf

Source : Sciencedirect.com

Ask an Expert

Q: How can Indian waterjet job shops enter the defence supply chain?

A: Breaking into defence manufacturing is not about scale, it is about capability, consistency, and compliance.

1. Upgrade Process Capability

- Tight tolerance cutting
- Documentation of parameters
- Repeatability across batches

2. Focus on High-Value Materials

- Titanium
- Armour steel
- Composites

3. Certification & Compliance

- Vendor approvals
- Quality standards
- Traceability

4. Position as a Specialist Vendor

Instead of general fabrication:
→ Become a “defence-grade cutting specialist”

5. Target the Right Ecosystem

Work with:

- DRDO vendors
- Aerospace Tier-1 suppliers
- Private defence manufacturers

Defence work is not high-volume—it is high-value. Waterjet shops must align accordingly.

Source : 2Do Consultancy

Marketplace & Innovations

Drone Manufacturing: A New Growth Frontier for Waterjet Cutting in India

The Market Shift

India's drone ecosystem is moving rapidly from policy push to real manufacturing demand.

India's drone ecosystem is expanding rapidly, with over 500 startups and companies operating across manufacturing, services, and integration. Industry and policy estimates suggest the market could reach ₹30,000+ crore (~$3–4 billion) by 2030, driven by defence and surveillance demand.

Led by companies like:

- ideaForge Technology
- Adani Defence and Aerospace

the focus is now shifting from imports to indigenous production at scale.

Where the Market Is Expanding

Unlike traditional defence platforms, drone manufacturing is:

- Distributed → spread across MSMEs and specialized vendors
- Iterative → frequent design changes and upgrades
- Material-driven → increasing use of composites and lightweight alloys

This is creating a new category of manufacturing demand: High-precision, low-volume, multi-material production.

The Innovation Trigger

This shift is being enabled by three key innovations:

1. Composite-First Design

Modern drones increasingly rely on:

- Carbon fiber sheets
- Lightweight laminates

These materials require non-thermal cutting methods to maintain structural integrity.

2. Rapid Design Iteration

Drone development cycles are fast:

- Prototype → test → redesign

This demands tool-less, flexible manufacturing processes.

3. Hybrid Manufacturing Ecosystems

Drone production integrates multiple technologies:

- CNC machining (metal components)
- 3D printing (complex housings)
- Waterjet cutting (structural and sheet components)

Where Waterjet Fits in This Market

Waterjet cutting aligns naturally with these requirements:

(a) Clean cutting of composite sheets without delamination

(b) Precision cutting of thin aluminium structures

(c) Ability to process multi-layer materials in a single pass.

The Real Opportunity: Supply Chain Manufacturing

The most significant opportunity lies not at the OEM level but within:

The vendor ecosystem supporting drone manufacturing

Each drone typically involves:

- 15–40 precision-cut structural components
- Multiple material types
- High repeatability requirements

This demand is fulfilled by:

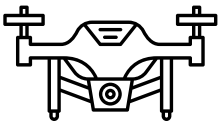
- Fabrication units
- Composite processors
- Precision cutting job shops

Market Direction for the Waterjet Industry Drone manufacturing is creating a new application segment characterized by:

- Smaller batch sizes
- Higher material complexity
- Faster turnaround expectations

This is distinctly different from traditional waterjet applications such as: Stone processing & Heavy fabrication

Marketplace & Innovations



Key Insight
"Drone manufacturing is not just a new industry, it is creating a new type of demand where flexibility, material integrity, and precision matter more than volume. This is where waterjet cutting finds a natural advantage."

Source : 2Do Marketing

Training & Events



- **Expo:** IMTOF , International Machine Tools Exhibition 2026 (April 02-06, Chennai) (https://imtof.in/index.html)
- **Expo:** Metal Forming Expo 2026 (April 09-11, Pune) (https://www.metalformingexpo.com/)
- **Expo:** Indus-Tech Expo 2026 (May 15-18, Kolkata)(https://industechexpo.com)

2Do Corner

Marketing Research is for :-

- Understanding Customers: Collecting data about customer preferences, behaviors, and needs.
- Analyzing Market Trends: Identifying trends and market demands for informed business decisions.

Get in touch with us to identify & understand target markets, customer needs, and market trends.

It is free for current clients of 2Do IOA Garnet !!

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