

# 航空機産業支援 / Technical assistance for aviation industry

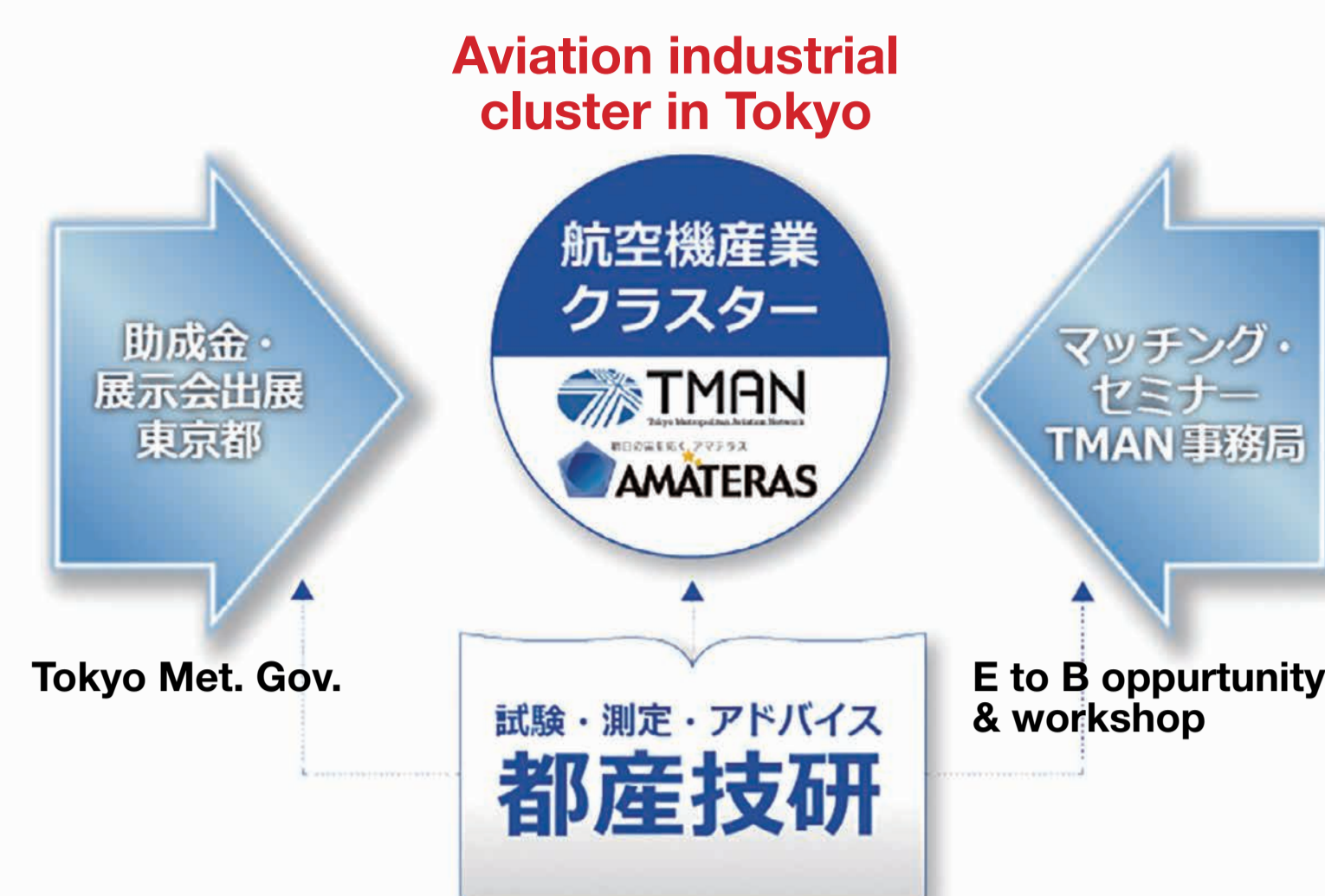
東京都により設置された試験研究機関であり、東京都内の中小企業に対する技術支援(研究開発、依頼試験、技術相談、人材育成など)により、東京の産業振興を図り、都民生活の向上に貢献することを役割としています。

Our mission is to promote the development of small- and medium- sized enterprises through industrial technology by research, consulting and testing, and thus to contribute the quality of life for the citizens in Tokyo.



Aviation Industry Support Laboratory

航空機産業支援室を設置し、TMANなどの航空機産業クラスターに参加している中小企業への技術支援を行っています。TIRI has been providing technical assistance to Tokyo SMEs who joined "TMAN" and "AMATERAS".



TIRI : R&D of the production technology  
Relationship between TIRI and the aviation industry cluster in Tokyo

## 航空機産業支援室による技術支援 / Technical assistance by "Aviation Industry Support Laboratory"

都産技研では、航空機産業クラスター「TMAN」、「AMATERAS」を中心に、航空機産業への参入・参入希望企業への技術支援を行っています。また、東京都・TMAN事務局と連携し、販路開拓、資質の向上、技術・品質向上を目的に、中小企業の航空機産業への参入を支援しています。航空機部品の一貫生産体制の構築を目指し、航空機産業クラスターとの試作と、その技術支援に取り組んでいます。

TIRI has been providing technical assistance to newcomers and established enterprises to the aviation industry, mainly aviation industry clusters "TMAN" and "AMATERAS" established by Tokyo Metropolitan Government. TIRI and TMAN enterprises are trying to form a new integrated production cluster of the aircraft parts, technical-wise and business-wise.

## 研究開発例 / Research & Development Examples

### 摩擦攪拌接合 (FSW) による異種金属接合 Dissimilar Metal Joining by Friction Stir Welding (FSW)

**Effectiveness of FSW joint**

- High strength
- Low distortion, good appearance
- Few defects (cast alloy joint)

**Schematic of friction stir welding**

Butting surface

Stir zone (接合部)

Tool (接合ツール)

Joining direction

• FSW, in which base metals are joined by means of fractional heat and plastic deformation, is a solid-state joining process.

Super duralumin 2024 FSW joint  
Tensile test specimen - 引張試験後外観

2024 Stir zone (接合部) 5083

Butt joint 10mm

Titanium / Aluminum dissimilar metal joint cross section

2024 TI-6Al-4V 2mm

### 摩擦攪拌接合 (FSW) 同種・異種金属接合例 Examples of similar/dissimilar metal joining by Friction Stir Welding (FSW)

### 金属材料の軽量化技術の研究開発 R&D of Metal Materials for Lightening

Hi-frequency coil

Gas atomization device

Ingot or pellets (Mg, Sn, Zn)

Ar

Heating time : 10 min  
Holding temp. : 750 °C (1023 K)  
Holding time : 10 min  
Nozzle diameter : Φ2 mm  
Atomizing pressure : 8~9 MPa (Ar)

Created 実験トマイズ Mg-Sn-Zn

Atomized powder (Mg-Sn-Zn alloy powder)

Sintered

Developed Mg-Sn-Zn

Sintered piece

Alloy powder

Comparison of toughness

Specific tensile strength,  $\sigma_{t2/p}$

Elongation,  $\epsilon$

Extruded + Aged (ZK60)

Die cast (AZ91D)

Sintered Mg alloy (Mg-Sn-Zn)

Rolling (Total)

Rolling (Ductility)

Rolling Mg

Rolled L291 (Mg-Li-Zn)

### 開発Mg-Sn-Zn 合金粉末と焼結品および開発Mg合金と従来品の強度比較 Developed Mg-Sn-Zn alloy powder and sintered piece comparison of toughness between developed Mg alloy and existing alloy

### チタン合金板のプレス成形法の開発 Press Forming of Titanium Alloy Sheets

Major strain  $\epsilon_1$

Minor strain  $\epsilon_2$

×: Measured strain (rolling direction)  
\* : Measured strain (transverse direction)

FLC (rolling direction)

FLC (transverse direction)

Fracture occur at bead part

Normal method

Without fracture at bead part

Developed method

Examples of workpiece for obtaining Forming Limit Curve

FLD of Ti-6Al-4V alloy sheets ( $t_0=1.0\text{mm}$ )

Occurrence of crack

Normal deep-drawing

Developed forming method

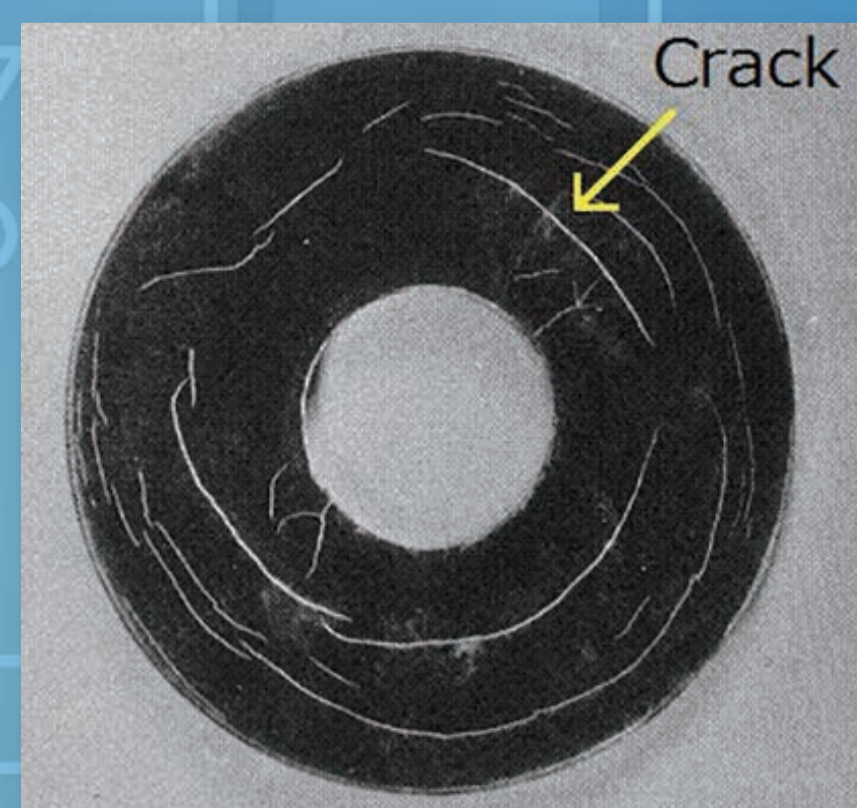
Examples of formed cup of Ti-6Al-4V alloy sheet (at 300 degrees Celsius, without lubrication)

### Ti-6Al-4V合金板の常温での成形限界 (FLD) の取得と低温での成形法の開発例 (300°C) Examples of Forming Limit Diagram (FLD) at room temperature and formed cup at 300 degrees Celsius of Ti-6Al-4V alloy sheets

### 非破壊検査 Nondestructive inspection

- 磁粉探傷試験 (MT)  
Magnetic particle testing (MT)
- 超音波探傷試験 (UT)  
Ultrasonic testing (UT)
- 浸透探傷試験 (PT)  
Penetrant testing (PT)

MTによる焼割れの観察  
Observation for quenching cracks by MT



### 航空機規格試験 Specialized testing service for aviation standards

Standard Test Methods for Determining Average Grain Size (ASTM E112)

- 自動画像解析による結晶粒度測定  
Standard Test Methods for Determining Average Grain Size (ASTM E112)
- 鉄鋼の介在物含有量測定  
Standard Test Methods for the inclusion Content of steel (ASTM E45 Method A)
- ロックウェル硬さ試験  
Standard Test Methods for Rockwell Hardness of Metallic Materials (ASTM E18)
- マイクロピッカース硬さ試験  
Standard Test Method for Knoop and Vickers Hardness of materials (ASTM E384)



航空機に搭載される電子・電気機器用の振動試験

Vibration testing (RTCA/DO-160G:Section 8)

リチウムイオン電池のUN国連勧告試験

Vibration testing (UN 38.3 T3)



航空機の内装品 (シート素材、電線、配線素材)などを対象として、難燃性を証明するための燃焼性試験

Flammability test (FAR 25.853 Appendix F Part I (b))



AMS (航空宇宙材料規格) で規定された表面処理品などを評価するための環境試験 (塩水噴霧試験)

Salt spray testing (ASTM B117)

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