# End-to-end IPS Business Process - "BIKE Example"

## Presentation of all S-Series IPS Specifications including S1000D and ASD-STE100 in one end-to-end practical example

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Rank/title of presenter: Experts from the different S-Series Steering Committees
Company/Organization: **ASD-Europe / AIA-USA**

Abstract-No: -

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# The S-Series IPS Specifications and their relevance to In-Service Product and Customer Support

End-to-end IPS Business Process - "BIKE Example"

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# Structure of the presentation

## Initial development of support solution:

**Baseline:**
Mountain bike **product breakdown** and its **„major“ equipment**

**IPS process** during development

- IPS framework / project setup
- Initial Preventive Maintenance Analysis
- Initial Logistic Support Analysis (LSA)
- Spare part provisioning / order adminstration
- Technical publication
- Training Needs Analysis (TNA) and training information

In-service data feedback

**Pre-Mod**
! The mountain bike accident !

30 minutes break ...

## Design modification after analysis of accident:

**Baseline:**
Mountain bike **design modification of mountain bike front brake**

**Post-Mod**

**IPS process** during in-service

- Result of accident investigation / update System FMECA / assessment logic Functional Failure Causes (FFC)
- Immediate feedback message to warn users of the pre-mod mountain bike
- Update of Front Brake breakdown / Maint. task requirements & analysis
- Update System Breakdown / update Illustrated Parts Catalogue / Supply
- Update DML / update data modules / produce and deliver TechPubs updates
- Update Training Situation Analysis / Task selection and analysis / objectives & media

# In the beginning …

There was an idea:

**Why don't we design, manufacture and support a bicycle?**

BUT:
It needs to have the best support EVER!

(So we'll use the ASD/AIA S-Series IPS* specifications to make sure!)

*IPS = Integrated Product Support

# So we launched a project

We called the project **Mbike**, which is shorthand for **Mountain Bike**.

We also decided that this project would create a specific mountain bike, which for marketing purposes we would call **Yeti Beti**. The product code would be **YB**.

Oh, and yes, there would be several variants of the product, but we'll talk about the one that we decided to call **Yeti SBS Beti**.

While engineering started the work, the program decided that we might as well share that information with everybody, using the SX000i data exchange (and not only for support!).

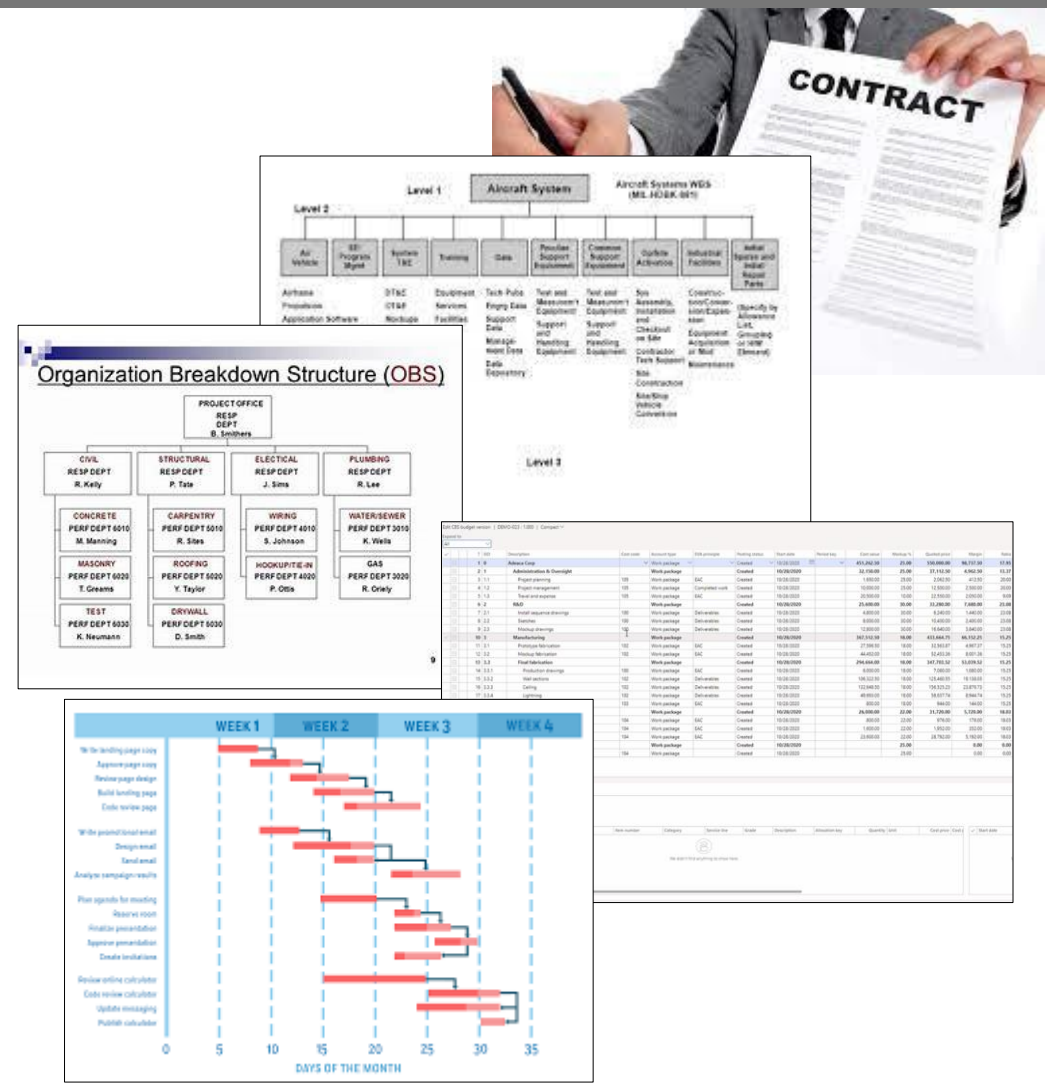
| Project | Data |
|---|---|
| Project Identifier | Mbike |
| Project Name | Mountain Bike |
| Project Duration | 1 year |

| Product | Data |
|---|---|
| Product Identifier | YB |
| Product Name | Yeti Beti |
| Product Life | 1/1/2019 - 31/12/2029 |
| Product Variant Identifier | YBSB5 |
| Product Variant Name | Yeti SB5 Beti |

# And there were the usual program-level things…

Yes, we know this is cumbersome stuff, but a program, even an integrated product support (IPS) one, has to exchange a lot of information, such as:

- **Contract data and contract clauses**
- **Work Breakdown Structure (WBS)**
- **Organizational Breakdown Structure (OBS)**
- **Cost Breakdown Structure (CBS)**
- **Planning**




Managing an IPS program is complex!

But, luckily, **SX000i** is capable of providing all this information to all affected parties.

# And knowing who was involved…

Of course, it was very important to know the project stakeholders, and what role(s) they would have:

- **Partners**
- **Suppliers**
- **Customers**
- **Etc…**

| Organization Identifier | Organization Name | Organization Type | Organization Description |
|---|---|---|---|
| Yeti | Yeti | Manufacturer | Developer and manufacturer of the Yeti Beti product. |
| MF | Müller Fahrräder | Manufacturer (under license) | Manufacturer of the Yeti Beti bike under license |
| SBH3 | Schultz Bike Hire | Operator | Bike hiring company |
| KHX784187 | Bike Leasing AG | Customer; Owner; Operator | Bike leasing/hiring company |
| SBT | Sevilla Biking Tours | Customer; Owner; Operator | Bike hiring company |
| GBH | Granada Bike Hire | Operator | Bike hiring company |
| SDC-CA | San Diego County | Operator | Bike hiring company |

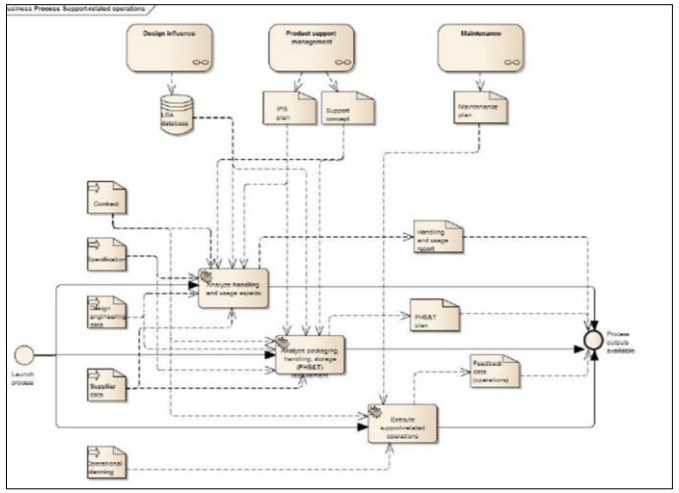
This can include organizations but also individuals!

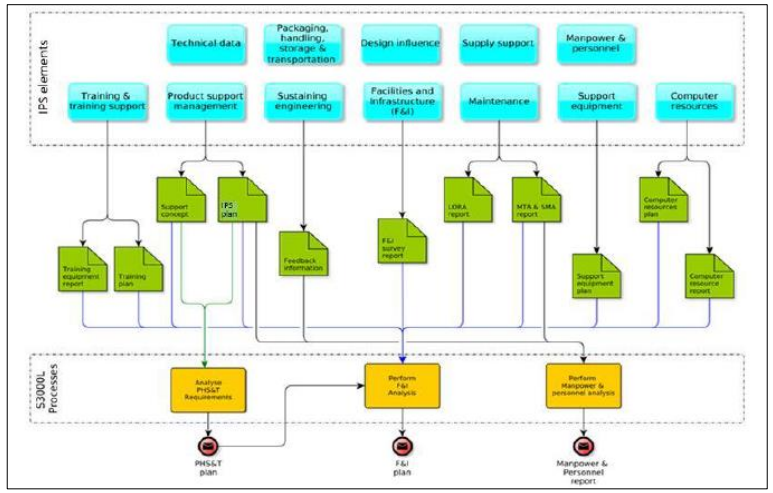
| Person identifier | Person Name | Person Middle Name | Person Family Name | Person Prefix Title | Person Suffix Title | Person Dates |
|---|---|---|---|---|---|---|
| HS22 | Hartmut | | Schmidt | | Jr. | |
| RS3 | Ramon | | Garcia | | | |
| HDM | Hans | Dieter | Müller | | | 7/7/1989 - |

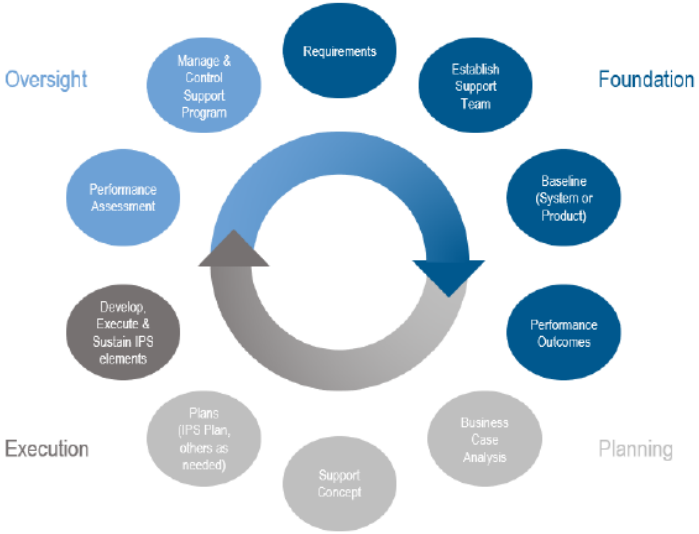
Note that the bike would also be manufactured by somebody else under license!

# Now, how do we coordinate the IPS program?

**SX000i** provides the overall process about how an integrated products support program works, including the definition of the deliverables and the interfaces between specifications.

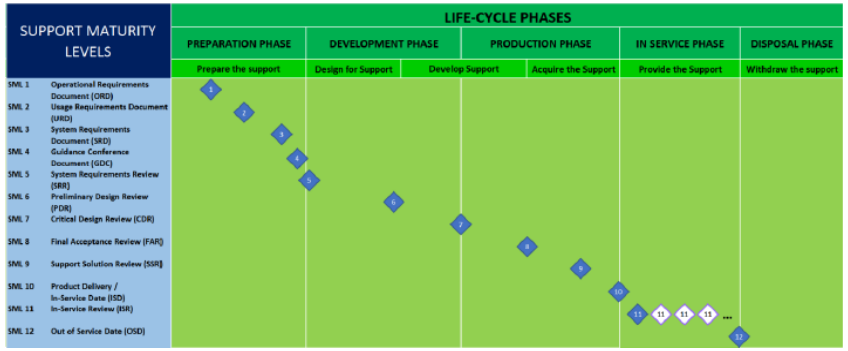





But it also defines **program guidelines, maturity levels, milestones** and **management metrics**.

IPS management should therefore be clear – so let's go!



# But wait a minute… how about the basic IPS information?

Again, **SX000i** provides key IPS program-level information:

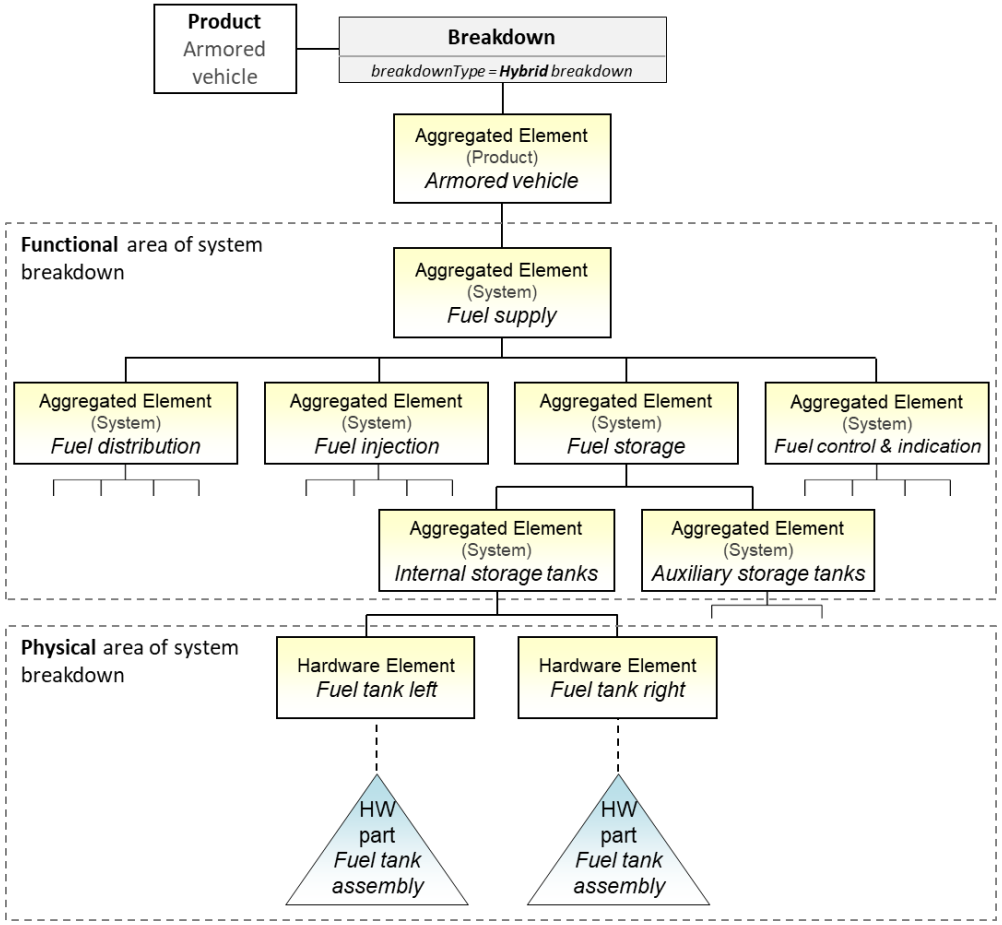
- **Support concept:** Manufacturer only delivers spares and support items and specialized repair. Training is by means of on-line courses.
- **Maintenance concept:** 4 levels (User On-Bike, User Garage, Bike Shop, Bike Manufacturer)
- **Sites**: 25 facilities with bike shop repair capability, main manufacturer repair site.
- **Person competencies:** 2 trades (mechanics and electronics), with 3 competence levels each, ranging from beginner to expert
- **Bike operations:** 2 operational scenarios (cycling, 400 h/year, and parking, 8360 h/year)
- **Fleet definition:** 1 fleet for every major bike hire company (average 100 bikes) + 1 fleet for the public in general (total 5000 bikes). Global fleet: 6000 bikes.

**So let's start now!**

# Product breakdown (1)

The starting point of any IPS activities is the development of a **product breakdown** suitable for any analysis activities in the context of **product support**.

- The structure and hierarchy of the required **design drawings** will be done by **engineering**
- The required **breakdown elements** including the definition of a Breakdown Element Identifier (BEI) will be allocated by LSA following the baselines given in S3000L
- The **BEI** is a common key data element for S1000D and S2000M to provide the correct hierarchy of the corresponding IPS elements (technical publication, spare parts catalogue)



# Product breakdown (2) – the functional part

Product | System | Subsystem | Sub-Subsystem

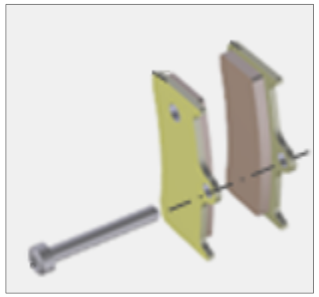
- **B5-A-00-00-00-00A** Yeti SB5 Beti Assembly214
  - **B5-A-A7-00-00-00A** SB5 Transmission System
    - B5-A-A7-10-00-00A SB5 Gearbox
    - B5-A-A7-30-00-00A SB5 Brake System
      - B5-A-A7-31-00-00A SB5 Front Brake System
      - B5-A-A7-32-00-00A SB5 Rear Brake System
    - B5-A-A7-60-00-00A SB5 Chain Assembly
  - **B5-A-B1-00-00-00A** SB5 Frame System
    - B5-A-B1-10-00-00A SB5 Main Frame Assembly
    - B5-A-B1-20-00-00A SB5 Rear Frame Assembly
    - B5-A-B1-40-00-00A SB5 Seat Assembly
  - **B5-A-B3-00-00-00A** SB5 Suspension/ Track/Wheels System
    - B5-A-B3-10-00-00A SB5 Front Shock Assembly
    - B5-A-B3-20-00-00A SB5 Rear Shock Assembly
    - B5-A-B3-50-00-00A SB5 Wheels
      - B5-A-B3-51-00-00A SB5 Wheel Assembly Front
      - B5-A-B3-52-00-00A SB5 Wheel Assembly Rear
  - **B5-A-H1-00-00-00A** SB5 Steering System
    - B5-A-H1-10-00-00A SB5 Handle Bar Assembly

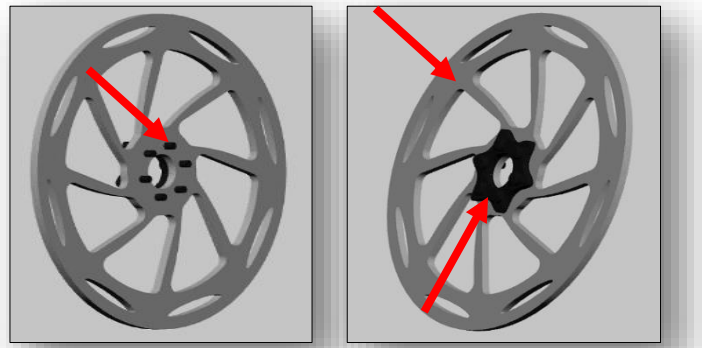
Examples in this presentation are focused on the Front Break System

# Product breakdown (3) – the physical part

Sub-Subsystem | HW breakdown element | HW part

- **B5-A-A7-30-00-00A** SB5 Brake System
  - **B5-A-A7-31-00-00A** SB5 Front Brake System
    - **FBA-0001** Front Wheel Brake
    - **B5-A-A7-31-01-00A** SB5 Front Brake Caliper
    - **B5-A-A7-31-02-00A** SB5 Front Brake Pads
      - **BP-0001** Front Brake Pads
        - **ISO4762-MAX40-Steel 10,9** Front Brake Pad Bolt
    - **B5-A-A7-31-04-00A** SB5 Front Brake Cable Assembly
    - **B5-A-A7-31-05-00A** SB5 Wheel Brake Disk
      - **WBD-0001** Wheel Brake Disk
        - **WBDP-0001** Wheel Brake Disk Plate
        - **WBDL-0001** Wheel Brake Disk Lock
        - **WBDB-0001** Wheel Brake Disk Bolt
    - **B5-A-A7-31-06-00A** SB5 Front Brake Lever
  - **B5-A-A7-32-00-00A** SB5 Rear Brake System





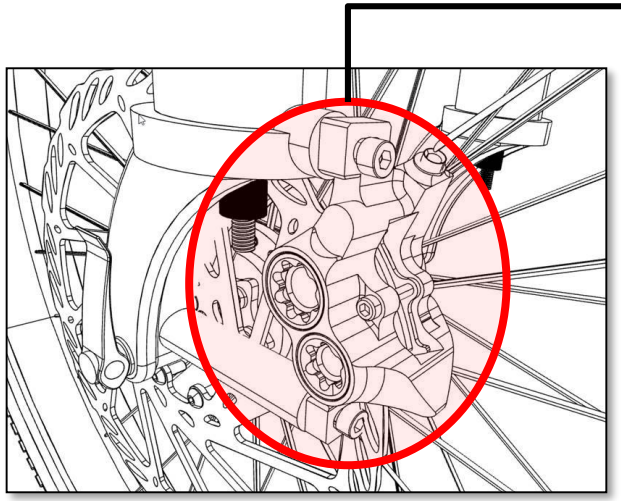
# S4000P Chapter 2.2 - Example System Analysis

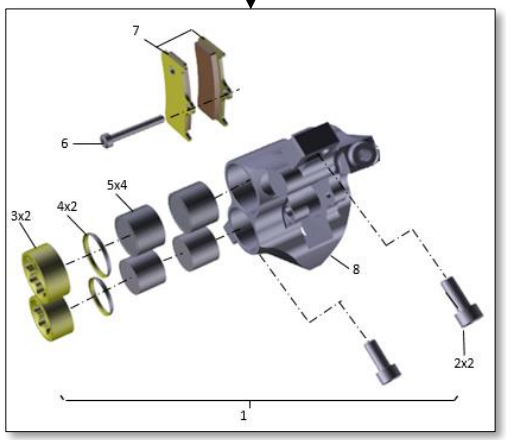
## System description

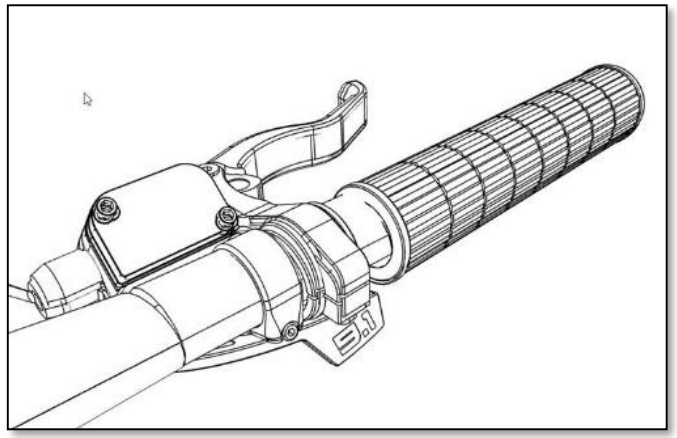
- The front brake system is a manually operated hydraulic brake system

## Objective of analysis

- Define Preventive Maintenance Task Requirements
  - Intervals or Limits





# Preparation

**Preparation**

Input

Process

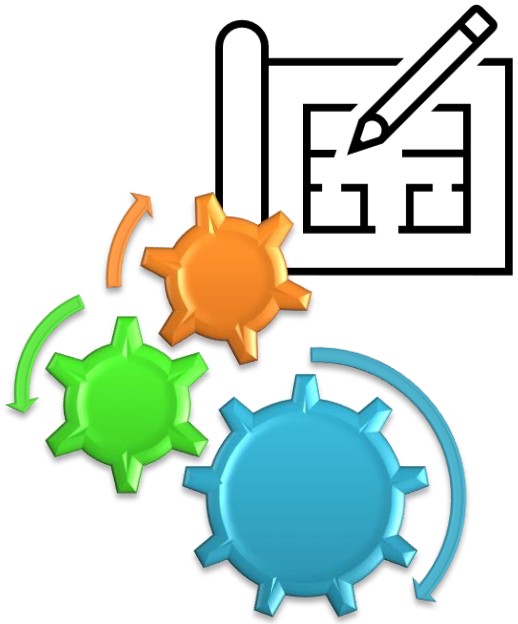
Output

**Define use cases**
- Ride the Mbike
- Store the Mbike
- Maintain the Mbike

**Identify stakeholder and requirements**
- Cyclist
- Fleet manager
- Maintainer

**Define life cycle phases**
- Usage
- Storage

**Define usage environment**
- e.g. STANAG 2895
- Temperature: -30°C to +45°C
- Humidity: 30%-99%



# Input

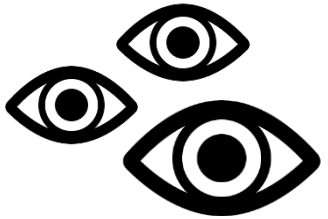
Preparation

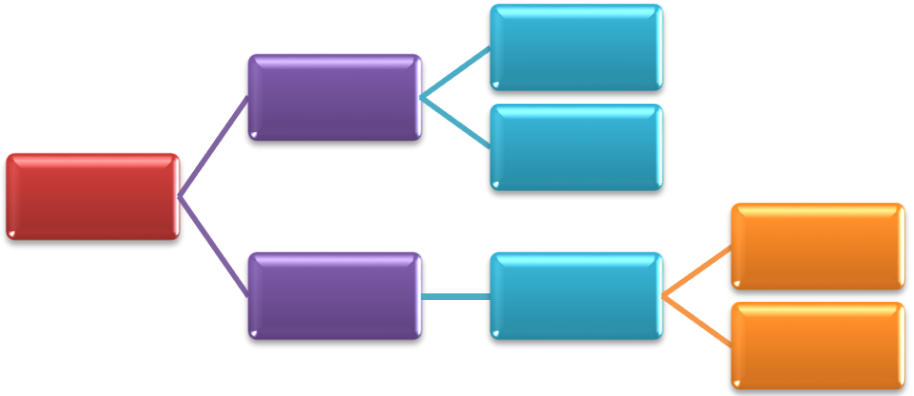
**Input**

Process

Output

- Requirements and constraints from use cases
- Functions with performance parameters
- Information on functional/logical/physical architecture
- Operational information and context
- 3D representation
- System architecture/ Reliability Block Diagram (RBD)
- System safety analysis
- Technical FMECA for parts
- Operating procedures
- Sensors and software
- Costs information





# Analysis process

Preparation

Input

**Process**

Output

## •Analyis Relevant Candidate (ARC) selection with justification

- Interface S3000L

## System FMECA

- Functional failures
- Failure Causes (FC)
- Probability
- Filtering of relevant failure modes

## Task requirement types

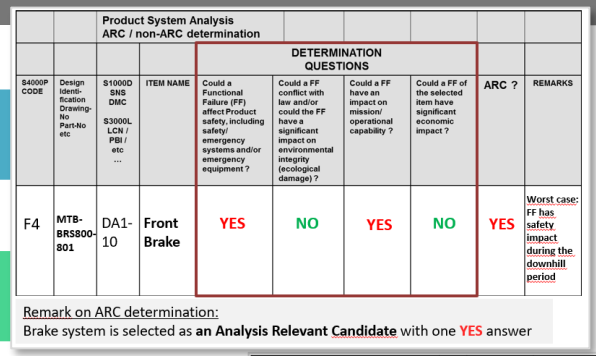
- Interface S1000D

## Definition of preventive measures

- Intervals and limits
- Failure distributions

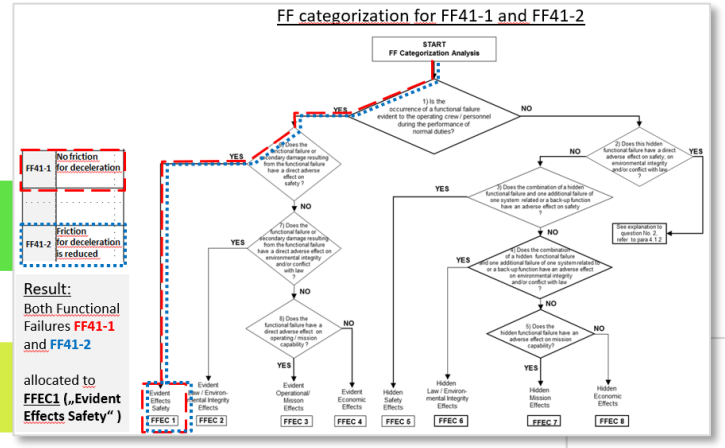
## Harmonization with master maintenance schedule

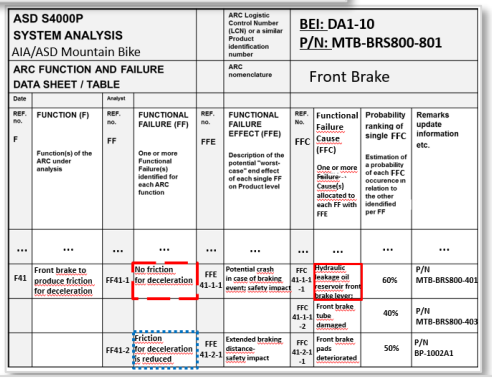
- Interface S3000L, S1000D



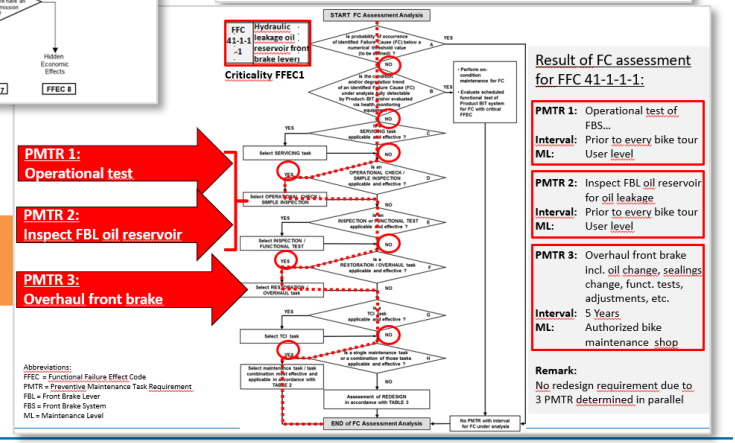
| | | | | Product System Analysis ARC / non-ARC determination | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | DETERMINATION QUESTIONS | | | | | |
| S4000P CODE | Design Identification Drawing-No Part-No etc | S1000D SNS DMC S3000L LCN / PBI / etc ... | ITEM NAME | Could a Functional Failure (FF) affect Product safety, including safety/ emergency systems and/or emergency equipment ? | Could a FF conflict with law and/or could the FF have a significant impact on environmental integrity (ecological damage) ? | Could a FF have an impact on mission/ operational capability ? | Could a FF of the selected item have significant economic impact ? | ARC ? | REMARKS |
| F4 | MTB-BRS800-801 | DA1-10 | Front Brake | YES | NO | YES | NO | YES | Worst case: FF has safety impact during the downhill period |

Remark on ARC determination:
Brake system is selected as **an Analysis Relevant Candidate** with one YES answer



| ASD S4000P SYSTEM ANALYSIS AIA/ASD Mountain Bike | | | | | | BEI: DA1-10 P/N: MTB-BRS800-801 | | | |
|---|---|---|---|---|---|---|---|---|---|
| ARC FUNCTION AND FAILURE DATA SHEET / TABLE | | | | | | Front Brake | | | |
| Date | Analyst | | | | | | | | |
| REF. no. F | FUNCTION (F) Function(s) of the ARC under analysis | REF. no. FF | FUNCTIONAL FAILURE (FF) One or more Functional Failure(s) identified for each ARC function | REF. no. FFE | FUNCTIONAL FAILURE EFFECT (FFE) Description of the potential "worst-case" end effect of each single FF on Product level | REF. No. FFC | Functional Failure Cause (FFC) One or more Failure Cause(s) allocated to each FF with FFE | Probability ranking of single FFC Estimation of a probability of each FFC occurence in relation to the other identified per FF | Remarks update information etc. |
| F41 | Front brake to produce friction for deceleration | FF41-1 | No friction for deceleration | FFE 41-1-1 | Potential crash in case of braking event; safety impact | FFC 41-1-1 | Hydraulic leakage oil reservoir front brake lever | 60% | P/N MTB-BRS800-401 |
| | | | | | | FFC 41-1-1 -2 | Front brake tube damaged | 40% | P/N MTB-BRS800-403 |
| | | FF41-2 | Friction for deceleration is reduced | FFE 41-2-1 | Extended braking distance-safety impact | FFC 41-2-1 -1 | Front brake pads deteriorated | 50% | P/N BP-1002A1 |



# Output

Preparation

Input

Process

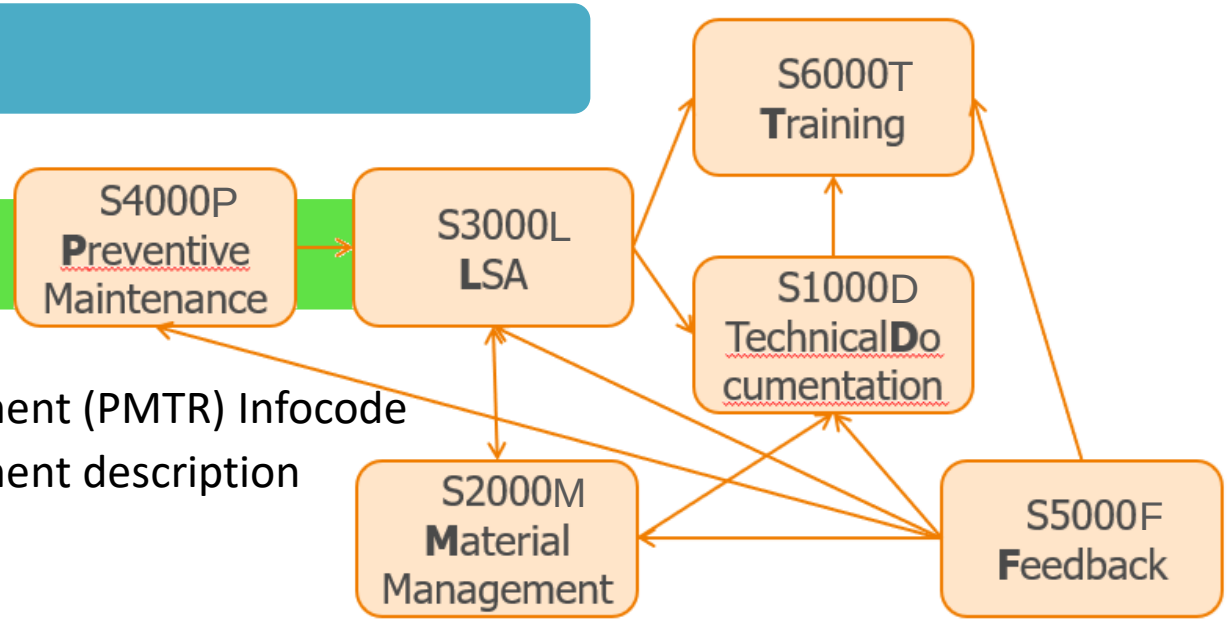
**Output**

## To Engineering

- Design improvements

## To S3000L

- Breakdown Element Identifier (BEI)
- Preventive Maintenance Task Requirement (PMTR) Infocode
- Preventive Maintenance Task Requirement description
- Interval/limit with unit
- Functional Failure Effect Code (FFEC)
- Justification




## To S3000L, S1000D, S6000T

- Functional description
- System FMECA
- Non-critical failures and their identification

# Result of ASD S4000P system analysis

**PMTR results** for front brake system example:

Three PMTR with interval (= PMTR**I**) developed during Failure Cause (FC) assessment

| **PMTR 1:** | **Operational test of Front Brake System by activation of Front Brake Lever** |
|---|---|
| Interval: | **Prior to every mountain bike tour** |
| Criticality: | FFEC1 - Evident Effects Safety |
| Maintenance Level (ML): | User level |

| **PMTR 2:** | **Inspection of Front Brake System hydraulic fluid** |
|---|---|
| Interval: | **Every 6 months** |
| Criticality: | FFEC1 - Evident Effects Safety |
| Maintenance Level (ML): | User level |

| **PMTR 3:** | **Overhaul of Front Brake System** |
|---|---|
| Interval: | **Every 5 years** |
| Criticality: | FFEC1 - Evident Effects Safety |
| Maintenance Level (ML): | Authorized shop level |

**Transfer of three PMTR into S3000L database**

# S3000L - Logistic Support Analysis

General analysis process, main steps (focused on **initial** analysis activities):

**Initial** analysis (design & development) → Handling of modification requirements **during the in-service phase**

1. Establishment of **product breakdown** for supportability analysis needs
2. Identification of all **task requirements** (maintenance, operational support, software support, disposal)
3. Identification of **tasks** to cover all identified task requirements
4. Performance of **Maintenance Task Analysis (MTA)**

- Processing of technical product modifications (e.g. triggered by change requests)
- Pr… ma… en…
- Pr… (changed usage scenario normally requires a modified support environment)

… to be presented **after** the bike accident and the corresponding design change

# S3000L - Example product breakdown (1) ⇨ Breakdown elements

1 Establishment of **product breakdown** for supportability analysis needs

| BEI | BE revision | Breakdown Element Name | BE Type | Part identifier * |
|---|---|---|---|---|
| B5-A-00-00-00-00A | 1.0 | Yeti SB5 Beti Assembly214 | Product | YBA-001 |
| B5-A-A0-00-00-00A | 1.0 | SB5 Propulsion General | General | N/A |
| B5-A-A7-00-00-00A | 1.0 | SB5 Transmission System | System | N/A |
| B5-A-A7-10-00-00A | 1.0 | SB5 Gearbox | Subsystem | N/A |
| B5-A-A7-11-00-00A | 1.0 | SB5 Pedal Assembly | Sub-Subsystem | PA-001 |
| B5-A-A7-11-01-00A | 1.0 | SB5 Pedal Right | | |
| B5-A-A7-11-02-00A | 1.0 | SB5 Pedal Left | | |
| B5-A-A7-11-03-00A | 1.0 | SB5 Pedal Gear | | |
| B5-A-A7-12-00-00A | 1.0 | SB5 Rear Gear Assembly | | |
| B5-A-A7-13-00-00A | 1.0 | SB5 Gear Shifter Assembly | | |
| B5-A-A7-13-01-00A | 1.0 | SB5 Gear Shifter Small Gear | Equipment | GSS[illegible]0001 |
| B5-A-A7-13-02-00A | 1.0 | SB5 Gear Shifter Small Gear | Equipment | GSSC[illegible]0001 |
| B5-A-A7-14-00-00A | 1.0 | SB5 Gear Shifter Button Assembly | Sub-Subsystem | GSBA[illegible]001 |
| B5-A-A7-30-00-00A | 1.0 | SB5 Brake System | Subsystem | N/A |
| B5-A-A7-31-00-00A | 1.0 | SB5 Front Brake System | Sub-Subsystem | FBA-0001 |
| B5-A-A7-31-01-00A | 1.0 | SB5 Front Brake Caliper | Equipment | FBCL-0001 |
| B5-A-A7-31-02-00A | 1.0 | SB5 Front Brake Pads | Equipment | BP-0001 |
| B5-A-A7-31-04-00A | 1.0 | SB5 Wheel Brake Disk | Equipment | WBD-0001 |
| B5-A-A7-31-05-00A | 1.0 | SB5 Front Brake Cable Assembly | Equipment | FBCA-001 |
| B5-A-A7-31-06-00A | 1.0 | SB5 Front Brake Lever | Equipment | FBS-0001 |
| B5-A-A7-32-00-00A | 1.0 | SB5 Rear Brake System | Sub-Subsystem | RBA-0001 |
| B5-A-A7-32-01-00A | 1.0 | SB5 Rear Brake Caliper | Equipment | RBCL-0001 |
| B5-A-A7-32-02-00A | 1.0 | SB5 Rear Brake Pad | Equipment | RBP-0001 |
| B5-A-A7-32-04-00A | 1.0 | SB5 Rear Brake Cable | Equipment | RBC-0001 |
| B5-A-A7-32-05-00A | 1.0 | SB5 Rear Brake Shifter | Equipment | RBS-0001 |

Concrete **parts** (represented by a part identifier, if applicable) installed at a specific **installation location** (represented by a **BEI**)

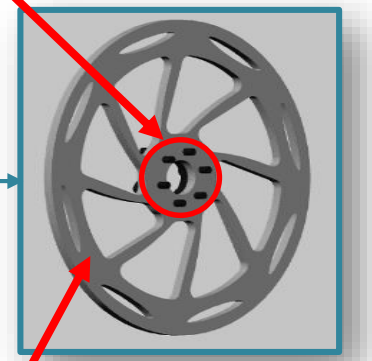
# S3000L Example product breakdown (2) ⇨ Parts and parts list

1 Establishment of **product breakdown** for supportability analysis needs

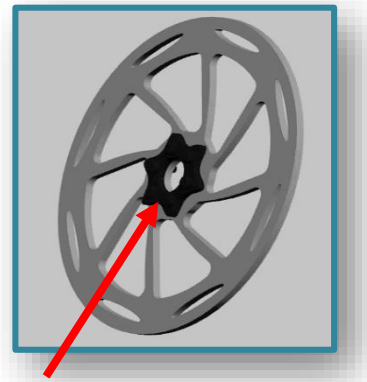
| BEI | BE revision | Breakdown Element Name | BE Type | Part identifier * |
|---|---|---|---|---|
| B5-A-A7-31-00-00A | 1.0 | SB5 Front Brake System | Sub-Subsystem | FBA-0001 |
| B5-A-A7-31-05-00A | 1.0 | **SB5 Wheel Brake Disk** | Equipment | WBD-0001 |

| **Part** name | Type | **Part** number | **Parent** part number (next higher assy) | **Parent** part name |
|---|---|---|---|---|
| Wheel Brake Disk | Part | WBD-0001 | FBA-0001 | Front brake system |
| *Wheel Brake Disk Plate* | *Component* | *WBDP-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Lock* | *Component* | *WBDL-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Bolt* | *Component* | *WBDB-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Bolt* | *Component* | *WBDB-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Bolt* | *Component* | *WBDB-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Bolt* | *Component* | *WBDB-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Bolt* | *Component* | *WBDB-0001* | *WBD-0001* | *Wheel Brake Disk* |
| *Wheel Brake Disk Bolt* | *Component* | *WBDB-0001* | *WBD-0001* | *Wheel Brake Disk* |

Wheel Brake Disk Bolts



Wheel Brake Disk Plate

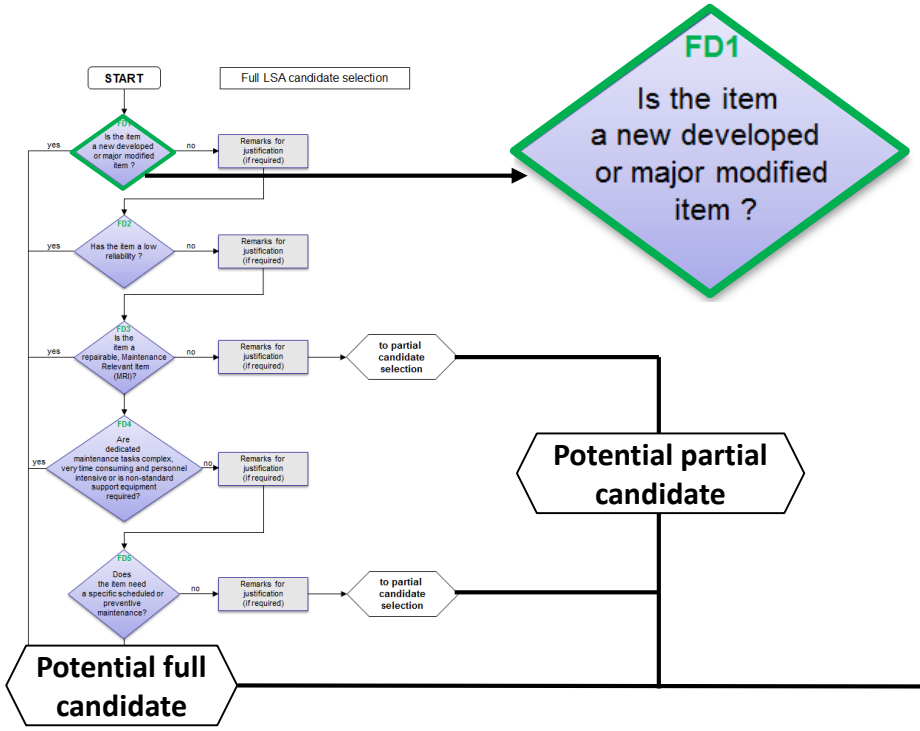


Wheel Brake Disk Lock

# S3000L - Example Product breakdown (3) ⇨ LSA candidate selection

**1** Establishment of **product breakdown** for supportability analysis needs

All elements from the product breakdown (**breakdown elements and parts**) are analyzed whether they are LSA candidates




| BEI (Breakdown Element Identifier) | BE revision | Breakdown Element Name | BE Type | LSA Cand. | PartNumber |
|---|---|---|---|---|---|
| B5-A-00-00-00-00A | 1.0 | Yeti SB5 Beti Assembly214 | Product | Full | YBA-001 |
| B5-A-A0-00-00-00A | 1.0 | SB5 Propulsion General | General | None | N/A |
| B5-A-A7-00-00-00A | 1.0 | SB5 Transmission System | System | None | N/A |
| B5-A-A7-10-00-00A | 1.0 | SB5 Gearbox | Subsystem | None | N/A |
| B5-A-A7-11-00-00A | 1.0 | SB5 Pedal Assembly | Sub-Subsystem | None | PA-001 |
| B5-A-A7-11-01-00A | 1.0 | SB5 Pedal Right | Equipment | Full | PR-0001 |
| B5-A-A7-11-02-00A | 1.0 | SB5 Pedal Left | Equipment | Full | PL-0001 |
| B5-A-A7-11-03-00A | 1.0 | SB5 Pedal Gear | Equipment | Full | PG-0001 |
| B5-A-A7-12-00-00A | 1.0 | SB5 Rear Gear Assembly | Sub-Subsystem | None | GA-0001 |
| B5-A-A7-13-00-00A | 1.0 | SB5 Gear Shifter Assembly | Sub-Subsystem | Full | GSA-0001 |
| B5-A-A7-13-01-00A | 1.0 | SB5 Gear Shifter Small Gear | Equipment | Full | GSSG-0001 |
| B5-A-A7-13-02-00A | 1.0 | SB5 Gear Shifter Small Gear | Equipment | Full | GSSG-0001 |
| B5-A-A7-14-00-00A | 1.0 | SB5 Gear Shifter Button Assembly | Sub-Subsystem | Partial | GSBA-0001 |
| B5-A-A7-30-00-00A | 1.0 | SB5 Brake System | Subsystem | **None** | N/A |
| B5-A-A7-31-00-00A | 1.0 | SB5 Front Brake System | Sub-Subsystem | **Full** | FBA-0001 |
| B5-A-A7-31-01-00A | 1.0 | SB5 Front Brake Caliper | Equipment | **Full** | FBCL-0001 |
| B5-A-A7-31-02-00A | 1.0 | SB5 Front Brake Pads | Equipment | **Full** | BP-0001 |
| B5-A-A7-31-05-00A | 1.0 | SB5 Wheel Brake Disk | Equipment | **Full** | WBD-0001 |
| B5-A-A7-31-04-00A | 1.0 | SB5 Front Brake Cable Assembly | Equipment | **Full** | FBCA-001 |
| B5-A-A7-31-06-00A | 1.0 | SB5 Front Brake Lever | Equipment | **Full** | FBL-0001 |

# S3000L - Maintenance Task requirements

2 Identification of all task requirements (maintenance, operational support, software support, disposal)

**Sources for task requirements** are, beyond others, technical analysis activities in the environment of Maintainability/Reliability:

- FMEA/FMECA
- Damage Analysis
- Preventive Maintenance Analysis
- Special Event Analysis

| BEI | BEI revision | Part identifier | BE name | Task requirement Identifier | Task requirement source | Task requirement description | Interval/threshold |
|---|---|---|---|---|---|---|---|
| B5-A-B3-51-01-00A | 1.0 | FW-1000-2FG | Front Wheel | PMTR51 | Tech FMEA | Check tire pressure | Before bike operation |
| B5-A-B3-51-01-00A | 1.0 | FW-1000-2FG | | | | r tube or tire | not applicable |
| B5-A-B3-51-01-00A | 1.0 | FW-1000-2FG | | | | r tube or tire | not applicable |
| ... | ... | ... | ... | ... | ... | ... | ... |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | TR00001 | Tech FMEA | Test Front Brake System | not applicable |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | TR00002 | Tech FMEA | Fault location on Front Brake System | not applicable |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR1 | PMA | Operational test of Front Brake System by activation of Front Brake Lever | Before bike operation |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR2 | PMA | Inspection of Front Brake System hydraulic fluid | 6 months |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR3 | PMA | Overhaul of Front Brake System | 5 years |
| B5-A-A7-32-05-00A | 1.0 | FBL-0001 | Front Brake Lever | TR00004 | Tech FMEA | Replace Front Brake Lever | not applicable |
| B5-A-A7-32-05-00A | 1.0 | FBL-0001 | Front Brake Lever | TR00005 | Tech FMEA | Repair Front Brake Lever | not applicable |
| B5-A-A7-31-04-00A | 1.0 | FBCA-001 | Front Brake Tube | TR00006 | Tech FMEA | Replace Front Brake Tube | not applicable |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | TR00007 | Tech FMEA | Replace Front Wheel Brake | not applicable |
| B5-A-A7-31-01-00A | 1.0 | FBCL-0001 | Front Brake Caliper Assembly | TR00008 | Tech FMEA | Replace Front Brake Caliper Assembly | not applicable |
| B5-A-A7-31-02-00A | 1.0 | BP-0001 | Front Brake Pads | TR00009 | Tech FMEA | Replace Front Brake Pads | not applicable |
| B5-A-A7-31-01-00A | 1.0 | FBCL-0001 | Front Brake Caliper Assembly | TR00010 | Tech FMEA | Repair Front Brake Caliper Assembly by replacement of brake pistons | not applicable |
| B5-A-A7-31-01-00A | 1.0 | FBCL-0001 | Front Brake Caliper Assembly | TR00011 | Tech FMEA | Repair Front Brake Caliper Assembly by replacement of caliper cap sealing | not applicable |
| ... | ... | ... | ... | ... | ... | ... | ... |

Let's focus on the Front Break System

# S3000L - Example (1) ⇨ task identification + MTA (resources)

2 Identification of all **task requirements** (maintenance, operational support, software support, disposal)

3 Identification of **tasks** to cover all identified task requirements

- **Pre-ride bike check**
  LSA candidate: **B5-A-00-00-00-00A**
  Covering PMA **PMTR1** task requirement

| | | | | | | |
|---|---|---|---|---|---|---|
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR1 | PMA | Operational test of Front Brake System by activation of Front Brake Lever | Before bike operation |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR2 | PMA | Inspection of Front Brake System hydraulic fluid | 6 months |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR3 | PMA | Overhaul of Front Brake System | 5 years |

| BEI | BE revision | Part Identifier | Part name | Task ID | Task Req. | Task name | Task type | Task revision | Spare part / Consumable Identifier | Spare part / Consumable Name | Support Equipment (SE) | Conditions and safety | ML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **B5-A-00-00-00-00A** | **1.0** | **YBA-001** | **Yeti SB5 Beti Assembly214** | T00001 | PMTR1 | Pre ride bike check | Rectifying | 1.0 | | | | Hold the mountain bike secure for easy work | ML1 |

**Identification** of tasks

**MTA** - accumulated resources

# S3000L - Example (1) ⇨ MTA (personnel, task description)

4 Performance of **Maintenance Task Analysis (MTA)**

- **Pre-ride bike check**
  LSA candidate: **B5-A-00-00-00-00A**
  Covering S4000P PMTR1 requirement

| Subtask identifier | Subtask description | Skill | Trade | Qty | Labour time [min] | Subtask duration [min] |
|---|---|---|---|---|---|---|
| | | Inter-mediate | MECH | | | On the job |
| *T00001-01* | Check tyre pressure before riding. | | | 1 | 1 | 1 |
| *T00001-02* | Remove small pieces of flint that may have lodged in the tyres. | | | 1 | 2 | 2 |
| *T00001-03* | Check your stem and handlebars (especially where they meet). Check for signs of surface damages which are beyond mere scratches. | | | 1 | 4 | 4 |
| *T00001-04* | Check crank by making them parallel to the ground and holding each one. Check whether it can be pulled or pushed to the left or to the right (when looking from above). If possible, this indicates wear in the bearing of the bottom bracket. | | | 1 | 2 | 2 |
| *T00001-05* | Check pedals for movement and make sure that the chain rings aren't bent. | | | 1 | 2 | 2 |
| *T00001-06* | Check for smooth gear changes. Gear cables should be clean and without signs of corrosion. The pivot points on the derailleurs should move freely. | | | 1 | 4 | 4 |
| *T00001-07* | Check brake pads for sufficient life left for the duration and conditions of the planned ride (most pads have ware indicators to support the decision) | | | 1 | 4 | 4 |
| *T00001-08* | Pull lever and check equal brake pads contact to the rim to ensure even wear. Try to move the bike and verify the correct function of the brake. | | | 1 | 2 | 2 |

Task **description**

**MTA** - personnel

# S3000L - Example (2) ⇨ task identification + MTA (resources)

2 Identification of all **task requirements** (maintenance, operational support, software support, disposal)

3 Identification of **tasks** to cover all identified task requirements

- **Replace front brake pads**
  LSA candidate: **B5-A-A7-31-02-00A**
  Covering task requirement **TR-00009** from **Tech FMEA**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B5-A-A7-31-02-00A | 1.0 | BP-0001 | Front Brake Pads | TR00009 | Tech FMEA | Replace Front Brake Pads | not applicable |

| BEI | BE revision | Part Identifier | Part name | Task ID | Task Req. | Task name | Task type | Task revision | Spare part / Consumable Identifier | Spare part / Consumable Name | Support Equipment (SE) | Support Equipment name | Conditions and safety | ML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **B5-A-A7-31-02-00A** | **1.0** | **BP-0001** | **Front Brake Pads** | T00002 | TR-00009 | Replace Front Brake Pads | Rectifying | 1.0 | PC-1000<br>ISO4762-MAX40-Steel 10,9<br>BP-0001 | Paper cloth<br>Bolt<br>Brake Pad Set | BST-001<br>ALLKEY5MM<br>PLI-001 | Bike stand special tool<br>5mm allen key<br>Pliers | (1) Hold the mountain bike secure for easy work<br>(2) Do not actuate brake when the wheel is removed (this would cause a bleeding of the brake unit) | ML1 |

**Identification** of tasks

**MTA** - accumulated resources

# S3000L – Example (2) ⇨ MTA (personnel, task description)

4 Performance of **Maintenance Task Analysis (MTA)**

- **Replace front brake pads**
  LSA candidate: **B5-A-A7-31-02-00A**
  Complete task covering task requirement **TR-00009** from **Tech FMEA**

| Subtask Identifier | Subtask description | Skill | Trade | Qty | Labour time [min] | Subtask duration [min] |
|---|---|---|---|---|---|---|
| | | A-Basic | MECH | | | On the job |
| T00002-01 | Remove front wheel (refer to B5-A-B3-51-01-00A-520A-D) | | | 1 | 3 | 3 |
| T00002-02 | Remove old Front Brake Pads (refer to B5-A-A7-31-02-00A-520A-D) | | | 1 | 3 | 3 |
| T00002-03 | Clean both caliper surfaces with paper cloth | | | 1 | 2 | 2 |
| T00002-04 | Install new Front Brake Pads (refer to B5-A-A7-31-02-00A-720A-D) | | | 1 | 5 | 5 |
| T00002-05 | Install front wheel (refer to B5-A-B3-51-01-00A-720A-D) | | | 1 | 4 | 4 |
| T00002-06 | Test Front Brake System (refer to B5-A-A7-31-00-00A-320A-D) | | | 1 | 2 | 2 |

Task **description** — **MTA** - personnel

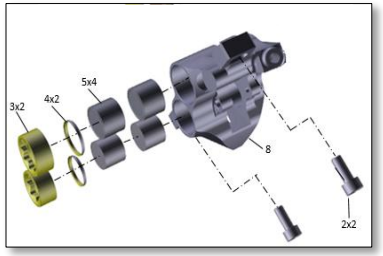
**The MTA information of the identified and analysed tasks is forwarded to:**

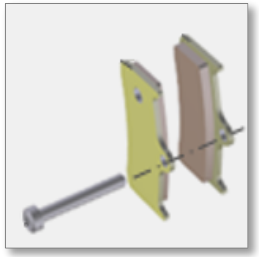
# Product breakdown (Engineering/Installation)

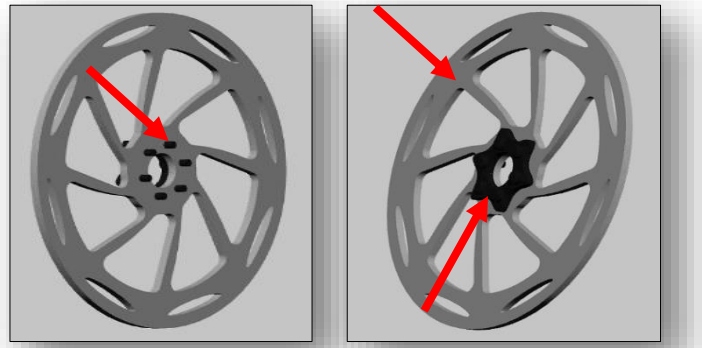
Sub-Subsystem | HW breakdown element | **Supplier parts**

**Examples for Illustrated Parts Catalogue (IPC) on the next slides**

- **B5-A-A7-30-00-00A** SB5 Brake System
  - **B5-A-A7-31-00-00A** SB5 Front Brake System
    - **FBA-0001** Front Wheel Brake
    - **B5-A-A7-31-01-00A** SB5 Front Brake Caliper
      - FBPB-0001
      - FBPB-0001
      - FBPB-0001 Front Brake Pad Bolt
    - **B5-A-A7-31-02-00A** SB5 Front Brake Pads
      - **BP-0001** Front Brake Pads
        - **ISO4762-MAX40-Steel 10,9** Front Brake Pad Bolt
    - **B5-A-A7-31-04-00A** SB5 Front Brake Cable Assembly
      - FBPB-0001
      - FBPB-0001
      - FBPB-0001 Front Brake Pad Bolt
    - **B5-A-A7-31-05-00A** SB5 Wheel Brake Disk
      - **WBD-0001** Wheel Brake Disk
        - **WBDP-0001** Wheel Brake Disk Plate
        - **WBDL-0001** Wheel Brake Disk Lock
        - **WBDB-0001** Wheel Brake Disk Bolt
        - Wheel Brake Disk Bolt
        - Wheel Brake Disk Bolt
        - Wheel Brake Disk Bolt
        - Wheel Brake Disk Bolt
        - Wheel Brake Disk Bolt
    - **B5-A-A7-31-06-00A** SB5 Front Brake Lever
      - FBPB-0001
      - FBPB-0001
      - FBPB-0001 Front Brake Pad Bolt
  - **B5-A-A7-32-00-00A** SB5 Rear Brake System





# Illustrated Parts Catalogue (IPC) Mountain Bike (1)

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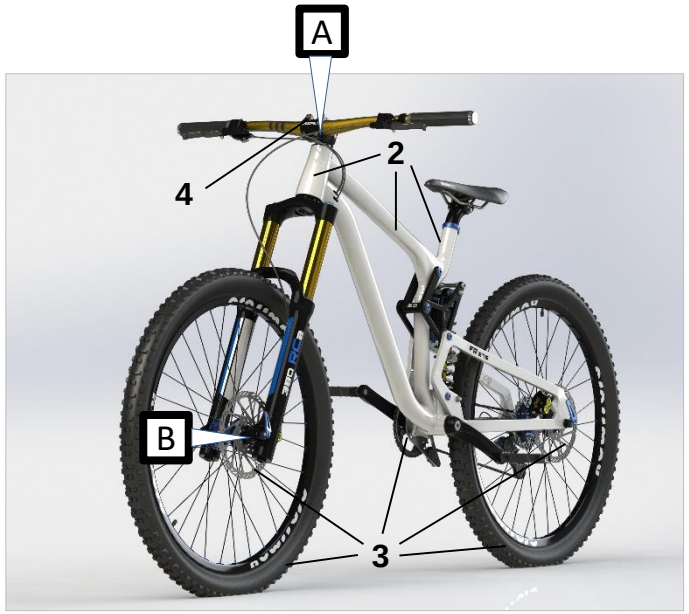


**FIG. 01 - MOUNTAIN BIKE**

ICN-B6865-10001-001-01 UNCLASSIFIED

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA / UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | 1 | | YBA-001 | B6865 | MOUNTAIN BIKE | | | 1 EA | | PAOOF |
| 001 | 2 | | TMS-0001 | B6865 | TRANSMISSION SYSTEM | | | 1 EA | | PAOOF |
| 002 | 2 | | FS-0000 | B6865 | FRAME SYSTEM | | | 1 EA | | PAOOF |
| 003 | 2 | | STW-0000 | B6865 | SUSPENSION / TRACK / WHEELS SYSTEM | | | 1 EA | | PAOOF |
| 004 | 2 | | SS-0000 | B6865 | STEERING SYSTEM | | | 1 EA | | PAOOF |

UNCLASSIFIED FIG 01

# Illustrated Parts Catalogue (IPC) Mountain Bike (2)

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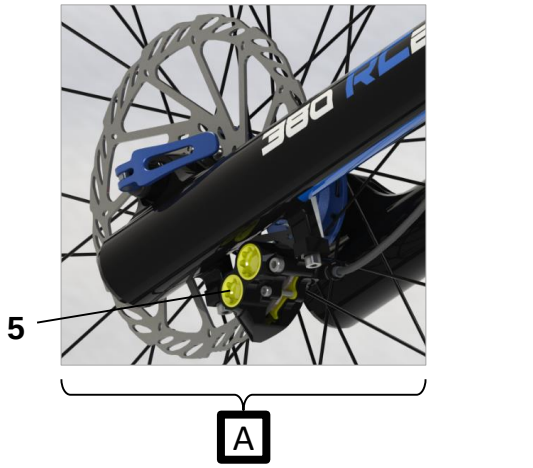


**FIG. 02 - BRAKE SYSTEM**

ICN-B6865-10002-001-01 UNCLASSIFIED

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA | UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 000 | 1 | | YBA-001 | B6865 | BRAKE SYSTEM (REF TO FIG 02) | | | AR | EA | | PAOOF |
| 001 | 2 | | FBA-0001 | B6865 | FRONT WHEEL BRAKE (REF TO FIG 03 / BEI B5-A-A7-31-00-00A) | | | 1 | EA | | PAOOF |
| 002 | 3 | | FBL-0001 | B6865 | FRONT BRAKE LEVER | | | 1 | EA | | PAOOF |
| 003 | 4 | | BKO-10004-A | H9RT5 | OIL HYDRAULIC | | | 1 | EA | | PAOOF |
| 004 | 4 | | ORS-009-A | DDF57 | OIL RESERVOIR | | | 1 | EA | | PAOOF |
| 005 | 4 | | COV-0008-B | NM12A | COVER | | | 1 | EA | | PAOZZ |
| 006 | 4 | | ISO4762-MAX30-A3 | I9006 | SCREW | | | 1 | EA | | PAOZZ |
| 007 | 4 | | BLL-009-2 | H1T06 | BRAKE LEVER LEFT | | | 1 | EA | | PAOZZ |
| 008 | 3 | | FBT-003-E21 | BAW12 | FRONT BRAKE TUBE | | | 1 | EA | | PAOOF |
| 009 | 4 | | BT-10000-401 | BAW12 | BRAKE TUBE | - 4 | | 1 | EA | | PAOZZ |
| 009 | 4 | | BT-10000-403 | BAW12 | BRAKE TUBE | 4 - | | 1 | EA | | PAOZZ |
| ... | ... | ... | ... | ... | etc ..... | ... | | ... | ... | | ... |

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# Illustrated Parts Catalogue (IPC) Mountain Bike (3)

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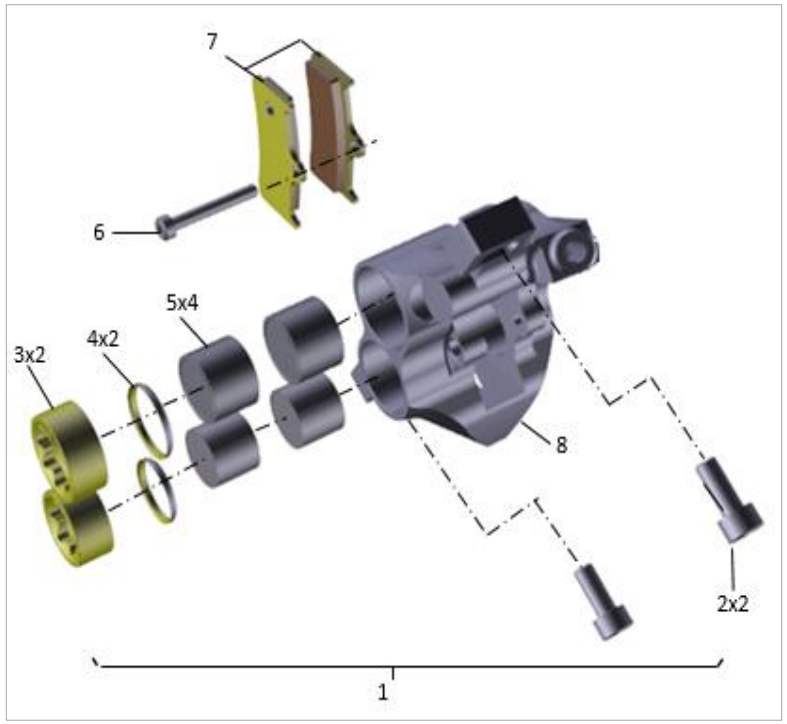


**FIG. 03 - FRONT WHEEL BRAKE (SHEET 1 OF 2)**

ICN-B6865-10002-001-01 UNCLASSIFIED

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA / UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | 1 | | FBA-0001 | B6865 | FRONT WHEEL BRAKE (REF TO FIG 03 / BEI B5-A-A7-31-00-00A) | | | AR EA | | PAOOF |
| 001 | 1 | | FBCL-0001 | H1T06 | BRAKE CALIPER | | | 1 EA | | PAODD |
| 002 | 2 | | ISO4762-M8X60-A2 | I9006 | SCREW,CAP,SOCKET HEAD | | | 2 EA | | PAOZZ |
| 003 | 2 | | CC-45-02 | H1T06 | CALIPER CAP | | | 2 EA | | PAOZZ |
| 004 | 2 | | CC-55-02 | H1T06 | CALIPER CAP SEALING | | | 2 EA | | PAOZZ |
| 005 | 3 | | BP-2000-9F | H1T06 | BRAKE PISTON | | | 4 EA | | PAOZZ |
| 006 | 3 | | ISO4762-MAX40-STEEL 10.9 | I9006 | BOLT | | | 1 EA | | PAOZZ |
| 007 | 3 | | BP-0001 | D2635 | BRAKE PAD SET (CONTAINS 2 PARTS) | | | 1 EA | | PAOZZ |
| 008 | 3 | | BCH-0003-9 | H1T06 | BRAKE CALIPER HOUSING | | | 1 EA | | PAOZZ |

UNCLASSIFIED FIG 03

# Illustrated Parts Catalogue (IPC) Mountain Bike (4)

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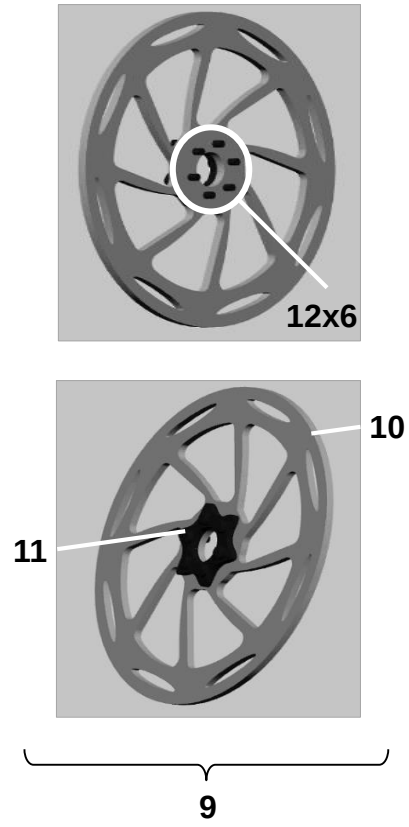



**FIG. 03 - FRONT WHEEL BRAKE (SHEET 2 OF 2)**

ICN-B6865-10002-001-01 UNCLASSIFIED

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA / UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| 009 | 2 | | WBD-0001 | H1T06 | BRAKE DISK ASSY | | | 1 EA | | PAOOF |
| 010 | 3 | | WBDP-0001 | H1T06 | BRAKE DISK PLATE | | | 1 EA | | PAODD |
| 011 | 3 | | WBDL-0001 | H1T06 | BRAKE DISK LOCK | | | 1 EA | | PAOZZ |
| 012 | 3 | | ISO4762-MAX20-STEEL 10.9 | I9006 | BOLT | | | 6 EA | | PAOZZ |

UNCLASSIFIED FIG 04

# S2000M Initial Provisioning Data

**In addition to the engineering breakdown, the following will also be considered:**

- Raw materials
- Consumables
- Repair kits

- Support equipment, tools and test equipment
- Shipment/Storage parts
- Category 1 (Special-to-Type) containers

**Note:** Initial Provisioning Data will be compiled **for all type of material** (e.g. mechanical parts, electrical components, electronic parts, avionic parts, structural parts)

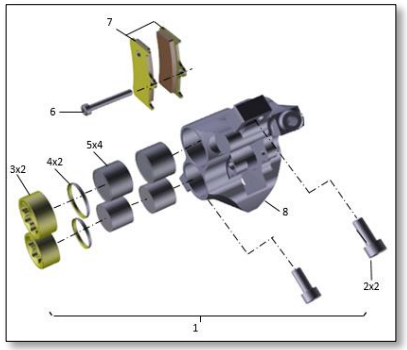
# Hardware/System identification - Product breakdown

S3000L Product breakdown → S1000D

**Brake system**
B5-A-A7-30-00-00A

**Front brake system**
B5-A-A7-31-00-00A

- **Front Brake Caliper** B5-A-A7-31-01-00A
- **Front Brake Pads** B5-A-A7-31-02-00A
- **Front Brake Cable Assembly** B5-A-A7-31-04-00A
- **Wheel Brake Disk** B5-A-A7-31-05-00A
- **Front Brake Shifter** B5-A-A7-31-06-00A




**Rear brake system**
B5-A-A7-32-00-00A

- **Rear Brake Caliper** B5-A-A7-32-01-00A
- **Rear Brake Pads** B5-A-A7-32-02-00A
- **Rear Brake Cable Assembly** B5-A-A7-32-04-00A
- **Wheel Brake Disk** B5-A-A7-32-05-00A
- **Rear Brake Shifter** B5-A-A7-32-06-00A

# Illustrated Parts Data (IPD) - Data modules (chapterized)

S2000M

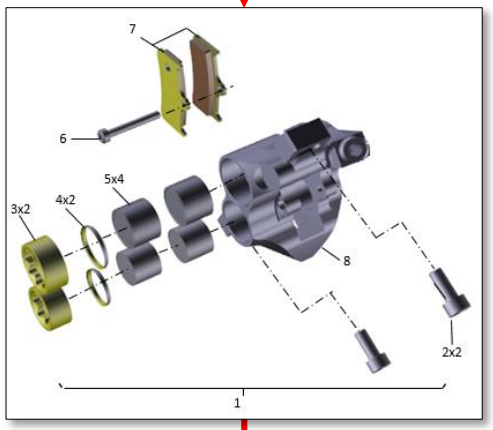
**Mountain bike - Illustrated parts data**
**B5-A-00-00-00-010-941A-D_001-00**

010: *Figure number & variant*

**Brake system - Illustrated parts data**
**B5-A-A7-30-00-010-941A-D_001-00**

**Front brake system - Illustrated parts data**
**B5-A-A7-31-00-010-941A-D_001-00**

**Design data**




**Front brake system - Description of how it is made**
**B5-A-A7-31-00-00A-041A-D_001-00**

# Maintenance planning - Data modules

Based on the maintenance planning information the **respective schedule data modules** will be produced.

Inspection tasks in relation to a limit/event (one data module per limit/event with all tasks)

**Mountain bike - Inspection**
**B5-A-05-40-00-00A-000A-D_001-00**

The pre-ride inspection tasks related to „**MOUNTAIN BIKE**“ are included in this data module. Based on S4000P (PMTR1) and S3000L (LSA candidate B5-A-00-00-00-00A) also the task:

- **Operational test of Front Brake System by activation of Front Brake Lever**

**Front brake system - Inspection**
**B5-A-05-40-00-01A-000A-D_001-00**

The 5-years-inspection tasks for the system „**FRONT BRAKE**“ are included in this data module. Based on S4000P (PMTR3) and S3000L (LSA candidate B5-A-A7-31-00-00A) also the task:

- **Overhaul Front Brake System**

All inspection tasks in relation to a certain system/ subsystem

**Front brake system - Maintenance lists**
**B5-A-05-20-A7-31A-000A-D_001-00**

All maintenance/inspection tasks relevant for system „**FRONT BRAKE**“ are listed in this data module. Based on S4000P (PMTR2 & PMTR3) and S3000L (LSA candidate B5-A-A7-31-00-00A) also the task:

- **Inspection of Front Brake System hydraulic fluid**
- **Overhaul Front Brake System**

All items with a time limit in relation to a system/ subsystem

**Front brake system - Time limits**
**B5-A-05-10-A7-31A-000A-D_001-00**

All items with a time limit in relation to Front Brake System
Example: **Brake pads**

- limitType = **On condition**
- threshold = **One month**

# Maintenance tasks - Data modules

Based on corrective maintenance task requirement (**TR00009**) and S3000L maintenance task analysis (LSA candidate **B5-A-A7-31-02-00A**) the following task is defined: „**Replace front brake pads**“:

**Front brake pads - Replace procedure**
**B5-A-A7-31-02-00A-921A-D_001-00**

| | |
|---|---|
| Maintenance level | ML2 (user garage) |
| Required conditions: | • Hold bike secure for easy work<br>• Do not actuate the brakes if the front wheel is removed |
| Required persons:<br>Skill level:<br>Trade: | 1<br>A-Basic<br>MECH |
| Estimated time: | 25 min |
| Required Support Equipment: | – Bike stand special tool (BST-001)<br>– 5mm allen key (ALLKEY5MM)<br>– Pliers (PLI-001) |
| Required supplies: | – Paper cloth |
| Required spares: | – Front brake pads (BP-0001)<br>– Bolt (ISO4762-MAX40-Steel 10,9) |

**Based on Maintenance Task Analysis (MTA) in S3000L the steps will be produced in the procedural data module.**

**Example:**

**Preliminary requirements**
– Remove front wheel (**refer to** ***B5-A-B3-51-01-00A-520A-D***)

**Steps:**
– Remove old Front Brake Pads (**refer to** ***B5-A-A7-31-02-00A-520A-D***)
– Clean both caliper surfaces with paper cloth
– Install new Front Brake Pads (**refer to** ***B5-A-A7-31-02-00A-720A-D***)

**Closeup**
– Install front wheel (**refer to** ***B5-A-B3-51-01-00A-720A-D***)
– Test Front Brake System (**refer** to ***B5-A-A7-31-00-00A-320A-D***)

Hyperlink

Hyperlink

**Wheel front - Remove procedure**
**B5-A-B3-51-01-00A-520A-D_001-00**

**Steps:**
– Unscrew the Front Brake Pad Bolt that fix the pads to the caliper
– Extract pads from the caliper

**Wheel front - Install procedure**
**B5-A-B3-51-01-00A-720A-D_001-00**

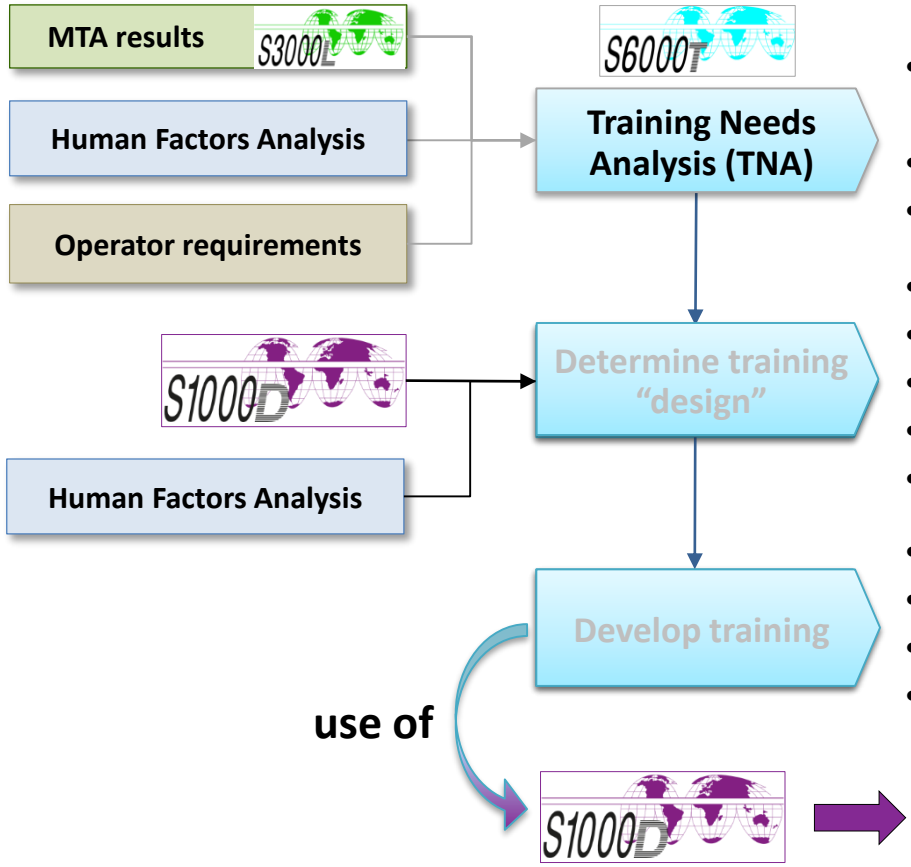
**Steps:**
– Insert the two pads into the caliper
– Screw the Front Brake Pad Bolt that fix the pads to the calliper

# S6000T - the main process

## General analysis and training development process:

**Initial** analysis (design & development phase)

*LMS = Learning Management System*
*SCORM = Sharable Content Object Reference Model*




- **Training situation analysis**: Analyze operational environment, existing training capabilities and potential gaps
- Identify **tasks** to be trained (input from MTA/LSA database)
- Define task **classification** (difficult/simple, frequency, important for product operability)

- Identify background concerning **experience** and **educational** needs
- Develop **training objectives** (including conditions for performance)
- Determine required **media** (including technical publications)
- **Sequence** the training objectives into learning objectives
- Describe **IT requirements** (e.g. LMS or reporting system)

- Develop **learning content** (training material)
- **Assemble/group** learning objects and **structure** learning courses
- Implement **sequencing** requirements
- Define required **data**

⇨ Learning Data Modules
⇨ SCO Content Data Modules
⇨ SCPM (SCORM Publication Modules)

# S6000T - Training situation, task selection and task analysis, TNA (1)

**Training Needs Analysis (TNA)**

## Excerpt from training situation analysis result

- Formal training on mountain bike **recommended** due to complexity of the product
- **Advanced technology** (hydraulic brake), which was not installed in previous mountain bike models, requires **new skills** for mountain bike maintainers
- …

## Task selection from LSA task list

| BE identifier | Task ID | Task name | Difficulty | Importance | Frequency | DIF decision | Analyst decision | Task type | Skill decay |
|---|---|---|---|---|---|---|---|---|---|
| B5-A-00-00-00-00A | T00001 | Perform pre-ride bike check | normal | moderate | often | no train | no train | Individual task | Low |
| **B5-A-A7-31-02-00A** | **T00002** | Replace front brake pads | moderate | high | low | train | train | Individual task | Medium |

## Task analysis : «Replace front brake pads " …»

| Task ID | Task name | Skill decay | Knowledge/ Skill level | Knowledge/Skill description |
|---|---|---|---|---|
| **T00002** | Replace front brake pads | Medium | **Knowledge** | Locate brake pads |
| | | | **Comprehension** | Explain how the brakes work |
| | | | **Perceptual** | Perform the procedure to replace the brake pads |

Subtask analysis : «Replace front brake pads …» (next slide)

# S6000T - Subtask analysis, TNA (2)

**Training Needs Analysis (TNA)**

| Task ID | Task name |
|---|---|
| **T00002** | Replace front brake pads |

Training Needs Analysis (TNA) can be extended **down to the lowest level of activity performance** ⇨ each subtask/working step within a maintenance or operations support task can be analyzed.

| Subtask description | Knowledge/Skill level | Knowledge/Skill description |
|---|---|---|
| Remove front wheel | *Refer to TNA for wheels* | *Refer to TNA for wheels* |
| Remove pads | **Knowledge** | Locate brake pads |
| | **Comprehension** | Explain functions of brake pads |
| | **Perceptual** | Use pad pusher |
| | **Perceptual** | Use allen wrench |
| Clean caliper surface | **Comprehension** | Explain function of brake disc |
| | **Perceptual** | Clean the caliper |
| Install pads | *Refer to „remove pads“* | *Refer to „remove pads“* |
| Install front wheel | *Refer to TNA for wheels* | *Refer to TNA for wheels* |
| Test front brake system | **Analyze** | Evaluate proper brake operation |

# S6000T - Determine Objectives/Media

**Determine training "design"** → **Develop training**

*PO: Performance Objective*
*TLO: Terminal Learning Objective*
*ELO: Enabling Learning Objective*
*ICW: Interactive Course Ware*

| Objective ID | Objective Type | Objective Title | Primary Media |
|---|---|---|---|
| **T00002.1** | PO | **Perform procedure to replace brake pad set** | Maintenance trainer |
| **T00002.1.1** | TLO | Given a scenario correctly identify the steps necessary to replace brake pad set | ICW-3 |
| **T00002.1.1.1** | ELO | Given a list of parameters correctly describe the operation of the brake system | ICW-1 |
| **T00002.1.2** | TLO | Using and in accordance with applicable publications, the student will demonstrate the knowledge and ability to remove the pads | ICW-3 |
| **T00002.1.2.1** | ELO | Given a model of the front brake, correctly identify the location of brake pads | ICW-1 |
| … | … | … | … |

S1000D

Front brake system - Description of how it is made
B5-A-**A7-31-00-00A-**041A-D_001-00

→ S1000D SCORM

Learning content ⇨ Learning Data Module
B5-A-**A7-31-00-00A-**041A-A-**T40C**_001-00

Front brake pads - Replace procedure
B5-A-**A7-31-02-00A-**921A-D_001-00

→

Ability to perform ⇨ SCO Content Data Module
B5-A-**A7-31-02-00A-**921A-A-**T40C**_001-00

# Story of the bike accident

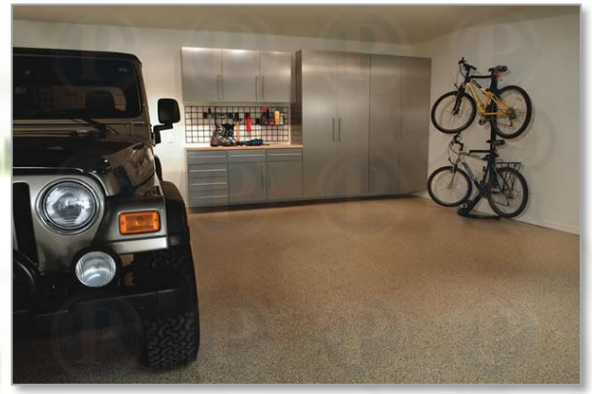
## AFTER A LITTLE COFFEE BREAK ...

***On a sunny Sunday morning, Hans-Dieter decided to take his three years old mountain bicycle ('Yeti SB5') for the first tour of the new mountain bike season.***

# Story of the bike accident

***During the last two years his bicycle was stored close to his car in the garage with humidity about an average level.***
***Prior to the first tour he checked in accordance with the instructions of the bike handbook:***

- ***the tyre pressures and condition***
- ***the hydraulic liquid reservoirs of the brakes for leakage***
- ***the operation of the brake system by activation of the brake levers***



***The planned tour was a real challenge, because it was the same as the Mountain Bike World Championship, which took place in June 2000 in the Sierra Nevada. The sun beats down from a cloudless sky, as our cycling friend set off.***

***Full of anticipation, Hans-Dieter stepped into the pedals and attacked the serpentine road.***

***After one hour, the asphalt was too boring and he turned into a forest path. At that time there was no sign of failure on his bike.***

# Story of the bike accident

***He noticed after the first longer downhill period that the front brakes were subject to a functional failure because they were not responding as positively as usual and they released only after a little time delay.***

***Our mountain biker just shrugged and rode on; nothing should be wrong as the bike had not been used in a serious way during the last two years.***

***His route led him ever higher until he arrived at the summit. Our friend took a deep breath and enjoying the sun on his back plunged down the mountain path.***
***Hans-Dieter took the first curves and as his speed increased he had to activate the front and rear brake intensively before the next curve. The front brake failed to release after the activation and he was thrown in a high arc over the front of his bike.***

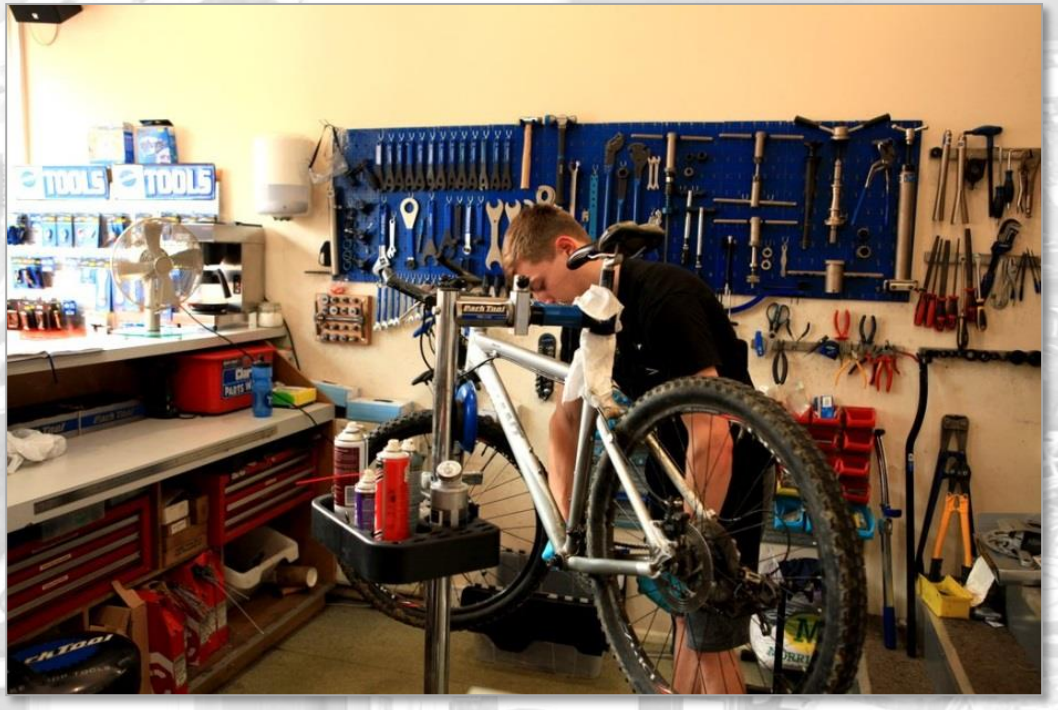
***The world around him was black and he sank into deep unconsciousness.***

***The damaged bike was not far from his still body, and thankfully to he was found relatively quickly. Hans-Dieter was flown to a nearby hospital by the mountain rescue service.***

# Story of the bike accident

***After the accident Hans-Dieter sent his mountain bike to a well-known mountain bicycle shop for a detailed failure cause investigation and for a repair cost assessment.***

***In addition, the manufacturer, Yeti, was informed about potential legal consequences and/or claims for repair costs in case obvious manufacturer design and/or user manual failure(s) were identified.***



# Accident reporting

You cannot know if something has happened if you are not told and have no information.

It can be routine stuff… Or perhaps not!

**Event**

| Event Id | Confirmed status | Description | Event group | Occurrence date & time | Severity | Reported by | Affected item | Location | Product usage phase | Related to Event |
|---|---|---|---|---|---|---|---|---|---|---|
| EV2331 | Confirmed 30/07/2022 16:30 | Mountain bike departed from hotel Nevada for mountain trail. | Operational | 30/07/2022 10:00 | None | Hans-Dieter (Yeti Beti App) | YBSB5 serial 46 | Hotel Nevada, Sierra Nevada, Spain | Start | Before event EV2347 |
| EV2347 | Confirmed 30/07/2022 16:30 | Mountain bike left the road and crashed against tree. Witnesses report high speed. Driver unconscious and cannot declare. Evacuated to nearest hospital. | Accident | 30/07/2022 11:22 | Critical | Police | YBSB5 serial 46 | AL-4402, Ohanes, Sierra Nevada, Spain | Descent | After event EV2331 |

Before you take any kind of action you NEED to find out WHAT has happened!

What damages?

What are the consequences?

**Consequence**

| Event Identifier | Consequence type | Consequence description |
|---|---|---|
| EV2347 | INJ | Personal injuries |
| EV2347 | MAT | Mountain bike inoperable, requires repair. |

**Damage due to Event**

| Event Identifier | Damage Id | Damage family | Damage description | Estimated cost | Damage status |
|---|---|---|---|---|---|
| EV2347 | DMG52 | Personal injuries | Driver unconscious; unknown injuries | | Confirmed 30/7/2022 16:30 |
| EV2347 | DMG53 | Mechanical | Front wheel bent | 180,00 € | Confirmed 30/7/2022 16:30 |
| EV2347 | DMG54 | Aesthetic | Paint scratched | 75,00 € | Confirmed 30/7/2022 16:31 |
| EV2347 | DMG55 | Personal injuries | Driver - broken leg | | Preliminary 30/7/2022 18:15 |
| EV2347 | DMG56 | Personal injuries | Driver - broken arm | | Unconfirmed 30/7/2022 18:15 |
| EV2347 | DMG57 | Mechanical | Left pedal broken | | Preliminary 30/7/2022 20:15 |
| EV2347 | DMG58 | Mechanical | Saddle torn | | Unconfirmed 30/7/2022 20:15 |

# There is a process for accidents ...

First, we report the accident to the authorities, by creating a safety issue

**Safety Issue**

| Document Id | Title | Description | Status | Creation date | Document type | Safety criticality | Reporting date | Assessment by | First identification | Applicable to Product variant | Applicable to PV Identifier | Associated to Event |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SISS20220730A | Mountain bike Yeti SB5 Beti Brake failure | Accident caused by Mountain Bike Yeti SB5 Beti experiencing | Engineering investigation pending | 30/07/2022 | Safety issue | Major | 30/07/2022 | Yeti Beti | 30/07/2022 11:22 | Yeti SB5 Beti | YBSB5 | EV2347 |

Then, of course, we inform the users about potential issues with the bike.

**Safety warning**

| Document Identifier | Associated to safety Issue | Title | Description | Status | Creation date | Document type | Safety criticality | Priority | Applicability dates | Applicable to Product variant | Applicable to PV Identifier |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SW16013 | SISS20220730A | Mountain Bike Yeti SB5 Beti safety warning | Mountain Bike Yeti SB5 Beti might experience problems with brakes, causing loss of braking capability and potential accident.<br>Preliminary recommended actions to the operators:<br>- Do not use Mountain Bike Yeti SB5 Beti at high speeds<br>- Avoid extensive brake usage<br>- Take bike to shop for brake inspection. | Preliminary | 01/08/2022 | Preliminary safety warnng | Critical | High | 01/08/2022 | Yeti SB5 Beti | YBSB5 |

# We have a brief look into the bike's history

First we look at the operational periods as sent out automatically by his Yeti Beti App.

| Operational period | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **PV Identifier** | **PV serial number** | **Period Identifier** | **Actual operational period** | **Operational period name** | **Period scheduled** | **Period result** | **Start** | **End** | **Operator** | **Reported by** |
| YBSB5 | 46 | OP140801-HD | 1/8/2019 08:00 - 1/8/2019 17:00 | Day trip Bike 46, Hans-Dieter | 1/8/2019 08:00 - 1/8/2019 17:00 | OK | Hans-Dieter garage, Munich, Germany | Hans-Dieter garage, Munich, Germany | Hans-Dieter | Hans-Dieter (Yeti Beti App) |
| YBSB5 | 46 | OP140804-HD | 4/8/2019 08:00 - 4/8/2019 17:30 | Day trip Bike 46, Hans-Dieter | 4/8/2019 08:00 - 4/8/2019 17:00 | Delayed | Hans-Dieter garage, Munich, Germany | Hans-Dieter garage, Munich, Germany | Hans-Dieter | Hans-Dieter (Yeti Beti App) |
| YBSB5 | 46 | OP160730-HD | 30/7/2022 08:00 - 30/7/2022 11:22 | Round trip Bike 46, Hans-Dieter | 30/7/2022 10:00 - 30/7/2022 14:00 | Accident | Nevada Hotel, Sierra Nevada, Spain | AL-4402, Ohanes, Andalucía, Spain | Hans-Dieter | Hans-Dieter (Yeti Beti App) |

The last highlighted operational period is the accident.

But note that Hans-Dieter has not used the bike **for three years**!

And this was not his usual trip!

# We have a look at the Product Logbook

The configuration indicates all parts are the ones as delivered to the customer.

The operator apparently does all the pre-checks… Except the last one!

**Logbook entries**

| Serialized item | Operating counter | Logbook entry Id | Date & time | Type | Entry | Associated to event |
|---|---|---|---|---|---|---|
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-34 | 04/08/2019 17:30 | Corrective maintenance | Changed flat tyre (Yeti Beti App) | EV1372 |
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-35 | 04/08/2019 18:20 | Pre-check | Tyre pressure check (Yeti Beti App) | EV1373 |
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-36 | 04/08/2019 18:21 | Pre-check | Checked brake lever oil reservoir for oil leakage (Yeti Beti App) | EV1373 |
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-37 | 04/08/2019 18:21 | Pre-check | Checked operation of the brake system by activation of the brake lever. (Yeti Beti App) | EV1373 |
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-38 | 30/07/2022 7:50 | Pre-check | Tyre pressure check (Yeti Beti App) | EV2331 |
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-39 | 30/07/2022 7:52 | Pre-check | Checked brake lever oil reservoir for oil leakage (Yeti Beti App) | EV2331 |
| Yeti SB5 Beti s/n 46 | 678 km | MTB2k46-40 | 30/07/2022 7:53 | Pre-check | Activation of brake lever not detected (Yeti Beti App) | EV2331 |

But note that he did not perform (or at least recorded) any scheduled maintenance in three years!

→ **ACCIDENT ENGINEERING INVESTIGATION AND UPDATE PROCESS**

# PREPARATION

**Preparation**

Input

Process

Output

**Collect data**

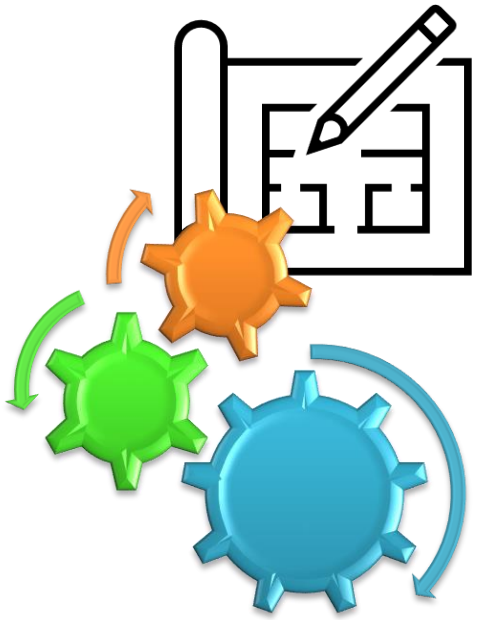
- All documentation and logs
- Maintenance data and findings
- Maintainer notes
- Local maintenance policies

**Product information**

- As maintained configuration
- Previous analysis results

**Logistics configuration management**

- S1000D
- S5000F
- S3000L
- S4000P



# INPUT: INDUSTRY ACCIDENT INVESTIGATION

Preparation

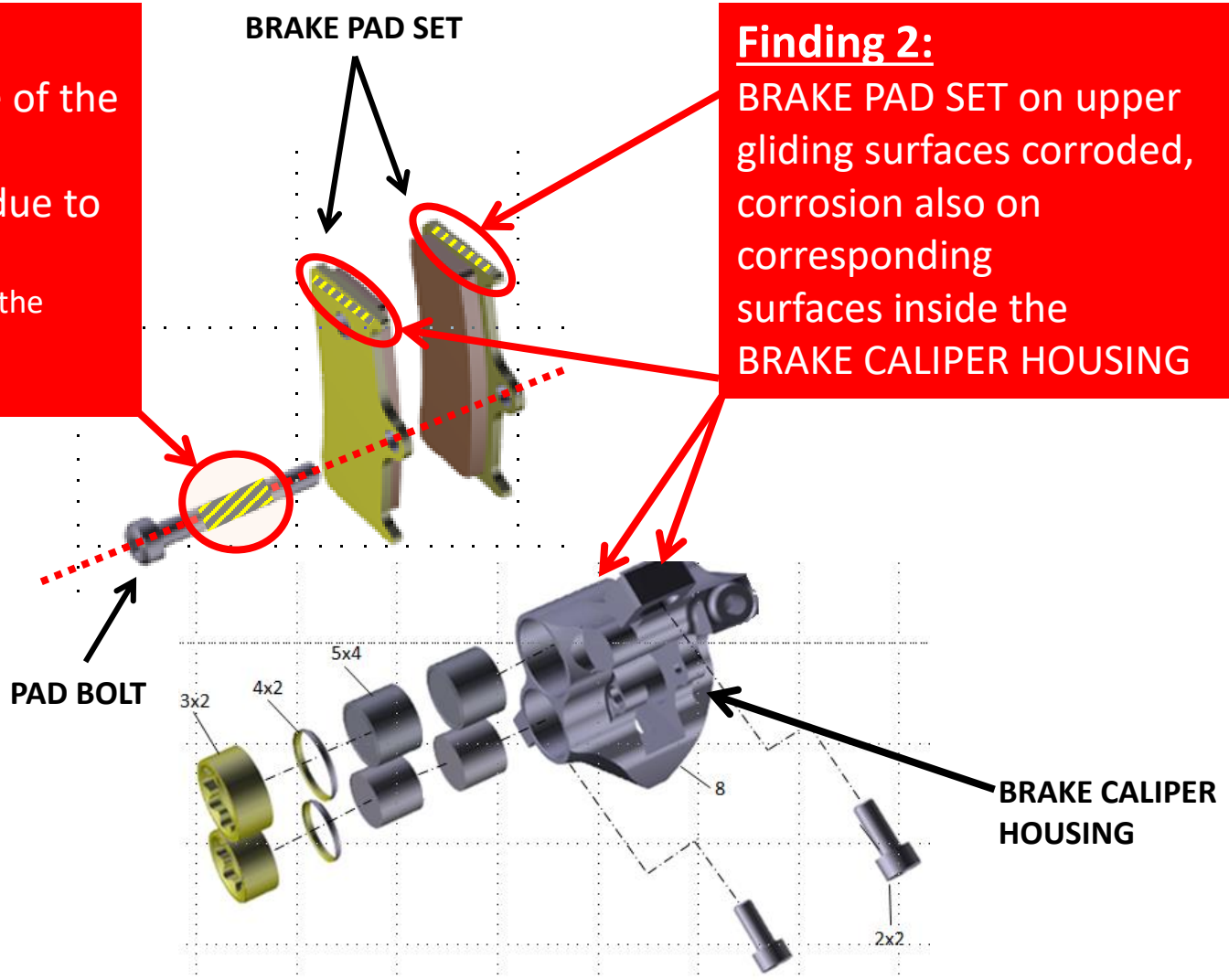
**Input**

Process

Output

**Finding 1:**
Very rough surface of the PAD BOLT
in its central area due to deterioration;
(bolt diameter is below the acceptable minimum tolerance value)

**Finding 2:**
BRAKE PAD SET on upper gliding surfaces corroded, corrosion also on corresponding surfaces inside the BRAKE CALIPER HOUSING



# INPUT: RESULTS OF INDUSTRY ACCIDENT INVESTIGATION

Preparation

**Input**

Process

Output

**Expert statement No. 1 related to finding 1:**

- **PAD BOLT** (PRE MOD) was made of corroding/oxidizing steel;
- **Deterioration process** caused **material wear** at the central area of the bolt surface **;**
- Rough bolt **material surface prohibited the BRAKE PAD SET to glide on the PAD BOLT**

**Expert statement No. 2 related to finding 2:**

- **BRAKE PAD SET** installation **without gliding paste** (PRE MOD).
- All **gliding surfaces** of the BRAKE PAD SET **corroded.**
- **High friction on gliding surfaces** inside the BRAKE CALIPER HOUSING**.**

**Expert summary:**

- Corrosion/oxidation processes caused **high friction** on relevant **gliding surfaces**;
- After strong front brake activation **BRAKE PADS clamped** inside the BRAKE CALIPER HOUSING and on the PAD BOLT surface;
- **No subsequent brake release** after front brake activation **caused accident**.

# PROCESS

Preparation

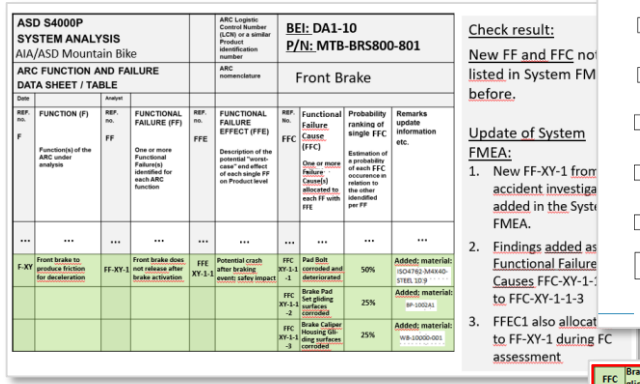
Input

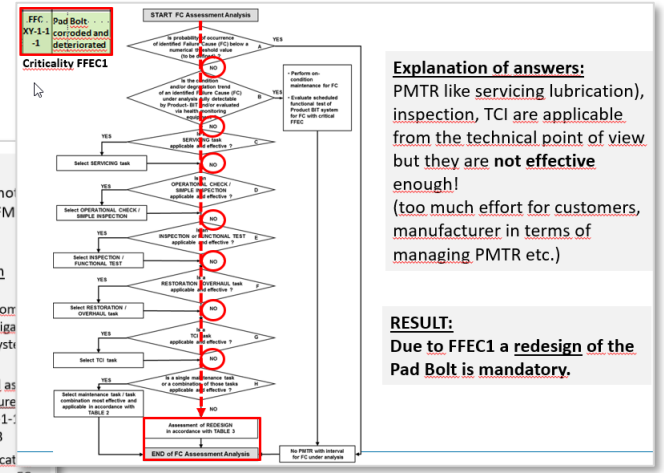
**Process**

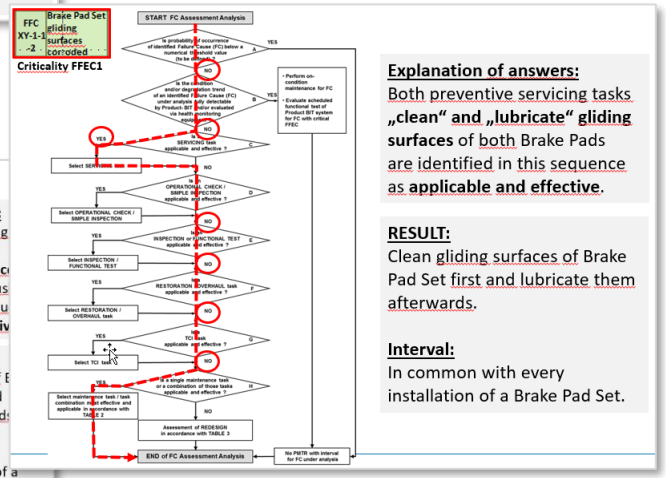
Output

## •Review system FMECA

- Update system FMECA
- Add functional failure
- Add functional failure cause
- Add functional failure cause
- Determine possible task requirements
- Review applicability and effectiveness

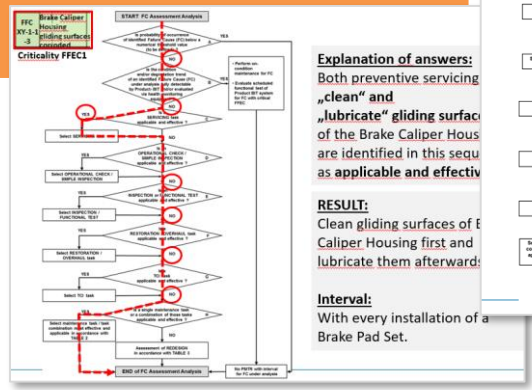



## Pattern

- Review analysis
- Determine difference
- Document results



# OUTPUT

Preparation

Input

Process

**Output**

To Engineering

- Design Change

To S3000L

- New Task Requirements

To avoid **finding 1** in the future, a **technical modification** of the pad bolt is required:

**Installation of a new corrosion-free pad bolt (POST MOD)**
**Old pad bolts shall be replaced as soon as possible**

To avoid **finding 2** in future, the following **modifications concerning task performance** are **mandatory**:

**Every brake pad set must be installed using graphite gliding paste after cleaning of relevant gliding surfaces.**

**Two warning remarks** are to be added **in the bike maintenance manual**:

**Severy injury may result if brake pad set is installed without graphite gliding paste on indicated surfaces.**

**Keep brake disc surface free from any gliding paste or oil contamination during maintenance. Clean brake disc after every brake maintenance.**

**Transfer of output to S3000L**

# Launch safety instructions to affected users!

Now we know what has happened, we need to warn the impacted owners/users of the PRE MOD Bike, so as to take preventive measures.

We do that by means of a safety instruction:

**Safety Instructions**

| Document Id | Associated to safety Issue | Title | Description | Status | Creation date | Document type | Safety Criticality | Safety priority | Applicability dates |
|---|---|---|---|---|---|---|---|---|---|
| SIN20220803A | SISS20220730A | Yeti SB5 Beti Brake safety instructions | Special safety instructions associated to Yeti SB5 Beti brake MTB-BRS800-801 | Approved | 14-8-22 13:19 | Special safety instructions | Major | High | 14/08/2022 - 31/12/2022 |

This instruction includes several actions to be performed:

**Required Safety Action**

| Safety Instruction Id | Safety action identifier | Type | Description | Priority | Release date | Required implemention date |
|---|---|---|---|---|---|---|
| SIN20220803A | 1 | Mandatory | **The BRAKE PAD SET must always be installed using graphite gliding paste on clean gliding surfaces (also inside the Brake Caliper Housing)-** | High | 14.08.2022 | 30.08.2022 |
| SIN20220803A | 2 | Mandatory | Pending formal MB manual update, add manually the following statements to the MB manual:<br>- *„Severe injury may result in case of installation of the BRAKE PAD SET without graphite gliding paste on indicated surfaces „Keep BRAKE DISK surface free from any gliding paste or oil contamination during maintenance. Clean BRAKE DISK after brake maintenance.“* | High | 14.08.2022 | 30.08.2022 |

# S3000L - Logistic Support Analysis

General analysis process, main steps (focused on **initial** analysis activities):

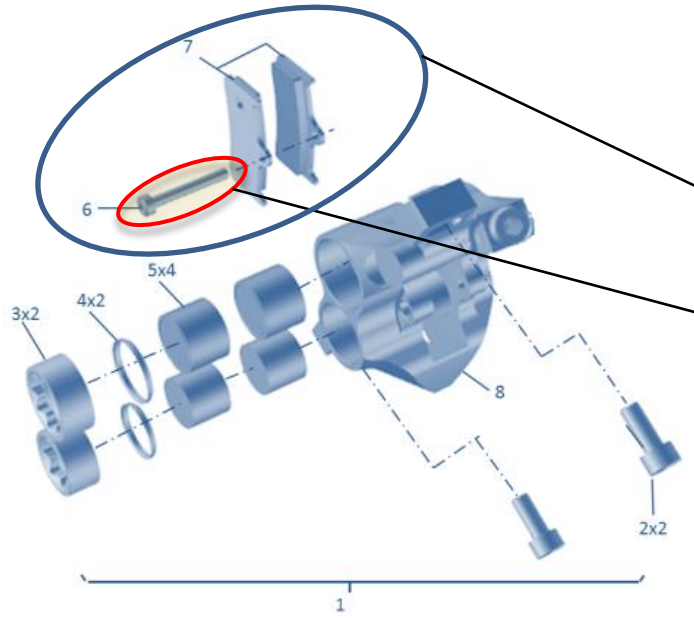
**Initial** analysis (design & development) → Handling of modification requirements **during the in-service phase**

1. Establishment of **product breakdown** for supportability analysis needs
2. Identification of all **task requirements** (maintenance, operational support, software support, disposal)
3. Identification of **tasks** to cover all identified task requirements
4. Performance of **Maintenance Task Analysis (MTA)**

- Processing of technical product modifications (e.g. triggered by change requests)
- Processing of required changes within the maintenance and operations support environment (e.g. triggered by shortfalls)
- Processing of changes in product usage (changed usage scenario normally requires a modified support environment)

# Product breakdown/parts ⇨ POST MOD

1 Establishment of **product breakdown** for supportability analysis needs




| Part identifier | Part name | Remark | PRE MOD | POST MOD |
|---|---|---|---|---|
| … | … | | | |
| FBA-0001 | Front Brake System | Old part (to be eliminated) | x | |
| FBA-0002 | Front Brake System | New part (based on brake pads with new bolt) | | x |
| FBAD-0002 | Front Brake Adapter | | | |
| FBB-0001 | Front Brake Bolt | | | |
| FBCL-0001 | Front Brake Caliper | | | |
| FBAN-0001 | Front Brake Adjuster knob | | | |
| BP-0001 | Front Brake Pads | Old part (to be eliminated) | x | |
| BP-0002 | Front Brake Pads | New part (based on new bolt) | | x |
| ISO4762-MAX40-STEEL 10.9 | Front Brake Pad Bolt | Old part (to be eliminated) | x | |
| ISO4762-M4X40-A2 | Front Brake Pad Bolt | New part | | x |
| FBADJ-0001 | Front Break Adjuster | | | |
| … | … | | | |
| EXXOL D60 | Naphtha Aliphatic | New consumable | | x |
| MOLYKOTEBR2 Plus | Graphite gliding paste | New consumable | | x |
| … | … | | | |

Summary of consequences for **parts list**:

- **PRE MOD** Front Brake Pad Bolt, Front Brake Pads and Front Brake System will disappear from the parts list and are replaced by the **POST MOD** parts
- **Two new entries** for consumables

# Product breakdown/breakdown elements ⇨ POST MOD

1 Establishment of **product breakdown** for supportability analysis needs

| BEI | BE revision | Breakdown Element Name | BE Type | Part identifier | Remark |
|---|---|---|---|---|---|
| ... | ... | ... | ... | ... | |
| B5-A-A7-30-00-00A | 1.0 | SB5 Brake System | Subsystem | N/A | |
| B5-A-A7-31-00-00A | 2.0 | SB5 Front Brake System | Sub-Subsystem | **FBA-0002** | BE realization updated, new part identifier due to new design |
| B5-A-A7-31-01-00A | 1.0 | SB5 Front Brake Caliper | Equipment | FBCL-0001 | |
| B5-A-A7-31-02-00A | 2.0 | SB5 Front Brake Pads | Equipment | **BP-0002** | BE realization updated, new part identifier due to new design |
| B5-A-A7-31-04-00A | 1.0 | SB5 Wheel Brake Disk | Equipment | WBD-0001 | |
| B5-A-A7-31-05-00A | 1.0 | SB5 Front Brake Cable Assembly | Equipment | FBCA-001 | |
| B5-A-A7-31-06-00A | 1.0 | SB5 Front Brake Lever | Equipment | FBS-0001 | |
| B5-A-A7-32-00-00A | 1.0 | SB5 Rear Brake System | Sub-Subsystem | RBA-0001 | |
| B5-A-A7-32-01-00A | 1.0 | SB5 Rear Brake Caliper | Equipment | RBCL-0001 | |
| B5-A-A7-32-02-00A | 1.0 | SB5 Rear Brake Pad | Equipment | ~~R~~BP-0001 | |
| B5-A-A7-32-04-00A | 1.0 | SB5 Rear Brake Cable | Equipment | RBC-0001 | |
| B5-A-A7-32-05-00A | 1.0 | SB5 Rear Brake Shifter | Equipment | RBS-0001 | |

Summary of consequences for **breakdown elements**:

- **PRE MOD** realization of SB5 Front Brake Pads and SB5 Front Brake System will disappear from the product breakdown and are replaced by the **POST MOD** realization.

# Maintenance Task requirements ⇨ POST MOD

2 Identification of all task requirements (maintenance, operational support, software support, disposal)

**Sources for task requirements** are, beyond others, technical analysis activities in the environment of Maintainability/Reliability:

- FMEA/FMECA
- Damage Analysis
- Preventive Maintenance Analysis
- Special Event Analysis

| BEI | BEI revision | Part identifier | BE name | Task requirement Identifier | Task requirement source | Task requirement description | Interval/threshold |
|---|---|---|---|---|---|---|---|
| B5-A-B3-51-01-00A | 1.0 | FW-1000-2FG | Front Wheel | PMTR51 | Tech FMEA | Check tire pressure | Before bike operation |
| B5-A-B3-51-01-00A | 1.0 | FW-1000-2FG | Front Wheel | TR00034 | Tech FMEA | Replace inner tube or tire | not applicable |
| B5-A-B3-51-01-00A | 1.0 | FW-1000-2FG | Front Wheel | TR00035 | Tech FMEA | Replace inner tube or tire | not applicable |
| ... | ... | ... | ... | ... | ... | ... | ... |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | TR00001 | Tech FMEA | Test Front Brake System | not applicable |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | TR00002 | Tech FMEA | Fault location on Front Brake System | not applicable |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR1 | PMA | Operational test of Front Brake System by activation of Front Brake Lever | Before bike operation |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR2 | PMA | Inspection of Front Brake System hydraulic fluid | 6 months |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | PMTR3 | PMA | Overhaul of Front Brake System | 5 years |
| B5-A-A7-32-05-00A | 1.0 | FBL-0001 | Front Brake Lever | TR00004 | Tech FMEA | Replace Front Brake Lever | not applicable |
| B5-A-A7-32-05-00A | 1.0 | FBL-0001 | Front Brake Lever | TR00005 | Tech FMEA | Repair Front Brake Lever | not applicable |
| B5-A-A7-31-04-00A | 1.0 | FBCA-001 | Front Brake Tube | TR00006 | Tech FMEA | Replace Front Brake Tube | not applicable |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake System | TR00007 | Tech FMEA | Replace Front Wheel Brake | not applicable |
| B5-A-A7-31-01-00A | 1.0 | FBCL-0001 | Front Brake Caliper Assembly | TR00008 | Tech FMEA | Replace Front Brake Caliper Assembly | not applicable |
| B5-A-A7-31-02-00A | 1.0 | BP-0001 | Front Brake Pads | TR00009 | Tech FMEA | Replace Front Brake Pads | not applicable |
| B5-A-A7-31-01-00A | 1.0 | FBCL-0001 | Front Brake Caliper Assembly | TR00010 | Tech FMEA | Repair Front Brake Caliper Assembly by replacement of brake pistons | not applicable |
| B5-A-A7-31-01-00A | 1.0 | FBCL-0001 | Front Brake Caliper Assembly | TR00011 | Tech FMEA | Repair Front Brake Caliper Assembly by replacement of caliper cap sealing | not applicable |
| ... | ... | ... | ... | ... | ... | ... | ... |

Summary of consequences for **task requirements**:

- The task requirement to perform an **operational test** of the Front Brake System before every operation of the mountain bike is not impacted by the design change. Means, this task requirement remains unchanged.
- The task requirement **to replace the Front Brake Pads** if they are worn out is not impacted by the design change. Means, this task requirement remains unchanged.

  However: Due to the modified Brake Pad Bolt and due to the need to grease the sliding surfaces, a change in the task performance is expected.
- **Overhaul task after 5 years still applicable**, but modified due to design change (new brake pad bolt)

# Example (1) ⇨ task identification + MTA (resources) ⇨ POST MOD

2 Identification of all **task requirements** (maintenance, operational support, software support, disposal)

3 Identification of **tasks** to cover all identified task requirements

- **Pre-ride bike che**
  LSA candidate: **B**
  Covering PM nt

NO CHANGES

| | | | | | | |
|---|---|---|---|---|---|---|
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Brake Syste | | Operational test of Front Brake System by activation of Front Brake Lever | Before bike operation |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Front Br | PMA | Inspection of Front Brake System hydraulic fluid | 6 months |
| B5-A-A7-32-00-00A | 1.0 | FBA-0001 | Fro | PMA | Overhaul of Front Brake System | 5 years |

| BEI | BE revision | Part Identifier | Part n | | k name | Task type | Task revision | Spare part / Consumable Identifier | Spare part / Consumable Name | Support Equipment (SE) | Conditions and safety | ML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B5-A-00-00-00-00A | 1.0 | YBA | | PMTR1 | Pre ride bike check | Rectifying | 1.0 | | | | Hold the mountain bike secure for easy work | ML1 |

**Identification** of tasks

**MTA** - accumulated resources

# Example (1) ⇨ MTA (personnel, task description) ⇨ POST MOD

4 Performance of **Maintenance Task Analysis (MTA)**

- **Pre-ride bike check**
  LSA candidate: **B5-A-00-00-00-00A**
  Covering **S4000P** **PMTR1** requi

NO CHANGES

| Subtask identifier | Subtask description | | | | Labour time [min] | Subtask duration [min] |
|---|---|---|---|---|---|---|
| | | | MECH | | | On the job |
| *T00001-01* | Check tyre pressure before riding. | | | 1 | 1 | 1 |
| *T00001-02* | Remove small pieces of flint that may have lodged in the tyre | | | 1 | 2 | 2 |
| *T00001-03* | Check your stem and handlebars (especially where they m nages which are beyond mere scratches. | | | 1 | 4 | 4 |
| *T00001-04* | Check crank by making them parallel to the grou ether it can be pulled or pushed to the left or to the right (w e, this indicates wear in the bearing of the bottom bracke | | | 1 | 2 | 2 |
| *T00001-05* | Check pedals for movement and ma ent. | | | 1 | 2 | 2 |
| *T00001-06* | Check for smooth gear changes thout signs of corrosion. The pivot points on the derailleu | | | 1 | 4 | 4 |
| *T00001-07* | Check brake pads for sufficien d conditions of the planned ride (most pads have ware indicators to sup | | | 1 | 4 | 4 |
| *T00001-08* | Pull lever and check equal brake pa e rim to ensure even wear. Try to move the bike and verify the correct function of the | | | 1 | 2 | 2 |

Task **description**

**MTA** - personnel

# Example (2) ⇨ POST MOD task modification requirements

2 Identification of all **task requirements** (maintenance, operational support, software support, disposal)

3 Identification of **tasks** to cover all identified task requirements

4 Performance of **Maintenance Task Analysis (MTA)**

- **Replace front brake pads**

  LSA candidate: **B5-A-A7-31-02-00A**

  Covering task requirement **TR-00009** from **Tech FMEA**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B5-A-A7-31-02-00A | 1.0 | BP-0001 | Front Brake Pads | TR00009 | Tech FMEA | Replace Front Brake Pads | not applicable |

| BEI | BE revision | Part Identifier | Part name | Task ID | Task Req. | Task name | Task type | Task revision | Spare part / Consumable Identifier | Spare part / Consumable Name | Support Equipment (SE) | Support Equipment name | Conditions and safety | ML |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B5-A-A7-31-02-00A | 1.0 | BP-0001 | Front Brake Pads | T00002 | TR-00009 | Replace Front Brake Pads | Rectifying | 1.0 | PC-1000<br>ISO4762-MAX40-Steel 10,9<br>BP-0001 | Paper cloth<br>Bolt<br>Brake Pad Set | BST-001<br>ALLKEY5MM<br>PLI-001 | Bike stand special tool<br>5mm allen key<br>Pliers | (1) Hold the mountain bike secure for easy work<br>(2) Do not actuate brake when the wheel is removed (this would cause a bleeding of the brake unit) | ML1 |

**Identification** of tasks — **MTA** - accumulated resources

Required LSA update due to the design change:

- **New spare parts** to be used within the task (remember: new bolt to be used (included in Brake Pads Set!)
- **New consumables** to be considered to be considered during the Brake Pad Set installation
- **New support equipment** to be considered during the Brake Pad Set installation
- **New warnings & cautions** to be considered during the Brake Pad Set installation
- **New task steps** to be considered during the Brake Pad Set installation

| Subtask Identifier | Subtask description | Skill | Trade | Qty | Labour time [min] | Subtask duration [min] |
|---|---|---|---|---|---|---|
| | | A-Basic | MECH | | | On the job |
| T00002-01 | Remove front wheel (refer to B5-A-B3-51-01-00A-520A-D) | | | 1 | 3 | 3 |
| T00002-02 | Remove old Front Brake Pads (refer to B5-A-A7-31-02-00A-520A-D) | | | 1 | 3 | 3 |
| T00002-03 | Clean both caliper surfaces with paper cloth | | | 1 | 2 | 2 |
| T00002-04 | Install new Front Brake Pads (refer to B5-A-A7-31-02-00A-720A-D) | | | 1 | 5 | 5 |
| T00002-05 | Install front wheel (refer to B5-A-B3-51-01-00A-720A-D) | | | 1 | 4 | 4 |
| T00002-06 | Test Front Brake System (refer to B5-A-A7-31-00-00A-320A-D) | | | 1 | 2 | 2 |

Task **description** — **MTA** - personnel

# Example (2) ⇨ POST MOD task modification details

Changes due to the modifications:

- **New spare parts** to be used within the task
- **Two new consumables** to be considered
- **One new support equipment** to be considered
- **Two new warnings & cautions** to be considered
- **New task steps** to be considered, changes in sequence and **modification** of subtask T00002-03

| Spare part / Consumable Identifier | Spare part / Consumable Name | Support Equipment (SE) Identifier | Support Equipment name |
|---|---|---|---|
| PC-1000 | Paper cloth | BST-001 | Bike stand special tool |
| BP-0002 | Front Brake Pads (including new bolt) | ALLKEY5MM | 5mm allen key |
| ISO4762-M4X40-A2 | Bolt *(new)* | PLI-001 | Pliers |
| MOLYKOTEBR2 Plus | Graphite gliding paste | RG-000A | Rubber gloves |
| EXXSOL D60 | Naphtha Aliphatic (disc cleaner) | | |
| | | | |

| Subtask Identifier | Subtask description |
|---|---|
| T00002-01 | Remove front wheel (refer to B5-A-B3-51-01-00A-520A-D) |
| T00002-02 | Remove old Front Brake Pads (refer to B5-A-A7-31-02-00A-520A-D) |
| T00002-03 | Clean caliper inside surfaces and rotor with paper cloth and appropriate detergent |
| T00002-04 | Grease gliding surfaces of the brake pad bolt, the brake pads and the caliper housing before installation of the new brake pads |
| T00002-05 | Install new Front Brake Pads (refer to B5-A-A7-31-02-00A-720A-D) |
| T00002-06 | Install front wheel (refer to B5-A-B3-51-01-00A-720A-D) |
| T00002-07 | Clean brake disc and brake pads with paper cloth and appropriate detergent |
| T00002-08 | Test Front Brake System (refer to B5-A-A7-31-00-00A-320A-D) |

| Conditions and safety |
|---|
| (1) Hold the mountain bike secure for easy work<br>(2) Do not actuate brake when the wheel is removed (this would cause a bleeding of the brake unit) |
| (3) Severe injury may result in case of installation of the brake pad set without graphite gliding paste on indicated surfaces.<br>(4) Keep brake disc surface free from any gliding paste or oil contamination during maintenance. Clean brake disc after every brake maintenance. |
| |

**The MTA information of the identified and analysed tasks is forwarded to ⇨**

# Product breakdown (Engineering/Installation) ⇨ POST MOD

Sub-Subsystem

HW breakdown element

**Supplier parts**

**B5-A-A7-30-00-00A**
SB5 Brake System

**B5-A-A7-31-00-00A**
SB5 Front Brake System

**FBA-0002**
Front Wheel Brake

new partnumber for the Front Wheel Brake

**B5-A-A7-32-00-00A**
SB5 Rear Brake System

**B5-A-A7-31-01-00A**
SB5 Front Brake Caliper

**B5-A-A7-31-02-00A**
SB5 Front Brake Pads

**B5-A-A7-31-04-00A**
SB5 Front Brake Cable Assembly

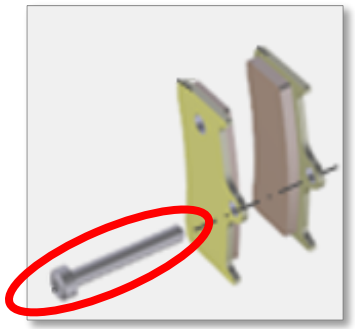
**B5-A-A7-31-05-00A**
SB5 Wheel Brake Disk

**B5-A-A7-31-06-00A**
SB5 Front Brake Lever

**BP-0002**
Front Brake Pads

new partnumber for the front brake pads (including bolt !)

**ISO4762-M4X40-A2**
Front Brake Pad Bolt



new bolt with a new partnumber

# Illustrated Parts Catalogue (IPC) Mountain Bike (1)

No change on illustration required

UNCLASSIFIED

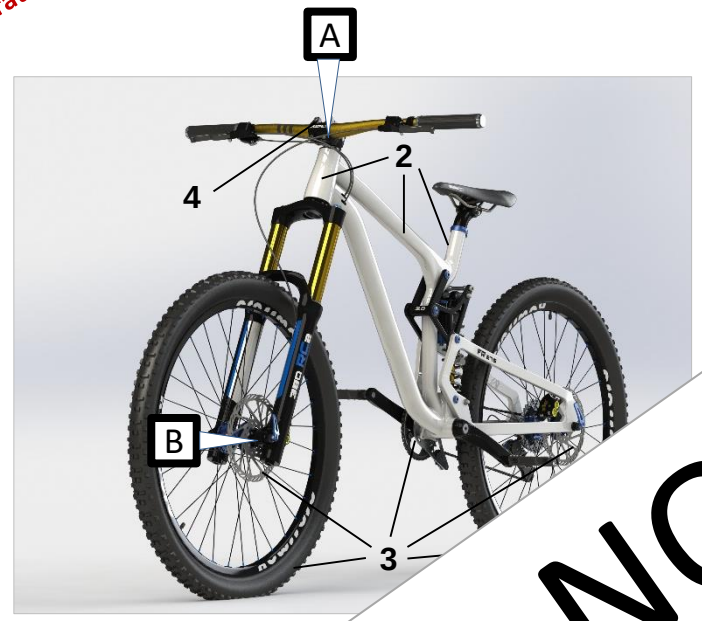



FIG. 01 - MOUNTAIN BIKE

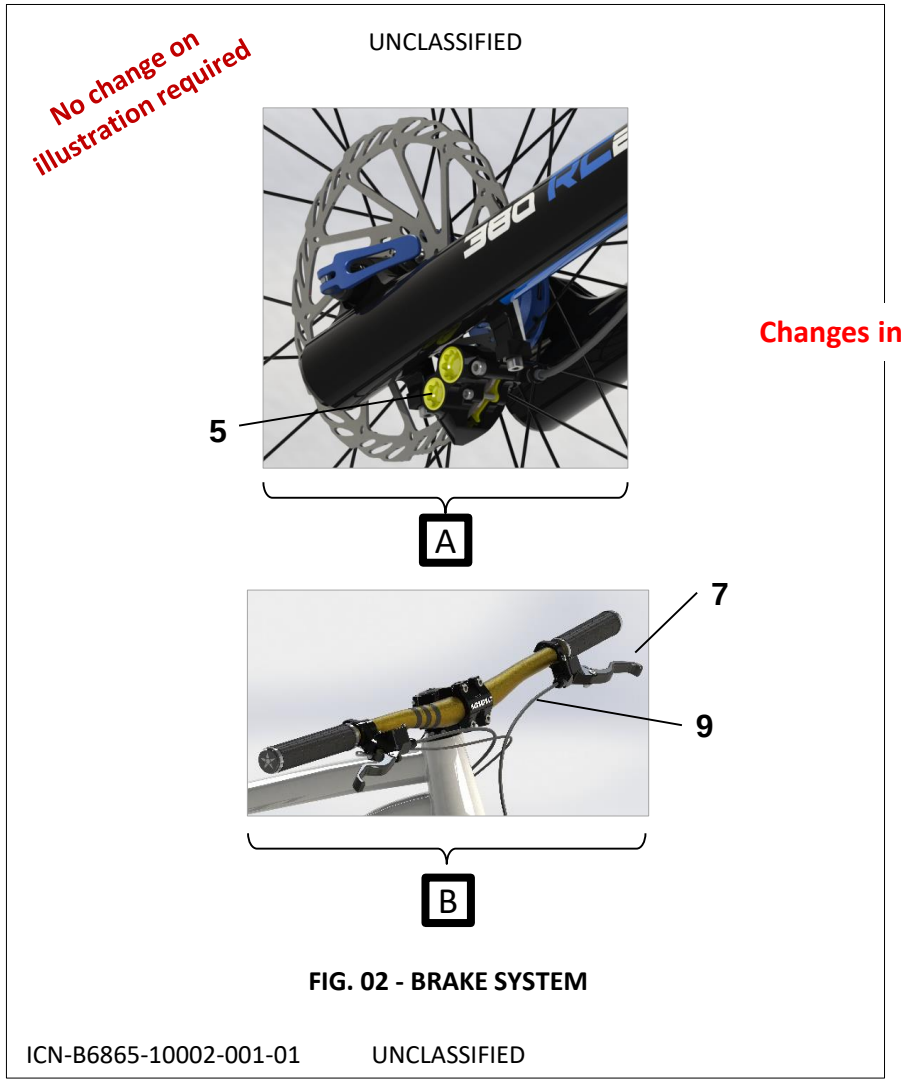
ICN-B6865-10001-001-01 UNCLASSIFIED

NO CHANGES

| INDEX | IND | ASP | PARTNUMBER | NCAGE | | MOV | ICY | QNA UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | 1 | | YBA-001 | | | | | 1 EA | | PAOOF |
| 001 | 2 | | | | SYSTEM | | | 1 EA | | PAOOF |
| 002 | | | | | SYSTEM | | | 1 EA | | PAOOF |
| | | | | | SUSPENSION / TRACK / WHEELS SYSTEM | | | 1 EA | | PAOOF |
| | | | | B6865 | STEERING SYSTEM | | | 1 EA | | PAOOF |

UNCLASSIFIED FIG 01

# Illustrated Parts Catalogue (IPC) Mountain Bike (2)




Changes in IPC

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | 1 | | YBA-001 | B6865 | BRAKE SYSTEM (REF TO FIG 02) | | | AR | | PAOOF |
| 001 | 2 | | FBA-0001 | B6865 | **FRONT WHEEL BRAKE PRE MOD (REF TO FIG 03 / BEI B5-A-A7-31-00-00A)** | | **-3** | EA 1 | | PAOOF |
| **001** | **2** | | **FBA-0002** | **B6865** | **FRONT WHEEL BRAKE POST MOD (REF TO FIG 03 / BEI B5-A-A7-31-00-00A)** | | **5-** | EA **1** | | **PAOOF** |
| 002 | 3 | | FBL-0001 | B6865 | FRONT BRAKE LEVER | | | EA 1 | | PAOOF |
| 003 | 4 | | BKO-10004-A | H9RT5 | OIL HYDRAULIC | | | EA 1 | | PAOOF |
| 004 | 4 | | ORS-009-A | DDF57 | OIL RESERVOIR | | | EA 1 | | PAOOF |
| 005 | 4 | | COV-0008-B | NM12A | COVER | | | EA 1 | | PAOZZ |
| 006 | 4 | | ISO4762-MAX30-A3 | I9006 | SCREW | | | EA 1 | | PAOZZ |
| 007 | 4 | | BLL-009-2 | H1T06 | BRAKE LEVER LEFT | | | EA 1 | | PAOZZ |
| 008 | 3 | | FBT-003-E21 | BAW12 | FRONT BRAKE TUBE | | | EA 1 | | PAOOF |
| ... | ... | ... | ... | ... | etc ..... | ... | | EA ... ... | | ... |

UNCLASSIFIED FIG 02

# Illustrated Parts Catalogue (IPC) Mountain Bike (3)

**No change on illustration required**

UNCLASSIFIED

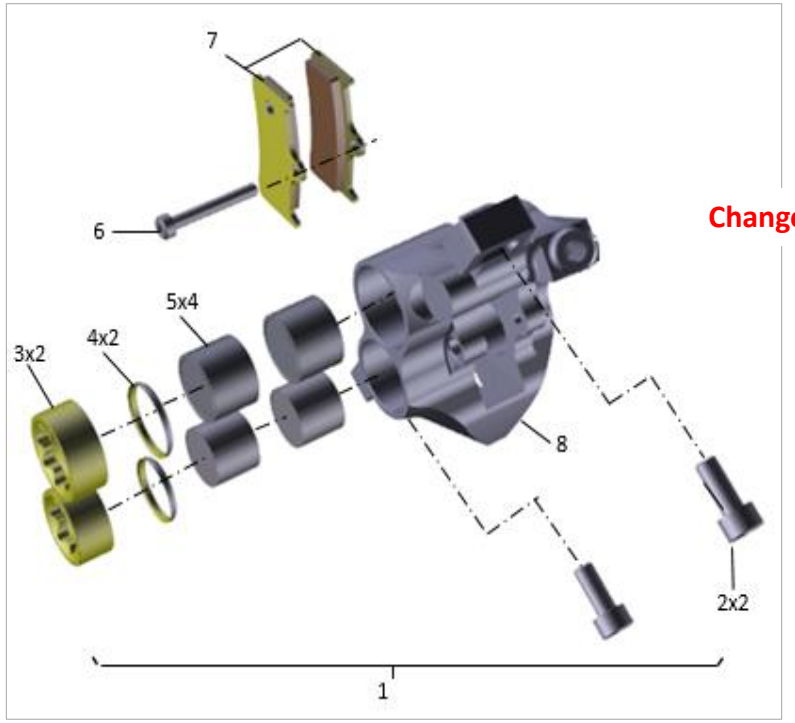



**FIG. 03 - FRONT WHEEL BRAKE (SHEET 1 OF 2)**

ICN-B6865-10002-001-01 UNCLASSIFIED

**Changes in IPC**

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA / UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| 000 | 1 | | FBA-0001 | B6865 | **FRONT WHEEL BRAKE PRE MOD (REF TO FIG 03 / BEI B5-A-A7-31-00-00A)** | | **-3** | 1 EA | | PAOOF |
| **000** | **1** | | **FBA-0002** | **B6865** | **FRONT WHEEL BRAKE POST MOD (REF TO FIG 03 / BEI B5-A-A7-31-00-00A)** | | **5-** | **1 EA** | | **PAOOF** |
| 001 | 1 | | FBCL-0001 | H1T06 | BRAKE CALIPER | | | 1 EA | | PAODD |
| 002 | 2 | | ISO4762-M8X60-A2 | I9006 | SCREW,CAP,SOCKET HEAD | | | 2 EA | | PAOZZ |
| 003 | 2 | | CC-45-02 | H1T06 | CALIPER CAP | | | 2 EA | | PAOZZ |
| 004 | 2 | | CC-55-02 | H1T06 | CALIPER CAP SEALING | | | 2 EA | | PAOZZ |
| 005 | 3 | | BP-2000-9F | H1T06 | BRAKE PISTON | | | 4 EA | | PAOZZ |
| 006 | 3 | | ISO4762-MAX40-STEEL 10.9 | I9006 | **BOLT (PRE MOD)** | | | 1 EA | | PAOZZ |
| **006** | **3** | | **ISO4762-M4X40-A2** | **I9006** | **BOLT (POST MOD)** | | | **1 EA** | | **PAOZZ** |
| 007 | 3 | | BP-0001 | D2635 | **BRAKE PAD SET (CONTAINS 2 PARTS) PRE MOD** | | | 1 EA | | PAOZZ |
| **007** | **3** | | **BP-0002** | **D2635** | **BRAKE PAD SET (CONTAINS 2 PARTS) POST MOD** | | | **1 EA** | | **....** |

UNCLASSIFIED FIG 03

# Illustrated Parts Catalogue (IPC) Mountain Bike (4)

No change on illustration required

UNCLASSIFIED

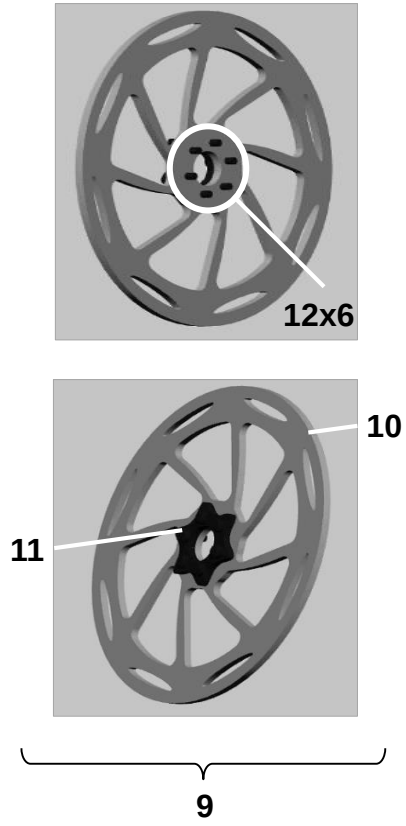



**FIG. 03 - FRONT WHEEL BRAKE (SHEET 2 OF 2)**

ICN-B6865-10002-001-01 UNCLASSIFIED

**Changes in IPC, added new consumables**

| INDEX | IND | ASP | PARTNUMBER | NCAGE | DESCRIPTION | MOV | ICY | QNA / UI | UOC | SMR |
|---|---|---|---|---|---|---|---|---|---|---|
| ... | | | ... | ... | ... | | | | | |
| 009 | 2 | | WBD-0001 | H1T06 | BRAKE DISK ASSY | | | 1 EA | | PAOOF |
| 010 | 3 | | WBDP-0001 | H1T06 | BRAKE DISK PLATE | | | 1 EA | | PAODD |
| 011 | 3 | | WBDL-0001 | H1T06 | BRAKE DISK LOCK | | | 1 EA | | PAOZZ |
| 012 | 3 | | ISO4762-MAX20-STEEL 10.9 | I9006 | BOLT | | | 6 EA | | PAOZZ |
| **013** | **2** | | **MOLYKOTEBR2PLUS** | **D8367** | **GRAPHITE GLIDING PASTE (NI/POST MOD/SUPPLIED IN 100 ML TUBE)** | | | **5 ML** | | **PAOZZ** |
| **014** | **2** | | **EXXSOL D60** | **D1123** | **NAPHTA ALIPHATIC DISC CLEANER (NI/POST MOD/ SUPPLIED IN 5 LITRE CAN)** | | | **1 LI** | | **PAOZZ** |

UNCLASSIFIED FIG 04

# S2000M Initial Provisioning Data

# Illustrated Parts Data (IPD) - Data modules (chapterized) ⇨ POST MOD

S2000M

**Mountain bike - Illustrated parts data**
B5-A-00-00-00-010-941A-D_001-00

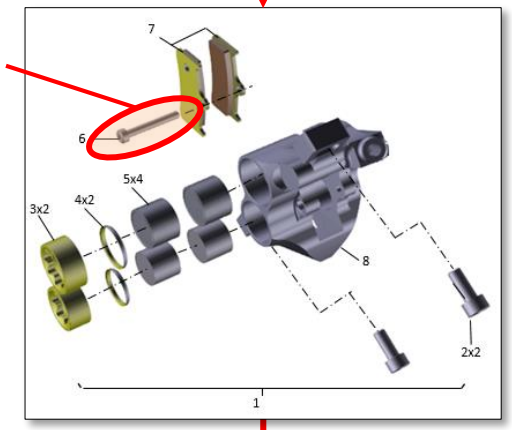
010: *Figure number & variant*

**Brake system - Illustrated parts data**
B5-A-A7-30-00-010-941A-D_001-00

**Front brake system - Illustrated parts data**
B5-A-A7-31-00-010-941A-D_*002*-00

**Design data**

new brake pad bolt




**Front brake system - Description of how it is made**
B5-A-A7-31-00-00A-041A-D_*002*-00

# Maintenance planning - Data modules ⇨ POST MOD

Based on the **modified S3000L maintenance planning information** the respective schedule data modules **will be updated**.

Inspection tasks in relation to a limit/event (one data module per limit/event with all tasks)

**Mountain bike - Inspection**
**B5-A-05-40-00-00A-000A-D_001-00**

The pre-ride inspection tasks related to „**MOUNTAIN BIKE**“ are included in this data module. Based on S4000P (PMTR1) and S3000L (LSA candidate B5-A-00-00-00-00A) **no update** for task:

- **Operational test of Front Brake System by activation of Front Brake Lever**

**Front brake system - Inspection**
**B5-A-05-40-00-01A-000A-D_*002*-00**

The 5-years-inspection tasks for the system „**FRONT BRAKE**“ are included in this data module. Based on S4000P (PMTR3) and S3000L (LSA candidate B5-A-A7-31-00-00A) also **updated task** in relation to:

- **Overhaul Front Brake System**

All inspection tasks in relation to a certain system/ subsystem

**Front brake system - Maintenance lists**
**B5-A-05-20-A7-31A-000A-D_*002*-00**

All maintenance/inspection tasks relevant for system „**FRONT BRAKE**“ are listed in this data module. Based on S4000P (PMTR2 & PMTR3) and S3000L (LSA candidate B5-A-A7-31-00-00A) also **updated task** in relation to:

- Inspection of Front Brake System hydraulic fluid (not impacted)
- **Overhaul Front Brake System**

All items with a time limit in relation to a system/ subsystem

**Front brake system - Time limits**
**B5-A-05-10-A7-31A-000A-D_*002*-00**

**Include new items** with a time limit in relation to brake pads.
Example: **New** brake pad bolt

- limitType = **On condition**
- threshold = **One months**

# Maintenance tasks - Data modules ⇨ POST MOD

Based on corrective maintenance task requirement (**TR00009**) and **updated** S3000L maintenance task analysis (LSA candidate **B5-A-A7-31-02-00A**) the following task is **updated**: „**Replace front brake pads**“:

| **Preliminary requirements** | |
|---|---|
| Maintenance level | ML2 (user garage) |
| Required conditions: | • Hold bike secure for easy work<br>• Do not actuate the brakes if the front wheel is removed<br>• Remove front wheel (refer toB5-A-B3-51-01-00A-520A-D) |
| Required persons:<br>Skill level:<br>Trade: | 1<br>A-Basic<br>MECH |
| Estimated time: | **30 min** |
| Required Support Equipment: | – Bike stand special tool (BST-001)<br>– 5mm allen key (ALLKEY5MM)<br>– Pliers (PLI-001)<br>– **Rubber gloves (RG-000A)** |
| Required supplies: | – Paper cloth (PC-1000)<br>– **Graphite gliding paste (MOLYKOTEBR2 Plus)**<br>– **Naphtha aliphatic disc cleaner (EXXSOL D60)** |
| Required spares: | – **Front brake pads (BP-0002), including new bolt (ISO4762-M4X40-A2)** |
| Required safety: | • **Severe injury may result in case of installation of the brake pad set without graphite gliding paste on indicated surfaces.**<br>• **Keep brake disc surface free from any gliding paste or oil contamination during maintenance. Clean brake disc after every brake maintenance.** |

**Front brake pads - Replace procedure**
**B5-A-A7-31-02-00A-921A-D_*002*-00**

Based on **updated** Maintenance Task Analysis (MTA) in S3000L the steps will be **updated** in the procedural data module.

**Preliminary requirements: ...**

**Steps:**

- Remove old Front Brake Pads (**refer to *B5-A-A7-31-02-00A-520A-D***)
- **Clean caliper inside surfaces and rotor with paper cloth and appropriate detergent**
- **Grease gliding surfaces of the brake pad bolt, the brake pads and the caliper housing before installation of the new brake pads**
- Install new Front Brake Pads (**refer to *B5-A-A7-31-02-00A-720A-D***)

**Closeup**

- Install front wheel (**refer to *B5-A-B3-51-01-00A-720A-D***)
- **Clean brake disc and brake pads with paper cloth and appropriate detergent**
- Test Front Brake System (**refer** to ***B5-A-A7-31-00-00A-320A-D***)

# S6000T - Training situation, task selection and task analysis, TNA (1)

**Training Needs Analysis (TNA)**

## Excerpt from training situation analysis result

- Formal training on mountain bike **recommended** due to complexity of the product
- **Advanced technology** (hydraulic brake), which was not installed in previous mountain bike models, requires **new skills** for mountain bike maintainers
- …

## Task selection from LSA task list

| BE identifier | Task ID | Task name | Difficulty | Importance | Frequency | DIF decision | Analyst decision | Task type | Skill decay |
|---|---|---|---|---|---|---|---|---|---|
| B5-A-00-00-00-00A | T00001 | Perform pre-ride bike check | normal | moderate | often | no train | no train | Individual task | Low |
| **B5-A-A7-31-02-00A** | **T00002** | Replace front brake pads | moderate | high | ov | train | train | Individual task | Medium |

No changes

## Task analysis : «Replace front brake pads " …»

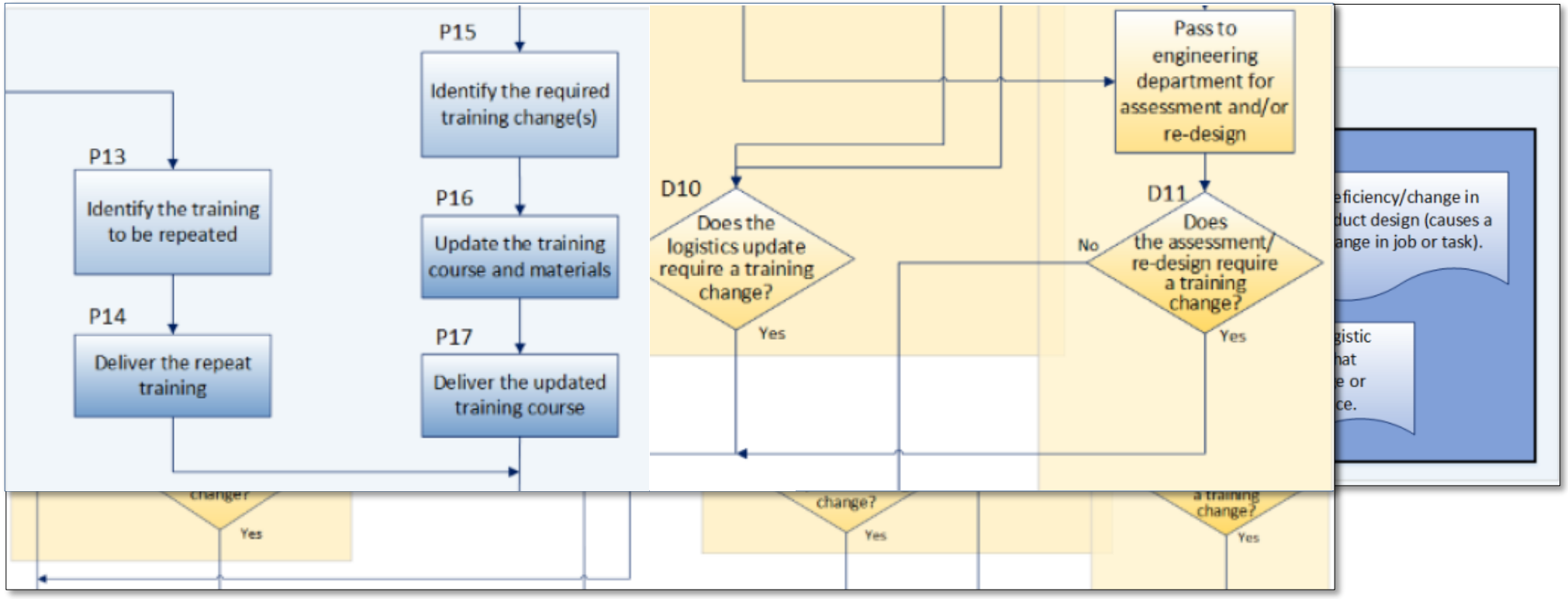
| Task ID | Task name | Skill decay | Knowledge/ Skill level | Knowledge/Skill description |
|---|---|---|---|---|
| **T00002** | Replace front brake pads | Medium | **Knowledge** | Locate brake pads |
| | | | **Comprehension** | Explain how the brakes work |
| | | | **Perceptual** | Perform the procedure to replace the brake pads |

Subtask analysis : «Replace front brake pads …» (next slide)

# S6000T - Training situation, task selection and task analysis, after accident!

**Finding the cause of the accident and the process of mitigating it for the future in order to maintain the operation availability of the bike.**

**ISHPO analysis**



# S6000T - Subtask analysis, TNA (2)

**Training Needs Analysis (TNA)**

| Task ID | Task name |
|---|---|
| T00002 | Replace front brake pads |

Training Needs Analysis (TNA) can be extended **down to the lowest level of activity performance** ⇨ each subtask/working step within a maintenance or operations support task can be analyzed.

**New training needs due to design modification**

| Subtask description | Knowledge/Skill level | Knowledge/Skill description |
|---|---|---|
| Remove front wheel | *Refer to TNA for wheels* | *Refer to TNA for wheels* |
| Remove pads | **Knowledge** | Locate brake pads |
| | **Comprehension** | Explain functions of brake pads |
| | **Perceptual** | Use pad pusher |
| | **Perceptual** | Use allen wrench |
| Clean caliper surface | **Comprehension** | Explain function of brake disc |
| | **Perceptual** | Clean the caliper |
| **Install new bolt** | **Comprehension** | **How to locate bolt** |
| | **Perceptual** | **Grease bolt, the upper surface of the brake pad set and the caliper surfaces prior to brake pads installation** |
| Install pads | *Refer to „remove pads“* | *Refer to „remove pads“* |
| Install front wheel | *Refer to TNA for wheels* | *Refer to TNA for wheels* |
| Test front brake system | **Analyze** | Evaluate proper brake operation |

# S6000T - Determine Objectives/Media

**Determine training "design"** → **Develop training**

*PO: Performance Objective*
*TLO: Terminal Learning Objective*
*ELO: Enabling Learning Objective*
*ICW: Interactive Course Ware*

| Objective ID | Objective Type | Objective Title | Primary Media |
|---|---|---|---|
| … | … | … | … |
| **T00002.1** | PO | **Perform procedure to replace brake pad set** | Maintenance trainer |
| **T00002.1.1** | TLO | Given a scenario correctly identify the steps necessary to replace brake pad set | ICW-3 |
| … | … | … | … |
| **T00002.1.5** | **TLO** | **Using and in accordance with applicable publications, the student will demonstrate the knowledge and ability to install the new bolt** | **ICW-3** |
| **T00002.1.5.1** | **ELO** | **Given a list of statements correctly identify the statement that describes how to locate the bolt** | **ICW-1** |
| **T00002.1.5.2** | **ELO** | **Given a scenario correctly grease the bolt** | **ICW-3** |
| **T00002.1.5.3** | **ELO** | **Given a scenario correctly grease the upper surface of the brake pad set** | **ICW-3** |
| … | … | … | … |

**New training objectives**

S1000D

Front brake system - Description of how it is made
B5-A-**A7-31-00-00A-**041A-D_***002***-00

Front brake pads - Replace procedure
B5-A-**A7-31-02-00A-**921A-D_***002***-00

S1000D SCORM

Learning content ⇨ Learning Data Module
B5-A-**A7-31-00-00A-**041A-A-T40C_***002***-00

Ability to perform ⇨ SCO Content Data Module
B5-A-**A7-31-02-00A-**921A-A-T40C_***002***-00

# Inform the users about the need to update the bike

We must inform the impacted owners/users about the need to change the bike to the POST MOD state, by means of an additional action associated to the safety instruction:

**Safety Instructions**

| Document Id | Associated to safety Issue | Title | Description | Status | Creation date | Document type | Safety Criticality | Safety priority | Applicability dates |
|---|---|---|---|---|---|---|---|---|---|
| SIN20220803A | SISS20220730A | Yeti SB5 Beti Brake safety instructions | Special safety instructions associated to Yeti SB5 Beti brake MTB-BRS800-801 | Approved | 14-8-22 13:19 | Special safety instructions | Major | High | 14/08/2022 - 31/12/2022 |

This instruction already included the provisional actions to be performed, and now the need to modify the bike:

**Required Safety Action**

| Safety Instruction Id | Safety action identifier | Type | Description | Priority | Release date | Required implemention date |
|---|---|---|---|---|---|---|
| SIN20220803A | 1 | Mandatory | **The BRAKE PAD SET must always be installed using graphite gliding paste on clean gliding surfaces (also inside the Brake Caliper Housing)** | High | 14.08.2022 | 30.08.2022 |
| SIN20220803A | 2 | Mandatory | Pending formal MB manual update, add manually the following statements to the MB manual:<br>- *„Severy injury may result in case of installation of the BRAKE PAD SET without graphite gliding paste on indicated surfaces.“*<br>- *„Keep BRAKE DISK surface free from any gliding paste or oil contamination during maintenance. Clean BRAKE DISK after brake maintenance.“* | High | 14.08.2022 | 30.08.2022 |
| SIN20220803A | 3 | Mandatory | Replace ISO4762-M4X40 - STEEL 10.9 bolt (pre-mod) by ISO4762-M4X40-A2 bolt (post-mod) using service bulletin SB1607. | High | 29.09.2022 | 31.12.2022 |

# But that is not sufficient…

Yes, the reported safety action tells the users **WHAT** to do.

But they must also know **HOW**!

So we raise a **technical order** and the associated **Service Bulletin**.

**Change embodiment**

| Change authorization | Change embodiment requirement Id | Change embodiment requirement date | Change embodiment requirement type | | Technical order priority | Technical Order required implementation date | | |
|---|---|---|---|---|---|---|---|---|
| Yeti SB5 Beti-CH1602 | CH1602 | 31.12.2022 | Mandatory | | N/A | N/A | | |

**Service Bulletin**

| SB Id | Title | Document type | Description | Status | Date | Type | Priority | Embodiment Limit | Cost |
|---|---|---|---|---|---|---|---|---|---|
| SB1607 | Yeti SB5 Beti brake bolt replacement | SB | Replace ISO4762-M4X40 - STEEL 10.9 bolt (pre-mod) by ISO4762-M4X40-A2 bolt (post-mod) | Approved | 29.09.2022 | Mandatory | High | 31.12.2022 | Free |

# Full Bike accident safety report

You may wonder - how does all this information fit together?

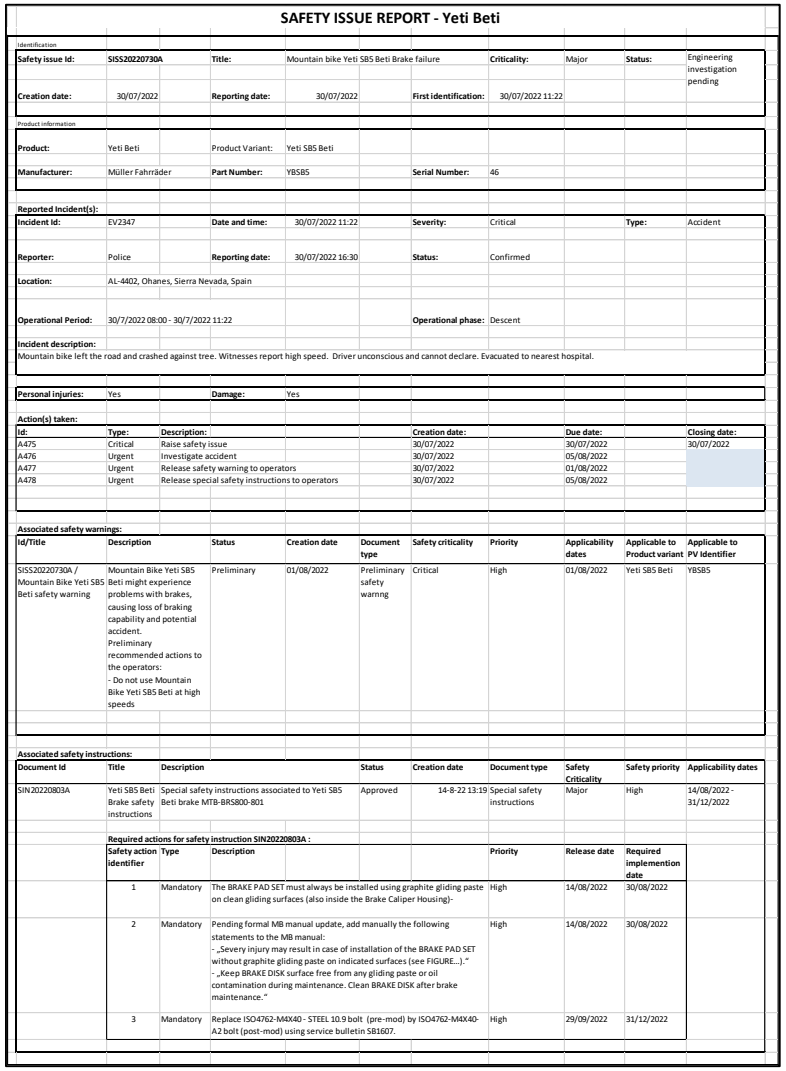
This is an **example of a report** about the bike accident using part of the data that you saw today.

It combines **information from the whole process**, ranging from the accident reporting to the actions to be taken.

Because the data model is integrated, it is possible to use in the same report information from multiple specifications.

Using the **existing cross-referencing**, you can then further drill down in the S-Series data as required.

**Big data at your fingertips because you standardized!**



**SAFETY ISSUE REPORT - Yeti Beti**

Identification

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Safety issue id:** | SISS20220730A | **Title:** | Mountain bike Yeti SB5 Beti Brake failure | **Criticality:** | Major | **Status:** | Engineering investigation pending |
| **Creation date:** | 30/07/2022 | **Reporting date:** | 30/07/2022 | **First identification:** | 30/07/2022 11:22 | | |

Product information

| | | | | | |
|---|---|---|---|---|---|
| **Product:** | Yeti Beti | Product Variant: | Yeti SB5 Beti | | |
| **Manufacturer:** | Müller Fahrräder | **Part Number:** | YBSB5 | **Serial Number:** | 46 |

**Reported Incident(s):**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Incident id:** | EV2347 | **Date and time:** | 30/07/2022 11:22 | **Severity:** | Critical | **Type:** | Accident |
| **Reporter:** | Police | **Reporting date:** | 30/07/2022 16:30 | **Status:** | Confirmed | | |
| **Location:** | AL-4402, Ohanes, Sierra Nevada, Spain | | | | | | |
| **Operational Period:** | 30/7/2022 08:00 - 30/7/2022 11:22 | | | **Operational phase:** | Descent | | |

**Incident description:**
Mountain bike left the road and crashed against tree. Witnesses report high speed. Driver unconscious and cannot declare. Evacuated to nearest hospital.

| | | | |
|---|---|---|---|
| **Personal injuries:** | Yes | **Damage:** | Yes |

**Action(s) taken:**

| Id: | Type: | Description: | Creation date: | Due date: | Closing date: |
|---|---|---|---|---|---|
| A475 | Critical | Raise safety issue | 30/07/2022 | 30/07/2022 | 30/07/2022 |
| A476 | Urgent | Investigate accident | 30/07/2022 | 05/08/2022 | |
| A477 | Urgent | Release safety warning to operators | 30/07/2022 | 01/08/2022 | |
| A478 | Urgent | Release special safety instructions to operators | 30/07/2022 | 05/08/2022 | |

**Associated safety warnings:**

| Id/Title | Description | Status | Creation date | Document type | Safety criticality | Priority | Applicability dates | Applicable to Product variant | Applicable to PV identifier |
|---|---|---|---|---|---|---|---|---|---|
| SISS20220730A / Mountain Bike Yeti SB5 Beti safety warning | Mountain Bike Yeti SB5 Beti might experience problems with brakes, causing loss of braking capability and potential accident. Preliminary recommended actions to the operators: - Do not use Mountain Bike Yeti SB5 Beti at high speeds | Preliminary | 01/08/2022 | Preliminary safety warnng | Critical | High | 01/08/2022 | Yeti SB5 Beti | YBSB5 |

**Associated safety instructions:**

| Document Id | Title | Description | Status | Creation date | Document type | Safety Criticality | Safety priority | Applicability dates |
|---|---|---|---|---|---|---|---|---|
| SIN20220803A | Yeti SB5 Beti Brake safety instructions | Special safety instructions associated to Yeti SB5 Beti brake MTB-BRS800-801 | Approved | 14-8-22 13:19 | Special safety instructions | Major | High | 14/08/2022 - 31/12/2022 |

**Required actions for safety instruction SIN20220803A :**

| Safety action identifier | Type | Description | Priority | Release date | Required implemention date |
|---|---|---|---|---|---|
| 1 | Mandatory | The BRAKE PAD SET must always be installed using graphite gliding paste on clean gliding surfaces (also inside the Brake Caliper Housing)- | High | 14/08/2022 | 30/08/2022 |
| 2 | Mandatory | Pending formal MB manual update, add manually the following statements to the MB manual: - „Severy injury may result in case of installation of the BRAKE PAD SET without graphite gliding paste on indicated surfaces (see FIGURE...)." - „Keep BRAKE DISK surface free from any gliding paste or oil contamination during maintenance. Clean BRAKE DISK after brake maintenance." | High | 14/08/2022 | 30/08/2022 |
| 3 | Mandatory | Replace ISO4762-M4X40 - STEEL 10.9 bolt (pre-mod) by ISO4762-M4X40-A2 bolt (post-mod) using service bulletin SB1607. | High | 29/09/2022 | 31/12/2022 |

# Summary

## Concept phase:

S5000F

In Service feedback from past projects

SX000i

- Support strategy
- Contract
- Management info
- Etc...

## Development phase:

**Engineering / Support Engineering**
System/subsystem matrix
Engineering Product breakdown

S4000P

**System analysis** (*Front brake*)
- Determine Analysis Relevant Candidates
- Definition of Functional Failures, Effects and Causes
- Functional Failure Categoration
- Failure Cause Assessment

S3000L

**Logistic Support Analysis**
- Customer & operational requirements
- Product breakdown / LSA candidates
- Maintenance task requirements (e.g. **PMTR1**, **PMTR2** & **PMTR3** included in maintenance tasks)
- Maintenance Task Analysis (MTA)

**Material Services**
- Physical breakdown (engineering installation)
- Illustrated Parts Catalogue (IPC)

S2000M

**Technical Publication**
- Data Module Requirement List (DMRL)
- Data modules / Publication modules

S1000D

**Training**
- Task selection & analysis
- Determine objectives/media

S6000T

## In-service phase:

S1000D

**Technical Publication**
➔ **Based on Finding 1 & 2**
Update of data module and publication modules

S6000T

**Training**
➔ **Based on Finding 1 & 2**
- Update of task selection & analysis
- Update of determination of objectives/media

S2000M

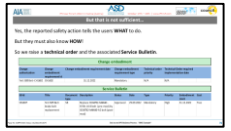
**Material Services**
➔ **Based on Finding 1 & 2**
Update physical breakdown
Update Illustrated Parts Catalogue (IPC)

S3000L

**Logistic Support Analysis**
➔ **Based on Finding 1 & 2**
Update LSA data (product breakdown, task requirements, tasks)

S5000F

**In-Service feedback**
➔ **Based on Finding 1 & 2**
Warn users/owners using Pre-Mod bike



S5000F

Inform users about modification and safety information changes

**Post - Mod**

Mountain bike accident !
In Service feedback

S4000P

**Result of accident analysis**
- Check/Update System FMECA
- Failure cause assessment
- Conclusions & requirements

➔ **Finding 1 & 2 (for front brake)**

S5000F

**Entry into in-service**

**Pre - Mod**

**IPS**

S5000F

## Disposal

Disposal feedback

# Thank You

## for your attention!

## Questions?