

## Training References

# SPACE Training Modules

**Our Next Event:**  
18-22 / 04 / 2022

**@ CreaCannes**  
**Pépinière d'Entreprises**  
**11 av Maurice Chevalier**  
**06150 Cannes la Bocca**



# *Training Package* **“GREENSPACE”**

*“All you needed to know about  
Space Debris Mitigation & Remediation  
as Space System Engineer & Designer  
..without daring to ask”*

## **SPACE Training Ab Initio**

*2 Modules (3h) => 1day*

*Basic Knowledge : Orbital Dynamics / Space Environment*

## **SPACE DEBRIS**

*6 Modules (2h) => 2 days*

*Space Debris History – Status – Consequences*

*Space Debris Laws & Tools – Mitigations & Remediations*

## **Space SYSTEMS**

*2 Modules (3h) => 1day*

*Debris-Critical Platform & Payload Systems*



# What Will you Learn :

## Basic Space Trainings

Systems Trainings - Missions Training  
Orbital Dynamics – Space Environment  
Space Actors – Regulation Laws

## Space Debris

Space Safety / Space Debris / Space Sustainability ->  
**GREENSpace**

### Risk in Orbit : Collisions & Impacts

Conjunction Risk / Debris Catalog / Tracking Network  
Debris Flux / Ballistic Equation / Shielding techniques

### Risk on Ground : Atmospheric Reentry & Ablation

Atmospheric Decay & Reentry Prediction  
Aerothermal Equation & Ablation – Reentry Analysis  
Debris Risk Assessment – on Population / Traffic  
Trade-off Design for Demise / Controlled Reentry

## Space Systems Expertise

Debris -Critical Space Hardware  
Spacecrafts, Platforms, Optical Payloads,  
Avionic, Propulsion, Mechanisms, ...  
Mechanical –Thermo Architecture,

# What Will you Get :

## Handbook Presentations

Verbal Presentation (delivered Powerpoint Presentation)  
Videos & Animations  
Dedicated Trainer & Coach  
Dedicated Practices & Evaluation Exercises

## Tools Training

Orbital Mechanics - Orbital Tracking Tool  
Debris Catalog – Debris Conjunction Tool  
Reentry Prediction & EOL Mission Assessment  
Reentry Analysis – Debris Risk Assessment

# Target Audience:

## Space Engineers

Junior Space Mission Analysts / Space Debris Analyst  
Space System Designer & Manager (Junior -> Senior)  
Space Hardware Engineer (Junior -> Senior)

## Our Staff

# Team Presentation

## *e.NOVA Aerospace* Key Personnel : *Stephane HEINRICH (SHE)*

**SHE** is a **Senior Space consultant**

with experience working for customers on-site such as **Thales, Airbus, Safran** Groups.  
With **more than 20 years** experience he mostly worked on space and **ESA projects**  
(GOMOS - IASI instruments, ATV avionics chain, PLANCK, Sentinel-3 satellites).



He has a clear expertise in avionics and propulsion equipments and space systems

He is mainly involved in Quality & Safety topics

He was trained by TAS-F dependability and safety department and IAASS training courses in ALTEC, Torino.

He is an **IAASS professional fellow** attending most **Space Safety / Space Debris conferences**

He is the former founder & leader of **ALTRAN\_Cannes Research Team** working on Space Safety & Debris topics :

“MMOD : Mitigations Measures for Orbital Debris

“ODAR : Orbital Debris Atmospheric Reentry: Design for Demise/ Controlled Reentry

The team was involved in 2 D4D Activities for ESA Cleanspace (S/C & OP/L)

The team has leaded 2 CLEANSAT Building Blocks for ESA Cleanspace

He is certified as a **ALTRAN \_France Certified Trainer** and the former Bid Leader for ESA ITTs.

He founded the *e.NOVA Aerospace* Company in in 2019 to focus on GREENSPACE & NEWSPACE innovative topics

The company is currently preparing the” **Qualiopi” French Certificate** for its Space Training Courses .





# Our Location / Our Expertises

@ CreaCannes  
Pépinière d'Entreprises  
11 av Maurice Chevalier  
06150 Cannes la Bocca



# Space Innovations: GREENSPACE & NEWSPACE

*MMOD: Mitigations Measures for Orbital Debris*



NEWSPACE

## Space Systems Expertise

Spacecrafts, Launchers, Platforms, Payloads,  
Avionic, Propulsion, Mechanisms, Power, ...  
Mechanical –Thermo Architecture, Optical instruments

## System Design & Optimization

Historical **State of the Art** – Multidisciplinary Fields Survey  
Technical & Actors **Intelligence Survey**  
Preliminary System **Concepts studies** – Trade-Off  
**Concurrent Design** Facilities Techniques  
Systems **Budget Assessment** / Spec **Compliance Matrix**  
Computed **Design Optimization** (cross data range sweep )

## Mission Sim° & Data Managt

Launch Sequence **Tracks & Performance** Assessment  
Orbital Flight Tracks / Maneuvers & Missions Budgets  
Reentry Tracks / **AeroTh environment** & Maneuvers  
4D Track **Flight Simulations** via CFD data interpolation  
4D Flight **Track Visualization** & CAD models Animations  
CAD models Exploitation & Mathematical computation  
**Science Data Exploitation** : Visu° & Comput° (DTM,MTO)

## Space Trainings

Basic Trainings - **Systems Trainings** - Missions Training  
**Product & Quality Assurance** and Safety  
**Space Safety / Space Debris** / Mitigations & Remediations  
**Space Agencies / Space Actors** / Space Business aspects  
**Space News & Trends** / Technical & Business Intelligence

## Research & Innovation (Crédit Impôt Recherche)

Space Safety / Space Debris / Space Sustainability -> **GREENSpace**  
**MMOD** : Impact in-Flight Impact Risk Assessment (S/C Robustness)  
**ODAR**: Ground Debris Risk vs Population Assessment (Demisability)  
**D4D & D4B** Techniques : Design for Demise & Dismantlement  
Reentry Prediction & Risk vs Population Assessments  
Space Innovations / Space Competitiveness -> **NEWSpace**  
Shape Memory Alloys (**SMA**) deployment/release mechanisms  
Atmospheric **Reentry Kits** / **Sample Return** Capsules  
**Booster Stage recovery** by Aircraft s - Airships / **Catapult Launch**

## Quality & Safety Expertise

Projects **Product Assurance** / Production **Quality Assurance**  
**Safety, Dependability**, Reliability, REACH, RoHs, LCA  
Space Materials & Processess, Space Projects Documentation  
Avionics, Propulsion, Mechanisms, Power, systems  
AOCS, Functional Chain Validation, MBSE, ISVV, ...

## Space Safety & Debris Mitigation

Satellite Robustness to MicroMeteoroids /Debris Impacts  
Satellite Atmospheric Reentry – **Design for Demise**  
Satellite Atmospheric Reentry – **Controlled Reentry**  
Atmospheric Reentry – **Prediction & Risk Assessment**  
Mitigation Measures for Orbital Debris - **Launchers Reusability**  
Mitigation Measures for Orbital Debris - **Spacecrafts Compliance**

## Business Prospective & Bid Managt

Space Actors & European Suppliers & **Intelligence Network**  
ESA Registration / **ESA & CNES Bid redaction & training**  
Space Agencies **R&T**, **Call for Ideas**, Innovative funding etc...

# Our Training Catalog Inventory

## 1 **SPACE Training Modules**

Ab Initio

*12 Modules (1h) => 2days*

## 2 **Space SYSTEMS**

Training Modules

*8 Modules (1h) => 1day*

*8 Modules (2h) => 2days*

## 3 **Space MISSIONS**

Training Modules

*8 Modules (1h) => 1day*

*8 Modules (2h) => 2days*

Survey Presentation

**ESA & Business**

*8 Modules (1h) => 1day*

*16 Modules (1h) => 2days*

## 4 **SPACE Training Modules**

**LAUNCHER / micro L/V**

*8 Modules (1h) => 1day*

*8 Modules (2h) => 2days*

## 5 **SPACE Training Modules**

**SAFETY & SPACE**

*8 Modules (1h) => 1day*

*8 Modules (2h) => 2days*

## 6 **SPACE Training Modules**

**SPACE DEBRIS**

*8 Modules (1h) => 1day*

*8 Modules (2h) => 2days*

Survey Presentation

**NASA**

*8 Modules (1h) => 1day*

## 7 **SPACE QUALITY Training**

Ab Initio & TAS Oriented

*8 Modules (1h) => 1days*

*8 Modules (2h) => 2days*

## 8 **SPACE QUALITY Training**

Restricted to TAS Activities

*8 Modules (1h) => 1day*

## 9 **SPACE QUALITY Training**

«How to do a MIP Inspection»

*8 Modules (1h) => 1day*

Survey Presentation

**CNES – ONERA**

*8 Modules (1h) => 1day*

1.

TRAINING MODULES  
**SPACE ab Initio**

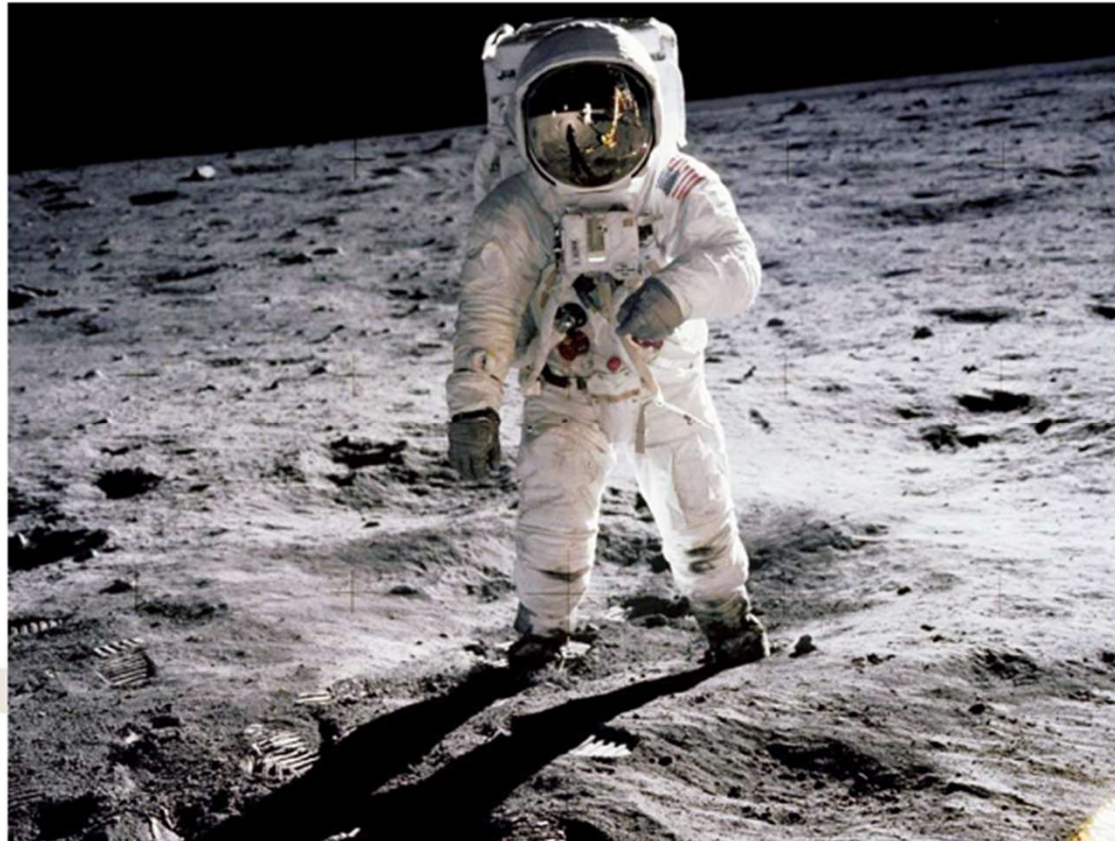


## 0. CONTENT:

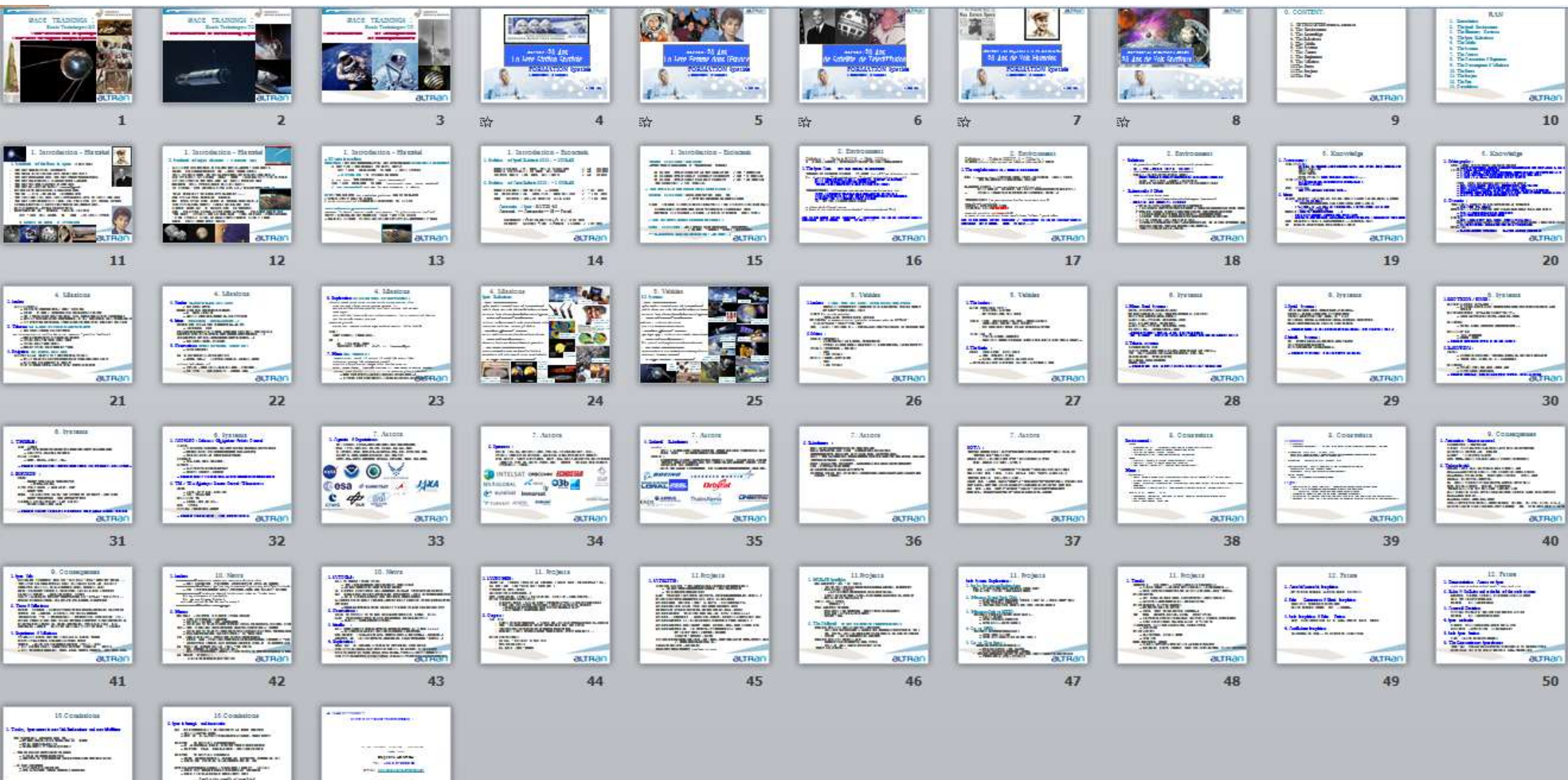
1. INTRODUCTION (Hi:
2. The Environment
3. The Knowledge
4. The Missions
5. The Vehicles
6. The Systems
7. The Actors
8. The Requirements
9. The Validation
10. The News
11. The Projects
12. The Future

# SPACE TRAININGS : Basic Trainings v10.0

1969-2019: 50Yrs of 1st Man on the Moon







# 0. CONTENT:

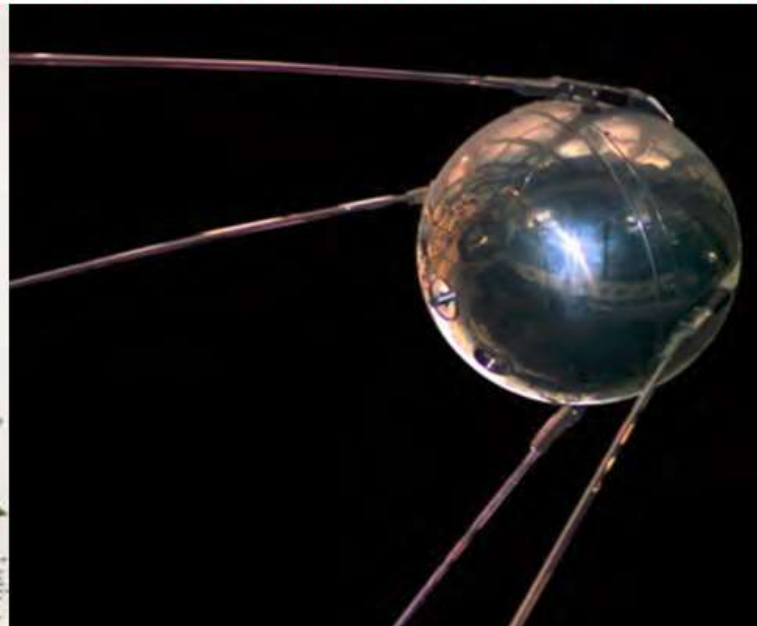
1. INTRODUCTION (Historical & Economical )
2. The Environment
3. The Knowledge
4. The Missions
5. The Vehicles
6. The Systems
7. The Actors
8. The Requirements
9. The Validation
10. The News
11. The Projects
12. The Future



Space Innovations- TRAINING Modules

## SPACE TRAININGS : Basic Trainings v8.0

1957-2017 : 60 Years of Spaceflight  
1967-2017 : 1st Tragedies For Space Exploration



2.

TRAINING MODULES  
Space **SYSTEMS**



# CONTENT

## 0. Introduction

1. Space Mission
2. AIRBUS LEO
3. OHB GEO
4. ESA GEO

## 1.Spacecraft Systems

1. THALES LEO
2. AIRBUS LEO
3. OHB GEO
4. ESA GEO
5. NASA Probe

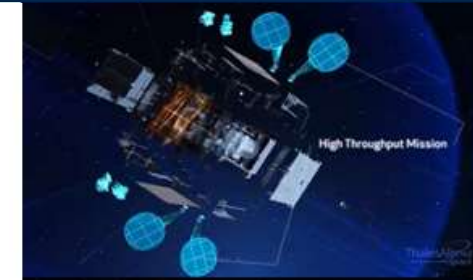
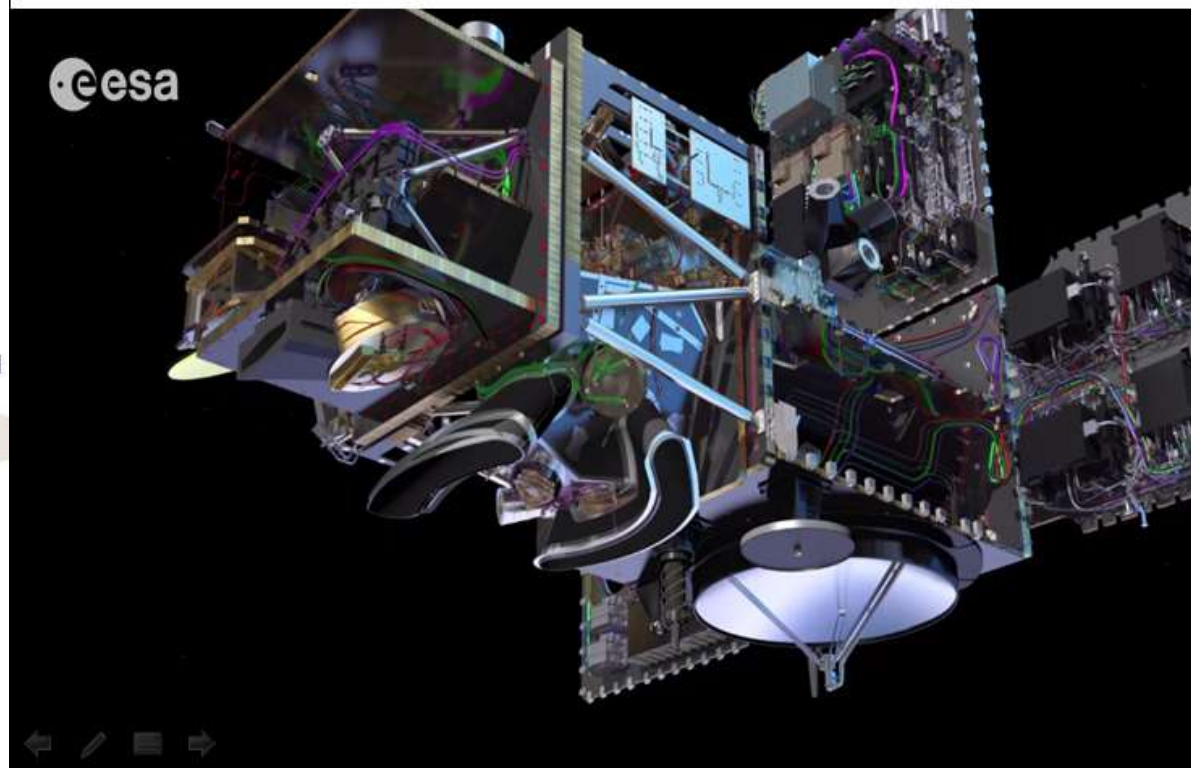
## 2.Platform Systems

1. Structural
2. Thermal
3. Electrical
4. Communications
5. Propulsion
6. Attitude Control
7. Data Handling & Command Control

# SPACE TRAININGS :

## Space Systems v1.0

State of the Art – Systems Overview





# CONTENT

## 0. Introduction

1. Space Mission
2. AIRBUS LEO
3. OHB GEO
4. ESA GEO

## 1.Spacecraft Systems

1. THALES LEO
2. AIRBUS LEO
3. OHB GEO
4. ESA GEO
5. NASA Probe

## 2.Platform Systems

1. Structural
2. Thermal
3. Electrical
4. Communications
5. Propulsion
6. Attitude Control
7. Data Handling & Command Control

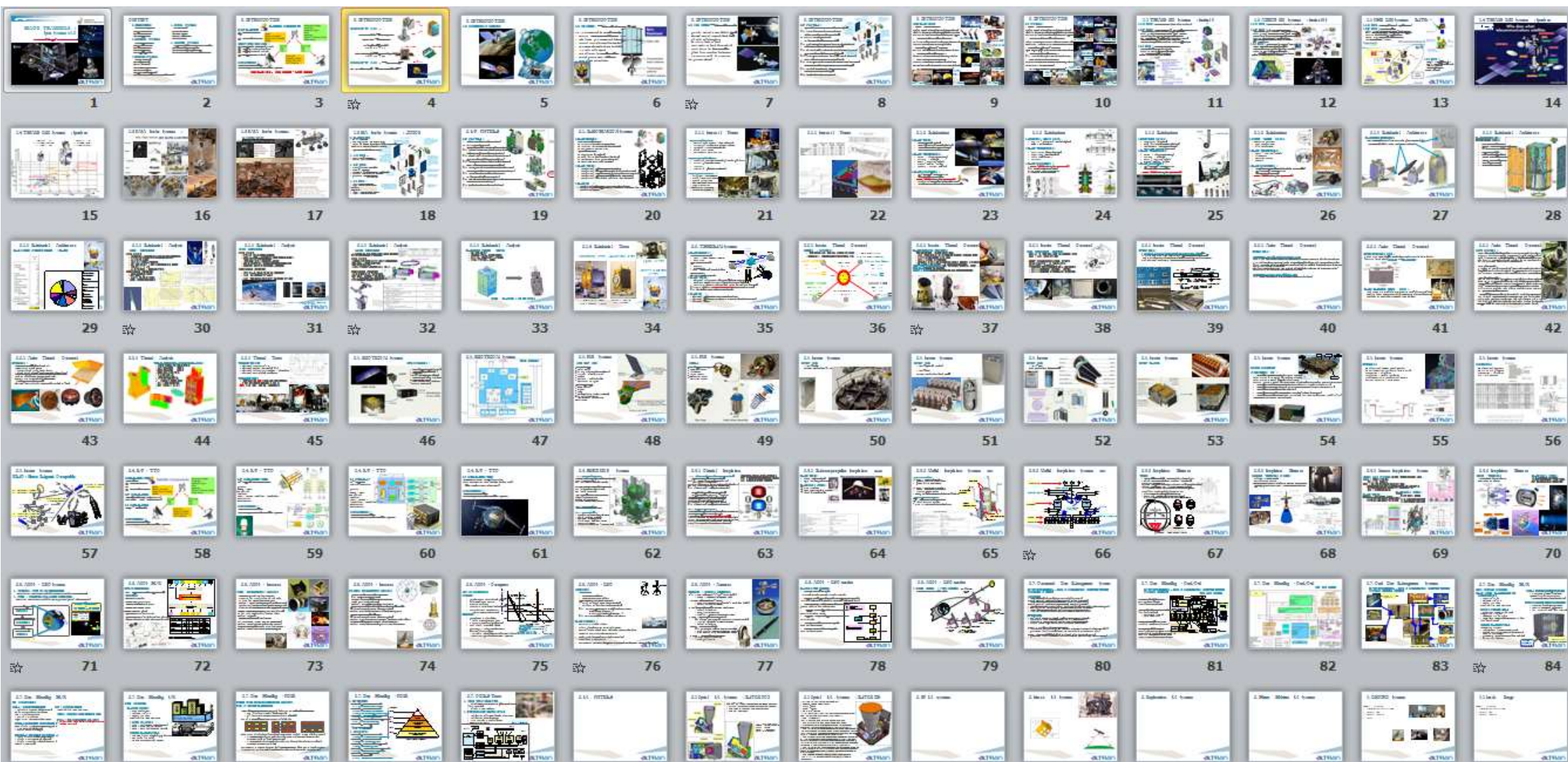
## 3. Payload Systems

1. Optical
2. Satcom
3. Science
4. Exploration
5. Human

## 4. GROUND Systems

1. Assembly Integration Test Facilities
2. Launch Site Facilities
3. Ground Control Station
4. Ground Tracking and Observation





3.

TRAINING MODULES

**Space MISSIONS**



# SUMMARY

## 0. Introduction

1.Launch:

2.Telecom:

3.Meteo:

4.Observation:

5.Science:

6.Navigation:

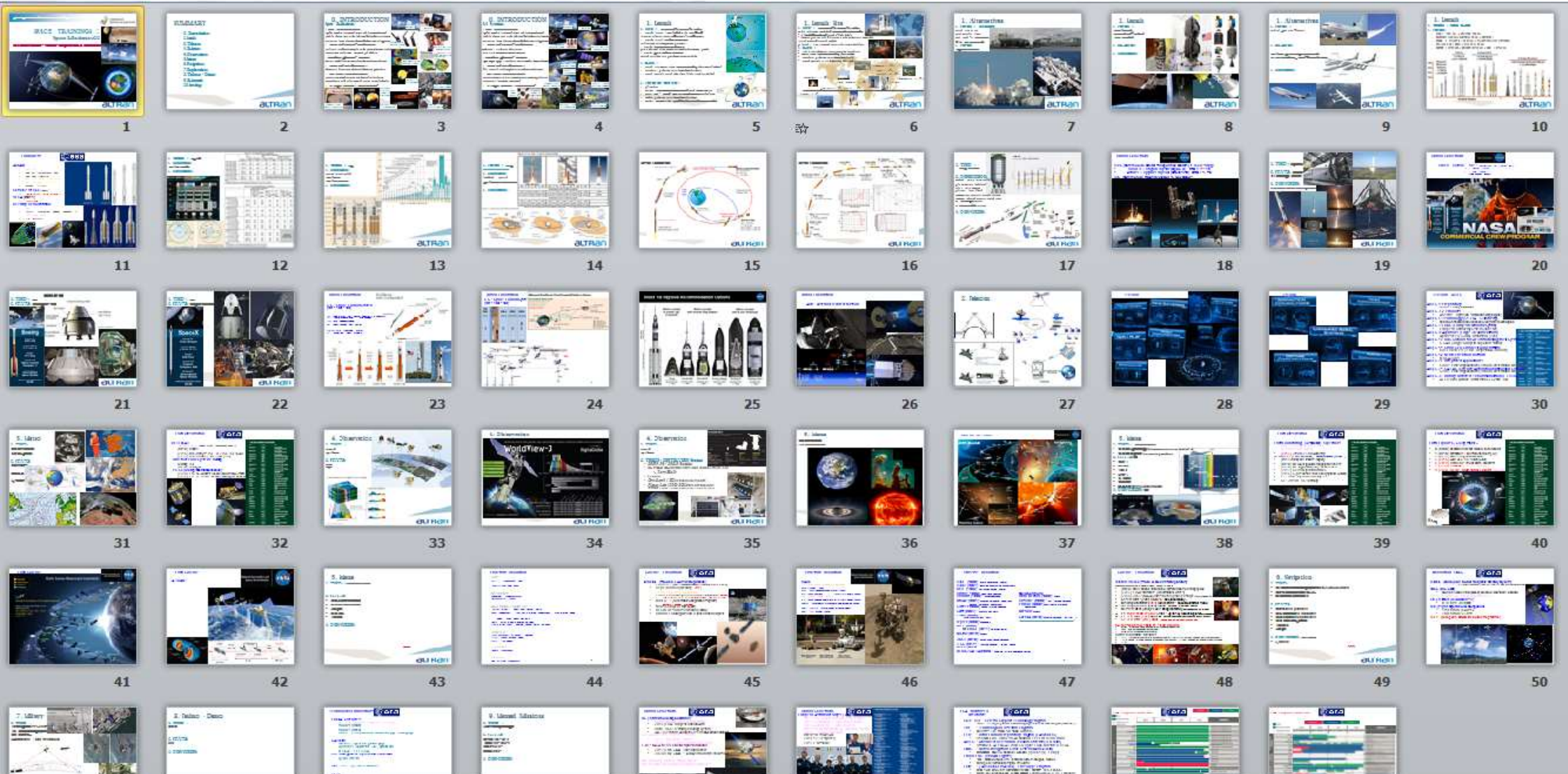
7.Exploration:

8.Techno - Demo:

9.Manned:

10.Servicing:





**3.**

**TRAINING MODULES**

**ESA & NASA Programs**

# Summary

1. ESA Presentation
2. ESA Previous Success
3. ESA Management
4. ESA Budget
5. ESA News
6. ESA Programs & Directorate
7. ESA Programs Schedule
8. ESA Links
9. ESA Acronyms
10. Acronyms

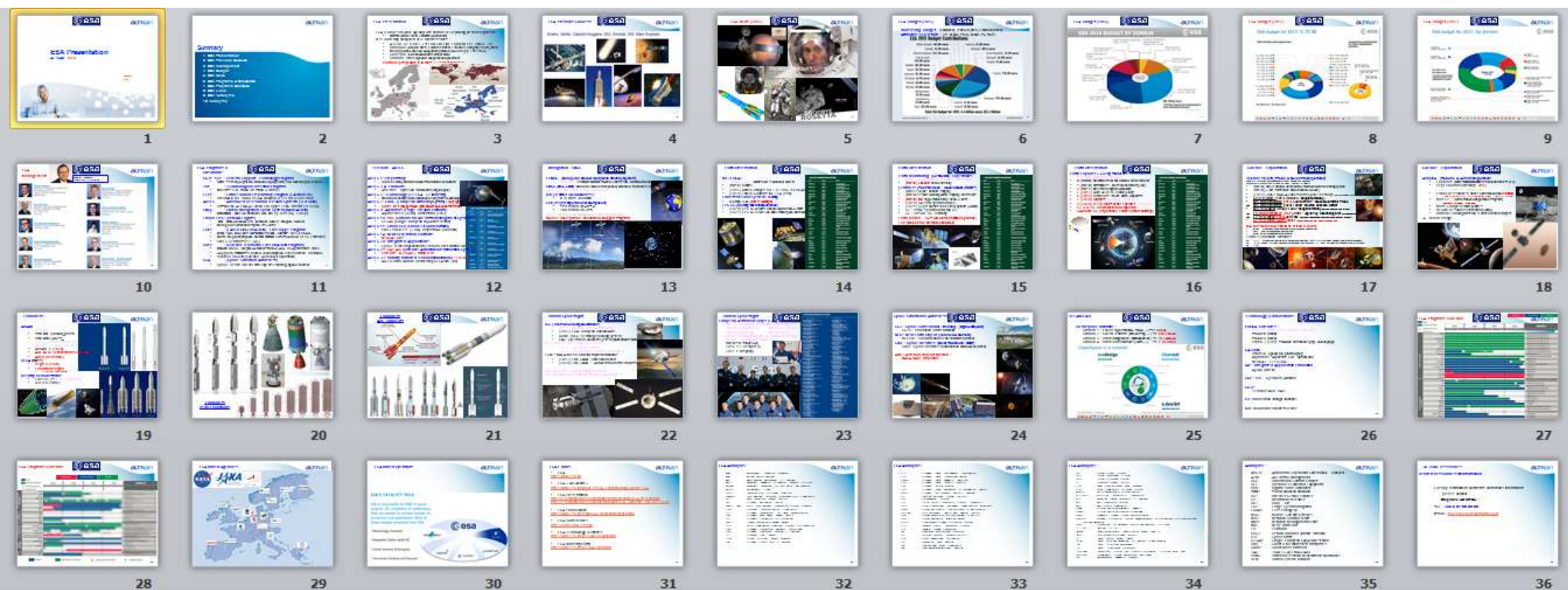
## ESA Presentation

v11.0

January  
2019











# NASA Presentation

v2.0

Novembre  
2016



## NASA Activities in Space and on Earth

Chris Blackerby  
International Programs Specialist  
Office of International and Interagency Relations  
National Aeronautics and Space Administration

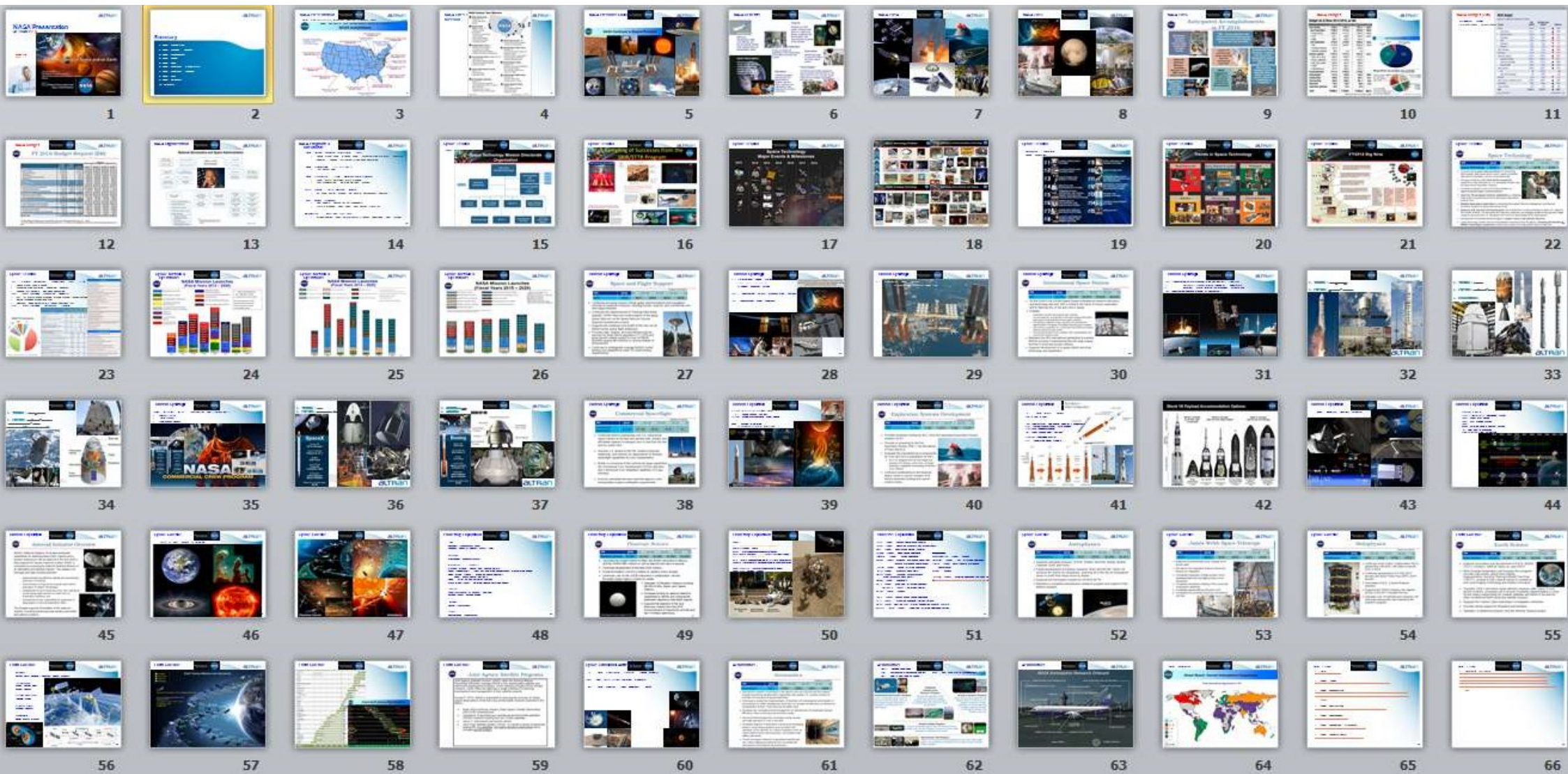
June 6, 2016  
Internal

www.nasa.gov

## Summary

1. NASA Presentation
2. NASA Previous Success
3. NASA Management
4. NASA Budget
5. NASA News
6. NASA Programs & Directorate
7. NASA Programs Schedule
8. NASA Links
9. NASA Acronyms
10. Acronyms

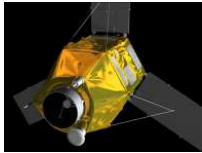






# French Aerospace CNES – ONERA

v1.0



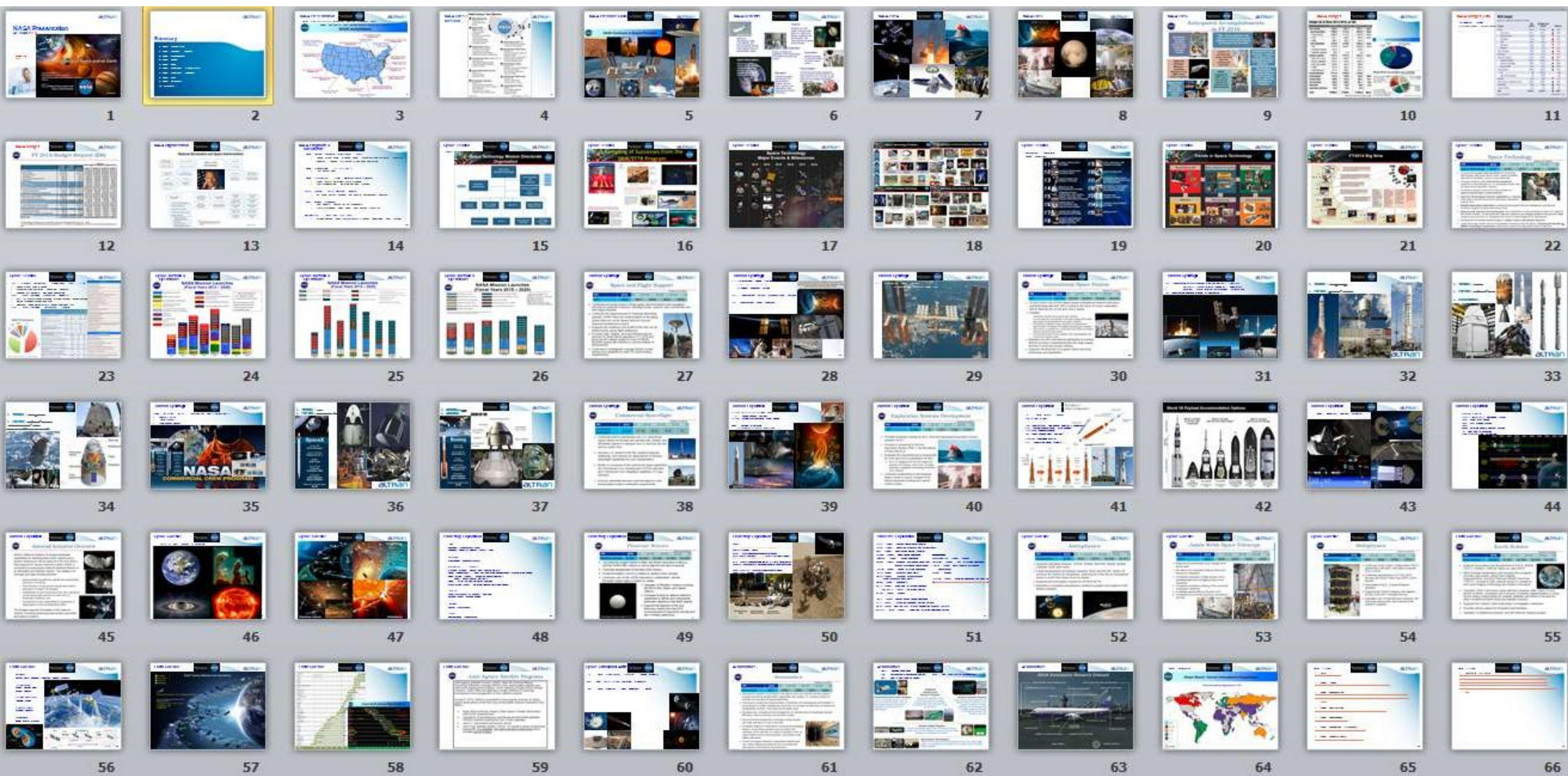
January 2018



## Summary

1. CNES Presentation
2. CNES Previous Success
3. CNES Management
4. CNES Budget
5. CNES News
6. CNES Programs & Directorate
7. CNES Programs Schedule
8. CNES Links
9. CNES Acronyms
10. Acronyms







# French Aerospace / R & T CNRS / CEA & Labs

v1.0



November 2018



# 4.

## SPACE TRAINING MODULES **LAUNCHERS – Access to Space**

# Summary

Introduction

Basics & Goals

Launch Sites

Alternatives

Launchers

State of the Art

Market

Perspectives

Reusability

Small Launchers

Sounding Rockets

Upper Stages

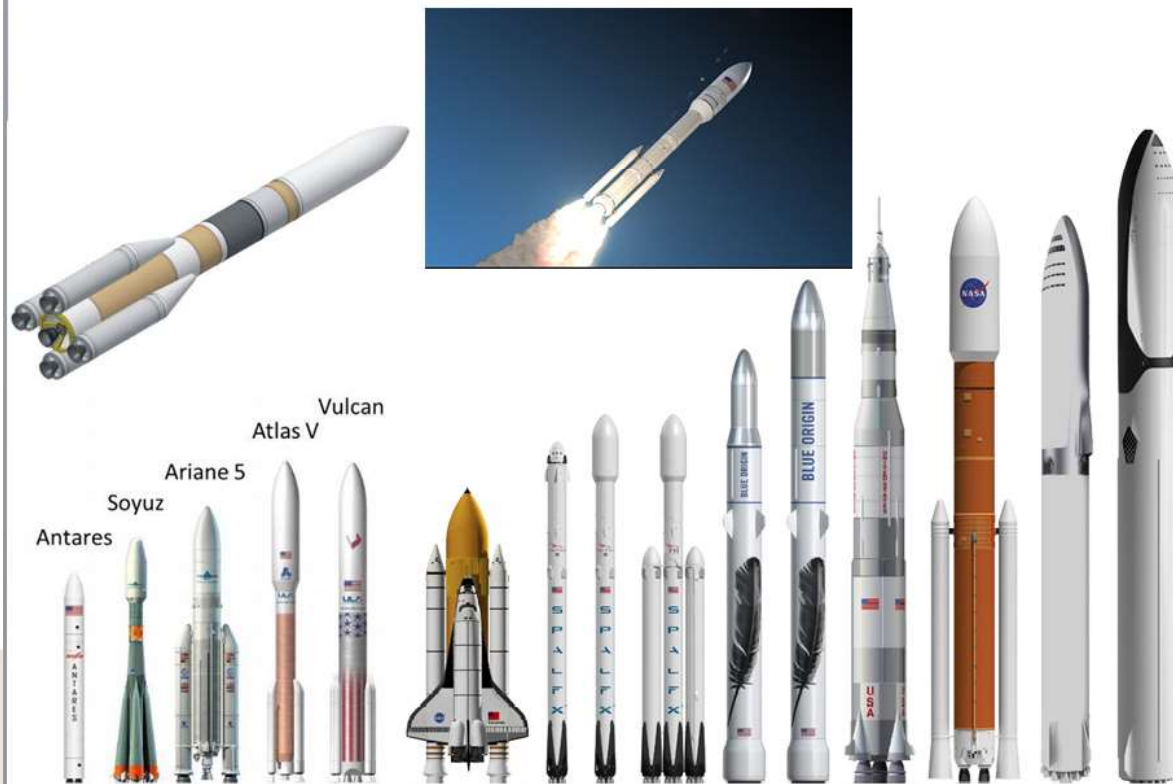
Shuttle

Engines

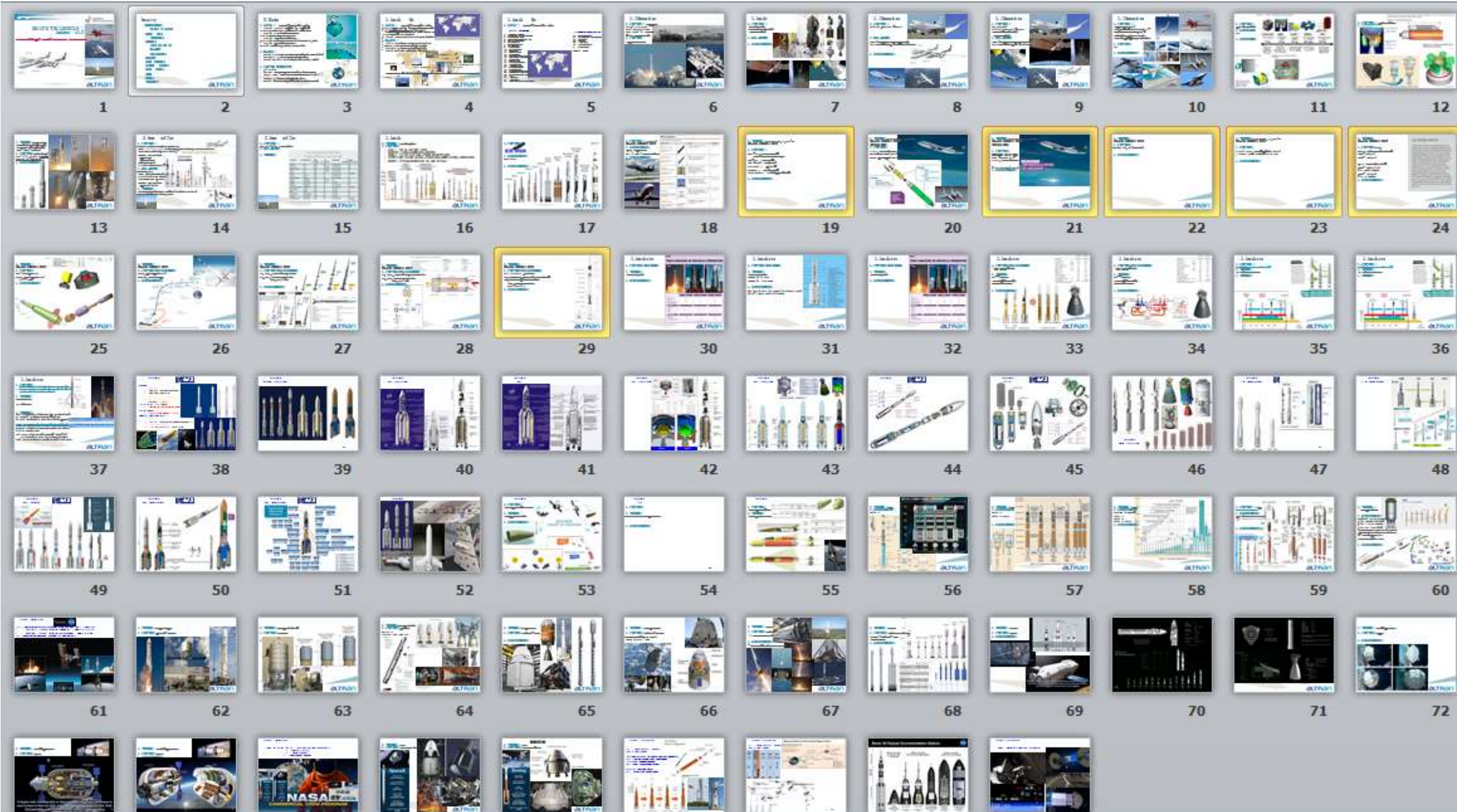
Technos

## SPACE TRAININGS : Launchers v1.0

State of the Art – Trends – Perspectives & Innovations







**5.**

SPACE TRAINING MODULES  
**SPACE SAFETY**

## Scope

1. Introduction
2. Applicability
3. Standards & Regulations
4. SubSystems concerned
5. Impacts on Engineering
6. Impacts on Manufacturing & Test
7. Impacts on Operations
8. Submission Process
9. ....

# SPACE SAFETY Training v1.1

## 1. Introduction & Currents Trends







1



2



3



4



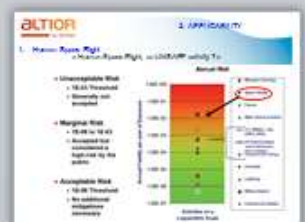
5



6



7



8



9



10



11



12



13



14



15



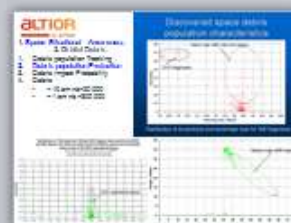
16



17



18



19



20



21



22



23



24



25



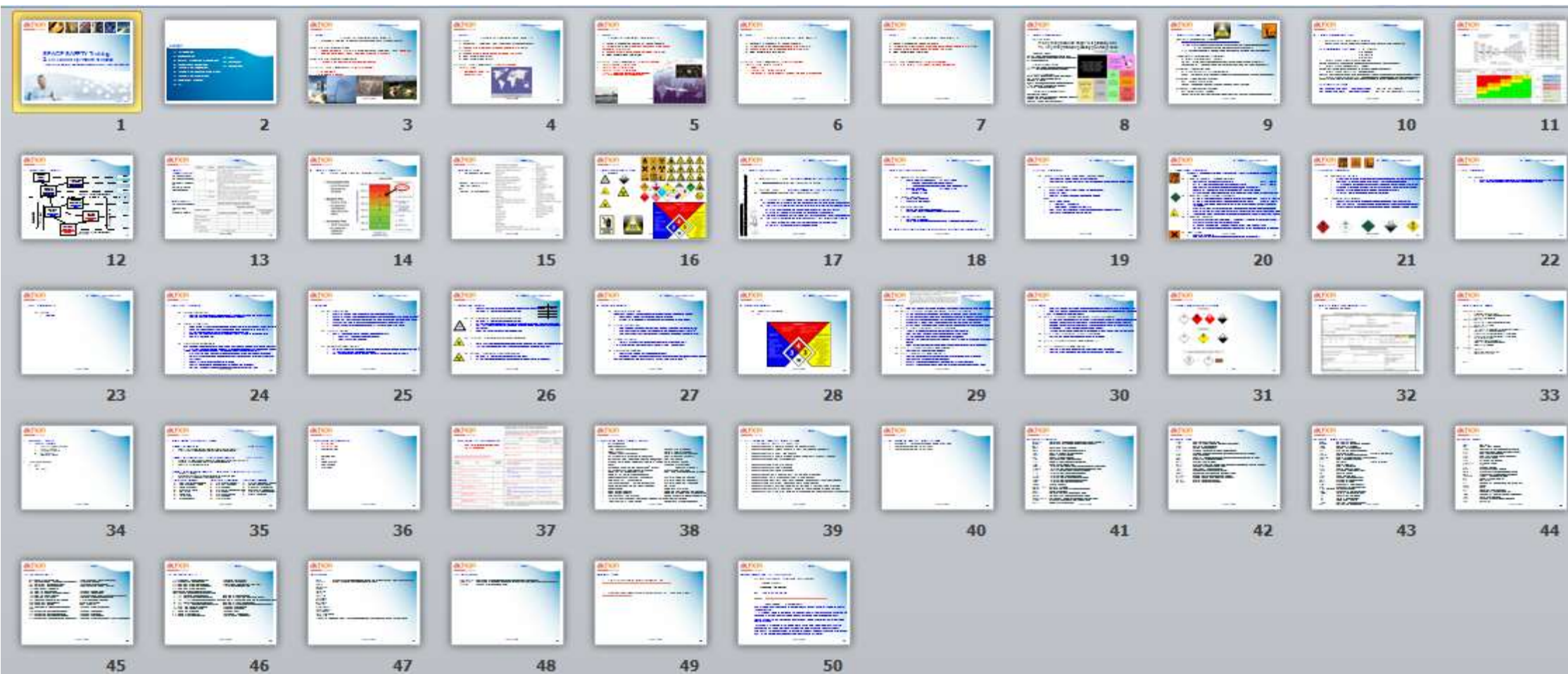
26



27



28



6.

TRAINING MODULES  
**SPACE DEBRIS**





## SPACE SAFETY Training

### 4. Space Debris

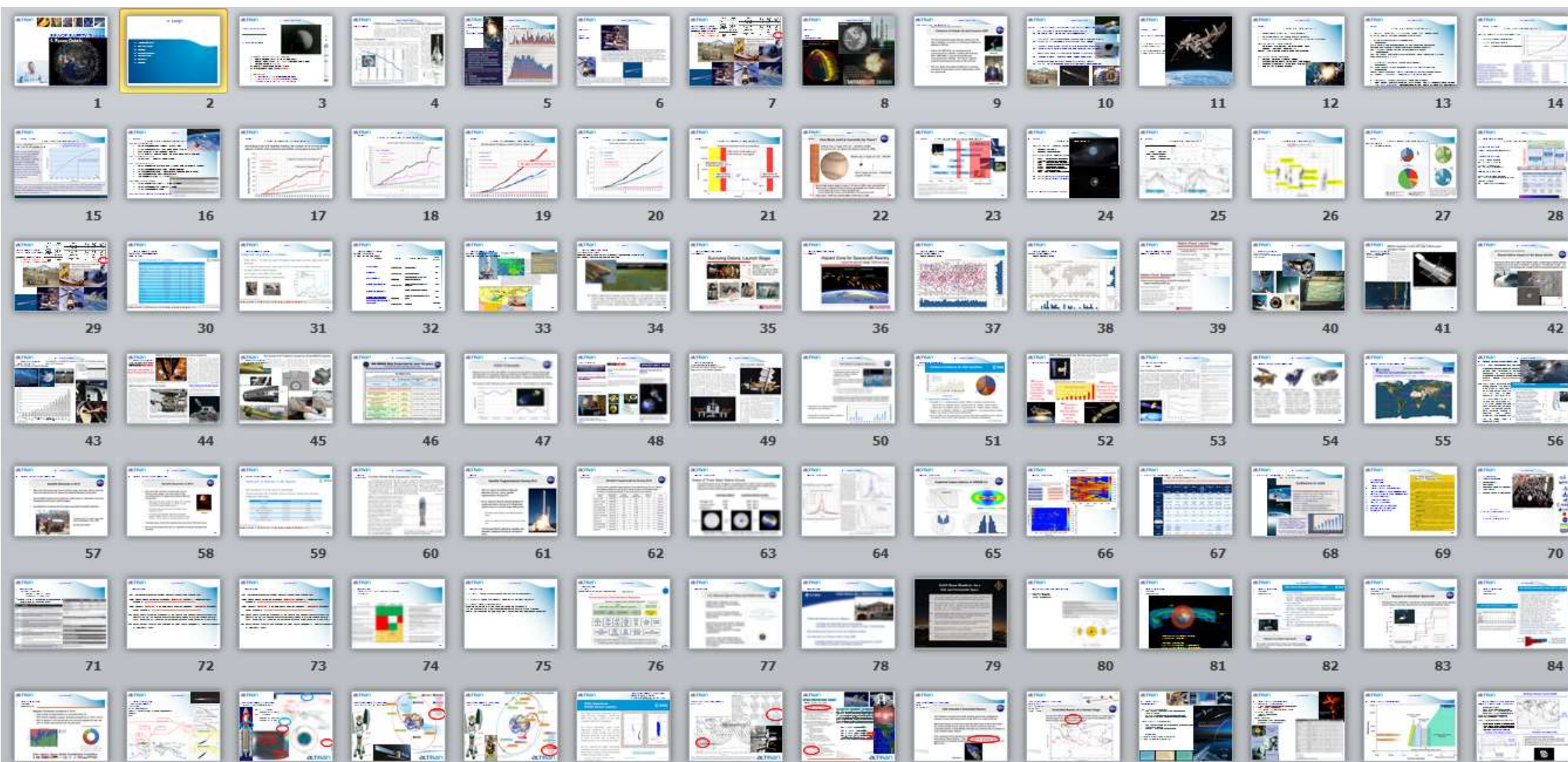


Jan 2017

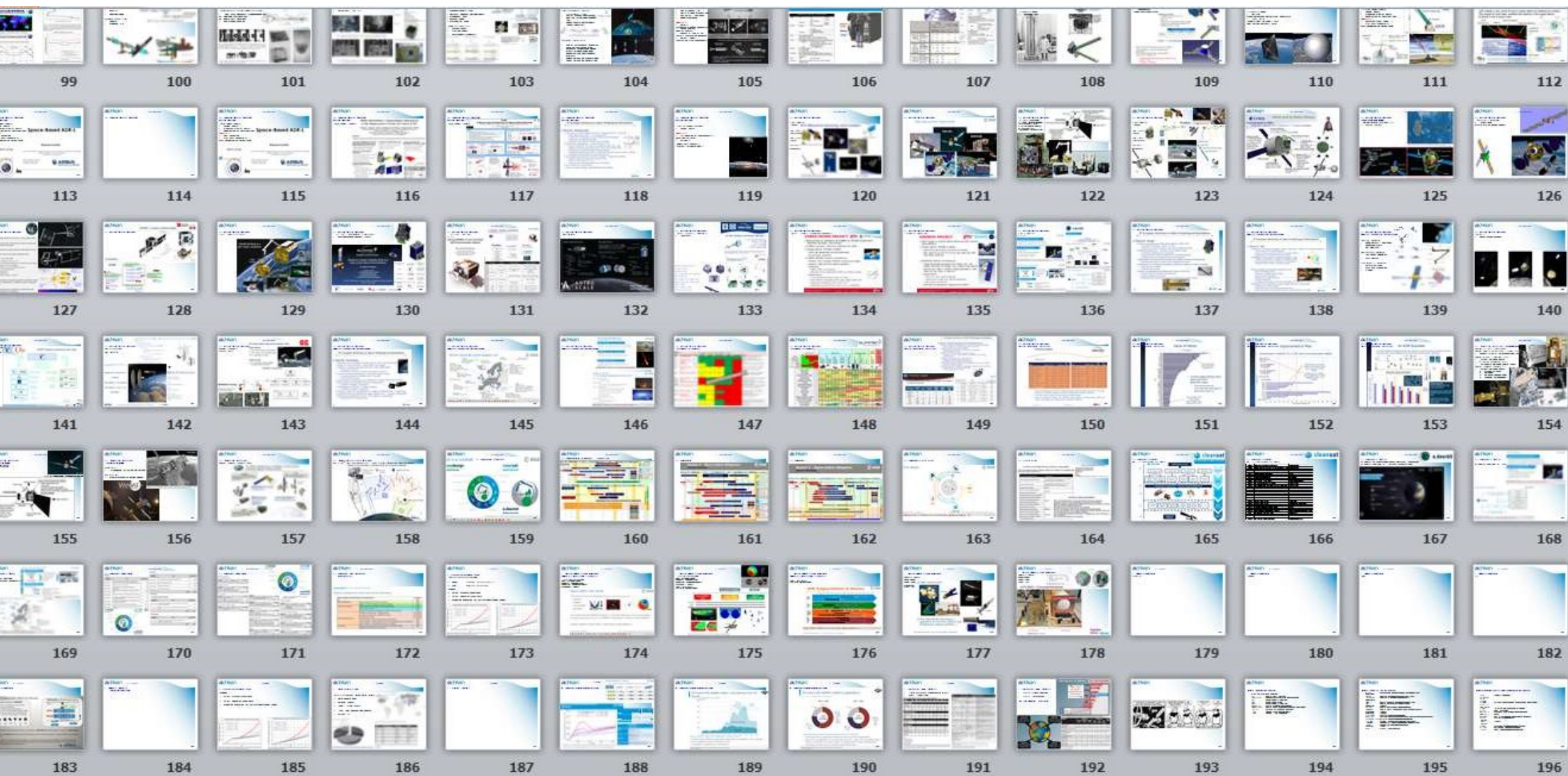
1. INTRODUCTION
2. DEFINITIONS
3. STATUS
4. CONSEQUENCES
5. SOLUTIONS
6. TOOLS
7. FUTURE













# 7.

TRAINING MODULES

**Space QUALITY**

Ab Initio & TAS oriented

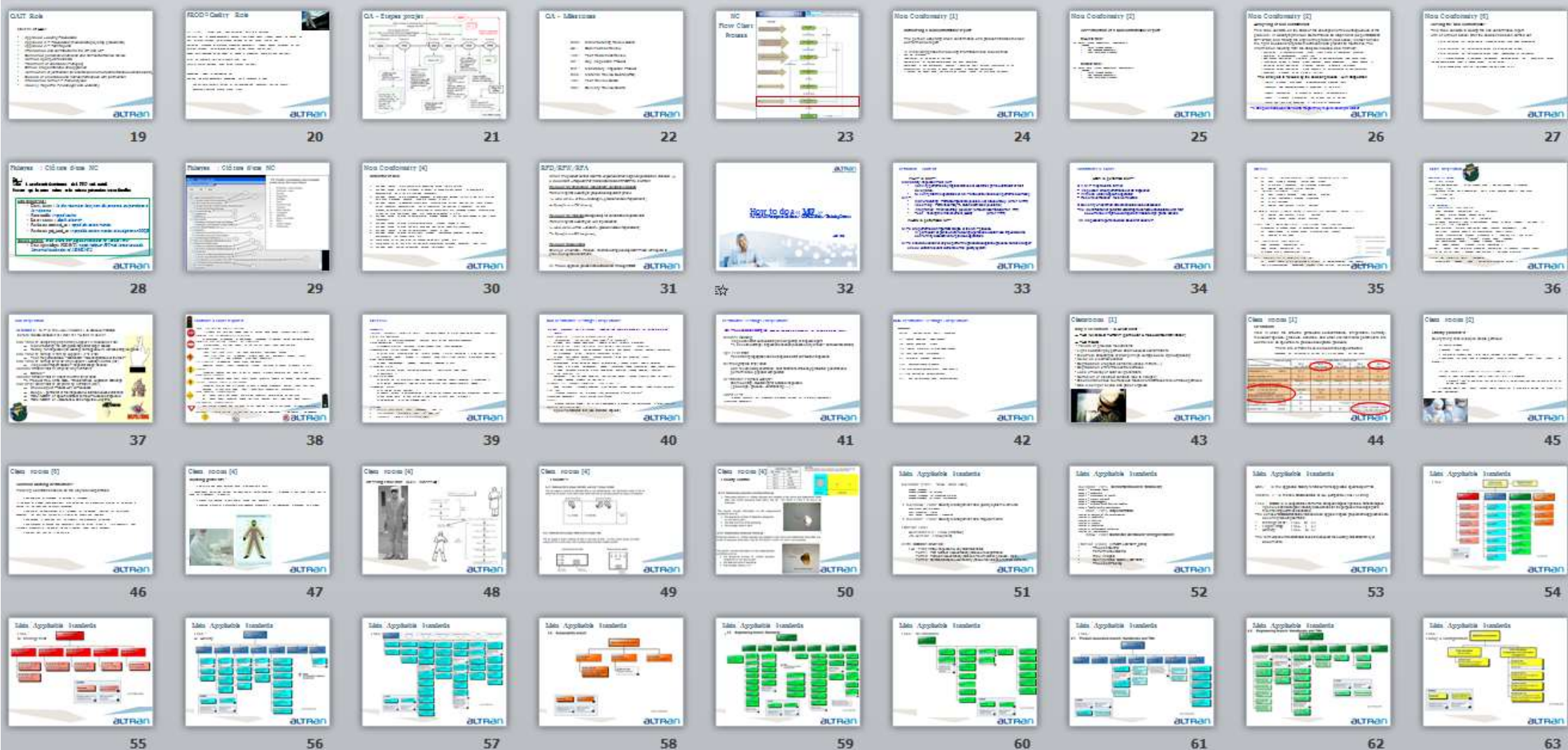
# PA-QA TRAININGS :

PMO / AIT / Prod° / Suppliers v2.0

Basic Trainings – Thales Alenia Space oriented



1. Introduction
2. Definitions
3. Programmatic Milestones
4. Non Conformity
5. RFD / RFD Request for deviation
6. MIP
7. Clean room
8. ECSS Standards
9. TAS Standards
10. TAS Tools
11. Acronyms
12. References





8.

TRAINING MODULES

**Space QUALITY**

TAS oriented – Activity Specific

# PA-QA TRAININGS :

PMO / AIT / Prod\* / Suppliers v1.0

Prod\* Environment



## Summary

1. Introduction
2. I-NEXT Service Modules
3. I-NEXT Solar Arrays
4. I-NEXT Mechanisms
5. EON Modules
6. MPL
7. TAS Standards
8. TAS Tools
9. Acronyms
10. References





9.

TRAINING MODULES

**MIP & Key Inspections**

## Summary

1. Definition & Context
2. Conditions & Goals
3. Inputs required
4. Cautions & Skills required
5. Doc° Inspection
6. H/w Inspection
7. Outputs required
8. Testing / Inspections
9. EEE Boards Inspections

11. Mechanical Aspects
12. Thermal Aspects
13. Radiations Aspects
14. EEE Aspects
15. PCB Aspects
16. Materials / Processes Aspects
17. Standards
18. Personnel Certification
19. Acronyms
20. Altran Ressources



## How to do a « MIP »

QUALITY Pole / Training Course





1



2



3



4



5



6



7



8



9



10



11



12



13



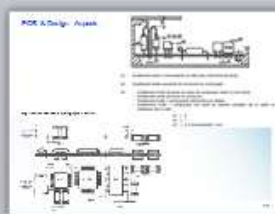
14



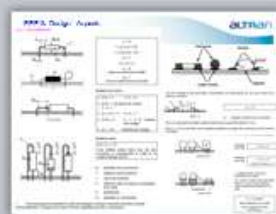
15



16



17



18



19



20



21



22



23



24



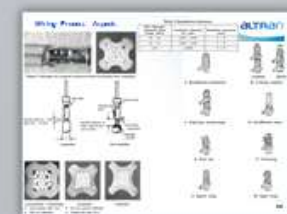
25



26



27



28